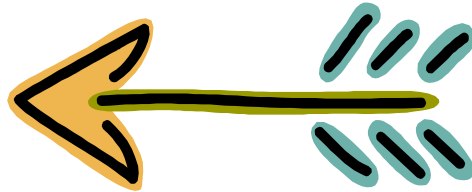


***To open the menu  
please click on the icon  
near the top left  
of this page.***



***To find keywords  
Enter the word in the “Find”  
Or “Search” box at the top.***

## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Brake Pipe Nuts	22 N·m	16 lb ft
Brake Pressure Modulator Valve (BPMV) Nuts	15 N·m	11 lb ft
Front Wheel Speed Sensor Bolt	8 N·m	71 lb in
Rear Wheel Speed Sensor Bolt	8 N·m	71 lb in



## ABS Component Specifications

Application	Specification	
	Metric	English
Antilock Brake System (ABS) Main Relay Operation Voltage	9-16 V	
Antilock Brake System (ABS) Type	4 Channel 4 Sensor	
Speed Ring		
┆ Inside Diameter - Front	69.6 mm	2.7401 in
┆ Inside Diameter - Rear	58 mm	2.2835 in
┆ Outside Diameter - Front	83.7 mm	3.2952 in
┆ Outside Diameter - Rear	69 mm	2.7165 in
┆ Tooth Volume of the Speed Ring (Front) ┆ Tooth Volume of the Speed Ring (Rear)	47 EA	
	40 EA	
Wheel Speed Sensor - Resistance	1,215-1,485	

## Antilock Brake System Automated Bleed Procedure

### Bleeding the ABS System

Perform a manual or pressure bleeding procedure. Refer to [Hydraulic Brake System Bleeding](#). If the desired brake pedal height results are not achieved, perform the automated bleed procedure below.

The procedure cycles the system valves and runs the pump in order to purge the air from the secondary circuits normally closed off during normal base brake operation and bleeding. The automated bleed procedure is recommended when air ingestion is suspected in the secondary circuits, or when the BPMV has been replaced.

### Automated Bleed Procedure

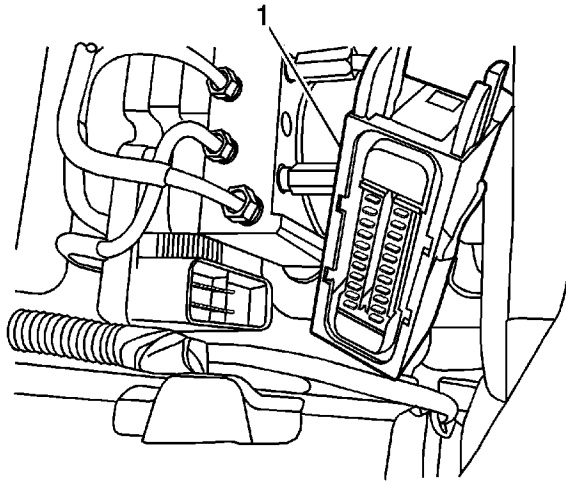
**Caution:** The Auto Bleed Procedure may be terminated at any time during the process by pressing the EXIT button. No further Scan Tool prompts pertaining to the Auto Bleed procedure will be given. After exiting the bleed procedure, relieve bleed pressure and disconnect bleed equipment per manufacturers instructions. Failure to properly relieve pressure may result in spilled brake fluid causing damage to components and painted surfaces.

1. Raise the vehicle on a suitable support. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove all four tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#).
3. Inspect the brake system for leaks and visual damage. Refer to [Brake Pipe and Hose Inspection](#) or [Symptoms - Hydraulic Brakes](#). Repair or replace as needed.
4. Inspect the battery state of charge. Refer to [Battery Inspection/Test](#).
5. Install a scan tool.
6. Turn ON the ignition, with the engine OFF.
7. With the scan tool, establish communications with the EBCM. Select Special Functions. Select Automated Bleed from the Special Functions menu.
8. Bleed the base brake system. Refer to [Hydraulic Brake System Bleeding](#).
9. Follow the scan tool directions until the desired brake pedal height is achieved.
10. If the bleed procedure is aborted, a malfunction exists. Perform the following steps before resuming the bleed procedure:
  - If a DTC is detected, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) and diagnose the appropriate DTC.
  - If the brake pedal feels spongy, perform the conventional brake bleed procedure again. Refer to [Hydraulic Brake System Bleeding](#).
11. When the desired pedal height is achieved, press the brake pedal in order to inspect for firmness.
12. Remove the scan tool.
13. Install the tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#).
14. Inspect the brake fluid level.
15. Road test the vehicle while inspecting that the pedal remains high and firm.

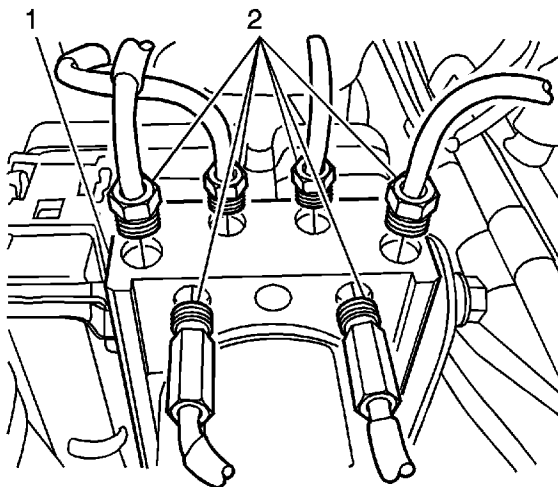
## Brake Pressure Modulator Valve Assembly Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the electronic brake control module (EBCM) connector (1).



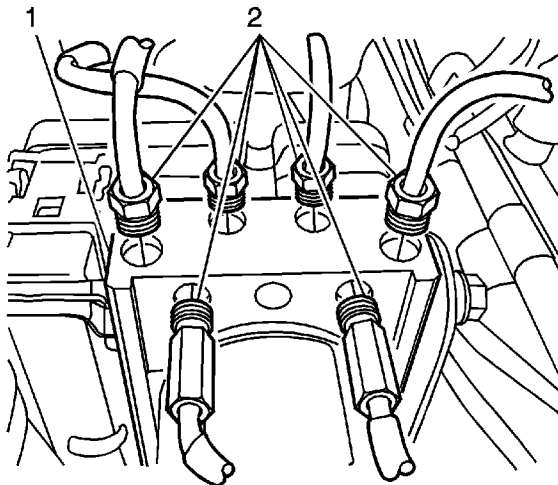
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**Note:** Take care not to allow air into the hydraulic unit or into the brake pipes from the master cylinder. If air gets into the hydraulic unit, it will require a bleeding procedure using a scan tool programmed for the ABS 5.3 system. As long as no air enters the hydraulic unit, a simple bleeding procedure is all the system will require.

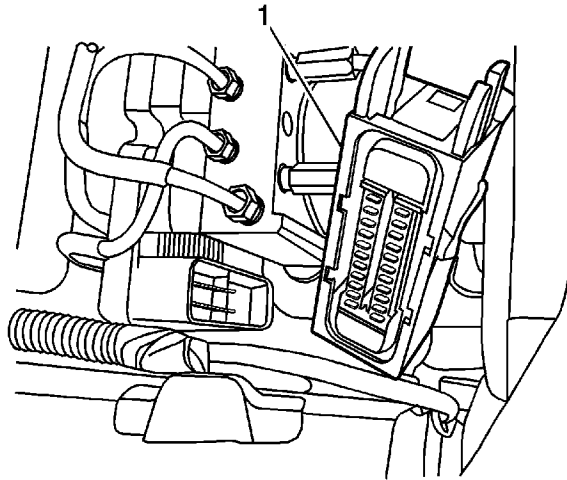
3. Remove the brake pipes from the brake pressure modulator valve (BMPV) assembly.
4. Plug the brake pipes.
5. Loosen the mounting nuts (2) on the BMPV assembly (1).
6. Position the brake pipes aside far enough to allow for lifting the BMPV assembly from the mounting bracket. It may be necessary to loosen the brake pipes on the master cylinder to allow for moving those pipes out of the way.
7. Remove the BMPV assembly from the mounting bracket.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the BMPV assembly (1) into the mounting bracket. Secure with two nuts (2) and tighten to **15 N·m (11 lb ft)**.
2. Remove the plugs from the brake pipes and connect the brake pipes to the BMPV assembly (1) and tighten to **22 N·m (16 lb ft)**.

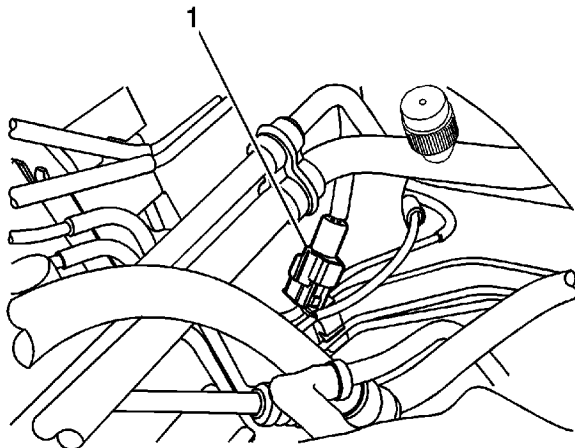


3. Connect the EBCM connector (1).
4. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
5. Bleed the brake system. Refer to [Hydraulic Brake System Bleeding](#).
6. Perform the [Diagnostic System Check - Vehicle](#).
7. Refer to [Control Module References](#) for programming and setup information.

## Front Wheel Speed Sensor Replacement

### Removal Procedure

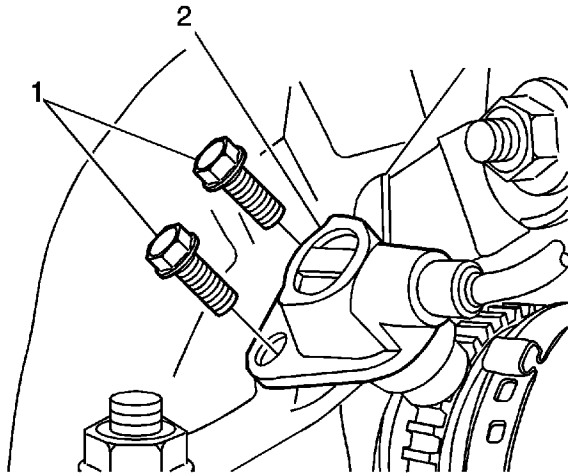
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the front wheel speed sensor electrical connector (1).

**Danger:** To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

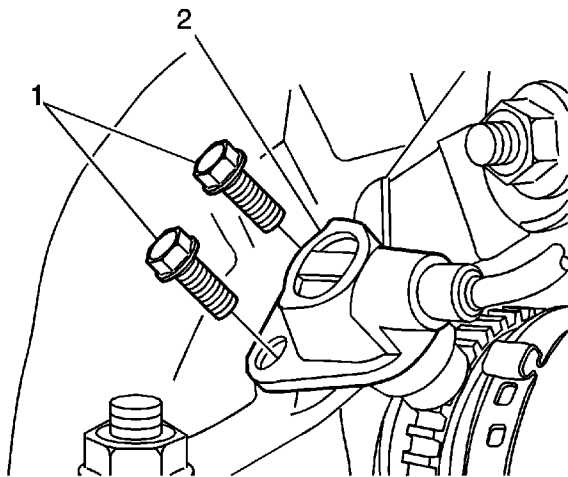
3. Raise and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
4. Remove the wheel. Refer to [Tire and Wheel Removal and Installation](#).



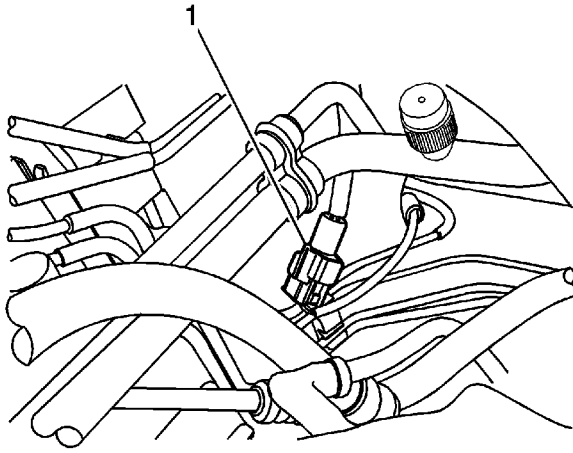
5. Remove the bolts (1) and the front wheel speed sensor (2) from the steering knuckle.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the front wheel speed sensor (2) to the steering knuckle. Secure it with the bolts (1) and tighten to **8 N·m (71 lb in)**.
2. Install the wheel. Refer to [Tire and Wheel Removal and Installation](#).
3. Lower the vehicle.



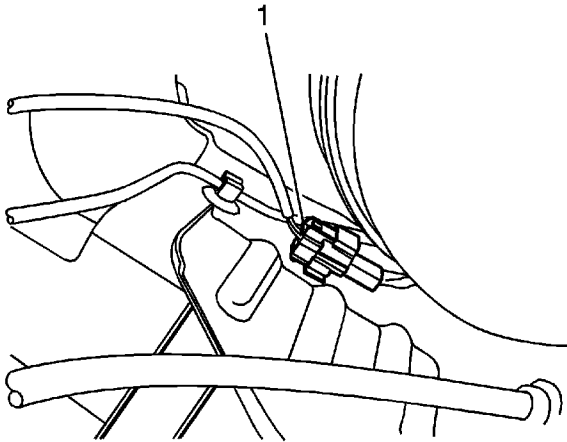
4. Connect the front wheel speed sensor electrical connector (1).
5. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).



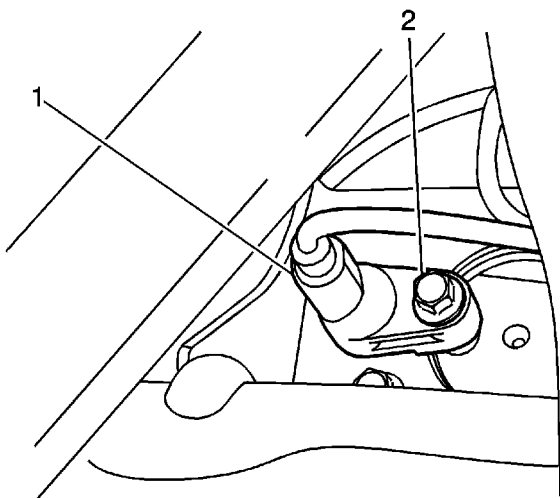
## Rear Wheel Speed Sensor Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



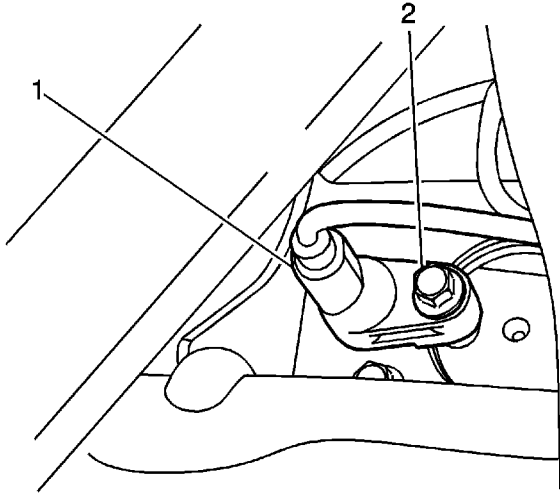
1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the rear wheel speed sensor electrical connector (1).



3. Remove the rear wheel speed sensor bolt (2).
4. Remove the rear wheel speed sensor (1) from the backing plate.

## Installation Procedure

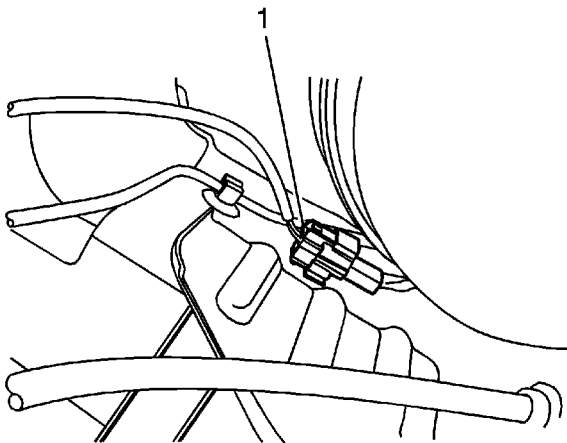
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the rear wheel speed sensor (1) to the backing plate. Secure it with the bolt (2).

### **Tighten**

Tighten the rear wheel speed sensor bolt to 8 N·m (71 lb in).

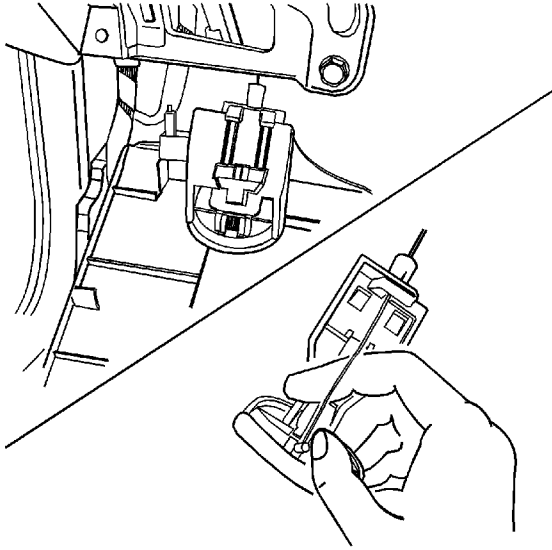




2. Connect the rear wheel speed sensor electrical connector (1).
3. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

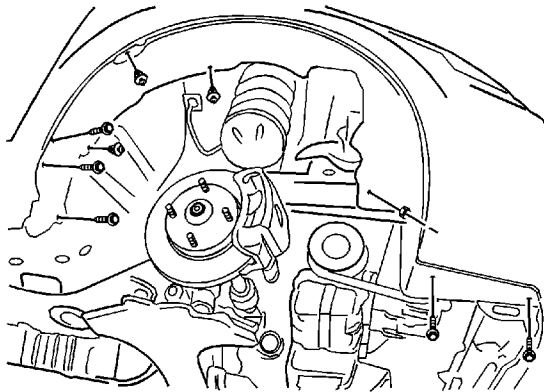
## Hood Primary Latch Release Cable Replacement

### Removal Procedure



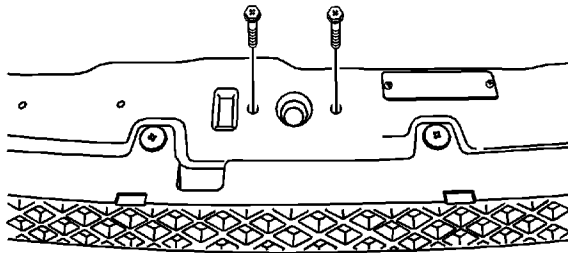
1. Pull out the hood release handle in order to access the screws.
2. Remove the screws and the hood release handle from the instrument panel.

**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.

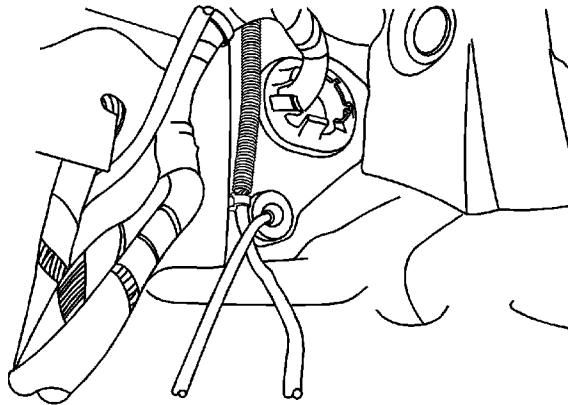




3. Raise and suitably support the vehicle.
4. Remove the front wheel. Refer to [Tire and Wheel Removal and Installation](#).
5. Remove the screws and the splash shield.

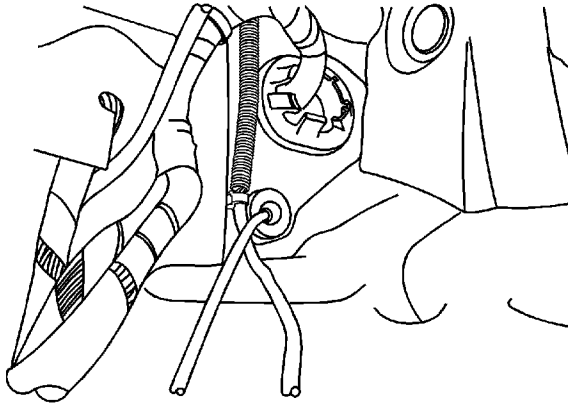


6. Open the hood.
7. Remove the screws and the hood secondary latch.



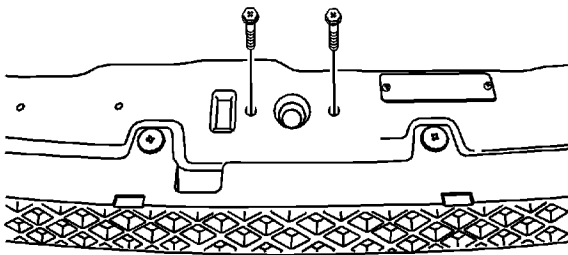
8. Remove the cable from the hood release handle.
9. Remove the cable from inside the vehicle.

## Installation Procedure

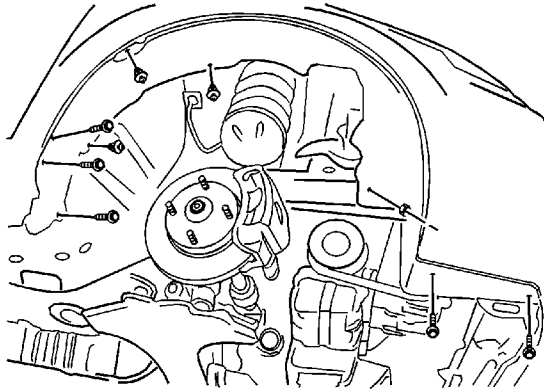


1. Install the cable from inside the vehicle.
2. Install the cable to the hood release handle.

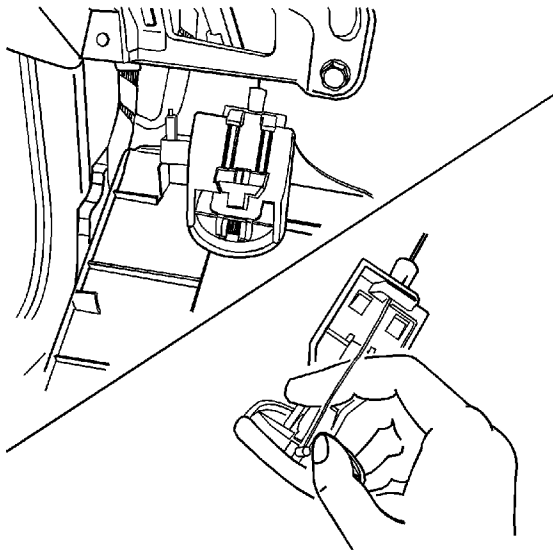
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



3. Install the screws and the hood secondary latch and tighten to **8 N·m (71 lb in)**.



4. Install the splash shield with the screws and tighten to **1.5 N·m (13 lb in)**.

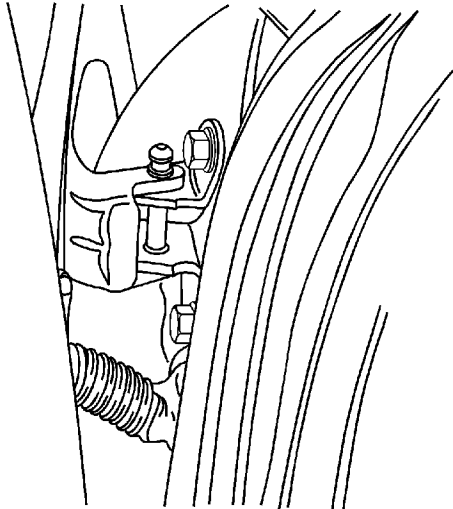


5. Install the front wheel. Refer to [Tire and Wheel Removal and Installation](#).
6. Lower the vehicle.
7. Install the hood release on the instrument panel with the screws and tighten to **1.5 N·m (13 lb in)**.

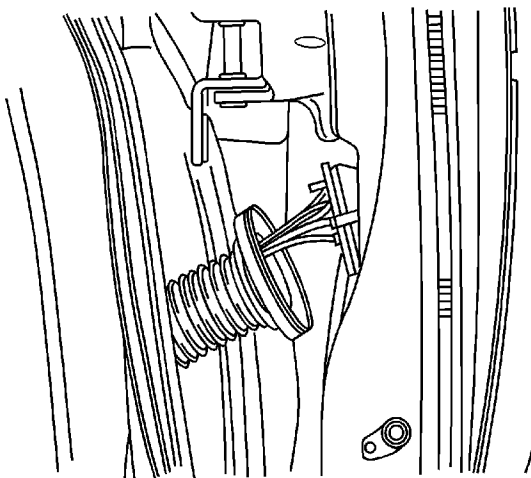
## Front Side Door Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the door hold open link. Refer to [Door Check Link Replacement](#).
3. Remove the body-to-door rubber grommet and the electrical wires.
4. With the aid of another technician, remove the bolts and the front door.

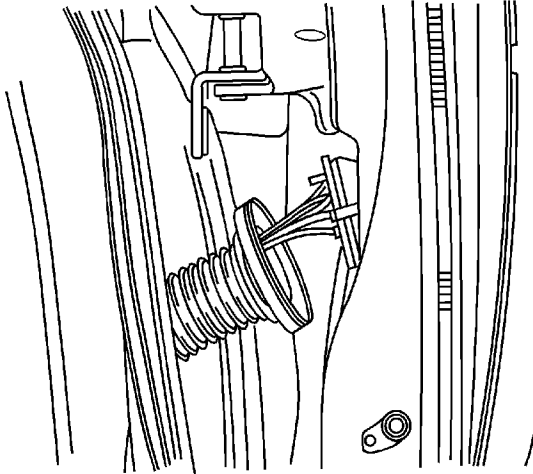




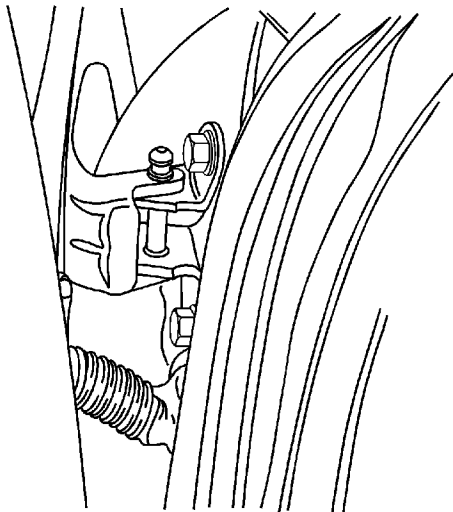


5. Disconnect the body-to-door rubber grommet and the electrical connector.

## Installation Procedure



1. Connect the electrical connector and the body-to-door rubber grommet.



2. With the aid of another technician, lightly secure the front door with the bolts.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Adjust the door for proper fit.

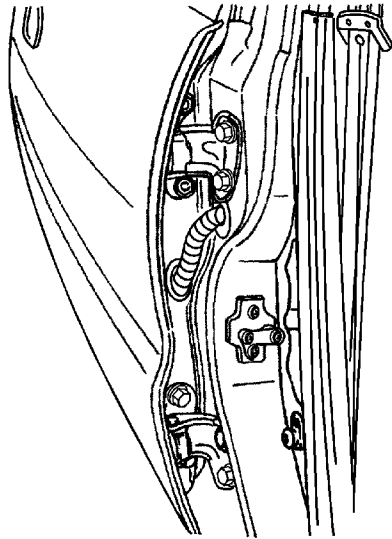
**Tighten**

- Tighten the door hinge-to-body bolts to 35 N·m (26 lb ft).
  - Tighten the door hinge-to-door bolts to 15 N·m (11 lb ft).
4. Install the door hold open link. Refer to [Door Check Link Replacement](#).
  5. Connect the negative battery cable.
  6. Perform the waterleak test. Refer to [Waterleak Test Preparation](#).
  7. Check for windnoise. Refer to [Air/Wind Noise](#).

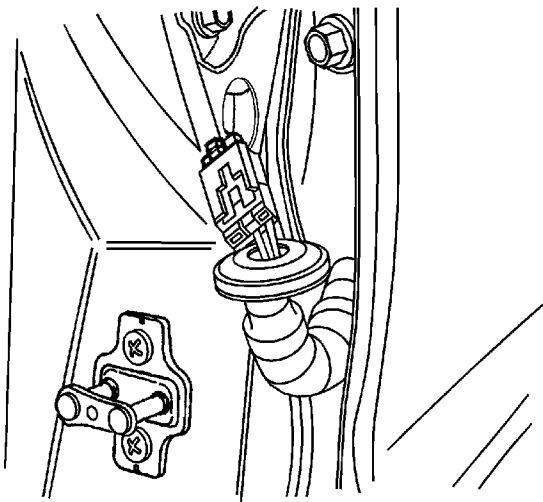
## Rear Door Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



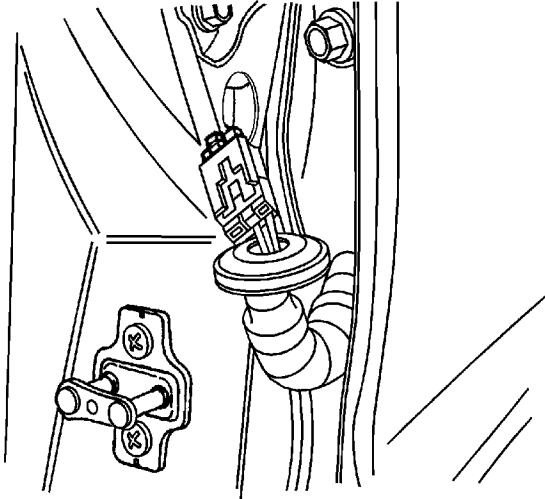
1. Disconnect the negative battery cable.
2. Remove the door hold open link. Refer to [Door Check Link Replacement](#).
3. With the aid of another technician, remove the bolts and the rear door.



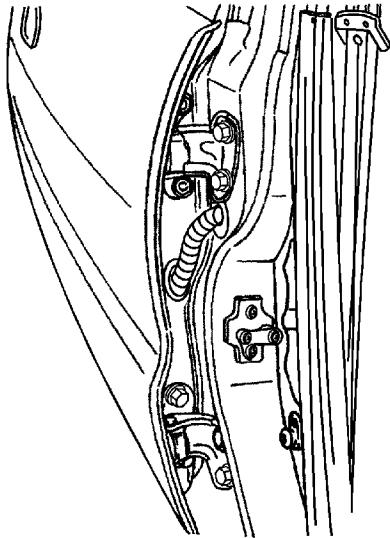
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4. Disconnect the body-to-door rubber grommet and the electrical connector.

## Installation Procedure



1. Connect the body-to-door rubber grommet and the electrical connector.



2. With the aid of another technician, lightly secure the rear door with the bolts.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Adjust the door for proper fit.

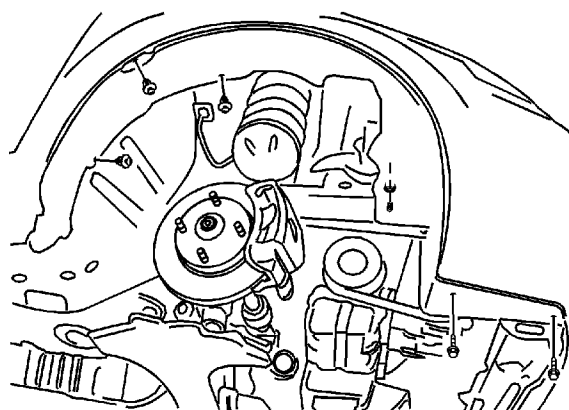
**Tighten**

- Tighten the door hinge-to-body bolts to 35 N·m (26 lb ft).
  - Tighten the door hinge-to-door bolts to 15 N·m (11 lb ft).
4. Install the rear door hold open link. Refer to [Door Check Link Replacement](#).
  5. Connect the negative battery cable.
  6. Perform the waterleak test. Refer to [Waterleak Test Preparation](#).
  7. Check for windnoise. Refer to [Air/Wind Noise](#).

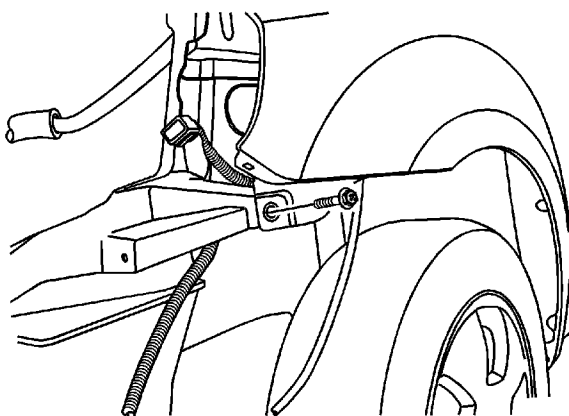
## Front Fender Replacement (Notchback)

### Removal Procedure

**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.

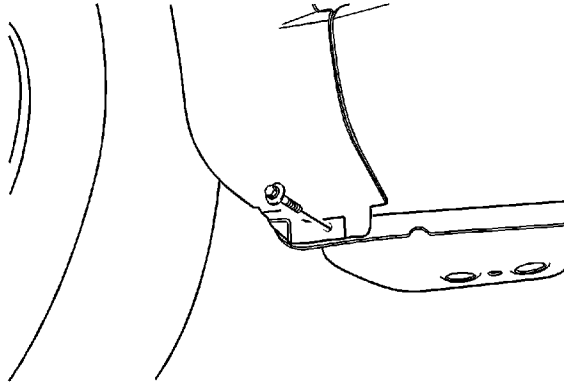


1. Raise and suitably support the vehicle.
2. Remove the necessary bolts from the splash shield.
3. Remove the headlamp assembly. Refer to [Headlamp Replacement](#).
4. Remove the two screws attaching the front fascia to the fender.

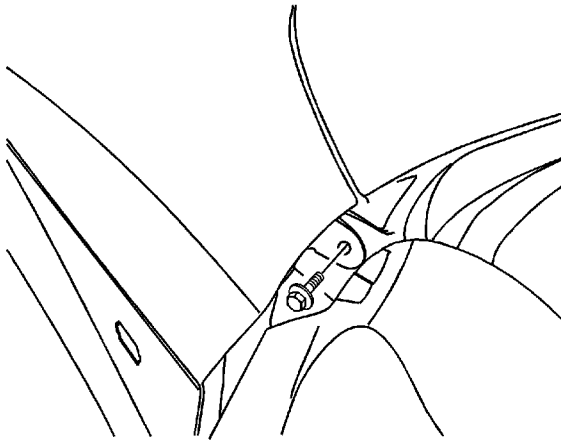




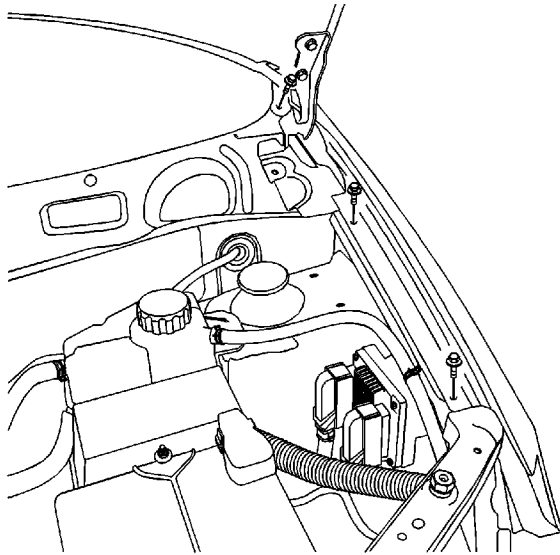
5. Remove the screws underneath the front bumper fascia.



6. Remove the bolt at the base of the fender.
7. Remove the air inlet panel. Refer to [Air Inlet Grille Panel Replacement](#).

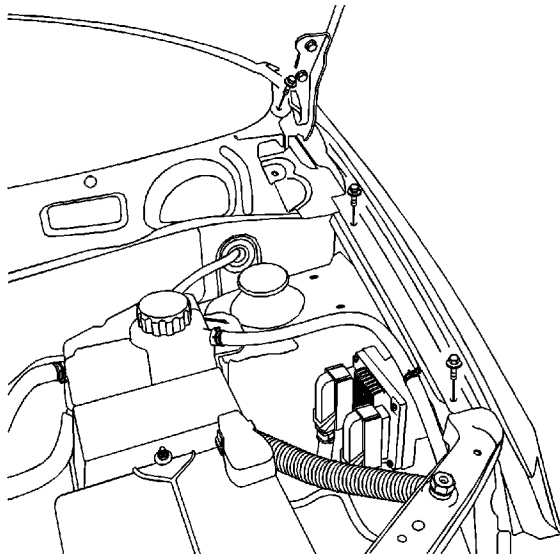


8. Open the front door. Remove the bolt at the base of the windshield pillar.



9. Remove the bolts along the top of the fender.
10. Remove the repeater lamp. Refer to [Repeater Lamp Replacement](#).
11. Remove the fender.

## Installation Procedure

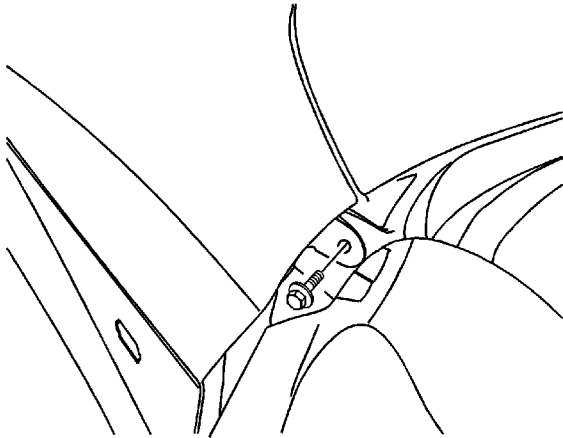


1. Install the fender.
2. Install the repeater lamp. Refer to [Repeater Lamp Replacement](#).

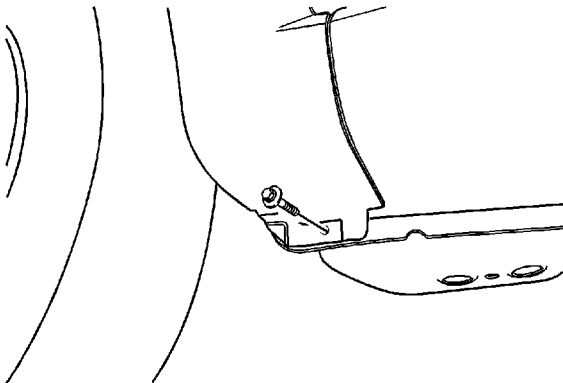
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the bolts along the top of the fender and tighten to **10 N·m (89 lb in)**.

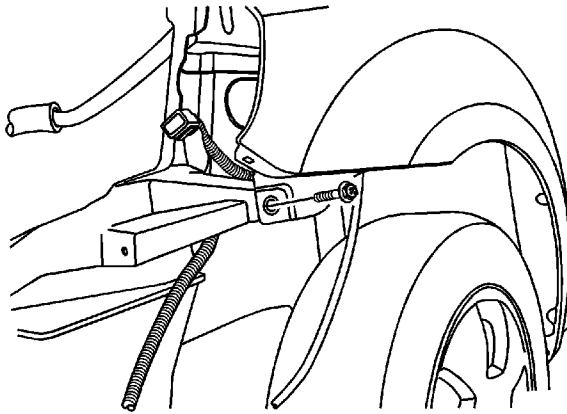




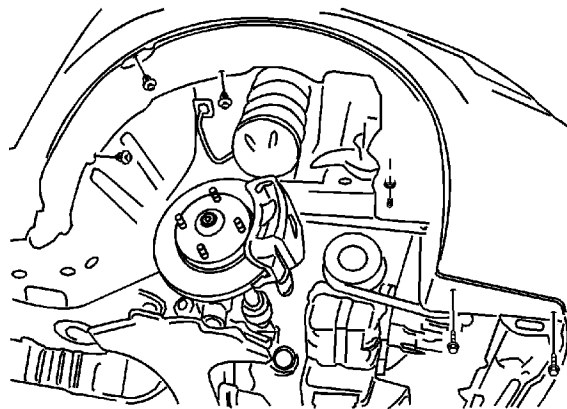
4. Install the bolt at the base of the windshield pillar and tighten to **8 N·m (71 lb in)**.
5. Install the air inlet panel. Refer to [Air Inlet Grille Panel Replacement](#).



6. Install the bolts at the base of the fender and tighten to **10 N·m (89 lb in)**.



7. Secure the fender to the front bumper fascia with the screw and tighten to **1.5 N·m (13 lb in)**.
8. Secure the fender behind the front bumper fascia with the screws and tighten to **4 N·m (35 lb in)**.



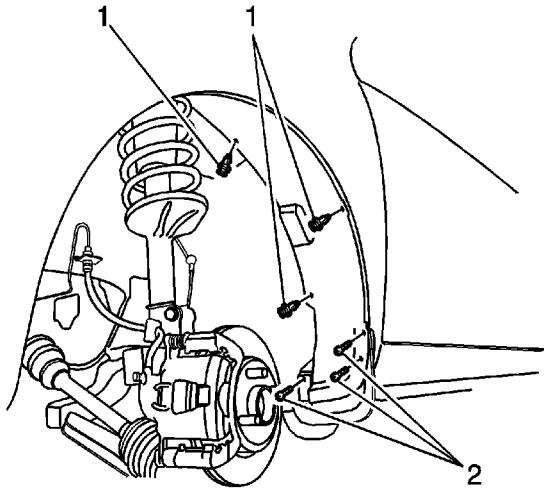
9. Install the necessary splash shield screws and tighten to **1.5 N·m (13 lb in)**.
10. Install the headlamp. Refer to [Headlamp Replacement](#).
11. Lower the vehicle.

## Front Fender Replacement (Hatchback)

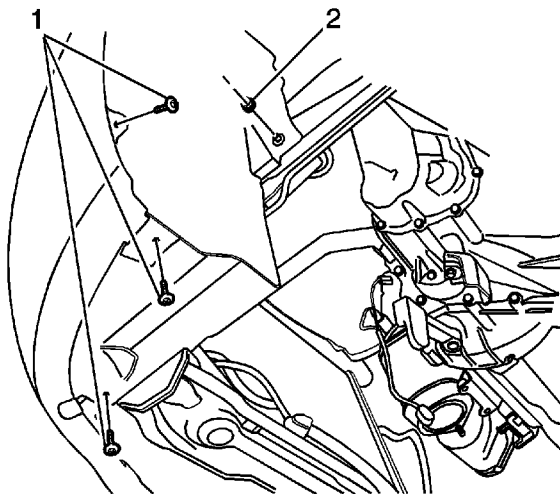
### Removal Procedure

**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.

1. Raise and suitably support the vehicle.
2. Remove the front wheel. Refer to [Tire and Wheel Removal and Installation](#).

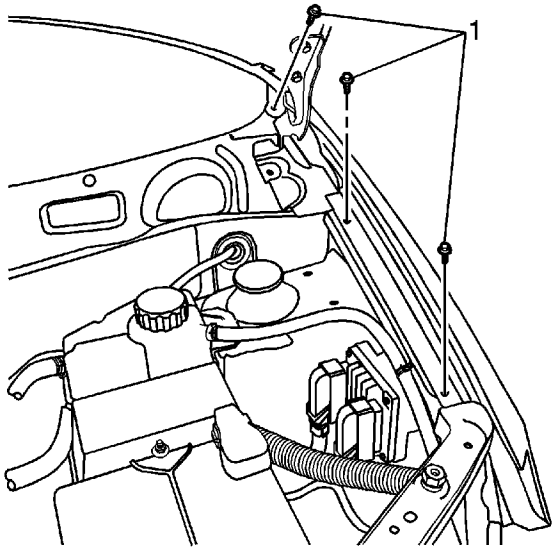


3. Remove the fender liner to mud guard bolts (2).
4. Remove the fender liner clips (1).

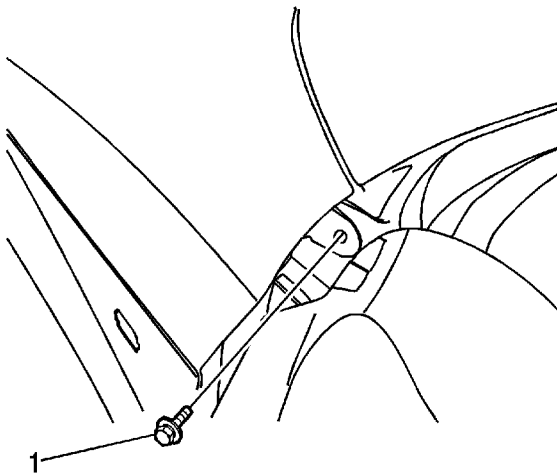




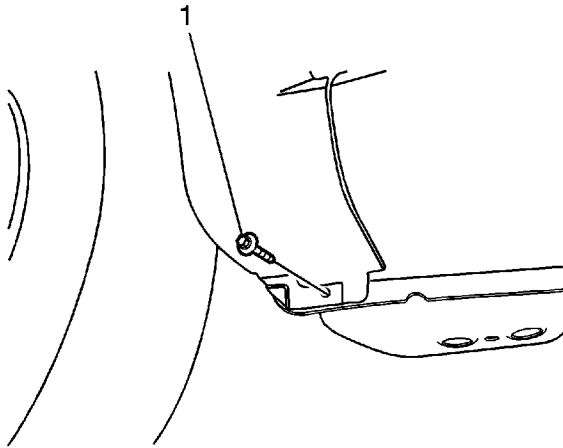
5. Remove the fender liner nuts (2) and screws (1).
6. Remove the fascia grille. Refer to [Fascia Grille Replacement](#).
7. Remove the front fascia. Refer to [Front Bumper Fascia Replacement](#).
8. Remove the left side of the air inlet panel. Refer to [Air Inlet Grille Panel Replacement](#).
9. Remove the side marker lamps. Refer to [Front Side Marker Lamp Replacement](#).



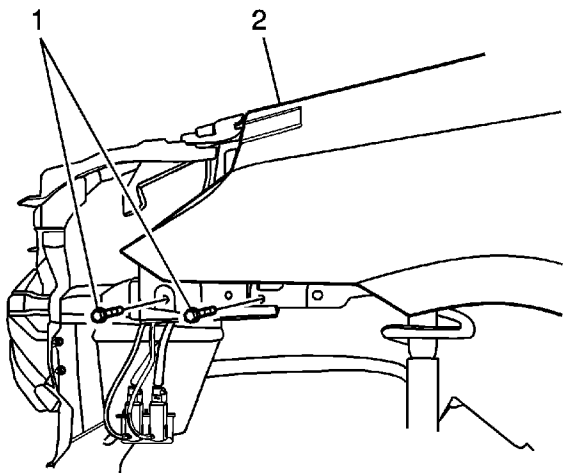
10. Remove the upper fender bolts (1).



11. Open the front door. Remove the bolt at the base of the windshield pillar (1).

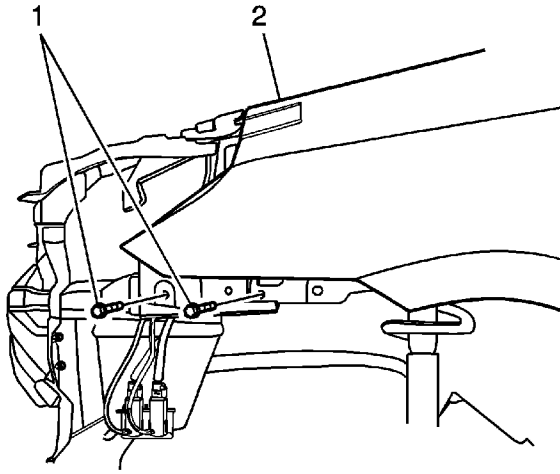


12. Remove the bolt (1) at the base of the fender.



13. Remove the front fender bolts (1).  
14. Remove the fender (2) from the vehicle.

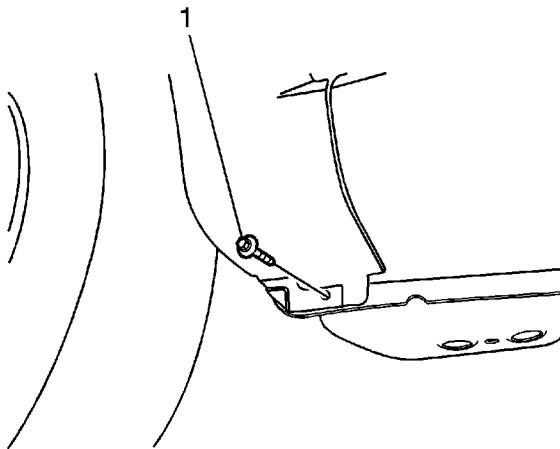
## Installation Procedure



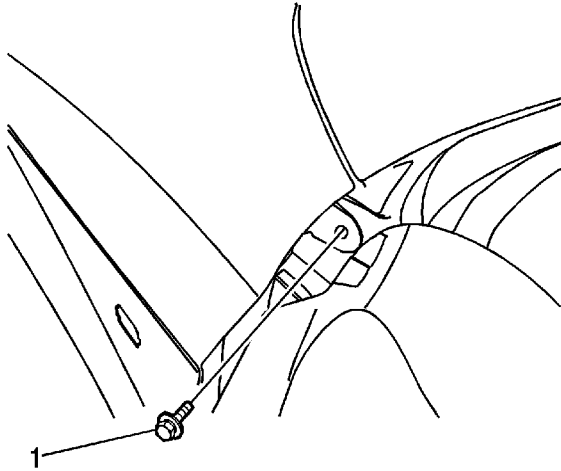
1. Install the fender (2) to the vehicle.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

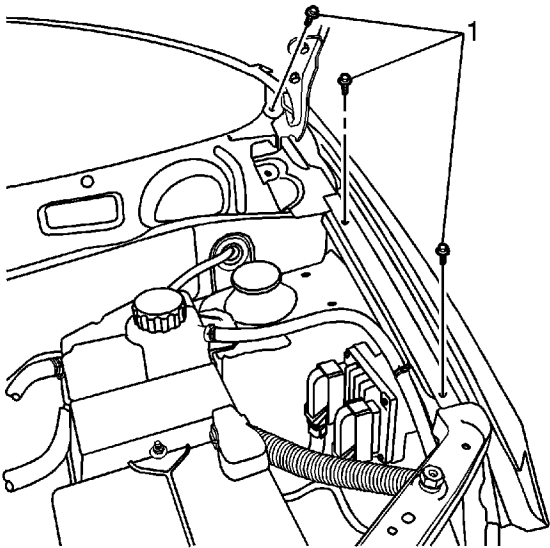
2. Install the front fender bolts (1) and tighten to **8 N·m (71 lb in)**.



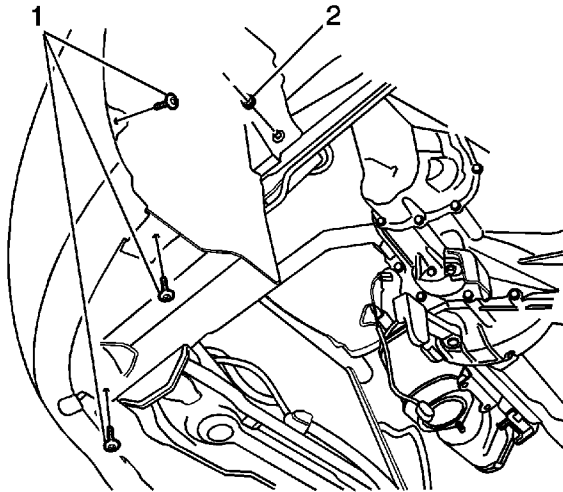
3. Install the bolt (1) at the base of the fender and tighten to **8 N·m (71 lb in)**.



4. Install the bolt at the base of the Windshield Pillar (1) and tighten to **8 N·m (71 lb in)**.



5. Install the upper fender bolts (1) and tighten to **8 N·m (71 lb in)**.
6. Install the side marker lamps. Refer to [Front Side Marker Lamp Replacement](#).
7. Install the left side of the air inlet panel. Refer to [Air Inlet Grille Panel Replacement](#).
8. Install the front fascia. Refer to [Front Bumper Fascia Replacement](#).
9. Install the fascia grille. Refer to [Fascia Grille Replacement](#).



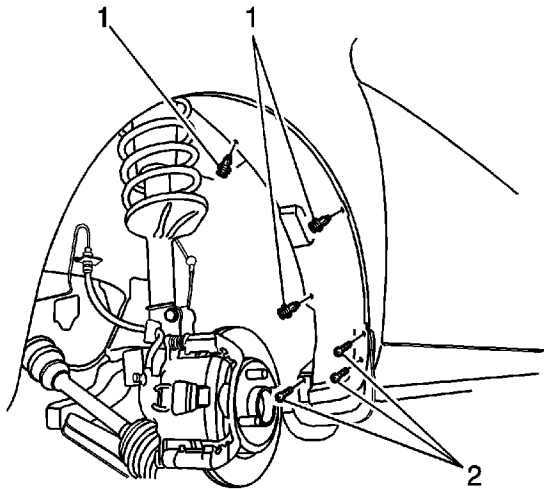
10. Install the fender liner nuts (2) and screws (1).

**Tighten**

Tighten the fender liner nuts to 13 N·m (113 lb in).

**Tighten**

Tighten the fender liner bolts to 1.5 N·m (13 lb in).

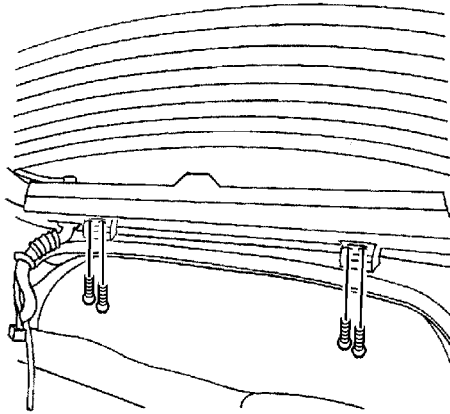


11. Install the fender liner clips (1).  
12. Install the fender liner to mud guard bolts (2) and tighten to **1.5 N·m (13 lb in)**.  
13. Install the front wheel. Refer to [Tire and Wheel Removal and Installation](#).  
14. Lower the vehicle.



## Liftgate Replacement

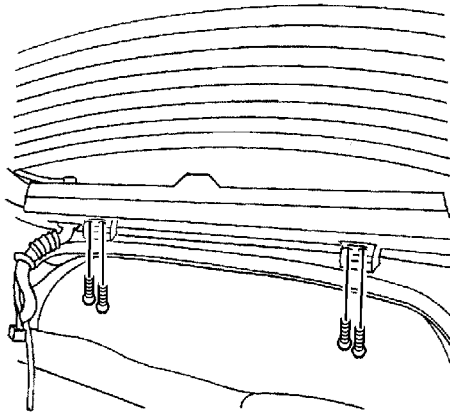
### Removal Procedure



1. Open and suitably support the hatchback door.
2. Disconnect the hatchback door grommet, the electrical connector, and the washer hose.
3. Remove the gas support assemblies from the hatchback door and the body. Refer to [Liftgate Strut Replacement](#).
4. With the aid of another technician, remove the bolts and the hatchback door from the hinges.

### Installation Procedure

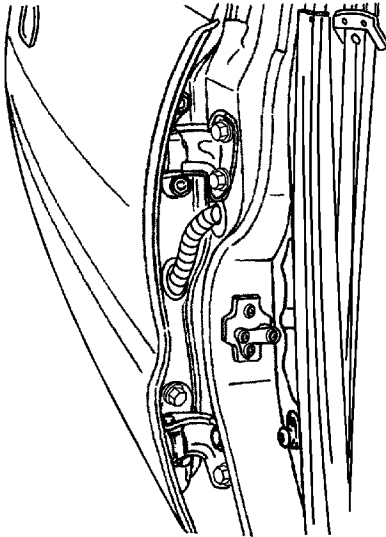
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. With the aid of another technician, install the hatchback door to the hinges with the bolts and tighten to **20 N·m (15 lb ft)**.
2. Install the gas support assemblies to the hatchback door and the body. Refer to [Liftgate Strut Replacement](#).
3. Connect the hatchback door electrical connector, the washer hose, and the grommet.
4. Close the hatchback door.

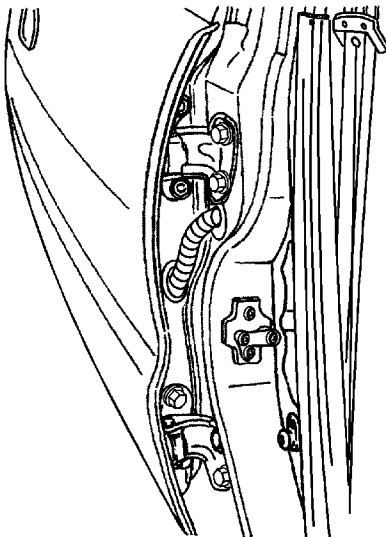
## Door Hinge Replacement

### Removal Procedure



With the aid of another technician, remove the bolts and the hinge from the door and the body.

### Installation Procedure





**Caution:** Refer to [Fastener Caution](#) in the Preface section.

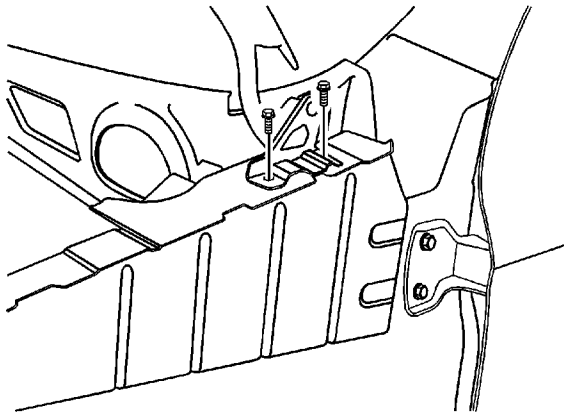
With the aid of another technician, install the hinge to the door and the body with the bolts.

### **Tighten**

- Tighten the door hinge-to-body bolts to 35 N·m (26 lb ft).
- Tighten the door hinge-to-door bolts to 15 N·m (11 lb ft).

## Hood Hinge Replacement

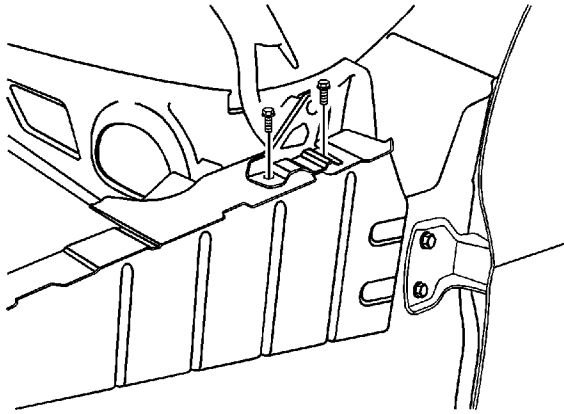
### Removal Procedure



1. Remove the hood. Refer to [Hood Replacement](#).
2. Remove the bolts and the hinge.

### Installation Procedure

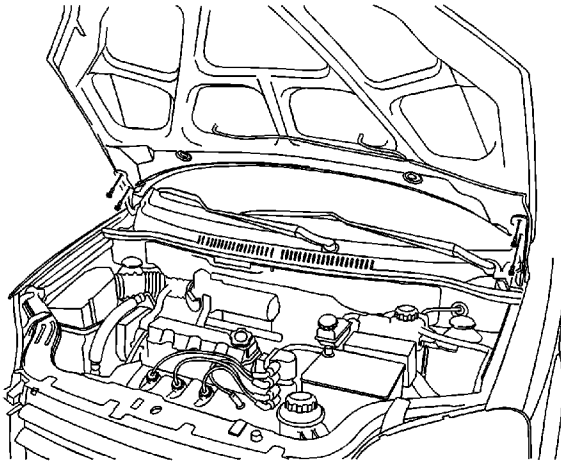
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the hinge with the bolts and tighten to **20 N·m (15 lb ft)**.
2. Install the hood. Refer to [Hood Replacement](#).

## Hood Replacement

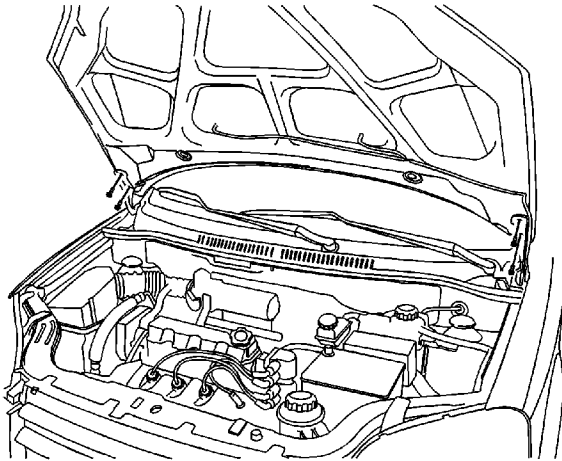
### Removal Procedure



**Note:** Install protective coverings over the fenders and the windshield in order to prevent damage to the paint, the glass, and the moldings when removing and installing the hood.

1. Raise and support the hood.
2. Remove the washer hose.
3. Mark the position of the hinge to the hood in order to aid in alignment during installation.
4. Remove the bolts retaining the hood to both hinges.
5. With the aid of another technician, remove the hood from the hinges.

### Installation Procedure



1. With the aid of another technician, position the hood in the location marked during removal.

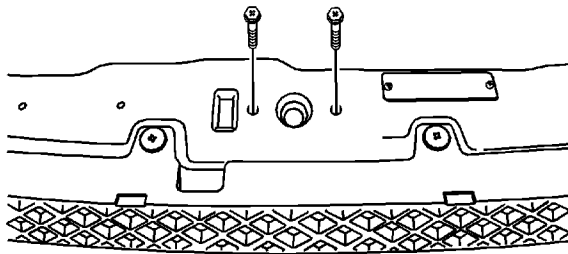
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the 2 bolts securing the hood to each hinge and tighten to **20 N·m (15 lb ft)**.
3. Install the washer hose.
4. Inspect the hood for proper alignment.



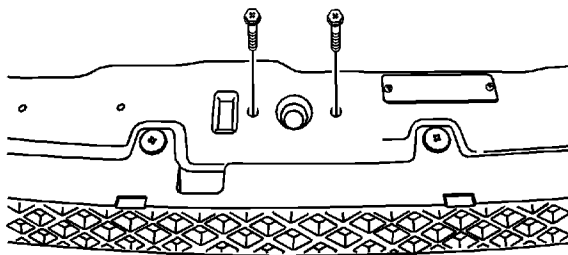
## Hood Primary and Secondary Latch Replacement

### Removal Procedure



1. Open the hood.
2. Remove the screws and the hood latch.
3. Disconnect the hood release cable.

### Installation Procedure





1. Connect the hood release cable to the latch.

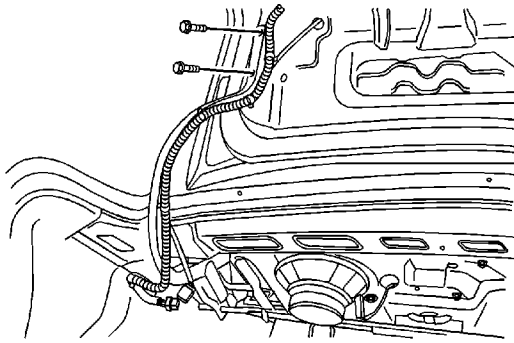
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the hood latch with the screws and tighten to **8 N·m (71 lb in)**.

## Rear Compartment Lid Replacement

### Removal Procedure

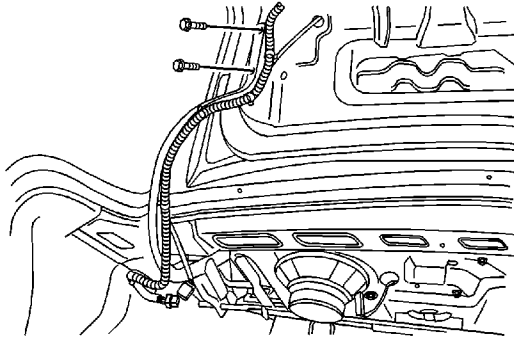
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the electrical connector.
3. Disconnect the electrical harness from the rear deck lid hinge arm.
4. Remove the bolts and the rear deck lid.

### Installation Procedure

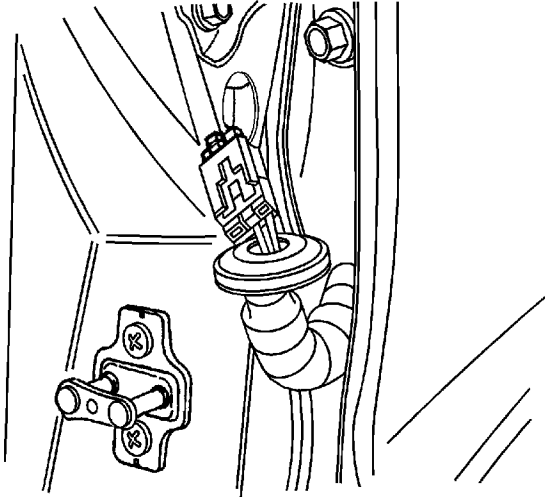
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the rear deck lid with the bolts and tighten to **10 N·m (89 lb in)**.
2. Connect the electrical harness to the rear deck lid hinge arm.
3. Connect the electrical connector.
4. Connect the negative battery cable.

## Door Check Link Replacement

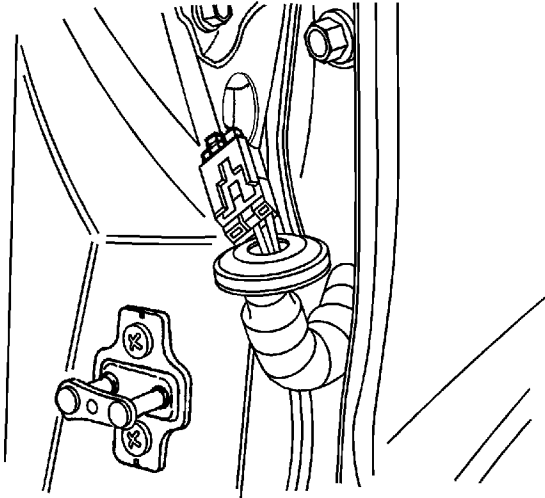
### Removal Procedure



1. Remove the door trim panel. Refer to [Front Side Door Trim Panel Replacement](#).
2. Reposition the door seal trim.
3. Remove the bolts on the door and on the body.
4. Remove the door hold open link.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



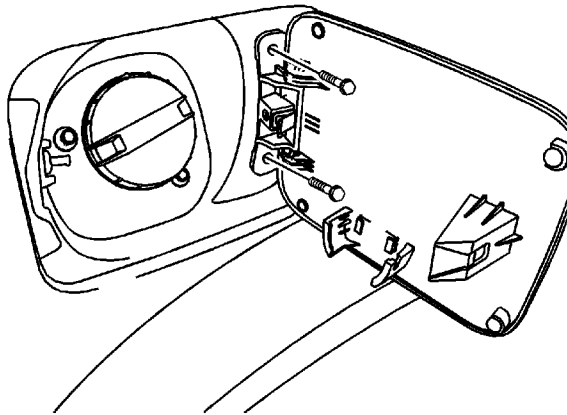
1. Install the door hold open link to the door and the body with the bolts.

#### **Tighten**

- Tighten the door hold open link-to-body bolts to 35 N·m (26 lb ft).
  - Tighten the door hold open link-to-door bolts to 5 N·m (44 lb in).
2. Reposition the door seal trim.
  3. Install the door trim panel. Refer to [Front Side Door Trim Panel Replacement](#).

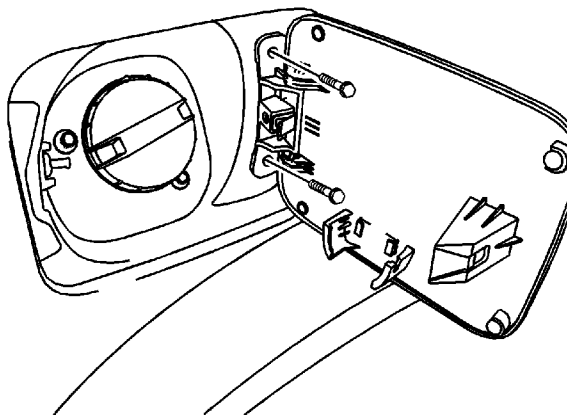
## Fuel Tank Filler Door Replacement

### Removal Procedure



Remove the screws and the fuel filler door.

### Installation Procedure





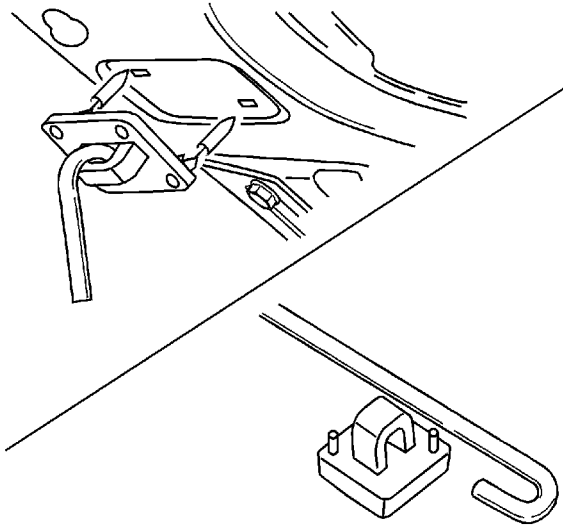
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

Install the fuel filler door with the screws and tighten to **2 N·m (18 lb in)**.



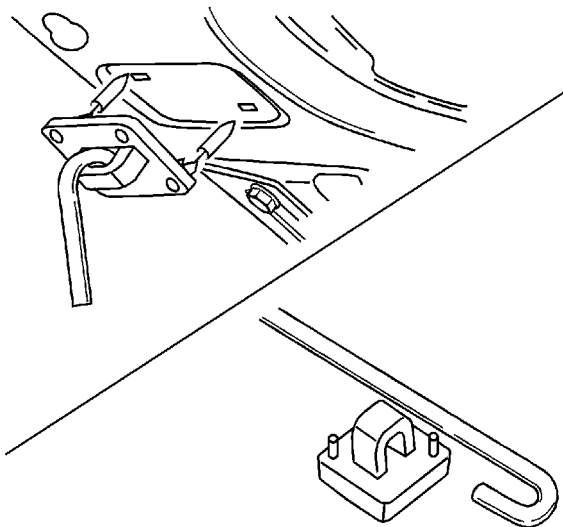
## Hood Hold-Open Rod Replacement

### Removal Procedure



1. Support the hood in the open position.
2. Remove the hood prop rod by gently prying the base from the radiator support.

### Installation Procedure

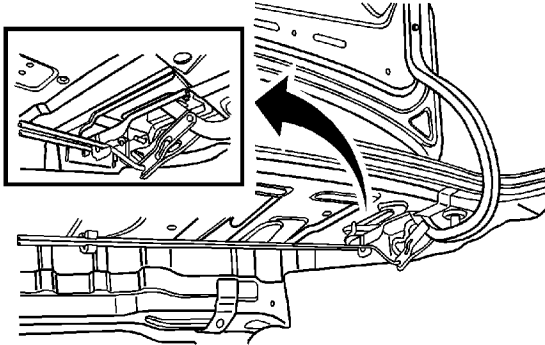




1. Install the hood prop rod by snapping the base back into the radiator support.
2. Close the hood.

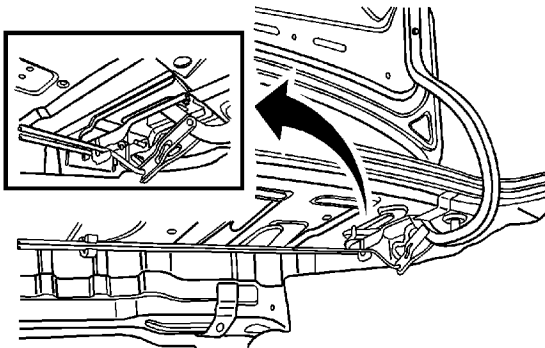
## Rear Compartment Lid Hinge Torque Rod Replacement

### Removal Procedure



1. Remove the torque rod from the rear deck lid hinge arm.
2. Remove the torque rod from the hinges.

### Installation Procedure



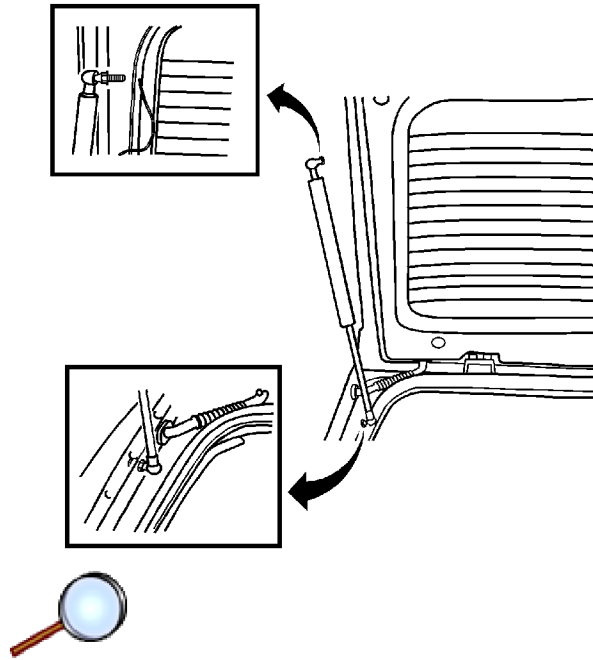


1. Install the torque rod onto the hinges.
2. Install the torque rod onto the rear deck lid hinge arm.

## Liftgate Strut Replacement

### Removal Procedure

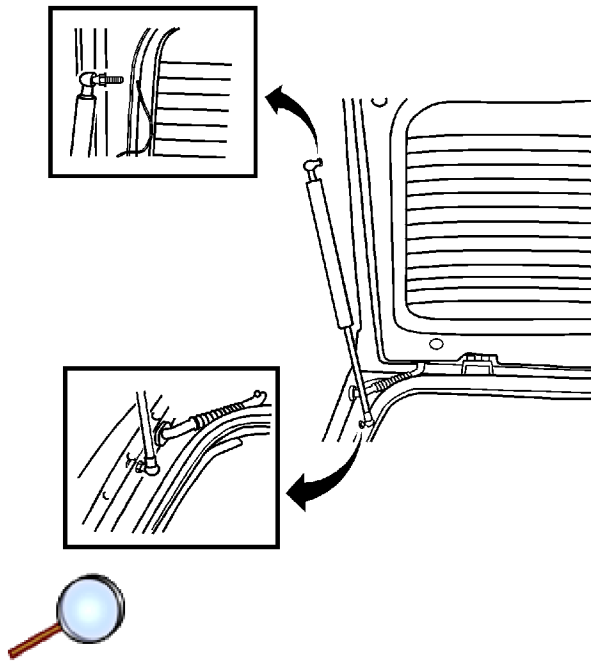
**Caution:** Refer to [Liftgate Assist Rod Caution](#) in the Preface section.



1. Open and suitably support the hatchback door.
2. Unscrew and remove the gas support assembly from the hatchback door and the body.

### Installation Procedure

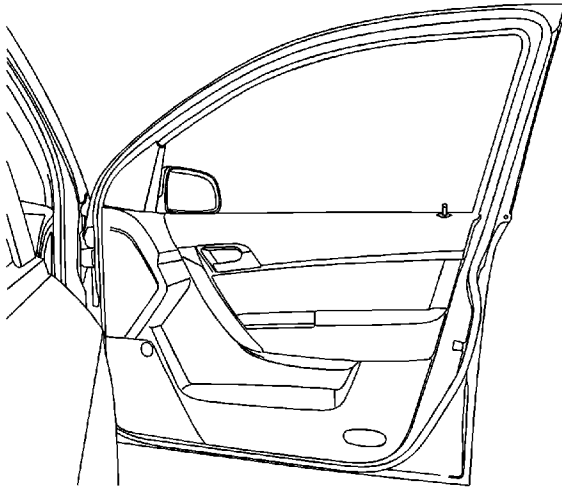
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the gas support assembly onto the hatchback door and the body and tighten to **8 N·m (71 lb in)**.
2. Close the hatchback door.

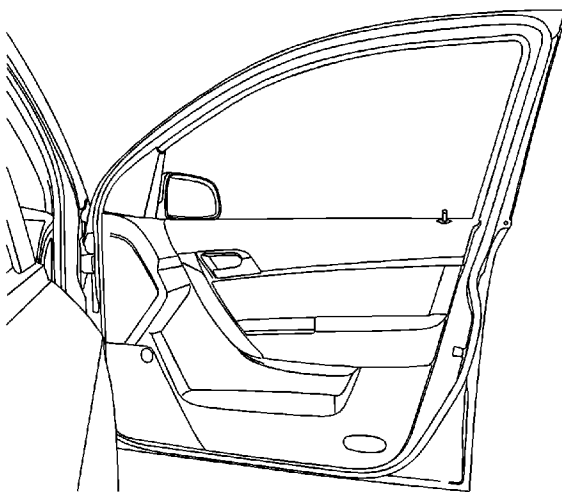
## Door Weatherstrip Replacement

### Removal Procedure



1. Remove the door hold open link-to-body bolt.
2. Remove the door weatherstrip.

### Installation Procedure





1. Install the door weatherstrip.

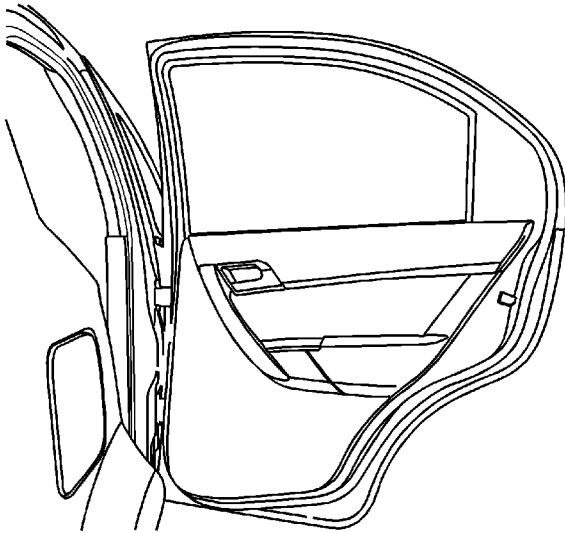
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the door hold open link to the body with the bolt and tighten to **35 N·m (26 lb ft)**.



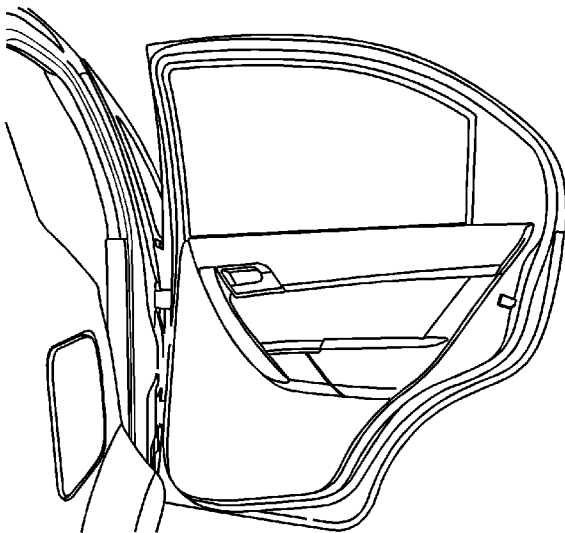
## Door Opening Weatherstrip Replacement

### Removal Procedure



Remove the door opening weatherstrip.

### Installation Procedure

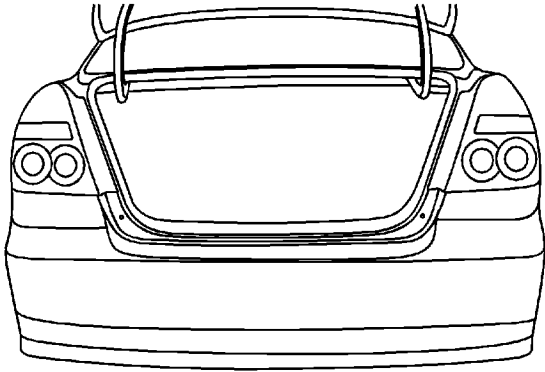




Install the door opening weatherstrip.

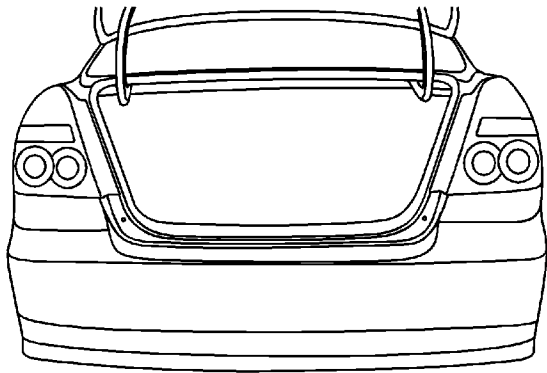
## Rear Compartment Lid Weatherstrip Replacement

### Removal Procedure



1. Open the luggage compartment lid.
2. Remove the luggage compartment rear trim panel. Refer to [Rear Compartment Trim Panel Replacement](#).
3. Remove the weatherstrip from around the gutter.

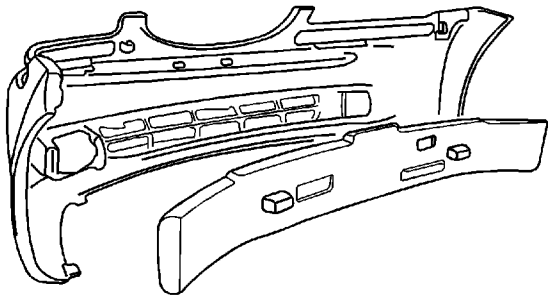
### Installation Procedure



1. Install the weatherstrip onto the gutter flange.
2. Inspect the weatherstrip. Make sure that the clinch is completely seated onto the flange.
3. Using a water hose without a nozzle, test the rear deck lid to make sure that no leaks are present.
4. Install the luggage compartment rear trim panels. Refer to [Rear Compartment Trim Panel Replacement](#) .

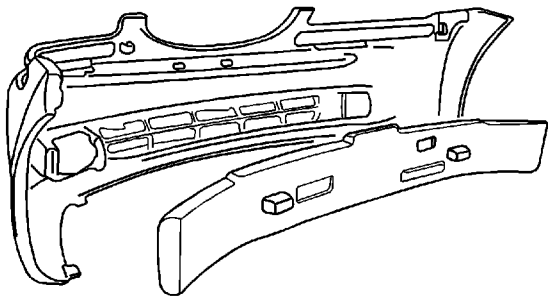
## Front Bumper Fascia Energy Absorber Replacement

### Removal Procedure



1. Remove the front bumper fascia. Refer to [Front Bumper Fascia Replacement](#) .
2. Remove the front bumper energy absorber.

### Installation Procedure

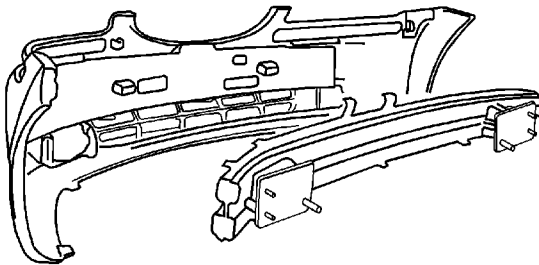




1. Install the front bumper energy absorber.
2. Install the front bumper fascia. Refer to [Front Bumper Fascia Replacement](#) .

## Front Bumper Impact Bar Replacement (Hatchback)

### Removal Procedure

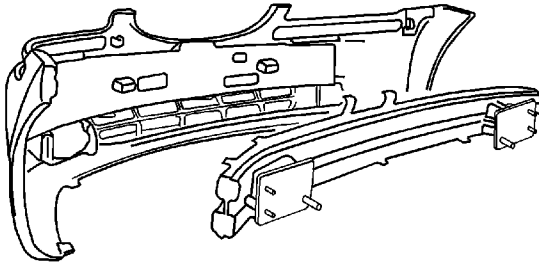


1. Remove the front bumper fascia.

Refer to [Front Bumper Fascia Replacement](#) .

2. Remove the front bumper impact beam.

### Installation Procedure



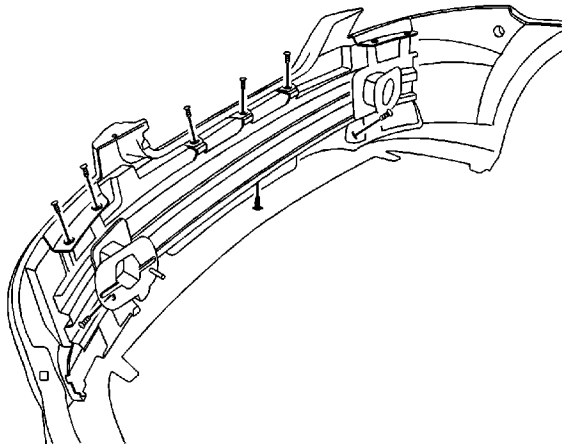
1. Install the front bumper impact beam.
2. Install the front bumper fascia.

Refer to [Front Bumper Fascia Replacement](#) .



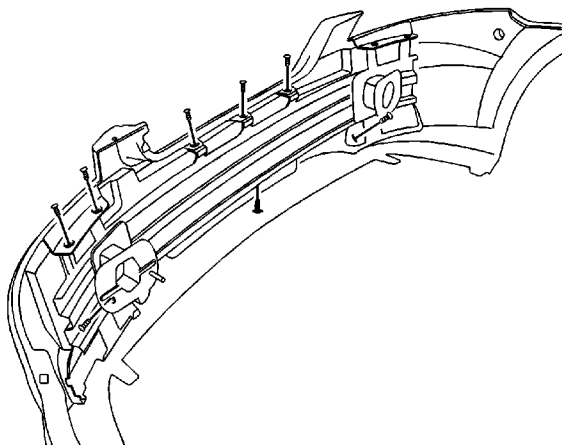
## Front Bumper Impact Bar Replacement (Notchback)

### Removal Procedure



1. Remove the front bumper fascia. Refer to [Front Bumper Fascia Replacement](#) .
2. Remove the front bumper impact beam.

### Installation Procedure



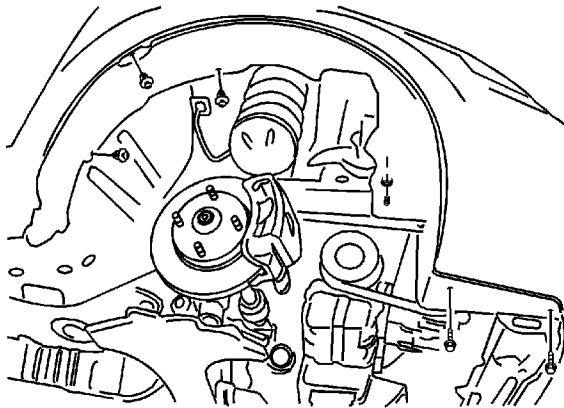


1. Install the front bumper impact beam.
2. Install the front bumper fascia. Refer to [Front Bumper Fascia Replacement](#) .

## Front Bumper Fascia Replacement (Notchback)

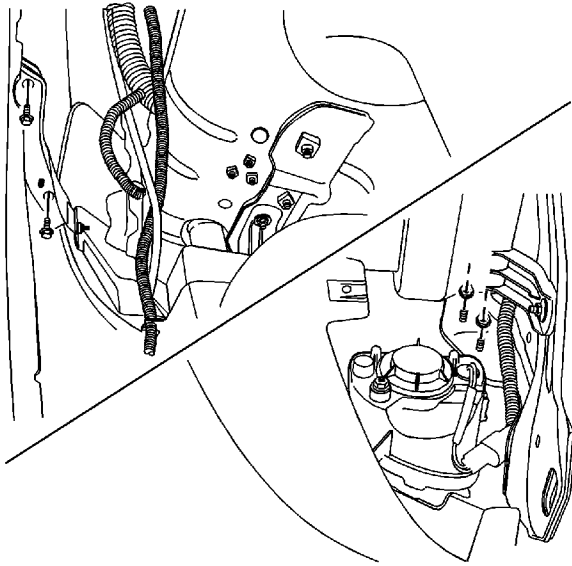
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

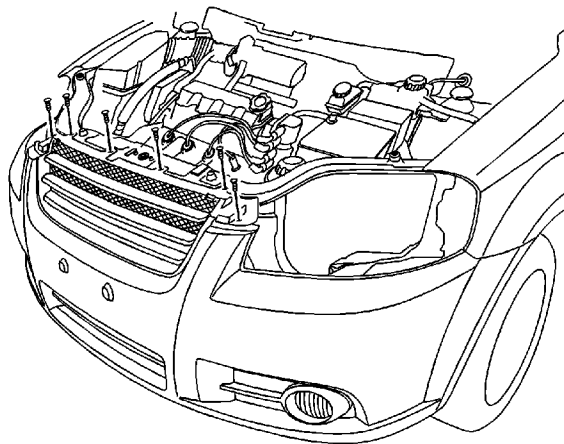


1. Disconnect the negative battery cable.
2. Remove the necessary screws, the retainers, and nuts, from the front wheel well splash shields.

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

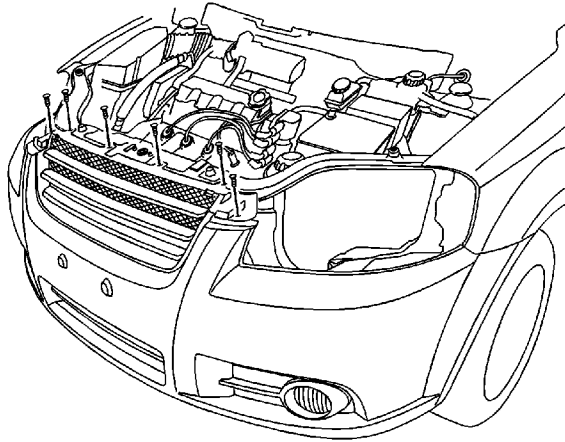


3. Remove the headlamps, the front side marker lamp, and the front fog lamps. Refer to [Headlamp Replacement](#) , [Front Side Marker Lamp Replacement](#) and [Front Fog Lamp Replacement](#).
4. Remove the screws from the wheel wells.
5. Remove the retainers from the upper fascia.
6. Remove the screws attaching the fascia to the fender.
7. Remove the retainers from underneath the fascia.



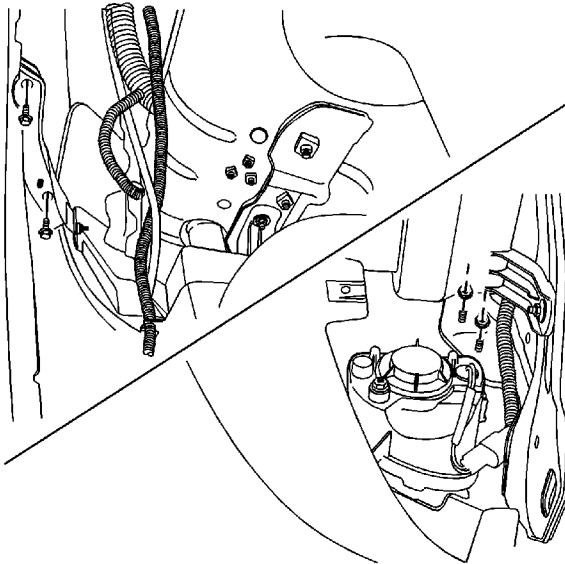
8. Remove the retainers on the top of the fascia.
9. Remove the front bumper fascia.

## Installation Procedure

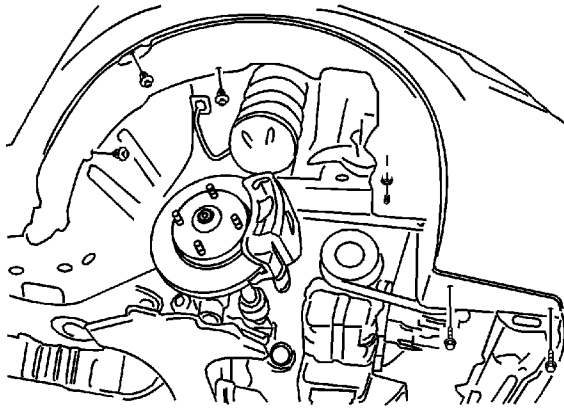


1. Install the bumper fascia.
2. Install the retainers on the top of the fascia.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



3. Install the retainers underneath the fascia.
4. Install the screws attaching the fascia to the fender and tighten to **1.5 N·m (13 lb in)**.
5. Install the headlamps, the front side marker lamps, and the front fog lamps. Refer to [Headlamp Replacement](#) , [Front Side Marker Lamp Replacement](#) and [Front Fog Lamp Replacement](#).



6. Install the screws, the retainers, and the nuts to the front wheel well splash shields.

**Tighten**

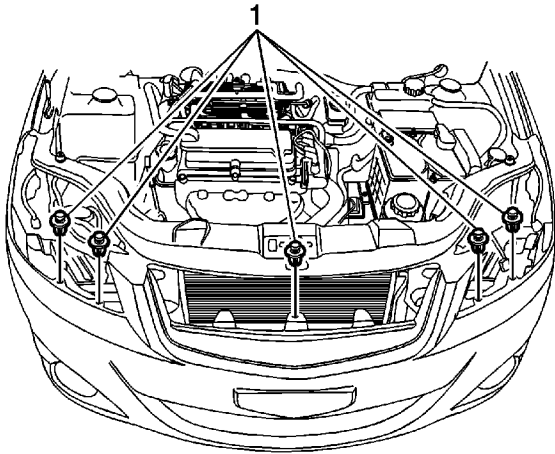
- Tighten the splash shield screws to 1.5 N·m (13 lb in).
  - Tighten the splash shield nuts to 1.5 N·m (13 lb in).
7. Connect the negative battery cable.

## Front Bumper Fascia Replacement (Hatchback)

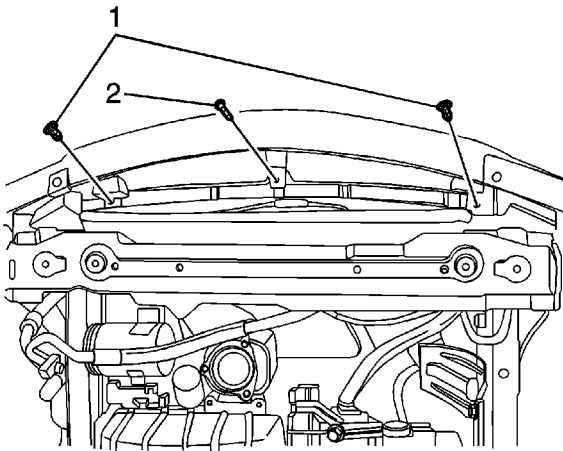
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the negative battery cable.
2. Remove the necessary screws, bolts, and nuts, from the front wheel well splash shields.
3. Remove the headlamps. Refer to [Headlamp Replacement](#).
4. Remove the fascia grille. Refer to [Fascia Grille Replacement](#).

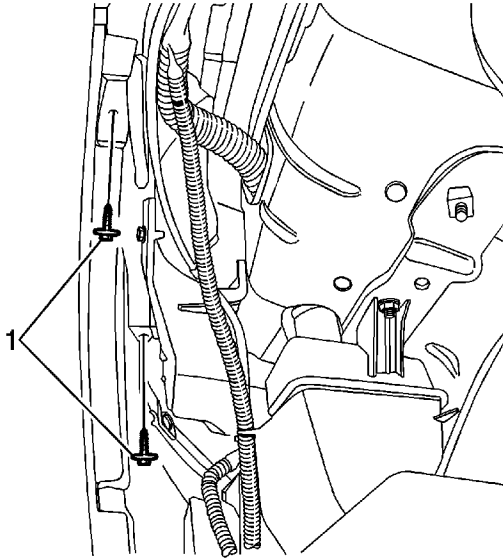


5. Remove the clips (1) from the top of the front fascia.



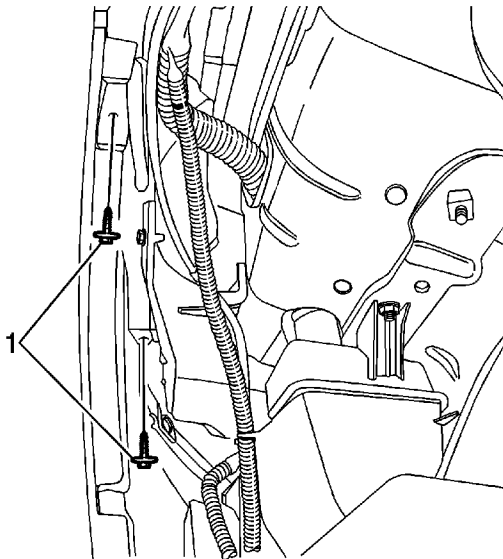


6. Remove the clips (1) from the bottom of the front fascia.
7. Remove screw (2) from the bottom of the front fascia.



8. Remove the bolts (1) from the inside of the front bumper fascia.
9. Remove the front fascia from the vehicle.

## Installation Procedure

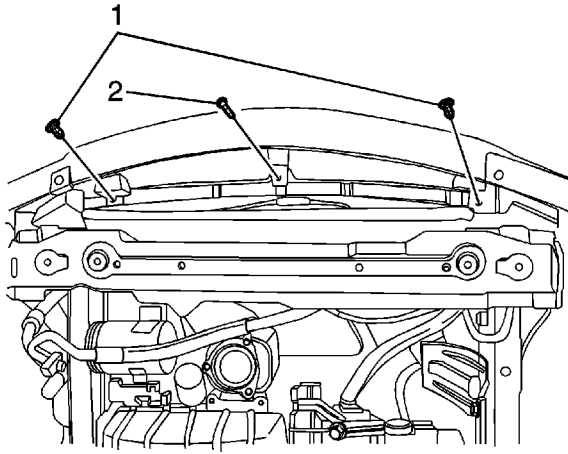


1. Install the front fascia from the vehicle.

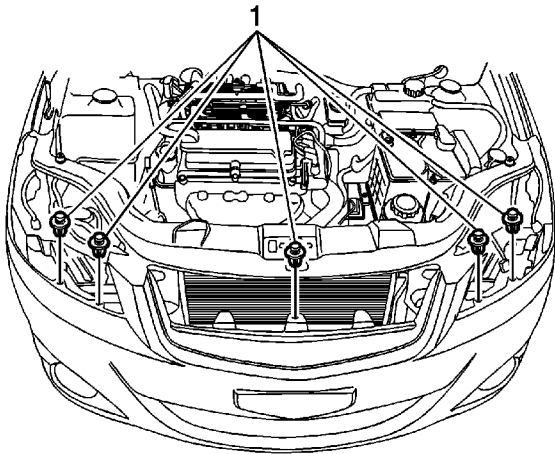


**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the bolts (1) to the inside of the front bumper fascia and tighten to **1.5 N·m (13 lb in)**.
3. Remove the clips (1) from the bottom of the front fascia.



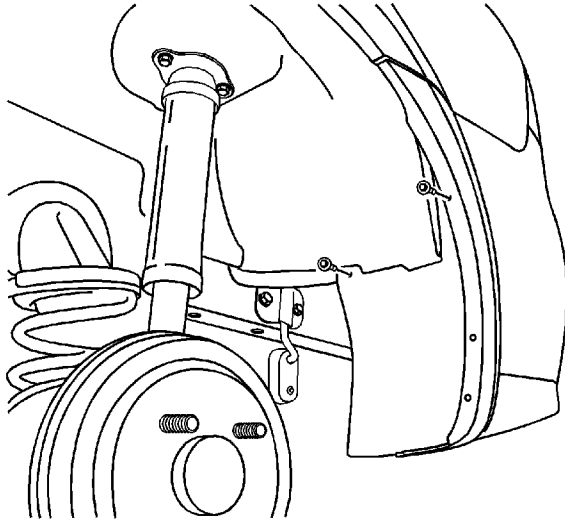
4. Install screw (2) to the bottom of the front fascia and tighten to **1.5 N·m (13 lb in)**.



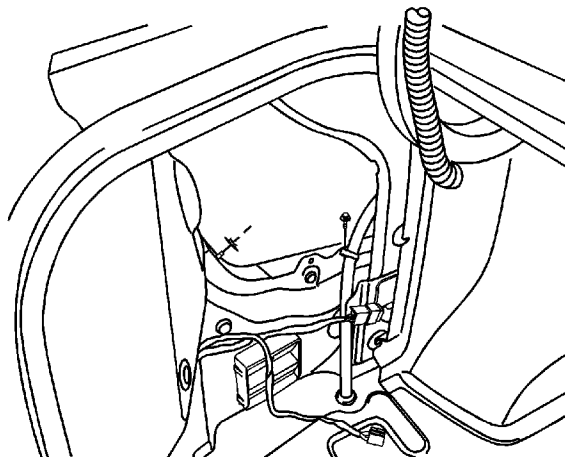
5. Install the clips (1) to the top of the front fascia.
6. Install the fascia grille. Refer to [Fascia Grille Replacement](#).
7. Install the headlamps. Refer to [Headlamp Replacement](#).
8. Install the necessary screws, bolts, and nuts, to the front wheel well splash shields.
9. Connect the negative battery cable.

## Rear Bumper Fascia Replacement (Notchback)

### Removal Procedure



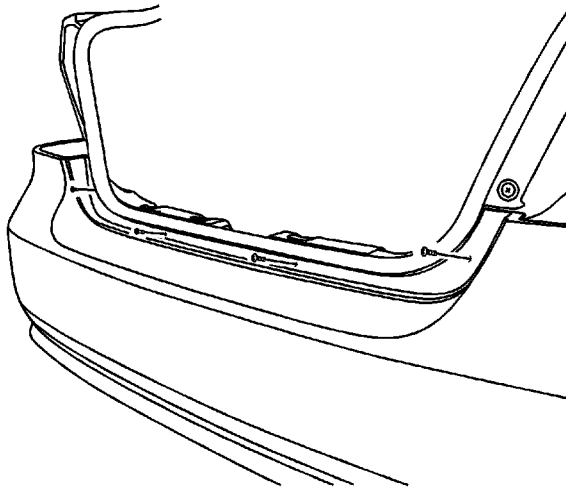
1. Remove the screws and the mud guards.
2. Remove the screws attaching the splash shields to the fascia.
3. Remove the screws from the bottom of the fascia.
4. Remove the rear luggage compartment side panels.



5. Remove the nuts in the luggage compartment.

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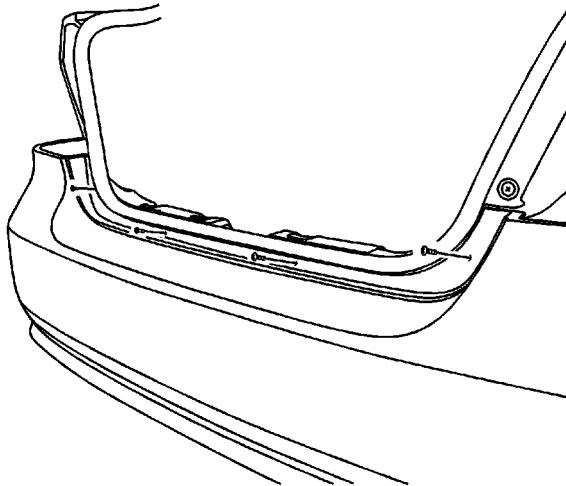
6. Remove the bolts in the luggage compartment.



7. Remove the rear upper fascia screws.
8. Remove the tail lamps. Refer to [Tail Lamp Replacement](#).
9. Remove the inner upper fascia retainers.
10. Remove the fascia.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

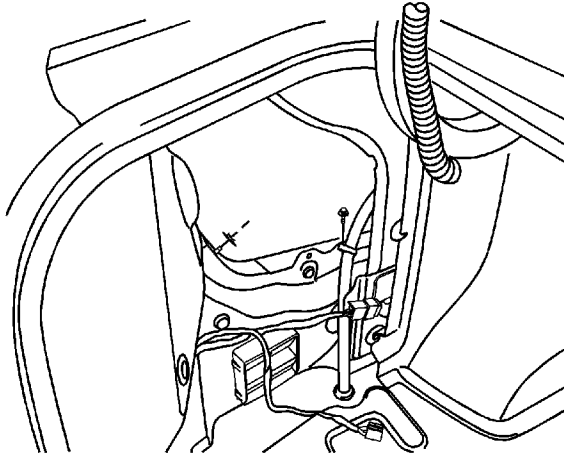


1. Install the fascia with the rear upper fascia screws.

**Tighten**

Tighten the rear upper fascia screws to 1.5 N·m (13 lb in).

2. Install the rear inner upper fascia retainers.
3. Install the tail lamps. Refer to [Tail Lamp Replacement](#).



4. Install the bolts in the luggage compartment.

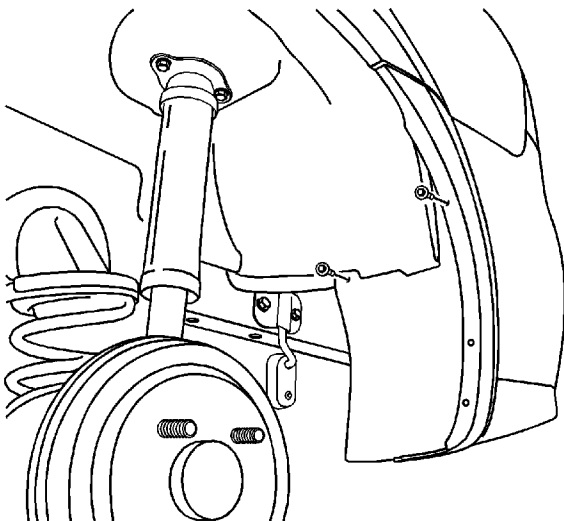
**Tighten**

Tighten the luggage compartment fascia bolts to 4 N·m (35 lb in).

5. Install the nuts in the luggage compartment.

**Tighten**

Tighten the luggage compartment fascia nuts to 4 N·m (35 lb in).





6. Install the splash shield screws.

**Tighten**

Tighten the splash shield screws to 1.5 N·m (13 lb in).

7. Install the lower fascia screws.

**Tighten**

Tighten the lower fascia screws to 1.5 N·m (13 lb in).

8. Install the mud guards with the screws.

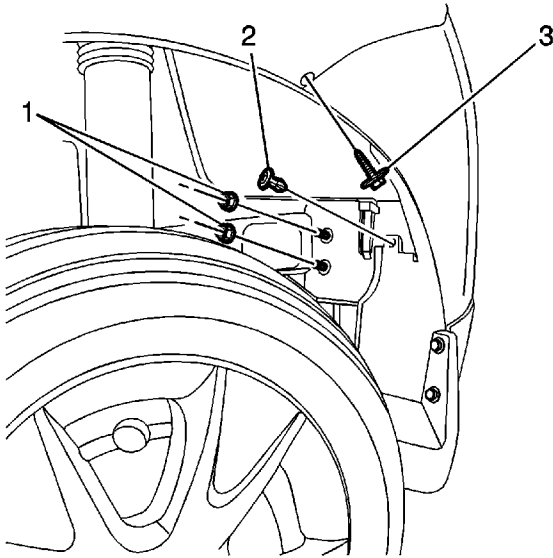
**Tighten**

Tighten the mud guard screws to 1.5 N·m (13 lb in).

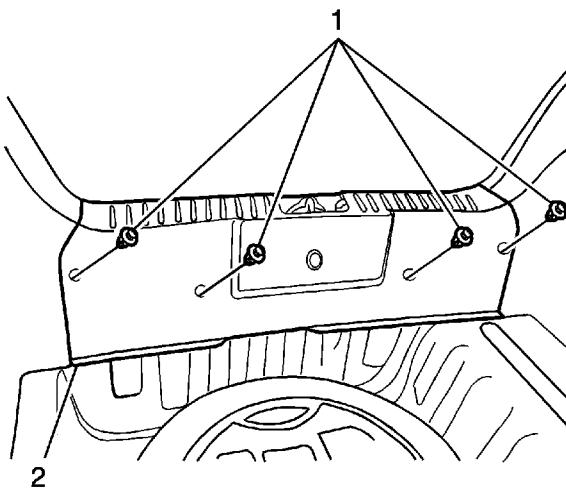
## Rear Bumper Fascia Replacement (Hatchback)

### Removal Procedure

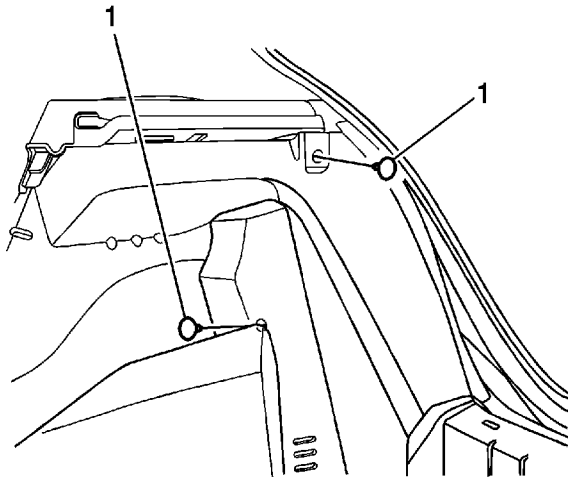
1. Remove the screws and the mud guards.
2. Remove the screws and the splash shields.
3. Remove the tail lamps. Refer to [Tail Lamp Replacement](#).



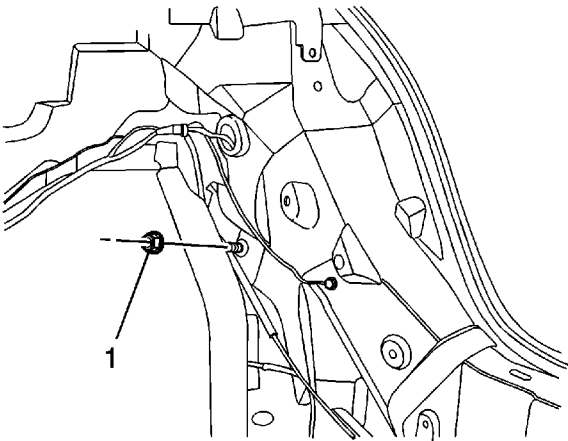
4. Remove the rear bumper fascia nuts (1).
5. Remove the rear bumper fascia bolt (3).
6. Remove the rear bumper fascia clip (2).



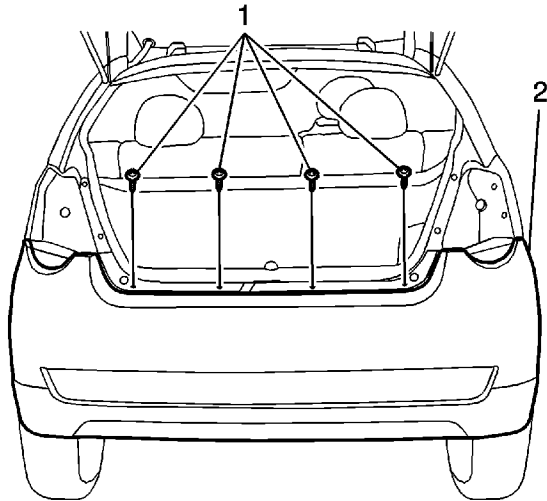
7. Remove the clips (1) from the rear sill trim (2).
8. Remove the rear sill trim panel (2).



9. Remove the rear side panel trim clips (1) and screw.



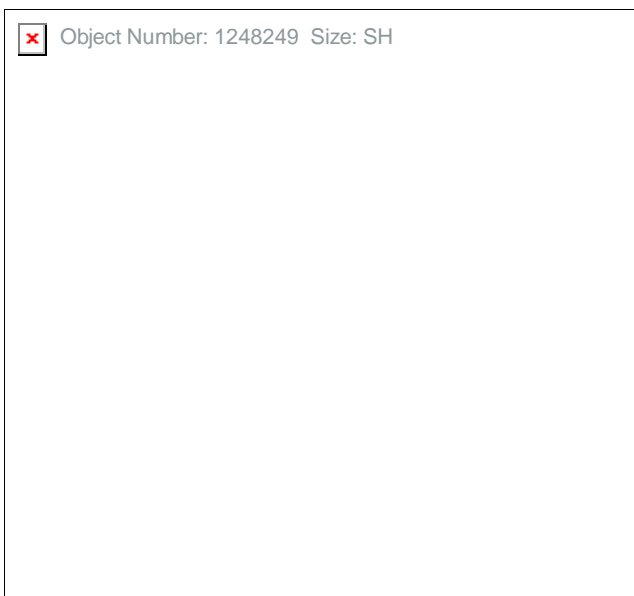
10. Remove the rear bumper fascia-to-lower back panel nut through the gap between the rear side panel trim and the lower back panel.



11. Remove the rear upper fascia screws (1).
12. Remove the fascia (2).

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

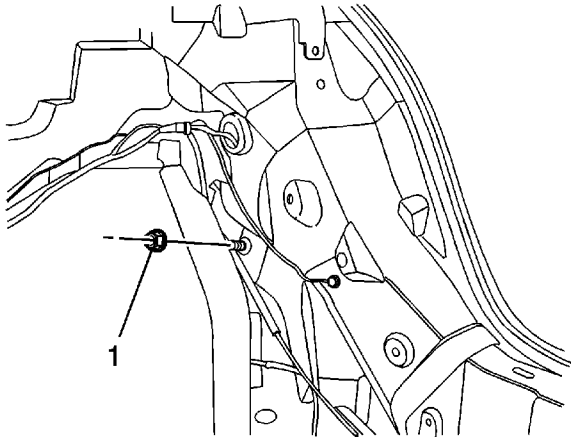


1. Install the fascia (1) with the rear upper fascia screws (2).

### **Tighten**

Tighten the rear upper fascia screws to 1.5 N·m (13 lb in).

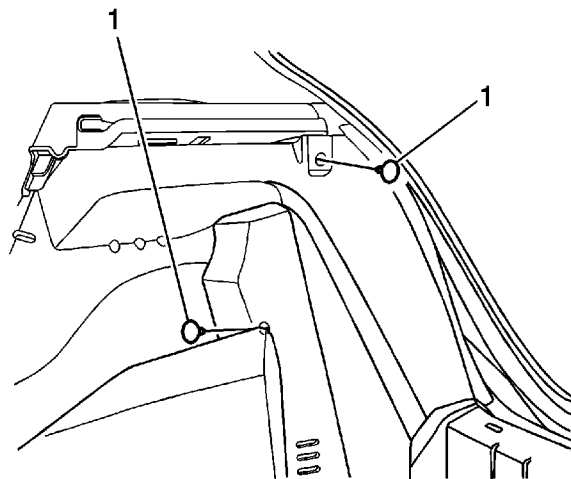




2. Install the rear bumper fascia-to-lower back panel nut (1) through the gap between the rear side panel trim and the lower back panel.

**Tighten**

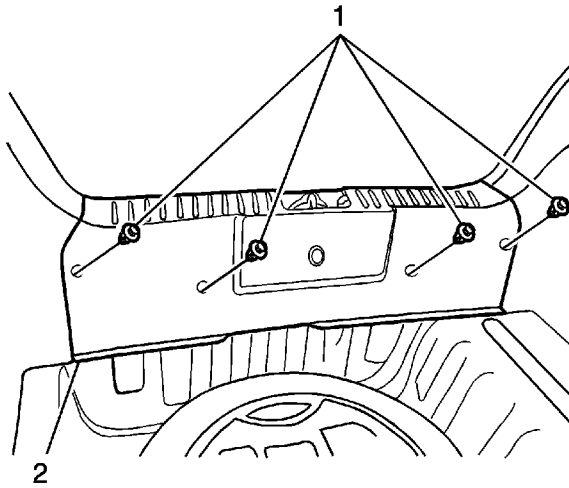
Tighten the rear fascia nut to 4 N·m (35 lb in).



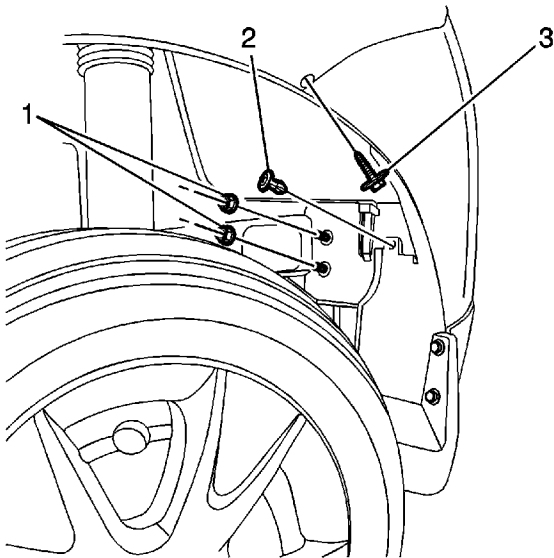
3. Install the rear side panel trim clips (1) and screw.

**Tighten**

Tighten the rear side panel trim screw to 1.5 N·m (13 lb in).



4. Install the rear sill trim panel (2).
5. Install the clips (1) to the rear sill trim (2).



6. Install the rear bumper fascia clip (2).
7. Install the rear bumper fascia bolt (3).

**Tighten**

Tighten the rear bumper fascia bolt (3) to 1.5 N·m (13 lb in).

8. Install the rear bumper fascia nuts (1).

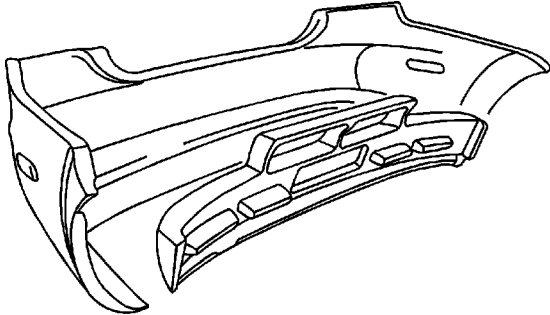
**Tighten**

Tighten the rear bumper fascia nut (1) to 25 N·m (18 lb ft).

9. Install the tail lamps. Refer to [Tail Lamp Replacement](#).
10. Install the screws and the splash shields.
11. Install the screws and the mud guards.

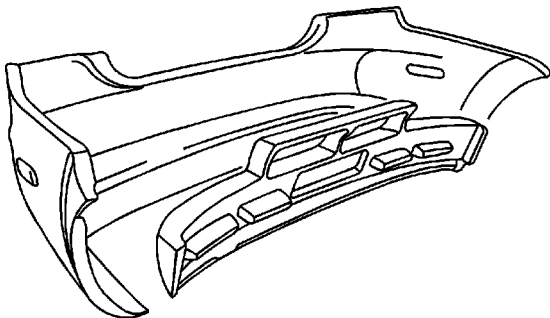
## Rear Energy Absorber Replacement (North American)

### Removal Procedure



1. Remove the rear bumper fascia. Refer to [Rear Bumper Fascia Replacement](#) .
2. Remove the energy absorber.

### Installation Procedure

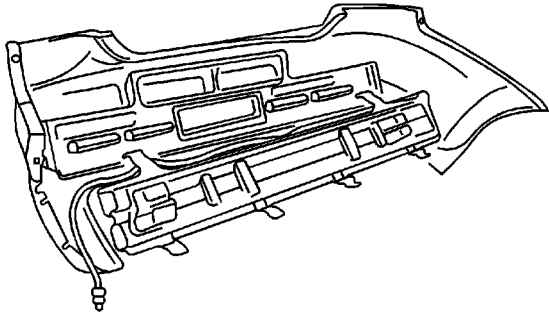




1. Install the energy absorber.
2. Install the rear bumper fascia. Refer to [Rear Bumper Fascia Replacement](#) .

## Rear Bumper Impact Bar Replacement

### Removal Procedure

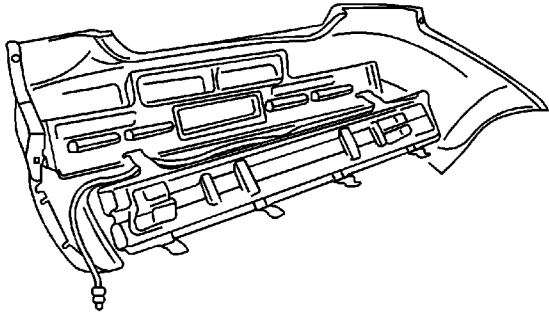


1. Remove the rear bumper fascia.

Refer to [Rear Bumper Fascia Replacement](#) .

2. Remove the rear bumper impact beam.

### Installation Procedure



1. Install the rear bumper impact beam.
2. Install the rear bumper fascia.

Refer to [Rear Bumper Fascia Replacement](#) .

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Driver Information and Entertainment Cellular, Entertainment, and Navigation](#) | [Specifications](#) | **Document ID: 1733617**

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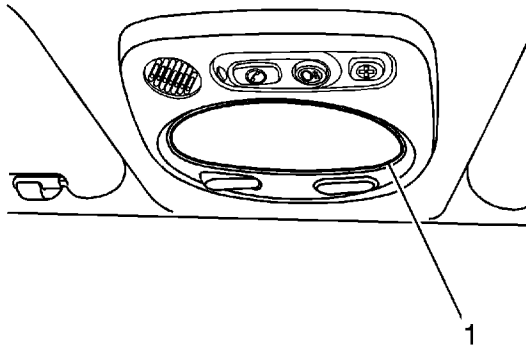
## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Audio System Screws	6 N·m	53 lb in
Front Speaker Screws	3.5 N·m	31 lb in
Rear Speaker Screws	3 N·m	27 lb in
Back Glass Antenna Retaining Screw	3 N·m	27 lb in

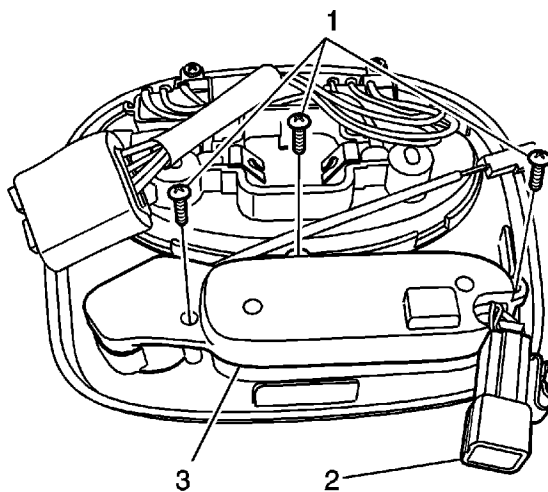


## OnStar Button Assembly Replacement

### Removal Procedure



1. Remove the interior courtesy lamp retaining tabs (1). Refer to [Interior Courtesy Lamp Replacement](#).

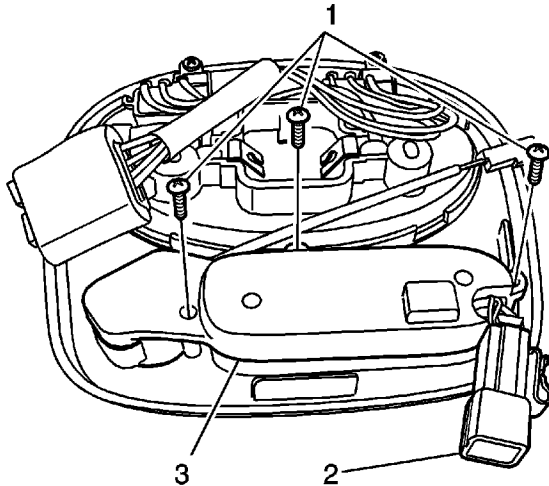


2. Disconnect the electrical connector (2).
3. Remove the screws (1) and the OnStar button cover (3) from the interior courtesy lamp.

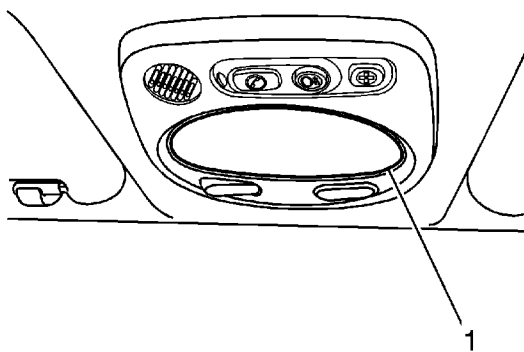
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## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



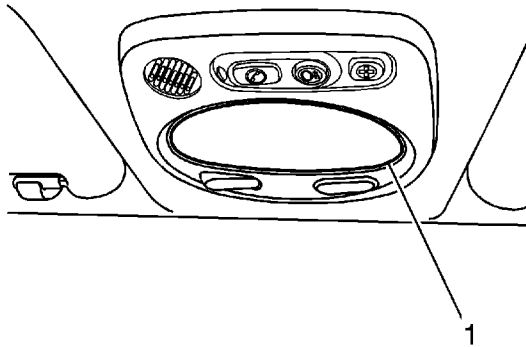
1. Install the Onstar button cover (3) and the screws (1) to the interior courtesy lamp and tighten to **2.5 N·m (22 lb in)**.
2. Connect the electrical connector (2).



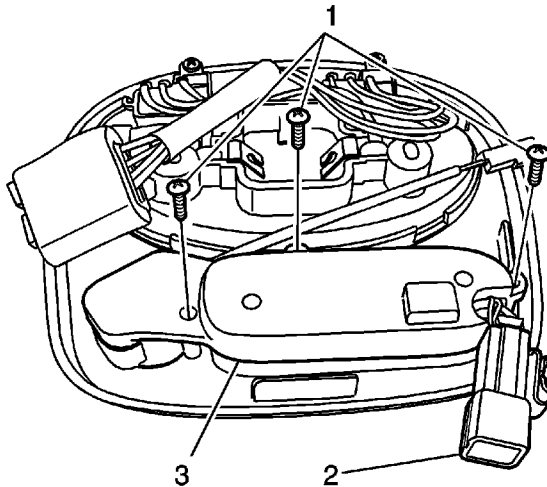
3. Install the interior courtesy lamp (1). Refer to [Interior Courtesy Lamp Replacement](#).

## Mobile Telephone Microphone Replacement

### Removal Procedure

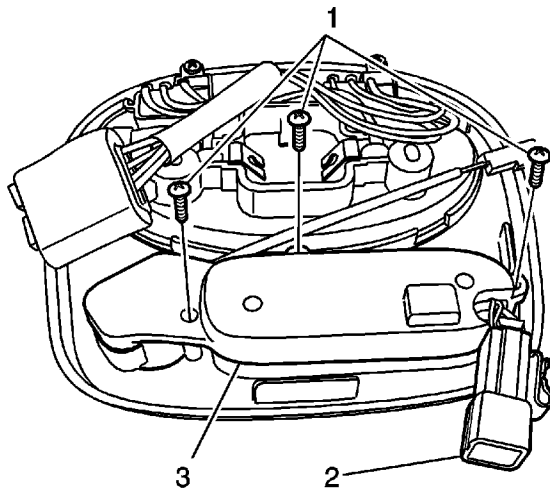


1. Remove the interior courtesy lamp (1). Refer to [Interior Courtesy Lamp Replacement](#).



2. Disconnect the electrical connector (2).
3. Remove the screws (1) and the OnStar button cover (3) from the interior courtesy lamp.
4. Remove the OnStar cellular microphone from the interior courtesy lamp.

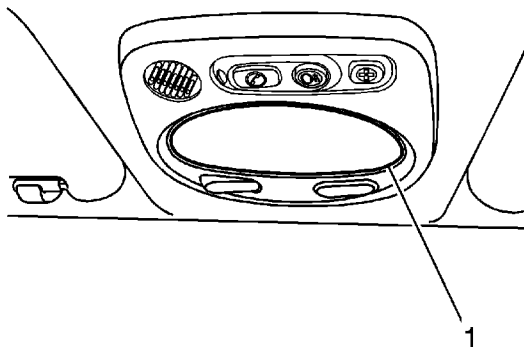
## Installation Procedure



1. Install the OnStar cellular microphone on the interior courtesy lamp.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the OnStar button cover (3) and the screws (1) to the interior courtesy lamp and tighten to **2.5 N·m (22 lb in)**.
3. Connect the electrical connector (2).

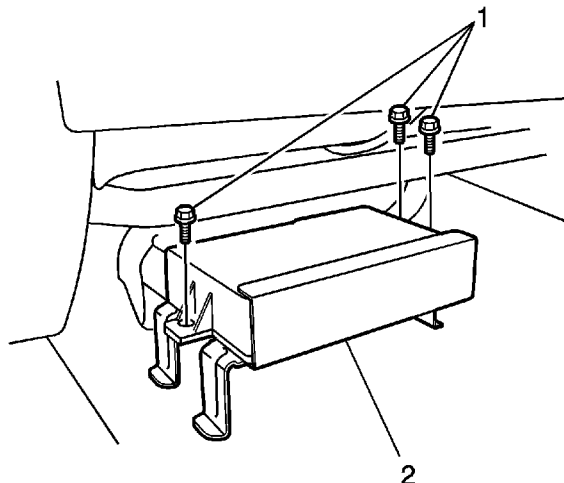


4. Install the interior courtesy lamp (1). Refer to [Interior Courtesy Lamp Replacement](#).

## Communication Interface Module Replacement

### Removal Procedure

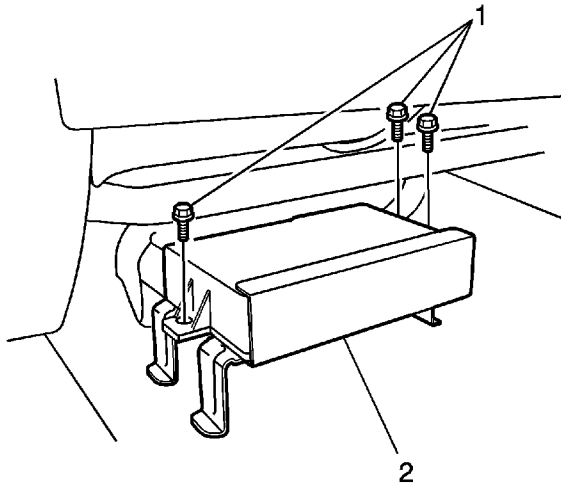
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



**Note:** The vehicle communication interface module (VCIM) has a specific set of unique numbers that tie the module to each vehicle. These numbers, the 10-digit station identification and the 11-digit electronic serial number, are used by the National Cellular Network and OnStar® to identify the specific vehicle. Because these numbers are tied to the vehicle identification number of the vehicle, you must never exchange these parts with those of another vehicle.

1. Disconnect the battery ground cable.
2. Disconnect the electrical connectors from the communication interface module which is located on the bottom of the driver seat.
3. Slide the driver seat forward.
4. Remove the bolts (1) and remove the communication interface module cover (2) from the seat rear side.

### Installation Procedure



1. Position the vehicle communication interface module (2) in the vehicle.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the bolts (1) and tighten to **3 N·m (27 lb in)**.
3. Restore the driver seat position.
4. Connect vehicle communication interface module electrical connectors.

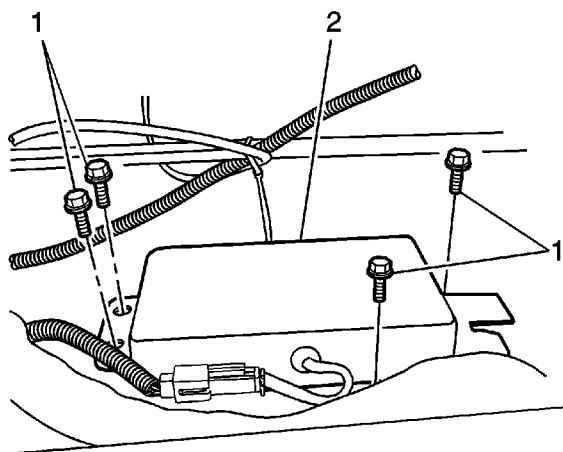
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

5. Connect the battery ground cable.

## Communication Interface Module Battery Replacement Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

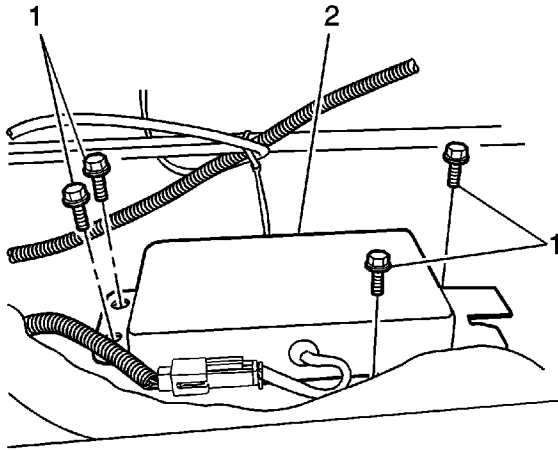
1. Disconnect the battery ground cable.



2. Slide the passenger seat rearward.
3. Disconnect the electrical connector from the Onstar module which is located on the bottom of the passenger seat.
4. Remove the bolts (1) and the Onstar battery (2).

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



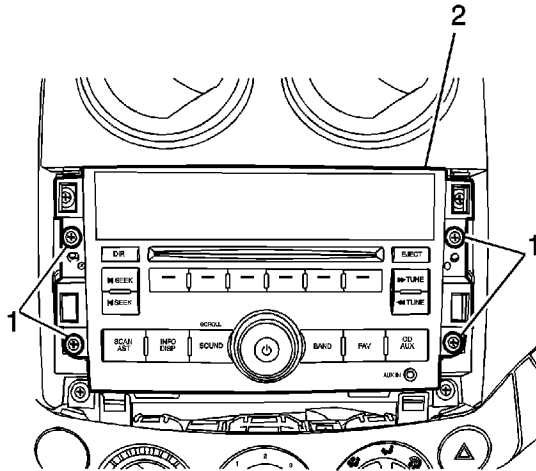
1. Install the Onstar battery (2) with the bolts (1) and tighten to **3 N·m (27 lb in)**.
2. Restore the seat position.
3. Connect the electrical connectors.
4. Connect the negative battery cable.



## Radio Replacement (Hatchback)

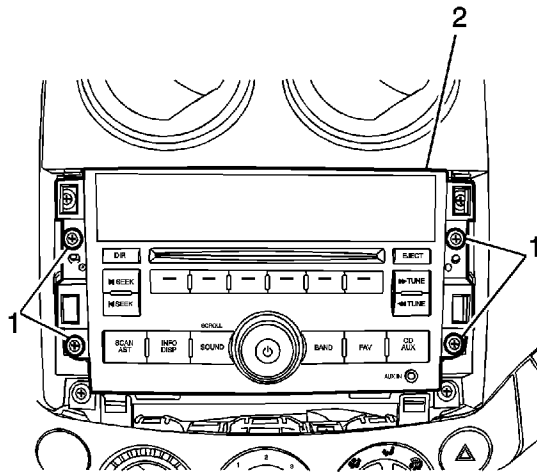
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the instrument panel (I/P) lower trim panel. Refer to [Instrument Panel Lower Trim Panel Replacement](#).
3. Remove the screws (1) and the audio system (2).
4. Disconnect the audio system electrical connector and the antenna cable.

### Installation Procedure



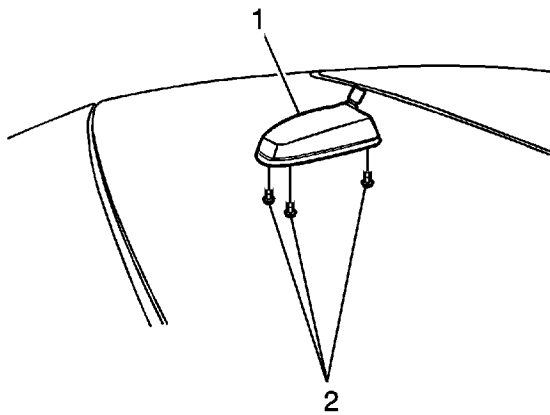
1. Connect the audio system electrical connector and the antenna cable.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the audio system (2) with the screws (1) and tighten to **6 N·m (53 lb in)**.
3. Install the I/P lower trim panel. Refer to [Instrument Panel Lower Trim Panel Replacement](#).
4. Connect the negative battery cable.

# Cellular and Navigation Antenna Assembly Replacement

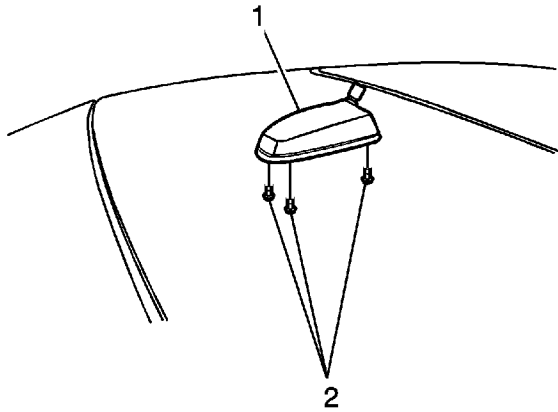
## Removal Procedure



1. Lower the headliner. Refer to [Headlining Trim Panel Replacement](#).
2. Disconnect the connector of the antenna coax cable.
3. Remove the screws (2) and the cellular/navigation antenna (1).

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

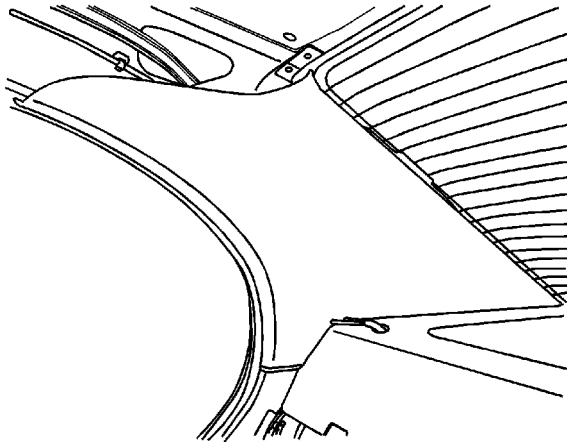


1. Install the cellular/navigation antenna (1) and the screws (2). Tighten to **9 N·m (80 lb in)**
2. Connect the connector of the antenna coax cable.
3. Install the headliner. Refer to [Headlining Trim Panel Replacement](#).

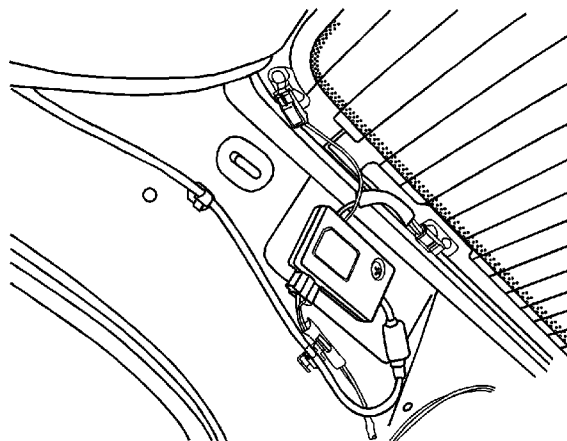
## Radio Antenna Module Replacement (Notchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the rear quarter upper trim panel. Refer to [Quarter Upper Trim Panel Replacement](#).



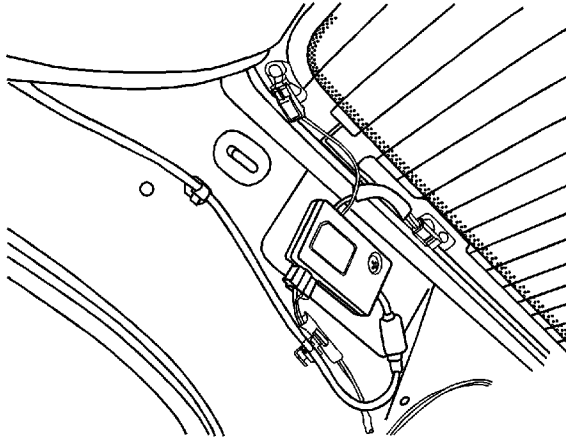
3. Disconnect the negative battery cable.

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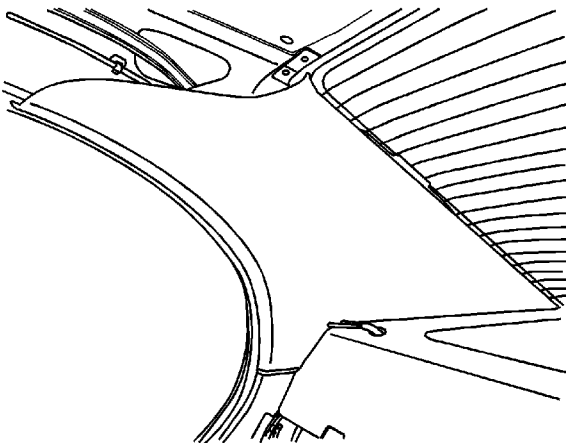
4. Remove the screws and the glass antenna module.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the glass antenna module with the screws and tighten to **2.5-3.5 N·m (22-31 lb in)**.
2. Connect the electrical connectors.

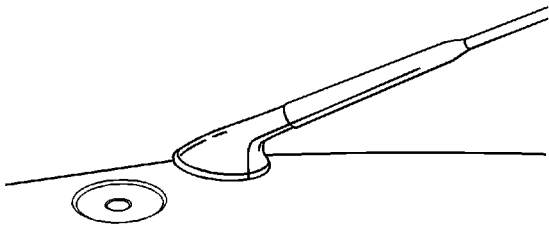


3. Install the rear quarter upper trim panel. Refer to [Quarter Upper Trim Panel Replacement](#).
4. Connect the negative battery cable.

## Radio Antenna Module Replacement (Hatchback)

### Removal Procedure

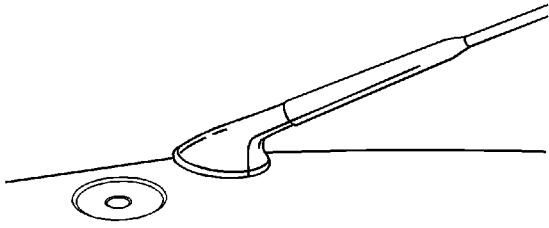
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the interior courtesy lamp. Refer to [Interior Courtesy Lamp Replacement](#).
3. Remove the screw from the vehicle inside.
4. Remove the roof antenna.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



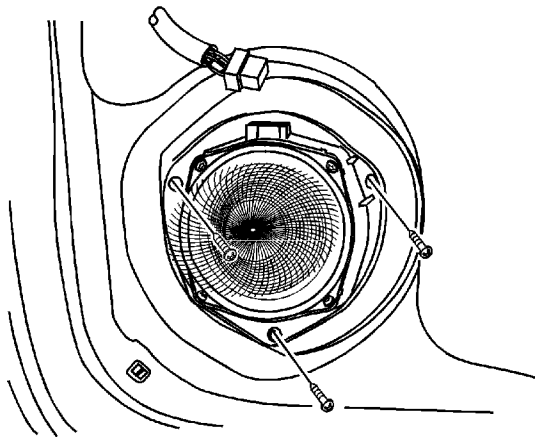
1. Install the roof antenna with the screw and tighten to **3 N·m (27 lb in)**.
2. Install the interior courtesy lamp. Refer to [Interior Courtesy Lamp Replacement](#).
3. Connect the negative battery cable.



## Radio Front Speaker Replacement

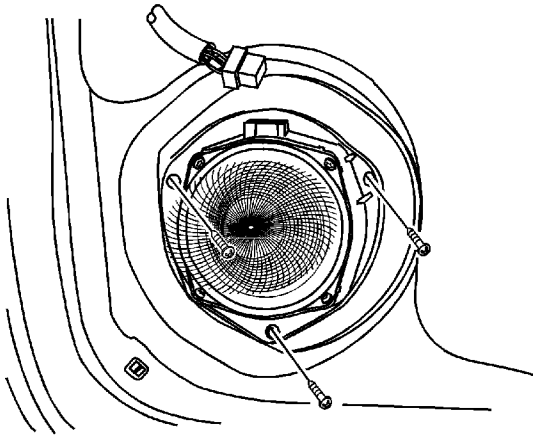
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the front door trim panel. Refer to [Front Side Door Trim Panel Replacement](#).
3. Remove the screws and the front speaker.
4. Disconnect the electrical connector.

### Installation Procedure



1. Connect the electrical connector.

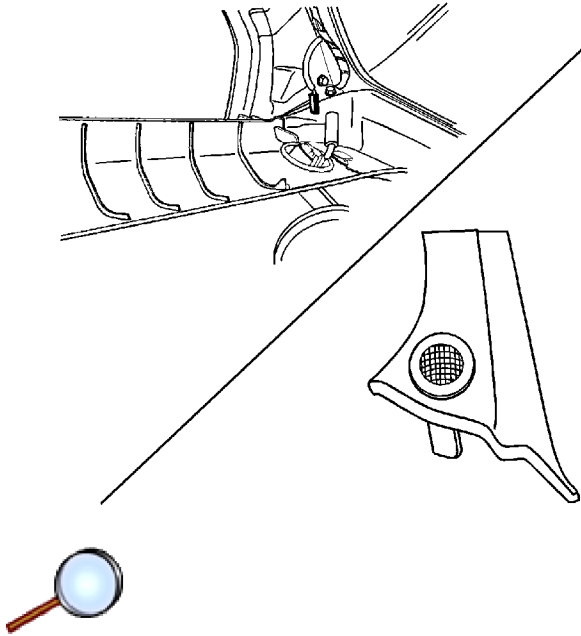
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the front speaker with the screws and tighten to **3.5 N·m (31 lb in)**.
3. Install the front door trim panel. Refer to [Front Side Door Trim Panel Replacement](#).
4. Connect the negative battery cable.

## Front Upper Speaker Replacement

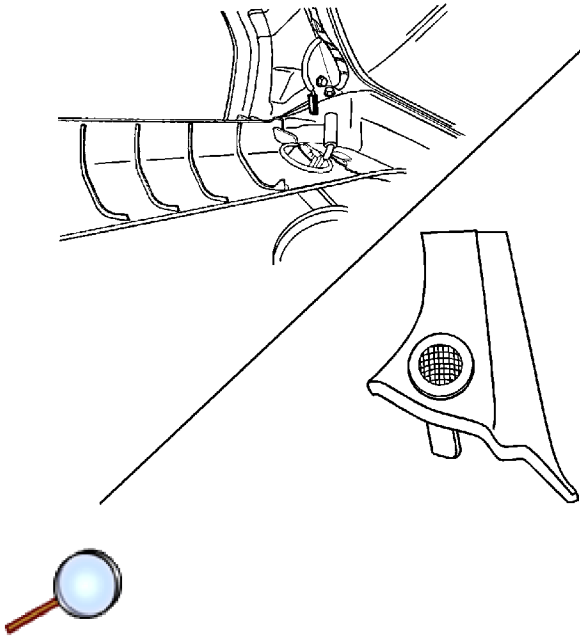
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Pry off the windshield pillar garnish molding. Refer to [Windshield Pillar Garnish Molding Replacement](#).
3. Disconnect the electrical connector.
4. Remove the tweeter.

### Installation Procedure

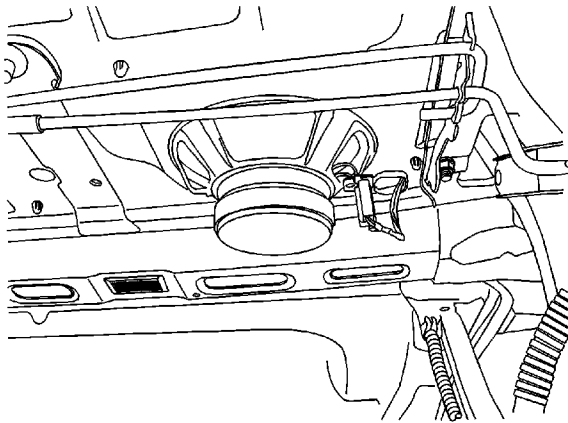


1. Install the tweeter.
2. Connect the electrical connector.
3. Install the windshield pillar garnish molding. Refer to [Windshield Pillar Garnish Molding Replacement](#).
4. Connect the negative battery cable.

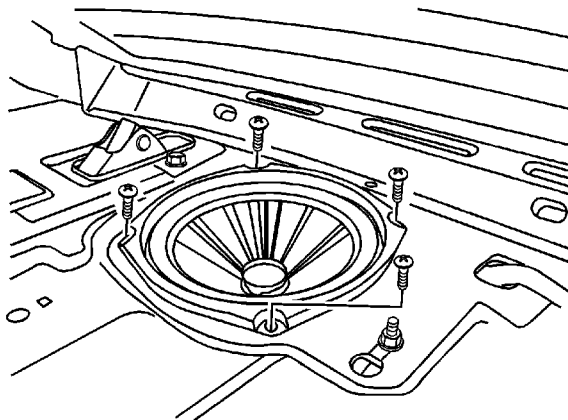
## Radio Rear Speaker Replacement (Notchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the rear window shelf trim panel. Refer to [Rear Window Shelf Trim Panel Replacement](#).
3. Disconnect the electrical connector.

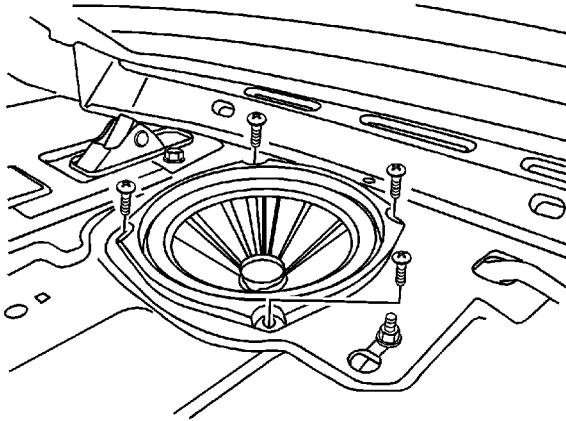




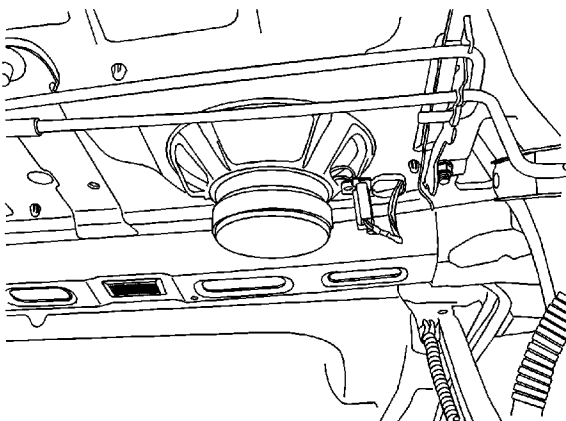
4. Remove the screws and the rear speakers.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the rear speakers with the screws and tighten to **3 N·m (27 lb in)**.



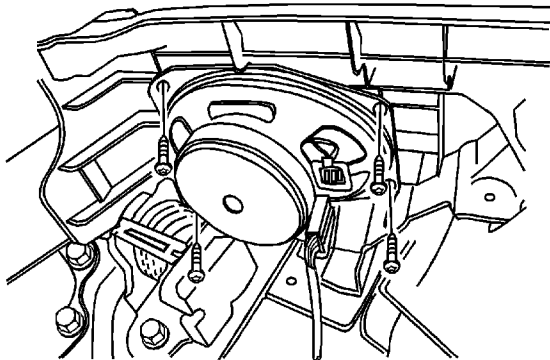
2. Connect the electrical connector.
3. Install the rear window shelf trim panel. Refer to [Rear Window Shelf Trim Panel Replacement](#).

4. Connect the negative battery cable.

## Radio Rear Speaker Replacement (Hatchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

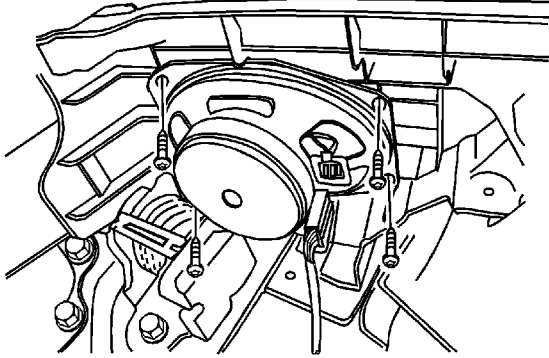


1. Disconnect the negative battery cable.
2. Remove the rear cargo area side trim panel. Refer to [Cargo Area Side Trim Panel Replacement](#).
3. Disconnect the electrical connector.
4. Remove the screws and the rear speaker.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



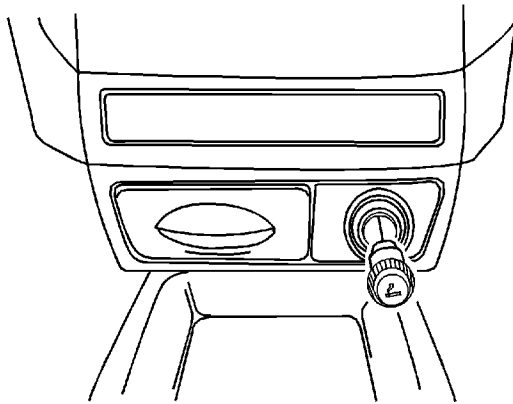


1. Install the rear speaker with the screws and tighten to **3 N·m (27 lb in)**.
2. Connect the electrical connector.
3. Install the rear cargo area side trim panel. Refer to [Cargo Area Side Trim Panel Replacement](#).
4. Connect the negative battery cable.

## Cigar Lighter Housing Replacement

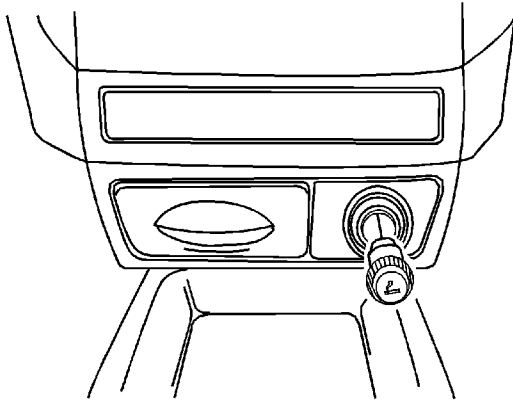
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the cigar lighter from the cigar lighter housing.
3. Remove the floor console. Refer to [Front Floor Console Replacement](#).
4. Remove the cigar lighter housing from the instrument panel.
5. Disconnect the cigar lighter electrical connector.

### Installation Procedure



1. Connect the cigar lighter electrical connector.
2. Install the cigar lighter housing in the instrument panel.
3. Install the floor console. Refer to [Front Floor Console Replacement](#).
4. Install the cigar lighter in the cigar lighter housing.
5. Connect the negative battery cable.

## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Clutch Control Cable Mounting Nuts	13 N·m	115 lb in
Clutch Master Cylinder Nuts	22 N·m	16 lb ft
Clutch Pedal Shaft Nut	20 N·m	15 lb ft
Pressure Plate-to-Flywheel Bolts (Cable)	18 N·m	13 lb ft
Pressure Plate-to-Flywheel Bolts (Hydraulic)	15 N·m	11 lb ft
Release Arm Bolt and Nut	16 N·m	12 lb ft
Release Cylinder Bolts	20 N·m	15 lb ft

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Transmission](#) | [Clutch](#) | [Specifications](#) |

Document ID: 1313438

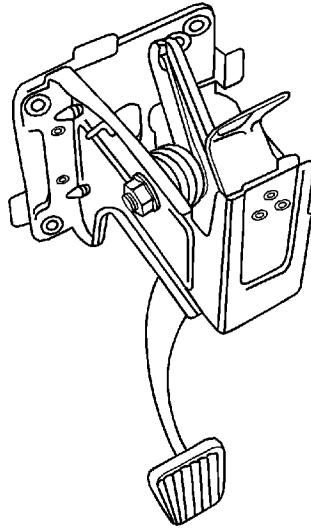
## General Specifications

Application	Specification	
	Metric	English
Fluid (Hydraulic Clutch)	Common Use, Brake Fluid	
Inside Diameter (1.4L/1.5L SOHC/1.4L/1.6L DOHC Hydraulic Clutch)	145 mm	5.7 in
Inside Diameter (1.2L Cable Clutch)	127 mm	5.0 in
Outside Diameter	215 mm	8.5 in
Outside Diameter (1.2L Cable Clutch)	184 mm	7.2 in
Thickness	8.4 mm	0.331 in
Type	Single Dry Plate	

## Clutch Pedal Replacement (Cable)

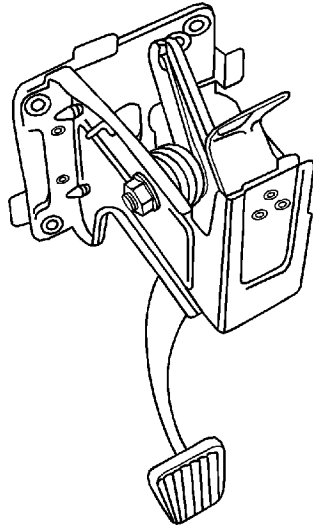
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the clutch cable. Refer to [Clutch Cable Replacement](#).
2. Remove the clutch pedal bracket mounting bolts from the cowl.
3. Release the clutch pedal return spring.
4. Remove the clutch pedal shaft nut.
5. Remove the clutch pedal shaft.
6. Remove the clutch pedal from the mounting bracket.
7. Remove the clutch pedal mounting shaft bushings.
8. Remove the clutch pedal return spring.

### Installation Procedure



**Note:** Be sure to coat the clutch pedal shaft, the bushings and the spring with grease.

1. Install the clutch pedal return spring.
2. Install the clutch pedal mounting shaft bushings.
3. Install the clutch pedal to the mounting bracket.

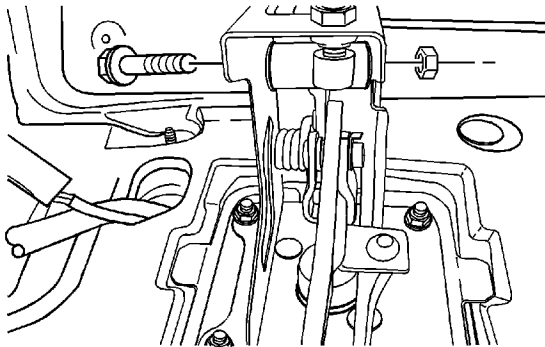
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the clutch pedal shaft.
5. Install the clutch pedal shaft nut and tighten to **20 N·m (15 lb ft)**.
6. Re-attach the clutch pedal return spring to the clutch pedal.
7. Install the clutch cable. Refer to [Clutch Cable Replacement](#).
8. Adjust the clutch cable. Refer to [Clutch Assembly Adjustment](#).

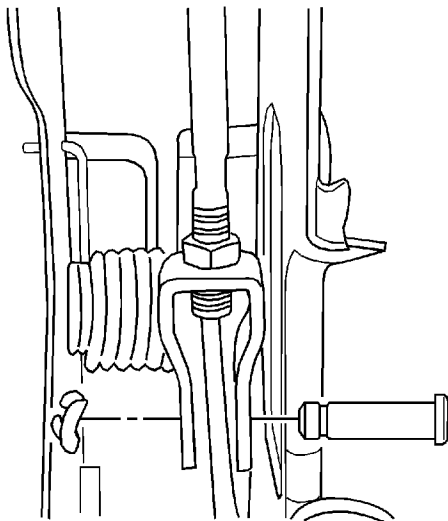
## Clutch Pedal Replacement (Hydraulic)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the return spring from the clutch pedal.
3. Remove the nut, the washer, and the pedal mounting shaft.

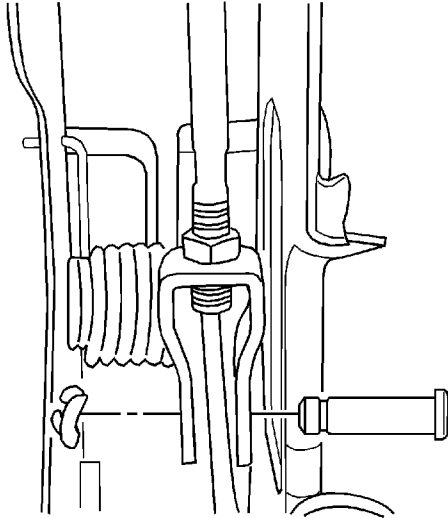


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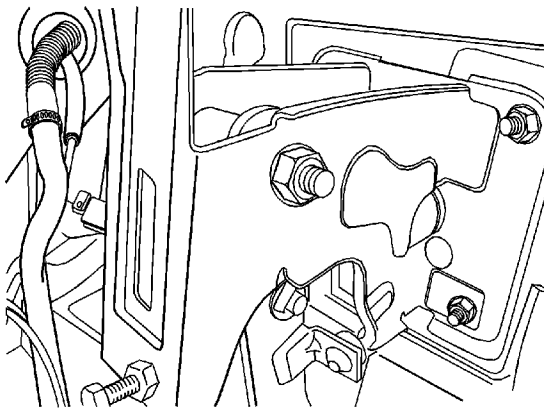


4. Remove the locking clip and push rod fixing pin.
5. Remove the push rod from the clutch pedal.
6. Remove the clutch pedal.

## Installation Procedure



1. Install the clutch pedal.
2. Coat the push rod with multi-purpose grease.
3. Install the push rod to the clutch pedal.
4. Install the locking clip and push rod fixing pin.



5. Coat the pedal mounting shaft with multi-purpose grease.

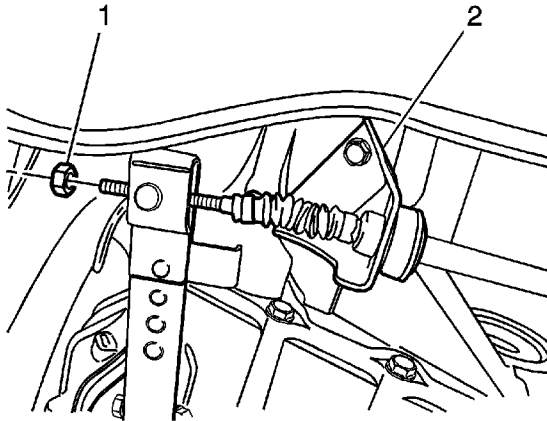
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

6. Install the pedal mounting shaft, washer, and nut and tighten to **20 N·m (15 lb ft)**.
7. Connect the return spring to the clutch pedal.
8. Connect the negative battery cable.

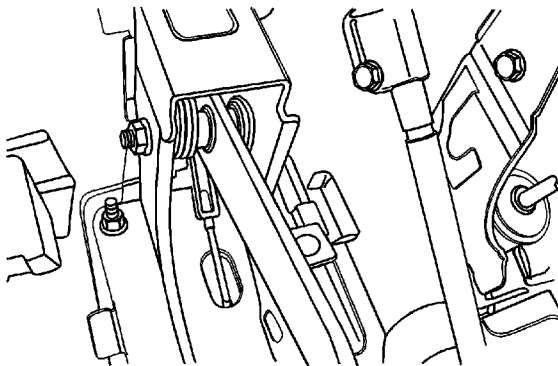
## Clutch Cable Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

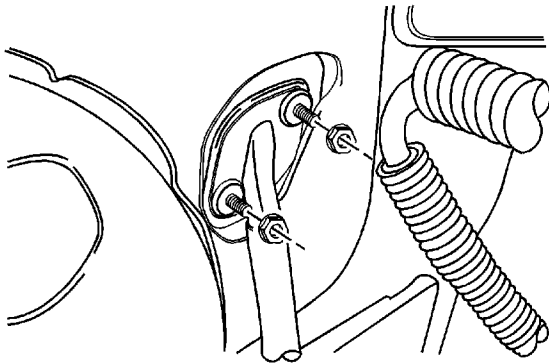


1. Disconnect the negative battery cable.
2. Remove the clutch control cable adjusting nut (1).
3. Remove the clutch control cable from the mounting bracket (2).



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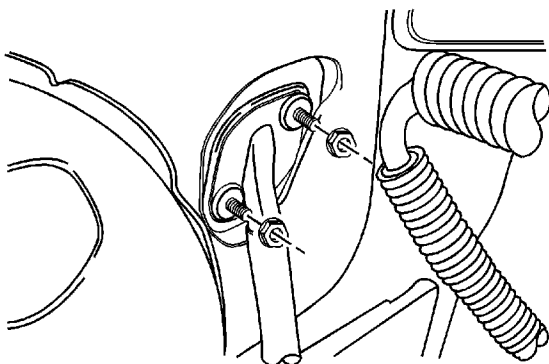
4. Disconnect the clutch control cable from the clutch pedal.
5. Remove the battery.



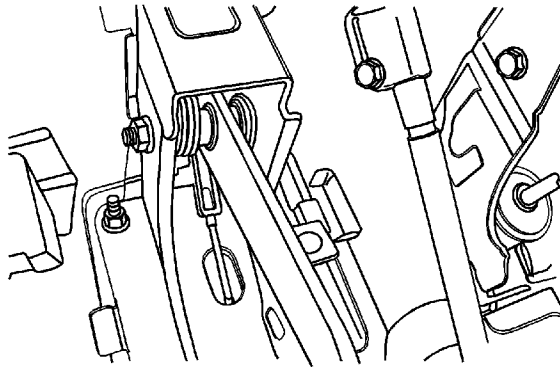
6. Remove the clutch control cable to cowl mounting nuts.
7. Remove the clutch control cable.

## Installation Procedure

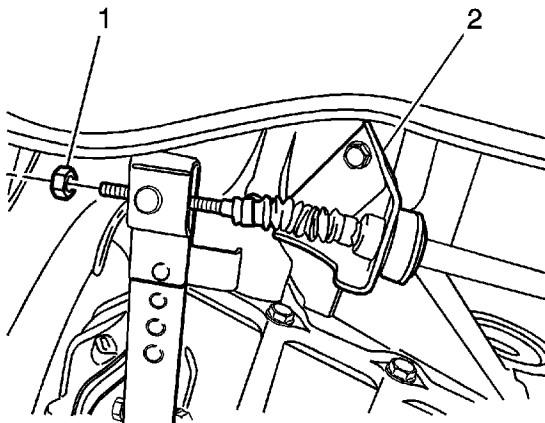
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the clutch control cable to cowl and install the clutch control cable mounting nuts and tighten to **13 N·m (115 lb in)**.



2. Install the battery.
3. Connect the clutch control cable to the clutch pedal.

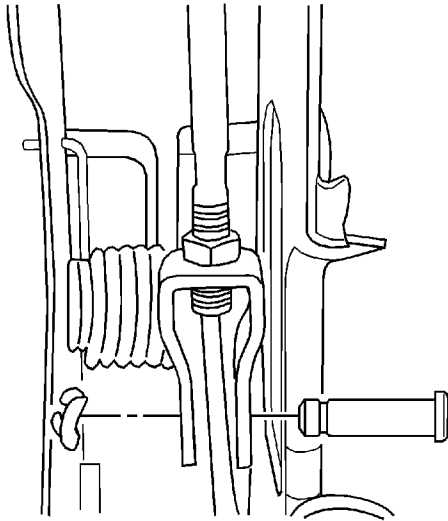


4. Install the clutch control cable to the mounting bracket (2).
5. Install the clutch control cable-adjusting nut (1).
6. Adjust the clutch control cable.

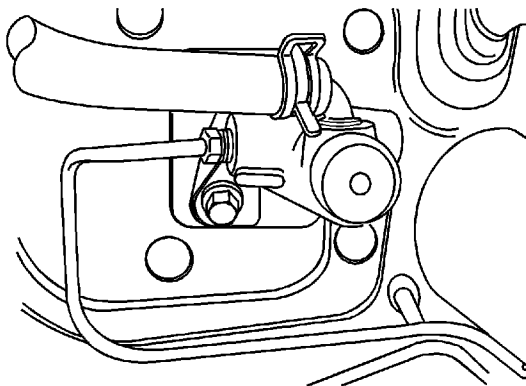
## Clutch Master Cylinder Replacement

### Removal Procedure

Before disconnecting the reservoir tank hose, remove the clutch/brake fluid from the reservoir tank.

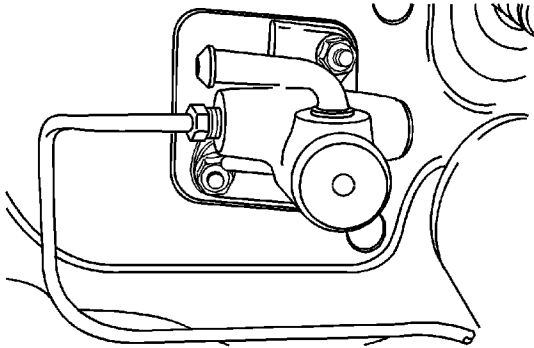


1. Remove the locking clip.
2. Remove the push rod fixing pin and push rod.

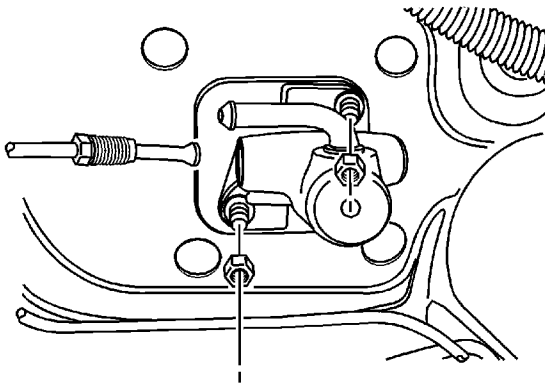


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3. Disconnect the hose clamp on the master cylinder.
4. Disconnect the master cylinder hose.



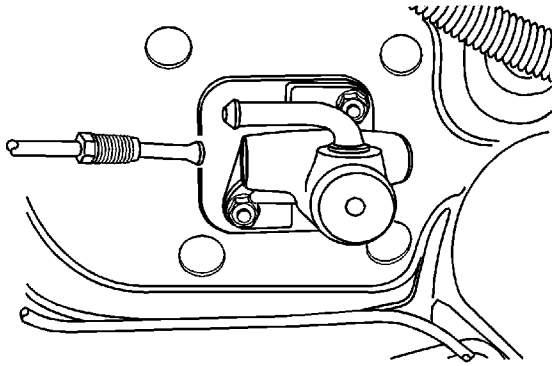
5. Remove the master cylinder pipe.



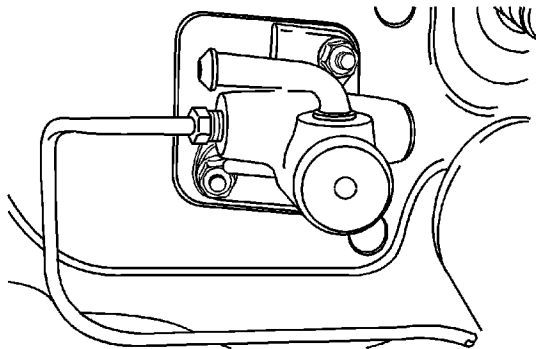
6. Remove the clutch master cylinder nuts.
7. Remove the clutch master cylinder.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

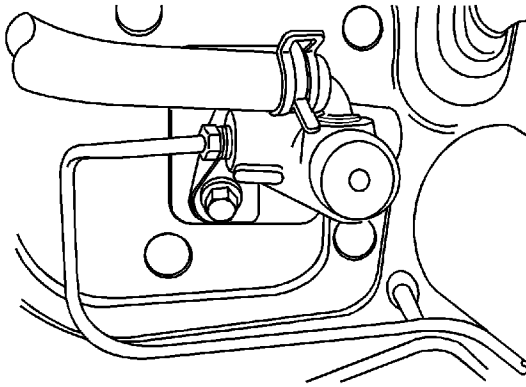


1. Install the clutch master cylinder.
2. Install the clutch master cylinder nuts and tighten to **22 N·m (16 lb ft)**.

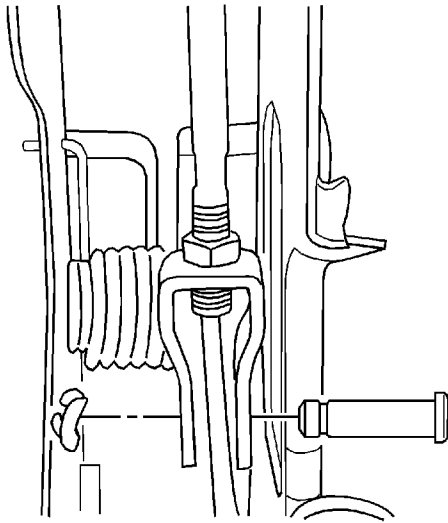


3. Install the master cylinder pipe.





4. Connect the master cylinder hose.
5. Connect the hose clamp on the master cylinder.



6. Install the push rod fixing pin and push rod.
7. Install the locking clip.
8. Bleed the air.
9. Adjust the clutch pedal. Refer to [Clutch Pedal Free Travel Adjustment](#).
10. Fill the reservoir with clutch/brake fluid up to the MAX level.

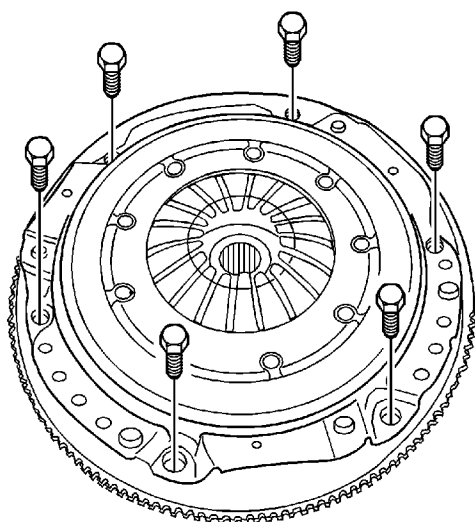
# Clutch, Pressure Plate, and Pilot Bearing Replacement

## Special Tools

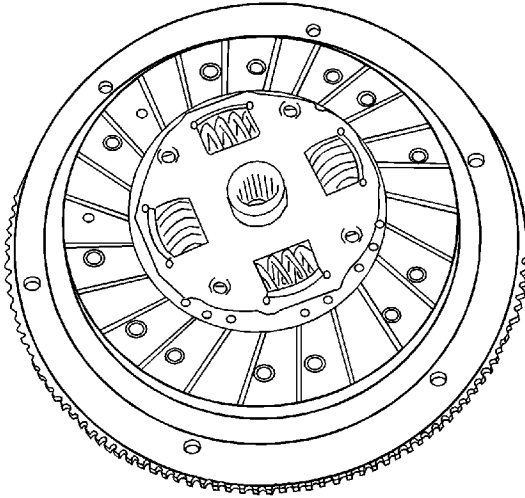
[DT 46551](#) (DW210-010) Clutch Center Guide

## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



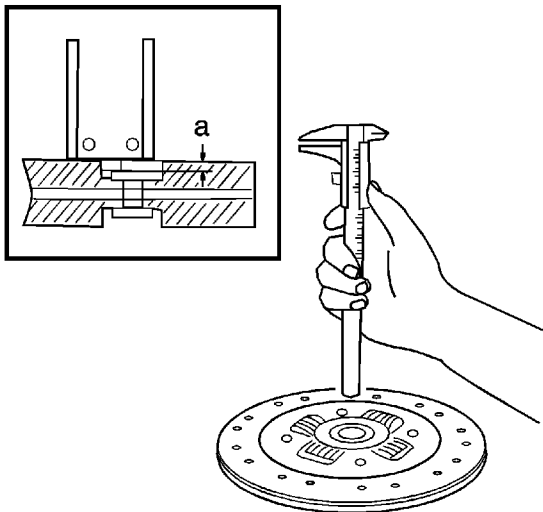
1. Disconnect the negative battery cable.
2. Remove the transaxle from the vehicle. Refer [Transmission Replacement](#) for the D16 transaxle, or [Transmission Replacement](#) for the Y4M transaxle.
3. Remove the pressure plate bolts and the pressure plate.



**Note:** Support the pressure plate when you remove the last bolt.

4. Remove the clutch disc from the flywheel

## Inspection Procedure



**Warning:** Refer to [Safety Glasses Warning](#) in the Preface section.

## Visual Inspection of Clutch Disc

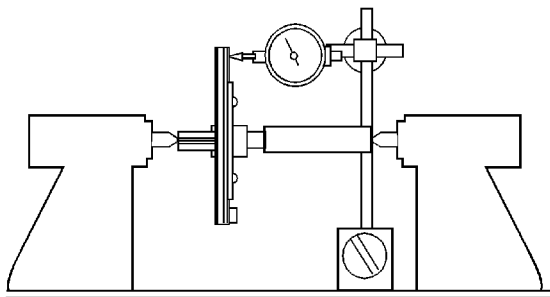
1. Inspect the worn or oily contamination on the clutch surface.
2. Inspect the damaged or weakened torsion spring.
3. Inspect for a warped or bent clutch disc. After inspection, replace the clutch disc, if necessary.

## Clutch Disc Inspection

1. Measure the rivet head depth from the clutch disc surface.
2. Replace the clutch disc if the measured value is below the limit.

### Specification

The rivet head depth standard is 1.2 mm (0.047 in), limit is 0.5 mm (0.020 in).

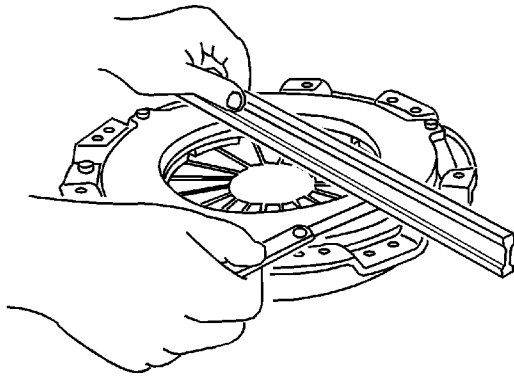


## Clutch Disc Runout in Rotational Direction Inspection

1. Measure runout using the dial gage.
2. If runout exceeds the limit, replace the clutch disc.

### Specification

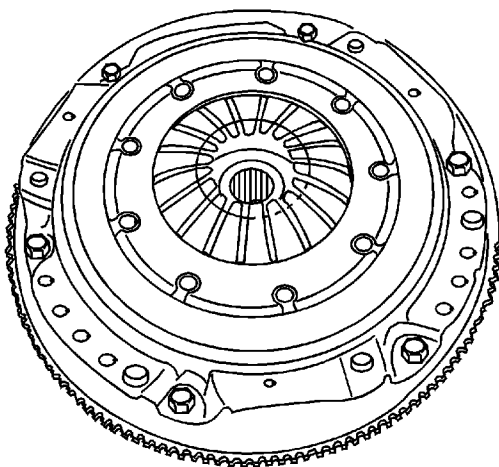
The disc runout limit in rotational direction - periphery - is 0.7 mm (0.028 in).



### Visual Inspection of the Pressure Plate

1. Inspect for a worn diaphragm spring finger.
2. Inspect for a worn or cracked pressure plate surface.
3. Inspect for the polluted face by the oil. After inspection, replace the pressure plate if necessary.

### Installation Procedure



1. Coat the spline on the clutch disc with multi-purpose grease.

2. Align the pressure plate and the clutch disc onto the flywheel using [DT 46551](#) .

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

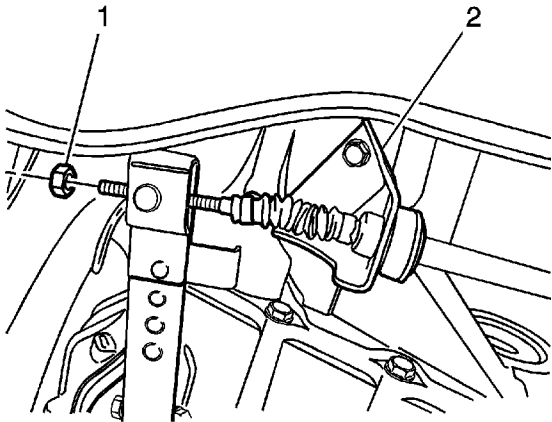
3. Install the pressure plate bolts.

#### **Tighten**

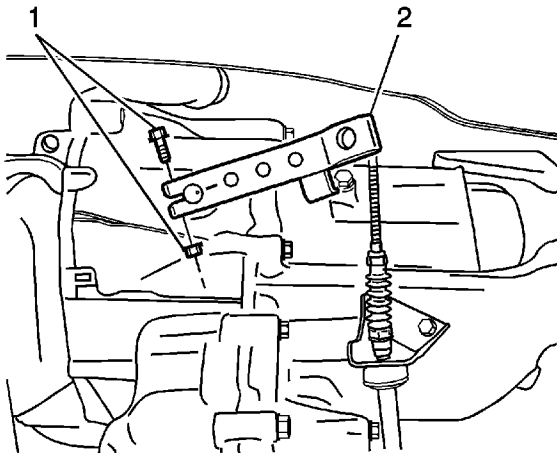
- For the hydraulic clutch type, tighten the bolts to 15 N·m (11 lb ft).
  - For the cable clutch type, tighten the bolts to 18 N·m (13 lb ft).
4. Remove [DT 46551](#) from the clutch assembly.
  5. Install the transaxle into the vehicle. Refer to [Transmission Replacement](#) for the D16 transaxle or [Transmission Replacement](#) for the Y4M transaxle.
  6. Connect the negative battery cable.

## Clutch Release Arm Replacement

### Removal Procedure



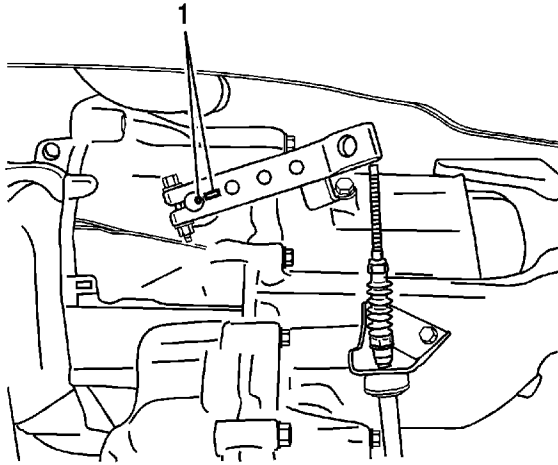
1. Mark the clutch release arm location to the release shaft position.
2. Remove the adjusting nut (1) for the clutch cable.
3. Remove the clutch control cable (2) from the release arm.



4. Remove the clutch release arm retaining bolt and nut (1).
  5. Remove the release arm (2).
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## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the release arm to the release shaft and align to the marked position (1).
2. Install the release arm bolt and nut and tighten to **16 N·m (12 lb ft)**.
3. Install the clutch control cable to the release arm and install the clutch control cable adjusting nut.
4. Adjust the clutch cable. Refer to [Clutch Assembly Adjustment](#).

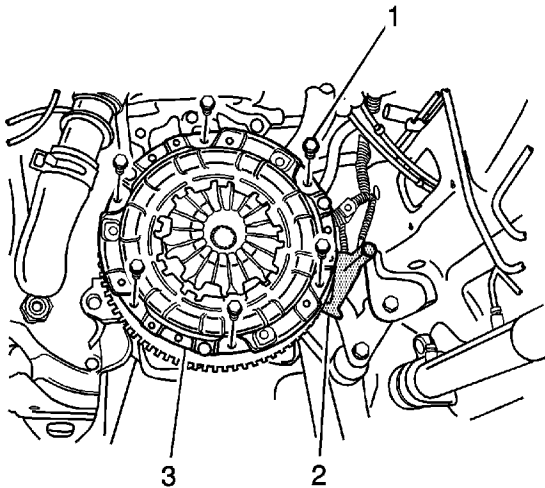


# Clutch Pilot Bearing Replacement

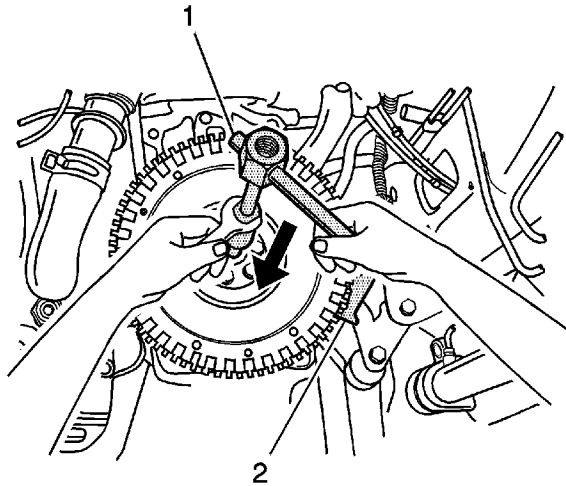
## Special Tools

- [J 23907](#) (09917-58010) Input Shaft Bearing Remover
- [J 35271](#) (09924-17810) Flywheel Holder
- [09925-98210](#) Input Shaft Bearing Installer

## Removal Procedure



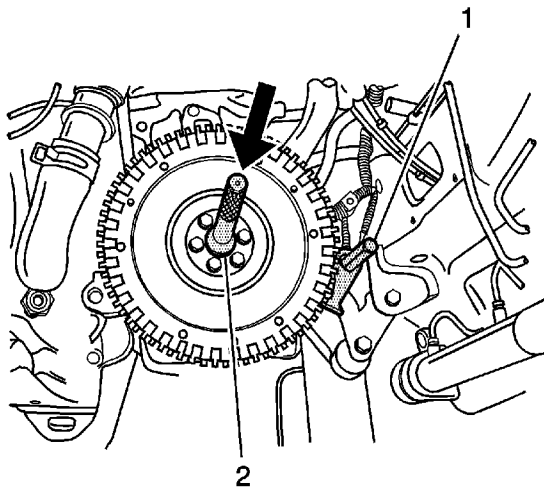
1. Remove the transaxle from the vehicle. Refer to [Transmission Replacement](#) for the D16 transaxle or [Transmission Replacement](#) for the Y4M transaxle.
2. Install [J 35271](#) (2) to the flywheel.
3. Remove the pressure plate and the clutch disc. Refer to [Clutch, Pressure Plate, and Pilot Bearing Replacement](#).



**Warning:** Wear safety glasses in order to avoid eye damage.

4. Remove the transmission input shaft bearing from the crankshaft using [J 23907](#) (1).

## Installation Procedure



1. Install the input shaft bearing using [09925-98210](#) (2) and [J 35271](#) (1).
2. Install the pressure plate and the clutch disc. Refer to [Clutch, Pressure Plate, and Pilot Bearing Replacement](#).
3. Remove [J 35271](#) (1) from the flywheel.
4. Install the transaxle to the vehicle. Refer to [Transmission Replacement](#) for the D16 transaxle

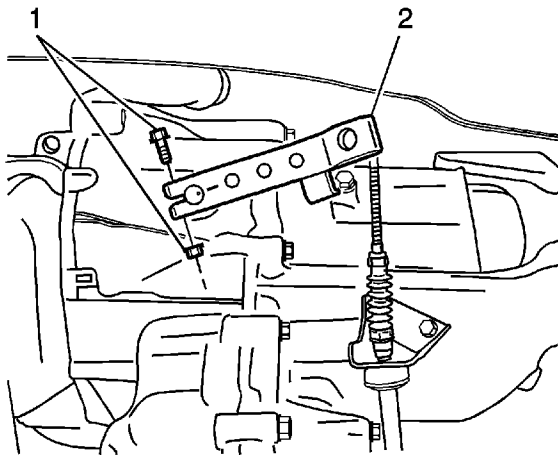
or [Transmission Replacement](#) for the Y4M transaxle.

## Release Bearing Replacement

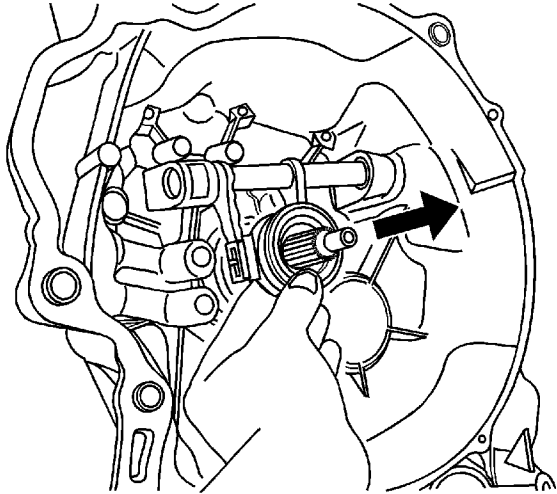
### Special Tools

- [DT 47513](#) (DW210-030) Bushing Joint Pipe
- [DT 47514](#) (DW210-040) Bushing Remover/Installer
- [J 2619-01](#) (09930-30102) Sliding Shaft
- [09943-88211](#) Bushing, Bearing Installer

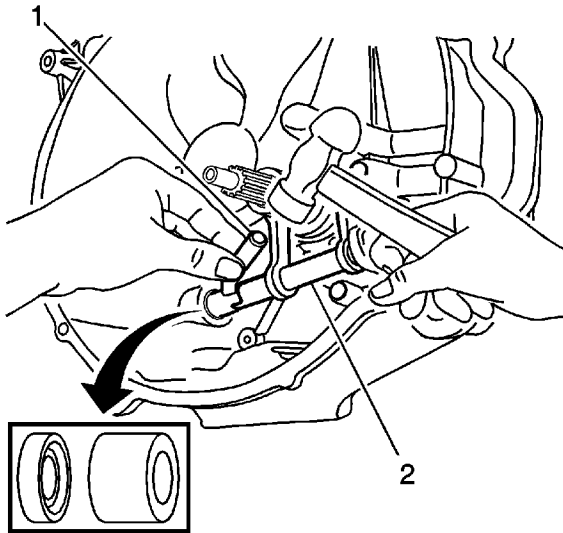
### Removal Procedure



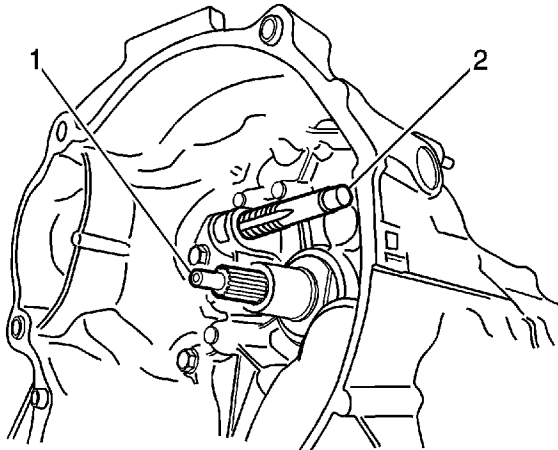
1. Remove the transaxle from the vehicle. Refer to [Transmission Replacement](#) for the D16 transaxle or [Transmission Replacement](#) for the Y4M transaxle.
2. Remove the release arm (2). Refer to [Clutch Release Arm Replacement](#).



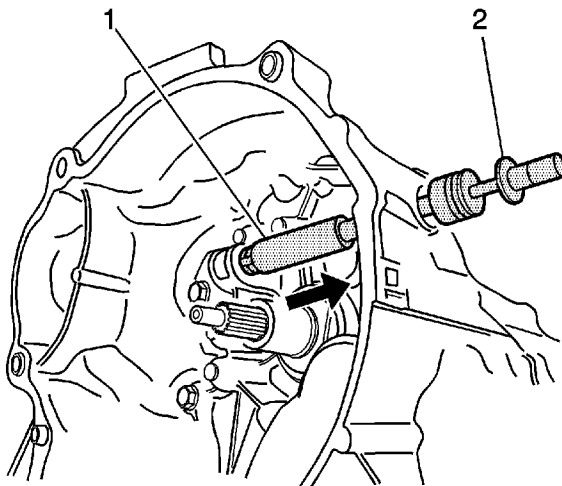
3. Remove the release bearing.



4. Remove the release shaft and bushing.
5. Remove the No. 2 bushing and the seal using [DT 47514](#) (1) and a hammer.
6. Remove the release shaft (2).



7. Thread the tap (M16 x 1.51) (2) into the bushing.

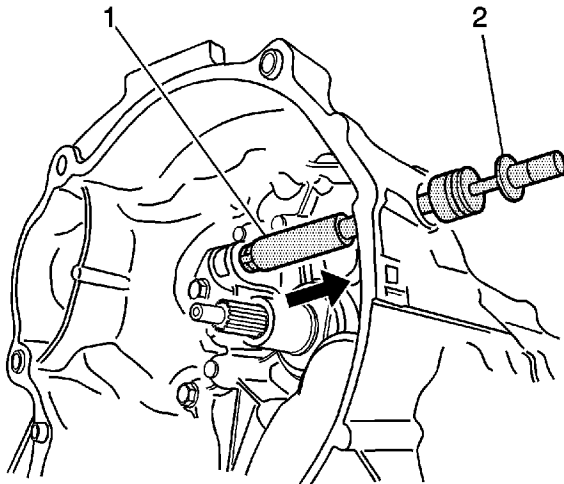


8. Connect [J 2619-01](#) (2) to the end of [DT 47513](#) (1).  
9. Remove the bushing by pulling.

## **Release Bearing and Shaft Inspection**

### **Bearing Inspection**

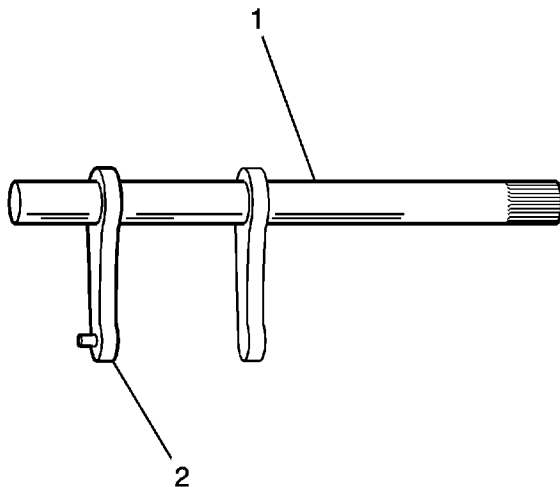
Perform the following release bearing inspection:



1. Inspect for noisy, worn and damaged release bearing.
2. Inspect for a grabbing rotation of release bearing.
3. Replace the release bearing if necessary.

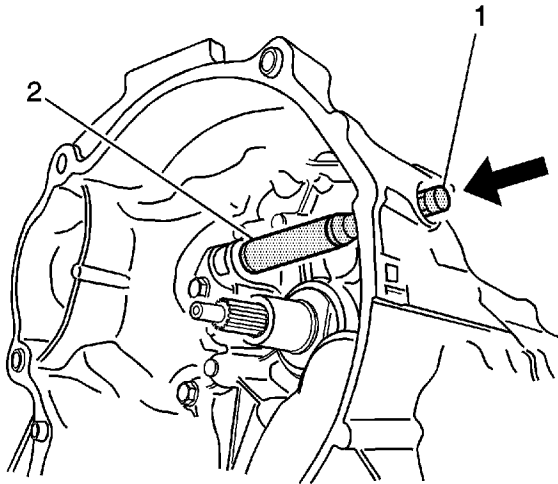
## Shaft Inspection

Perform the following release bearing shaft inspection:

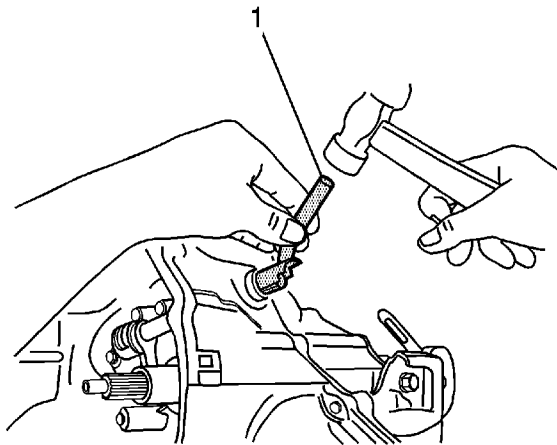


1. Inspect for a warped shaft (1).
2. Inspect for a worn fork (2).
3. Replace the shaft if necessary.

## Installation Procedure

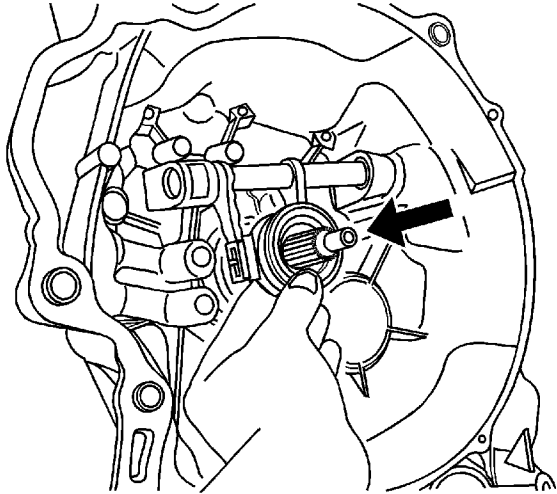


1. Install the release shaft No. 1 bushing using [DT 47513](#) (2), [09943-88211](#) (1) and a hammer.

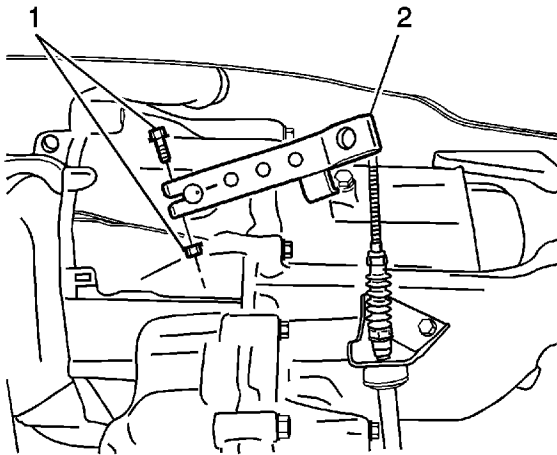


2. Install the release shaft.
3. Coat the release shaft and bushing with grease.
4. Install the release shaft No. 2 bushing and seal using [DT 47514](#) (1) and a hammer.





5. Coat the spline of the transaxle input shaft with multipurpose grease.
6. Coat the release bearing bore of the release shaft with multi-purpose grease.
7. Install the release bearing.



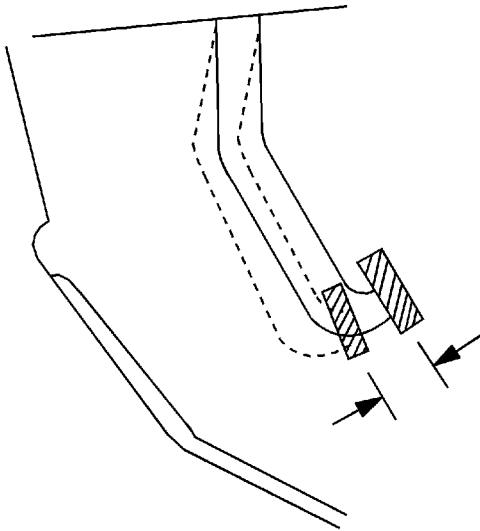
8. Install the release arm (2). Refer to [Clutch Release Arm Replacement](#)

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

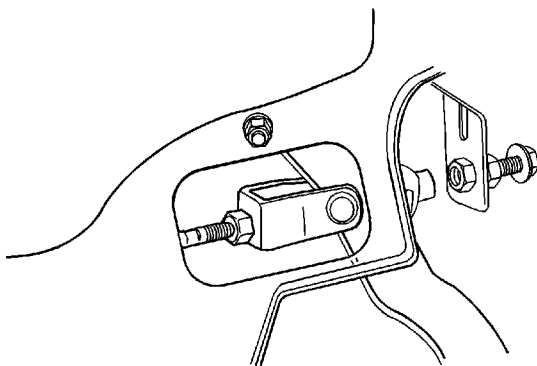
9. Install the release arm bolt and nut (1) and tighten to **16 N·m (12 lb ft)**.
10. Install the transaxle to the vehicle. Refer to [Transmission Replacement](#) for the D16 transaxle or [Transmission Replacement](#) for the Y4M transaxle.

## Clutch Pedal Free Travel Adjustment (Hydraulic)

### Adjustment Procedure



1. Determine the clutch pedal play. Depress the clutch pedal lightly with your hand and measure the distance when you feel resistance.

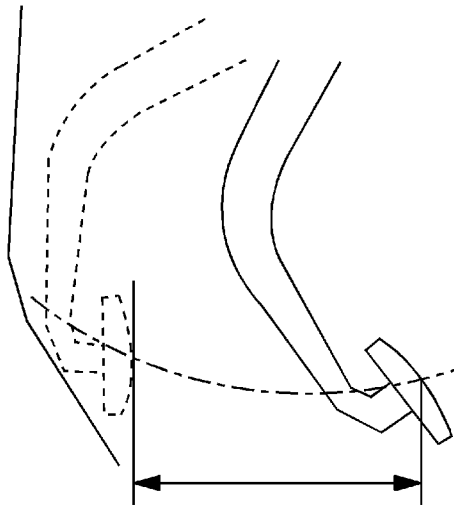


2. Adjust the clutch pedal play. Loosen the locknut and turn the pushrod.
3. Tighten the locknut after adjustment.

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**Specification**

The clutch pedal play is 10-12 mm (0.4-0.5 in).

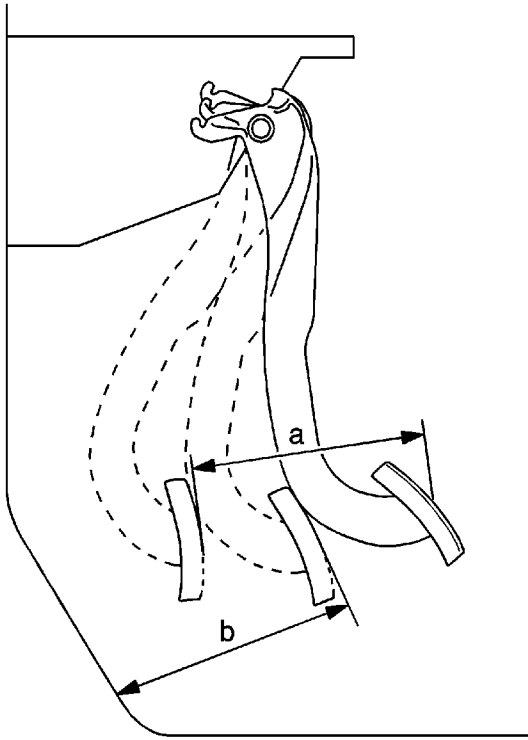


4. Measure the clutch pedal travel. Press the clutch pedal all the way to the floor. Measure from the starting position to the ending position.
5. Adjust the clutch pedal travel. Loosen the locknut and turn the bolt.
6. Tighten the locknut after adjustment.

**Specification**

The clutch pedal travel is 120-125 mm (4.7-4.9 in).

## Clutch Pedal Free Travel Adjustment (Cable)



This cable type of clutch engagement/disengagement system is designed to have no free travel in the clutch pedal. Adjust the clutch cable adjusting nut until the below specifications are met:

### Specifications

- Clutch pedal travel for disengagement (a): Pedal Travel 120-130 mm (4.7-5.1 in)
- Clearance between clutch pedal and floor just before clutch engagement (b): Clearance between pedal and floor just before clutch connection 50-60 mm (1.9-2.3 in)

**Warning:** When performing this check, the vehicle could move suddenly. Personal injury or property damage may result. Make sure there is enough room around the vehicle, in case the vehicle does move. Do not use the accelerator pedal, and be ready to turn OFF the engine immediately if it starts.

After starting the engine, Inspect if the clearance between pedal and floor is within specified range. If the clutch adjustments cannot be obtained, Inspect for interference of the clutch pedal. If no interference or obstructions are found, the clutch cable may be worn and require replacement.

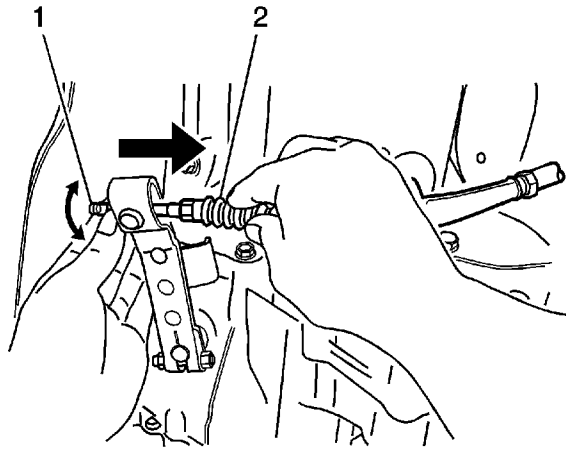
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## **Clutch Cable Inspection**

Inspect the clutch cable and replace it if any of the following conditions exists:

- Excessively worn cable
- Loose cable
- Bent or distorted cable
- Damaged boot
- Worn end

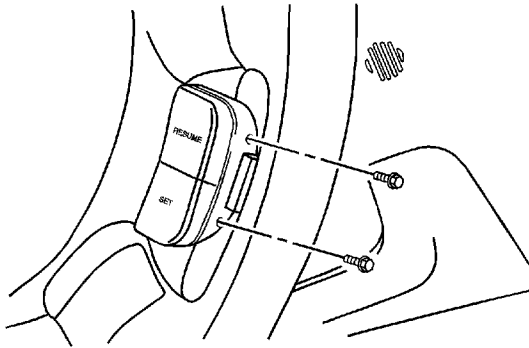
## Clutch Assembly Adjustment



If clutch engagement/disengagement is difficult or operating unsmooth, adjust the clutch cable by adjusting clutch cable adjustment nut (1) until the desired free travel is obtained. Refer to [Clutch Pedal Free Travel Adjustment](#) .

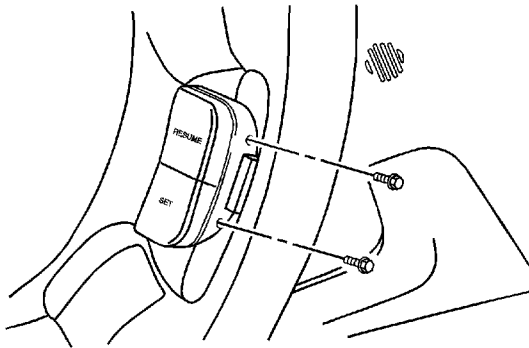
## Cruise Control Switch Replacement

### Removal Procedure



1. Disconnect the negative battery cable.
2. Remove the screws and the cruise control switch.
3. Disconnect the cruise control switch connector.

### Installation Procedure





1. Connect the cruise control switch connector.
2. Install the cruise control switch and the screws.
3. Connect the negative battery cable.



## Clutch Pedal Cruise Control Release Switch Adjustment

### Cruise Control Clutch Switch Adjustment

1. Push the switch assembly through the pedal support and turn 90 degrees.
2. Hold the clutch pedal to the rest position.
3. Connect the cruise control clutch pedal switch electrical connector.
4. Verify the operation of the clutch switch by operating the cruise control and checking the clutch switch stops operation of the cruise control when the clutch pedal is pressed.

# Clutch Pedal Cruise Control Release Switch Replacement

## Removal Procedure

1. Disconnect the cruise control clutch pedal switch electrical connector.
2. Turn the switch 90 degrees counterclockwise and remove.

## Installation Procedure

1. Position the cruise control clutch switch in the pedal support, then turn the switch 90 degrees clockwise.
2. Connect the cruise control clutch pedal switch electrical connector.
3. Adjust the cruise control clutch pedal switch. Refer to [Clutch Pedal Cruise Control Release Switch Adjustment](#) .

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Brakes](#) | [Disc Brakes](#) | [Specifications](#) |

Document ID: 1307700

## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Brake Hose Inlet Fitting-to-Caliper Bolt	40 N·m	30 lb ft
Caliper Bleeder Valve	6 N·m	53 lb in
Caliper-to-Steering Knuckle Mounting Bolts	95 N·m	70 lb ft
Retaining Frame-to-Caliper Housing Bolts	27 N·m	20 lb ft
Rotor-to-Front Wheel Hub Detent Screw	4 N·m	35 lb in
Splash Shield-to-Steering Knuckle Screws	4 N·m	35 lb in

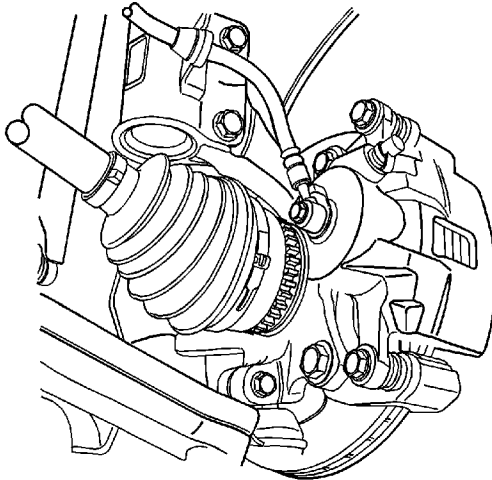
## Disc Brake Component Specifications

Application	Specification	
	Metric	English
Caliper Piston Minimum Diameter	54 mm	2.12 in
Disc Type	Ventilated	
Discard Thickness for 236 mm (9.29 in) Diameter Rotor	18 mm	0.709 in
Discard Thickness for 256 mm (10.08 in) Diameter Rotor	22 mm	0.866 in
Maximum Assembled Lateral Runout - Installed	0.06 mm	0.002 in
Maximum Groove Depth	0.40 mm	0.016 in
Maximum Lateral Runout - Not Installed	0.03 mm	0.001 in
Maximum Thickness Variation	0.10 mm	0.004 in
New Rotor Thickness - 236 mm (9.29 in) Diameter Rotor	20 mm	0.787 in
New Rotor Thickness - 256 mm (10.08 in) Diameter Rotor	24 mm	0.945 in
Rotor Diameter - Larger Size with SACL500 Stamping	256 mm	10.08 in
Rotor Diameter - Smaller Size with SACL485F Stamping	236 mm	9.29 in

## Front Disc Brake Pads Replacement

### Removal Procedure

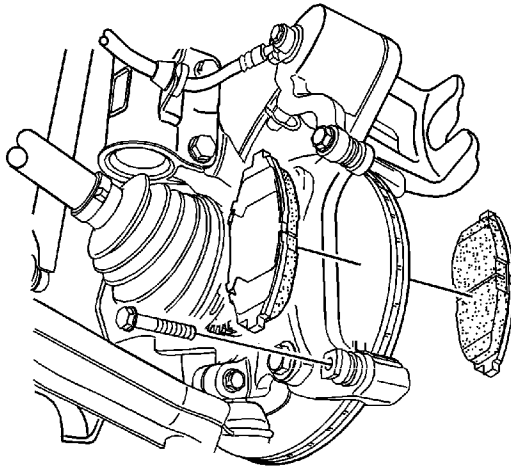
**Caution:** Refer to [Brake Caliper Caution](#) in the Preface section.



1. Raise and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. To maintain wheel balance, mark the relative positions of the wheel and the hub, and remove the front wheel. Refer to [Tire and Wheel Removal and Installation](#).

**Note:** It is not necessary to remove the caliper to service the brake shoes.

3. Remove the lower bolt of the caliper assembly retaining frame.

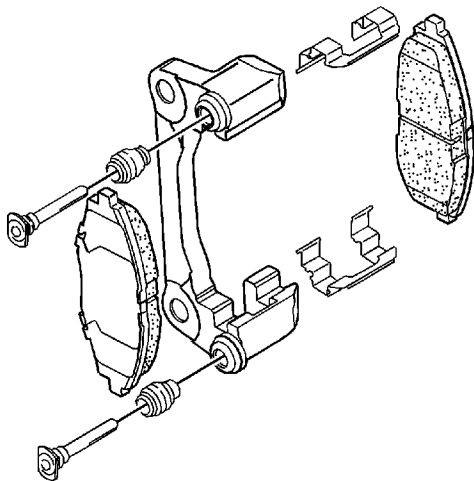


4. Pull the caliper piston housing up.

**Warning:** Refer to [Brake Dust Warning](#) in the Preface section.

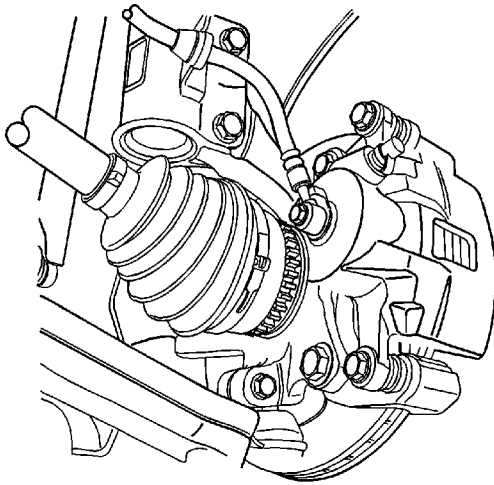
5. Remove the brake pads.

## Installation Procedure



1. Measure the minimum lining thickness. Refer to [Brake Pad Inspection](#).
2. Install the brake pads into the caliper.
3. Push the piston inward, if necessary.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



**Note:** Take care not to damage the piston seal when the piston housing is pulled down.

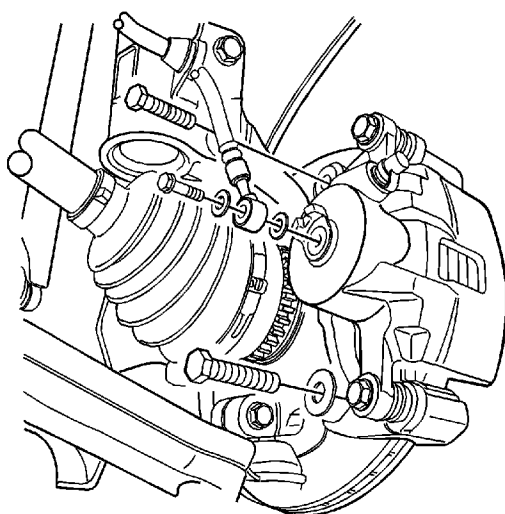
4. Pull down the caliper piston housing and secure it to the retaining frame with the lower bolt and tighten to **27 N·m (20 lb ft)**.
5. Align the marks that were made before the wheel removal and install the front wheels. Refer to [Tire and Wheel Removal and Installation](#).
6. Lower the vehicle.

## Brake Caliper Replacement

### Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Mark the position of the front wheels relative to the wheel hubs and remove the wheels. Refer to [Tire and Wheel Removal and Installation](#).

**Warning:** Refer to [Brake Dust Warning](#) in the Preface section.



3. Remove the fitting and the washers that attach the brake hose to the caliper.

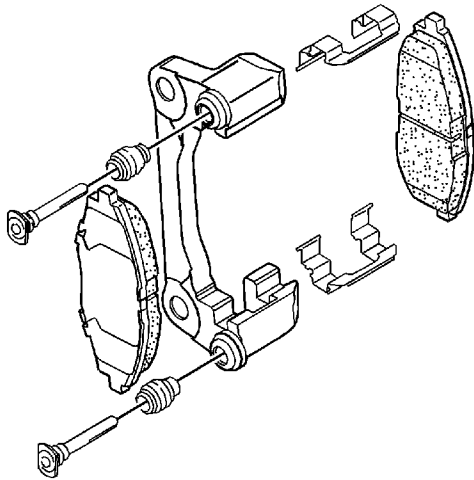
**Warning:** Refer to [Brake Fluid Irritant Warning](#) in the Preface section.

**Caution:** Refer to [Brake Fluid Effects on Paint and Electrical Components Caution](#) in the Preface section.

4. Disconnect the brake hose, and plug the openings in the caliper and the brake hose to prevent fluid loss and contamination.
5. Remove the caliper mounting bolts from the steering knuckle.
6. Remove the caliper assembly.

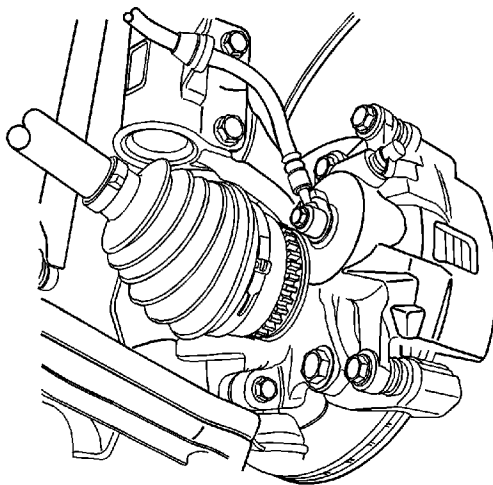
### Installation Procedure





1. Ensure the slide pins are lubricated with Silicone Brake Lubricant, GM P/N 89021536, ACDelco P/N 89021537 (Canadian P/N 89021538), or equivalent. If necessary, refer to [Front Brake Caliper Overhaul](#).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



2. Install the caliper assembly with the mounting bolts.

**Tighten**

Tighten the caliper-to-steering knuckle mounting bolts to 95 N·m (70 lb ft).

3. Install the brake hose to the caliper with the washers and the brake hose inlet fitting.

**Tighten**

Tighten the brake hose inlet fitting to 40 N·m (30 lb ft).

4. Install the front wheels. Refer to [Tire and Wheel Removal and Installation](#).
5. Lower the vehicle.

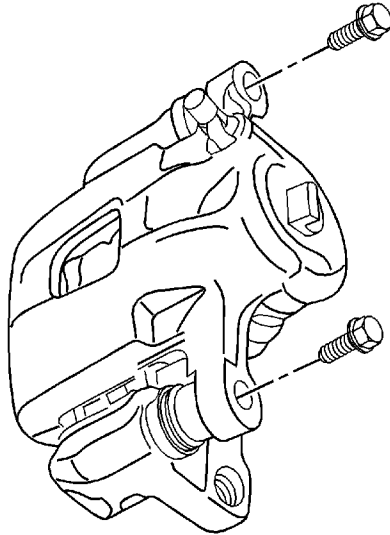
**Warning:** Do not move the vehicle until a firm brake pedal is obtained. Failure to obtain a firm pedal before moving vehicle may result in personal injury.

6. With the engine OFF, gradually apply and release the brake pedal several times in order to position the caliper piston and the pads.
7. Bleed the brake system. Refer to [Hydraulic Brake System Bleeding](#).

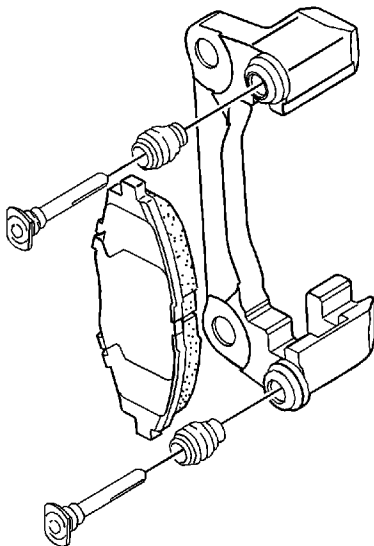
## Front Brake Caliper Overhaul

### Disassembly Procedure

1. Remove the caliper assembly. Refer to [Brake Caliper Replacement](#).

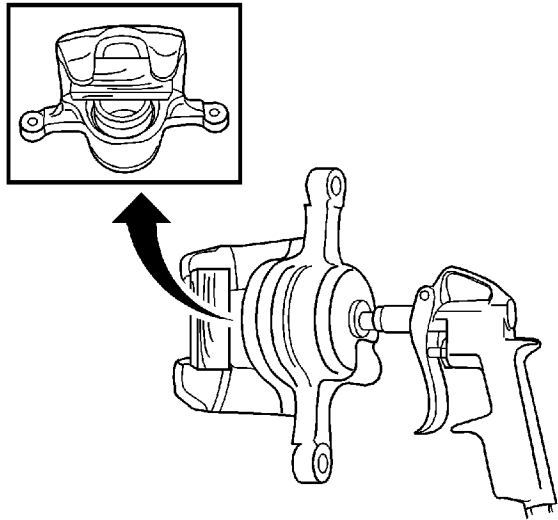


2. Remove the caliper guide pin that connects the caliper piston housing to the retaining frame.
3. Remove the bleeder valve protector and the bleeder valve.



4. Pull out the pins and the rubber boots.
5. Remove the front pad brake set, including the pad springs, from the caliper. Refer to [Front Disc Brake Pads Replacement](#).

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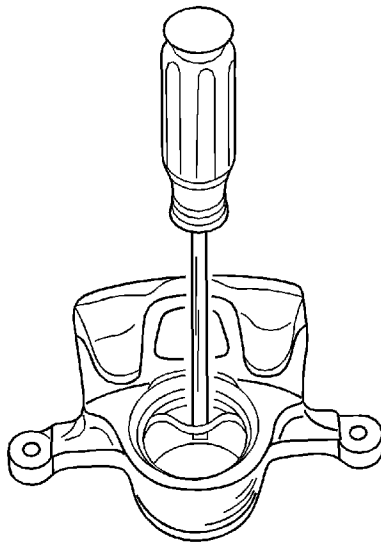
6. Insert a cloth or a piece of hardwood into the caliper housing.

**Warning:** Wear safety glasses when using compressed air in order to prevent eye injury.

**Warning:** Do not place fingers in front of the caliper piston(s) in an attempt to catch or protect it when applying compressed air. The piston(s) can fly out with force and could result in serious bodily injury.

**Caution:** Use just enough air pressure to ease the piston out of the bore. You can damage a blown-out piston even with the padding.

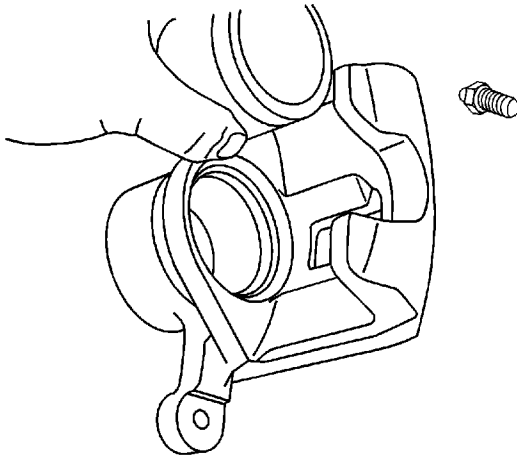
7. Apply compressed air to the caliper brake hose connector hole in order to remove the piston from the caliper.
8. Remove the outer seal.





9. Remove the inner seal from the caliper piston bore.

## Inspection Procedure

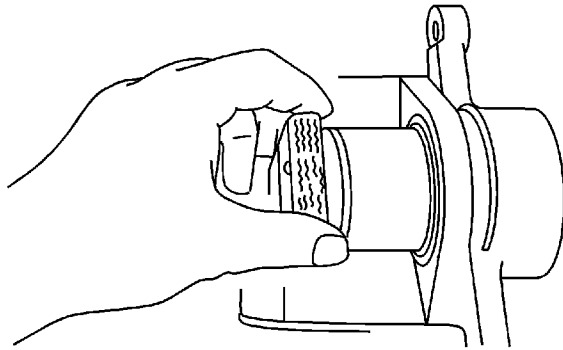


1. Clean all parts in denatured alcohol or brake fluid.
2. Use unlubricated compressed air in order to dry the parts and blow out all passages in the housing and the bleeder valve.
3. Inspect the caliper bleeder valve.

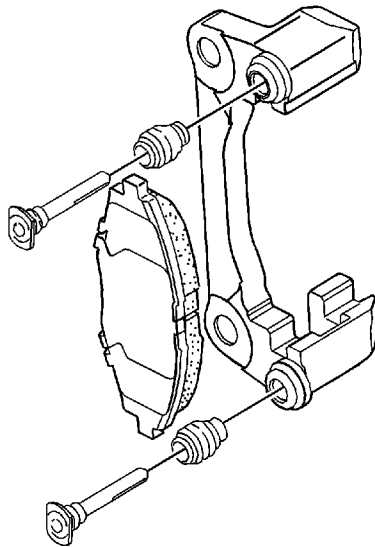
**Note:** Do not use a hone or any other procedure to remove material from the piston or the caliper bore.

4. Inspect the piston and the caliper for scoring, nicks, and corrosion. Replace components if necessary.

## Assembly Procedure

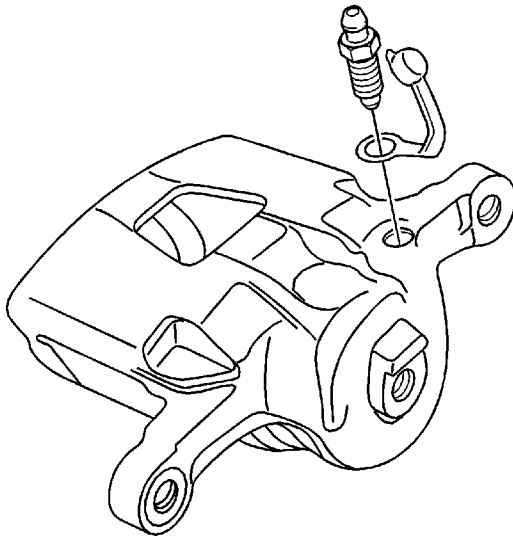


1. Lubricate a new piston inner seal with brake fluid.
2. Install the piston inner seal into the caliper housing groove. Ensure the seal is not twisted.
3. Lubricate the outer piston dust seal with brake fluid.
4. Install the outer piston dust seal in the groove.
5. Lubricate the piston with brake fluid.
6. Push the piston into its bore and ensure the dust seal is seated in the piston groove.

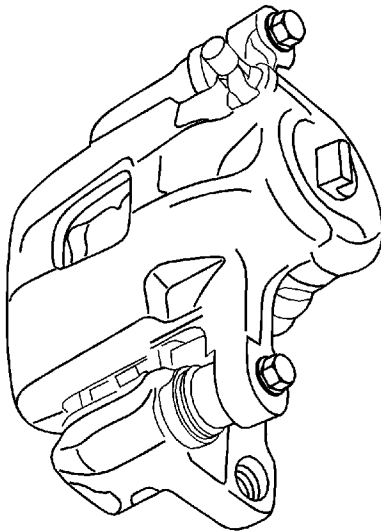


7. Coat the pins with Silicone Brake Lubricant, GM P/N 89021536, ACDelco P/N 89021537 (Canadian P/N 89021538), or equivalent, and install the boots.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



8. Install the caliper bleeder valve and the dust cap and tighten to **6 N·m (53 lb in)**.
9. Install the front pad brake set and the pad springs. Refer to [Front Disc Brake Pads Replacement](#).

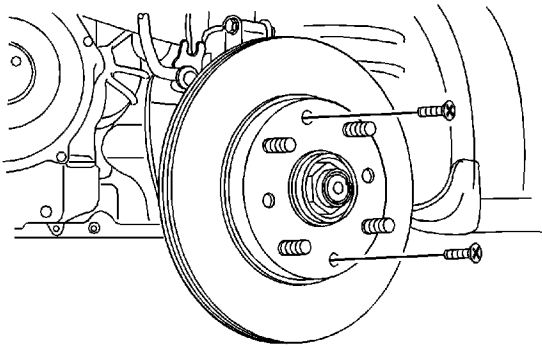


10. Connect the retaining frame to the caliper housing with the guide pin bolts and tighten to **27 N·m (20 lb ft)**.
11. Install the caliper assembly. Refer to [Brake Caliper Replacement](#).

## Brake Rotor Replacement

### Removal Procedure

**Caution:** Refer to [Brake Caliper Caution](#) in the Preface section.

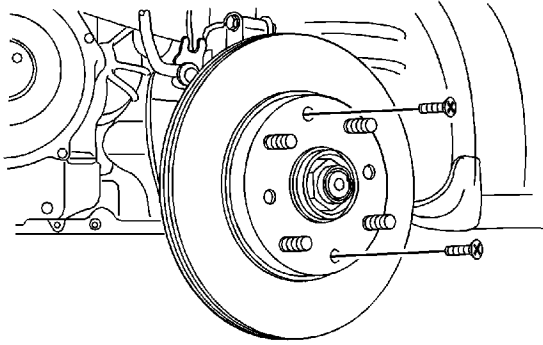


**Note:** To guarantee uniform braking on both sides, both rotors must have identical surfaces regarding smoothness and scoring depth. For this reason, always replace both rotors.

1. Remove the caliper assembly without disconnecting the brake hoses. Refer to [Brake Caliper Replacement](#).
2. Remove the caliper bracket.
3. Remove the rotor-to-front wheel hub detent screw from the rotor and the front wheel hub.
4. Pull off the rotor.

### Installation Procedure





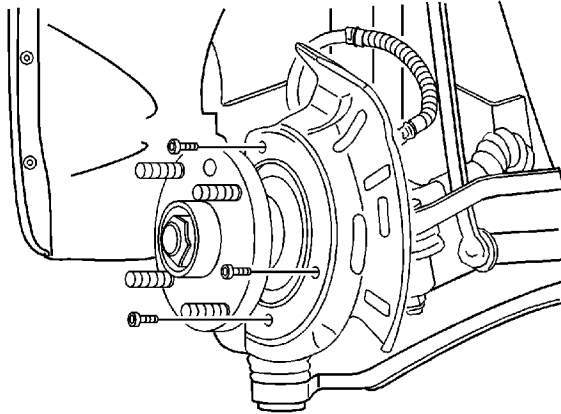
1. Inspect the rotor. Refer to [Brake Rotor Surface and Wear Inspection](#).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the rotor to the front wheel hub by tightening the detent screw to **4 N·m (35 lb in)**.
3. Install the caliper bracket and tighten to **95 N·m (70 lb ft)**.
4. Install the caliper assembly. Refer to [Brake Caliper Replacement](#).

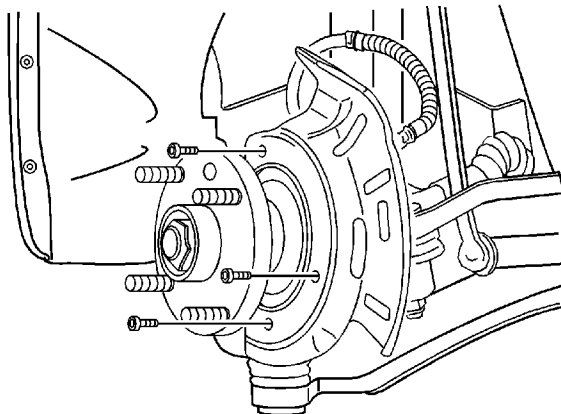
## Front Brake Shield Replacement

### Removal Procedure



1. Remove the rotor. Refer to [Brake Rotor Replacement](#).
2. Remove the screws for the splash shield from the steering knuckle.
3. Remove the splash shield.

### Installation Procedure





1. Install the splash shield.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Secure the splash shield to the steering knuckle with the screws and tighten to **4 N·m (35 lb in)**.
3. Install the rotor. Refer to [Brake Rotor Replacement](#).

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Brakes](#) | [Drum Brakes](#) | [Specifications](#) |

Document ID: 1757463

## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Backing Plate-to-Rear Axle Nuts	28 N·m	21 lb ft
Brake Pipe Fitting	16 N·m	12 lb ft
Drum-to-Hub Screws	4 N·m	35 lb in
Wheel Cylinder-to-Backing Plate Bolt	8 N·m	71 lb in

## Drum Brake Component Specifications

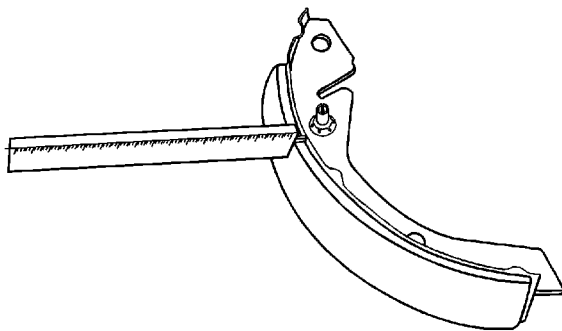
Application	Specification	
	Metric	English
Brake Drum Inside Diameter - New	200 mm	7.87 in
Brake Drum Maximum Inside Diameter	201 mm	7.91 in
Brake Drum Maximum Radial Runout - Not Installed	0.04 mm	0.002 in
Wheel Cylinder Diameter - Rear	20.64 mm	0.81 in

## Brake Shoe Inspection

### Inspection Procedure

1. Remove the brake drum. Refer to [Brake Drum Replacement](#).

**Warning:** Refer to [Brake Dust Warning](#) in the Preface section.



2. Measure the lining thickness.

#### **Specification**

The minimum lining thickness is 0.5 mm (0.02 in).

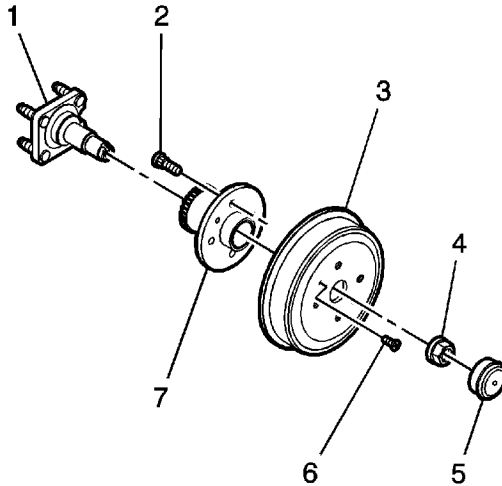
**Note:** Replace the shoe and lining assembly in axle sets only.

3. If the lining thickness is less than the specification, or if a defect is found, replace the linings. Refer to [Brake Shoe Replacement](#).
4. Install the brake drum. Refer to [Brake Drum Replacement](#).

## Brake Drum Replacement

### Removal Procedure

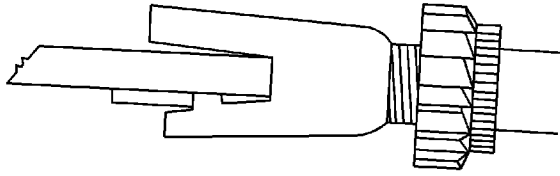
1. Release the park brake.
2. Apply the brake pedal 10 times.
3. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
4. Remove the rear tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#).



5. Remove the screws (6) from the brake drum (3).
6. Remove the brake drum from the hub (3).

### Inspection Procedure

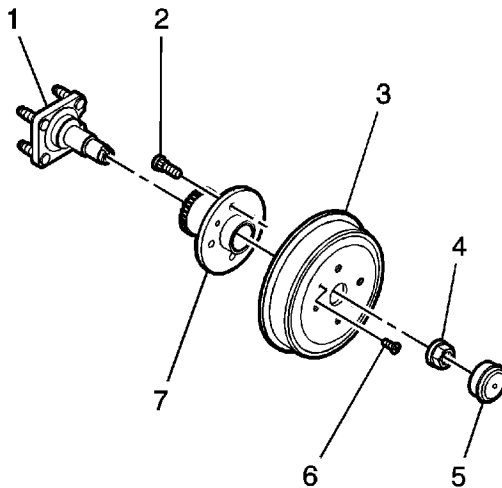
1. Clean the brake components.
2. Inspect the brake drum. Replace the drum, if necessary. Refer to [Brake Drum Surface and Wear Inspection](#).



3. Apply lubricant to the adjuster assembly.
4. Inspect the threads of the adjuster assembly for smooth rotation.

## Installation Procedure

1. Adjust the rear brakes. Refer to [Drum Brake Adjustment](#).



2. Install the brake drum (3) to the hub (7).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the screws (6) to the brake drum.



**Tighten**

Tighten the screws to 4 N·m (35 lb in).

4. Install the rear tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#).
5. Lower the vehicle.

**Note:** If the clicking sound of the adjuster is not audible from either brake drum, the clearance between the brake shoes and the brake drum is adjusted.

6. Apply the brake pedal at least 10 times in order to adjust the clearance between the brake shoes and the brake drum.

Verify the clicking sound of the adjuster assembly is not audible from either brake drum.

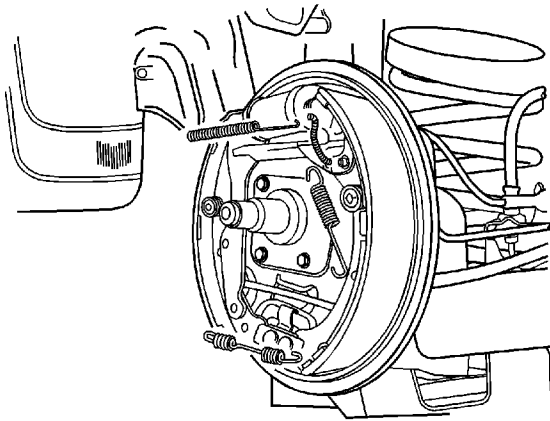
7. Adjust the park brake. Refer to [Parking Brake Adjustment](#).

## Brake Shoe Replacement

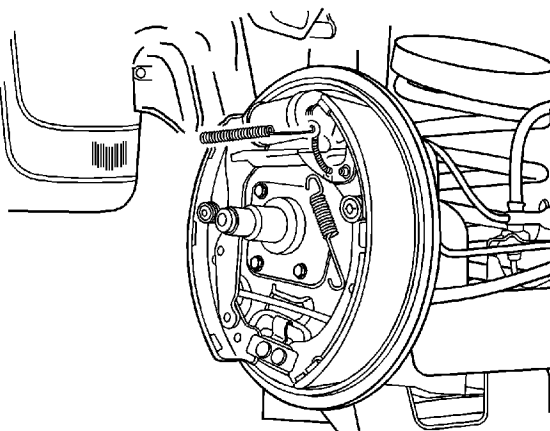
### Removal Procedure

**Warning:** Refer to [Brake Dust Warning](#) in the Preface section.

1. Remove the brake drum. Refer to [Brake Drum Replacement](#).



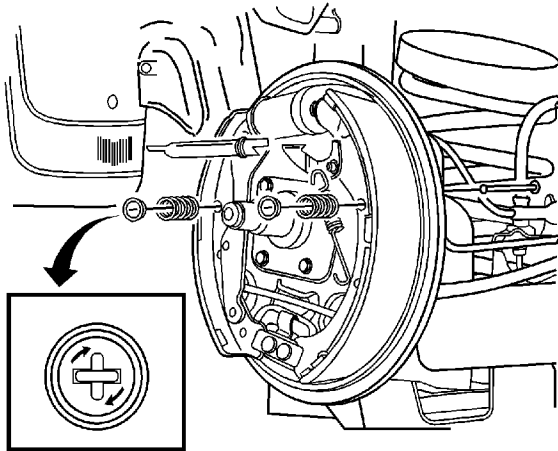
2. Remove the lower return spring.



3. Remove the upper end of the connecting link from the leading shoe to relieve tension on the upper return spring.

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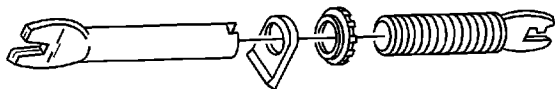
4. Remove the connecting link spring.
5. Remove the connecting link and the adjusting lever.
6. Remove the upper return spring and the adjuster.



7. Remove the trailing shoe hold-down spring and cap.
8. Remove the trailing shoe hold-down pin.
9. Remove the trailing shoe.
10. Remove the leading shoe hold-down spring and cap.
11. Remove the leading shoe hold-down pin.
12. Remove the leading shoe.

## Inspection Procedure

**Warning:** Refer to [Safety Glasses Warning](#) in the Preface section.

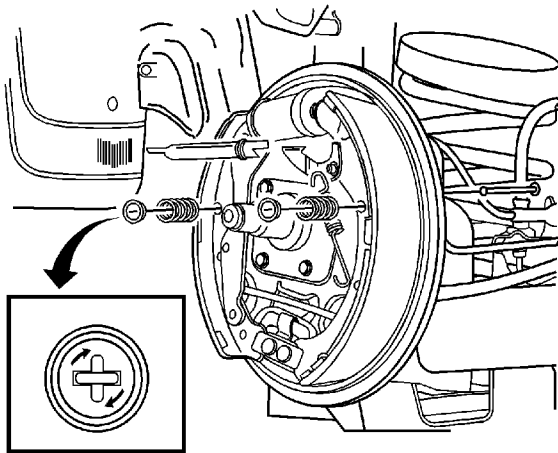




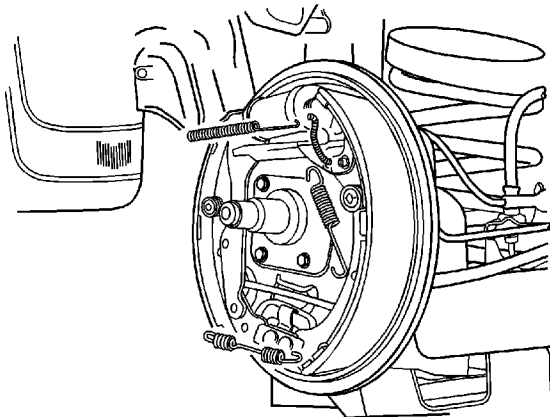
1. Measure the minimum brake lining thickness. Refer to [Brake Shoe Inspection](#).
2. Clean the adjuster assembly and apply grease.
3. Inspect the threads of the adjuster assembly for smooth rotation.
4. Inspect the brake components for damage or wear. Replace any damaged or worn components.

## **Installation Procedure**

1. Verify the park brake cable is properly routed.
2. Attach the park brake cable to the trailing shoe lever.



3. Install the trailing shoe with the hold-down spring, the cap, and the pin.





**Note:** Do not overstretch the lower return spring.

4. Install the lower return spring to the trailing shoe.
5. Position the leading shoe and the adjuster assembly against the backing plate.
6. Install the lower return spring to the leading shoe.
7. Install the adjuster assembly.
8. Turn the adjuster in as far as possible.
9. Install the leading shoe with the hold-down spring, the cap, and the pin.
10. Install the adjusting lever to the leading shoe.
11. Install the connecting link to the leading shoe.
12. Install the connecting link spring.

**Note:** Do not overstretch the lower return spring.

13. Install the upper return spring from the leading shoe to the connecting link.

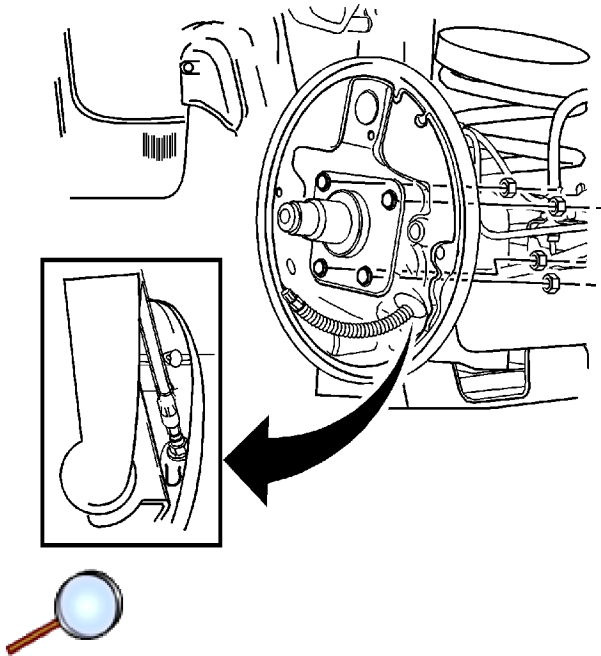
**Note:** The nut must not lock firmly at the end of the adjustment assembly.

14. Ensure the adjuster assembly nut is drawn all the way to the stop.
15. Adjust the rear brakes. Refer to [Drum Brake Adjustment](#).
16. Install the brake drum. Refer to [Brake Drum Replacement](#).
17. Adjust the park brake. Refer to [Parking Brake Adjustment](#).

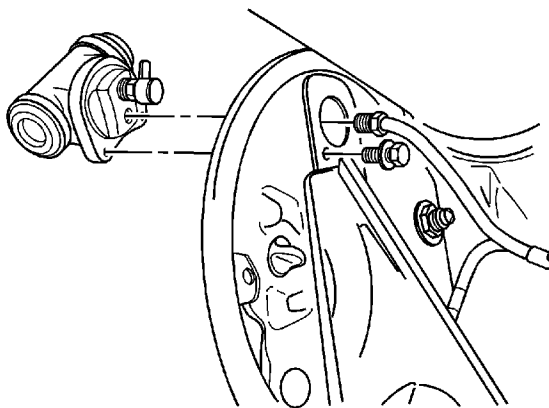
## Rear Brake Backing Plate Replacement

### Removal Procedure

**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.



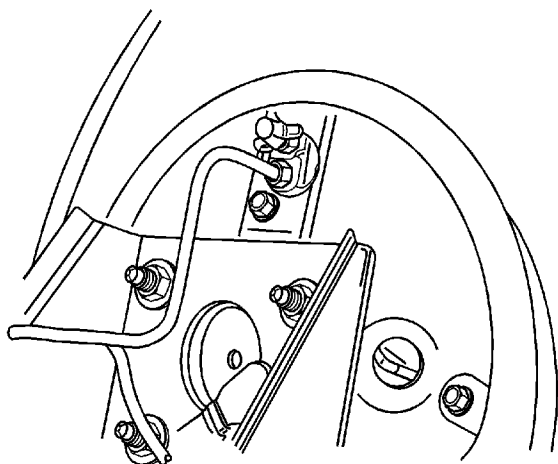
1. Raise and suitably support the vehicle.
2. Remove the brake shoe components, including complete removal of the parking brake with the retainer. Refer to [Brake Shoe Replacement](#).
3. Remove the nuts that secure the wheel hub assembly to the backing plate.
4. Remove the brake line and plug the opening in the line to prevent fluid loss or contamination.





5. Remove the wheel cylinder assembly. Refer to [Wheel Cylinder Replacement](#).
6. Remove the wheel hub assembly.
7. In case of an antilock brake system (ABS) brake, disconnect the cable that goes to the wheel speed sensor.
8. Separate the backing plate and the gasket.

## Installation Procedure



1. Place the backing plate with a new gasket on the wheel hub. The ABS hub is shown.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Insert the complete wheel hub/backing plate assembly into the rear axle plate. In case of ABS brakes, install the nuts and connect the wheel speed sensor.

### **Tighten**

Tighten the brake wheel hub/backing plate-to-rear axle nuts to 28 N·m (21 lb ft).

3. Install the brake wheel cylinder assembly to the backing plate. Refer to [Wheel Cylinder Replacement](#).
4. Connect the brake line.

### **Tighten**

Tighten the brake line to 16 N·m (12 lb ft).

5. Install the brake components. Refer to [Brake Shoe Replacement](#).
6. Install the parking brake cable with the retainer by attaching the cable to the brake shoe lever. Refer to [Park Brake Cable Replacement](#).
7. Bleed the brakes. Refer to [Hydraulic Brake System Bleeding](#).

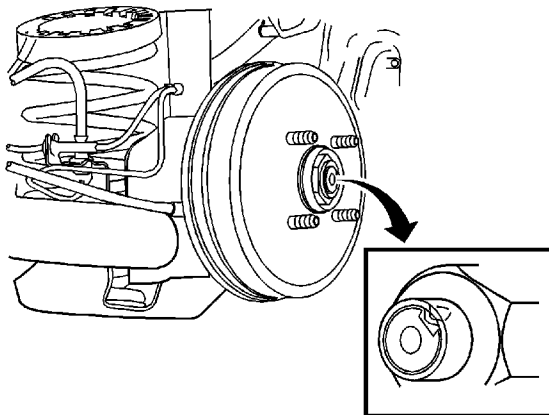
8. Lower the vehicle.



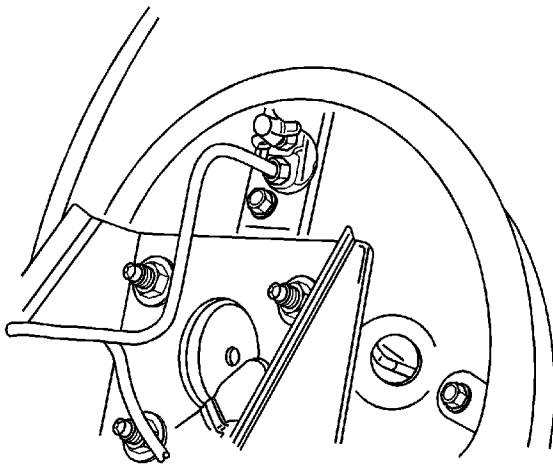
## Wheel Cylinder Replacement

### Removal Procedure

**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.

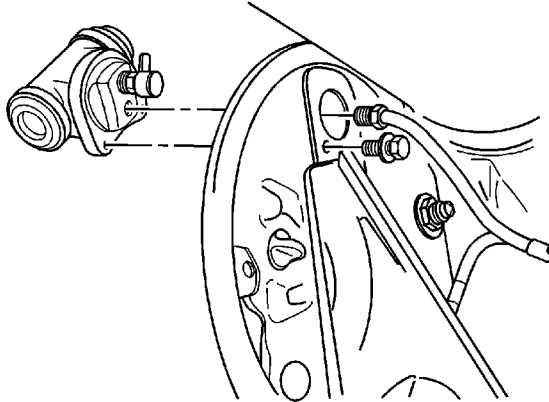


1. Raise and suitably support the vehicle.
2. Remove the rear wheels. Refer to [Tire and Wheel Removal and Installation](#).
3. Mark the position of the wheels relative to the wheel hubs.
4. Remove the brake drum.
5. Remove the shoe and lining. Refer to [Brake Shoe Replacement](#).





6. Clean the dirt and foreign material from around the wheel cylinder brake line inlet, the pilot, and the bolt.
7. Disconnect the brake line from the wheel cylinder.
8. Plug the opening in the brake line to prevent fluid loss or contamination.



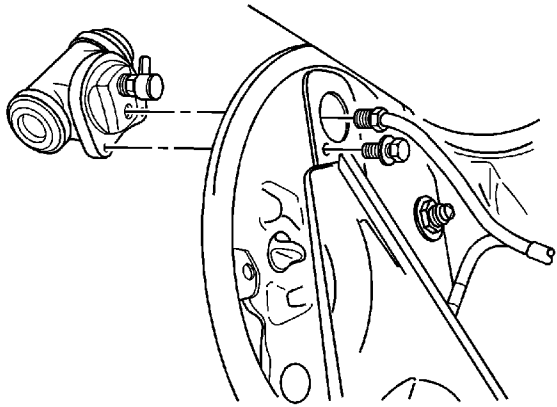
**Warning:** Brake fluid may irritate eyes and skin. In case of contact, take the following actions:

- Eye contact - rinse thoroughly with water.
- Skin contact - rinse with soap and water.
- If ingested - consult a physician immediately.

9. Remove the wheel cylinder-to-backing plate bolt.
10. Gently tap out the wheel cylinder from the backing plate, using care not to damage the bleeder valve or its cap.

## Installation Procedure

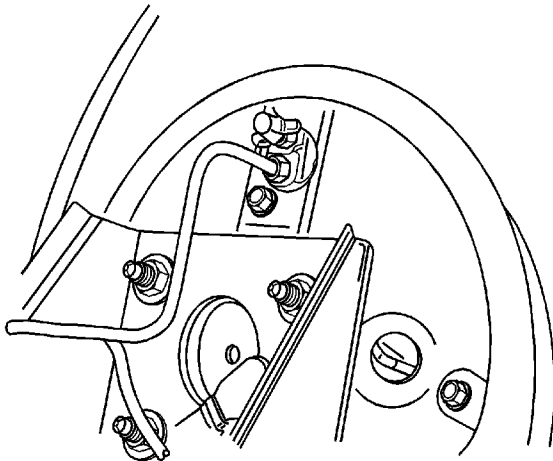
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the wheel cylinder to the backing plate with the wheel cylinder bolt.

**Tighten**

Tighten the wheel cylinder-to-backing plate bolt to 8 N·m (71 lb in).



2. Connect the brake line to the wheel cylinder.

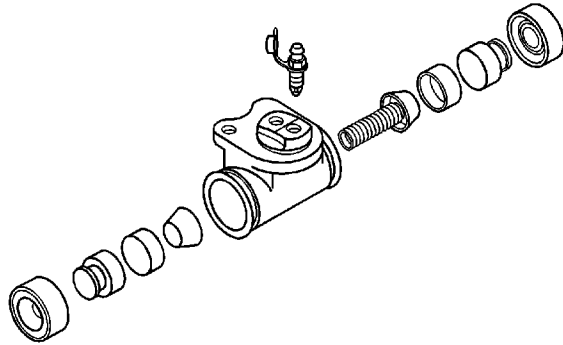
**Tighten**

Tighten the brake line to 16 N·m (12 lb ft).

3. Install the shoe and lining, and the brake drum. Refer to [Brake Shoe Replacement](#).
4. Bleed the brakes. Refer to [Hydraulic Brake System Bleeding](#).

## Wheel Cylinder Overhaul

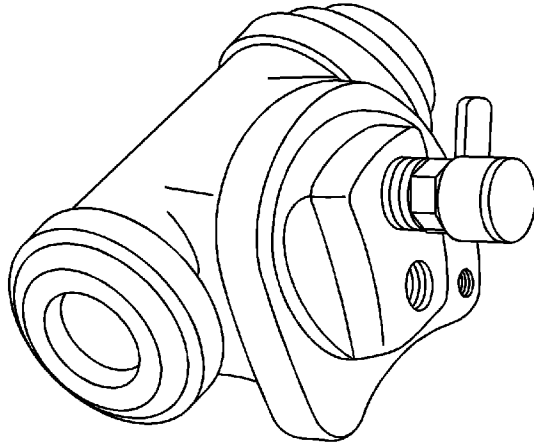
### Disassembly Procedure



**Warning:** Brake fluid may irritate eyes and skin. In case of contact, take the following actions:

- Eye contact - rinse thoroughly with water.
- Skin contact - rinse with soap and water.
- If ingested - consult a physician immediately.

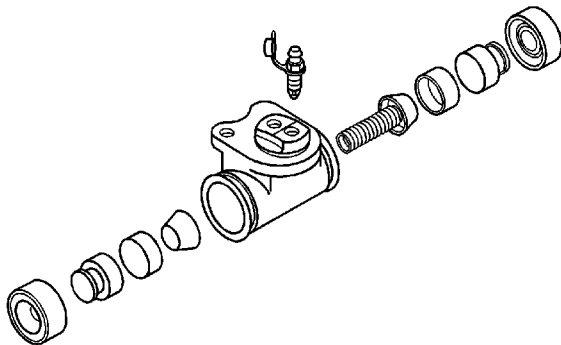
1. Remove the wheel cylinder assembly from the backing plate. Refer to [Wheel Cylinder Replacement](#).
2. Twist off the boots, the pistons, and the seals from each end of the wheel cylinder.
3. Remove the spring assembly.



4. Remove the bleeder cap and the bleeder valve.

## Assembly Procedure

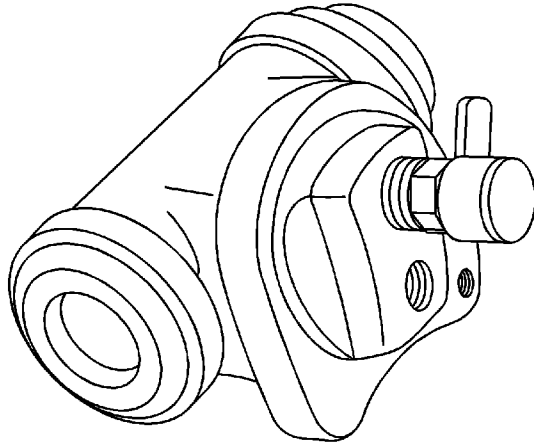
**Warning:** Refer to [Safety Glasses Warning](#) in the Preface section.



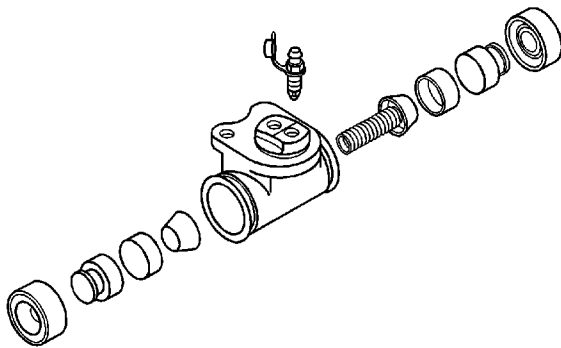
1. Inspect the wheel cylinder bore and the pistons for scoring, nicks, corrosion, and wear.

**Note:** If the bore will not clean up with a crocus cloth, replace the assembly.

2. Use a crocus cloth to polish out light corrosion in the wheel cylinder bore.



3. Clean all the parts in clean denatured alcohol or brake fluid. Dry all the parts with unlubricated compressed air and lubricate the new seals, the pistons, and the wheel cylinder bore with clean brake fluid before assembly.
4. Thinly coat all the parts except the dust caps with brake cylinder fluid.
5. Fasten the bleeder valve and the cap to the wheel cylinder.



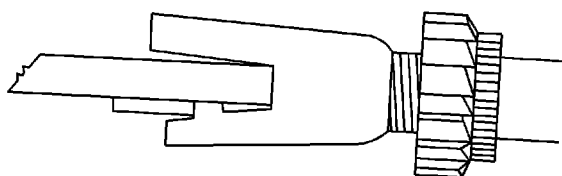
6. Attach to the wheel cylinder the spring assembly, followed by the pistons, the seals, and the boots.
7. Inspect the pistons for free movement.
8. Install the wheel cylinder assembly. Refer to [Wheel Cylinder Replacement](#).

## Drum Brake Adjustment

### Adjustment Procedure

**Warning:** Refer to [Brake Dust Warning](#) in the Preface section.

1. Remove the brake drum. Refer to [Brake Drum Replacement](#).



2. Using the rear brake adjuster nut, turn the adjuster assembly in until a sufficient amount of drag occurs on the brake drum.
3. Place the parking brake lever stops against the edge of the shoe web. If necessary, loosen the park brake cable at the equalizer. Refer to [Parking Brake Lever Replacement](#).
4. Install the brake drum. Refer to [Brake Drum Replacement](#).

**Note:** If the clicking sound of the adjuster assembly is not audible from either brake drum, the clearance between the brake shoes and the drum is adjusted.

5. Apply the brake pedal at least 10 times. Verify the clicking sound of the adjuster assembly is not audible from either brake drum.
6. Adjust the park brake. Refer to [Parking Brake Adjustment](#).

## Temperature Versus Resistance

°C	°F	ECT Ohms	IAT Ohms
Temperature vs Resistance Values (Approximate)			
100	212	177	187
90	194	241	246
80	176	332	327
70	158	467	441
60	140	667	603
50	122	973	837
45	113	1188	991
40	104	1459	1180
35	95	1802	1412
30	86	2238	1700
25	77	2796	2055
20	68	3520	2500
15	59	4450	3055
10	50	5670	3760
5	41	7280	4651
0	32	9420	5800
-5	23	12300	7273
-10	14	16180	9200
-15	5	21450	9200
-20	-4	28680	15080
-30	-22	52700	25600
-40	-40	100700	45300



## Altitude Versus Barometric Pressure

Altitude Measured in Meters (m)	Altitude Measured in Feet (ft)	Barometric Pressure Measured in Kilopascals (kPa)
Determine your altitude by contacting a local weather station or by using another reference source.		
4 267	14,000	56-64
3 962	13,000	58-66
3 658	12,000	61-69
3 353	11,000	64-72
3 048	10,000	66-74
2 743	9,000	69-77
2 438	8,000	71-79
2 134	7,000	74-82
1 829	6,000	77-85
1 524	5,000	80-88
1 219	4,000	83-91
914	3,000	87-95
610	2,000	90-98
305	1,000	94-102
0	0 Sea Level	96-104
-305	-1,000	101-105

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Engine](#) | [Engine Controls and Fuel - 1.2L](#) | [Specifications](#) | **Document ID: 2038770**

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## Ignition System Specifications

Application	Specification	
	Metric	English
Ignition Sequence	1-3-4-2	1-3-4-2
Ignition Timing	4°- 5° (BTDC)	
Ignition Type	Direct Ignition System	
Spark Plug Gap	0.8-0.9 mm	0.031-0.035 in
Spark Plug Maker	Selim Tech	
Spark Plug Type	RA7YC	

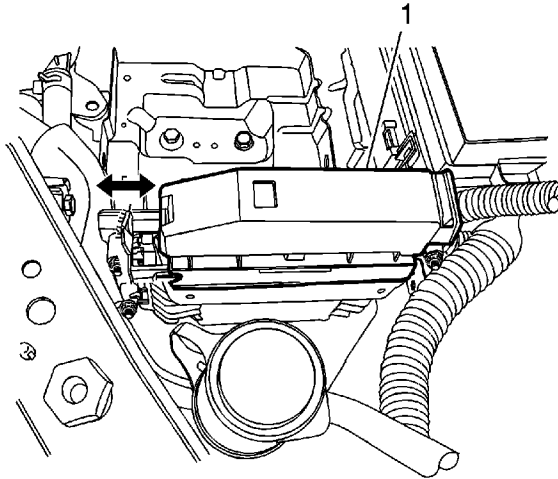
## Fastener Tightening Specifications

Application	Specifications	
	Metric	English
Accessory Mounting Bracket Bolts	37 N·m	27 lb ft
Camshaft Position Sensor Bolt	12 N·m	106 lb in
Crankshaft Position (CKP) Sensor Bolt	6.5 N·m	58 lb in
Engine Control Module (ECM) Nuts	7 N·m	62 lb in
Engine Coolant Temperature Sensor	17.5 N·m	13 lb ft
Evaporative Emission Canister Bracket Retaining Bolt	8 N·m	71 lb in
Evaporative Emission Canister Flange Bolt	20 N·m	16 lb ft
Evaporative Emission Canister Purge Solenoid Bracket Bolt	5 N·m	44 lb in
Evaporative Emission Vent Solenoid Bolt	8.5 N·m	75 lb in
Exhaust Gas Recirculation Retaining Bolts	30 N·m	22 lb ft
Exhaust Gas Recirculation Retaining Bolts	22 N·m	16 lb ft
Exhaust Gas Recirculation Retaining Nuts	10 N·m	89 lb in
Fuel Filter Bracket Bolt	4 N·m	35 lb in
Fuel Pressure Regulator Retaining Screw	12 N·m	106 lb in
Fuel Pump Retaining Bolts	4 N·m	35 lb in
Fuel Tank Retaining Bolts	20 N·m	15 lb ft
Fuel Rail Bolt	25 N·m	18 lb ft
Heated Oxygen Sensor (HO2S)	42 N·m	31 lb ft
Idle Air Control Valve Retaining Bolts	3 N·m	27 lb in
Ignition Coil Bolt	10 N·m	89 lb in
Knock Sensor (KS) Bolt	20 N·m	15 lb ft
Map Sensor Retaining Bolts	10 N·m	89 lb in
Oil Pressure Switch Fitting	30 N·m	22 lb ft
Spark Plug Cover Bolts	3 N·m	27 lb in
Throttle Body Nuts	10.5 N·m	93 lb in
Throttle Position Sensor Retaining Bolts	3 N·m	24 lb in

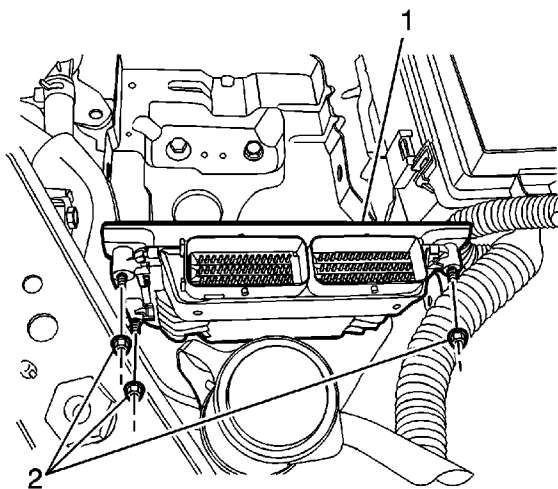
## Engine Control Module Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



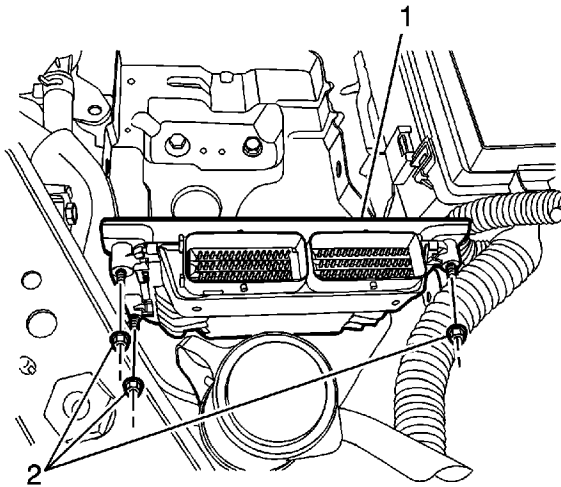
1. Disconnect the negative battery cable.
2. Pull the ECM connector lever.
3. Disconnect the ECM connector (1).



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4. Remove the ECM bracket retaining nuts (2).
5. Remove the ECM (1).

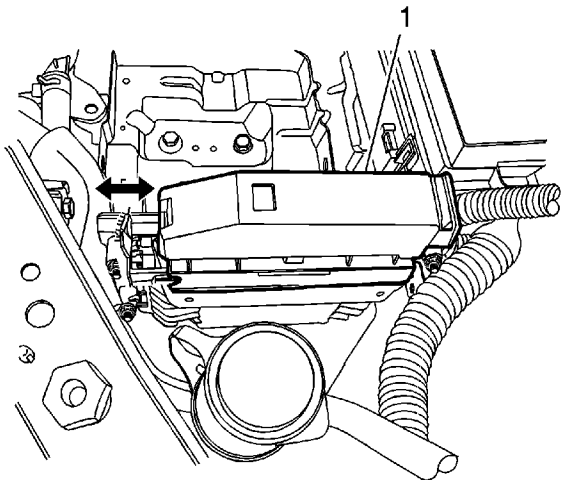
## Installation Procedure



1. Install the ECM (1).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ECM bracket retaining nuts (2) and tighten to **7 N·m (62 lb in)**.

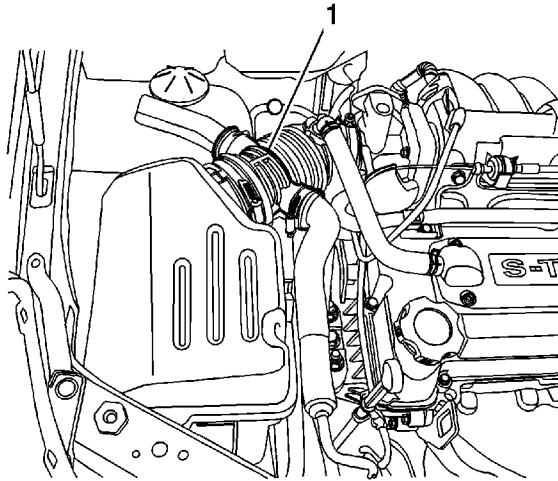


3. Connect the ECM connector (1).
4. Push the ECM connector lever.

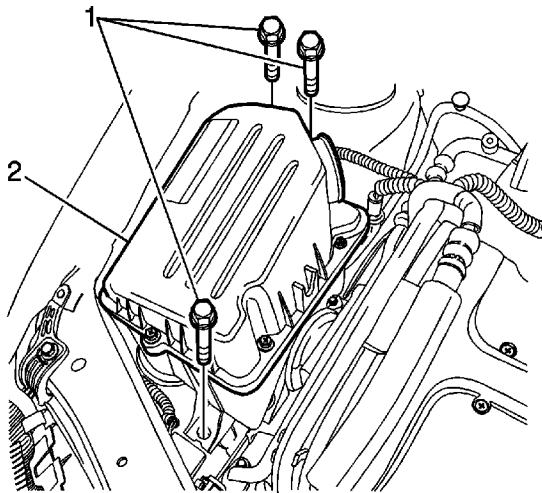
5. Connect the negative battery cable.

## Air Cleaner Assembly Replacement

### Removal Procedure



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the breather hose.
3. Loosen the clamp and disconnect outlet tube (1).

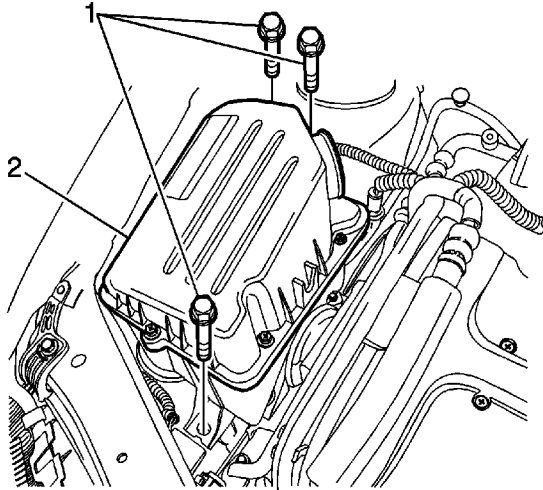


4. Remove the air cleaner assembly bolts (1).

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5. Remove the air cleaner assembly (2).

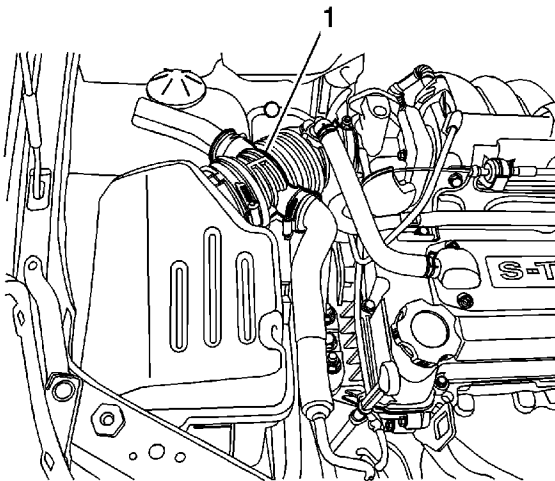
## Installation Procedure



1. Install the air cleaner assembly (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the air cleaner assembly bolts (1) and tighten to **6 N·m (4.4 lb ft)**.



3. Connect the air cleaner outlet tube (1) and tighten the clamp.
4. Connect the breather hose.
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and](#)



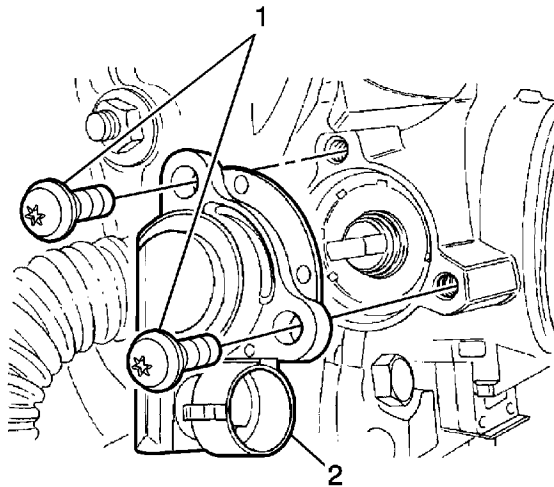
[Connection.](#)

# Throttle Position Sensor Replacement

## Removal Procedure

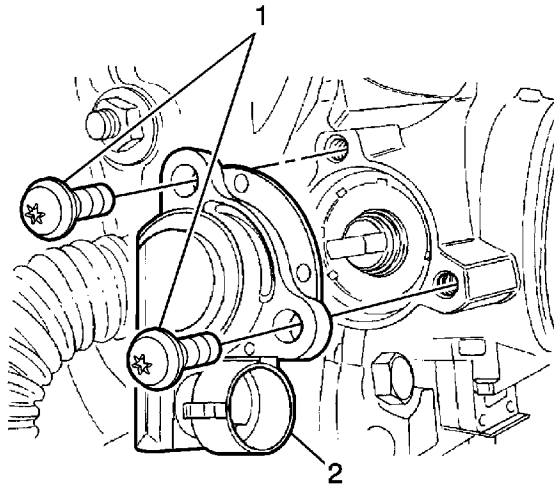
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#)
3. Disconnect the throttle position sensor (TPS) connector



4. Remove the TPS retaining bolts (1).
5. Remove the TPS (2).

## Installation Procedure



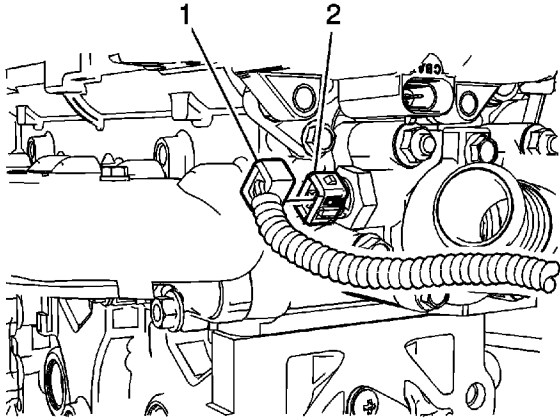
1. Install the TPS (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the TPS retaining bolts (1) and tighten to **2.7 N·m (23.9 lb in)**.
3. Connect the TPS connector.
4. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#)
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Engine Coolant Temperature Sensor Replacement

### Removal Procedure



**Note:** Use care when handling the ECT sensor. Damage to the sensor will affect the proper operation of the fuel injection system.

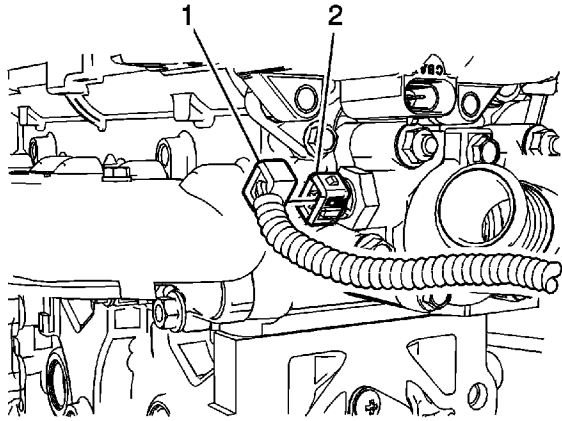
1. Relieve the coolant system pressure and remove the coolant. Refer to [Cooling System Draining and Filling](#)

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Disconnect the engine coolant temperature (ECT) sensor connector (1).
4. Carefully remove the ECT sensor (2).

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

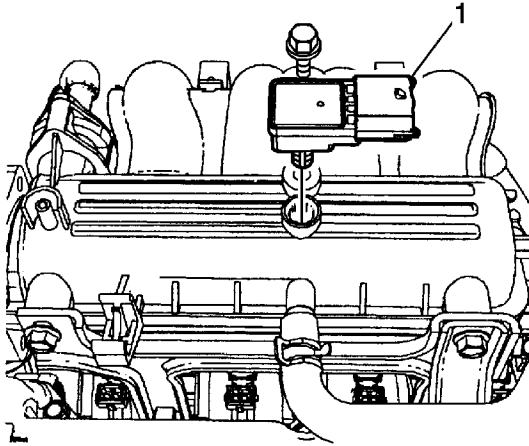


1. Install the ECT sensor (2) and tighten to **17.5 N·m (12.9 lb ft)**.
2. Connect the engine coolant temperature (ECT) sensor connector (1).
3. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
4. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

## Manifold Absolute Pressure Sensor Replacement

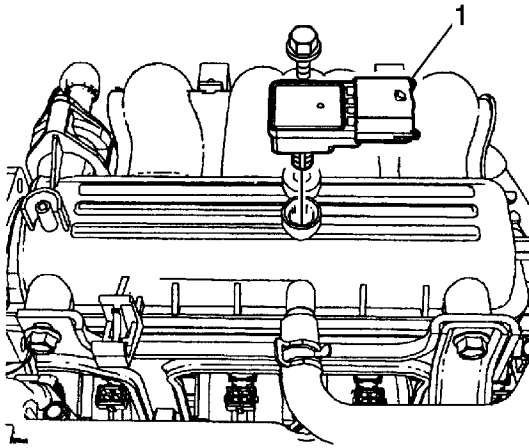
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the T-MAP sensor connector.
3. Remove the T-MAP sensor retaining bolt.
4. Remove the T-MAP sensor (1).

### Installation Procedure



1. Install the T-MAP sensor (1).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the T-MAP sensor retaining bolt and tighten to **10 N·m (89 lb in)**.
3. Connect the T-MAP sensor connector.
4. Connect the negative battery cable.

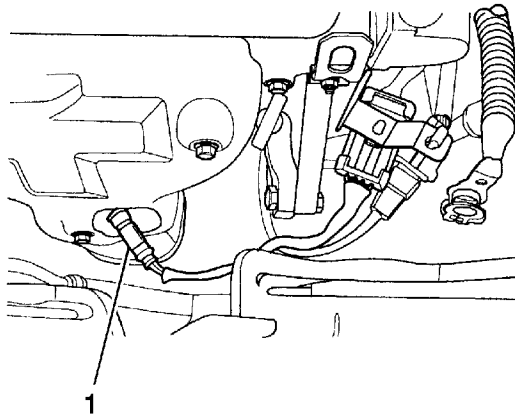
# Heated Oxygen Sensor Replacement - Sensor 1

## Special Tools

[EN-48259](#) Oxygen Sensor Remover/Installer

## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

**Caution:** Refer to [Heated Oxygen and Oxygen Sensor Caution](#) in the Preface section.

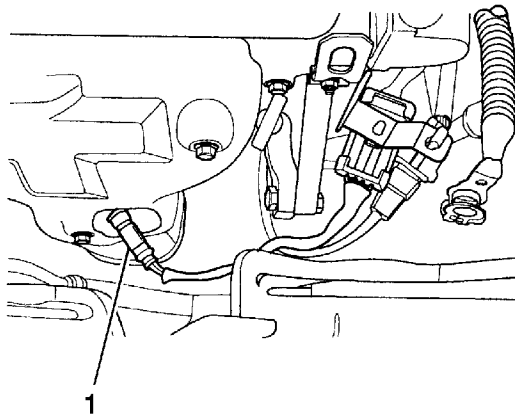
2. Disconnect the front heated oxygen sensor (HO2S1) connector.

**Caution:** Refer to [Heated Oxygen and Oxygen Sensor Caution](#) in the Preface section.

3. Carefully remove the HO2S1 (1) by using [EN-48259](#) from the exhaust manifold.

## Installation Procedure





**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti-seize compound applied before reinstallation.

1. Coat the threads of the HO2S1 with an anti-seize compound, if needed.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the HO2S1 (1) into the exhaust manifold and tighten to **42 N·m (31 lb ft)**.
3. Connect the HO2S1 connector.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

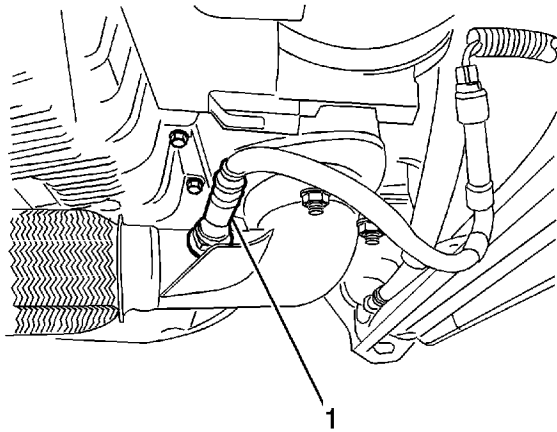
# Heated Oxygen Sensor Replacement - Sensor 2

## Special Tools

[EN-48259](#) Oxygen Sensor Remover/Installer

## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

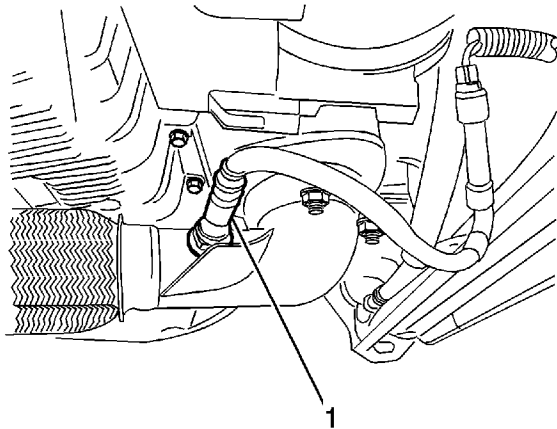
**Caution:** Refer to [Heated Oxygen and Oxygen Sensor Caution](#) in the Preface section.

2. Disconnect the electrical connector.

**Caution:** Refer to [Heated Oxygen and Oxygen Sensor Caution](#) in the Preface section.

3. Carefully remove the HO2S2 (1) by using the [EN-48259](#).

## Installation Procedure



**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti-seize compound applied before reinstallation.

1. Coat the threads of the HO2S2 with an anti-seize compound, if needed.

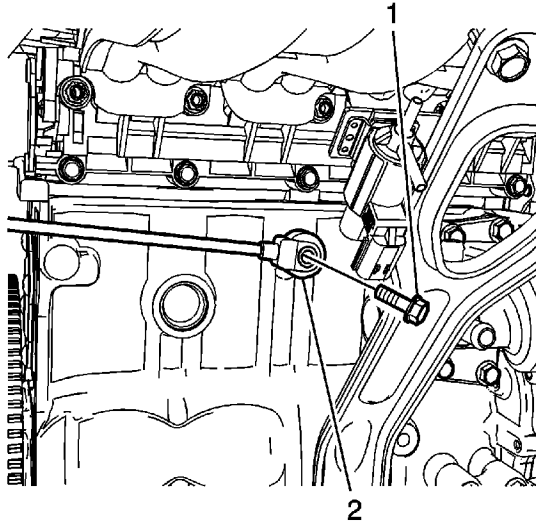
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the HO2S2 (1) into the exhaust front pipe and tighten the oxygen sensor to **42 N·m (31 lb ft)**.
3. Connect the HO2S2 connector.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Knock Sensor Replacement

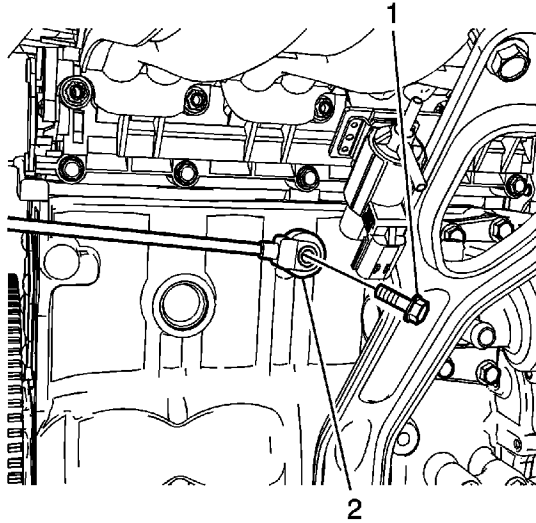
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the electrical connector at the knock sensor.
3. Remove the knock sensor retaining bolt (1) from the engine block.
4. Remove the knock sensor (2).

### Installation Procedure



1. Install the knock sensor (2).

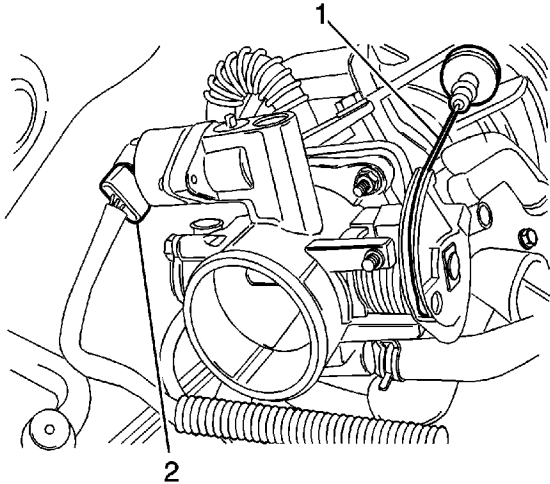
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the knock sensor retaining bolt (1) and tighten to **20 N·m (15 lb ft)**.
3. Connect the electrical connector at the knock sensor.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

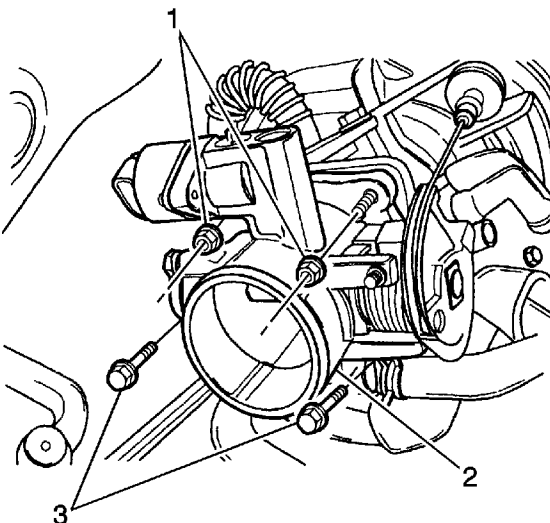
## Throttle Body Assembly Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#)
3. Disconnect the throttle cable (2).
4. Disconnect the throttle position sensor (TPS) and IACV connectors (1).
5. Disconnect the coolant inlet and outlet hose.



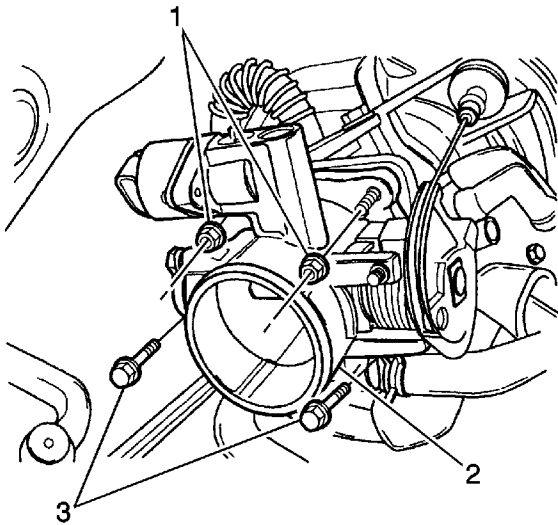
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**Note:** Cover the entrance of the intake manifold after removing the throttle body to prevent any dirt from entering.

6. Remove the throttle body retaining bolts (3) and nuts (1).
7. Remove the throttle body (2) with the gasket.

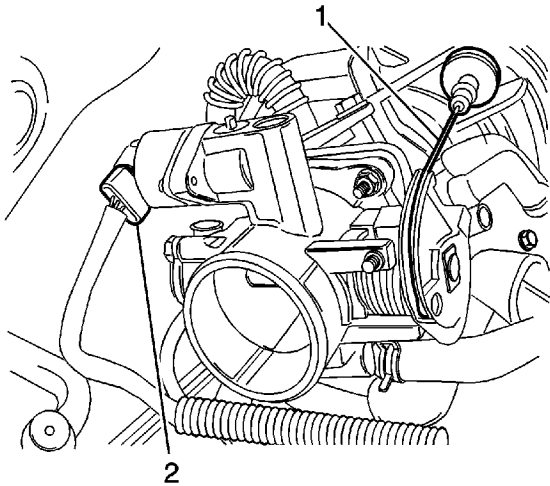
## Installation Procedure



1. Install the throttle body (2) with the NEW throttle body gasket.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the throttle body retaining bolts (3) and nuts (1) and tighten to **10.5 N·m (7.7 lb ft)**.



**Note:** After connecting the throttle cable, check that the throttle valve is closed fully.

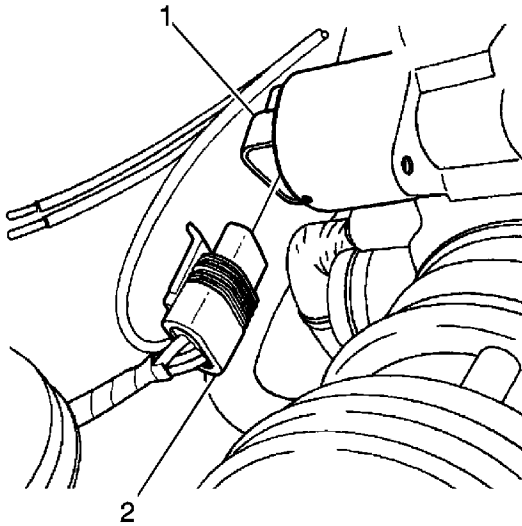
3. Connect the throttle cable (2).
4. Connect the throttle position sensor (TPS) and the IACV connectors (1).
5. Connect the coolant hose.
6. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).



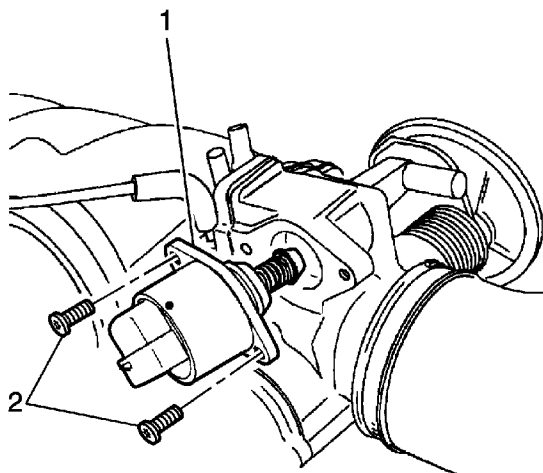
## Idle Air Control Valve Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



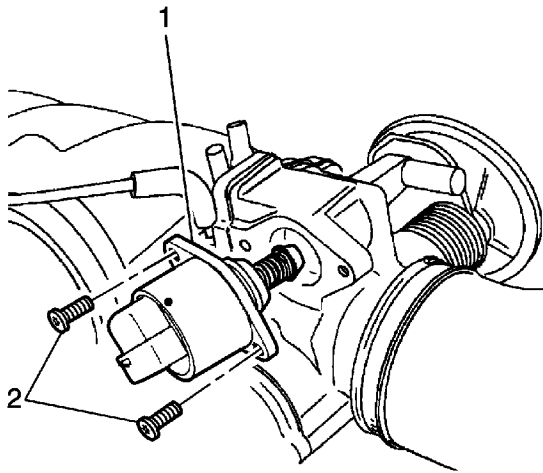
1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the idle air control valve (IACV) connector (2).



**Note:** Clean the IAC valve O-ring seal area, the pintle valve seat and the air passage with a suitable fuel system cleaner. Do not use methyl ethyl ketone.

3. Remove the IACV retaining bolts (2).
4. Remove the IACV (1).

## Installation Procedure

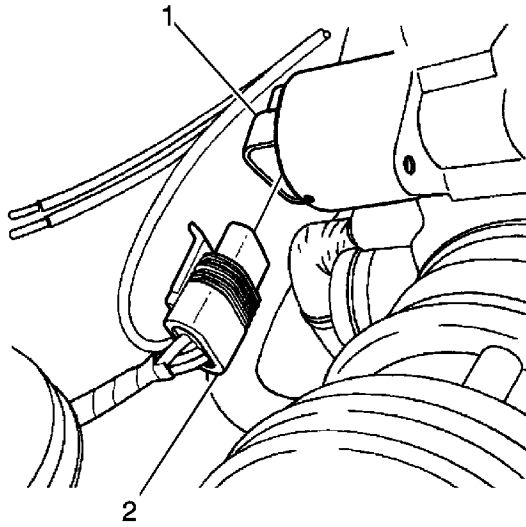


**Note:** If installing a new IAC valve, be sure to replace it with an identical part. On IACV that have been in service, do not push on the valve pintle. The force required to move the pintle may damage the threads on the worm drive.

1. Install the new O-ring seal with the IACV (1).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

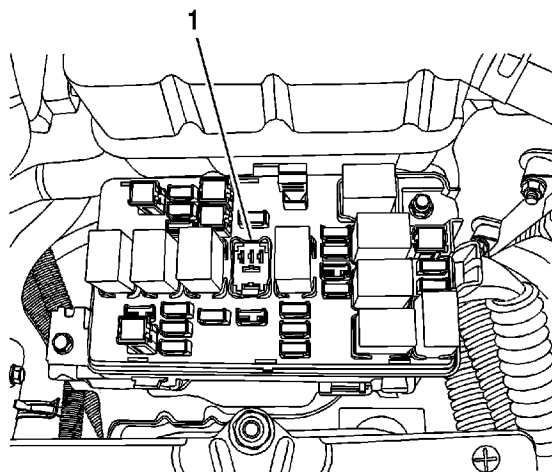
2. Install the IACV retaining bolts (2) and tighten to **3 N·m (27 lb in)**.



3. Connect the IACV connector (2).
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Fuel Pressure Relief

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



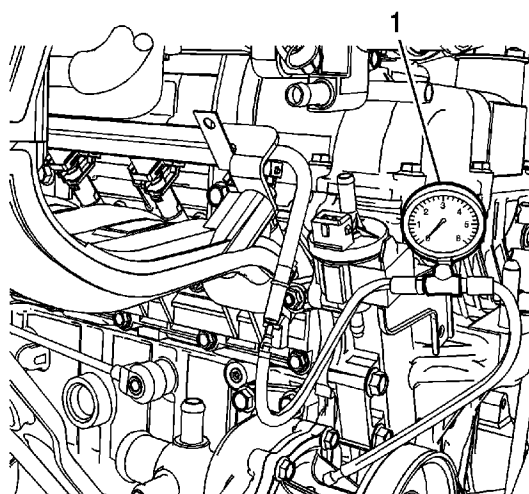
1. Remove the fuel cap.
2. Remove the fuel pump fuse (1) from the engine fuse block.
3. Start the engine and allow the engine to stall.
4. Crank the engine for an additional 10 seconds.

# Fuel Pressure Gage Installation and Removal

## Special Tools

[DW100-010](#) Fuel Pressure Gage

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#)
3. Install the [DW100-010](#) .
4. Measure the fuel pressure.

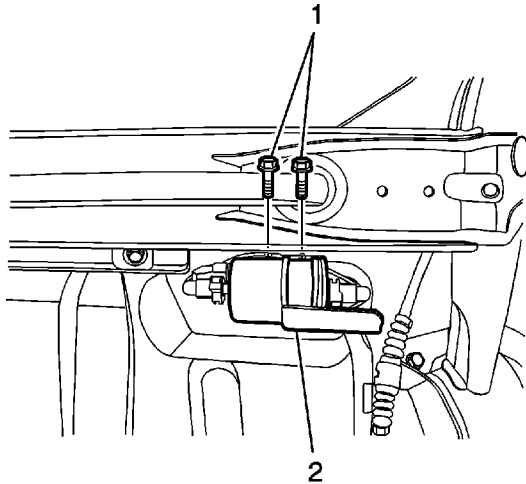
### Fuel Pressure Specification

380 kPa (battery voltage: 13.2V)

## Fuel Filter Replacement

### Removal Procedure

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.

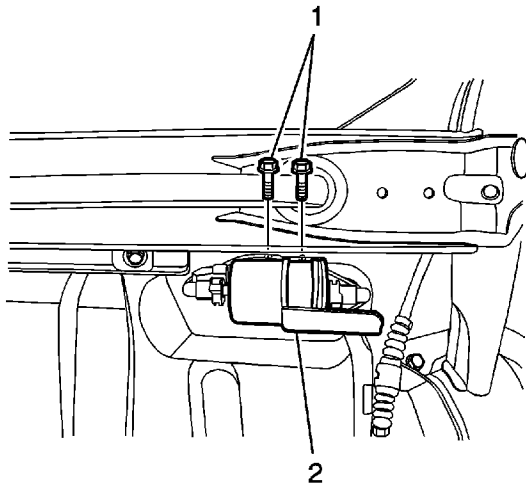


1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Disconnect the inlet/outlet fuel lines by moving the line connector lock forward and pulling the hose off of the fuel filter tube.
4. Remove the fuel filter bracket bolts (1).
5. Remove the fuel filter (2).

### Installation Procedure



1. Install the fuel filter (2).
2. Install the fuel filter bracket bolts (1).
3. Connect the inlet/outlet quick connector lines.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Fuel Tank Draining

**Warning:** Gasoline or gasoline vapors are highly flammable. A fire could occur if an ignition source is present. Never drain or store gasoline or diesel fuel in an open container, due to the possibility of fire or explosion. Have a dry chemical (Class B) fire extinguisher nearby.

1. Loosen the fuel filler cap.
2. Remove the fuel sender assembly. Refer to [Fuel Sender Assembly Replacement](#).
3. Use a hand operated pump device in order to drain the fuel through the fuel sender assembly opening on the fuel tank.

**Note:** If you are removing the fuel tank do not connect the fuel or vapor lines. Do not connect the electrical connectors or install the access panel.

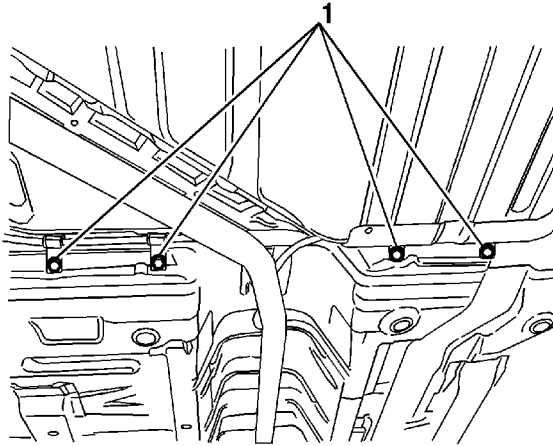
4. Install the fuel sender assembly to the fuel tank. Refer to [Fuel Sender Assembly Replacement](#).
5. Tighten the fuel filler cap.



## Fuel Tank Replacement

### Removal Procedure

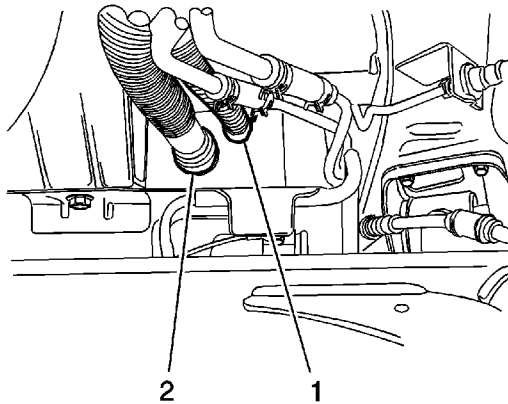
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



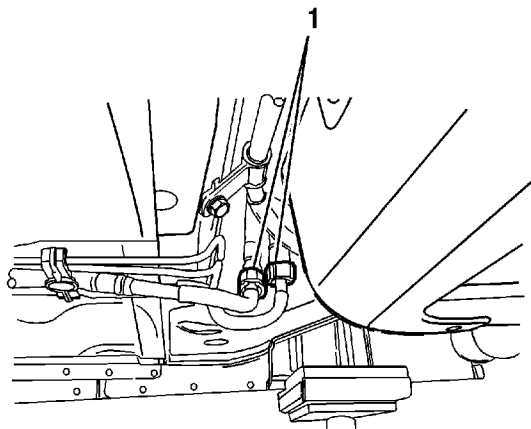
1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

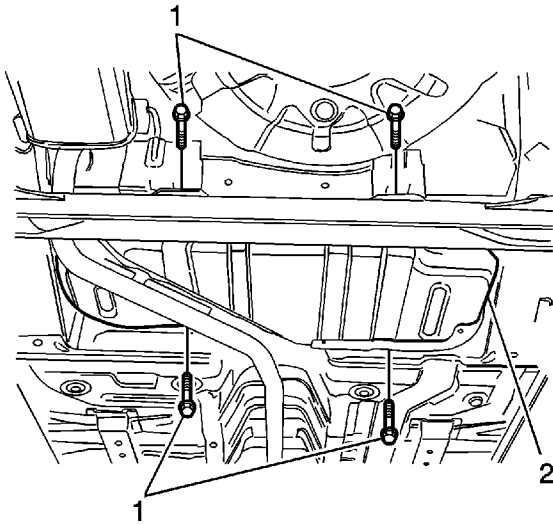
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Drain the fuel tank.
4. Disconnect the parking brake cable retainer clamps (1) and the support along the fuel tank to provide clearance for the tank.



5. Remove the fuel tank filler tube clamp at the fuel tank.
6. Disconnect the fuel tank filler tube (2).
7. Disconnect the fuel tank filler tube at the fuel tank.
8. Disconnect the canister vapor tube at control valve vapor tube (1).

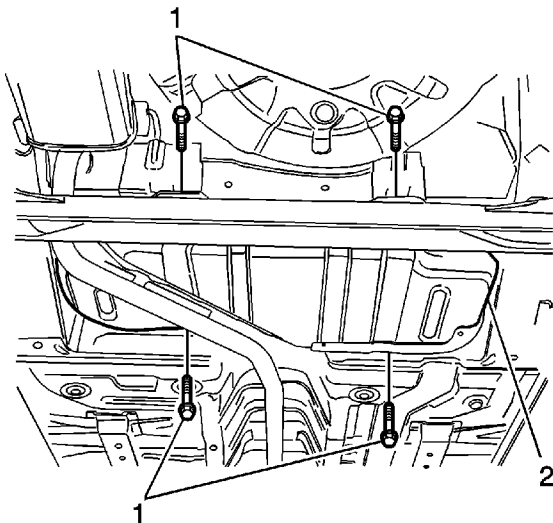


9. Disconnect the fuel pump harness connector at the right rear corner of the fuel tank.
10. Disconnect the fuel inlet line (1) near the right front of the fuel tank.
11. Disconnect the wiring harness clips and the fuel line clips as needed.



12. Support the fuel tank.
13. Remove the fuel tank retaining bolts (1).
14. Carefully lower the fuel tank (2).
15. Remove the fuel tank (2).
16. Transfer any parts as needed.

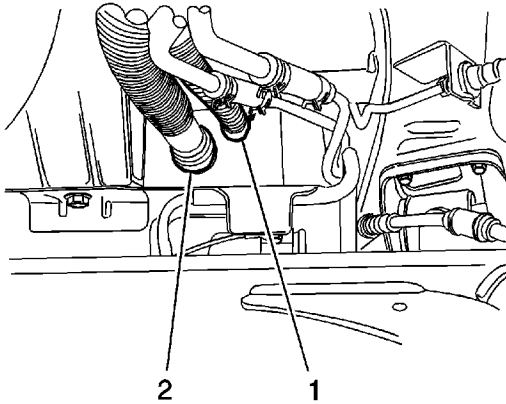
## Installation Procedure



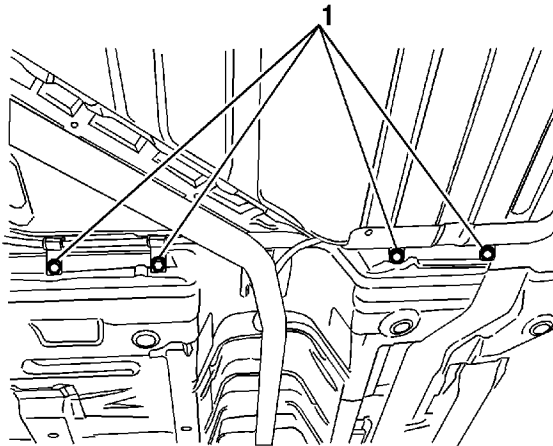
1. Raise the fuel tank (2) into position.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the fuel tank mounting bolts (1) and tighten to **20 N·m (15 lb ft)**.



3. Connect the fuel outlet line.
4. Connect the wiring harness clips and the fuel line clips as needed.
5. Connect the fuel pump electrical connector.
6. Connect the fuel vapor line.
7. Connect the fuel tank filler tube (2) and fuel tank vent tube (1).
8. Install the fuel tank filler tube clamp at the fuel tank.



9. Install the parking brake cable retainer clamps (1) and the support and tighten to **10 N·m (89 lb in)**.
10. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
11. Fill the fuel tank.
12. Perform a leak check of the fuel tank and the fuel line connections.

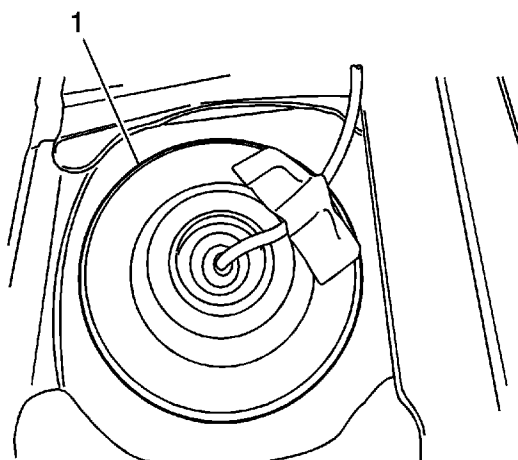
# Fuel Sender Assembly Replacement

## Special Tools

EN-49090 Remover/Installer - Fuel Pump Lock Ring

## Removal Procedure

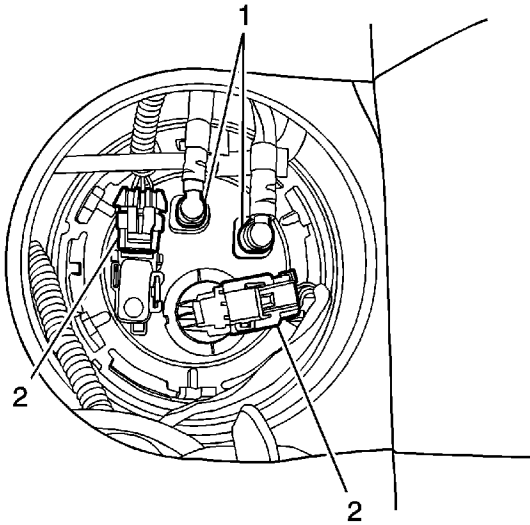
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



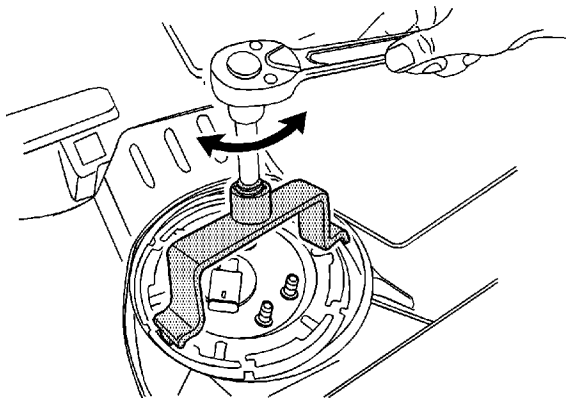
1. Relieve the fuel pressure.

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

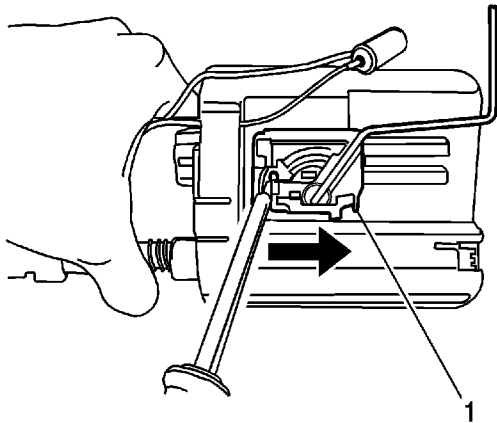
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the rear seat. Refer to [Rear Seat Replacement](#).
4. Remove the fuel pump access cover (1).



5. Disconnect the electrical connectors (2) at the fuel pump assembly.
6. Disconnect the fuel outlet line (1).

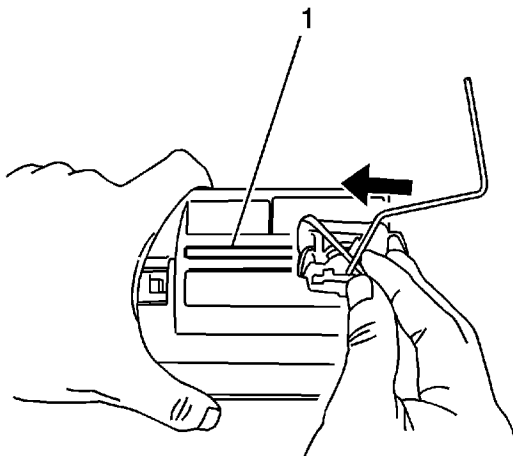


7. Remove the fuel pump lock ring by using EN-49090.
8. Remove the fuel pump.
9. Disconnect the insulator.



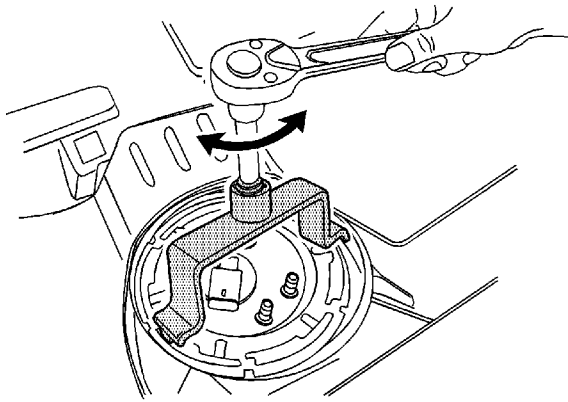
10. Remove the fuel sender assembly (1).

## Installation Procedure

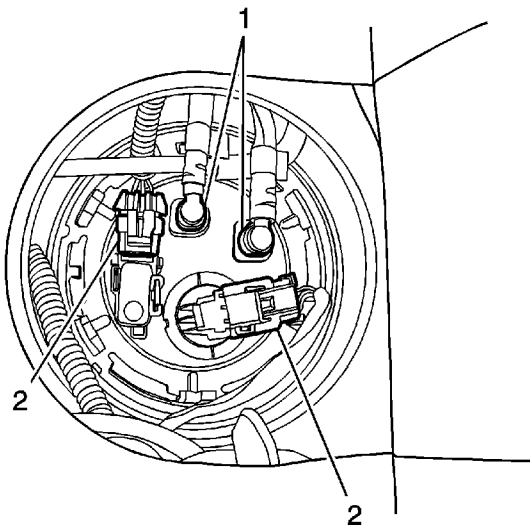


**Note:** Be careful to install the fuel sender to fuel pump housing exactly. If not installed exactly, fuel indicating may be incorrect.

1. Install the fuel sender assembly (1).
2. Connect the fuel sender insulator.

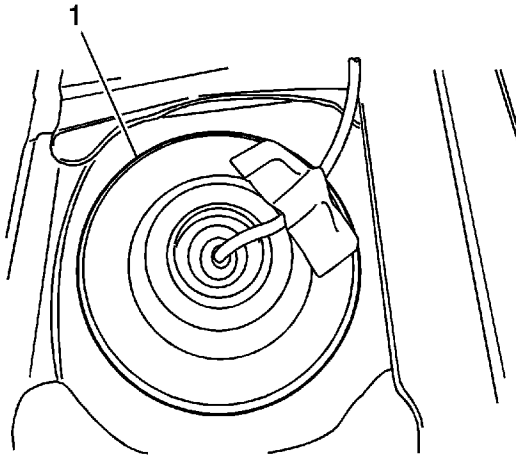


3. Install the fuel pump to fuel tank.
4. Install the fuel pump lock ring by using EN-49090.



5. Connect the electrical connectors (2) at the fuel pump assembly.
6. Connect the fuel outlet lines (1).





7. Install the fuel pump access cover (1).
8. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
9. Perform an operational check of the fuel pump.
10. Install the rear seat. Refer to [Rear Seat Replacement](#).

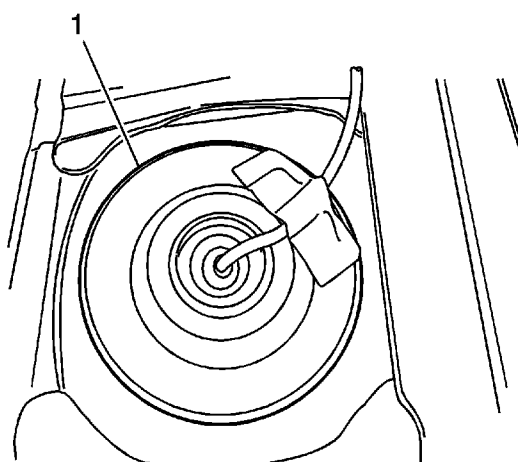
# Fuel Pump Replacement

## Special Tools

EN-49090 Remover/Installer - Fuel Pump Lock Ring

## Removal Procedure

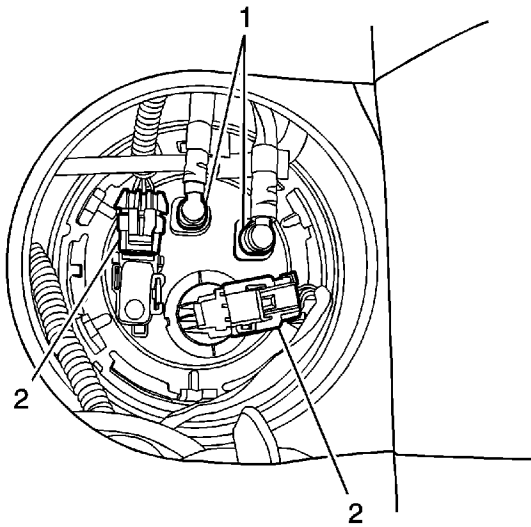
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



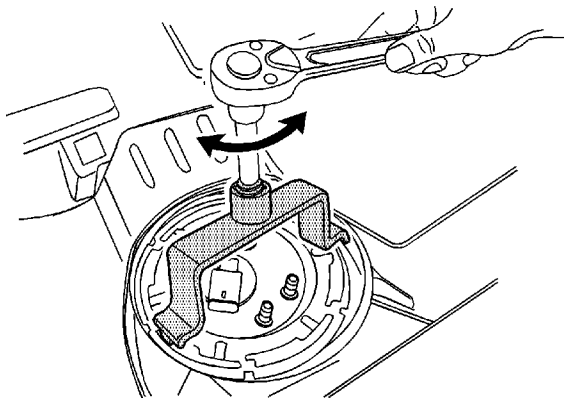
1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#)

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

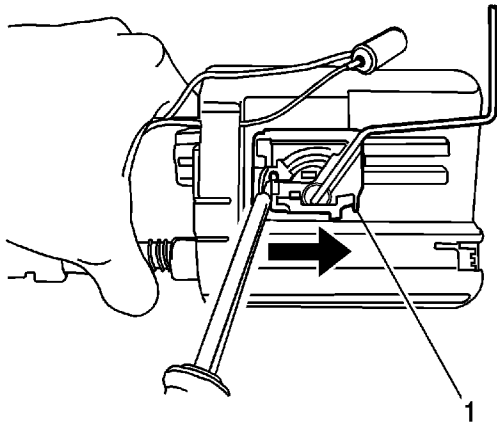
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the rear seat. Refer to [Rear Seat Replacement](#)
4. Remove the fuel pump access cover (1).



5. Disconnect the electrical connectors (2) at the fuel pump assembly.
6. Disconnect the fuel outlet lines (1).

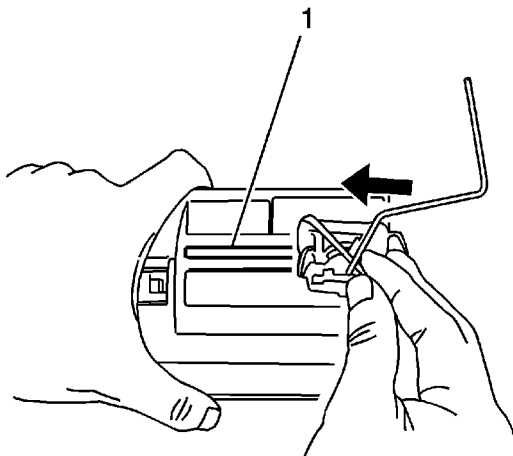


7. Remove the fuel pump lock ring by using EN-49090.
8. Remove the fuel pump.
9. Disconnect the insulator.



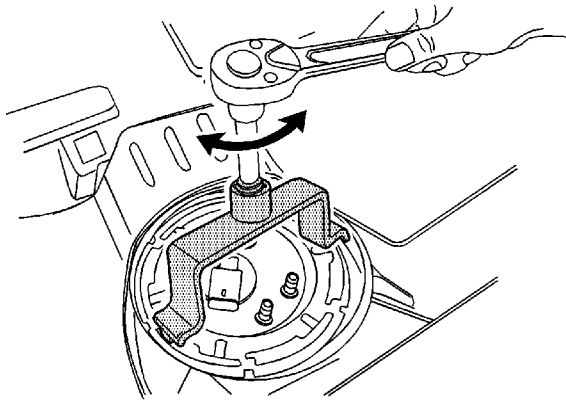
10. Remove the fuel sender assembly (1).

## Installation Procedure

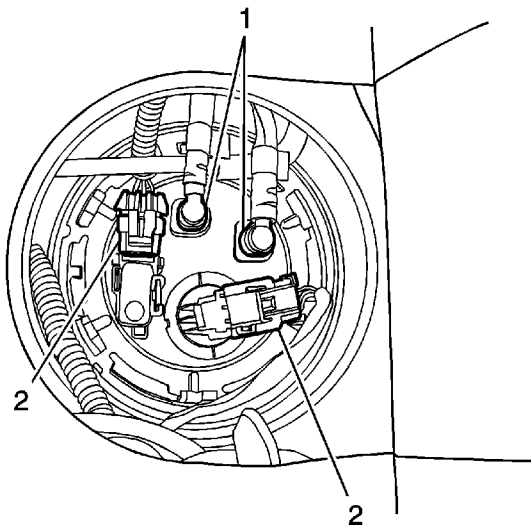


**Note:** Be careful to install the fuel sender to fuel pump housing exactly. If not installed exactly, fuel indicating may be incorrect.

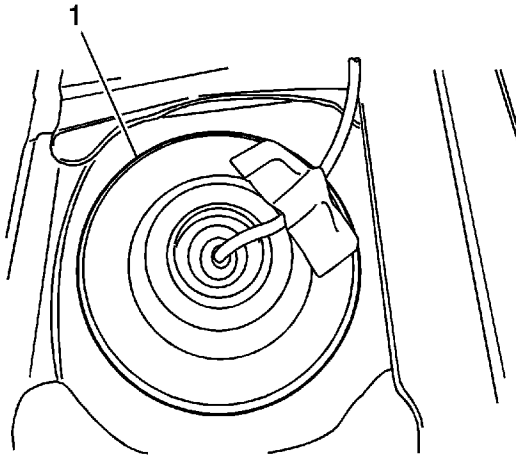
1. Install the fuel sender assembly (1).
2. Connect the fuel sender insulator.



3. Install the fuel pump to fuel tank.
4. Install the fuel pump lock ring by using EN-49090.



5. Connect the electrical connectors (2) at the fuel pump assembly.
6. Connect the fuel outlet lines (1).



7. Install the fuel pump access cover (1).
8. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
9. Perform an operational check of the fuel pump.
10. Install the rear seat. Refer to [Rear Seat Replacement](#).

## Fuel Injection Fuel Rail Assembly Replacement

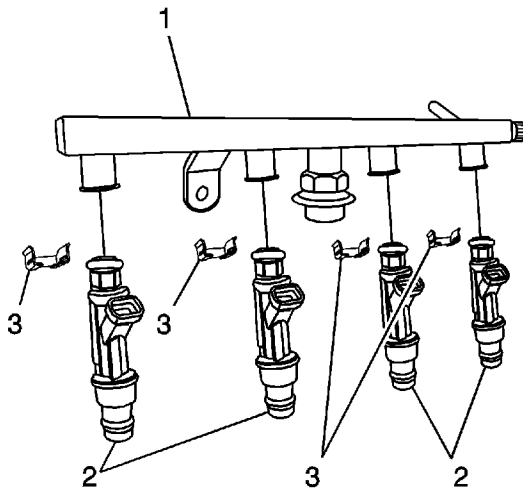
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

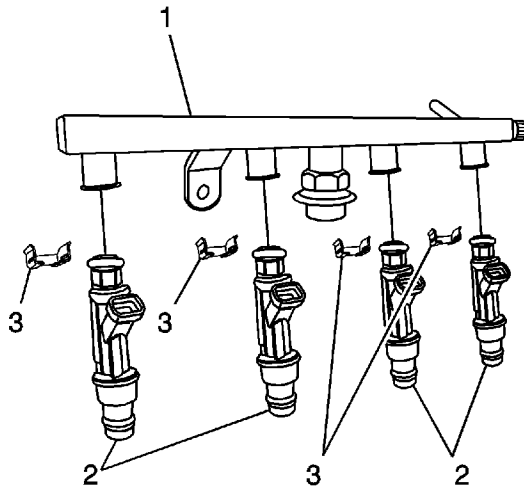
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.

2. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).
3. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
4. Disconnect the quick connector fuel feed line from the fuel rail.
5. Disconnect the wiring harness from the upper side of the fuel rail.
6. Disconnect the fuel injector harness connector.
7. Remove the fuel rail mounting bolts.
8. Remove the fuel rail with the fuel injectors attached.



9. Remove the fuel injector retainer clips (3).
10. Remove the fuel injectors (2) by pulling down and out.
11. Discard the fuel injector O-rings.

### Installation Procedure



**Note:** Different injectors are calibrated for different flow rates. When ordering new fuel injectors, be certain to order the identical part number that is inscribed on the old injector.

1. Install the new O-rings on the fuel injectors (2).
2. Install the retainer clip (3) after installing injectors on the fuel rail (1).
3. Install the fuel rail and injector assembly to the intake manifold.

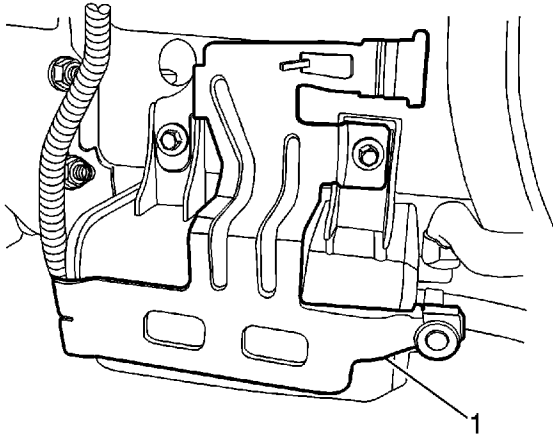
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the fuel rail retaining bolts and tighten to **10 N·m (7.3 lb ft)**.
5. Connect the fuel injector harness connectors.
6. Connect the harness on the upper side of the fuel rail.
7. Connect the quick connector fuel feed line on the fuel rail.
8. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#)
9. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).



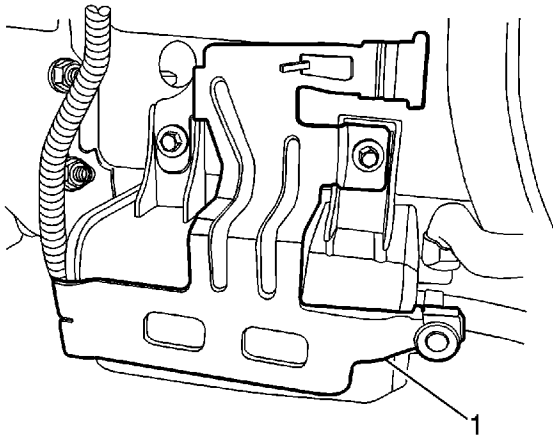
## Evaporative Emission Canister Replacement

### Removal Procedure



1. Remove the EVAP canister vent solenoid valve.
2. Disconnect the inlet and outlet hose from the EVAP canister.
3. Remove the EVAP canister bracket retaining bolt.
4. Remove the EVAP canister (1).

### Installation Procedure



1. Install the EVAP canister (1).

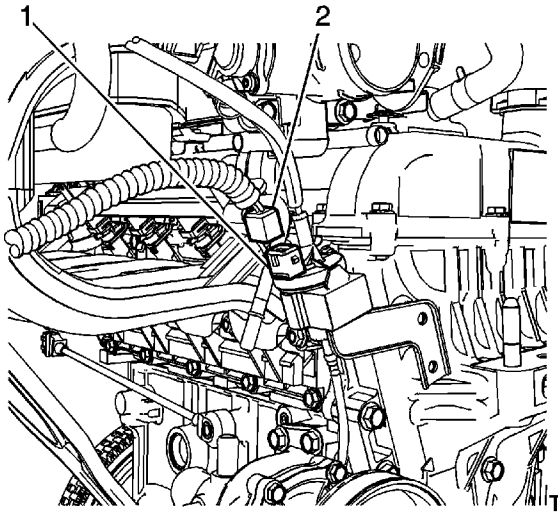
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the EVAP canister bracket retaining bolt and tighten to **8 N·m (71 lb in)**.
3. Connect the inlet and outlet hose to the EVAP canister.
4. Install the EVAP canister vent solenoid valve.

# Evaporative Emission Canister Purge Solenoid Valve Replacement

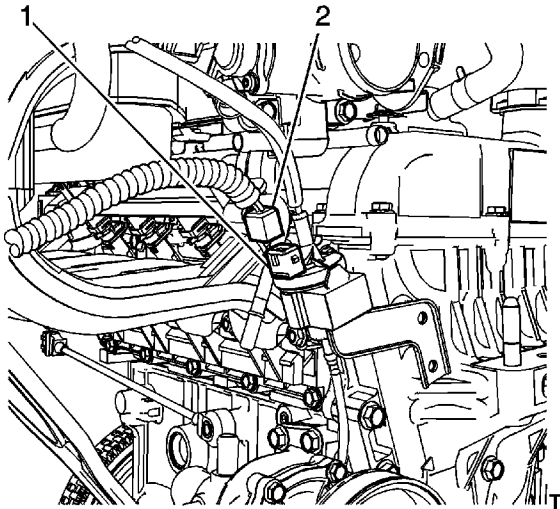
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
3. Disconnect the EVAP canister purge solenoid connector (2).
4. Disconnect the EVAP canister purge solenoid inlet and outlet hose.
5. Remove the EVAP canister purge solenoid (1) from the bracket.

## Installation Procedure

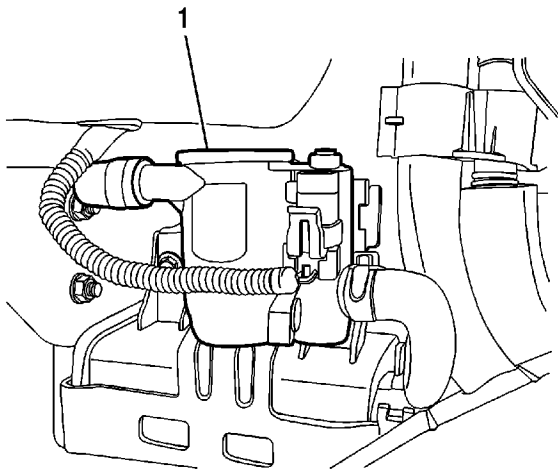


1. Install the EVAP canister purge solenoid (1) to the bracket.
2. Connect the EVAP canister purge solenoid inlet and outlet hose.
3. Connect the EVAP canister purge solenoid connector (2).
4. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Evaporative Emission Canister Vent Solenoid Valve Replacement

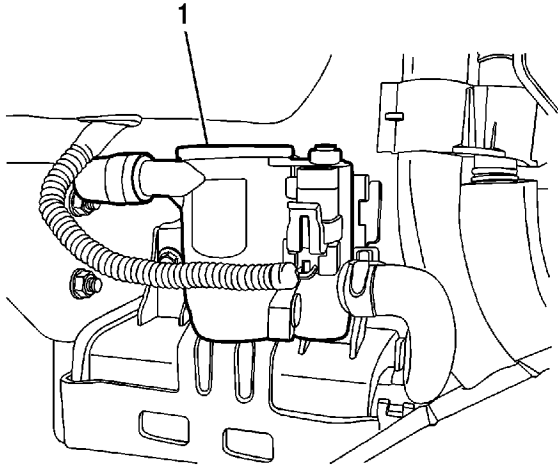
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the EVAP canister vent solenoid valve connector.
3. Disconnect the EVAP canister vent hose.
4. Remove the EVAP canister vent assembly (1) pushing it to the left side.

## Installation Procedure

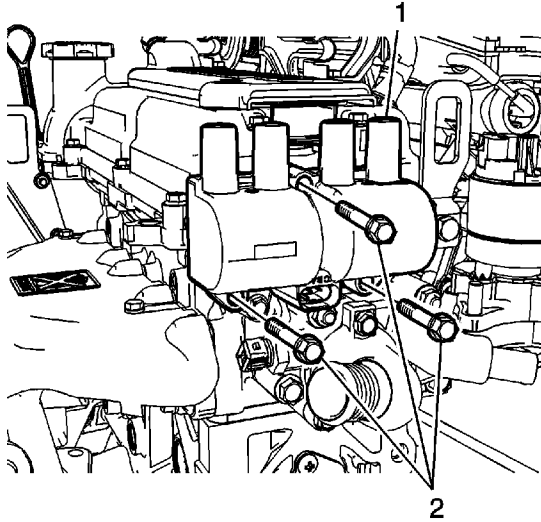


1. Install the EVAP canister vent assembly (1) pushing it to the right side.
2. Connect the EVAP canister vent hose.
3. Connect the EVAP canister vent solenoid valve connector.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

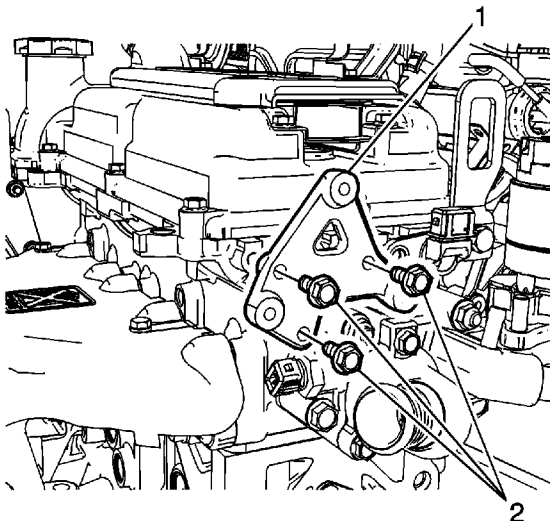
# Ignition Coil Replacement

## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the ignition cables.
3. Disconnect the ignition cable harness connector.
4. Remove the ignition coil retaining bolts (2).
5. Remove the ignition coil (1).

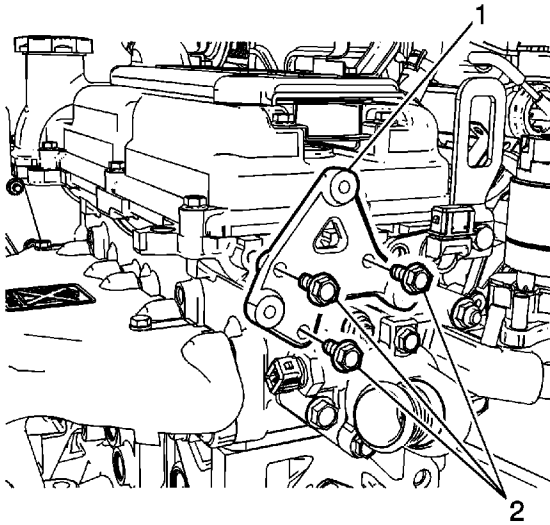


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6. Remove the ignition coil bracket retaining bolts (2).
7. Remove the ignition coil bracket (1).

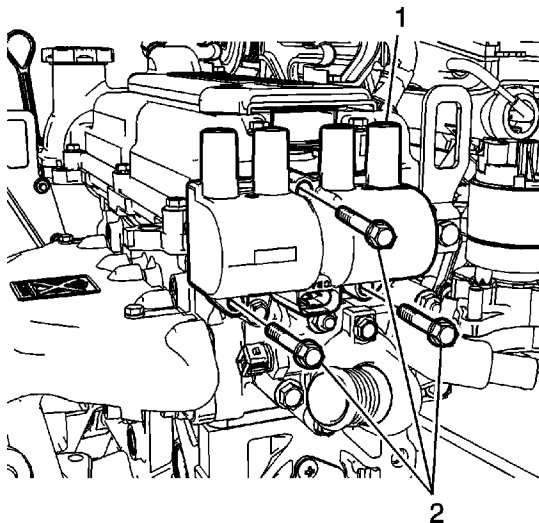
## Installation Procedure



1. Install the ignition coil bracket (1).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ignition coil bracket retaining bolts (2) and tighten to **10 N·m (7.3 lb ft)**.







3. Install the ignition coil (1).
4. Install the ignition coil retaining bolts (2) and tighten to **10 N·m (7.3 lb ft)**.
5. Connect the ignition coil harness connector.
6. Connect the ignition cables.
7. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Spark Plug Wire Inspection

Spark plug wire integrity is vital for proper engine operation. A thorough inspection will be necessary to accurately identify conditions that may affect engine operation. Inspect for the following conditions:

1. Correct routing of the spark plug wires. Incorrect routing may cause cross-firing.
2. Any signs of cracks or splits in the wires.
3. Inspect each boot for the following conditions:
  - Tearing
  - Piercing
  - Arcing
  - Carbon tracking
  - Corroded terminal

If corrosion, carbon tracking, or arcing are indicated on a spark plug wire boot or on a terminal, replace the wire and the component connected to the wire.

## Spark Plug Wire Replacement

### Removal Procedure

1. Turn OFF the ignition.
2. Disconnect the spark plug wire at each spark plug.
  - Twist each spark plug boot 1/2 turn before removing.
  - Pull only on the boot or use a tool designed for this purpose in order to remove the wire from each spark plug.
3. Disconnect the spark plug wire from the coil.
  - Twist each spark plug boot 1/2 turn before removing.
  - Pull only on the boot or use a tool designed for this purpose in order to remove the wires from the coil.

### Installation Procedure

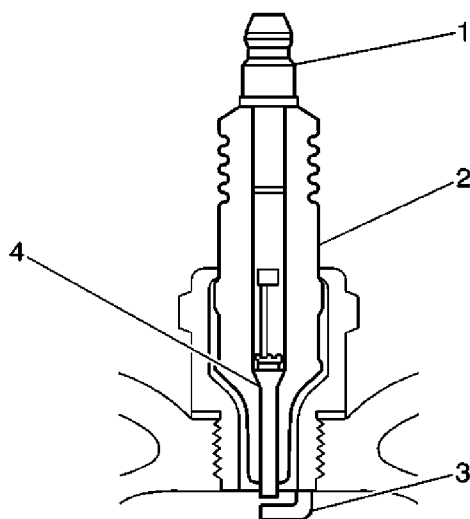
1. Install the spark plug wire on the coil.
2. Install the spark plug wire at each spark plug.
3. Inspect the wires for proper installation:
  - Push down on each boot in order to inspect the seating.
  - Reinstall any loose boot.
  - Wire routing must be kept intact during service and followed exactly when wires have been disconnected or when replacement of the wires is necessary. Failure to route the wires correctly can lead to radio interference and crossfire of the plugs, or shorting of the leads to the ground.
  - Any time the spark plug wires or boots are installed on the spark plugs, new dielectric grease needs to be applied inside the boot.

## Spark Plug Inspection

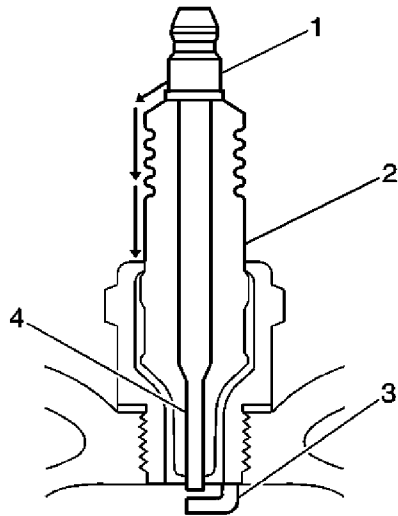
### Spark Plug Usage

- Ensure that the correct spark plug is installed. An incorrect spark plug causes driveability conditions.
- Ensure that the spark plug has the correct heat range. An incorrect heat range causes the following conditions:
  - Spark plug fouling--Colder plug
  - Pre-ignition causing spark plug and/or engine damage--Hotter plug

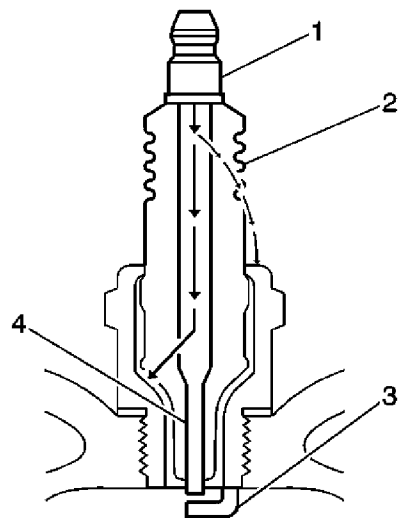
### Spark Plug Inspection



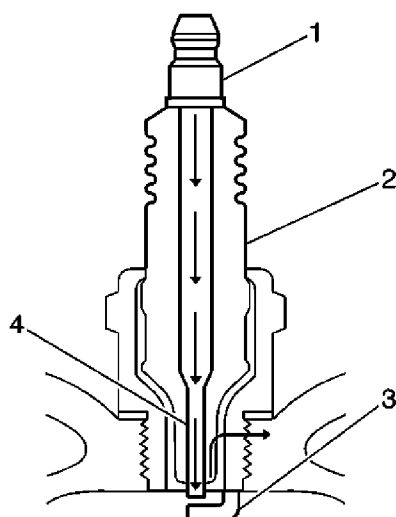
1. Inspect the terminal post (1) for damage.
  - Inspect for a bent or broken terminal post (1).
  - Test for a loose terminal post (1) by twisting and pulling the post. The terminal post (1) should NOT move.



2. Inspect the insulator (2) for flashover or carbon tracking, soot. This is caused by the electrical charge traveling across the insulator (2) between the terminal post (1) and ground. Inspect for the following conditions:
  - Inspect the spark plug boot for damage.
  - Inspect the spark plug recess area of the cylinder head for moisture, such as oil, coolant, or water. A spark plug boot that is saturated causes arcing to ground.



3. Inspect the insulator (2) for cracks. All or part of the electrical charge may arc through the crack instead of the electrodes (3, 4).



4. Inspect (3) for evidence of improper arcing.
  - Measure the gap between the center electrode (4) and the side electrode (3) terminals. An excessively wide electrode gap can prevent correct spark plug operation.
  - Inspect for the correct spark plug torque. Insufficient torque can prevent correct spark plug operation. An over torqued spark plug, causes the insulator (2) to crack.
  - Inspect for signs of tracking that occurred near the insulator tip instead of the center electrode (4).
  - Inspect for a broken or worn side electrode (3).
  - Inspect for a broken, worn, or loose center electrode (4) by shaking the spark plug.
    - A rattling sound indicates internal damage.
    - A loose center electrode (4) reduces the spark intensity.
  - Inspect for bridged electrodes (3, 4). Deposits on the electrodes (3, 4) reduce or eliminates the gap.
  - Inspect for worn or missing platinum pads on the electrodes (3, 4), if equipped.
  - Inspect for excessive fouling.
5. Inspect the spark plug recess area of the cylinder head for debris. Dirty or damaged threads can cause the spark plug not to seat correctly during installation.

## Spark Plug Visual Inspection

- Normal operation--Brown to grayish-tan with small amounts of white powdery deposits are normal combustion by-products from fuels with additives.
- Carbon fouled--Dry, fluffy black carbon, or soot caused by the following conditions:
  - Rich fuel mixtures
- Leaking fuel injectors
- Excessive fuel pressure
- Restricted air filter element
- Incorrect combustion

- Reduced ignition system voltage output
- Weak coils
- Worn ignition wires
- Incorrect spark plug gap
  - Excessive idling or slow speeds under light loads can keep spark plug temperatures so low that normal combustion deposits may not burn off.
- Deposit fouling--Oil, coolant, or additives that include substances such as silicone, very white coating, reduces the spark intensity. Most powdery deposits will not effect spark intensity unless they form into a glazing over the electrode.

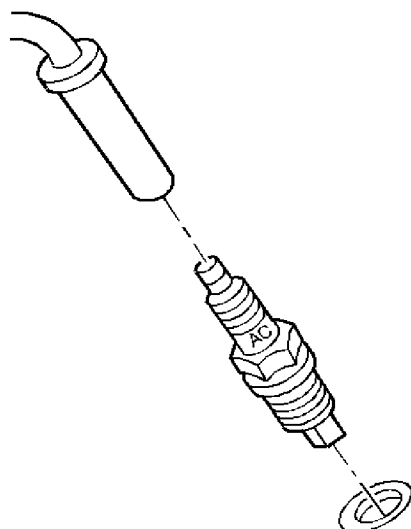
## Spark Plug Replacement

### Removal Procedure

**Caution:** Observe the following service precautions:

- Allow the engine to cool before removing the spark plugs. Attempting to remove spark plugs from a hot engine can cause the spark plugs to seize. This can damage the cylinder head threads.
- Clean the spark plug recess area before removing the spark plug. Failure to do so can result in engine damage due to dirt or foreign material entering the cylinder head, or in contamination of the cylinder head threads. Contaminated threads may prevent proper seating of the new spark plug.
- Use only the spark plugs specified for use in the vehicle. Do not install spark plugs that are either hotter or colder than those specified for the vehicle. Installing spark plugs of another type can severely damage the engine.

1. Turn OFF the ignition.



2. Remove the spark plug wires from the spark plugs. Refer to [Spark Plug Wire Replacement](#).
3. Remove the spark plugs from the engine.

### Installation Procedure

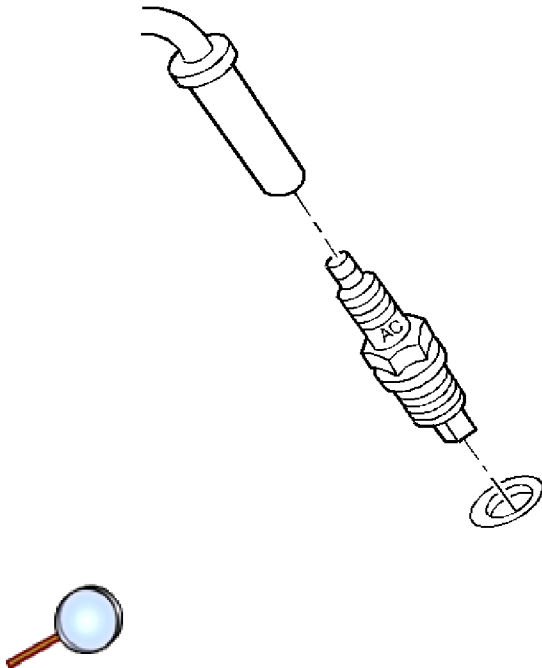
**Caution:** It is important to check the gap of all new and reconditioned spark plugs before installation. Pre-set gaps may have changed during handling. Use a round wire feeler gauge to be sure of an accurate check, particularly on used plugs. Installing plugs with the wrong gap can cause poor engine performance and may even damage the engine.

1. Gap the spark plugs to the specifications.

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**Caution:** Refer to [Fastener Caution](#) in the Preface section.



**Caution:** Be sure plug threads smoothly into cylinder head and is fully seated. Use a thread chaser if necessary to clean threads in cylinder head. Cross-threading or failing to fully seat spark plug can cause overheating of plug, exhaust blow-by, or thread damage. Follow the recommended torque specifications carefully. Over or under-tightening can also cause severe damage to engine or spark plug.

2. Install the spark plugs to the engine.

**Tighten**

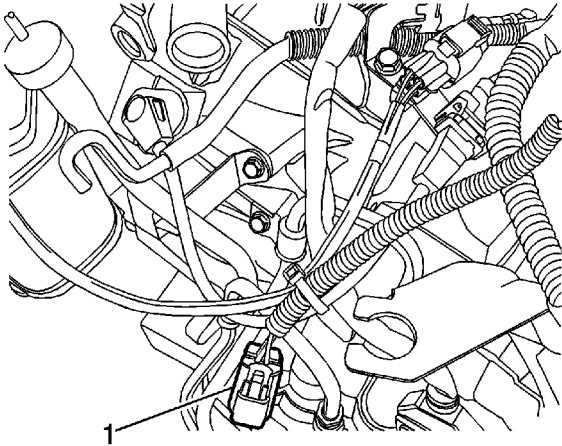
Tighten the spark plugs to 25 N·m (18 lb ft).

3. Install the spark plug wires to the spark plugs. Refer to [Spark Plug Wire Replacement](#).

## Crankshaft Position Sensor Replacement

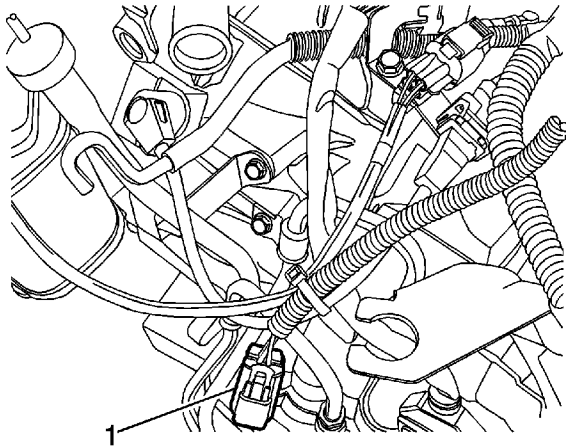
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the crankshaft position (CKP) sensor connector (1).
3. Remove the CKP sensor retaining bolt.
4. Remove the CKP sensor.

### Installation Procedure



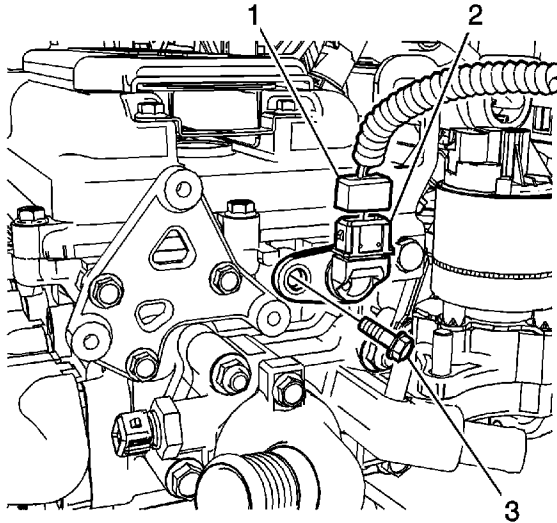
1. Install the CKP sensor.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the CKP sensor retaining bolt and tighten to **6.5 N·m (58 lb in)**.
3. Connect the crankshaft position (CKP) sensor connector (1).
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Camshaft Position Sensor Replacement

### Removal Procedure

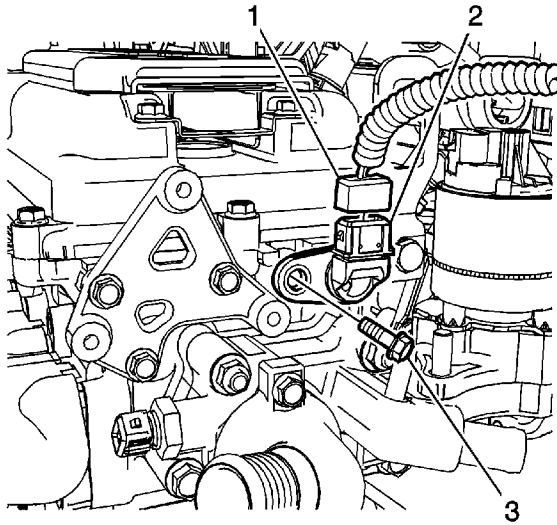


**Note:** A small amount of engine oil may be lost after removal of the camshaft position sensor.

1. Remove the ignition coil.
2. Disconnect the sensor electrical connector (1).
3. Remove the camshaft position (CMP) sensor bolt (3) and sensor (2).

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

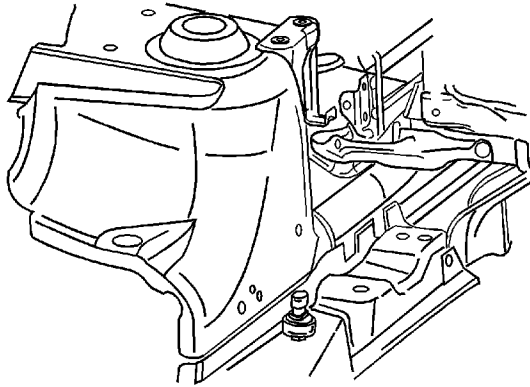


1. Install the CMP sensor (2) and bolts (3) and tighten to **12 N·m (106 lb in)**.
2. Connect the sensor electrical connector (1).
3. Install the ignition coil.

## Rough Road Sensor Replacement

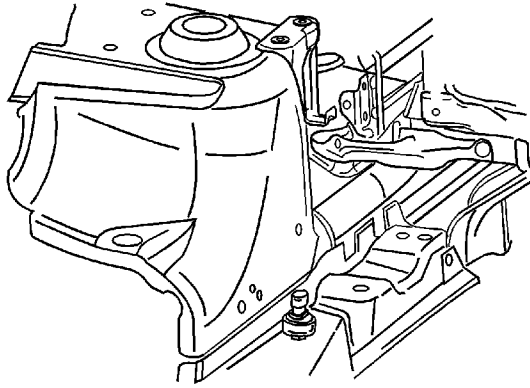
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the rough road sensor electrical connector and remove the rough road sensor.

### Installation Procedure

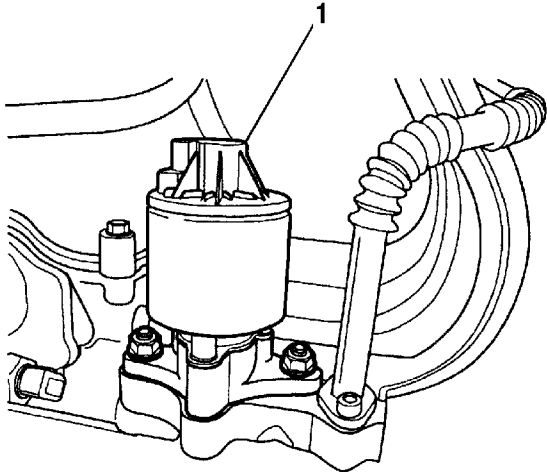


1. Install the rough road sensor and connect the electrical connector.
2. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Exhaust Gas Recirculation Valve Replacement

### Removal Procedure

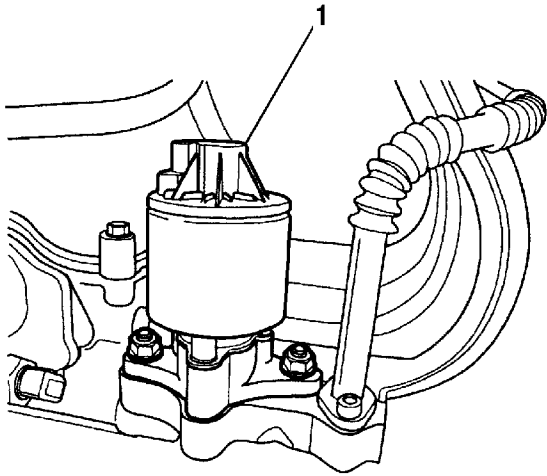
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the EGR valve electrical connector.
3. Remove the nuts and the EGR valve (1)

### Installation Procedure





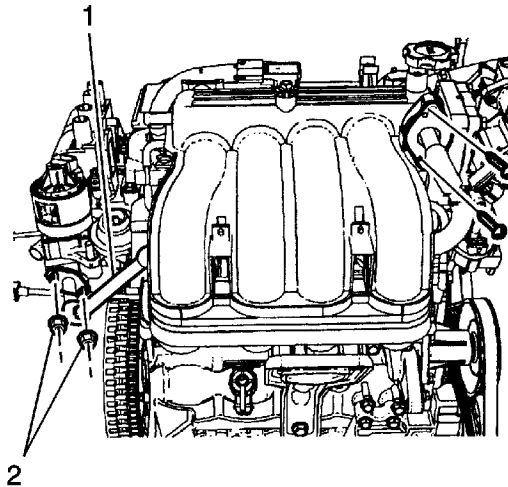
1. Clean the mating surface.
2. Install a new EGR valve gasket.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the EGR valve (1) with the retaining nuts and tighten to **30 N·m (22 lb ft)**.
4. Connect the EGR valve electrical connector.
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

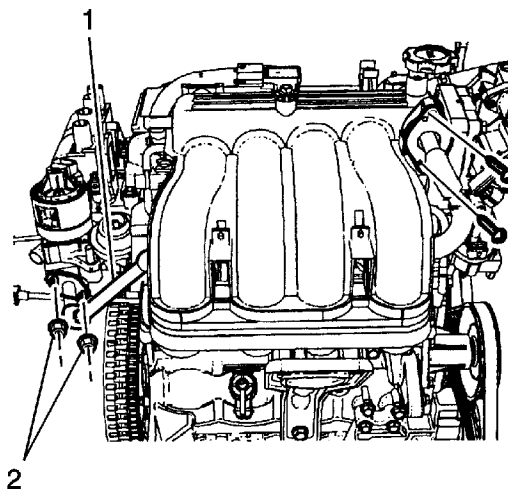
## Exhaust Gas Recirculation Valve Pipe Replacement

### Removal Procedure



1. Remove the EGR pipe retaining bolt from the intake manifold.
2. Remove the EGR pipe retaining nuts (2) from the coolant outlet case.
3. Remove the EGR pipe (1).

### Installation Procedure





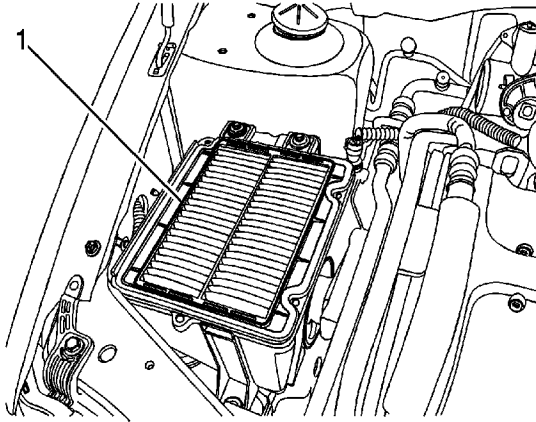
1. Install the EGR pipe (1).
2. Install and tighten the EGR pipe retaining nuts (2) from the coolant outlet case.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install and tighten the EGR pipe retaining bolt from the intake manifold.
  - Tighten the exhaust gas recirculation pipe retaining nuts to **10 N·m (89 lb in)**.
  - Tighten the exhaust gas recirculation pipe retaining bolts to **22 N·m (16.2 lb in)**.

## Air Cleaner Element Replacement

### Removal Procedure

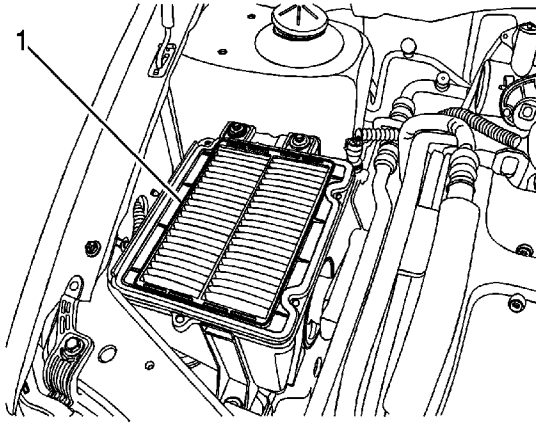


1. Remove the air filter upper housing.
2. Remove the air filter element (1).

### Installation Procedure

1. Install the air filter element (1).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



2. Replace the air filter upper housing bolts and tighten to **2 N·m (1.5 lb ft)**.

## Idle Learn

The Idle Learn Procedure listed below must be performed whenever the following occurs:

- The throttle body assembly is replaced
  - The throttle body is cleaned
  - The engine control module (ECM) is replaced
  - The idle air control valve (IAC) is replaced
  - Power disconnection (battery cable, ECM fuse, etc.) (Delphi ECM only)
- 
1. Turn the ignition ON.
  2. Turn the ignition OFF for 15 seconds.
  3. Turn the ignition ON for 5 seconds.
  4. Turn the ignition OFF for 15 seconds.
  5. Start the engine in park/neutral.
  6. Allow the engine to run until the engine coolant temperature is greater than 85°C (185°F).
  7. Turn the A/C ON for 10 seconds, if equipped.
  8. If the vehicle is equipped with an automatic transaxle, apply the parking brake. While pressing the brake pedal, place the transaxle in drive (D) for 10 seconds.
  9. Turn the A/C OFF for 10 seconds, if equipped.
  10. If the vehicle is equipped with an automatic transaxle, while pressing the brake pedal, place the transaxle in park/neutral.
  11. Turn the ignition OFF. The idle learn procedure is complete.

## Temperature Versus Resistance

°C	°F	ECT Ohms	IAT Ohms
Temperature vs Resistance Values (Approximate)			
100	212	177	187
90	194	241	246
80	176	332	327
70	158	467	441
60	140	667	603
50	122	973	837
45	113	1188	991
40	104	1459	1180
35	95	1802	1412
30	86	2238	1700
25	77	2796	2055
20	68	3520	2500
15	59	4450	3055
10	50	5670	3760
5	41	7280	4651
0	32	9420	5800
-5	23	12300	7273
-10	14	16180	9200
-15	5	21450	9200
-20	-4	28680	15080
-30	-22	52700	25600
-40	-40	100700	45300

## Altitude Versus Barometric Pressure

Altitude Measured in Meters (m)	Altitude Measured in Feet (ft)	Barometric Pressure Measured in Kilopascals (kPa)
Determine your altitude by contacting a local weather station or by using another reference source.		
4 267	14,000	56-64
3 962	13,000	58-66
3 658	12,000	61-69
3 353	11,000	64-72
3 048	10,000	66-74
2 743	9,000	69-77
2 438	8,000	71-79
2 134	7,000	74-82
1 829	6,000	77-85
1 524	5,000	80-88
1 219	4,000	83-91
914	3,000	87-95
610	2,000	90-98
305	1,000	94-102
0	0 Sea Level	96-104
-305	-1,000	101-105



[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Engine](#) | [Engine Controls and Fuel - 1.4L \(L95\)](#)  
| [Specifications](#) | Document ID: 1640706

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## Ignition System Specifications

Application	Specification	
	Metric	English
Firing Order	1-3-4-2	
Spark Plug Wire Resistance	2,000-12,000 ohms	
Spark Plug Gap	1.0-1.1 mm	0.039-0.043 in
Spark Plug Torque	25 N·m	18 lb ft
Spark Plug Type	Woojin - BKR6E-11	

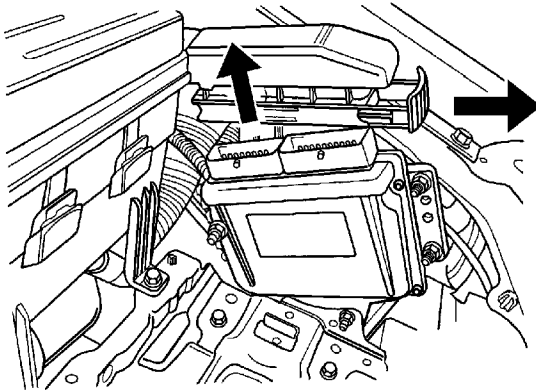
## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accessory Mounting Bracket Bolts	37 N·m	27 lb ft
Camshaft Position Sensor Bolts	12 N·m	106 lb in
Crankshaft Position Sensor Retaining Bolt	6.5 N·m	58 lb in
Electronic Ignition System Ignition Coil Retaining Bolts	10 N·m	89 lb in
Engine Control Module Bolts	4 N·m	35 lb in
Engine Coolant Temperature Sensor Bolt	20 N·m	15 lb ft
Evaporative Emission Canister Flange Bolt	20 N·m	15 lb ft
Evaporative Emission Canister Protective Cover	8 N·m	71 lb in
Evaporative Emission Canister Purge Solenoid Bracket Bolt	5 N·m	44 lb in
Evaporative Emission Vent Solenoid Bolt	8.5 N·m	75 lb in
Exhaust Gas Recirculation Valve Retaining Bolts	30 N·m	22 lb ft
Fuel Filter Mounting Bracket Assembly Bolt	4 N·m	35 lb in
Fuel Pressure Regulator Retaining Screw	12 N·m	106 lb in
Fuel Rail Retaining Bolts	25 N·m	18 lb ft
Fuel Tank Retaining Bolts	20 N·m	15 lb ft
Idle Air Control Valve Retaining Bolts	3 N·m	27 lb in
Knock Sensor Bolt	20 N·m	15 lb ft
Manifold Absolute Pressure Sensor Mounting Bracket Bolt	4 N·m	35 lb in
Manifold Absolute Pressure Sensor Retaining Bolts and Nuts	8 N·m	71 lb in
Oxygen Sensor Bolt	42 N·m	31 lb ft
Rear A/C Compressor Mounting Bracket Bolts	35 N·m	26 lb ft
Spark Plug Cover Bolts	3 N·m	27 lb in
Throttle Body Retaining Nuts	15 N·m	11 lb ft
Throttle Position Sensor Retaining Bolts	2 N·m	18 lb in
Variable Geometry Induction System Solenoid	10 N·m	89 lb in

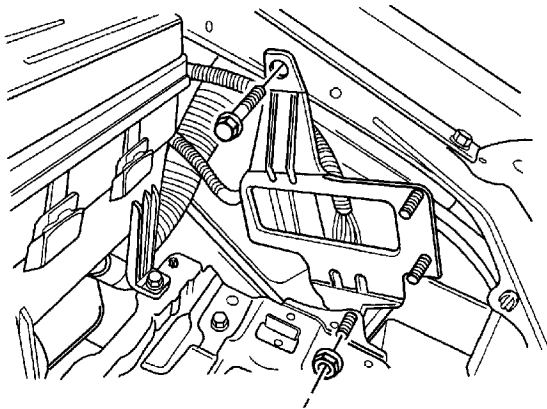
## Engine Control Module Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the engine control module (ECM) wiring harness connector.
3. Remove the nuts from the ECM mounting bracket.

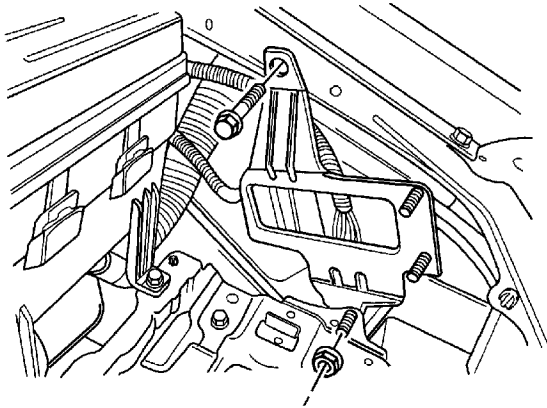


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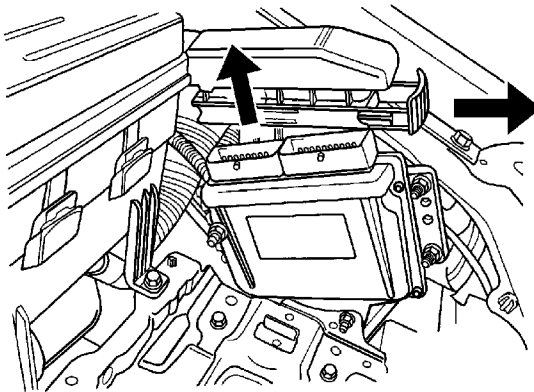
4. Remove the ECM mounting bracket with the bolt and the nut.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the ECM mounting bracket with the bolt and the nut and tighten to **12 N·m (9 lb ft)**.



2. Install the ECM with the nuts and tighten to **12 N·m (9 lb ft)**.
3. Refer to [Control Module References](#) for programming and setup information.

## Crankshaft Position System Variation Learn

**Important:** If the crankshaft position variation learn procedure has not learned, a false misfire could be detected and DTC P0300 may set. If sent here from DTC P0300, proceed with the crankshaft position variation learn procedure.

1. Monitor the engine control module (ECM) for DTCs with a scan tool. If other DTCs are set, except DTC P0300, or P1336, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC.
2. Select the crankshaft position variation learn procedure with a scan tool.
3. The scan tool instructs you to perform the following:
  - 3.1. Accelerate to wide open throttle (WOT).
  - 3.2. Release throttle when fuel cut-off occurs.
  - 3.3. Observe fuel cut-off for applicable engine.
  - 3.4. Engine should not accelerate beyond calibrated RPM value.
  - 3.5. Release throttle immediately if value is exceeded.
  - 3.6. Block drive wheels.
  - 3.7. Set parking brake.
  - 3.8. DO NOT apply brake pedal.
  - 3.9. Cycle ignition from OFF to ON.
  - 3.10. Apply and hold brake pedal.
  - 3.11. Start and idle engine.
  - 3.12. Turn A/C OFF.

Vehicle must remain in Park or Neutral.

The scan tool monitors certain component signals to determine if all the conditions are met to continue with the procedure. The scan tool only displays the condition that inhibits the procedure. The scan tool monitors the following components:

- Crankshaft position (CKP) sensors activity--If there is a CKP sensor condition, refer to the applicable DTC.
  - Camshaft position (CMP) signal activity--If there is a CMP signal condition, refer to the applicable DTC.
  - Engine coolant temperature (ECT)--If the engine coolant temperature is not warm enough, idle the engine until the engine coolant temperature reaches the correct temperature.
4. Enable the CKP system variation learn procedure with the scan tool and perform the following:

**Important:** While the CKP variation learn procedure is in progress, hold the throttle at WOT for 5 fuel-cutoffs. The learn procedure must determine there has been 5 fuel-cutoffs to properly perform the test.

- Accelerate to WOT.

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- Hold throttle while fuel cut-off occurs.
5. The scan tool displays Learn Status: Learned this ignition. If the scan tool indicates that DTC P1336 ran and passed, the CKP variation learn procedure is complete. If the scan tool indicates DTC P1336 failed or did not run, refer to [DTC P1336](#) . If any other DTCs set, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC.
  6. Turn OFF the ignition for 30 seconds after the learn procedure is completed successfully.

The CKP system variation learn procedure is also required when the following service procedures have been performed, regardless of whether or not DTC P1336 is set:

- An engine replacement
- An ECM replacement
- A harmonic balancer replacement
- A crankshaft replacement
- A CKP sensor replacement
- Any engine repairs which disturb the crankshaft to CKP sensor relationship.

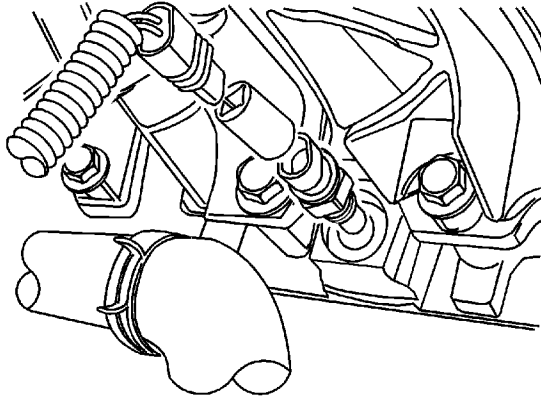
## Idle Learn

The Idle Learn Procedure listed below must be performed whenever the following occurs:

- The throttle body assembly is replaced
  - The throttle body is cleaned
  - The engine control module (ECM) is replaced
  - The idle air control valve (IAC) is replaced
  - Power disconnection (battery cable, ECM fuse, etc.) (Delphi ECM only)
- 
1. Turn the ignition ON.
  2. Turn the ignition OFF for 15 seconds.
  3. Turn the ignition ON for 5 seconds.
  4. Turn the ignition OFF for 15 seconds.
  5. Start the engine in park/neutral.
  6. Allow the engine to run until the engine coolant temperature is greater than 85°C (185°F).
  7. Turn the A/C ON for 10 seconds, if equipped.
  8. If the vehicle is equipped with an automatic transaxle, apply the parking brake. While pressing the brake pedal, place the transaxle in drive (D) for 10 seconds.
  9. Turn the A/C OFF for 10 seconds, if equipped.
  10. If the vehicle is equipped with an automatic transaxle, while pressing the brake pedal, place the transaxle in park/neutral.
  11. Turn the ignition OFF. The idle learn procedure is complete.

## Engine Coolant Temperature Sensor Replacement

### Removal Procedure



1. Relieve the coolant system pressure.

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

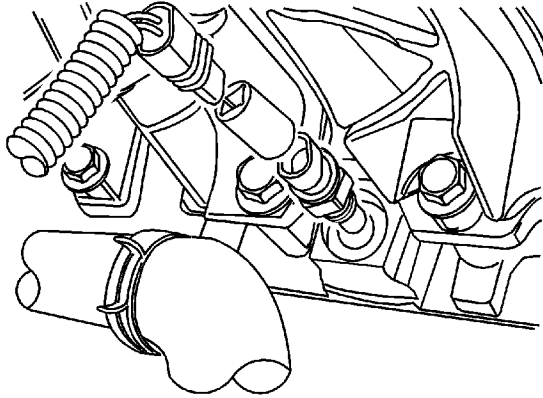
2. Disconnect the negative battery cable.

**Caution:** Use care when handling the coolant sensor. Damage to the coolant sensor will affect the operation of the fuel control system.

3. Disconnect the engine coolant temperature (ECT) sensor connector.
4. Carefully remove the ECT sensor from the cylinder head underneath the electronic ignition (EI) system ignition coil.

### Installation Procedure





**Caution:** Use care when handling the coolant sensor. Damage to the coolant sensor will affect the operation of the fuel control system.

1. Coat the threads on the ECT sensor with sealer.

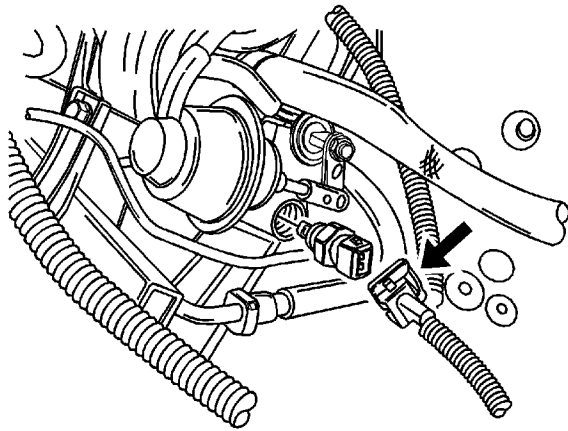
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ECT sensor into the cylinder head and tighten to **17.5 N·m (13 lb ft)**.
3. Connect the ECT sensor connector.
4. Fill the cooling system.
5. Connect the negative battery cable.

## Intake Air Temperature Sensor Replacement

### Removal Procedure

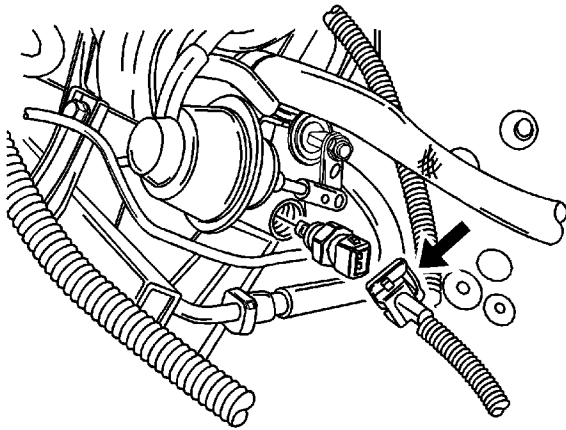
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the intake air temperature (IAT) sensor connector.
3. Remove the IAT sensor.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

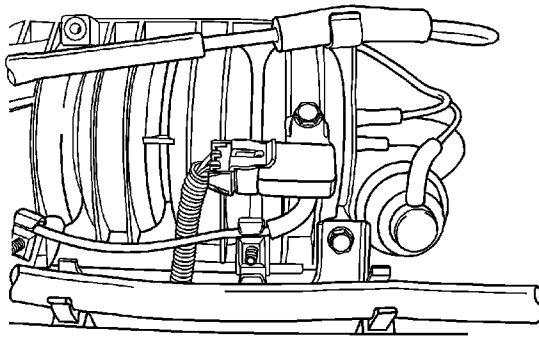


1. Insert the IAT sensor and tighten to **22 N·m (16 lb ft)**.
2. Connect the IAT sensor connector.
3. Connect the negative battery cable.

## Manifold Absolute Pressure Sensor Replacement

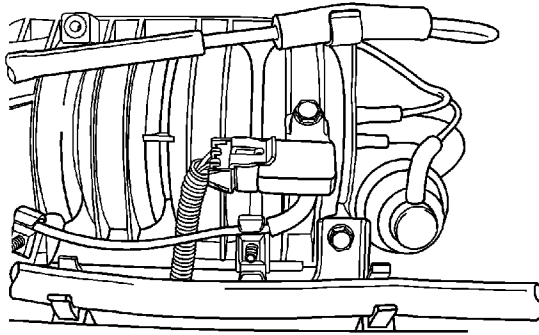
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the vacuum hose from the manifold absolute pressure (MAP) sensor.
3. Disconnect the MAP connector.
4. Remove the MAP sensor mounting bracket bolt.
5. Remove the bolts and nuts securing the MAP sensor to the mounting bracket.

### Installation Procedure



1. Insert the MAP sensor into the mounting bracket.

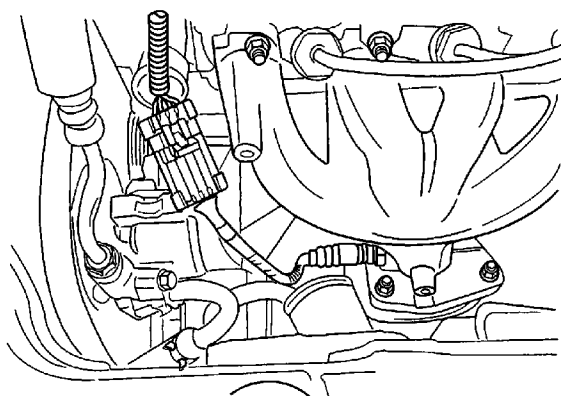
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the bolts through the MAP sensor and the bracket. Install the retaining nuts and tighten to **8 N·m (71 lb in)**.
3. Install the MAP sensor and the mounting bracket to the firewall with the mounting bracket bolt and tighten to **4 N·m (35 lb in)**.
4. Connect the MAP sensor connector.
5. Connect the vacuum hose to the MAP sensor.
6. Connect the negative battery cable.

## Heated Oxygen Sensor Replacement - Sensor 1

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.

**Caution:** Do not remove the pigtail from either the heated oxygen sensor (HO2S) or the oxygen sensor (O2S). Removing the pigtail or the connector will affect sensor operation.

Handle the oxygen sensor carefully. Do not drop the HO2S. Keep the in-line electrical connector and the louvered end free of grease, dirt, or other contaminants. Do not use cleaning solvents of any type.

Do not repair the wiring, connector or terminals. Replace the oxygen sensor if the pigtail wiring, connector, or terminal is damaged.

This external 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 degraded 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.
- Do not damage the sensor pigtail and harness wires in such a way that the wires inside are exposed. This could provide a path for foreign materials to enter the sensor and

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cause performance problems.

- Ensure the sensor or vehicle lead wires are not bent sharply or kinked. Sharp bends or kinks 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 wired sensor may rely on this ground as the only ground contact to the sensor. Removal of the ground wire will cause poor engine performance.
- Ensure that the peripheral seal remains intact on the vehicle harness connector in order to prevent damage due to water intrusion. The engine harness may be repaired using Packard's Crimp and Splice Seals Terminal Repair Kit. Under no circumstances should repairs be soldered since this could result in the air reference being obstructed.

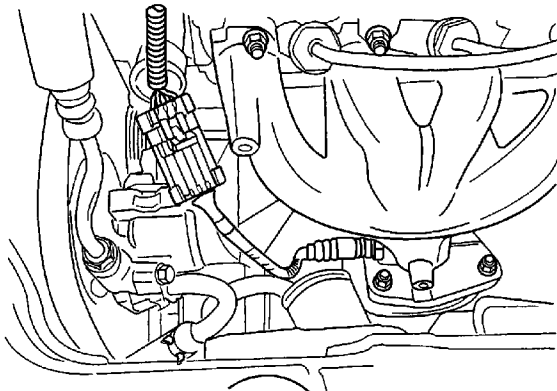
**Caution:** Do not solder heated oxygen sensor wires. Soldering the wires will result in the loss of the air reference to the sensor. Refer to Engine Electrical for proper wire and connection repair techniques.

2. Disconnect the front heated oxygen sensor (HO2S) 1 connector.

**Caution:** Remove oxygen sensors with the engine temperature above 48°C (120°F). Otherwise the oxygen sensors may be difficult to remove.

3. Carefully remove the HO2S1 from the exhaust manifold.

## Installation Procedure



**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti-seize compound applied before reinstallation.

1. Coat the threads of the HO2S1 with an anti-seize compound, if needed.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

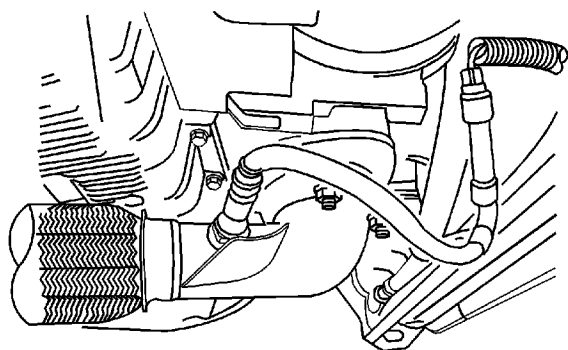
2. Install the HO2S1 into the exhaust manifold and tighten to **42 N·m (31 lb ft)**.
3. Connect the HO2S1 connector.
4. Connect the negative battery cable.



## Heated Oxygen Sensor Replacement - Sensor 2

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.

**Caution:** Do not remove the pigtail from either the heated oxygen sensor (HO2S) or the oxygen sensor (O2S). Removing the pigtail or the connector will affect sensor operation.

Handle the oxygen sensor carefully. Do not drop the HO2S. Keep the in-line electrical connector and the louvered end free of grease, dirt, or other contaminants. Do not use cleaning solvents of any type.

Do not repair the wiring, connector or terminals. Replace the oxygen sensor if the pigtail wiring, connector, or terminal is damaged.

This external 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 degraded 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.
- Do not damage the sensor pigtail and harness wires in such a way that the wires inside are exposed. This could provide a path for foreign materials to enter the sensor and

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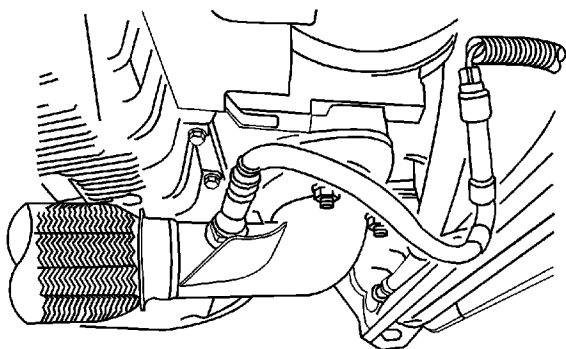
cause performance problems.

- Ensure the sensor or vehicle lead wires are not bent sharply or kinked. Sharp bends or kinks 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 wired sensor may rely on this ground as the only ground contact to the sensor. Removal of the ground wire will cause poor engine performance.
- Ensure that the peripheral seal remains intact on the vehicle harness connector in order to prevent damage due to water intrusion. The engine harness may be repaired using Packard's Crimp and Splice Seals Terminal Repair Kit. Under no circumstances should repairs be soldered since this could result in the air reference being obstructed.

**Caution:** Do not solder heated oxygen sensor wires. Soldering the wires will result in the loss of the air reference to the sensor. Refer to Engine Electrical for proper wire and connection repair techniques.

2. Disconnect the electrical connector.
3. Remove the heated oxygen sensor (HO2S) 2.

## Installation Procedure



**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti-seize compound applied before reinstallation.

1. Coat the threads of the HO2S2 with an anti-seize compound, if needed.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the HO2S2.

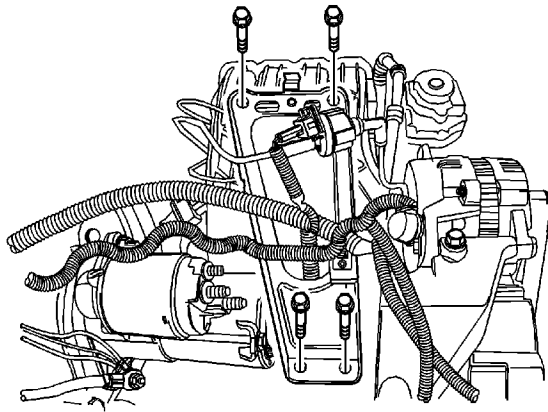
Tighten the heated oxygen sensor to **42 N·m (31 lb ft)**.

3. Connect the electrical connector.
4. Connect the negative battery cable.

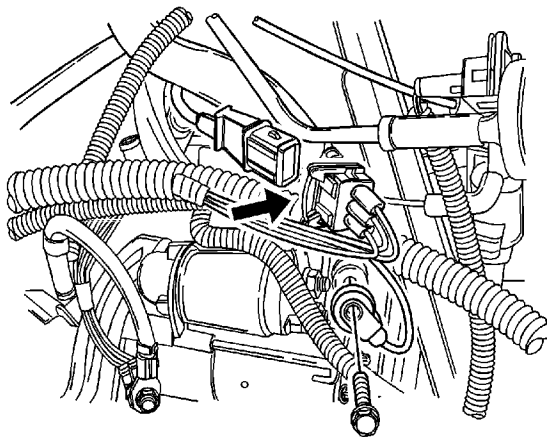
## Knock Sensor Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the intake manifold support bracket bolts.
3. Remove the intake manifold support bracket.

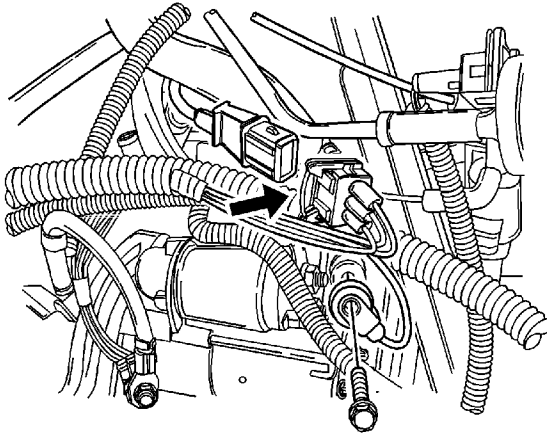


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4. Disconnect the knock sensor (KS) electrical connector.
5. Remove the KS bolt.
6. Remove the KS.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

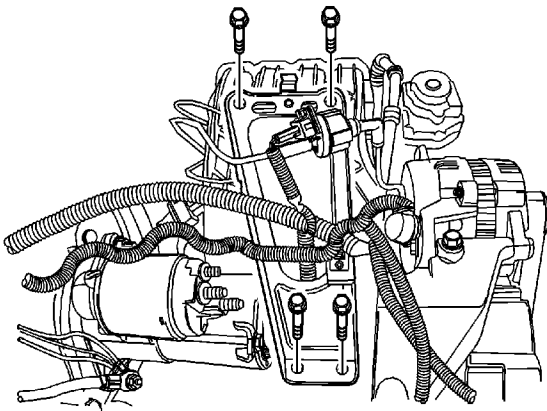


1. Install the KS with the bolt.

### **Tighten**

Tighten the knock sensor bolt to 20 N·m (15 lb ft).

2. Connect the KS electrical connector.





3. Install the intake manifold support bracket with the bolts.

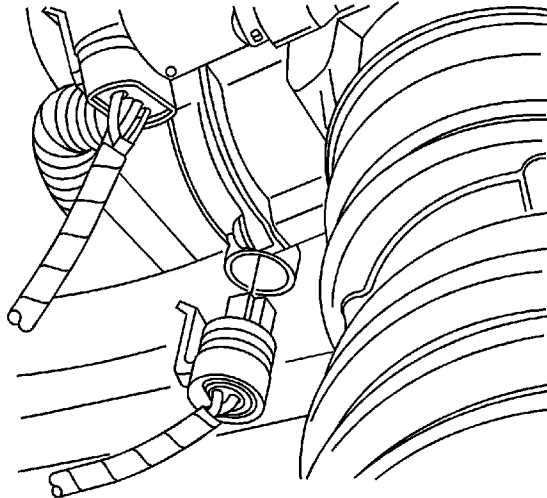
**Tighten**

- Tighten the intake manifold support bracket upper bolts to 25 N·m (18 lb ft).
  - Tighten the intake manifold support bracket lower bolts to 45 N·m (33 lb ft).
4. Connect the negative battery cable.

## Throttle Position Sensor Replacement

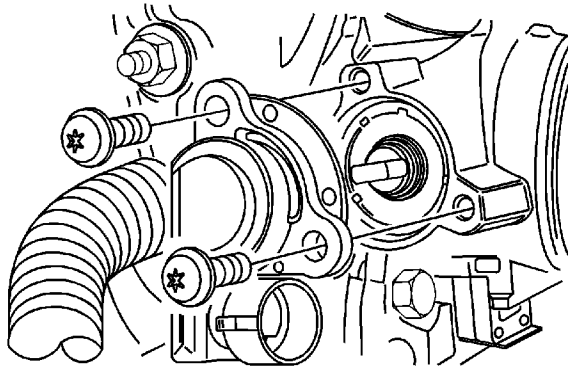
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the throttle position (TP) sensor connector.
3. Remove the TP sensor retaining bolts and the TP sensor.

### Installation Procedure



1. With the throttle valve closed, position the TP sensor on the throttle shaft. Align the TP sensor with the bolt holes.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the TP sensor retaining bolts.

#### **Tighten**

Tighten the throttle position sensor retaining bolts to 2 N·m (18 lb in).

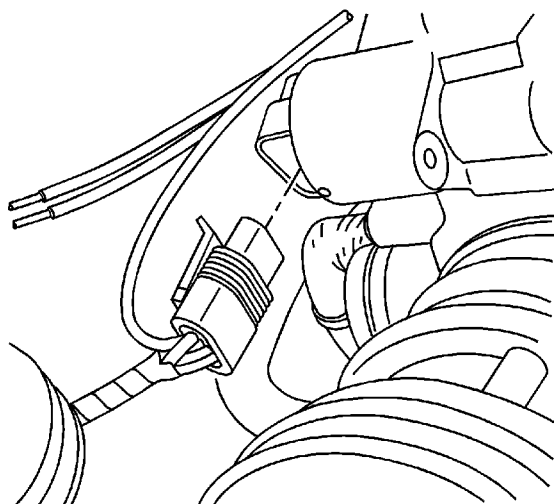
3. Connect the TP sensor connector.
4. Connect the negative battery cable.



## Idle Air Control Valve Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



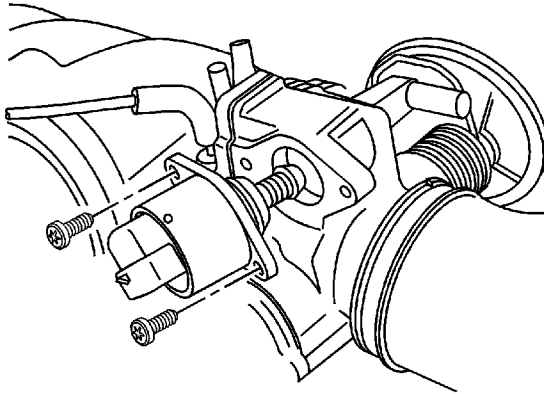
1. Disconnect the negative battery cable.
2. Disconnect the idle air control (IAC) valve connector.
3. Remove the IAC valve retaining bolts.

**Caution:**

- Do Not push or pull on the IAC valve pintle on IAC valves that have been in service. The force required to move the pintle may damage the threads on the worm drive.
- Do Not soak the IAC valve in any liquid cleaner or solvent, as damage may result.

4. Remove the IAC valve.
5. Clean the IAC valve O-ring seal area, the pintle valve seat, and the air passage with a suitable fuel system cleaner. Do not use methyl ethyl ketone.

### Installation Procedure

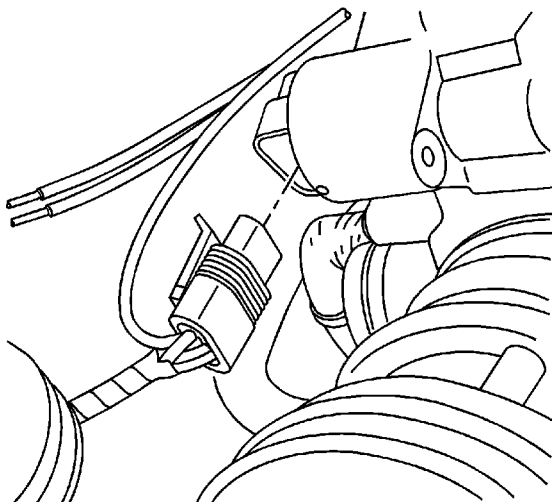


**Important:** If installing a new IAC valve, be sure to replace it with an identical part. The IAC valve pintle shape and diameter are designed for the specific application. Measure the distance between the tip of the IAC valve pintle and the mounting flange. If the distance is greater than 28 mm (1.1 in), use finger pressure to slowly retract the pintle.

The force required to retract the pintle will not damage the IAC valve. The purpose of the 28 mm (1.1 in) setting is to prevent the IAC pintle from bottoming out on the pintle seat. This 28 mm (1.1 in) setting is also an adequate setting for controlled idle on a restart.

1. Lubricate a new O-ring with engine oil. Install the new O-ring onto the valve.
2. Install the IAC valve into the throttle body.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.





3. Install the IAC valve retaining bolts.

**Tighten**

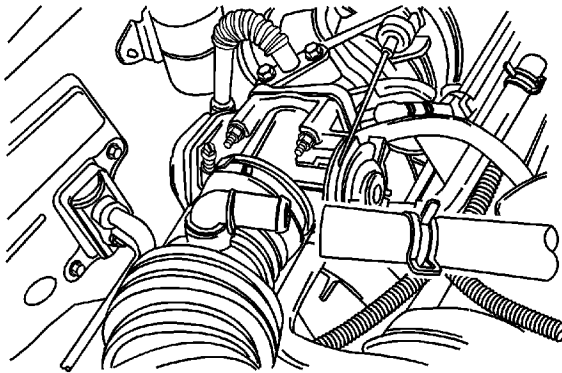
Tighten the idle air control valve retaining bolts to 3 N·m (27 lb in).

4. Connect the IAC valve connector.
5. Connect the negative battery cable.
6. Start the engine and check for the proper idle speed.

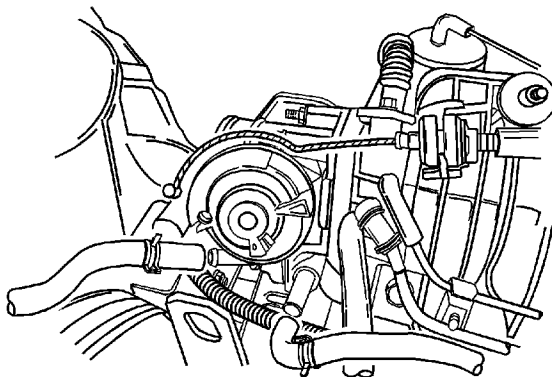
# Throttle Body Assembly Replacement

## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



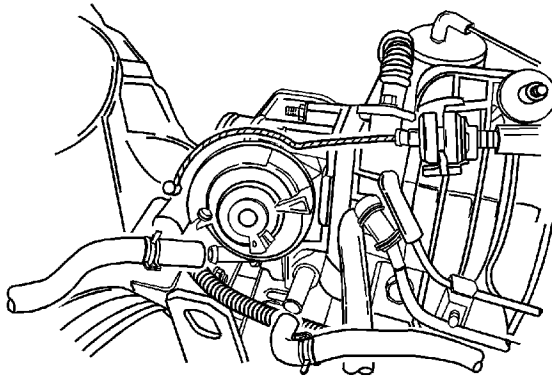
1. Disconnect the negative battery cable.
2. Remove the intake air tube.
3. Disconnect the breather hose.



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4. Disconnect the coolant hose from the throttle body.
5. Disconnect the throttle cables by opening the release slot.
6. Disconnect the main throttle idle actuator (MTIA) electrical connector.
7. Remove the throttle body bolt and the nuts.
8. Remove the throttle body.

## Installation Procedure



1. Install the throttle body assembly to the intake manifold.

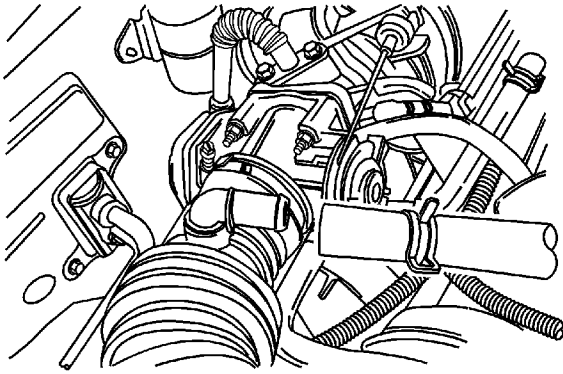
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the throttle body retaining nuts and the bolt.

### **Tighten**

Tighten the throttle body retaining nuts and the bolt to 15 N·m (11 lb ft).

3. Connect the throttle cable.
4. Connect the coolant hoses.



5. Connect the breather hose.
6. Install the intake air tube.
7. Connect the negative battery cable.

## Fuel Pressure Relief

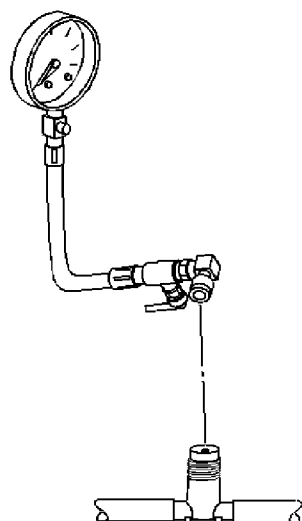
1. Remove the fuel cap.
2. Remove the fuel pump fuse EF10 from the engine fuse box.
3. Start the engine and allow the engine to stall.
4. Crank the engine for an additional 10 seconds.

## Fuel Pressure Gage Installation and Removal

### Installation Procedure

**Warning:** Refer to [Gasoline/Gasoline Vapors Warning](#) in the Preface section.

1. Remove the left fuel rail cover.



**Warning:** Wrap a shop towel around the fuel pressure connection in order to reduce the risk of fire and personal injury. The towel will absorb any fuel leakage that occurs during the connection of the fuel pressure gage. Place the towel in an approved container when the connection of the fuel pressure gage is complete.

**Caution:** Clean all of the following areas before performing any disconnections in order to avoid possible contamination in the system:

- The fuel pipe connections
- The hose connections
- The areas surrounding the connections

2. Install the fuel pressure gage to the fuel pressure service connection, located on the fuel rail.
3. Turn ON the ignition.

**Warning:** Do not drain the fuel into an open container. Never store the fuel in an open container due to the possibility of a fire or an explosion.

4. Place the bleed hose of the fuel pressure gage into an approved gasoline container.
5. Open the bleed valve on the fuel pressure gage in order to bleed the air from the fuel pressure gage.
6. Command the fuel pump ON with a scan tool.

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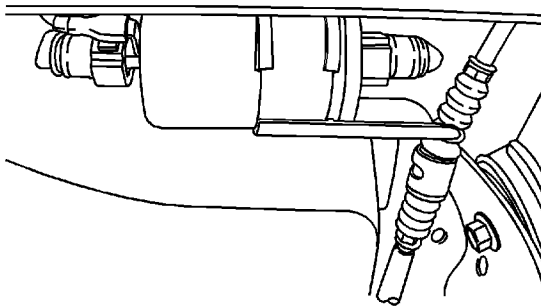


7. Close the bleed valve on the fuel pressure gage.
8. Inspect for fuel leaks.

## Fuel Filter Replacement

### Removal Procedure

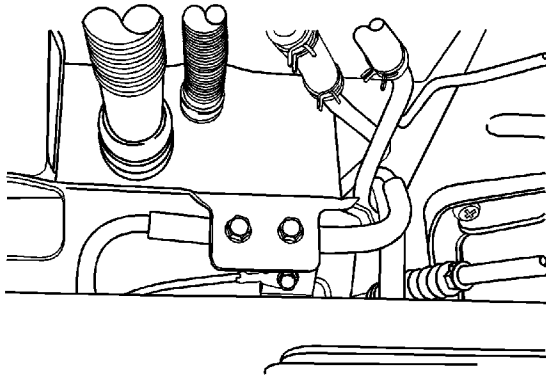
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



1. Relieve the fuel system pressure. Refer to [Fuel Pressure Relief](#).

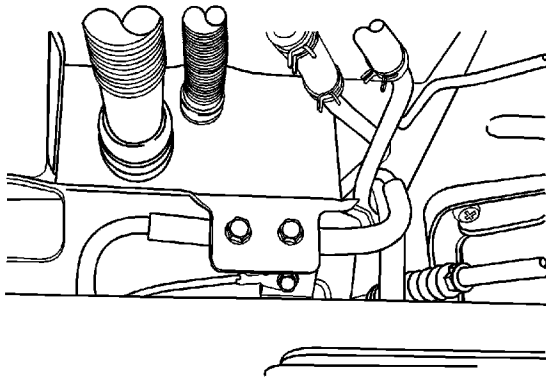
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the negative battery cable.
3. Disconnect the inlet/outlet fuel lines by moving the line connector lock forward and pulling the hose off of the fuel filter tube.
4. Disconnect the fuel filter ground.



5. Remove the fuel filter bracket bolts.
6. Pull the fuel filter out of the retaining clamp.

## Installation Procedure



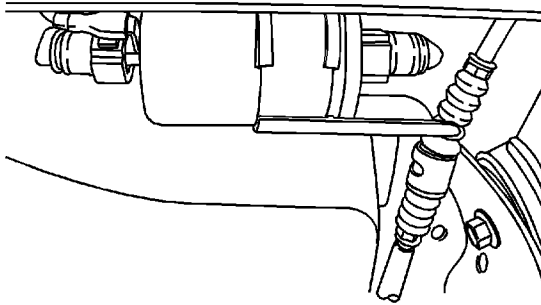
1. Install the new fuel filter into the retaining clamp. Note the flow direction.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the fuel filter bracket bolts.

**Tighten**

Tighten the fuel filter bracket bolts to 4 N·m (35 lb in).

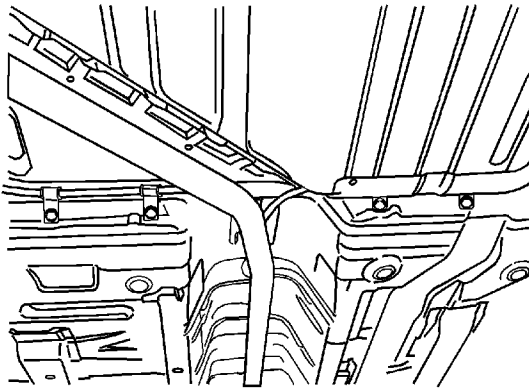


3. Connect the inlet/outlet lines. Secure the lines with the connector lock.
4. Perform a leak test of the fuel filter.

## Fuel Tank Replacement

### Removal Procedure

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.

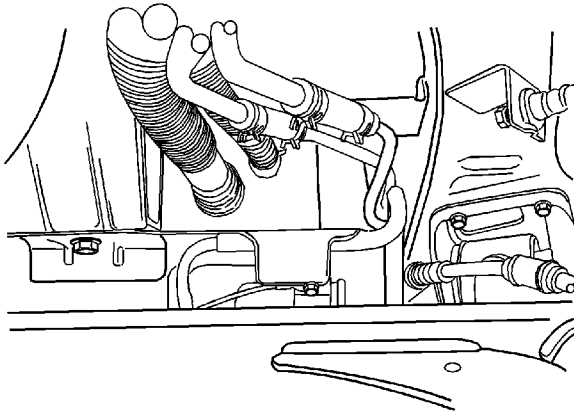


**Warning:** Gasoline or gasoline vapors are highly flammable. A fire could occur if an ignition source is present. Never drain or store gasoline or diesel fuel in an open container, due to the possibility of fire or explosion. Have a dry chemical (Class B) fire extinguisher nearby.

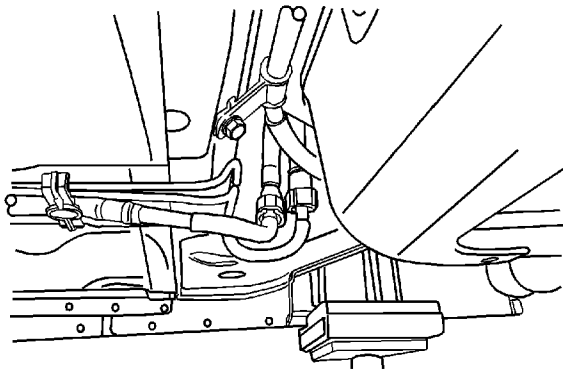
1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

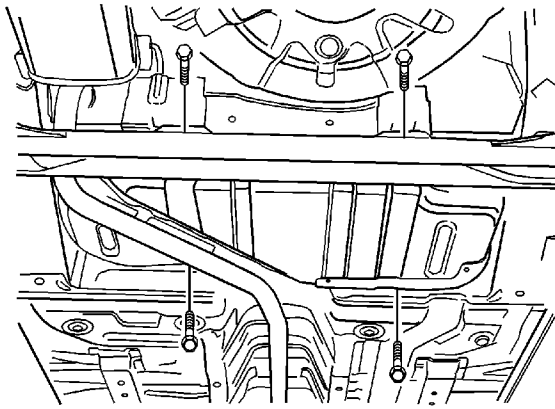
2. Disconnect the negative battery cable.
3. Drain the fuel tank.
4. Disconnect the parking brake cable retainer clamps and the support along the fuel tank to provide clearance for the tank.



5. Remove the fuel tank filler tube clamp at the fuel tank.
6. Disconnect the fuel tank filler tube.
7. Disconnect the fuel tank filler tube at the fuel tank.
8. Disconnect the canister vapor tube at the control valve vapor tube.

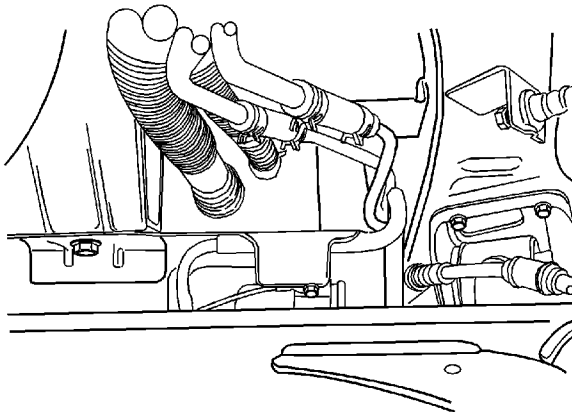


9. Disconnect the fuel pump harness connector at the right rear corner of the fuel tank.
10. Disconnect the fuel inlet line near the right front of the fuel tank.
11. Disconnect the wiring harness clips and the fuel line clips as needed.



12. Support the fuel tank.
13. Remove the fuel tank retaining bolts.
14. Carefully lower the fuel tank.
15. Remove the fuel tank.
16. Transfer any parts as needed.

## Installation Procedure



1. Raise the fuel tank into position.

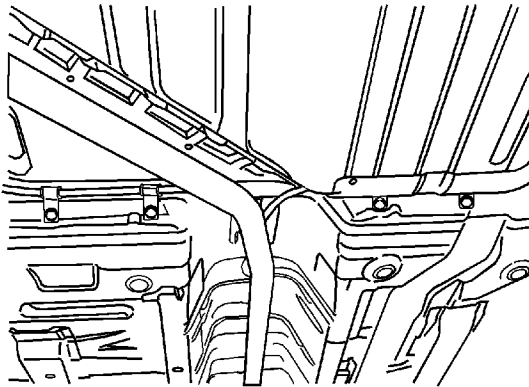
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the fuel tank mounting bolts.

**Tighten**

Tighten the fuel tank retaining bolts to 20 N·m (15 lb ft).

3. Connect the fuel outlet line.
4. Connect the wiring harness clips and the fuel line clips as needed.
5. Connect the fuel pump electrical connector.
6. Connect the fuel vapor line.
7. Connect the fuel tank filler tube and fuel tank vent tube.
8. Install the fuel tank filler tube clamp at the fuel tank.



9. Install the parking brake cable retainer clamps and the support.

**Tighten**

Tighten the parking brake cable retainer clamps to 10 N·m (89 lb in).

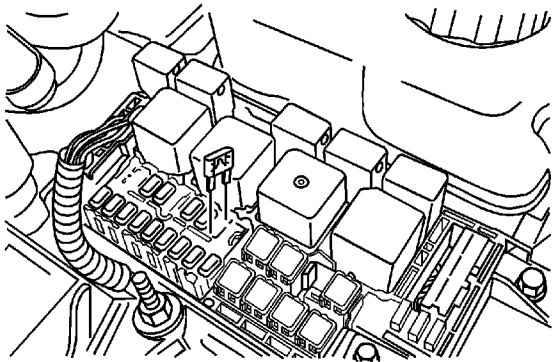
10. Connect the negative battery cable.
11. Fill the fuel tank.
12. Perform a leak check of the fuel tank and the fuel line connections.



## Fuel Sender Assembly Replacement

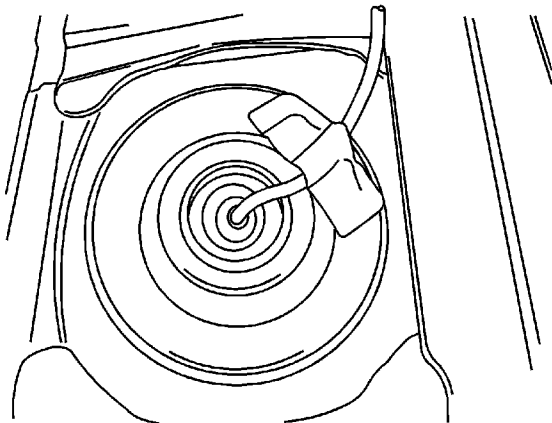
### Removal Procedure

**Warning:** Refer to [Relieving Fuel Pressure Warning](#) in the Preface section.



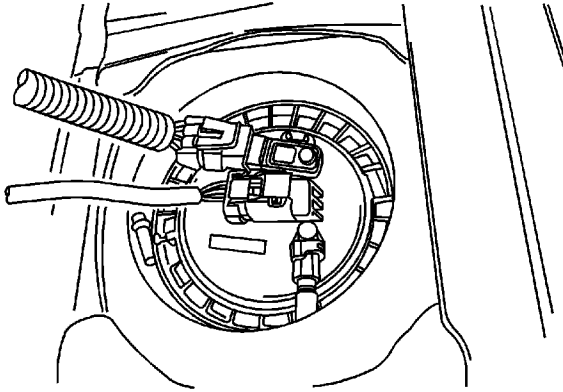
1. Relieve the fuel system pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



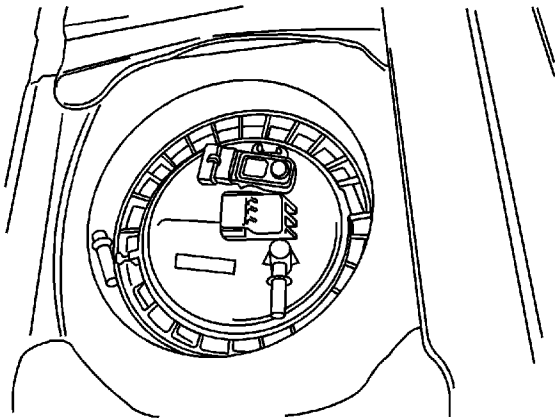


2. Disconnect the negative battery cable.
3. Remove the rear seat. Refer to [Rear Seat Cushion Replacement](#).
4. Remove the fuel pump access cover.



5. Disconnect the electrical connector at the fuel pump assembly.
6. Disconnect the fuel line.
7. Remove the fuel pump assembly clip.
8. Remove the fuel pump assembly from the tank.
9. Remove and discard the gasket.

## Installation Procedure



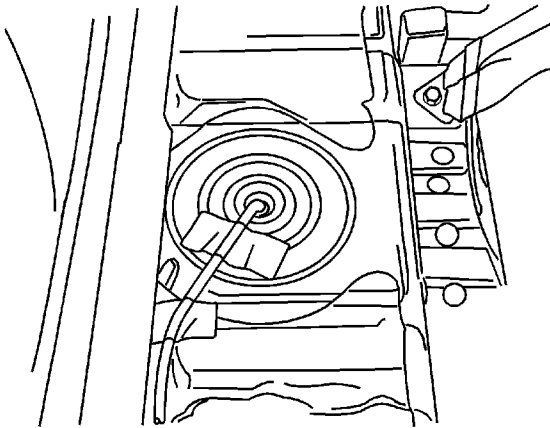


1. Clean the gasket mating surface on the fuel tank.
2. Position the new gasket in place.
3. Install the fuel pump into the fuel tank in the same location as removed for ease of line and connector installation.
4. Install the fuel pump assembly clip.
5. Connect the fuel pump assembly connector.
6. Install the fuel pump line.
7. Install the fuel pump access cover.
8. Install the EF10 fuse.
9. Connect the negative battery cable.
10. Perform an operational check of the fuel pump.
11. Install the rear seat. Refer to [Rear Seat Cushion Replacement](#).

## Fuel Pump Replacement

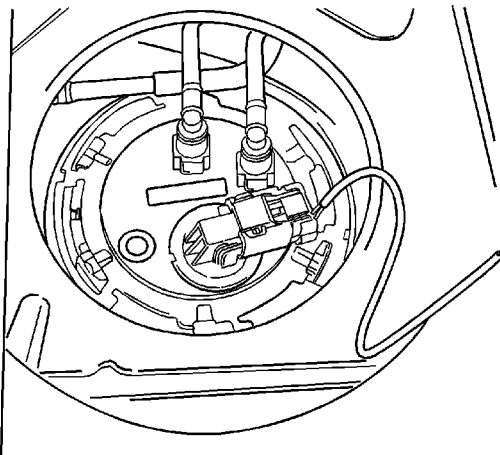
### Removal Procedure

**Warning:** Refer to [Fuel Pressure Caution](#) in the Preface section.



1. Relieve the fuel system pressure. Refer to [Fuel Pressure Relief](#).

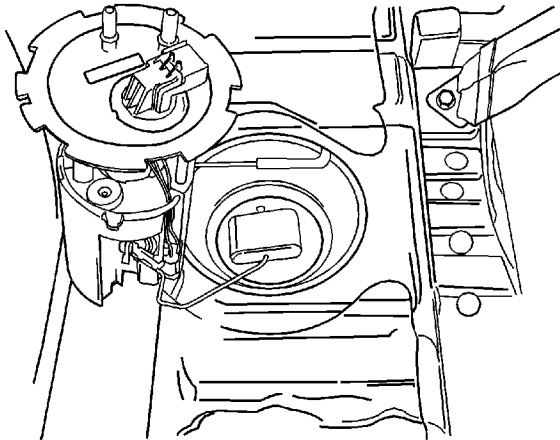
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.





2. Disconnect the negative battery cable.
3. Remove the rear seat.
4. Remove the fuel pump access cover.
5. Disconnect the electrical connector at the fuel pump assembly.
6. Disconnect the fuel outlet line.
7. Turn the lock ring counterclockwise to clear the tank tabs.
8. Remove the fuel pump assembly from the tank.
9. Remove and discard the gasket.

## **Installation Procedure**

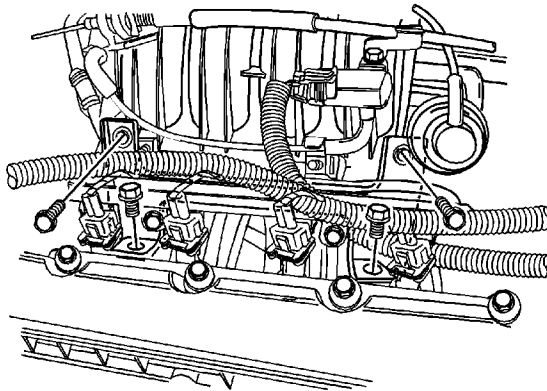


1. Clean the gasket mating surface on the fuel tank.
2. Position the new gasket in place.
3. Install the fuel pump into the fuel tank in the same location as removed for ease of line and connector installation.
4. Position the lock ring in place and turn it clockwise until it contacts the tank stop.
5. Connect the fuel pump assembly connector.
6. Install the fuel pump outlet line.
7. Install the pump access cover.
8. Connect the negative battery cable.
9. Perform an operational check of the fuel pump.
10. Install the rear seat.

## Fuel Injection Fuel Rail Assembly Replacement

### Removal Procedure

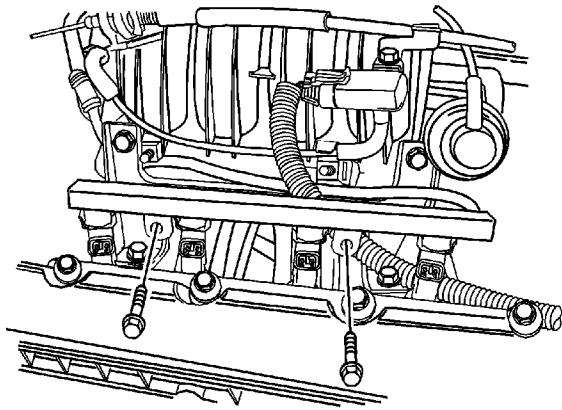
**Warning:** Refer to [Relieving Fuel Pressure Warning](#) in the Preface section.



1. Relieve the fuel system pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the negative battery cable.
3. Remove the intake manifold bracket bolts.
4. Remove the intake manifold bracket.
5. Disconnect the fuel injector harness connectors.



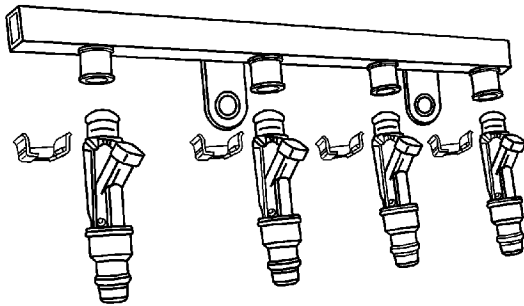
6. Remove the fuel feed line.
7. Remove the fuel rail mounting bolts.

**Caution:**

- Use care when servicing the fuel system components, especially the fuel injector electrical connectors, the fuel injector tips, and the injector O-rings. Plug the inlet and the outlet ports of the fuel rail in order to prevent contamination.
- Do not use compressed air to clean the fuel rail assembly as this may damage the fuel rail components.
- Do not immerse the fuel rail assembly in a solvent bath in order to prevent damage to the fuel rail assembly.

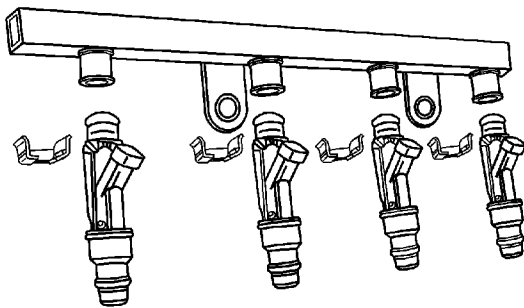
**Note:** If an injector becomes separated from the rail and remains in the cylinder head, replace the injector O-ring seals and the retaining clip.

8. Remove the fuel rail with the fuel injectors attached.



9. Remove the fuel injector retainer clips.
10. Remove the fuel injectors by pulling down and out.
11. Discard the fuel injector O-rings.

## Installation Procedure

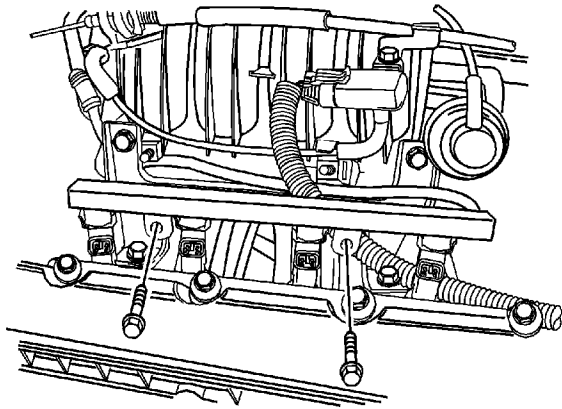


**Note:** Different injectors are calibrated for different flow rates. When ordering new fuel injectors, be certain to order the identical part number that is inscribed on the old injector.

1. Lubricate the new fuel injector O-rings with engine oil. Install the new O-rings on the fuel injectors.



2. Install the fuel injectors into the fuel rail sockets with the fuel injector terminals facing outward.



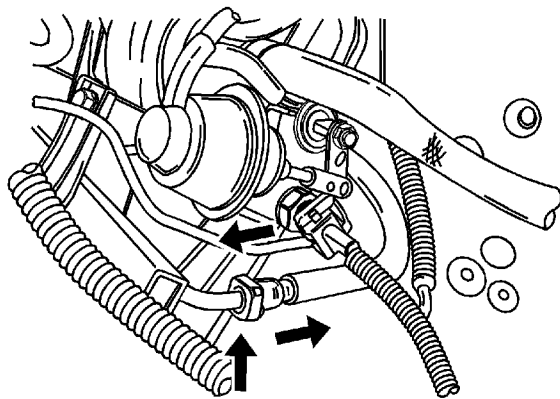
3. Install the fuel injector retainer clips onto the fuel injectors and the fuel rail ledge.
4. Make sure that the clip is parallel to the fuel injector harness connector.
5. Install the fuel rail assembly into the cylinder head.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

6. Install the fuel rail mounting bolts.

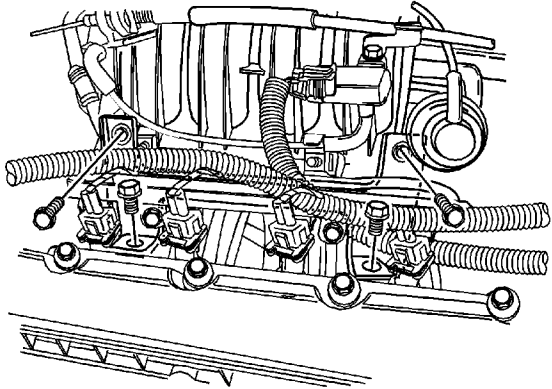
### Tighten

Tighten the fuel rail mounting bolts to 25 N·m (18 lb ft).





7. Connect the fuel feed hose.

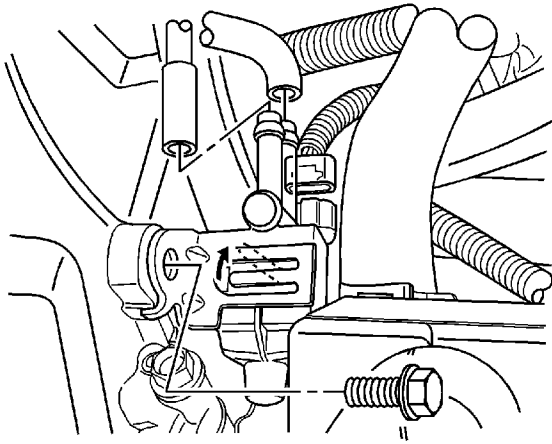


8. Connect the fuel injector harness connectors. Rotate each fuel injector as required to avoid stretching the wiring harness.
9. Install the intake manifold bracket with the bolts.
10. Connect the negative battery cable.
11. Perform a leak check of the fuel rail and fuel injectors.

# Evaporative Emission Canister Purge Solenoid Valve Replacement

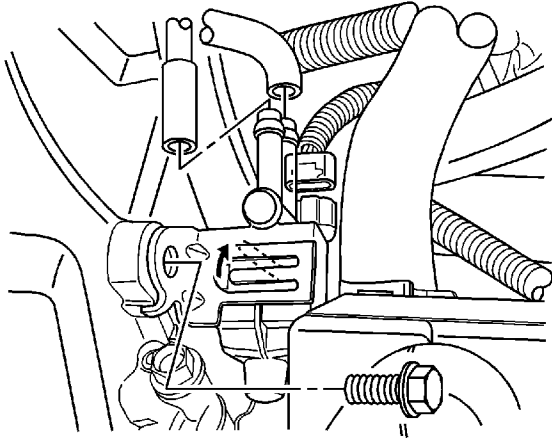
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the evaporative emission (EVAP) canister purge solenoid connector.
3. Disconnect the vacuum hoses from the EVAP canister purge solenoid.
4. Remove the EVAP canister purge solenoid bracket bolt from the intake manifold.
5. Unclip the EVAP canister purge solenoid from the mounting bracket.

## Installation Procedure



1. Attach the EVAP canister purge solenoid to the mounting bracket.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the EVAP canister purge solenoid and the mounting bracket to the intake manifold with the bracket bolt.

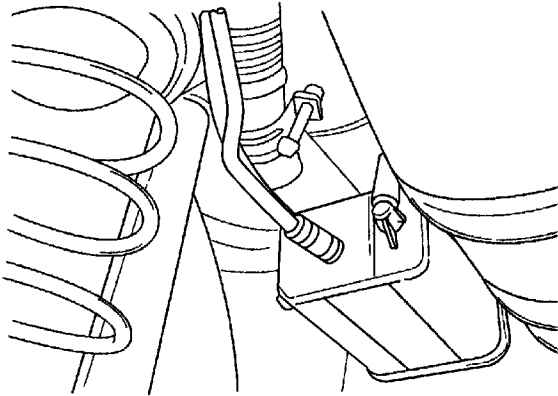
### **Tighten**

Tighten the EVAP canister purge solenoid bracket bolt to 5 N·m (44 lb in).

3. Connect the vacuum hoses to the EVAP canister purge solenoid.
4. Connect the EVAP canister purge solenoid connector.
5. Connect the negative battery cable.

## Evaporative Emission Canister Replacement

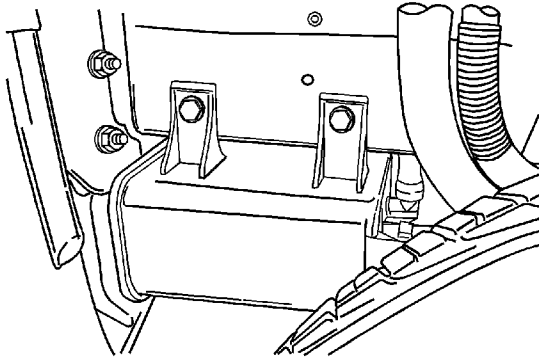
### Removal Procedure



**Warning:** Do not breathe the air through the EVAP component tubes or hoses. The fuel vapors inside the EVAP components may cause personal injury.

1. Disconnect the evaporative emission (EVAP) canister fuel vapor hoses.
2. Remove the bolt securing the EVAP canister flange to the vehicle.
3. Slide the EVAP canister out of the track holder.
4. Remove the EVAP canister.

### Installation Procedure



1. Insert the EVAP canister into the track and slide it into position.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the EVAP emission canister flange bolt.

**Tighten**

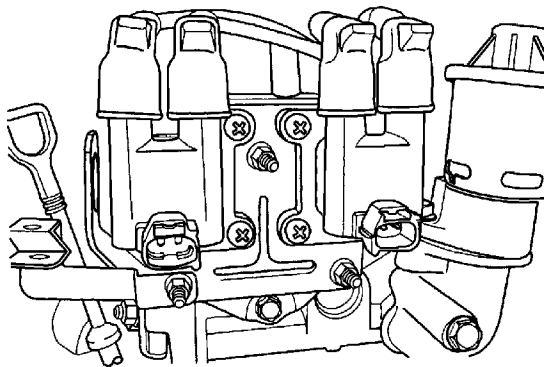
Tighten the evaporative emission canister flange bolt to 20 N·m (15 lb ft).

3. Connect the canister fuel vapor hoses.

# Ignition Coil Replacement

## Removal Procedure

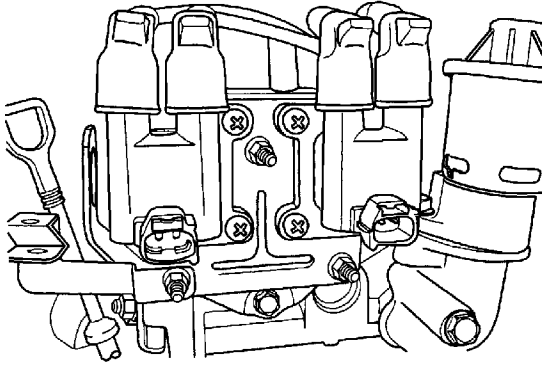
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the electronic ignition (EI) system ignition coil connector.
3. Note the ignition wire location and remove the ignition wire.
4. Remove the EI system ignition coil retaining nuts.
5. Remove the EI system ignition coil.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the EI system ignition coil into the mounting location and install the retaining nuts.

**Tighten**

Tighten the EI system ignition coil retaining nuts to 10 N·m (89 lb in).

2. Connect the EI system ignition coil connector.
3. Connect the negative battery cable.



## Spark Plug Wire Inspection

Spark plug wire integrity is vital for proper engine operation. A thorough inspection will be necessary to accurately identify conditions that may affect engine operation. Inspect for the following conditions:

1. Correct routing of the spark plug wires. Incorrect routing may cause cross-firing.
2. Any signs of cracks or splits in the wires.
3. Inspect each boot for the following conditions:
  - Tearing
  - Piercing
  - Arcing
  - Carbon tracking
  - Corroded terminal

If corrosion, carbon tracking, or arcing are indicated on a spark plug wire boot or on a terminal, replace the wire and the component connected to the wire.

## Spark Plug Wire Replacement

### Removal Procedure

1. Turn OFF the ignition.
2. Disconnect the spark plug wire at each spark plug.
  - Twist each spark plug boot 1/2 turn before removing.
  - Pull only on the boot or use a tool designed for this purpose in order to remove the wire from each spark plug.
3. Disconnect the spark plug wire from the coil.
  - Twist each spark plug boot 1/2 turn before removing.
  - Pull only on the boot or use a tool designed for this purpose in order to remove the wires from the coil.

### Installation Procedure

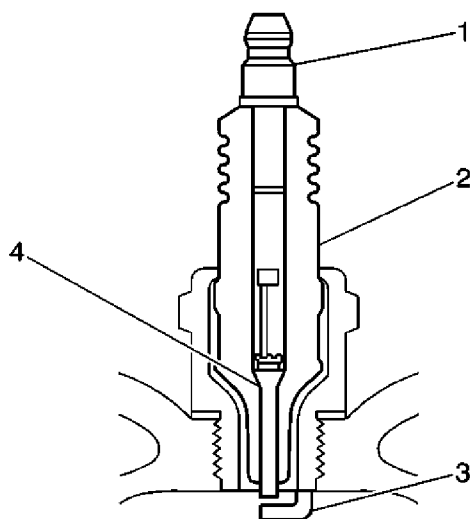
1. Install the spark plug wire on the coil.
2. Install the spark plug wire at each spark plug.
3. Inspect the wires for proper installation:
  - Push down on each boot in order to inspect the seating.
  - Reinstall any loose boot.
  - Wire routing must be kept intact during service and followed exactly when wires have been disconnected or when replacement of the wires is necessary. Failure to route the wires correctly can lead to radio interference and crossfire of the plugs, or shorting of the leads to the ground.
  - Any time the spark plug wires or boots are installed on the spark plugs, new dielectric grease needs to be applied inside the boot.

## Spark Plug Inspection

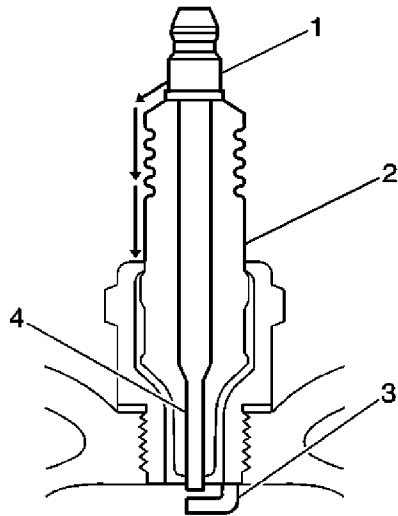
### Spark Plug Usage

- Ensure that the correct spark plug is installed. An incorrect spark plug causes driveability conditions.
- Ensure that the spark plug has the correct heat range. An incorrect heat range causes the following conditions:
  - Spark plug fouling--Colder plug
  - Pre-ignition causing spark plug and/or engine damage--Hotter plug

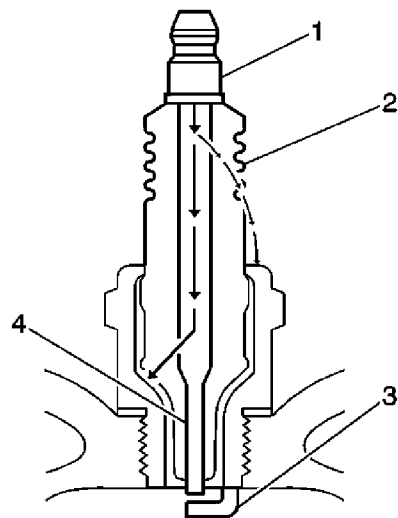
### Spark Plug Inspection



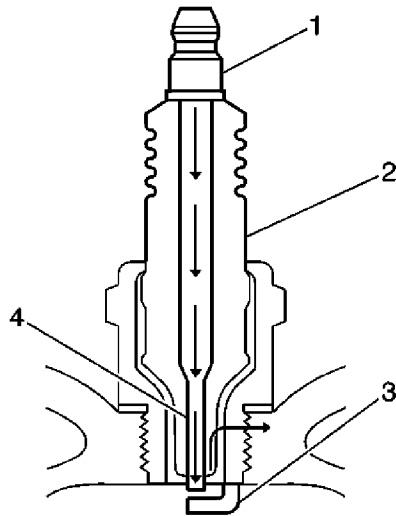
1. Inspect the terminal post (1) for damage.
  - Inspect for a bent or broken terminal post (1).
  - Test for a loose terminal post (1) by twisting and pulling the post. The terminal post (1) should NOT move.



2. Inspect the insulator (2) for flashover or carbon tracking, soot. This is caused by the electrical charge traveling across the insulator (2) between the terminal post (1) and ground. Inspect for the following conditions:
  - Inspect the spark plug boot for damage.
  - Inspect the spark plug recess area of the cylinder head for moisture, such as oil, coolant, or water. A spark plug boot that is saturated causes arcing to ground.



3. Inspect the insulator (2) for cracks. All or part of the electrical charge may arc through the crack instead of the electrodes (3, 4).



4. Inspect (3) for evidence of improper arcing.
  - Measure the gap between the center electrode (4) and the side electrode (3) terminals. An excessively wide electrode gap can prevent correct spark plug operation.
  - Inspect for the correct spark plug torque. Insufficient torque can prevent correct spark plug operation. An over torqued spark plug, causes the insulator (2) to crack.
  - Inspect for signs of tracking that occurred near the insulator tip instead of the center electrode (4).
  - Inspect for a broken or worn side electrode (3).
  - Inspect for a broken, worn, or loose center electrode (4) by shaking the spark plug.
    - A rattling sound indicates internal damage.
    - A loose center electrode (4) reduces the spark intensity.
  - Inspect for bridged electrodes (3, 4). Deposits on the electrodes (3, 4) reduce or eliminates the gap.
  - Inspect for worn or missing platinum pads on the electrodes (3, 4), if equipped.
  - Inspect for excessive fouling.
5. Inspect the spark plug recess area of the cylinder head for debris. Dirty or damaged threads can cause the spark plug not to seat correctly during installation.

## Spark Plug Visual Inspection

- Normal operation--Brown to grayish-tan with small amounts of white powdery deposits are normal combustion by-products from fuels with additives.
- Carbon fouled--Dry, fluffy black carbon, or soot caused by the following conditions:
  - Rich fuel mixtures
- Leaking fuel injectors
- Excessive fuel pressure
- Restricted air filter element
- Incorrect combustion

- Reduced ignition system voltage output
- Weak coils
- Worn ignition wires
- Incorrect spark plug gap
  - Excessive idling or slow speeds under light loads can keep spark plug temperatures so low that normal combustion deposits may not burn off.
- Deposit fouling--Oil, coolant, or additives that include substances such as silicone, very white coating, reduces the spark intensity. Most powdery deposits will not effect spark intensity unless they form into a glazing over the electrode.

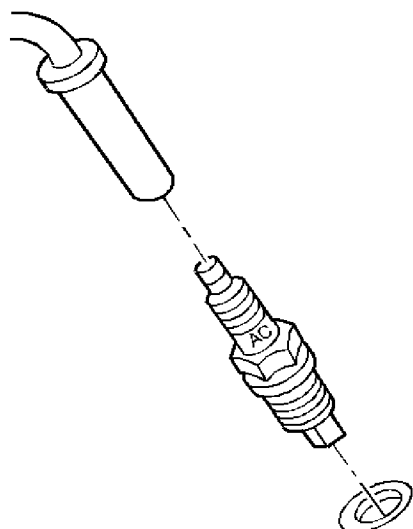
## Spark Plug Replacement

### Removal Procedure

**Caution:** Observe the following service precautions:

- Allow the engine to cool before removing the spark plugs. Attempting to remove spark plugs from a hot engine can cause the spark plugs to seize. This can damage the cylinder head threads.
- Clean the spark plug recess area before removing the spark plug. Failure to do so can result in engine damage due to dirt or foreign material entering the cylinder head, or in contamination of the cylinder head threads. Contaminated threads may prevent proper seating of the new spark plug.
- Use only the spark plugs specified for use in the vehicle. Do not install spark plugs that are either hotter or colder than those specified for the vehicle. Installing spark plugs of another type can severely damage the engine.

1. Turn OFF the ignition.



2. Remove the spark plug wires from the spark plugs. Refer to [Spark Plug Wire Replacement](#).
3. Remove the spark plugs from the engine.

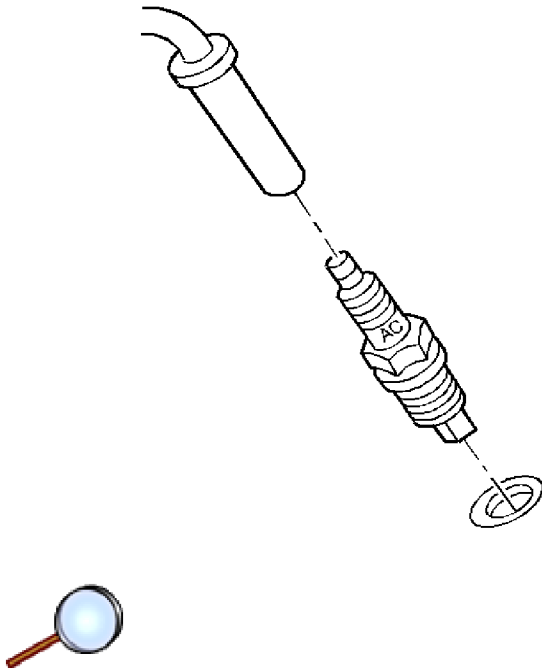
### Installation Procedure

**Caution:** It is important to check the gap of all new and reconditioned spark plugs before installation. Pre-set gaps may have changed during handling. Use a round wire feeler gauge to be sure of an accurate check, particularly on used plugs. Installing plugs with the wrong gap can cause poor engine performance and may even damage the engine.

1. Gap the spark plugs to the specifications.

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**Caution:** Refer to [Fastener Caution](#) in the Preface section.



**Caution:** Be sure plug threads smoothly into cylinder head and is fully seated. Use a thread chaser if necessary to clean threads in cylinder head. Cross-threading or failing to fully seat spark plug can cause overheating of plug, exhaust blow-by, or thread damage. Follow the recommended torque specifications carefully. Over or under-tightening can also cause severe damage to engine or spark plug.

2. Install the spark plugs to the engine.

#### **Tighten**

Tighten the spark plugs to 25 N·m (18 lb ft).

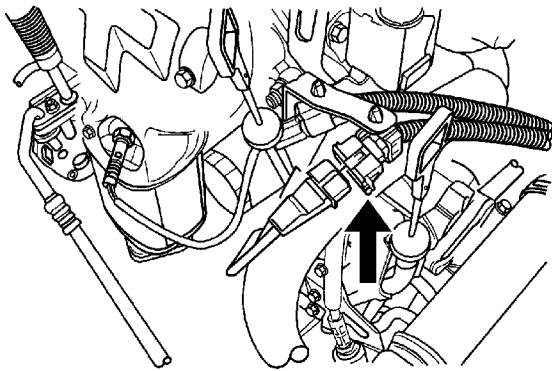
3. Install the spark plug wires to the spark plugs. Refer to [Spark Plug Wire Replacement](#).



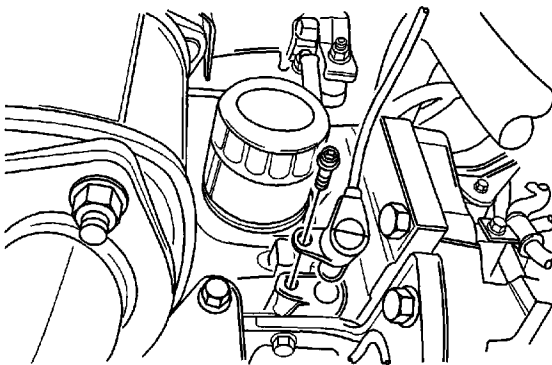
## Crankshaft Position Sensor Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the crankshaft position (CKP) sensor electrical connector.



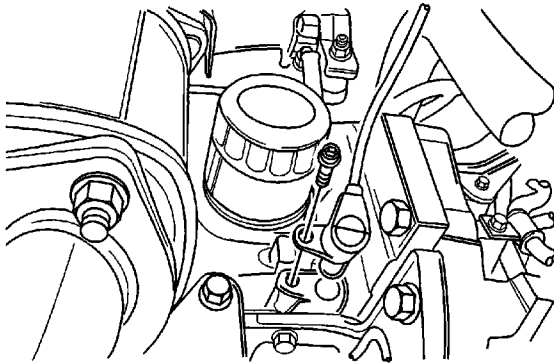
3. Remove the CKP sensor bolt.

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4. Remove the CKP sensor.

## Installation Procedure

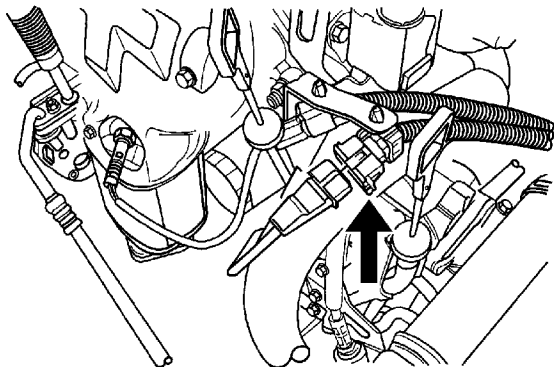
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the CKP sensor with the bolt.

### **Tighten**

Tighten the CKP sensor bolt to 6.5 N·m (57 lb in).



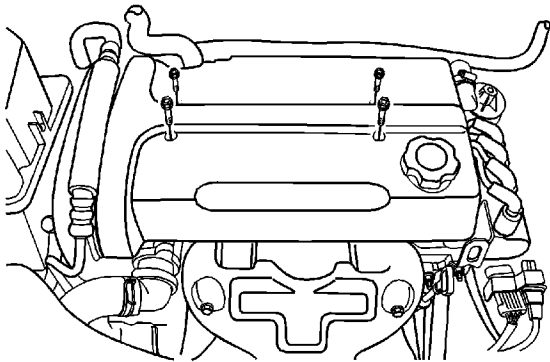


2. Connect the CKP sensor electrical connector.
3. Connect the negative battery cable.

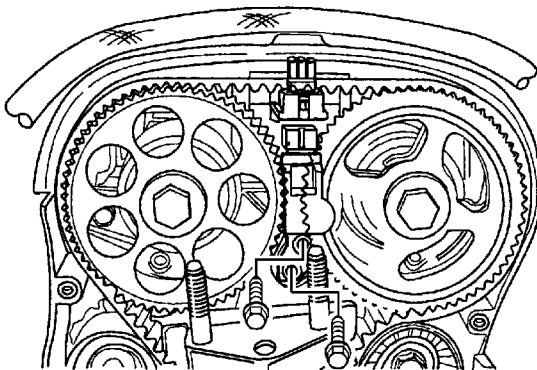
## Camshaft Position Sensor Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the engine cover bolts and the nuts.
3. Remove the engine cover.

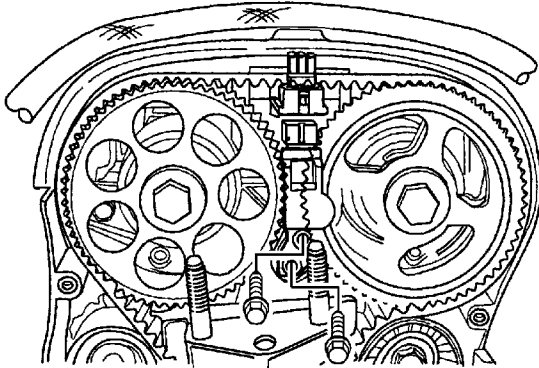


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4. Disconnect the camshaft position (CMP) sensor electrical connector.
5. Remove the timing belt front cover. Refer to [Timing Belt Cover Replacement](#).

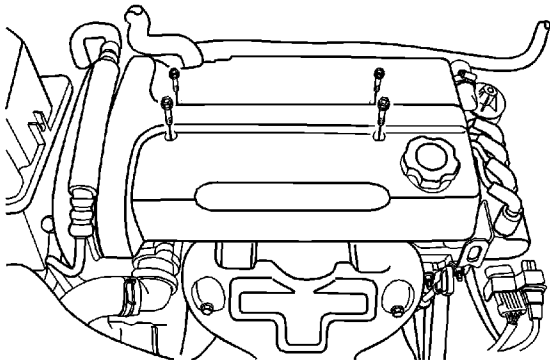
## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the CMP sensor and bolt.

Tighten the CMP sensor bolts to **7 N·m (62 lb in)**.



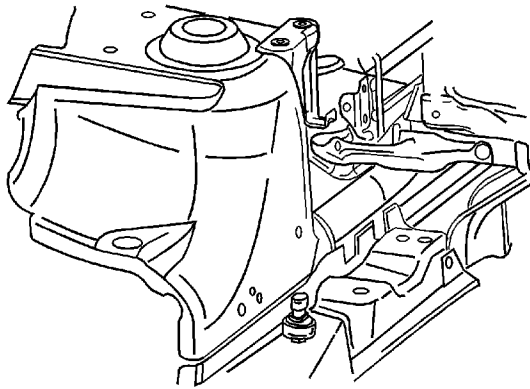


2. Install the timing belt front cover. Refer to [Timing Belt Cover Replacement](#).
3. Connect the CMP sensor electrical connector.
4. Install the engine cover.
5. Connect the negative battery cable.

## Rough Road Sensor Replacement

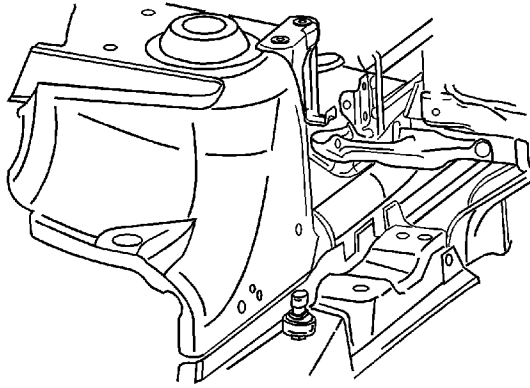
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the rough road sensor electrical connector and remove the rough road sensor.

### Installation Procedure



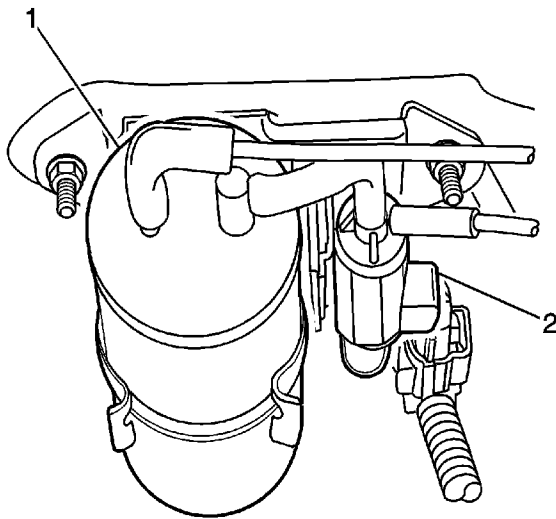
1. Install the rough road sensor and connect the electrical connector.
2. Connect the negative battery cable.



# Intake Manifold Tuning Valve Actuator Solenoid Replacement

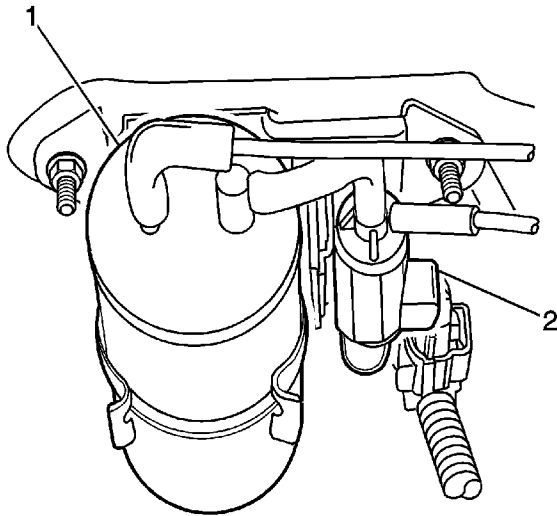
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the intake manifold tuning (IMT) valve solenoid (2) connector.
3. Disconnect the vacuum hoses from the IMT valve solenoid (2).
4. Remove the IMT valve solenoid (2).

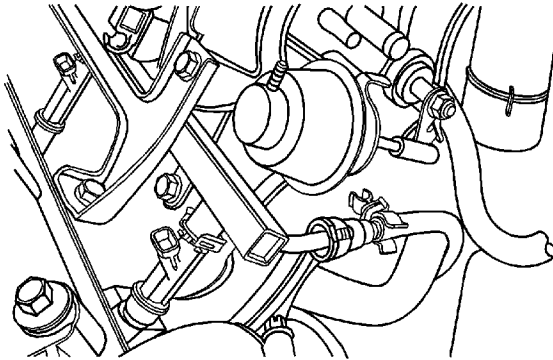
## Installation Procedure



1. Install the IMT valve solenoid.
2. Connect the vacuum hoses to the IMT valve solenoid (2).
3. Connect the IMT valve solenoid (2) connector.
4. Connect the negative battery cable.

## Intake Manifold Tuning Valve Actuator Replacement

### Removal Procedure

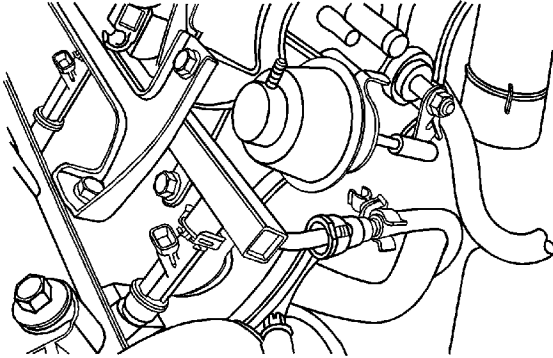


1. Disconnect the vacuum hose from the intake manifold tuning (IMT) valve actuator valve.

**Note:** Ensure the IMT valve is closed before removing the IMT valve actuator retaining bolts and valve.

2. Remove the IMT valve actuator valve bolts.
3. Remove the IMT valve actuator valve from the IMT valve.

### Installation Procedure



1. Install the IMT valve actuator valve to the IMT valve.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the IMT valve actuator valve bolts.

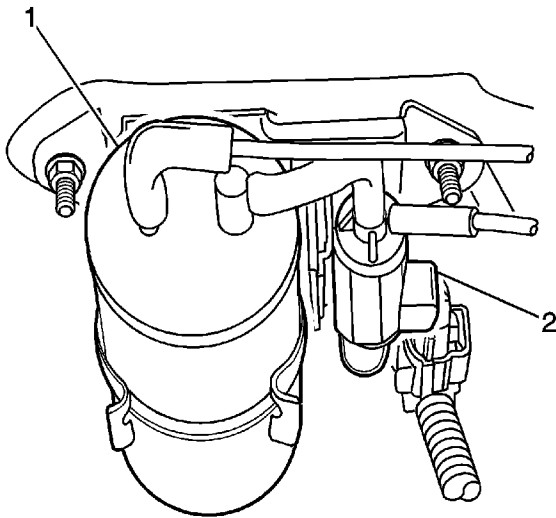
**Tighten**

Tighten the IMT valve actuator valve retaining bolts to 12 N·m (106 lb ft).

3. Connect the vacuum hose to the IMT valve actuator valve.

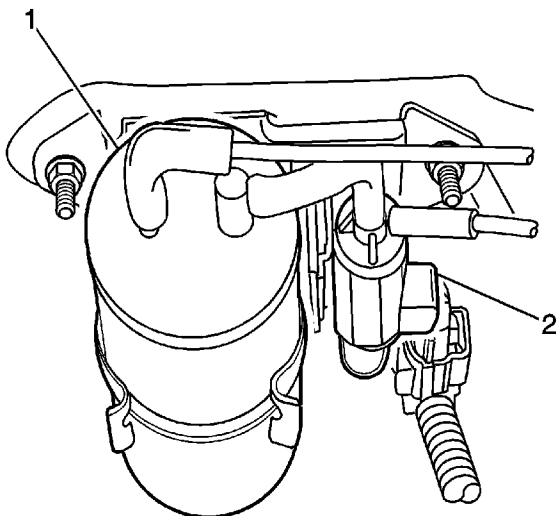
# Intake Air Tuning Valve Vacuum Reservoir Replacement

## Removal Procedure



1. Remove the vacuum hoses from the intake manifold (IMT) vacuum reservoir (1).
2. Remove the IMT valve reservoir (1).

## Installation Procedure



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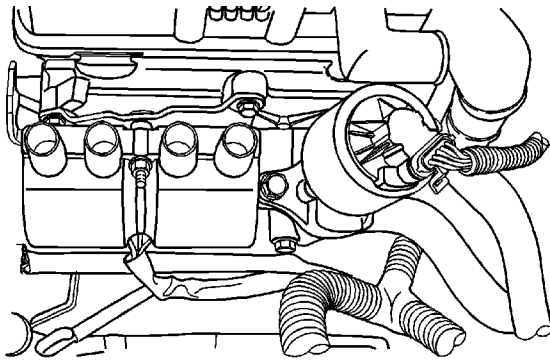


1. Install the IMT valve reservoir (1).
2. Install the vacuum hoses to the IMT valve reservoir (1).

## Exhaust Gas Recirculation Valve Replacement

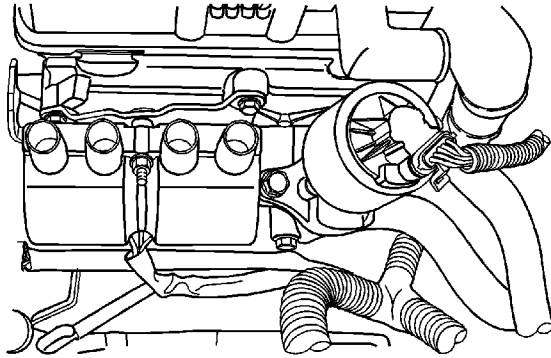
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the exhaust gas recirculation (EGR) valve electrical connector.
3. Remove the bolts and the EGR valve.

### Installation Procedure



1. Clean the cylinder head mating surface.
2. Install a new EGR valve gasket.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the EGR valve with the retaining bolts.

#### **Tighten**

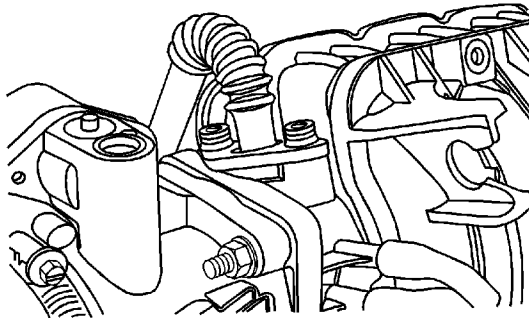
Tighten the EGR valve retaining bolts to 30 N·m (22 lb ft).

4. Connect the EGR valve electrical connector.
5. Connect the negative battery cable.

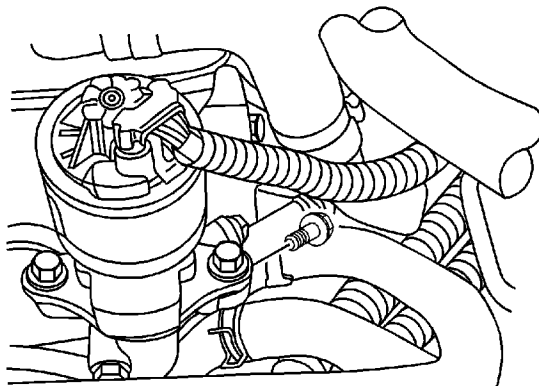


## Exhaust Gas Recirculation Valve Pipe Replacement

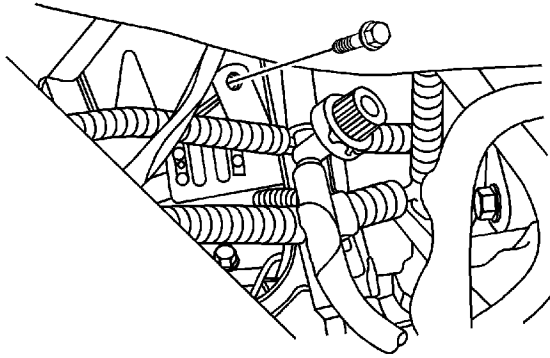
### Removal Procedure



1. Remove the exhaust gas recirculation (EGR) pipe mounting bolts from the intake manifold.



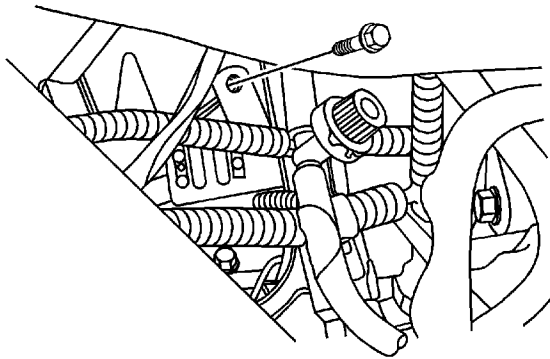
2. Remove the EGR pipe mounting bolts from the EGR valve.
3. Raise and suitable support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



4. Remove the lower mounting bolt attaching the EGR pipe to the intake manifold.
5. Remove the EGR pipe.

## Installation Procedure

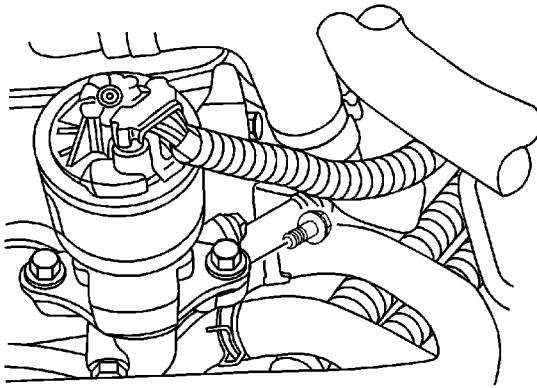
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the EGR pipe and the lower bolt attaching the EGR pipe to the intake manifold.

### **Tighten**

Tighten the EGR pipe mounting bolt to 12 N·m (106 lb in).

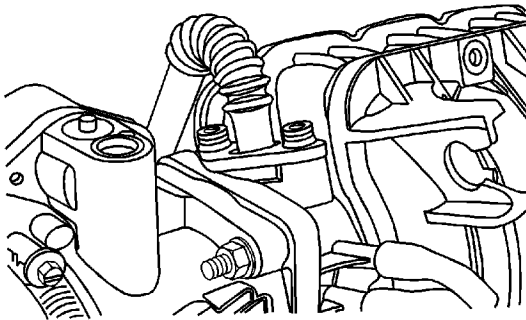


2. Install the EGR pipe mounting bolts to the EGR valve.

**Tighten**

Tighten the EGR pipe to EGR valve mounting bolts to 10 N·m (89 lb in).

3. Lower the vehicle.



4. Install the EGR pipe mounting bolts to the intake manifold.

**Tighten**

Tighten the EGR pipe to intake manifold mounting bolts to 12 N·m (106 lb in).

## Air Cleaner Element Replacement

### Removal Procedure

1. Loosen the air cleaner intake duct clamp at the air cleaner assembly.
2. Remove the air cleaner intake duct from the upper air cleaner cover.
3. Remove the upper air cleaner screws.
4. Remove the upper air cleaner cover from the lower air cleaner housing.
5. Remove the air cleaner filter from lower air cleaner housing.

### Installation Procedure

1. Install the air cleaner filter into the lower air cleaner housing.
2. Install the upper air cleaner cover to lower air cleaner housing.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the upper air cleaner screws.

#### **Tighten**

Tighten the upper air cleaner cover screws to 3 N·m (27 lb in).

4. Install the intake duct to the upper air cleaner cover.

#### **Tighten**

Tighten the intake duct clamp to 3 N·m (27 lb in).

## Temperature Versus Resistance

°C	°F	ECT Ohms	IAT Ohms
Temperature vs Resistance Values (Approximate)			
100	212	177	187
90	194	241	246
80	176	332	327
70	158	467	441
60	140	667	603
50	122	973	837
45	113	1188	991
40	104	1459	1180
35	95	1802	1412
30	86	2238	1700
25	77	2796	2055
20	68	3520	2500
15	59	4450	3055
10	50	5670	3760
5	41	7280	4651
0	32	9420	5800
-5	23	12300	7273
-10	14	16180	9200
-15	5	21450	9200
-20	-4	28680	15080
-30	-22	52700	25600
-40	-40	100700	45300

## Altitude Versus Barometric Pressure

Altitude Measured in Meters (m)	Altitude Measured in Feet (ft)	Barometric Pressure Measured in Kilopascals (kPa)
Determine your altitude by contacting a local weather station or by using another reference source.		
4 267	14,000	56-64
3 962	13,000	58-66
3 658	12,000	61-69
3 353	11,000	64-72
3 048	10,000	66-74
2 743	9,000	69-77
2 438	8,000	71-79
2 134	7,000	74-82
1 829	6,000	77-85
1 524	5,000	80-88
1 219	4,000	83-91
914	3,000	87-95
610	2,000	90-98
305	1,000	94-102
0	0 Sea Level	96-104
-305	-1,000	101-105

## Ignition System Specifications

Application	Specification	
	Metric	English
Ignition Sequence	1-3-4-2	1-3-4-2
Ignition Timing (at idle)	6° (BTDC)	
Ignition Type	Direct Ignition System	
Spark Plug Gap	1.0-1.1 mm	0.039-0.043 in
Spark Plug Maker	Woojin NGK	
Spark Plug Type	ZFR6U-11	

## Fastener Tightening Specifications

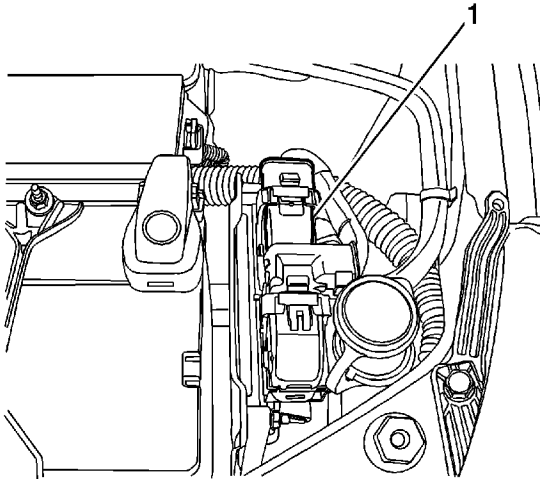
Application	Specifications	
	Metric	English
Accelerator Pedal Nut	12 N·m	106 lb in
Camshaft Position Actuator Solenoid Valve Bolt	6 N·m	53 lb in
Crankshaft Position (CKP) Sensor Bolt	4.5 N·m	40 lb in
Engine Control Module (ECM) Nuts	8 N·m	71 lb in
Engine Coolant Temperature 2 (ECT2) Sensor	20 N·m	15 lb ft
Fuel Filter Bracket Bolt	4 N·m	35 lb in
Fuel Rail Bolt	8 N·m	71 lb in
Heated Oxygen Sensor (HO2S)	40 N·m	30 lb ft
Ignition Coil Bolt	8 N·m	71 lb in
Knock Sensor (KS) Bolt	20 N·m	15 lb ft
Map Sensor Screw	8 N·m	71 lb in
Throttle Body Bolts	8 N·m	71 lb in



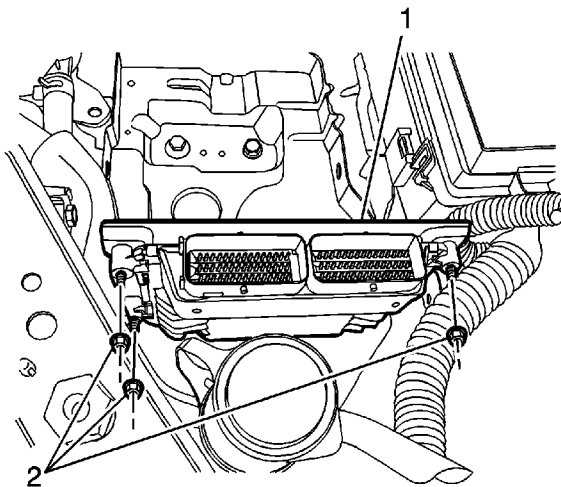
## Engine Control Module Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



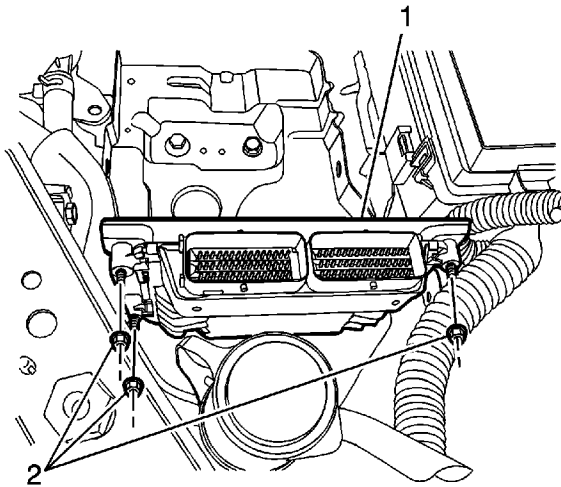
1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Unlock the ECM connector locking lever (1).



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3. Remove the ECM retaining nuts (2).
4. Remove the ECM (1).

## Installation Procedure



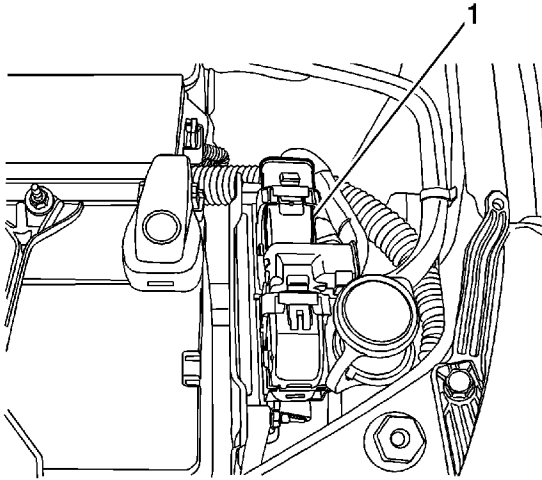
1. Install the ECM (1).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ECM retaining nuts (2).

### **Tighten**

Tighten the ECM retaining nuts to 8 N·m (70.8 lb in).



3. Lock the ECM connector locking lever (1).
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Crankshaft Position System Variation Learn

**Important:** If the crankshaft position variation learn procedure has not learned, a false misfire could be detected and DTC P0300 may set. If sent here from DTC P0300, proceed with the crankshaft position variation learn procedure.

1. Monitor the engine control module (ECM) for DTCs with a scan tool. If other DTCs are set, except DTC P0300, or P0315, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC.
2. Select the crankshaft position variation learn procedure with a scan tool.
3. The scan tool instructs you to perform the following:
  - 3.1. Accelerate to wide open throttle (WOT).
  - 3.2. Release throttle when fuel cut-off occurs.
  - 3.3. Observe fuel cut-off for applicable engine.
  - 3.4. Engine should not accelerate beyond calibrated RPM value.
  - 3.5. Release throttle immediately if value is exceeded.
  - 3.6. Block drive wheels.
  - 3.7. Set parking brake.
  - 3.8. DO NOT apply brake pedal.
  - 3.9. Cycle ignition from OFF to ON.
  - 3.10. Apply and hold brake pedal.
  - 3.11. Start and idle engine.
  - 3.12. Turn A/C OFF.

Vehicle must remain in Park or Neutral.

The scan tool monitors certain component signals to determine if all the conditions are met to continue with the procedure. The scan tool only displays the condition that inhibits the procedure. The scan tool monitors the following components:

- Crankshaft position (CKP) sensors activity--If there is a CKP sensor condition, refer to the applicable DTC.
  - Camshaft position (CMP) signal activity--If there is a CMP signal condition, refer to the applicable DTC.
  - Engine coolant temperature (ECT)--If the engine coolant temperature is not warm enough, idle the engine until the engine coolant temperature reaches the correct temperature.
4. Enable the CKP system variation learn procedure with the scan tool and perform the following:

**Important:** While the CKP variation learn procedure is in progress, hold the throttle at WOT for 5 fuel-cutoffs. The learn procedure must determine there has been 5 fuel-cutoffs to properly perform the test.

- Accelerate to WOT.

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- Hold throttle while fuel cut-off occurs.
5. The scan tool displays Learn Status: Learned this ignition. If the scan tool indicates that DTC P0315 ran and passed, the CKP variation learn procedure is complete. If the scan tool indicates DTC P0315 failed or did not run, refer to [DTC P0315](#) . If any other DTCs set, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC.
  6. Turn OFF the ignition for 30 seconds after the learn procedure is completed successfully.

The CKP system variation learn procedure is also required when the following service procedures have been performed, regardless of whether or not DTC P0315 is set:

- An engine replacement
- An ECM replacement
- A harmonic balancer replacement
- A crankshaft replacement
- A CKP sensor replacement
- Any engine repairs which disturb the crankshaft to CKP sensor relationship.

## Idle Learn

The Idle Learn Procedure listed below must be performed whenever the following occurs:

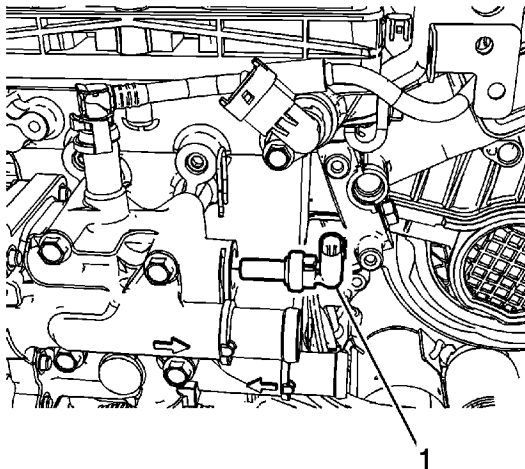
- The throttle body assembly is replaced
  - The throttle body is cleaned
  - The engine control module (ECM) is replaced
  - The idle air control valve (IAC) is replaced
  - Power disconnection (battery cable, ECM fuse, etc.) (Delphi ECM only)
- 
1. Turn the ignition ON.
  2. Turn the ignition OFF for 15 seconds.
  3. Turn the ignition ON for 5 seconds.
  4. Turn the ignition OFF for 15 seconds.
  5. Start the engine in park/neutral.
  6. Allow the engine to run until the engine coolant temperature is greater than 85°C (185°F).
  7. Turn the A/C ON for 10 seconds, if equipped.
  8. If the vehicle is equipped with an automatic transaxle, apply the parking brake. While pressing the brake pedal, place the transaxle in drive (D) for 10 seconds.
  9. Turn the A/C OFF for 10 seconds, if equipped.
  10. If the vehicle is equipped with an automatic transaxle, while pressing the brake pedal, place the transaxle in park/neutral.
  11. Turn the ignition OFF. The idle learn procedure is complete.

# Engine Coolant Temperature Sensor Replacement (ECT 1)

## Removal Procedure

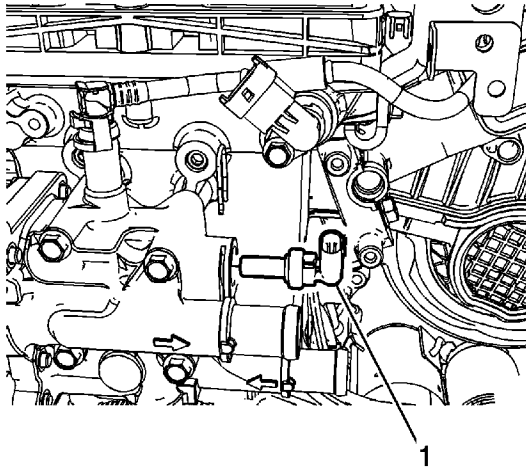
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Drain the engine coolant. Refer to [Cooling System Draining and Filling](#).
3. Disconnect the ECT sensor connector.



4. Remove the ECT retaining clip.
5. Remove the ECT (1) from the coolant distributor.

## Installation Procedure



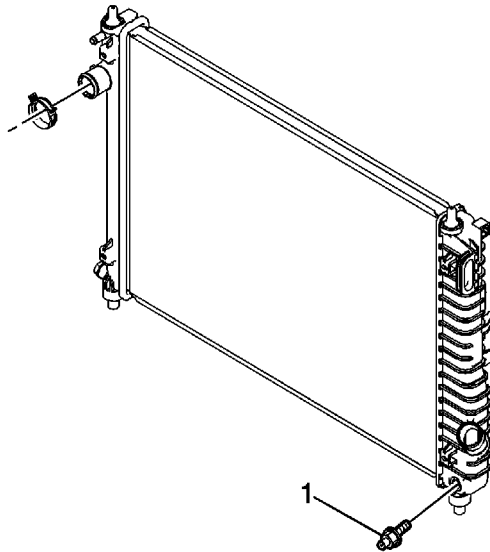
1. Install the ECT (1) to the coolant distributor.
2. Install the ECT retaining clip.
3. Connect the ECT sensor connector.
4. Refill the engine coolant. Refer to [Cooling System Draining and Filling](#).
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).



# Engine Coolant Temperature Sensor Replacement (ECT 2)

## Removal Procedure

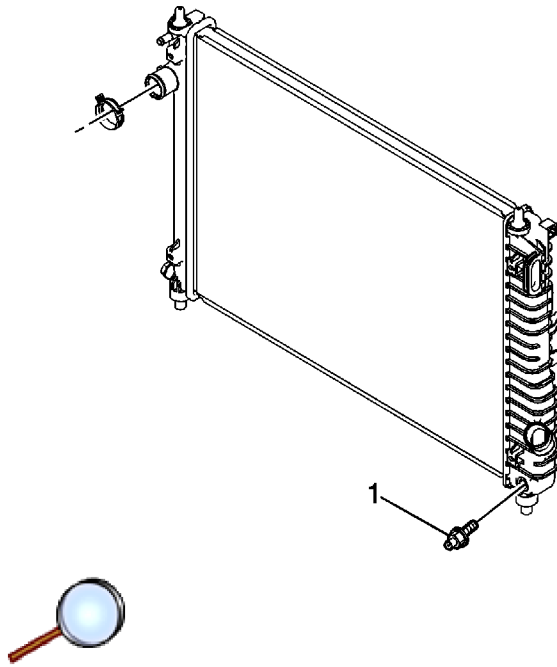
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Drain the engine coolant. Refer to [Cooling System Draining and Filling](#).
3. Disconnect the ECT 2 sensor connector.
4. Remove the ECT 2 sensor (1) from the radiator.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the ECT 2 sensor (1) to the radiator.

**Tighten**

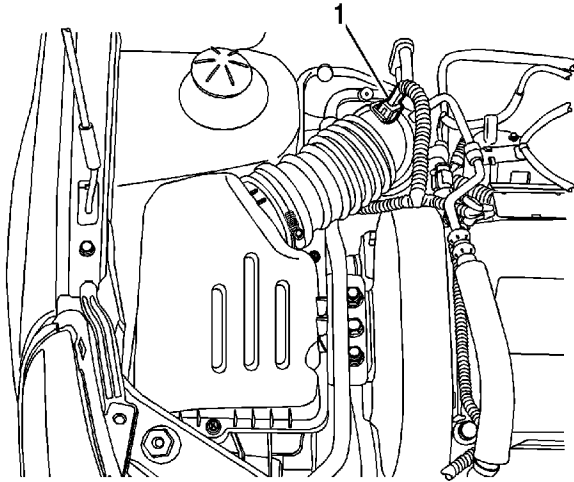
Tighten the ECT 2 sensor to 20 N·m (15 lb ft).

2. Connect the ECT 2 sensor connector.
3. Fill the engine coolant. Refer to [Cooling System Draining and Filling](#).
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Intake Air Temperature Sensor Replacement

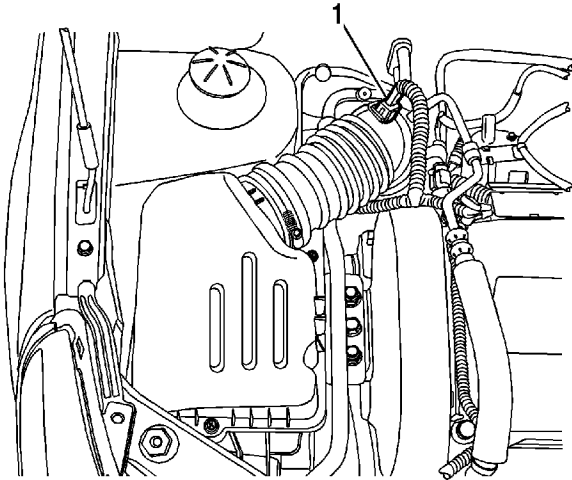
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the intake air temperature (IAT) sensor connector (1).
3. Remove the IAT sensor.

## Installation Procedure

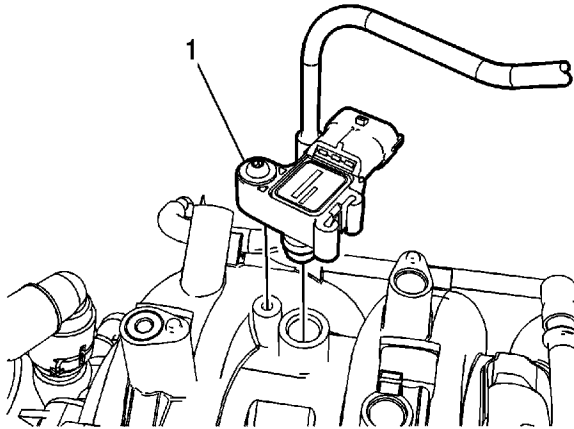


1. Install the IAT sensor.
2. Connect the IAT sensor connector (1).
3. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Manifold Absolute Pressure Sensor Replacement

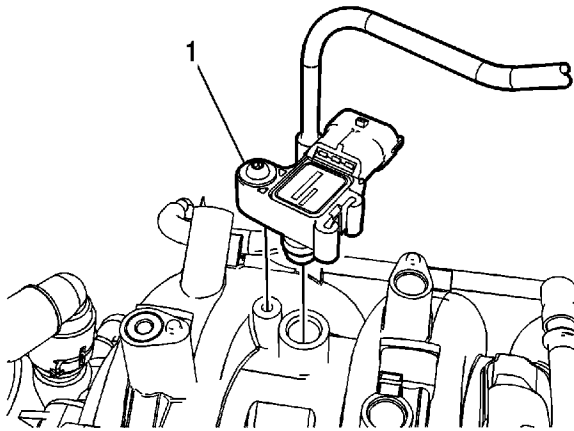
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the manifold air pressure (MAP) sensor connector.
3. Remove the MAP sensor (1).

### Installation Procedure



1. Install the MAP sensor (1).
2. Connect the MAP sensor connector.
3. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Heated Oxygen Sensor Replacement - Sensor 1

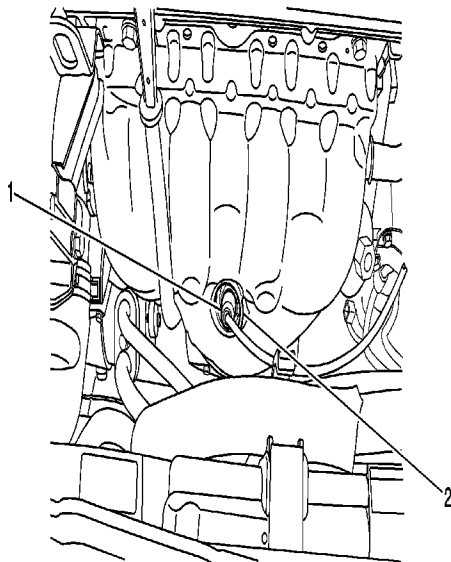
## Special Tools

[EN-48259](#) Oxygen Sensor Remover/Installer

## Removal Procedure

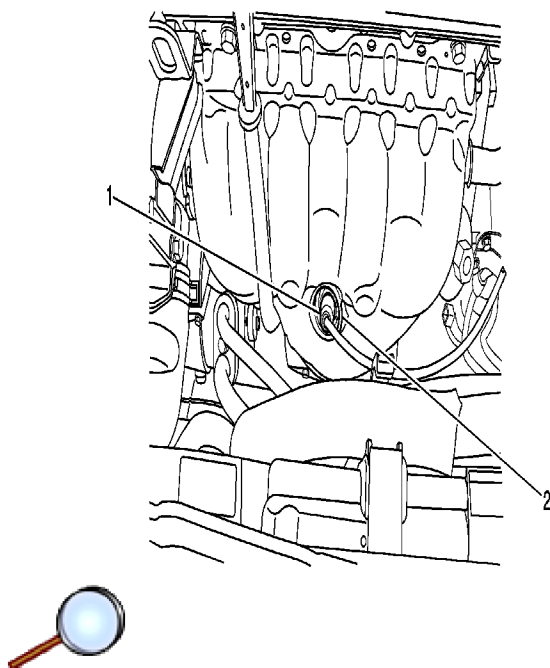
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

**Caution:** Refer to [Heated Oxygen and Oxygen Sensor Caution](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the HO2S1 connector.
3. Install the [EN-48259](#).
4. Remove the HO2S1 (1).

## Installation Procedure



**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti seize compound applied before reinstallation.

1. Coat the threads of the HO2S1 with an anti-seize compound, if needed.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

**Note:** Ensure the HO2S1 sensor heat shield (2) is installed with the slot facing away from the exhaust manifold.

2. Install the HO2S1 (1) into the exhaust manifold.

#### **Tighten**

Tighten the HO2S1 to 40 N·m (29.5 lb ft).

3. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).



# Heated Oxygen Sensor Replacement - Sensor 2

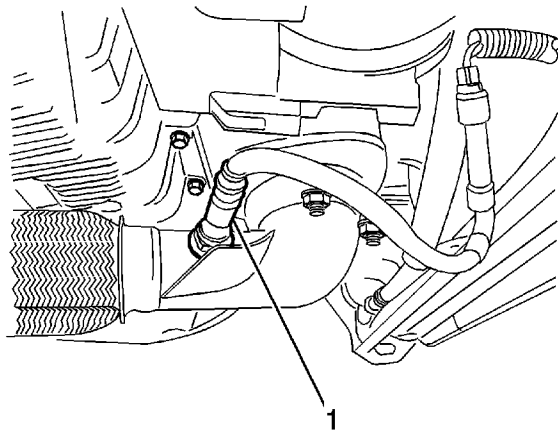
## Special Tools

[EN-48259](#) Oxygen Sensor Remover/Installer

## Removal Procedure

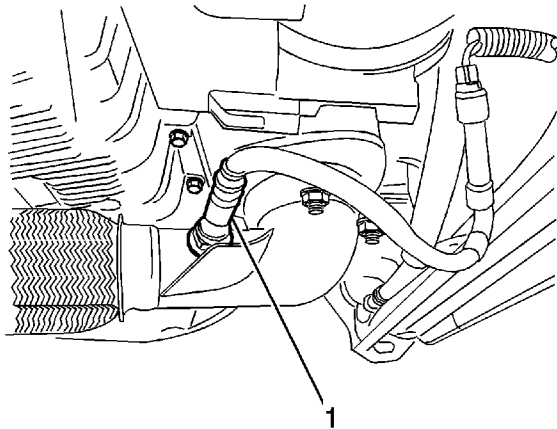
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

**Caution:** Refer to [Heated Oxygen and Oxygen Sensor Caution](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the HO2S2 connector.
3. Install the [EN-48259](#).
4. Remove the HO2S2 (1).

## Installation Procedure



**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti seize compound applied before reinstallation.

1. Coat the threads of the HO2S2 with an anti-seize compound, if needed.
2. Install the HO2S2 (1) into the exhaust manifold.

### **Tighten**

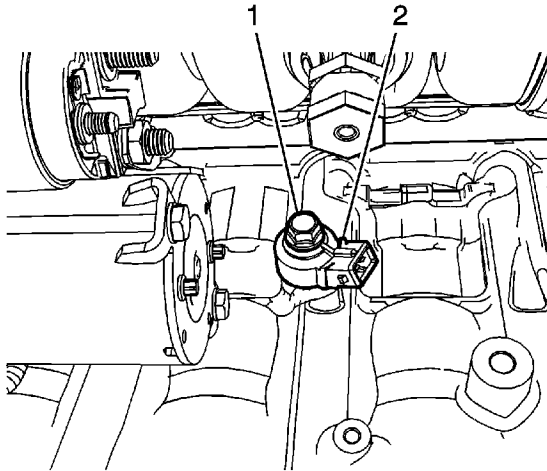
Tighten the HO2S1 to 40 N·m (29.5 lb ft).

3. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Knock Sensor Replacement

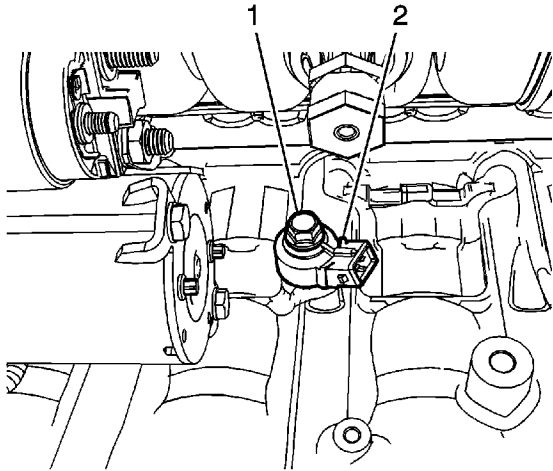
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the knock sensor bolt (1).
3. Remove the knock sensor (2).

### Installation Procedure



1. Install the knock sensor (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the knock sensor bolt (1).

**Tighten**

Tighten the knock sensor bolt (1) to 20 N·m (14.7 lb ft).

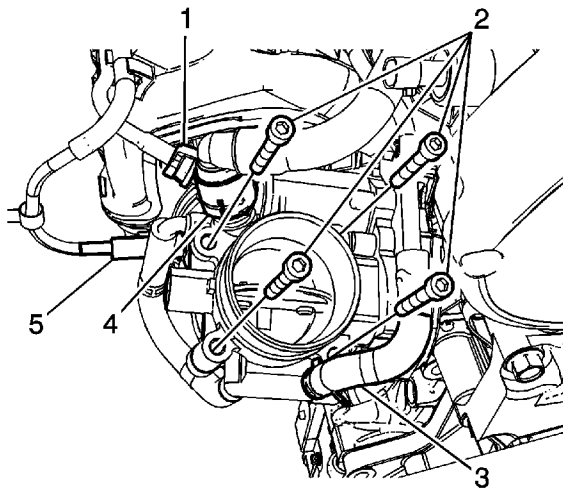
3. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Throttle Body Assembly Replacement

## Removal Procedure

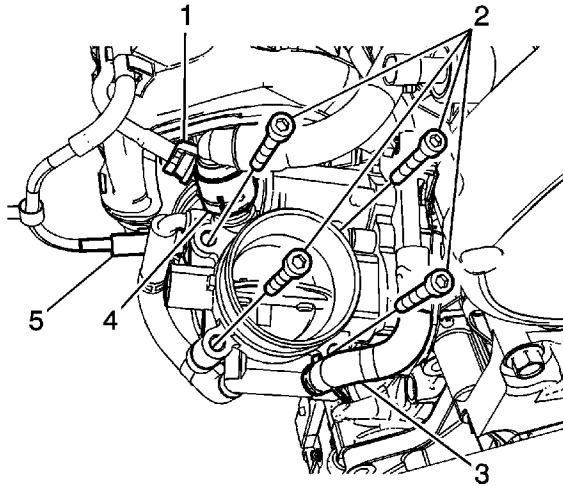
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Drain the engine coolant. Refer to [Cooling System Draining and Filling](#).
3. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).



4. Disconnect the ETC connector.
5. Disconnect the coolant inlet hose (3).
6. Disconnect the coolant outlet hose (1).
7. Disconnect the EVAP hose (5).
8. Detach the PCV hose (4).
9. Remove the ETC tightening bolts (2).
10. Remove the ETC with the seal ring.

## Installation Procedure



1. Install the ETC with the seal ring.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ETC tightening bolts (2).

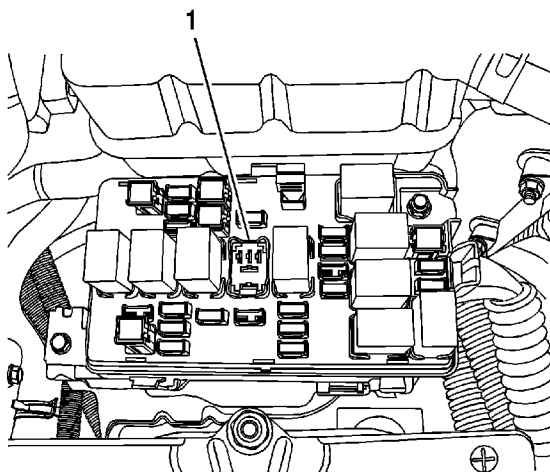
#### **Tighten**

Tighten the ETC tightening bolts to 8 N·m (70.8 lb in).

3. Connect the coolant inlet hose (3).
4. Connect the coolant outlet hose (1).
5. Connect the EVAP hose (5).
6. Connect the PCV hose (4).
7. Connect the ETC connector.
8. Install the air-cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#)
9. Refill the engine coolant. Refer to [Cooling System Draining and Filling](#)
10. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Fuel Pressure Relief

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



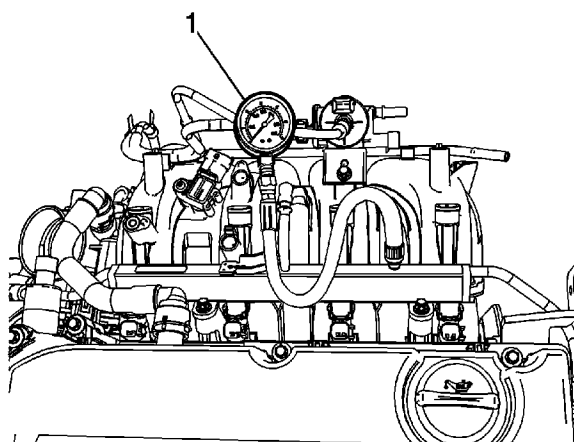
1. Remove the fuel cap.
2. Remove the fuel pump fuse (1) from the engine fuse block.
3. Start the engine and allow the engine to stall.
4. Crank the engine for an additional 10 seconds.

# Fuel Pressure Gage Installation and Removal

## Special Tools

*DW-100-763* Fuel Pressure Gauge

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).
2. Install the *DW-100-763* gauge (1).
3. Measure the fuel pressure.

## Specification

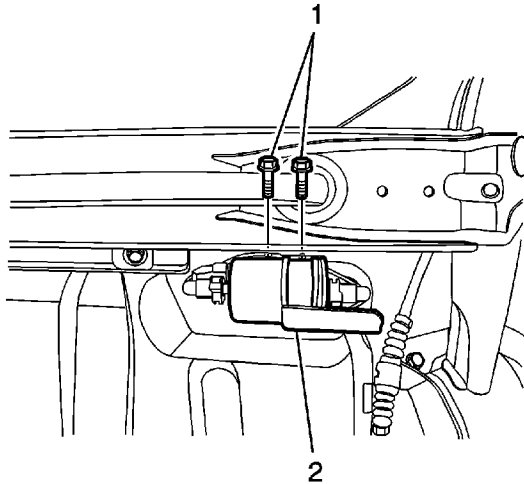
Fuel Pressure Specification: 380 kPa (Battery Voltage: 13.2V)



## Fuel Filter Replacement

### Removal Procedure

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.

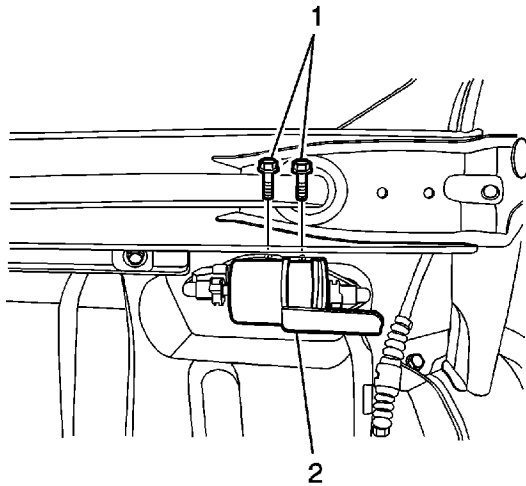


1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Disconnect the inlet/outlet fuel lines by moving the line connector lock forward and pulling the hose off of the fuel filter tube.
4. Remove the fuel filter bracket bolts (1).
5. Remove the fuel filter (2).

### Installation Procedure

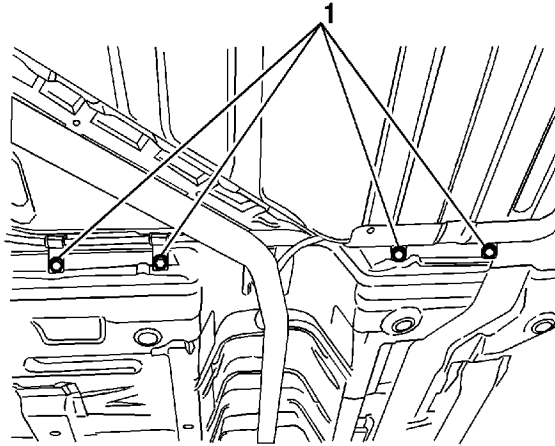


1. Install the fuel filter (2).
2. Install the fuel filter bracket bolts (1).
3. Connect the inlet/outlet quick connector lines.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Fuel Tank Replacement

### Removal Procedure

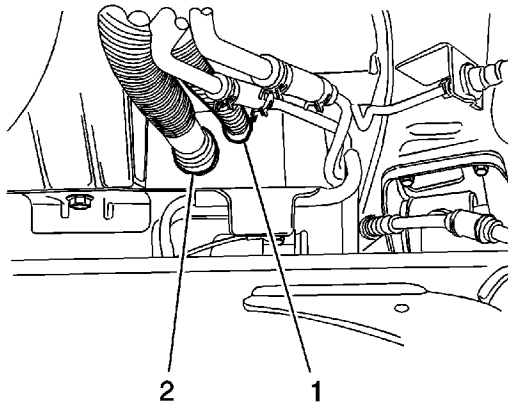
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



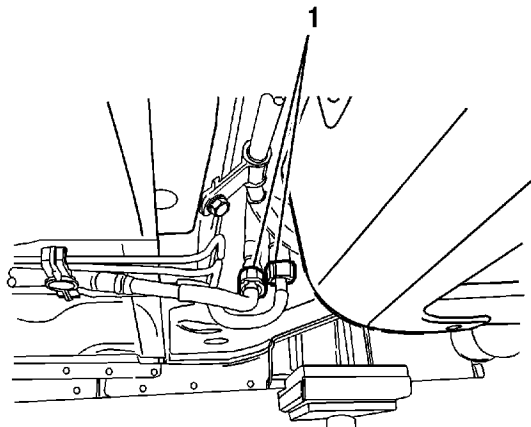
1. Relieve the fuel pressure. Refer to [Fuel Pressure Gage Installation and Removal](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

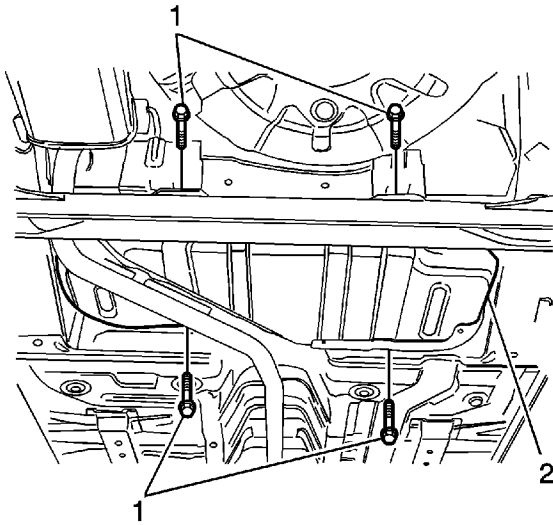
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Drain the fuel tank.
4. Disconnect the parking brake cable retainer clamps (1) and the support along the fuel tank to provide clearance for the tank.



5. Remove the fuel tank filler tube clamp at the fuel tank.
6. Disconnect the fuel tank filler tube (2) and vent tube (1).
7. Disconnect the canister vapor tube at control valve vapor tube.



8. Disconnect the fuel pump harness connector at the right rear corner of the fuel tank.
9. Disconnect the fuel lines (1) near the right front of the fuel tank.
10. Disconnect the wiring harness clips and the fuel line clips as needed.

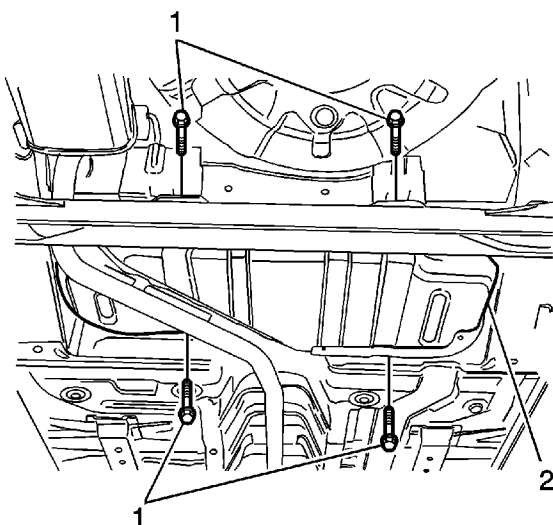


11. Support the fuel tank.
12. Remove the fuel tank retaining bolts (1).
13. Carefully lower the fuel tank.
14. Remove the fuel tank.

## Installation Procedure

1. Raise the fuel tank into position.

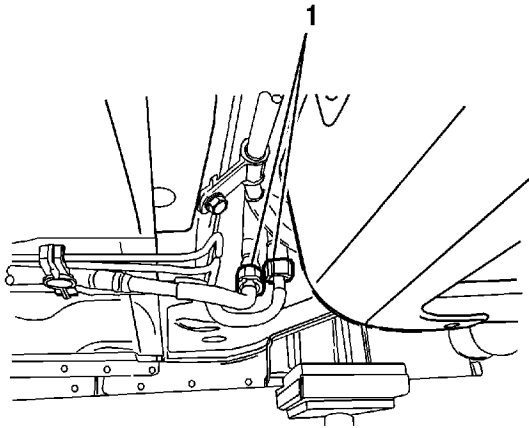
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



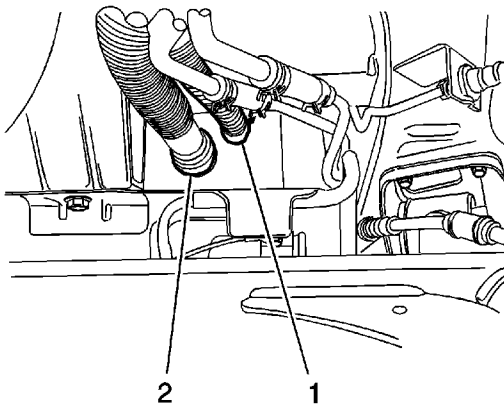
2. Install the fuel tank mounting bolts (1).

**Tighten**

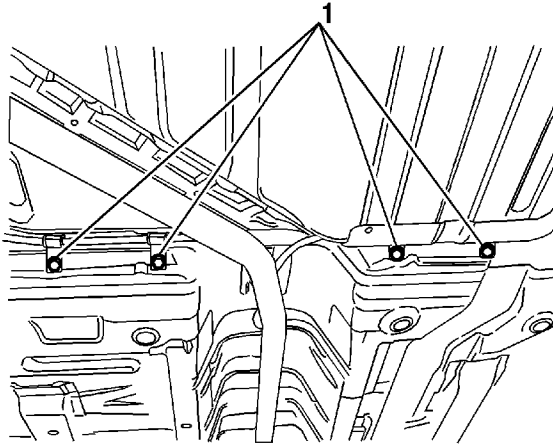
Tighten the fuel tank retaining bolts to 20 N·m (15 lb ft).



3. Connect the fuel lines (1).
4. Connect the wiring harness clips and the fuel line clips as needed.
5. Connect the fuel pump electrical connector.
6. Connect the fuel vapor line.



7. Connect the fuel tank filler tube (2) and fuel tank vent tube (1).
8. Install the fuel tank filler tube clamp at the fuel tank.



9. Install the parking brake cable retainer clamps (1) and the support.

**Tighten**

Tighten the parking brake cable retainer clamps to 10 N·m (89 lb in).

10. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
11. Fill the fuel tank.
12. Perform a leak check of the fuel tank and the fuel line connections.

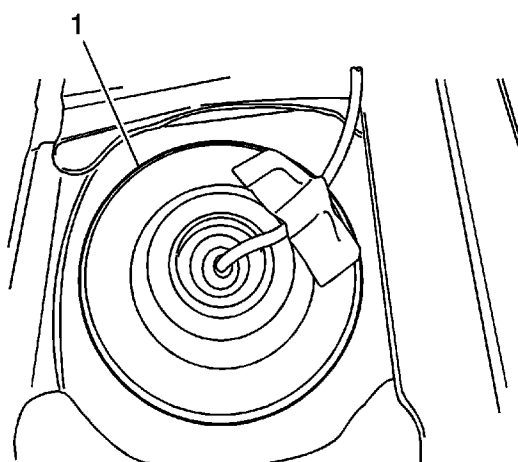
# Fuel Sender Assembly Replacement

## Special Tools

EN-49090 Remover/Installer -- Fuel Pump Lock Ring

## Removal Procedure

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.

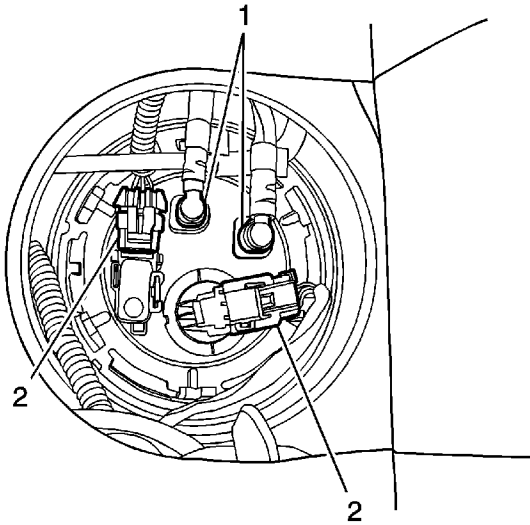


1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

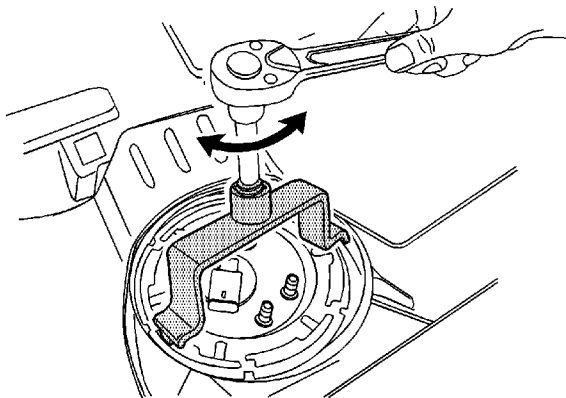
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the rear seat. Refer to [Rear Seat Replacement](#).
4. Remove the fuel pump access cover (1).

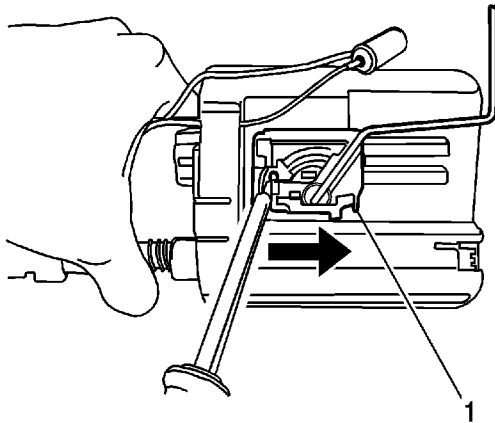




5. Disconnect the electrical connectors (2) at the fuel pump assembly.
6. Disconnect the fuel lines (1).

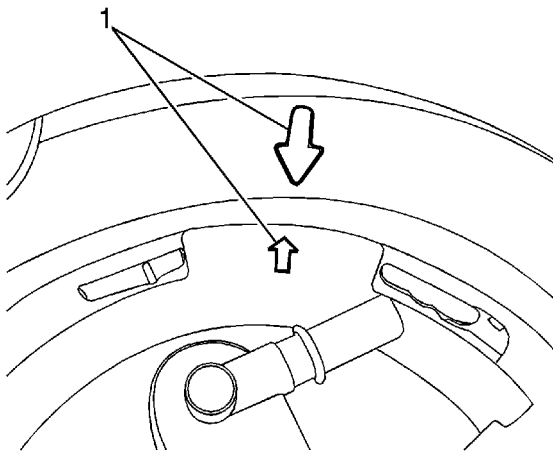


7. Remove the fuel pump lock ring by using *EN-49090* ring .
8. Remove the fuel pump.
9. Disconnect the insulator.



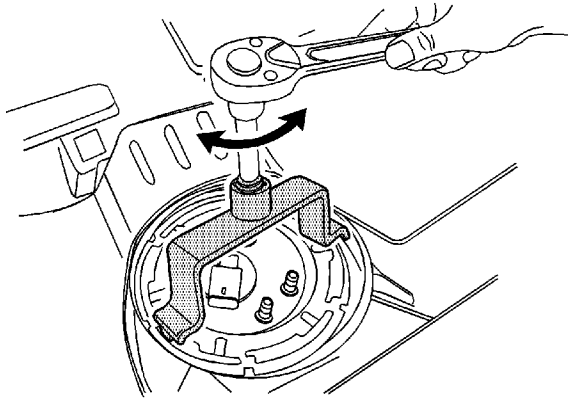
10. Remove the fuel sender assembly (1).

## Installation Procedure

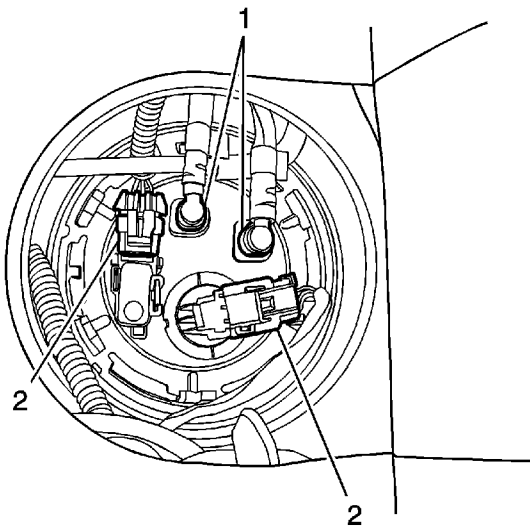


**Note:** Be careful to install the fuel sender to fuel pump housing exactly. If not installed exactly, fuel indicating may be incorrect.

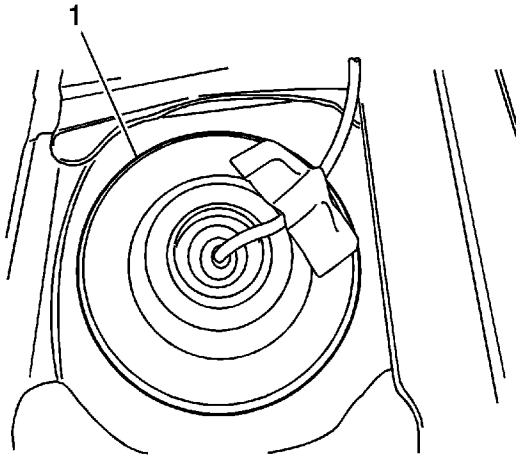
1. Install the fuel sender assembly. Align marks (1).
2. Connect the fuel sender insulator.



3. Install the fuel pump to fuel tank.
4. Install the fuel pump lock ring by using *EN-49090* ring .



5. Connect the electrical connectors (2) at the fuel pump assembly.
6. Connect the fuel lines (1).



7. Install the fuel pump access cover (1).
8. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
9. Perform an operational check of the fuel pump.
10. Install the rear seat. Refer to [Rear Seat Replacement](#).

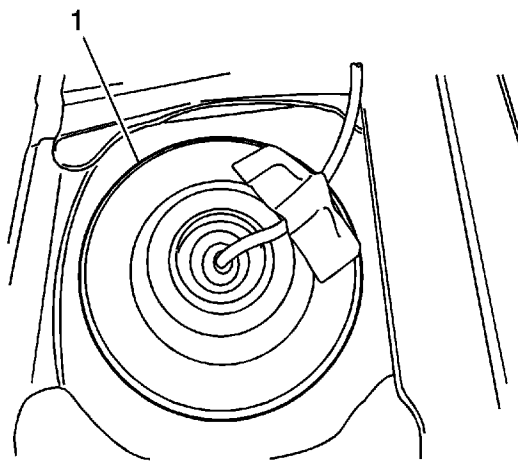
# Fuel Pump Replacement

## Special Tools

EN-49090 Remover/Installer -- Fuel Pump Lock Ring

## Removal Procedure

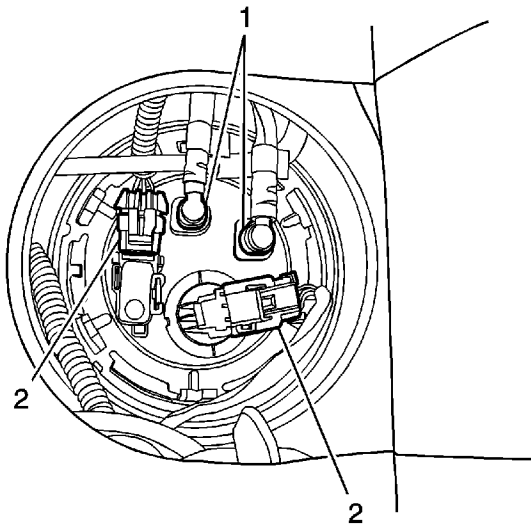
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



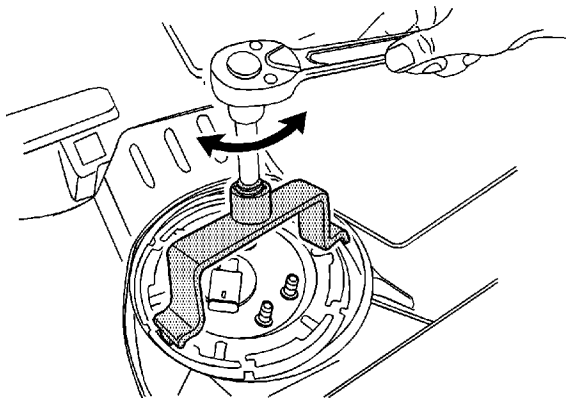
1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

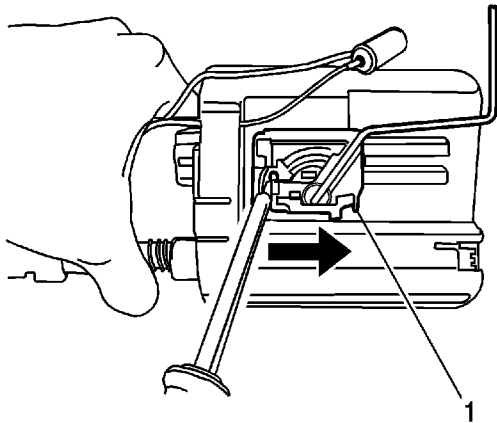
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the rear seat. Refer to [Rear Seat Replacement](#).
4. Remove the fuel pump access cover (1).



5. Disconnect the electrical connectors (2) at the fuel pump assembly.
6. Disconnect the fuel lines (1).

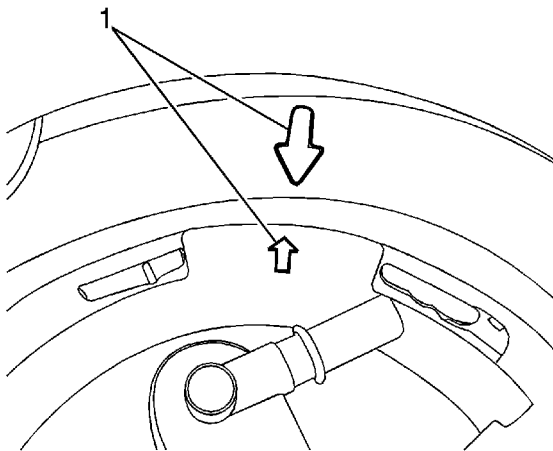


7. Remove the fuel pump lock ring by using *EN-49090* ring .
8. Remove the fuel pump.
9. Disconnect the insulator.



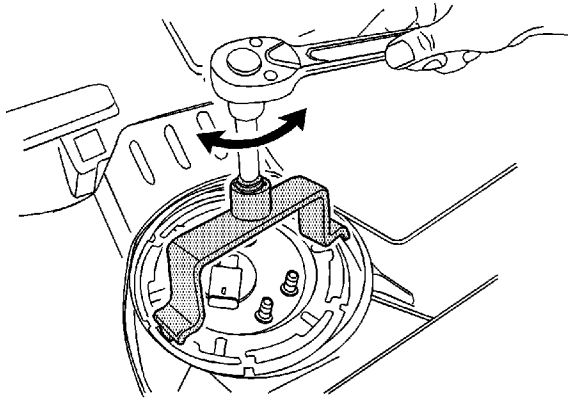
10. Remove the fuel sender assembly (1).

## Installation Procedure

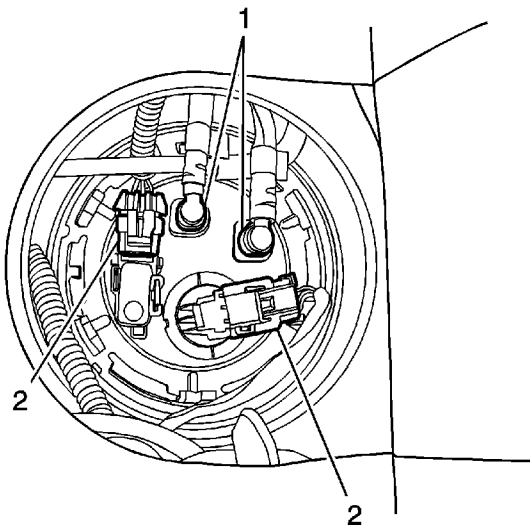


**Note:** Be careful to install the fuel sender to fuel pump housing exactly. If not installed exactly, fuel indicating may be incorrect.

1. Install the fuel sender assembly. Align marks (1).
2. Connect the fuel sender insulator.

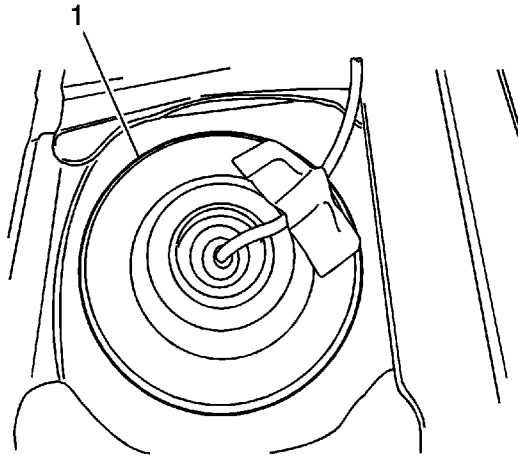


3. Install the fuel pump to fuel tank.
4. Install the fuel pump lock ring by using *EN-49090* ring .



5. Connect the electrical connectors (2) at the fuel pump assembly.
6. Connect the fuel lines (1).





7. Install the fuel pump access cover (1).
8. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
9. Perform an operational check of the fuel pump.
10. Install the rear seat. Refer to [Rear Seat Replacement](#).

## Fuel Injection Fuel Rail Assembly Replacement

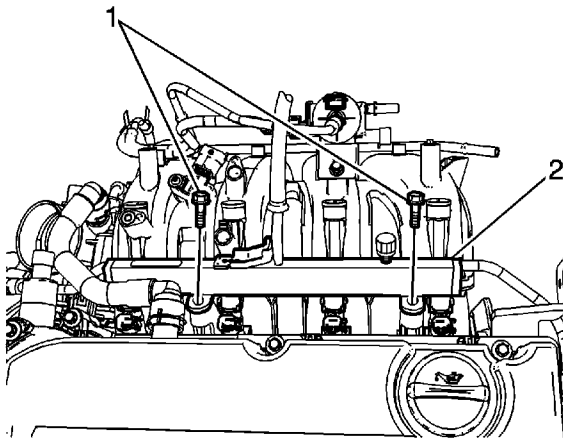
### Removal Procedure

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.

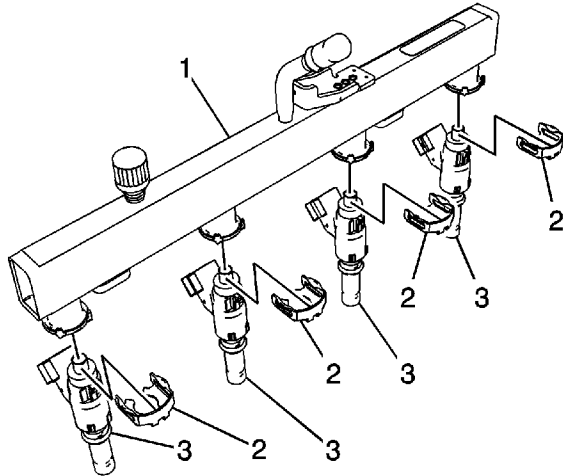
1. Relieve the fuel pressure system. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Disconnect the injector connectors.

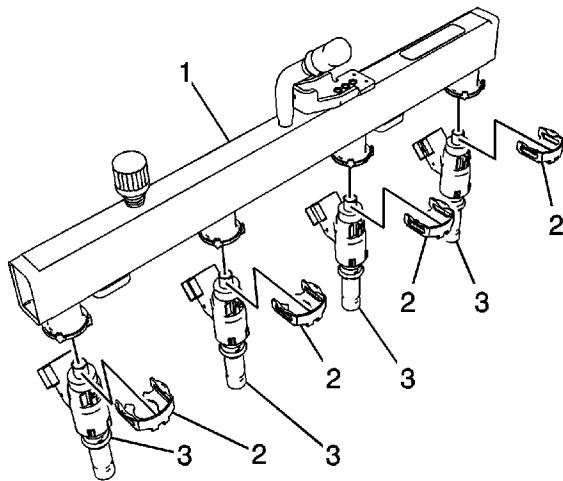


4. Disconnect the fuel line from the fuel rail.
5. Remove the fuel rail bolts (1).
6. Remove the fuel rail (2) with the injectors.

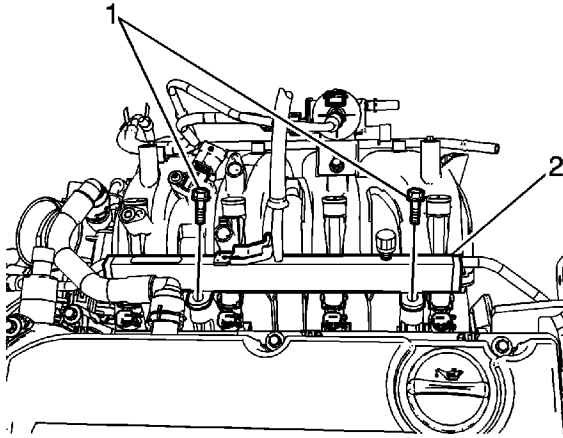


7. Detach the fuel injector retainer clips (2).
8. Detach the fuel injectors (3) by pulling down and out.
9. Discard the fuel injector O-rings.

## Installation Procedure



1. Install the fuel injector O-rings.
2. Connect fuel injectors (3) to the fuel rail (1).
3. Install the fuel injector retainer clips (2).



4. Install the fuel rail (2) with the injectors to the intake manifold.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

5. Install the fuel rail bolts (1).

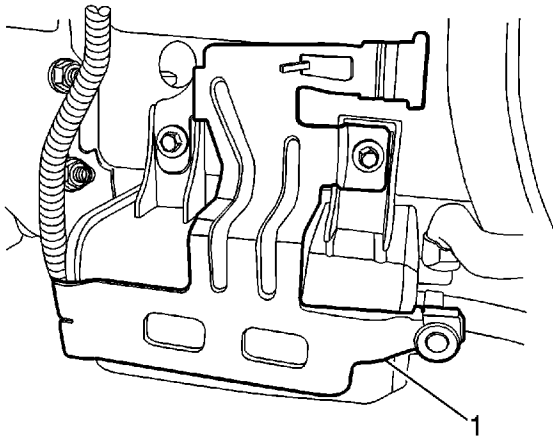
#### **Tighten**

Tighten the fuel rail tightening bolt to 8 N·m (70.8 lb in).

6. Connect the fuel line from the fuel rail and put a dust cap to avoid strange materials.
7. Connect the fuel injector connectors.
8. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

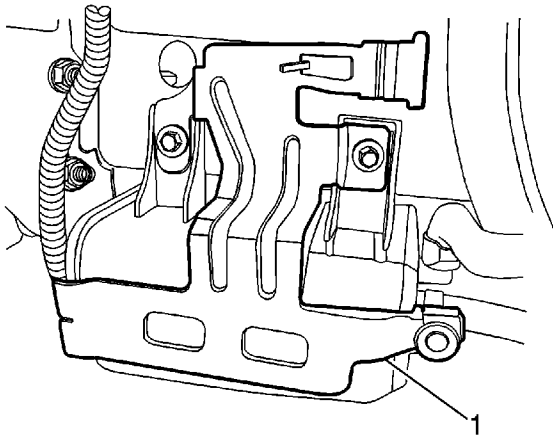
## Evaporative Emission Canister Replacement

### Removal Procedure



1. Remove the EVAP canister vent.
2. Disconnect the inlet and outlet hose from the EVAP canister.
3. Remove the EVAP canister bracket retaining bolt.
4. Remove the EVAP canister (1).

### Installation Procedure



1. Install the EVAP canister (1).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the EVAP canister bracket retaining bolt.

**Tighten**

Tighten evaporative emission canister bracket retaining bolt to 8 N·m (71 lb in).

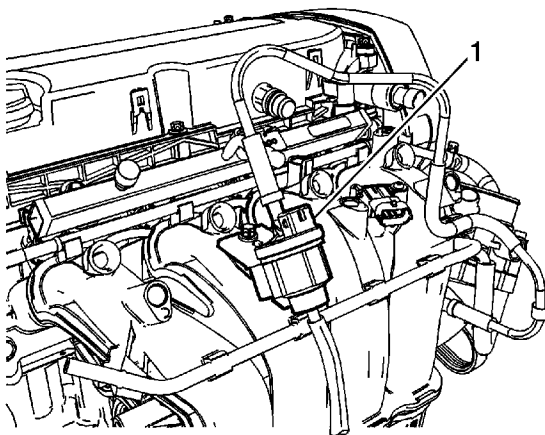
3. Connect the inlet and outlet hose to the EVAP canister.
4. Install the EVAP canister vent.

# Evaporative Emission Canister Purge Solenoid Valve Replacement

## Removal Procedure

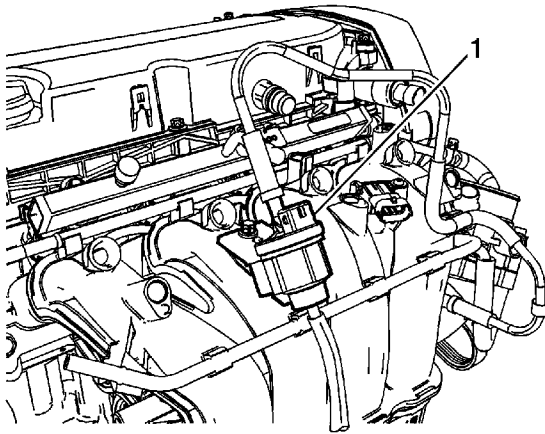
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the EVAP canister purge valve upper and lower hoses.
3. Disconnect the EVAP canister purge valve connector.
4. Detach the EVAP canister purge valve (1).

## Installation Procedure



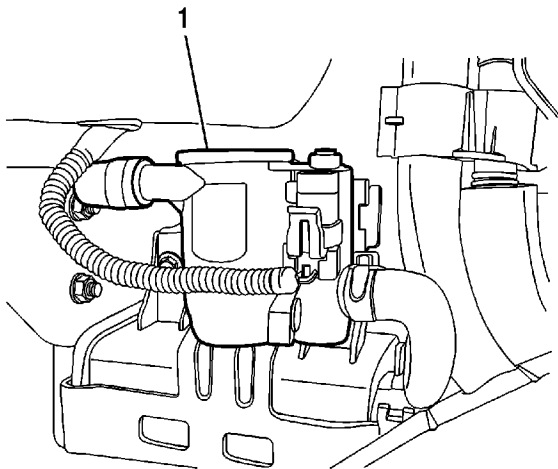
1. Install the EVAP canister purge valve (1).
2. Connect the EVAP canister purge valve connector.
3. Connect the EVAP canister purge valve upper and lower hoses.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).



# Evaporative Emission Canister Vent Solenoid Valve Replacement

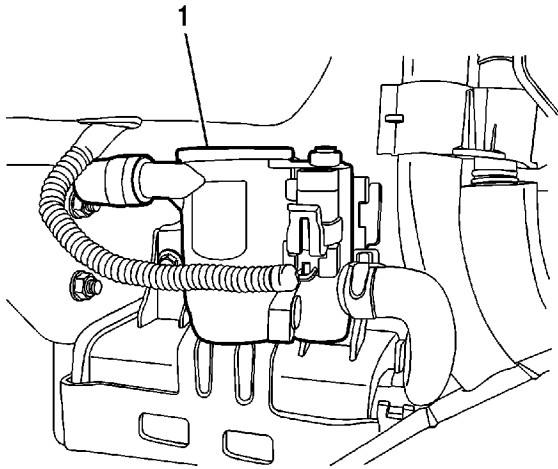
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the EVAP canister vent solenoid valve connector.
3. Disconnect the EVAP canister vent hose.
4. Remove the EVAP canister vent assembly (1) pushing it to the left side.

## Installation Procedure



1. Install the EVAP canister vent assembly (1) pushing it to the right side.
2. Connect the EVAP canister vent hose.
3. Connect the EVAP canister vent solenoid valve connector.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

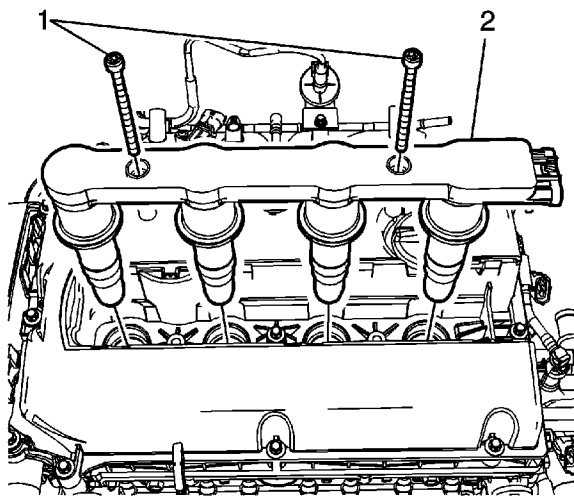
# Ignition Coil Replacement

## Special Tools

[KM-6009](#) Remover/Installer

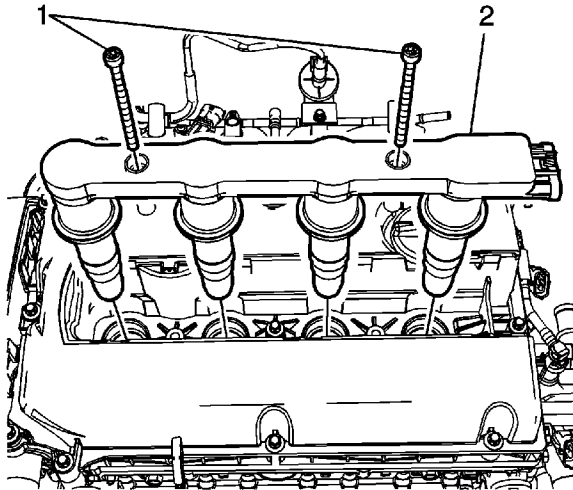
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Detach the ignition coil cover.
3. Disconnect the ignition coil connector.
4. Remove the ignition coil bolts (1).
5. Install the [KM-6009](#).
6. Remove the ignition coil (2).

## Installation Procedure



1. Install the ignition coil (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ignition coil bolts (1).

#### **Tighten**

Tighten the ignition coil bolts to 8 N·m (70.8 lb in).

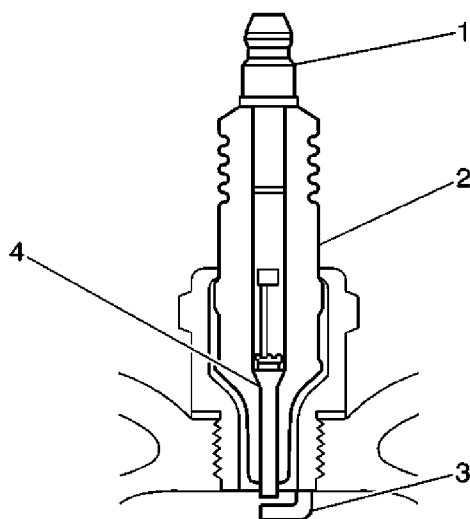
3. Connect the ignition coil connector.
4. Install the ignition coil cover.
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Spark Plug Inspection

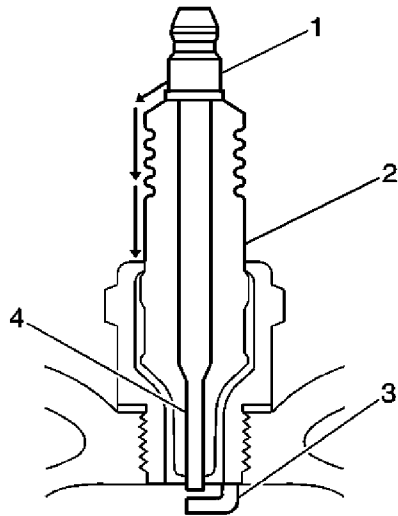
### Spark Plug Usage

- Ensure that the correct spark plug is installed. An incorrect spark plug causes driveability conditions.
- Ensure that the spark plug has the correct heat range. An incorrect heat range causes the following conditions:
  - Spark plug fouling--Colder plug
  - Pre-ignition causing spark plug and/or engine damage--Hotter plug

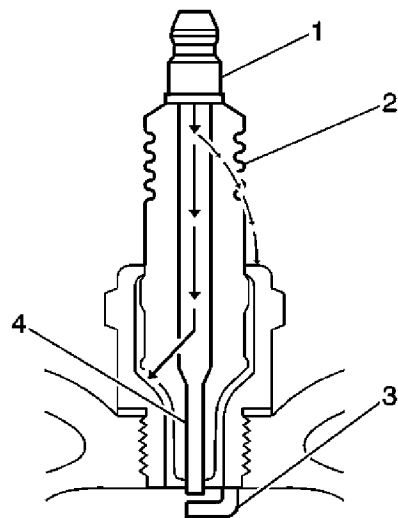
### Spark Plug Inspection



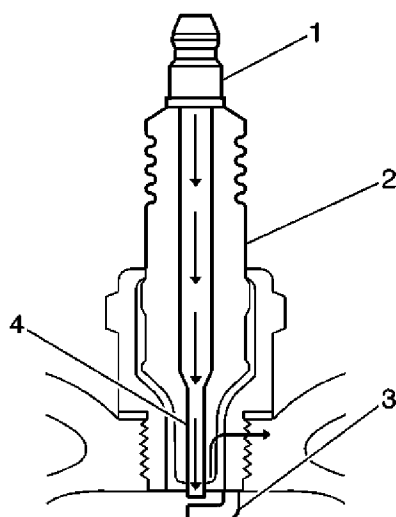
1. Inspect the terminal post (1) for damage.
  - Inspect for a bent or broken terminal post (1).
  - Test for a loose terminal post (1) by twisting and pulling the post. The terminal post (1) should NOT move.



2. Inspect the insulator (2) for flashover or carbon tracking, soot. This is caused by the electrical charge traveling across the insulator (2) between the terminal post (1) and ground. Inspect for the following conditions:
- Inspect the spark plug boot for damage.
  - Inspect the spark plug recess area of the cylinder head for moisture, such as oil, coolant, or water. A spark plug boot that is saturated causes arcing to ground.



3. Inspect the insulator (2) for cracks. All or part of the electrical charge may arc through the crack instead of the electrodes (3, 4).



4. Inspect (3) for evidence of improper arcing.
  - Measure the gap between the center electrode (4) and the side electrode (3) terminals. An excessively wide electrode gap can prevent correct spark plug operation.
  - Inspect for the correct spark plug torque. Insufficient torque can prevent correct spark plug operation. An over torqued spark plug, causes the insulator (2) to crack.
  - Inspect for signs of tracking that occurred near the insulator tip instead of the center electrode (4).
  - Inspect for a broken or worn side electrode (3).
  - Inspect for a broken, worn, or loose center electrode (4) by shaking the spark plug.
    - A rattling sound indicates internal damage.
    - A loose center electrode (4) reduces the spark intensity.
  - Inspect for bridged electrodes (3, 4). Deposits on the electrodes (3, 4) reduce or eliminates the gap.
  - Inspect for worn or missing platinum pads on the electrodes (3, 4), if equipped.
  - Inspect for excessive fouling.
5. Inspect the spark plug recess area of the cylinder head for debris. Dirty or damaged threads can cause the spark plug not to seat correctly during installation.

## Spark Plug Visual Inspection

- Normal operation--Brown to grayish-tan with small amounts of white powdery deposits are normal combustion by-products from fuels with additives.
- Carbon fouled--Dry, fluffy black carbon, or soot caused by the following conditions:
  - Rich fuel mixtures
- Leaking fuel injectors
- Excessive fuel pressure
- Restricted air filter element
- Incorrect combustion

- Reduced ignition system voltage output
- Weak coils
- Worn ignition wires
- Incorrect spark plug gap
  - Excessive idling or slow speeds under light loads can keep spark plug temperatures so low that normal combustion deposits may not burn off.
- Deposit fouling--Oil, coolant, or additives that include substances such as silicone, very white coating, reduces the spark intensity. Most powdery deposits will not effect spark intensity unless they form into a glazing over the electrode.



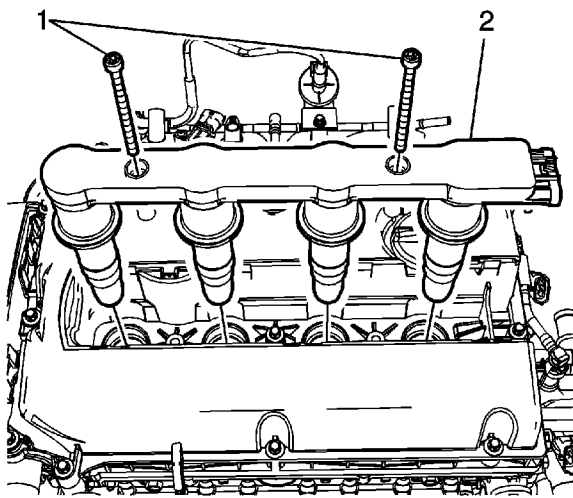
# Spark Plug Replacement

## Special Tools

[KM-6009](#) Remover/Installer

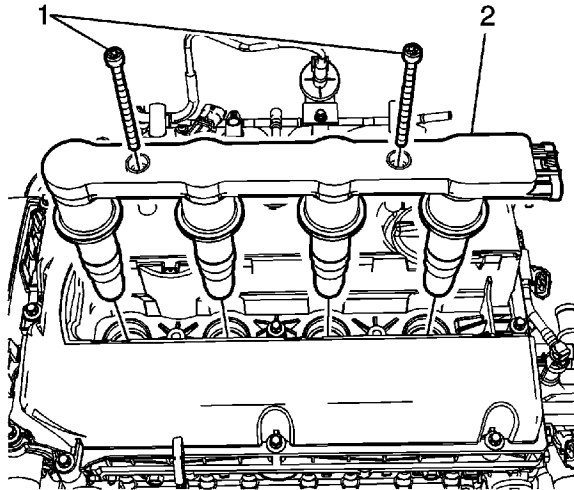
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Detach the ignition coil cover.
3. Disconnect the ignition coil connector.
4. Remove the ignition coil bolts (1).
5. Install the [KM-6009](#).
6. Remove the ignition coil (2).
7. Remove the spark plugs.

## Installation Procedure



1. Install The spark plugs.
2. Install the ignition coil (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the ignition coil bolts (1).

#### **Tighten**

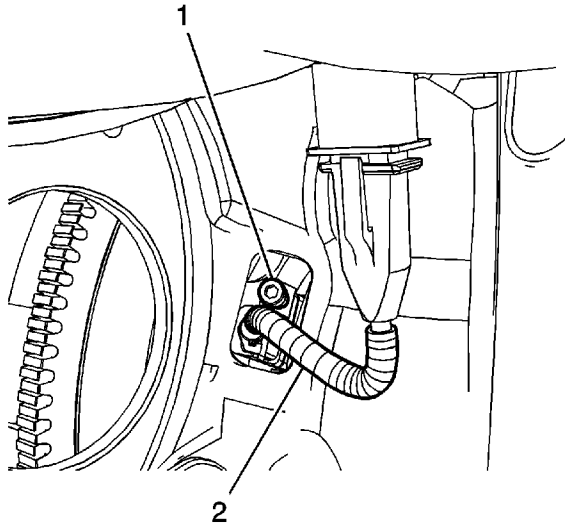
Tighten the ignition coil bolts (1) to 8 N·m (70.8 lb in).

4. Connect the ignition coil connector.
5. Install the ignition coil cover.
6. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Crankshaft Position Sensor Replacement

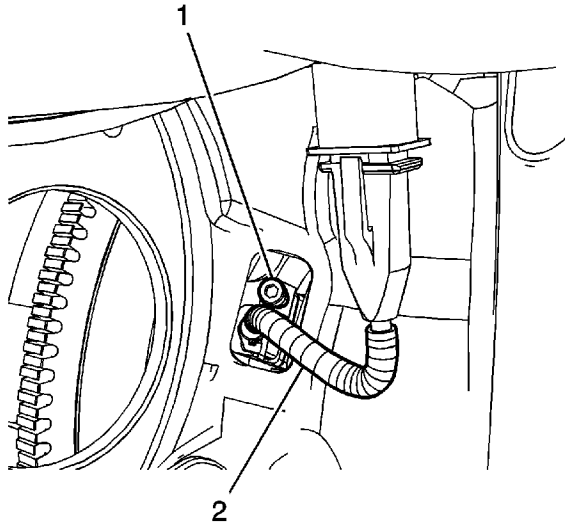
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the starter. Refer to [Starter Motor Replacement](#).
3. Remove the CKP sensor bolt (1).
4. Remove the CKP sensor (2).

### Installation Procedure



1. Install the CKP sensor (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the CKP sensor bolt (1).

#### **Tighten**

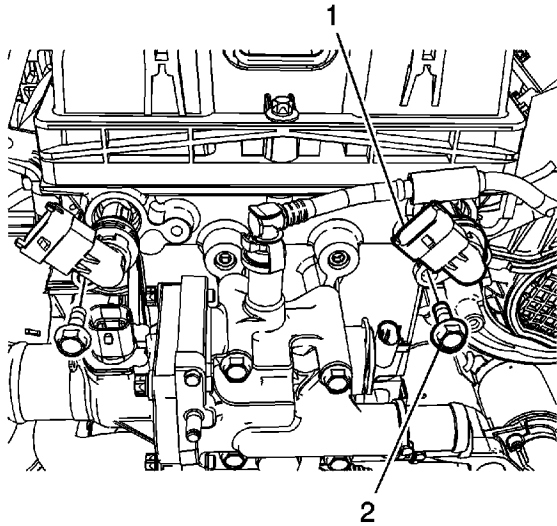
Tighten the CKP sensor bolt (1) to 4.5 N·m (39.8 lb in).

3. Install the starter. Refer to [Starter Motor Replacement](#).
4. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Camshaft Position Sensor Replacement

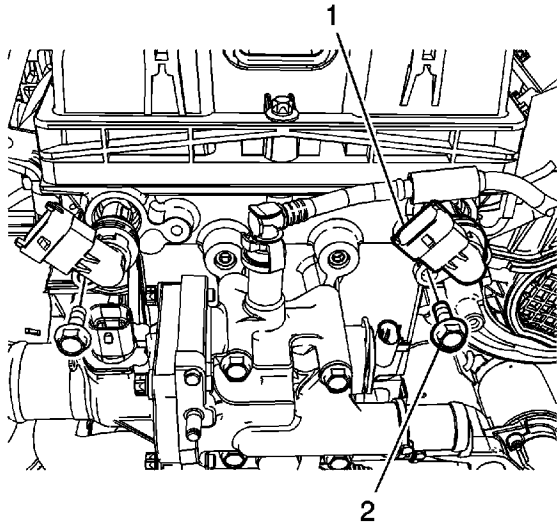
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the CMP sensor connectors.
3. Remove the CMP sensor bolt (2).
4. Remove the CMP sensor (1).

### Installation Procedure

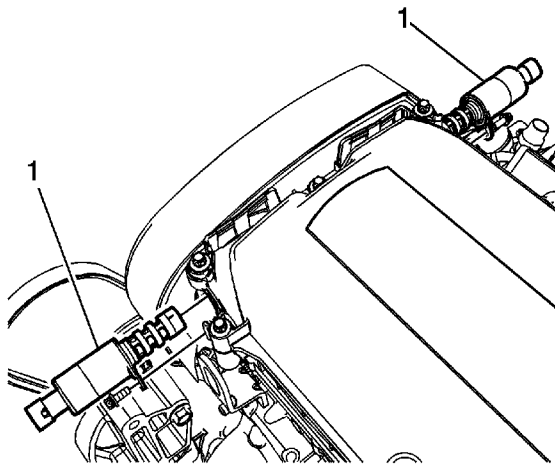


1. Install the CMP sensor (1).
2. Install the CMP sensor bolt (2).
3. Connect the CMP sensor connectors.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Camshaft Position Actuator Solenoid Valve Replacement

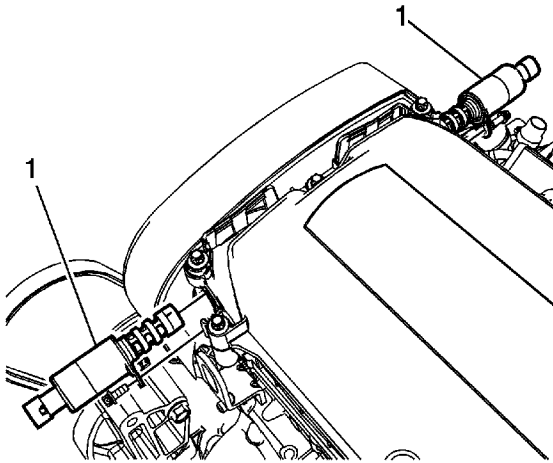
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the camshaft position actuator valve connectors.
3. Remove the camshaft position actuator valve bolt.
4. Remove the camshaft position actuator valve (1) and seal.

## Installation Procedure



1. Install the camshaft position actuator valve (1) and seal. Coat seal with clean engine oil prior to installation.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the camshaft position actuator valve bolt.

#### **Tighten**

Tighten the camshaft position actuator valve bolt to 6 N·m (53 lb in).

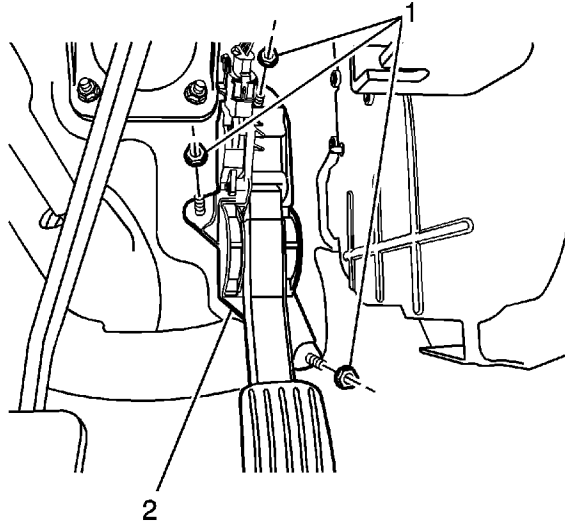
3. Connect the camshaft position actuator valve connectors.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).



## Accelerator Pedal Position Sensor Replacement

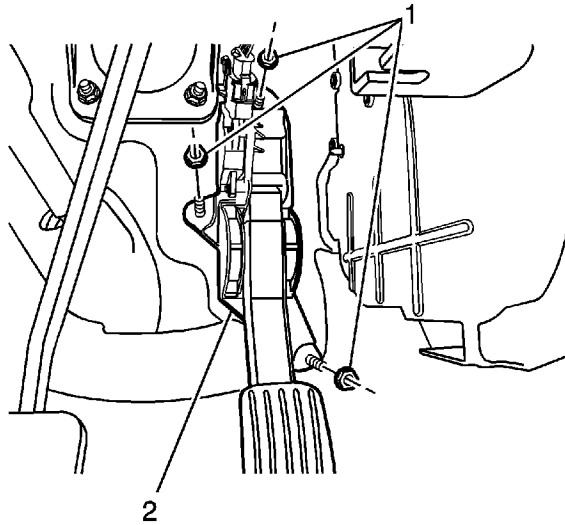
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the accelerator pedal position sensor connector.
3. Remove the 3 accelerator pedal retaining nuts (1).
4. Remove the accelerator pedal (2).

### Installation Procedure



1. Install the accelerator pedal (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the 3 accelerator pedal retaining nuts (1).

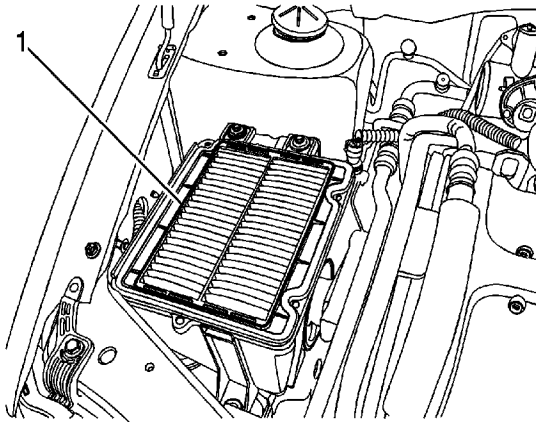
#### **Tighten**

Tighten the accelerator pedal retaining nuts to 19 N·m (14 lb ft).

3. Connect the accelerator pedal position sensor connector.
4. Connect the battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Air Cleaner Element Replacement

### Removal Procedure



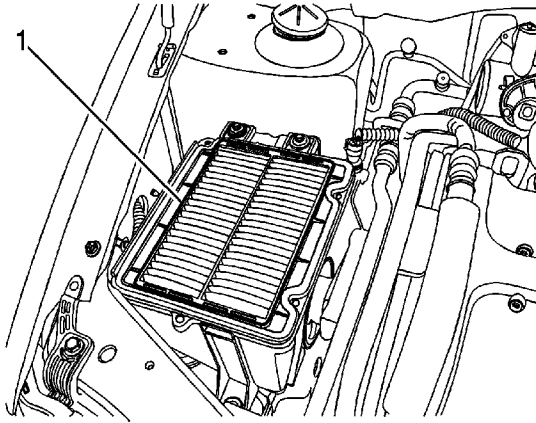
1. Remove the air filter upper housing.

**Note:** Before replacing a new one, check the maintenance interval and the quality of the air cleaner element.

2. Replace the air filter element (1).

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



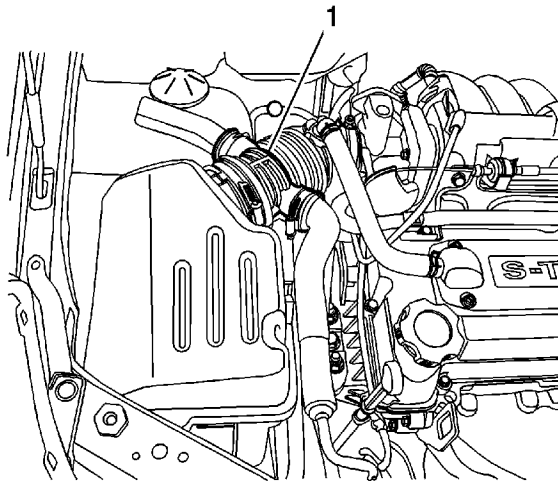
1. Install the air filter element (1).
2. Install the air filter upper housing.

**Tighten**

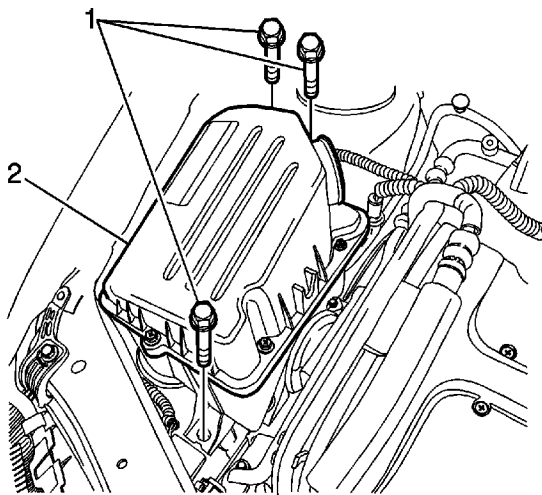
Tighten the air filter upper housing bolts to 2 N·m (1.5 lb ft).

## Air Cleaner Assembly Replacement

### Removal Procedure



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the breather hose.
3. Loosen the clamp and disconnect outlet tube (1).

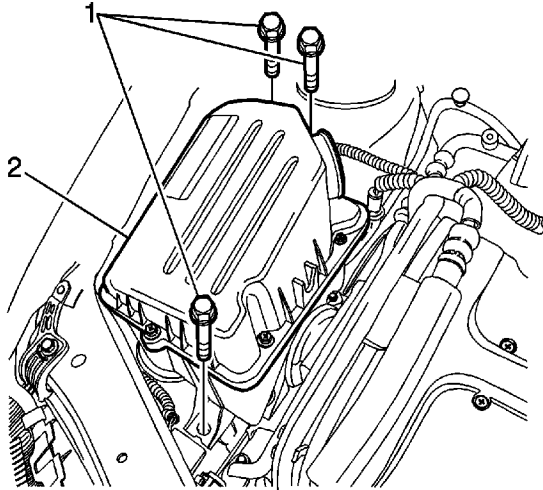


4. Remove the air cleaner assembly bolts (1).

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5. Remove the air cleaner assembly (2).

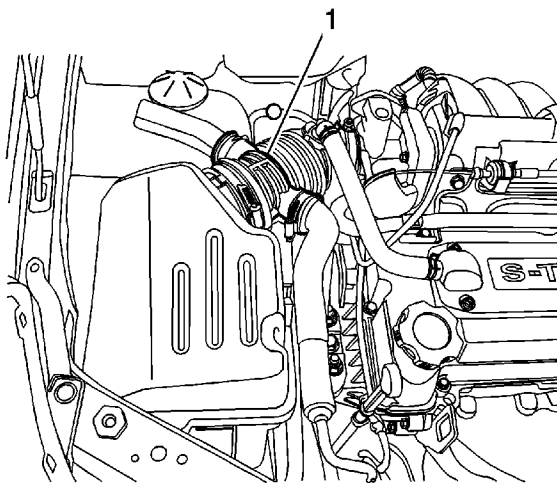
## Installation Procedure



1. Install the air cleaner assembly (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the air cleaner assembly bolts (1) and tighten to **6 N·m (4.4 lb ft)**.



3. Connect the air cleaner outlet tube (1) and tighten the clamp.
4. Connect the breather hose.
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and](#)

[Connection.](#)

## Temperature Versus Resistance

°C	°F	ECT Ohms	IAT Ohms
Temperature vs Resistance Values (Approximate)			
100	212	177	187
90	194	241	246
80	176	332	327
70	158	467	441
60	140	667	603
50	122	973	837
45	113	1188	991
40	104	1459	1180
35	95	1802	1412
30	86	2238	1700
25	77	2796	2055
20	68	3520	2500
15	59	4450	3055
10	50	5670	3760
5	41	7280	4651
0	32	9420	5800
-5	23	12300	7273
-10	14	16180	9200
-15	5	21450	9200
-20	-4	28680	15080
-30	-22	52700	25600
-40	-40	100700	45300



## Altitude Versus Barometric Pressure

Altitude Measured in Meters (m)	Altitude Measured in Feet (ft)	Barometric Pressure Measured in Kilopascals (kPa)
Determine your altitude by contacting a local weather station or by using another reference source.		
4 267	14,000	56-64
3 962	13,000	58-66
3 658	12,000	61-69
3 353	11,000	64-72
3 048	10,000	66-74
2 743	9,000	69-77
2 438	8,000	71-79
2 134	7,000	74-82
1 829	6,000	77-85
1 524	5,000	80-88
1 219	4,000	83-91
914	3,000	87-95
610	2,000	90-98
305	1,000	94-102
0	0 Sea Level	96-104
-305	-1,000	101-105

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Engine](#) | [Engine Controls and Fuel - 1.5L](#) | [Specifications](#) | **Document ID: 1313432**

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## Ignition System Specifications

Application	Specification	
	Metric	English
Ignition Sequence	1-3-4-2	1-3-4-2
Ignition Timing	10° (BTDC)	
Ignition Type	Direct Ignition System	
Spark Plug Gap	0.7-0.8 mm	0.028-0.031 in
Spark Plug Maker	Champion	
Spark Plug Type	RN9YC	

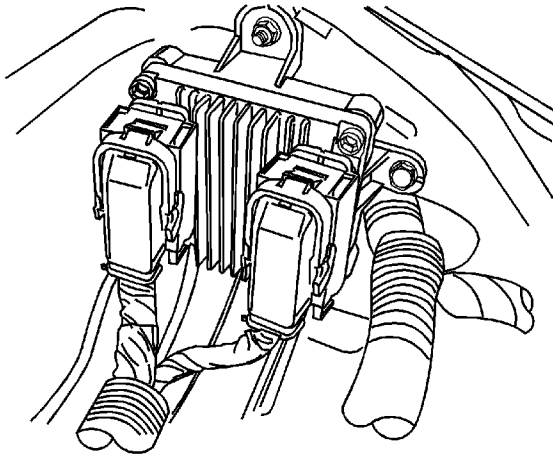
## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accessory Mounting Bracket Bolts	37 N·m	27 lb ft
Camshaft Position Sensor Bolts	12 N·m	106 lb in
Crankshaft Position Sensor Retaining Bolt	6.5 N·m	58 lb in
Electronic Ignition System Ignition Coil Retaining Bolts	10 N·m	89 lb in
Engine Control Module Bolts	4 N·m	35 lb in
Engine Coolant Temperature Sensor Retaining Bolt	20 N·m	15 lb ft
Evaporative Emission Canister Flange Bolt	20 N·m	15 lb ft
Evaporative Emission Canister Protective Cover	8 N·m	71 lb in
Evaporative Emission Canister Purge Solenoid Bracket Bolt	5 N·m	44 lb in
Fuel Filter Mounting Bracket Assembly Bolt	4 N·m	35 lb in
Fuel Pressure Regulator Retaining Screw	12 N·m	106 lb in
Fuel Rail Retaining Bolts	25 N·m	18 lb ft
Fuel Tank Retaining Bolts	20 N·m	15 lb ft
Idle Air Control Valve Retaining Bolts	3 N·m	27 lb in
Knock Sensor Bolt	20 N·m	15 lb ft
Manifold Absolute Pressure Sensor Mounting Bracket Bolt	4 N·m	35 lb in
Manifold Absolute Pressure Sensor Retaining Bolts and Nuts	8 N·m	71 lb in
Oxygen Sensor Retaining Bolt	42 N·m	31 lb ft
Parking Brake Cable Retainer Clamps	10 N·m	89 lb in
Rear A/C Compressor Mounting Bracket Bolts	35 N·m	26 lb ft
Spark Plug Cover Bolts	3 N·m	27 lb in
Throttle Body Retaining Nuts	15 N·m	11 lb ft
Throttle Position Sensor Retaining Bolts	2 N·m	18 lb in

## Engine Control Module Replacement

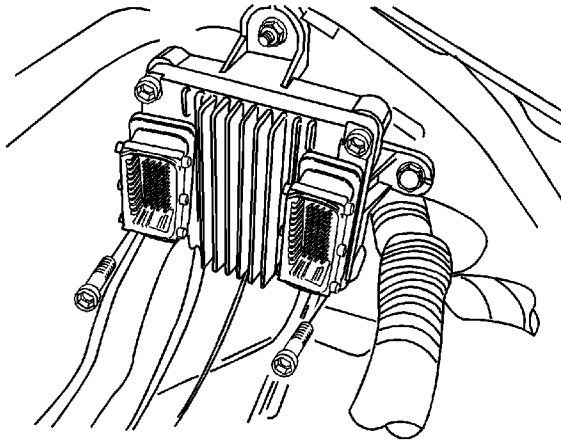
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the engine control module (ECM) connectors.
3. Remove the ECM retaining bolts.
4. Remove the ECM from the ECM mount.

### Installation Procedure



1. Position the ECM in place.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ECM to the ECM mount and install the retaining bolts.

#### **Tighten**

Tighten the ECM retaining bolts to 4 N·m (35 lb in).

3. Connect the negative battery cable.
4. Perform a crankshaft position system variation learning procedure. Refer to [Crankshaft Position System Variation Learn](#).
5. Refer to [Control Module References](#) for programming and setup information.

## Crankshaft Position System Variation Learn

1. Monitor the engine control module (ECM) for DTCs with a scan tool. If other DTCs are set, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC.
2. Select the crankshaft position variation learn procedure with a scan tool.
3. The scan tool instructs you to perform the following:
  - 3.1. Accelerate to wide open throttle (WOT).
  - 3.2. Release throttle when fuel cut-off occurs.
  - 3.3. Observe fuel cut-off for applicable engine.
  - 3.4. Engine should not accelerate beyond calibrated RPM value.
  - 3.5. Release throttle immediately if value is exceeded.
  - 3.6. Block drive wheels.
  - 3.7. Set parking brake.
  - 3.8. DO NOT apply brake pedal.
  - 3.9. Cycle ignition from OFF to ON.
  - 3.10. Apply and hold brake pedal.
  - 3.11. Start and idle engine.
  - 3.12. Turn A/C OFF.

Vehicle must remain in Park or Neutral.

The scan tool monitors certain component signals to determine if all the conditions are met to continue with the procedure. The scan tool only displays the condition that inhibits the procedure. The scan tool monitors the following components:

- Crankshaft position (CKP) sensors activity--If there is a CKP sensor condition, refer to the applicable DTC.
  - Camshaft position (CMP) signal activity--If there is a CMP signal condition, refer to the applicable DTC.
  - Engine coolant temperature (ECT)--If the engine coolant temperature is not warm enough, idle the engine until the engine coolant temperature reaches the correct temperature.
4. Enable the CKP system variation learn procedure with the scan tool and perform the following:

**Important:** While the CKP variation learn procedure is in progress, hold the throttle at WOT for 5 fuel-cutoffs. The learn procedure must determine there has been 5 fuel-cutoffs to properly perform the test.

- Accelerate to WOT.
  - Hold throttle while fuel cut-off occurs.
5. The scan tool displays Learn Status: Learned this ignition. If any other DTCs set, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC.
  6. Turn OFF the ignition for 30 seconds after the learn procedure is completed successfully.

The CKP system variation learn procedure is also required when the following service procedures have been performed:

- An engine replacement
- An ECM replacement
- A harmonic balancer replacement
- A crankshaft replacement
- A CKP sensor replacement
- Any engine repairs which disturb the crankshaft to CKP sensor relationship.

## Idle Learn

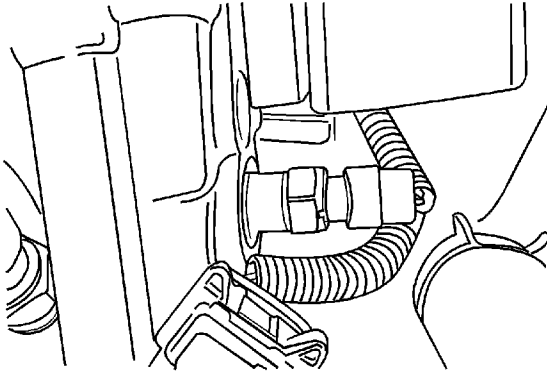
The Idle Learn Procedure listed below must be performed whenever the following occurs:

- The throttle body assembly is replaced
  - The throttle body is cleaned
  - The engine control module (ECM) is replaced
  - The idle air control valve (IAC) is replaced
  - Power disconnection (battery cable, ECM fuse, etc.) (Delphi ECM only)
- 
1. Turn the ignition ON.
  2. Turn the ignition OFF for 15 seconds.
  3. Turn the ignition ON for 5 seconds.
  4. Turn the ignition OFF for 15 seconds.
  5. Start the engine in park/neutral.
  6. Allow the engine to run until the engine coolant temperature is greater than 85°C (185°F).
  7. Turn the A/C ON for 10 seconds, if equipped.
  8. If the vehicle is equipped with an automatic transaxle, apply the parking brake. While pressing the brake pedal, place the transaxle in drive (D) for 10 seconds.
  9. Turn the A/C OFF for 10 seconds, if equipped.
  10. If the vehicle is equipped with an automatic transaxle, while pressing the brake pedal, place the transaxle in park/neutral.
  11. Turn the ignition OFF. The idle learn procedure is complete.



## Engine Coolant Temperature Sensor Replacement

### Removal Procedure



1. Relieve the coolant system pressure.

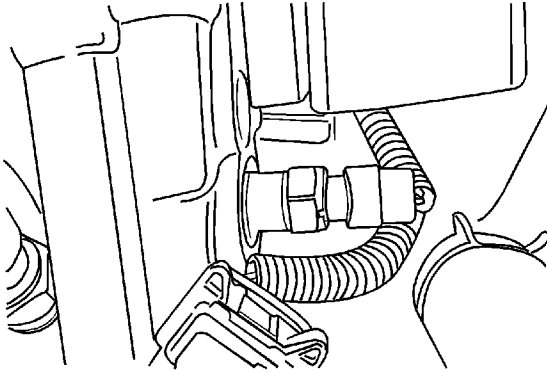
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the negative battery cable.
3. Disconnect the engine coolant temperature (ECT) sensor connector.

**Caution:** Use care when handling the coolant sensor. Damage to the coolant sensor will affect the operation of the fuel control system.

4. Carefully remove the ECT sensor from the cylinder head underneath the electronic ignition (EI) system ignition coil.

### Installation Procedure



**Caution:** Use care when handling the coolant sensor. Damage to the coolant sensor will affect the operation of the fuel control system.

1. Coat the threads on the ECT sensor with sealer.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ECT sensor into the cylinder head.

#### **Tighten**

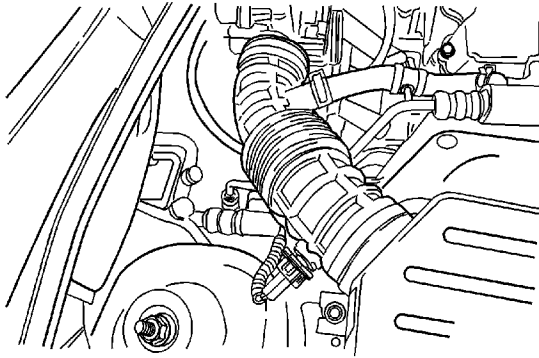
Tighten the coolant temperature sensor to 20 N·m (15 lb in).

3. Connect the ECT sensor connector.
4. Fill the cooling system.
5. Connect the negative battery cable.

## Intake Air Temperature Sensor Replacement

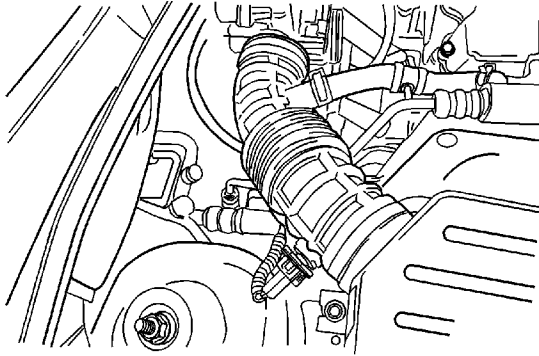
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the intake air temperature (IAT) sensor connector.
3. Remove the IAT sensor by pulling it out of the air intake tube.

### Installation Procedure

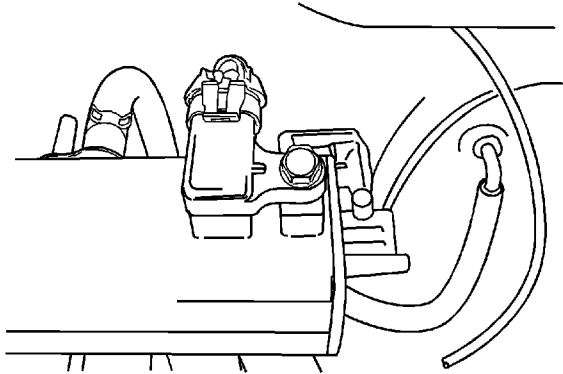


1. Insert the IAT sensor into the air intake tube.
2. Connect the IAT connector.
3. Connect the negative battery cable.

## Manifold Absolute Pressure Sensor Replacement

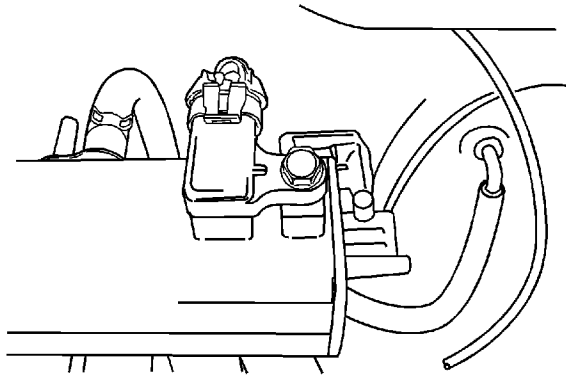
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the vacuum hose from the manifold absolute pressure (MAP) sensor.
3. Disconnect the MAP connector.
4. Remove the MAP sensor mounting bracket bolt.
5. Remove the bolts and nuts securing the MAP sensor to the mounting bracket.

### Installation Procedure



1. Insert the MAP sensor into the mounting bracket.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the bolts through the MAP sensor and the bracket. Install the retaining nuts.

**Tighten**

Tighten the MAP sensor retaining bolts and nuts to 8 N·m (71 lb in).

3. Install the MAP sensor and the mounting bracket to the firewall with the mounting bracket bolt.

**Tighten**

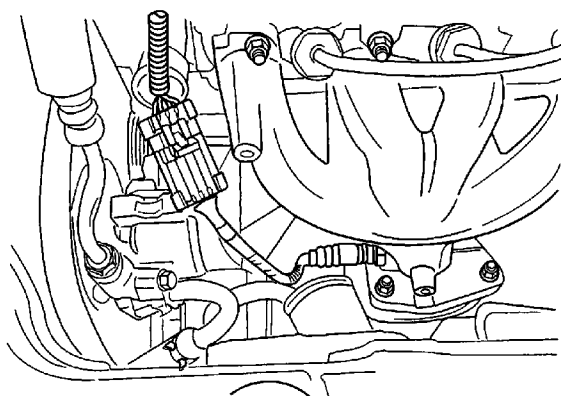
Tighten the MAP sensor mounting bracket bolt to 4 N·m (35 lb in).

4. Connect the MAP sensor connector.
5. Connect the vacuum hose to the MAP sensor.
6. Connect the negative battery cable.

## Oxygen Sensor Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.

**Caution:** Do not remove the pigtail from either the heated oxygen sensor (HO2S) or the oxygen sensor (O2S). Removing the pigtail or the connector will affect sensor operation.

Handle the oxygen sensor carefully. Do not drop the HO2S. Keep the in-line electrical connector and the louvered end free of grease, dirt, or other contaminants. Do not use cleaning solvents of any type.

Do not repair the wiring, connector or terminals. Replace the oxygen sensor if the pigtail wiring, connector, or terminal is damaged.

This external 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 degraded 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.
- Do not damage the sensor pigtail and harness wires in such a way that the wires inside are exposed. This could provide a path for foreign materials to enter the sensor and

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cause performance problems.

- Ensure the sensor or vehicle lead wires are not bent sharply or kinked. Sharp bends or kinks 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 wired sensor may rely on this ground as the only ground contact to the sensor. Removal of the ground wire will cause poor engine performance.
- Ensure that the peripheral seal remains intact on the vehicle harness connector in order to prevent damage due to water intrusion. The engine harness may be repaired using Packard's Crimp and Splice Seals Terminal Repair Kit. Under no circumstances should repairs be soldered since this could result in the air reference being obstructed.

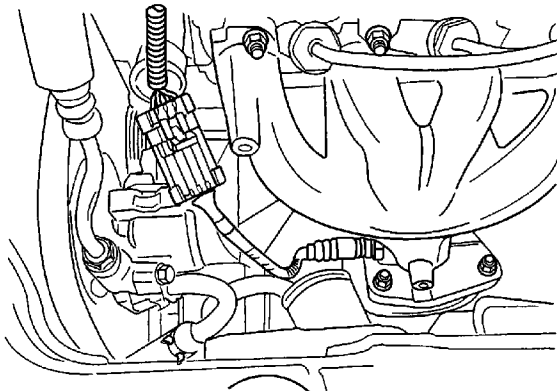
**Caution:** Do not solder heated oxygen sensor wires. Soldering the wires will result in the loss of the air reference to the sensor. Refer to Engine Electrical for proper wire and connection repair techniques.

2. Disconnect the front heated oxygen sensor (HO2S) 1 connector.

**Caution:** Remove oxygen sensors with the engine temperature above 48°C (120°F). Otherwise the oxygen sensors may be difficult to remove.

3. Carefully remove the HO2S 1 from the exhaust manifold.

## Installation Procedure



**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti-seize compound applied before reinstallation.



1. Coat the threads of the HO2S 1 with an anti-seize compound, if needed.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the HO2S 1 into the exhaust manifold.

**Tighten**

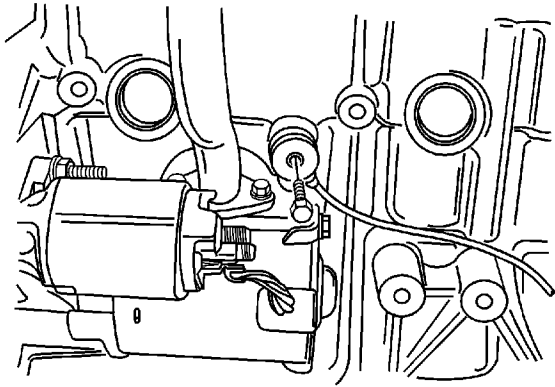
Tighten the oxygen sensor to 42 N·m (31 lb ft).

3. Connect the HO2S 1 connector.
4. Connect the negative battery cable.

## Knock Sensor Replacement

### Removal Procedure

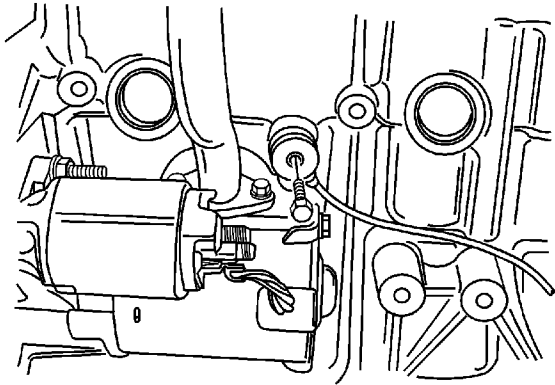
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the intake manifold. Refer to [Intake Manifold Replacement](#).
3. Disconnect the electrical connector at the knock sensor (KS).
4. Remove the KS.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the KS.

**Tighten**

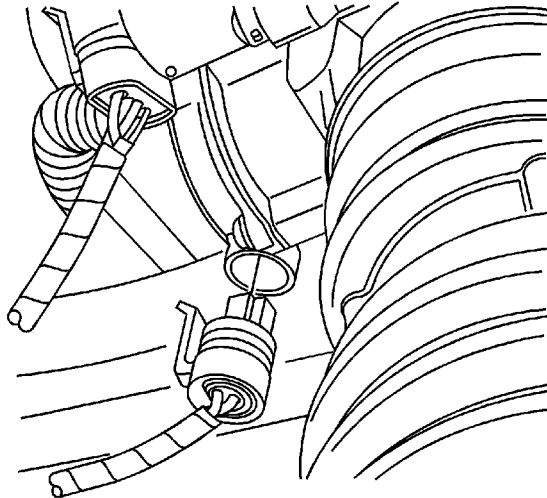
Tighten the KS bolt to 20 N·m (15 lb ft).

2. Connect the electrical connector at the KS.
3. Install the intake manifold. Refer to [Intake Manifold Replacement](#).
4. Connect the negative battery cable.

## Throttle Position Sensor Replacement

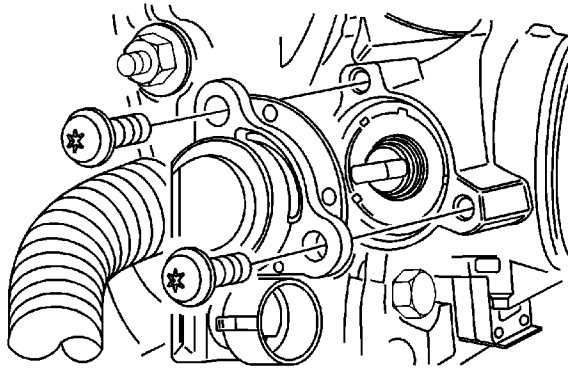
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the throttle position (TP) sensor connector.
3. Remove the TP sensor retaining bolts and the TP sensor.

### Installation Procedure



1. With the throttle valve closed, position the TP sensor on the throttle shaft. Align the TP sensor with the bolt holes.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the TP sensor retaining bolts.

#### **Tighten**

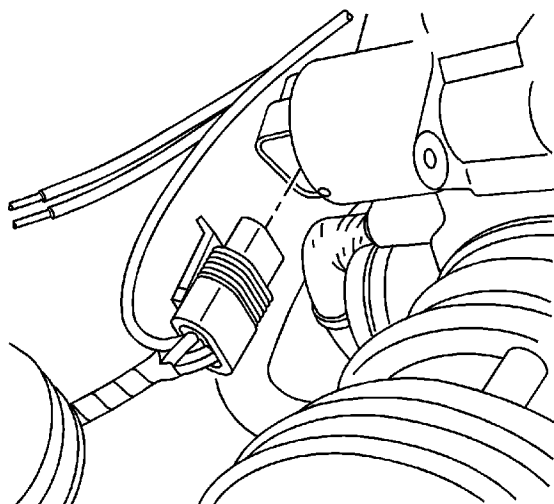
Tighten the throttle position sensor retaining bolts to 2 N·m (18 lb in).

3. Connect the TP sensor connector.
4. Connect the negative battery cable.

## Idle Air Control Valve Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



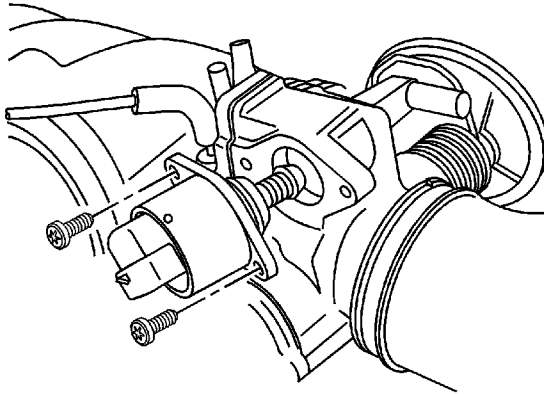
1. Disconnect the negative battery cable.
2. Disconnect the idle air control (IAC) valve connector.

**Caution:**

- Do Not push or pull on the IAC valve pintle on IAC valves that have been in service. The force required to move the pintle may damage the threads on the worm drive.
- Do Not soak the IAC valve in any liquid cleaner or solvent, as damage may result.

3. Remove the IAC valve retaining bolts.
4. Remove the IAC valve.
5. Clean the IAC valve O-ring seal area, the pintle valve seat and the air passage with a suitable fuel system cleaner. Do not use methyl ethyl ketone.

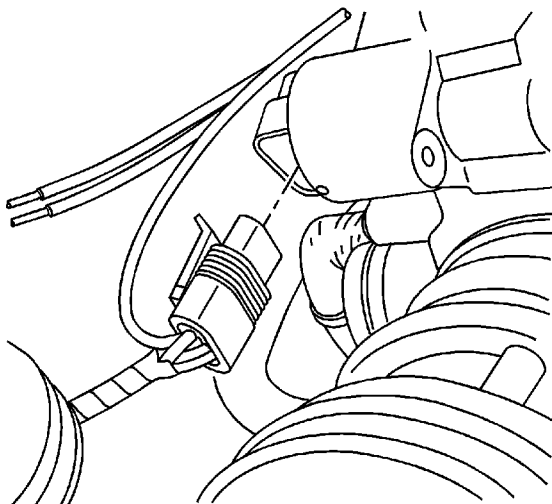
### Installation Procedure



**Note:** If installing a new IAC valve, be sure to replace it with an identical part. The IAC valve pintle shape and diameter are designed for the specific application. Measure the distance between the tip of the IAC valve pintle and the mounting flange. If the distance is greater than 28 mm (1.1 in), use finger pressure to slowly retract the pintle. The force required to retract the pintle will not damage the IAC valve. The purpose of the 28 mm (1.1 in) setting is to prevent the IAC pintle from bottoming out on the pintle seat. This 28 mm (1.1 in) setting is also an adequate setting for controlled idle on a restart.

1. Lubricate a new O-ring with engine oil. Install the new O-ring onto the valve.
2. Install the IAC valve into the throttle body.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.





3. Install the IAC valve retaining bolts.

**Tighten**

Tighten the idle air control valve retaining bolts to 3 N·m (27 lb in).

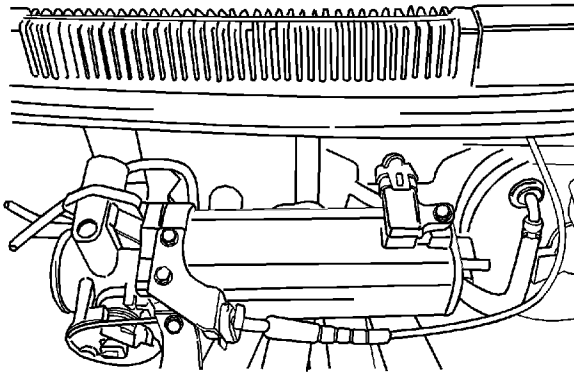
4. Connect the IAC valve connector.
5. Connect the negative battery cable.
6. Start the engine and check for the proper idle speed.



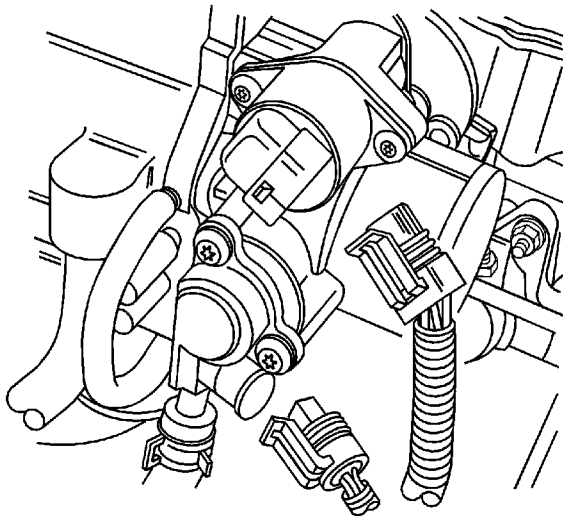
## Throttle Body Assembly Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

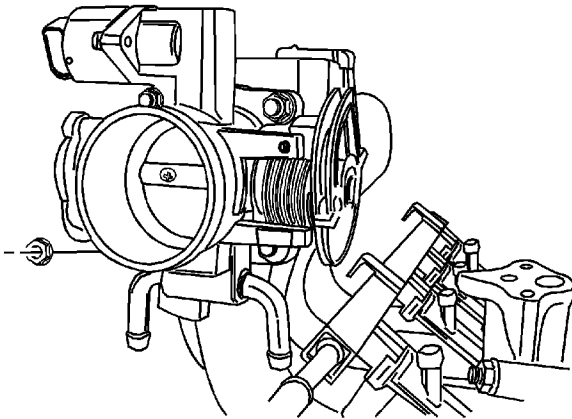


1. Disconnect the negative battery cable.
2. Remove the air intake tube from the throttle body.
3. Disconnect the throttle cables by opening the throttle and moving the cable through the release slot.



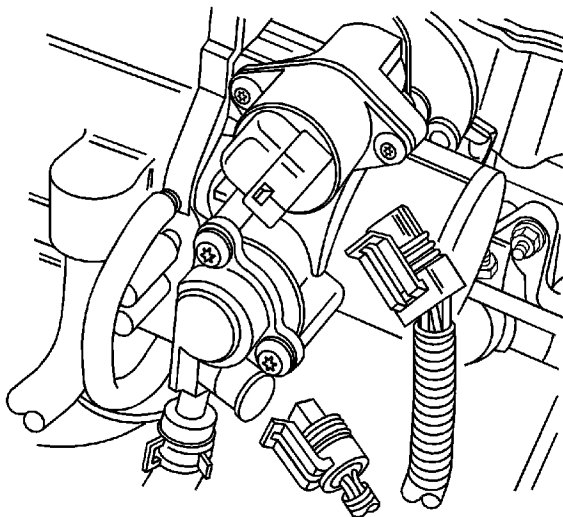


4. Disconnect the vacuum hoses from the throttle body.
5. Disconnect the throttle position (TP) sensor and the idle air control valve connectors.



6. Remove the coolant hoses from the throttle body.
7. Remove the throttle body retaining bolts.
8. Remove the throttle body and discard the gasket.
9. Remove the TP sensor. Refer to [Throttle Position Sensor Replacement](#).
10. Remove the idle air control (IAC) valve. Refer to [Idle Air Control Valve Replacement](#).

## **Installation Procedure**





**Caution:** Use care when cleaning the old gasket from the aluminum surfaces in order to prevent damage to the sealing surfaces.

1. Clean the gasket mating surface on the intake manifold.

**Caution:** Do not subject a throttle body assembly which contains the following components to an immersion cleaner or a strong solvent:

- Throttle position (TP) sensor
- Idle air control (IAC) valve
- Sealed throttle shaft bearings

The cleaners will damage the electric components or sensors.

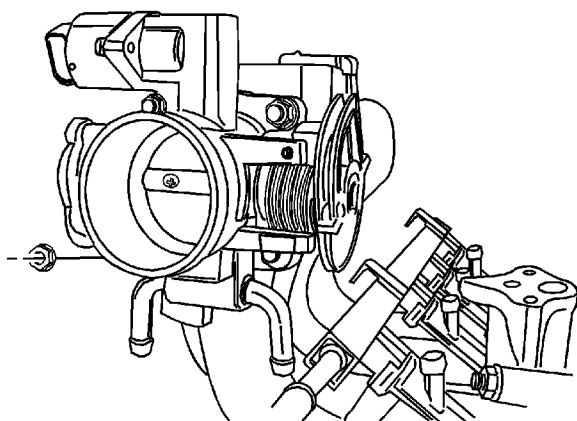
The cleaners will damage some of these components that contain seals or O-rings.

Solvents can wash away or break down the grease used on non-serviceable throttle shaft bearings.

Never use a wire brush or scraper to clean the throttle body. A wire brush or sharp tools may damage the throttle body components.

Do not use a cleaner that contains methyl ethyl ketone. This extremely strong solvent may damage components and is not necessary for this type of cleaning.

2. Clean the throttle body.
3. Install the TP sensor. Refer to [Throttle Position Sensor Replacement](#).
4. Install the IAC valve. Refer to [Idle Air Control Valve Replacement](#).



5. Install the throttle body assembly with a new gasket to the intake manifold.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

6. Install the throttle body retaining bolts.

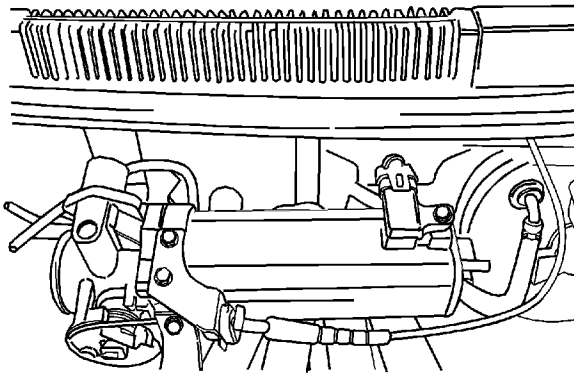
**Tighten**

Tighten the throttle body retaining bolts to 15 N·m (11 lb ft).

7. Install the coolant hoses.
8. Connect the vacuum hoses to the throttle body.

**Note:** Make sure the throttle control cables do not hold the throttle open. With the engine OFF, check to see that the accelerator pedal is free.

9. Connect the throttle cables.



10. Install the air intake tube.
11. Connect the TP sensor connector and the IAC valve connector.
12. Connect the negative battery cable.
13. Fill the cooling system.

## Fuel Pressure Relief

**Warning:** Refer to [Relieving Fuel Pressure Warning](#) in the Preface section.

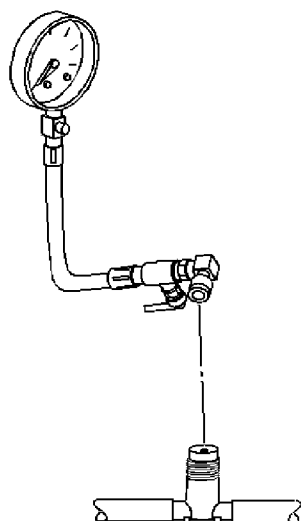
1. Remove the fuel cap.
2. Remove the fuel pump fuse EF10 from the engine fuse box.
3. Start the engine and allow the engine to stall.
4. Crank the engine for an additional 10 seconds.

## Fuel Pressure Gage Installation and Removal

### Installation Procedure

**Warning:** Refer to [Gasoline/Gasoline Vapors Warning](#) in the Preface section.

1. Remove the left fuel rail cover.



**Warning:** Wrap a shop towel around the fuel pressure connection in order to reduce the risk of fire and personal injury. The towel will absorb any fuel leakage that occurs during the connection of the fuel pressure gage. Place the towel in an approved container when the connection of the fuel pressure gage is complete.

**Caution:** Clean all of the following areas before performing any disconnections in order to avoid possible contamination in the system:

- The fuel pipe connections
- The hose connections
- The areas surrounding the connections

2. Install the fuel pressure gage to the fuel pressure service connection, located on the fuel rail.
3. Turn ON the ignition.

**Warning:** Do not drain the fuel into an open container. Never store the fuel in an open container due to the possibility of a fire or an explosion.

4. Place the bleed hose of the fuel pressure gage into an approved gasoline container.
5. Open the bleed valve on the fuel pressure gage in order to bleed the air from the fuel pressure gage.
6. Command the fuel pump ON with a scan tool.

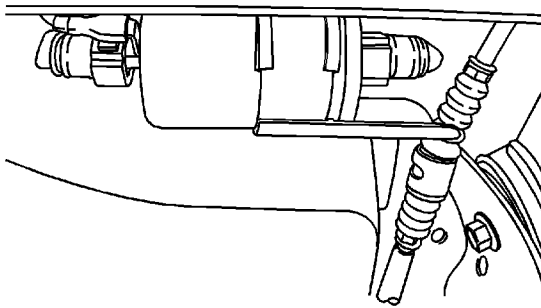
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7. Close the bleed valve on the fuel pressure gage.
8. Inspect for fuel leaks.

## Fuel Filter Replacement

### Removal Procedure

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.

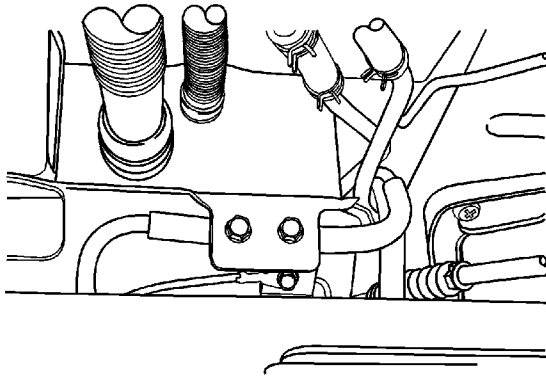


1. Relieve the fuel system pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

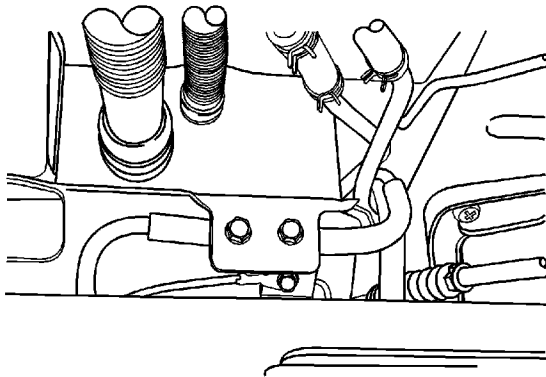
2. Disconnect the negative battery cable.
3. Disconnect the inlet/outlet fuel lines by moving the line connector lock forward and pulling the hose off of the fuel filter tube.
4. Disconnect the fuel filter ground.





5. Remove the fuel filter bracket bolts.
6. Pull the fuel filter out of the retaining clamp.

## Installation Procedure



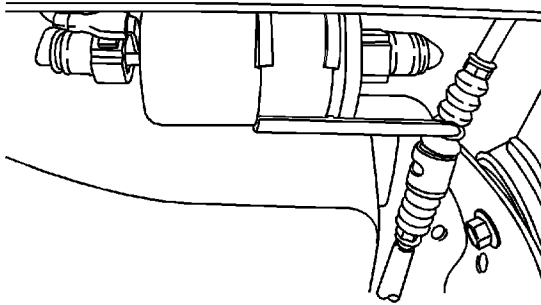
1. Install the new fuel filter into the retaining clamp. Note the flow direction.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the fuel filter bracket bolts.

**Tighten**

Tighten the fuel filter bracket bolts to 4 N·m (35 lb ft).



3. Connect the inlet/outlet lines. Secure the lines with the connector lock.
4. Connect the negative battery cable.
5. Perform a leak test of the fuel filter.

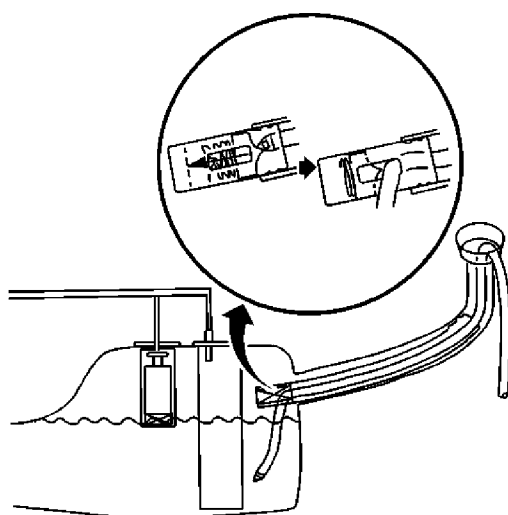
## Fuel Tank Draining

### Special Tools

- [J 42960-2](#) Fuel Flapper Door Holder
- [J 42960-1](#) Fuel Drain Hose

**Warning:** Never drain or store fuel in an open container. Always use an approved fuel storage container in order to reduce the chance of fire or explosion.

**Warning:** Place a dry chemical (Class B) fire extinguisher nearby before performing any on-vehicle service procedures. Failure to follow these precautions may result in personal injury.



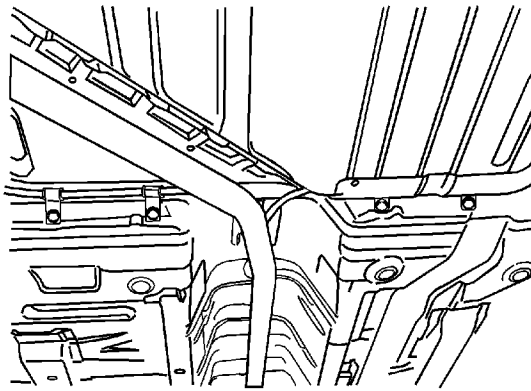
1. Remove the fuel filler cap.
2. Install the [J 42960-2](#) into the fuel fill pipe in order to hold the door open.
3. Insert the [J 42960-1](#) into the fuel tank until the hose reaches the bottom of the fuel tank.
4. Use an air operated pump device in order to drain as much fuel through the fuel fill pipe as possible.

## Fuel Tank Replacement

### Removal Procedure

**Warning:** Refer to [Gasoline/Gasoline Vapors Warning](#) in the Preface section.

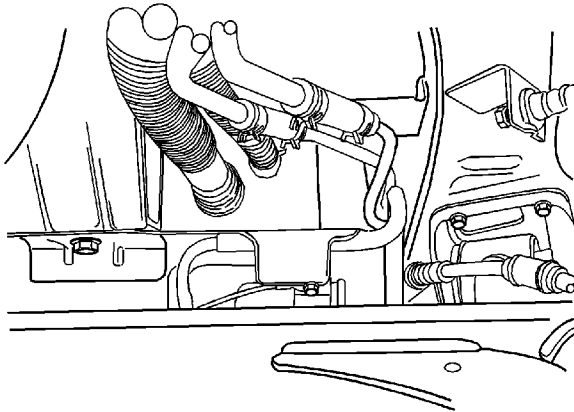
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



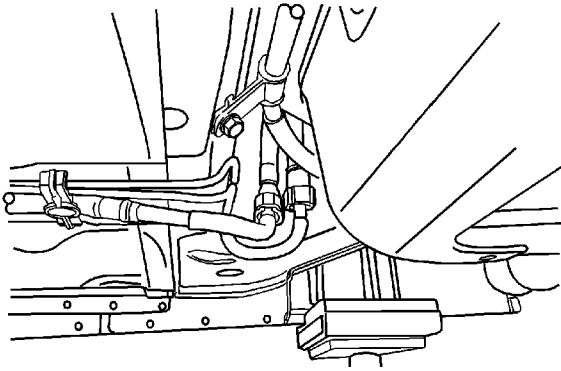
1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

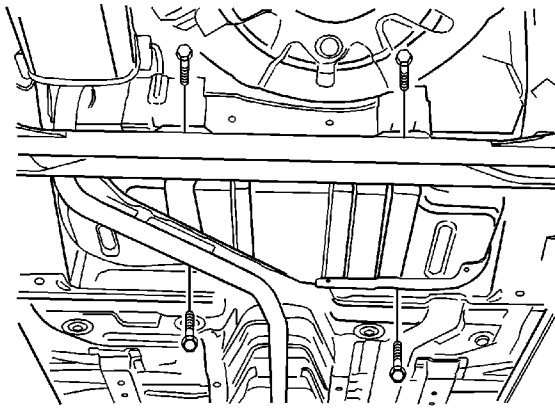
2. Disconnect the negative battery cable.
3. Drain the fuel tank.
4. Disconnect the parking brake cable retainer clamps and the support along the fuel tank to provide clearance for the tank.



5. Remove the fuel tank filler tube clamp at the fuel tank.
6. Disconnect the fuel tank filler tube.
7. Disconnect the fuel tank filler tube at the fuel tank.
8. Disconnect the canister vapor tube at control valve vapor tube.

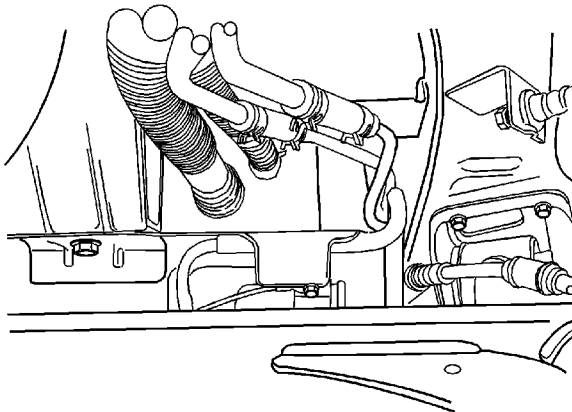


9. Disconnect the fuel pump harness connector at the right rear corner of the fuel tank.
10. Disconnect the fuel inlet line near the right front of the fuel tank.
11. Disconnect the wiring harness clips and the fuel line clips as needed.



12. Support the fuel tank.
13. Remove the fuel tank retaining bolts.
14. Carefully lower the fuel tank.
15. Remove the fuel tank.
16. Transfer any parts as needed.

## Installation Procedure



1. Raise the fuel tank into position.

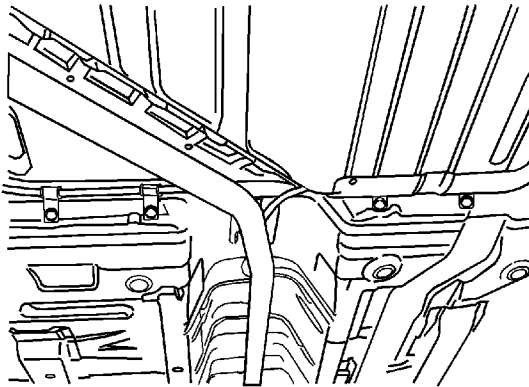
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the fuel tank mounting bolts.

**Tighten**

Tighten the fuel tank retaining bolts to 20 N·m (15 lb ft).

3. Connect the fuel outlet line.
4. Connect the wiring harness clips and the fuel line clips as needed.
5. Connect the fuel pump electrical connector.
6. Connect the fuel vapor line.
7. Connect the fuel tank filler tube and fuel tank vent tube.
8. Install the fuel tank filler tube clamp at the fuel tank.



9. Install the parking brake cable retainer clamps and the support.

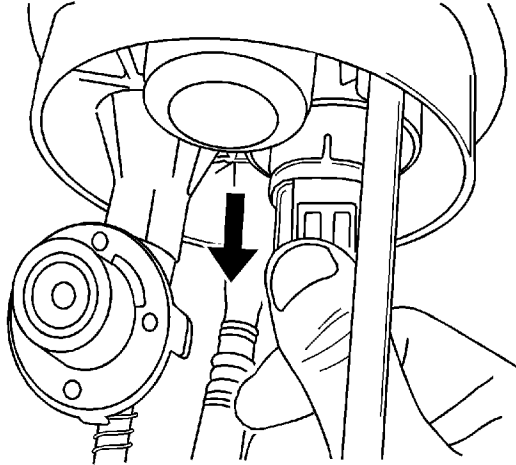
**Tighten**

Tighten the parking brake cable retainer clamps to 10 N·m (89 lb in).

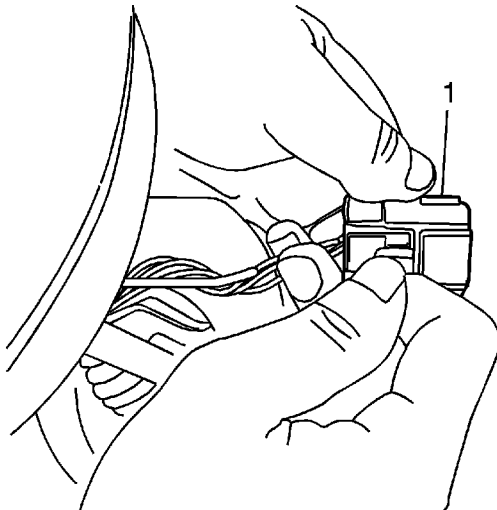
10. Connect the negative battery cable.
11. Fill the fuel tank.
12. Perform a leak check of the fuel tank and the fuel line connections.

## Fuel Sender Assembly Replacement

### Removal Procedure



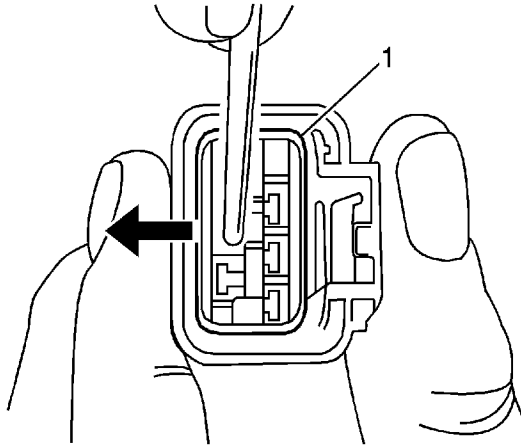
1. Remove the fuel pump. Refer to [Fuel Pump Replacement](#).
2. Disconnect the insulator connector.



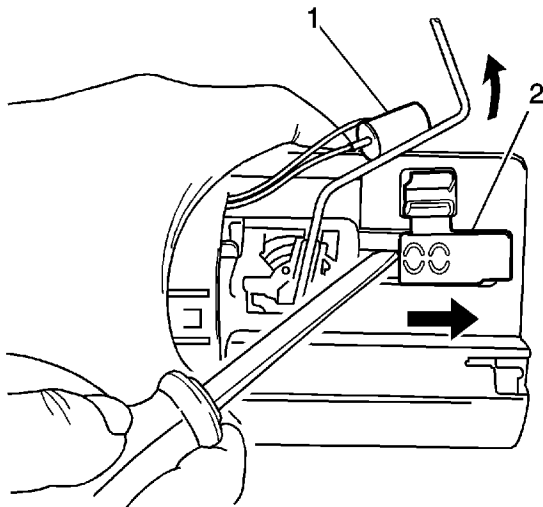
3. Push the terminal wedge (1) in the insulator connector.

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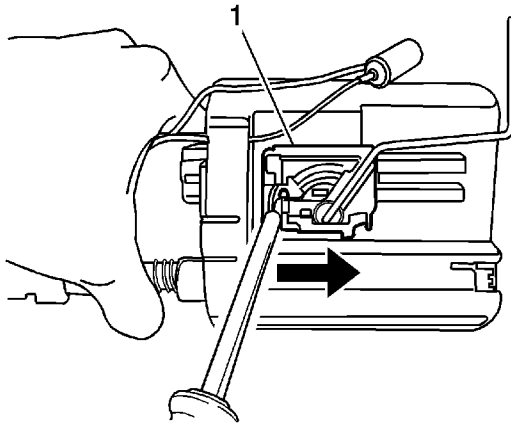




4. Push the wedge (1) outside and then pull the wires to disconnect from the insulator.

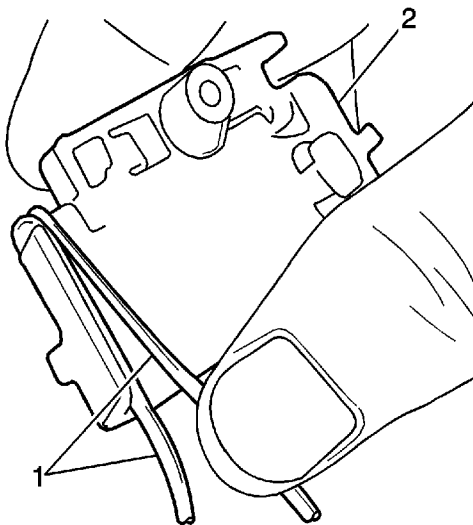


5. Remove the fuel level sensor (1) from the sender housing (2).

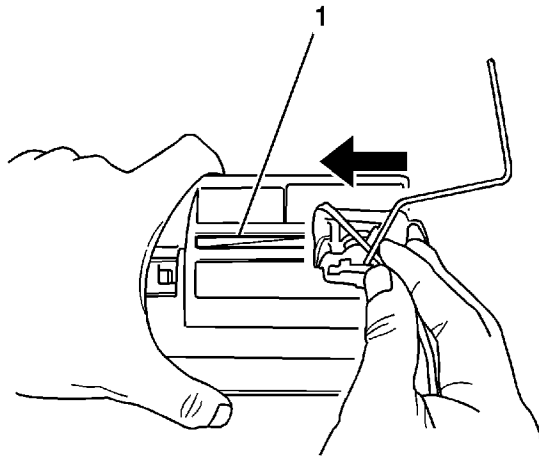


6. Remove the fuel sender assembly (1).

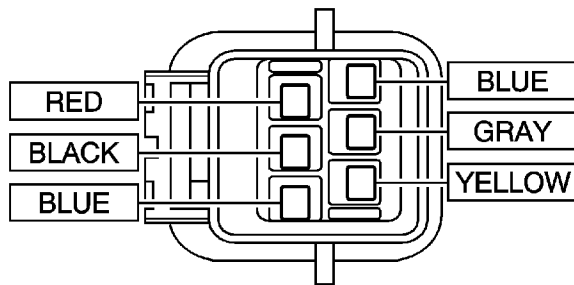
## Installation Procedure



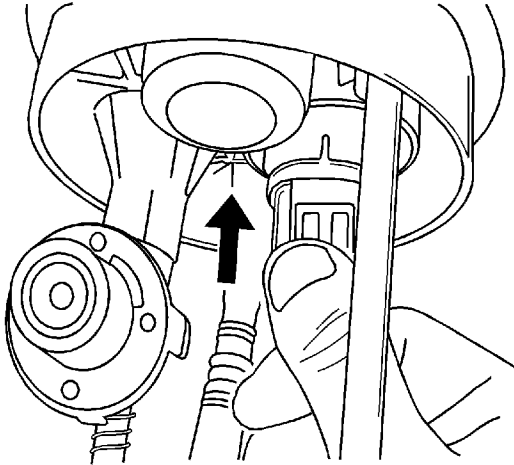
1. Wind the wires (1) to the sender assembly (2)..



2. Install the sender assembly onto the fuel pump assembly (1).
3. Install the fuel level sensor onto the sender housing.



4. Connect the wire into the insulator connector.

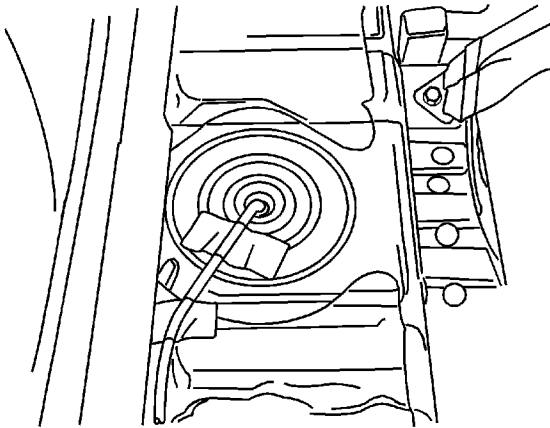


5. Connect the insulator connector.
6. Install the fuel pump. Refer to [Fuel Pump Replacement](#).

## Fuel Pump Replacement

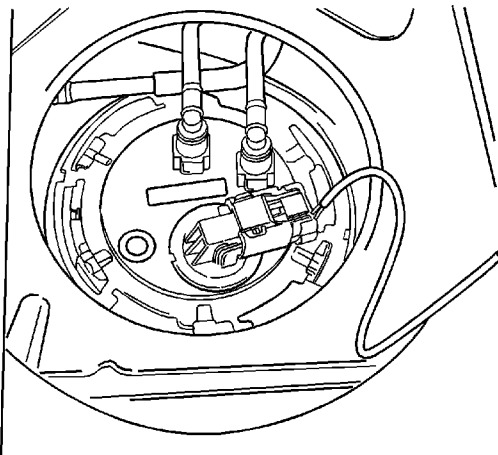
### Removal Procedure

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



1. Relieve the fuel system pressure. Refer to [Fuel Pressure Relief](#).

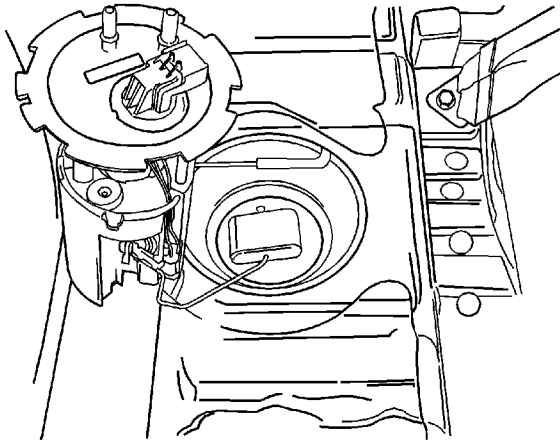
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.





2. Disconnect the negative battery cable.
3. Remove the rear seat.
4. Remove the fuel pump access cover.
5. Disconnect the electrical connector at the fuel pump assembly.
6. Disconnect the fuel outlet line.
7. Turn the lock ring counterclockwise to clear the tank tabs.
8. Remove the fuel pump assembly from the tank.
9. Remove and discard the gasket.

## **Installation Procedure**

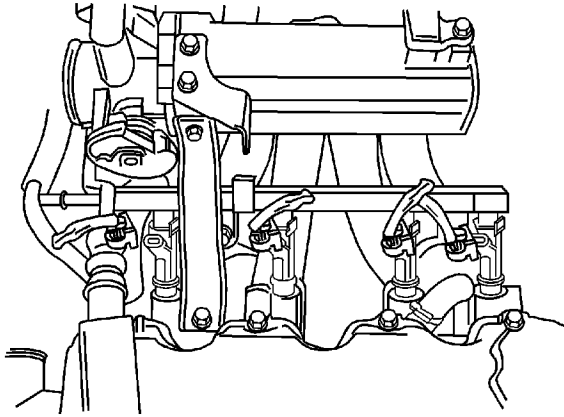


1. Clean the gasket mating surface on the fuel tank.
2. Position the new gasket in place.
3. Install the fuel pump into the fuel tank in the same location as removed for ease of line and connector installation.
4. Position the lock ring in place and turn it clockwise until it contacts the tank stop.
5. Connect the fuel pump assembly connector.
6. Install the fuel pump outlet line.
7. Install the pump access cover.
8. Connect the negative battery cable.
9. Perform an operational check of the fuel pump.
10. Install the rear seat.

## Fuel Injection Fuel Rail Assembly Replacement

### Removal Procedure

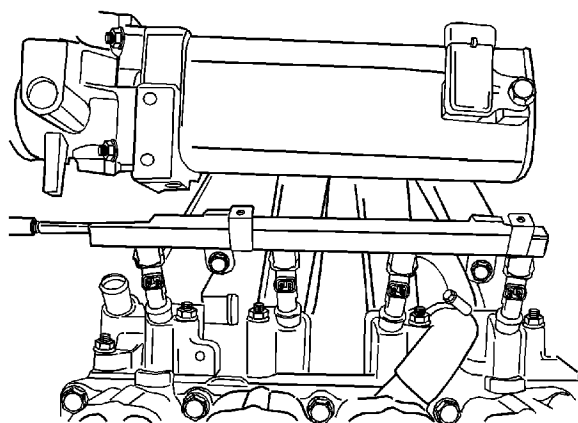
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



1. Relieve the fuel system pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the negative battery cable.
3. Disconnect the fuel injector harness connectors.



4. Remove the fuel inlet line.
5. Remove the fuel rail mounting bolts.

**Warning:** Refer to [Safety Goggles and Fuel Warning](#) in the Preface section.

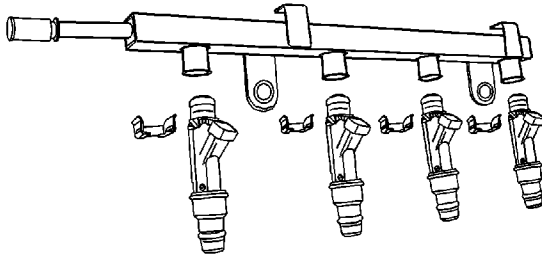
**Caution:**

- Use care when servicing the fuel system components, especially the fuel injector electrical connectors, the fuel injector tips, and the injector O-rings. Plug the inlet and the outlet ports of the fuel rail in order to prevent contamination.
- Do not use compressed air to clean the fuel rail assembly as this may damage the fuel rail components.
- Do not immerse the fuel rail assembly in a solvent bath in order to prevent damage to the fuel rail assembly.

**Note:** If an injector becomes separated from the rail and remains in the cylinder head, replace the injector O-ring seals and the retaining clip.

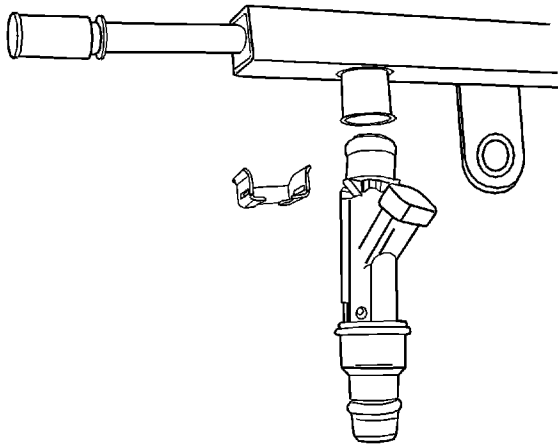
6. Remove the fuel rail with the fuel injectors attached.





7. Remove the fuel injector retainer clips.
8. Remove the fuel injectors by pulling down and out.
9. Discard the fuel injector O-rings.

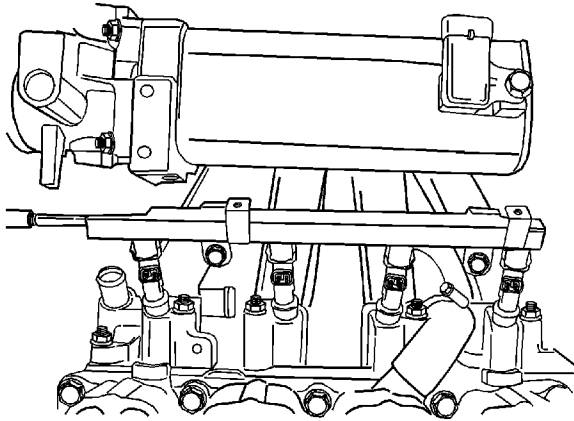
## Installation Procedure



**Note:** Different injectors are calibrated for different flow rates. When ordering new fuel injectors, be certain to order the identical part number that is inscribed on the old injector.

1. Lubricate the new fuel injector O-rings with engine oil. Install the new O-rings on the fuel injectors.

2. Install the fuel injectors into the fuel rail sockets with the fuel injector terminals facing outward.
3. Install the fuel injector retainer clips onto the fuel injectors and the fuel rail ledge.
4. Make sure that the clip is parallel to the fuel injector harness connector.



5. Install the fuel rail assembly into the cylinder head.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

6. Install the fuel rail mounting bolts.

#### **Tighten**

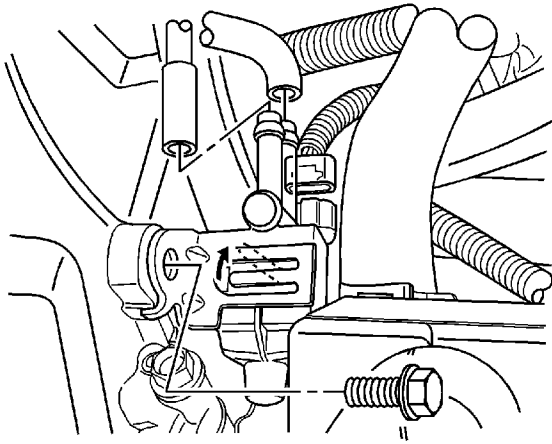
Tighten the fuel rail mounting bolts to 25 N·m (18 lb ft).

7. Connect the fuel inlet hose.
8. Connect the fuel injector harness connectors. Rotate each fuel injector as required to avoid stretching the wire harness.
9. Connect the negative battery cable.
10. Perform a leak check of the fuel rail and fuel injectors.

# Evaporative Emission Canister Purge Solenoid Valve Replacement

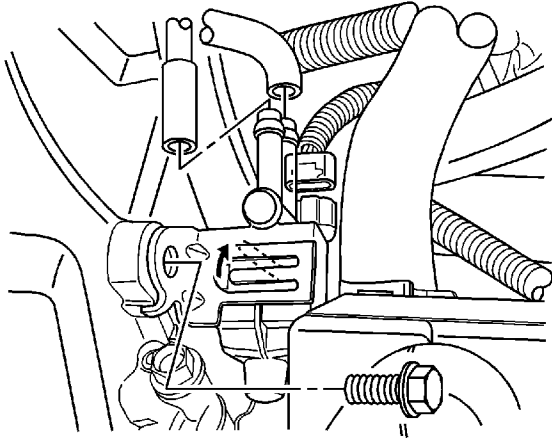
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the evaporative emission (EVAP) canister purge solenoid connector.
3. Disconnect the vacuum hoses from the EVAP canister purge solenoid.
4. Remove the EVAP canister purge solenoid bracket bolt from the intake manifold.
5. Unclip the EVAP canister purge solenoid from the mounting bracket.

## Installation Procedure



1. Attach the EVAP canister purge solenoid to the mounting bracket.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the EVAP canister purge solenoid and the mounting bracket to the intake manifold with the bracket bolt.

### **Tighten**

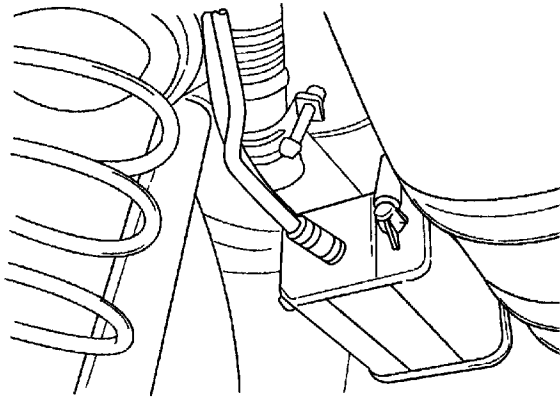
Tighten the EVAP canister purge solenoid bracket bolt to 5 N·m (44 lb in).

3. Connect the vacuum hoses to the EVAP canister purge solenoid.
4. Connect the EVAP canister purge solenoid connector.
5. Connect the negative battery cable.

## Evaporative Emission Canister Replacement

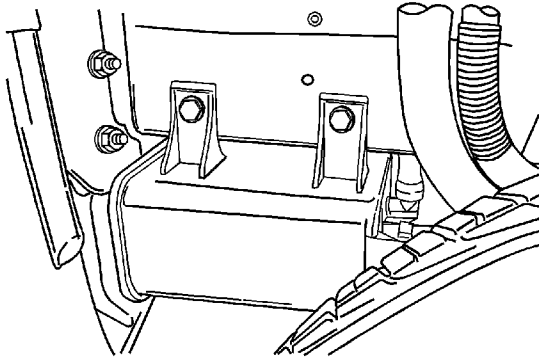
### Removal Procedure

**Warning:** Refer to [Fuel Vapors in Evaporative Emission Components Warning](#) in the Preface section.



1. Disconnect the evaporative (EVAP) emission canister fuel vapor hoses.
2. Remove the bolt securing the EVAP emission canister flange to the vehicle.
3. Slide the EVAP emission canister out of the track holder.
4. Remove the EVAP emission canister.

### Installation Procedure



1. Insert the EVAP emission canister into the track and slide it into position.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the EVAP emission canister flange bolt.

**Tighten**

Tighten the evaporative emission canister flange bolt to 20 N·m (15 lb ft).

3. Connect the canister fuel vapor hoses.

## Spark Plug Wire Inspection

Spark plug wire integrity is vital for proper engine operation. A thorough inspection will be necessary to accurately identify conditions that may affect engine operation. Inspect for the following conditions:

1. Correct routing of the spark plug wires. Incorrect routing may cause cross-firing.
2. Any signs of cracks or splits in the wires.
3. Inspect each boot for the following conditions:
  - Tearing
  - Piercing
  - Arcing
  - Carbon tracking
  - Corroded terminal

If corrosion, carbon tracking, or arcing are indicated on a spark plug wire boot or on a terminal, replace the wire and the component connected to the wire.

## Spark Plug Wire Replacement

### Removal Procedure

1. Turn OFF the ignition.
2. Disconnect the spark plug wire at each spark plug.
  - Twist each spark plug boot 1/2 turn before removing.
  - Pull only on the boot or use a tool designed for this purpose in order to remove the wire from each spark plug.
3. Disconnect the spark plug wire from the coil.
  - Twist each spark plug boot 1/2 turn before removing.
  - Pull only on the boot or use a tool designed for this purpose in order to remove the wires from the coil.

### Installation Procedure

1. Install the spark plug wire on the coil.
2. Install the spark plug wire at each spark plug.
3. Inspect the wires for proper installation:
  - Push down on each boot in order to inspect the seating.
  - Reinstall any loose boot.
  - Wire routing must be kept intact during service and followed exactly when wires have been disconnected or when replacement of the wires is necessary. Failure to route the wires correctly can lead to radio interference and crossfire of the plugs, or shorting of the leads to the ground.
  - Any time the spark plug wires or boots are installed on the spark plugs, new dielectric grease needs to be applied inside the boot.

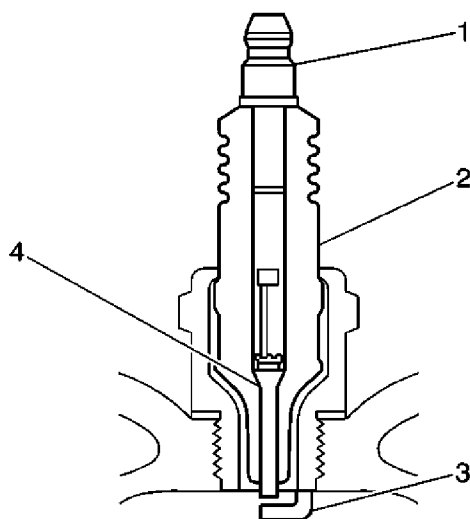


## Spark Plug Inspection

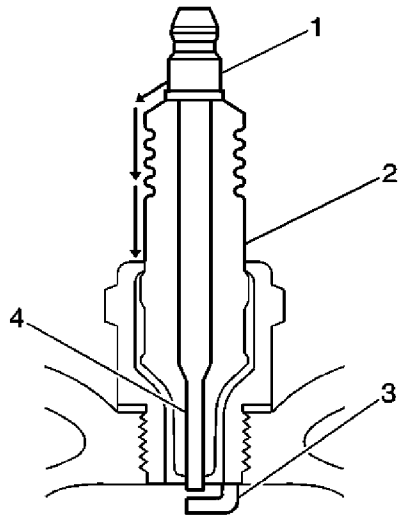
### Spark Plug Usage

- Ensure that the correct spark plug is installed. An incorrect spark plug causes driveability conditions.
- Ensure that the spark plug has the correct heat range. An incorrect heat range causes the following conditions:
  - Spark plug fouling--Colder plug
  - Pre-ignition causing spark plug and/or engine damage--Hotter plug

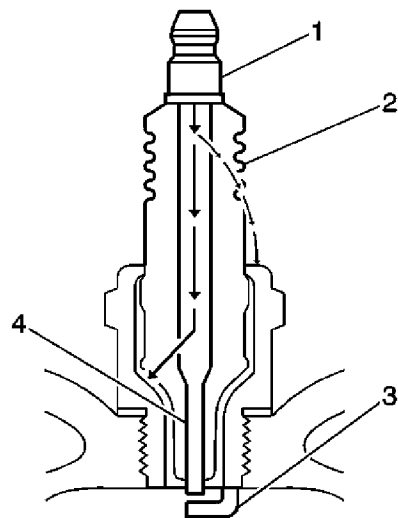
### Spark Plug Inspection



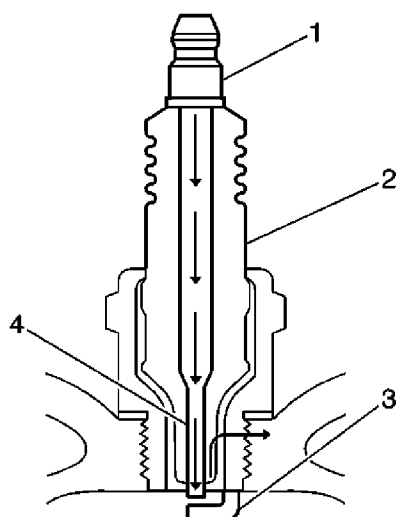
1. Inspect the terminal post (1) for damage.
  - Inspect for a bent or broken terminal post (1).
  - Test for a loose terminal post (1) by twisting and pulling the post. The terminal post (1) should NOT move.



2. Inspect the insulator (2) for flashover or carbon tracking, soot. This is caused by the electrical charge traveling across the insulator (2) between the terminal post (1) and ground. Inspect for the following conditions:
- Inspect the spark plug boot for damage.
  - Inspect the spark plug recess area of the cylinder head for moisture, such as oil, coolant, or water. A spark plug boot that is saturated causes arcing to ground.



3. Inspect the insulator (2) for cracks. All or part of the electrical charge may arc through the crack instead of the electrodes (3, 4).



4. Inspect (3) for evidence of improper arcing.
  - Measure the gap between the center electrode (4) and the side electrode (3) terminals. An excessively wide electrode gap can prevent correct spark plug operation.
  - Inspect for the correct spark plug torque. Insufficient torque can prevent correct spark plug operation. An over torqued spark plug, causes the insulator (2) to crack.
  - Inspect for signs of tracking that occurred near the insulator tip instead of the center electrode (4).
  - Inspect for a broken or worn side electrode (3).
  - Inspect for a broken, worn, or loose center electrode (4) by shaking the spark plug.
    - A rattling sound indicates internal damage.
    - A loose center electrode (4) reduces the spark intensity.
  - Inspect for bridged electrodes (3, 4). Deposits on the electrodes (3, 4) reduce or eliminates the gap.
  - Inspect for worn or missing platinum pads on the electrodes (3, 4), if equipped.
  - Inspect for excessive fouling.
5. Inspect the spark plug recess area of the cylinder head for debris. Dirty or damaged threads can cause the spark plug not to seat correctly during installation.

## Spark Plug Visual Inspection

- Normal operation--Brown to grayish-tan with small amounts of white powdery deposits are normal combustion by-products from fuels with additives.
- Carbon fouled--Dry, fluffy black carbon, or soot caused by the following conditions:
  - Rich fuel mixtures
- Leaking fuel injectors
- Excessive fuel pressure
- Restricted air filter element
- Incorrect combustion

- Reduced ignition system voltage output
- Weak coils
- Worn ignition wires
- Incorrect spark plug gap
  - Excessive idling or slow speeds under light loads can keep spark plug temperatures so low that normal combustion deposits may not burn off.
- Deposit fouling--Oil, coolant, or additives that include substances such as silicone, very white coating, reduces the spark intensity. Most powdery deposits will not effect spark intensity unless they form into a glazing over the electrode.

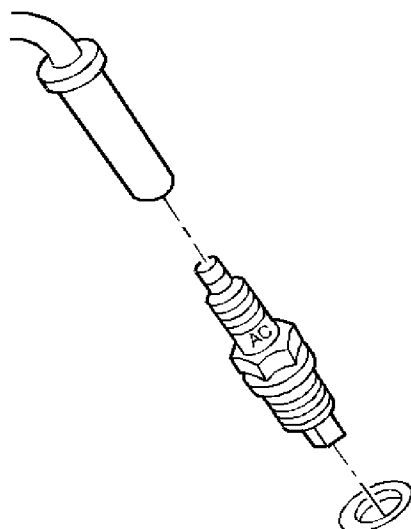
## Spark Plug Replacement

### Removal Procedure

**Caution:** Observe the following service precautions:

- Allow the engine to cool before removing the spark plugs. Attempting to remove spark plugs from a hot engine can cause the spark plugs to seize. This can damage the cylinder head threads.
- Clean the spark plug recess area before removing the spark plug. Failure to do so can result in engine damage due to dirt or foreign material entering the cylinder head, or in contamination of the cylinder head threads. Contaminated threads may prevent proper seating of the new spark plug.
- Use only the spark plugs specified for use in the vehicle. Do not install spark plugs that are either hotter or colder than those specified for the vehicle. Installing spark plugs of another type can severely damage the engine.

1. Turn OFF the ignition.



2. Remove the spark plug wires from the spark plugs. Refer to [Spark Plug Wire Replacement](#).
3. Remove the spark plugs from the engine.

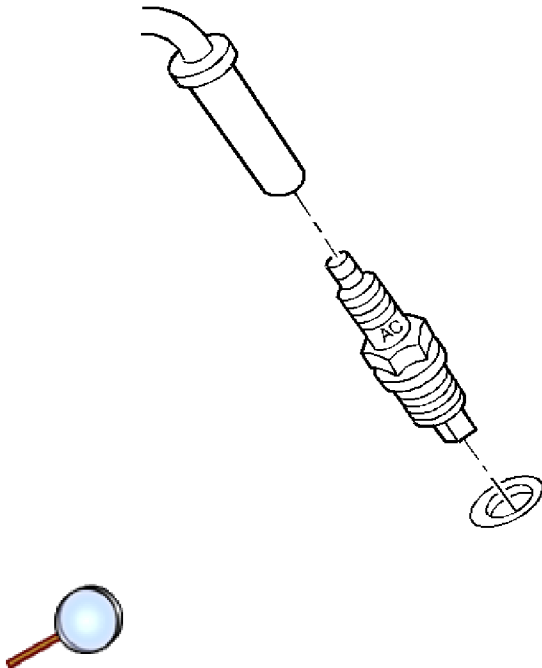
### Installation Procedure

**Caution:** It is important to check the gap of all new and reconditioned spark plugs before installation. Pre-set gaps may have changed during handling. Use a round wire feeler gauge to be sure of an accurate check, particularly on used plugs. Installing plugs with the wrong gap can cause poor engine performance and may even damage the engine.

1. Gap the spark plugs to the specifications.

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**Caution:** Refer to [Fastener Caution](#) in the Preface section.



**Caution:** Be sure plug threads smoothly into cylinder head and is fully seated. Use a thread chaser if necessary to clean threads in cylinder head. Cross-threading or failing to fully seat spark plug can cause overheating of plug, exhaust blow-by, or thread damage. Follow the recommended torque specifications carefully. Over or under-tightening can also cause severe damage to engine or spark plug.

2. Install the spark plugs to the engine.

**Tighten**

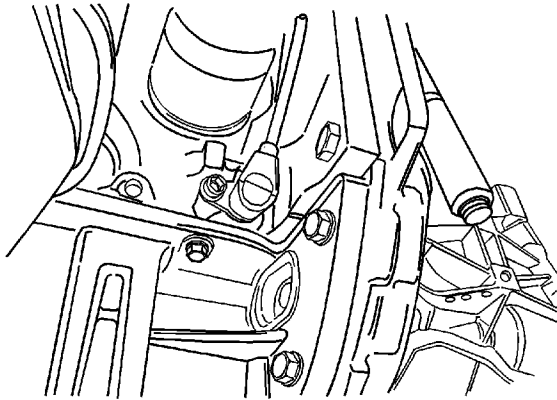
Tighten the spark plugs to 25 N·m (18 lb ft).

3. Install the spark plug wires to the spark plugs. Refer to [Spark Plug Wire Replacement](#).

## Crankshaft Position Sensor Replacement

### Removal Procedure

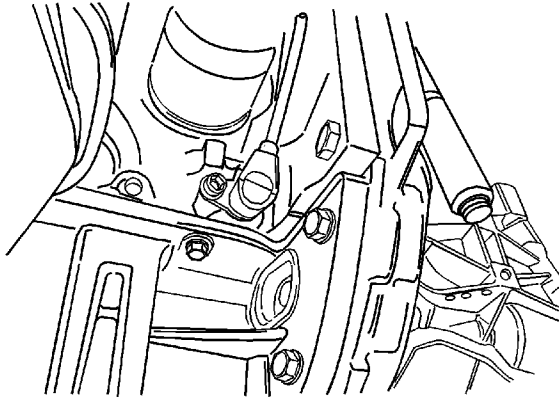
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the crankshaft position (CKP) sensor connector at the frame bracket.
3. Remove the wiring tie straps as needed.
4. Remove the CKP sensor retaining bolt.
5. Remove the CKP sensor.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the CKP sensor with the retaining bolt.

**Tighten**

Tighten the crankshaft position sensor retaining bolt to 6.5 N·m (58 lb in).

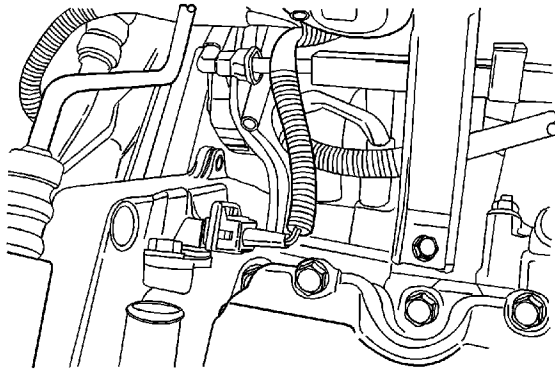
2. Connect the CKP sensor connector at the frame bracket.
3. Secure the wire with the tie straps as needed.
4. Connect the negative battery cable.



## Camshaft Position Sensor Replacement

### Removal Procedure

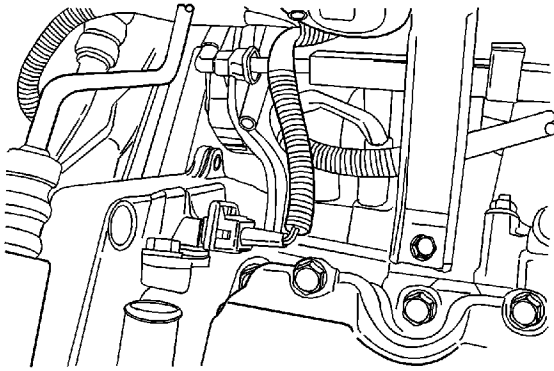
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the sensor electrical connector.
3. Remove the camshaft position (CMP) sensor bolts and sensor.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the CMP sensor and bolts.

**Tighten**

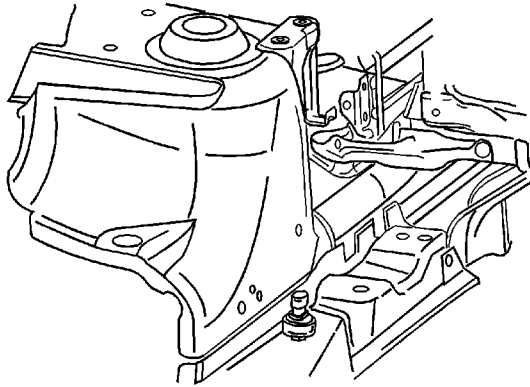
Tighten the camshaft position bolts to 12 N·m (106 lb in).

2. Connect the sensor electrical connector.
3. Connect the negative battery cable.

## Rough Road Sensor Replacement

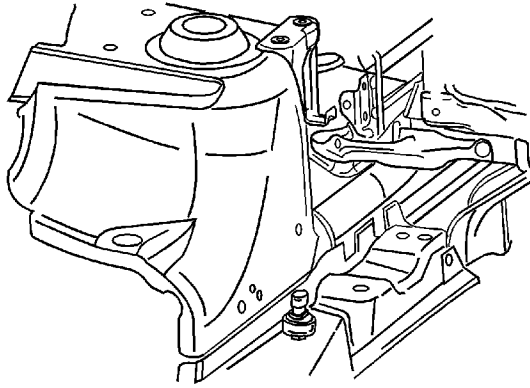
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the rough road sensor electrical connector and remove the rough road sensor.

### Installation Procedure



1. Install the rough road sensor and connect the electrical connector.
2. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Temperature Versus Resistance

°C	°F	ECT Ohms	IAT Ohms
Temperature vs Resistance Values (Approximate)			
100	212	177	187
90	194	241	246
80	176	332	327
70	158	467	441
60	140	667	603
50	122	973	837
45	113	1188	991
40	104	1459	1180
35	95	1802	1412
30	86	2238	1700
25	77	2796	2055
20	68	3520	2500
15	59	4450	3055
10	50	5670	3760
5	41	7280	4651
0	32	9420	5800
-5	23	12300	7273
-10	14	16180	9200
-15	5	21450	9200
-20	-4	28680	15080
-30	-22	52700	25600
-40	-40	100700	45300

## Altitude Versus Barometric Pressure

Altitude Measured in Meters (m)	Altitude Measured in Feet (ft)	Barometric Pressure Measured in Kilopascals (kPa)
Determine your altitude by contacting a local weather station or by using another reference source.		
4 267	14,000	56-64
3 962	13,000	58-66
3 658	12,000	61-69
3 353	11,000	64-72
3 048	10,000	66-74
2 743	9,000	69-77
2 438	8,000	71-79
2 134	7,000	74-82
1 829	6,000	77-85
1 524	5,000	80-88
1 219	4,000	83-91
914	3,000	87-95
610	2,000	90-98
305	1,000	94-102
0	0 Sea Level	96-104
-305	-1,000	101-105

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Engine](#) | [Engine Controls and Fuel - 1.6L \(LXT\)](#)  
| [Specifications](#) | Document ID: 1640706

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## Ignition System Specifications

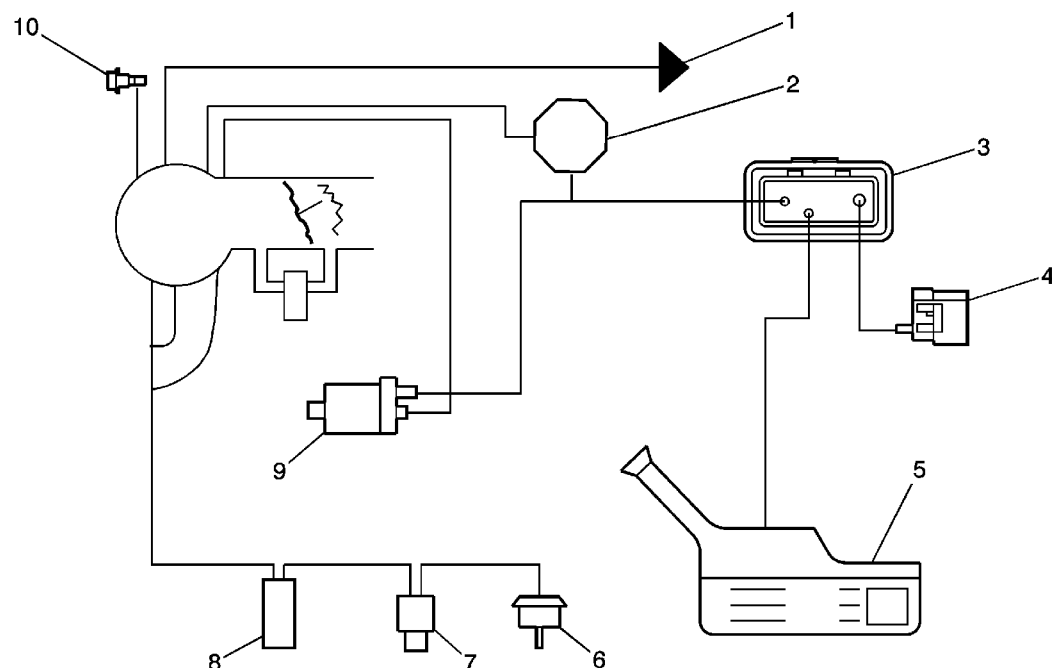
Application	Specification	
	Metric	English
Firing Order	1-3-4-2	
Spark Plug Wire Resistance	2,000-12,000 ohms	
Spark Plug Gap	1.0-1.1 mm	0.039-0.043 in
Spark Plug Torque	25 N·m	18 lb ft
Spark Plug Type	Woojin - BKR6E-11	

## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accessory Mounting Bracket Bolts	37 N·m	27 lb ft
Camshaft Position Sensor Bolts	12 N·m	106 lb in
Crankshaft Position Sensor Retaining Bolt	6.5 N·m	58 lb in
Electronic Ignition System Ignition Coil Retaining Bolts	10 N·m	89 lb in
Engine Control Module Bolts	4 N·m	35 lb in
Engine Coolant Temperature Sensor Bolt	20 N·m	15 lb ft
Evaporative Emission Canister Flange Bolt	20 N·m	15 lb ft
Evaporative Emission Canister Protective Cover	8 N·m	71 lb in
Evaporative Emission Canister Purge Solenoid Bracket Bolt	5 N·m	44 lb in
Evaporative Emission Vent Solenoid Bolt	8.5 N·m	75 lb in
Exhaust Gas Recirculation Valve Retaining Bolts	30 N·m	22 lb ft
Fuel Filter Mounting Bracket Assembly Bolt	4 N·m	35 lb in
Fuel Pressure Regulator Retaining Screw	12 N·m	106 lb in
Fuel Rail Retaining Bolts	25 N·m	18 lb ft
Fuel Tank Retaining Bolts	20 N·m	15 lb ft
Idle Air Control Valve Retaining Bolts	3 N·m	27 lb in
Knock Sensor Bolt	20 N·m	15 lb ft
Manifold Absolute Pressure Sensor Mounting Bracket Bolt	4 N·m	35 lb in
Manifold Absolute Pressure Sensor Retaining Bolts and Nuts	8 N·m	71 lb in
Oxygen Sensor Bolt	42 N·m	31 lb ft
Rear A/C Compressor Mounting Bracket Bolts	35 N·m	26 lb ft
Spark Plug Cover Bolts	3 N·m	27 lb in
Throttle Body Retaining Nuts	15 N·m	11 lb ft
Throttle Position Sensor Retaining Bolts	2 N·m	18 lb in
Variable Geometry Induction System Solenoid	10 N·m	89 lb in

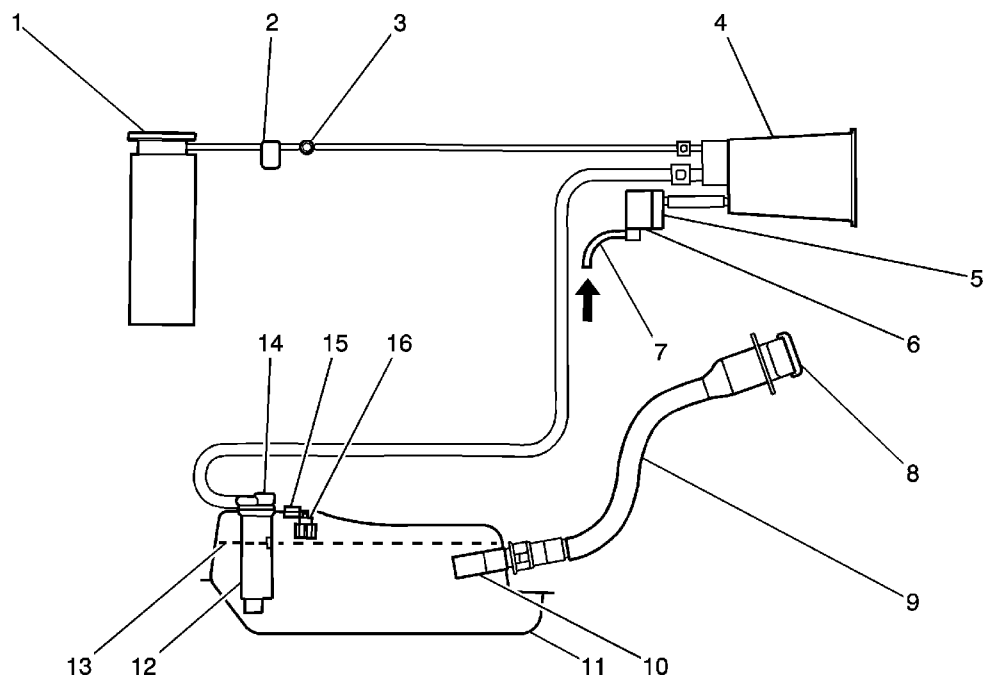


## Emission Hose Routing Diagram



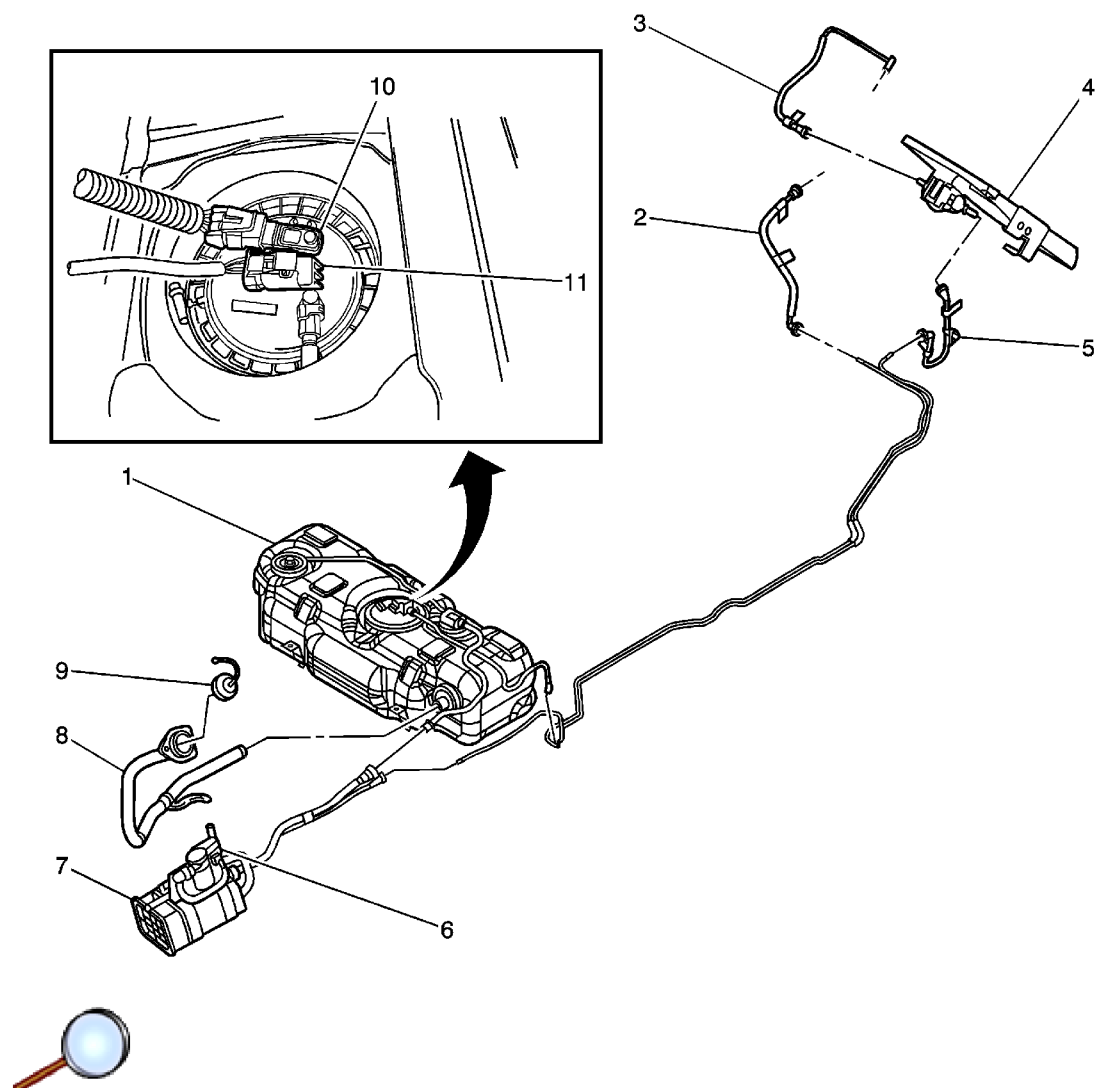
- (1) To HVAC
- (2) Vacuum Brake Booster
- (3) Evaporative Emissions (EVAP) Canister
- (4) EVAP Vent Solenoid
- (5) Fuel Tank
- (6) Intake Manifold Tuning Valve (IMTV) Vacuum Actuator/Variable Geometry Induction System (VGIS) Vacuum Actuator
- (7) IMTV Solenoid/VGIS Solenoid
- (8) IMTV Vacuum Reservoir/VGIS Vacuum Reservoir
- (9) EVAP Purge Solenoid
- (10) Manifold Absolute Pressure (MAP) Sensor

## Evaporative Emissions Hose Routing Diagram



- (1) Intake Manifold
- (2) Evaporative Emissions (EVAP) Canister Purge Solenoid Valve
- (3) Service Port
- (4) Evaporative Emissions (EVAP) Canister
- (5) Evaporative Emissions (EVAP) Canister Vent Solenoid Valve
- (6) Air Filter
- (7) Fresh Air Intake
- (8) Fuel Filler Cap
- (9) Fuel Filler Tube
- (10) Check Valve
- (11) Fuel Tank
- (12) Fuel Fill Vent Valve
- (13) Fuel Level at Shut-Off
- (14) Fuel Pressure Relief Valve
- (15) Fuel Tank Pressure Sensor
- (16) Rollover Valve

## Fuel Hose/Pipes Routing Diagram

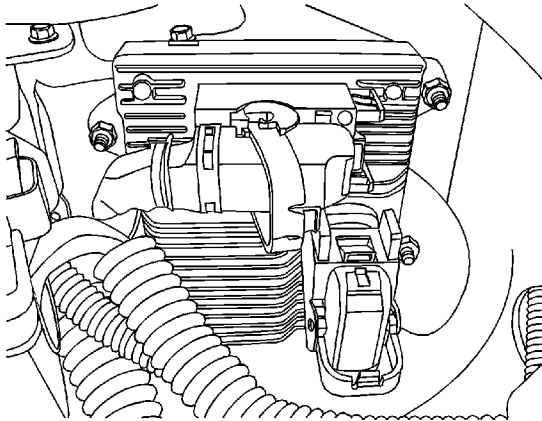


- (1) Fuel Tank
- (2) Fuel Line to Fuel Rail
- (3) EVAP Canister Purge Vacuum Line to Intake Manifold
- (4) EVAP Canister Purge Solenoid Valve
- (5) EVAP Service Port
- (6) EVAP Canister Vent Solenoid Valve
- (7) EVAP Canister
- (8) Fuel Fill Tube
- (9) Fuel Filler Cap
- (10) Fuel Tank Pressure Sensor (FTP)
- (11) Fuel Sender Assembly

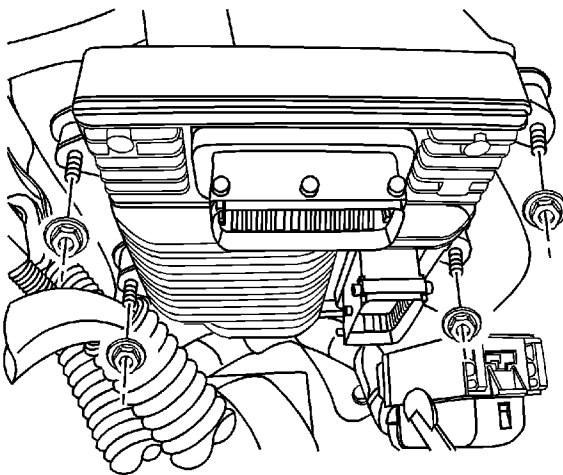
## Engine Control Module Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the engine control module (ECM) connectors.

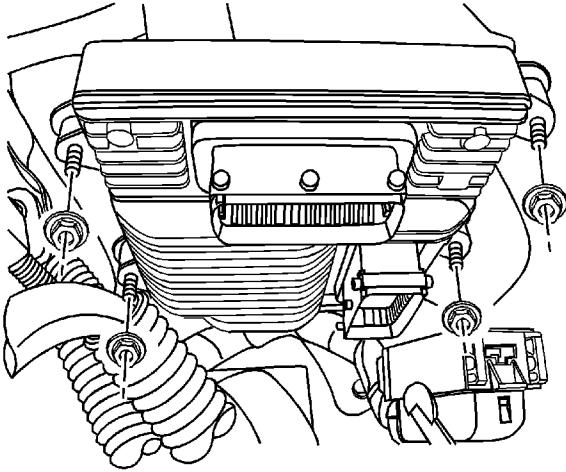


3. Remove the ECM retaining nuts.

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4. Remove the ECM from the ECM mount.

## Installation Procedure



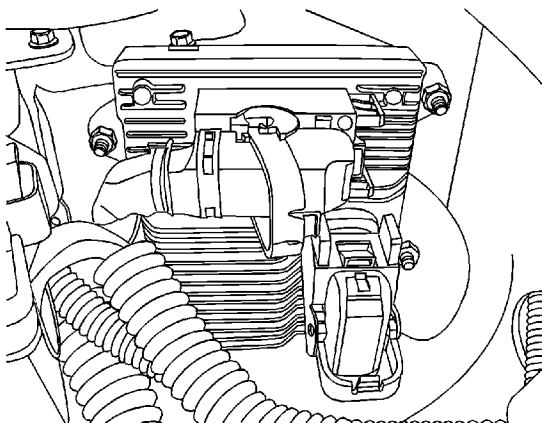
1. Position the ECM in place.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ECM to the ECM mount and install the retaining bolts.

### **Tighten**

Tighten the ECM retaining bolts to 4 N·m (35 lb in).





3. Connect the ECM connectors.
4. Connect the negative battery cable.
5. Perform the following procedures:
  - Program the ECM
  - [Crankshaft Position System Variation Learn](#)
  - [Idle Learn](#)
6. Refer to [Control Module References](#) for programming and setup information.

## Crankshaft Position System Variation Learn

**Important:** If the crankshaft position variation learn procedure has not learned, a false misfire could be detected and DTC P0300 may set. If sent here from DTC P0300, proceed with the crankshaft position variation learn procedure.

1. Monitor the engine control module (ECM) for DTCs with a scan tool. If other DTCs are set, except DTC P0300, or P0315, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC.
2. Select the crankshaft position variation learn procedure with a scan tool.
3. The scan tool instructs you to perform the following:
  - 3.1. Accelerate to wide open throttle (WOT).
  - 3.2. Release throttle when fuel cut-off occurs.
  - 3.3. Observe fuel cut-off for applicable engine.
  - 3.4. Engine should not accelerate beyond calibrated RPM value.
  - 3.5. Release throttle immediately if value is exceeded.
  - 3.6. Block drive wheels.
  - 3.7. Set parking brake.
  - 3.8. DO NOT apply brake pedal.
  - 3.9. Cycle ignition from OFF to ON.
  - 3.10. Apply and hold brake pedal.
  - 3.11. Start and idle engine.
  - 3.12. Turn A/C OFF.

Vehicle must remain in Park or Neutral.

The scan tool monitors certain component signals to determine if all the conditions are met to continue with the procedure. The scan tool only displays the condition that inhibits the procedure. The scan tool monitors the following components:

- Crankshaft position (CKP) sensors activity--If there is a CKP sensor condition, refer to the applicable DTC.
  - Camshaft position (CMP) signal activity--If there is a CMP signal condition, refer to the applicable DTC.
  - Engine coolant temperature (ECT)--If the engine coolant temperature is not warm enough, idle the engine until the engine coolant temperature reaches the correct temperature.
4. Enable the CKP system variation learn procedure with the scan tool and perform the following:

**Important:** While the CKP variation learn procedure is in progress, hold the throttle at WOT for 5 fuel-cutoffs. The learn procedure must determine there has been 5 fuel-cutoffs to properly perform the test.

- Accelerate to WOT.

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- Hold throttle while fuel cut-off occurs.
5. The scan tool displays Learn Status: Learned this ignition. If the scan tool indicates that DTC P0315 ran and passed, the CKP variation learn procedure is complete. If the scan tool indicates DTC P0315 failed or did not run, refer to [DTC P0315](#). If any other DTCs set, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC.
  6. Turn OFF the ignition for 30 seconds after the learn procedure is completed successfully.

The CKP system variation learn procedure is also required when the following service procedures have been performed, regardless of whether or not DTC P0315 is set:

- An engine replacement
- An ECM replacement
- A harmonic balancer replacement
- A crankshaft replacement
- A CKP sensor replacement
- Any engine repairs which disturb the crankshaft to CKP sensor relationship.



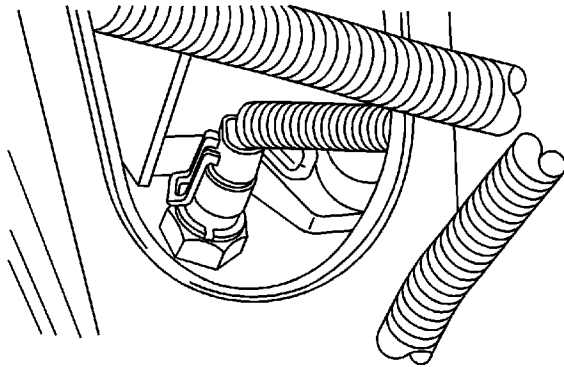
## Idle Learn

The Idle Learn Procedure listed below must be performed whenever the following occurs:

- The throttle body assembly is replaced
  - The throttle body is cleaned
  - The engine control module (ECM) is replaced
  - The idle air control valve (IAC) is replaced
  - Power disconnection (battery cable, ECM fuse, etc.) (Delphi ECM only)
- 
1. Turn the ignition ON.
  2. Turn the ignition OFF for 15 seconds.
  3. Turn the ignition ON for 5 seconds.
  4. Turn the ignition OFF for 15 seconds.
  5. Start the engine in park/neutral.
  6. Allow the engine to run until the engine coolant temperature is greater than 85°C (185°F).
  7. Turn the A/C ON for 10 seconds, if equipped.
  8. If the vehicle is equipped with an automatic transaxle, apply the parking brake. While pressing the brake pedal, place the transaxle in drive (D) for 10 seconds.
  9. Turn the A/C OFF for 10 seconds, if equipped.
  10. If the vehicle is equipped with an automatic transaxle, while pressing the brake pedal, place the transaxle in park/neutral.
  11. Turn the ignition OFF. The idle learn procedure is complete.

## Engine Coolant Temperature Sensor Replacement

### Removal Procedure



1. Relieve the coolant system pressure.

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

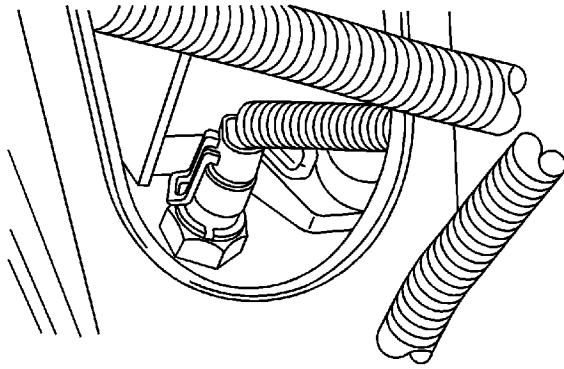
2. Disconnect the negative battery cable.
3. Drain the coolant below the engine coolant temperature (ECT) sensor level.
4. Disconnect the ECT sensor connector.

**Caution:** Use care when handling the coolant sensor. Damage to the coolant sensor will affect the operation of the fuel control system.

5. Remove the ECT sensor.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the ECT sensor.

**Tighten**

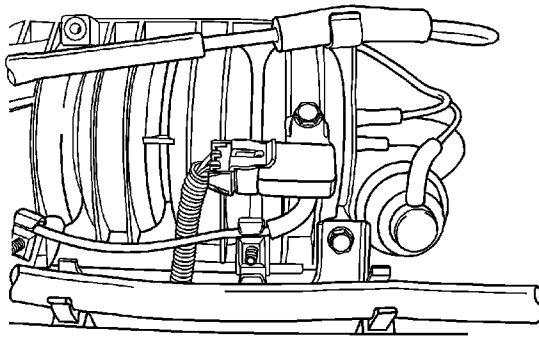
Tighten the ECT sensor to 20 N·m (15 lb ft).

2. Connect the ECT sensor connector.
3. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).
4. Connect the negative battery cable.

## Manifold Absolute Pressure Sensor Replacement

### Removal Procedure

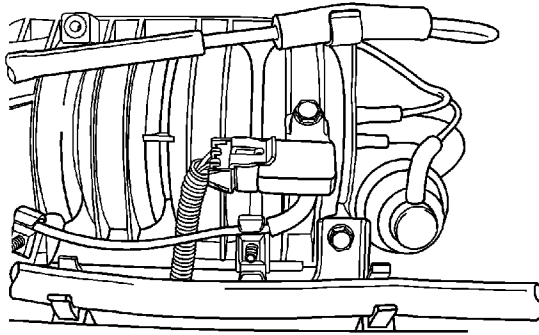
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the manifold absolute pressure (MAP) sensor electrical connector.
3. Disconnect the vacuum hose.
4. Remove the MAP sensor bolt.
5. Remove the MAP sensor.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the MAP sensor with the bolt.

**Tighten**

Tighten the MAP sensor bolt to 10 N·m (89 lb in).

2. Connect the vacuum hose.
3. Connect the MAP sensor electrical connector.
4. Connect the negative battery cable.

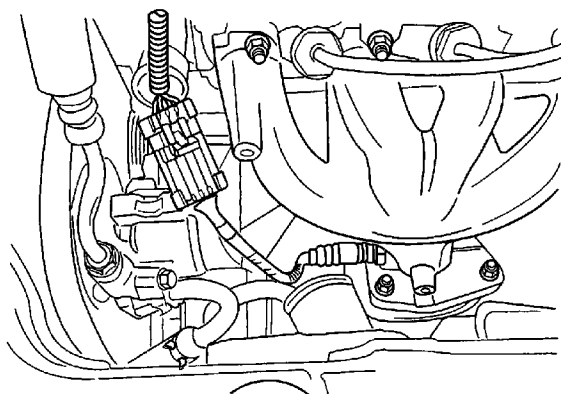
# Heated Oxygen Sensor Replacement - Sensor 1

## Special Tools

EN-46577 Oxygen Sensor Remover/Installer

## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.

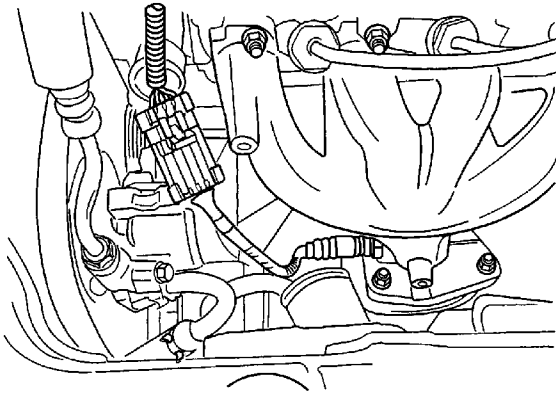
**Caution:** Refer to [Heated Oxygen and Oxygen Sensor Caution](#) in the Preface section.

2. Disconnect the front heated oxygen sensor (HO2S1) connector.

**Caution:** Remove oxygen sensors with the engine temperature above 48°C (120°F). Otherwise the oxygen sensors may be difficult to remove.

3. Carefully remove the HO2S1 from the exhaust manifold using [EN-46577](#).

## Installation Procedure



**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti-seize compound applied before reinstallation.

1. Coat the threads of the HO2S1 with an anti-seize compound, if needed.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the HO2S1 to the exhaust manifold using [EN-46577](#).

#### **Tighten**

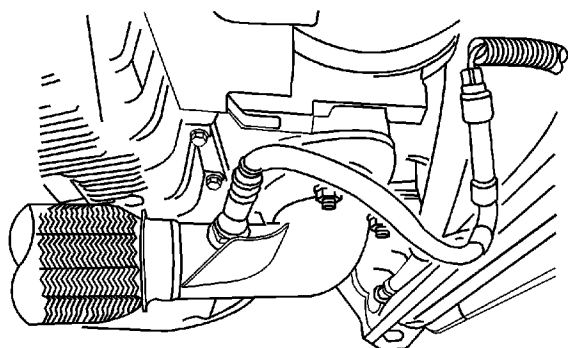
Tighten the oxygen sensor to 42 N·m (31 lb ft).

3. Connect the HO2S1 connector.
4. Connect the negative battery cable.

## Heated Oxygen Sensor Replacement - Sensor 2

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.

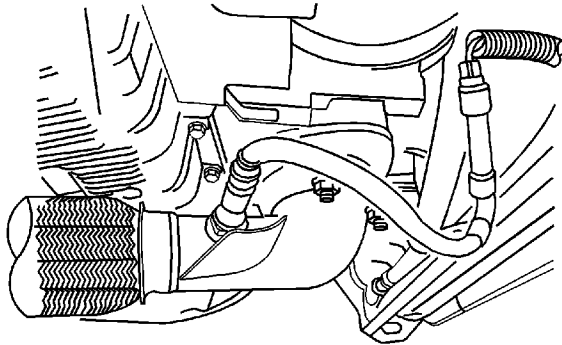
**Caution:** Refer to [Heated Oxygen and Oxygen Sensor Caution](#) in the Preface section.

**Caution:** Do not solder heated oxygen sensor wires. Soldering the wires will result in the loss of the air reference to the sensor. Refer to Engine Electrical for proper wire and connection repair techniques.

2. Disconnect the electrical connector.
3. Remove the heated oxygen sensor 2 (HO2S2).

### Installation Procedure





**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti-seize compound applied before reinstallation.

1. Coat the threads of the HO2S2 with an anti-seize compound, if needed.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the HO2S2.

#### **Tighten**

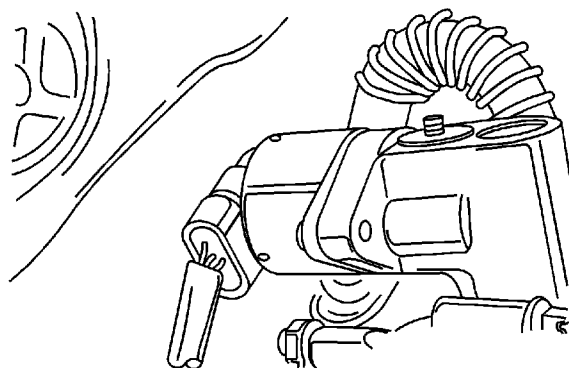
Tighten the heated oxygen sensor to 42 N·m (31 lb ft).

3. Connect the electrical connector.
4. Connect the negative battery cable.

## Idle Air Control Valve Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



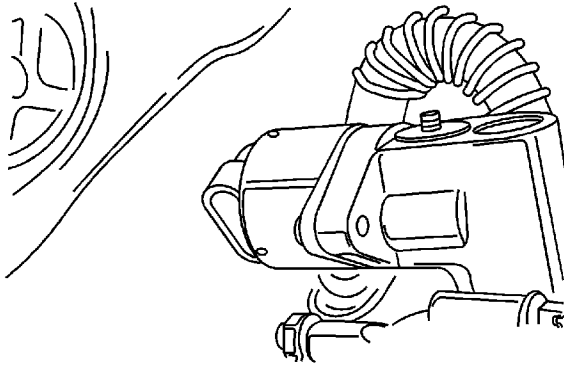
1. Disconnect the negative battery cable.
2. Disconnect the idle air control (IAC) valve connector.
3. Remove the IAC valve retaining bolts.

**Caution:**

- Do Not push or pull on the IAC valve pintle on IAC valves that have been in service. The force required to move the pintle may damage the threads on the worm drive.
- Do Not soak the IAC valve in any liquid cleaner or solvent, as damage may result.

4. Remove the IAC valve.
5. Clean the IAC valve O-ring seal area, the pintle valve seat, and the air passage with a suitable fuel system cleaner. Do not use methyl ethyl ketone.

### Installation Procedure

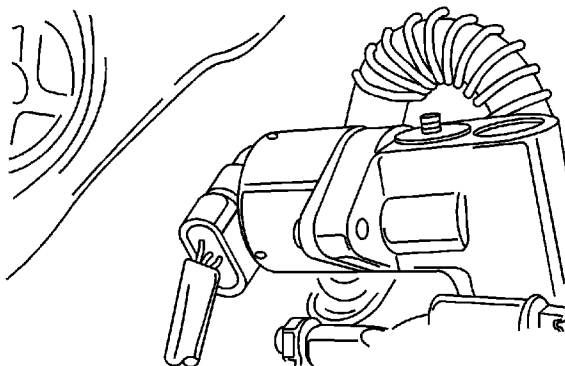


**Note:** If installing a new IAC valve, be sure to replace it with an identical part. The IAC valve pintle shape and diameter are designed for the specific application. Measure the distance between the tip of the IAC valve pintle and the mounting flange. If the distance is greater than 28 mm (1.1 in), use finger pressure to slowly retract the pintle.

The force required to retract the pintle will not damage the IAC valve. The purpose of the 28 mm (1.1 in) setting is to prevent the IAC pintle from bottoming out on the pintle seat. This 28 mm (1.1 in) setting is also an adequate setting for controlled idle on a restart.

1. Lubricate a new O-ring with engine oil. Install the new O-ring onto the valve.
2. Install the IAC valve into the throttle body.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.





3. Install the IAC valve retaining bolts.

**Tighten**

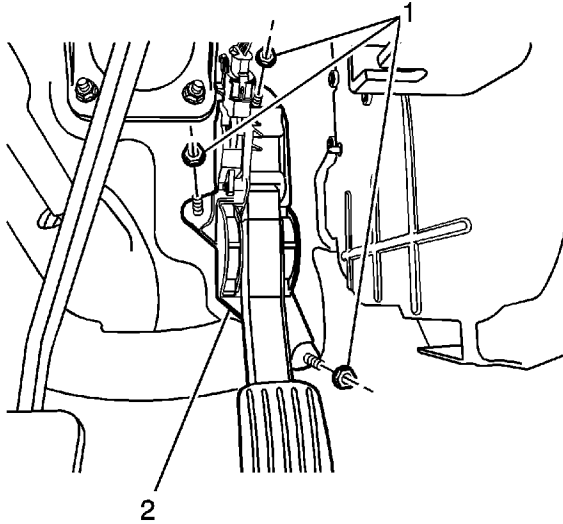
Tighten the idle air control valve retaining bolts to 3 N·m (27 lb in).

4. Connect the IAC valve connector.
5. Connect the negative battery cable.
6. Perform the idle learn procedure. Refer to [Idle Learn](#).

## Accelerator Pedal Position Sensor Replacement

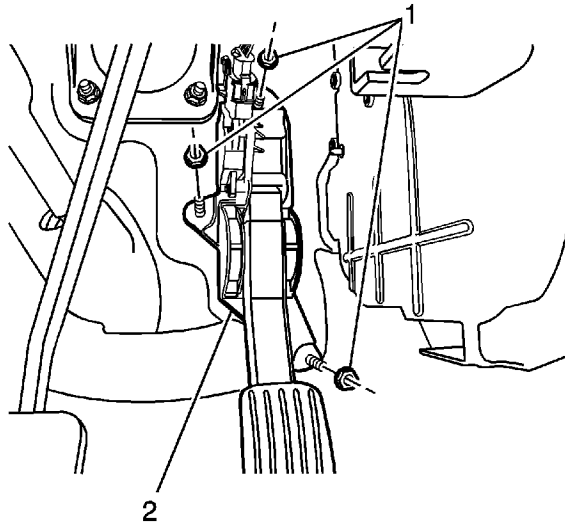
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the electronic throttle control (ETC) connector from the accelerator pedal.
3. Remove the 3 accelerator pedal retaining nuts.
4. Remove the accelerator pedal.

### Installation Procedure



1. Position the accelerator pedal.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the 3 accelerator pedal retaining nuts.

#### **Tighten**

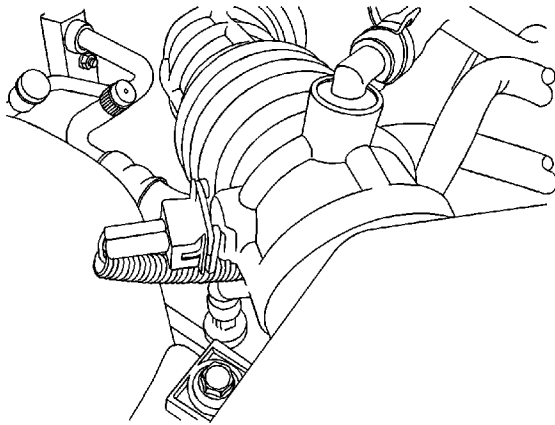
Tighten the accelerator pedal retaining nuts to 19 N·m (14 lb ft).

3. Connect the ETC connector to the accelerator pedal.
4. Connect the negative battery cable.

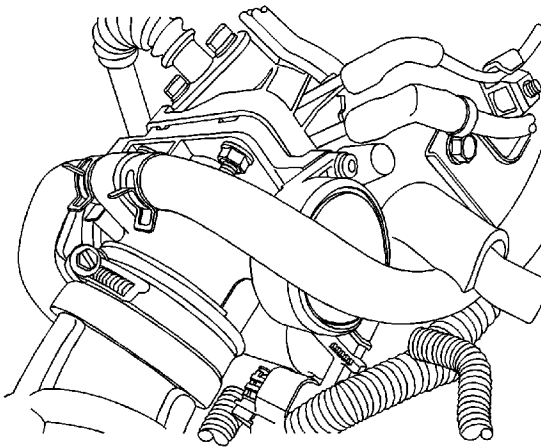
## Throttle Body Assembly Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

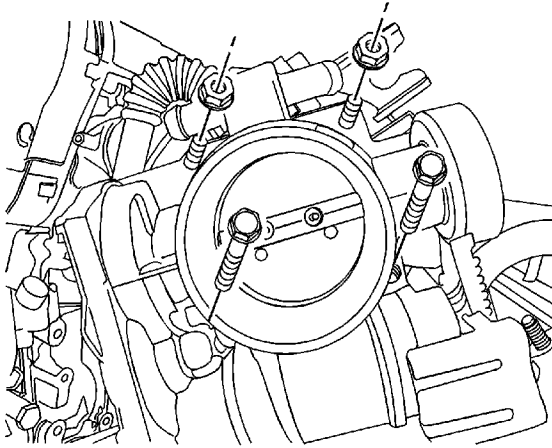


1. Disconnect the negative battery cable.
2. Disconnect the intake air temperature sensor connector.
3. Remove the air cleaner inlet duct from the throttle body.



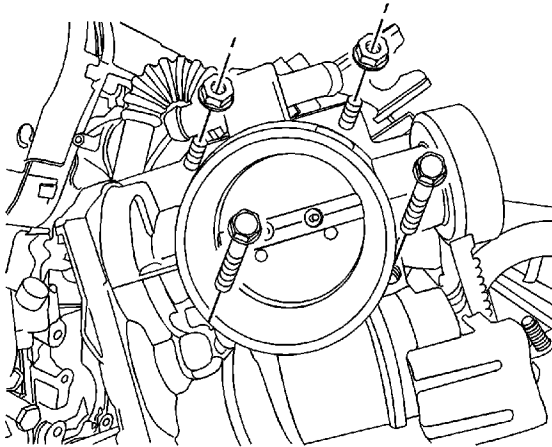
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4. Disconnect the electronic throttle body connector.
5. Disconnect the coolant hoses from the electronic throttle body.



6. Remove the throttle body retaining bolts.
7. Remove the throttle body and discard the gasket.

## Installation Procedure



**Caution:** Use care when cleaning the old gasket from the aluminum surfaces in order to prevent damage to the sealing surfaces.

1. Clean the gasket mating surface on the intake manifold.



**Note:** If the electronic throttle control valve is removed from the throttle body, the throttle body may be cleaned in a cold immersion type cleaner. Do not clean the electronic throttle control valve with any type of solvent or cleaner.

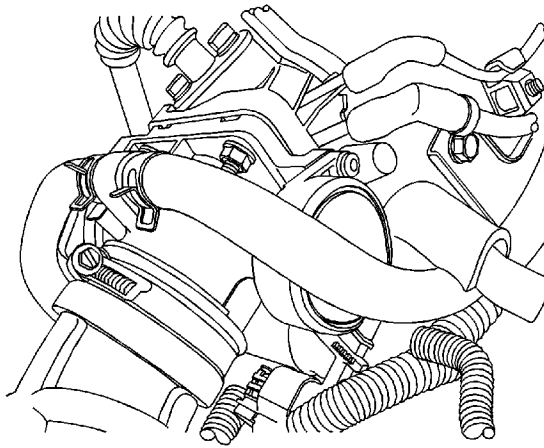
2. Clean the throttle body.
3. Install the electronic throttle body assembly with a new gasket.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

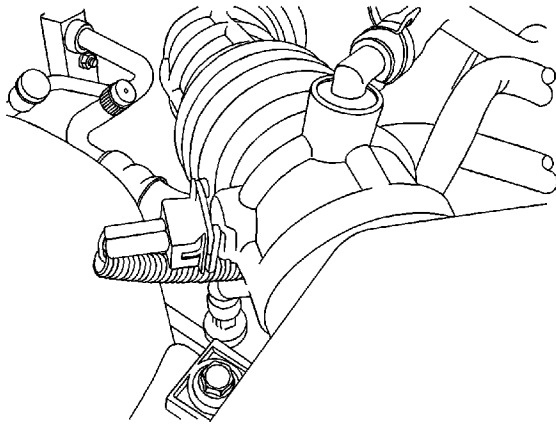
4. Install the electronic throttle body retaining nuts and bolts.

### **Tighten**

Tighten the throttle body retaining bolts and nuts to 15 N·m (11 lb ft).



5. Connect the electronic throttle body electrical connector.
6. Install the throttle body coolant hoses.

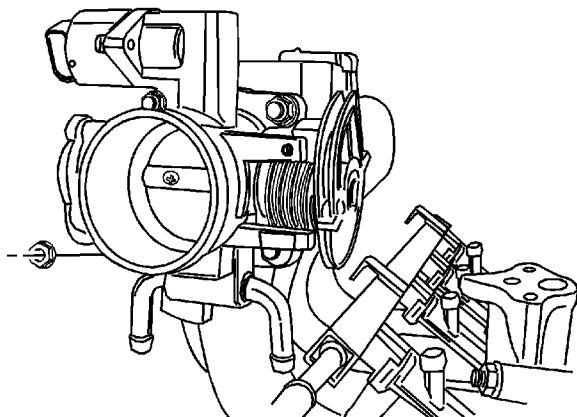


7. Install the air cleaner inlet duct to the throttle body.
8. Connect the negative battery cable.
9. Fill the cooling system.

## Throttle Body Inspection and Cleaning

**Warning:** Wear safety glasses when using compressed air in order to prevent eye injury.

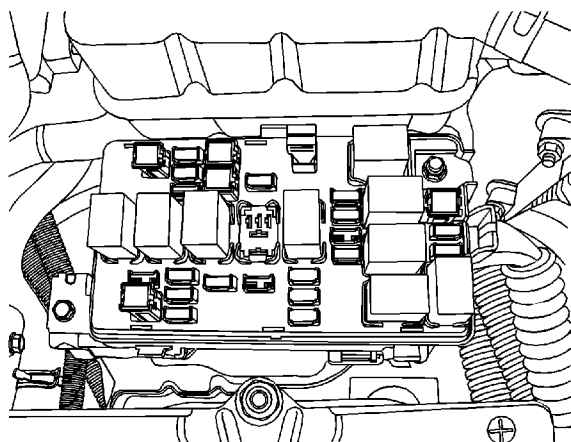
1. Remove the throttle body from the vehicle. Refer to [Throttle Body Assembly Replacement](#).



2. Open the throttle valve of the throttle body.
3. Use a solvent soaked cloth to remove dirt or carbon deposits/buildup from the throttle valve and the throttle bore.
4. Ensure that the throttle valve and throttle bore are clean and dry.
5. Inspect that the throttle valve operates smoothly and freely.

Install the throttle body to the vehicle. Refer to [Throttle Body Assembly Replacement](#).

## Fuel Pressure Relief



**Warning:** Remove the fuel tank cap and relieve the fuel system pressure before servicing the fuel system in order to reduce the risk of personal injury. After you relieve the fuel system pressure, a small amount of fuel may be released when servicing the fuel lines, the fuel injection pump, or the connections. In order to reduce the risk of personal injury, cover the fuel system components with a shop towel before disconnection. This will catch any fuel that may leak out. Place the towel in an approved container when the disconnection is complete.

1. Remove the fuel cap.
2. Remove the fuel pump fuse from the engine fuse box.
3. Start the engine and allow the engine to stall.
4. Crank the engine for an additional 10 seconds.

# Fuel Pressure Gage Installation and Removal

## Special Tools

[J 34730-1A](#) Fuel Pressure Gage

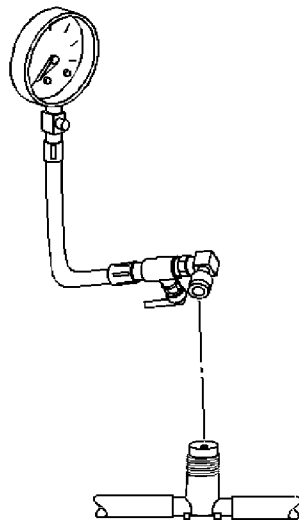
## Installation Procedure

**Warning:** Gasoline or gasoline vapors are highly flammable. A fire could occur if an ignition source is present. Never drain or store gasoline or diesel fuel in an open container, due to the possibility of fire or explosion. Have a dry chemical (Class B) fire extinguisher nearby.

**Warning:** Wrap a shop towel around the fuel pressure connection in order to reduce the risk of fire and personal injury. The towel will absorb any fuel leakage that occurs during the connection of the fuel pressure gage. Place the towel in an approved container when the connection of the fuel pressure gage is complete.

**Caution:** Clean all of the following areas before performing any disconnections in order to avoid possible contamination in the system:

- The fuel pipe connections
- The hose connections
- The areas surrounding the connections



1. Install the [J 34730-1A](#) to the fuel pressure connection, located on the fuel rail.

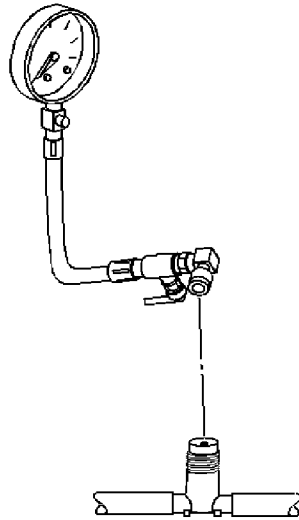
**Warning:** Do not drain the fuel into an open container. Never store the fuel in an open container due to the possibility of a fire or an explosion.

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2. Place the bleed hose of the fuel pressure gage into an approved gasoline container.
3. Open the bleed valve on the fuel pressure gage in order to bleed the air from the gage.
4. Turn ON the ignition, with the engine OFF.
5. Command the fuel pump ON with a scan tool until all of the air is bled out of the gage.
6. Close the bleed valve on the fuel pressure gage.
7. Command the fuel pump ON with a scan tool.
8. Inspect for fuel leaks.

## **Removal Procedure**

1. Place the fuel pressure gage bleed hose into an approved container and open the bleed valve to bleed fuel system pressure.



2. Place a shop towel under the fuel pressure gage to catch any remaining fuel spillage.
3. Remove the [J 34730-1A](#) from fuel pressure connection.
4. Drain any fuel remaining in the fuel pressure gage into an approved container.
5. Install the cap on the fuel pressure connection.
6. Place the shop towel in an approved container.

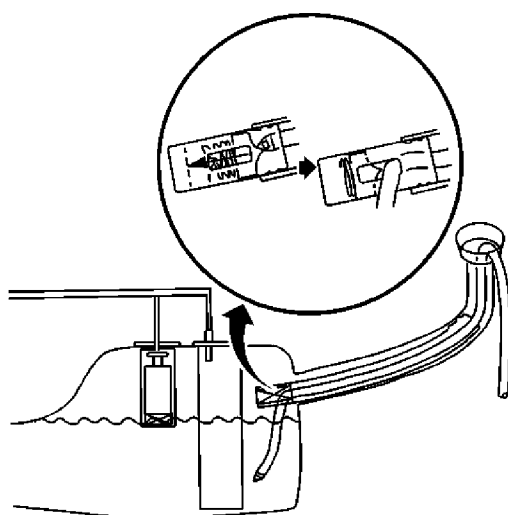
## Fuel Tank Draining

### Special Tools

- [J 42960-2](#) Fuel Flapper Door Holder
- [J 42960-1](#) Fuel Drain Hose

**Warning:** Never drain or store fuel in an open container. Always use an approved fuel storage container in order to reduce the chance of fire or explosion.

**Warning:** Place a dry chemical (Class B) fire extinguisher nearby before performing any on-vehicle service procedures. Failure to follow these precautions may result in personal injury.

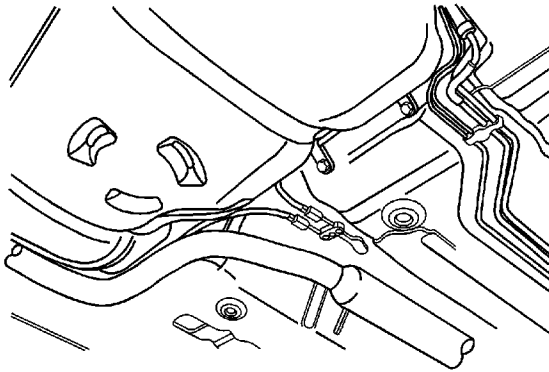


1. Remove the fuel filler cap.
2. Install the [J 42960-2](#) into the fuel fill pipe in order to hold the door open.
3. Insert the [J 42960-1](#) into the fuel tank until the hose reaches the bottom of the fuel tank.
4. Use an air operated pump device in order to drain as much fuel through the fuel fill pipe as possible.

## Fuel Tank Replacement

### Removal Procedure

**Warning:** Refer to [Relieving Fuel Pressure Warning](#) in the Preface section.

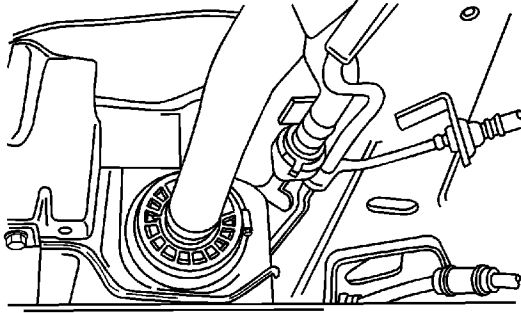


1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

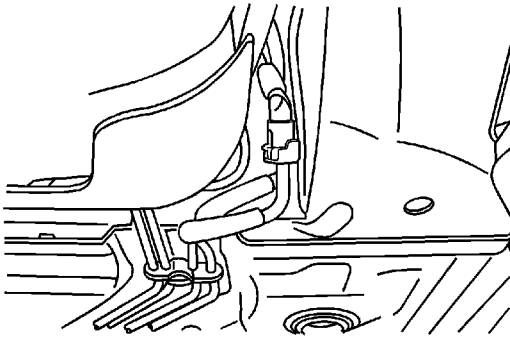
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the negative battery cable.
3. Drain the fuel tank.
4. Disconnect the parking brake cable retainer clamps and the support along the fuel tank to provide clearance for the tank.

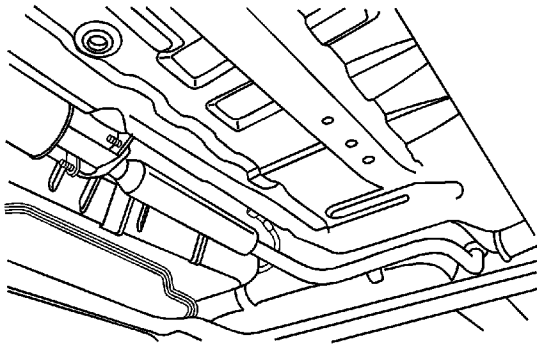




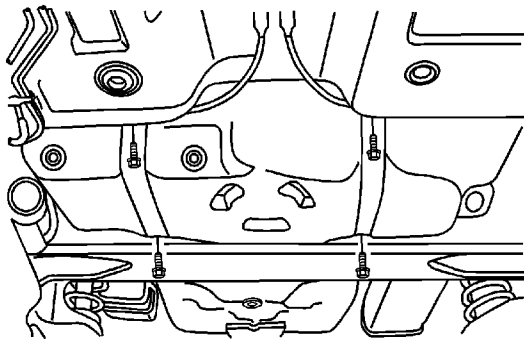
5. Remove the fuel tank filler tube clamp at the fuel tank.
6. Disconnect the fuel tank filler tube.
7. Disconnect the fuel tank filler tube at the fuel tank.
8. Disconnect the canister vapor tube at the control valve vapor tube.



9. Disconnect the fuel line near the right front of the fuel tank.
10. Disconnect the wiring harness clips and the fuel line clips as needed.

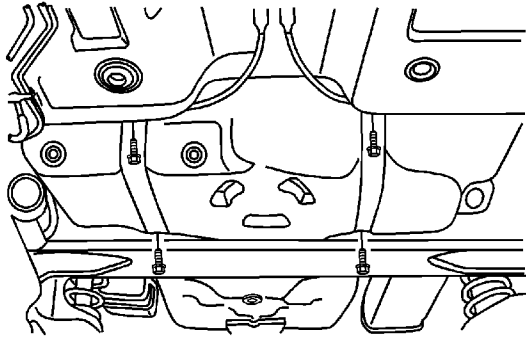


11. Remove the front exhaust pipe. Refer to [Front Pipe Replacement](#).



12. Support the fuel tank.
13. Remove the fuel tank retaining nuts.
14. Carefully lower the fuel tank.
15. Remove the fuel tank.
16. Transfer any parts as needed.

## **Installation Procedure**



1. Raise the fuel tank into position.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

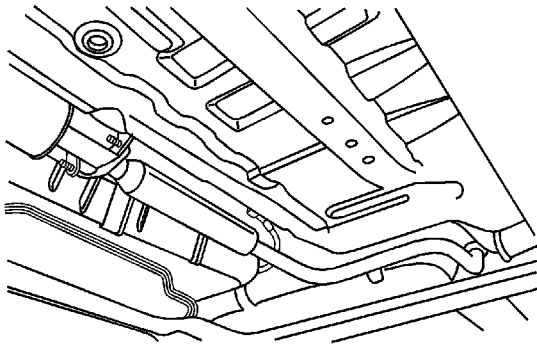
**Caution:** Refer to [Fuel Tank Strap Fastener Caution](#) in the Preface section.

2. Install the fuel tank mounting straps and bolts.

#### **Tighten**

Tighten the fuel tank strap retaining bolts to 20 N·m (15 lb ft).

3. Connect the fuel line.
4. Connect the wiring harness clips and the fuel line clips as needed.
5. Connect the fuel pump electrical connector.
6. Connect the fuel vapor line.
7. Connect the fuel tank filler tube and the fuel tank vent tube.
8. Install the fuel tank filler tube clamp at the fuel tank.
9. Install the front exhaust pipe. Refer to [Front Pipe Replacement](#).



10. Install the parking brake cable retainer clamps and the support.

**Tighten**

Tighten the parking brake cable retainer clamps to 10 N·m (89 lb in).

11. Connect the negative battery cable.
12. Fill the fuel tank.
13. Perform a leak check of the fuel tank and the fuel line connections.

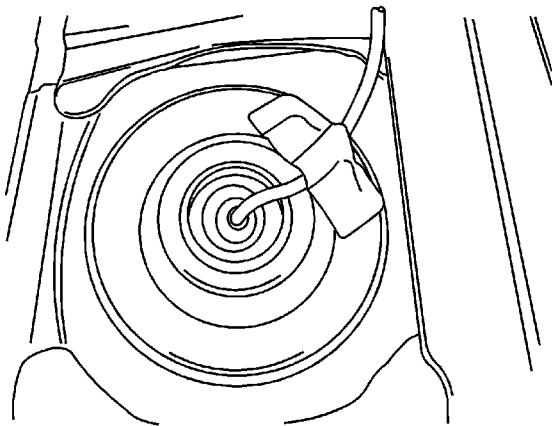
## Fuel Tank Pressure Sensor Replacement

### Removal Procedure

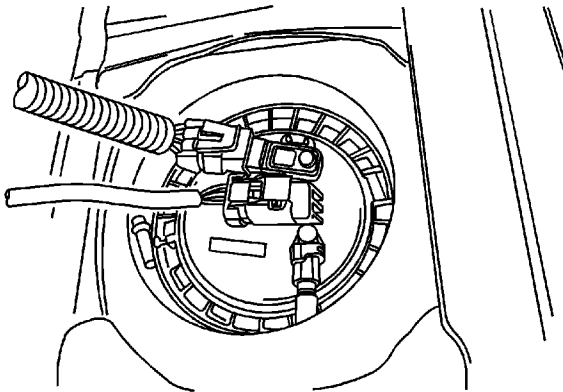
1. Remove the fuel fill cap.

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the negative battery cable.
3. Remove the rear seat. Refer to [Rear Seat Cushion Replacement](#).



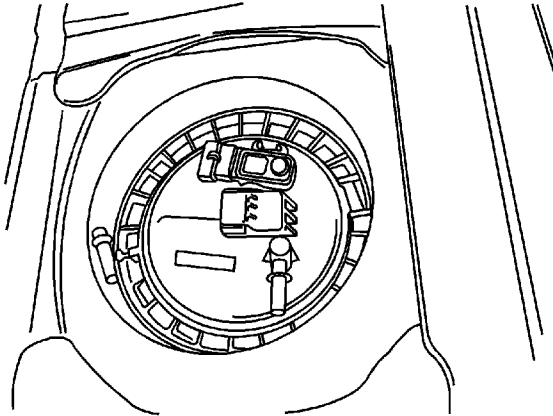
4. Remove the fuel sender assembly access cover.



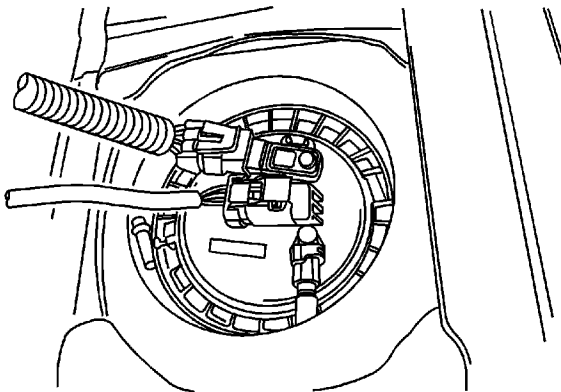


5. Disconnect the fuel tank pressure (FTP) sensor electrical connector.
6. Remove the FTP from the fuel sender assembly.

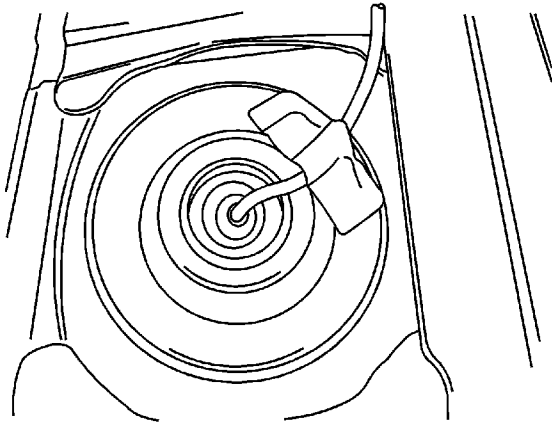
## Installation Procedure



1. Install the FTP sensor to the fuel sender assembly.



2. Connect the FTP sensor electrical connector.

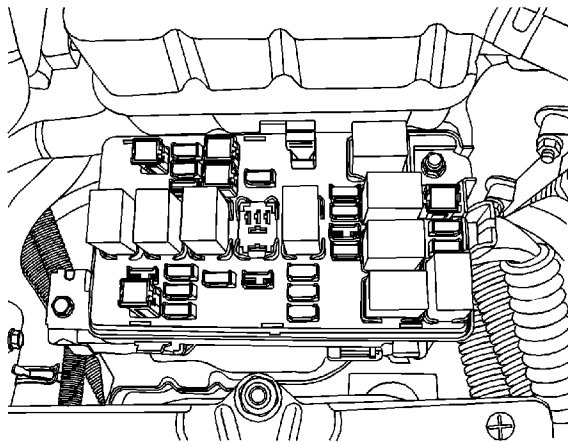


3. Install the fuel pump access cover.
4. Install the rear seat. Refer to [Rear Seat Cushion Replacement](#).
5. Connect the negative battery cable.
6. Install the fuel fill cap.

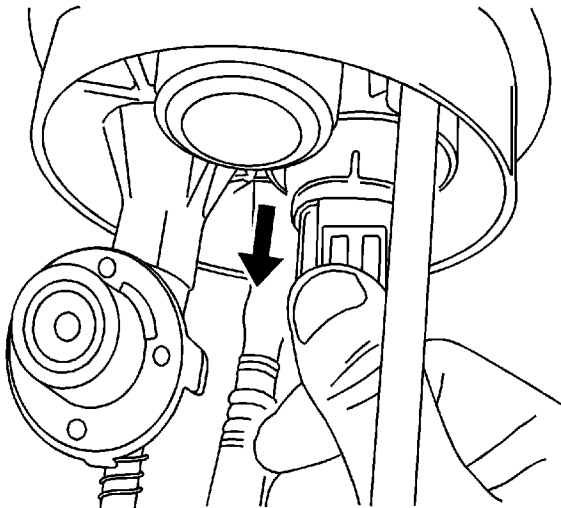
## Fuel Sender Assembly Replacement

### Removal Procedure

**Warning:** Refer to [Relieving Fuel Pressure Warning](#) in the Preface section.



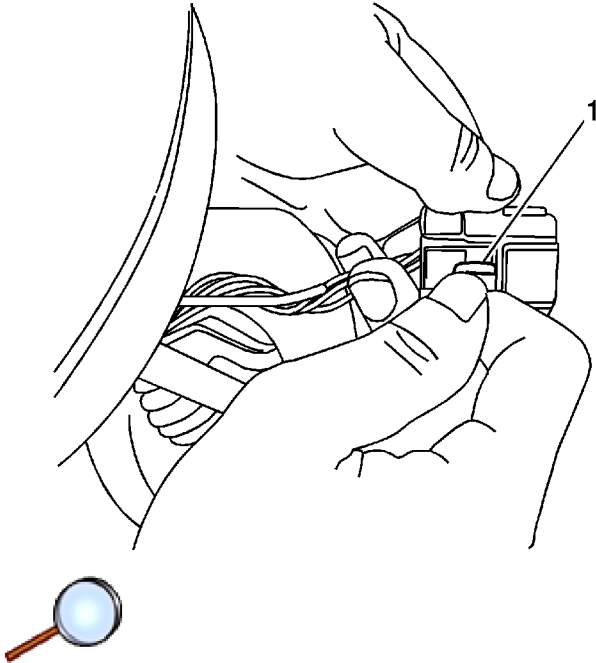
1. Relieve the fuel system pressure. Refer to [Fuel Pressure Relief](#).
2. Remove the fuel pump assembly. Refer to [Fuel Pump Replacement](#).



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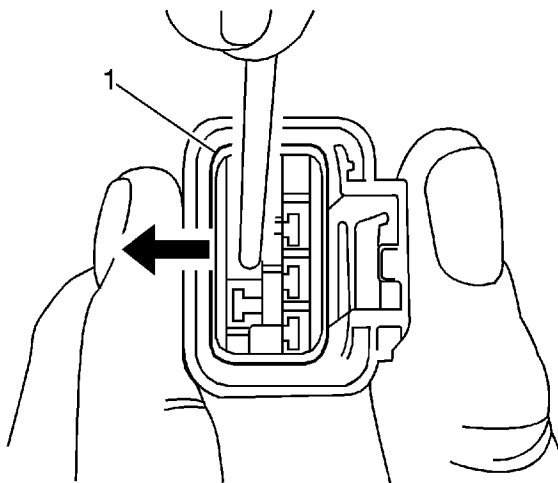


3. Disconnect the insulator connector.

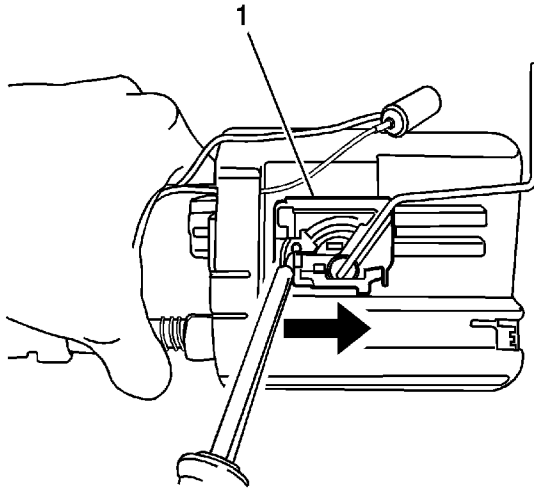


**Note:** The wedge may be disconnected with severe force but can be reconnected.

4. Push the terminal wedge (1) in the insulator connector.

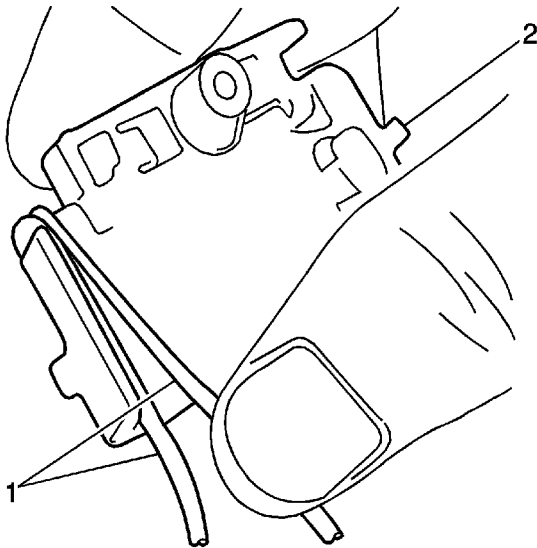


5. Remove the fuel level sensor (1) from the sender housing (2).
6. Remove the sender housing.

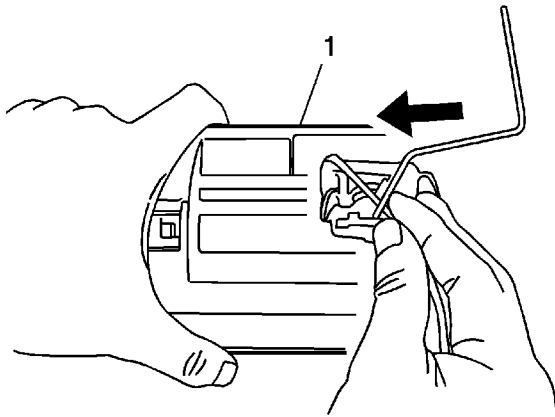


7. Remove the fuel sender assembly (3).

## Installation Procedure

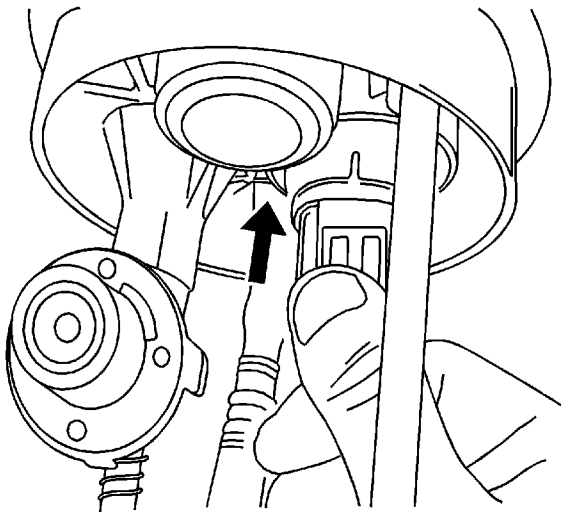


1. Install the wires (1) into the sender assembly (2).



**Note:** Ensure the sender assembly and the fuel level sensor are installed properly. If not the fuel gauge and fuel level warning indicator will not function properly.

2. Install the sender assembly onto the fuel pump assembly (1).
3. Install the fuel level sensor onto the sender housing.
4. Connect the wire into the insulator connector.

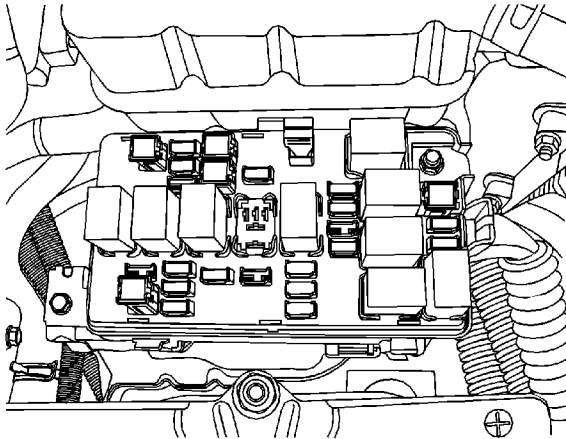


5. Connect the insulator connector
6. Install the fuel pump assembly into the fuel tank. Refer to [Fuel Pump Replacement](#).

## Fuel Pump Replacement

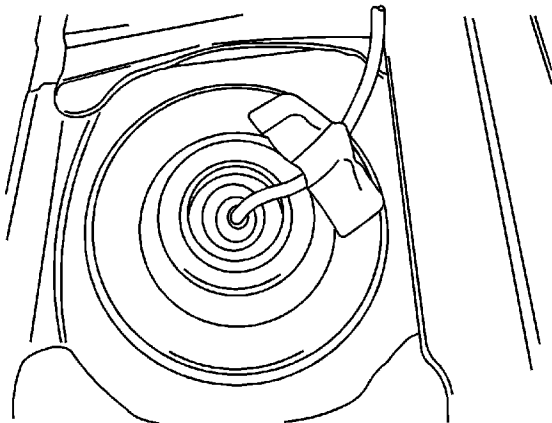
### Removal Procedure

**Warning:** Refer to [Relieving Fuel Pressure Warning](#) in the Preface section.



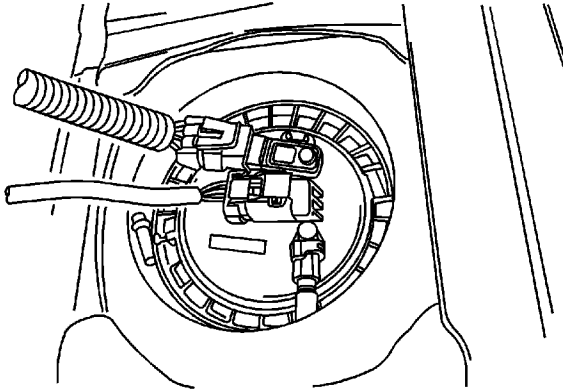
1. Relieve the fuel system pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



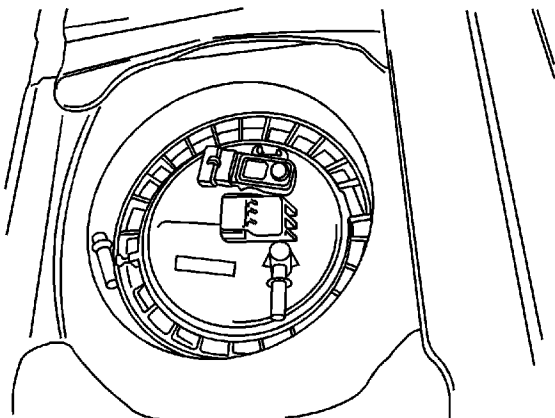


2. Disconnect the negative battery cable.
3. Remove the rear seat. Refer to [Rear Seat Cushion Replacement](#).
4. Remove the fuel pump access cover.



5. Disconnect the electrical connector at the fuel pump assembly.
6. Disconnect the fuel line.
7. Remove the fuel pump assembly clip.
8. Remove the fuel pump assembly from the tank.
9. Remove and discard the gasket.

## Installation Procedure

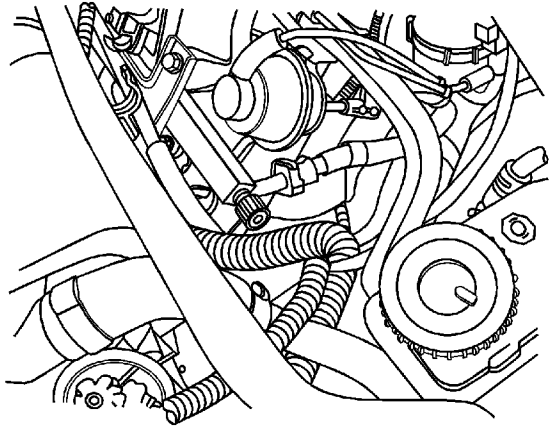




1. Clean the gasket mating surface on the fuel tank.
2. Position the new gasket in place.
3. Install the fuel pump into the fuel tank in the same location as removed for ease of line and connector installation.
4. Install the fuel pump assembly clip.
5. Connect the fuel pump assembly connector.
6. Install the fuel pump line.
7. Install the fuel pump access cover.
8. Install the EF10 fuse.
9. Connect the negative battery cable.
10. Perform an operational check of the fuel pump.
11. Install the rear seat. Refer to [Rear Seat Cushion Replacement](#).

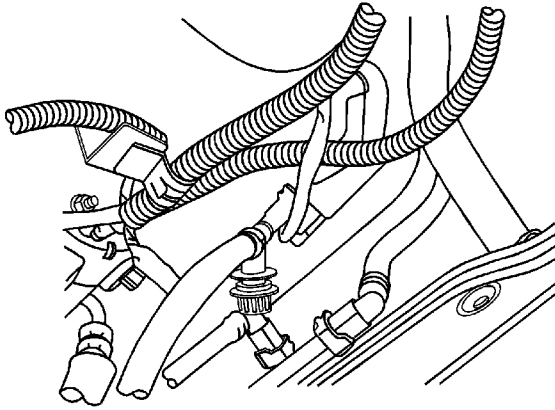
## Fuel Hose/Pipes Assembly Replacement

### Removal Procedure

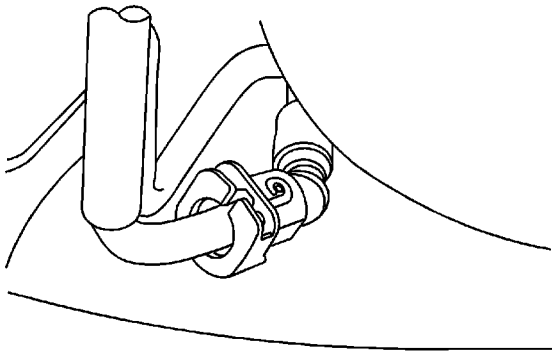


**Warning:** Do not allow smoking or the use of open flames in the area where work on the fuel or EVAP system is taking place. Anytime work is being done on the fuel system, disconnect the negative battery cable, except for those tests where battery voltage is required.

1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).
2. Disconnect the front fuel hose from the fuel rail.

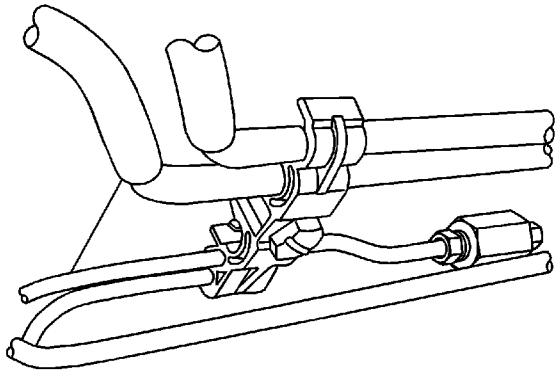


3. Lift and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
4. Disconnect the front fuel hose from the fuel pipe.

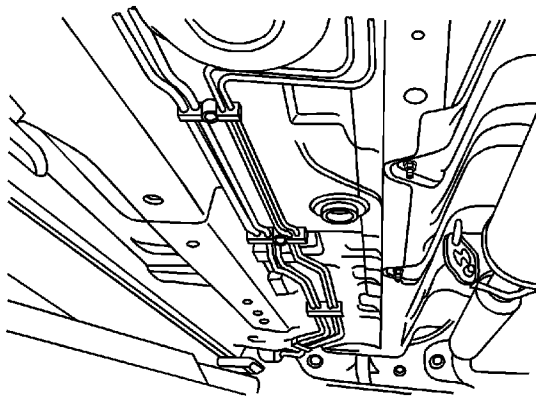


5. Disconnect the rear fuel hose from the fuel pipe.

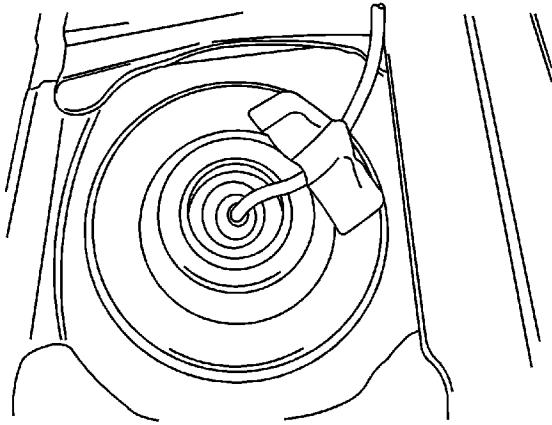




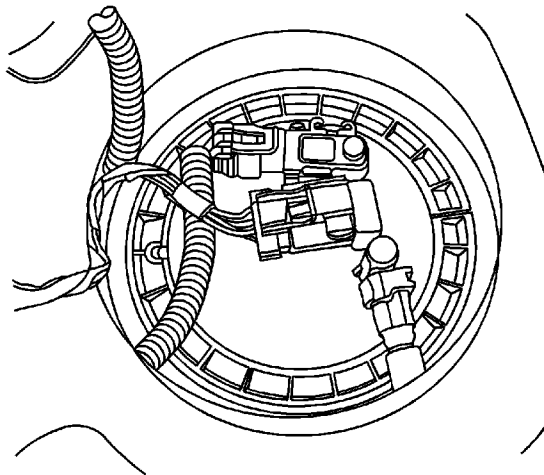
6. Remove the fuel pipe mounting plastic bolt.



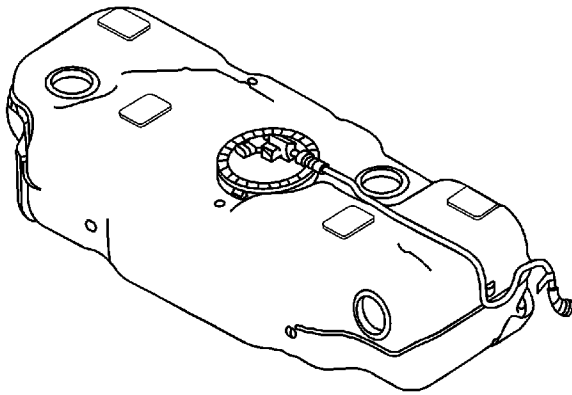
7. Remove the fuel pipe mounting screws and cover.
8. Remove the fuel pipe.



9. Remove the fuel pump access cover. Refer to [Fuel Sender Assembly Replacement](#).

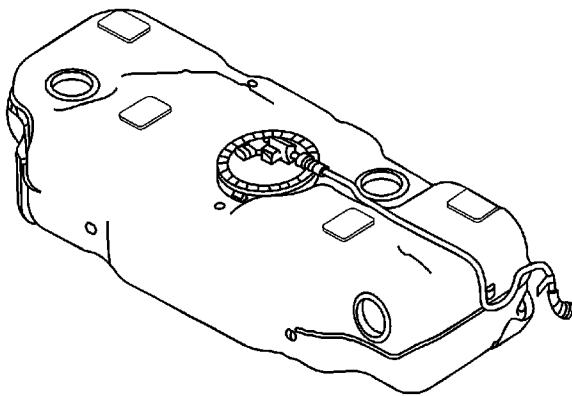


10. Disconnect the fuel hose from the fuel pump.

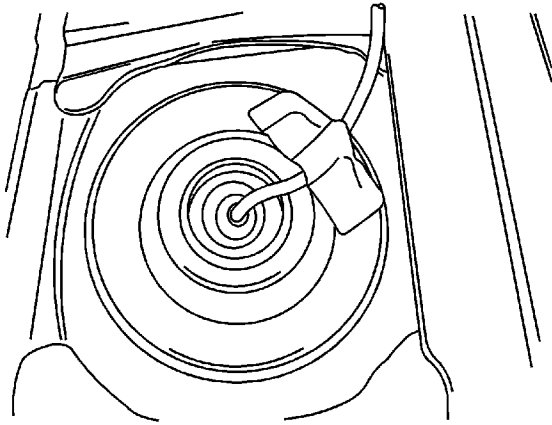


11. Remove the fuel tank. Refer to [Fuel Tank Replacement](#).
12. Remove rear fuel hose.

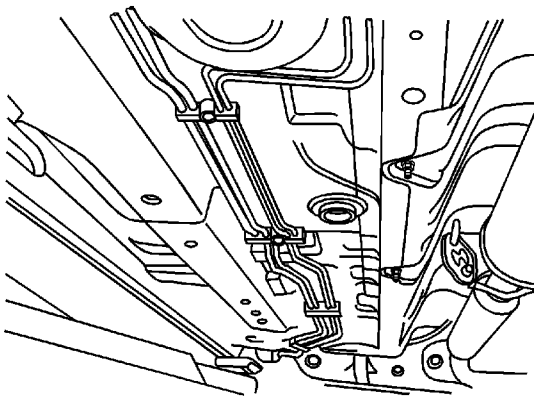
## Installation Procedure



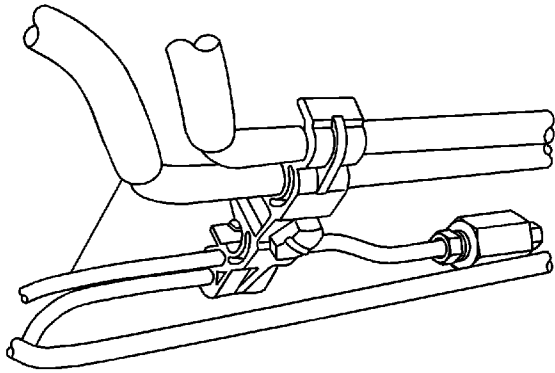
1. Connect the rear fuel hose.
2. Install the fuel tank. Refer to [Fuel Tank Replacement](#).



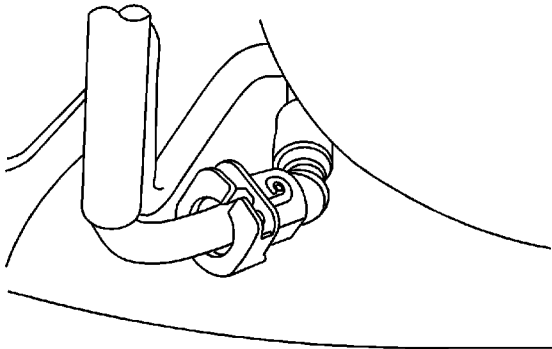
3. Install the fuel pump access cover. Refer to [Fuel Sender Assembly Replacement](#).



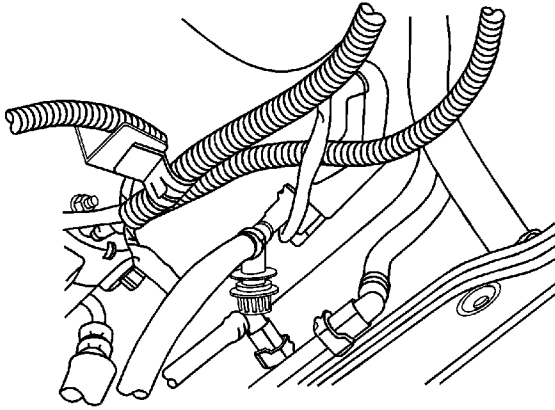
4. Install the fuel pipe.
5. Install the fuel pipe mounting screws and cover.



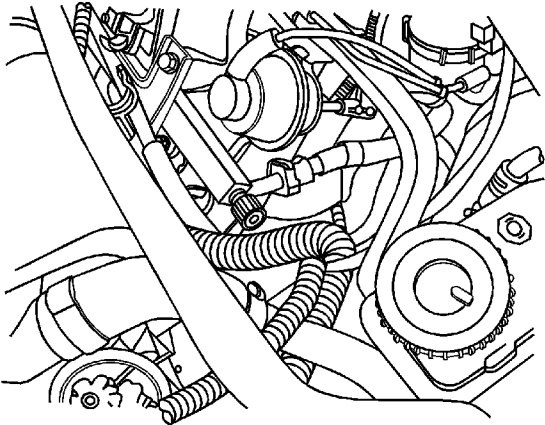
6. Install the fuel pipe mounting plastic bolt.



7. Connect the rear fuel hose to the fuel pipe.



8. Connect the front fuel hose to the fuel pipe.
9. Lower the vehicle.

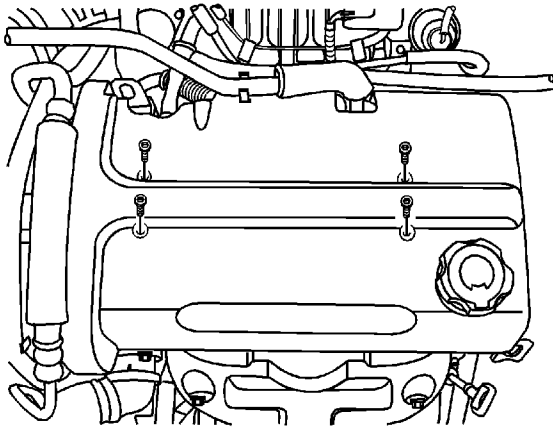


10. Connect the fuel hose to the fuel rail.
11. Connect the negative battery cable, if disconnected.

# Fuel Injection Fuel Rail Assembly Replacement

## Removal Procedure

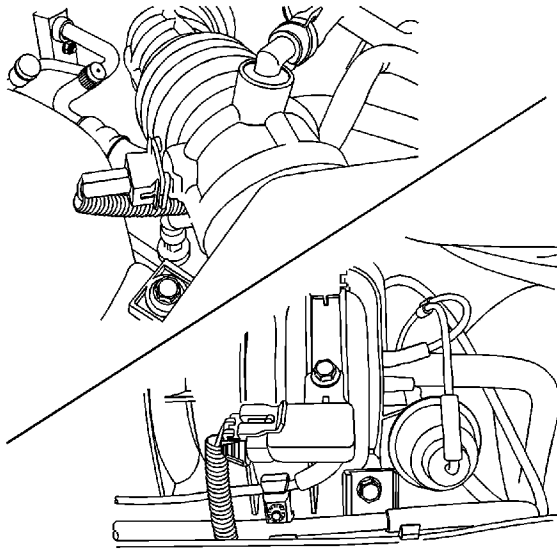
**Warning:** Refer to [Relieving Fuel Pressure Warning](#) in the Preface section.



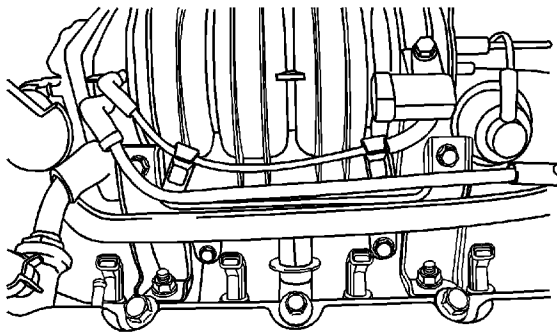
1. Relieve the fuel system pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the negative battery cable.
3. Remove the engine cover bolts and cover.

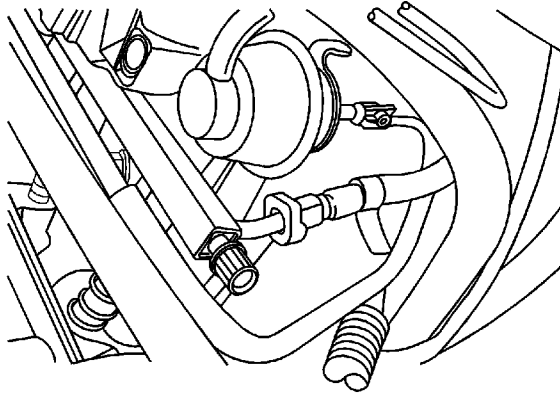


4. Disconnect the electronic throttle control connector.
5. Disconnect the intake air temperature sensor.
6. Disconnect the camshaft position sensor.
7. Disconnect the manifold absolute pressure sensor.
8. Disconnect the fuel injector harness connectors.

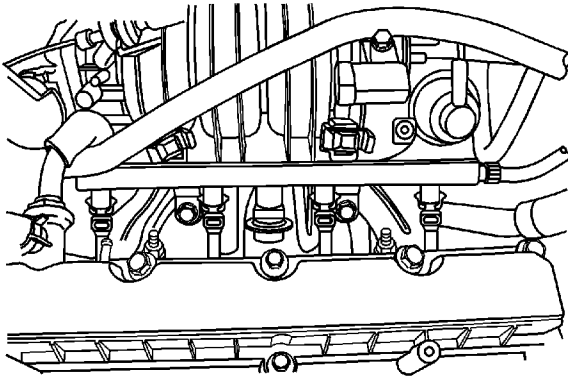


9. Remove the purge solenoid valve to intake manifold hose.
10. Remove the MAP sensor vacuum hose.
11. Remove the upper intake manifold bracket bolts.
12. Remove the upper intake manifold bracket.





13. Disconnect the fuel feed line.

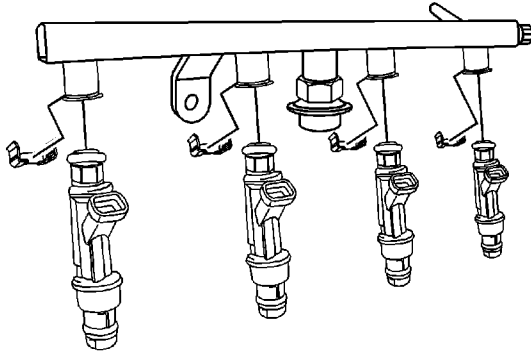


14. Disconnect the throttle body outlet coolant hose.

**Caution:**

- Use care when servicing the fuel system components, especially the fuel injector electrical connectors, the fuel injector tips, and the injector O-rings. Plug the inlet and the outlet ports of the fuel rail in order to prevent contamination.
- Do not use compressed air to clean the fuel rail assembly as this may damage the fuel rail components.
- Do not immerse the fuel rail assembly in a solvent bath in order to prevent damage to the fuel rail assembly.

15. Remove the fuel rail mounting bolts.



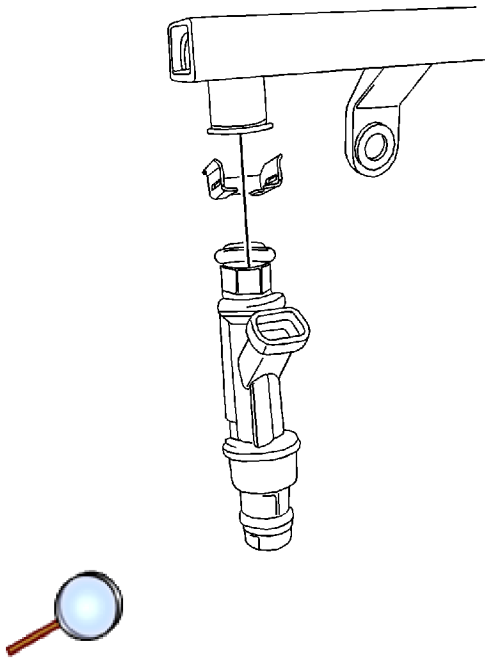
**Caution:**

- Use care when servicing the fuel system components, especially the fuel injector electrical connectors, the fuel injector tips, and the injector O-rings. Plug the inlet and the outlet ports of the fuel rail in order to prevent contamination.
- Do not use compressed air to clean the fuel rail assembly as this may damage the fuel rail components.
- Do not immerse the fuel rail assembly in a solvent bath in order to prevent damage to the fuel rail assembly.

**Note:** If an injector becomes separated from the rail and remains in the cylinder head, replace the injector O-ring seals and the retaining clip.

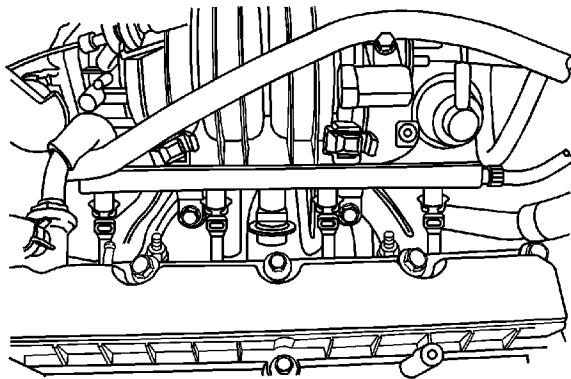
16. Remove the fuel rail with the fuel injectors attached.
17. Remove the fuel injector retaining clips.
18. Remove the fuel injectors by pulling down and out.
19. Discard the fuel injector O-rings.

## Installation Procedure



**Note:** Different injectors are calibrated for different flow rates. When ordering new fuel injectors, be certain to order the identical part number that is inscribed on the old injector.

1. Lubricate the new fuel injector O-rings with engine oil. Install the new O-rings on the fuel injectors.
2. Install the fuel injectors into the fuel rail sockets with the fuel injector terminals facing outward.
3. Install the fuel injector retainer clips onto the fuel injectors and the fuel rail ledge.
4. Make sure that the clip is parallel to the fuel injector harness connector.



5. Install the fuel rail assembly into the cylinder head.

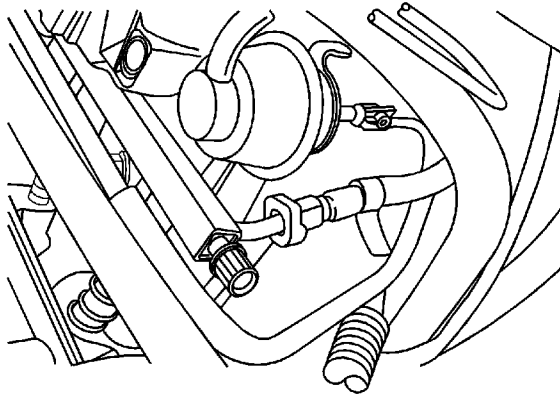
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

6. Install the fuel rail mounting bolts.

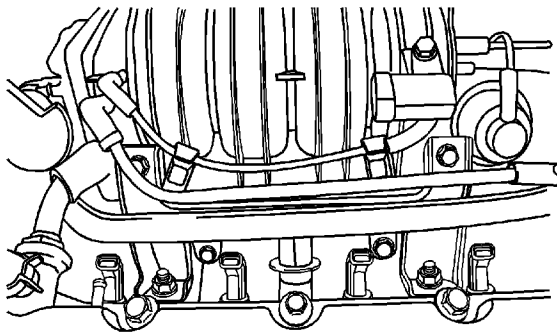
**Tighten**

Tighten the fuel rail mounting bolts to 25 N·m (18 lb ft).

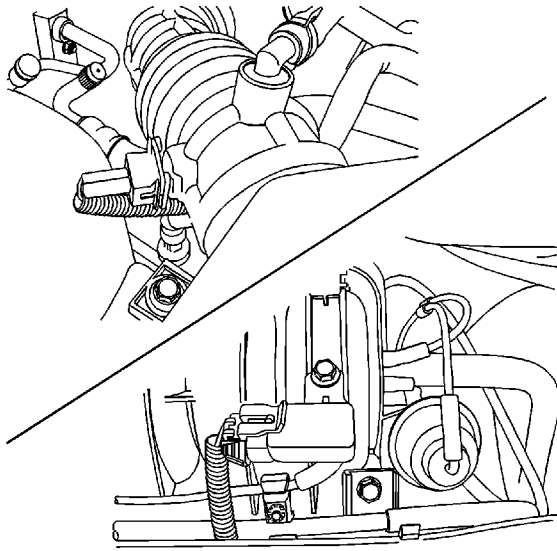
7. Connect the throttle body coolant hose.



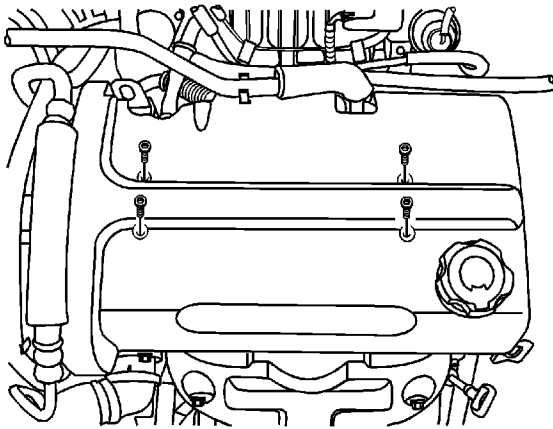
8. Connect the fuel feed hose.



9. Install the intake manifold upper bracket with the bolts.
10. Install the MAP sensor vacuum hose.
11. Install the purge solenoid to intake manifold hose.



12. Connect the fuel injector harness connectors. Rotate each fuel injector as required to avoid stretching the wiring harness.
13. Connect the MAP sensor connector.
14. Connect the Camshaft position sensor.
15. Connect the intake air temperature sensor.
16. Connect the electronic throttle control connector.

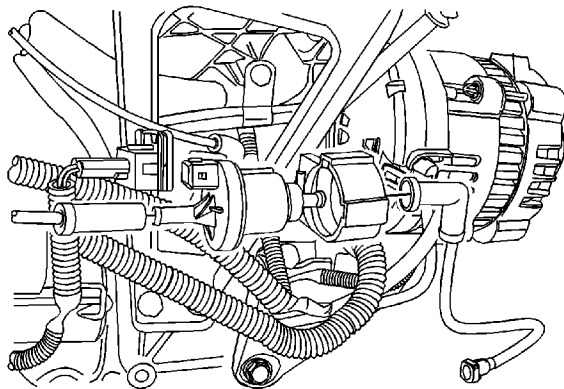


17. Install the engine cover with bolts.
18. Connect the negative battery cable.
19. Perform a leak check of the fuel rail and fuel injectors.

# Evaporative Emission Canister Purge Solenoid Valve Replacement

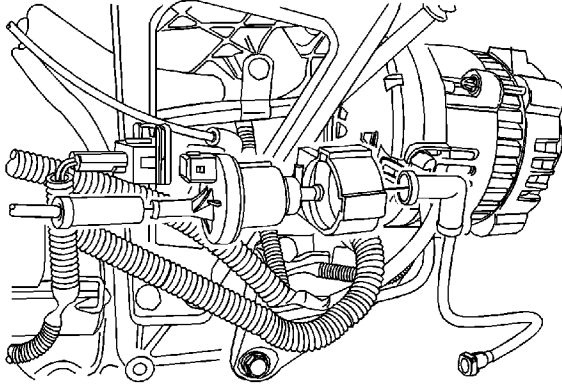
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the evaporative emission (EVAP) canister purge solenoid connector.
3. Disconnect the vacuum hoses from the EVAP canister purge solenoid.
4. Remove the EVAP canister purge solenoid from the intake manifold.

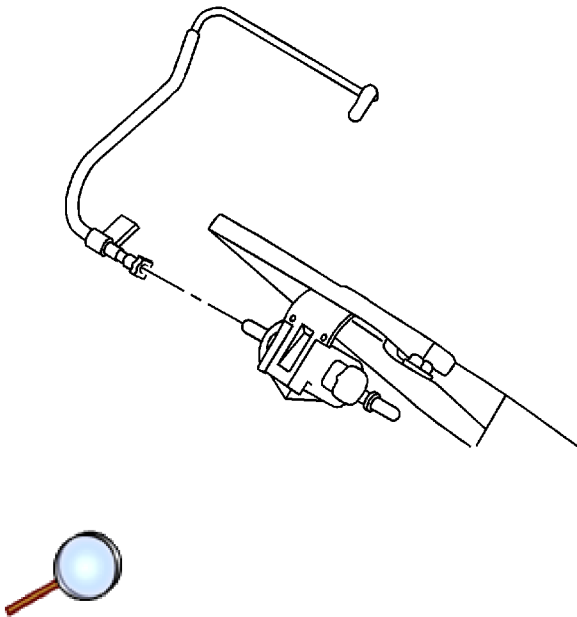
## Installation Procedure



1. Attach the EVAP canister purge solenoid to the intake manifold.
2. Connect the vacuum hoses to the EVAP canister purge solenoid.
3. Connect the EVAP canister purge solenoid connector.
4. Connect the negative battery cable.

## Evaporative Emission System Hoses/Pipes Replacement

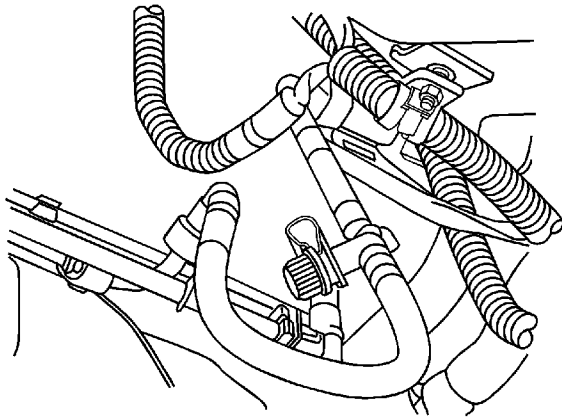
### Removal Procedure



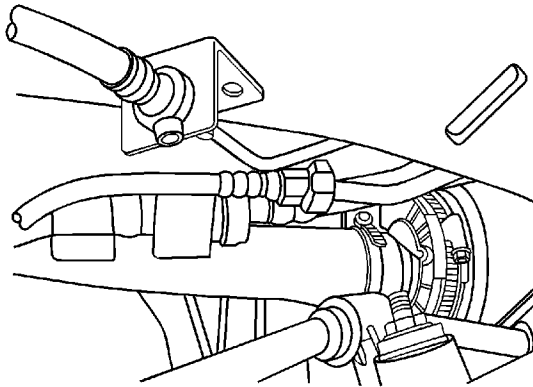
**Warning:** Do not allow smoking or the use of open flames in the area where work on the fuel or EVAP system is taking place. Anytime work is being done on the fuel system, disconnect the negative battery cable, except for those tests where battery voltage is required.

1. Disconnect the evaporative emission (EVAP) canister purge solenoid valve to intake manifold hose.

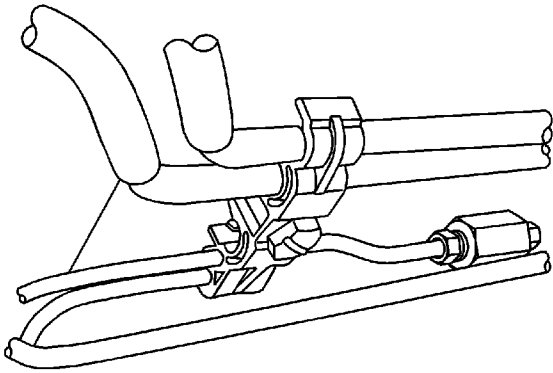




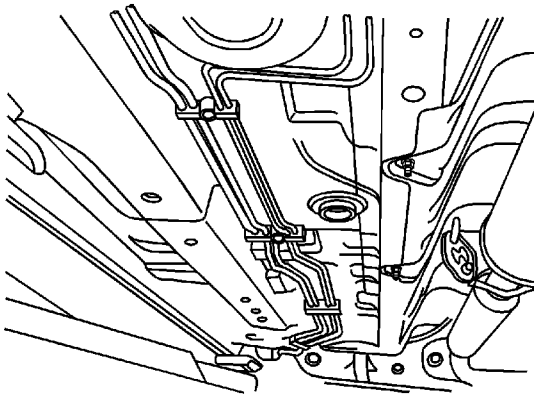
2. Remove the EVAP canister front tube from the EVAP canister purge solenoid valve and the EVAP canister vapor pipe.



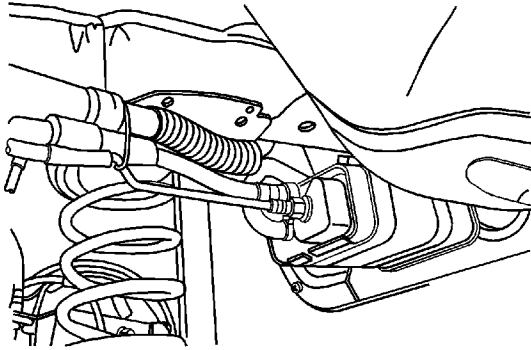
3. Disconnect the EVAP canister pipe from the EVAP canister vapor rear tube.



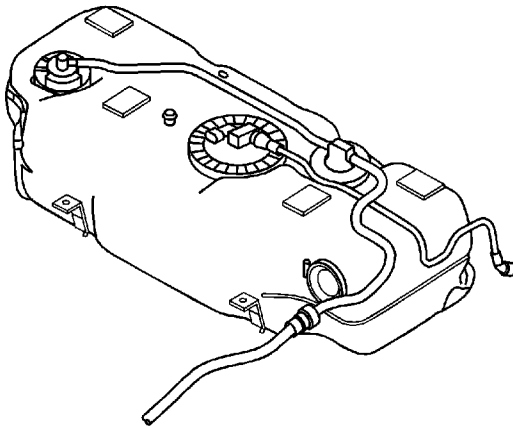
4. Lift and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
5. Remove the EVAP canister vapor pipe plastic bolt and cover.



6. Remove the EVAP canister vapor pipe 4 mounting screws and cover.
7. Remove the EVAP canister vapor pipe.

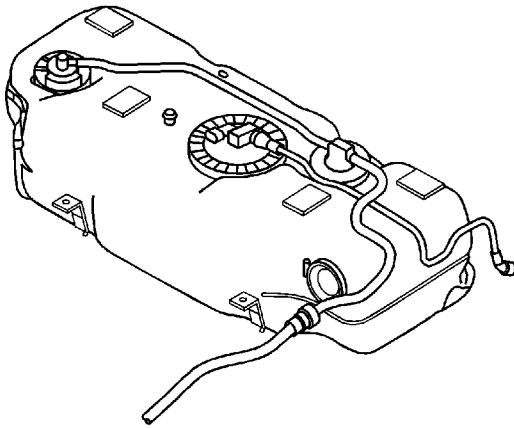


8. Remove the EVAP canister vapor rear tube clip.
9. Disconnect the EVAP canister vapor rear tube.
10. Remove the EVAP canister purge tube clip.
11. Disconnect the EVAP canister purge tube.

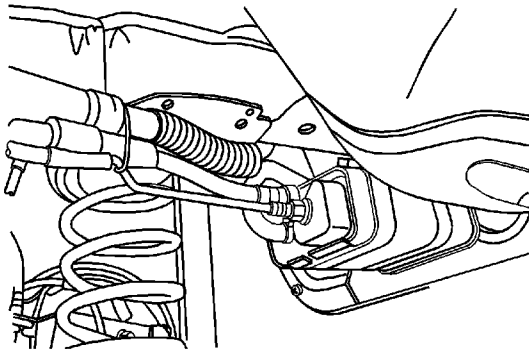


12. Remove the fuel tank. Refer to [Fuel Tank Replacement](#).
13. Remove the rollover valve tube from the fuel tank.

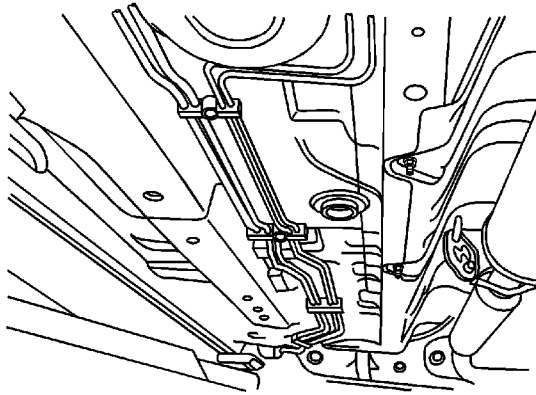
## **Installation Procedure**



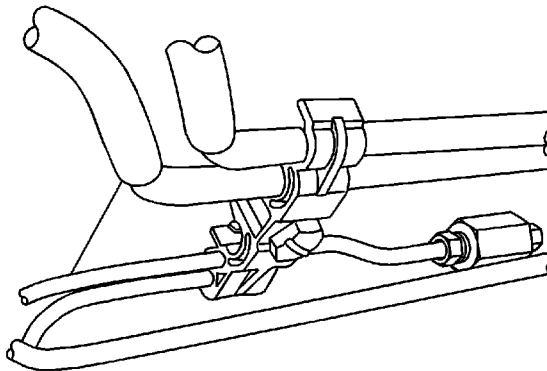
1. Install the rollover valve to the fuel tank.
2. Install the fuel tank. Refer to [Fuel Tank Replacement](#).



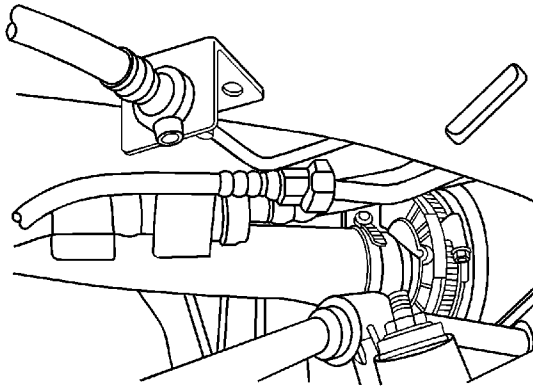
3. Connect the EVAP canister purge tube.
4. Install the EVAP canister purge tube clip.
5. Connect the EVAP canister vapor rear tube.
6. Install the EVAP canister vapor rear tube clip.



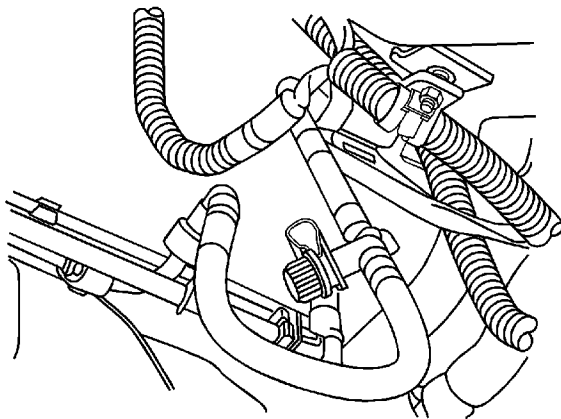
7. Install the EVAP canister vapor pipe.
8. Install the EVAP canister vapor pipe mounting screws and cover.



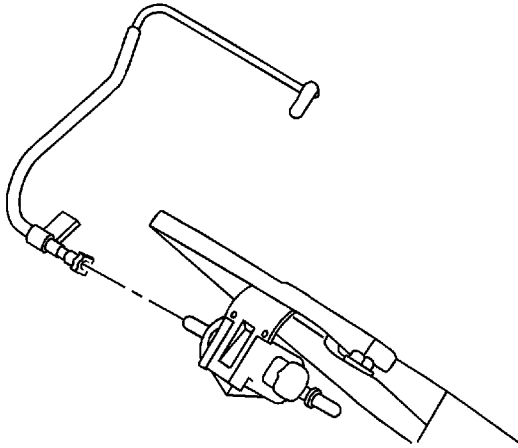
9. Install the EVAP canister vapor pipe plastic bolt and cover.
10. Lower the vehicle.



11. Connect the EVAP canister vapor pipe from the EVAP canister vapor rear tube.



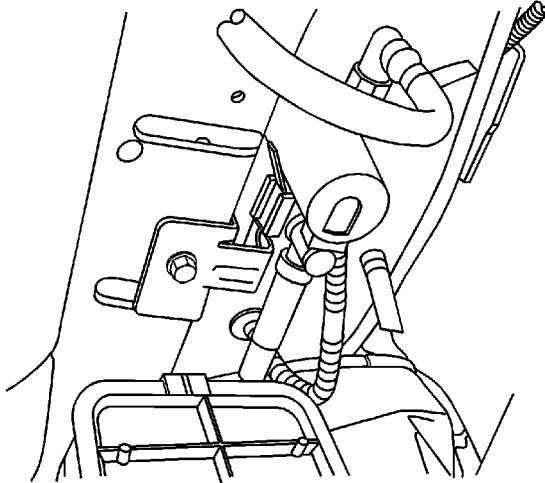
12. Connect the EVAP canister front tube from the EVAP canister purge solenoid valve and the EVAP canister vapor pipe.



13. Connect the EVAP canister purge solenoid valve to intake manifold hose.

# Evaporative Emission Canister Vent Solenoid Valve Replacement

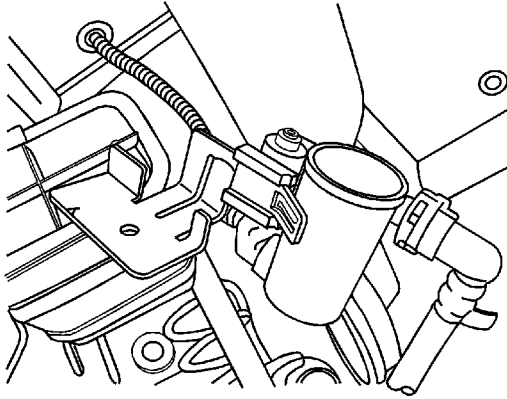
## Removal Procedure



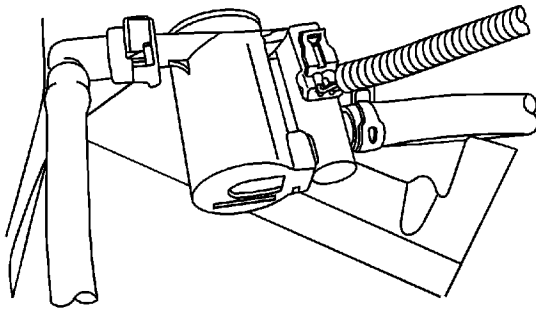
**Warning:** Do not allow smoking or the use of open flames in the area where work on the fuel or EVAP system is taking place. Anytime work is being done on the fuel system, disconnect the negative battery cable, except for those tests where battery voltage is required.

1. Raise and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the evaporative emission (EVAP) canister vent solenoid valve bracket bolt.



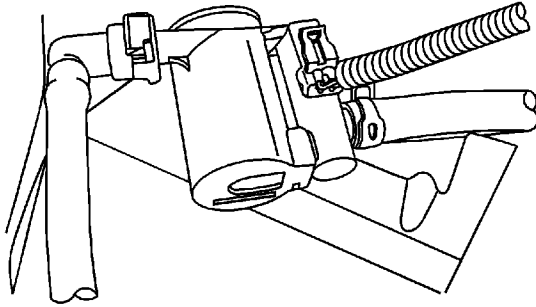


3. Remove the EVAP canister vent solenoid valve bracket.

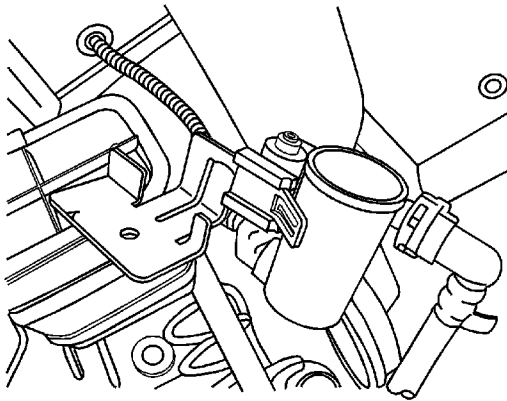


4. Disconnect the EVAP canister vent solenoid valve electrical connector.
5. Remove the EVAP canister vent solenoid valve hose clip.
6. Disconnect the EVAP canister vent solenoid valve hoses.
7. Remove the EVAP canister vent solenoid valve.

## Installation Procedure

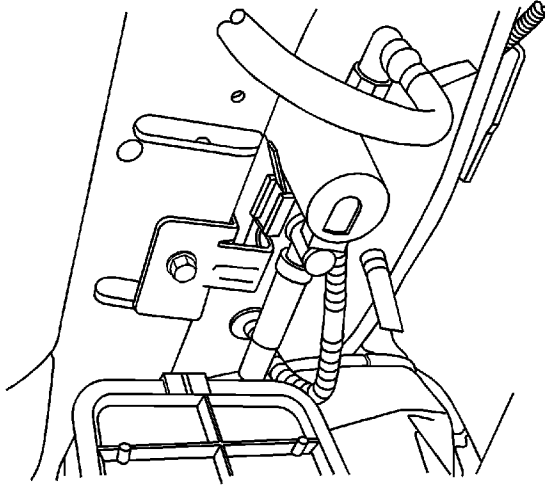


1. Connect the EVAP canister vent solenoid valve hoses.
2. Install the EVAP canister vent solenoid valve hose clip.
3. Connect the EVAP canister vent solenoid valve electrical connector.



4. Install the EVAP canister vent solenoid valve bracket to the EVAP canister vent solenoid valve.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



5. Install the bolt to the EVAP canister vent solenoid valve bracket.

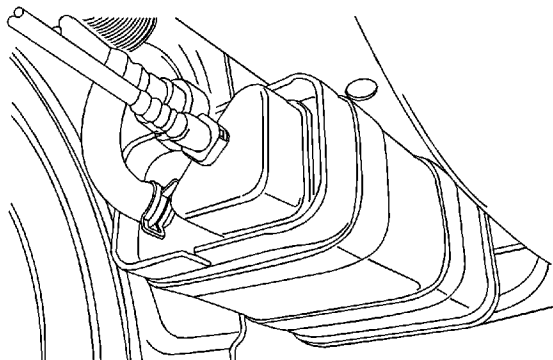
**Tighten**

Tighten the EVAP canister vent solenoid valve bracket bolt to 4 N·m (35 lb in).

6. Lower the vehicle.
7. Connect the negative battery cable, if disconnected.

## Evaporative Emission Canister Replacement

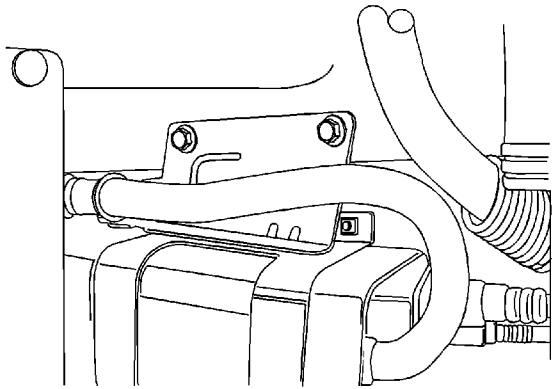
### Removal Procedure



**Warning:** Do not allow smoking or the use of open flames in the area where work on the fuel or EVAP system is taking place. Anytime work is being done on the fuel system, disconnect the negative battery cable, except for those tests where battery voltage is required.

1. Disconnect the canister fuel vapor hoses.
2. Remove the bolt that secures the canister flange to the vehicle.
3. Slide the canister out of the track holder.
4. Remove the canister.

### Installation Procedure



1. Insert the canister into the track and slide it into position.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the canister flange bolt.

**Tighten**

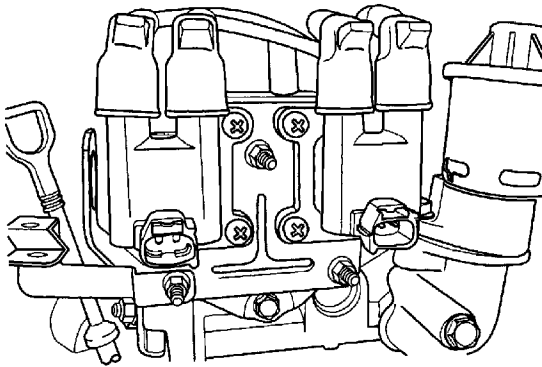
Tighten the evaporative emission (EVAP) canister flange bolt to 4 N·m (35 lb in).

3. Connect the canister fuel vapor hoses.

## Ignition Coil Replacement

### Removal Procedure

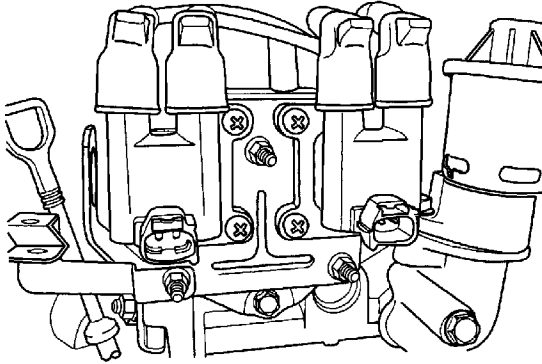
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the electronic ignition (EI) system ignition coil connector.
3. Note the ignition wire location and remove the ignition wire.
4. Remove the EI system ignition coil retaining nuts.
5. Remove the EI system ignition coil.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the EI system ignition coil into the mounting location and install the retaining nuts.

**Tighten**

Tighten the EI system ignition coil retaining nuts to 10 N·m (89 lb in).

2. Connect the EI system ignition coil connector.
3. Connect the negative battery cable.

## Spark Plug Wire Inspection

Spark plug wire integrity is vital for proper engine operation. A thorough inspection will be necessary to accurately identify conditions that may affect engine operation. Inspect for the following conditions:

1. Correct routing of the spark plug wires. Incorrect routing may cause cross-firing.
2. Any signs of cracks or splits in the wires.
3. Inspect each boot for the following conditions:
  - Tearing
  - Piercing
  - Arcing
  - Carbon tracking
  - Corroded terminal

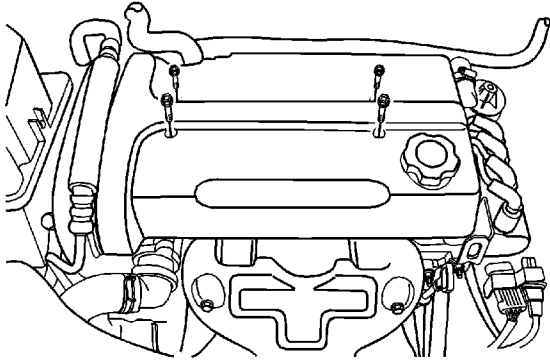
If corrosion, carbon tracking, or arcing are indicated on a spark plug wire boot or on a terminal, replace the wire and the component connected to the wire.



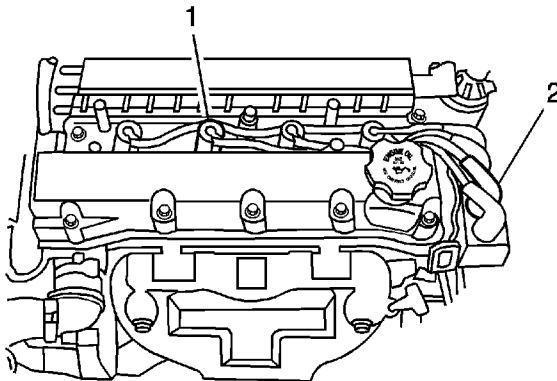
## Spark Plug Wire Replacement

### Removal Procedure

1. Turn OFF the ignition.



2. Remove the engine cover from the engine.



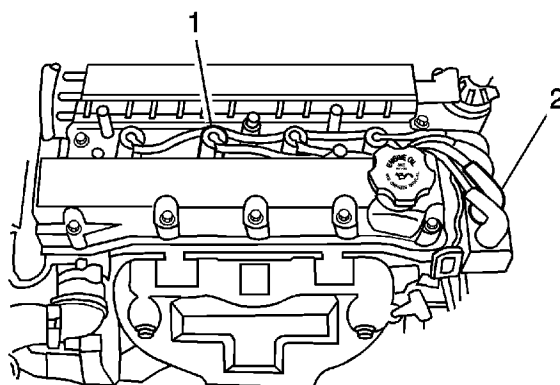
3. Disconnect the spark plug wire (1) at each spark plug.
  - Twist each spark plug boot 1/2 turn before removing.
  - Pull only on the boot or use a tool designed for this purpose in order to remove the wire

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from each spark plug.

4. Disconnect the spark plug wire from the coil (2).
  - Twist each spark plug boot 1/2 turn before removing.
  - Pull only on the boot or use a tool designed for this purpose in order to remove the wires from the coil.

## Installation Procedure

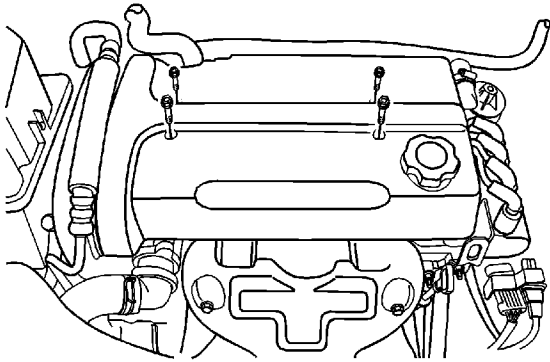


1. Install the spark plug wire on the coil (2).
2. Install the spark plug wire (1) at each spark plug.

**Caution:** If the boot to wire movement has occurred, the boot will give a false visual impression of being fully seated. Ensure that the boots have been properly assembled by pushing sideways on the installed boots. Failure to properly seat the terminal onto the spark plug will lead to wire core erosion and result in an engine misfire or crossfire condition, and possible internal damage to the engine.

3. Inspect the wires for proper installation:
  - Push down on each boot in order to inspect the seating.
  - Reinstall any loose boot.
  - Wire routing must be kept intact during service and followed exactly when wires have been disconnected or when replacement of the wires is necessary. Failure to route the wires correctly can lead to radio interference and crossfire of the plugs, or shorting of the leads to the ground.
  - Any time the spark plug wires or boots are installed on the spark plugs, new dielectric grease needs to be applied inside the boot.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



4. Install the engine cover on the engine.

**Tighten**

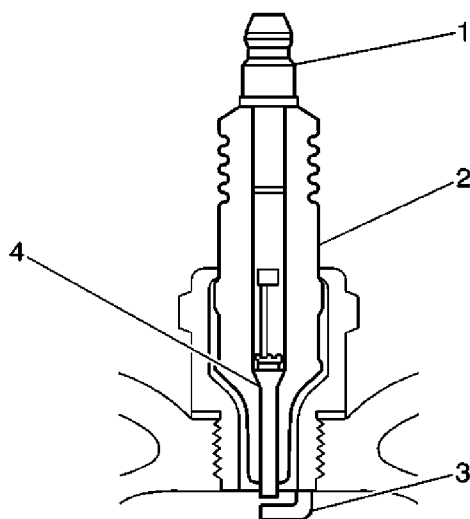
Tighten the engine cover bolts to 3 N·m (31 lb in).

## Spark Plug Inspection

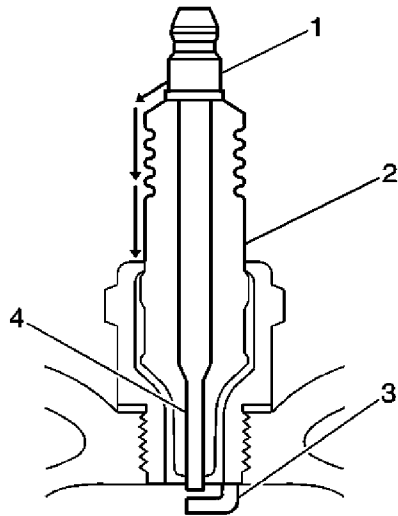
### Spark Plug Usage

- Ensure that the correct spark plug is installed. An incorrect spark plug causes driveability conditions.
- Ensure that the spark plug has the correct heat range. An incorrect heat range causes the following conditions:
  - Spark plug fouling--Colder plug
  - Pre-ignition causing spark plug and/or engine damage--Hotter plug

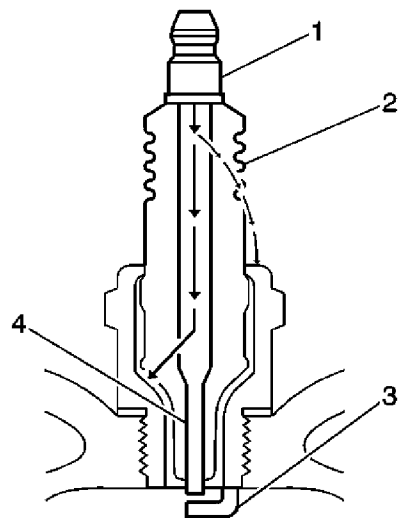
### Spark Plug Inspection



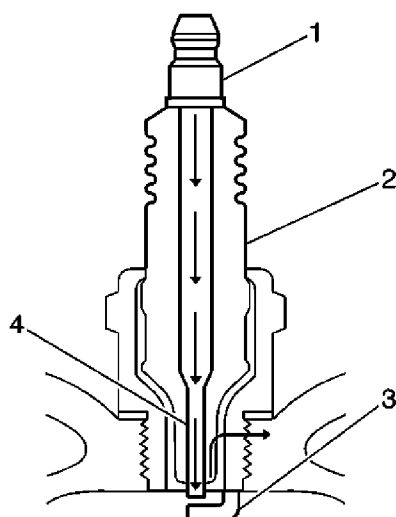
1. Inspect the terminal post (1) for damage.
  - Inspect for a bent or broken terminal post (1).
  - Test for a loose terminal post (1) by twisting and pulling the post. The terminal post (1) should NOT move.



2. Inspect the insulator (2) for flashover or carbon tracking, soot. This is caused by the electrical charge traveling across the insulator (2) between the terminal post (1) and ground. Inspect for the following conditions:
  - Inspect the spark plug boot for damage.
  - Inspect the spark plug recess area of the cylinder head for moisture, such as oil, coolant, or water. A spark plug boot that is saturated causes arcing to ground.



3. Inspect the insulator (2) for cracks. All or part of the electrical charge may arc through the crack instead of the electrodes (3, 4).



4. Inspect (3) for evidence of improper arcing.
  - Measure the gap between the center electrode (4) and the side electrode (3) terminals. An excessively wide electrode gap can prevent correct spark plug operation.
  - Inspect for the correct spark plug torque. Insufficient torque can prevent correct spark plug operation. An over torqued spark plug, causes the insulator (2) to crack.
  - Inspect for signs of tracking that occurred near the insulator tip instead of the center electrode (4).
  - Inspect for a broken or worn side electrode (3).
  - Inspect for a broken, worn, or loose center electrode (4) by shaking the spark plug.
    - A rattling sound indicates internal damage.
    - A loose center electrode (4) reduces the spark intensity.
  - Inspect for bridged electrodes (3, 4). Deposits on the electrodes (3, 4) reduce or eliminates the gap.
  - Inspect for worn or missing platinum pads on the electrodes (3, 4), if equipped.
  - Inspect for excessive fouling.
5. Inspect the spark plug recess area of the cylinder head for debris. Dirty or damaged threads can cause the spark plug not to seat correctly during installation.

## Spark Plug Visual Inspection

- Normal operation--Brown to grayish-tan with small amounts of white powdery deposits are normal combustion by-products from fuels with additives.
- Carbon fouled--Dry, fluffy black carbon, or soot caused by the following conditions:
  - Rich fuel mixtures
- Leaking fuel injectors
- Excessive fuel pressure
- Restricted air filter element
- Incorrect combustion

- Reduced ignition system voltage output
- Weak coils
- Worn ignition wires
- Incorrect spark plug gap
  - Excessive idling or slow speeds under light loads can keep spark plug temperatures so low that normal combustion deposits may not burn off.
- Deposit fouling--Oil, coolant, or additives that include substances such as silicone, very white coating, reduces the spark intensity. Most powdery deposits will not effect spark intensity unless they form into a glazing over the electrode.

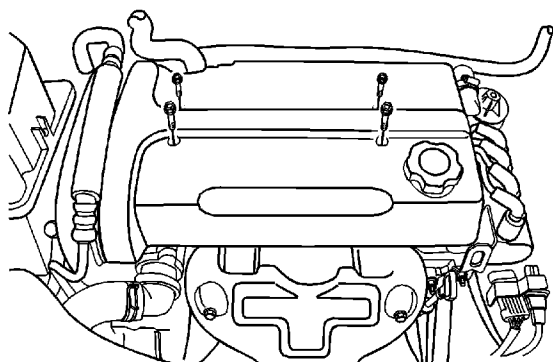
# Spark Plug Replacement

## Removal Procedure

**Caution:** Observe the following service precautions:

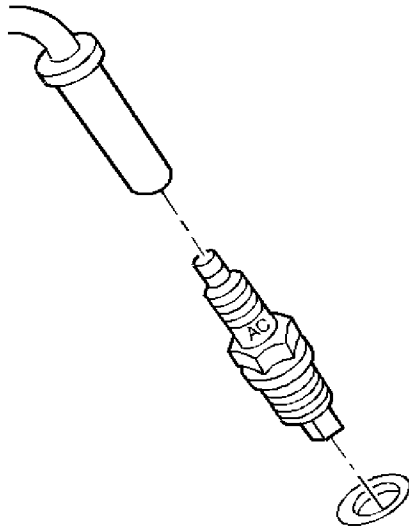
- Allow the engine to cool before removing the spark plugs. Attempting to remove spark plugs from a hot engine can cause the spark plugs to seize. This can damage the cylinder head threads.
- Clean the spark plug recess area before removing the spark plug. Failure to do so can result in engine damage due to dirt or foreign material entering the cylinder head, or in contamination of the cylinder head threads. Contaminated threads may prevent proper seating of the new spark plug.
- Use only the spark plugs specified for use in the vehicle. Do not install spark plugs that are either hotter or colder than those specified for the vehicle. Installing spark plugs of another type can severely damage the engine.

1. Turn OFF the ignition.



2. Loosen the 4 bolts and remove the engine cover.





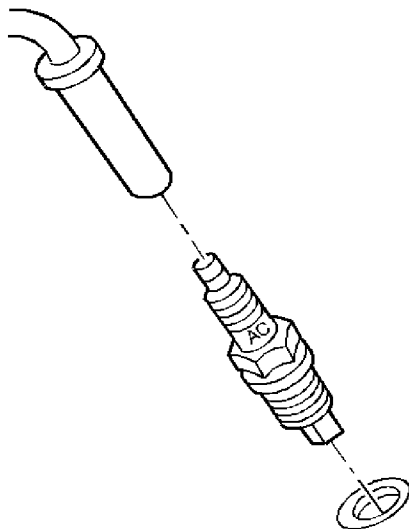
3. Remove the spark plug wires from the spark plugs. Refer to [Spark Plug Wire Replacement](#).
4. Remove the spark plugs from the engine.

## Installation Procedure

**Caution:** It is important to check the gap of all new and reconditioned spark plugs before installation. Pre-set gaps may have changed during handling. Use a round wire feeler gauge to be sure of an accurate check, particularly on used plugs. Installing plugs with the wrong gap can cause poor engine performance and may even damage the engine.

1. Gap the spark plugs to the specifications. Refer to [Ignition System Specifications](#).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.





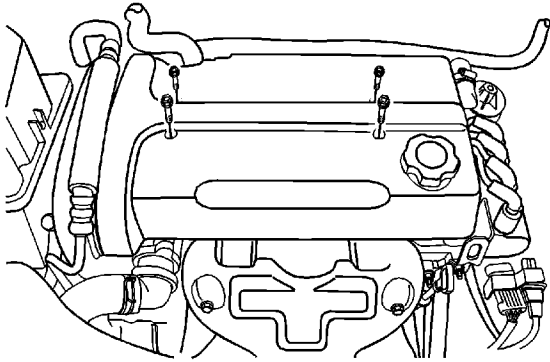
**Caution:** Be sure plug threads smoothly into cylinder head and is fully seated. Use a thread chaser if necessary to clean threads in cylinder head. Cross-threading or failing to fully seat spark plug can cause overheating of plug, exhaust blow-by, or thread damage. Follow the recommended torque specifications carefully. Over or under-tightening can also cause severe damage to engine or spark plug.

2. Install the spark plugs to the engine.

**Tighten**

Tighten the spark plugs to 25 N·m (18 lb ft).

3. Install the spark plug wires to the spark plugs. Refer to [Spark Plug Wire Replacement](#).



4. Install the engine cover and tighten the 4 bolts.

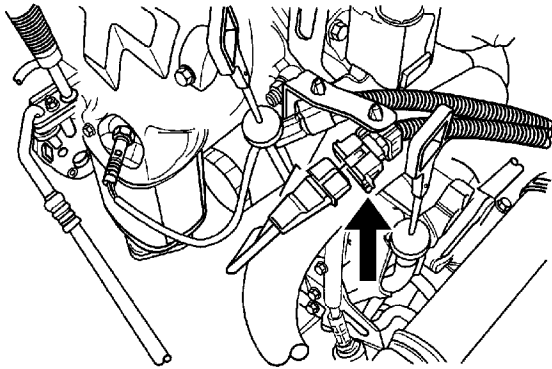
**Tighten**

Tighten the engine cover bolts to 3 N·m (31 lb in).

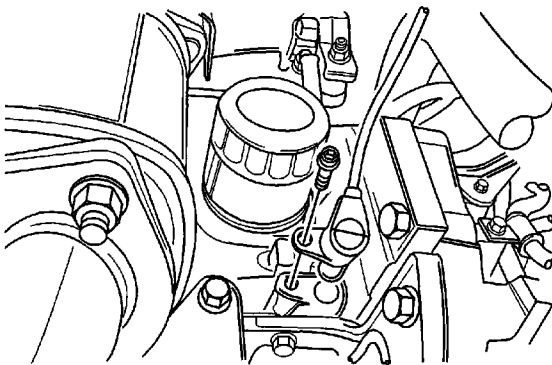
## Crankshaft Position Sensor Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the crankshaft position (CKP) sensor electrical connector.



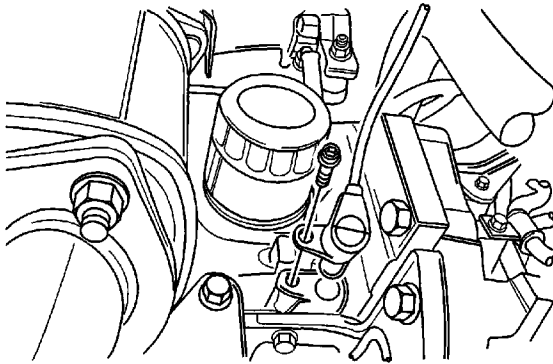
3. Remove the CKP sensor bolt.

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4. Remove the CKP sensor.

## Installation Procedure

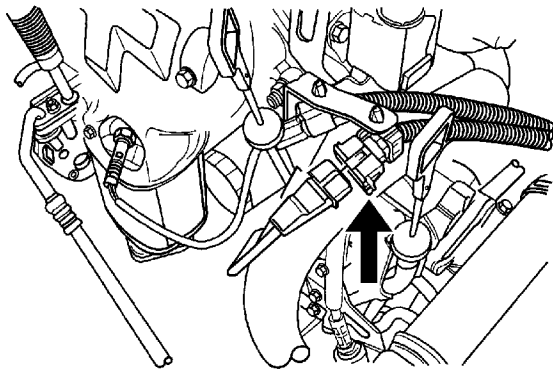
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the CKP sensor with the bolt.

### **Tighten**

Tighten the CKP sensor bolt to 6.5 N·m (58 lb in).



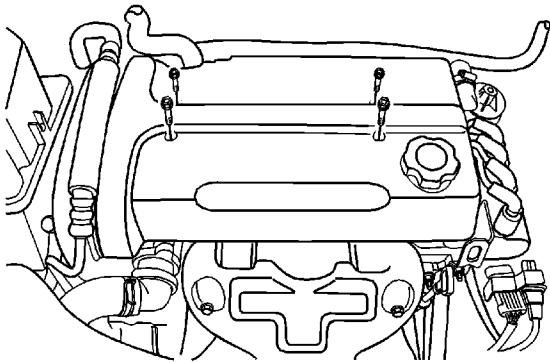


2. Connect the CKP sensor electrical connector.
3. Connect the negative battery cable.

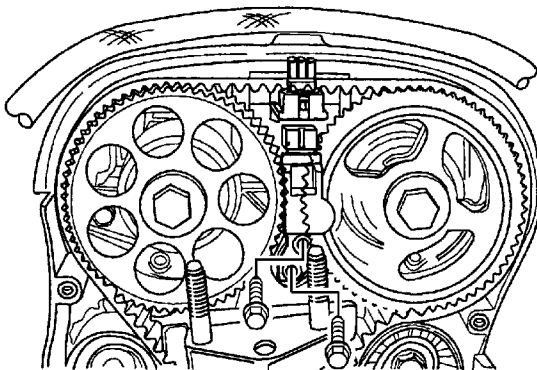
## Camshaft Position Sensor Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the engine cover bolts and the nuts.
3. Remove the engine cover.

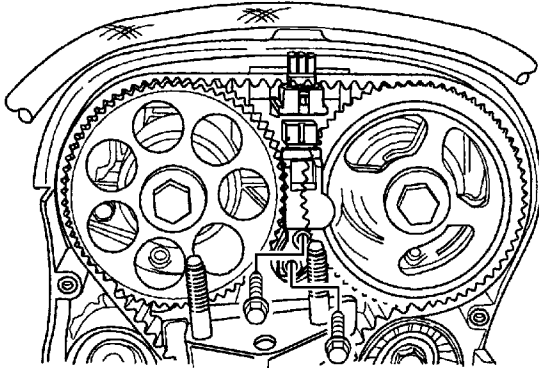


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4. Disconnect the camshaft position (CMP) sensor electrical connector.
5. Remove the timing belt front cover. Refer to [Timing Belt Replacement](#).

## Installation Procedure

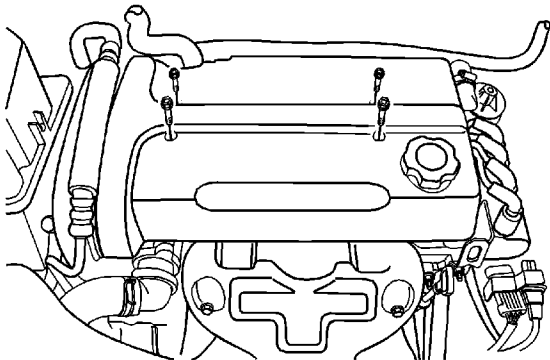
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the CMP sensor and bolt.

### **Tighten**

Tighten the CMP sensor bolts to 7 N·m (62 lb in).





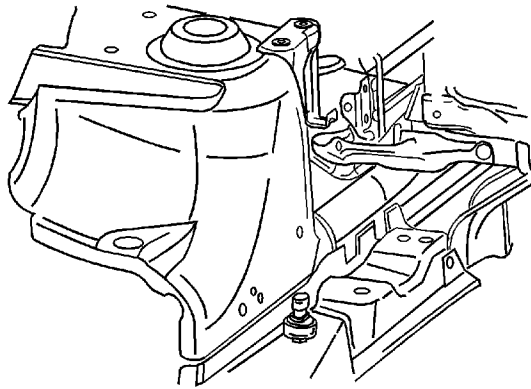
2. Install the timing belt front cover. Refer to [Timing Belt Replacement](#).
3. Connect the CMP sensor electrical connector.
4. Install the engine cover.
5. Connect the negative battery cable.



## Rough Road Sensor Replacement

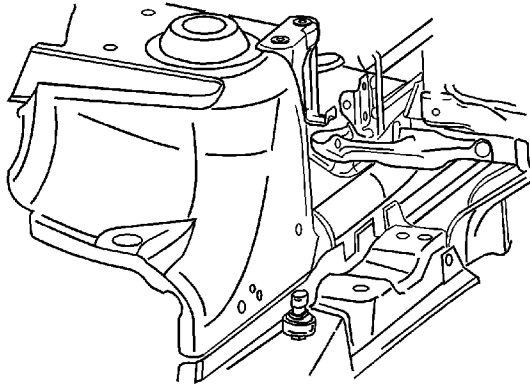
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the rough road sensor electrical connector and remove the rough road sensor.

### Installation Procedure

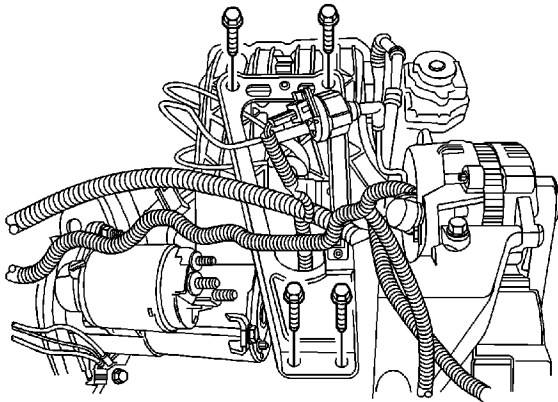


1. Install the rough road sensor and connect the electrical connector.
2. Connect the negative battery cable.

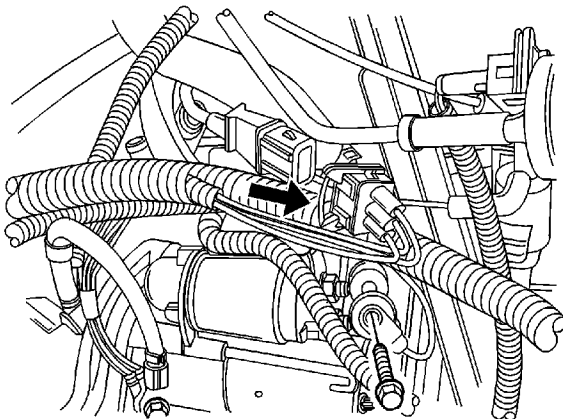
## Knock Sensor Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the intake manifold bracket bolts and bracket.



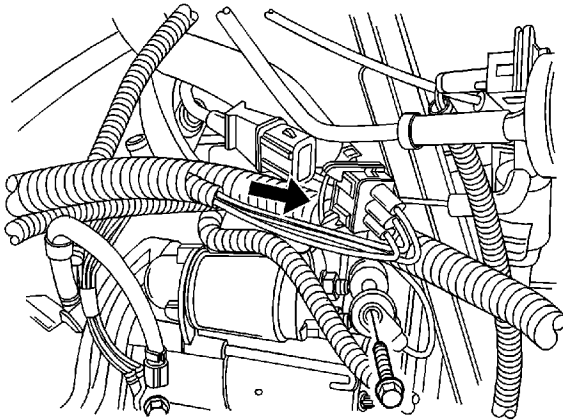
3. Disconnect the knock sensor (KS) electrical connector.

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4. Remove the Knock sensor bolt.
5. Remove the knock sensor.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

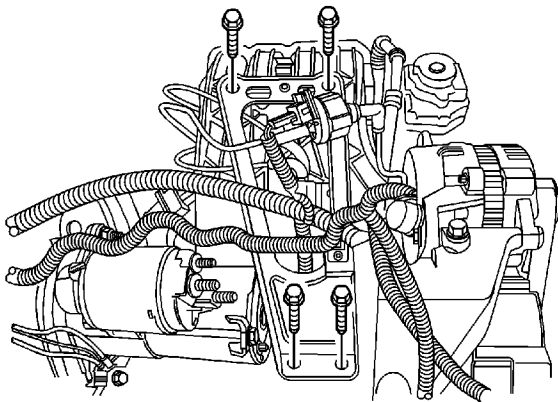


1. Install the KS with the bolt.

### **Tighten**

Tighten the KS bolt to 20 N·m (15 lb ft).

2. Connect the KS electrical connector.





3. Install the intake manifold bracket and bolts.

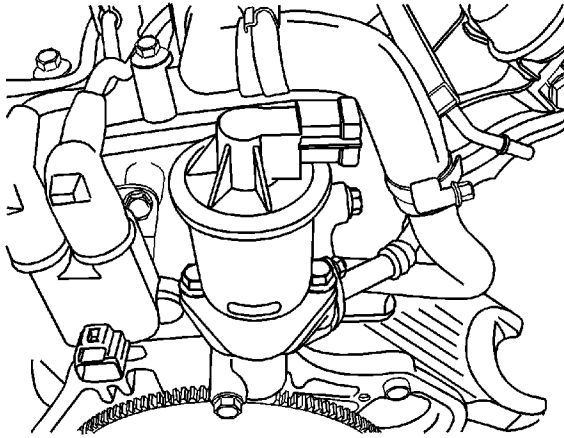
**Tighten**

- Tighten the bracket upper bolt to 25 N·m (18 lb ft).
  - Tighten the bracket lower bolt to 45 N·m (33 lb ft).
4. Connect the negative battery cable.

## Exhaust Gas Recirculation Valve Replacement

### Removal Procedure

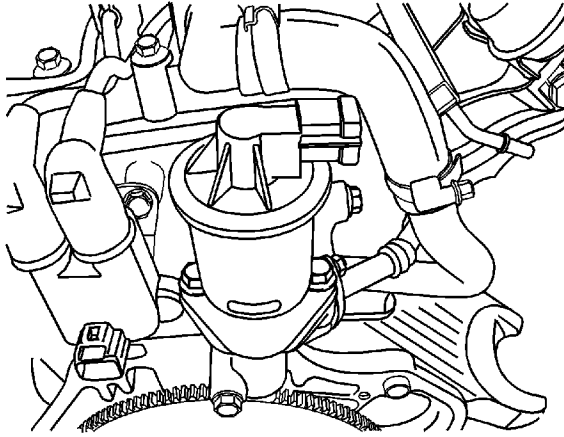
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the electrical exhaust gas recirculation (EGR) valve electrical connector.
3. Remove the EGR valve retaining bolts.
4. Remove the EGR valve.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the EGR valve with the bolts.

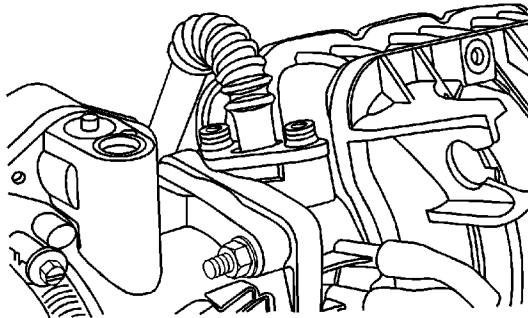
**Tighten**

Tighten the electrical EGR valve retaining bolts to 30 N·m (22 lb ft).

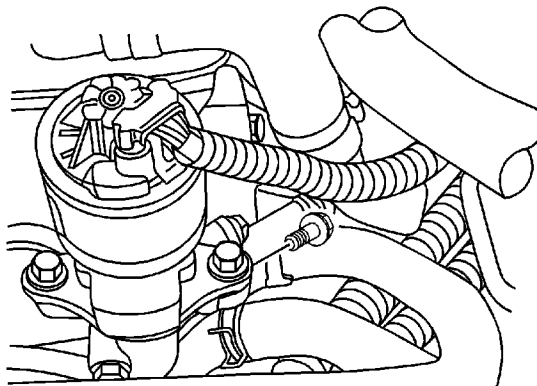
2. Connect the EGR valve electrical connector.
3. Connect the negative battery cable.

## Exhaust Gas Recirculation Valve Pipe Replacement

### Removal Procedure

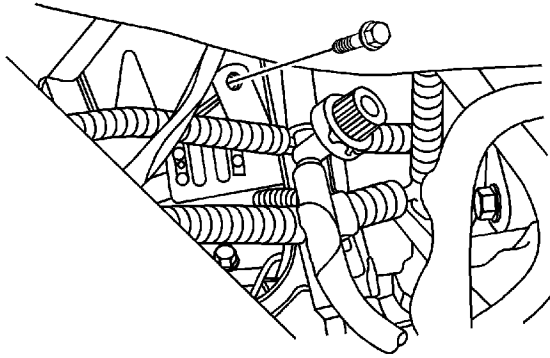


1. Remove the exhaust gas recirculation (EGR) pipe mounting bolts from the intake manifold.



2. Remove the EGR pipe mounting bolts from the EGR valve.
3. Raise and suitable support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

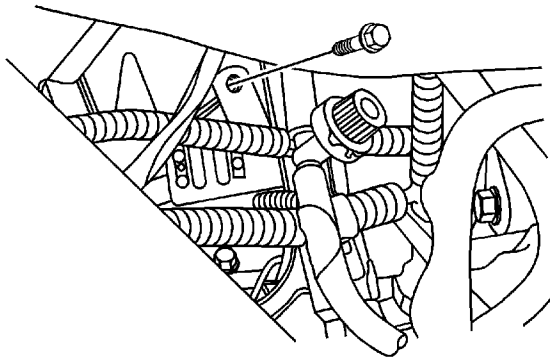




4. Remove the lower mounting bolt attaching the EGR pipe to the intake manifold.
5. Remove the EGR pipe.

## Installation Procedure

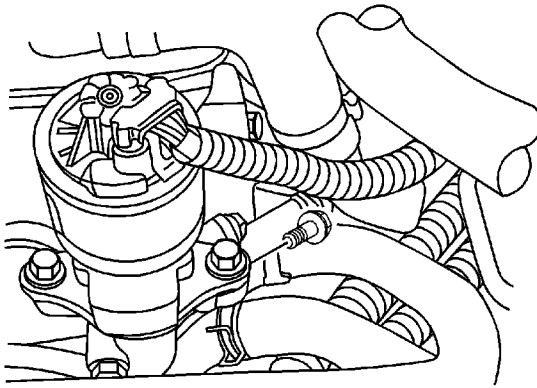
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the EGR pipe and the lower bolt attaching the EGR pipe to the intake manifold.

### **Tighten**

Tighten the EGR pipe mounting bolt to 12 N·m (106 lb in).

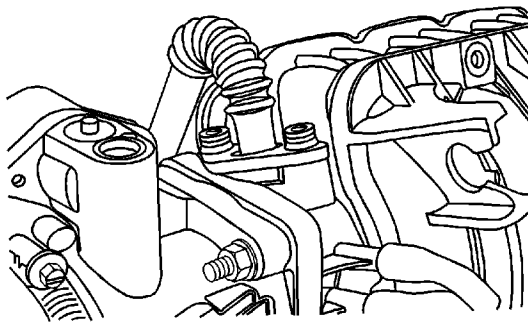


2. Install the EGR pipe mounting bolts to the EGR valve.

**Tighten**

Tighten the EGR pipe to EGR valve mounting bolts to 10 N·m (89 lb in).

3. Lower the vehicle.



4. Install the EGR pipe mounting bolts to the intake manifold.

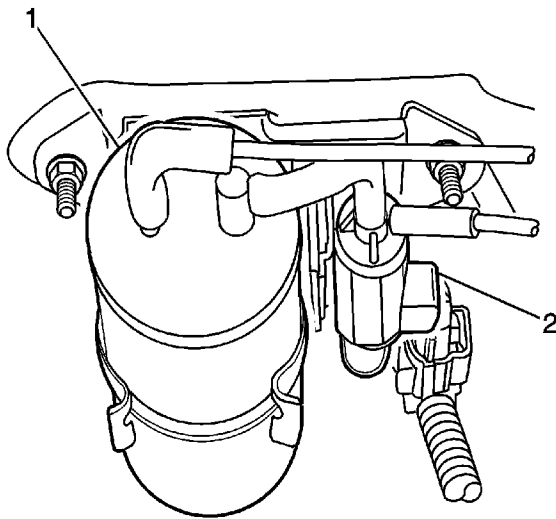
**Tighten**

Tighten the EGR pipe to intake manifold mounting bolts to 12 N·m (106 lb in).

# Intake Manifold Tuning Valve Actuator Solenoid Replacement

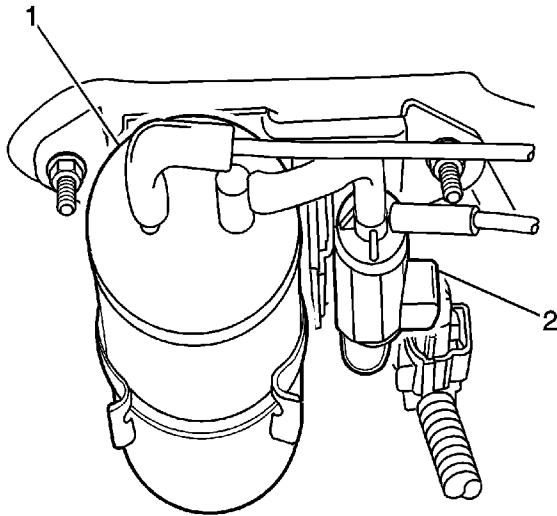
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the intake manifold tuning (IMT) valve solenoid (2) connector.
3. Disconnect the vacuum hoses from the IMT valve solenoid (2).
4. Remove the IMT valve solenoid (2).

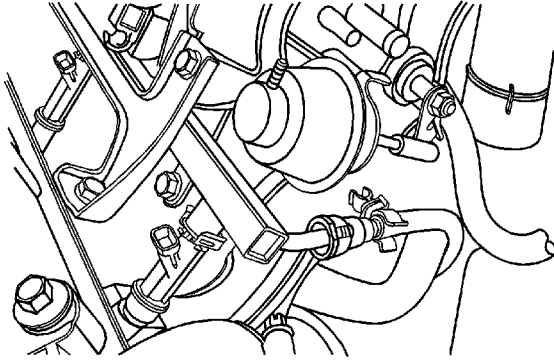
## Installation Procedure



1. Install the IMT valve solenoid.
2. Connect the vacuum hoses to the IMT valve solenoid (2).
3. Connect the IMT valve solenoid (2) connector.
4. Connect the negative battery cable.

## Intake Manifold Tuning Valve Actuator Replacement

### Removal Procedure

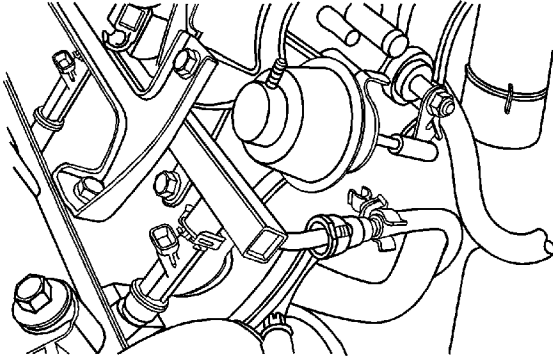


1. Disconnect the vacuum hose from the intake manifold tuning (IMT) valve actuator valve.

**Note:** Ensure the IMT valve is closed before removing the IMT valve actuator retaining bolts and valve.

2. Remove the IMT valve actuator valve bolts.
3. Remove the IMT valve actuator valve from the IMT valve.

### Installation Procedure



1. Install the IMT valve actuator valve to the IMT valve.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the IMT valve actuator valve bolts.

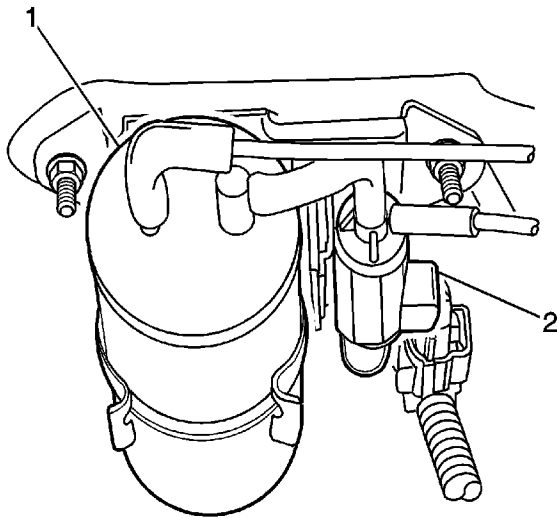
**Tighten**

Tighten the IMT valve actuator valve retaining bolts to 12 N·m (106 lb ft).

3. Connect the vacuum hose to the IMT valve actuator valve.

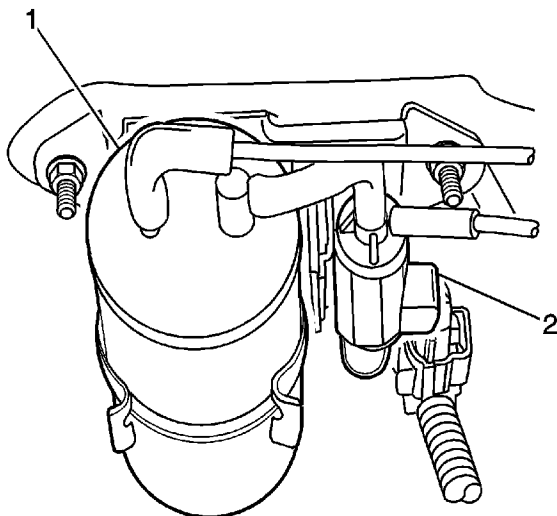
# Intake Air Tuning Valve Vacuum Reservoir Replacement

## Removal Procedure



1. Remove the vacuum hoses from the intake manifold (IMT) vacuum reservoir (1).
2. Remove the IMT valve reservoir (1).

## Installation Procedure



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1. Install the IMT valve reservoir (1).
2. Install the vacuum hoses to the IMT valve reservoir (1).

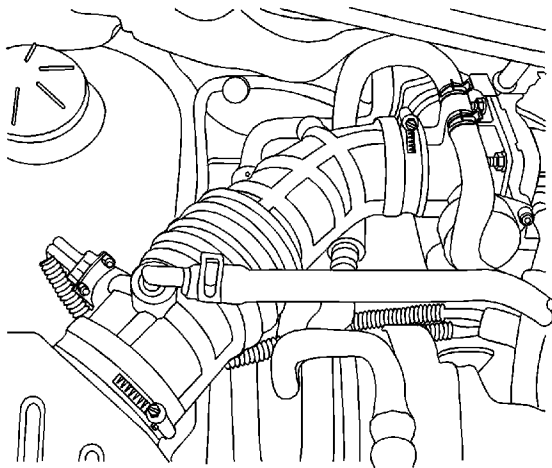


## Air Cleaner Inlet Duct Replacement

### Removal Procedure

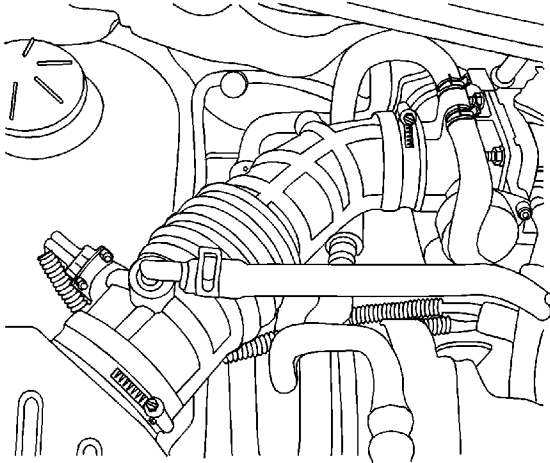
**Note:** The intake air temperature sensor is no longer replaced as a separate service item. If the intake air temperature sensor is faulty, replacement of the entire air cleaner inlet duct will be necessary.

1. Turn OFF the ignition.
2. Disconnect the electrical connector from the intake air temperature (IAT) sensor.
3. Disconnect the breather tube from the air cleaner intake duct.



4. Loosen the clamps securing the air cleaner intake duct.
5. Remove air cleaner intake duct.

### Installation Procedure



**Note:** An improperly installed air cleaner intake duct or breather tube will cause incorrect sensor readings resulting in MIL illumination or a drivability concern.

1. Install the air cleaner intake duct.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Tighten the clamps securing the air cleaner intake duct.

**Tighten**

Tighten the clamp to 3 N·m (27 lb in).

3. Connect the breather tube to the air cleaner intake duct.
4. Connect the electrical connector to the IAT sensor.

## Air Cleaner Element Replacement

### Removal Procedure

1. Loosen the air cleaner intake duct clamp at the air cleaner assembly.
2. Remove the air cleaner intake duct from the upper air cleaner cover.
3. Remove the upper air cleaner screws.
4. Remove the upper air cleaner cover from the lower air cleaner housing.
5. Remove the air cleaner filter from lower air cleaner housing.

### Installation Procedure

1. Install the air cleaner filter into the lower air cleaner housing.
2. Install the upper air cleaner cover to lower air cleaner housing.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the upper air cleaner screws.

#### **Tighten**

Tighten the upper air cleaner cover screws to 3 N·m (27 lb in).

4. Install the intake duct to the upper air cleaner cover.

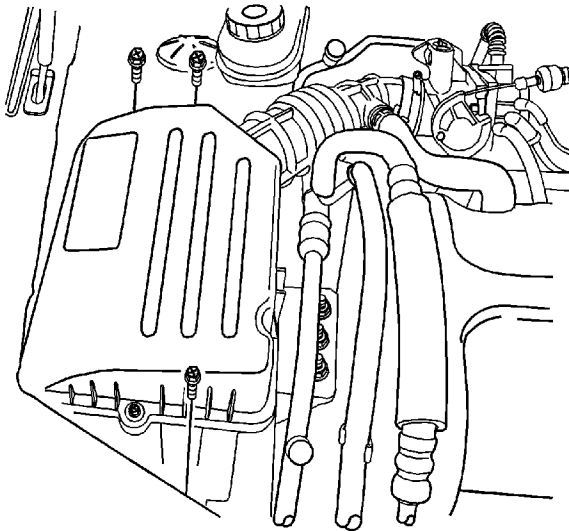
#### **Tighten**

Tighten the intake duct clamp to 3 N·m (27 lb in).

## Air Cleaner Assembly Replacement

### Removal Procedure

1. Loosen the air cleaner intake duct clamp at the air cleaner assembly.
2. Remove the air cleaner intake duct from the air cleaner assembly.

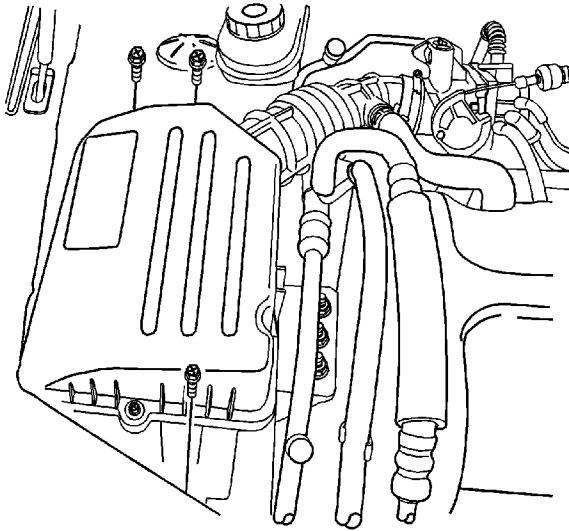


3. Remove the air cleaner assembly attachment bolts.
4. Remove the air cleaner assembly.

### Installation Procedure

1. Install the air cleaner assembly.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



2. Install the air cleaner assembly attachment bolts.

**Tighten**

Tighten the nut to 10 N·m (89 lb in).

3. Install the air cleaner intake duct to the air cleaner assembly.

**Tighten**

Tighten the air cleaner intake duct clamp to 3 N·m (27 lb in).

## Temperature Versus Resistance

°C	°F	ECT Ohms	IAT Ohms
Temperature vs Resistance Values (Approximate)			
100	212	177	187
90	194	241	246
80	176	332	327
70	158	467	441
60	140	667	603
50	122	973	837
45	113	1188	991
40	104	1459	1180
35	95	1802	1412
30	86	2238	1700
25	77	2796	2055
20	68	3520	2500
15	59	4450	3055
10	50	5670	3760
5	41	7280	4651
0	32	9420	5800
-5	23	12300	7273
-10	14	16180	9200
-15	5	21450	9200
-20	-4	28680	15080
-30	-22	52700	25600
-40	-40	100700	45300

## Altitude Versus Barometric Pressure

Altitude Measured in Meters (m)	Altitude Measured in Feet (ft)	Barometric Pressure Measured in Kilopascals (kPa)
Determine your altitude by contacting a local weather station or by using another reference source.		
4 267	14,000	56-64
3 962	13,000	58-66
3 658	12,000	61-69
3 353	11,000	64-72
3 048	10,000	66-74
2 743	9,000	69-77
2 438	8,000	71-79
2 134	7,000	74-82
1 829	6,000	77-85
1 524	5,000	80-88
1 219	4,000	83-91
914	3,000	87-95
610	2,000	90-98
305	1,000	94-102
0	0 Sea Level	96-104
-305	-1,000	101-105

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Engine](#) | [Engine Controls and Fuel - 1.6L \(LXV\)](#)  
| [Specifications](#) | Document ID: 2089178

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## Ignition System Specifications

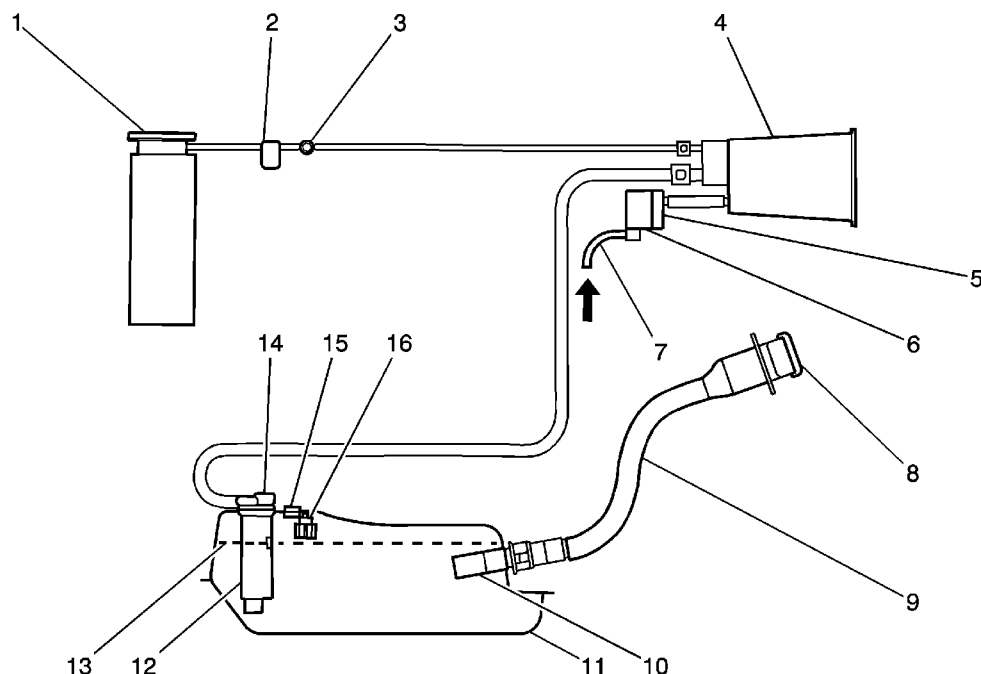
Application	Specification	
	Metric	English
Firing Order	1-3-4-2	
Spark Plug Gap	1.0-1.1 mm	0.039-0.043 in
Spark Plug Torque	25 N·m	18 lb ft
Spark Plug Type	Woojin NGK - ZFR6U-II	



## Fastener Tightening Specifications

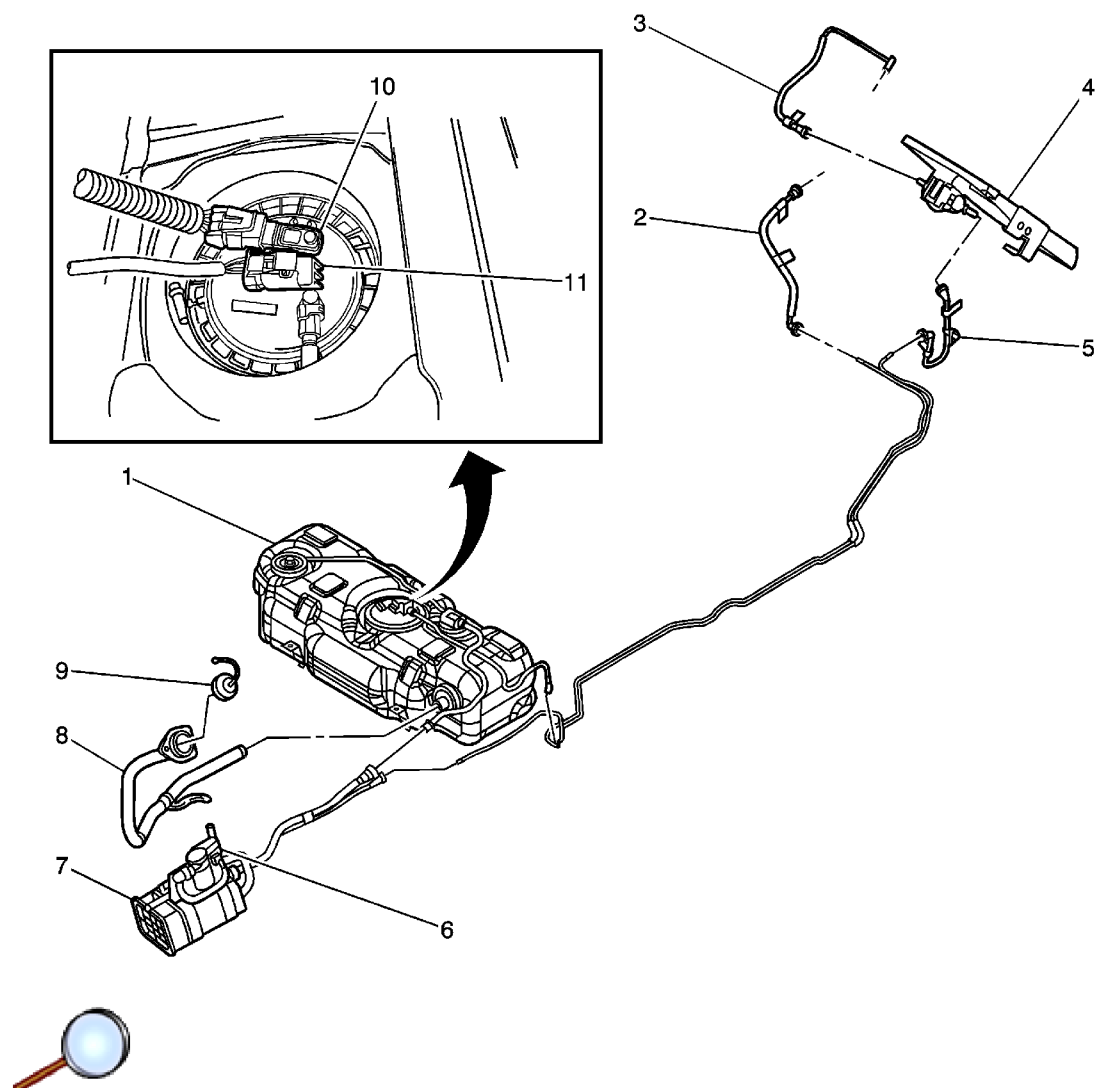
Application	Specifications	
	Metric	English
Accelerator Pedal Nut	12 N·m	106 lb in
Camshaft Position Actuator Solenoid Valve Bolt	6 N·m	53 lb in
Crankshaft Position (CKP) Sensor Bolt	4.5 N·m	40 lb in
Engine Control Module (ECM) Nuts	8 N·m	71 lb in
Engine Coolant Temperature 2 (ECT2) Sensor	20 N·m	15 lb ft
Fuel Filter Bracket Bolt	4 N·m	35 lb in
Fuel Rail Bolt	8 N·m	71 lb in
Heated Oxygen Sensor (HO2S)	40 N·m	30 lb ft
Ignition Coil Bolt	8 N·m	71 lb in
Knock Sensor (KS) Bolt	20 N·m	15 lb ft
Map Sensor Screw	8 N·m	71 lb in
Throttle Body Bolts	8 N·m	71 lb in

## Evaporative Emissions Hose Routing Diagram



- (1) Intake Manifold
- (2) Evaporative Emissions (EVAP) Canister Purge Solenoid Valve
- (3) Service Port
- (4) Evaporative Emissions (EVAP) Canister
- (5) Evaporative Emissions (EVAP) Canister Vent Solenoid Valve
- (6) Air Filter
- (7) Fresh Air Intake
- (8) Fuel Filler Cap
- (9) Fuel Filler Tube
- (10) Check Valve
- (11) Fuel Tank
- (12) Fuel Fill Vent Valve
- (13) Fuel Level at Shut-Off
- (14) Fuel Pressure Relief Valve
- (15) Fuel Tank Pressure Sensor
- (16) Rollover Valve

## Fuel Hose/Pipes Routing Diagram

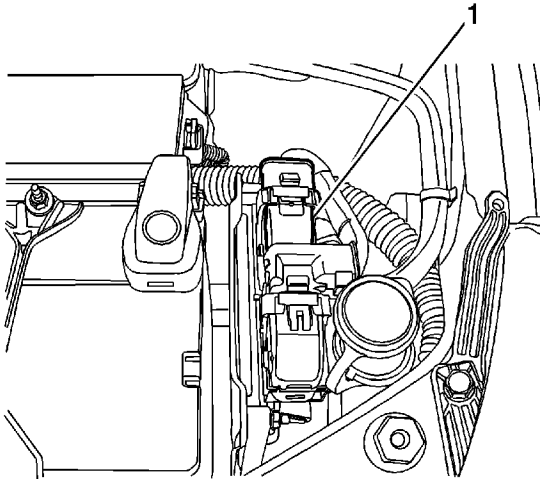


- (1) Fuel Tank
- (2) Fuel Line to Fuel Rail
- (3) EVAP Canister Purge Vacuum Line to Intake Manifold
- (4) EVAP Canister Purge Solenoid Valve
- (5) EVAP Service Port
- (6) EVAP Canister Vent Solenoid Valve
- (7) EVAP Canister
- (8) Fuel Fill Tube
- (9) Fuel Filler Cap
- (10) Fuel Tank Pressure Sensor (FTP)
- (11) Fuel Sender Assembly

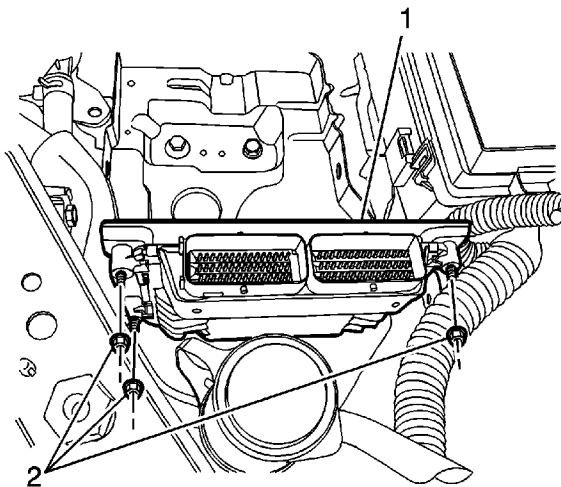
## Engine Control Module Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



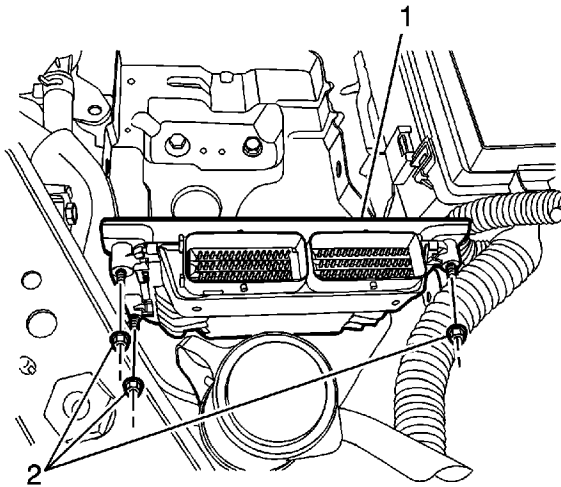
1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Unlock the ECM connector locking lever (1).



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3. Remove the ECM retaining nuts (2).
4. Remove the ECM (1).

## Installation Procedure



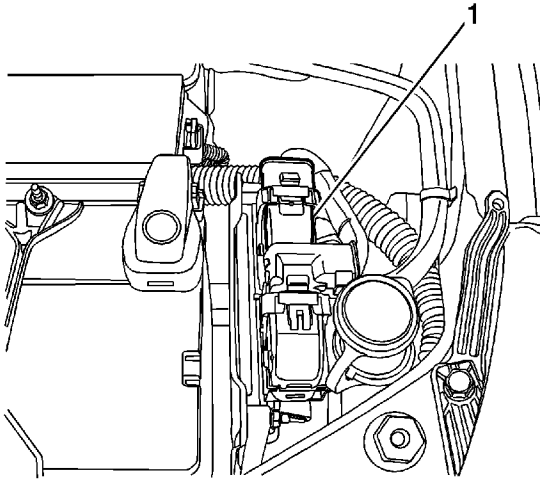
1. Install the ECM (1).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ECM retaining nuts (2).

### **Tighten**

Tighten the ECM retaining nuts to 8 N·m (70.8 lb in).



3. Lock the ECM connector locking lever (1).
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Crankshaft Position System Variation Learn

**Note:** The crankshaft position (CKP) system variation learn procedure is required when the following service procedures have been performed, regardless of whether DTC P0315 is set:

- Engine replacement
- Engine control module (ECM) replacement
- Crankshaft damper replacement
- Crankshaft replacement
- CKP sensor replacement
- Any engine repairs which disturb the crankshaft to CKP sensor relationship

**Note:** The scan tool monitors certain component signals to determine if all the conditions are met to continue with the CKP system variation learn procedure. The scan tool only displays the condition that inhibits the procedure. The scan tool monitors the following components:

- CKP sensor activity--If there is a CKP sensor condition, refer to the applicable DTC that set.
- Camshaft position (CMP) signal activity--If there is a CMP signal condition, refer to the applicable DTC that set.
- Engine coolant temperature (ECT)--If the engine coolant temperature is not warm enough, idle the engine until the engine coolant temperature reaches the correct temperature.

1. Install a scan tool.
2. Monitor the ECM for DTCs with a scan tool. If other DTCs are set, except DTC P0315, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC that set.
3. With a scan tool, select the CKP system variation learn procedure and perform the following:
  - 3.1. Observe the fuel cut-off for the applicable engine.
  - 3.2. Block the drive wheels.
  - 3.3. Set the parking brake.
  - 3.4. Place the vehicle's transmission in Park or Neutral.
  - 3.5. Turn the air conditioning (A/C) OFF.
  - 3.6. Cycle the ignition from OFF to ON.
  - 3.7. Apply and hold the brake pedal for the duration of the procedure.
  - 3.8. Start and idle the engine.
  - 3.9. Accelerate to wide open throttle (WOT). The engine should not accelerate beyond the calibrated fuel cut-off RPM value noted in step 3.1. Release the throttle immediately if the value is exceeded.

**Note:** While the learn procedure is in progress, release the throttle immediately when the engine starts to decelerate. The engine control is returned to the operator and the engine responds to throttle position after the learn procedure is complete.

- 3.10. Release the throttle when fuel cut-off occurs.
4. The scan tool displays Learn Status: Learned this Ignition. If the scan tool indicates that DTC P0315 ran and passed, the CKP variation learn procedure is complete. If the scan tool indicates DTC P0315 failed or did not run, refer to [DTC P0315](#). If any other DTCs set, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC that set.

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5. Turn OFF the ignition for 30 seconds after the learn procedure is completed successfully.



## Idle Learn

### Description

The engine control module (ECM) learns the airflow through the throttle body to ensure the correct idle. The learned airflow values are stored within the ECM. These values are learned to adjust for production variation and will continuously learn during the life of the vehicle to compensate for reduced airflow due to throttle body coking. Anytime the throttle body airflow rate changes, for example due to cleaning or replacing, the values must be relearned.

An engine that had a heavily coked throttle body that has been cleaned or replaced may take several drive cycles to learn out the coking. To accelerate the process, the scan tool has the ability to reset all learned values back to zero. A new ECM will also have values set to zero.

The idle may be unstable or a DTC may set if the learned values do not match the actual airflow.

### Conditions for Running the Idle Learn Procedure

#### With Scan Tool - Reset Procedure

- DTCs P0068, P0101, P0102, P0103, P0106, P0107, P0108, P0116, P0117, P0118, P0119, P0121, P0122, P0123, P0128, P0171, P0172, P0201, P0202, P0203, P0204, P0222, P0223, P0300, P0351, P0352, P0353, P0354, P0496, P0601, P0604, P0606, P0641, P0651, P0697, P06A3, P1516, P2101, P2119, P2122, P2123, P2127, P2128, P2135, P2138, or P2176 are not set.
- Ignition ON, engine OFF.
- The vehicle speed sensor (VSS) is 0 km/h (0 mph).

#### Without Scan Tool - Learn Procedure

- DTCs P0068, P0101, P0102, P0103, P0106, P0107, P0108, P0116, P0117, P0118, P0119, P0121, P0122, P0123, P0128, P0171, P0172, P0201, P0202, P0203, P0204, P0222, P0223, P0300, P0351, P0352, P0353, P0354, P0496, P0601, P0604, P0606, P0641, P0651, P0697, P06A3, P1516, P2101, P2119, P2122, P2123, P2127, P2128, P2135, P2138, or P2176 are not set.
- The engine speed is between 450-4,000 RPM.
- The engine vacuum is greater than 5 kPa.
- The mass air flow (MAF) is greater than 2 g/s.
- The ignition 1 voltage is greater than 10 volts.

### Idle Learn Procedure

#### With Scan Tool - Reset Procedure

1. Ignition ON, engine OFF, with a scan tool, perform the Idle Learn Reset in Module Setup.
  2. Start the engine, monitor the TB Idle Airflow Compensation parameter. The TB Idle Airflow
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Compensation value should equal 0 percent and the engine should be idling at a normal idle speed.

3. Clear the DTCs with a scan tool.

## Without Scan Tool - Learn Procedure

**Note:** Do NOT perform this procedure if DTCs are set. Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).

1. Start and idle the engine in park/neutral for 3 minutes.
2. With a scan tool, monitor the desired and the actual engine speed.
3. The ECM will start to learn the new idle cells and the desired engine speed should start to decrease.
4. Ignition OFF for 60 seconds.
5. Start and idle the engine in park/neutral for 3 minutes.
6. After the 3 minute run time the engine should be idling normal.

**Note:**

- During the drive cycle the malfunction indicator lamp (MIL) may illuminate and idle speed DTCs set. If idle speed DTCs set, clear the DTCs so the ECM can continue to learn.
- If the vehicle is driven for more than 10 km (6 mi) a BARO update is necessary so the ECM can continue to learn. To update the BARO, accelerate to wide open throttle (WOT) and then release the throttle.

If the engine idle speed has not been learned the vehicle will need to be driven at speeds above 70 km/h (44 mph) with several decelerations and extended idles.

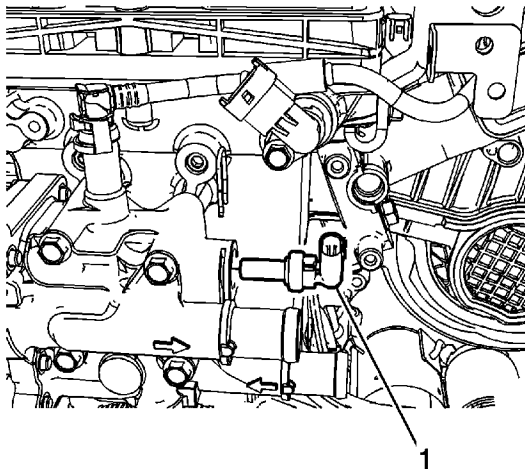
7. After the drive cycle, the engine should be idling normally.  
If the engine idle speed has not been learned, turn OFF the ignition for 60 seconds and repeat step 6.
8. Once the engine speed has returned to normal, clear the DTCs with a scan tool.

# Engine Coolant Temperature Sensor Replacement (ECT 1)

## Removal Procedure

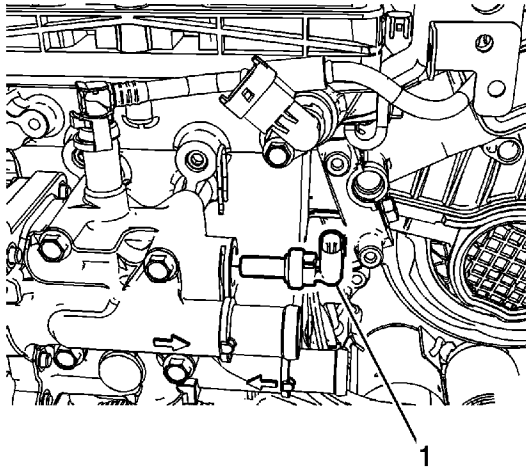
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Drain the engine coolant. Refer to [Cooling System Draining and Filling](#).
3. Disconnect the ECT sensor connector.



4. Remove the ECT retaining clip.
5. Remove the ECT (1) from the coolant distributor.

## Installation Procedure

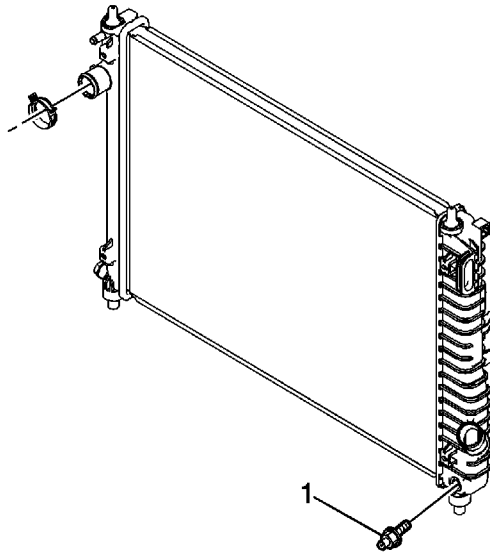


1. Install the ECT (1) to the coolant distributor.
2. Install the ECT retaining clip.
3. Connect the ECT sensor connector.
4. Refill the engine coolant. Refer to [Cooling System Draining and Filling](#).
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Engine Coolant Temperature Sensor Replacement (ECT 2)

## Removal Procedure

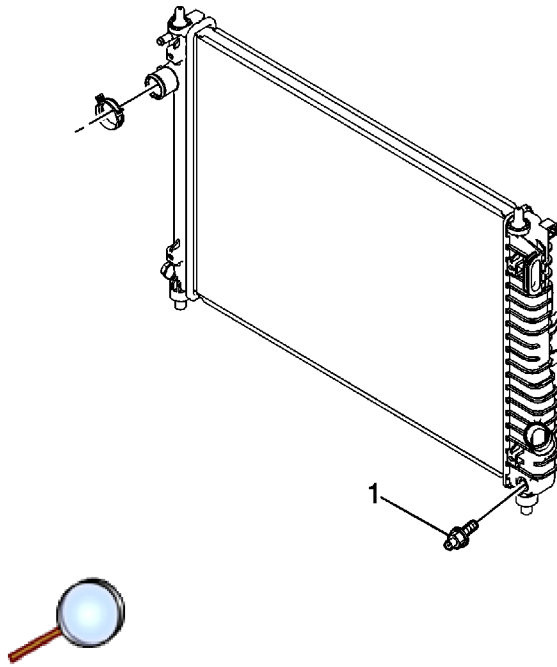
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Drain the engine coolant. Refer to [Cooling System Draining and Filling](#).
3. Disconnect the ECT 2 sensor connector.
4. Remove the ECT 2 sensor (1) from the radiator.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the ECT 2 sensor (1) to the radiator.

**Tighten**

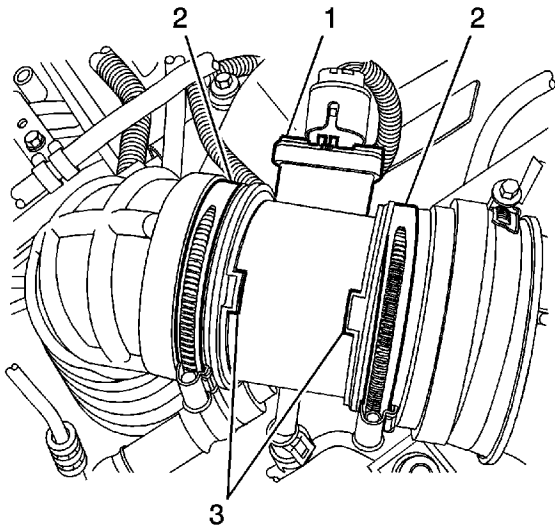
Tighten the ECT 2 sensor to 20 N·m (15 lb ft).

2. Connect the ECT 2 sensor connector.
3. Fill the engine coolant. Refer to [Cooling System Draining and Filling](#).
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Mass Airflow Sensor with Intake Air Temperature Sensor Replacement

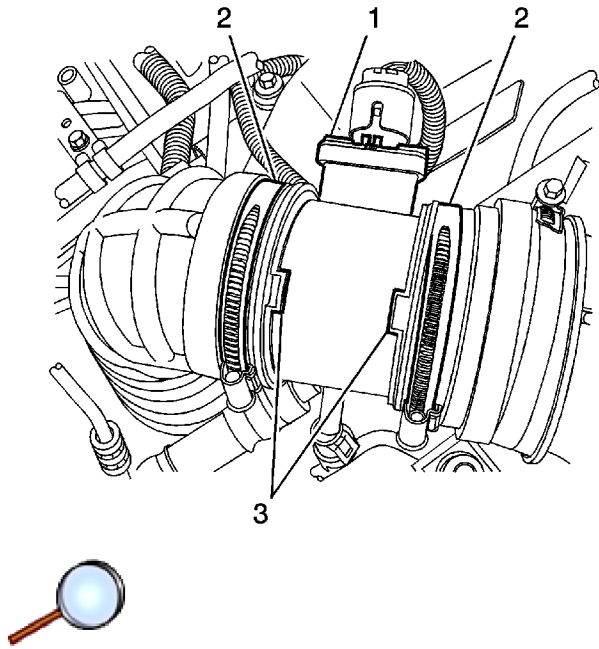
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the mass airflow sensor connector (1).
3. Loosen the two clamps (2).
4. Remove the mass airflow sensor.

## Installation Procedure



**Note:** Ensure the mass airflow sensor is installed correctly. The arrow indicates direction of airflow and the tabs of the hoses and notches (3) of the sensor must be aligned as illustrated. Failure to do so may cause drivability concerns and DTC's.

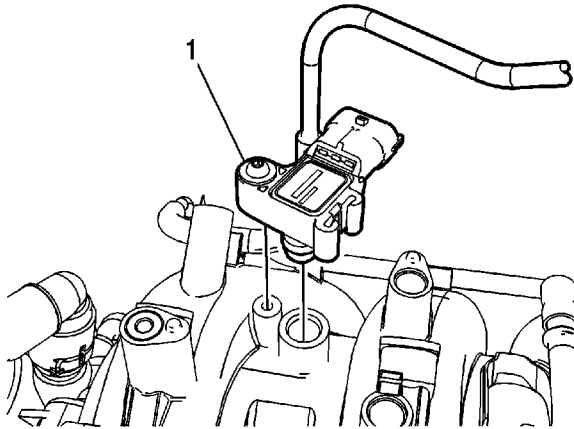
1. Install the mass airflow sensor.
2. Tighten the clamps (2).
3. Connect the mass airflow sensor connector (1).
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).



## Manifold Absolute Pressure Sensor Replacement

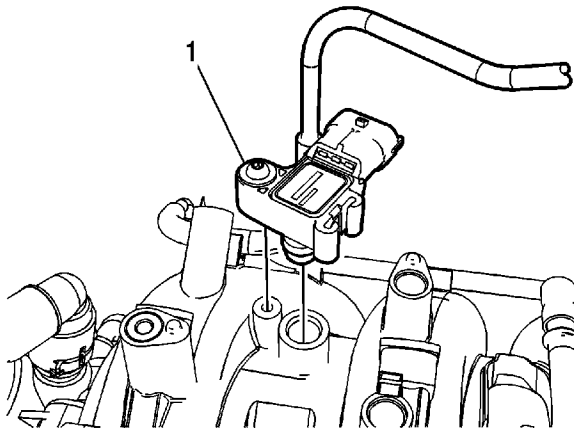
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the manifold air pressure (MAP) sensor connector.
3. Remove the MAP sensor (1).

### Installation Procedure



1. Install the MAP sensor (1).
2. Connect the MAP sensor connector.
3. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Heated Oxygen Sensor Replacement - Sensor 1

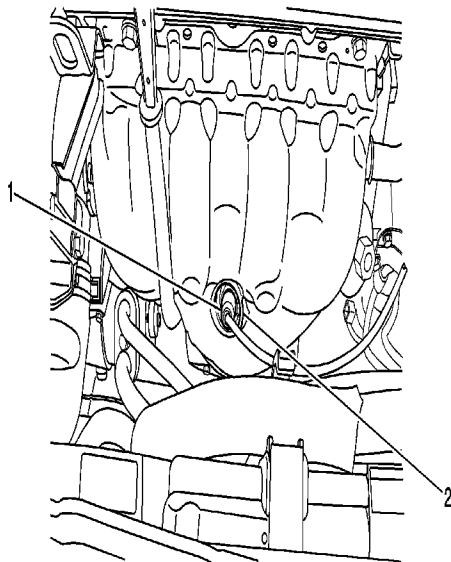
## Special Tools

[EN-48259](#) Oxygen Sensor Remover/Installer

## Removal Procedure

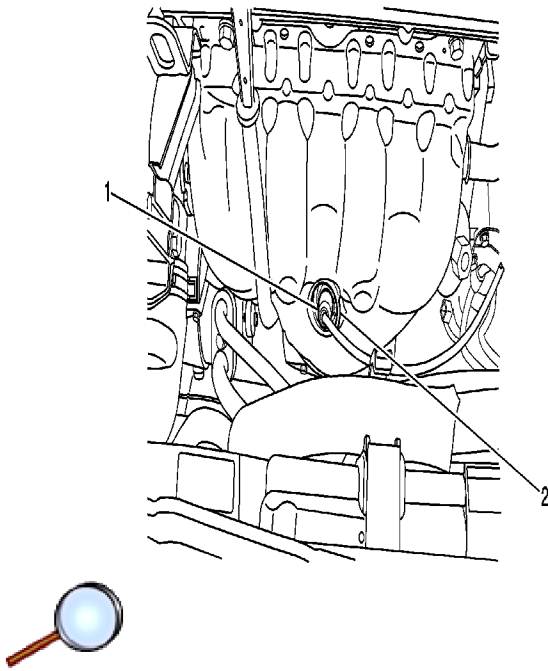
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

**Caution:** Refer to [Heated Oxygen and Oxygen Sensor Caution](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the HO2S1 connector.
3. Install the [EN-48259](#).
4. Remove the HO2S1 (1).

## Installation Procedure



**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti seize compound applied before reinstallation.

1. Coat the threads of the HO2S1 with an anti-seize compound, if needed.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

**Note:** Ensure the HO2S1 sensor heat shield (2) is installed with the slot facing away from the exhaust manifold.

2. Install the HO2S1 (1) into the exhaust manifold.

#### **Tighten**

Tighten the HO2S1 to 40 N·m (29.5 lb ft).

3. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Heated Oxygen Sensor Replacement - Sensor 2

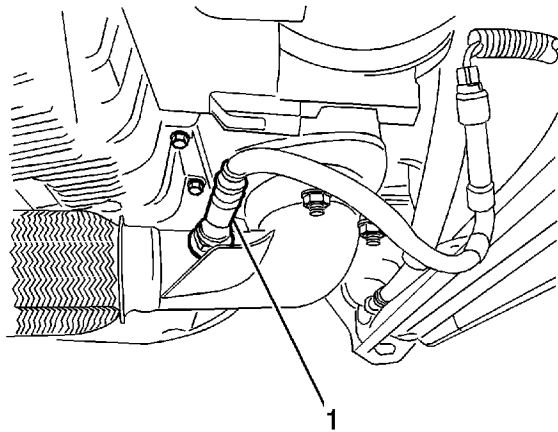
## Special Tools

[EN-48259](#) Oxygen Sensor Remover/Installer

## Removal Procedure

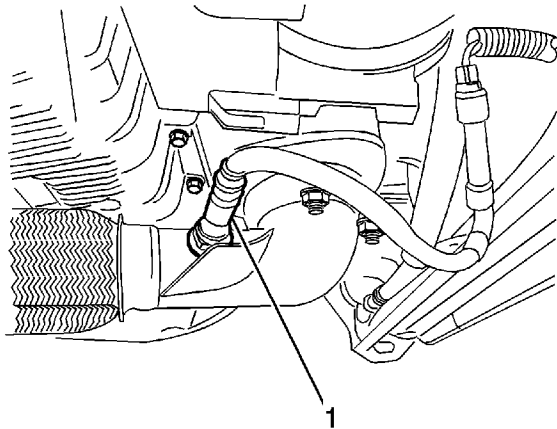
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

**Caution:** Refer to [Heated Oxygen and Oxygen Sensor Caution](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the HO2S2 connector.
3. Install the [EN-48259](#).
4. Remove the HO2S2 (1).

## Installation Procedure



**Note:** A special anti-seize compound is used on the oxygen sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and if for any reason it is to be reinstalled, the threads must have anti seize compound applied before reinstallation.

1. Coat the threads of the HO2S2 with an anti-seize compound, if needed.
2. Install the HO2S2 (1) into the exhaust manifold.

### **Tighten**

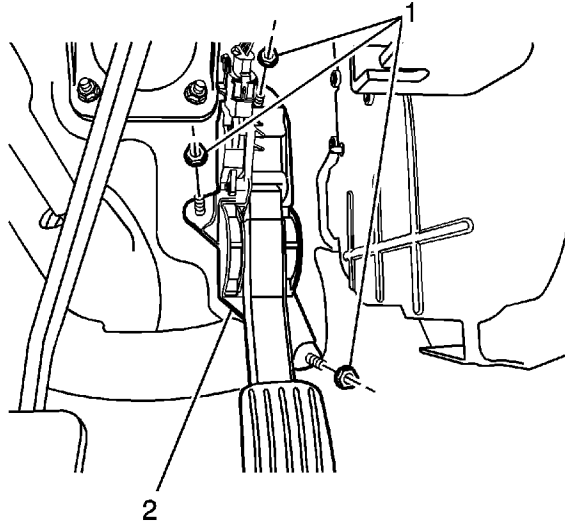
Tighten the HO2S1 to 40 N·m (29.5 lb ft).

3. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Accelerator Pedal Position Sensor Replacement

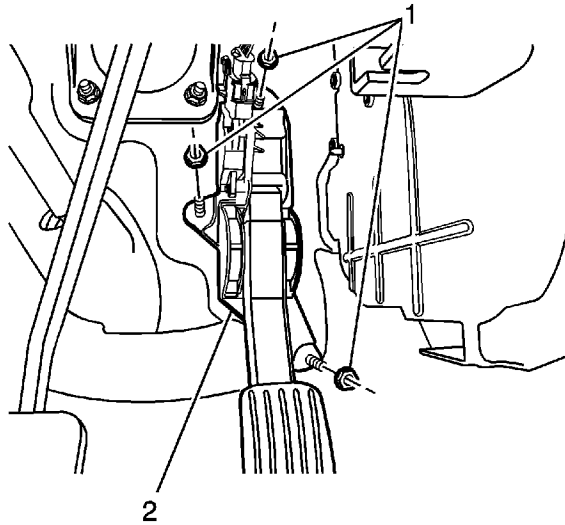
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the accelerator pedal position sensor connector.
3. Remove the 3 accelerator pedal retaining nuts (1).
4. Remove the accelerator pedal (2).

### Installation Procedure



1. Install the accelerator pedal (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the 3 accelerator pedal retaining nuts (1).

#### **Tighten**

Tighten the accelerator pedal retaining nuts to 19 N·m (14 lb ft).

3. Connect the accelerator pedal position sensor connector.
4. Connect the battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

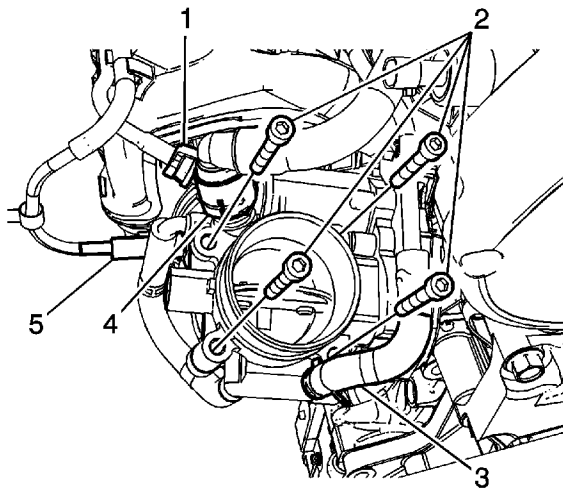


# Throttle Body Assembly Replacement

## Removal Procedure

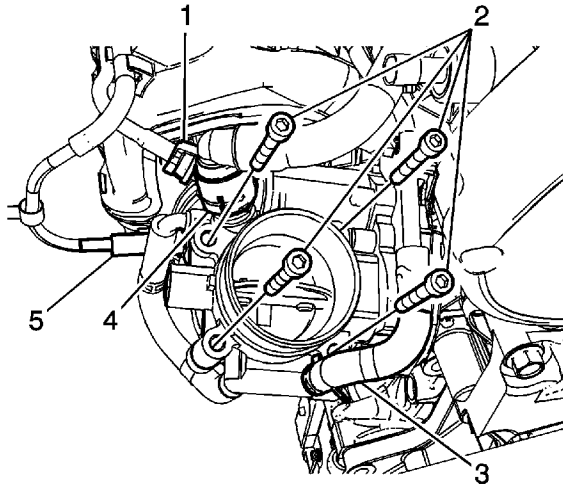
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Drain the engine coolant. Refer to [Cooling System Draining and Filling](#).
3. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).



4. Disconnect the ETC connector.
5. Disconnect the coolant inlet hose (3).
6. Disconnect the coolant outlet hose (1).
7. Disconnect the EVAP hose (5).
8. Detach the PCV hose (4).
9. Remove the ETC tightening bolts (2).
10. Remove the ETC with the seal ring.

## Installation Procedure



1. Install the ETC with the seal ring.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ETC tightening bolts (2).

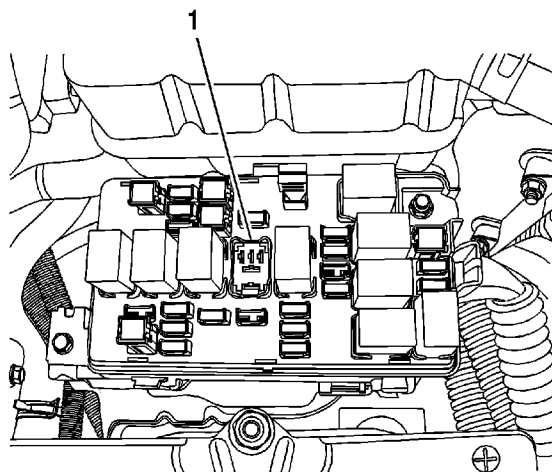
#### **Tighten**

Tighten the ETC tightening bolts to 8 N·m (70.8 lb in).

3. Connect the coolant inlet hose (3).
4. Connect the coolant outlet hose (1).
5. Connect the EVAP hose (5).
6. Connect the PCV hose (4).
7. Connect the ETC connector.
8. Install the air-cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#)
9. Refill the engine coolant. Refer to [Cooling System Draining and Filling](#)
10. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Fuel Pressure Relief

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



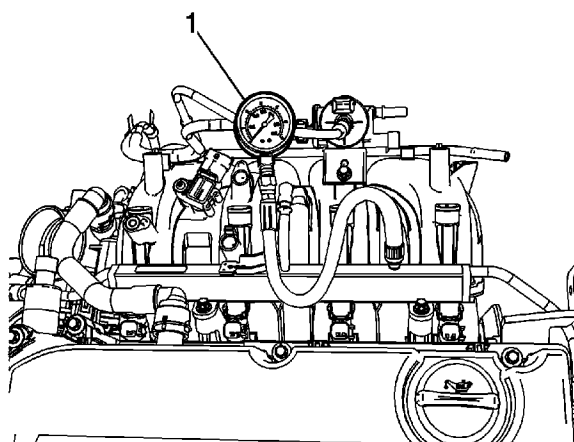
1. Remove the fuel cap.
2. Remove the fuel pump fuse (1) from the engine fuse block.
3. Start the engine and allow the engine to stall.
4. Crank the engine for an additional 10 seconds.

# Fuel Pressure Gage Installation and Removal

## Special Tools

*DW-100-763* Fuel Pressure Gauge

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).
2. Install the *DW-100-763* gauge (1).
3. Measure the fuel pressure.

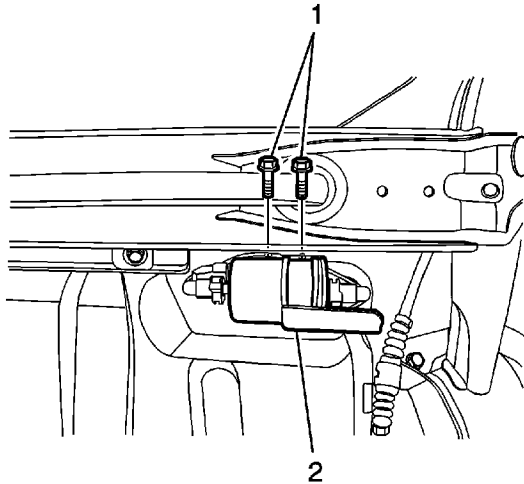
## Specification

Fuel Pressure Specification: 380 kPa (Battery Voltage: 13.2V)

## Fuel Filter Replacement

### Removal Procedure

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.

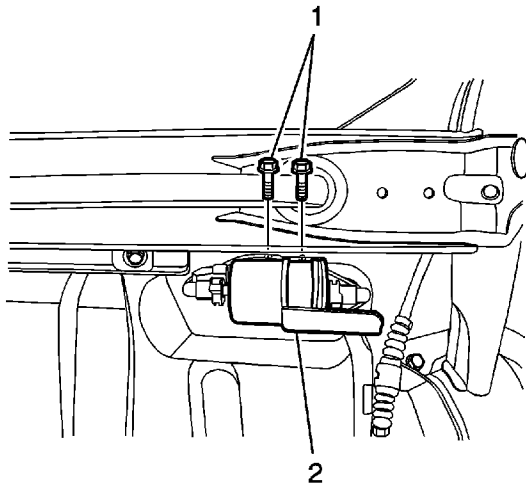


1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Disconnect the inlet/outlet fuel lines by moving the line connector lock forward and pulling the hose off of the fuel filter tube.
4. Remove the fuel filter bracket bolts (1).
5. Remove the fuel filter (2).

### Installation Procedure

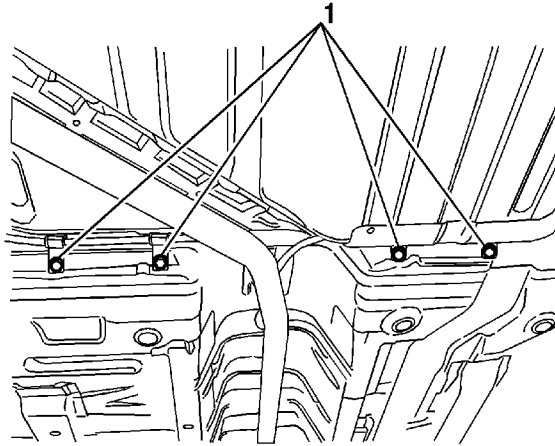


1. Install the fuel filter (2).
2. Install the fuel filter bracket bolts (1).
3. Connect the inlet/outlet quick connector lines.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Fuel Tank Replacement

### Removal Procedure

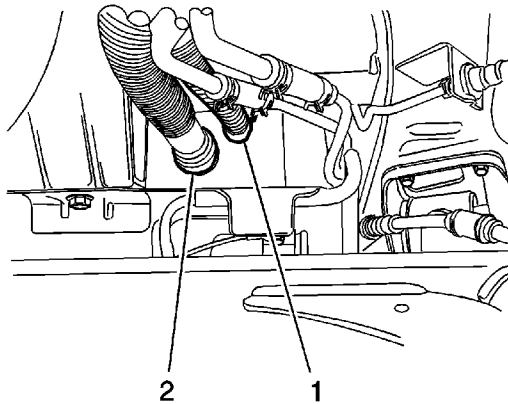
**Warning:** Refer to [Fuel Pressure Caution](#) in the Preface section.



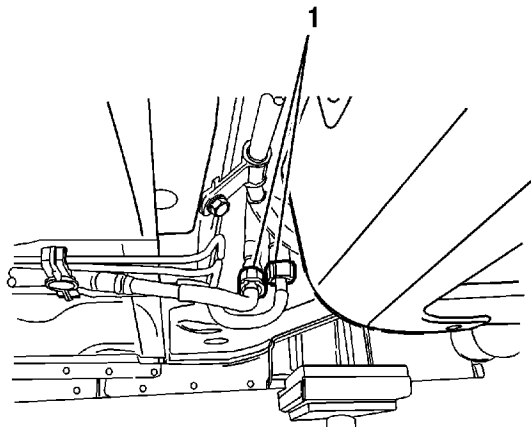
1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Drain the fuel tank.
4. Disconnect the parking brake cable retainer clamps (1) and the support along the fuel tank to provide clearance for the tank.

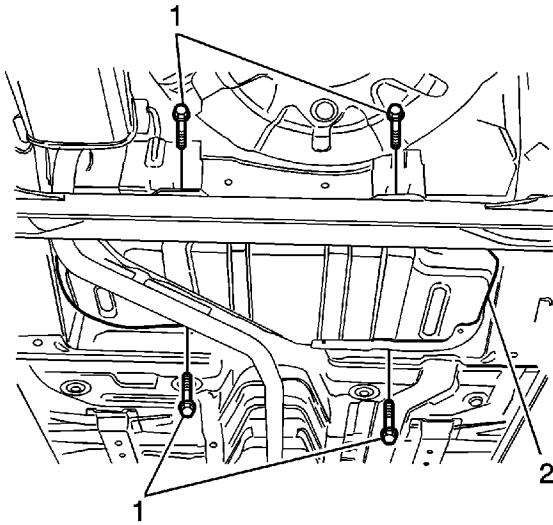


5. Remove the fuel tank filler tube clamp at the fuel tank.
6. Disconnect the fuel tank filler tube (2) and vent tube (1).
7. Disconnect the canister vapor tube at control valve vapor tube.



8. Disconnect the fuel pump harness connector at the right rear corner of the fuel tank.
9. Disconnect the fuel lines (1) near the right front of the fuel tank.
10. Disconnect the wiring harness clips and the fuel line clips as needed.



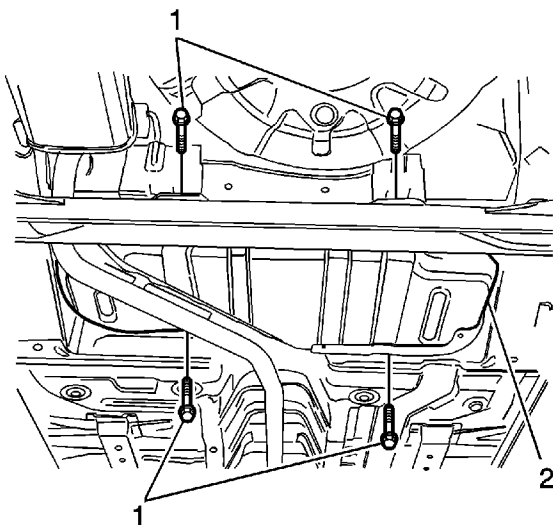


11. Support the fuel tank.
12. Remove the fuel tank retaining bolts (1).
13. Carefully lower the fuel tank.
14. Remove the fuel tank.

## Installation Procedure

1. Raise the fuel tank into position.

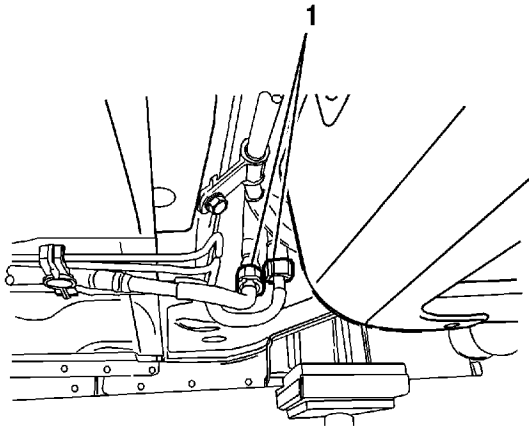
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



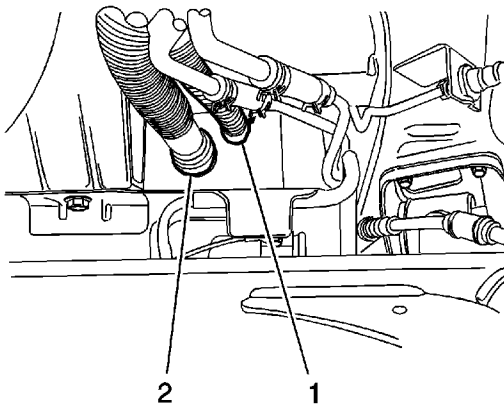
2. Install the fuel tank mounting bolts (1).

**Tighten**

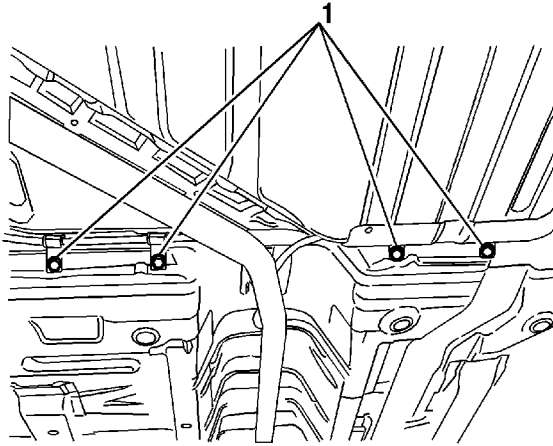
Tighten the fuel tank retaining bolts to 20 N·m (15 lb ft).



3. Connect the fuel lines (1).
4. Connect the wiring harness clips and the fuel line clips as needed.
5. Connect the fuel pump electrical connector.
6. Connect the fuel vapor line.



7. Connect the fuel tank filler tube (2) and fuel tank vent tube (1).
8. Install the fuel tank filler tube clamp at the fuel tank.



9. Install the parking brake cable retainer clamps (1) and the support.

**Tighten**

Tighten the parking brake cable retainer clamps to 10 N·m (89 lb in).

10. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
11. Fill the fuel tank.
12. Perform a leak check of the fuel tank and the fuel line connections.

## Fuel Tank Pressure Sensor Replacement

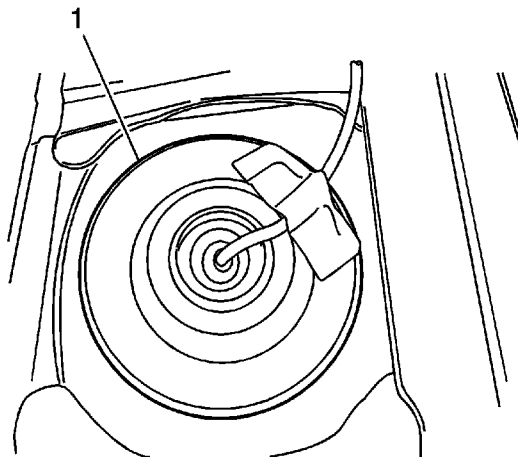
### Removal Procedure

**Warning:** Refer to [Fuel Pressure Caution](#) in the Preface section.

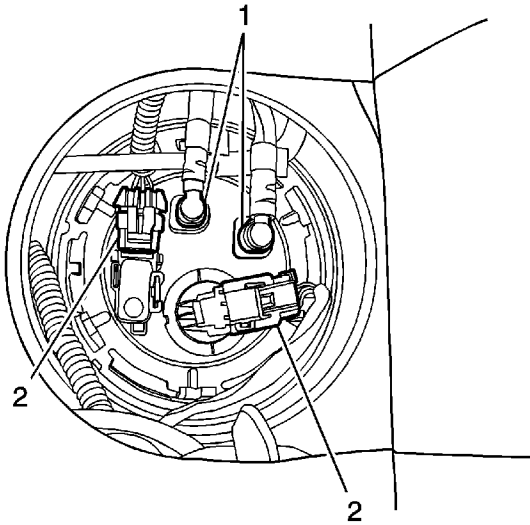
1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the rear seat. Refer to [Rear Seat Replacement](#).



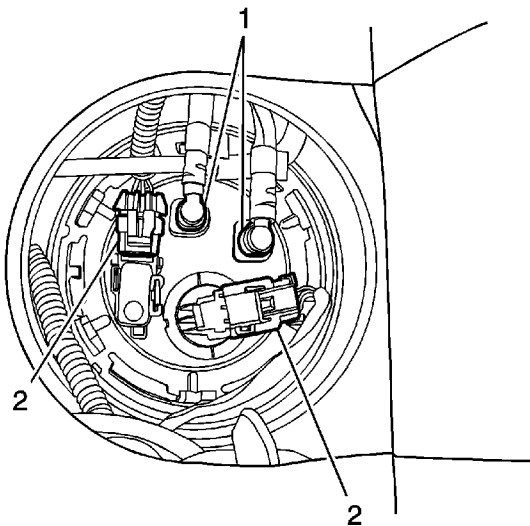
4. Remove the fuel pump access cover (1).



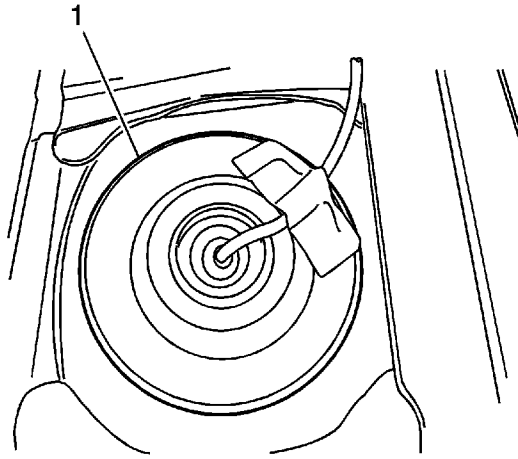
5. Disconnect the fuel tank pressure sensor connector (2).
6. Remove the fuel tank pressure sensor.

## Installation Procedure

1. Install the fuel tank pressure sensor.



2. Connect the fuel tank pressure sensor connector (2).



3. Install the fuel pump access cover (1).
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
5. Install the rear seat. Refer to [Rear Seat Replacement](#).

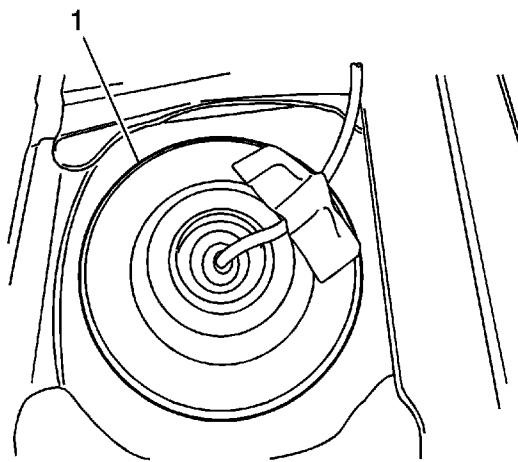
# Fuel Sender Assembly Replacement

## Special Tools

EN-49090 Remover/Installer -- Fuel Pump Lock Ring

## Removal Procedure

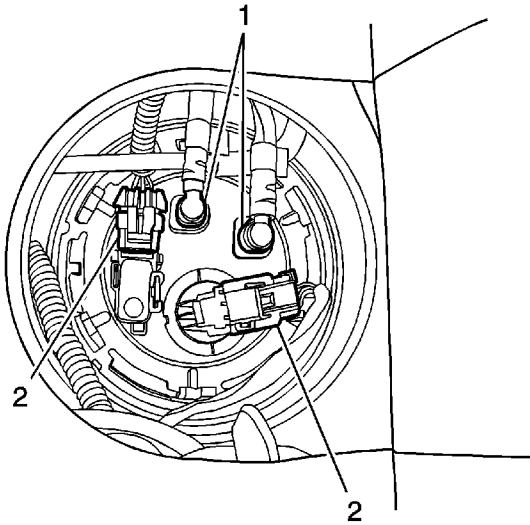
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



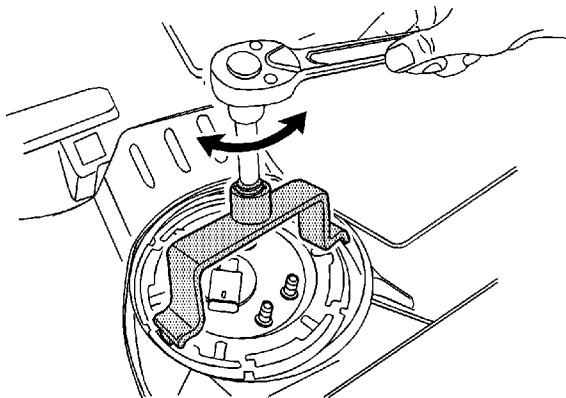
1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the rear seat. Refer to [Rear Seat Replacement](#).
4. Remove the fuel pump access cover (1).

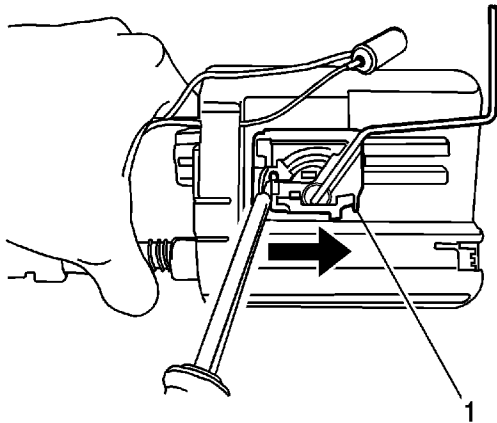


5. Disconnect the electrical connectors (2) at the fuel pump assembly.
6. Disconnect the fuel lines (1).



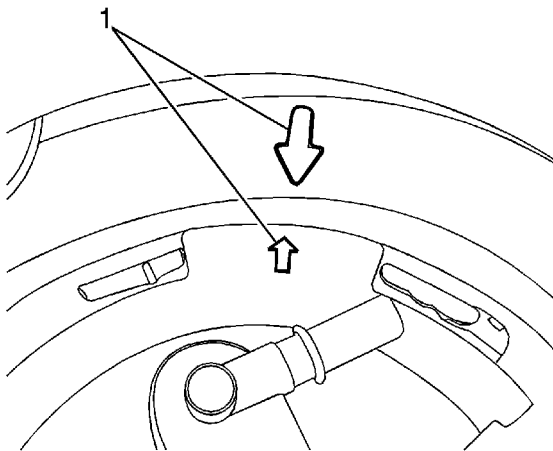
7. Remove the fuel pump lock ring by using *EN-49090* ring .
8. Remove the fuel pump.
9. Disconnect the insulator.





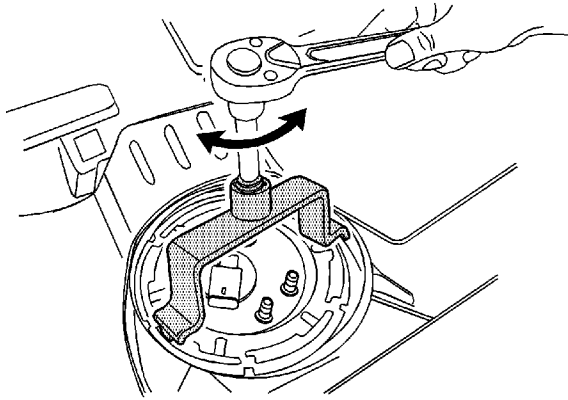
10. Remove the fuel sender assembly (1).

## Installation Procedure

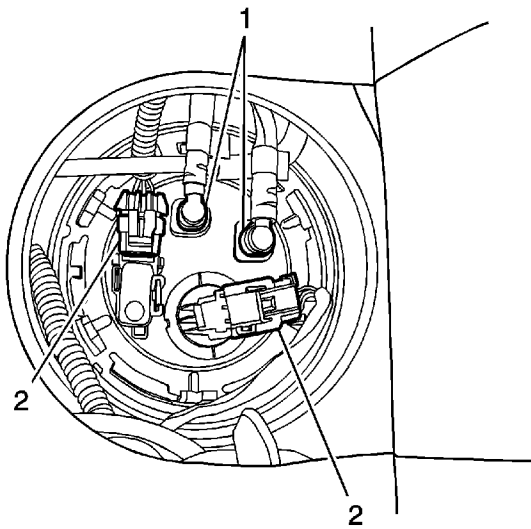


**Note:** Be careful to install the fuel sender to fuel pump housing exactly. If not installed exactly, fuel indicating may be incorrect.

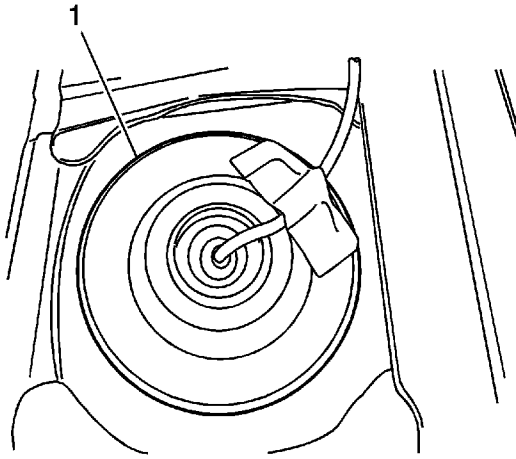
1. Install the fuel sender assembly. Align marks (1).
2. Connect the fuel sender insulator.



3. Install the fuel pump to fuel tank.
4. Install the fuel pump lock ring by using *EN-49090* ring .



5. Connect the electrical connectors (2) at the fuel pump assembly.
6. Connect the fuel lines (1).



7. Install the fuel pump access cover (1).
8. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
9. Perform an operational check of the fuel pump.
10. Install the rear seat. Refer to [Rear Seat Replacement](#).

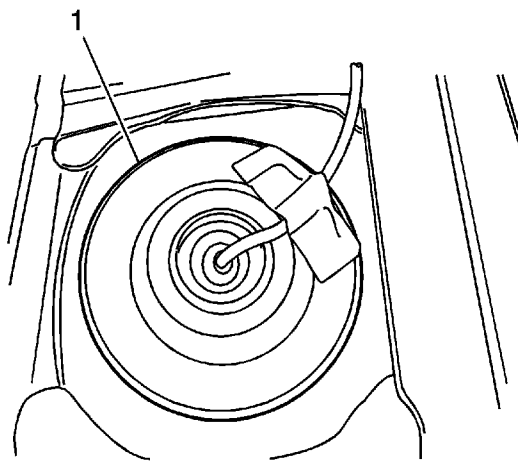
# Fuel Pump Replacement

## Special Tools

EN-49090 Remover/Installer -- Fuel Pump Lock Ring

## Removal Procedure

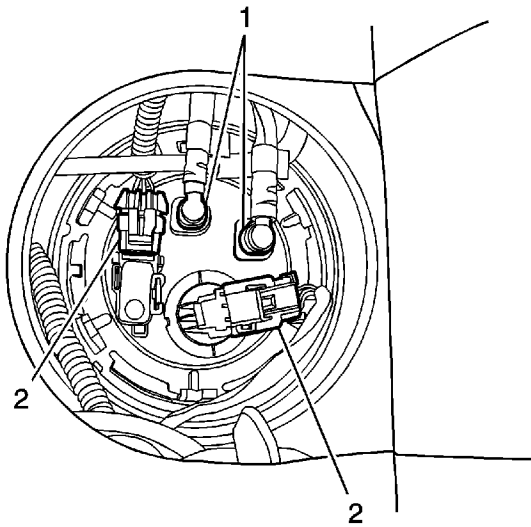
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



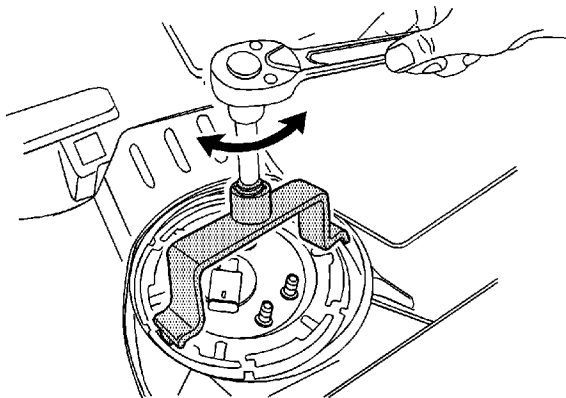
1. Relieve the fuel pressure. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

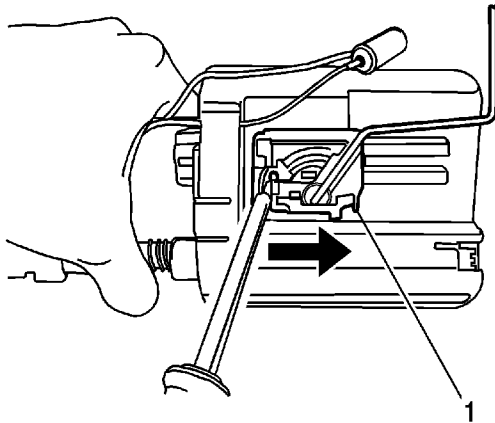
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the rear seat. Refer to [Rear Seat Replacement](#).
4. Remove the fuel pump access cover (1).



5. Disconnect the electrical connectors (2) at the fuel pump assembly.
6. Disconnect the fuel lines (1).

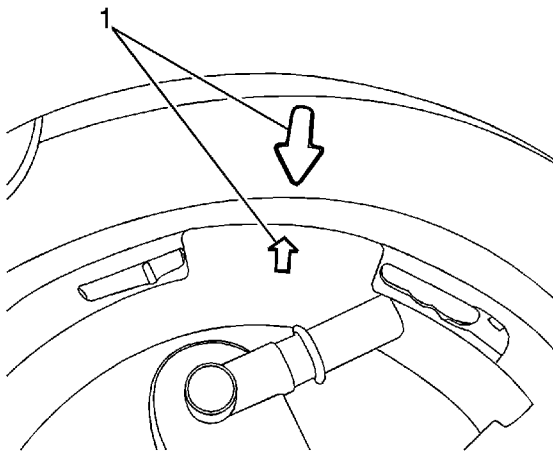


7. Remove the fuel pump lock ring by using *EN-49090* ring .
8. Remove the fuel pump.
9. Disconnect the insulator.



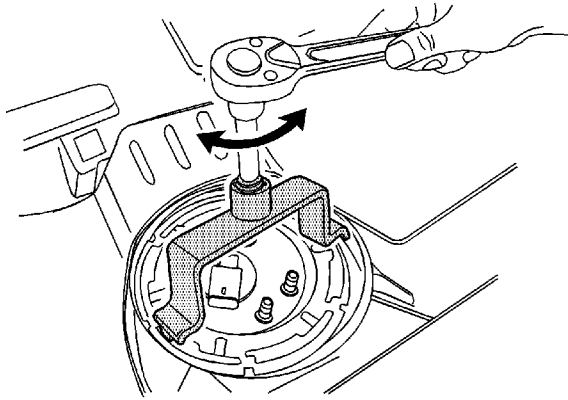
10. Remove the fuel sender assembly (1).

## Installation Procedure

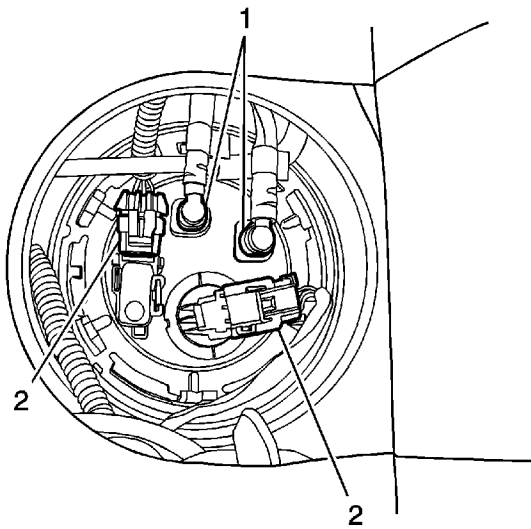


**Note:** Be careful to install the fuel sender to fuel pump housing exactly. If not installed exactly, fuel indicating may be incorrect.

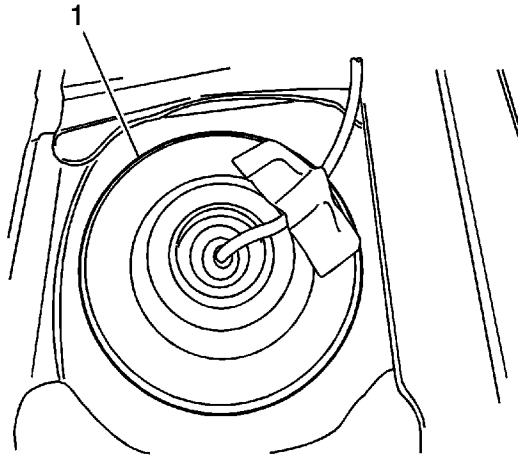
1. Install the fuel sender assembly. Align marks (1).
2. Connect the fuel sender insulator.



3. Install the fuel pump to fuel tank.
4. Install the fuel pump lock ring by using *EN-49090* ring .



5. Connect the electrical connectors (2) at the fuel pump assembly.
6. Connect the fuel lines (1).



7. Install the fuel pump access cover (1).
8. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
9. Perform an operational check of the fuel pump.
10. Install the rear seat. Refer to [Rear Seat Replacement](#).



## Fuel Injection Fuel Rail Assembly Replacement

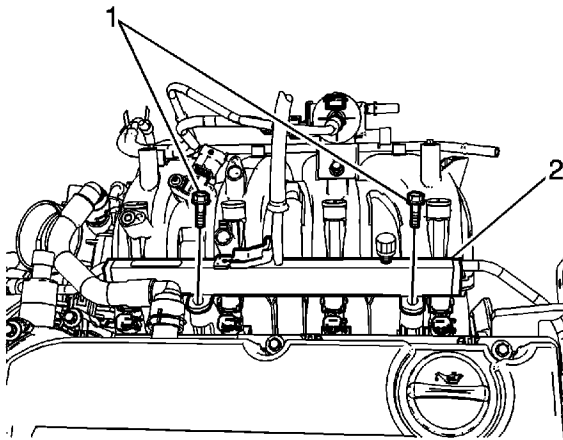
### Removal Procedure

**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.

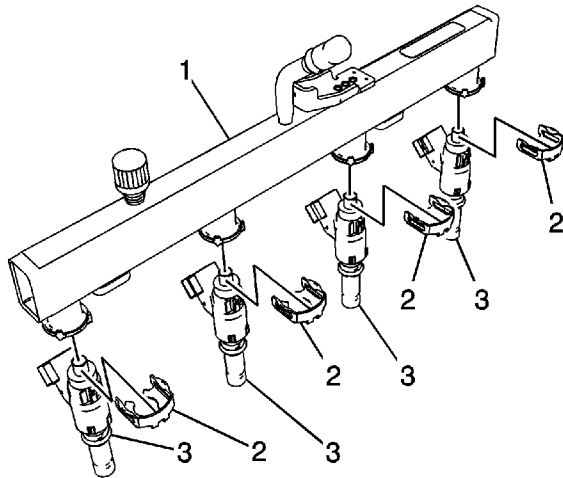
1. Relieve the fuel pressure system. Refer to [Fuel Pressure Relief](#).

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Disconnect the injector connectors.

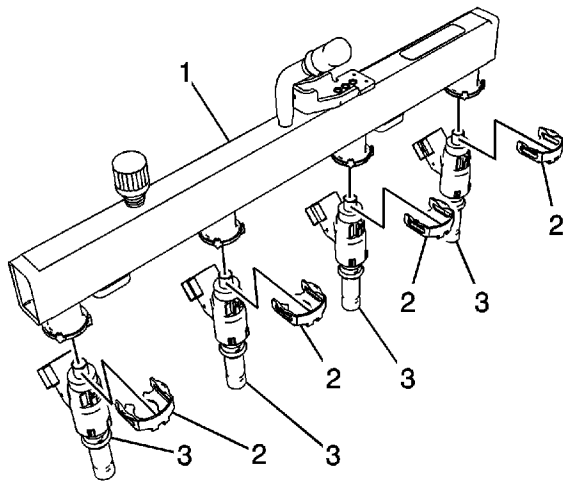


4. Disconnect the fuel line from the fuel rail.
5. Remove the fuel rail bolts (1).
6. Remove the fuel rail (2) with the injectors.

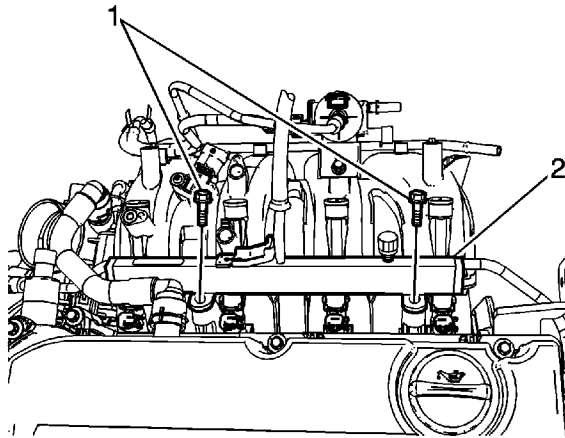


7. Detach the fuel injector retainer clips (2).
8. Detach the fuel injectors (3) by pulling down and out.
9. Discard the fuel injector O-rings.

## Installation Procedure



1. Install the fuel injector O-rings.
2. Connect fuel injectors (3) to the fuel rail (1).
3. Install the fuel injector retainer clips (2).



4. Install the fuel rail (2) with the injectors to the intake manifold.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

5. Install the fuel rail bolts (1).

#### **Tighten**

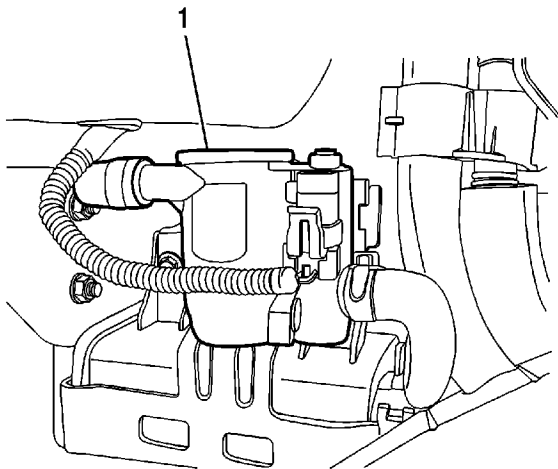
Tighten the fuel rail tightening bolt to 8 N·m (70.8 lb in).

6. Connect the fuel line from the fuel rail and put a dust cap to avoid strange materials.
7. Connect the fuel injector connectors.
8. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Evaporative Emission Canister Vent Solenoid Valve Replacement

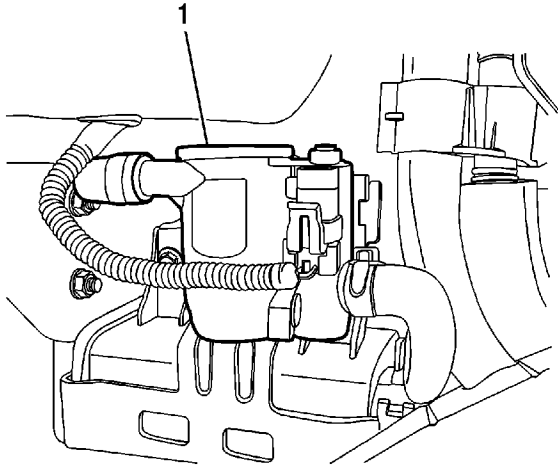
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the EVAP canister vent solenoid valve connector.
3. Disconnect the EVAP canister vent hose.
4. Remove the EVAP canister vent assembly (1) pushing it to the left side.

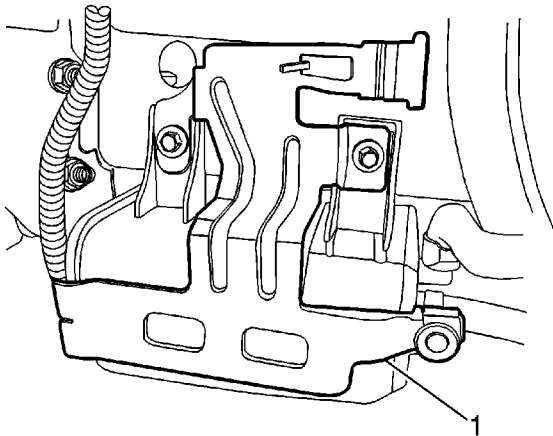
## Installation Procedure



1. Install the EVAP canister vent assembly (1) pushing it to the right side.
2. Connect the EVAP canister vent hose.
3. Connect the EVAP canister vent solenoid valve connector.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

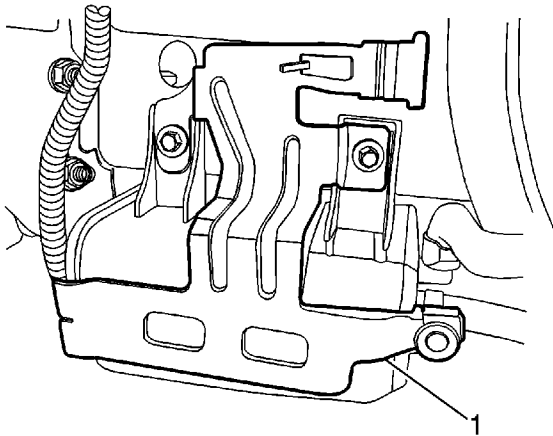
## Evaporative Emission Canister Replacement

### Removal Procedure



1. Remove the EVAP canister vent.
2. Disconnect the inlet and outlet hose from the EVAP canister.
3. Remove the EVAP canister bracket retaining bolt.
4. Remove the EVAP canister (1).

### Installation Procedure



1. Install the EVAP canister (1).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the EVAP canister bracket retaining bolt.

**Tighten**

Tighten evaporative emission canister bracket retaining bolt to 8 N·m (71 lb in).

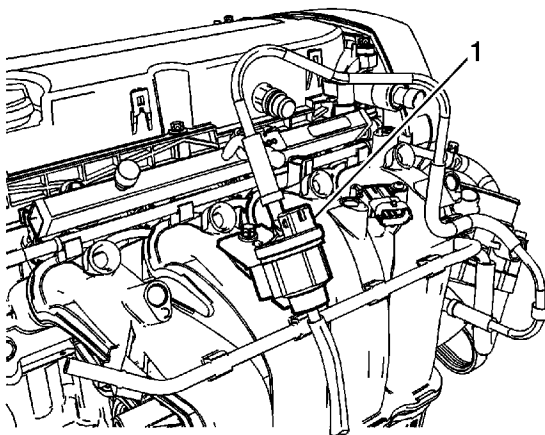
3. Connect the inlet and outlet hose to the EVAP canister.
4. Install the EVAP canister vent.

# Evaporative Emission Canister Purge Solenoid Valve Replacement

## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

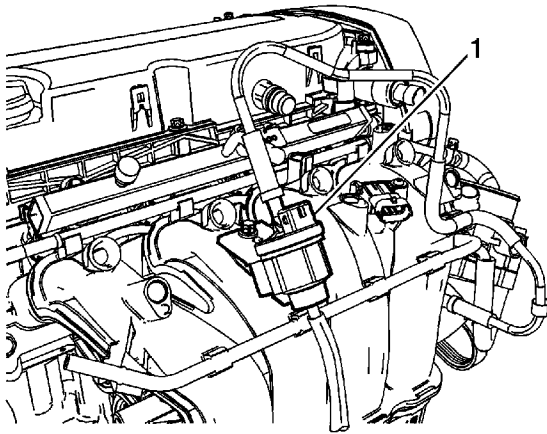
**Caution:** Refer to [Fuel Pressure Caution](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the EVAP canister purge valve upper and lower hoses.
3. Disconnect the EVAP canister purge valve connector.
4. Detach the EVAP canister purge valve (1).

## Installation Procedure





1. Install the EVAP canister purge valve (1).
2. Connect the EVAP canister purge valve connector.
3. Connect the EVAP canister purge valve upper and lower hoses.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

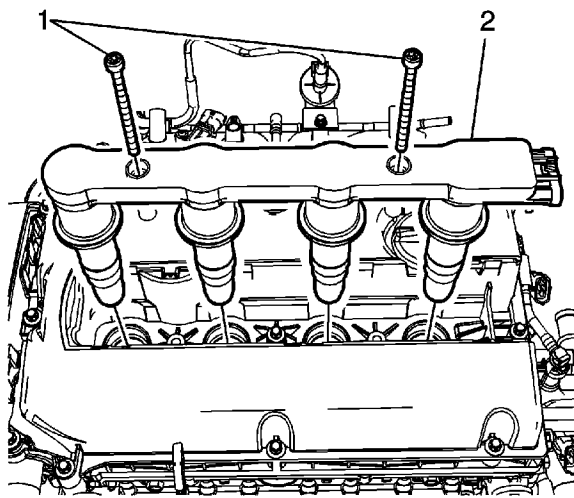
# Ignition Coil Replacement

## Special Tools

[KM-6009](#) Remover/Installer

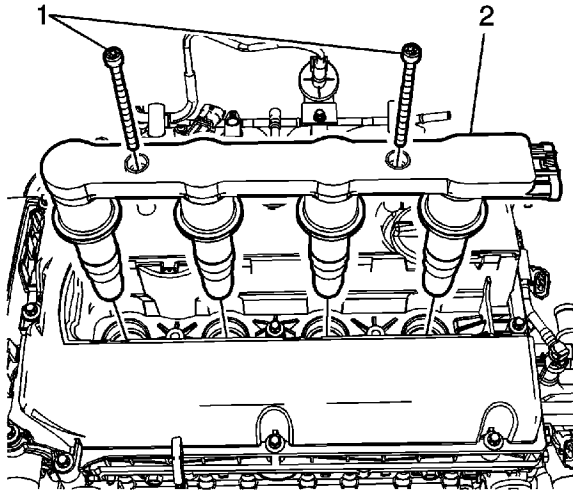
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Detach the ignition coil cover.
3. Disconnect the ignition coil connector.
4. Remove the ignition coil bolts (1).
5. Install the [KM-6009](#).
6. Remove the ignition coil (2).

## Installation Procedure



1. Install the ignition coil (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the ignition coil bolts (1).

#### **Tighten**

Tighten the ignition coil bolts to 8 N·m (70.8 lb in).

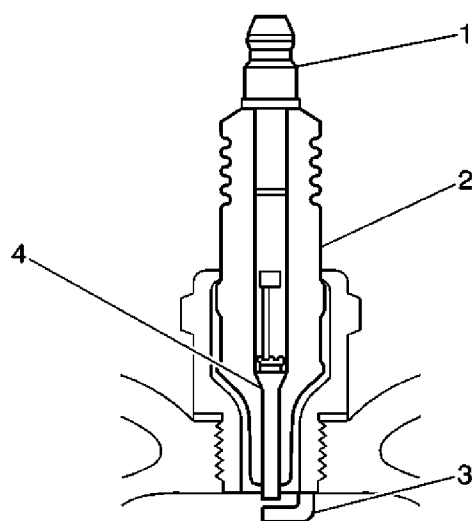
3. Connect the ignition coil connector.
4. Install the ignition coil cover.
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Spark Plug Inspection

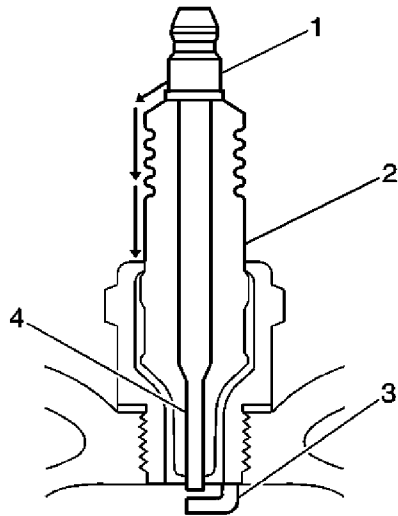
### Spark Plug Usage

- Ensure that the correct spark plug is installed. An incorrect spark plug causes driveability conditions.
- Ensure that the spark plug has the correct heat range. An incorrect heat range causes the following conditions:
  - Spark plug fouling--Colder plug
  - Pre-ignition causing spark plug and/or engine damage--Hotter plug

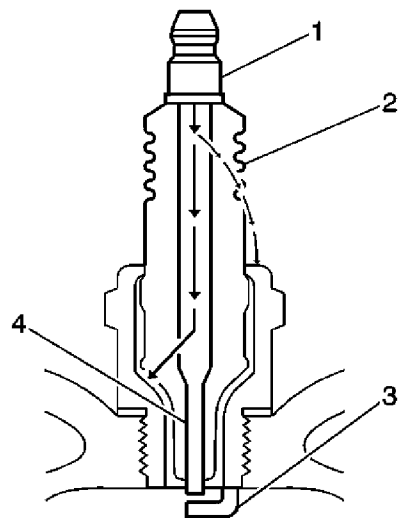
### Spark Plug Inspection



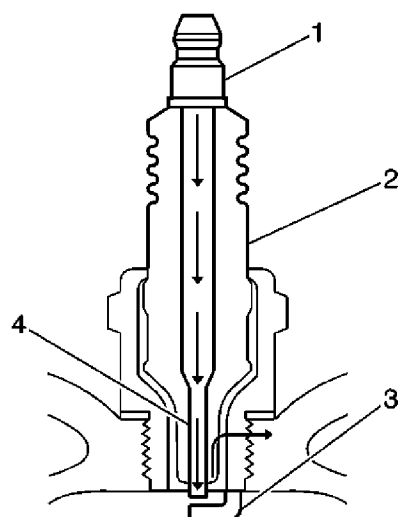
1. Inspect the terminal post (1) for damage.
  - Inspect for a bent or broken terminal post (1).
  - Test for a loose terminal post (1) by twisting and pulling the post. The terminal post (1) should NOT move.



2. Inspect the insulator (2) for flashover or carbon tracking, soot. This is caused by the electrical charge traveling across the insulator (2) between the terminal post (1) and ground. Inspect for the following conditions:
  - Inspect the spark plug boot for damage.
  - Inspect the spark plug recess area of the cylinder head for moisture, such as oil, coolant, or water. A spark plug boot that is saturated causes arcing to ground.



3. Inspect the insulator (2) for cracks. All or part of the electrical charge may arc through the crack instead of the electrodes (3, 4).



4. Inspect (3) for evidence of improper arcing.
  - Measure the gap between the center electrode (4) and the side electrode (3) terminals. An excessively wide electrode gap can prevent correct spark plug operation.
  - Inspect for the correct spark plug torque. Insufficient torque can prevent correct spark plug operation. An over torqued spark plug, causes the insulator (2) to crack.
  - Inspect for signs of tracking that occurred near the insulator tip instead of the center electrode (4).
  - Inspect for a broken or worn side electrode (3).
  - Inspect for a broken, worn, or loose center electrode (4) by shaking the spark plug.
    - A rattling sound indicates internal damage.
    - A loose center electrode (4) reduces the spark intensity.
  - Inspect for bridged electrodes (3, 4). Deposits on the electrodes (3, 4) reduce or eliminates the gap.
  - Inspect for worn or missing platinum pads on the electrodes (3, 4), if equipped.
  - Inspect for excessive fouling.
5. Inspect the spark plug recess area of the cylinder head for debris. Dirty or damaged threads can cause the spark plug not to seat correctly during installation.

## Spark Plug Visual Inspection

- Normal operation--Brown to grayish-tan with small amounts of white powdery deposits are normal combustion by-products from fuels with additives.
- Carbon fouled--Dry, fluffy black carbon, or soot caused by the following conditions:
  - Rich fuel mixtures
- Leaking fuel injectors
- Excessive fuel pressure
- Restricted air filter element
- Incorrect combustion

- Reduced ignition system voltage output
- Weak coils
- Worn ignition wires
- Incorrect spark plug gap
  - Excessive idling or slow speeds under light loads can keep spark plug temperatures so low that normal combustion deposits may not burn off.
- Deposit fouling--Oil, coolant, or additives that include substances such as silicone, very white coating, reduces the spark intensity. Most powdery deposits will not effect spark intensity unless they form into a glazing over the electrode.

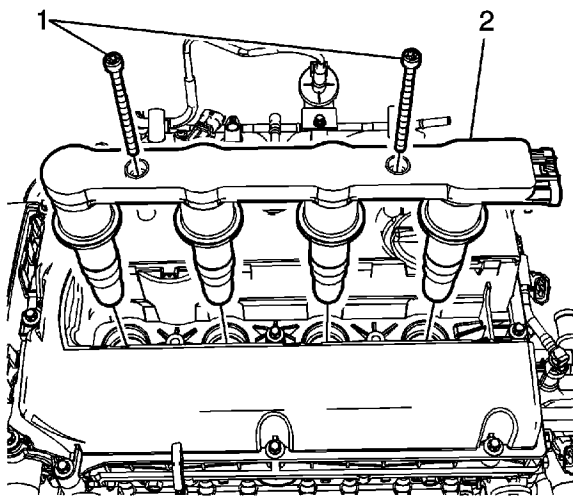
# Spark Plug Replacement

## Special Tools

[KM-6009](#) Remover/Installer

## Removal Procedure

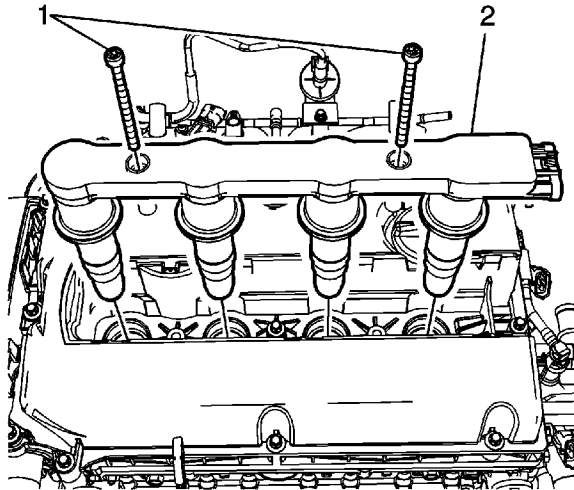
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Detach the ignition coil cover.
3. Disconnect the ignition coil connector.
4. Remove the ignition coil bolts (1).
5. Install the [KM-6009](#).
6. Remove the ignition coil (2).
7. Remove the spark plugs.

## Installation Procedure





1. Install The spark plugs.
2. Install the ignition coil (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the ignition coil bolts (1).

#### **Tighten**

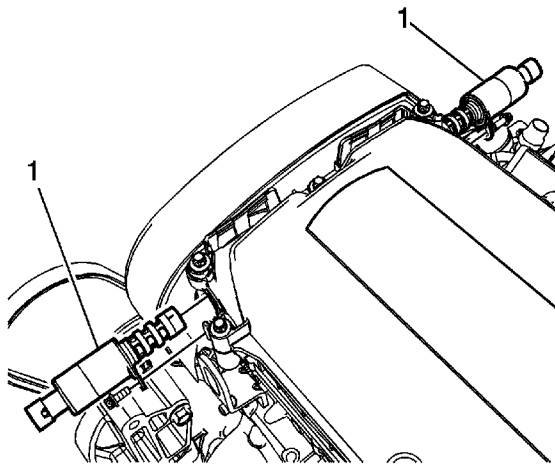
Tighten the ignition coil bolts (1) to 8 N·m (70.8 lb in).

4. Connect the ignition coil connector.
5. Install the ignition coil cover.
6. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

# Camshaft Position Actuator Solenoid Valve Replacement

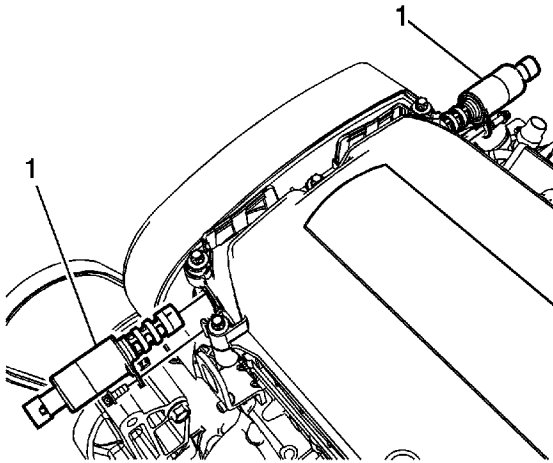
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the camshaft position actuator valve connectors.
3. Remove the camshaft position actuator valve bolt.
4. Remove the camshaft position actuator valve (1) and seal.

## Installation Procedure



1. Install the camshaft position actuator valve (1) and seal. Coat seal with clean engine oil prior to installation.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the camshaft position actuator valve bolt.

#### **Tighten**

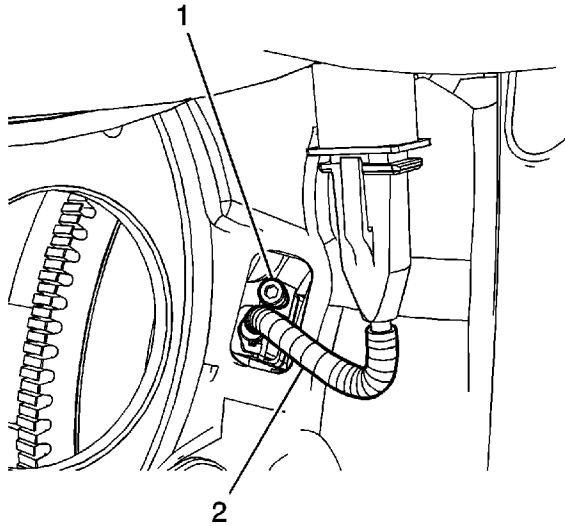
Tighten the camshaft position actuator valve bolt to 6 N·m (53 lb in).

3. Connect the camshaft position actuator valve connectors.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Crankshaft Position Sensor Replacement

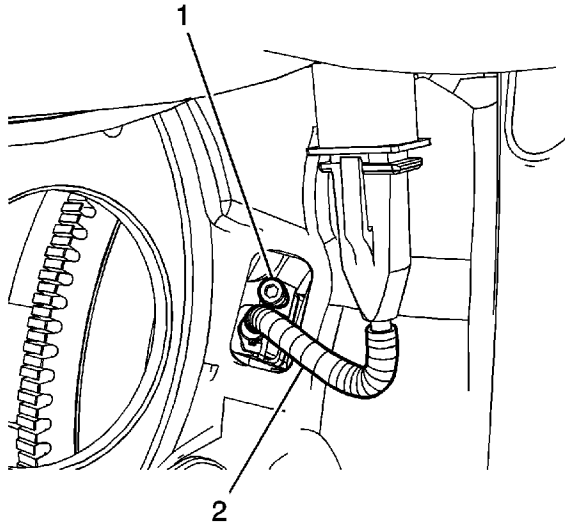
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the starter. Refer to [Starter Motor Replacement](#).
3. Remove the CKP sensor bolt (1).
4. Remove the CKP sensor (2).

### Installation Procedure



1. Install the CKP sensor (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the CKP sensor bolt (1).

#### **Tighten**

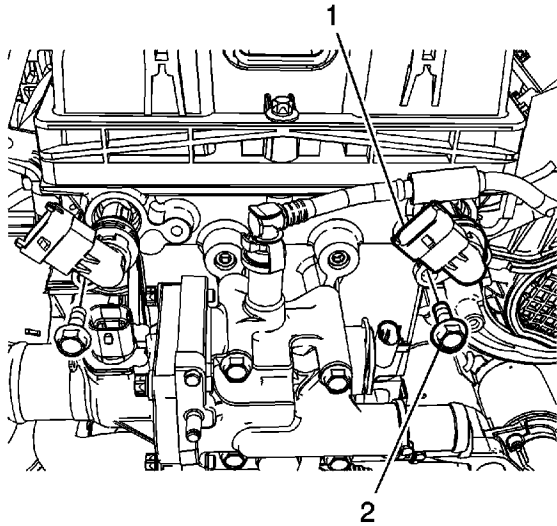
Tighten the CKP sensor bolt (1) to 4.5 N·m (39.8 lb in).

3. Install the starter. Refer to [Starter Motor Replacement](#).
4. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Camshaft Position Sensor Replacement

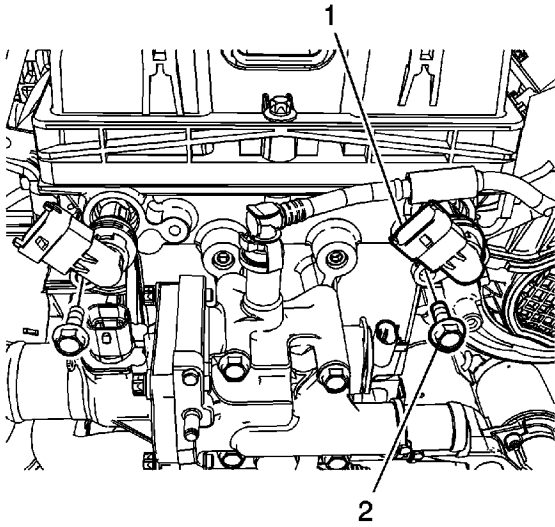
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the CMP sensor connectors.
3. Remove the CMP sensor bolt (2).
4. Remove the CMP sensor (1).

### Installation Procedure

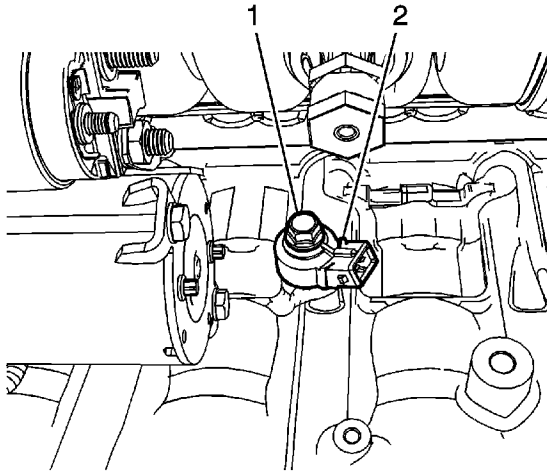


1. Install the CMP sensor (1).
2. Install the CMP sensor bolt (2).
3. Connect the CMP sensor connectors.
4. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Knock Sensor Replacement

### Removal Procedure

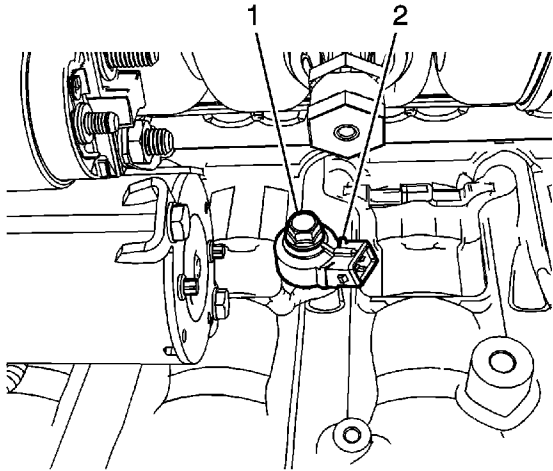
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the knock sensor bolt (1).
3. Remove the knock sensor (2).

### Installation Procedure





1. Install the knock sensor (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the knock sensor bolt (1).

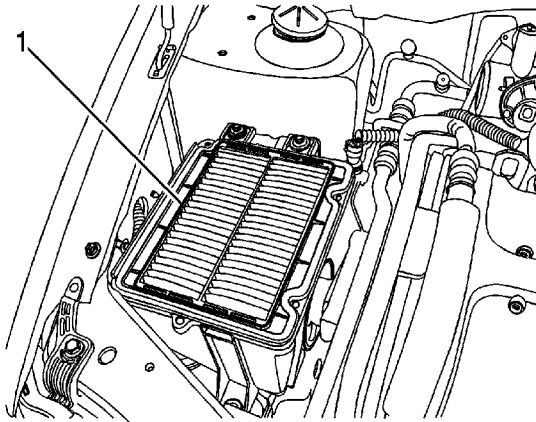
#### **Tighten**

Tighten the knock sensor bolt (1) to 20 N·m (14.7 lb ft).

3. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Air Cleaner Element Replacement

### Removal Procedure



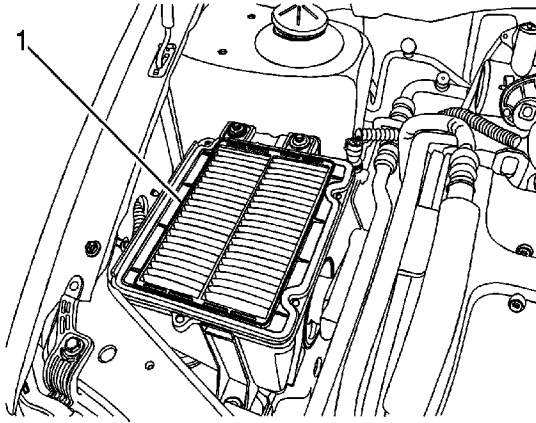
1. Remove the air filter upper housing.

**Note:** Before replacing a new one, check the maintenance interval and the quality of the air cleaner element.

2. Replace the air filter element (1).

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



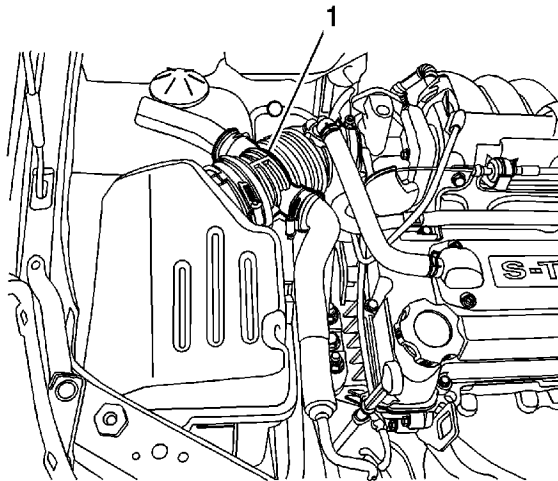
1. Install the air filter element (1).
2. Install the air filter upper housing.

**Tighten**

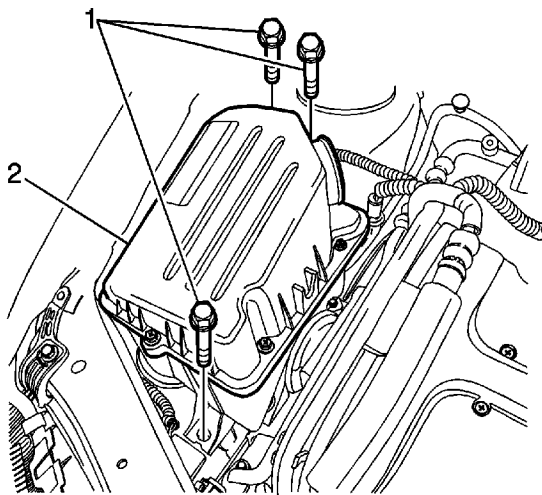
Tighten the air filter upper housing bolts to 2 N·m (1.5 lb ft).

## Air Cleaner Assembly Replacement

### Removal Procedure



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the breather hose.
3. Loosen the clamp and disconnect outlet tube (1).

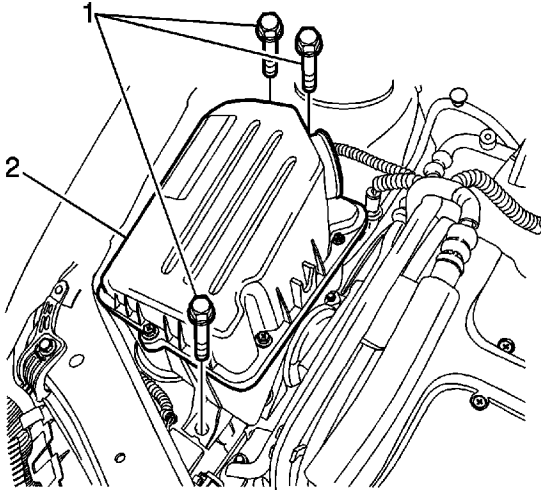


4. Remove the air cleaner assembly bolts (1).

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5. Remove the air cleaner assembly (2).

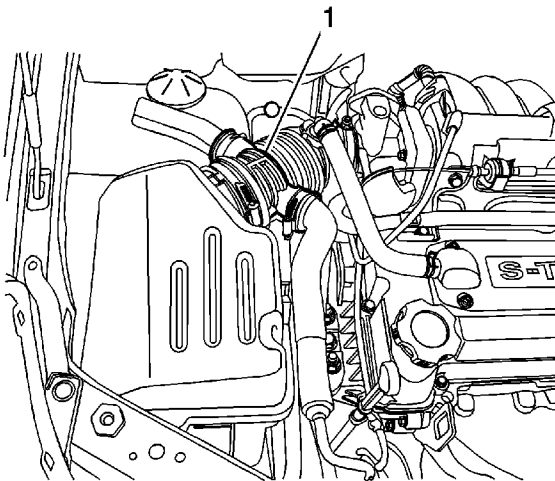
## Installation Procedure



1. Install the air cleaner assembly (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the air cleaner assembly bolts (1) and tighten to **6 N·m (4.4 lb ft)**.



3. Connect the air cleaner outlet tube (1) and tighten the clamp.
4. Connect the breather hose.
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and](#)

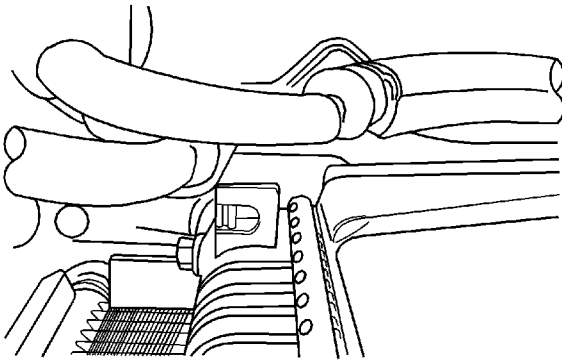
[Connection.](#)

## Fastener Tightening Specifications

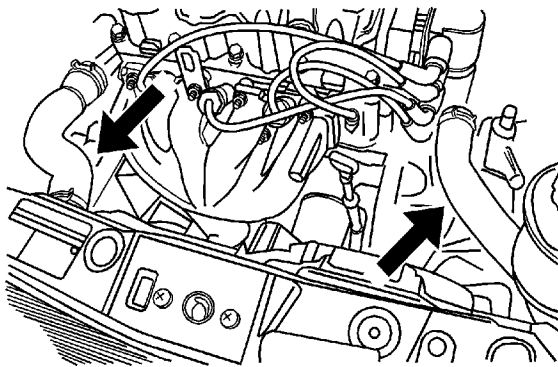
Application	Specification	
	Metric	English
Coolant Pump Mounting Bolts	10 N·m	89 lb in
Electric Cooling Fan Assembly Mounting Bolts	4 N·m	35 lb in
Electric Cooling Fan Motor Nut	3.2 N·m	28 lb in
Electric Cooling Fan Motor Retaining Screws	4 N·m	35 lb in
Negative Battery Terminal Retainer Bolt	15 N·m	11 lb ft
Surge Tank Attaching Bolt	10 N·m	89 lb in
Thermostat Housing Mounting Bolts	20 N·m	15 lb ft
Upper Left Radiator Retaining Bolt	7 N·m	62 lb in
Upper Right Radiator Retaining Bolt	7 N·m	62 lb in

## Cooling System Draining and Filling

**Warning:** As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the pressure cap while the engine is hot and pressure is high will cause the solution to boil instantaneously -- possibly with explosive force -- spewing the solution over the engine, fenders and the person removing the cap.



1. Place a pan below the vehicle to catch the draining coolant.
2. Remove the surge tank cap.
3. Unplug the drain cock.

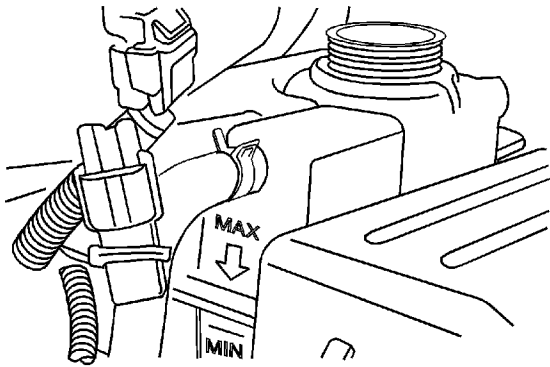






**Warning:** When enabling the SIR system, be extremely careful when installing the fuse and/or turning the ignition switch on. Stand clear of the inflator module and verify no loose objects are directly in front of the inflator modules. Possible personal injury or vehicle damage could result if an accidental deployment were to occur.

4. Catch the escaping fluid in a drain pan.
5. Remove all sludge and dirt from inside the surge tank. Refer to [Radiator Surge Tank Replacement](#).
6. Plug the drain cock.
7. Add clean water to the surge tank.
8. Fill the tank slowly so that the upper reservoir hose remains above the water line. This allows the air inside the cooling system to escape.
9. Start the engine.
10. Run the engine until the thermostat opens. You can tell the thermostat is open when both radiator hoses are hot to the touch.



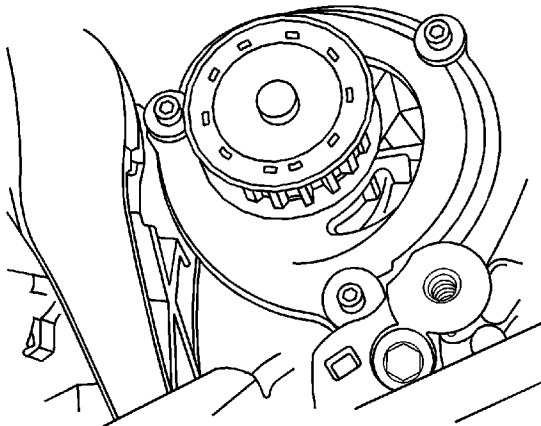
11. Stop the engine.
12. Repeat steps 1-9 until the drained water is clear and free of coolant and rust.

**Note:** To avoid damaging the vehicle, never use an antifreeze mixture more concentrated than 60 percent antifreeze to 40 percent water. The solution freezing point increases above this concentration.

13. Fill the cooling system through the surge tank with a mixture of ethylene glycol antifreeze and water. The mixture must be at least 50 percent antifreeze, but not more than 60 percent antifreeze for cold weather operation.
14. Fill the surge tank to the specified MAX fill mark on the outside of the tank.

## Coolant Pump Replacement (1.5L)

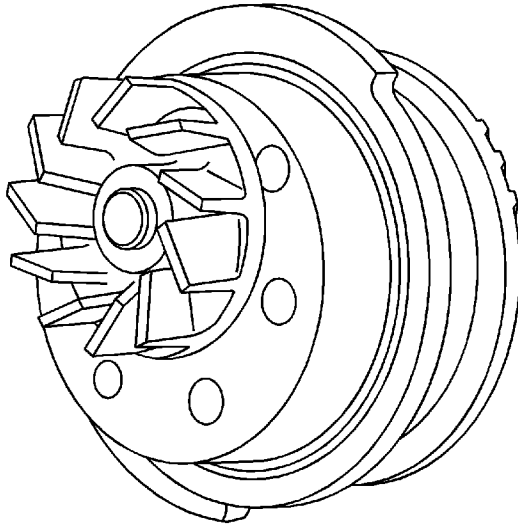
### Removal Procedure



1. Drain the engine cooling system to a level below the thermostat housing. Refer to [Cooling System Draining and Filling](#).
2. Remove the timing belt rear hood.
3. Remove the coolant pump mounting bolts.
4. Remove the coolant pump from the cylinder block.
5. Remove the ring seal from the coolant pump.

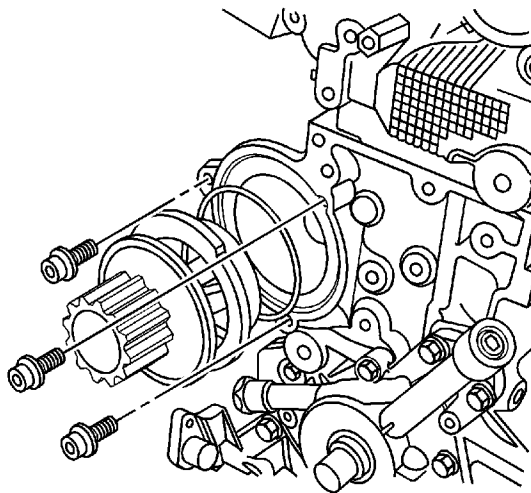
### Coolant Pump Cleaning and Inspection

**Warning:** Refer to [Safety Glasses Warning](#) in the Preface section.



1. Inspect the coolant pump body for cracks and leaks.
2. Inspect the coolant pump bearing for play or abnormal noise.
3. Inspect the coolant pump pulley for excessive wear. If the coolant pump is defective, replace the coolant pump as a unit.
4. Clean the mating surfaces of the coolant pump and cylinder block.

## Installation Procedure



1. Install a new ring seal to the coolant pump.
2. Coat the sealing surface of the ring seal with Lubriplate®.
3. Install the coolant pump to the engine block.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Secure the coolant pump to the engine block with the mounting bolts.

**Tighten**

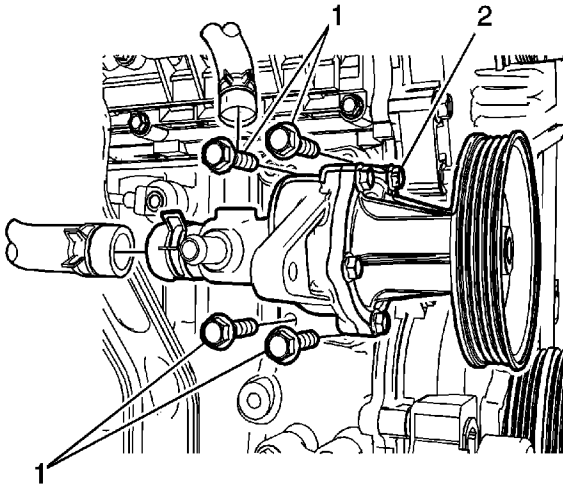
Tighten the coolant pump mounting bolts to 10 N·m (89 lb in).

5. Install the rear timing belt rear hood.
6. Refill the engine cooling system. Refer to [Cooling System Draining and Filling](#).

## Coolant Pump Replacement (1.2L DOHC)

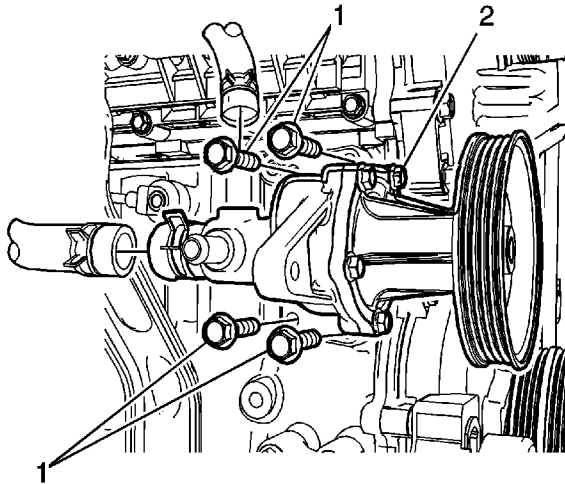
### Removal Procedure

1. Drain the coolant. Refer to [Cooling System Draining and Filling](#).
2. Remove the accessory belt. Refer to [Drive Belt Replacement](#).
3. Remove the generator. Refer to [Generator Replacement](#).



4. Remove the water pump retaining nuts, bolts (1).
5. Remove the water pump (2).
6. Remove the ring seal from the water pump.
7. Inspect the water pump for cracks, leaks or abnormal noises.
8. Cleaning the mating surfaces of the water pump and the cylinder head.

### Installation Procedure



1. Install the new ring seal to the water pump.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the water pump (2) to the engine block.

#### **Tighten**

Tighten the water pump retaining bolts (1) and nuts to 10 N·m (89 lb in).

3. Install the generator. Refer to [Generator Replacement](#).
4. Install the accessory belt. Refer to [Drive Belt Replacement](#).
5. Refill the engine cooling system. Refer to [Cooling System Draining and Filling](#).

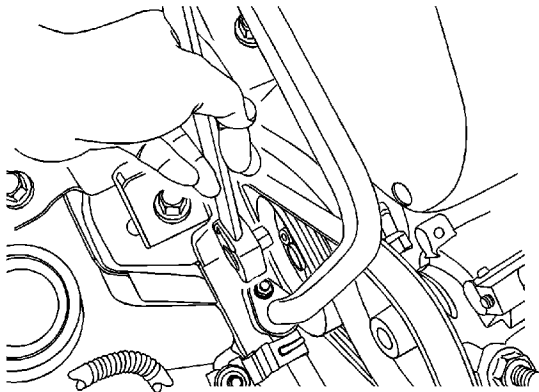
## Coolant Pump Replacement (1.4L LDT/1.6 LXV)

### Special Tools

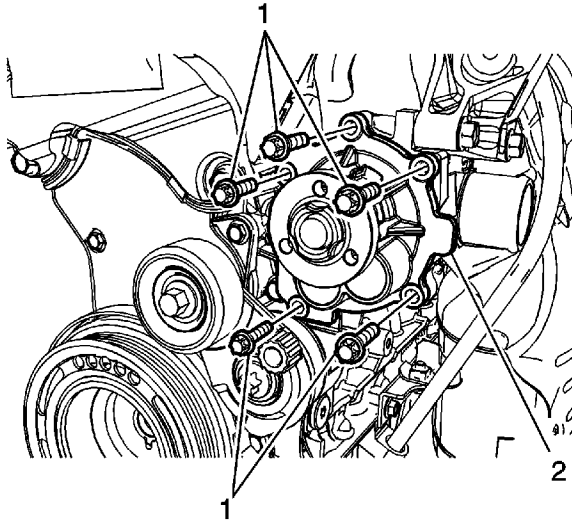
- EN-48356 Engine Fixture
- EN-49201 Water Pump Pulley Remover/Installer

### Removal Procedure

1. Drain the coolant. Refer to [Cooling System Draining and Filling](#).
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) and [Air Cleaner Assembly Replacement](#).
3. Remove the RH head lamp assembly. Refer to [Headlamp Replacement](#).

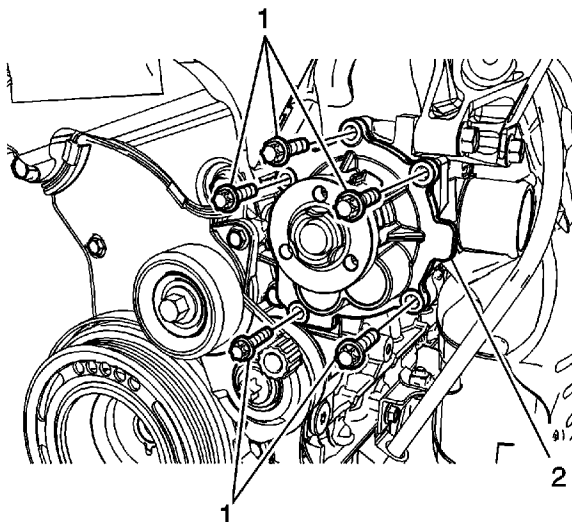


4. Disconnect the A/C pipe retainer and let the A/C pipe could be moved.
5. Remove the water pump pulley retaining bolts using *EN-48356* fixture .
6. Remove the accessory belt. Refer to [Drive Belt Replacement](#) and [Drive Belt Replacement](#).
7. Fix the engine using *EN-48356* fixture .
8. Remove the engine mount.



9. Remove the water pump pulley.
10. Remove the water pump retaining bolts (1).
11. Remove the water pump (2).
12. Remove the ring seal from the water pump.
13. Inspect the water pump for cracks, leaks or abnormal noise.
14. Cleaning the mating surfaces of the water pump and the cylinder head.

## Installation Procedure



1. Install a new ring seal to the water pump.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



2. Install the water pump (2) to the engine front cover.

**Tighten**

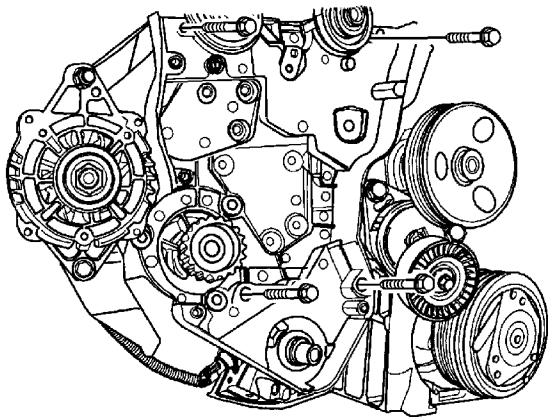
Tighten the water pump retaining bolts (1) to 10 N·m (89 lb in).

3. Install the water pump pulley.
4. Install the engine mount.
5. Install the accessory belt. Refer to [Drive Belt Replacement](#) and [Drive Belt Replacement](#).
6. Connect the A/C pipe retainer and fix the A/C pipe.
7. Install the RH head lamp assembly. Refer to [Headlamp Replacement](#).
8. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) and [Air Cleaner Assembly Replacement](#).
9. Refill the engine cooling system. Refer to [Cooling System Draining and Filling](#).

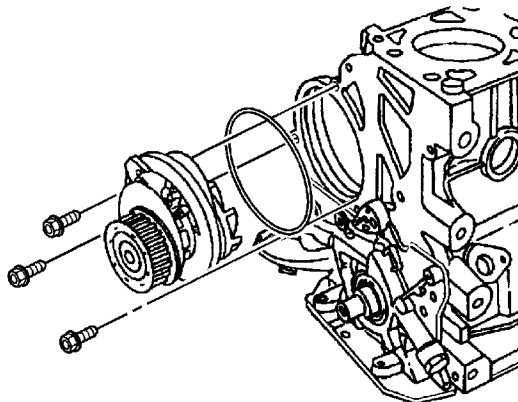
## Coolant Pump Replacement (1.4L/1.6L DOHC)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



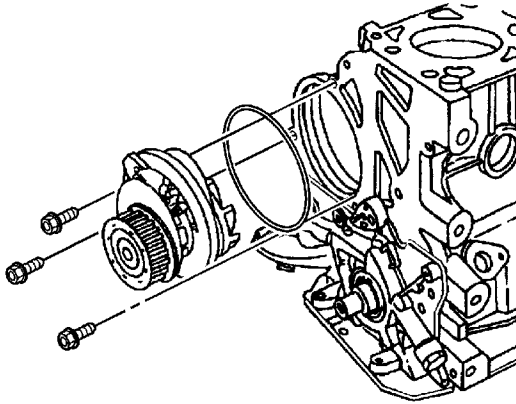
1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Drain the coolant. Refer to [Cooling System Draining and Filling](#).
3. Remove the rear timing belt cover. Refer to [Timing Belt Cover Replacement](#) for the 1.4L DOHC engine, or [Timing Belt Cover Replacement](#) for the 1.6L (L91) engine.





4. Remove the coolant pump mounting bolts.
5. Remove the coolant pump.
6. Remove the seal ring from the coolant pump.

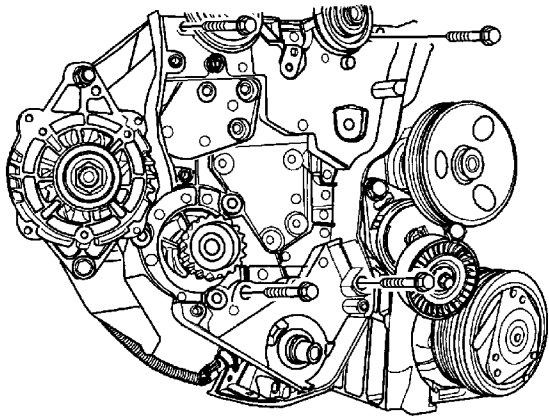
## Installation Procedure



1. Install a new seal ring to the coolant pump.
2. Coat the sealing surface of the seal ring with Lubriplater®.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the coolant pump to the engine block with the flange aligned with the recess of the rear timing belt cover.
4. Install the coolant pump mounting bolts and tighten to **10 N·m (89 lb in)**.

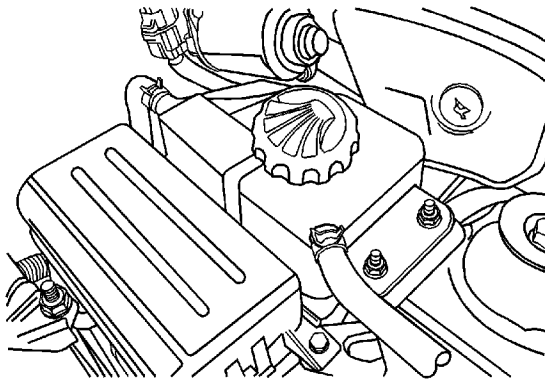


5. Install the rear timing belt cover. Refer to [Timing Belt Cover Replacement](#) for the 1.4 DOHC engine, or [Timing Belt Cover Replacement](#) for the 1.6L (L91) engine.
6. Fill the engine cooling system. Refer to [Cooling System Draining and Filling](#).
7. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#)

## Radiator Surge Tank Replacement

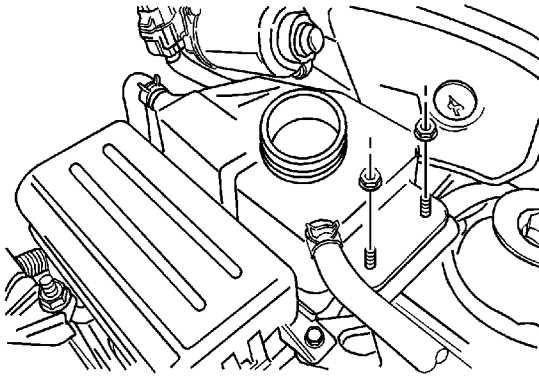
### Removal Procedure

**Warning:** Refer to [Radiator Cap Removal Warning](#) in the Preface section.



1. Drain the engine coolant to below the level of the surge tank.
2. Loosen the overflow hose clamps and disconnect the overflow hose from the top of the surge tank.
3. Remove the tank attaching nuts.
4. Remove the tank from the vehicle.
5. Clean the inside and the outside of the surge tank and the surge tank cap with soap and water.
6. Rinse the surge tank and the cap thoroughly.

### Installation Procedure



1. Install the surge tank to the vehicle.

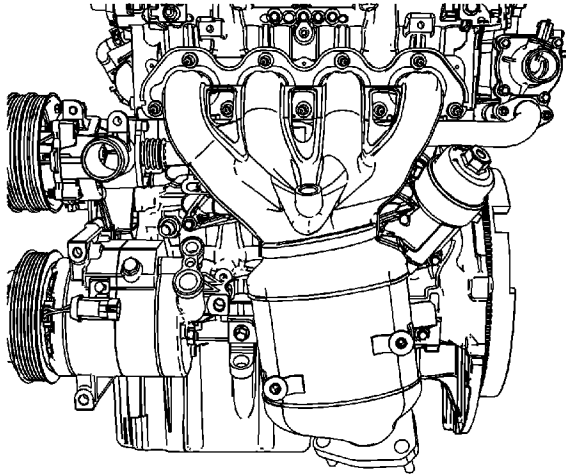
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Secure the surge tank with the attaching nuts and tighten to **10 N·m (89 lb in)**.
3. Connect the overflow hose to the surge tank.
4. Secure the overflow hose to the surge tank with the hose clamps.
5. Fill the surge tank with the coolant to the center ridge, or to the MAX mark.

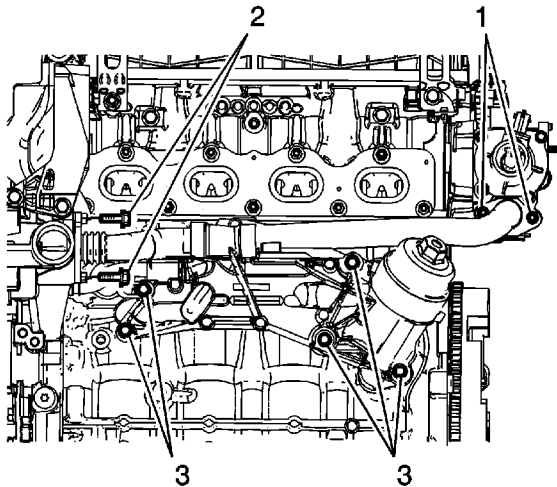
## Engine Oil Cooler Replacement

### Removal Procedure

1. Drain the engine coolant. Refer to [Cooling System Draining and Filling](#).
2. Drain the engine oil. Refer to [Engine Oil and Oil Filter Replacement](#).

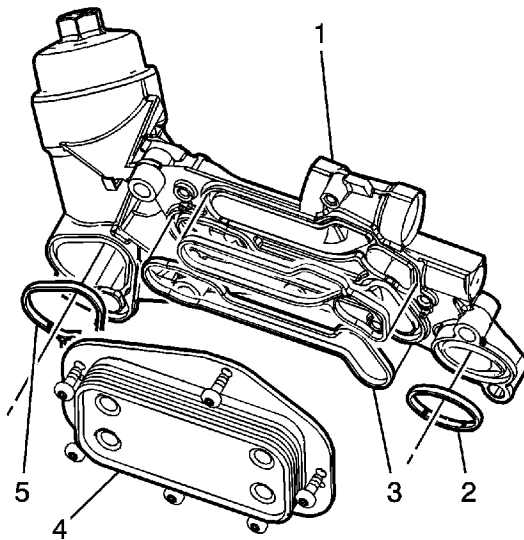


3. Remove the exhaust manifold. Refer to [Exhaust Manifold Replacement](#).



4. Remove the coolant pipe bolts from the engine coolant distributor case (1).
5. Remove the coolant pipe bolts from the engine front cover (2).
6. Remove the oil cooler tightening bolts (3).

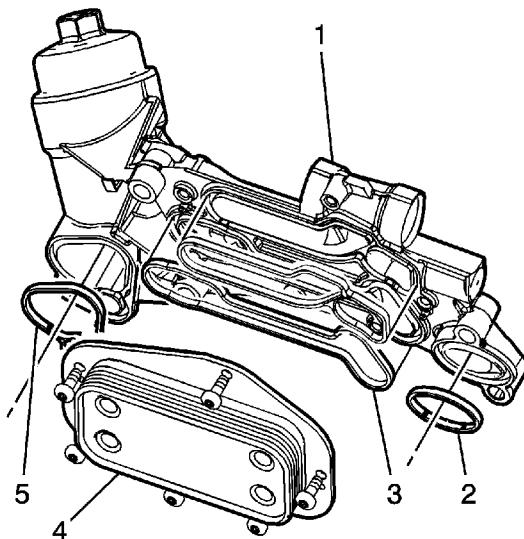
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7. Remove the heat exchanger (4) with the gasket.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



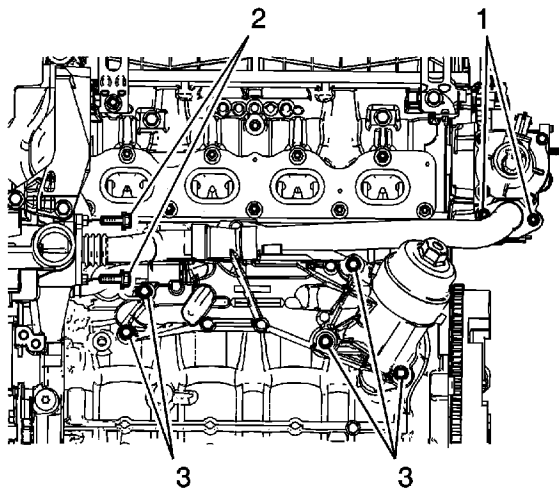
**Note:** Check for damage or leakage on the oil cooler gaskets. If damage or leakage, replace the related gasket with a new one.

1. Install the heat exchanger (4) with the gasket to the oil cooler housing.



**Tighten**

Tighten the heat exchanger bolts to 8 N·m(70.8 lb in).



2. Insert the coolant pipes to the oil cooler housing with the gasket.
3. Install the oil cooler tightening bolts (3).

**Tighten**

Tighten the oil cooler tightening bolts to 25 N·m (18.4 lb ft).

4. Install the coolant pipe bolts to the engine front cover (2).

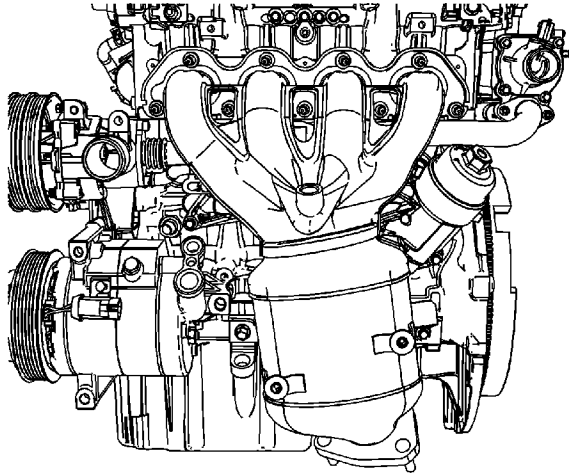
**Tighten**

Tighten the coolant pipe bolts to 8 N·m (70.8 lb in).

5. Install the coolant pipe bolts to the engine coolant distributor case (1).

**Tighten**

Tighten the coolant pipe bolts to 8 N·m (70.8 lb in).



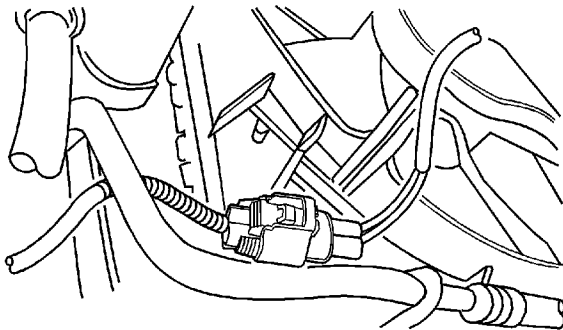
6. Remove the exhaust manifold. Refer to [Exhaust Manifold Replacement](#).

## Engine Coolant Fan Replacement

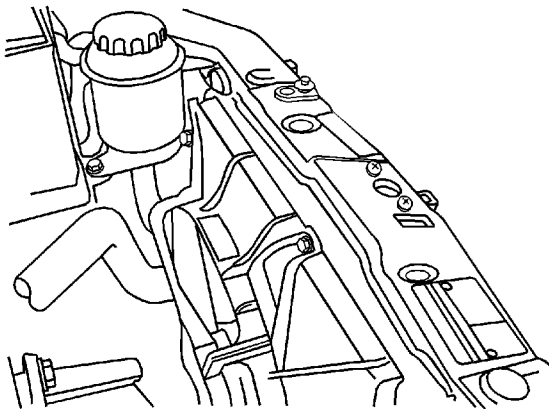
### Removal Procedure

**Warning:** Refer to [Electric Coolant Fan Warning](#) in the Preface section.

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



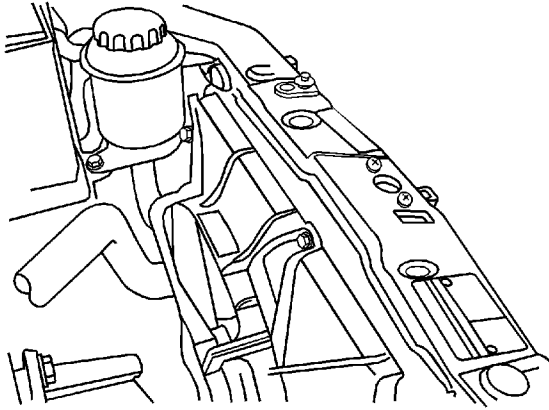
1. Disconnect the negative battery cable.
2. Disconnect the cooling fan electrical connector(s).





3. Remove the electric cooling fan mounting bolts.
4. Remove the electric cooling fan.

## Installation Procedure

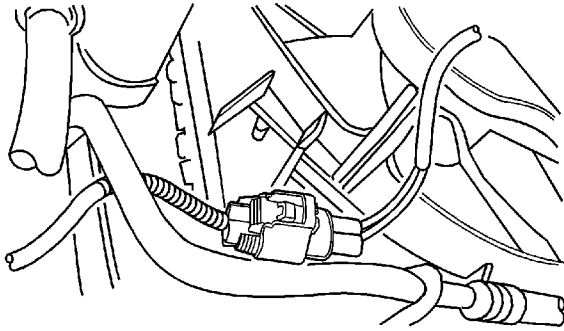


**Warning:** If a fan blade is bent or damaged in any way, do not repair or reuse the damaged part. Always replace a bent or damaged fan blade. Fan blades that have been damaged can not be assured of proper balance and could fail and fly apart during subsequent use. This creates an extremely dangerous situation.

The fan blades must remain in proper balance. You cannot assure fan blade balance once a fan blade has been bent or damaged. A fan blade that is not in proper balance could fail and fly apart during use, creating an extremely dangerous situation.

1. Install the electric cooling fan.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

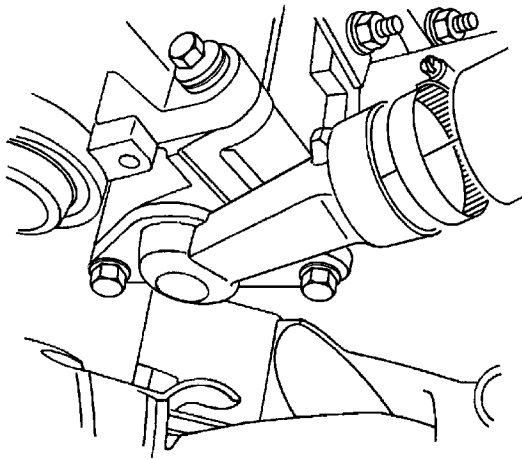


2. Install the electric cooling fan mounting bolts and tighten to **4 N·m (35 lb in)**.
3. Connect the cooling fan electrical connector.

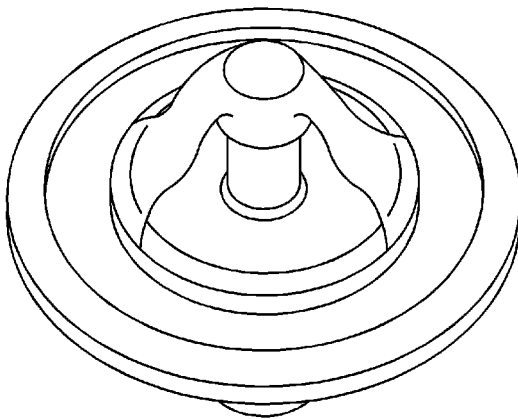
## Engine Coolant Thermostat Replacement (1.5L)

### Removal Procedure

**Warning:** To avoid being burned, do not remove the radiator cap or surge tank cap while the engine is hot. The cooling system will release scalding fluid and steam under pressure if radiator cap or surge tank cap is removed while the engine and radiator are still hot.



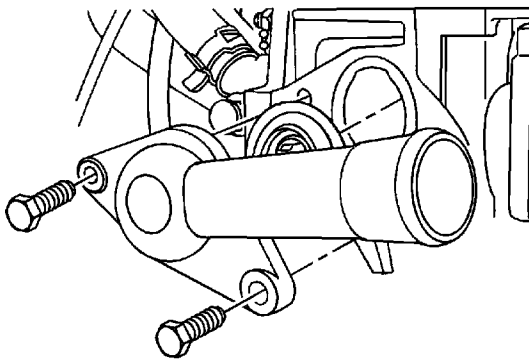
1. Drain the coolant. Refer to [Cooling System Draining and Filling](#).
2. Remove the timing belt rear hood.
3. Loosen the hose clamp on the upper radiator hose at the thermostat housing.
4. Disconnect the upper radiator hose from the thermostat housing.





5. Remove the mounting bolts that hold the thermostat housing to the cylinder head.
6. Remove the thermostat housing from the cylinder head.
7. Remove the thermostat from its recess in the cylinder head.
8. Inspect the valve seat for foreign matter that could prevent the valve from sealing properly.
9. Clean the thermostat housing and the cylinder head mating surfaces.

## Installation Procedure



1. Install the thermostat into the cylinder head recess.
2. Install the thermostat housing.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Secure the thermostat housing to the cylinder head with the mounting bolts.

### **Tighten**

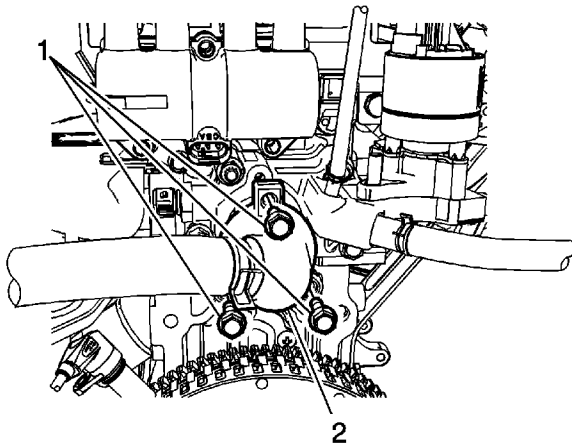
Tighten the thermostat housing mounting bolts to 20 N·m (15 lb ft).

4. Install the timing belt rear hood.
5. Connect the upper radiator hose to the thermostat housing.
6. Secure the upper radiator hose to the thermostat housing with a hose clamp.
7. Refill the engine cooling system. Refer to [Cooling System Draining and Filling](#).

## Engine Coolant Thermostat Replacement (1.2L DOHC)

### Removal Procedure

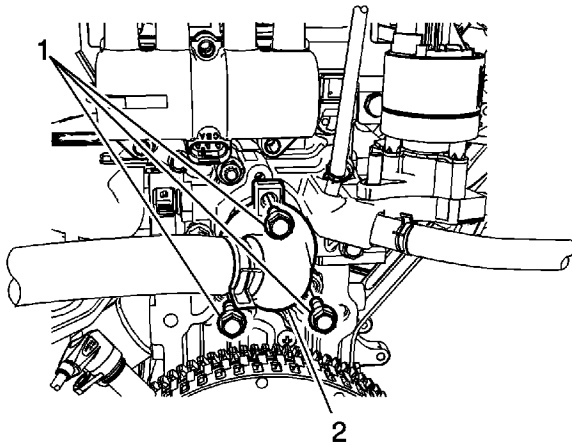
**Warning:** Refer to [Radiator Cap Removal Warning](#) in the Preface section.



1. Drain the coolant. Refer to [Cooling System Draining and Filling](#).
2. Remove the thermostat housing retaining bolts (1).
3. Remove the thermostat housing (2).
4. Remove the thermostat.
5. Inspect the thermostat for proper operation.
6. Clean the thermostat housing and the cylinder head mating surfaces.

### Installation Procedure





1. Install the thermostat into the cylinder head recess.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the thermostat housing (2).

#### **Tighten**

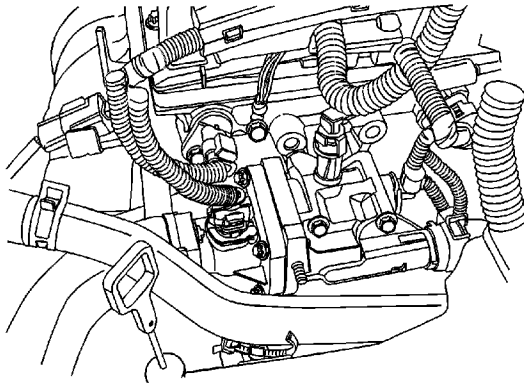
Tighten the thermostat housing retaining bolts (1) to 10 N·m (89 lb in).

3. Refill the engine cooling system. Refer to [Cooling System Draining and Filling](#).

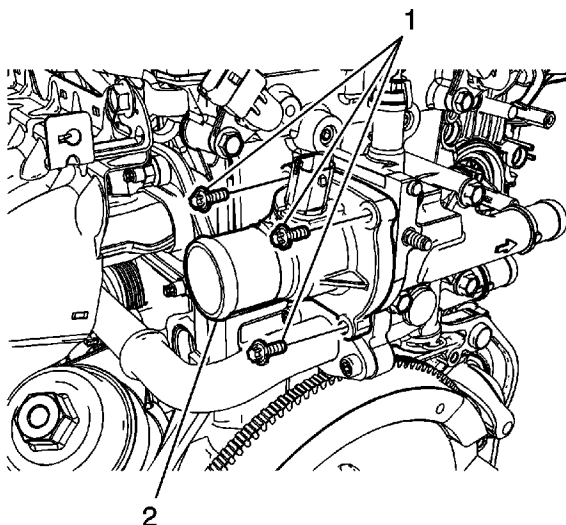
## Engine Coolant Thermostat Replacement (1.4L LDT/1.6 LXV)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



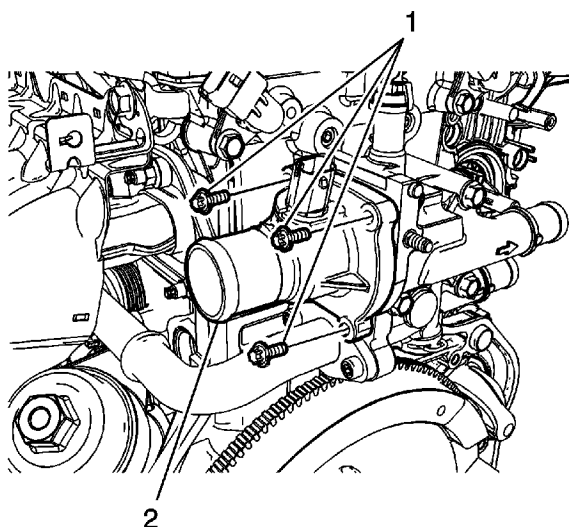
1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Drain the coolant. Refer to [Cooling System Draining and Filling](#).
3. Remove the upper radiator hose from the thermostat housing.





4. Disconnect the thermostat wiring harness plug.
5. Remove the thermostat housing retaining bolts (1).
6. Remove the thermostat housing (2).
7. Inspect the thermostat for proper operation. Refer to [Thermostat Diagnosis](#).
8. Clean the thermostat housing and the cylinder head mating surfaces.

## Installation Procedure



### **Note:**

- Do not use fallen parts. Plastic housing is very brittle and the fallen part may have internal crack that cause coolant leak.
- Do not reuse rubber gaskets.
- Check a coolant leak after the part replacement.

1. Fit the thermostat housing to the coolant distributor and use the NEW gasket.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the thermostat housing (2).

### **Tighten**

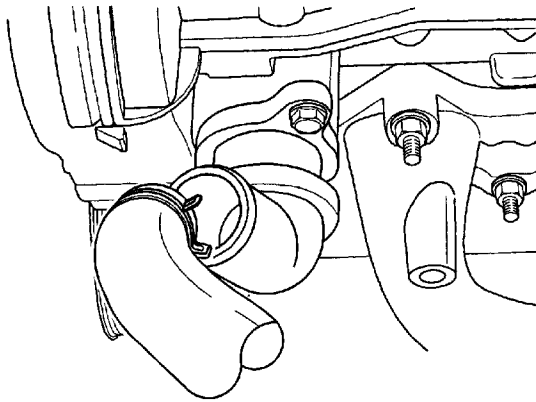
Tighten the thermostat housing retaining bolt (1) to 8 N·m (5.9 lb ft).

3. Connect the thermostat wiring harness plug.
4. Install the upper radiator hose from the thermostat housing.
5. Refill the engine cooling system. Refer to [Cooling System Draining and Filling](#).
6. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and](#)

[Connection.](#)

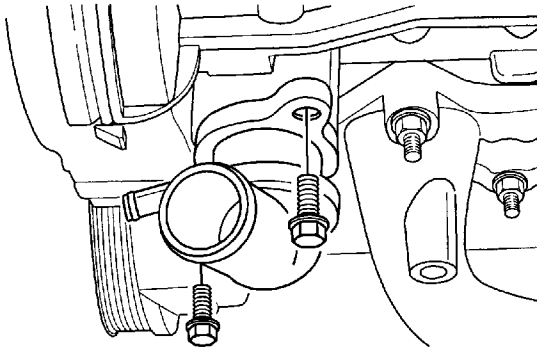
## Engine Coolant Thermostat Replacement (1.4L/1.6L DOHC)

### Removal Procedure



**Warning:** As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the pressure cap while the engine is hot and pressure is high will cause the solution to boil instantaneously -- possibly with explosive force -- spewing the solution over the engine, fenders and the person removing the cap.

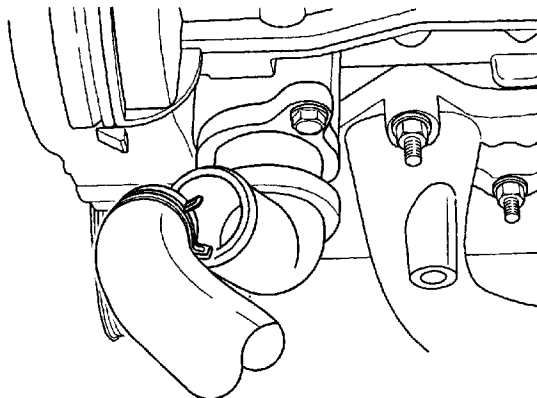
1. Drain the coolant. Refer to [Cooling System Draining and Filling](#).
2. Disconnect the upper radiator hose from the thermostat housing.
3. Disconnect the throttle body coolant inlet hose from the thermostat housing.



4. Remove the thermostat bolts.
5. Remove the thermostat housing.
6. Remove the thermostat with the gasket.
7. Inspect the gasket for cracks or other damage.
8. Inspect the valve seat for foreign matter that could prevent the valve from seating properly.
9. Clean the thermostat housing and mating surface.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the thermostat with the bolts and the thermostat housing and tighten to **20 N·m**

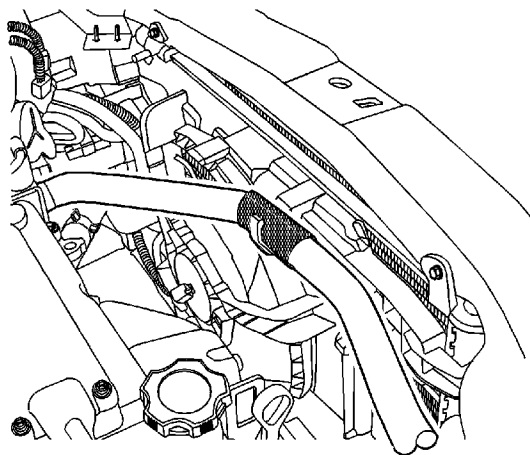
**(15 lb ft).**

2. Secure the upper radiator hose to the thermostat housing with a hose clamp.
3. Connect the throttle body coolant inlet hose to the thermostat housing.
4. Refill the engine cooling system. Refer to [Cooling System Draining and Filling](#).

## Radiator Replacement (1.2L DOHC)

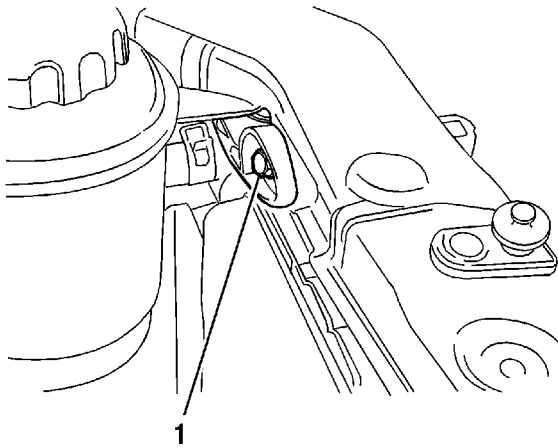
### Removal Procedure

**Warning:** Refer to [Radiator Cap Removal Warning](#) in the Preface section.

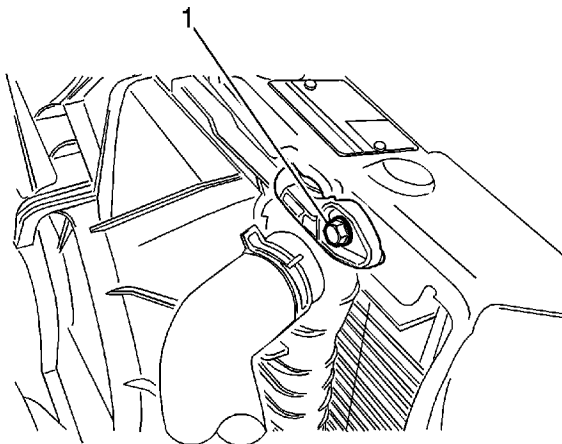


1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the power steering oil tank. Refer to [Power Steering Fluid Reservoir Replacement](#).
3. Drain the coolant. Refer to [Cooling System Draining and Filling](#).
4. Remove the electric cooling fans. Refer to [Engine Coolant Fan Replacement](#).
5. Disconnect the upper cooling fan hose from the radiator.
6. Disconnect the lower radiator hose from the radiator.

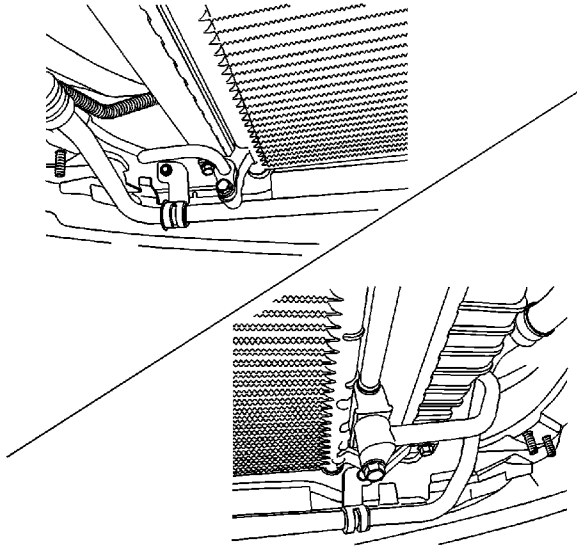




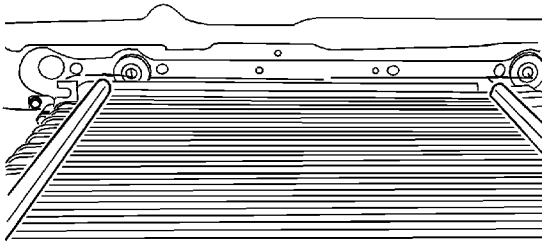
7. Remove the return hose from the surge tank at the radiator.
8. Remove the left upper radiator retaining bracket (1).



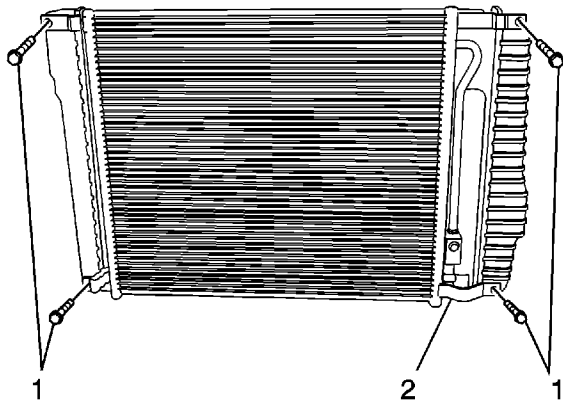
9. Remove the right upper radiator retaining bracket (1).



10. Remove the A/C gas. Refer to [Refrigerant Recovery and Recharging](#).
11. Remove the high pressure pipe bolt from both sides of the A/C condenser. Refer to [Refrigerant Recovery and Recharging](#).

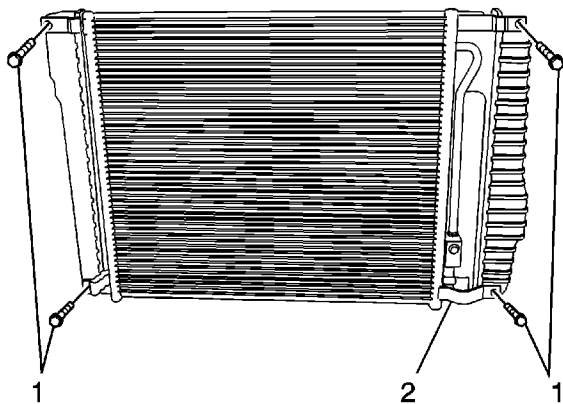


12. Remove up the radiator from the vehicle with the A/C condenser.

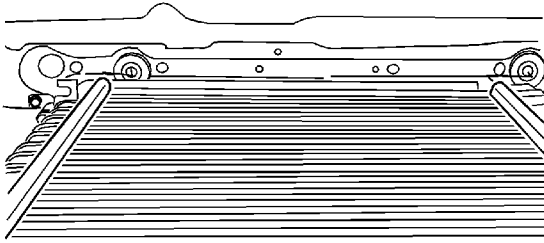


13. Remove the A/C condenser retaining bolts (1) and clips (2) from the radiator.

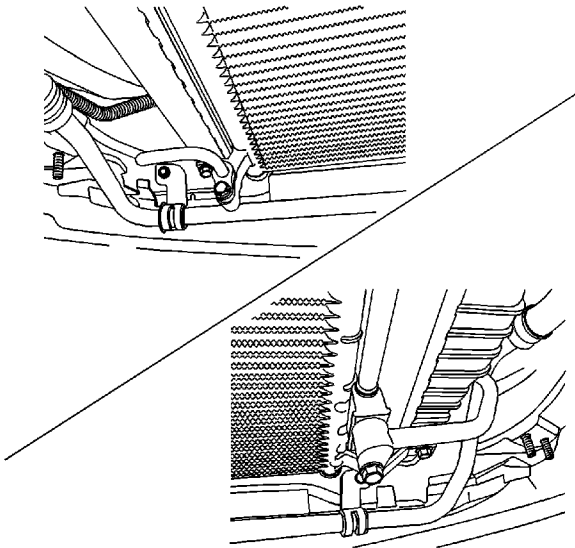
## Installation Procedure



1. Install the A/C condenser to the radiator. Secure with clips (2) and bolts (1)..

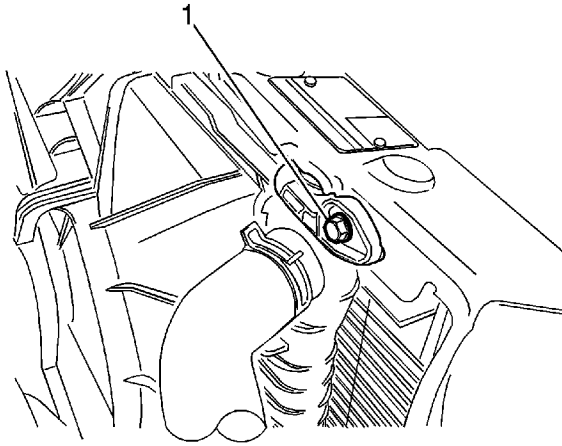


2. Install the radiator with the A/C condenser.



3. Install the high pressure pipe bolt from both sides of the A/C condenser.
4. Refill the A/C gas. Refer to [Refrigerant Recovery and Recharging](#).

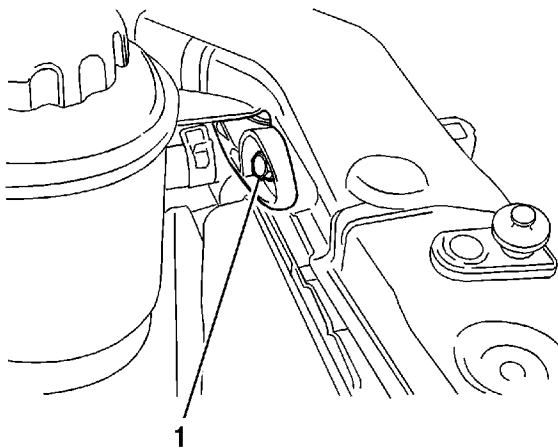
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



5. Install the right upper radiator retaining bracket.

**Tighten**

Tighten the upper right radiator retaining bracket bolt (1) to 10 N·m (89 lb in).

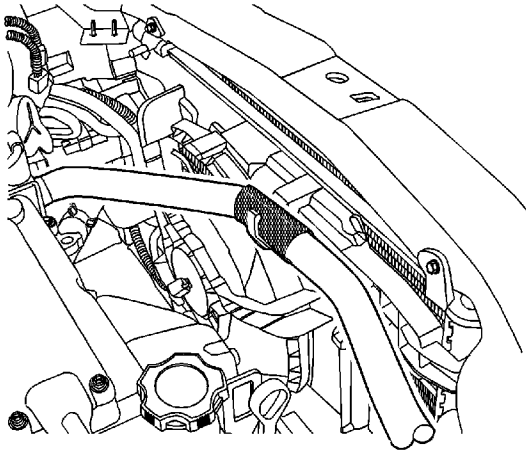


6. Install the left upper radiator retaining bracket.

**Tighten**

Tighten the left radiator retaining bracket bolt (1) to 10 N·m (89 lb in).

7. Install the return hose from the surge tank at the radiator.
8. Connect the lower radiator hose from the radiator.

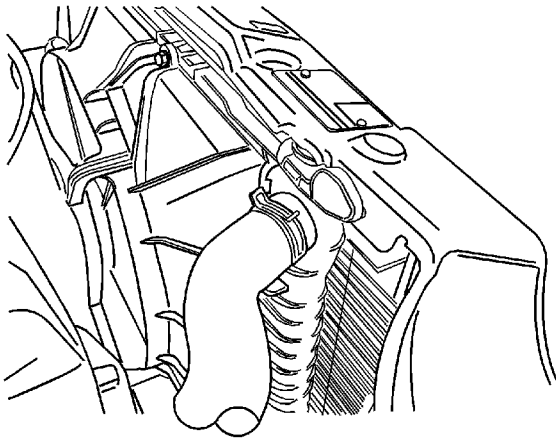


9. Connect the upper cooling fan hose from the radiator.
10. Install the electric cooling fan. Refer to [Engine Coolant Fan Replacement](#).
11. Refill the engine cooling system. Refer to [Cooling System Draining and Filling](#).
12. Install the power steering oil tank. Refer to [Power Steering Fluid Reservoir Replacement](#).
13. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

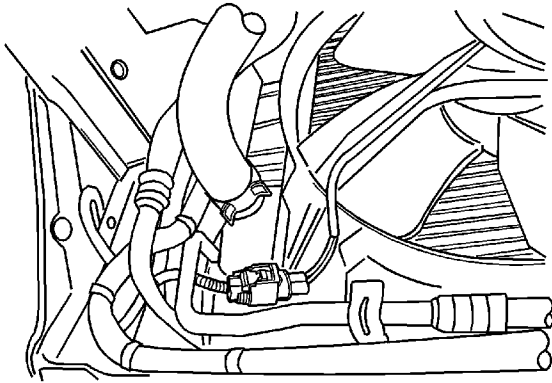
## Radiator Replacement (1.4L/1.5L/1.6L)

### Removal Procedure

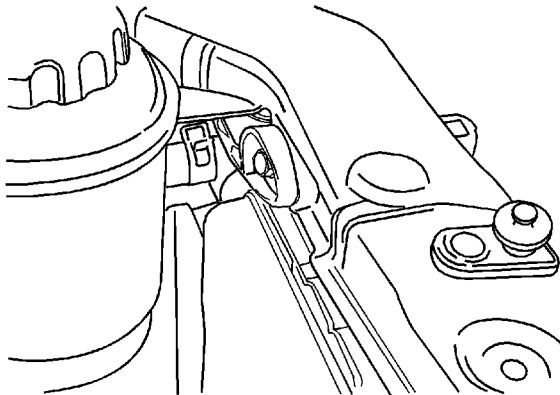
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Drain the engine cooling system. Refer to [Cooling System Draining and Filling](#).
3. Remove the electric cooling fans. Refer to [Engine Coolant Fan Replacement](#).
4. Remove the upper radiator hose clamp.
5. Disconnect the upper radiator hose from the radiator.

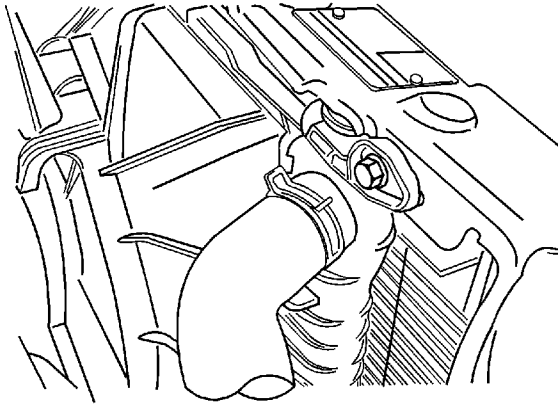


6. Disconnect the lower radiator hose from the radiator.
7. Remove the lower radiator hose clamp.

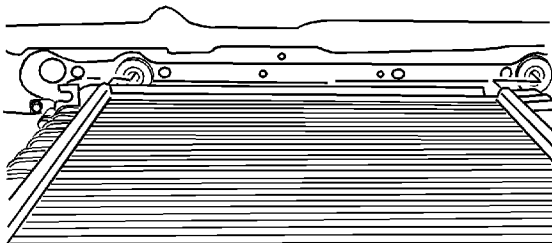


8. Remove the hose clamp from the surge tank hose at the radiator.
9. Disconnect the surge tank hose from the radiator.
10. Remove the left upper radiator retaining bolt.
11. Remove the left upper radiator retaining bracket.





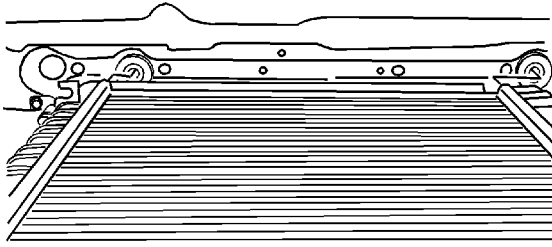
12. Remove the right upper radiator retaining bolt.
13. Remove the right upper radiator retaining bracket.



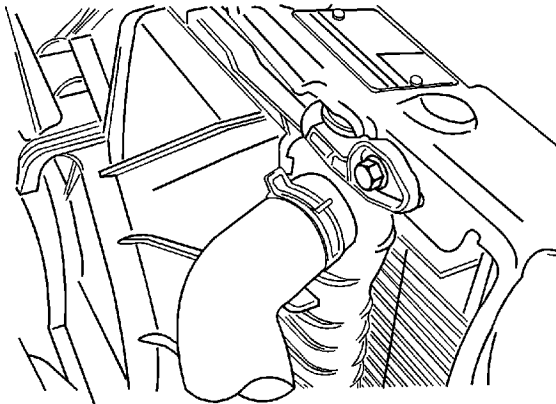
**Note:** The radiator still contains a substantial amount of coolant. Drain the remainder of the coolant from the radiator into a drain pan.

14. Remove the radiator from the vehicle.

## Installation Procedure



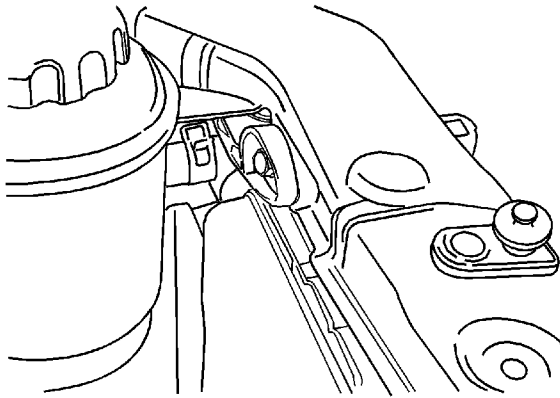
1. Set the radiator into place in the vehicle with the radiator bottom posts in the rubber shock bumpers.



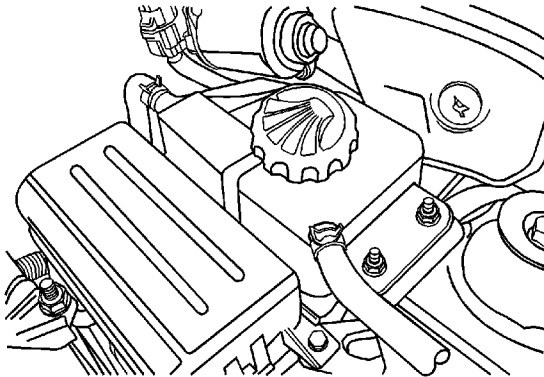
2. Position the radiator retainers in place.
3. Install the upper right radiator retaining bracket.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

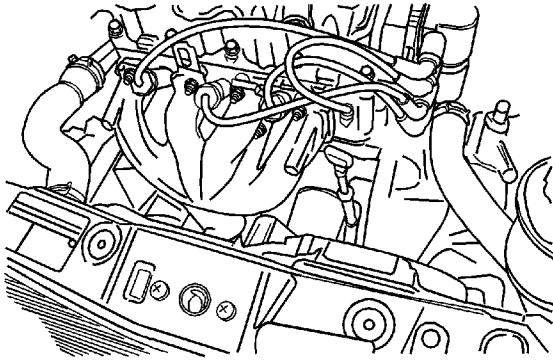
4. Install the upper right radiator retaining bolt and tighten to **7 N·m (62 lb in)**.



5. Install the upper left radiator retaining bracket.
6. Install the upper left radiator retaining bolt and tighten to **7 N·m (62 lb in)**.



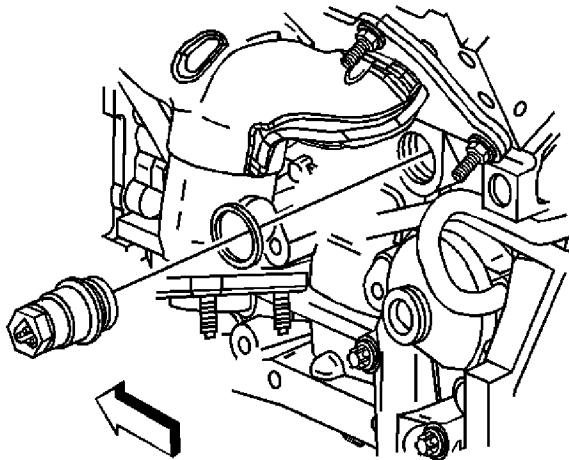
7. Connect the surge tank hose to the radiator.
8. Secure the surge tank hose with a hose clamp.



9. Connect the upper radiator hose and the lower radiator hose to the radiator.
10. Secure each hose with a hose clamp.
11. Install the electric cooling fans. Refer to [Engine Coolant Fan Replacement](#).
12. Refill the engine cooling system. Refer to [Cooling System Draining and Filling](#).
13. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Coolant Heater Replacement

### Removal Procedure



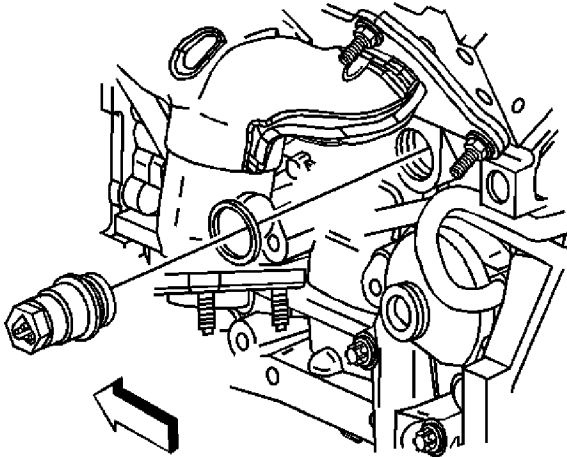
1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).

**Note:** A residual amount of coolant will drain from engine block.

2. Disconnect the coolant heater power supply cord from the coolant heater.
3. Remove the coolant heater and seal from the engine block.

### Installation Procedure

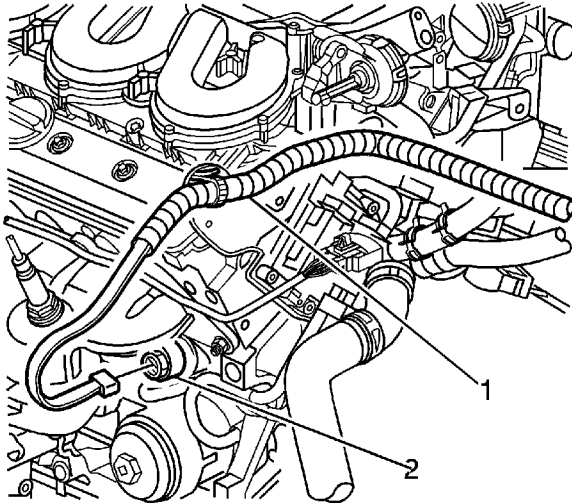
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



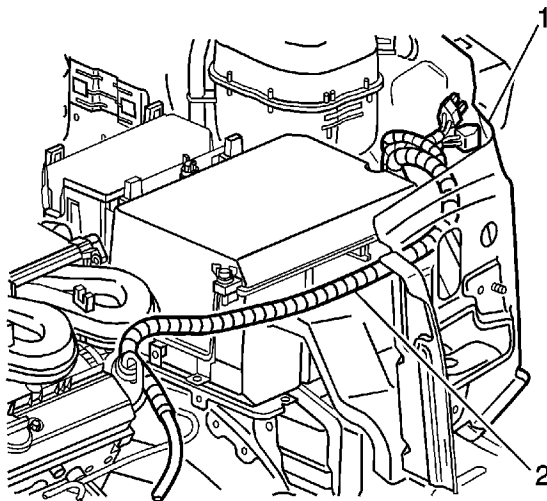
1. Install the seal to the coolant heater.
2. Install the coolant heater in to the engine block and tighten to **60 N·m (44 lb ft)**.
3. Connect the coolant heater power supply cord to the coolant heater.
4. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

## Coolant Heater Cord Replacement

### Removal Procedure



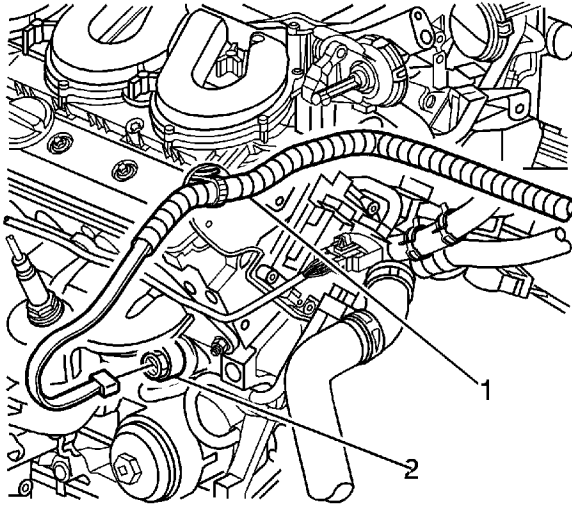
1. Disconnect the coolant heater power supply cord from the coolant heater (2).
2. Disconnect the coolant heater cord clip (1) from the engine lift bracket.



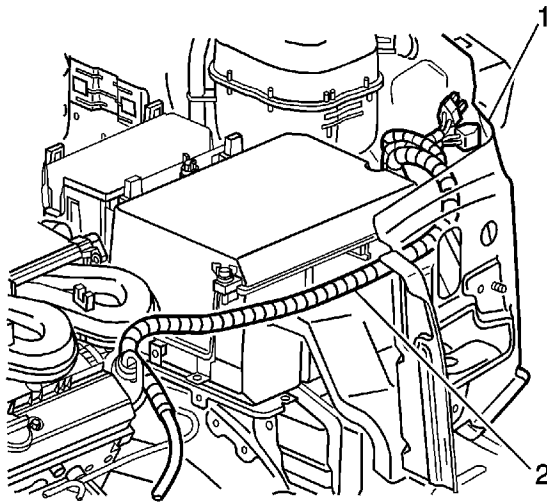
3. Disconnect the coolant heater cord from between the washer bottle and the coolant reservoir (1).
4. Remove the coolant heater cord from the vehicle.

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## Installation Procedure



1. Connect the coolant heater cord to the coolant heater (2).
2. Secure the coolant heater cord clip (1) to the engine lift bracket.



3. Route the coolant heater cord along the battery (2).
4. Secure the coiled power cord between the washer fluid bottle and the coolant reservoir (1).



## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Battery Cable Nuts	4.5 N·m	40 lb in
Battery Carrier Tray Lower Bolts	20 N·m	15 lb ft
Battery Carrier Tray Upper Bolts	20 N·m	15 lb in
Battery Retainer Clamp-to-Battery Rod Nuts	4 N·m	35 lb in
Engine Mount Lower Bracket Bolts (1.2L)	41 N·m	30 lb ft
Front Bearing Plate Screws	8 N·m	71 lb in
Fuel Rail Retaining Bolts	20 N·m	15 lb in
Generator Adjusting Bolt (1.2L)	7 N·m	62 lb ft
Generator Battery Lead Nut	15 N·m	11 lb ft
Generator Brush Holder Screws	12 N·m	106 lb in
Generator Drive and End Bearing Nut	81 N·m	60 lb ft
Generator Drive End Bearing Nut	81 N·m	60 lb ft
Generator Lower Bracket Mounting Bolt (1.2L)	28 N·m	21 lb ft
Generator Lower Bracket-to-Generator Nuts	25 N·m	18 lb ft
Generator Pulley Nut (1.2L)	110 N·m	81 lb ft
Generator Shackle Bracket Bolt	25 N·m	18 lb ft
Generator Through-Bolts	10 N·m	89 lb in
Harness Ground Bolt	41 N·m	30 lb ft
Reaction Rod Bolt and Nut (1.2L)	83 N·m	61 lb ft
Starter Field Coil Connector Nut	8 N·m	71 lb in
Starter Mounting Bolts (1.2L)	23 N·m	17 lb ft
Starter Mounting Bolts (1.4L/1.5L SOHC and 1.4L/1.6L DOHC)	43 N·m	32 lb ft
Starter Solenoid Assembly Screws	8 N·m	71 lb in
Starter Solenoid Nuts	15 N·m	11 lb ft
Starter Through-Bolts	6 N·m	53 lb in

## General Specifications

Application	Specification	
	Metric	English
Battery		
Manual <ul style="list-style-type: none"> <li>1.2L SOHC</li> <li>1.5L SOHC</li> </ul>	410 Cold Cranking Amps	
Automatic <ul style="list-style-type: none"> <li>1.4L SOHC/DOHC</li> <li>1.5L SOHC</li> </ul>	550 Cold Cranking Amps	
Alternator <ul style="list-style-type: none"> <li>1.4L SOHC/DOHC</li> <li>1.5L SOHC, A/T</li> </ul>	85 A	
Alternator <ul style="list-style-type: none"> <li>1.2L SOHC</li> <li>1.5L SOHC, M/T</li> </ul>	75 A	
Starter-Manual (No-Load Test Current Draw) <ul style="list-style-type: none"> <li>1.2L SOHC</li> <li>1.5L SOHC</li> </ul>	0.8 kW  Maximum 53 A (Drive Pinion Speed at Minimum 5,000 RPM, 11.5 V)	
Starter-Automatic (No-Load Test Current Draw) <ul style="list-style-type: none"> <li>1.4L SOHC/DOHC</li> <li>1.5L SOHC</li> </ul>	1.2 kW  Maximum 90 A (Drive Pinion Speed at Minimum 2,600 RPM, 11.5 V)	

## Battery Usage

Table 1: [Battery Voltage Specifications](#)

Application	Description
L4 Engine	
Cold Cranking Amps	550 amps
Load Test	270 amps
RC - Minimum	90 minutes
Replacement	85B-60

### Battery Voltage Specifications

Application	Specification	
	Metric	English
Minimum Voltage:		
9.6 V	21°C	70°F
9.4 V	20°C	68°F
9.1 V	0°C	32°F
8.8 V	-10°C	14°F
8.5 V	-18°C	0°F
8.0 V	Below -18°C	Below 0°F

## Starter Usage

Application	Description
Starter	
┆ No Load Test @ 12 volts (1.4L/1.5L SOHC and 1.4L/1.6L DOHC)	Maximum 90 amps
┆ Drive Pinion Speed (1.4L/1.5L SOHC and 1.4L/1.6L DOHC)	Minimum 2,600 RPM
┆ No Load Test 9 volts (1.2L)	Maximum 150 amps
┆ Drive Pinion Speed (1.2L)	Minimum 2,000 RPM
Solenoid	
┆ Hold-in Windings @ 12 volts	12-20 amps
┆ Pull-in Windings @ 12 volts	60-90 amps

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Engine](#) | [Engine Electrical](#) | [Specifications](#) |

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## Generator Usage

Application	Description
Generator Types (1.4L/1.5L SOHC and 1.4L/1.6L DOHC)	CS-121D
Generator Types (1.2L)	SG7K

## Battery Negative Cable Disconnection and Connection Removal Procedure

**Warning:** Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

1. Record all preset and theft codes, (if equipped), from the radio.
2. Turn the ignition switch to the OFF position.
3. Verify that all the electrical components are OFF such as interior lights, all doors are closed, the underhood lamp , etc.
4. Loosen the clamping bolt from the battery negative cable.
5. Remove the battery negative cable from the battery.
6. Position the battery negative cable away from any body ground.

## Installation Procedure

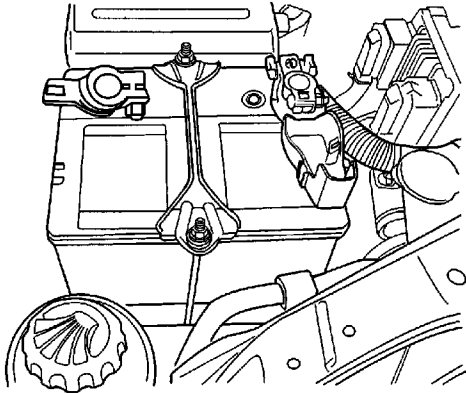
1. Verify that all the electrical components are OFF such as interior lights, all doors are closed, the underhood lamp , etc.
2. Clean corrosion from the negative battery cable using a metal brush.
3. Install the battery negative cable to the battery.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the clamping bolt to the negative cable and tighten to **4.5 N·m (40 lb in)**.
5. Reset the radio stations and the clock.

## Battery Tray Replacement

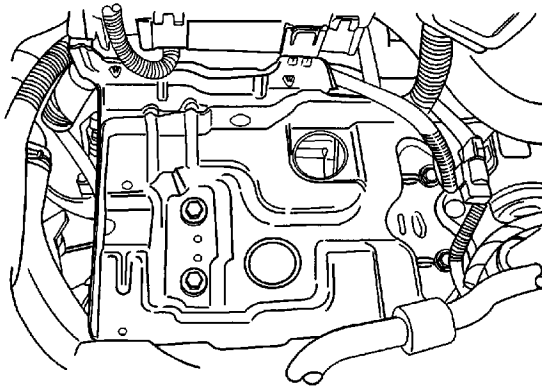
### Removal Procedure



1. Disconnect the negative battery cable and then disconnect the positive battery cable.

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Remove the nuts from the battery rods that fasten the battery hold-down bar clamp.

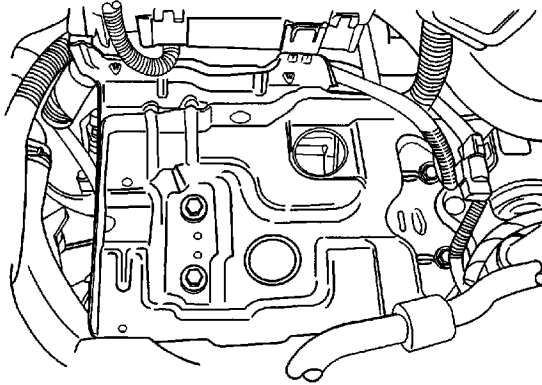


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3. Check the battery carrier tray for obvious cracks or damage. Detach the carrier tray if necessary by removing the upper and the lower bolts.

## Installation Procedure

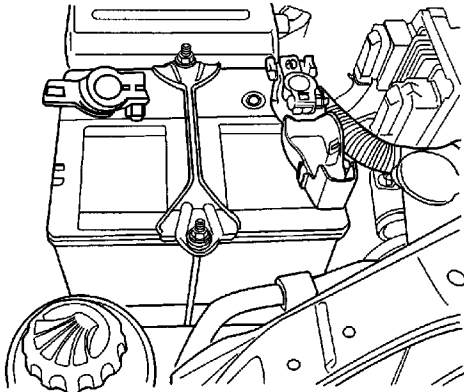
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the battery carrier by fastening the carrier tray upper and lower bolts.

### **Tighten**

Tighten the battery carrier tray upper and the lower bolts to 20 N·m (15 lb ft).







2. Install the battery into the tray.
3. Fasten the bar clamp to the battery by loosely attaching the battery rods from the batter tray cutouts through the bar clamp holes, and loosely tightening the nuts.

**Tighten**

Tighten the battery retainer clamp-to-battery rod nuts to 4 N·m (35 lb in).

4. Connect the negative battery cables.

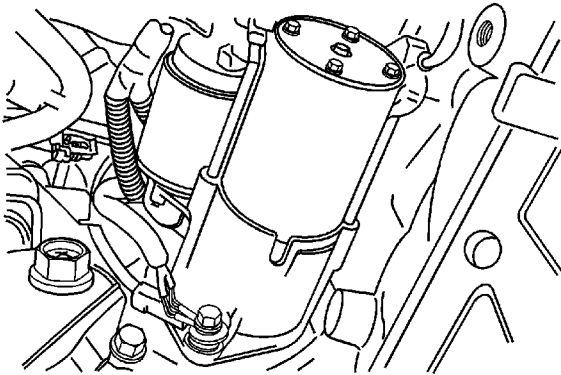
**Tighten**

Tighten the battery cable nuts to 4.5 N·m (40 lb in).

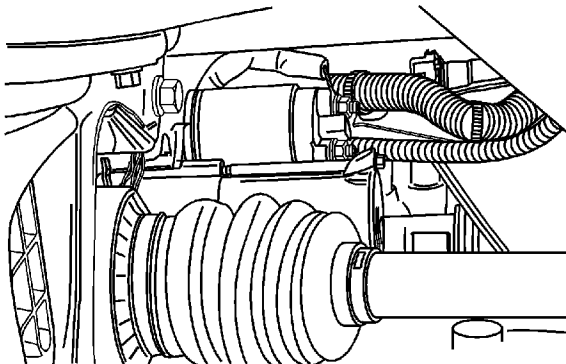
## Starter Replacement (1.4L)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable.
2. Remove the upper and the lower starter mounting bolts.

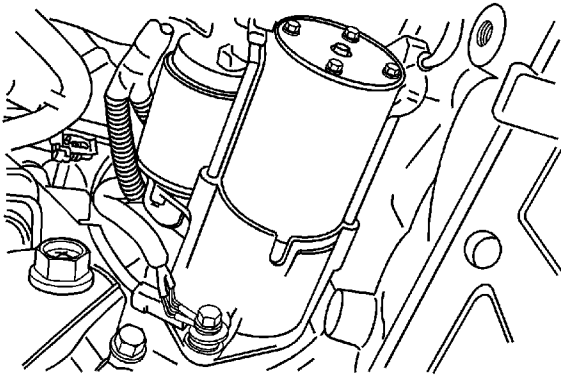


3. Remove the starter solenoid nuts to disconnect the electrical cable.

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4. Remove the starter assembly.

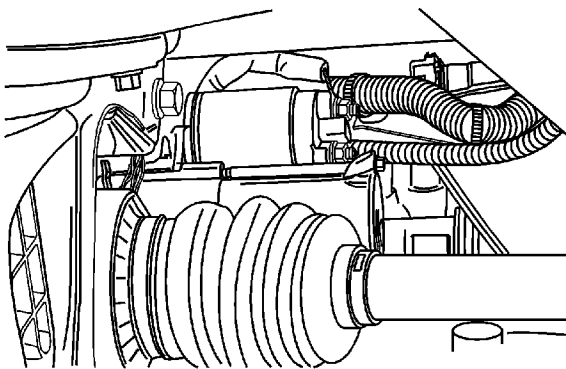
## Installation Procedure



1. Place the starter assembly in position.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the upper and the lower starter mounting bolts and tighten to **43 N·m (32 lb ft)**.



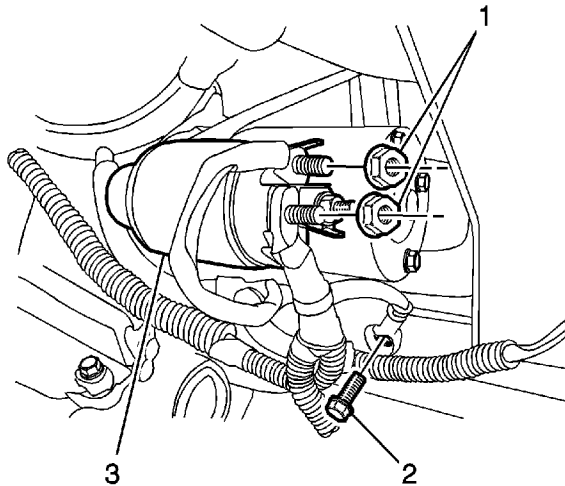
3. Position the starter electrical wire on the solenoid terminal.
4. Install the starter solenoid nuts and tighten to **15 N·m (11 lb ft)**.
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and](#)

[Connection.](#)

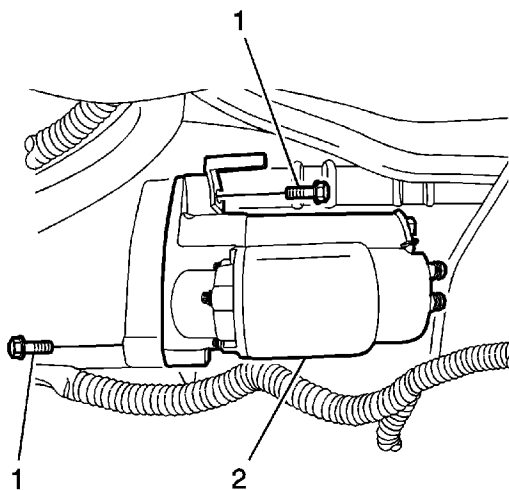
## Starter Replacement (1.2L DOHC)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



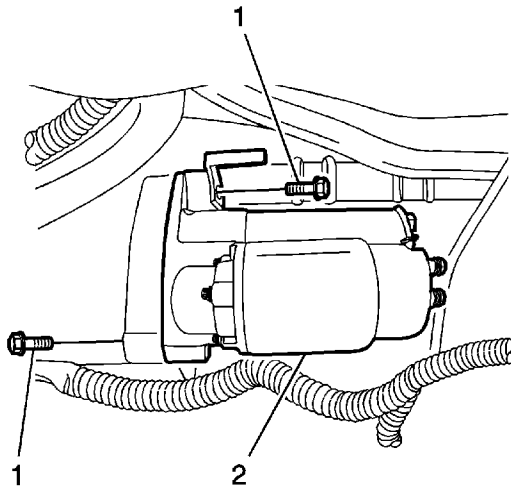
1. Disconnect the battery negative cable.
2. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
3. Remove the starter solenoid nut (1) to disconnect the starter harness.
4. Remove the starter solenoid nut (1) to disconnect the battery positive connector.
5. Remove the ground bolt (21) from the engine block.





6. Remove the starter retaining bolts (1).
7. Remove the starter (2).

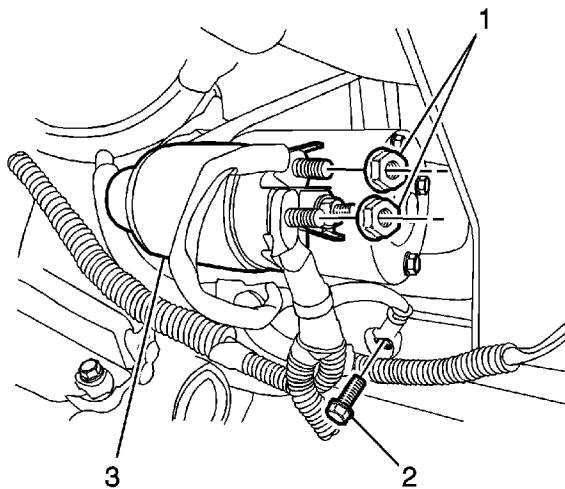
## Installation Procedure



1. Install the starter (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the starter retaining bolts (1) and tighten to **23 N·m (16.9 lb ft)**.



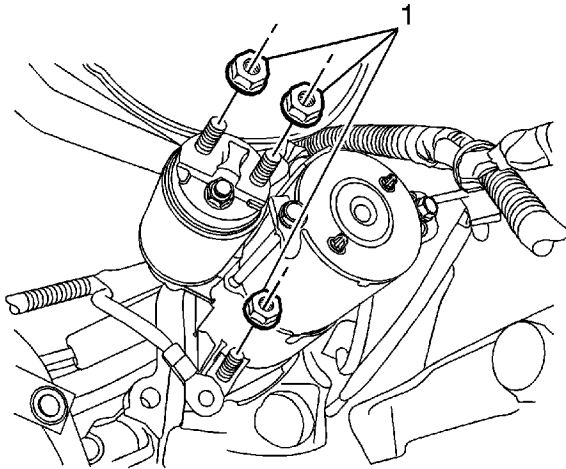


3. Install the ground bolt (2) from the engine block.
4. Install the starter solenoid nut (1) to connect the battery positive connector.
5. Install the starter solenoid nut (1) to connect the starter harness and tighten.
  - The engine ground bolt to **38 N·m (28.0 lb ft)**.
  - The starter solenoid harness connector nut to **10.5 N·m (7.7 lb ft)**.
  - The starter solenoid battery positive connector nut to **10.5 N·m (7.7 lb ft)**.
6. Lower the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
7. Connect the battery negative cable.

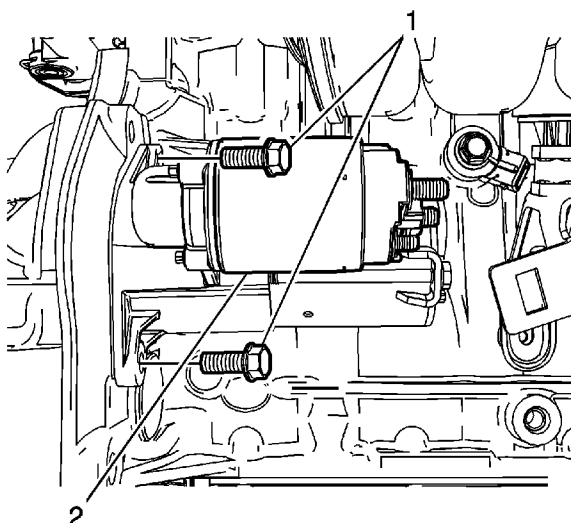
## Starter Replacement (1.4L LDT, 1.6 LXV)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
3. Remove the starter solenoid nut (1) to disconnect the starter harness.
4. Remove the starter solenoid nut (1) to disconnect the battery positive connector.
5. Remove the ground bolt from the engine block.

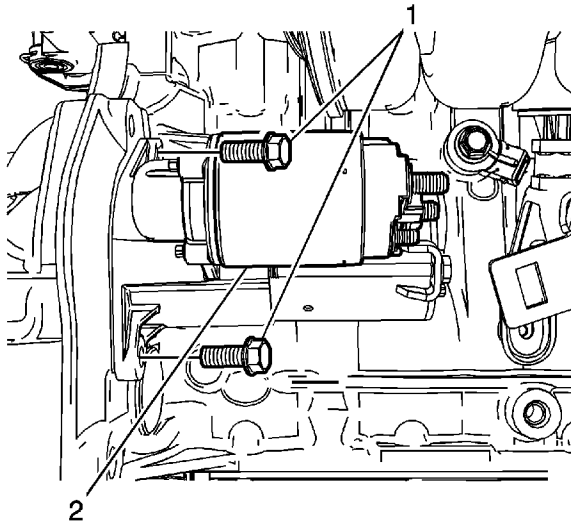






6. Remove the starter mounting bolts (1).
7. Remove the starter (2).

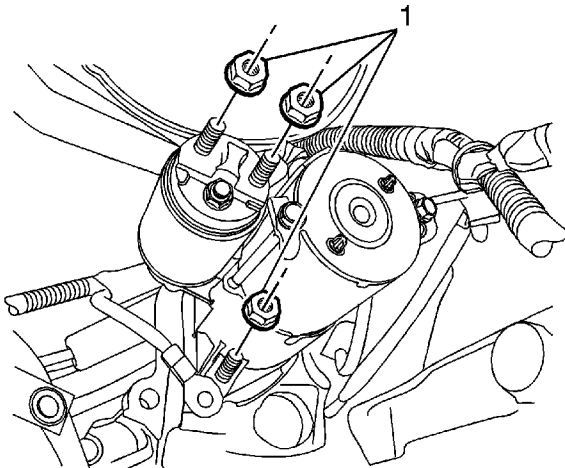
## Installation Procedure



1. Install the starter (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the starter mounting bolts (1) and tighten to **25 N·m (18.4 lb ft)**.



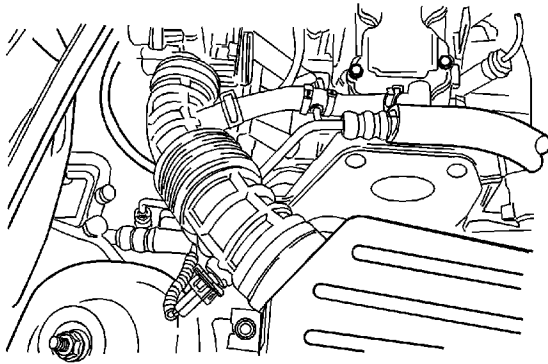


3. Install the ground bolt to the engine block.
4. Install the starter solenoid nut (1) to connect the battery positive connector.
5. Install the starter solenoid nut (1) to connect the starter harness and tighten.
  - The engine ground bolt to **38 N·m (28.0 lb ft)**.
  - The starter solenoid harness connector nut to **10.5 N·m (7.7 lb ft)**.
  - The starter solenoid battery positive connector nut to **10.5 N·m (7.7 lb ft)**.
6. Lower the vehicle.
7. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#)

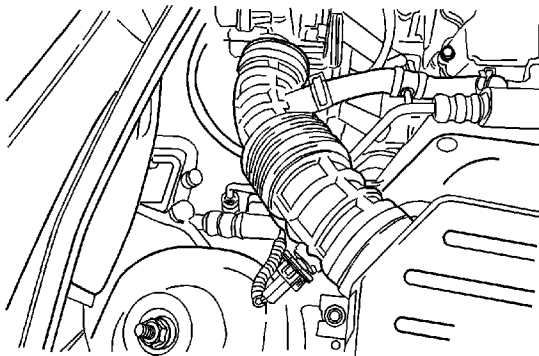
## Generator Replacement (1.4L)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

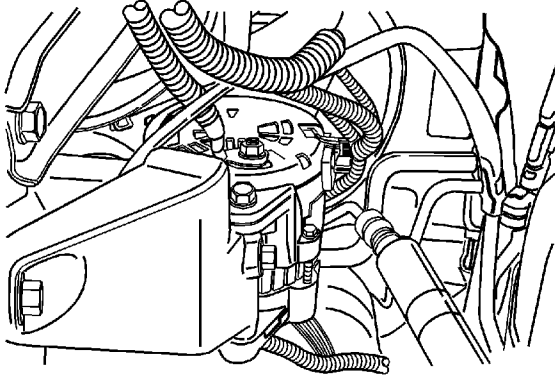


1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the intake air temperature (IAT) sensor electrical connector from the air intake tube.

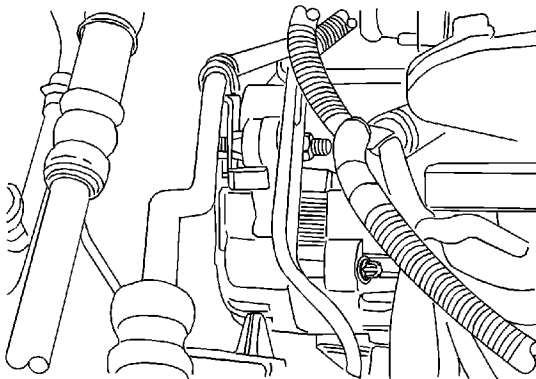




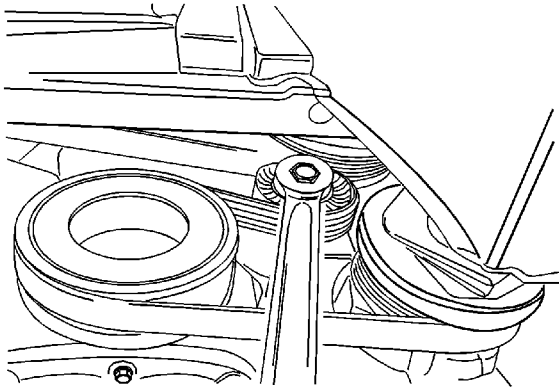
3. Remove the breather tube clamp and all other clamps to remove the air intake tube.



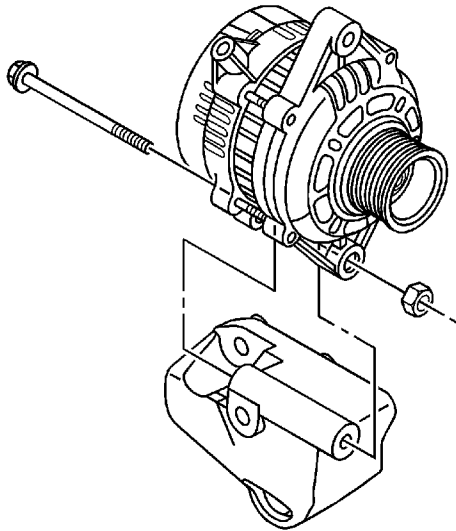
4. Remove the battery harness connector nut from the generator.



5. Remove the generator shackle bracket bolt.

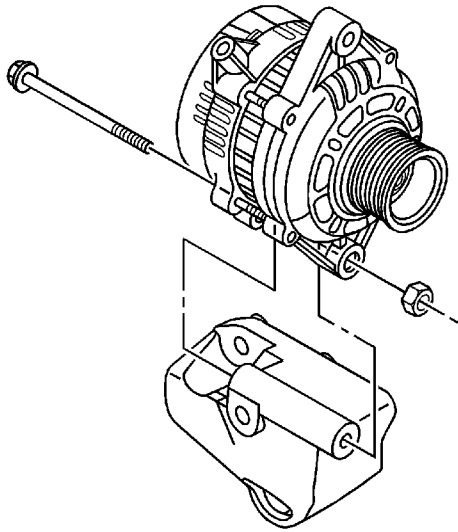


6. Remove the serpentine accessory drive belt. For vehicles equipped with power steering and air conditioning.



7. Remove the nuts which hold the generator lower bracket-to-generator bolts.
8. Carefully remove the generator.

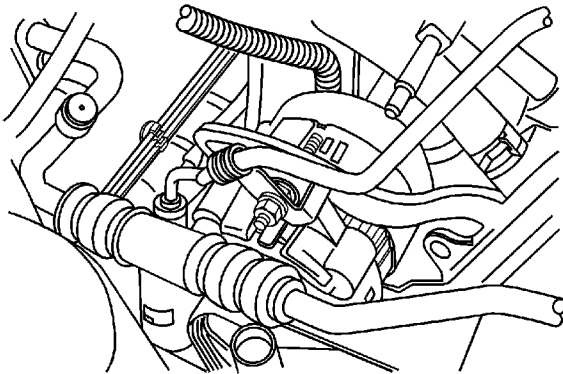
## Installation Procedure



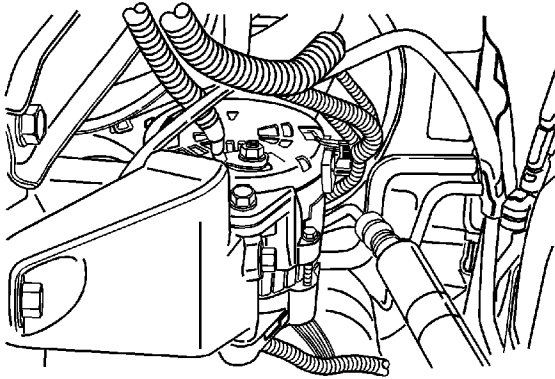
1. Install the generator at the generator lower bracket and insert the generator bolts.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

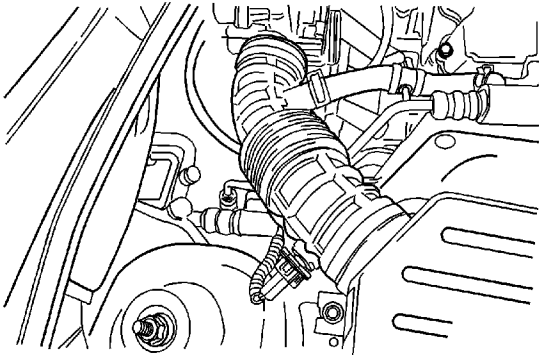
2. Install the nut and the washers on the generator lower bracket-to-generator bolts and tighten to **25 N·m (18 lb ft)**.



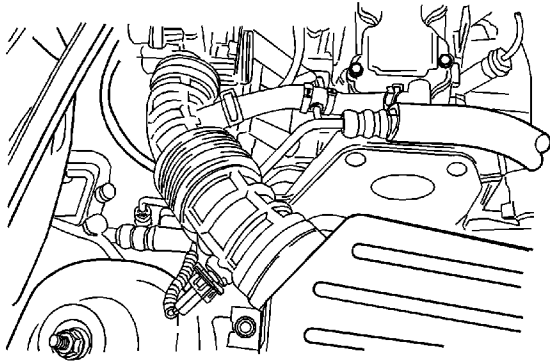
3. Install the generator and the lower support bracket assembly to the engine block with the bolts.
4. Secure the generator to the shackle bracket with the bolt and tighten to **25 N·m (18 lb ft)**.



5. Connect the harness connector to the back of the generator.
6. Install the generator lead to the battery and fasten the lead with the nut and tighten to **15 N·m (11 lb ft)**.



7. Install the air intake tube and the connector.



8. Install the IAT electrical connector to the air intake tube.
9. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

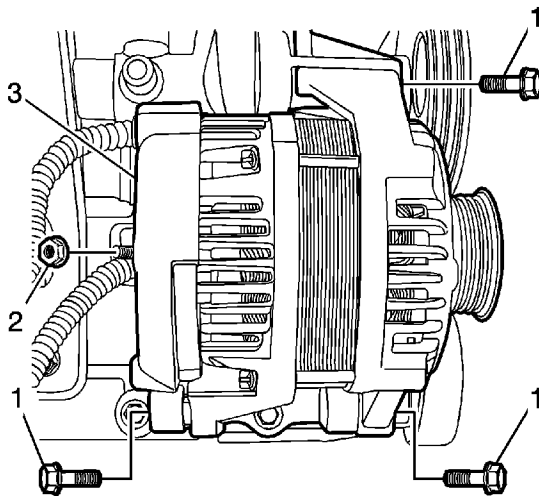


## Generator Replacement (1.2L)

### Removal Procedure

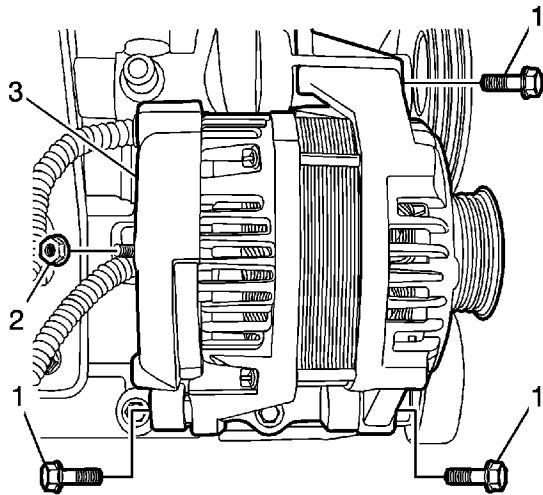
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
3. Remove the accessory belt. Refer to [Drive Belt Replacement](#).



4. Disconnect the harness connector.
5. Remove the battery harness connector nut (2) to disconnect the battery positive connector.
6. Disconnect the generator harness connector.
7. Remove the generator retaining bolts (1) and nuts.
8. Remove the generator (3).

### Installation Procedure



1. Install the generator (3).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

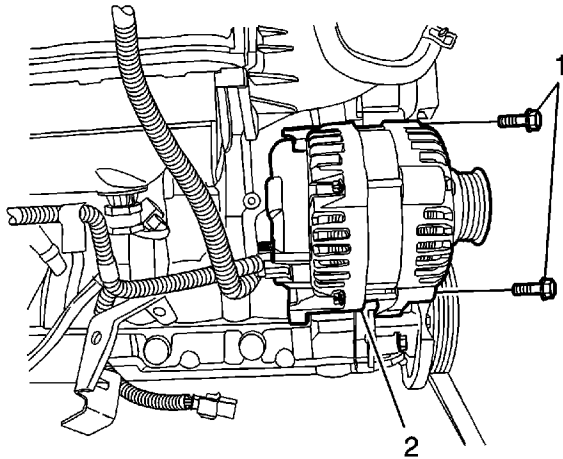
2. Install the generator retaining bolt (1) and nut. Tighten to **4.75 N·m (3.5 lb ft)**.
3. Install the battery harness connector nut (2) to connect the battery positive connector.
4. Connect the harness connector.
5. Install the accessory belt. Refer to [Drive Belt Replacement](#).
6. Lower the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
7. Connect the battery negative cable Refer to [Battery Negative Cable Disconnection and Connection](#).

## Generator Replacement (1.4L LDT, 1.6L LXV)

### Removal Procedure

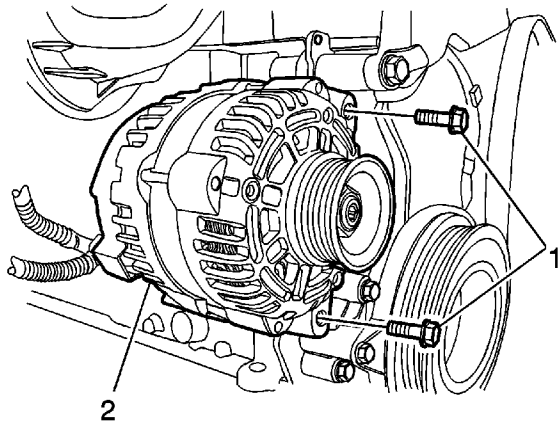
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
3. Remove the accessory belt. Refer to [Drive Belt Replacement](#) and [Drive Belt Replacement](#).



4. Disconnect the harness connector.
  - Remove the battery harness connector nut to disconnect the battery positive connector.
  - Disconnect the generator harness connector.
5. Remove the generator retaining bolts/nuts (1).
6. Remove the generator (2).

### Installation Procedure



1. Install the generator (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

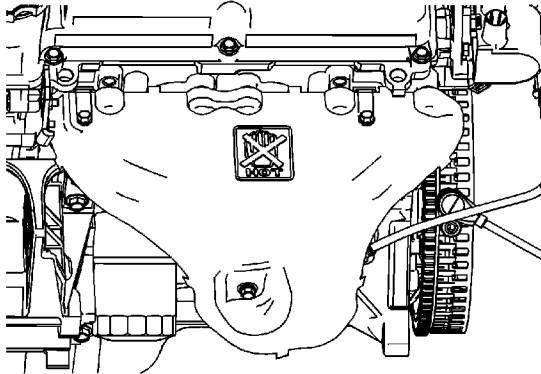
2. Install the generator retaining bolt/nut (1) and tighten to **25 N·m (18.4 lb ft)**.
3. Install the battery harness connector nut to connect the battery positive connector.
4. Connect the harness connector.
5. Install the accessory belt. Refer to [Drive Belt Replacement](#) and [Drive Belt Replacement](#).
6. Lower the vehicle.
7. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter-to-Exhaust Manifold Nuts	50 N·m	37 lb ft
Connecting Pipe-to-Catalytic Converter Nuts	40 N·m	30 lb ft
Exhaust Manifold Cover Bolts	15 N·m	11 lb ft
Front Exhaust Pipe Mounting Bracket Bolt	40 N·m	30 lb ft
Front Muffler-to-Connecting Pipe Nuts	30 N·m	22 lb ft
Front Muffler-to-Rear Muffler Nuts	30 N·m	22 lb ft
Post-Converter Heated Oxygen Sensor	41 N·m	30 lb ft

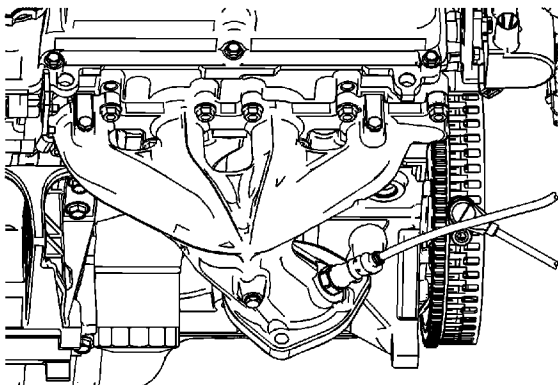
## Exhaust Manifold Replacement (1.2L)

### Removal Procedure



**Warning:** In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

1. Remove the fuel pump fuse.
2. Start the engine. After it stalls, crank the engine after it stalls for 10 seconds to rid the fuel system of fuel pressure.
3. Disconnect the oxygen sensor connector.

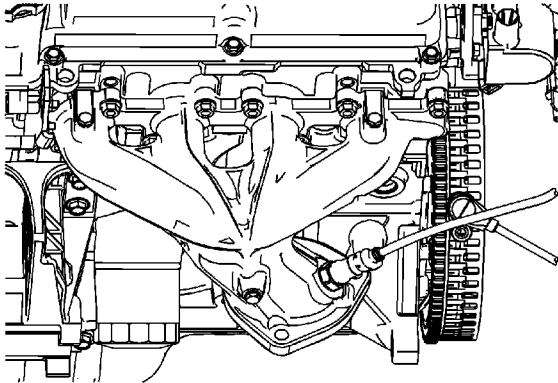




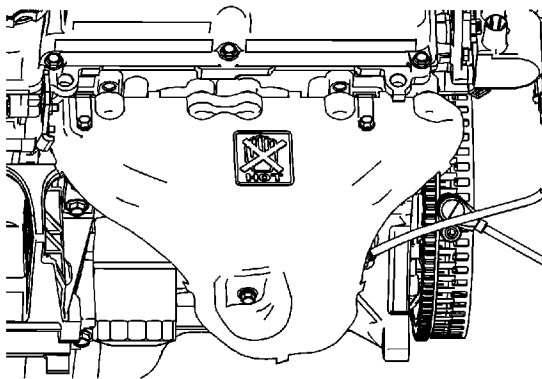
4. Remove the catalytic converter. Refer to [Catalytic Converter Replacement](#)
5. Remove the exhaust manifold.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the exhaust manifold retaining bolts/nuts and tighten.
  - The exhaust manifold retaining bolts to **25 N·m (18.4 lb ft)**.
  - The exhaust manifold retaining nuts to **20 N·m (14.7 lb ft)**.
2. Install the catalytic converter. Refer to [Catalytic Converter Replacement](#)





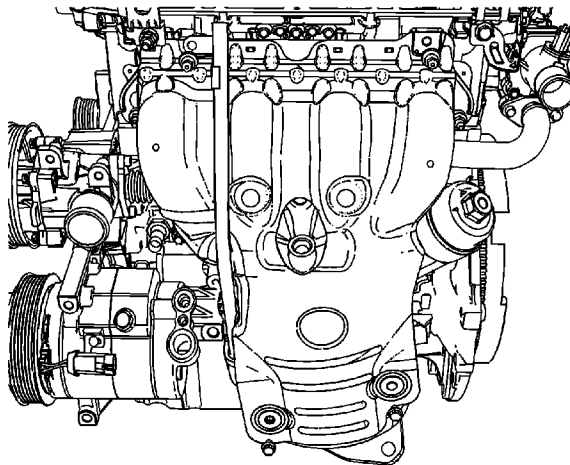
3. Connect the heater outlet hose from the coolant pipe.
4. Install the exhaust manifold heat shield and tighten to **15 N·m (11 lb ft)**.
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).



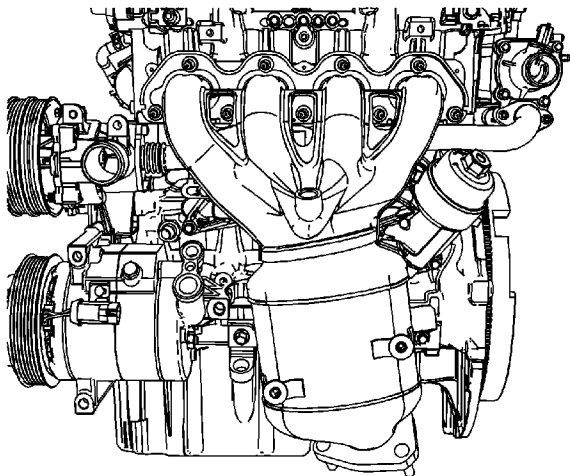
## Exhaust Manifold Replacement (1.4L)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#)
2. Disconnect the upper oxygen sensor connector.
3. Remove the exhaust manifold heat shield with engine oil indicator tube.
4. Remove the exhaust front pipe. Refer to [Front Pipe Replacement](#).



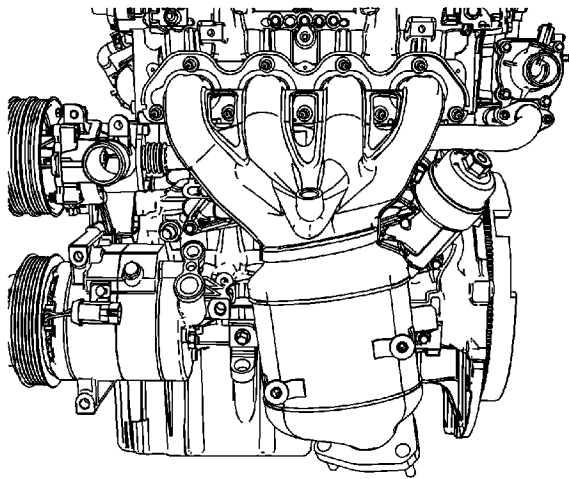


**Note:** The exhaust manifold and the catalytic converter are one piece.

5. Remove the exhaust manifold with the gasket.

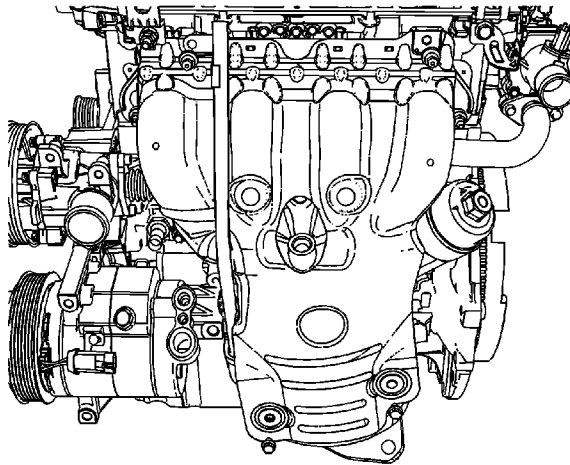
## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



**Note:** Check the exhaust gasket surface whether cracks or damages or not.

1. Install the exhaust manifold with the gasket and tighten.
  - The exhaust manifold nuts to 20 N·m (14.7 lb ft).
  - The exhaust manifold lower bracket bolts to 20 N·m (14.7 lb ft).

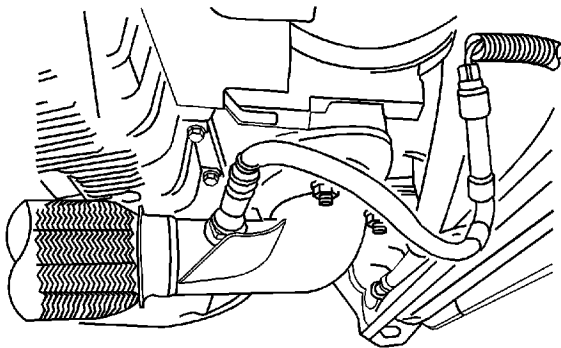


2. Install the exhaust front pipe. Refer to [Front Pipe Replacement](#).
3. Install the exhaust manifold heat shield with the engine oil indicator tube and tighten to **8 N·m (70.8 lb in)**.
4. Connect the upper oxygen sensor connector.
5. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

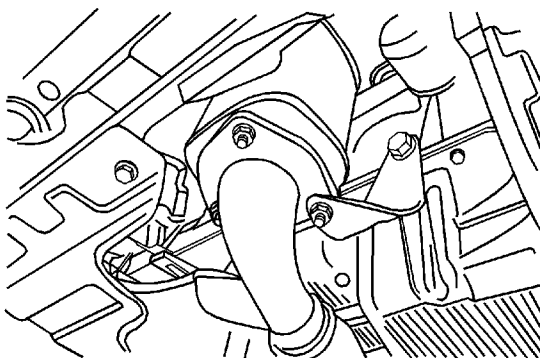
## Front Pipe Replacement

### Removal Procedure

**Warning:** Refer to [Exhaust Service Warning](#) in the Preface section.

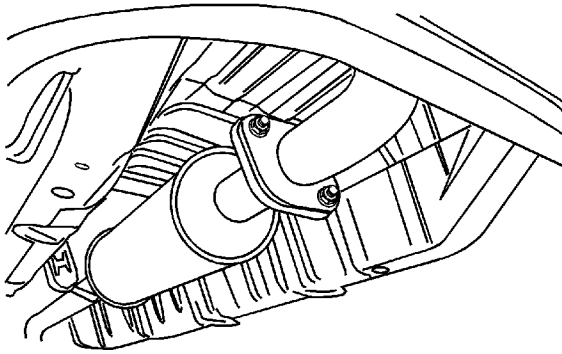


1. Remove the rear heated oxygen sensor.



2. Remove the connecting pipe mounting bracket bolt.
3. Remove the connecting pipe nuts and the gasket from the catalytic converter.

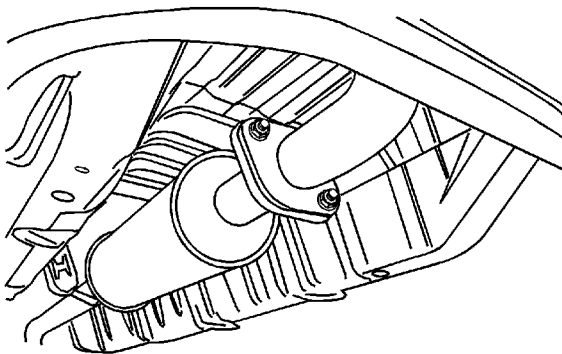
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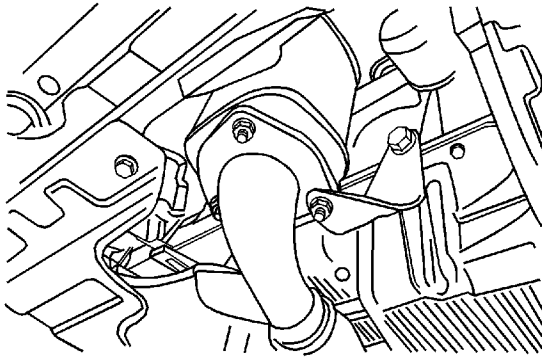
4. Remove the nuts from the front muffler pipe to the connecting pipe.
5. Clean the sealing surfaces on the front muffler pipe flange and the connecting pipe.
6. Check the connecting pipe for holes, damage, open seams, or other deterioration which could permit exhaust fumes to seep into the passenger compartment.

## **Installation Procedure**

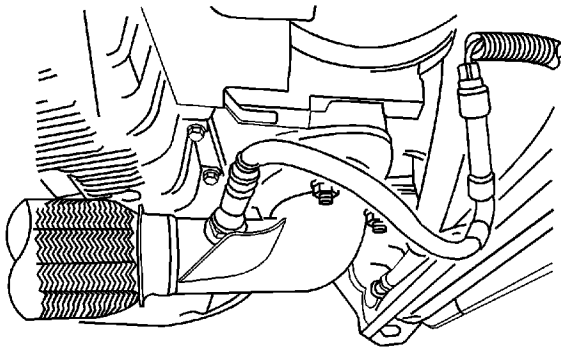
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the catalytic converter and the connecting pipe and the gasket to the front muffler pipe flange. Use the nuts to secure the converter and the connecting pipe and tighten to **30 N·m (22 lb ft)**.



2. Using the nuts and the gasket secure the connecting pipe to the catalytic converter and tighten to **40 N·m (30 lb ft)**.
3. Install the front exhaust pipe mounting bracket bolt and tighten to **40 N·m (30 lb ft)**.

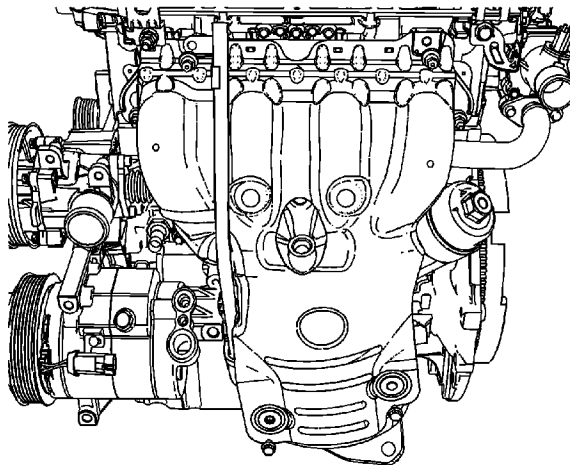


4. Install the rear heated oxygen sensor and tighten to **41 N·m (30 lb ft)**.

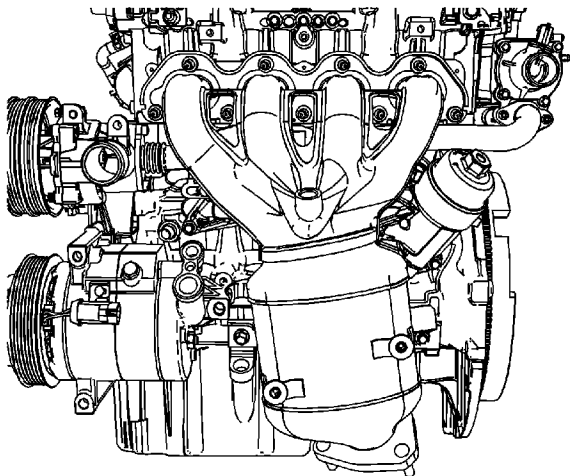
## Catalytic Converter Replacement (1.4L LDT/1.6L LXV)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

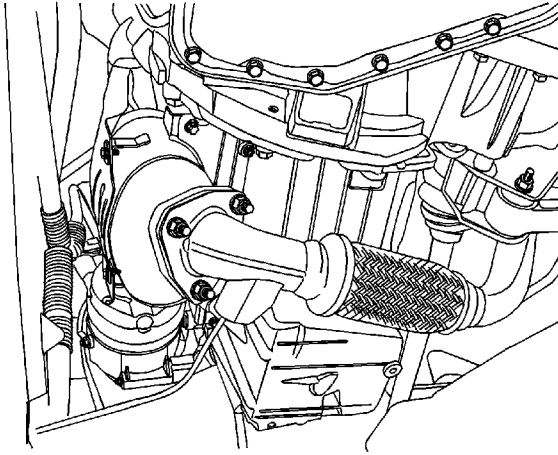


1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Disconnect the front heated oxygen sensor connector.
3. Remove the oil level gage tube.
4. Remove the exhaust manifold heat shield.



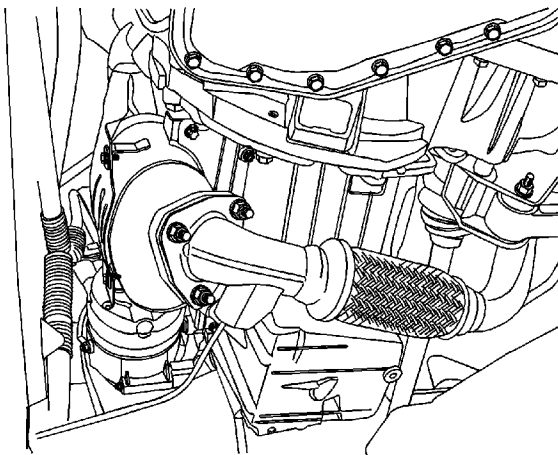


5. Remove the catalytic converter upper flange nuts.



6. Remove the exhaust front pipe mounting bracket bolt.
7. Remove the catalytic converter lower flange nuts.
8. Remove the catalytic converter and the gasket.

## Installation Procedure



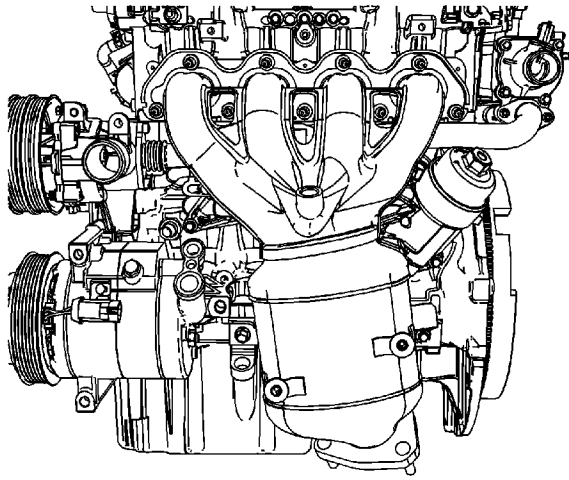
1. Install the catalytic converter and the gasket.



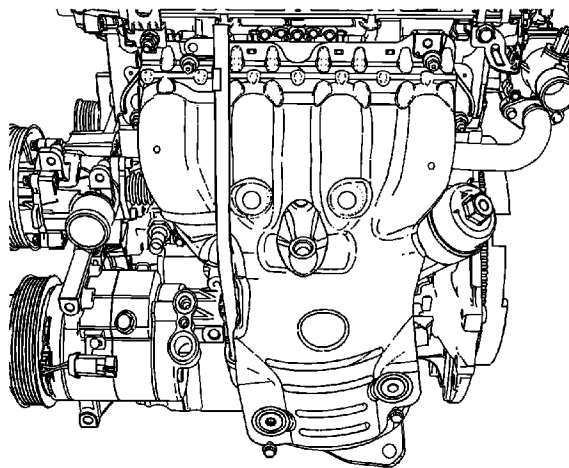
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

**Note:** Position the catalytic converter onto the exhaust manifold flange with one upper flange nut.

2. Install the catalytic converter lower flange nuts and the exhaust front pipe mounting bracket and tighten.
  - The exhaust front pipe to catalytic converter nuts to 40 N·m (30 lb ft).
  - The exhaust front pipe mounting bracket bolt to 40 N·m (30 lb ft).



3. Install the catalytic converter upper flange nuts to exhaust manifold nuts to 40 N·m (30 lb ft).



4. Install the exhaust manifold heat shield and tighten to **8 N·m (5.9 lb ft)**.

**Note:** Check the oil. If the oil dropped when removing the oil level gage tube, check and refill it.

5. Install the oil level gage tube.
6. Connect the front heated oxygen sensor connector.
7. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

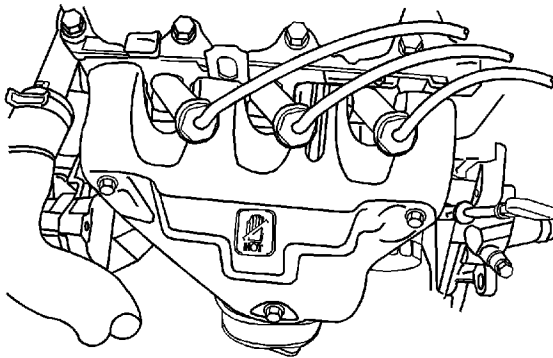
## Catalytic Converter Replacement (1.2L)

### Removal Procedure

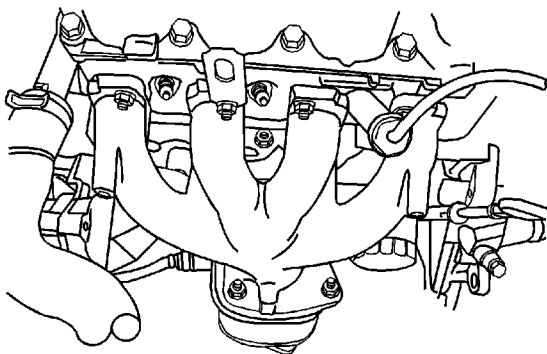
**Warning:** Refer to [Exhaust Service Warning](#) in the Preface section.

**Caution:** Refer to [Flex Decoupler Caution](#) in the Preface section.

**Caution:** Refer to [Catalytic Converter Movement Caution](#) in the Preface section.

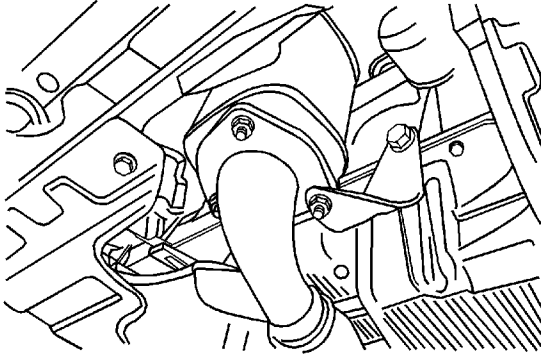


1. Remove the exhaust manifold cover with the bolts.



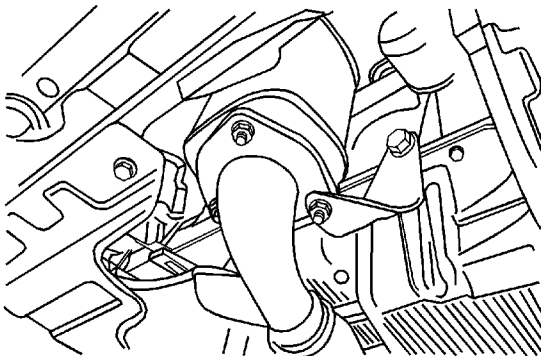


2. Remove the catalytic converter upper flange nut.



3. Remove the connecting pipe mounting bracket bolt.
4. Remove the catalytic converter lower flange nuts.
5. Remove the catalytic converter and the gasket.

## Installation Procedure

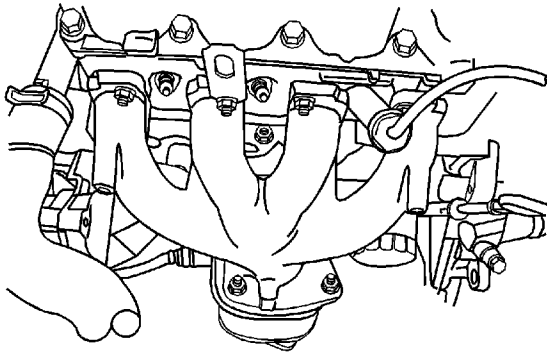


1. Install the catalytic converter and the gasket.

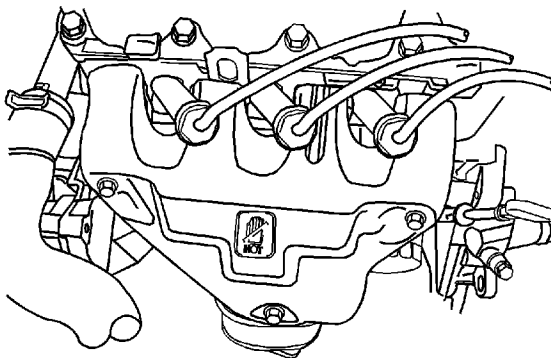
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

**Note:** Position the catalytic converter onto the exhaust manifold flange with one upper flange nut.

2. Install the catalytic converter lower flange nuts and the connecting pipe mounting bracket and tighten.
  - The connecting pipe to catalytic converter nuts to 40 N·m (30 lb ft).
  - The connecting pipe mounting bracket bolt to 40 N·m (30 lb ft).



3. Install the catalytic converter upper flange nuts and tighten to **50 N·m (37 lb ft)**.

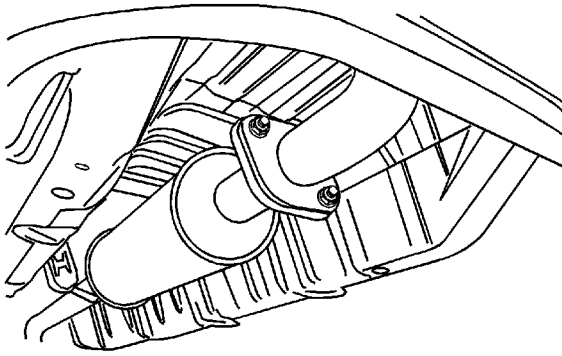


4. Install the exhaust manifold cover bolts and tighten to **15 N·m (11 lb ft)**.

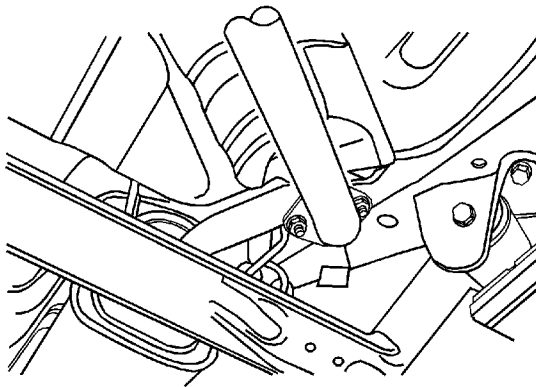
## Exhaust Muffler Replacement (Front)

### Removal Procedure

**Warning:** Refer to [Exhaust Service Warning](#) in the Preface section.

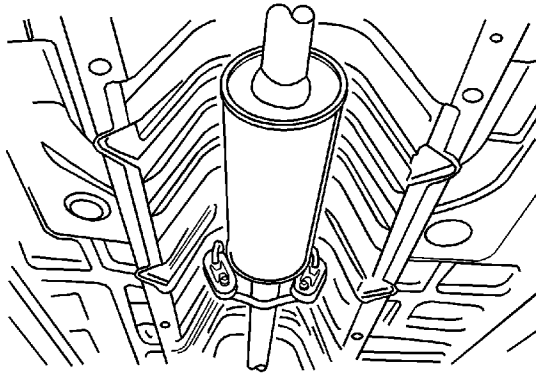


1. Remove the nuts and the gasket from the front muffler pipe to the connecting pipe flange.



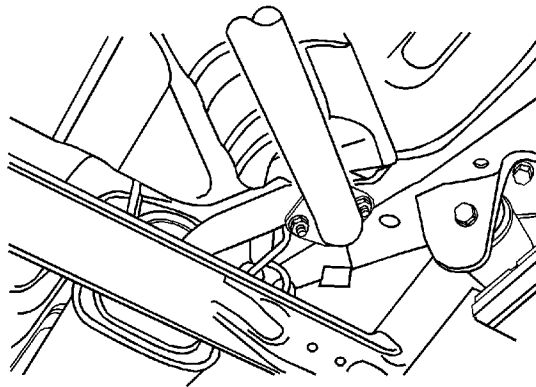
2. Remove the nuts and the gasket from the rear muffler pipe flange.

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3. Disconnect the front muffler from the rubber hanger.
4. Remove the front muffler.
5. Check the exhaust pipe and the front muffler for holes, damage, open seams, or other deterioration which could permit exhaust fumes to seep into the passenger compartment or the trunk.

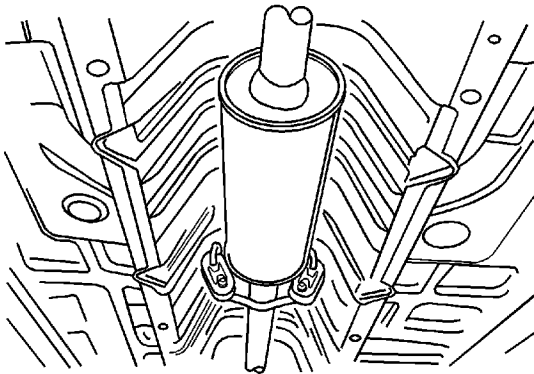
## Installation Procedure



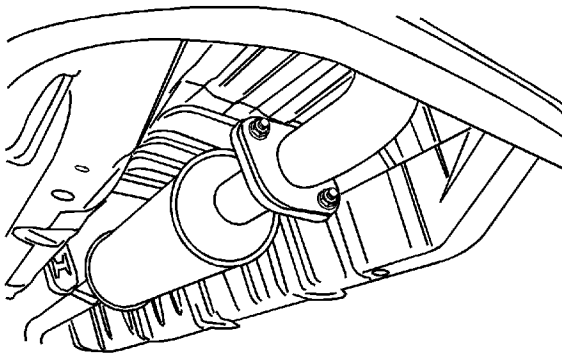
1. Connect the front muffler to the rubber hanger.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Attach the front muffler and the gasket to the rear muffler using the nuts. Secure the front muffler to the rubber hanger and tighten to **30 N·m (22 lb ft)**.



3. Loosely secure the front muffler assembly to the connecting pipe flange.



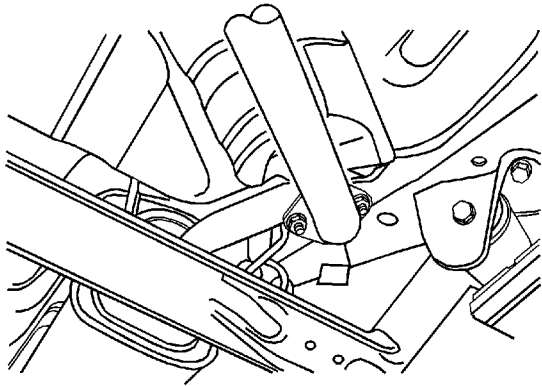
4. Secure the front muffler assembly to the connecting pipe flange with the nuts and tighten to **30 N·m (22 lb ft)**.



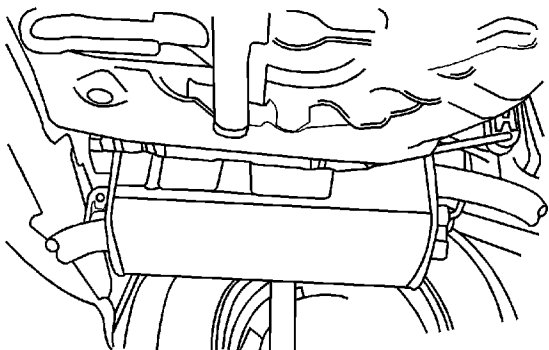
## Exhaust Muffler Replacement (Rear)

### Removal Procedure

**Warning:** Refer to [Exhaust Service Warning](#) in the Preface section.



1. Remove the nuts and the gasket from the rear muffler pipe flange-to-front muffler pipe flange.

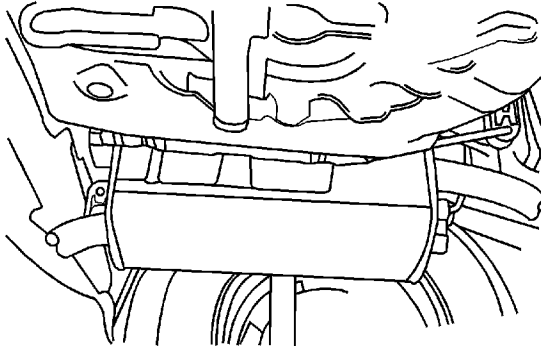


2. Detach the rear muffler assembly from the rubber hangers on the tail pipe end.

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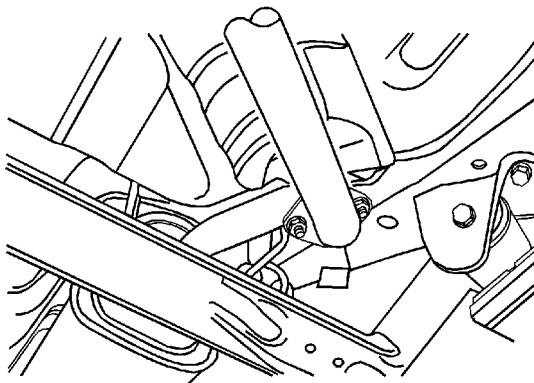
3. Remove the rear muffler assembly.
4. Check the rear muffler and the pipe for holes, damage, open seams, and other deterioration which could permit exhaust fumes to seep into the passenger compartment or the trunk.

## Installation Procedure



1. Secure the rear muffler assembly to the rubber hangers on the tail pipe end.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

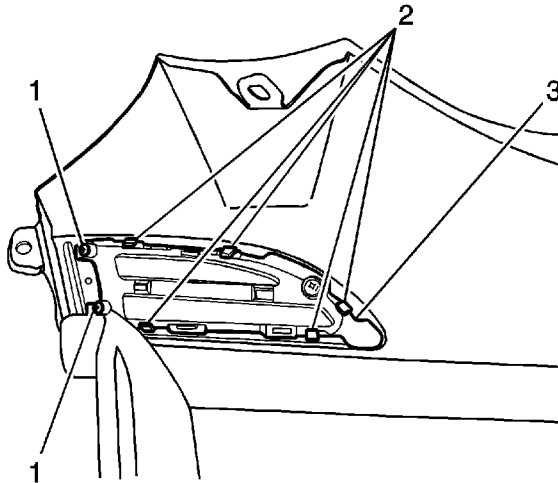


2. Secure the nuts and the gasket from the rear muffler pipe flange-to-front muffler pipe flange

and tighten to **30 N·m (22 lb ft)**.

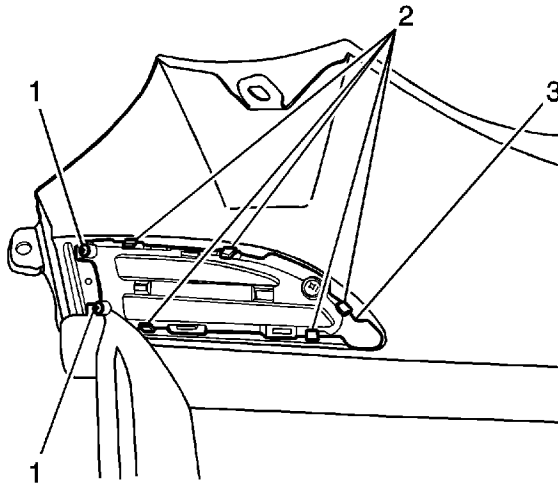
## Front Fender Center Molding Replacement (Hatchback)

### Removal Procedure



1. Remove the fender. Refer to [Front Fender Replacement](#)
2. Remove the screws (1).
3. Disengage the retaining tabs (2) and remove the fender molding (3) by pushing it out from the inside of the fender.

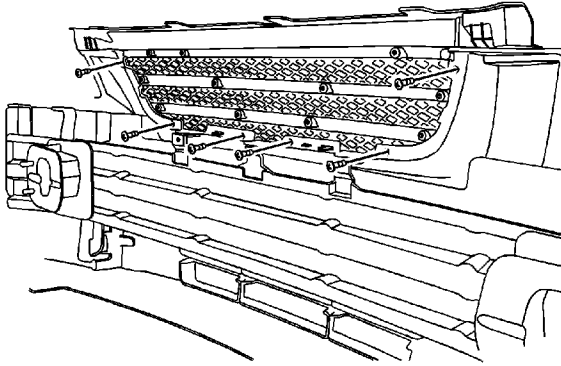
### Installation Procedure



1. Install the fender molding (3) by pushing the retaining tabs (2) in from the outside of the fender.
2. Install the screws (1).
3. Install the fender. Refer to [Front Fender Replacement](#)

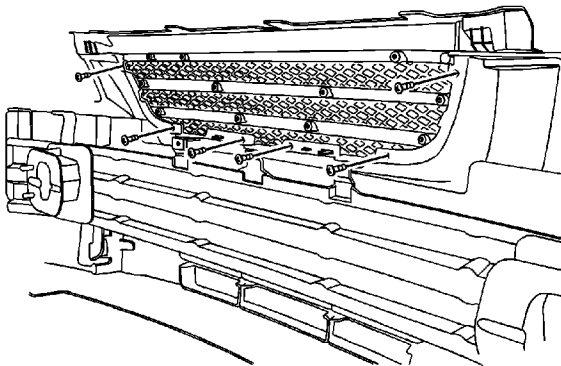
## Fascia Grille Replacement (Notchback)

### Removal Procedure



1. Open the hood.
2. Remove the front bumper fascia. Refer to [Front Bumper Fascia Replacement](#) .
3. Remove the screws and the radiator grille.

### Installation Procedure

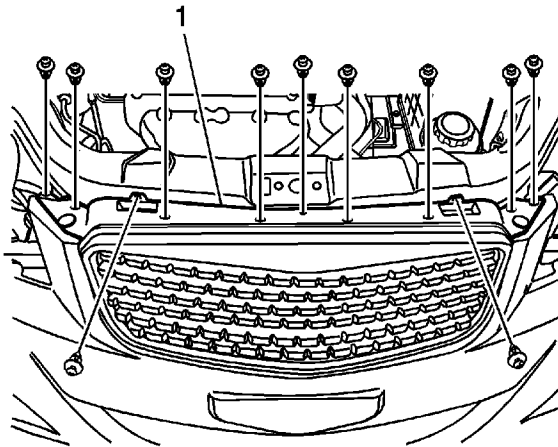




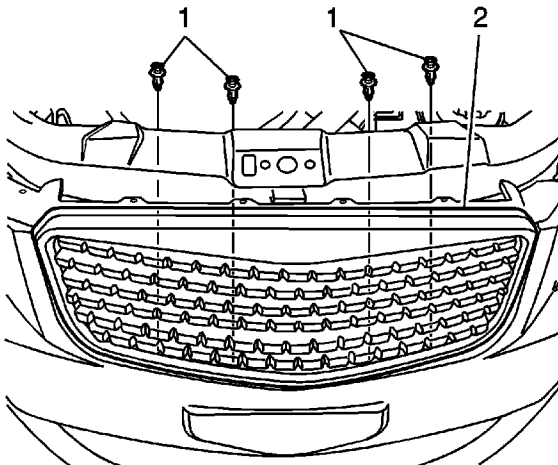
1. Install the radiator grille with the screws.
2. Install the front bumper fascia. Refer to [Front Bumper Fascia Replacement](#) .
3. Close the hood.

## Fascia Grille Replacement (Hatchback)

### Removal Procedure



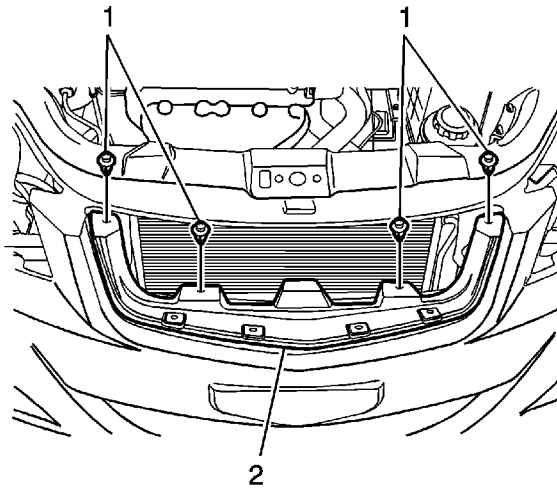
1. Open the hood.
2. Remove the upper clips on the radiator grille.
3. Remove the radiator grille upper cover (1).



4. Remove the grille to front fascia clips (1).
5. Remove the radiator grille (2).

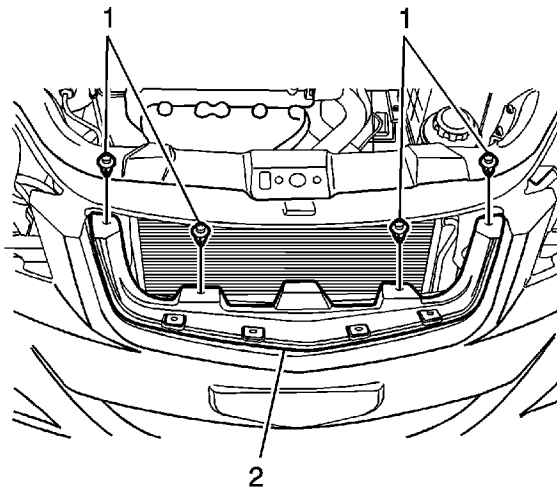
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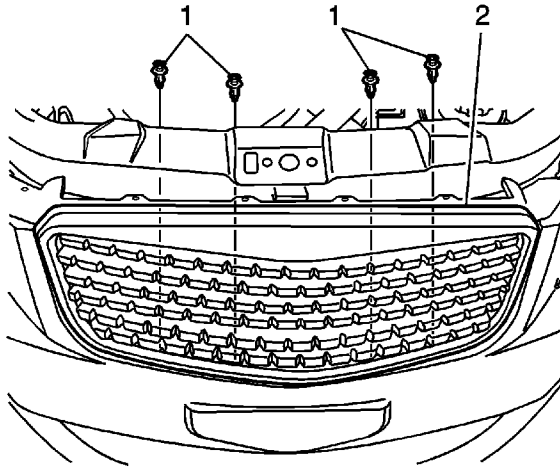


6. Remove the front fascia air guard clips (1), if necessary.
7. Remove the front fascia air guard (2) from the vehicle, if necessary.

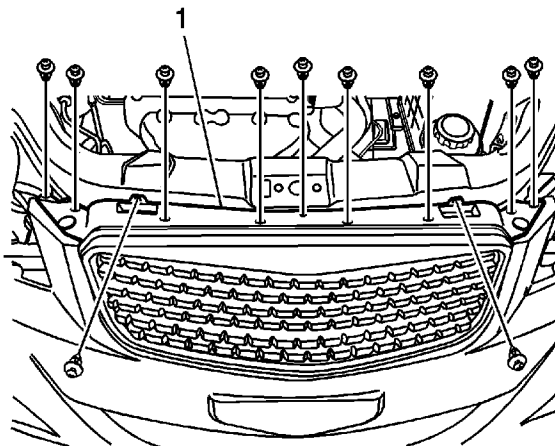
## Installation Procedure



1. Install the front fascia air guard (2) to the vehicle, if removed.
2. Install the front fascia air guard clips (1), if removed.



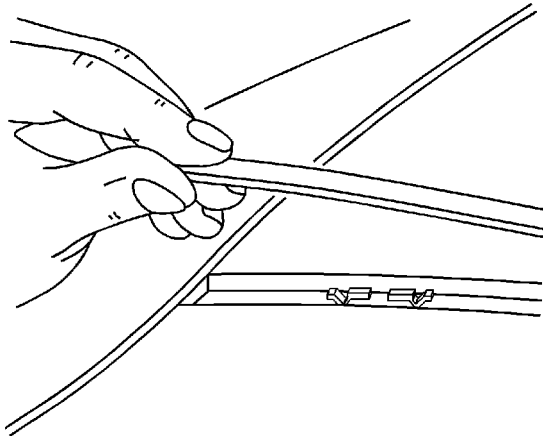
3. Install the radiator grille (2).
4. install the grille to front fascia clips (1).



5. Install the radiator grille upper cover (1).
6. Install the upper clips on the radiator grille.
7. Close the hood.

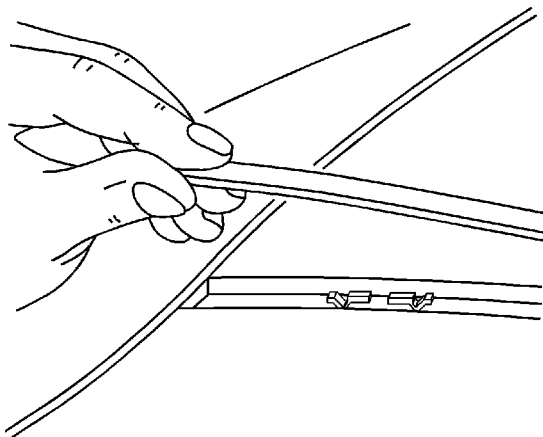
## Body Side Roof Drip Molding Replacement

### Removal Procedure



Remove the roof molding from the plastic clips.

### Installation Procedure

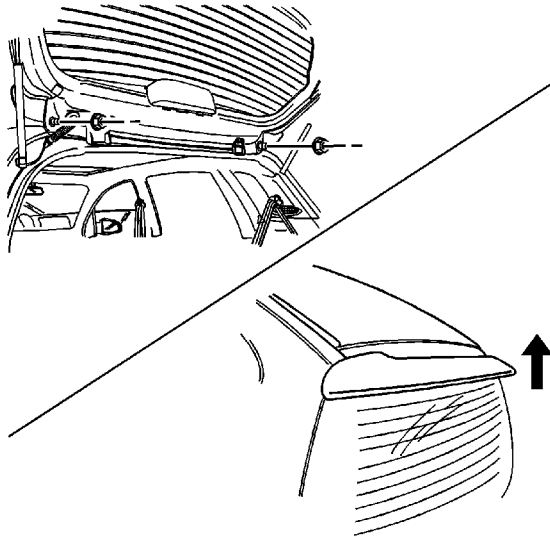




Press the roof molding onto the plastic clips.

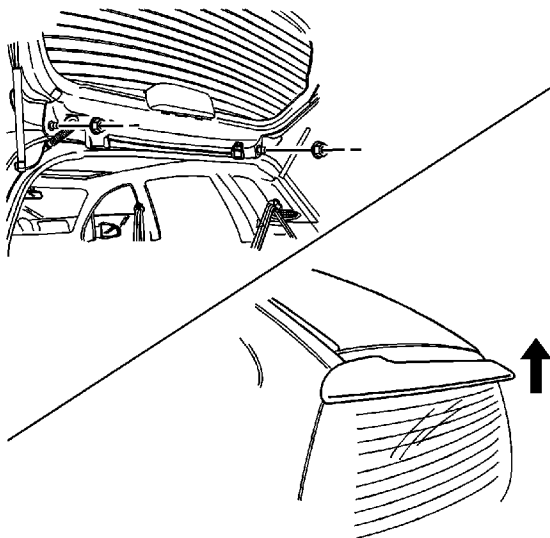
## Rear Spoiler Replacement (Hatchback)

### Removal Procedure



1. Open the tail gate.
2. Remove the rear spoiler from the tail gate.

### Installation Procedure



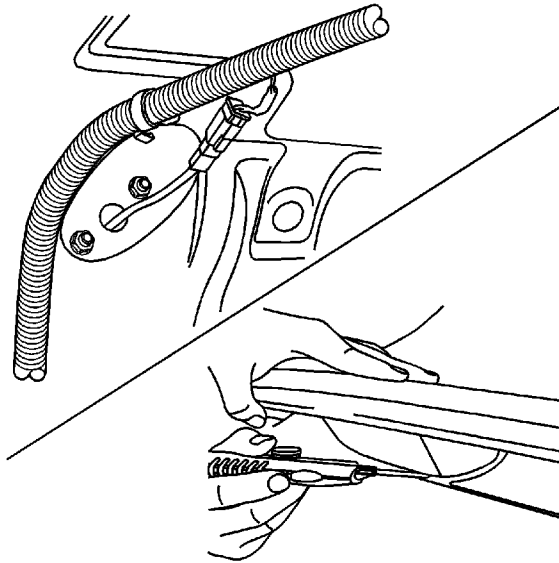


Install the rear spoiler on the tail gate with the nuts.

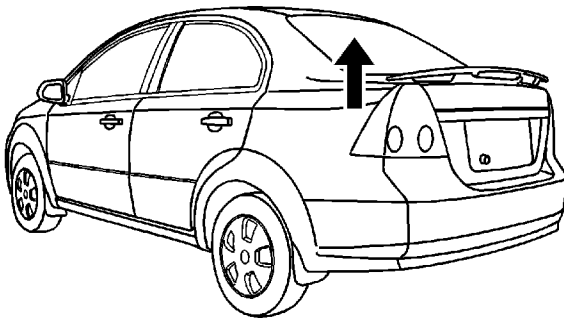
## Rear Spoiler Replacement (Notchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



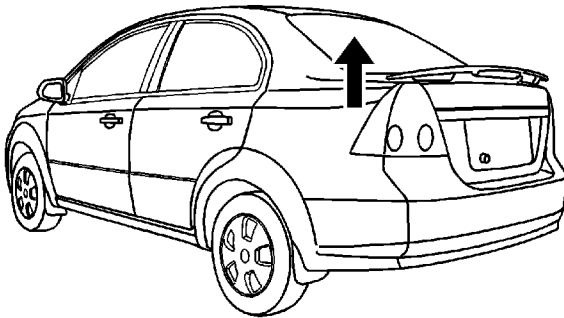
1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the clips and rear compartment trim.
3. Disconnect the rear spoiler electrical connector.
4. Remove the nuts.
5. Using a flat-bladed tool, carefully separate the rear spoiler from the rear compartment lid.





6. Remove the rear spoiler from the rear compartment lid.

## **Installation Procedure**

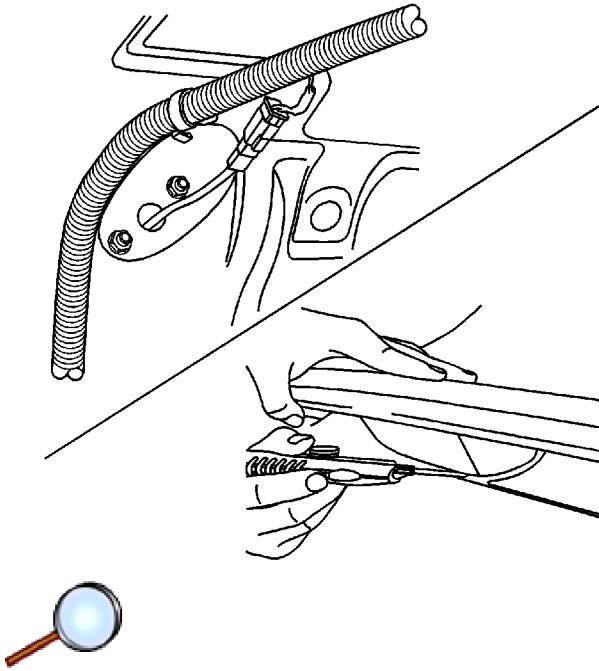


**Note:** If reusing the rear spoiler, remove any remaining double-sided tape from the rear spoiler and the rear compartment lid.

1. Apply new double-sided tape.
2. Peel off the adhesive backing paper and affix the rear spoiler on to the rear compartment lid, ensuring it is carefully positioned.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.





3. Install the nuts attaching the rear spoiler and tighten to **3 N·m (27 lb in)**.
4. Install the rear compartment lid trim with the clips.
5. Connect the negative battery cable.

## Fastener Tightening Specifications

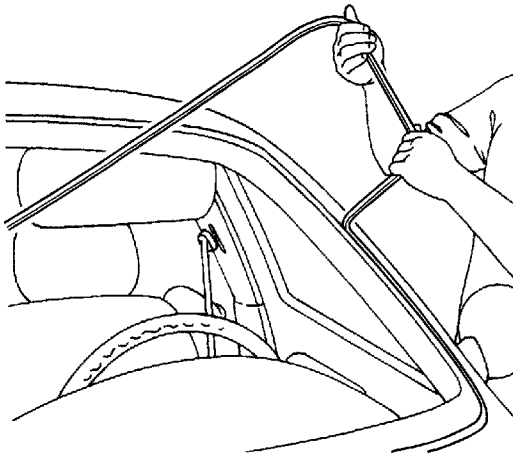
Application	Specification	
	Metric	English
Door Glass Screws	7 N·m	62 lb in
Exterior Rear Door Garnish Molding Screws	1.5 N·m	13 lb in
Guide Rail Bolts	7 N·m	62 lb in
Outside Rearview Mirror Assembly Screws	4.5 N·m	40 lb in
Rearview Mirror Mounting Screw	1.2 N·m	11 lb in

# Windshield Replacement

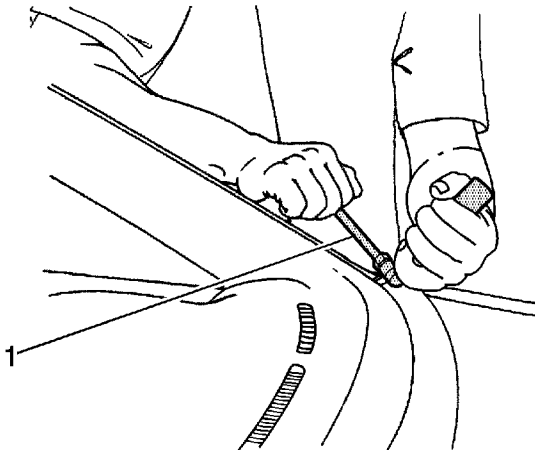
## Special Tools

[J 24402-A](#) Glass Sealant Remover

## Removal Procedure

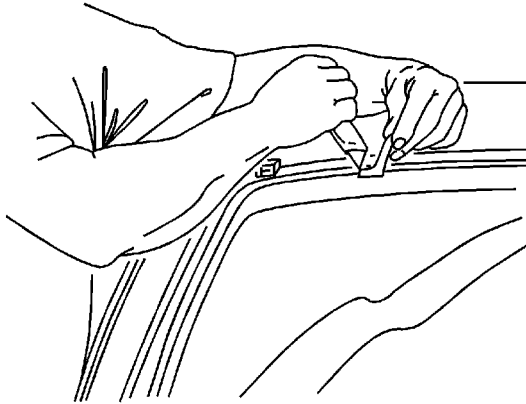


1. Remove the air inlet grille. Refer to [Air Inlet Grille Panel Replacement](#).
2. Remove the inside rearview mirror. Refer to [Inside Rearview Mirror Replacement](#).
3. Remove the weatherstrip around the windshield.





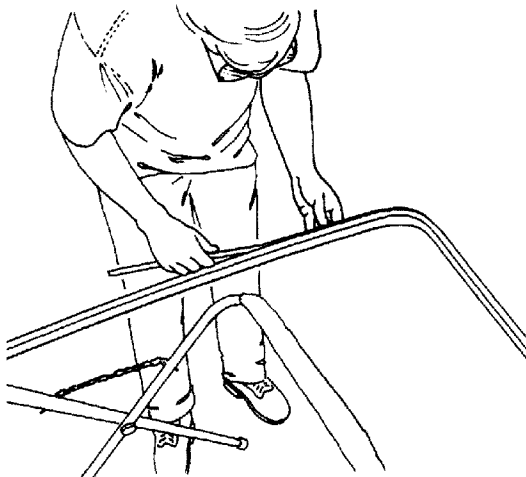
4. Using the glass sealant remover (1) [J 24402-A](#) , cut the adhesive around the windshield.



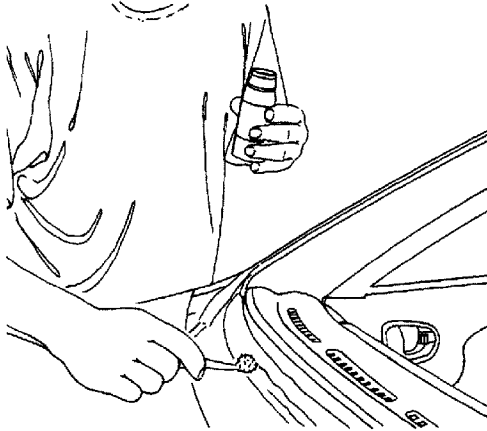
5. Remove the windshield from the vehicle.
6. Using a knife, remove the adhesive from the windshield.
7. Using a knife, remove the adhesive from the windshield frame.

## Installation Procedure

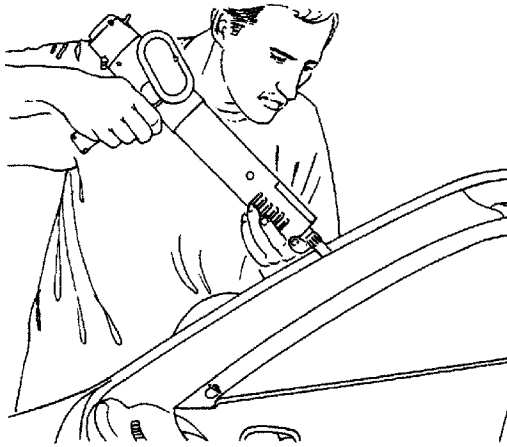
**Caution:** Refer to [Windshield Installation Caution](#) in the Preface section.



1. Install the new weatherstrip to the windshield.



2. Apply tape to the new weatherstrip and the windshield to hold the weatherstrip in place.
3. Apply adhesive primer to the windshield frame and the perimeter of the windshield.



4. Apply glass adhesive to the windshield frame.

**Warning:** Insufficient curing of urethane adhesive may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

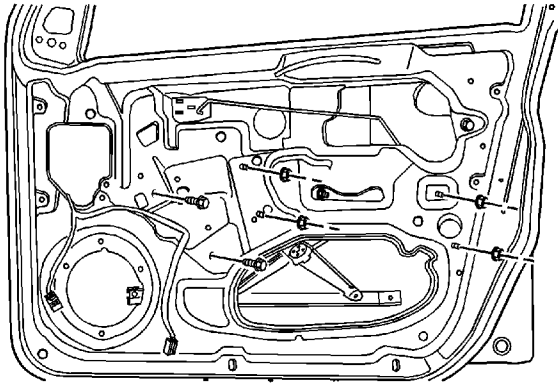
- For the moisture-curing type of urethane adhesive, allow a minimum of 6 hours at 21°C (70°F) or greater and with at least 30 percent relative humidity. Allow at least 24 hours for the complete curing of the urethane adhesive.
- For the chemical-curing type of urethane adhesive, allow a minimum of 1 hour .

Do NOT physically disturb the repair area until after these minimum times have elapsed.

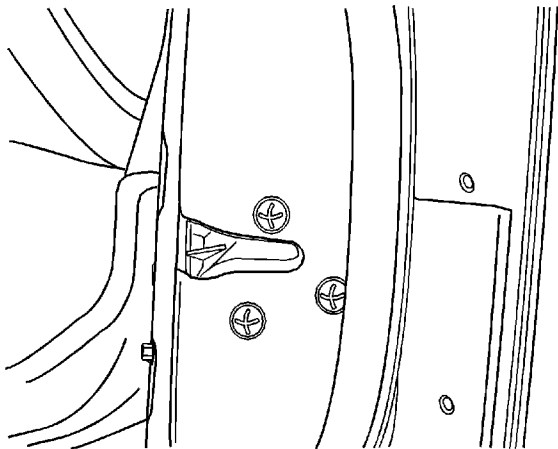
5. Install the windshield into the windshield frame.
6. Reposition the tape over the weatherstrip, the windshield, and the windshield frame to hold the windshield in place.
7. Let the adhesive dry for 24 hours.
8. Remove the tape.
9. Check for waterleaks by pouring water on the windshield. If a leak is found, dry the windshield and fill the area that leaks with adhesive. If the leak persists, remove the windshield and repeat the entire procedure.
10. Install the inside rearview mirror. Refer to [Inside Rearview Mirror Replacement](#).
11. Install the air inlet grille. Refer to [Air Inlet Grille Panel Replacement](#).

## Front Side Door Window Replacement

### Removal Procedure

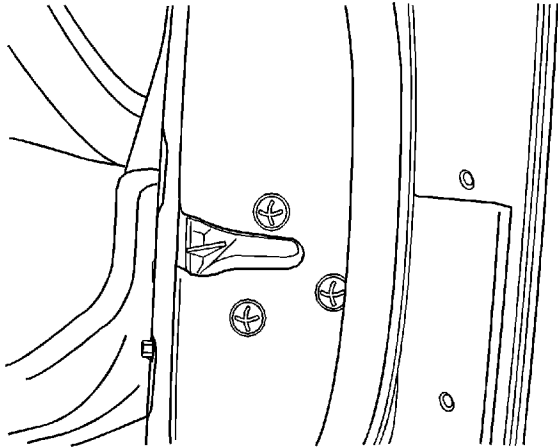


1. Remove the front door trim panel. Refer to [Front Side Door Trim Panel Replacement](#).
2. Remove the door seal trim. Refer to [Door Water Deflector Replacement](#).
3. Remove the outside channel molding. Refer to [Front Side Door Window Channel Replacement](#).
4. Remove the screws that secure the glass to the window regulator.



5. Remove the bolts and the guide rail.
6. Remove the glass from the door.

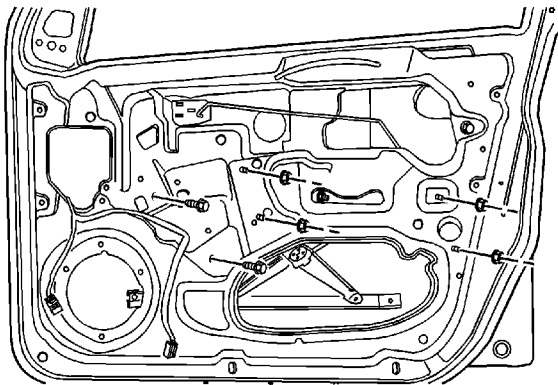
## Installation Procedure



1. Install the glass in the door.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the guide rail and the bolts. Tighten the guide rail bolts to **7 N·m (62 lb in)**.



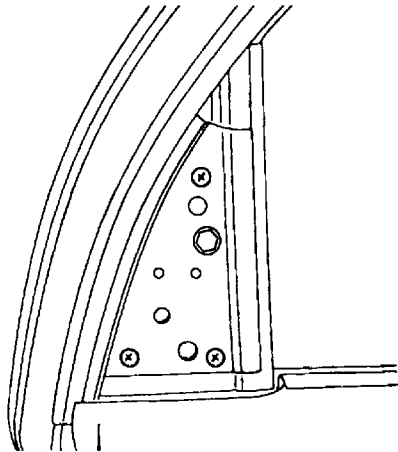
3. Install the glass to the window regulator with the screws. Tighten the door glass screws to **7 N·m (62 lb in)**.



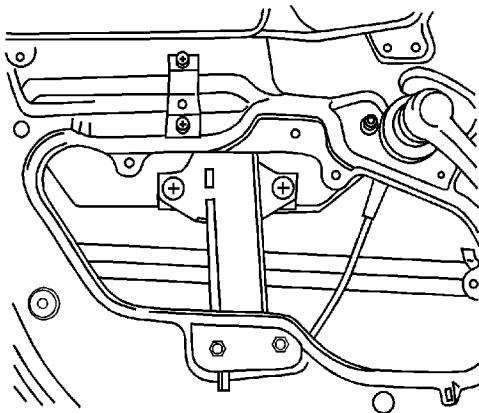
4. Install the outside channel molding. Refer to [Front Side Door Window Channel Replacement](#).
5. Install the door seal trim. Refer to [Door Water Deflector Replacement](#).
6. Install the front door trim panel. Refer to [Front Side Door Trim Panel Replacement](#).

## Rear Side Door Window Replacement

### Removal Procedure



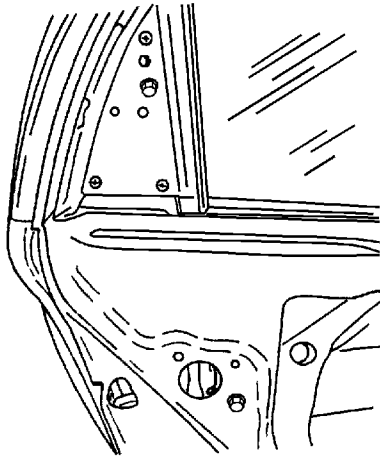
1. Remove the rear door trim panel. Refer to [Rear Door Trim Panel Replacement](#).
2. Remove the outside channel molding. Refer to [Rear Side Door Window Channel Replacement](#).
3. Remove the interior rear door garnish molding.
4. Remove the screws and the exterior rear door garnish molding.



5. Remove the door seal trim. Refer to [Door Water Deflector Replacement](#).

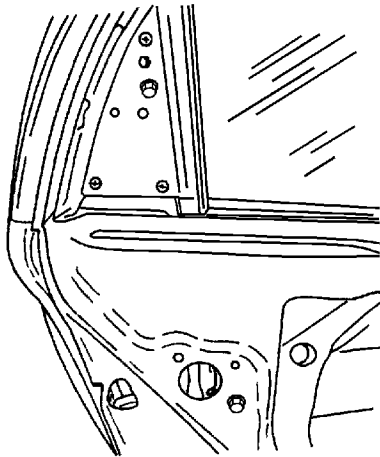
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6. Remove the screws that secure the glass to the window regulator.



7. Remove the bolts and the guide rail.
8. Remove the glass from the door.

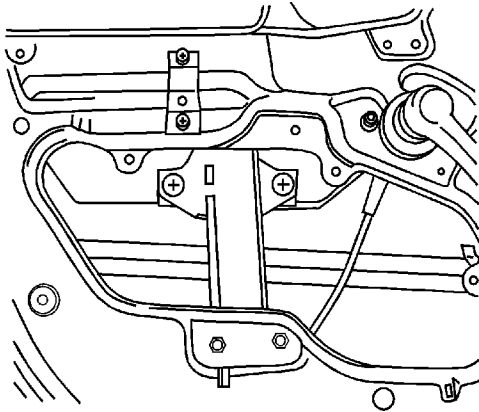
## Installation Procedure



1. Install the glass in the door.

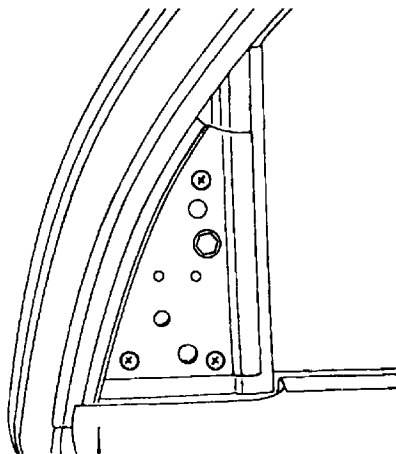
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the guide rail and the bolts. Tighten the guide rail bolts to **7 N·m (62 lb in)**.



3. Position the glass within the window regulator.
4. Install the glass screws.

Tighten the door glass screws to **7 N·m (62 lb in)**.



5. Install the door seal trim. Refer to [Door Water Deflector Replacement](#).
6. Install the exterior rear door garnish molding with the screws and tighten to **1.5 N·m (13 lb in)**.
7. Install the interior rear door garnish molding.
8. Install the outside channel molding. Refer to [Rear Side Door Window Channel Replacement](#).
9. Install the rear door trim panel. Refer to [Rear Door Trim Panel Replacement](#).

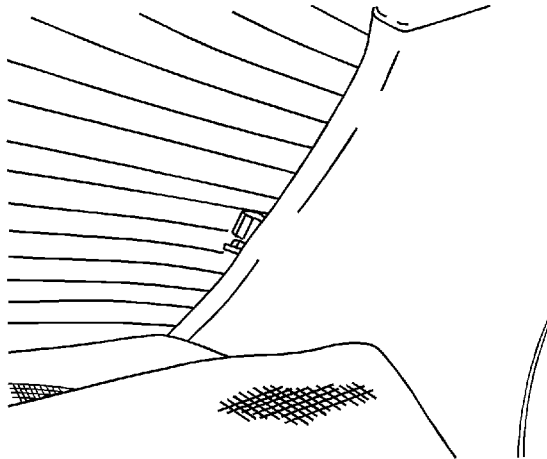
## Rear Window Replacement

### Special Tools

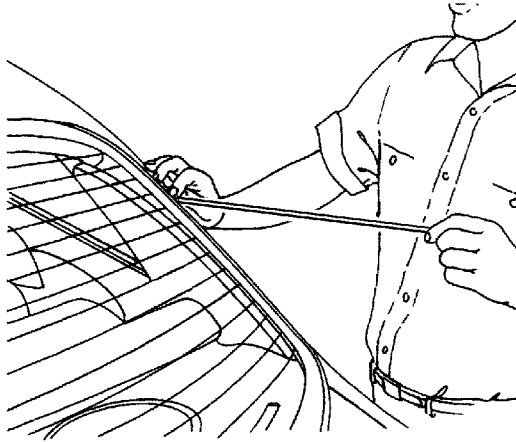
[J 24402-A](#) Glass Sealant Remover

### Removal Procedure

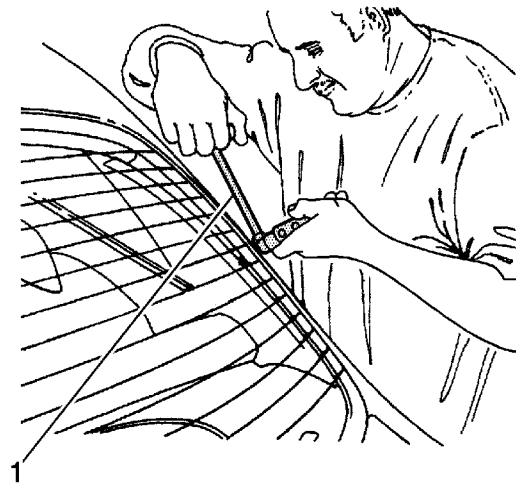
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



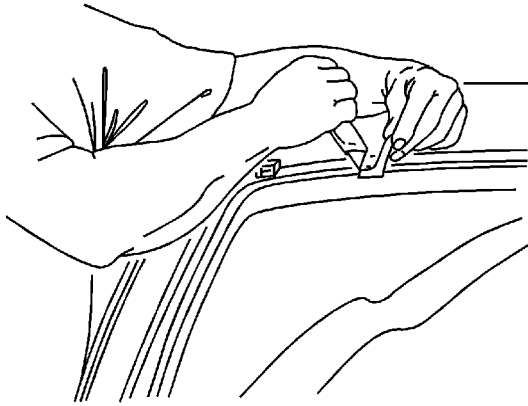
1. Disconnect the negative battery cable.
2. Disconnect the rear window defogger electrical connectors, left side electrical connector shown, right side electrical connector similar.



3. Remove the weatherstrip around the rear window.



4. Using the [J 24402-A](#) (1), cut the adhesive around the rear window.

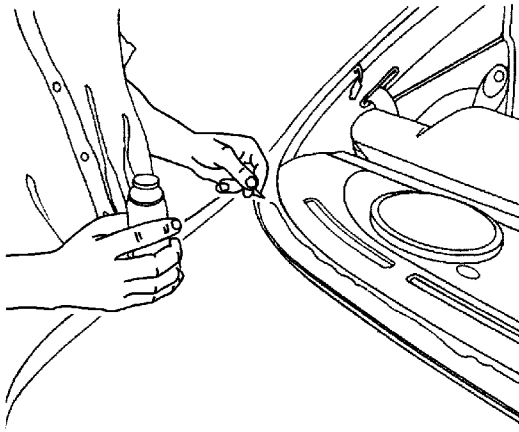


5. Remove the rear window from the vehicle.
6. Using a knife, remove the adhesive from the rear window.
7. Using a knife, remove the adhesive from the rear window frame.

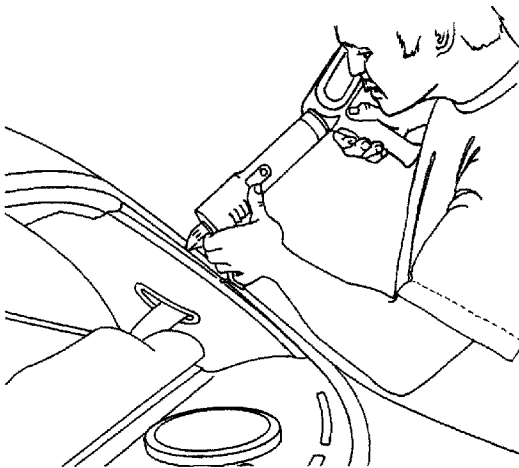
## Installation Procedure



1. Install the new weatherstrip to the rear window.



2. Apply tape to the new weatherstrip and the rear window to hold the weatherstrip in place.
3. Apply the adhesive primer to the rear window frame and the perimeter of the rear window.



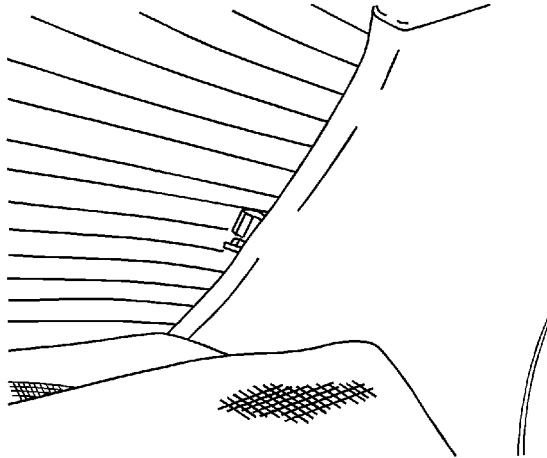
**Warning:** Insufficient curing of urethane adhesive may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

- For the moisture-curing type of urethane adhesive, allow a minimum of 6 hours at 21°C (70°F) or greater and with at least 30 percent relative humidity. Allow at least 24 hours for the complete curing of the urethane adhesive.
- For the chemical-curing type of urethane adhesive, allow a minimum of 1 hour .

Do NOT physically disturb the repair area until after these minimum times have elapsed.

4. Apply glass adhesive to the rear window frame.

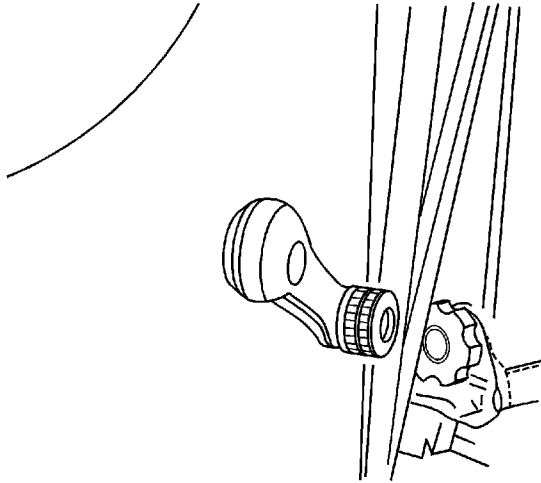




5. Install the rear window into the rear window frame.
6. Reposition the tape over the weatherstrip, the rear window, and the rear window frame to hold the rear window in place.
7. Let the adhesive dry for 24 hours.
8. Remove the tape.
9. Check for waterleaks by pouring water on the rear window. If a leak is found, dry the window and fill the area that leaks with adhesive. If the leak persists, remove the rear window and repeat the entire procedure.
10. Connect the rear window defogger electrical connectors, left side electrical connector shown, right side electrical connector similar.
11. Connect the negative battery cable.

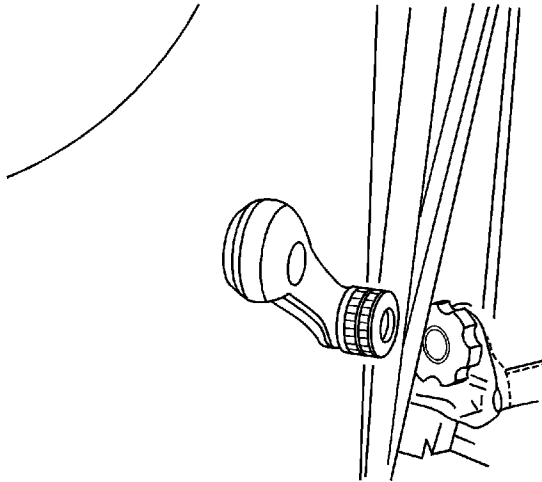
## Door Window Regulator Handle Replacement

### Removal Procedure



1. Push the plastic ring behind the window regulator handle toward the door to reveal the metal clip.
2. Pry off the metal clip.
3. Remove the window regulator handle and the plastic ring.

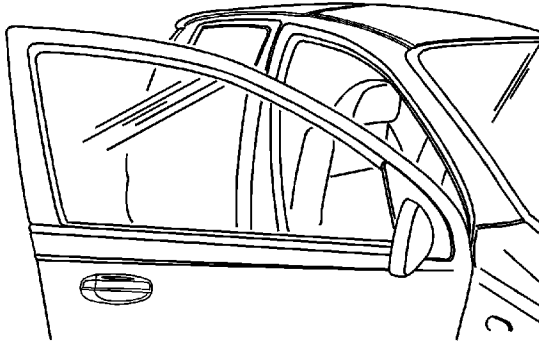
### Installation Procedure



1. Install the plastic ring.
2. Install the window regulator handle.
3. Insert the metal clip.

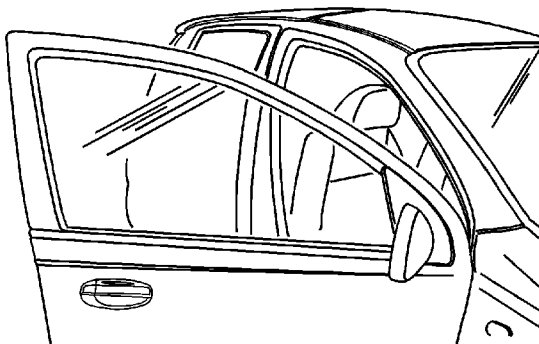
## Front Side Door Window Channel Replacement

### Removal Procedure



1. Remove the outside rearview mirror. Refer to [Outside Rearview Mirror Replacement](#).
2. Remove the front door glass. Refer to [Front Side Door Window Replacement](#).
3. Remove the glass run.

### Installation Procedure

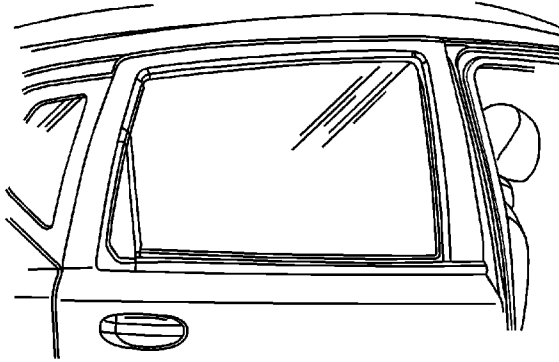




1. Install the glass run.
2. Install the front door glass. Refer to [Front Side Door Window Replacement](#).
3. Install the outside rearview mirror. Refer to [Outside Rearview Mirror Replacement](#).

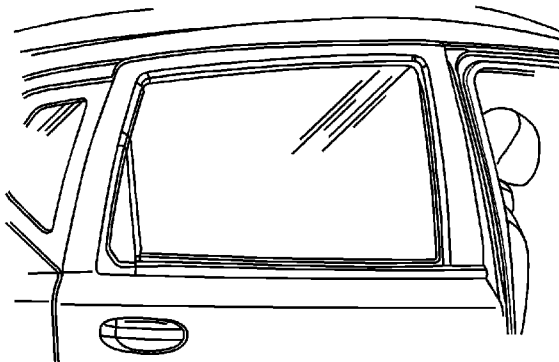
## Rear Side Door Window Channel Replacement

### Removal Procedure



1. Remove the rear door glass. Refer to [Rear Side Door Window Replacement](#) .
2. Remove the rear door interior and exterior garnish trim.
3. Remove the glass run.

### Installation Procedure

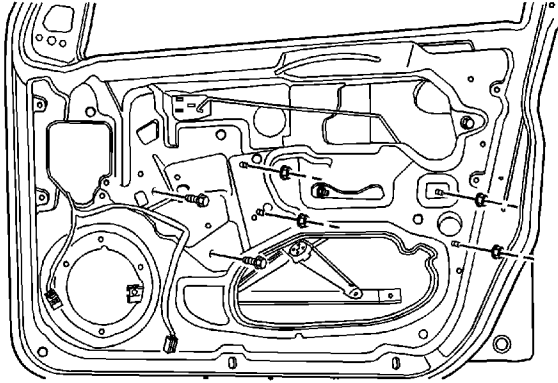




1. Install the glass run.
2. Install the rear door interior and exterior garnish trim.
3. Install the rear door glass. Refer to [Rear Side Door Window Replacement](#) .

## Door Window Regulator Replacement (Manual Front)

### Removal Procedure

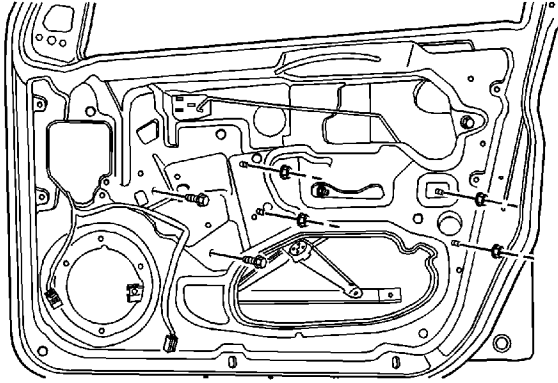


1. Remove the front door glass. Refer to [Front Side Door Window Replacement](#).
2. Remove the nuts and the window regulator.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

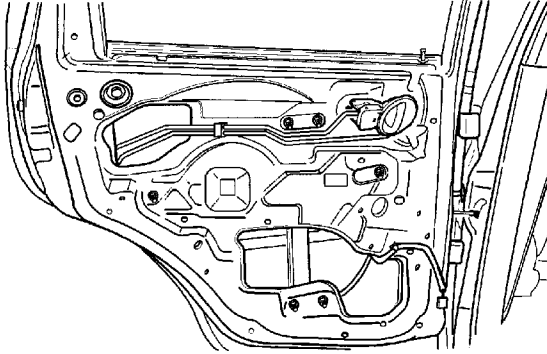




1. Install the window regulator and the nuts and tighten to **7 N·m (62 lb in)**.
2. Install the front door glass. Refer to [Front Side Door Window Replacement](#).

## Door Window Regulator Replacement (Manual Rear)

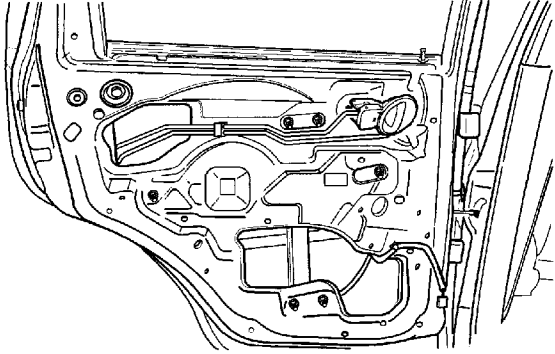
### Removal Procedure



1. Remove the rear door glass. Refer to [Rear Side Door Window Replacement](#).
2. Remove the nuts and the window regulator.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

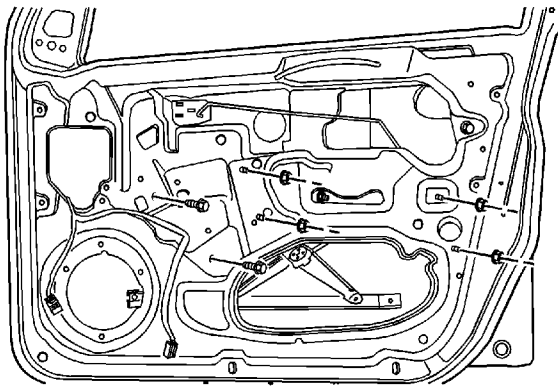


1. Install the window regulator with the nuts and tighten to **7 N·m (62 lb in)**.
2. Install the rear door glass. Refer to [Rear Side Door Window Replacement](#).

## Door Window Regulator Replacement (Power Front)

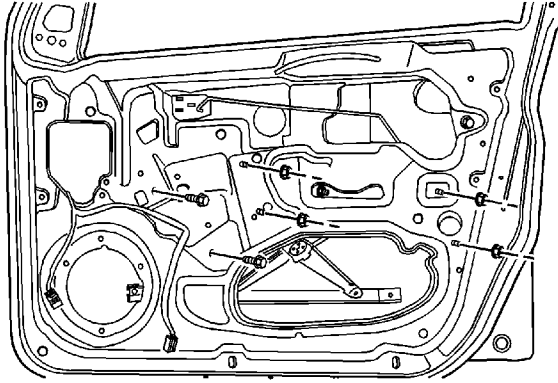
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the door glass. Refer to [Front Side Door Window Replacement](#).
3. Remove the nuts and the regulator.
4. Disconnect the electrical connector.

### Installation Procedure



1. Connect the electrical connector.

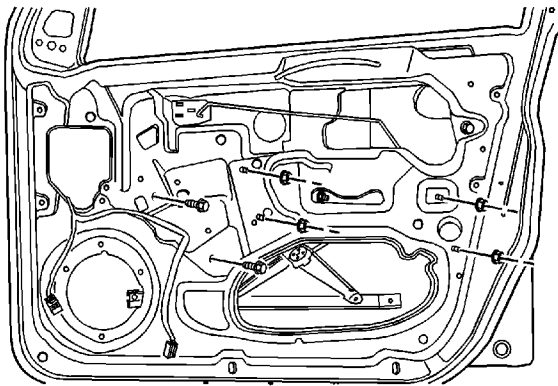
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the window regulator with the nuts and tighten to **7 N·m (62 lb in)**.
3. Install the front door glass. Refer to [Front Side Door Window Replacement](#).
4. Connect the negative battery cable.
5. If the vehicle is equipped with a one touch up function, and the driver side power window regulator has been replaced, perform the window motor reinitialization process. Refer to [Power Window Reinitialization](#).

## Door Window Regulator Replacement (Power Rear)

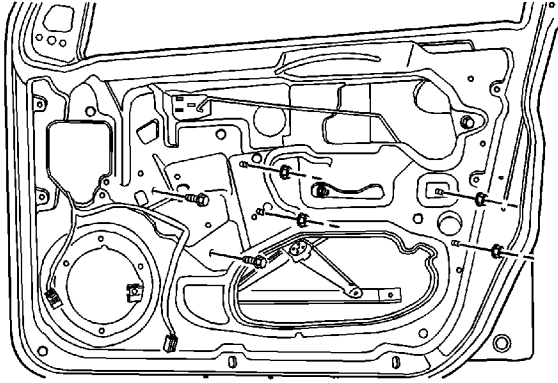
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the rear door glass. Refer to [Rear Side Door Window Replacement](#).
3. Remove the nuts and the regulator.
4. Disconnect the electrical connector.

### Installation Procedure



1. Connect the electrical connector.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the window regulator with the nuts and tighten to **7 N·m (62 lb in)**.
3. Install the rear door glass. Refer to [Rear Side Door Window Replacement](#).
4. Connect the negative battery cable.

## Window Motor Programming - Express Function

### Windows Motor Reprogramming

Driver side window motor assembly has been designed to memorize closing and opening steps.

If the driver side window motor assembly has been replaced or reassembled, it must be reprogrammed once in order for the safety function to operate properly. This can be done by operating the driver side window switch. If the reprogramming procedure does not be performed, the driver side window does not close automatically.

The following steps explain how to reprogram the driver side window motor assembly:

1. Press the driver side window switch until the window is under 100 mm from the top of window frame.

**Important:** Do not pull the window switch to the second step of the Up position.

2. Pull the driver side window switch to the first step of the Up position and hold until the window is fully UP.
3. Continue holding the window switch for approximately 3 seconds after the window motor stall.
4. The driver side window motor assembly is now programmed for the safety function.
5. Confirm the reprogramming procedure by performing auto-up operation.



## Power Window Reinitialization

### Reinitialization Description

If the driver side power window regulator assembly has been replaced or reassembled, it must be reprogrammed once in the order for the safety function to operate properly. This can be done by operating the driver side window switch. If the reprogramming procedure is not performed, the driver side window will not close automatically.

### Reinitialization Procedures

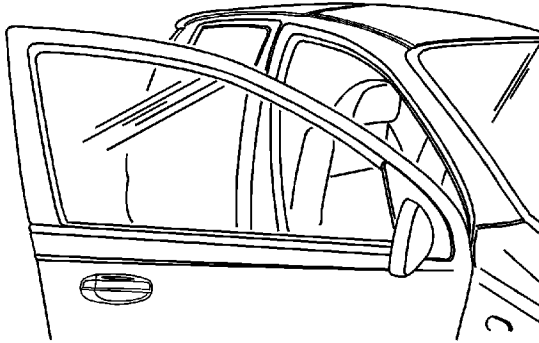
1. Press the driver side window switch until the window is under 100 mm (4.0 in) from the top of the window frame.
2. Pull the driver side window switch to the first step of the UP position and hold until the window is fully UP.

**Important:** Do not put the window switch to the second step of the UP position.

3. Continue holding the window switch for approximately 3 seconds after the window motor stall. The driver side window motor assembly is now programmed for the safety function.
4. Confirm the reprogramming procedure by performing the auto-up operation.

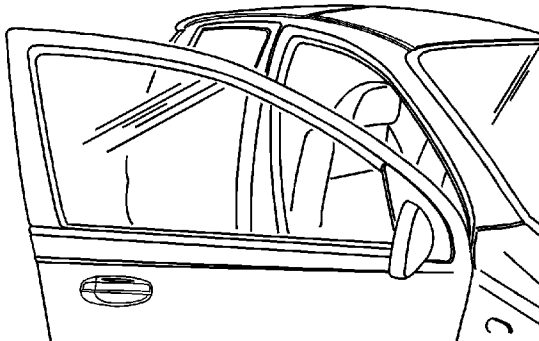
## Outer Belt Sealing Strip Replacement

### Removal Procedure



1. Lower the window completely.
2. Lift the outside channel molding off the door.

### Installation Procedure

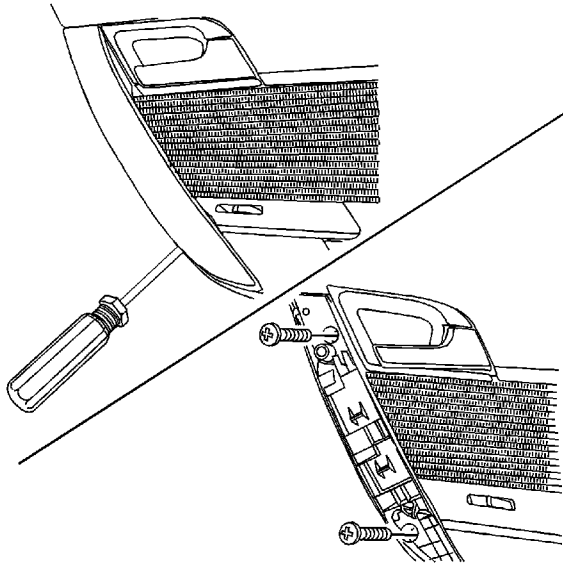




1. Press the outside channel molding onto the door.
2. Raise the window.

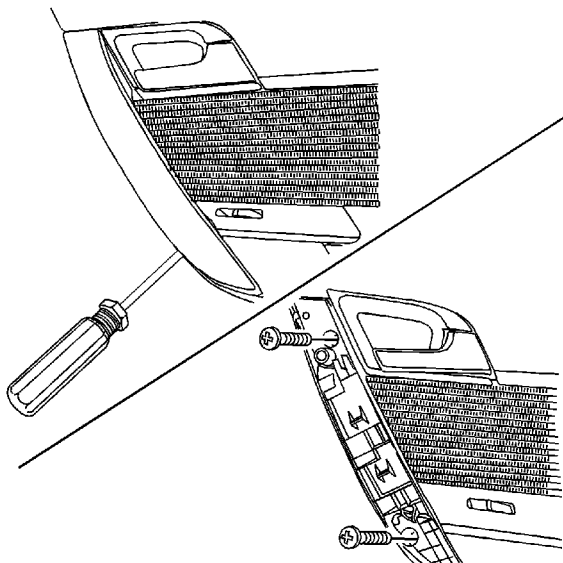
## Inner Belt Sealing Strip Replacement (Notchback)

### Removal Procedure



1. Remove the door trim panel. Refer to [Front Side Door Trim Panel Replacement](#) .
2. Straighten the retaining tabs in order to release the channel molding to the door trim panel.
3. Remove the channel molding.

### Installation Procedure



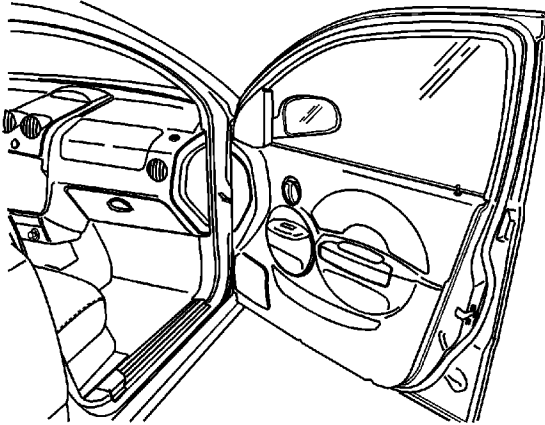
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1. Install the channel molding onto the door trim panel.
2. Bend the retaining tabs to secure the channel molding to the door trim panel.
3. Install the door trim panel. Refer to [Front Side Door Trim Panel Replacement](#) .

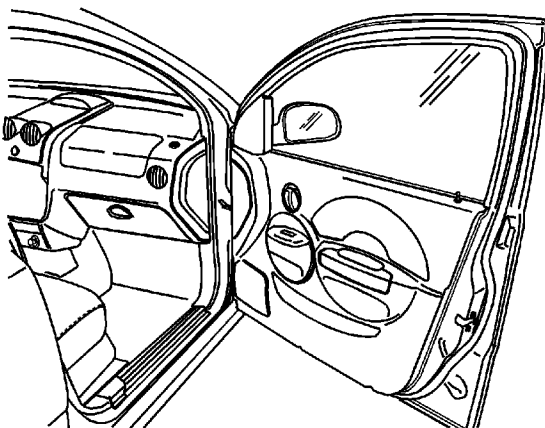
## Front Side Door Window Belt Outer Sealing Strip Replacement

### Removal Procedure



1. Remove the outside rearview mirror. Refer to [Outside Rearview Mirror Replacement](#).
2. Remove the front door secondary weatherstrip.

### Installation Procedure

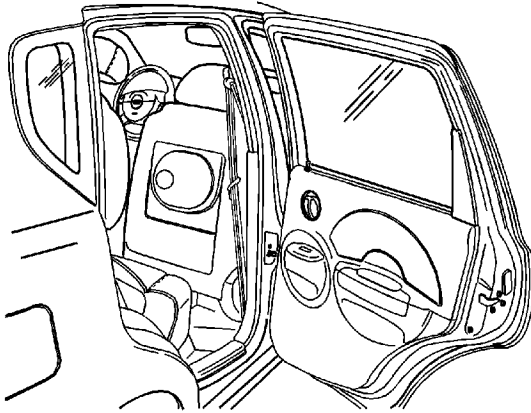




1. Install the front door secondary weatherstrip.
2. Install the outside rearview mirror. Refer to [Outside Rearview Mirror Replacement](#).

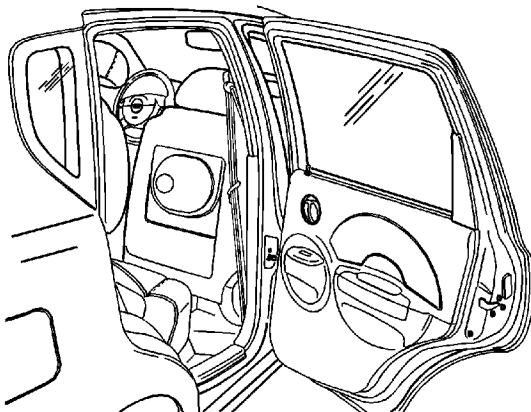
## Rear Side Door Window Outer Sealing Strip Replacement

### Removal Procedure



1. Remove the rear door interior and exterior garnish trim.
2. Remove the rear door secondary weatherstrip.

### Installation Procedure





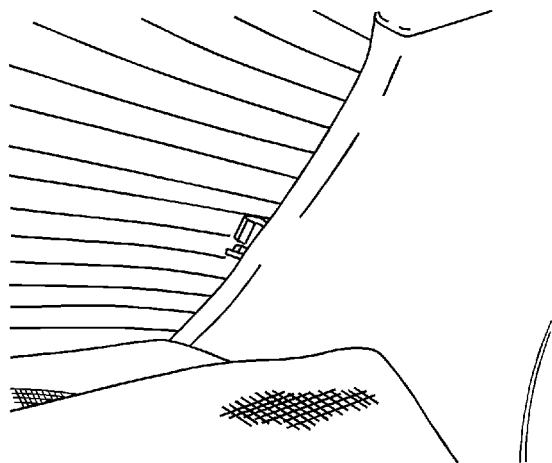


1. Install the rear door secondary weatherstrip.
2. Install the rear door interior and exterior garnish trim.

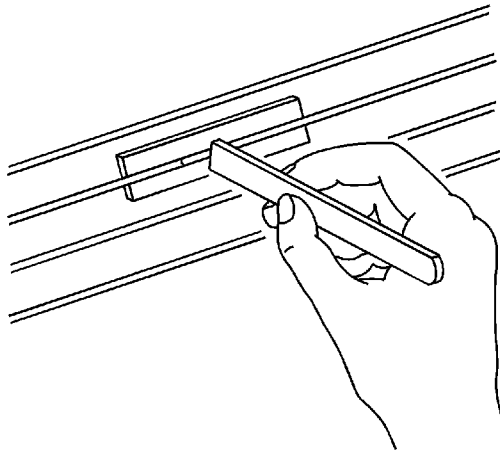
## Grid Line Repair

**Caution:** Refer to [Avoid Damage to Grid Lines Caution](#) in the Preface section.

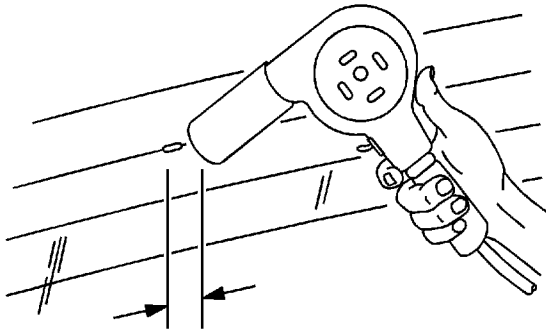
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the rear window defogger electrical connectors, left side electrical connector shown, right side electrical connector similar.
3. Inspect the rear window defogger grid lines
4. Mark the grid line break on the outside of the glass with a wax pencil or a crayon.
5. Use steel wool to buff the grid lines that are to be repaired. Wipe the lines clean using a cloth dampened with alcohol. Buff and clean about 6 mm (0.25 in) beyond each side of the break in the grid line.



6. Attach a grid line repair decal or 2 strips of tape above and below the repair areas.
  - A repair decal or tape must be used in order to control the width of the repair areas.
  - If a decal is used, the die-cut metered slot must be the same width as the grid line.
7. Apply the grid repair material to the repair area using a small wooden stick or a spatula. The grid repair material should be at room temperature.
8. Carefully remove the decal or the tape.



**Caution:** The grid line repair material must be cured with heat. To avoid heat damage to the interior trim, protect the trim near the repair area where heat is to be applied.

9. Heat the repair area for 1-2 minutes.
10. Hold the heat gun nozzle 25 mm (1 in) from the surface. A minimum temperature of 149°C (300°F) is required.

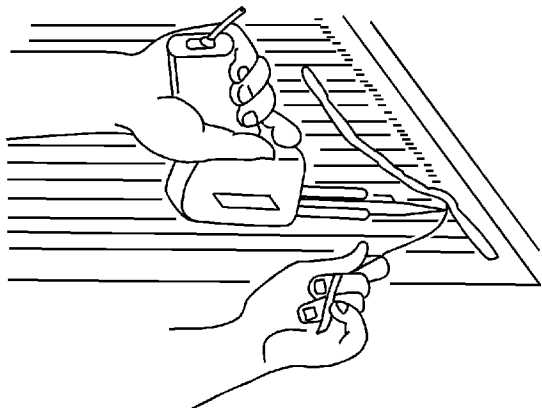
11. Inspect the grid line repair area. If the repair appears discolored, apply a coating of tincture of iodine to the area using a pipe cleaner or a line brush. Allow the iodine to dry for about 30 seconds. Carefully wipe off the excess iodine with lint-free cloth.
12. Connect the rear window defogger electrical connectors.

**Warning:** Refer to [Repair Material Curing Warning](#) in the Preface section.

13. Test the operation of the rear window defogger in order to verify that the repair was successful.

## Rear Window Defogger Braided Lead Wire

The rear window defogger bus lead wire or the terminal can be reattached by resoldering. Use a solder containing 3 percent silver and a rosin flux paste.



1. The repair area should be buffed with fine steel wool before soldering the bus lead wire.
2. Apply the paste-type rosin flux in small quantities to the wire lead and the bus lead wire repair area using a brush.
3. Coat the soldering iron tip with solder. Use only enough solder to ensure a complete repair.
4. Use only enough heat to melt the solder. Do not overheat the wire when resoldering to the bus lead wire.

## Floor Carpet Drying

If the carpet or the pad or insulator is wet, use the following criteria for drying or for replacing the components:

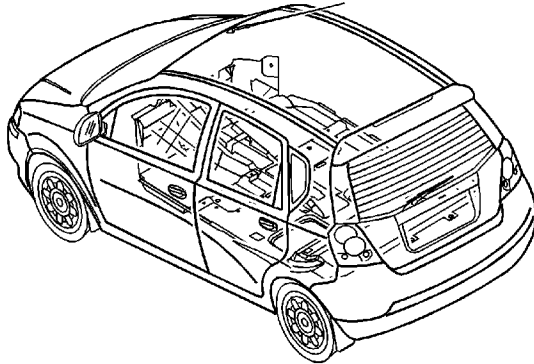
- For a 1-piece carpet assembly bonded to a cotton or a fiber padding, replace the entire assembly.
- For a 2-piece carpet assembly with a cotton or a fiber padding, replace the padding only. While the carpet is out of the vehicle, dry the carpet using the method described below.
- For a 1-piece carpet assembly bonded to a foam padding or attached to a synthetic padding, dry the carpet using the method described below.
- For a 2-piece carpet assembly with a synthetic padding, dry the assembly using the method described below.

### Drying Method

1. If you observe puddles of liquid on the carpet face, use a wet vacuum to remove the excess moisture.
2. Blot the face of the carpet with a towel in order to absorb as much moisture as possible.
3. Point a fan at the affected area and air dry the carpet.

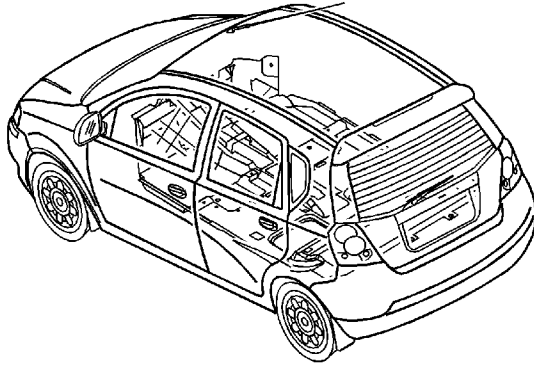
## Floor Panel Carpet Replacement (Hatchback)

### Removal Procedure



1. Remove the left and the right rear rocker trim panels. Refer to [Rear Side Door Sill Plate Replacement](#).
2. Remove the rear seat back. Refer to [Rear Seat Back Replacement](#).
3. Remove the bolts and the left and the right lower front seat belt anchors from the lower/center pillar.
4. Remove the left and the right lower B-pillar trim panels. Refer to [Rear Side Door Sill Plate Replacement](#).
5. Remove the front seats. Refer to [Front Seat Replacement - Bucket](#).
6. Pry off the left and the right front rocker trim panels.
7. Remove the floor console. Refer to [Front Floor Console Replacement](#).
8. Remove the floor carpet.

### Installation Procedure



1. Install the floor carpet.
2. Install the floor console. Refer to [Front Floor Console Replacement](#).
3. Install the left and the right front rocker, trim panels.
4. Install the front seats. Refer to [Front Seat Replacement - Bucket](#).
5. Install the left and the right lower B-pillar trim panels. Refer to [Center Pillar Lower Trim Panel Replacement](#).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

6. Install the left and the right lower front seat belt anchors to the lower/center pillar with the bolts.

#### **Tighten**

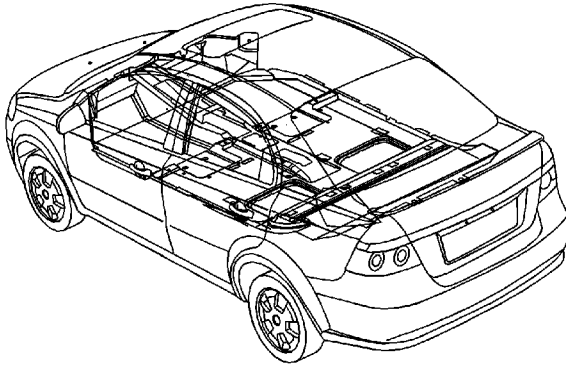
Tighten the seat belt anchor bolts to 35 N·m (26 lb ft).

7. Install the rear seat back. Refer to [Rear Seat Back Replacement](#).
8. Install the left and the right rear rocker trim panels. Refer to [Rear Side Door Sill Plate Replacement](#).



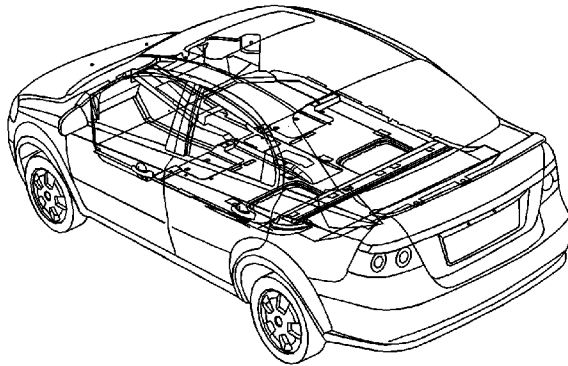
## Floor Panel Carpet Replacement (Notchback)

### Removal Procedure



1. Remove the left and the right rear door sill plate trim panels. Refer to [Rear Side Door Sill Plate Replacement](#).
2. Remove the bolts and the left and the right lower front seat belt anchors from the lower/center pillar.
3. Remove the left and the right lower B-pillar trim panels. Refer to [Center Pillar Lower Trim Panel Replacement](#).
4. Remove the front seats. Refer to [Front Seat Replacement - Bucket](#).
5. Remove the left and the right door sill plate trim panels. Refer to [Front Side Door Sill Plate Replacement](#).
6. Remove the floor console. Refer to [Front Floor Console Replacement](#).
7. Remove the floor carpet.

### Installation Procedure



1. Install the floor carpet.
2. Install the floor console. Refer to [Front Floor Console Replacement](#).
3. Install the left and the right door sill plate trim panels. Refer to [Front Side Door Sill Plate Replacement](#).
4. Install the front seats. Refer to [Front Seat Replacement - Bucket](#).
5. Install the left and the right lower B-pillar trim panels. Refer to [Center Pillar Lower Trim Panel Replacement](#).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

6. Install the left and the right lower front seat belt anchors to the lower/center pillar with the bolts.

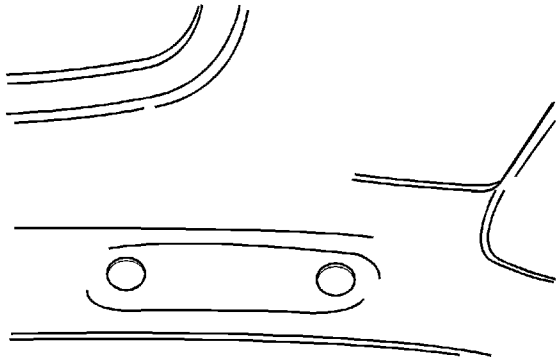
#### **Tighten**

Tighten the seat belt anchor bolts to 35 N·m (26 lb ft).

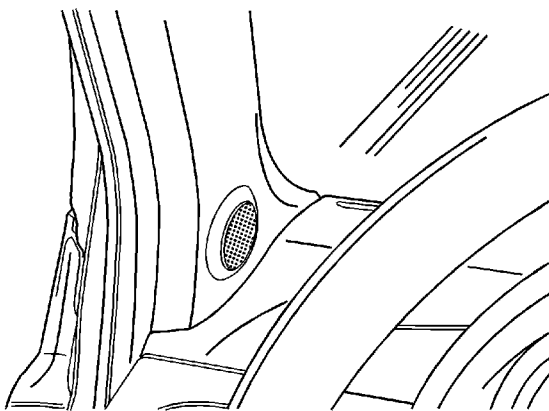
7. Install the left and the right rear door sill plate trim panels. Refer to [Rear Side Door Sill Plate Replacement](#).

## Headlining Trim Panel Replacement

### Removal Procedure



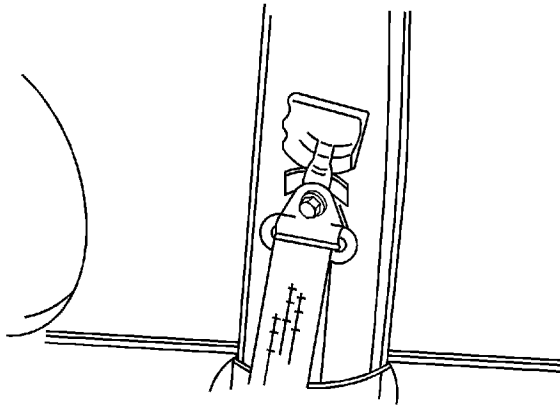
1. Remove the passenger assist handles. Refer to [Assist Handle Replacement](#).
2. Remove the coat hook. Refer to [Coat Hook Replacement](#).
3. Remove the plastic retainers in the headliner on the driver side.



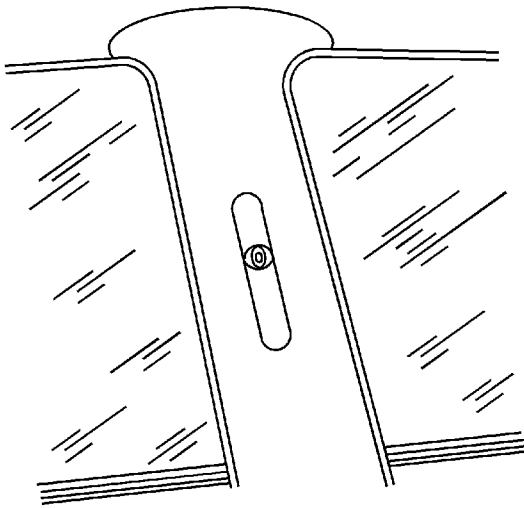
4. Remove the sun visors. Refer to [Sunshade Replacement](#).
5. Remove the interior courtesy lamp. Refer to [Interior Courtesy Lamp Replacement](#).

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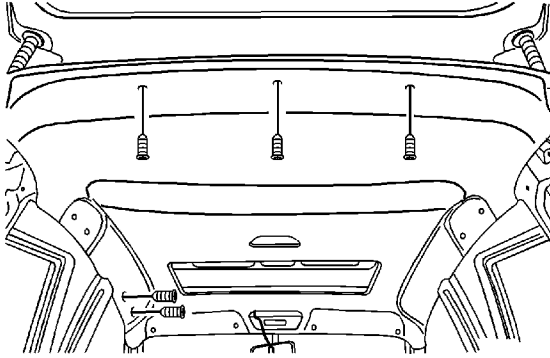
6. Remove the left and the right windshield pillar trim panels.



7. Remove the bolts and the seat belt anchors from the left and the right lower/center pillars.

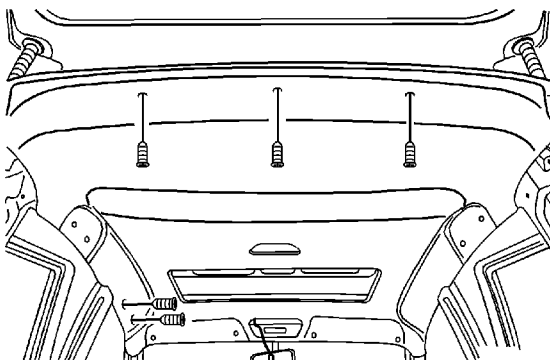


8. Reposition the top of the left and the right upper/center pillar trim panels.



9. Remove the left and the right rear quarter upper trim panels.
10. Remove the sunroof molding, if equipped.
11. Remove the plastic retainers in the headliner along the rear window.
12. Slide and tilt both front seats forward.
13. Pull the headliner down and turn it 45 degrees.
14. Remove the headliner through a rear door.

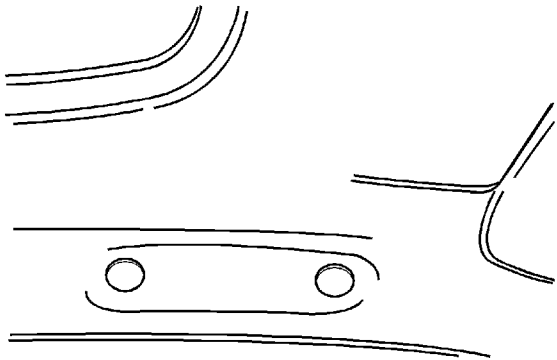
## Installation Procedure



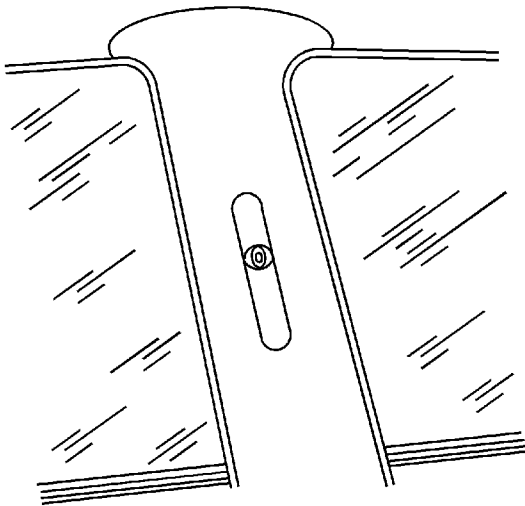
1. Recline both front seats.
2. Tilt the headliner on its side and slide it through a rear door.
3. Tilt and rotate the headliner until it is in position. Push it in place until the seals around the

doors cover the edges of the headliner.

4. Install the plastic retainers along the rear window.

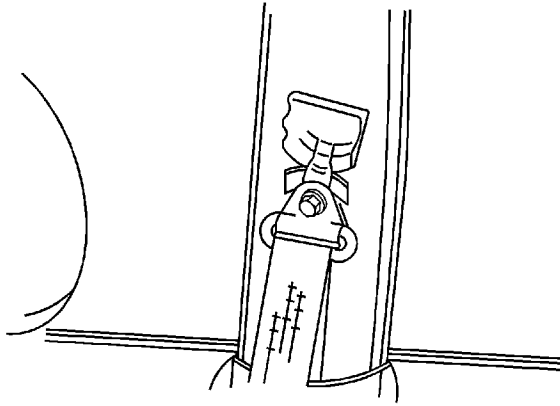


5. Install the plastic retainers in the headliner on the driver side.



6. Install the sunroof molding, if equipped.
7. Install the left and the right rear quarter upper trim panels.
8. Install the top of the left and the right upper/center pillar trim panels to the original position.

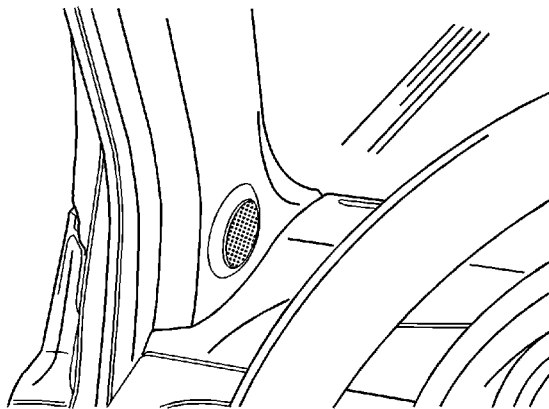
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



9. Install the seat belt anchors with the bolts in the left and the right upper/center pillar panels.

**Tighten**

Tighten the upper/center pillar seat belt bolts to 38 N·m (28 lb ft).



10. Install the left and the right windshield pillar trim panels.
11. Install the interior courtesy lamp. Refer to [Interior Courtesy Lamp Replacement](#).
12. Install the sun visors. Refer to [Sunshade Replacement](#).
13. Install the coat hook. Refer to [Coat Hook Replacement](#).
14. Install the passenger assist handles. Refer to [Assist Handle Replacement](#).

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Driveline/Axle](#) | [Front Drive Axle](#) | [Specifications](#) | **Document ID: 1290000**

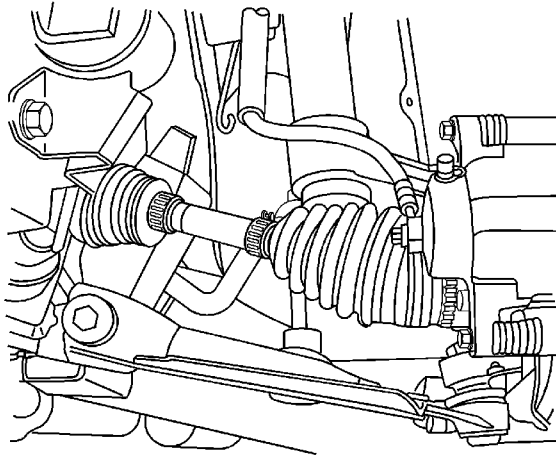
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## Fastener Tightening Specifications

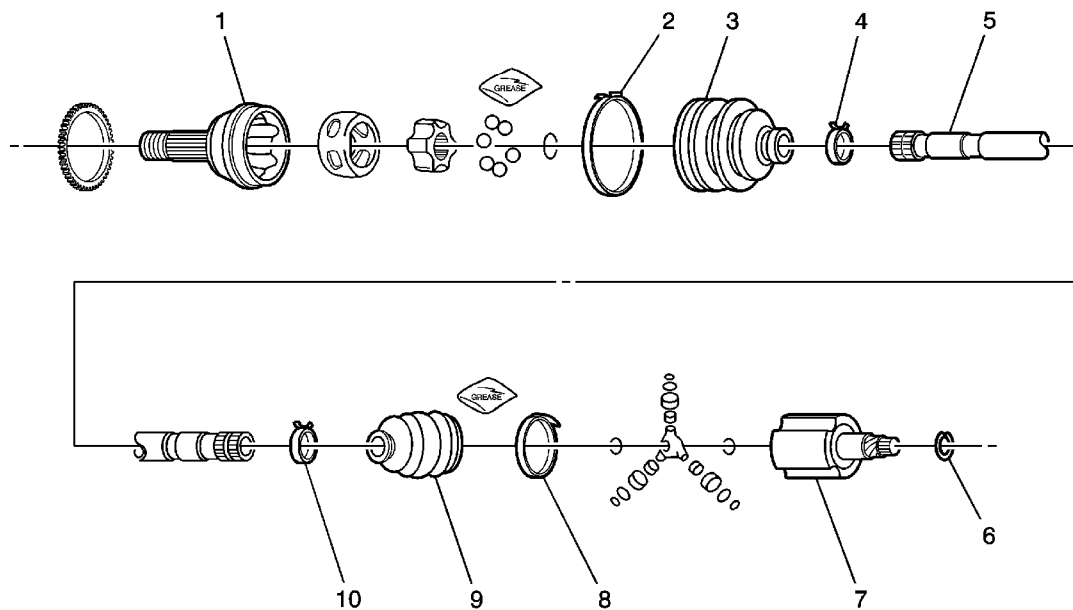
Application	Specification	
	Metric	English
Axle Shaft Caulking Nut	300 N·m	221 lb ft
Damping Block Connection Nut and Bolt	80 N·m	59 lb ft
Lower Ball Joint Nut	50 N·m	37 lb ft
Rear Mounting Bracket Bolts	60 N·m	44 lb ft
Tie Rod Nut	45 N·m	33 lb ft
Wheel Nuts	120 N·m	88 lb ft



## Front Drive Axle Disassembled Views (Automatic)

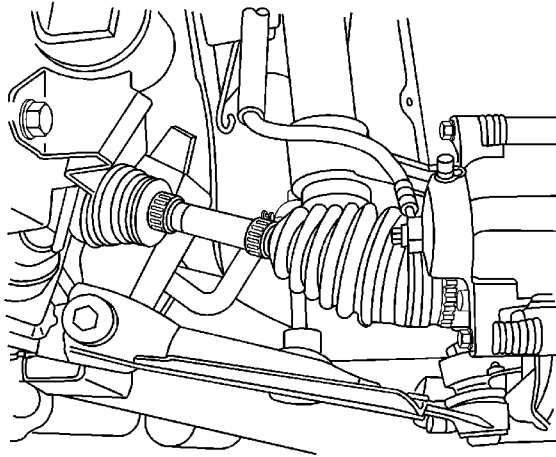


### Automatic

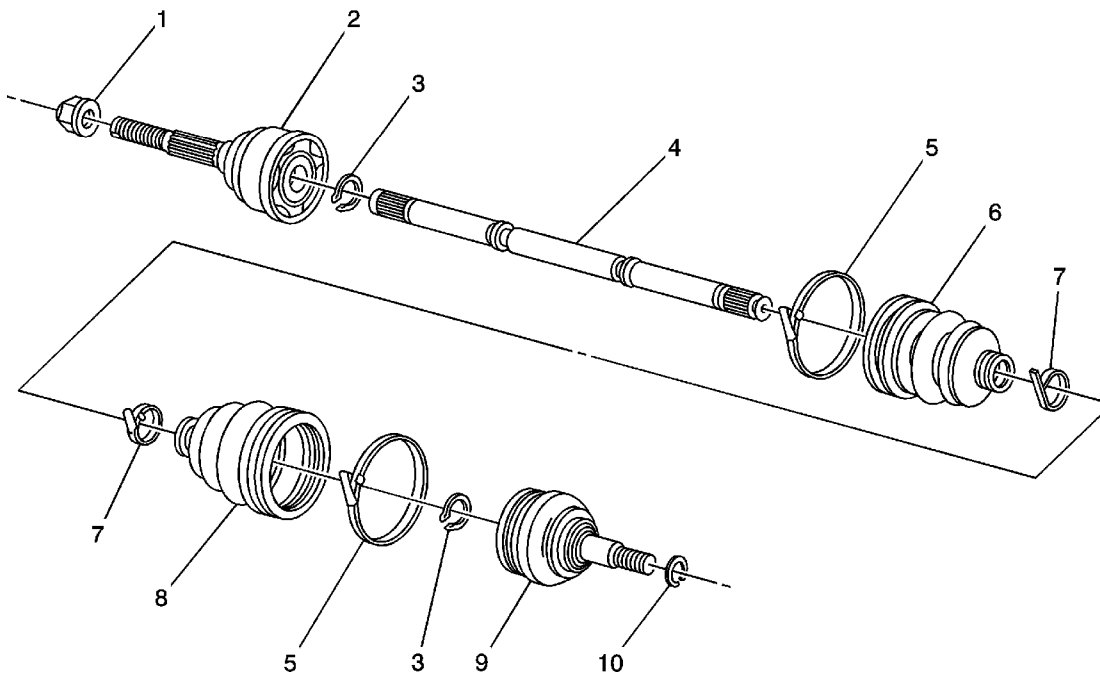


- (1) C/V Joint
- (2) Seal Retaining Clamp
- (3) Drive Axle Outboard Seal
- (4) Seal Retaining Clamp
- (5) Axle Shaft
- (6) Snap Ring
- (7) Tripot Housing
- (8) Seal Retaining Clamp
- (9) Drive Axle Inboard Seal
- (10) Seal Retaining Clamp

## Front Drive Axle Disassembled Views (Manual)



### Manual



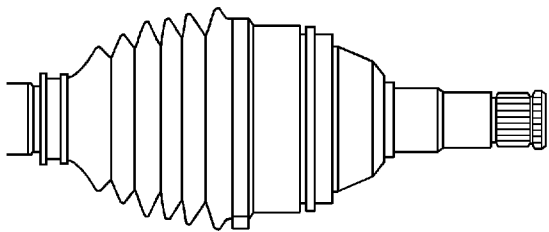
- (1) Caulking Nut
- (2) C/V Joint
- (3) Race Retaining Ring
- (4) Axle Shaft
- (5) Seal Retaining Clamp
- (6) Drive Axle Outboard Seal
- (7) Seal Retaining Clamp
- (8) Drive Axle Inboard Seal
- (9) Cross Groove Joint
- (10) Retaining Ring

# Wheel Drive Shaft Inner Joint and Boot Replacement (Manual)

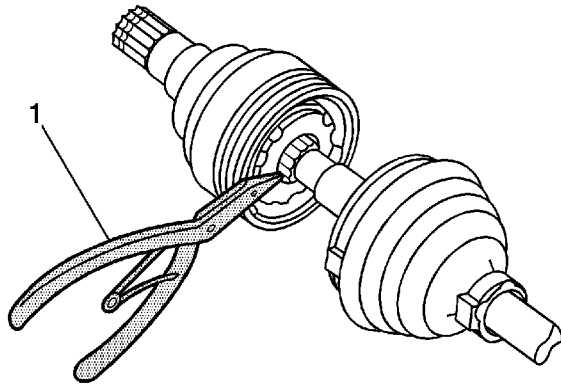
## Special Tools

- [J 8059](#) Snap Ring Pliers
- [J 35566](#) Seal Clamp Pliers

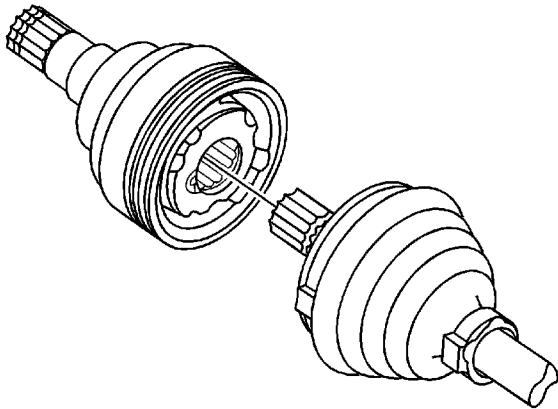
## Removal Procedure



1. Remove the large seal retaining clamp. Discard the clamp.
2. Remove the small seal retaining clamp. Discard the clamp.



3. Clean and degrease the joint.
4. Remove the shaft retaining ring using [J 8059](#) (1).

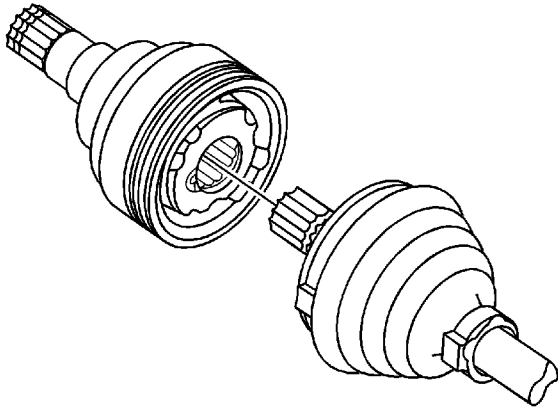


5. Remove the axle shaft from the joint assembly.

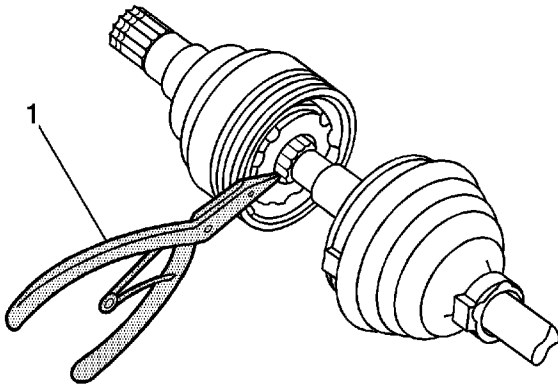
**Warning:** The ball retainer is stacked in position and is not serviceable. Attempting to service the ball retainer could result in reduced vehicle performance and possible personal injury.

6. Remove the seal from the joint assembly.

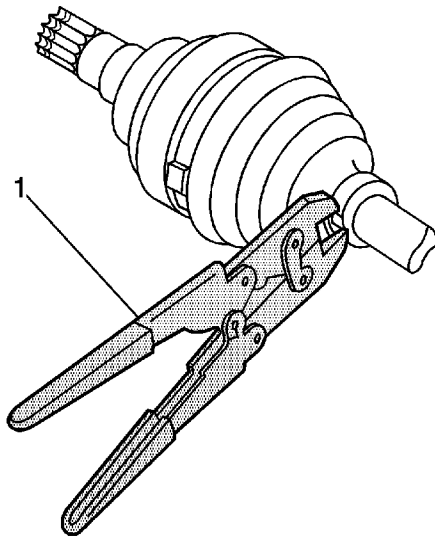
## Installation Procedure



1. Install a new small seal retaining clamp onto the seal. Do not crimp.
2. Install the seal onto the axle shaft.
3. Install the joint assembly onto the axle shaft.



4. Install the shaft retaining ring using the [J 8059](#) (1).



5. Fill the joint assembly with 120-140 grams (4.2-4.9 ounces) of the recommended grease. Repack the tripot with 120-140 grams (4.2-4.9 ounces) of the recommended grease.
6. Install the new large seal retaining clamp.
7. Crimp the new large seal retaining clamp using [J 35566](#) (1).
8. Crimp the new small retaining clamp using [J 35566](#) (1).

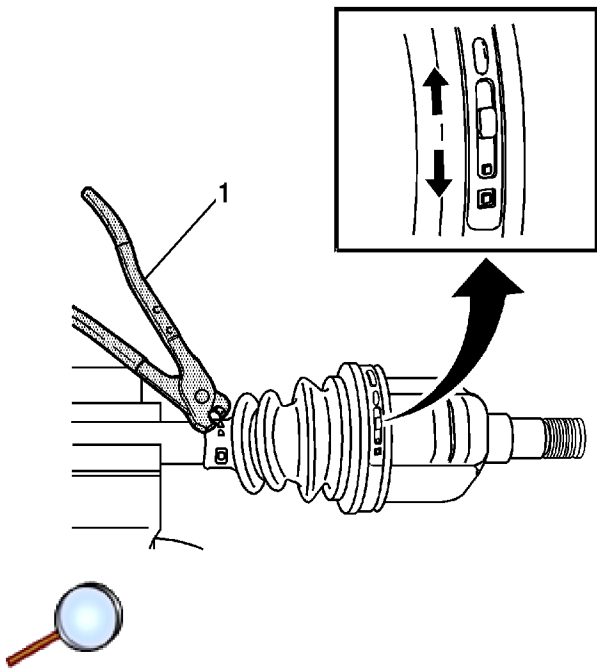


## Wheel Drive Shaft Inner Joint and Boot Replacement (Automatic)

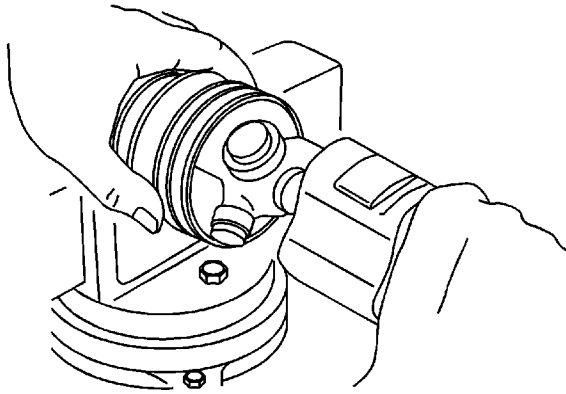
### Tools Required

- [J 35566](#) Seal Clamp Pliers
- [J 8059](#) Snap Ring Pliers

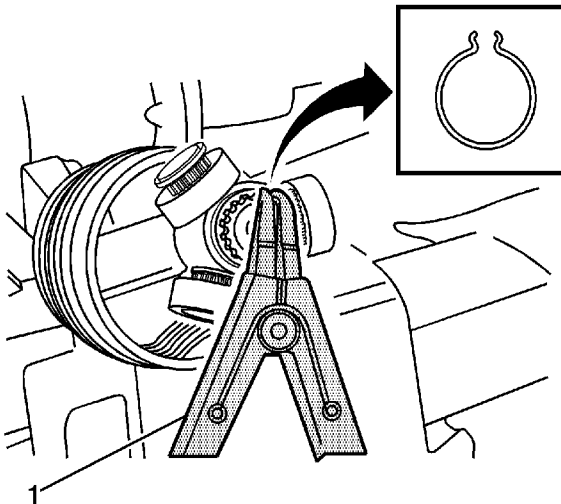
### Removal Procedure



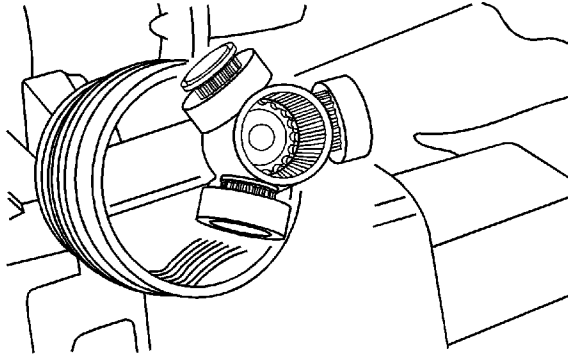
1. Remove the drive axle from the vehicle. Refer to [Front Drive Axle Inner Shaft and Inner Shaft Housing Replacement](#).
2. Using [J 35566](#) (1) remove the large seal retaining clamp. Discard the clamp.
3. Using [J 35566](#) (1) remove the small seal retaining clamp. Discard the clamp.



4. Separate the joint housing from the boot.

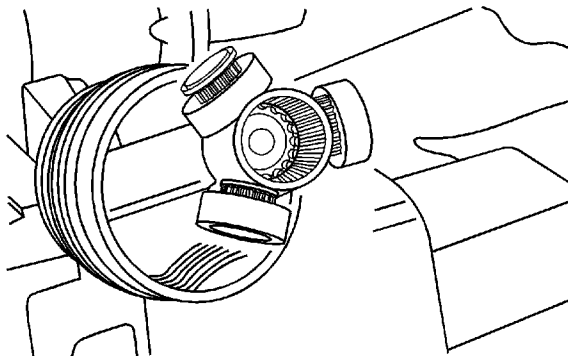


5. Clean and degrease the tripot assembly.
6. Remove the shaft retaining ring using [J 8059](#).

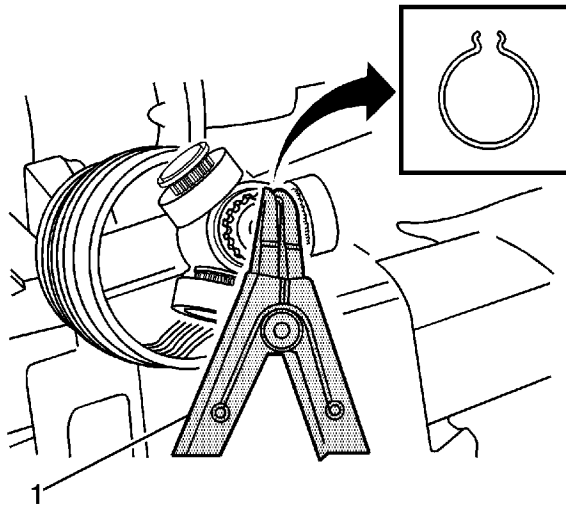


7. Remove the tripot and the tripot joint retaining ring from the axle shaft.
8. Remove the tripot joint seal from the axle shaft.

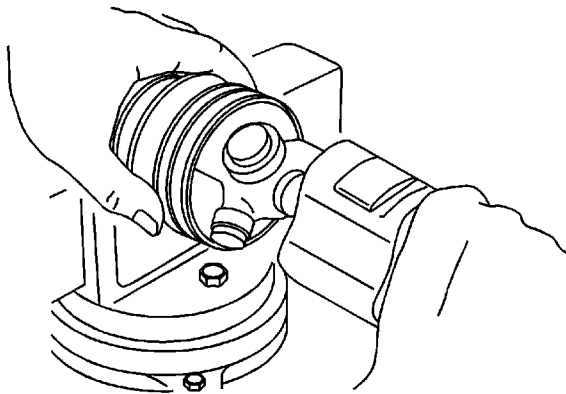
## Installation Procedure



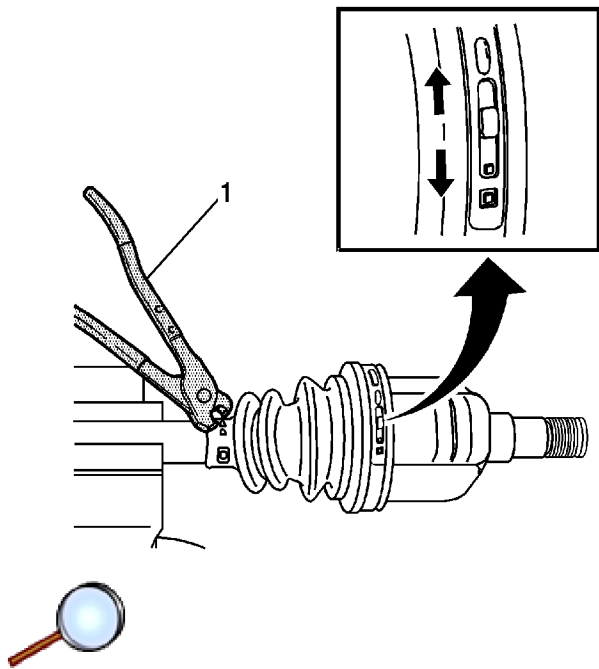
1. Install a new small seal retaining clamp onto the seal.
2. Install the seal onto the axle shaft.



3. Install the shaft retaining ring onto the axle shaft using [J 8059](#) (1).



4. Fill the tripot housing with 195-215 g (6.9-7.6 ounces) of the recommended grease. Repack the tripot with 195-215 g (6.9-7.6 ounces) of the recommended grease.
5. Install the boot to the joint housing.



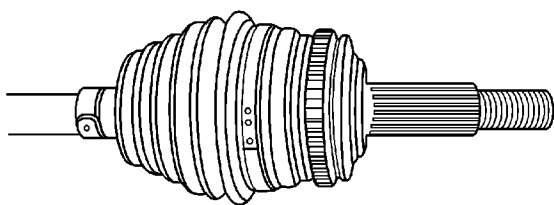
6. Install a new large seal retaining clamp. Crimp the large seal retaining clamp using [J 35566](#) (1).
7. Crimp the new small seal retaining clamp using [J 35566](#) (1).
8. Install the drive axle shaft to the vehicle. Refer to [Front Drive Axle Inner Shaft and Inner Shaft Housing Replacement](#).

## Wheel Drive Shaft Outer Joint and Boot Replacement (Manual)

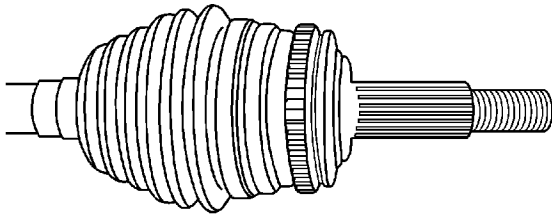
### Special Tools

- [J 8059](#) Snap Ring Pliers
- [J 35566](#) Seal Clamp Pliers

### Removal Procedure



1. Remove the cross groove joint seal assembly. Refer to [Wheel Drive Shaft Inner Joint and Boot Replacement](#).
2. Remove the large seal retaining clip. Discard the clamp.
3. Remove the small seal retaining clamp. Discard the clamp.

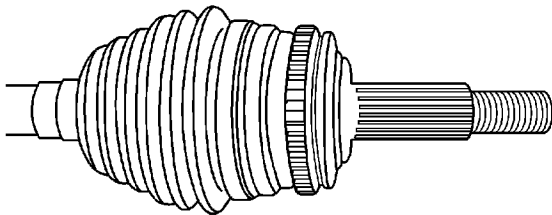


4. Clean and degrease the joint.

**Warning:** The outer joint is designed to be replaced as a one piece unit. Do not attempt to disassemble or service the outer joint. Improper service will affect both performance of the vehicle and could cause personal injury or vehicle damage.

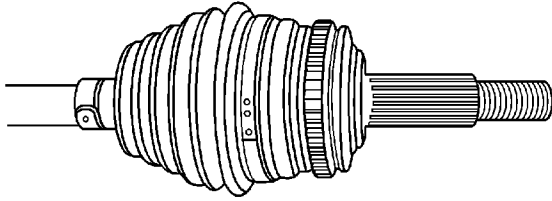
5. Remove the seal from the joint assembly.

## Installation Procedure

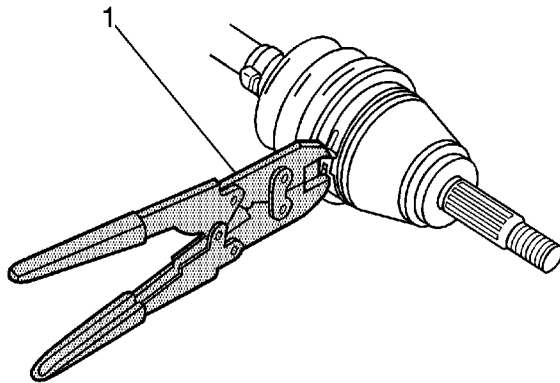


1. Install the seal onto the axle shaft.
2. Fill the joint seal with 110-130 grams (3.9-4.6 ounces) of the recommended grease. Repack

the joint with 110-130 grams (3.9-4.6 ounces) of the recommended grease.



3. Install a new large seal retaining clamp and a new small seal retaining clamp.



4. Crimp the new small seal retaining clamp and the new large seal retaining clamp using [J 35566](#) (1).
5. Install the cross groove joint seal assembly. Refer to [Wheel Drive Shaft Inner Joint and Boot Replacement](#).

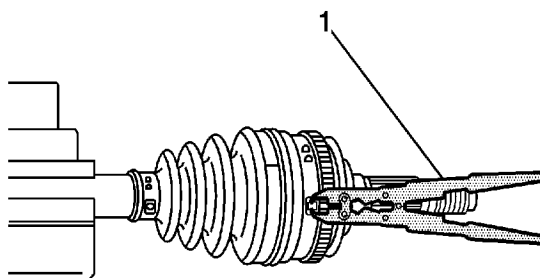


# Wheel Drive Shaft Outer Joint and Boot Replacement (Automatic)

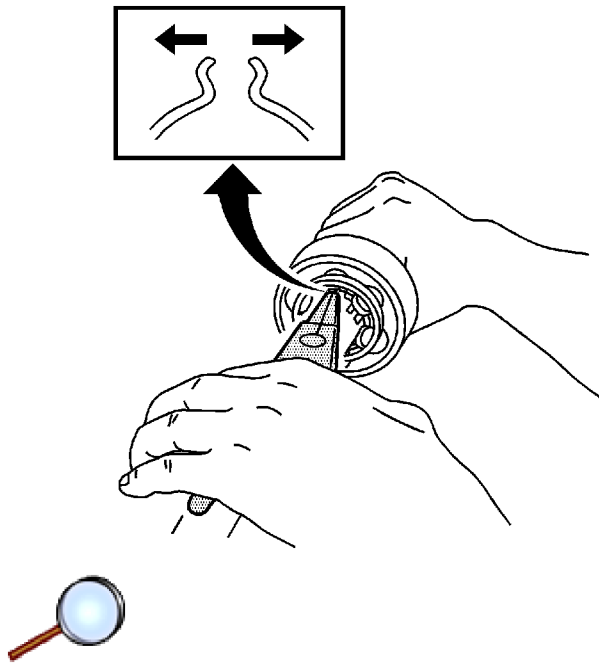
## Special Tools

- [J 8059](#) Snap Ring Pliers
- [J 35566](#) Seal Clamp Pliers

## Removal Procedure



1. Remove the drive axle from the vehicle. Refer to [Front Drive Axle Inner Shaft and Inner Shaft Housing Replacement](#).
2. Remove the large seal retaining clamp using [J 35566](#) (1). Discard the clamp.
3. Remove the small seal retaining clamp. Discard the clamp.

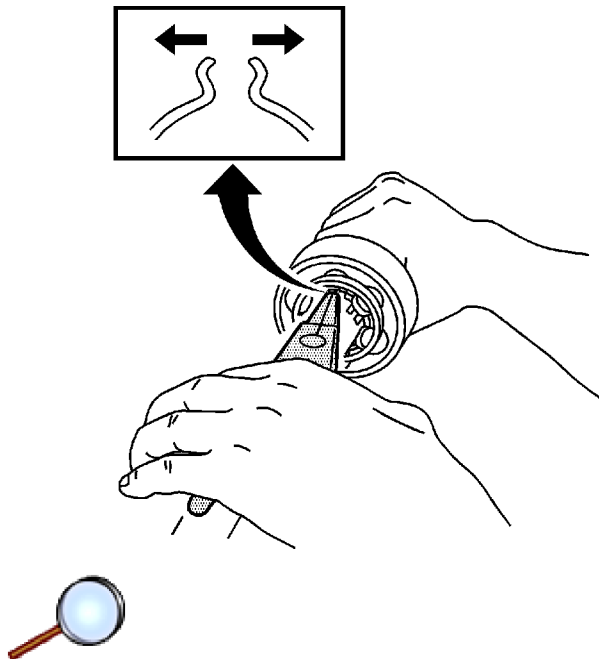


4. Clean and degrease the joint.
5. Spread the snap ring using [J 8059](#) and remove the outer joint and the axle shaft.

**Warning:** The outer joint is designed to be replaced as a one piece unit. Do not attempt to disassemble or service the outer joint. Improper service will affect both performance of the vehicle and could cause personal injury or vehicle damage.

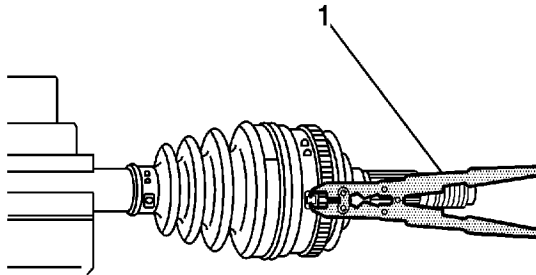
6. Remove the seal from the joint assembly.

## Installation Procedure



1. Install the seal onto the axle shaft.

2. Spread the snap ring using [J 8059](#) and remove the outer joint and the axle shaft.
3. Fill the joint seal with 110-130 g (3.9-4.6 ounces) of the recommended grease. Repack the joint with 110-130 g (3.9-4.6 ounces) of the recommended grease.



4. Install a new large seal retaining clamp and a new small seal retaining clamp.
5. Crimp the new small seal retaining clamp and the new large seal retaining clamp using [J 35566](#) (1).
6. Install the drive axle shaft to the vehicle. Refer to [Front Drive Axle Inner Shaft and Inner Shaft Housing Replacement](#).

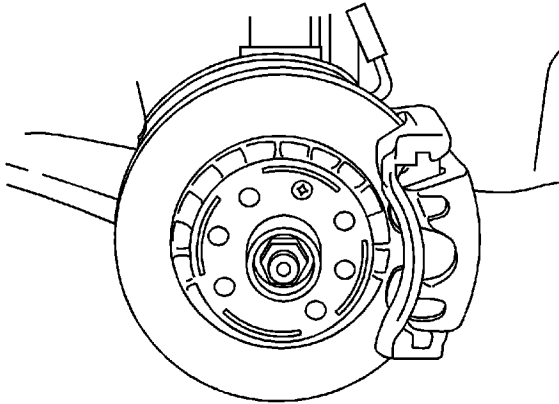
## Front Drive Axle Inner Shaft Replacement

### Special Tools

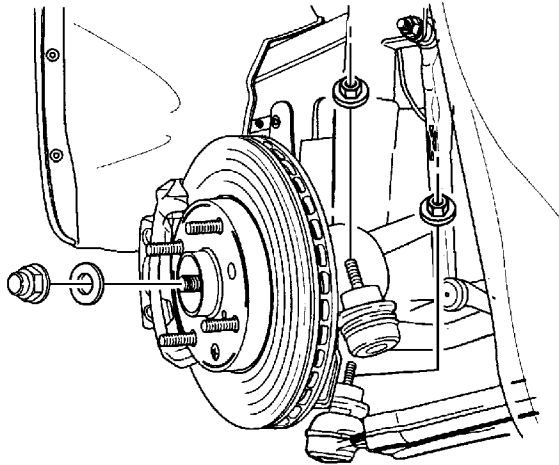
- [KM-460-B](#) Axle Shaft Remover
- [KM-507-C](#) Ball Joint Remover

### Removal Procedure

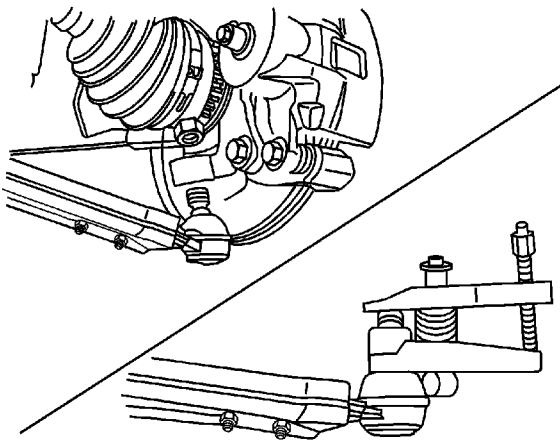
**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.



1. Raise and suitably support the vehicle.
2. Remove the wheels. Refer to [Tire and Wheel Removal and Installation](#).
3. Remove the engine splash shield, if necessary.

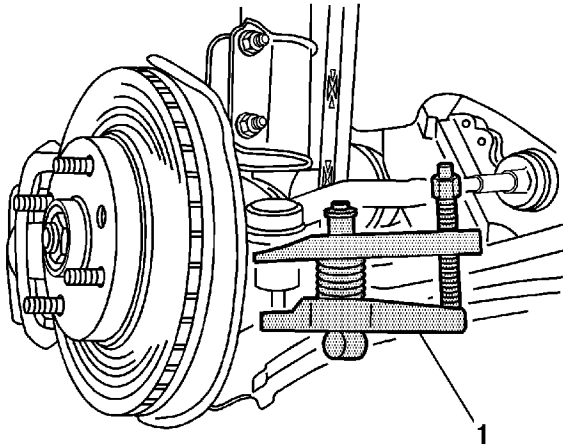


4. Remove the axle shaft stake nut (1). Discard the nut.
5. Remove the lower ball joint nut (2).



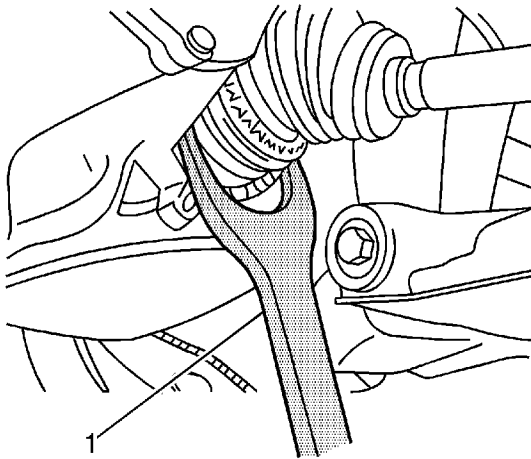
**Caution:** Use only the recommended tools for separating the ball joint from the knuckle. Failure to use the recommended tools may cause damage to the ball joint and seal.

6. Separate the steering knuckle from the lower ball joint using [KM-507-C](#).
7. Remove the tie rod nut.



**Caution:** Use only the recommended tools for separating the ball joint from the knuckle. Failure to use the recommended tools may cause damage to the ball joint and seal.

8. Separate the tie rod end using [KM-507-C](#) (1).



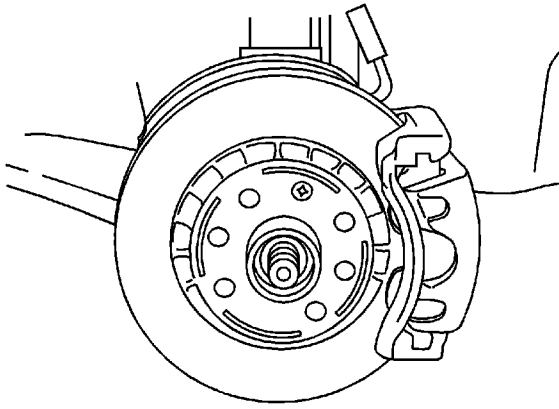
9. Push the drive axle shaft from the wheel hub.

**Caution:** Refer to [Drive Axle Caution](#) in the Preface section.

**Note:** Place a drain pan below the transaxle to catch the escaping fluid. Cap the transaxle drive opening after the drive axle has been removed to keep the fluid in and any contamination out.

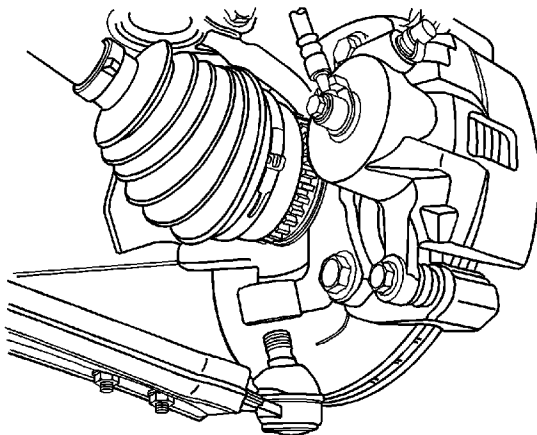
10. Remove the drive axle from the transaxle using [KM-460-B](#) (1).

## Installation Procedure



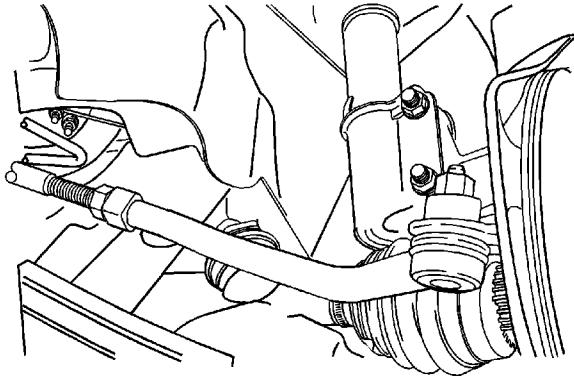
**Note:** Do not damage the seals.

1. Clean the hub seal and the transaxle seal.
2. Install the drive axle into the transaxle.
3. Install the wheel hub onto the axle shaft.

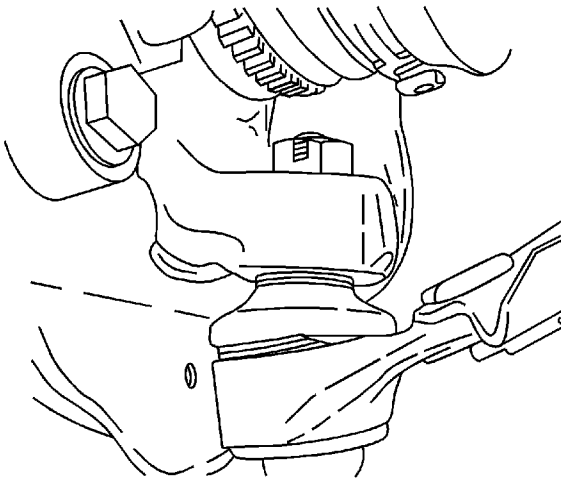


4. Mount the steering knuckle onto the lower ball joint.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

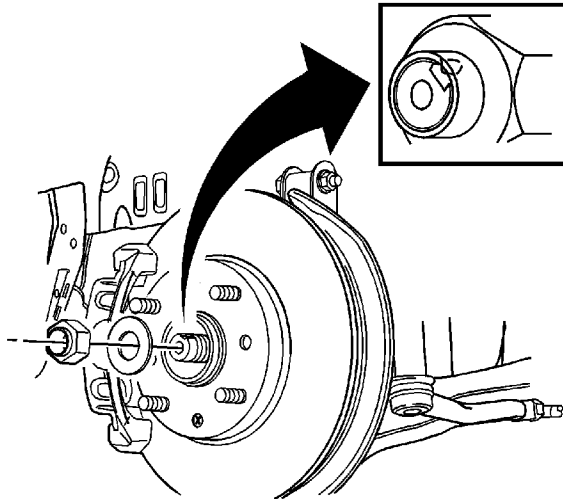


5. Install the tie rod into the knuckle/strut.
6. Install the tie rod nut and tighten to **45 N·m (33 lb ft)**.

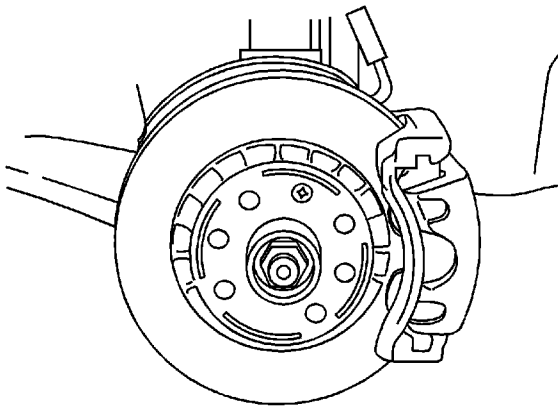


7. Install the lower ball joint nut and tighten to **50 N·m (37 lb ft)**.





8. Loosely install a new axle shaft staking nut. Always use a new nut.



9. Install the wheels. Install the nuts. Refer to [Tire and Wheel Removal and Installation](#).
10. Lower the vehicle to the floor.
11. Tighten the wheel nuts to **120 N·m (88 lb ft)**.
12. Tighten the axle shaft staking nut to **300 N·m (221 lb ft)**.
13. Peen the staking nut with a punch and a hammer until the nut is locked into place on the axle shaft hub.
14. Install the engine splash shields.
15. Refill the transaxle fluid to the proper level. Refer to [Transmission Fluid Level Inspection](#).

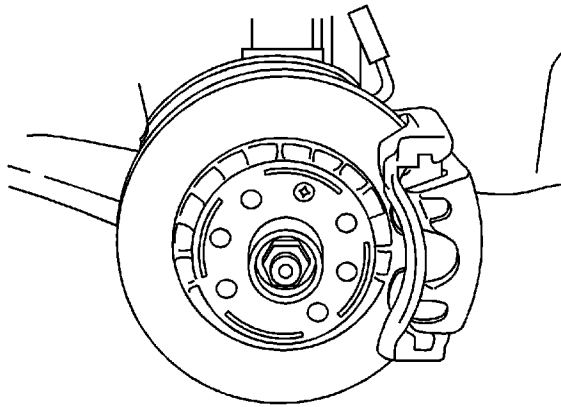
# Front Drive Axle Inner Shaft and Inner Shaft Housing Replacement

## Special Tools

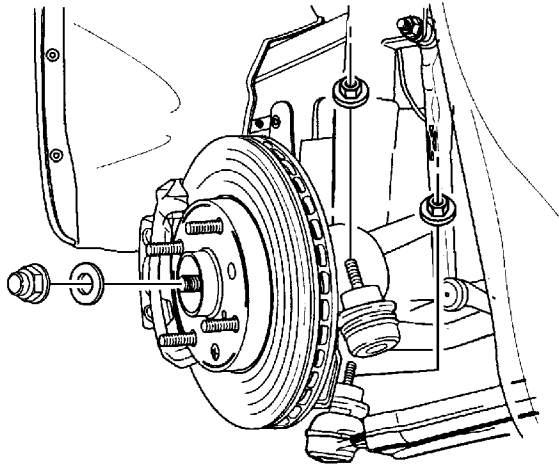
[KM-507-C](#) Ball Joint Remover

## Removal Procedure

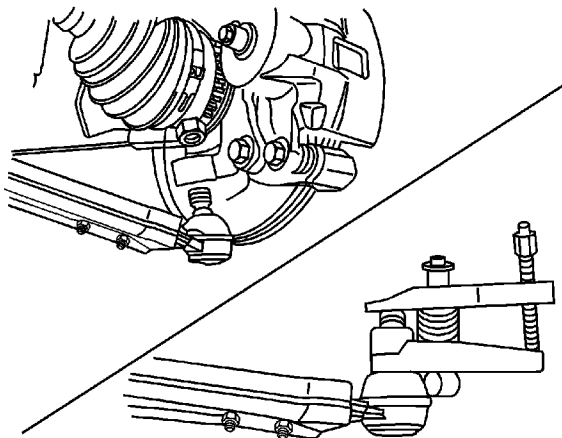
**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.



1. Raise and suitably support the vehicle.
2. Remove the wheels. Refer to [Tire and Wheel Removal and Installation](#).
3. Remove the engine splash shields.

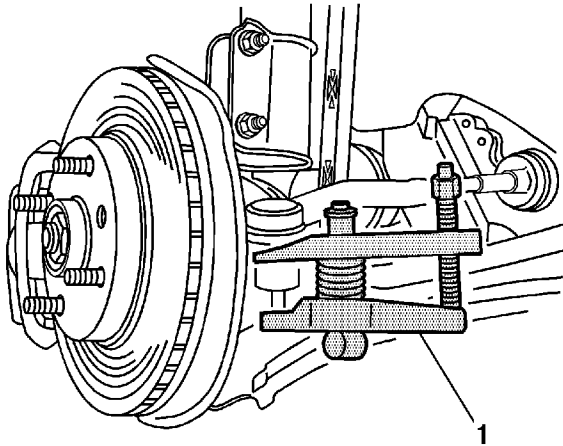


4. Remove the axle shaft staking nut (1). Discard the nut.
5. Remove the lower ball joint nut (2).



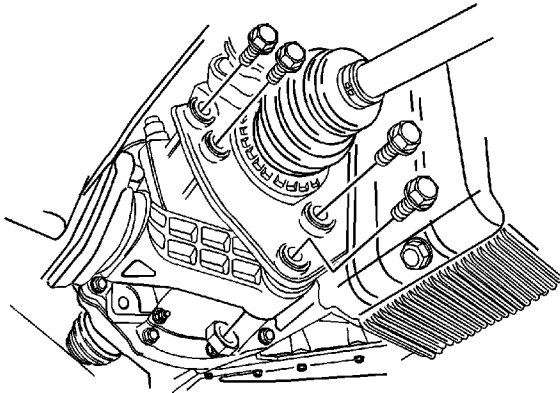
**Caution:** Use only the recommended tools for separating the ball joint from the knuckle. Failure to use the recommended tools may cause damage to the ball joint and seal.

6. Separate the steering knuckle from the lower ball joint using the [KM-507-C](#).
7. Remove the tie rod nut.

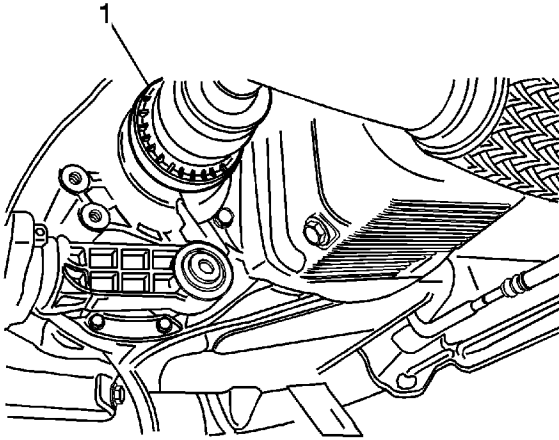


**Caution:** Use only the recommended tools for separating the ball joint from the knuckle. Failure to use the recommended tools may cause damage to the ball joint and seal.

8. Separate the tie rod end using the [KM-507-C](#) (1).



9. Remove the damping block connection nut and bolt.
10. Remove the rear mounting bracket bolts and the bracket.



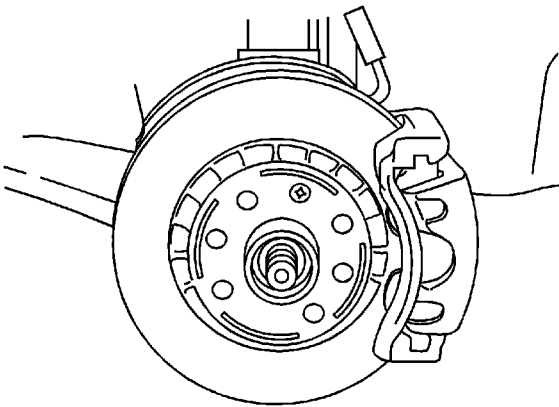
11. Push the drive axle shaft from the wheel hub.

**Caution:** Refer to [Drive Axle Caution](#) in the Preface section.

**Note:** Place a drain pan below the transaxle to catch the escaping fluid. Cap the transaxle drive opening after the drive axle has been removed to keep the fluid in and any contamination out.

12. Remove the drive axle from the transaxle using a suitable tool.

## Installation Procedure

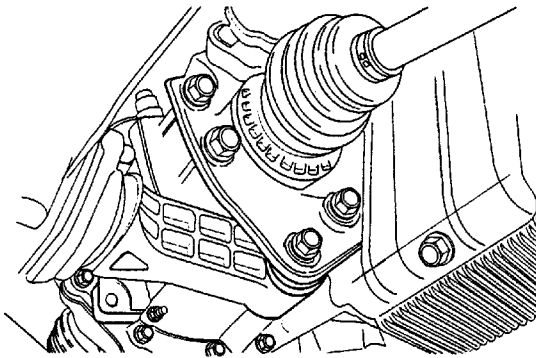




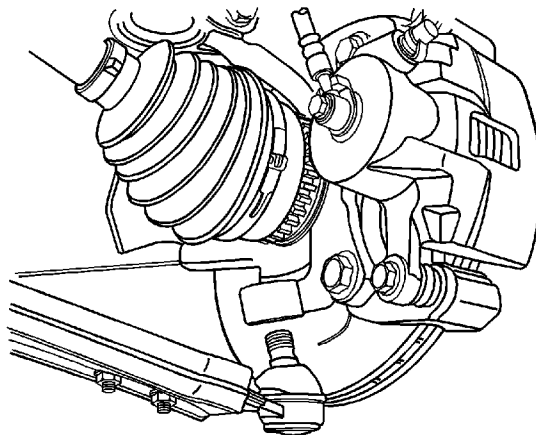
**Note:** Do not damage the seals.

1. Clean the hub seal and the transaxle seal.
2. Install the drive axle into the transaxle.
3. Install the wheel hub onto the axle shaft.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

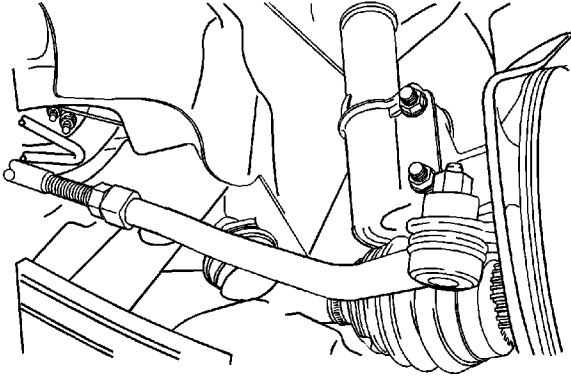


4. Install the rear mounting bracket bolts and the bracket and tighten to **60 N·m (44 lb ft)**.
5. Install the damping block connection nut and bolt and tighten to **80 N·m (59 lb ft)**.

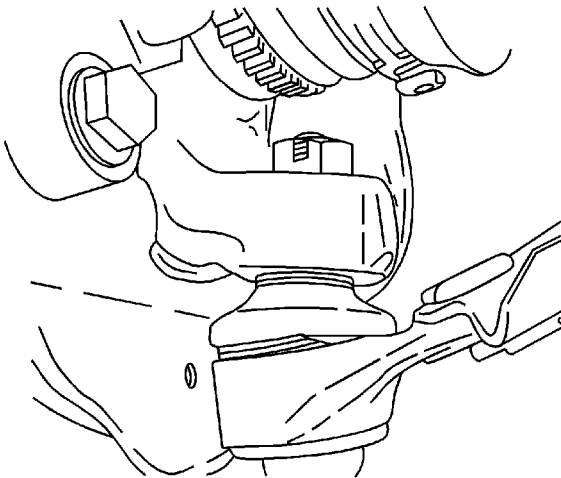




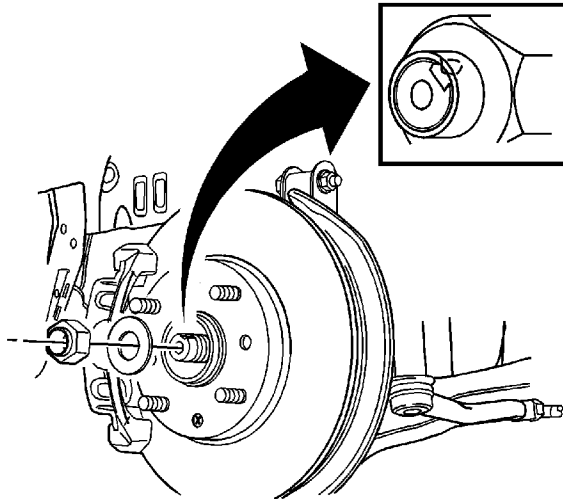
6. Mount the steering knuckle onto the lower ball joint.



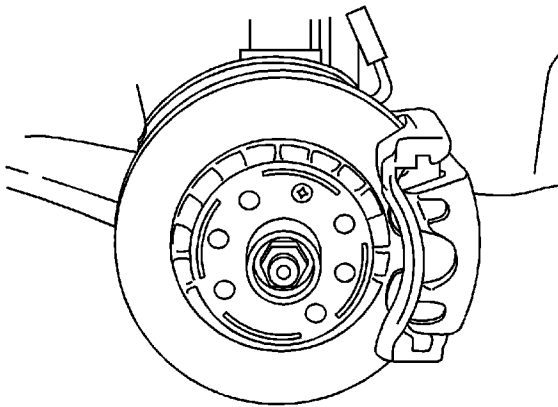
7. Install the tie rod into the knuckle/strut and install the tie rod nut and tighten to **45 N·m (33 lb ft)**.



8. Install the lower ball joint nut and tighten to **50 N·m (37 lb ft)**.



9. Loosely install a new axle shaft staking nut. Always use a new nut.



10. Install the wheels. Install the nuts. Refer to [Tire and Wheel Removal and Installation](#).
11. Lower the vehicle to the floor and tighten the wheel nuts to **120 N·m (88 lb ft)**.
12. Tighten the axle shaft staking nut to **300 N·m (221 lb ft)**
13. Peen the staking nut with a punch and a hammer until the nut is locked into place on the axle shaft hub.
14. Install the engine splash shields.
15. Refill the transaxle fluid to the proper level. Refer to [Transmission Fluid Draining](#).



## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Ball Joint-to-Control Arm Nuts	150 N·m	111 lb ft
Ball Joint-to-Knuckle Nut	55 N·m	41 lb ft
Control Arm Front Mounting Bolt	110 N·m	81 lb ft
Control Arm Rear Mounting Bolts	110 N·m	81 lb ft
Crossmember Assembly Front to Body Nut	150 N·m	111 lb ft
Crossmember Assembly Rear to Body Nut	150 N·m	111 lb ft
Drive Axle-to-Hub Caulking Nut	300 N·m	221 lb ft
Engine Mounting Reaction Rod Bolts	60 N·m	44 lb ft
Knuckle Assembly to Front Strut Bolts	100 N·m	74 lb ft
Piston Rod Nut	60 N·m	44 lb ft
Power Steering Pipe Fittings	22 N·m	16 lb ft
Splash Shield-to-Steering Knuckle Screws	4 N·m	35 lb in
Stabilizer Shaft-to-Link Nut	50 N·m	37 lb ft
Strut Assembly-to-Body Nuts	60 N·m	44 lb ft
Tie Rod End Ball Joint Nut	45 N·m	33 lb ft
U-clamp Bolt	25 N·m	18 lb ft

[2008 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Suspension](#) | [Front Suspension](#) | [Specifications](#)  
| Document ID: 1283759

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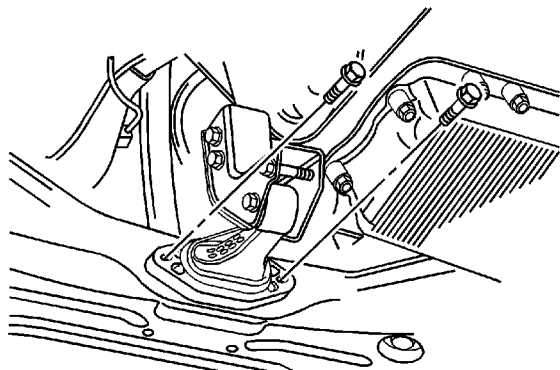
## General Specifications

Application	Specification	
	Metric	English
Center of Front Wheel to Bottom of Front Wheel Well	344 mm	13.5 in
Center of Rear Wheel to Bottom of Rear Wheel Well	343 mm	13.5 in

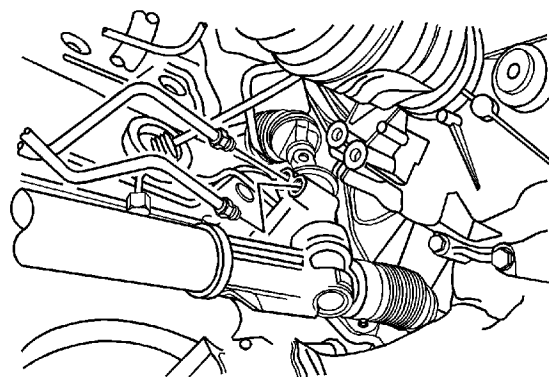
## Front Suspension Crossmember Replacement

### Removal Procedure

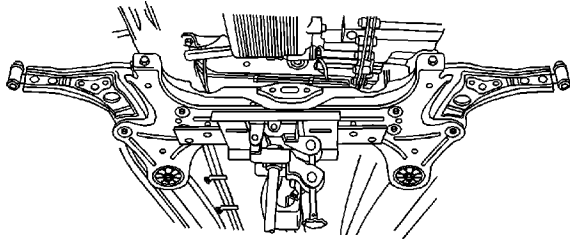
1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .



2. Remove the front tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#) .
3. Remove the control arm ball joint and stabilizer shaft link nut, lower.
4. Remove the tie rod end ball joint.
5. Remove the engine mounting reaction rod bolts.

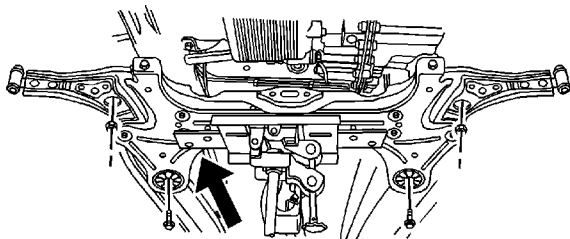


6. Drain the power steering fluid.
7. Remove the power steering pipe fittings.
8. Remove the intermediate shaft lower joint.



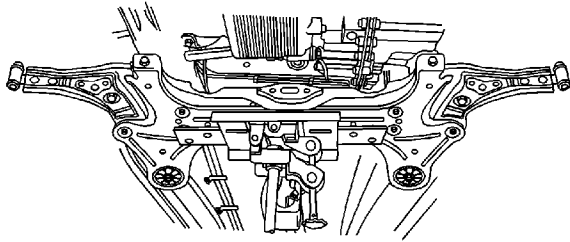
**Caution:** Failure to support crossmember can cause crossmember to drop to the ground when crossmember mounting bolts are removed.

9. Remove the crossmember assembly.



10. Remove the stabilizer bar, power steering gear set, and control arm from the crossmember.

## Installation Procedure



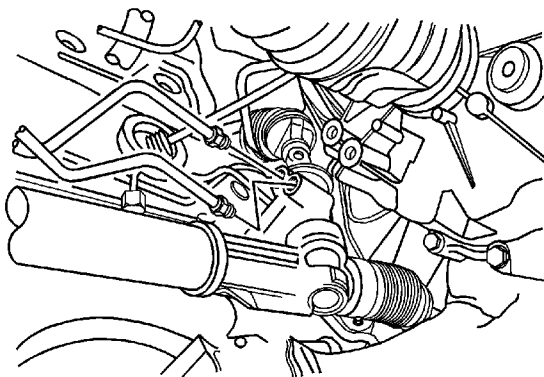
1. Install the stabilizer bar, power steering gear set, and control arm from the crossmember.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

2. Install the crossmember assembly front to body nut and the crossmember assembly rear to body bolt.

### **Tighten**

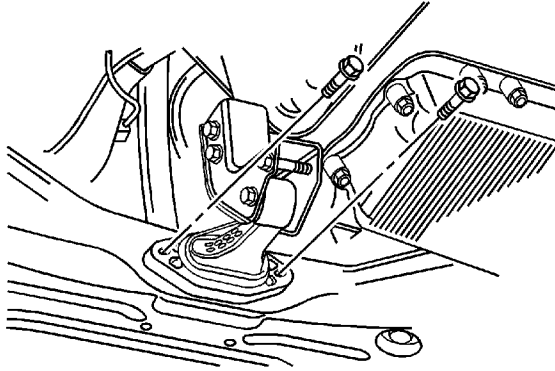
Tighten the crossmember assembly front to body nut and rear to body bolt to 150 N·m (111 lb ft).



3. Connect the intermediate shaft lower joint and power steering pipe fittings.

**Tighten**

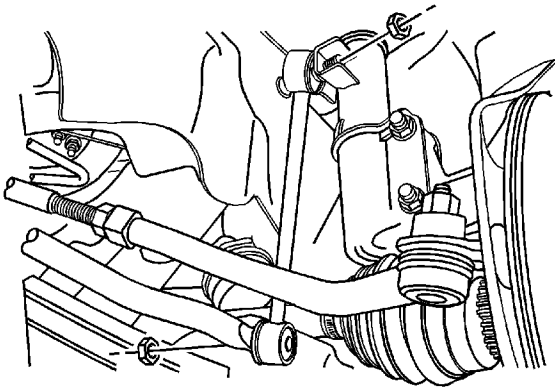
Tighten the power steering pipe fittings to 22 N·m (16 lb ft).



4. Install the engine mounting reaction rod bolts.

**Tighten**

Tighten the engine mounting reaction rod bolts to 60 N·m (44 lb ft).



5. Install the tie rod end ball joint nut.

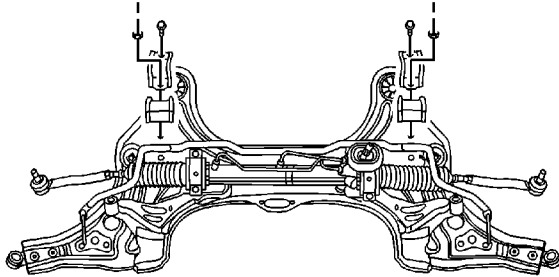
**Tighten**

Tighten the tie rod end ball joint nut to 45 N·m (33 lb ft).

6. Install the control arm ball joint and stabilizer shaft link nut, lower.
7. Install the front tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#) .
8. Lower the vehicle.

## Stabilizer Shaft Replacement

### Removal Procedure

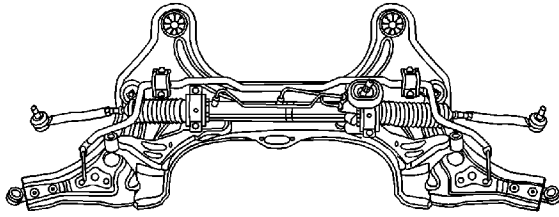


1. Remove the crossmember assembly. Refer to [Front Suspension Crossmember Replacement](#) .
2. Remove the stabilizer bar from the crossmember assembly by removing the U-clamp bolts.

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.





1. Install the U-clamps and the stabilizer bar to the crossmember.

**Tighten**

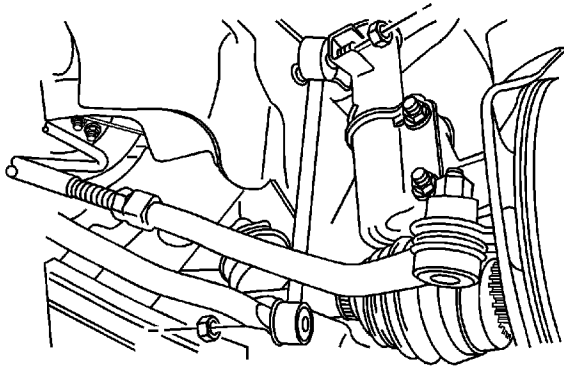
Tighten the U-clamp bolts to the crossmember assembly to 25 N·m (18 lb ft).

2. Install the crossmember assembly. Refer to [Front Suspension Crossmember Replacement](#) .

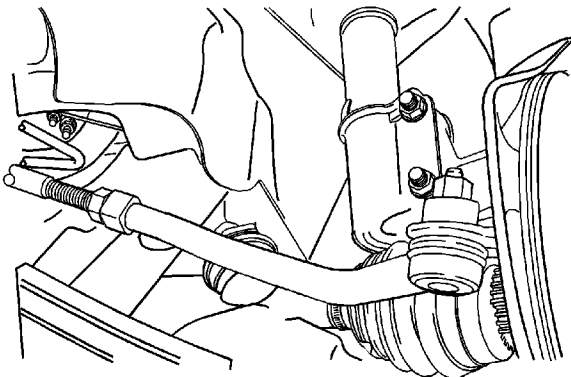
## Stabilizer Shaft Link Replacement

### Removal Procedure

**Notice:** Refer to [Vehicle Lifting and Jacking Notice](#) in the Preface section.



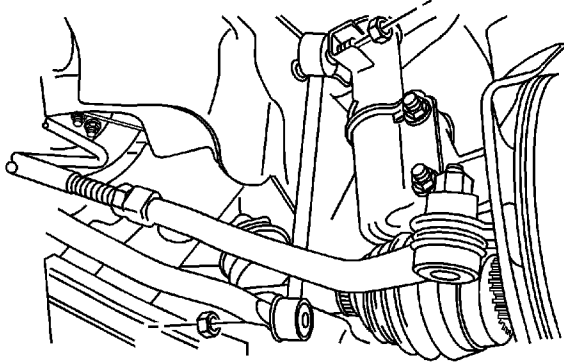
1. Lift and suitably support the vehicle, allowing the front suspension to hang free.
2. Remove the front wheel. Refer to [Tire and Wheel Removal and Installation](#) .
3. Remove the stabilizer shaft-to-knuckle nut and the shaft-to-link nut.



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4. Disconnect the stabilizer shaft from the knuckle by removing the stabilizer shaft link assembly.

## Installation Procedure



1. Install the stabilizer shaft into the vehicle.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

2. Install the stabilizer shaft-to-knuckle nut and the shaft-to-link nut.

### **Tighten**

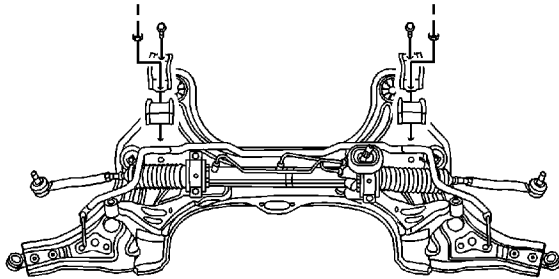
Tighten the stabilizer shaft link nuts to 50 N·m (37 lb ft).

3. Install the front wheel. Refer to [Tire and Wheel Removal and Installation](#).
4. Lower the vehicle.

## Stabilizer Shaft Insulator Replacement

### Removal Procedure

1. Raise and support the vehicle. Use jacks in order to support the front suspension crossmember. Refer to [Lifting and Jacking the Vehicle](#).

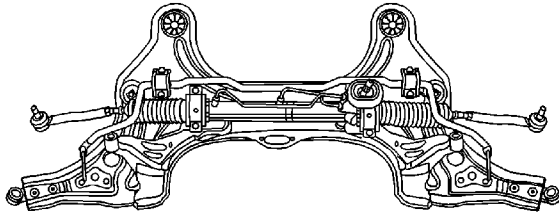


2. Lower the front suspension crossmember slightly in order to access the stabilizer shaft insulator brackets. Refer to [Front Suspension Crossmember Replacement](#).
3. Remove the bolts from the stabilizer shaft insulator brackets.
4. Remove the brackets from the stabilizer shaft insulators.
5. Remove the stabilizer shaft insulators.
6. Clean the stabilizer shaft.

### Installation Procedure

1. Install the insulators to the stabilizer shaft.
2. Install the brackets to the stabilizer shaft insulators.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



3. Install the bolts to the stabilizer shaft insulator brackets.

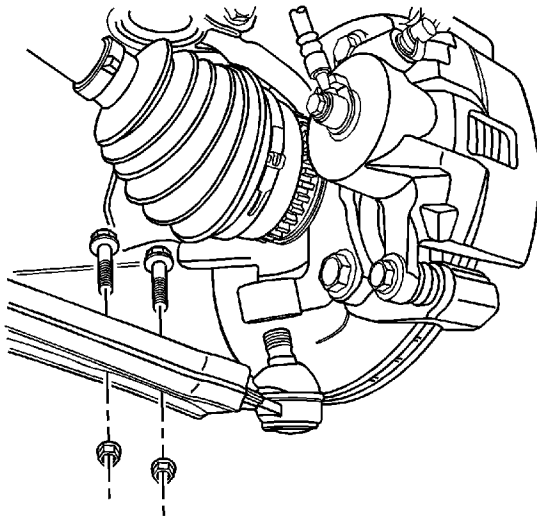
**Tighten**

Tighten the stabilizer shaft insulator bracket bolts to 25 N·m (18 lb ft).

4. Raise and install the front suspension crossmember. Refer to [Front Suspension Crossmember Replacement](#).
5. Remove the jacks and lower the vehicle.

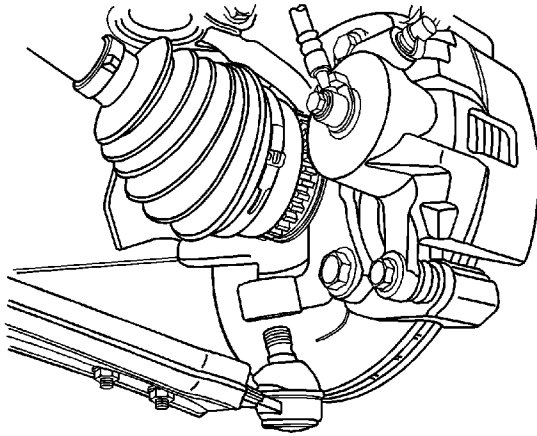
## Lower Control Arm Ball Joint Replacement

### Disassembly Procedure



1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Place the jackstands under the frame of the vehicle and lower the vehicle slightly so the weight of the vehicle rests on the frame and not on the control arms.
3. Remove the wheel. Refer to [Tire and Wheel Removal and Installation](#) .
4. Remove the control arm. Refer to [Control Arm Replacement](#) .
5. Remove the ball joint mounting nuts and bolts.

### Assembly Procedure



1. Connect the ball joint to the control arm with the mounting bolts.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

2. Install the nuts to secure the bolts from below the control arm.

#### **Tighten**

Tighten the ball joint-to-control arm nuts to 150 N·m (111 lb ft).

3. Install the control arm. Refer to [Control Arm Replacement](#) .
4. Install the front wheel. Refer to [Tire and Wheel Removal and Installation](#) .
5. Remove the jackstands.
6. Lower the vehicle.

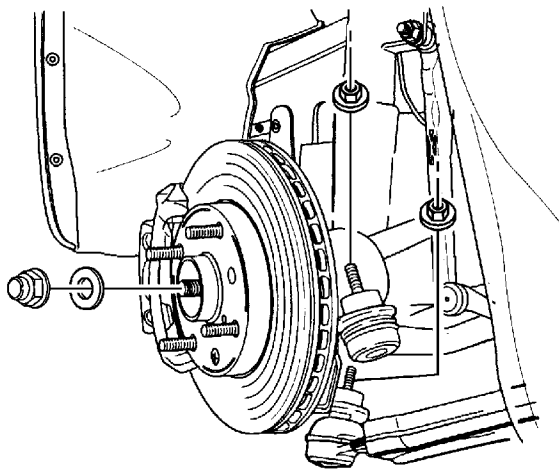
# Steering Knuckle Replacement

## Tools Required

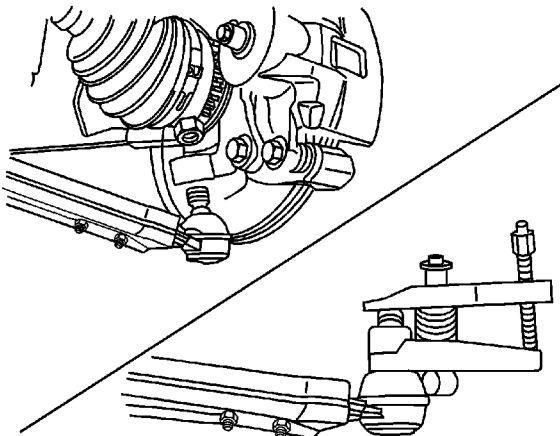
[KM-507-C](#) Ball Joint Remover

## Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the front wheels. Refer to [Tire and Wheel Removal and Installation](#) .



3. Remove the axle shaft caulking nut. Discard the nut.
4. Remove the lower ball joint nut.

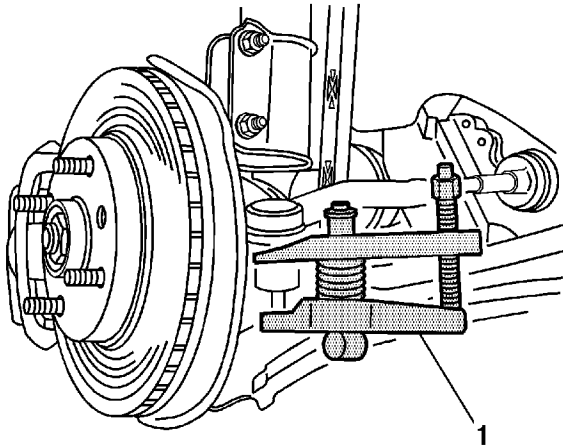






**Notice:** Use only the recommended tools for separating the ball joint from the knuckle. Failure to use the recommended tools may cause damage to the ball joint and seal.

5. Use the [KM-507-C](#) in order to separate the lower ball joint from the steering knuckle.
6. Remove the outer tie rod nut.

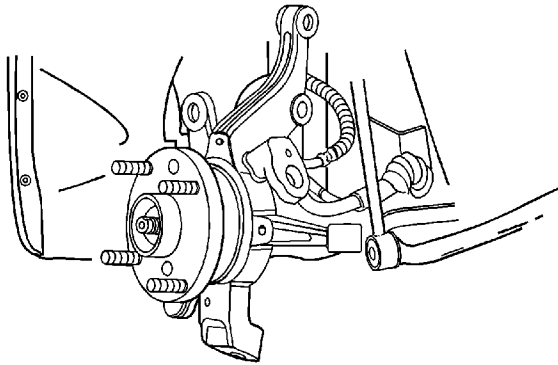


7. Use the [KM-507-C](#) (1) in order to separate the outer tie rod end from the steering knuckle.

**Notice:** Support the brake caliper with heavy mechanic wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may cause damage to the brake hose and in turn may cause a brake fluid leak.

**Important:** DO NOT disconnect the hydraulic brake flexible hose from the caliper.

8. Remove the brake caliper and the pads as an assembly and support the assembly with heavy mechanics wire, or equivalent. Verify there is no tension on the brake hose. Refer to [Brake Caliper Replacement](#) .
9. Remove the brake rotor. Refer to [Brake Rotor Replacement](#) .



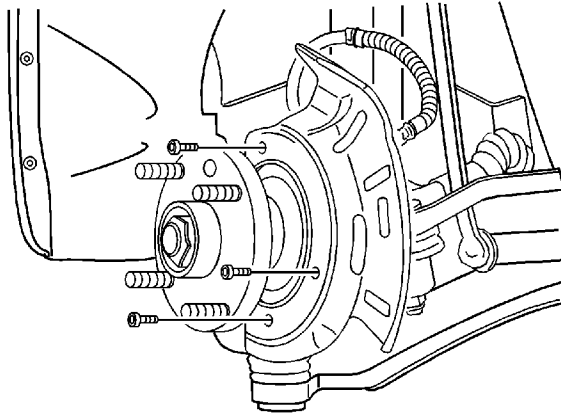
10. Remove the ABS wheel speed sensor, if equipped. Refer to [Front Wheel Speed Sensor Replacement](#) .
11. Remove the front strut nuts and bolts.

**Notice:** Do not overextend the wheel drive shaft. Allowing the inboard joint to overextend can cause separation of the internal components and lead to joint failure.

12. Support the wheel drive shaft.
13. Remove the knuckle assembly.
14. Remove the wheel hub, bearing and seal from the knuckle. Refer to [Wheel Hub, Bearing, Knuckle, and Seal Replacement](#) .
15. Remove the splash shield and the screws from the knuckle.

## **Installation Procedure**

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the splash shield to the knuckle with the screws.

#### **Tighten**

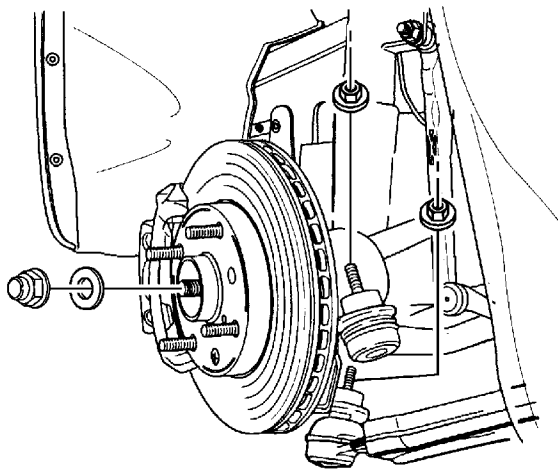
Tighten the splash shield-to-steering knuckle screws to 4 N·m (35 lb in).

2. Install the wheel hub, bearing and seal to the knuckle. Refer to [Wheel Hub, Bearing, Knuckle, and Seal Replacement](#).
3. Install the knuckle assembly to the front strut with the nuts and bolts.

#### **Tighten**

Tighten the knuckle assembly to the front strut with nuts and bolts to 100 N·m (74 lb ft).

4. Install the ABS wheel speed sensor. Refer to [Front Wheel Speed Sensor Replacement](#).
5. Install the brake rotor. Refer to [Brake Rotor Replacement](#).
6. Install the brake caliper. Refer to [Brake Caliper Replacement](#).





7. Install the lower ball joint to the steering knuckle.
8. Install the lower ball joint nut.

**Tighten**

Tighten the lower ball joint nut to 55 N·m (41 lb ft).

9. Install the outer tie rod end to the steering knuckle.
10. Install the outer tie rod nut.

**Tighten**

Tighten the outer tie rod nut to 45 N·m (33 lb ft).

11. Loosely install a NEW axle shaft caulking nut.
12. Tighten the axle shaft caulking nut.

**Tighten**

Tighten the axle shaft caulking nut to 300 N·m (221 lb ft).

13. Stake the caulking nut.
14. Install the front wheels. Refer to [Tire and Wheel Removal and Installation](#) .
15. Lower the vehicle.
16. Inspect the vehicle. Refer to [Preliminary Alignment Inspection](#) and to [Straight Ahead Inspection](#) .
17. Measure the wheel alignment.
18. If necessary, adjust the front toe. Refer to [Front Toe Adjustment](#) .

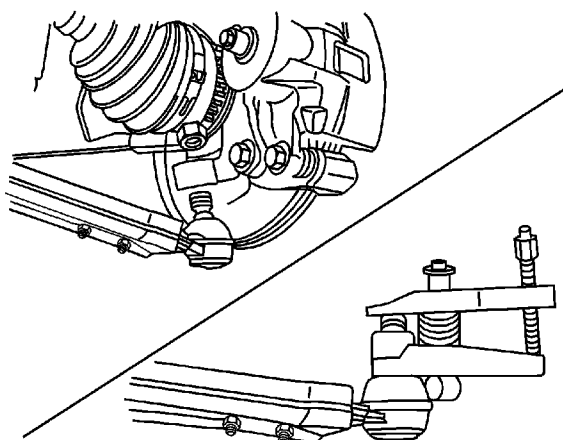
## Control Arm Replacement

### Tools Required

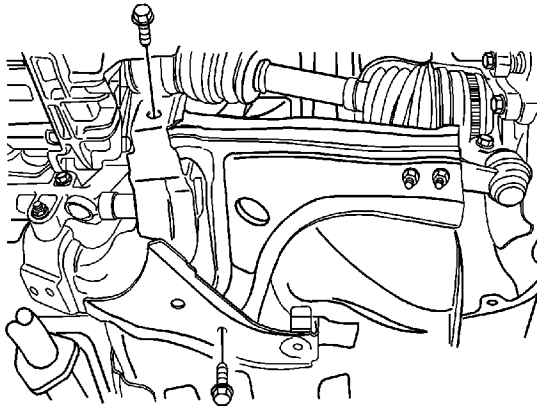
[KM-507-C](#) Ball Joint Remover

### Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Place the jackstands under the frame of the vehicle.
3. Lower the vehicle slightly so the weight of the vehicle rests on the frame and not on the control arms.
4. If the transaxle blocks access to the control arm front mounting bolt, use a jack in order to slightly raise the transaxle case.
5. Remove the front tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .
6. If equipped, disconnect the stabilizer shaft from the control arm by removing the control arm-link bolt assembly. Refer to [Stabilizer Shaft Replacement](#) .
7. If equipped, remove the retaining clip from the ball joint stud.

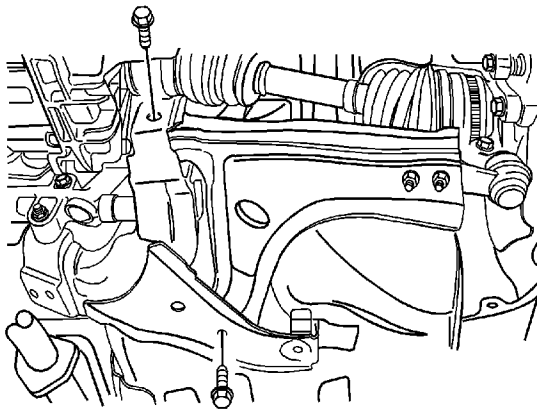


8. Remove the ball joint-to-knuckle nut from the ball joint stud.
9. Push the top of the ball joint seal down.
10. Position the bottom of the [KM-507-C](#) between the ball joint seal and the knuckle.
11. Disconnect the ball joint from the knuckle using the [KM-507-C](#) .



12. Remove the control arm front mounting bolt and lock washer.
13. Remove the control arm rear mounting bolt.
14. Remove the control arm from the vehicle.

## Installation Procedure



1. Install the control arm onto the vehicle.

**Important:** Do not tighten the control arm bolts at this point.

2. Install the control arm front mounting bolt and lock washer.
3. Apply a thread sealer to the control arm rear mounting bolt.

4. Install the control arm rear mounting bolt.

**Notice:** Use a new self-locking nut when installing the control arm link assembly. Failure to do so may allow the normal road and vehicle vibration to possibly loosen the nut and could cause vehicle handling concerns.

5. If equipped, install the stabilizer shaft link bolt assembly to the control arm. Refer to [Stabilizer Shaft Replacement](#).
6. Install the ball joint to the steering knuckle.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

7. Tighten the ball joint-to-knuckle nut.

#### **Tighten**

Tighten the ball joint-to-knuckle nut to 55 N·m (41 lb ft).

8. If equipped, install the retaining clip to the ball joint stud.
9. Install the front tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#).
10. Place the jackstands under the control arms.
11. Lower the vehicle onto the jackstands.

**Important:** The control arms must support the weight of the vehicle while the control arm mounting bolts are being tightened.

12. Tighten the control arm rear mounting bolts.

#### **Tighten**

Tighten the control arm rear mounting bolts to 110 N·m (81 lb ft).

13. Tighten the control arm front mounting bolt.

#### **Tighten**

Tighten the control arm front mounting bolt to 110 N·m (81 lb ft).

14. Remove the jackstands.
15. Lower the vehicle.

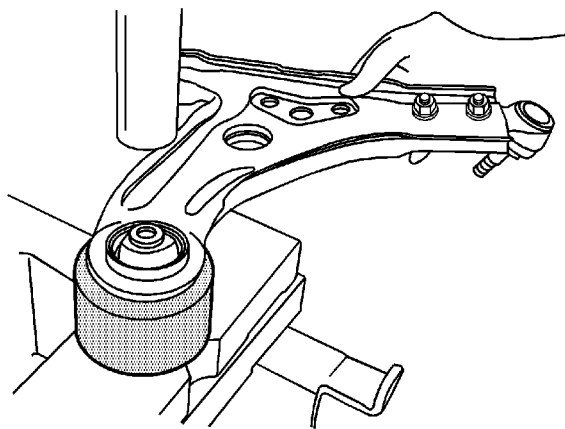
## Front Lower Control Arm Bushing Replacement

### Tools Required

- [CH-48358](#) Front Control Arm Rear Bushing Replacer
- [KM-158](#) Remover/Installer
- [KM-307-B](#) Removal Plate
- [KM-508-A](#) Control Arm Bushing Remover/Installer

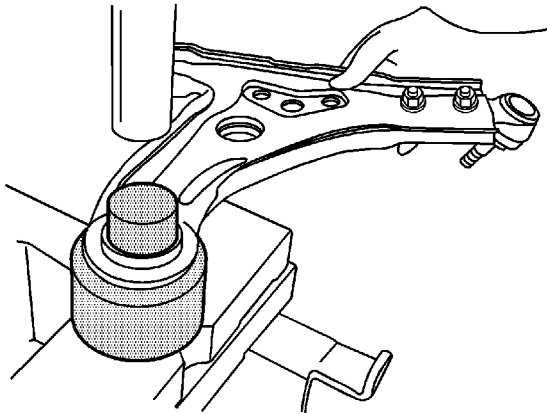
### Disassembly Procedure

1. Remove the front lower control arm assembly. Refer to [Control Arm Replacement](#) .
2. Note the location of the arrow on the rear bushing relative to the dot stamped on the control arm.
3. Note the location of the plus signs on the front bushing relative to the control arm.

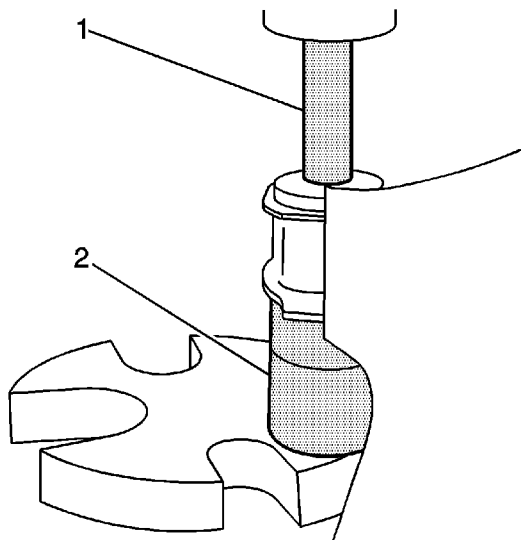


4. From the [CH-48358](#) kit, place the CH-48358-2 on a press.
5. Place the control arm assembly on the press. Position the rear bushing on the CH-48358-2.



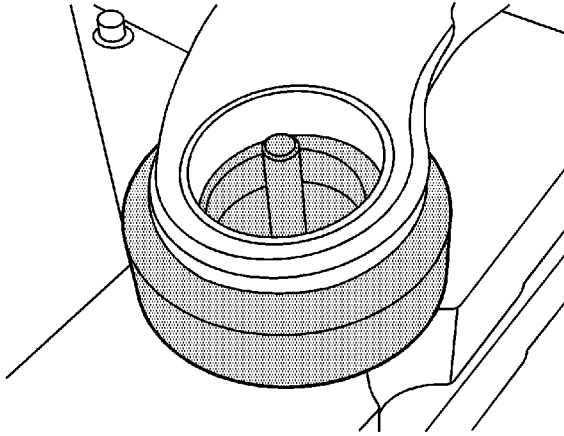


6. Place the CH-48358-1 on the front control arm rear bushing.
7. Use the press in order to remove the rear bushing.
8. Remove any dirt or burrs from the surface of the rear bushing hole.

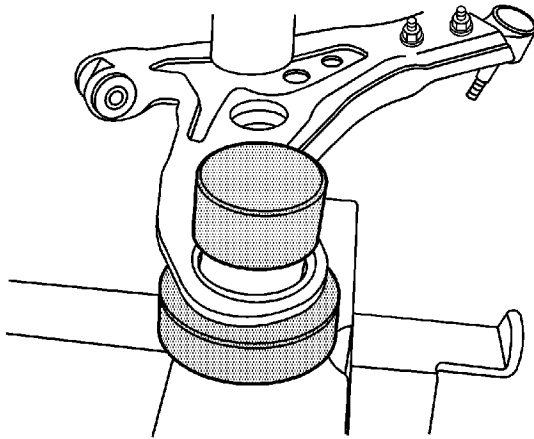


9. Place the [KM-307-B](#) on a press.
10. From the [KM-508-A](#) kit, place the KM-508-4 (2) on the [KM-307-B](#).
11. Place the control arm assembly on the press. Position the front control arm front bushing on the KM-508-4.
12. From the [KM-158](#) kit, place the KM-158-5 (1) on the front bushing.
13. Use the press in order to remove the front bushing.

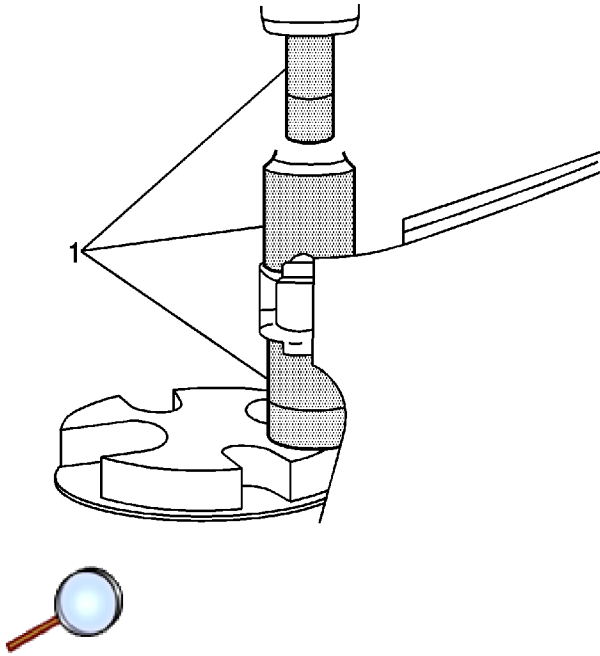
## Assembly Procedure



1. Place the CH-48358-4 on the press.
2. Position the control arm on the CH-48358-4.
3. Align the arrow on the rear bushing with the dot on the control arm.



4. Place a NEW rear bushing on the control arm.
5. Place the CH-48358-3 on the rear bushing.
6. Use the press in order to install the rear bushing.



7. Place the [KM-307-B](#) on a press.
8. From the [KM-508-A](#) kit (1), place the KM-508-4 on the [KM-307-B](#) .
9. Place the control arm on the KM-508-4.
10. Place the KM-508-2 on the control arm.
11. Coat the outside of the front bushing and the inside of the front bushing hole in the control arm with lubricant.
12. Place the front bushing in the KM-508-2. Align the plus signs on the bushing with the control arm.
13. Place the KM-508-3 on the front bushing.
14. Use the press in order to install the front bushing.
15. Center the front bushing.
16. Install the front lower control arm assembly. Refer to [Control Arm Replacement](#) .

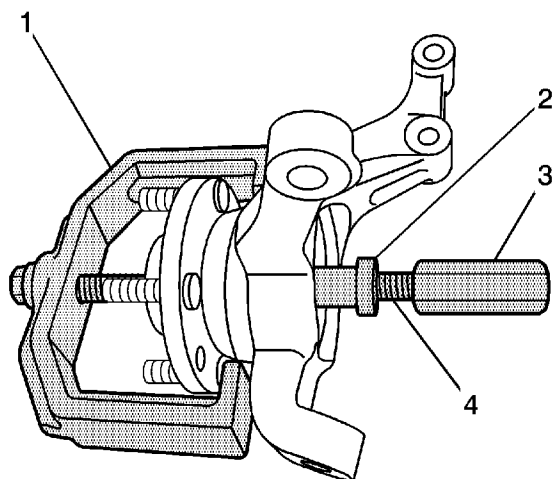
## Wheel Hub, Bearing, Knuckle, and Seal Replacement

### Tools Required

- [DT-47540](#) (DW340-120-01) Wheel Hub Replacer Adapter
- [DT-47541](#) (DW340-120-02) Wheel Bearing Remover Adapter
- [DT-47542](#) (DW340-120-03) Wheel Bearing Installer Adapter
- [DT-47543](#) (DW-340-120-04) Wheel Bearing Installer Adapter
- [J 21474-01](#) Control Arm Bushing Set
- [J 22912-B](#) Split Plate
- [J-37105-C](#) ( [CH-46560](#) ) (DW-340-040) Front Hub Service Set

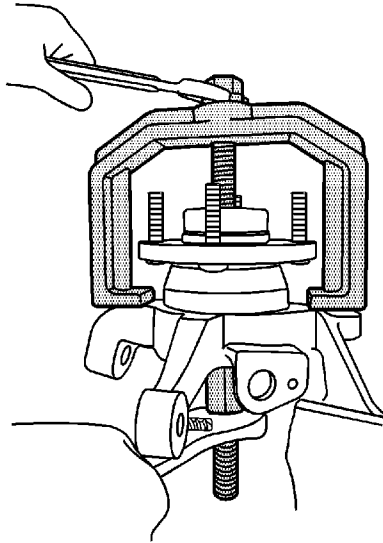
### Disassembly Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the wheel hub, bearing, knuckle, and brake shield as an assembly. Refer to [Steering Knuckle Replacement](#).
3. Use a vise in order to hold the knuckle assembly.
4. Remove the brake shield. Refer to [Front Brake Shield Replacement](#).

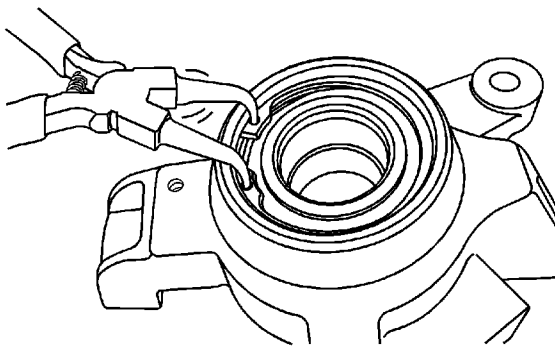


5. From the front hub service set [J-37105-C](#) ( [CH-46560](#) ) (DW-340-040), apply lubricant J-23444-A to the rod (4) J-36661-2 (CH-46560-04).
6. Insert the rod J-36661-2 (CH-46560-04) through the following:
  - 6.1. The bearing 217801 (CH-46560-06) (DW340-040-6)
  - 6.2. The bridge (1) J-37105-1 (CH-46560-01) (DW340-040-1)
  - 6.3. The hub

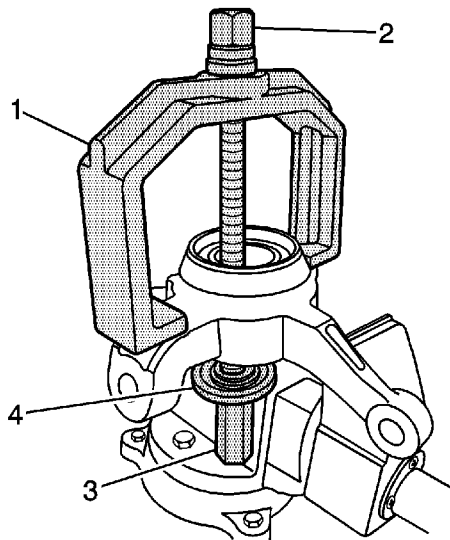
- 6.4. The adapter (2) [DT-47540](#) (DW340-120-01)
7. From either the control arm bushing set [J 21474-01](#) or the front hub service set [CH-46560](#) , install the nut (3) J-21474-4 (CH-46560-05) to the rod J-36661-2 (CH-46560-04).



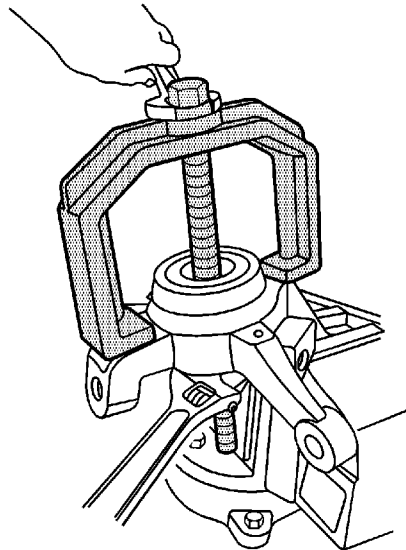
8. Remove the wheel hub from the wheel bearing.
9. Remove the special tools from the knuckle.
10. If necessary, use the split plate [J 22912-B](#) , or equivalent, and a hydraulic press in order to remove the bearing race from the hub.



11. Remove the retaining ring from the knuckle.



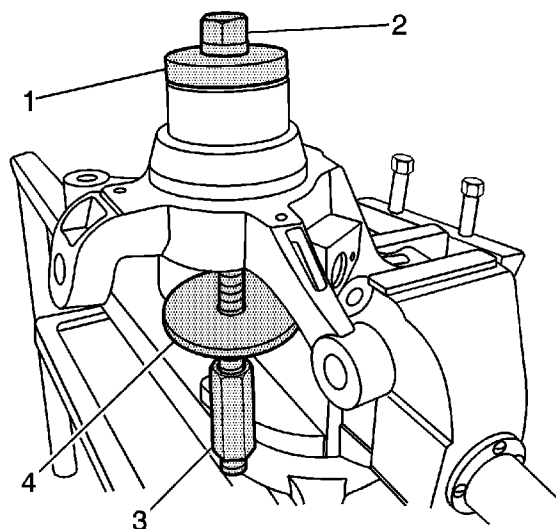
12. Insert the rod (2) J-36661-2 (CH-46560-04) through the following:
  - 12.1. The bearing 217801 (CH-46560-06) (DW340-040-6)
  - 12.2. The bridge (1) J-37105-1 (CH-46560-01) (DW340-040-1)
  - 12.3. The wheel bearing
  - 12.4. The adapter (4) [DT-47541](#) (DW340-120-02)
13. Install the nut (3) J-21474-4 (CH-46560-05) to the rod J-36661-2 (CH-46560-04).



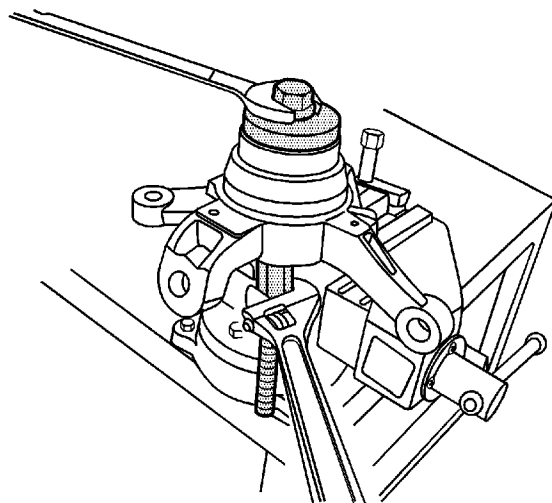
14. Remove the wheel bearing from the knuckle.
15. Remove the special tools from the knuckle.
16. Discard the wheel bearing.
17. Clean the bore of the knuckle.

## Assembly Procedure

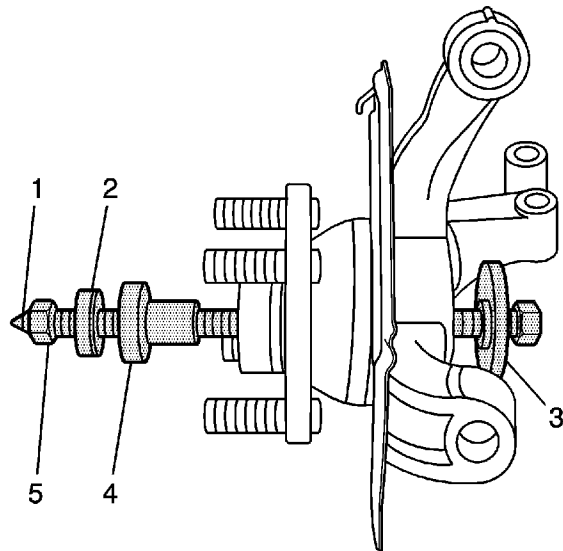
1. Use a vise in order to hold the steering knuckle.



2. Insert the rod (2) J-36661-2 (CH-46560-04) through the following:
  - 2.1. The bearing 217801 (CH-46560-06) (DW340-040-6)
  - 2.2. The adapter (1) [DT-47543](#) (DW-340-120-04)
  - 2.3. The NEW wheel bearing
  - 2.4. The adapter (4) [DT-47542](#) (DW340-120-03)
3. Install the nut (3) J-21474-4 (CH-46560-05) to the rod J-36661-2 (CH-46560-04).



4. Install the wheel bearing to the knuckle.
5. Remove the special tools from the knuckle.
6. Install the retaining ring to the knuckle.
7. Install the brake shield. Refer to [Front Brake Shield Replacement](#).



8. Insert the rod (1) J-36661-2 (CH-46560-04) through the following:
  - 8.1. The adapter (3) [DT-47541](#) (DW340-120-02)
  - 8.2. The hub
  - 8.3. The adapter (4) [DT-47540](#) (DW340-120-01)
  - 8.4. The bearing (2) 217801 (CH-46560-06) (DW340-040-6)
9. Install the nut (5) to the rod J-36661-2 (CH-46560-04).
10. Install the hub to the wheel bearing.
11. Remove the special tools from the knuckle.
12. Verify the hub rotates smoothly.
13. Install the wheel hub, bearing, knuckle, and brake shield as an assembly. Refer to [Steering Knuckle Replacement](#).
14. Lower the vehicle.



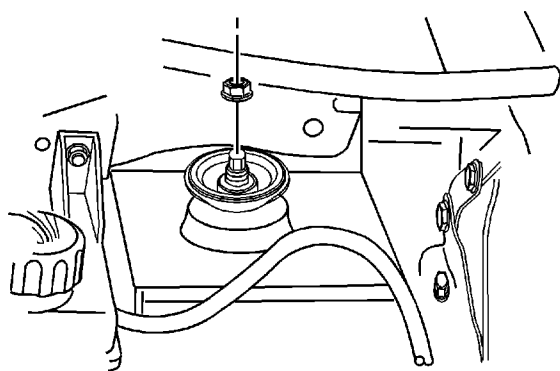
## Strut Assembly Replacement

### Tools Required

[J 42468](#) Front Strut Mount Nut Wrench

### Removal Procedure

1. Remove the strut nut cap, if equipped.

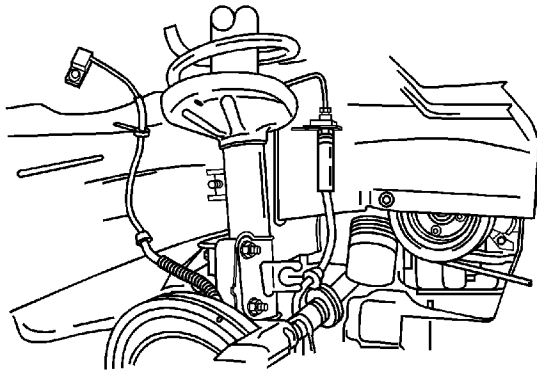


**Notice:** Do not allow the absorber rod to rotate during disassembly/reassembly. Use hand tools to keep the absorber rod from rotating. If air tools are used, and the rod is allowed to rotate, damage to the absorber may occur.

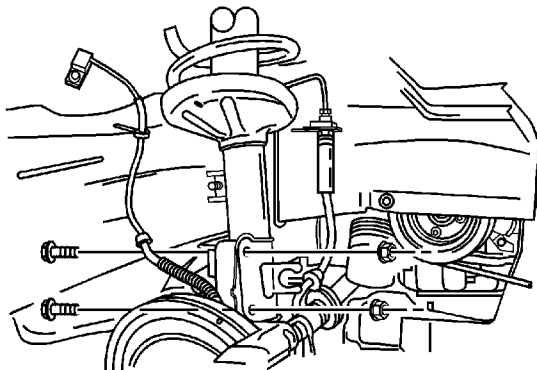
2. Use a wrench in order to hold the piston rod while loosening the strut assembly-to-body nut with the [J 42468](#) or equivalent.

**Important:** Raise and support the vehicle on a frame contact hoist, not on a suspension contact hoist. Support the front lower control arm with a jack stand near the ball joint in order to avoid overextending the CV joints and the brake hose.

3. Raise and support the vehicle in order to access the bottom and the top of the strut. Refer to [Lifting and Jacking the Vehicle](#).
4. Remove the front tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#).



5. Remove the ABS speed sensor wire, if equipped, from the strut bracket.
6. Remove the brake hose from the strut bracket.
7. Remove the stabilizer shaft link upper nut.
8. Remove the stabilizer shaft link upper stud from the strut bracket.



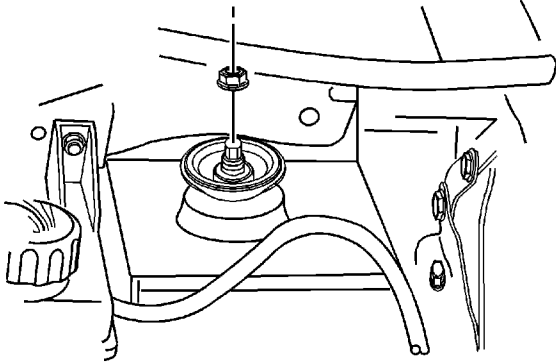
9. Remove the nuts and the bolts from the strut.
10. Remove the strut assembly-to-body nut with the [J 42468](#) or equivalent.

**Notice:** Care should be taken to avoid chipping or cracking the spring coating when handling the front suspension coil spring. Failure to observe this notice may result in spring breakage.

11. Remove the strut assembly from the vehicle.

## Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

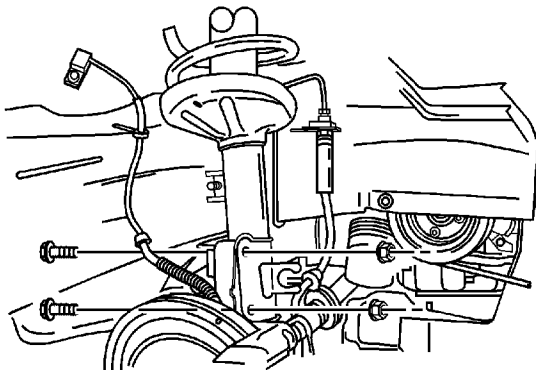


1. Install the strut assembly into the vehicle with the strut assembly-to-body nut. Use a wrench in order to hold the piston rod while tightening the nut with the [J 42468](#) or equivalent.

#### **Tighten**

Tighten the strut assembly-to-body nut to 60 N·m (44 lb ft).

2. Install the strut nut cap, if equipped.



3. Install the strut to the knuckle.
4. Install the nuts and the bolts to the strut.

**Tighten**

Tighten the knuckle-to-strut nuts and bolts to 100 N·m (74 lb ft).

5. Install the stabilizer shaft link upper stud to the strut bracket.
6. Install the stabilizer shaft link upper nut.

**Tighten**

Tighten the stabilizer shaft link upper nut to 50 N·m (37 lb ft).

7. Install the brake hose to the strut bracket.
8. Install the ABS speed sensor wire, if equipped, to the strut bracket.
9. Install the front tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .
10. Remove the jack stands and lower the vehicle.

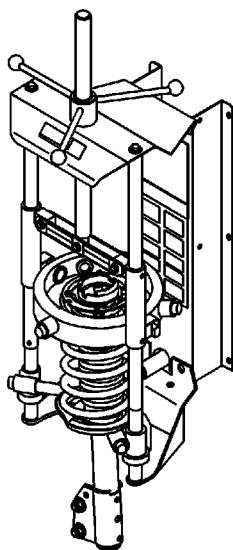
## Strut, Strut Component, and Spring Replacement

### Tools Required

- [J 45400](#) ( [KM-329-A](#) ) Strut Spring Compressor
- [J-44626](#) ( [SA9603E](#) ) Oxygen Sensor 22 mm Socket

### Disassembly Procedure

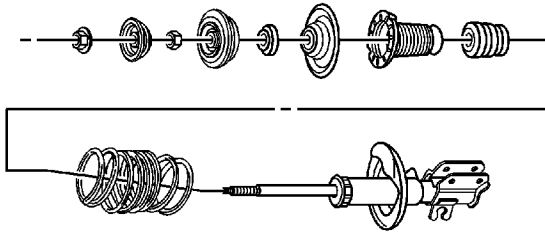
1. Remove the strut assembly. Refer to [Strut Assembly Replacement](#) .
2. Use paint in order to mark the position of the spring relative to the strut assembly-to-knuckle bracket.



3. Install the strut assembly to the [J 45400](#) ( [KM-329-A](#) ) or equivalent. Ensure the hooks are seated on the spring properly.
4. Compress the spring with the [J 45400](#) ( [KM-329-A](#) ) or equivalent.

**Notice:** Do not allow the absorber rod to rotate during disassembly/reassembly. Use hand tools to keep the absorber rod from rotating. If air tools are used, and the rod is allowed to rotate, damage to the absorber may occur.

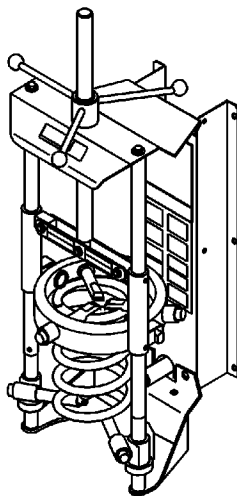
5. Use a wrench in order to hold the threaded piston rod while removing the piston rod nut with the [J-44626](#) ( [SA9603E](#) ) or equivalent.



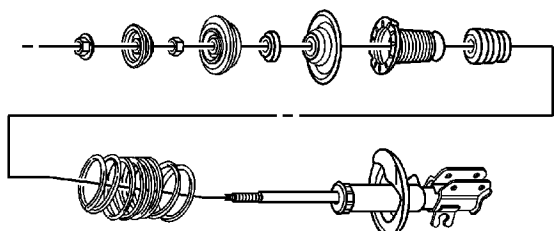
6. Remove the following components from the strut:

- The strut mount
- The strut mount bearing
- The spring upper seat
- The strut cartridge upper cover
- The bumper stop
- The coil spring

## Assembly Procedure



1. Install the spring to the [J 45400](#) ( [KM-329-A](#) ) or equivalent. Ensure the hooks are seated on the spring properly.
2. Compress the spring using the [J 45400](#) ( [KM-329-A](#) ) or equivalent.



**Important:** Locate the spring to the original position on the spring seat.

3. Align the match marks and install the spring to the strut.
4. Install the following components to the strut:
  - The bumper stop
  - The strut cartridge upper cover
  - The spring upper seat
  - The strut mount bearing
  - The strut mount

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

5. Use a wrench in order to hold the threaded piston rod while installing the piston rod nut with the [J-44626](#) ( [SA9603E](#) ) or equivalent.

### Tighten

Tighten the piston rod nut to 60 N·m (44 lb ft).

6. Remove the strut assembly from the [J 45400](#) ( [KM-329-A](#) ) or equivalent.
7. Install the strut assembly to the vehicle. Refer to [Strut Assembly Replacement](#) .

# GENERIC OBD-II TROUBLE CODES

## DTC CODES P0001 to P0099

P0010....'A' Camshaft Position Actuator Circuit (Bank 1)

P0011....'A' Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)

P0012....'A' Camshaft Position - Timing Over-Retarded (Bank 1)

P0013....'B' Camshaft Position - Actuator Circuit (Bank 1)

P0014....'B' Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)

P0015....'B' Camshaft Position -Timing Over-Retarded (Bank 1)

P0020....'A' Camshaft Position Actuator Circuit (Bank 2)

P0021....'A' Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)

P0022....'A' Camshaft Position - Timing Over-Retarded (Bank 2)

P0023....'B' Camshaft Position - Actuator Circuit (Bank 2)

P0024....'B' Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)

P0025....'B' Camshaft Position - Timing Over-Retarded (Bank 2)

P0030....HO2S Heater Control Circuit (Bank 1 Sensor 1)

P0031....HO2S Heater Control Circuit Low (Bank 1 Sensor 1)

P0032....HO2S Heater Control Circuit High (Bank 1 Sensor 1)

P0033....Turbo Charger Bypass Valve Control Circuit

P0034....Turbo Charger Bypass Valve Control Circuit Low

P0035....Turbo Charger Bypass Valve Control Circuit High

P0036....HO2S Heater Control Circuit (Bank 1 Sensor 2)

P0037....HO2S Heater Control Circuit Low (Bank 1 Sensor 2)

P0038....HO2S Heater Control Circuit High (Bank 1 Sensor 2)

P0042....HO2S Heater Control Circuit (Bank 1 Sensor 3)

P0043....HO2S Heater Control Circuit Low (Bank 1 Sensor 3)



P0044....HO2S Heater Control Circuit High (Bank 1 Sensor 3)

P0050....HO2S Heater Control Circuit (Bank 2....Sensor 1)

P0051....HO2S Heater Control Circuit Low (Bank 2 Sensor 1)

P0052....HO2S Heater Control Circuit High (Bank 2 Sensor 1)

P0056....HO2S Heater Control Circuit (Bank 2 Sensor 2)

P0057....HO2S Heater Control Circuit Low (Bank 2 Sensor 2)

P0058....HO2S Heater Control Circuit High (Bank 2 Sensor 2)

P0062....HO2S Heater Control Circuit (Bank 2 Sensor 3)

P0063....HO2S Heater Control Circuit Low (Bank 2 Sensor 3)

P0064....HO2S Heater Control Circuit High (Bank 2 Sensor 3)

P0065....Air Assisted Injector Control Range/Performance

P0066....Air Assisted Injector Control Circuit or Circuit Low

P0067....Air Assisted Injector Control Circuit High

P0070....Ambient Air Temperature Sensor Circuit

P0071....Ambient Air Temperature Sensor Range/Performance

P0072....Ambient Air Temperature Sensor Circuit Low Input

P0073....Ambient Air Temperature Sensor Circuit High Input

P0074....Ambient Air Temperature Sensor Circuit Intermittent

P0075....Intake Valve Control Solenoid Circuit (Bank 1)

P0076....Intake Valve Control Solenoid Circuit Low (Bank 1)

P0077....Intake Valve Control Solenoid Circuit High (Bank 1)

P0078....Exhaust Valve Control Solenoid Circuit (Bank 1)

P0079....Exhaust Valve Control Solenoid Circuit Low (Bank 1)

P0080....Exhaust Valve Control Solenoid Circuit High (Bank 1)

P0081....Intake valve Control Solenoid Circuit (Bank 2)

P0082....Intake Valve Control Solenoid Circuit Low (Bank 2)

P0083....Intake Valve Control Solenoid Circuit High (Bank 2)

P0084....Exhaust Valve Control Solenoid Circuit (Bank 2)

P0085....Exhaust Valve Control Solenoid Circuit Low (Bank 2)

P0086....Exhaust Valve Control Solenoid Circuit High (Bank 2)

P0100....Mass or Volume Air Flow Circuit

P0101....Mass or Volume Air Flow Circuit Range/Performance Problem

P0102....Mass or Volume Air Flow Circuit Low Input

P0103....Mass or Volume Air Flow Circuit High Input

P0104....Mass or Volume Air Flow Circuit Intermittent

P0105....Manifold Absolute Pressure/Barometric Pressure Circuit

P0106....Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance Problem

P0107....Manifold Absolute Pressure/Barometric Pressure Circuit Low Input

P0108....Manifold Absolute Pressure/Barometric Pressure Circuit High Input

P0109....Manifold Absolute Pressure/Barometric Pressure Circuit Intermittent

P0110....Intake Air Temperature Circuit

P0111....Intake Air Temperature Circuit Range/Performance Problem

P0112....Intake Air Temperature Circuit Low Input

P0113....Intake Air Temperature Circuit High Input

P0114....Intake Air Temperature Circuit Intermittent

P0115....Engine Coolant Temperature Circuit

P0116....Engine Coolant Temperature Circuit Range/Performance Problem

P0117....Engine Coolant Temperature Circuit Low Input

P0118....Engine Coolant Temperature Circuit High Input

P0119....Engine Coolant Temperature Circuit Intermittent

P0120....Throttle/Pedal Position Sensor/Switch A Circuit

P0121....Throttle/Pedal Position Sensor/Switch A Circuit Range/Performance Problem

P0122....Throttle/Pedal Position Sensor/Switch A Circuit Low Input

P0123....Throttle/Pedal Position Sensor/Switch A Circuit High Input

P0124....Throttle/Pedal Position Sensor/Switch A Circuit Intermittent

P0125....Insufficient Coolant Temperature for Closed Loop Fuel Control

P0126....Insufficient Coolant Temperature for Stable Operation

P0127....Intake Air Temperature Too High

P0128....Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

P0130....O2 Sensor Circuit (Bank 1 Sensor 1)

P0131....O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)

P0132....O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)

P0133....O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)

P0134....O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)

P0135....O2 Sensor Heater Circuit (Bank 1 Sensor 1)

P0136....O2 Sensor Circuit Malfunction (Bank 1 Sensor 2)

P0137....O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)

P0138....O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)

P0139....O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)

P0140....O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)

P0141....O2 Sensor Heater Circuit (Bank 1 Sensor 2)

P0142....O2 Sensor Circuit Malfunction (Bank 1 Sensor 3)

P0143....O2 Sensor Circuit Low Voltage (Bank 1 Sensor 3)

P0144....O2 Sensor Circuit High Voltage (Bank 1 Sensor 3)

P0145....O2 Sensor Circuit Slow Response (Bank 1 Sensor 3)

P0146....O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 3)

P0147....O2 Sensor Heater Circuit (Bank 1 Sensor 3)

P0148....Fuel Delivery Error

P0149....Fuel Timing Error

P0150....O2 Sensor Circuit (Bank 2 Sensor 1)

P0151....O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)

P0152....O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)

P0153....O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)

P0154....O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)

P0155....O2 Sensor Heater Circuit (Bank 2 Sensor 1)

P0156....O2 Sensor Circuit Malfunction (Bank 2 Sensor 2)

P0157....O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)

P0158....O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)

P0159....O2 Sensor Circuit Slow Response (Bank 2 Sensor 2)

P0160....O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2)

P0161....O2 Sensor Heater Circuit (Bank 2 Sensor 2)

P0162....O2 Sensor Circuit Malfunction (Bank 2 Sensor 3)

P0163....O2 Sensor Circuit Low Voltage (Bank 2 Sensor 3)

P0164....O2 Sensor Circuit High Voltage (Bank 2 Sensor 3)

P0165....O2 Sensor Circuit Slow Response (Bank 2 Sensor 3)

P0166....O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 3)

P0167....O2 Sensor Heater Circuit (Bank 2 Sensor 3)

P0168....Fuel Temperature Too High

P0169....Incorrect Fuel Composition

P0170....Fuel Trim (Bank 1)

P0171....System too Lean (Bank 1)

P0172....System too Rich (Bank 1)

P0173....Fuel Trim Malfunction (Bank 2)

P0174....System too Lean (Bank 2)

P0175....System too Rich (Bank 2)

P0176....Fuel Composition Sensor Circuit

P0177....Fuel Composition Sensor Circuit Range/Performance

P0178....Fuel Composition Sensor Circuit Low Input

P0179....Fuel Composition Sensor Circuit High Input

P0180....Fuel Temperature Sensor A Circuit

P0181....Fuel Temperature Sensor A Circuit Range/Performance

P0182....Fuel Temperature Sensor A Circuit Low Input

P0183....Fuel Temperature Sensor A Circuit High Input

P0184....Fuel Temperature Sensor A Circuit Intermittent

P0185....Fuel Temperature Sensor B Circuit

P0186....Fuel Temperature Sensor B Circuit Range/Performance

P0187....Fuel Temperature Sensor B Circuit Low Input

P0188....Fuel Temperature Sensor B Circuit High Input

P0189....Fuel Temperature Sensor B Circuit Intermittent

P0190....Fuel Rail Pressure Sensor Circuit

P0191....Fuel Rail Pressure Sensor Circuit Range/Performance

P0192....Fuel Rail Pressure Sensor Circuit Low Input

P0193....Fuel Rail Pressure Sensor Circuit High Input

P0194....Fuel Rail Pressure Sensor Circuit Intermittent

P0195....Engine Oil Temperature Sensor

P0196....Engine Oil Temperature Sensor Range/Performance

P0197....Engine Oil Temperature Sensor Low

P0198....Engine Oil Temperature Sensor High

P0199....Engine Oil Temperature Sensor Intermittent

P0200....Injector Circuit

P0201....Injector Circuit - Cylinder 1

P0202....Injector Circuit - Cylinder 2

P0203....Injector Circuit - Cylinder 3

P0204....Injector Circuit - Cylinder 4

P0205....Injector Circuit - Cylinder 5

P0206....Injector Circuit - Cylinder 6

P0207....Injector Circuit - Cylinder 7

P0208....Injector Circuit - Cylinder 8

P0209....Injector Circuit - Cylinder 9

P0210....Injector Circuit - Cylinder 1

P0211....Injector Circuit - Cylinder 11

P0212....Injector Circuit - Cylinder 12

P0213....Cold Start Injector 1

P0214....Cold Start Injector 2

P0215....Engine Shutoff Solenoid

P0216....Injector/Injection Timing Control Circuit

P0217....Engine Coolant Over Temperature Condition

P0218....Transmission Fluid Over Temperature Condition

P0219....Engine Over Speed Condition

P0220....Throttle/Pedal Position Sensor/Switch 'B' Circuit

P0221....Throttle/Pedal Position Sensor/Switch 'B' Circuit Range/Performance Problem

P0222....Throttle/Pedal Position Sensor/Switch 'B' Circuit Low Input

P0223....Throttle/Pedal Position Sensor/Switch 'B' Circuit High Input

P0224....Throttle/Pedal Position Sensor/Switch 'B' Circuit Intermittent

P0225....Throttle/Pedal Position Sensor/Switch 'C' Circuit

P0226....Throttle/Pedal Position Sensor/Switch 'C' Circuit Range/Performance Problem

P0227....Throttle/Pedal Position Sensor/Switch 'C' Circuit Low Input

P0228....Throttle/Pedal Position Sensor/Switch 'C' Circuit High Input

P0229....Throttle/Pedal Position Sensor/Switch 'C' Circuit Intermittent

P0230....Fuel Pump Primary Circuit

P0231....Fuel Pump Secondary Circuit Low

P0232....Fuel Pump Secondary Circuit High

P0233....Fuel Pump Secondary Circuit Intermittent

P0234....Turbo/Super Charger Overboost Condition

P0235....Turbo/Super Charger Boost Sensor 'A' Circuit

P0236....Turbo/Super Charger Boost Sensor 'A' Circuit Range/Performance

P0237....Turbo/Super Charger Boost Sensor 'A' Circuit Low

P0238....Turbo/Super Charger Boost Sensor 'A' Circuit High

P0239....Turbo/Super Charger Boost Sensor 'B' Circuit

P0240....Turbo/Super Charger Boost Sensor 'B' Circuit Range/Performance

P0241....Turbo/Super Charger Boost Sensor 'B' Circuit Low

P0242....Turbo/Super Charger Boost Sensor 'B' Circuit High

P0243....Turbo/Super Charger Wastegate Solenoid 'A'

P0244....Turbo/Super Charger Wastegate Solenoid 'A' Range/Performance

P0245....Turbo/Super Charger Wastegate Solenoid 'A' Low

P0246....Turbo/Super Charger Wastegate Solenoid 'A' High

P0247....Turbo/Super Charger Wastegate Solenoid 'B'

P0248....Turbo/Super Charger Wastegate Solenoid 'B' Range/Performance

P0249....Turbo/Super Charger Wastegate Solenoid 'B' Low

P0250....Turbo/Super Charger Wastegate Solenoid 'B' High

P0251....Injection Pump Fuel Metering Control 'A' (Cam/rotor/Injector)

P0252....Injection Pump Fuel Metering Control 'A' Range/Performance (Cam/Rotor/Injector)

P0253....Injection Pump Fuel Metering Control 'A' Low (Cam/Rotor/Injector)

P0254....Injection Pump Fuel Metering Control 'A' High (Cam/Rotor/Injector)

P0255....Injection Pump Fuel Metering Control 'A' Intermittent (Cam/Rotor/Injector)

P0256....Injection Pump Fuel Metering Control 'B' (Cam/Rotor/Injector)

P0257....Injection Pump Fuel Metering Control 'B' Range/Performance (Cam/Rotor/Injector)

P0258....Injection Pump Fuel Metering Control 'B' Low (Cam/Rotor/Injector)

P0259....Injection Pump Fuel Metering Control 'B' High (Cam/Rotor/Injector)

P0260....Injection Pump Fuel Metering Control 'B' Intermittent (Cam/Rotor/Injector)

P0261....Cylinder 1 Injector Circuit Low

P0262....Cylinder 1 Injector Circuit High

P0263....Cylinder 1 Contribution/Balance

P0264....Cylinder 2 Injector Circuit Low

P0265....Cylinder 2 Injector Circuit High

P0266....Cylinder 2 Contribution/Balance

P0267....Cylinder 3 Injector Circuit Low

P0268....Cylinder 3 Injector Circuit High

P0269....Cylinder 4....Contribution/Balance

P0270....Cylinder 4 Injector Circuit Low



P0271....Cylinder 4 Injector Circuit High  
P0272....Cylinder 4 Contribution/Balance  
P0273....Cylinder 5 Injector Circuit Low  
P0274....Cylinder 5 Injector Circuit High  
P0275....Cylinder 5 Contribution/Balance  
P0276....Cylinder 6....Injector Circuit Low  
P0277....Cylinder 6....Injector Circuit High  
P0278....Cylinder 6 Contribution/Balance  
P0279....Cylinder 7 Injector Circuit Low  
P0280....Cylinder 7 Injector Circuit High  
P0281....Cylinder 7 Contribution/Balance  
P0282....Cylinder 8 Injector Circuit Low  
P0283....Cylinder 8 Injector Circuit High  
P0284....Cylinder 8 Contribution/Balance  
P0285....Cylinder 9 Injector Circuit Low  
P0286....Cylinder 9 Injector Circuit High  
P0287....Cylinder 9 Contribution/Balance  
P0288....Cylinder 10....Injector Circuit Low  
P0289....Cylinder 10....Injector Circuit High  
P0290....Cylinder 10....Contribution/Balance  
P0291....Cylinder 11 Injector Circuit Low  
P0292....Cylinder 11 Injector Circuit High  
P0293....Cylinder 11 Contribution/Balance  
P0294....Cylinder 12 Injector Circuit Low  
P0295....Cylinder 12 Injector Circuit High

P0296....Cylinder 12 Contribution/Balance

P0298....Engine Oil Over Temperature

P0300....Random/Multiple Cylinder Misfire Detected

P0301....Cylinder 1 Misfire Detected

P0302....Cylinder 2 Misfire Detected

P0303....Cylinder 3 Misfire Detected

P0304....Cylinder 4 Misfire Detected

P0305....Cylinder 5 Misfire Detected

P0306....Cylinder 6 Misfire Detected

P0307....Cylinder 7 Misfire Detected

P0308....Cylinder 8 Misfire Detected

P0309....Cylinder 9 Misfire Detected

P0310....Cylinder 10....Misfire Detected

P0311....Cylinder 11 Misfire Detected

P0312....Cylinder 12 Misfire Detected

P0313....Misfire Detected with Low Fuel

P0314....Single Cylinder Misfire (Cylinder not Specified)

P0320....Ignition/Distributor Engine Speed Input Circuit

P0321....Ignition/Distributor Engine Speed Input Circuit Range/Performance

P0322....Ignition/Distributor Engine Speed Input Circuit No Signal

P0323....Ignition/Distributor Engine Speed Input Circuit Intermittent

P0324....Knock Control System Error

P0325....Knock Sensor 1 Circuit (Bank 1 or Single Sensor)

P0326....Knock Sensor 1 Circuit Range/Performance (Bank 1 or Single Sensor)

P0327....Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)

P0328....Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)

P0329....Knock Sensor 1 Circuit Input Intermittent (Bank 1 or Single Sensor)

P0330....Knock Sensor 2 Circuit (Bank 2)

P0331....Knock Sensor 2 Circuit Range/Performance (Bank 2)

P0332....Knock Sensor 2 Circuit Low Input (Bank 2)

P0333....Knock Sensor 2 Circuit High Input (Bank 2)

P0334....Knock Sensor 2 Circuit Input Intermittent (Bank 2)

P0335....Crankshaft Position Sensor A Circuit

P0336....Crankshaft Position Sensor A Circuit Range/Performance

P0337....Crankshaft Position Sensor A Circuit Low Input

P0338....Crankshaft Position Sensor A Circuit High Input

P0339....Crankshaft Position Sensor A Circuit Intermittent

P0340....Camshaft Position Sensor 'A' Circuit (Bank 1 or Single Sensor)

P0341 Camshaft Position Sensor 'A' Circuit Range/Performance (Bank 1 or Single Sensor)

P0342....Camshaft Position Sensor 'A' Circuit Low Input (Bank 1 or Single Sensor)

P0343....Camshaft Position Sensor 'A' Circuit High Input (Bank 1 or Single Sensor)

P0344....Camshaft Position Sensor 'A' Circuit Intermittent (Bank 1 or Single Sensor)

P0345....Camshaft Position Sensor 'A' Circuit (Bank 2)

P0346....Camshaft Position Sensor 'A' Circuit Range/Performance (Bank 2)

P0347 ....Camshaft Position Sensor 'A' Circuit Low Input (Bank 2)

P0348....Camshaft Position Sensor 'A' Circuit High Input (Bank 2)

P0349....Camshaft Position Sensor 'A' Circuit Intermittent (Bank 2)

P0350....Ignition Coil Primary/Secondary Circuit

P0351 ....Ignition Coil 'A' Primary/Secondary Circuit

P0352....Ignition Coil 'B' Primary/Secondary Circuit

P0353....Ignition Coil 'C' Primary/Secondary Circuit

P0354....Ignition Coil 'D' Primary/Secondary Circuit

P0355....Ignition Coil 'F' Primary/Secondary Circuit

P0356....Ignition Coil 'F' Primary/Secondary Circuit

P0357....Ignition Coil 'G' Primary/Secondary Circuit

P0358....Ignition Coil 'H' Primary/Secondary Circuit

P0359....Ignition Coil 'I' Primary/Secondary Circuit

P0360....Ignition Coil 'J' Primary/Secondary Circuit

P0361....Ignition Coil 'K' Primary/Secondary Circuit

P0362....Ignition Coil 'L' Primary/Secondary Circuit

P0365....Camshaft Position Sensor 'B' Circuit (Bank 1)

P0366....Camshaft Position Sensor 'B' Circuit Range/Performance (Bank 1)

P0367....Camshaft Position Sensor 'B' Circuit Low Input (Bank 1)

P0368....Camshaft Position Sensor 'B' Circuit High Input (Bank 1)

P0369....Camshaft Position Sensor 'B' Circuit Intermittent (Bank 1)

P0370....Timing Reference High Resolution Signal 'A'

P0371....Timing Reference High Resolution Signal 'A' Too Many Pulses

P0372....Timing Reference High Resolution Signal 'A' Too Few Pulses

P0373....Timing Reference High Resolution Signal 'A' Intermittent/Erratic Pulses

P0374....Timing Reference High Resolution Signal 'A' No Pulse

P0375....Timing Reference High Resolution Signal 'B'

P0376....Timing Reference High Resolution Signal 'B' Too Many Pulses

P0377....Timing Reference High Resolution Signal 'B' Too Few Pulses

P0378....Timing Reference High Resolution Signal 'B' Intermittent/Erratic Pulses

P0379....Timing Reference High Resolution Signal 'B' No Pulses

P0380....Glow Plug/Heater Circuit 'A'

P0381....Glow Plug/Heater Indicator Circuit

P0382....Glow Plug/Heater Circuit 'B'

P0385....Crankshaft Position Sensor 'B' Circuit

P0386....Crankshaft Position Sensor 'B' Circuit Range/Performance

P0387....Crankshaft Position Sensor 'B' Circuit Low Input

P0388....Crankshaft Position Sensor 'B' Circuit High Input

P0389....Crankshaft Position Sensor 'B' Circuit Intermittent

P0390....camshaft Position Sensor 'B' Circuit

P0391....Camshaft Position Sensor 'B' circuit Range/Performance (Bank 2)

P0392....Camshaft Position Sensor 'B' Circuit Low Input (Bank 2)

P0393....Camshaft Position Sensor 'B' Circuit High Input (Bank 2)

P0394....Camshaft Position Sensor 'B' Circuit Intermittent (Bank 2)

P0400....Exhaust Gas Recirculation Flow

P0401....Exhaust Gas Recirculation Flow Insufficient Detected

P0402....Exhaust Gas Recirculation Flow Excessive Detected

P0403....Exhaust Gas Recirculation Control Circuit

P0404....Exhaust Gas Recirculation Control Circuit Range/Performance

P0405....Exhaust Gas Recirculation Sensor 'A' Circuit Low

P0406....Exhaust Gas Recirculation Sensor 'A' Circuit High

P0407....Exhaust Gas Recirculation Sensor 'B' Circuit Low

P0408....Exhaust Gas Recirculation Sensor 'B' Circuit High

P0409....Exhaust Gas Recirculation Sensor 'A' Circuit

P0410....Secondary Air Injection System

P0411....Secondary Air Injection System Incorrect Flow Detected

P0412....Secondary Air Injection System Switching Valve 'A' Circuit

P0413....Secondary Air Injection System Switching Valve 'A' Circuit Open

P0414....Secondary Air Injection System Switching Valve 'A' Circuit Shorted

P0415....Secondary Air Injection System Switching Valve 'B' Circuit

P0416....secondary Air Injection System Switching Valve 'B' Circuit Open

P0417....secondary Air Injection System Switching Valve 'B' Circuit Shorted

P0416....Secondary Air Injection System Relay 'A' Circuit

P0419....Secondary Air injection System Relay 'B' Circuit

P0420....Catalyst System Efficiency Below Threshold (Bank 1)

P0421....Warm Up Catalyst Efficiency Below Threshold (Bank 1)

P0422....Main Catalyst Efficiency Below Threshold (Bank 1)

P0423....Heated Catalyst Efficiency Below Threshold (Bank 1)

P0424....Heated Catalyst Temperature Below Threshold (Bank 1)

P0425....Catalyst Temperature Sensor (Bank 1)

P0426....Catalyst Temperature Sensor Range/Performance (Bank 1)

P0427....Catalyst Temperature Sensor Low Input (Bank 1)

P0428....Catalyst Temperature Sensor High Input (Bank 1)

P0429....Catalyst Heater Control Circuit (Bank 1)

P0430....Catalyst System Efficiency Below Threshold (Bank 2)

P0431....Warm Up Catalyst Efficiency Below Threshold (Bank 2)

P0432....Main Catalyst Efficiency Below Threshold (Bank 2)

P0433....Heated Catalyst Efficiency Below Threshold (Bank 2)

P0434....Heated Catalyst Temperature Below Threshold (Bank 2)

P0435....Catalyst Temperature Sensor (Bank 2)

P0436....Catalyst Temperature Sensor Range/Performance (Bank 2)

P0437....Catalyst Temperature Sensor Low Input (Bank 2)

P0438....Catalyst Temperature Sensor High Input (Bank 2)

P0439....Catalyst Heater Control Circuit (Bank 2)

P0440....Evaporative Emission Control System

P0441....Evaporative Emission Control System Incorrect Purge Flow

P0442....Evaporative Emission Control System Leak Detected (small leak)

P0443....Evaporative Emission Control System Purge Control Valve Circuit

P0444....Evaporative Emission Control System Purge Control Valve Circuit Open

P0445....Evaporative Emission Control System Purge Control Valve Circuit Shorted

P0446....Evaporative Emission Control System Vent Control Circuit

P0447....Evaporative Emission Control System Vent Control Circuit Open

P0448....Evaporative Emission Control System Vent Control Circuit Shorted

P0449....Evaporative Emission Control System Vent Valve/Solenoid Circuit

P0450....Evaporative Emission Control System Pressure Sensor

P0451....Evaporative Emission Control System Pressure Sensor Range/Performance

P0452....Evaporative Emission Control System Pressure Sensor Low Input

P0453....Evaporative Emission Control System Pressure Sensor High input

P0454....Evaporative Emission Control System Pressure Sensor Intermittent

P0455....Evaporative Emission Control System Leak Detected (gross leak)

P0456....Evaporative Emission Control System Leak Detected (very small leak)

P0457....Evaporative Emission Control System Leak Detected (fuel cap loose/off)

P0460....Fuel Level Sensor Circuit

P0461....Fuel Level Sensor Circuit Range/Performance

P0462....Fuel Level Sensor Circuit Low Input

P0463....Fuel Level Sensor Circuit High Input

P0464....Fuel Level Sensor Circuit Intermittent

P0465....EVAP Purge Flow Sensor Circuit

P0466....EVAP Purge Flow Sensor Circuit Range/Performance

P0467....EVAP Purge Flow Sensor Circuit Low Input

P0468....EVAP Purge Flow Sensor Circuit High Input

P0469....EVAP Purge Flow Sensor Circuit Intermittent

P0470....Exhaust Pressure Sensor

P0471....Exhaust Pressure Sensor Range/Performance

P0472....Exhaust Pressure Sensor Low

P0473....Exhaust Pressure Sensor High

P0474....Exhaust Pressure Sensor Intermittent

P0475....Exhaust Pressure Control Valve

P0476....Exhaust Pressure Control Valve Range/Performance

P0477....Exhaust Pressure Control Valve Low

P0478....Exhaust Pressure Control Valve High

P0479....Exhaust Pressure Control Valve Intermittent

P0480....Cooling Fan 1 Control Circuit

P0481....Cooling Fan 2 Control Circuit

P0482....Cooling Fan 3 Control Circuit

P0483....Cooling Fan Rationality Check

P0484....Cooling Fan Circuit Over Current

P0485....Cooling Fan Power/Ground Circuit

P0486....Exhaust Gas Recirculation Sensor 'B' Circuit

P0487....Exhaust Gas Recirculation Throttle Position Control Circuit

P0488....Exhaust Gas Recirculation Throttle Position Control Range/Performance



P0491....Secondary Air Injection System (Bank 1)

P0492....Secondary Air Injection System (Bank

P0500....Vehicle Speed Sensor

P0501....Vehicle Speed Sensor Range/Performance

P0502....Vehicle Speed Sensor Circuit Low Input

P0503....Vehicle Speed Sensor Intermittent/Erratic/High

P0505....Idle Control System

P0506....Idle Control System RPM Lower Than Expected

P0507....Idle Control System RPM Higher Than Expected

P0508....Idle Control System Circuit Low

P0509....Idle Control System Circuit High

P0510....Closed Throttle Position Switch

P0512....Starter Request Circuit

P0513....Incorrect Immobilizer Key

P0515....Battery Temperature Sensor Circuit

P0516....Battery Temperature Sensor Circuit Low

P0517....Battery Temperature Sensor Circuit High

P0520....Engine Oil Pressure Sensor/Switch Circuit

P0521....Engine Oil Pressure Sensor/Switch Range/Performance

P0522....Engine Oil Pressure Sensor/Switch Low Voltage

P0523....Engine Oil Pressure Sensor/Switch High Voltage

P0524....Engine Oil Pressure Too Low

P0530....A/C Refrigerant Pressure Sensor Circuit

P0531....A/C Refrigerant Pressure Sensor Circuit Range/Performance

P0532....A/C Refrigerant Pressure Sensor Circuit Low Input

P0533....A/C Refrigerant Pressure Sensor Circuit High Input

P0534....Air Conditioner Refrigerant Charge Loss

P0540....Intake Air Heater Circuit

P0541....Intake Air Heater Circuit Low

P0542....Intake Air Heater Circuit High

P0544....Exhaust Gas Temperature Sensor Circuit (Bank 1)

P0545....Exhaust Gas Temperature Sensor Circuit Low (Bank 1)

P0546....Exhaust Gas Temperature Sensor Circuit High (Bank 1)

P0547....Exhaust Gas Temperature Sensor Circuit (Bank 2)

P0548....Exhaust Gas Temperature Sensor Circuit Low (Bank 2)

P0549....Exhaust Gas Temperature Sensor Circuit High (Bank 2)

P0550....Power Steering Pressure Sensor Circuit

P0551....Power Steering Pressure Sensor Circuit Range/Performance

P0552....Power Steering Pressure Sensor Circuit Low Input

P0553....Power Steering Pressure Sensor Circuit High Input

P0554....Power Steering Pressure Sensor Circuit Intermittent

P0560....System Voltage

P0561....System Voltage Unstable

P0562....System Voltage Low

P0563....System Voltage High

P0564....Cruise Control Multi-Function Input Signal

P0565....Cruise Control On Signal

P0566....Cruise Control Off Signal

P0567....Cruise Control Resume Signal

P0568....Cruise Control Set Signal

P0569....Cruise Control Coast Signal

P0570....Cruise Control Accel Signal

P0571....Cruise Control/Brake Switch A Circuit

P0572....Cruise Control/Brake Switch A Circuit Low

P0573....Cruise Control/Brake Switch A Circuit High

P0574....Cruise Control System - Vehicle Speed Too High

P0575....Cruise Control Input Circuit

P0576....Cruise Control Input Circuit Low

P0577....Cruise Control input Circuit High

P0600....Serial Communication Link

P0601....Internal Control Module Memory Check Sum Error

P0602....Control Module Programming Error

P0603....Internal Control Module Keep Alive Memory (KAM) Error

P0604....Internal Control Module Random Access Memory (RAM) Error

P0605....Internal Control Module Read Only Memory (ROM) Error

P0606....ECM/PCM Processor

P0607....Control Module Performance

P0608....Control Module VSS Output 'A'

P0609....Control Module VSS Output 'B'

P0610....Control Module Vehicle Options Error

P0615....Starter Relay Circuit

P0616....Starter Relay Circuit Low

P0617....Starter Relay Circuit High

P0618....Alternative Fuel Control Module KAM Error

P0619....Alternative Fuel Control Module RAM/ROM Error

P0620....Generator Control Circuit

P0621....Generator Lamp 'L' Terminal Control Circuit

P0622....Generator Field 'F' Terminal Control Circuit

P0623....Generator Lamp Control Circuit

P0624....Fuel Cap Lamp Control Circuit

P0630....VIN Not Programmed or Mismatch - ECM/PCM

P0631....VIN Not Programmed or Mismatch - TCM

P0635....Power Steering Control Circuit

P0836....Power Steering Control Circuit Low

P0637....Power Steering Control Circuit High

P0638....Throttle Actuator Control Range/Performance (Bank 1)

P0639....Throttle Actuator Control Range/Performance (Bank 2)

P0640....Intake Air Heater Control Circuit

P0645....A/C Clutch Relay Control Circuit

P0646....A/C Clutch Relay Control Circuit Low

P0647....A/C Clutch Relay Control Circuit High

P0648....Immobilizer Lamp Control Circuit

P0649....Speed Control Lamp Control Circuit

P0650....Malfunction Indicator Lamp (ML) Control Circuit

P0654....Engine RPM Output Circuit

P0655....Engine Hot Lamp Output Control Circuit

P0656....Fuel Level Output Circuit

P0660....Intake Manifold Tuning Valve Control Circuit (Bank 1)

P0661....Intake Manifold Tuning Valve Control Circuit Low (Bank 1)

P0662....Intake Manifold Tuning Valve Control Circuit High (Bank 1)

P0663....Intake Manifold Tuning Valve Control Circuit (Bank 2)

P0664....Intake Manifold Tuning Valve Control Circuit Low (Bank 2)

P0665....Intake Manifold Tuning Valve Control Circuit High (Bank 2)

P0700....Transmission Control System (MIL Request)

P0701....Transmission Control System Range/Performance

P0702....Transmission Control System Electrical

P0703....Torque Converter/Brake Switch B Circuit

P0704....Clutch Switch In put Circuit Malfunction

P0705....Transmission Range Sensor Circuit Malfunction (PRNDL Input)

P0706....Transmission Range Sensor Circuit Range/Performance

P0707....Transmission Range Sensor Circuit Low Input

P0708....Transmission Range Sensor Circuit High Input

P0709....Transmission Range Sensor Circuit intermittent

P0710....Transmission Fluid Temperature Sensor Circuit

P0711....Transmission Fluid Temperature Sensor Circuit Range/Performance

P0712....Transmission Fluid Temperature Sensor Circuit Low Input

P0713....Transmission Fluid Temperature Sensor Circuit High Input

P0714....Transmission Fluid Temperature Sensor Circuit Intermittent

P0715....Input/Turbine Speed Sensor Circuit

P0716....Input/Turbine Speed Sensor Circuit Range/Performance

P0717....Input/Turbine Speed Sensor Circuit No Signal

P0718....Input/Turbine Speed Sensor Circuit Intermittent

P0719....Torque Converter/Brake Switch B Circuit Low

P0720....Output Speed Sensor Circuit

P0721....Output Speed Sensor Circuit Range/Performance

P0722....Output Speed Sensor Circuit No Signal

P0723....Output Speed Sensor Circuit Intermittent

P0724....Torque Converter/Brake Switch B Circuit High

P0725....Engine Speed Input Circuit

P0726....Engine Speed Input Circuit Range/Performance

P0727....Engine Speed Input Circuit No Signal

P0728....Engine Speed Input Circuit Intermittent

P0730....Incorrect Gear Ratio

P0731....Gear 1 Incorrect Ratio

P0732....Gear 2 Incorrect Ratio

P0733....Gear 3 Incorrect Ratio

P0734....Gear 4 Incorrect Ratio

P0735....Gear 5 Incorrect Ratio

P0736....Reverse Incorrect Ratio

P0737....TCM Engine Speed Output Circuit

P0739....TCM Engine Speed Output Circuit Low

P0739....TCM Engine Speed Output Circuit High

P0740....Torque Converter Clutch Circuit

P0741....Torque Converter Clutch Circuit Performance or Stuck Off

P0742....Torque Converter Clutch Circuit Stuck On

P0743....Torque Converter Clutch Circuit Electrical

P0744....Torque Converter Clutch Circuit Intermittent

P0745....Pressure Control Solenoid 'A'

P0746....Pressure Control Solenoid 'A' Performance or Stuck Off

P0747....Pressure Control Solenoid 'A' Stuck On

P0748....Pressure Control Solenoid 'A' Electrical

P0749....Pressure Control Solenoid 'A' Intermittent

P0750....Shift Solenoid 'A'

P0751....Shift Solenoid 'A' Performance or Stuck Off

P0752....Shift Solenoid 'A' Stuck On

P0753....Shift Solenoid 'A' Electrical

P0754....Shift Solenoid 'A' Intermittent

P0765....Shift Solenoid 'B'

P0756....Shift Solenoid 'B' Performance or Stuck Off

P0757....Shift Solenoid 'B' Stuck On

P0758....Shift Solenoid 'B' Electrical

P0759....Shift Solenoid 'B' Intermittent

P0760....Shift Solenoid 'C'

P0761....Shift Solenoid 'C' Performance or Stuck Off

P0762....Shift Solenoid 'C' Stuck On

P0763....Shift Solenoid 'C' Electrical

P0764....Shift Solenoid 'C' Intermittent

P0765....Shift Solenoid 'C'

P0766....Shift Solenoid 'D' Performance or Stuck Off

P0767....Shift Solenoid 'D' Stuck On

P0768....Shift Solenoid 'D' Electrical

P0769....Shift Solenoid 'D' Intermittent

P0770....Shift Solenoid 'E'

P0771....Shift Solenoid 'E' Performance or Stuck Off

P0772....Shift Solenoid 'E' Stuck On

P0773....Shift Solenoid 'E' Electrical

P0774....Shift Solenoid 'E' Intermittent

P0775....Pressure Control Solenoid 'B'

P0776....Pressure Control Solenoid 'B' Performance or Stuck Off

P0777....Pressure Control Solenoid 'B' Stuck On

P0778....Pressure Control Solenoid 'B' Electrical

P0779....Pressure Control Solenoid 'B' Intermittent

P0780....Shift

P0781....1-2 Shift

P0782....2-3 Shift

P0783....3-4 Shift

P0784....4-5 Shift

P0785....Shift/Timing Solenoid

P0786....Shift/Timing Solenoid Range/Performance

P0787....Shift/Timing Solenoid Low

P0788....Shift/Timing Solenoid High

P0789....Shift/Timing Solenoid Intermittent

P0790....Normal/Performance Switch Circuit

P0791....Intermediate Shaft Speed Sensor Circuit

P0792....Intermediate Shaft Speed Sensor Circuit Range/Performance

P0793....Intermediate Shaft Speed Sensor Circuit No Signal

P0794....Intermediate Shaft Speed Sensor Circuit Intermittent

P0795....Pressure Control Solenoid 'C'

P0796....Pressure Control Solenoid 'C' Performance or Stuck off

P0797....Pressure Control Solenoid 'C' Stuck On



P0798....Pressure Control Solenoid 'C' Electrical

P0799....Pressure Control Solenoid 'C' Intermittent

P0801....Reverse Inhibit Control Circuit

P0803....1-4 Upshift (Skip Shift) Solenoid Control Circuit

P0804....1-4 Upshift (Skip Shift) Lamp Control Circuit

P0805....Clutch Position Sensor Circuit

P0806....Clutch Position Sensor Circuit Range/Performance

P0807....Clutch Position Sensor Circuit Low

P0808....Clutch Position Sensor Circuit High

P0809....Clutch Position Sensor Circuit Intermittent

P0810....Clutch Position Control Error

P0811....Excessive Clutch Slippage

P0812....Reverse Input Circuit

P0813....Reverse Output Circuit

P0814....Transmission Range Display Circuit

P0815....Upshift Switch Circuit

P0816....Downshift Switch Circuit

P0817....Starter Disable Circuit

P0818....Driveline Disconnect Switch Input Circuit

P0820....Gear Lever X-Y Position Sensor Circuit

P0821....Gear Lever X Position Circuit

P0822....Gear Lever Y Position Circuit

P0823....Gear Lever X Position Circuit Intermittent

P0824....Gear Lever Y Position Circuit Intermittent

P0825....Gear Lever Push-Pull Switch (Shift Anticipate)

P0830....Clutch Pedal Switch 'A' Circuit

P0831....Clutch Pedal Switch 'A' Circuit Low

P0832....Clutch Pedal Switch 'A' Circuit High

P0833....Clutch Pedal Switch 'B' Circuit

P0834....Clutch Pedal Switch 'B' Circuit Low

P0835....Clutch Pedal Switch 'B' Circuit High

P0836....Four Wheel Drive (4WD) Switch Circuit

P0837....Four Wheel Drive (4WD) Switch Circuit Range/Performance

P0838....Four Wheel Drive (4WD) Switch Circuit Low

P0839....Four Wheel Drive (4WD) Switch Circuit High

P0840....Transmission Fluid Pressure Sensor/Switch 'A' Circuit

P0841....Transmission Fluid Pressure Sensor/Switch 'A' Circuit Range/Performance

P0842....Transmission Fluid Pressure Sensor/Switch 'A' Circuit Low

P0843....Transmission Fluid Pressure Sensor/Switch 'A' Circuit High

P0844....Transmission Fluid Pressure Sensor/Switch 'A' Circuit Intermittent

P0845....Transmission Fluid Pressure Sensor/Switch 'B' Circuit

P0846....Transmission Fluid Pressure Sensor/Switch 'B' Circuit Range/Performance

P0847....Transmission Fluid Pressure Sensor/Switch 'B' Circuit Low

P0848....Transmission Fluid Pressure Sensor/Switch 'B' Circuit High

P0849....Transmission Fluid Pressure Sensor/Switch 'B' Circuit Intermittent

P0850....Park/Neutral Switch Input Circuit

P0851....Park/Neutral Switch Input Circuit Low

P0852....Park/Neutral Switch Input Circuit High

P0853....Drive Switch Input Circuit

P0854....Drive Switch Input Circuit Low

P0855....Drive Switch Input Circuit High

P0856....Traction Control Input Signal

P0857....Traction Control Input Signal Range/Performance

P0858....Traction Control Input Signal Low

P0859....Traction Control Input Signal High

P0860....Gear Shift Module Communication Circuit

P0861....Gear Shift Module Communication Circuit Low

P0862....Gear Shift Module Communication Circuit High

P0863....TCM Communication Circuit

P0864....TCM Communication Circuit Range/Performance

P0865....TCM Communication Circuit Low

P0866....TCM Communication Circuit High

P0867....Transmission Fluid Pressure

P0868....Transmission Fluid Pressure Low

P0869....Transmission Fluid Pressure High

P0870....Transmission Fluid Pressure Sensor/Switch "C" circuit

P0871....Transmission Fluid Pressure Sensor/Switch "C" Circuit Range/Performance

P0872....Transmission Fluid Pressure Sensor/Switch "C" circuit Low

P0873....Transmission Fluid Pressure Sensor/Switch "C" circuit High

P0874....Transmission Fluid Pressure Sensor/Switch "C" circuit Intermittent

P0875....Transmission Fluid Pressure Sensor/Switch "D" circuit

P0876....Transmission Fluid Pressure Sensor/Switch "D" Circuit Range/Performance

P0877....Transmission Fluid Pressure Sensor/Switch "D" circuit Low

P0878....Transmission Fluid Pressure Sensor/Switch "D" circuit High

P0879....Transmission Fluid Pressure Sensor/Switch "D" circuit Intermittent

P0880....TCM Power Input Signal

P0881....TCM Power Input Signal Range/Performance

P0882....TCM Power Input Signal Low

P0883....TCM Power Input Signal High

P0884....TCM Power Input Signal Intermittent

P0885....TCM Power Relay Control Circuit/Open

P0886....TCM Power Relay Control Circuit Low

P0887....TCM Power Relay Control Circuit High

P0888....TCM Power Relay Sense Circuit

P0889....TCM Power Relay Sense Circuit Range/Performance

P0890....TCM Power Relay Sense Circuit Low

P0891....TCM Power Relay Sense Circuit High

P0892....TCM Power Relay Sense Circuit Intermittent

P0893....Multiple Gears Engaged

P0894....Transmission Component Slipping

P0895....Shift Time Too Short

P0896....Shift Time Too Long

P0897....Transmission Fluid Deteriorated

P0898....Transmission Control System MIL Request Circuit Low

P0899....Transmission Control System MIL Request Circuit High

P0900....Clutch Actuator Circuit/Open

P0901....Clutch Actuator Circuit Range/Performance

P0902....Clutch Actuator Circuit Low

P0903....Clutch Actuator Circuit High

P0904....Gate Select Position Circuit

P0905....Gate Select Position Circuit Range/Performance

P0906....Gate Select Position Circuit Low

P0907....Gate Select Position Circuit High

P0908....Gate Select Position Circuit Intermittent

P0909....Gate Select Control Error

P0910....Gate Select Actuator Circuit/Open

P0911....Gate Select Actuator Circuit Range/Performance

P0912....Gate Select Actuator Circuit Low

P0913....Gate Select Actuator Circuit High

P0914....Gear Shift Position Circuit

P0915....Gear Shift Position Circuit Range/Performance

P0916....Gear Shift Position Circuit Low

P0917....Gear Shift Position Circuit High

P0918....Gear Shift Position Circuit Intermittent

P0919....Gear Shift Position Control Error

P0920....Gear Shift Forward Actuator Circuit/Open

P0921....Gear Shift Forward Actuator Circuit Range/Performance

P0922....Gear Shift Forward Actuator Circuit Low

P0923....Gear Shift Forward Actuator Circuit High

P0924....Gear Shift Reverse Actuator Circuit/Open

P0925....Gear Shift Reverse Actuator Circuit Range/Performance

P0926....Gear Shift Reverse Actuator Circuit Low

P0927....Gear Shift Reverse Actuator Circuit High

P0928....Gear Shift Lock Solenoid Control Circuit/Open

P0929....Gear Shift Lock Solenoid Control Circuit Range/Performance

P0930....Gear Shift Lock Solenoid Control Circuit Low

P0931....Gear Shift Lock Solenoid Control Circuit High

P0932....Hydraulic Pressure Sensor Circuit

P0933....Hydraulic Pressure Sensor Range/Performance

P0934....Hydraulic Pressure Sensor Circuit Low

P0935....Hydraulic Pressure Sensor Circuit High

P0936....Hydraulic Pressure Sensor Circuit Intermittent

P0937....Hydraulic Oil Temperature Sensor Circuit

P0938....Hydraulic Oil Temperature Sensor Range/Performance

P0939....Hydraulic Oil Temperature Sensor Circuit Low

P0940....Hydraulic Oil Temperature Sensor Circuit High

P0941....Hydraulic Oil Temperature Sensor Circuit Intermittent

P0942....Hydraulic Pressure Unit

P0943....Hydraulic Pressure Unit Cycling Period Too Short

P0944....Hydraulic Pressure Unit Loss of Pressure

P0945....Hydraulic Pump Relay C ircuit/Open

P0946....Hydraulic Pump Relay C ircuit Range/Performance

P0947....Hydraulic Pump Relay C ircuit Low

P0948....Hydraulic Pump Relay C ircuit High

P0949....Auto Shift Manual Adaptive Learning Not Complete

P0950....Auto Shift Manual Control Circuit

P0951....Auto Shift Manual Control Circuit Range/Performance

P0952....Auto Shift Manual Control Circuit Low

P0953....Auto Shift Manual Control Circuit High

P0954....Auto Shift Manual Control Circuit Intermittent

P0955....Auto Shift Manual Mode Circuit

P0956....Auto Shift Manual Mode Circuit Range/Performance

P0957....Auto Shift Manual Mode Circuit Low

P0958....Auto Shift Manual Mode Circuit High

P0959....Auto Shift Manual Mode Circuit Intermittent

P0960....Pressure Control Solenoid "A" Control Circuit/Open

P0961....Pressure Control Solenoid "A" Control Circuit Range/Performance

P0962....Pressure Control Solenoid "A" Control Circuit Low

P0963....Pressure Control Solenoid "A" Control Circuit High

P0964....Pressure Control Solenoid "B" Control Circuit/Open

P0965....Pressure Control Solenoid "B" Control Circuit Range/Performance

P0966....Pressure Control Solenoid "B" Control Circuit Low

P0967....Pressure Control Solenoid "B" Control Circuit High

P0968....Pressure Control Solenoid "C" Control Circuit/Open

P0969....Pressure Control Solenoid "C" Control Circuit Range/Performance

P0970....Pressure Control Solenoid "C" Control Circuit Low

P0971....Pressure Control Solenoid "C" Control Circuit High

P0972....Shift Solenoid "A" Control Circuit Range/Performance

P0973....Shift Solenoid "A" Control Circuit Low

P0974....Shift Solenoid "A" Control Circuit High

P0975....Shift Solenoid "B" Control Circuit Range/Performance

P0976....Shift Solenoid "B" Control Circuit Low

P0977....Shift Solenoid "B" Control Circuit High

P0978....Shift Solenoid "C" Control Circuit Range/Performance

P0979....Shift Solenoid "C" Control Circuit Low

P0980....Shift Solenoid "C" Control Circuit High

P0981....Shift Solenoid "D" Control Circuit Range/Performance

P0982....Shift Solenoid "D" Control Circuit Low

P0983....Shift Solenoid "D" Control Circuit High

P0984....Shift Solenoid "E" Control Circuit Range/Performance

P0985....Shift Solenoid "E" Control Circuit Low

P0986....Shift Solenoid "E" Control Circuit High

P0987....Transmission Fluid Pressure Sensor/Switch "E" Circuit

P0988....Transmission Fluid Pressure Sensor/Switch "E" Circuit Range/Performance

P0989....Transmission Fluid Pressure Sensor/Switch "E" Circuit Low

P0990....Transmission Fluid Pressure Sensor/Switch "E" Circuit High

P0991....Transmission Fluid Pressure Sensor/Switch "E" Circuit Intermittent

P0992....Transmission Fluid Pressure Sensor/Switch "F" Circuit

P0993....Transmission Fluid Pressure Sensor/Switch "F" Circuit Range/Performance

P0994....Transmission Fluid Pressure Sensor/Switch "F" Circuit Low

P0995....Transmission Fluid Pressure Sensor/Switch "F" Circuit High

P0996....Transmission Fluid Pressure Sensor/Switch "F" Circuit Intermittent

P0997....Shift Solenoid "F" Control Circuit Range/Performance

P0998....Shift Solenoid "F" Control Circuit Low



# GM CODES

## GM Code List P1000-P1299

**NOTE:** For some code numbers, there may be more than one definition because the same number may be used for different faults on different model years or models.

P1031....O2 Sensor heater control circuit problem

P1105....Secondary Vacuum Sensor circuit

P1106....MAP sensor circuit voltage intermittent high or low

P1107....MAP sensor voltage intermittent low

P1108....BARO to MAP sensor circuit comparison too high

P1109....Secondary port throttle system

P1111....Intake Air Temperature Sensor circuit intermittent high voltage

P1112....Intake Air Temperature Sensor circuit intermittent low voltage

P1113....Intake Resonance Switchover Valve Control

P1114....Engine Coolant Temperature intermittent high or low

P1115....Engine Coolant Temperature intermittent high or low

P1116....Engine Coolant Temperature erratic

P1117....Engine coolant temperature below minimum voltage/254 F

P1118....Engine coolant temperature above maximum voltage/-40 F

P1119....Engine coolant temperature out of range

P1120....Throttle position sensor 1 circuit

P1121....Ignition control module 4X circuit, or TPS out of range

P1122....Ignition control module 4X circuit, or TPS out of range

P1125....Average Pump Period system, or pedal position system

P1133....A/C pressure sensor high voltage, or O2 sensor bank 1 sensor 1 sluggish

P1134.... 5 volt reference 2 voltage low, or O2 sensor bank 1 sensor 1

P1135....O2 Sensor 1 bank 1 reading lean, or 4/5 shift solenoid stuck on

P1136....5 volt reference 2 circuit, or O2 sensor bank 1 sensor 1 rich

P1137....O2 Sensor low voltage during power enrichment

P1138....O2 Sensor high voltage during decel fuel cutoff

P1139....Brake booster vacuum sensor (low vacuum)

P1139. . O2 Sensor insufficient switching (Bank 1 Sensor 2)

P1140....O2 Sensor Sluggish (Bank 1 Sensor 2)

P1141....O2 Sensor Heater Control circuit (Bank 1 Sensor 2)

P1143....O2 Sensor reading lean or low voltage (Bank 1 Sensor 3)

P1144....O2 Sensor reading rich or high voltage (Bank 1 Sensor 3)

P1145....O2 Sensor sluggish (slow crosscounts) (Bank 1 Sensor 3)

P1153....A/C pressure sensor low voltage

P1153.... . O2 Sensor low switching (Bank 2 Sensor 1)

P1154....O2 Sensor low transition time (Bank 2 Sensor 1)

P1155....A/C evap temperature switch high voltage

P1155. . O2 Sensor reading lean (Bank 2 Sensor 1)

P1156....A/C high pressure switch high voltage

P1156. . O2 Sensor reading rich (Bank 2 Sensor 1)

P1157....O2 Sensor rich or high voltage (Bank 2 Sensor 2)

P1158....O2 Sensor rich or high voltage (Bank 2 Sensor 2)

P1158. . .Engine overtemperature protection fault

P1159....O2 Sensor crosscounts (Bank 2 Sensor 2)

P1161....O2 Sensor heater control circuit (Bank 2 Sensor 2)

P1163....O2 Sensor reading lean or low voltage (Bank 2 Sensor 3)

P1164....O2 Sensor reading rich or high voltage (Bank 2 Sensor 3)

P1165....O2 Sensor crosscounts (Bank 2 Sensor 3)

P1170....Bank to bank fuel trim offset

P1171....Fuel system lean during acceleration

P1185....Engine Temperature Sensor circuit

P1186....Engine Oil Temperature circuit performance

P1187....Engine Oil Pressure Sensor circuit low voltage,

P1188....Engine Oil Pressure Sensor circuit voltage high

P1189....Engine Oil Pressure Switch circuit

P1190....Vacuum leak

P1191....Intake air duct leak

P1200....Injector control circuit

P1211....Mass Airflow circuit intermittent high

P1212....Mass Airflow circuit intermittent low

P1214....Injection Pump Timing Offset

P1215....Ground fault detection indicated (generator driver circuit)

P1216....Fuel Solenoid response time too short

P1217....Fuel Solenoid response time too long

P1218....Injection Pump calibration circuit

P1219....Throttle Position Sensor reference voltage

P1220....Throttle Position Sensor circuit fault

P1221....Fuel pump second circuit low

P1121 . . Throttle position sensor circuit performance

P1222....Injector circuit cylinder 1 intermittent

P1225....Injector circuit cylinder 2 intermittent

P1228....Injector circuit cylinder 3 intermittent

P1231....Injector circuit cylinder 4 intermittent

P1234....Injector circuit cylinder 5 intermittent

P1237....Injector circuit cylinder 6 intermittent

P1240....Injector circuit cylinder 7 intermittent

P1243....Injector circuit cylinder 8 intermittent

P1250....Early fuel evaporation heater circuit

P1257....Boost Control fault, or supercharger overboost

P1258....Engine overtemperature protection, or low coolant fuel disable

P1260....Fuel Pump Speed Relay control circuit, or last test failed speed control circuit

P1271....Accelerator Pedal Position Sensor 1-2 correlation

P1272....Accelerator Pedal Position Sensor 2-3 correlation

P1273....Accelerator Pedal Position Sensor 1-3 correlation

P1274....Injection wiring incorrect

P1275....Acceleration position sensor 2 circuit, or boost control

P1276....Accelerator Pedal Positioning Sensor 1 circuit

P1280....Accelerator Pedal Positioning Sensor 2 circuit

P1281....Accelerator Pedal Positioning Sensor 2 circuit out of range

P1285....Accelerator Pedal Positioning Sensor 2 circuit

P1286....Accelerator Pedal Positioning Sensor 2 circuit out of range

#### **GM Code List P1300-P1499**

**NOTE:** For some code numbers, there may be more than one definition because the same number may be used for different faults on different model years or models.

P1300....Ignition coil 1 primary feedback circuit

P1305....Ignition Coil 2 primary feedback circuit

P1310....Ignition Coil 3 primary feedback circuit

P1315....Ignition Coil 4 primary feedback circuit

P1320....Distributorless ignition 4X signal intermittent

P1321....Electronic ignition system fault

P1322....Electronic ignition system control missing

P1323....Loss of high resolution rpm signal

P1324....Crank rpm too low

P1335....Crankshaft positioning sensing circuit

P1336....Crankshaft position system variation not learned

P1345....Camshaft to crankshaft position correlation fault

P1346....Crankshaft sensor system variation not learned, or intake camshaft position out of range

P1349....Intake Camshaft position system

P1350....Ignition control system

P1351....Ignition control circuit voltage high

P1351....Ignition control circuit open

P1352....Bypass circuit open or voltage high

P1353....Ignition control output high/pulse detected when ground cylinder #3

P1354....Ignition control output high/pulse detected when ground cylinder #4

P1355....Ignition control output high/pulse detected when ground cylinder #5

P1356....Ignition control output high/pulse detected when ground cylinder #6

P1357....Ignition control output high/pulse detected when ground cylinder #7

P1358....Ignition control output high/pulse detected when ground cylinder #8

P1359....Ignition Coil group 1 control circuit

P1360....Ignition Coil group 2 control circuit

P1361....Ignition control cylinder #1 not toggling after enable, or low voltage

P1362....Ignition control cylinder #2 not toggling after enable, or low voltage, or bypass circuit shorted or low voltage

P1363....Ignition control cylinder #3 not toggling after enable, or low voltage

P1364....Ignition control cylinder #4 not toggling after enable,or low voltage

P1365....Ignition control cylinder #5 not toggling after enable,or low voltage

P1366....Ignition control cylinder #6 not toggling after enable,or low voltage

P1367....Ignition control cylinder #7 not toggling after enable,or low voltage

P1368....Ignition control cylinder #8 not toggling after enable, or low voltage

P1370....Too many ignition reference pulses

P1371....Too few ignition reference pulses

P1372....Crankshaft Position Sensor A-B correlation

P1374....Crankshaft position sensor, 3X Reference circuit

P1375....24X Reference circuit voltage too high

P1376....Reference voltage low, or ignition ground circuit

P1377....Ignition control module CAM pulse to 4X reference pulse comparison

P1380....ABS rough road/misfire diagnosis prevented

P1381....Misfire detected, no EBCM/PCM serial data

P1401....Exhaust Gas Recirculation flow test fault

P1403....Exhaust Gas Recirculation Solenoid 1 error

P1404....Exhaust Gas Recirculation Solenoid 2 error

P1405....Exhaust Gas Rrecirculation Solenoid 3 error

P1406....Exhaust Gas Recirculation pintle position error

P1407....EGR valve air leak

P1408....EGR valve vacuum failure

P1409....EGR valve vacuum leak

P1410....EGR valve vacuum restriction, or fuel tank pressure system

P1415....AIR system Bank 1

P1416....AIR system Bank 2

P1431....Fuel Level Sensor 2 circuit

P1432....Fuel Level Sensor 2 circuit low voltage

P1433....Fuel Level Sensor 2 circuit voltage high

P1441....EVAP Canister continuous open purge flow, or high voltage during non-purge

P1442....EVAP monitor circuit/vacuum switch high voltage

P1450....Barometric Pressure Sensor (BARO) circuit

P1451....Barometric Pressure Sensor performance

P1460....Cooling Fan control system, or misfire detected (Catera only)

P1483....Engine cooling system performance

#### **GM Code List P1500-P1699**

**NOTE:** For some code numbers, there may be more than one definition because the same number may be used for different faults on different model years or models.

P1500....Starter signal circuit

P1501....Vehicle speed sensor circuit intermittent, or Theft deterrent system

P1502....Theft deterrent system no password received

P1503....Theft deterrent system password improper

P1508....Idle Air Control system -- idle too low

P1509....Idle Air Control system -- idle too high

P1510....Backup power supply

P1511....Throttle Control System - backup system performance

P1514....Airflow to throttle position sensor too high

P1515....Electronic throttle module throttle position

P1516....Electronic throttle module throttle position

P1517....Electronic throttle module, or TAC module fault

P1518....No communication between electronic throttle module and PCM

P1519....Throttle Actuator Control Module

P1520....Park/Neutral Switch circuit, gear indicator system

P1523....Electronic throttle control throttle return

P1524....Throttle Position Sensor out of range or misadjusted

P1525....Throttle Body Service required

P1526....Throttle position learn process not complete

P1527....Transmission range/pressure switch comparison

P1528....Governor control system

P1530....Ignition timing adjustment switch circuit, or A/C Refrigerant Pressure Sensor error

P1531....A/C low refrigerant

P1532....Engine coolant temperature sensor intermittent, or A/C Evaporator Temperature circuit low voltage

P1533....A/C Low Side Temperature Sensor circuit

P1535....A/C High Side Temperature Sensor circuit

P1536....A/C system ECT overtemperature

P1537....A/C request circuit voltage low

P1538....A/C request circuit voltage high

P1539....A/C High Pressure Switch circuit voltage high

P1540....A/C system high pressure

P1542....A/C system high pressure or high temperature

P1543....A/C system performance out of range

P1545....A/C Clutch Relay Control circuit

P1546....A/C Clutch Relay control circuit voltage low

P1550....Cruise control, motor actuator circuit

P1554....Speed Control status circuit

P1555....Electric Variable Orifice fault (Saturn)

P1558....Speed Control (SPS low)



P1560....Speed Control System/Transaxle not in Drive

P1561....Speed Control Vent Solenoid

P1562....Speed Control Vacuum Solenoid

P1564....ECM battery voltage loss (Catera only), or speed control system/vehicle acceleration too high

P1565....Speed Control Servo Position Sensor

P1566....Speed Control System/Engine RPM too high

P1567....Speed Control Master Switch

P1568....Speed Control (SPS high)

P1570....Speed Control System/Traction Control active

P1571....Traction Control System desired torque circuit

P1572....Traction Control System active circuit voltage low too long

P1573....PCM/EBTCM serial data circuit communication malfunction

P1574....EBTCM system/stop lamp circuit voltage high

P1575....Stop lamp control circuit (97-98 Corvette only), or extended travel brake switch circuit voltage high

P1576....Brake Booster Vacuum Sensor circuit voltage high

P1577....Brake Booster Vacuum Sensor circuit voltage low

P1578....Brake Booster Vacuum Sensor circuit low vacuum

P1579....Park/Neutral to Drive/Reverse at high throttle angle

P1580....Cruise Control Module move circuit, low voltage

P1581....Cruise Control Module move circuit, high voltage

P1582....Cruise Control Module direction circuit, low voltage

P1583....Cruise Control Module direction circuit, high voltage

P1584....Cruise control disabled

P1585....Cruise Control inhibit output circuit

P1586....Cruise Control Brake Switch 2 circuit

P1599....Engine stall detected

P1600....Powertrain control module battery, or loss of communication between PCM and TCM

P1601....ECM overtemperature

P1602....PCM to ABS module communication problem

P1603....Serial data communication problem

P1604....IPC Serial data communication problem

P1605....Serial data communication problem with HVAC module

P1607....Engine Oil Level Switch circuit

P1610....Loss of PZM serial data, or failure of body function controller (1997 Cutlass & Malibu only)

P1611....Loss of CVRTD serial data

P1617....Engine Oil Level Switch circuit

P1619....Engine Oil Life Monitor reset circuit, or oil life error

P1620....Engine coolant low (Saturn)

P1621....Powertrain control module memory error, or VCM EEPROM performance (1998 5.7L only)

P1623....PCM Prom error, or Transaxle Temperature Sensor fault (Saturn)

P1624....Powertrain control module software reset, or customer snapshot data available (Saturn)

P1625....Powertrain control module system reset, or TCM flash checksum fault (Saturn)

P1626....Anti-theft system fuel enable circuit (Passkey error)

P1627....A/D performance, or Powertrain Control Module fault

P1628....PCM Engine Control Temperature Pull-up Resistor, or Engine Coolant Temperature Sensor circuit resistor fault

P1629....Anti-theft device cranking signal or Passkey cranking error

P1630....System voltage too high/too low, or ECM immobilizer learning mode (Cavalier & Monte Carlo only)

P1631....Oxygen sensor #1 slow response, or anti-theft password incorrect

P1632....Anti-theft fuel disable signal received

P1633....Ignition power circuit low voltage

P1634....Ignition power circuit low voltage

P1635....5 volt reference voltage to sensors low

P1636....Powertrain control module fault

P1637....Alternator warning lamp control signal "L" terminal problem

P1638....Alternator Field (F) terminal circuit

P1639....Powertrain Control Module 5 volt reference voltage low

P1640....Powertrain control module fault

P1641....EVAP fuel tank pressure sensor circuit voltage high, or fan 1 relay control circuit, or MIL light circuit, or A/C compressor clutch relay circuit

P1642....Fan control relay, or vehicle speed sensor output, or secondary air injection relay fault (96 Lumina/Monte 3.4L)

P1643....Powertrain control module fault

P1644....Throttle position sensor circuit, or traction control fault

P1645....Boost control solenoid circuit, or EVAP solenoid output circuit

P1646....Powertrain control module fault (quad driver 1)

P1647....Powertrain control module fault (quad driver 1)

P1650....Powertrain control module fault (quad driver 2)

P1651....Powertrain control module fault (quad driver 2), or cooling fan relay 1

P1652....Cooling fan relay 2, or suspension control module (Cadillac only)

P1653....Traction control circuit (Pontiac), or fuel gauge control circuit (Chevy except Caprice), or engine oil level warning lamp (Caprice & 99 Olds Silhouette only)

P1654....A/C relay circuit, or cruise control disable output circuit

P1655....Powertrain control module fault (quad driver 2), or EVAP canister purge valve

P1656....Powertrain control module fault (quad driver 2), or wastegate solenoid control circuit (turbo models only)

P1657....Powertrain control module fault (quad driver 2), or skip shift solenoid control circuit

P1660....Cooling fan circuit, or powertrain control module fault

P1661....EVAP fuel tank pressure sensor circuit, or Check Engine Light circuit, or PCM quad driver fault

P1662....PCM quad driver fault, or cruise control circuit

P1663....Alternator warning lamp circuit, or oil change warning lamp circuit

P1664....Powertrain control module fault (quad driver 3), or fuel cutoff solenoid

P1665....Powertrain control module fault (quad driver 3), or EVAP canister vent valve

P1667....Powertrain control module fault (quad driver 3), or reverse inhibit solenoid control circuit

P1670....Powertrain control module fault (quad driver 4)

P1671....Malfunction Indicator Lamp (MIL) circuit fault

P1672....Powertrain control module fault (quad driver 4), or low engine oil level lamp control circuit

P1673....Powertrain control module fault (quad driver 4), or engine hot lamp control circuit

P1674....Powertrain control module fault (quad driver 4), or tachometer control circuit

P1675....EVAP vent solenoid control circuit

P1676....Powertrain control module fault (quad driver 4), or EVAP canister vent valve

P1677....Powertrain control module fault (quad driver 4)

P1680....Powertrain control module fault

P1681....Powertrain control module fault

P1682....Powertrain control module fault

P1683....Powertrain control module fault

P1684....Powertrain control module fault

P1685....Powertrain control module fault

P1686....Powertrain control module fault

P1687....Powertrain control module fault

P1689....Traction Control System delivered torque control circuit

P1690....Powertrain control module loop overrun

P1691....Coolant gauge circuit voltage low

P1692....Coolant gauge circuit voltage high

P1693....Tachometer circuit voltage low

P1694....Tachometer circuit voltage high

P1695....Remote keyless entry circuit

P1696....Remote keyless entry circuit

#### **GM Code List P1700-P1899**

**NOTE:** For some code numbers, there may be more than one definition because the same number may be used for different faults on different model years or models.

P1700....Malfunction Indicator Lamp requested by trans control module

P1701....Malfunction Indicator Lamp request circuit

P1740....Torque control/management request circuit

P1760....Transmission Control Module supply voltage interrupted

P1780....Park/Neutral Position Switch circuit

P1781....Engine torque signal circuit

P1792....ECM to Transmission Control Module engine coolant signal

P1800....ECM to Transmission Control Module engine coolant signal

P1810....ATF pressure manual valve position switch malfunction

P1811....Long shift and maximum adaptation limit reached

P1812....TOT condition

P1814....Torque converter clutch (TCC) overstress

P1819....Transmission range switch out of range, possible no start

P1820....Transmission range switch A voltage low

P1822....Transmission range switch B voltage high

P1823....Transmission range switch P voltage low

P1825....Transmission range switch A, B, C & P signals invalid

P1826....Transmission range switch C voltage high

P1835....Kickdown Switch circuit

P1842....1-2 Shift Solenoid circuit low input

P1843....1-2 Shift Solenoid circuit high input

P1845....2-3 Shift Solenoid circuit low input

P1847 ....2-3Shift Solenoid circuit high input

P1850....Brake Band Aply Solenoid

P1860....Torque Converter Clutch (TCC) PWM Solenoid circuit

P1864....TCC Enable Solenoid circuit

P1868....Transmission Fluid life

P1870....Transmission component slipping

P1873....Oxygen sensor bank 2 sensor 2 crosscounts

P1874....Oxygen sensor bank 1 sensor 3 crosscounts

P1875....4WD Low Switch circuit electrical

P1886....Transaxle Shift, Timing Solenoid performance

P1887 ....TCC Release Switch malfunction

P1890....Throttle Position signal input

P1891 ....Throttle position sensor circuit signal low

P1892....Throttle position sensor circuit signal high

P1895....Engine torque delivered circuit

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## Fastener Tightening Specifications

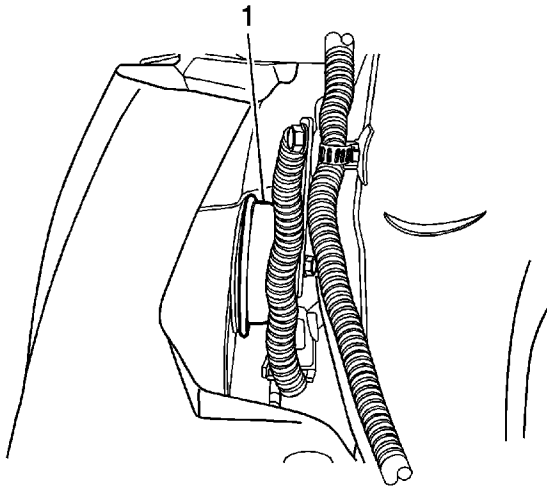
Application	Specification	
	Metric	English
Horn Bolt	21 N·m	16 lb ft

## Horn Replacement (Notchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

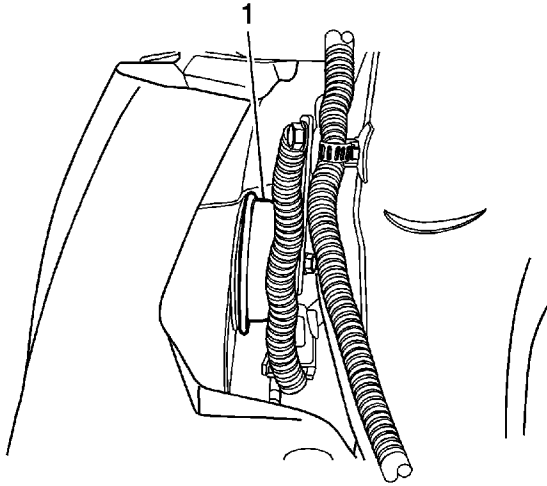
1. Disconnect the negative battery cable.
2. Remove the left headlamp assembly. Refer to [Headlamp Replacement](#).



3. Remove the bolt from the horn.
4. Disconnect the electrical connector.
5. Remove the horn (1).

### Installation Procedure





1. Connect the electrical connector.

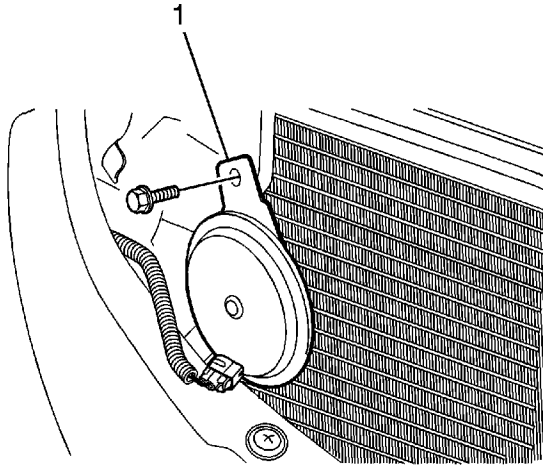
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the horn (1) with the bolt and tighten to **21 N·m (16 lb ft)**.
3. Install the left headlamp assembly. Refer to [Headlamp Replacement](#).
4. Connect the negative battery cable.

## Horn Replacement (Hatchback)

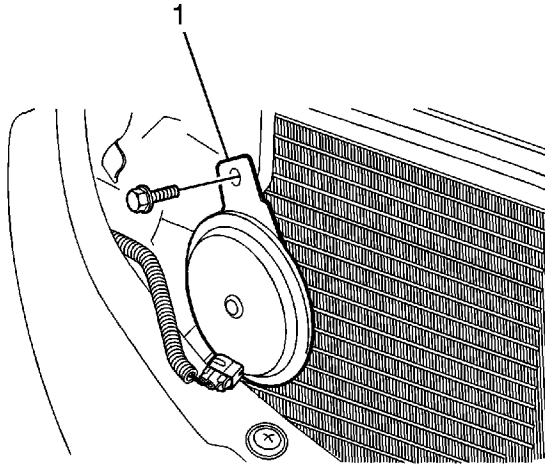
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the fascia grille. Refer to [Fascia Grille Replacement](#).
3. Remove the bolt from the horn.
4. Disconnect the electrical connector.
5. Remove the horn (1).

### Installation Procedure



1. Connect the electrical connector.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the horn (1) with the bolt and tighten to **21 N·m (16 lb ft)**.
3. Install the fascia grille. Refer to [Fascia Grille Replacement](#).
4. Connect the negative battery cable.

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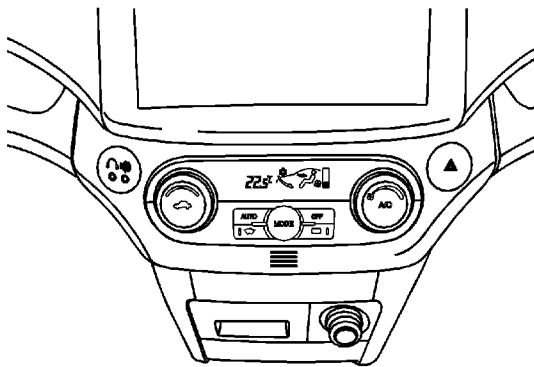
## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Control Assembly Retaining Screws	2N·m	18 lb in

## Heater and Air Conditioning Control Replacement

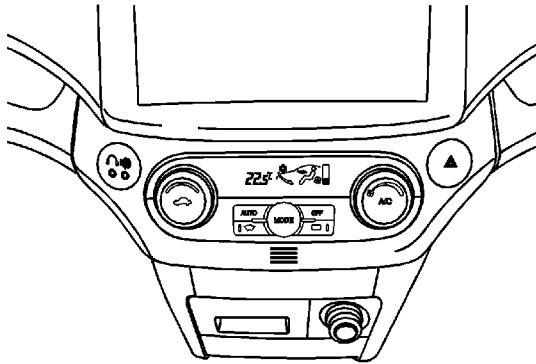
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the audio system trim molding.
3. Remove the lower HVAC control assembly trim molding.
4. Remove the HVAC control assembly screws.
5. Disconnect the electrical connectors.
6. Remove the HVAC control assembly.

### Installation Procedure



1. Connect the electrical connectors.

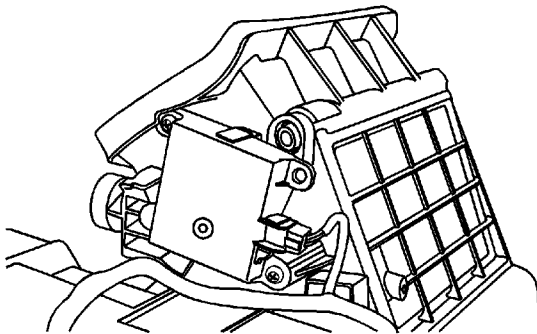
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Position the HVAC control assembly on the center molding and install the retaining screws and tighten to **2 N·m (18 lb in)**.
3. Install the audio trim panel.
4. Connect the negative battery cable.

## Air Inlet Valve Actuator Replacement

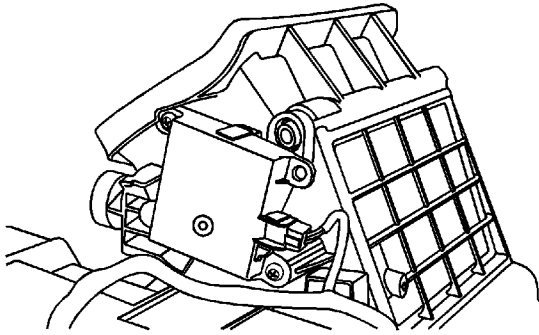
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).
3. Disconnect the electrical connector.
4. Remove the motor retaining screws.
5. Remove the motor.

### Installation Procedure



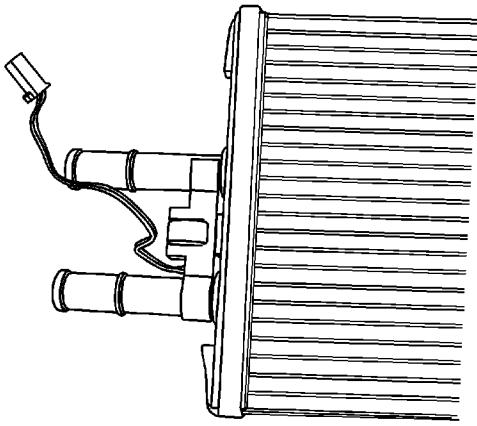
1. Install the motor.
2. Install the motor retaining bolts and tighten.
3. Connect the electrical connector.
4. Install the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#)
5. Connect the negative battery cable.



# Automatic A/C Engine Coolant Temperature Sensor Replacement

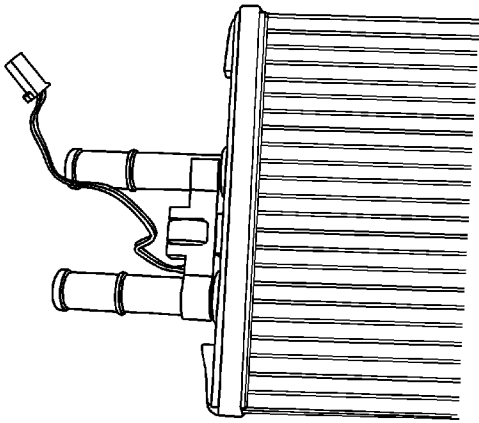
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the heater core cover. Refer to [Heater Core Replacement](#).
3. Disconnect the electrical connector.
4. Remove the sensor retaining screws.
5. Remove the sensor from the heater core pipe.

## Installation Procedure

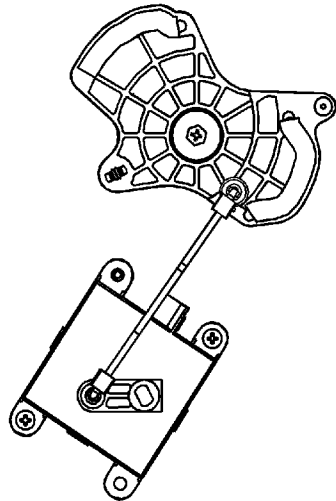


1. Install the sensor with the retaining screws and tighten.
2. Connect the electrical connector.
3. Install the heater core cover. Refer to [Heater Core Replacement](#).
4. Connect the negative battery cable.

## Mode Valve Actuator Replacement

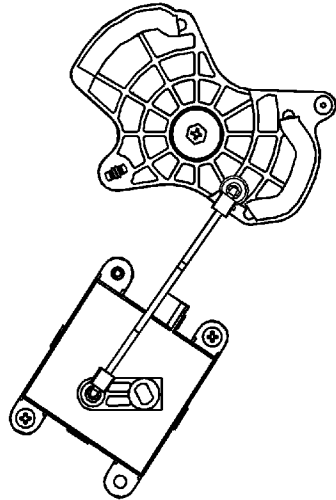
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).
3. Disconnect the electrical connector.
4. Remove the motor actuating rod by snapping it out of the lever with needle-nose pliers.
5. Remove the motor retaining bolts.
6. Remove the mode door motor.

### Installation Procedure

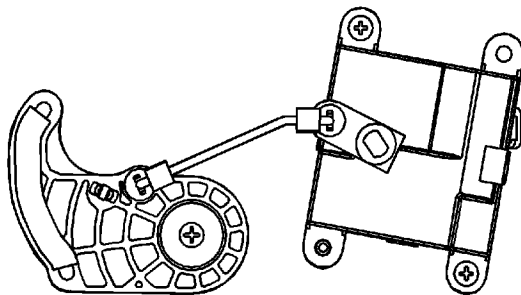


1. Install the mode door motor.
2. Install the motor retaining screws and tighten.
3. Install the actuating rod.
4. Connect the electrical connector.
5. Install the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).
6. Connect the negative battery cable.

## Temperature Valve Actuator Replacement

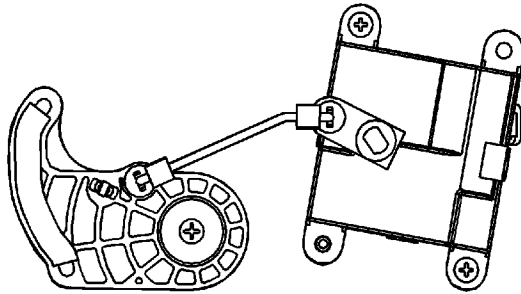
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).
3. Disconnect the electrical connector.
4. Remove the actuating rod by snapping it out of the lever with needle-nose pliers.
5. Remove the air temperature actuator retaining screws.
6. Remove the air temperature actuator.

### Installation Procedure

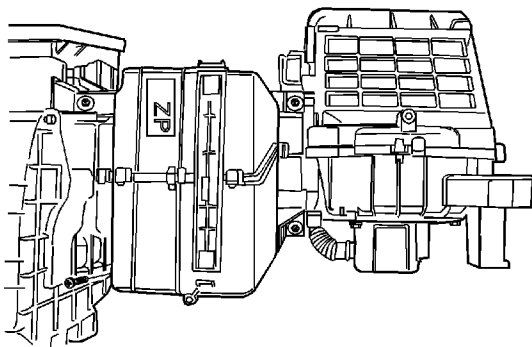


1. Install the air temperature actuator.
2. Install the retaining screws and tighten.
3. Install the actuating rod.
4. Connect the electrical connector.
5. Install the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).
6. Connect the negative battery cable.

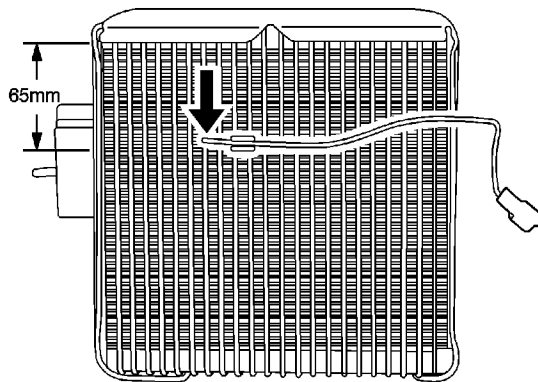
# Air Conditioning Refrigerant Temperature Sensor Replacement

## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



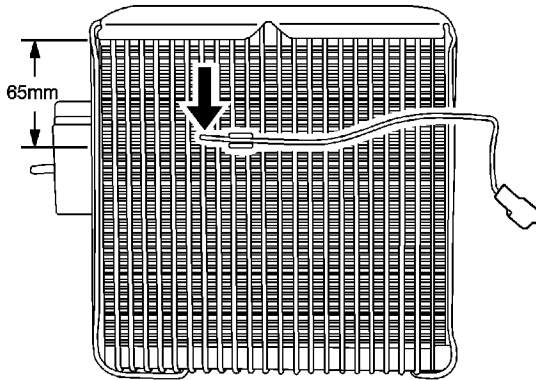
1. Disconnect the negative battery.
2. Remove the evaporator core. Refer to [Air Conditioning Evaporator Core Replacement](#).





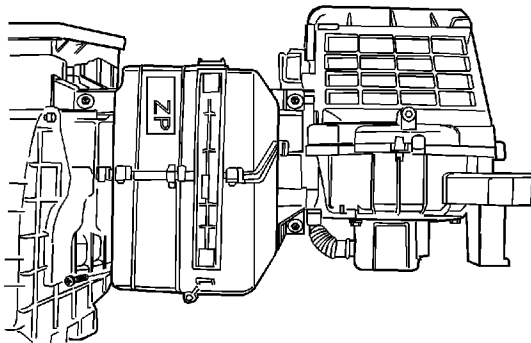
3. Remove the intake sensor with the connector.

## Installation Procedure



**Note:** To achieve peak air conditioning performance the intake sensor should be located at column 8 and a height of 65 mm.

1. Install the intake sensor with the connector.



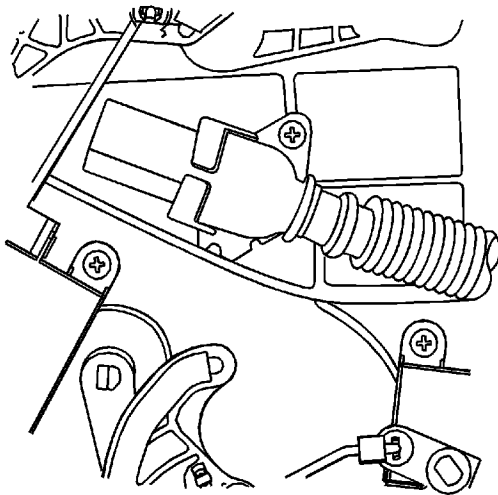


2. Install the evaporator core. Refer to [Air Conditioning Evaporator Core Replacement](#).
3. Connect the negative battery.

## Inside Air Temperature Sensor Replacement

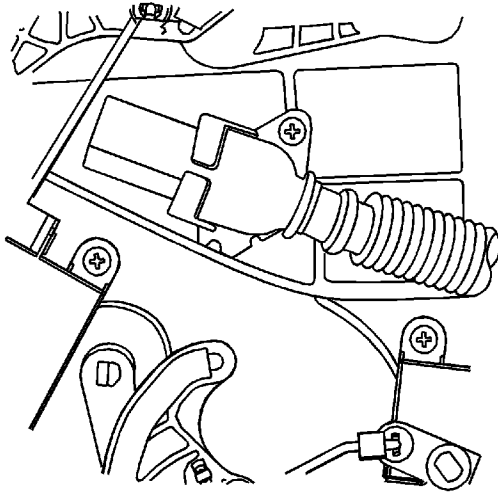
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#)
3. Disconnect the electrical connector.
4. Remove the retaining screws.
5. Remove the air inlet tube.
6. Remove the inside air temperature sensor.

### Installation Procedure

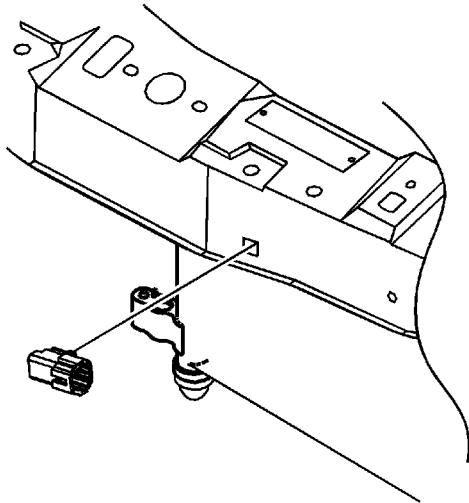


1. Install the inside air temperature sensor with the retaining screws and tighten.
2. Install the air inlet tube and connect the electrical connector.
3. Install instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#)
4. Connect the negative battery cable.

## Ambient Air Temperature Sensor Replacement

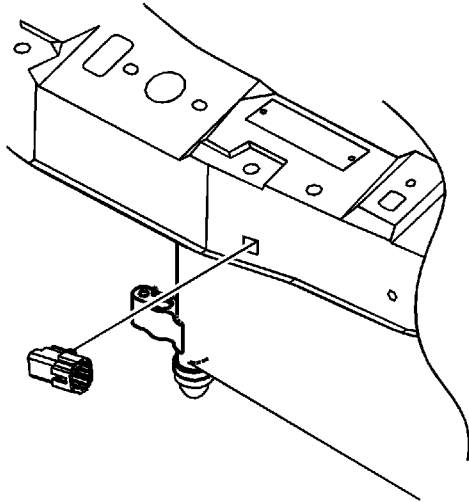
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the front bumper. Refer to [Front Bumper Fascia Replacement](#).
3. Disconnect the ambient air temperature sensor electrical connector.
4. Remove the ambient air temperature sensor from the bracket.

### Installation Procedure

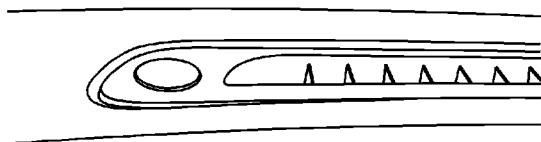


1. Install the ambient air temperature sensor into its bracket.
2. Connect the electrical connector.
3. Install the front bumper. Refer to [Front Bumper Fascia Replacement](#)
4. Connect the negative battery cable.

## Sun Load Temperature Sensor Replacement

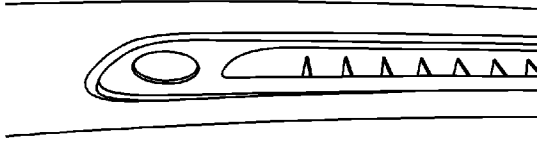
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Gently pry up on the sun load sensor to remove it.
3. Secure the electrical connector to prevent it from falling beneath the dash.
4. Disconnect the electrical connector and remove the sun load sensor.

### Installation Procedure



1. Connect the electrical connector.
2. Insert and press the sun load sensor into position in the dash.
3. Connect the negative battery cable.

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [HVAC](#) | [HVAC - Manual](#) | [Specifications](#) |

Document ID: 1379663

## Fastener Tightening Specifications

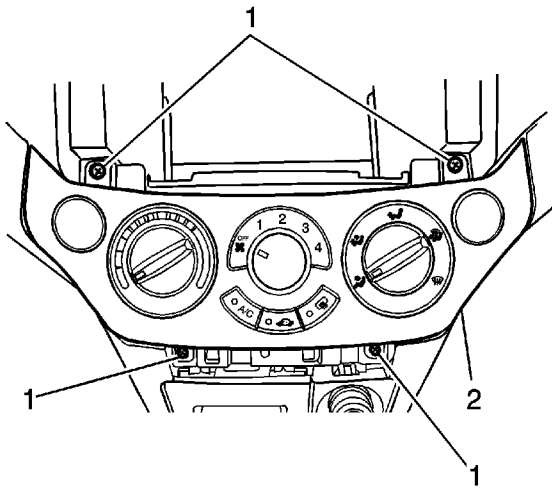
Application	Specification	
	Metric	English
HVAC Controller Retaining Screws	3 N·m	27 lb in



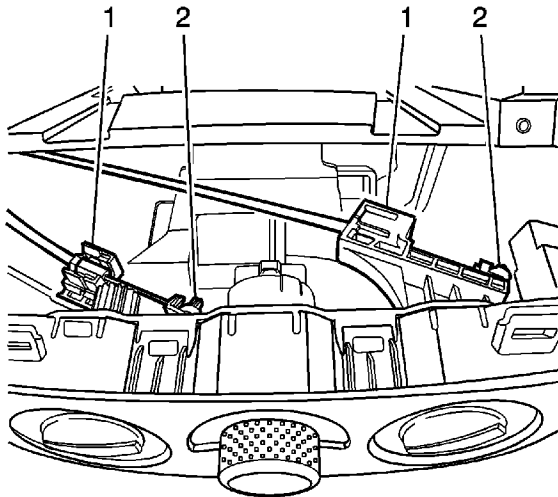
## Heater and Air Conditioning Control Replacement (Hatchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



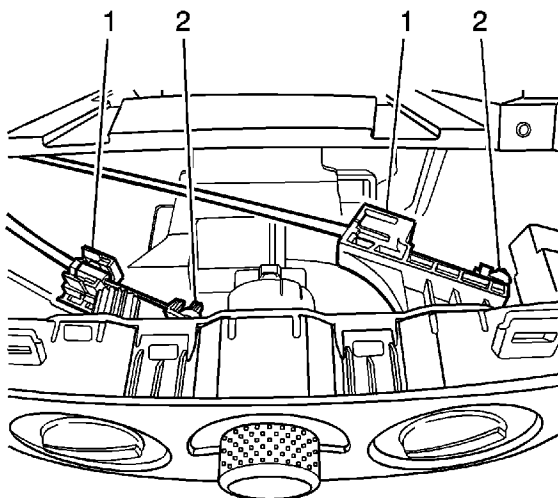
1. Disconnect the negative battery cable.
2. Remove the Instrument panel lower trim panel. Refer to [Instrument Panel Lower Trim Panel Replacement](#).
3. Remove the instrument panel lower center trim. Refer to [Instrument Panel Lower Center Trim Replacement](#).
4. Remove the HVAC controller retaining screws (1).
5. Remove the controller (2) by pulling it out to provide clearance for the removal of the cable.



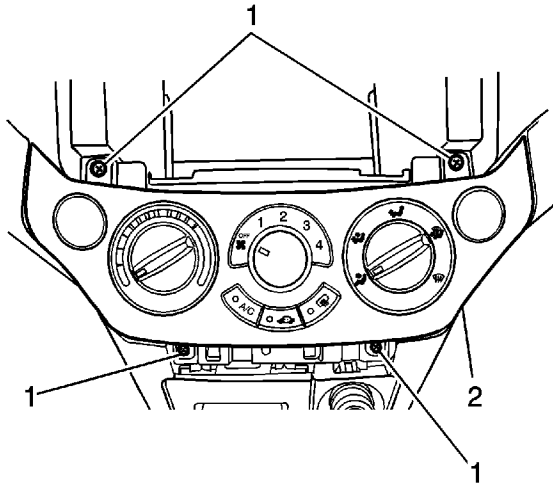
**Note:** Note the location of the cables and the housings to facilitate their reinstallation.

6. Disconnect the mechanical control cables by gently prying off the cable eyelet (2) and unsnapping the cable housing (1) from the mechanical slide.
7. Disconnect the electrical connectors.

## Installation Procedure



1. Connect the electrical connectors to the proper sockets on the back of the controller.
2. Install the mechanical cable housings (1) to the proper control positions.
3. Install the eyelets (2) on the end of each cable, pressing each onto the proper post.



4. Install the controller (2) by gently inserting the controller into the proper position on the instrument panel.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

5. Install the left and the right controller retaining screws (1).

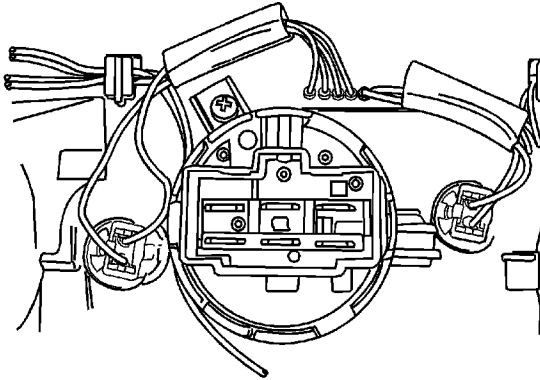
#### **Tighten**

Tighten the HVAC controller retaining screws to 3 N·m (27 lb in).

6. Install the instrument panel lower center trim. Refer to [Instrument Panel Lower Center Trim Replacement](#).
7. Install the instrument panel lower trim panel. Refer to [Instrument Panel Lower Trim Panel Replacement](#).
8. Connect the negative battery cable.
9. Confirm the proper operation of the controller by moving it through all of the controller's possible functioning positions.

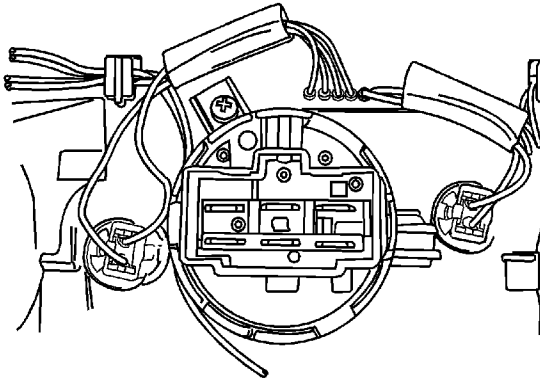
## Blower Motor Switch Replacement

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the HVAC control assembly. Refer to [Heater and Air Conditioning Control Replacement](#).
3. Remove the screws that secure the switch assembly to the knob mount support.
4. Remove the switch assembly. Note the position of the spring, the electrical contact washer, and the contact key/keyway on the knob post.

## Installation Procedure



1. Install the spring and the electrical contact washer over the blower switch knob post.
2. Align the contact key with the post keyway.
3. Position the switch assembly over the mount posts.
4. Install the switch assembly with the screws.
5. Connect the electrical connectors to the rear of the control assembly.
6. Install the HVAC control assembly. Refer to [Heater and Air Conditioning Control Replacement](#).
7. Connect the negative battery cable.
8. Perform an operational check of the blower switch positions.

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [HVAC](#) | [HVAC - Manual](#) | [Repair Instructions](#) |

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## Temperature Control Cable Adjustment

Because the cable and the cable housings have fixed lengths, it is impossible to make a temperature cable adjustment.

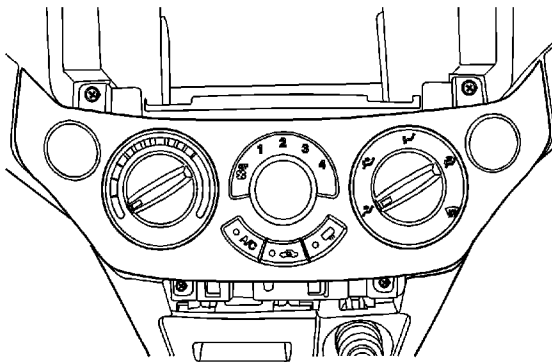
The heater/air distribution case linkage also cannot be adjusted.

If a malfunction is suspected, verify the proper operation of the controller and the mechanical doors for the heater/air distributor case assembly.

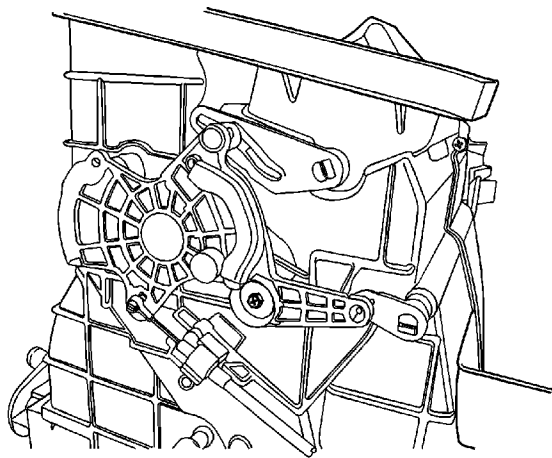
## Mode Control Cable Replacement (Notchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



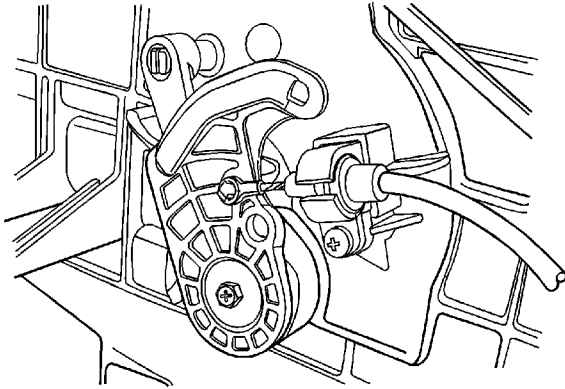
1. Disconnect the negative battery cable.
2. Remove the audio system. Refer to [Radio Replacement](#).
3. Remove the HVAC controller. Refer to [Heater and Air Conditioning Control Replacement](#).



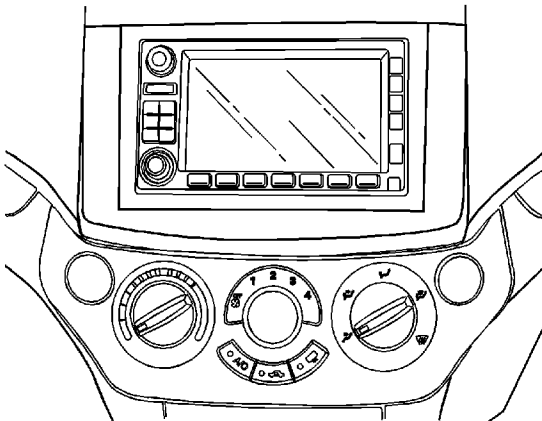
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4. Disconnect the heater/defrost cable eyelet from the post.

## Installation Procedure



1. Connect the vehicle heater/defrost cable eyelet to the post and the cable housing to the slide.



2. Install the HVAC controller. Refer to [Heater and Air Conditioning Control Replacement](#).
3. Install the audio system. Refer to [Radio Replacement](#).
4. Install the dash end panel.
5. Connect the negative battery cable.
6. Operate the heating/cooling systems to verify proper function.



## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Cleaner Housing Assembly Retaining Bolts	12 N·m	106 lb in
Air Deflector Screws	2 N·m	18 lb in
A/C System Hose Connector Retaining Nut	33 N·m	24 lb ft
A/C Pressure Transducer	8 N·m	71 lb in
Blower Motor Screws	6 N·m	53 lb in
Blower Resistor Retaining Screws	6 N·m	53 lb in
Clutch Drive Shaft Bolt (SP10 Compressor)	12-15 N·m	106-133 lb in
Clutch Plate and Hub Assembly Nut (V5 Compressor)	17 N·m	13 lb ft
Compressor-to-Bracket Mounting Bolts	27 N·m	20 lb ft
Compressor Through Bolt	10 N·m	89 lb in
Condenser Pipe Connector Block-to-Receiver Dryer Nut	10 N·m	89 lb in
Expansion Valve Retaining Bolts	12 N·m	106 lb in
Heater/Air Distribution Case Assembly Retaining Screws	8 N·m	71 lb in
Liquid Pipe Connector Block-to-Condenser Retaining Bolt	14 N·m	10 lb ft
Liquid Evaporator Pipe Connector Block Retaining Nut	15 N·m	11 lb ft
Receiver Dryer Bolt	14 N·m	10 lb ft
Refrigerant Discharge Hose Support Clamp Bolt	7 N·m	62 lb in
Refrigerant Discharge Hose Connector Block Bolt	16 N·m	12 lb ft
Refrigerant Discharge Hose-to-Compressor Block Retaining Nut	33 N·m	24 lb ft
Refrigerant Suction Hose Connector Block Retaining Nut	15 N·m	11 lb ft
Upper Condenser Mount Nut	3 N·m	27 lb in

## Refrigerant System Capacities (V5 System)

Application	Specification	
	Metric	English
R-134a System	520±20 g	18±1 oz
	RHD - 570±20 g	RHD - 20±1 oz
Refrigerant Oil in A/C System		
┆ Type	Union Carbide 488 Polyalkylene Glycol (PAG) Oil	
┆ Capacity	200 ml	6.8 oz

## Refrigerant System Capacities (SP10 System - 1.2L Engine)

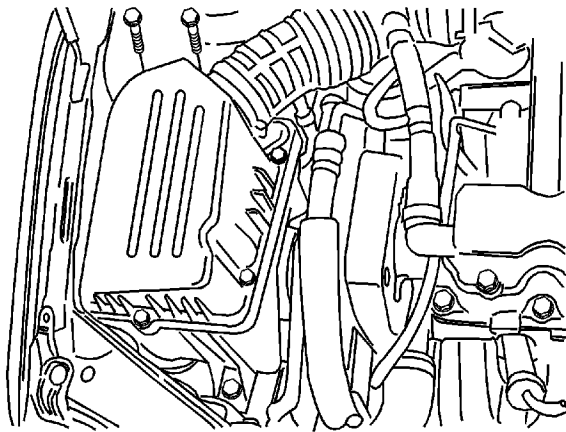
Application	Specification	
	Metric	English
R-134a System	520±20 g	18±1 oz
	RHD - 570±20 g	RHD - 20±1 oz
Refrigerant Oil in A/C System		
┆ Type	Union Carbide RL897 Polyalkylene Glycol (PAG) Oil (ISU513)	
┆ Capacity	150 ml	5.0 oz

## Refrigerant Tubes Replacement (North America)

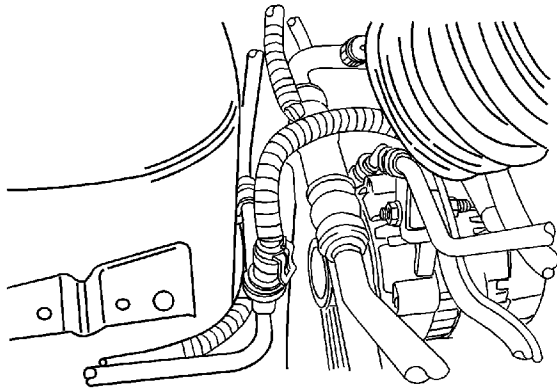
### Removal Procedure

**Note:** Left-hand Drive Shown, Right-Hand Drive Similar.

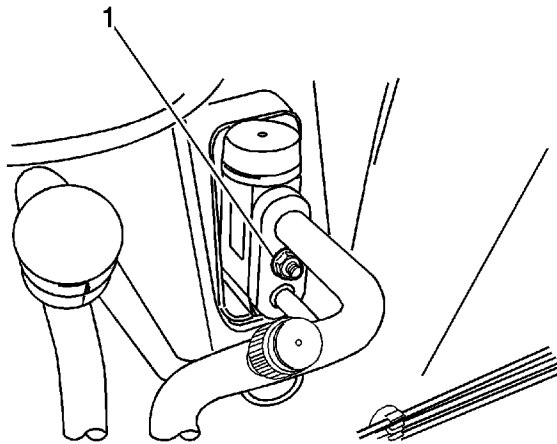
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



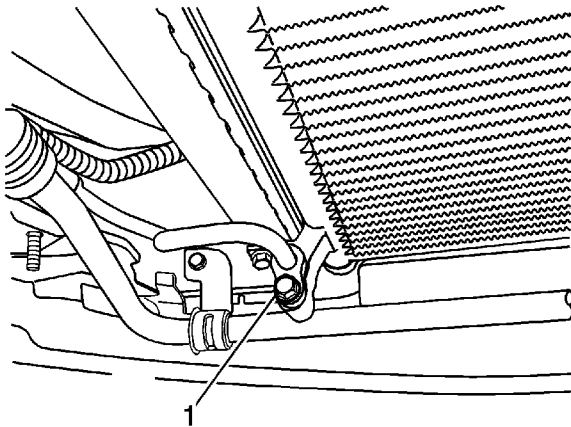
1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
3. Remove the air cleaner housing bolts and the air filter housing assembly.



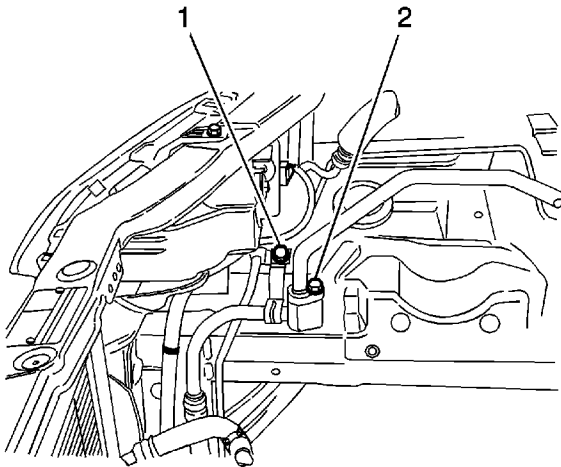
-  4. Disconnect the electrical connector at the pressure transducer.



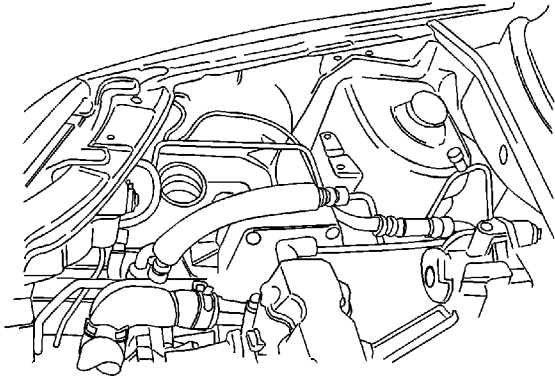
-  5. Remove the evaporator pipe connector block retaining nut (1) at the fire wall.



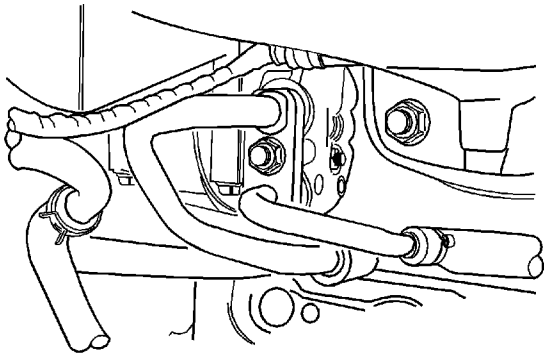
6. Remove the pipe connector block to condenser retaining bolt (1).



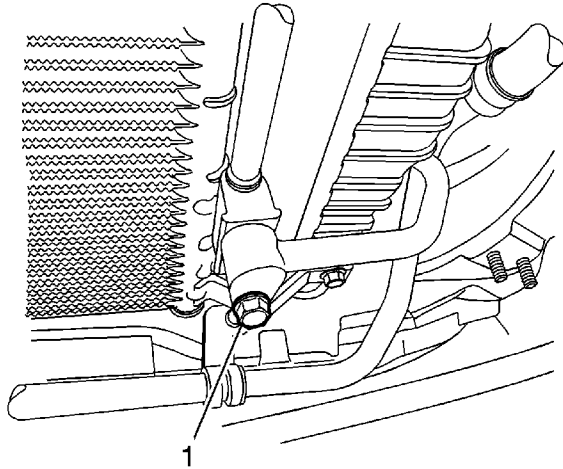
7. Remove the refrigerant suction hose to liquid pipe block retaining nut (2).  
8. Remove the liquid evaporator pipe support clamp bolt (1).



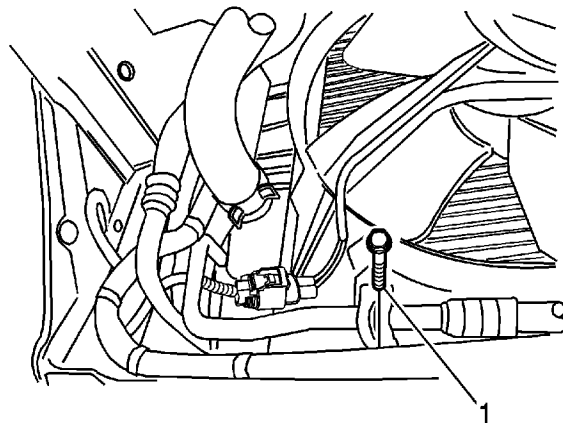
9. Remove the liquid evaporator pipe and the refrigerant suction hose.



10. Remove the refrigerant suction hose and the refrigerant discharge hose to compressor connector block retaining nut.



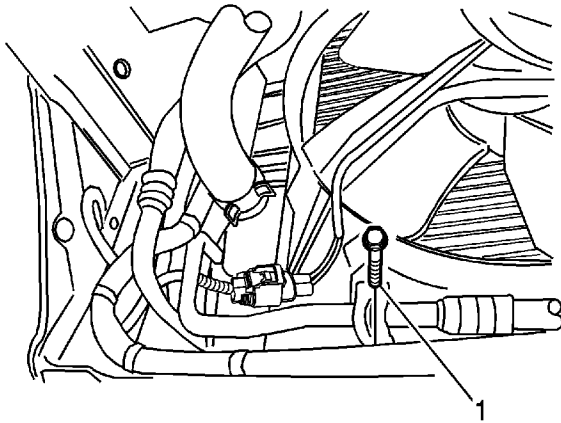
11. Remove the refrigerant discharge hose connector block bolt (1) at the condenser.



12. Remove the refrigerant discharge hose support clamp bolt (1).  
13. Remove the refrigerant discharge hose.  
14. Cap the opening at the receiver-dryer to prevent contamination.

## Installation Procedure





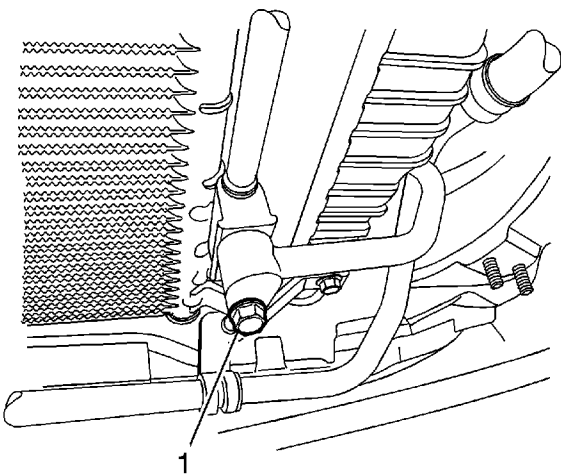
1. Position the refrigerant suction hose section into the vehicle.
2. Install a new O-ring on the connector block at the condenser.
3. Install a new O-ring at the liquid condenser to evaporator plate pipe connector block.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the refrigerant discharge hose support clamp bolt (1).

#### **Tighten**

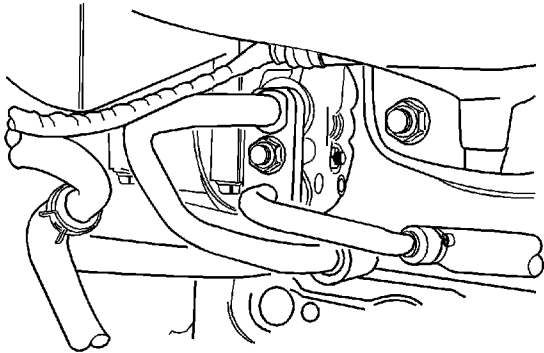
Tighten the refrigerant discharge hose support clamp bolt to 8 N·m (71 lb in).



5. Install the refrigerant discharge hose connector block bolt (1) at the condenser.

**Tighten**

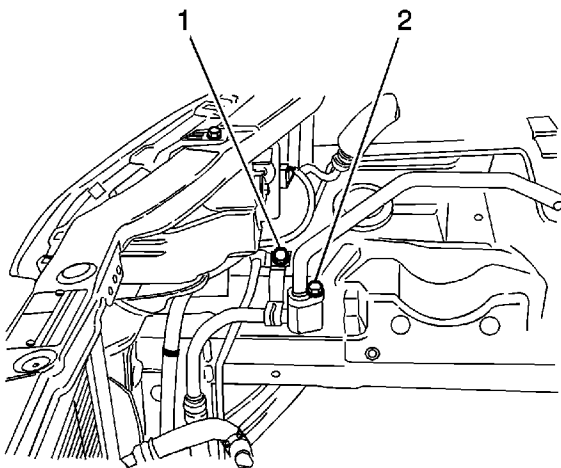
Tighten the refrigerant discharge hose connector block bolt to 16 N·m (12 lb ft).



6. Install the refrigerant suction hose and the refrigerant discharge hose to compressor connector block retaining nut.

**Tighten**

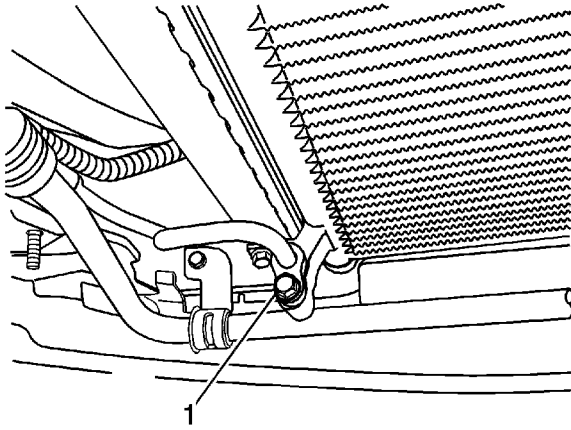
Tighten the refrigerant suction hose and the refrigerant discharge hose to compressor connector block retaining nut to 33 N·m (24 lb ft).



7. Install the refrigerant suction hose connector block retaining nut (2).

**Tighten**

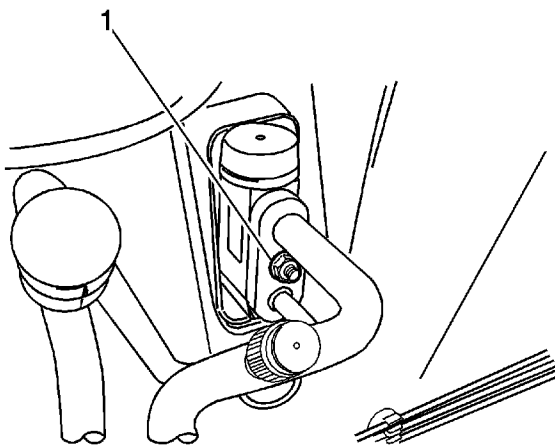
Tighten the refrigerant suction hose connector block retaining nut to 15 N·m (11 lb ft).



8. Install the liquid pipe connector block to condenser retaining bolt (1).

**Tighten**

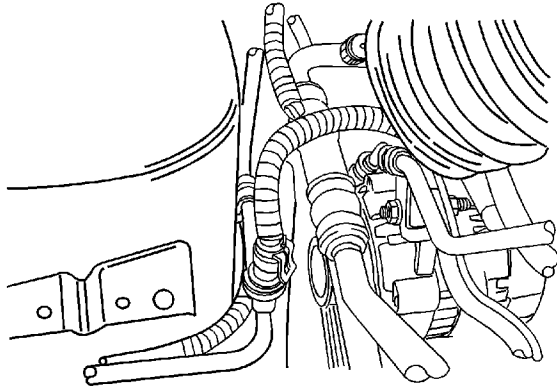
Tighten the liquid pipe connector block to condenser retaining bolt to 14 N·m (10 lb ft).



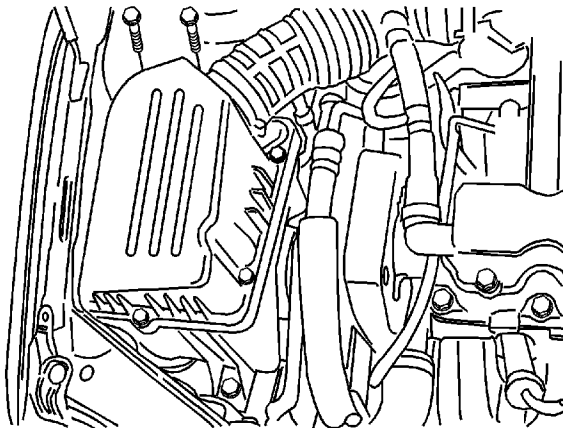
9. Install the liquid evaporator pipe connector block retaining nut (1) at the fire wall.

**Tighten**

Tighten the liquid evaporator pipe connector block retaining nut to 15 N·m (11 lb ft).



10. Connect the electrical connector to the pressure transducer.



11. Install the air cleaner housing assembly with the retaining bolts.

### **Tighten**

Tighten the air cleaner housing assembly retaining bolts to 12 N·m (106 lb in).

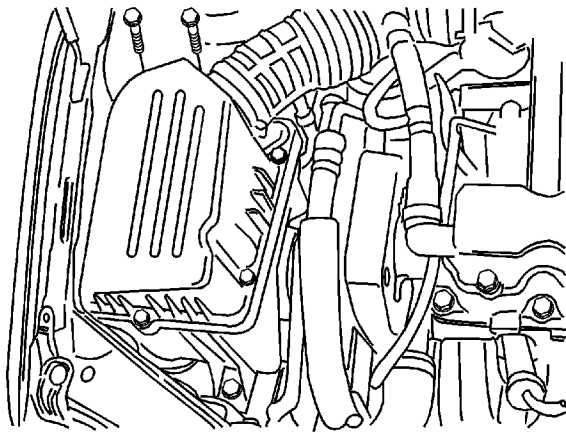
12. Connect the negative battery cable.
13. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).

## Refrigerant Tubes Replacement (Except North America)

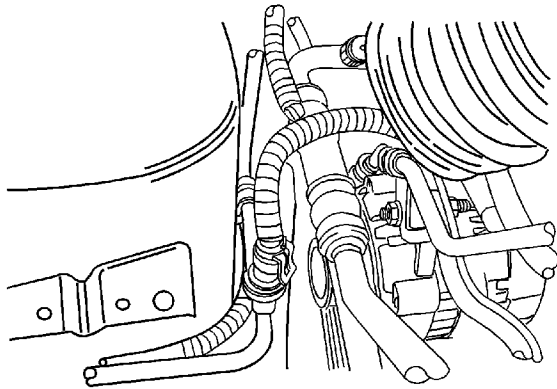
### Removal Procedure

**Note:** Left-hand Drive Shown, Right-Hand Drive Similar.

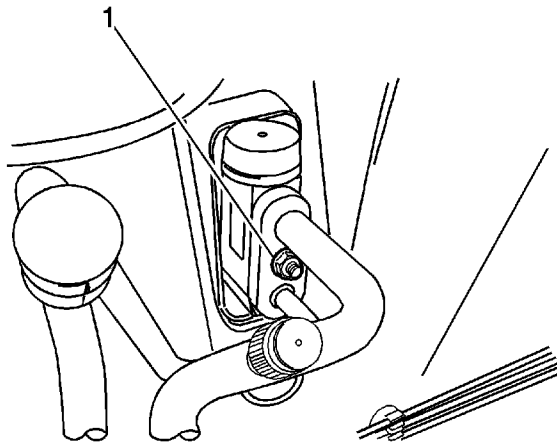
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



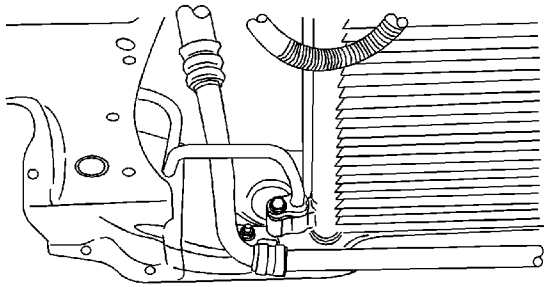
1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
3. Remove the air cleaner housing bolts and the air filter housing assembly.



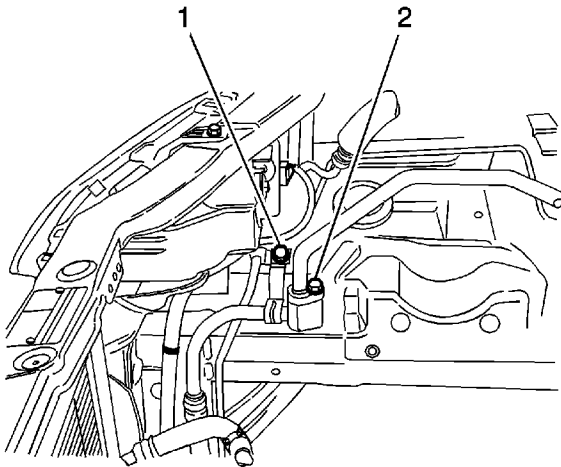
4. Disconnect the electrical connector at the pressure transducer.



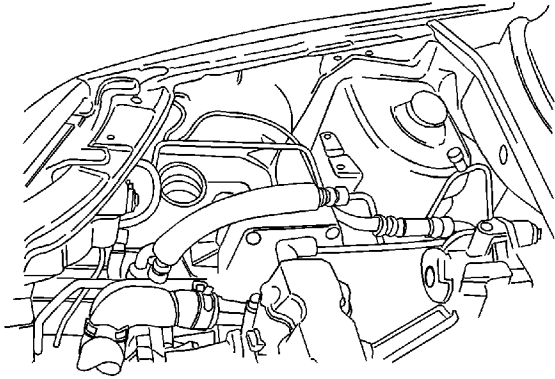
5. Remove the evaporator pipe connector block retaining nut (1) at the fire wall.



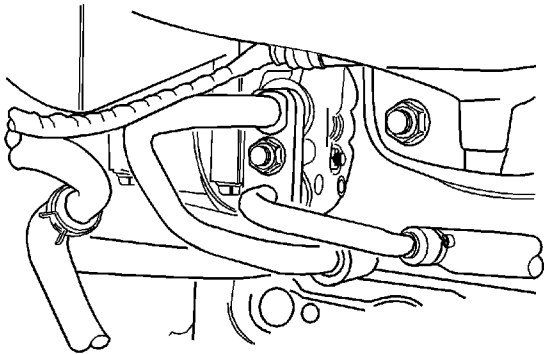
6. Remove the pipe connector block to condenser retaining bolt.



7. Remove the refrigerant suction hose to liquid pipe block retaining nut (2).
8. Remove the liquid evaporator pipe support clamp bolt (1).

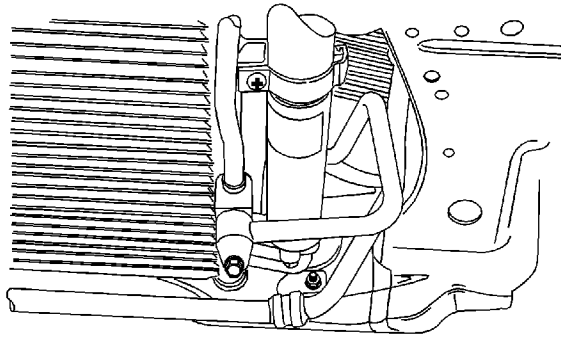


9. Remove the liquid evaporator pipe and the refrigerant suction hose.

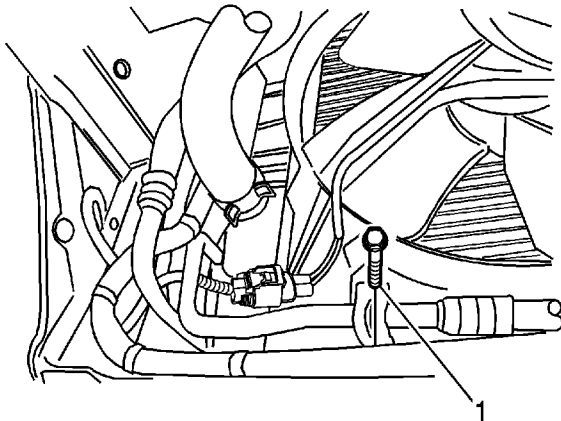


10. Remove the refrigerant suction hose and the refrigerant discharge hose to compressor connector block retaining nut.



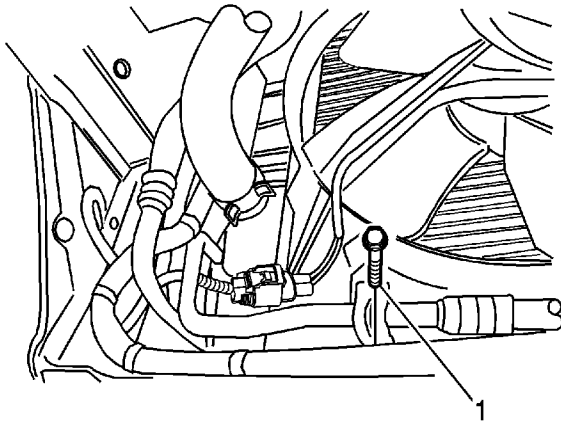


11. Remove the refrigerant discharge hose connector block bolt at the condenser.



12. Remove the refrigerant discharge hose support clamp bolt (1).
13. Remove the refrigerant discharge hose.
14. Cap the opening at the receiver-dryer to prevent contamination.

## Installation Procedure



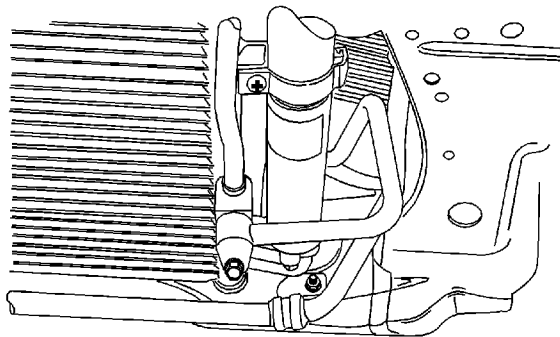
1. Position the refrigerant suction hose section into the vehicle.
2. Install a new O-ring on the connector block at the condenser.
3. Install a new O-ring at the liquid condenser to evaporator plate pipe connector block.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the refrigerant discharge hose support clamp bolt (1).

#### **Tighten**

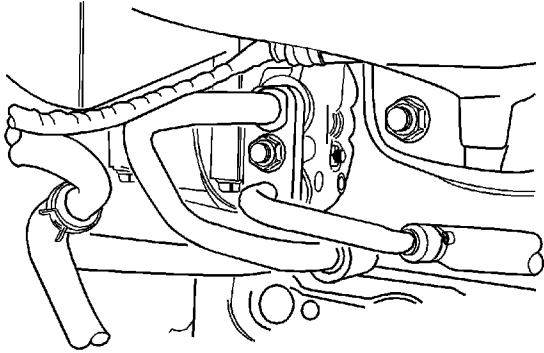
Tighten the refrigerant discharge hose support clamp bolt to 8 N·m (71 lb in).



5. Install the refrigerant discharge hose connector block bolt at the condenser.

**Tighten**

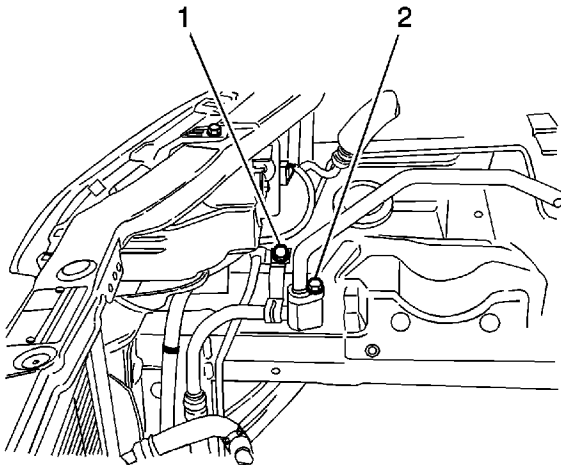
Tighten the refrigerant discharge hose connector block bolt to 16 N·m (12 lb ft).



6. Install the refrigerant suction hose and the refrigerant discharge hose to compressor connector block retaining nut.

**Tighten**

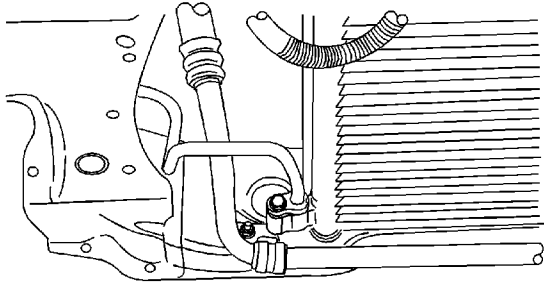
Tighten the refrigerant suction hose and the refrigerant discharge hose to compressor connector block retaining nut to 33 N·m (24 lb ft).



7. Install the refrigerant suction hose connector block retaining nut (2).

**Tighten**

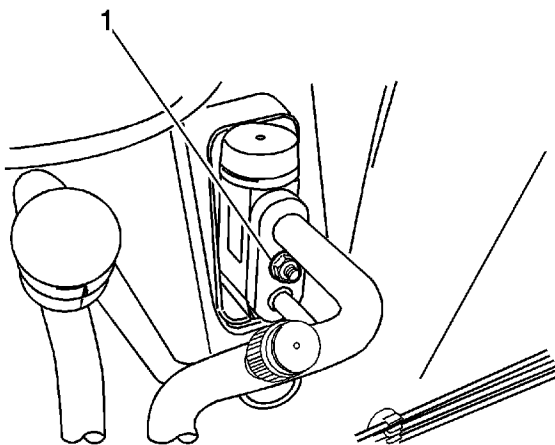
Tighten the refrigerant suction hose connector block retaining nut to 15 N·m (11 lb ft).



8. Install the liquid pipe connector block to condenser retaining bolt.

**Tighten**

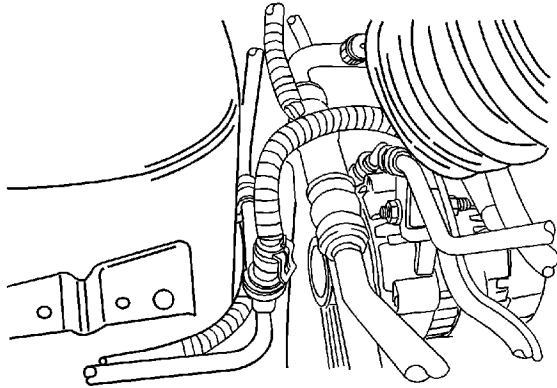
Tighten the liquid pipe connector block to condenser retaining bolt to 14 N·m (10 lb ft).



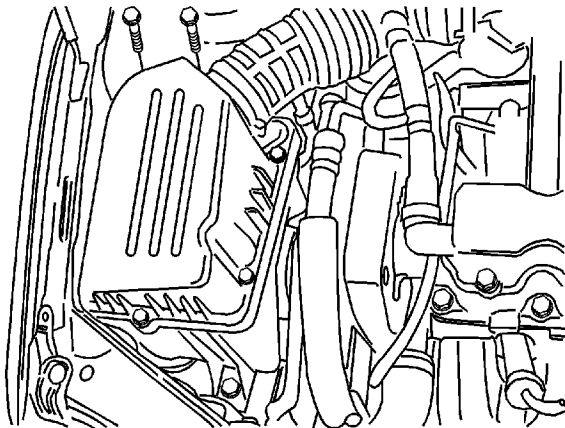
9. Install the liquid evaporator pipe connector block retaining nut (1) at the fire wall.

**Tighten**

Tighten the liquid evaporator pipe connector block retaining nut to 15 N·m (11 lb ft).



10. Connect the electrical connector to the pressure transducer.



11. Install the air cleaner housing assembly with the retaining bolts.

### **Tighten**

Tighten the air cleaner housing assembly retaining bolts to 12 N·m (106 lb in).

12. Connect the negative battery cable.
13. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).

## Refrigerant Recovery and Recharging

The efficient operation and life of the air conditioning system is dependent upon the chemical stability of the refrigeration system. When foreign materials, such as dirt, air, or moisture, contaminate the refrigeration system, they will change the stability of the refrigerant and the polyalkaline glycol (PAG) compressor oil. They will also affect the pressure-temperature relationship, reduce efficient operation, and can possibly cause interior corrosion and abnormal wear of moving parts.

Observe the following practices to ensure chemical stability in the system:

- Wipe away dirt or oil at and near any connection before opening that connection. This will reduce the chance of dirt entering the system.
- Cap, plug, or tape both sides of a connection as soon as possible after opening the connection. This will prevent the entry of dirt, foreign material, and moisture.
- Keep all tools clean and dry, including the manifold gage set and all replacement parts.
- Use a clean and dry transfer device and container to add PAG refrigerant oil. This will ensure that the oil remains as moisture-free as possible.
- Have everything you need ready to allow you to perform all operations quickly when opening an A/C system. Do not leave the A/C system open any longer than necessary.
- Evacuate and recharge any A/C system that has been opened.

All service parts are dehydrated and sealed before shipping. They should remain sealed until just before making connections. All the parts should be at room temperature before uncapping. This prevents condensation of moisture from the air from entering the system. Reseal all parts as soon as possible if the caps have been removed but the connections cannot be made promptly.

**Warning:** Use only refillable refrigerant tanks that are authorized for the charging station being used. The use of other tanks may cause personal injury or void the warranty. Refer to the Manufacturer's instructions for the charging station.

**Warning:** Refer to [Protective Goggles and Glove Warning](#) in the Preface section.

A charging station discharges, evacuates, and recharges an air conditioning system with one hook-up. Filtering during the recovery cycle together with filtering during the evacuation cycle ensures a supply of clean, dry refrigerant for A/C system charging.

- Never use the R-134a charging station on a system charged with R-12. The refrigerants and the oils are not compatible and must never be mixed in even the smallest amount. Mixing refrigerant residue will damage the equipment.
- Never use adapters which convert from one size fitting to another. This will allow contamination which may cause system failure.

## Charging Station Setup and Maintenance

Refer to the manufacturer's instructions for all initial setup procedures and all maintenance procedures. There are many charging stations available. All perform the various tasks required to discharge the system and recover refrigerant, evacuate the system, add a measured amount of oil,

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and recharge an air conditioning system with a measured amount of refrigerant.

## Control Panel Functions

A charging station will have controls and indicators to allow the operator to control and monitor the operation in progress. Refer to the manufacturer's instructions for details. These can be expected to include:

1. Main power switch--The main power switch supplies electrical power to the control panel.
2. Display--The display shows the time programmed for vacuum and the weight of the refrigerant programmed for recharging. Refer to the manufacturer's instructions for detailed programming information.
3. Low-side manifold gage--This gage shows the system's low-side pressure.
4. High-side manifold gage--This gage shows the system's high-side pressure.
5. Controls--This will contain the controls that control various operating functions.
6. Low-side valve--This valve connects the low side of the A/C system to the unit.
7. Moisture indicator--This indicator shows if the refrigerant is wet or dry.
8. High-side valve--This valve connects the high side of the A/C system to the unit.

## Refrigerant Recovery

**Note:** Use only a refrigerant tank that is designed for the charging station in use. The unit's overfill limitation mechanism is calibrated specifically for use with this tank. The tank's valves are also specifically for this unit.

1. Attach the high-side hose with the quick disconnect coupler to the high-side fitting of the vehicle's A/C system.
2. Open the coupler valve after attachment.
3. Attach the low-side hose with the quick disconnect coupler to the low-side fitting of the vehicle's A/C system.
4. Open the coupler valve after attachment.
5. Check the high-side and the low-side gages on the unit's control panel in order to ensure that the A/C system has pressure. If there is no pressure, there is no refrigerant in the system to recover.

**Note:** If there is no refrigerant in the system, do not continue with the recovery operation. This will draw air into the recovery tank.

6. Open both the high-side and the low-side valves.
7. Open the gas and the liquid valves on the tank.
8. Drain any oil that may be in the oil separator.
9. Close the oil drain valve.
10. Plug the unit into the proper voltage outlet.
11. Turn ON the main power switch.

**Caution:** Never reuse refrigerant oil. Damage to the A/C system may result. Dispose of the refrigerant oil properly.

12. Begin the recovery process. Refer to the manufacturer's instructions for the charging station in use.

**Note:** Some A/C system PAG lubricating oil may be removed with the refrigerant during recovery. The amount of oil removed varies. A charging station separates the oil from the

refrigerant and allows a means of determining how much oil was removed. Replace the same amount of oil when you recharge the system. Refer to the manufacturer's instructions for the charging station in use.

13. Wait 5 minutes. Check the control panel low-side gage. If the A/C has maintained vacuum, the recovery is complete.

**Note:** If the control indicator shows that the refrigerant tank is full during the recovery process and the unit shuts OFF, install an empty unit tank to store the refrigerant needed for steps later in the procedure. Do not use any other type of tank.

14. There is more refrigerant in the system if the low side gage pressure rises above zero. Recover the additional refrigerant. Repeat this step until the system maintains vacuum for 2 minutes.

## Evacuation

The unit tank must contain a sufficient amount of R-134a refrigerant for charging. Check the amount of refrigerant in the tank. If there is less than 3.6 kg (8 lbs) of refrigerant, add new refrigerant to the tank. Refer to the manufacturer's instructions for adding refrigerant.

1. Verify that the high side and the low side hoses are connected to the A/C system. Open both the high side and the low side valves on the unit's control panel.
2. Open both the gas and the liquid valves on the tank.

**Note:** Refer to the manufacturer's instructions for the charging station in use. It is necessary to evacuate the system before recharging it with new or recycled refrigerant.

3. Start the vacuum pump and begin the evacuation process. Non-condensable gases, mostly air, are automatically vented from the tank during the recycling process. You may hear the pressure being released.

**Note:** Change the vacuum pump oil frequently. Refer to the manufacturer's instructions for the charging station in use.

4. Check for leaks in the system. Refer to the manufacturer's instructions for the charging station in use.

## A/C System Oil Charge Replenishing

Any oil removed from the A/C system during the recovery process must be replenished at this time.

1. Use the correct graduated bottle of PAG oil for the R-134a system.
  - Keep the oil bottles tightly capped at all times to protect the oil from moisture and contamination.
  - Never open the oil injection valve while there is positive pressure in the A/C system. This will result in oil blow-back through the bottle vent. You must have A/C system vacuum for this operation.
  - Never let the oil level drop below the pick-up tube while charging or replenishing the system. This will allow air into the A/C system.
2. Refer to the manufacturer's instructions for the charging station in use. Add the proper



amount of PAG oil to the system.

3. Close the valve when the required oil charge has been pulled into the system.

## **Charging**

**Note:** Evacuate the air conditioning system before charging.

1. Close the low-side valve on the control panel.
2. Open the high-side valve on the control panel.
3. Refer to the manufacturer's instructions for the charging station in use.
4. Enter the amount of refrigerant needed to charge the A/C. Be sure that you are using the correct system of measurement (kg, lb).
5. Begin the charging process.

## **Successful Transfer Complete**

1. Close the high-side valve on the unit's control panel. Both valves should be closed.
2. Start the vehicle and the A/C system.
3. Let the engine run until the readings on the high-side and low-side gages stabilize.
4. Compare the readings to the system specifications.
5. Check the evaporator outlet temperature to ensure that the A/C system is operating within the system specifications.
6. Keep the A/C running.
7. Close the high side coupler valve.
8. Disconnect the high-side hose from the vehicle.
9. Open the high-side and low-side valves on the control panel.
10. The system will quickly draw in refrigerant from both hoses through the low-side hose.
11. Close the low-side coupler valve.
12. Disconnect the low-side hose from the vehicle.

## **Unsuccessful Transfer**

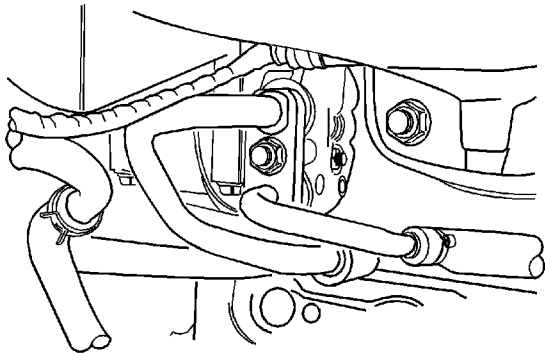
Sometimes the total charge does not transfer into the A/C system. There are 2 reasons why this may occur.

1. The pressure in the unit's tank and the pressure in the A/C system are roughly equal. This will cause the transfer to proceed too slowly. Refer to the manufacturer's instructions for the charging station in use.
2. There was not enough refrigerant in the unit's tank to transfer the full charge. It is necessary to recover the partial charge of refrigerant from the vehicle and evacuate and charge the A/C system again. Refer to the manufacturer's instructions for the charging station in use.

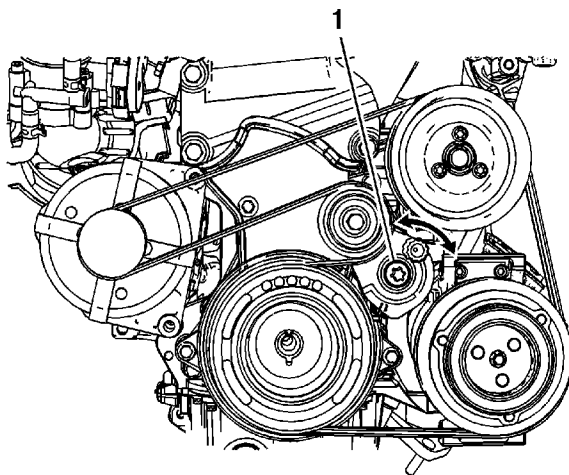
## Air Conditioning Compressor Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

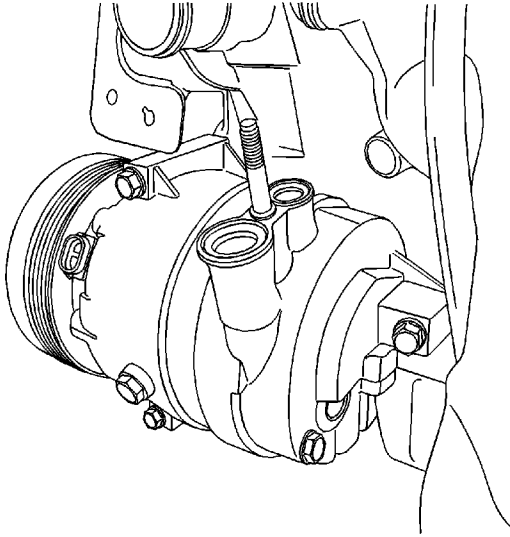


1. Disconnect the negative battery cable.
2. Discharge and recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
3. Remove the compressor A/C hose assembly connector block fitting nut.
4. Raise and suitably support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
5. Disconnect the electrical connector at the compressor.



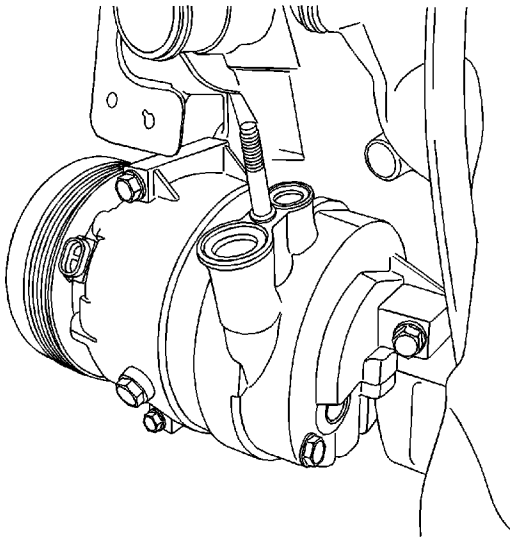


6. Remove serpentine accessory drive belt.



7. Remove the A/C compressor-to-bracket bolts.
8. Remove the compressor.
9. Drain the oil from the compressor into a container. Measure the amount of oil drained and then discard the used oil.

## Installation Procedure



1. Add oil to the new compressor. Use the exact amount of oil that you drained from the old

compressor.

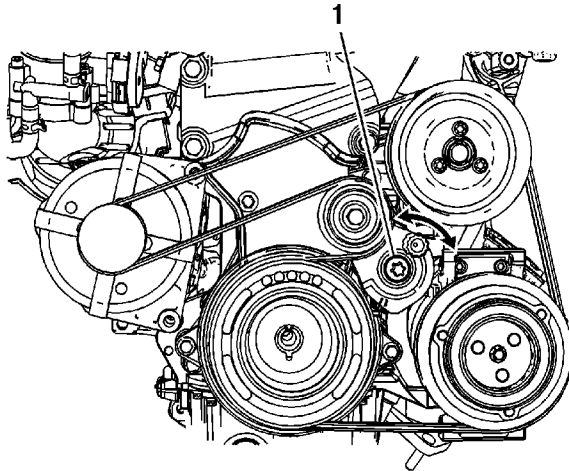
2. Install the compressor.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

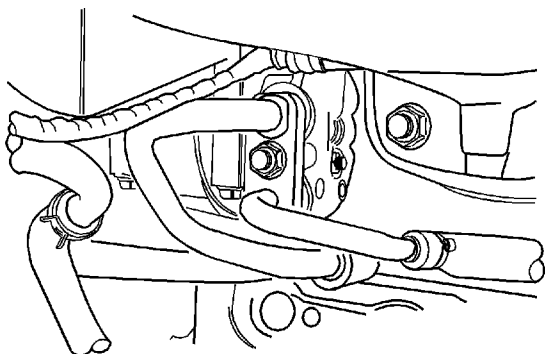
3. Install the compressor-to-bracket mounting bolts.

### Tighten

Tighten the compressor bracket bolt to 27 N·m (20 lb ft).



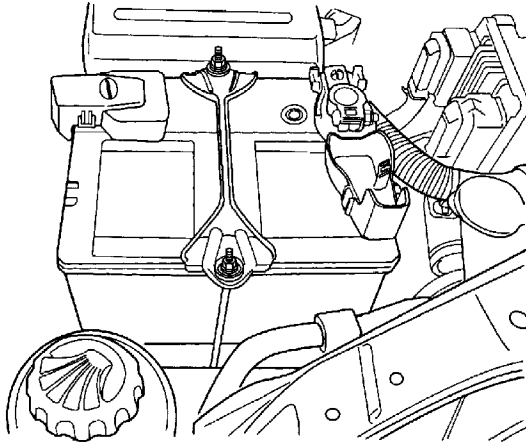
4. Install the serpentine accessory drive belt.
5. Lower the vehicle.



6. Install new O-ring to the A/C hose assembly connector block fitting.
7. Install the compressor hose assembly connector block fitting and tighten the retaining nut.

**Tighten**

Tighten the A/C system hose connector retaining nut to 33 N·m (24 lb ft).



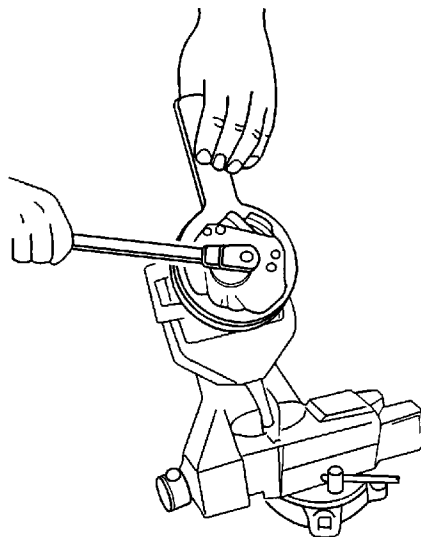
8. Connect the electrical connector at the compressor.
9. Connect the negative battery cable.
10. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).

## Compressor Clutch Plate and Hub Assembly Removal (V5 Compressor)

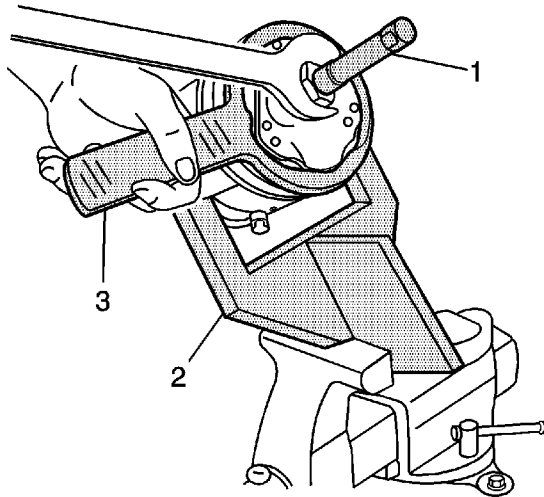
### Tools Required

- [J 33013-B](#) Hub and Drive Plate Remover/Installer
- [J 33027-A](#) Clutch Hub Holding Tool
- [J 42428](#) Compressor Holding Fixture

### Disassembly Procedure



1. Remove the compressor. Refer to [Air Conditioning Compressor Replacement](#) .
2. Install the [J 42428](#) to the compressor and hold the compressor holding fixture using a bench vise.
3. Use the [J 33027-A](#) to keep the clutch drive plate and the hub assembly from turning. Remove the shaft nut.

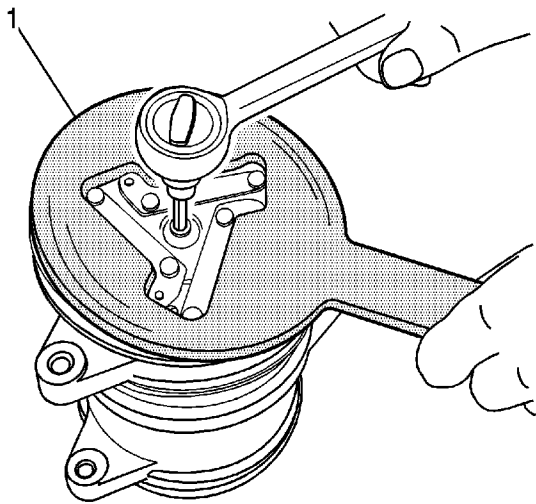


4. Thread the [J 33013-B](#) (1) into the hub. Hold the body of the remover with a wrench and turn the center screw into the remover body to remove the clutch drive plate and hub assembly.
5. Remove the clutch hub key. Retain the key for assembly (3).

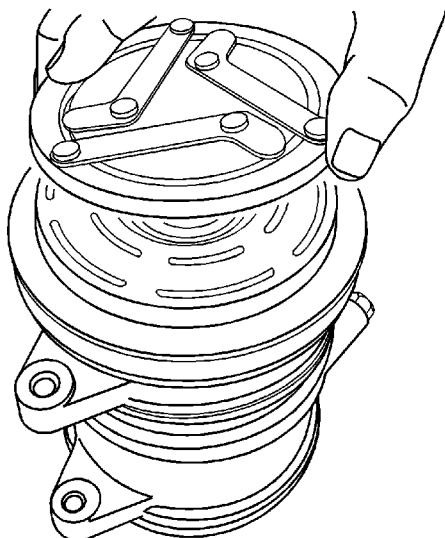
## Compressor Clutch Plate and Hub Assembly Removal (SP10 Compressor)

### Tools Required

[DW-610-010](#) Clutch Hub Holding Tool



1. Remove the compressor. Refer to [Air Conditioning Compressor Replacement](#) .
2. Use the [DW-610-010](#) clutch hub holding tool (1) to keep the clutch drive assembly from turning.
3. Remove the shaft bolt.





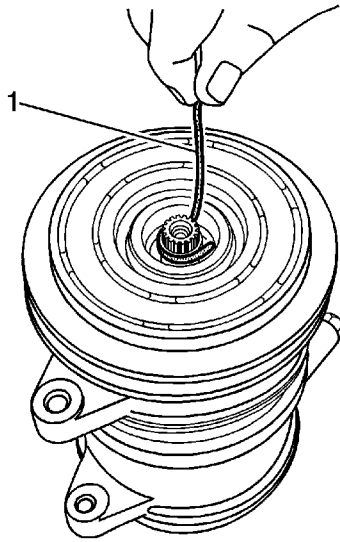


4. Pull the clutch drive assembly up by hand.

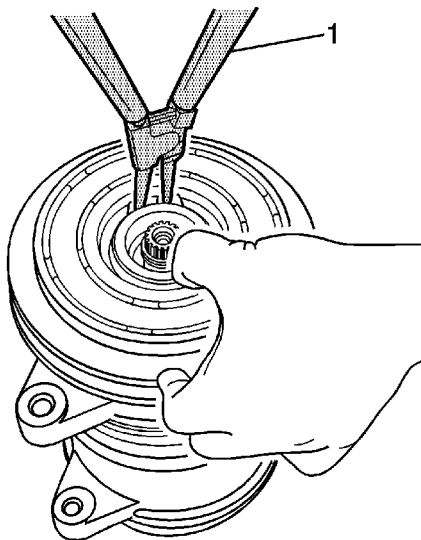
## Clutch Rotor and Bearing Removal (SP10 Compressor)

### Tools Required

[J 9553-01](#) O-Ring Remover



1. Remove the clutch and drive assembly. Refer to [Compressor Clutch Plate and Hub Assembly Removal](#).
2. Remove the shims using the [J 9553-01](#) O-ring remover.



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3. Remove the pulley ring retainer using the snap ring pliers (1).
4. Pull the pulley groove with both hands until the pulley and bearing assembly is free.

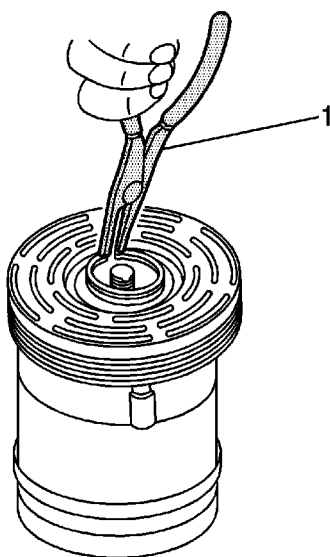
## Clutch Rotor and Bearing Removal (V5 Compressor)

### Special Tools

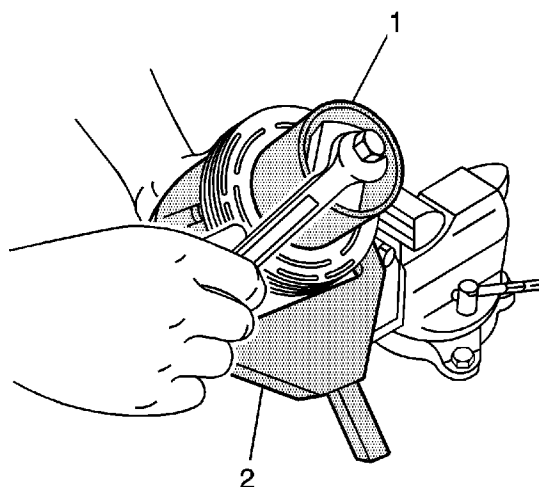
- [J 6083](#) Snap Ring Pliers
- [J 8092](#) Driver Handle
- [J 9398-A](#) Bearing Remover
- [J 33020](#) Pulley Puller

### Disassembly Procedure

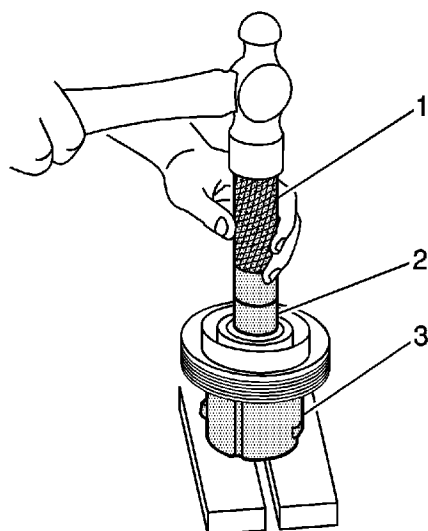
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
3. Remove the compressor. Refer to [Air Conditioning Compressor Replacement](#).
4. Remove the clutch drive plate and hub assembly. Refer to [Compressor Clutch Plate and Hub Assembly Removal](#).



5. Remove the pulley rotor and the bearing assembly retaining ring using the [J 6083](#) .
6. Install the [J 33020](#) (1) into the inner circle of slots in the pulley rotor. Turn the [J 33020](#) (1) clockwise in the slots to engage the puller tangs with the segments between the slots in the rotor.
7. Hold the [J 33020](#) (1) in place and tighten the puller bolt against the compressor shaft to remove the pulley rotor and the bearing assembly.



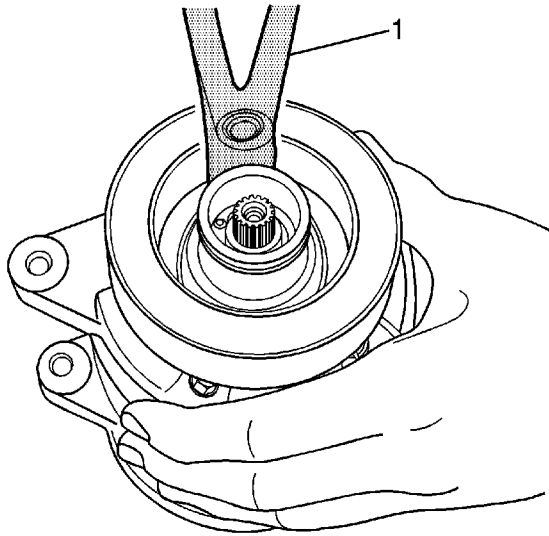
**Caution:** The rotor hub must be properly supported to prevent damage to the pulley rotor during bearing removal.

8. Remove the puller bolt from the [J 33020](#) . With the puller tangs still engaged in the rotor slots, invert the assembly onto a solid flat surface or blocks.

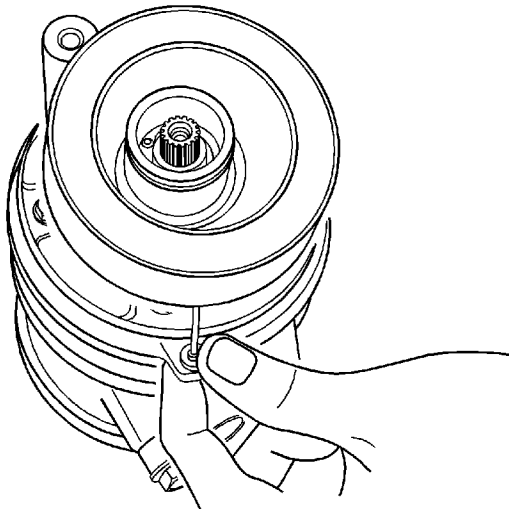
**Caution:** When removing the bearing, it is not necessary to remove the staking in front of the bearing. It will be necessary to file away the old stake metal for proper clearance for the new bearing to be installed into the rotor bore or the bearing may be damaged.

9. Drive the bearing out of the rotor hub with the [J 9398-A](#) (2) and the [J 8092](#) (1).

## Air Conditioning Clutch Coil Removal (SP10 Compressor)



1. Remove the clutch and drive assembly. Refer to [Compressor Clutch Plate and Hub Assembly Removal](#).
2. Remove the pulley and bearing assembly. Refer to [Clutch Rotor and Bearing Removal](#).
3. Remove the coil retainer using the snap ring pliers (1).



4. Remove the coil and housing assembly.

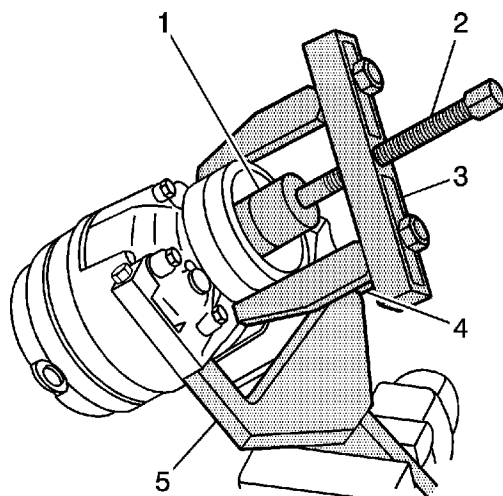
## Air Conditioning Clutch Coil Removal (V5 Compressor)

### Special Tools

- [J 8433-1](#) Puller Crossbar
- [J 8433-3](#) Forcing Screw
- [J 33023-A](#) Puller Pilot
- [J 33025](#) Clutch Coil Puller Legs

### Disassembly Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



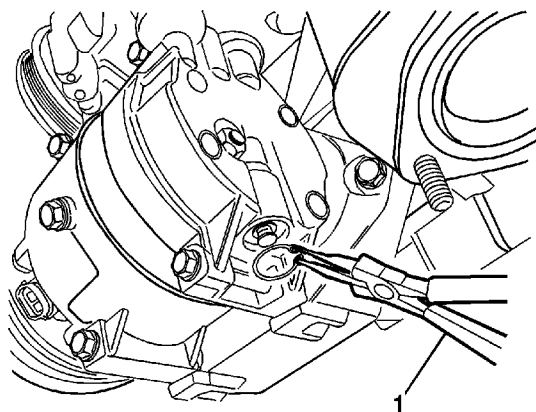
1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
3. Remove the compressor. Refer to [Air Conditioning Compressor Replacement](#).
4. Remove the clutch plate and hub assembly. Refer to [Compressor Clutch Plate and Hub Assembly Removal](#).
5. Remove the clutch rotor and bearing. Refer to [Clutch Rotor and Bearing Removal](#).
6. Mark the clutch coil terminal location on the compressor housing.
7. Install the [J 33023-A](#) (1) on the compressor housing. Also install the [J 8433-1](#) (3) with the [J 33025](#) (4).
8. Tighten the [J 8433-3](#) (2) against the [J 33023-A](#) (1) to remove the clutch coil.



## Compressor Control Valve Assembly Removal

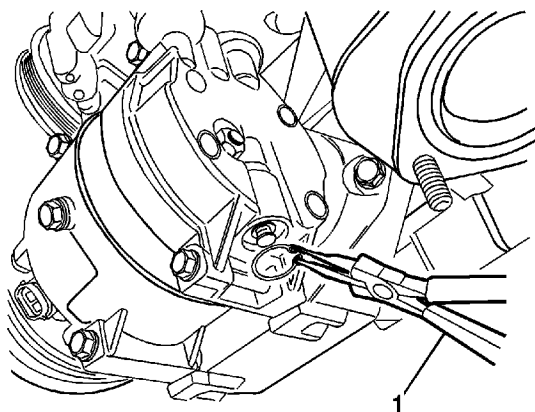
### Tools Required

[J 5403](#) Snap Ring Pliers



1. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#) .
2. Remove the control valve retaining ring using the [J 5403](#) (1).
3. Remove the control valve assembly.

## Compressor Control Valve Assembly Install

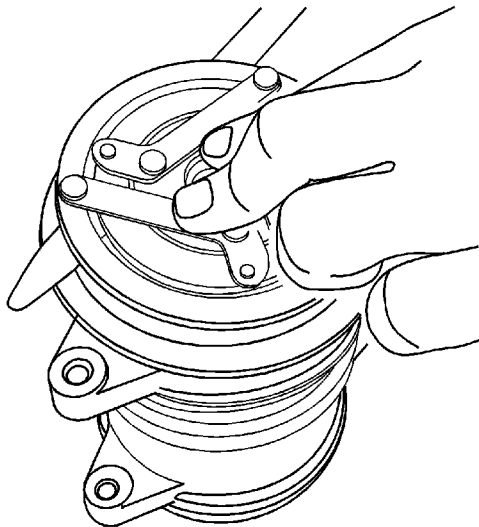


### Tools Required

[J 5403](#) Snap Ring Pliers

1. Install the control valve assembly.
2. Install the control valve retaining ring using [J 5403](#) (1).
3. Recover the refrigerant. Refet to [Refrigerant Recovery and Recharging](#) .

## Compressor Clutch Plate/Hub Assembly Install (SP10 Compressor)



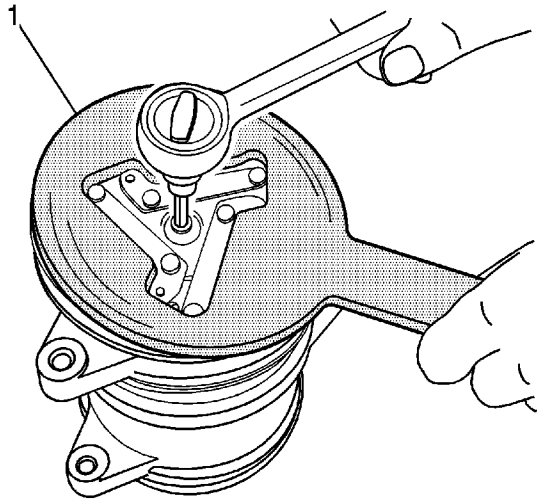
1. Place the clutch drive assembly to match the shaft serration with the drive hub serration.
2. Gently insert the clutch drive assembly.

**Important:** If the air gap is correct, proceed to the next step. If not, change the shim to meet the specified air gap.

3. Check the air gap with the feeler gage roughly by pressing the clutch drive assembly before fastening the shaft bolt.

### Specification

0.3-0.7 mm (0.012-0.028 in)



4. Use the [DW-610-010](#) clutch hub holding tool (1) to keep the clutch drive assembly from turning.
5. Place the washer before fastening the shaft bolt.

**Tighten**

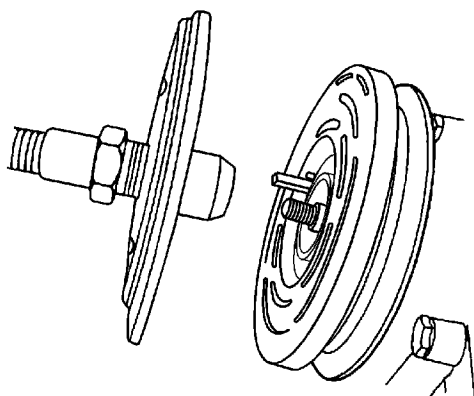
Tighten the shaft bolt to 12-15 N·m (106-133 lb in).

6. Recheck the air gap with the feeler gage.

## Compressor Clutch Plate/Hub Assembly Install (V5 Compressor)

### Special Tools

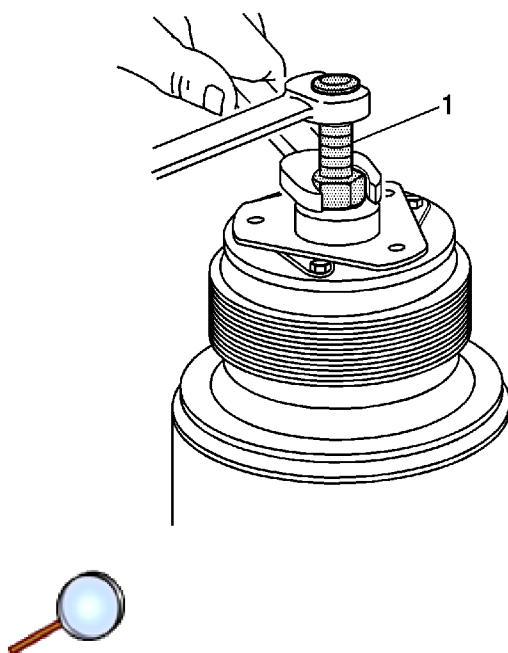
- [J 33013-B](#) Hub and Drive Plate Remover/Installer
- [J 33022](#) Shaft Nut Socket
- [J 33027-A](#) Clutch Hub Holding Tool
- [J 42428](#) Compressor Holding Fixture



1. Install the clutch hub key into the hub keyway. Allow the key to project approximately 3.2 mm (1/8 in) out of the keyway. The hub key is curved slightly to provide an interference fit in the hub key groove.
2. Be sure the frictional surface of the clutch plate and the pulley rotor are clean before installing the clutch drive plate and the hub assembly.

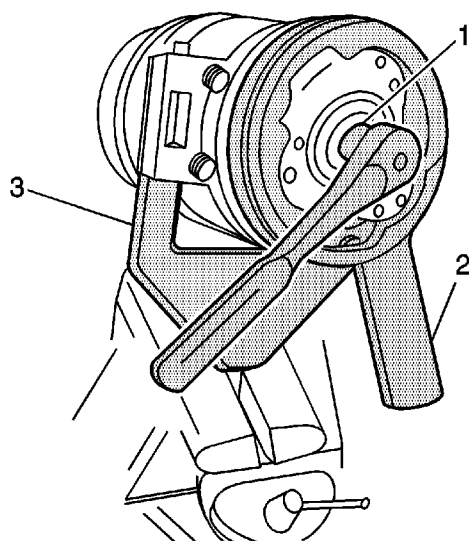
**Caution:** Do not drive or pound on the clutch hub or the shaft. Internal damage to the compressor may result.

3. Align the clutch hub key with the shaft keyway. Place the clutch drive plate and hub assembly onto the compressor shaft.



**Note:** If the center bolt is threaded fully onto the end of the compressor shaft, or if the body of the [J 33013-B](#) (1) is held and the center bolt is rotated, the key will wedge and could break the clutch drive plate and the hub assembly.

4. Remove the [J 33013-B](#) (1) center bolt and reverse the body direction on the center bolt. The body of the [J 33013-B](#) (1) should be backed off sufficiently to allow the center bolt to be threaded onto the end of the compressor shaft.
5. Install the [J 33013-B](#) (1) and the bearing onto the clutch drive plate. Thread the center bolt onto the compressor shaft.
6. Hold the center bolt with a wrench. Tighten the hex portion of the [J 33013-B](#) (1) body to press the hub onto the shaft. Tighten the body several turns.
7. Remove the [J 33013-B](#) (1) and check to see that the clutch hub key is still in place in the keyway before installing the clutch drive plate and the hub assembly to its final position. The air gap between frictional surfaces of the clutch drive plate and the clutch pulley rotor should be 0.38-0.64 mm (0.015-0.025 in).





8. Remove the [J 33013-B](#) . Check for proper positioning of the clutch hub key. It should be even or slightly above the clutch hub.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

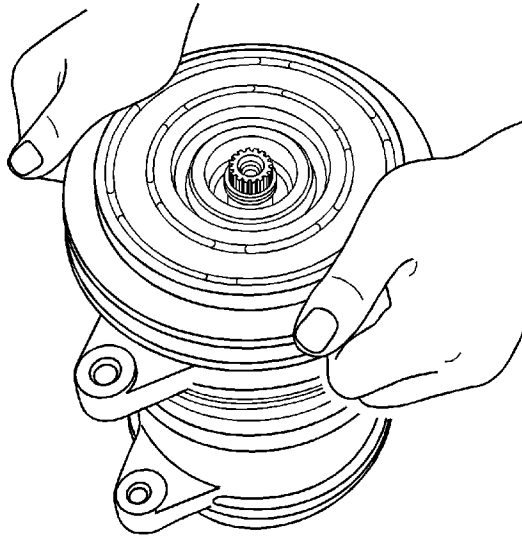
9. Install the shaft nut. Hold the clutch drive plate and the hub assembly with the [J 33027-A](#) (2). Use the [J 33022](#) (1) and tighten the nut against the compressor shaft shoulder.

### **Tighten**

Tighten the clutch plate and hub assembly nut to 17 N·m (13 lb ft).

10. Spin the pulley rotor by hand to verify that the pulley is not rubbing the clutch drive plate.
11. Remove the compressor from the bend vise and remove the [J 42428](#) (3) on the compressor.
12. Install the compressor. Refer to [Air Conditioning Compressor Replacement](#).

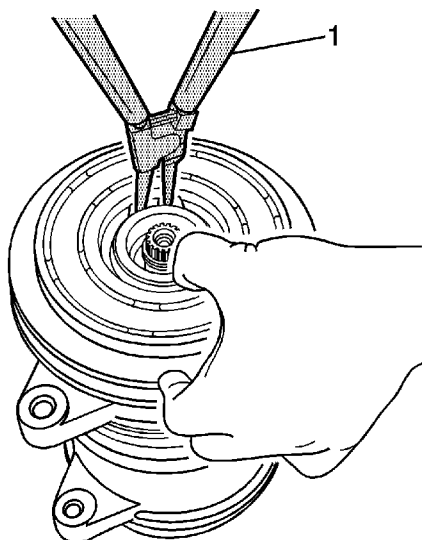
## Clutch Rotor and/or Bearing Install (SP10 Compressor)



1. Locate the rotor pulley on the front head housing squarely and precisely.
2. Insert the pulley and bearing assembly by gradually increasing the force on the pulley surface.

**Important:** Ensure pulley is fully seated.

3. Check for proper installation of the pulley by spinning it.

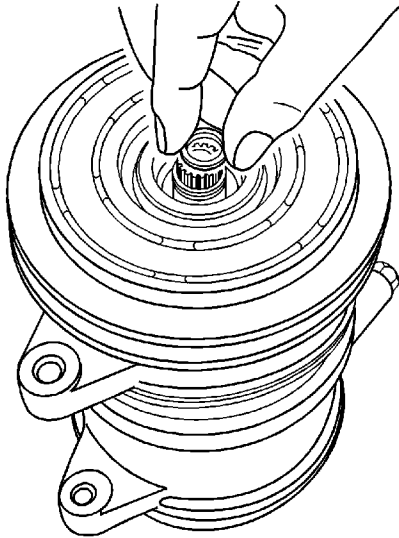




**Important:** Care must be taken to avoid damage to the bearing seal when assembling.

**Important:** Sharp edge of the retainer should be placed on its upper side during installation. Upon completion, squeeze the retainer to ensure it is well installed.

4. Install the retainer ring using the snap ring pliers (1).



5. Place the shim(s) on the shaft shoulder. Determine type and quantity of shim(s) to use to make an air gap of the specified size.

**Specification**

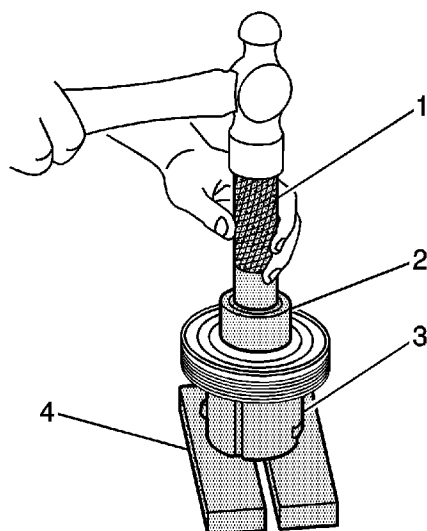
0.3-0.7 mm (0.012-0.028 in)

6. Install the clutch and drive assembly. Refer to [Compressor Clutch Plate/Hub Assembly Install](#).

## Clutch Rotor and/or Bearing Install (V5 Compressor)

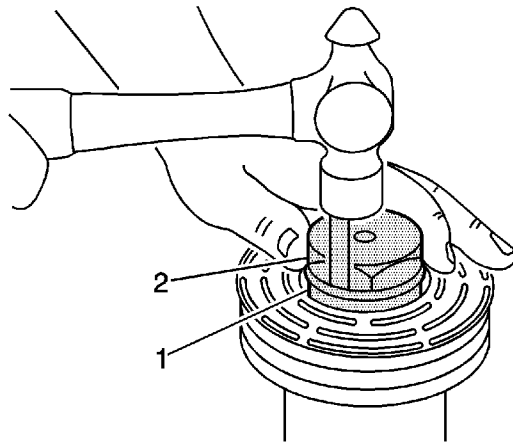
### Special Tools

- [J 33017](#) Pulley Rotor and Bearing Assembly Installer
- [J 33019](#) Bearing Staking Guide/Bearing Staking Pin
- [J 33023-A](#) Puller Pilot
- [J 42428](#) Compressor Holding Fixture
- [J 6083](#) Snap Ring Pliers
- [J 8092](#) Driver Handle
- [J 8433-1](#) Puller Crossbar
- [J 8433-3](#) Forcing Screw
- [J 9481-A](#) Bearing Installer

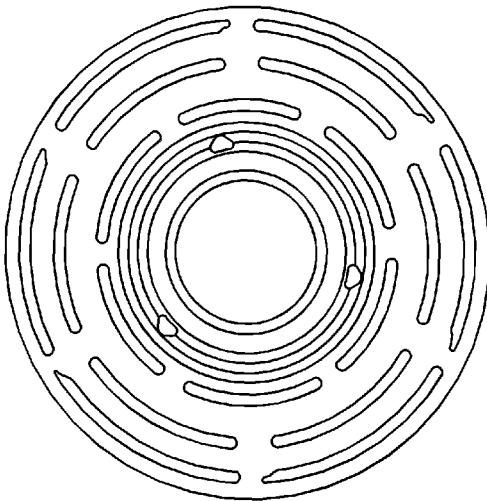


**Caution:** Do not support the rotor by resting the pulley rim on a flat surface during the bearing installation or the rotor face could be damaged.

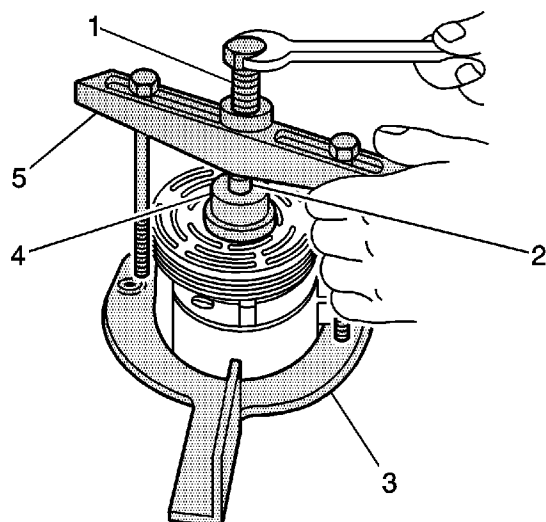
1. Invert the pulley rotor and place it on a support block to fully support the rotor hub during bearing installation.
2. Align the new bearing squarely in the pulley bore. Use the [J 9481-A](#) (2) and the [J 8092](#) (1), drive the bearing fully into the pulley bore.



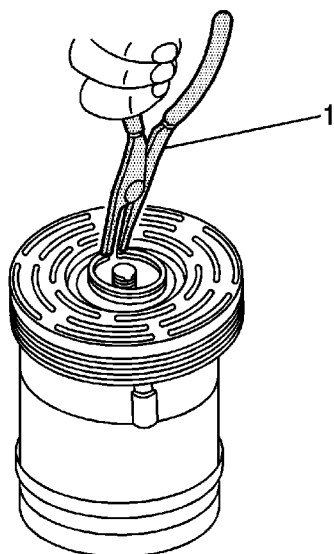
3. Place the [J 33019](#) (1) and the [J 33019](#) (2) in the rotor hub core. Shift the rotor and bearing assembly on the block to give full support to the hub under the staking pin location. A heavy-duty rubber band may be used to hold the staking tool pin in the guide. The pin should be properly positioned in the guide after each impact on the pin.



4. Strike the pin with a hammer until a metal stake, similar to the original, is formed down to, but not touching, the bearing. The metal stake should not contact the outer race of the bearing to avoid the possibility of distorting the outer race. Stake in 3 places 120° apart.



5. With the compressor mounted to the [J 42428](#) (3), position the rotor and the bearing assembly on the compressor housing.
6. Position the [J 33017](#) (4) and the [J 33023-A](#) (2) directly over the inner race of the bearing.
7. Position the [J 8433-1](#) (5) center forcing bolt on the [J 33023-A](#) (2) and assemble the 2 through-bolts and the washers through the [J 8433-1](#) (5) slots. Thread them into the [J 42428](#) (3). The thread of the through-bolts should engage the full thickness of the fixture.
8. Tighten the center [J 8433-3](#) (1) in the [J 8433-1](#) (5) to force the pulley rotor and the bearing assembly onto the compressor housing.

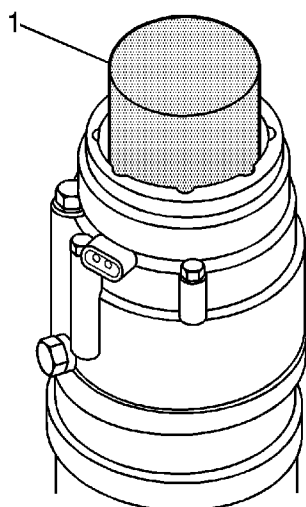


9. Install the rotor and the bearing assembly retainer ring using the [J 6083](#) (1).
10. Reinstall the clutch drive plate and the hub assembly. Refer to [Compressor Clutch Plate/Hub Assembly Install](#).
11. Install the compressor. Refer to [Air Conditioning Compressor Replacement](#).
12. Connect the negative battery cable.
13. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).

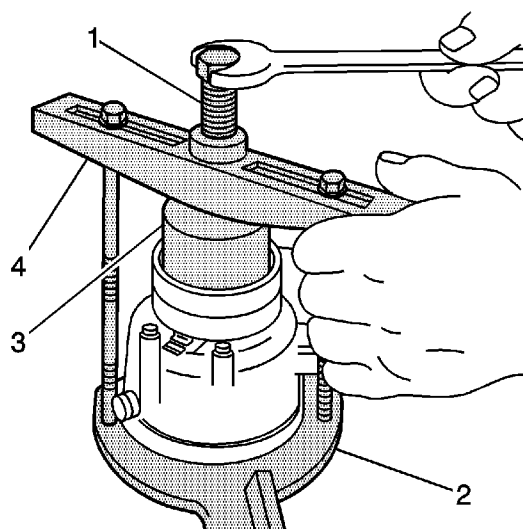
## Air Conditioning Clutch Coil Installation (V5 Compressor)

### Tools Required

- [J 8433-1](#) Puller Crossbar
- [J 8433-3](#) Forcing Screw
- [J 33024](#) Clutch Coil Installer Adapter
- [J 42428](#) Compressor Holding Fixture



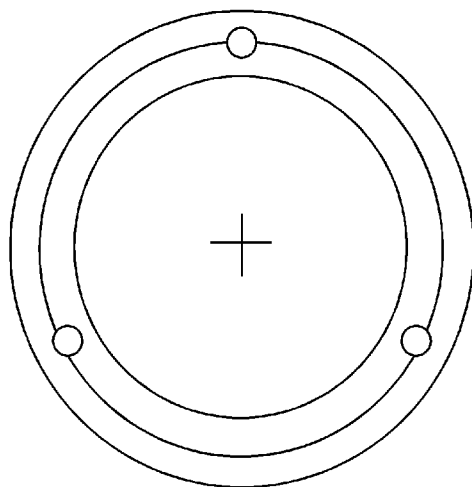
1. Place the clutch coil assembly on the compressor housing with the terminals positioned at the marked location.
2. Place the [J 33024](#) (1) over the internal opening of the clutch coil housing and align the [J 33024](#) (1) with the compressor housing.



3. Center the [J 8433-1](#) (4) in the countersunk center hole of the [J 33024](#) (3). Install the [J 42428](#) (2) through-bolts and the washers through the crossbar slots. Thread them into the holding fixture to the full thickness of the holding fixture.

**Important:** Be sure the clutch coil and the installer stay in-line during installation.

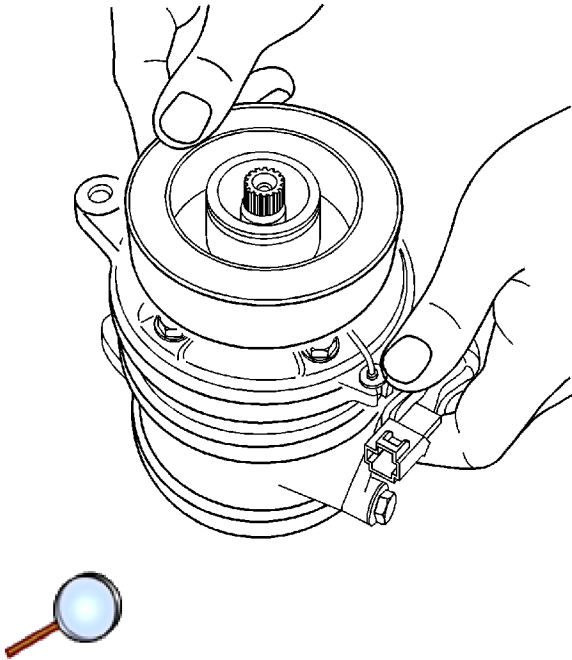
4. Turn the [J 8433-3](#) (1), or use a suitable vise, to force the clutch coil onto the compressor housing.



5. When the clutch coil is fully seated on the compressor housing, use a 3 mm (1/8 inch) diameter drift punch and stake the housing at 3 places, 120° apart, to ensure that the clutch coil will remain in position. Stake point size should be only one-half the area of the punch tip and approximately 0.28-0.35 mm (0.01-0.015 in) deep.
6. Install the clutch rotor and bearing assembly. Refer to [Clutch Rotor and/or Bearing Install](#).

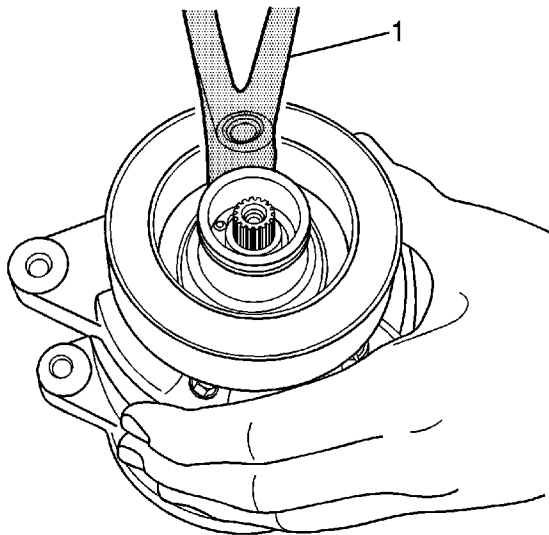
7. Install the clutch plate and hub assembly. Refer to [Compressor Clutch Plate/Hub Assembly Install](#) .
8. Install the compressor. Refer to [Air Conditioning Compressor Replacement](#) .
9. Connect the negative battery cable.
10. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#) .

## Air Conditioning Clutch Coil Installation (SP10 Compressor)



**Important:** Coil flange protrusion must match front head hole to prevent coil movement and allow for correct lead wire location. The lead wire must then be tightened by pulling it toward the compressor body to prevent it from touching the pulley.

1. Gently install the coil and housing assembly. The lead wire clamp must be inserted tightly onto the front head slot.







2. Install the retainer ring using the snap ring pliers (1).

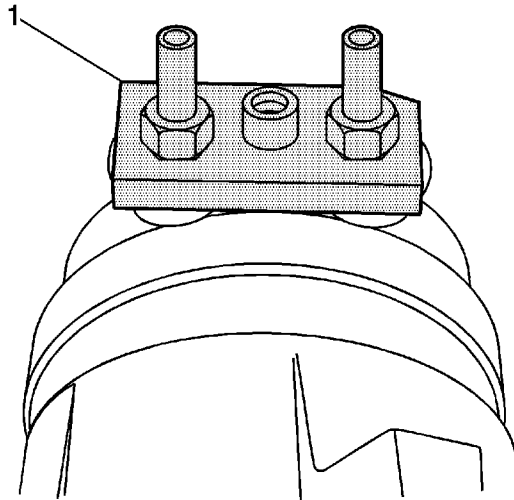
**Important:** Sharp edge side of the coil retainer should be placed on its upper side during assembly. Upon completion, squeeze the retainer to ensure it is well installed.

3. Install the pulley and bearing assembly. Refer to [Clutch Rotor and/or Bearing Install](#) .
4. Install the clutch and drive assembly. Refer to [Compressor Clutch Plate/Hub Assembly Install](#) .

## Compressor Leak Testing

### Tools Required

[J 9625-A](#) Pressure Test Set



1. Install the [J 9625-A](#) (1) connector to the suction/discharge ports on the compressor.
2. Attach the center hose of the manifold gage set on the charging station to a refrigerant drum standing in an upright position. Open the valve on the drum.
3. Connect the charging station high and low-pressure lines to the corresponding fittings on the [J 9625-A](#) (1) connectors, or hoses equipped with valve depressors. The suction port, low-side, of the compressor has a large internal opening. The discharge port, high-side, has a smaller internal opening into the compressor.
4. Open the low-pressure control, the high-pressure control, and the refrigerant control on the charging station to allow the refrigerant vapor to flow into the compressor.
5. Using a leak detector, check for leaks at the high-pressure relief valve seal, the housing seal, the rear head seal, the center cylinder seal, the through-bolt gaskets, and the compressor shaft seal. After checking for leaks, shut off the low-pressure control, the high-pressure control, and the refrigerant control lines on the charging station.
6. If an external leak is present, perform the necessary corrective measures and recheck for leaks to verify that the leak has been corrected.
7. Loosen the manifold gage hose connections to the gage adapters connected to the low and high sides. Allow the vapor pressure to release from the compressor. If the valve depressor-type hoses are used, loosen the hose connections at the gage manifold to release vapor pressure from the compressor.
8. Disconnect both gage hoses. Remove the [J 9625-A](#) (1).

## O-Ring Replacement

**Important:** Even though O-rings may look identical, it is extremely important that only recommended service replacement air conditioning O-rings be used, or excessive leakage of refrigerant may occur.

**Important:** Always slip the O-ring onto the flange tube to ensure proper locating and sealing.

Install new General Motors-approved service replacement air conditioning O-rings whenever a joint or a fitting is assembled, except when the O-rings are provided on new components.

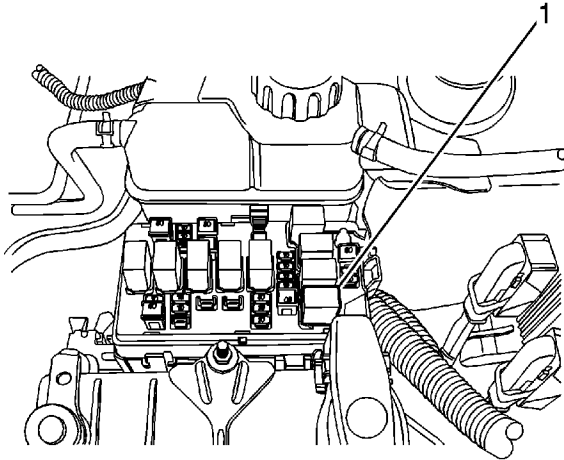
When replacing O-rings on an air conditioning component or a joint connection, the fitting design should be identified to ensure installation of the correct air conditioning service replacement O-ring. Some joint connections and components will implement a captured O-ring design fitting that uses a groove to retain the O-ring. Others do not have a groove and use a non-captured or standard O-ring. Assembly and tightening procedures are the same for both designs, but the O-rings are different.

Before installation, verify that both O-rings and fittings have not been nicked or deformed. Deformed or nicked parts must be replaced. Failure to use the proper service replacement parts and procedures may result in excessive refrigerant leakage.

## Compressor Relay Replacement (Notchback)

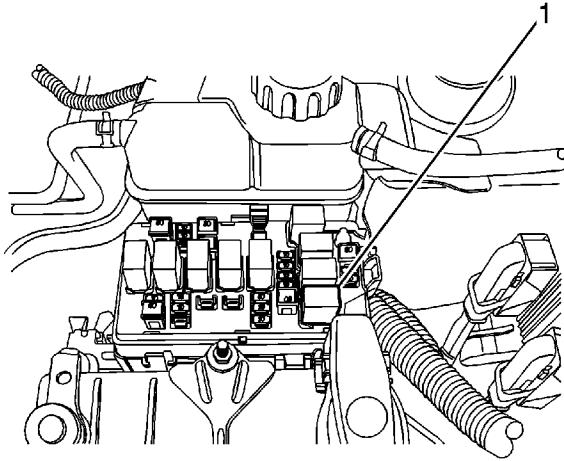
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. The relay is located in the fuse junction box in the engine compartment on the right-hand side.
3. Pull the relay (1) straight up and out.

### Installation Procedure

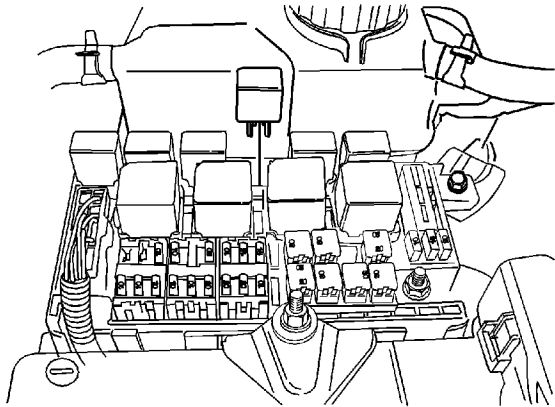


1. Align the relay terminal contacts with the base receptacle.
2. Push the relay (1) into the base until it is seated.
3. Connect the negative battery cable.

## Compressor Relay Replacement (Hatchback)

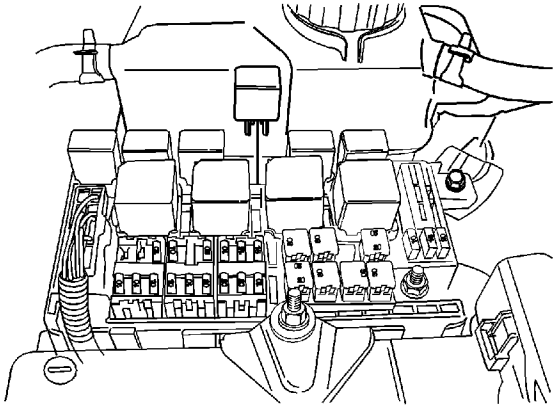
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. The relay is located in the fuse junction box in the engine compartment on the right-hand side.
3. Pull the relay straight up and out.

### Installation Procedure

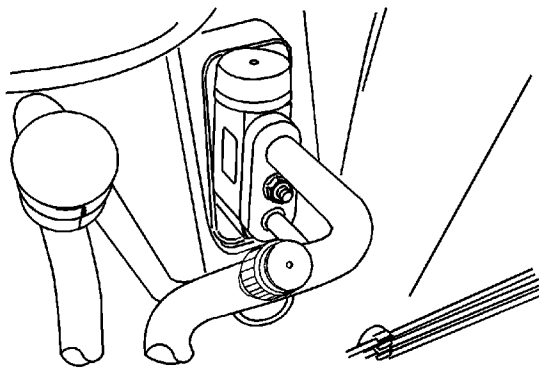


1. Align the relay terminal contacts with the base receptacle.
2. Push the relay into the base until it is seated.
3. Connect the negative battery cable.

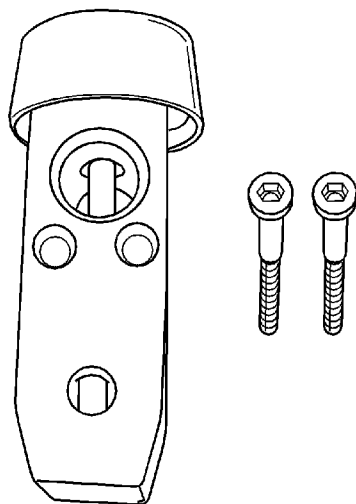
# Air Conditioning Evaporator Thermal Expansion Valve Replacement

## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



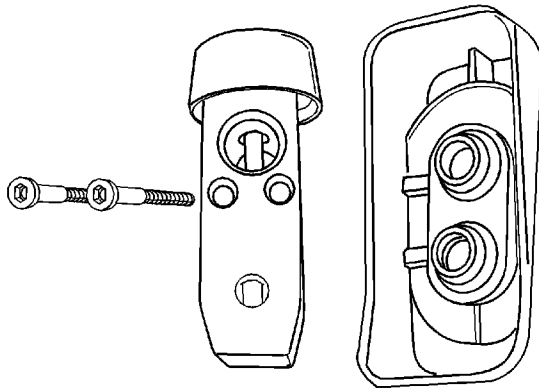
1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
3. Remove the liquid evaporator pipe connector block retaining nut at the cowl.





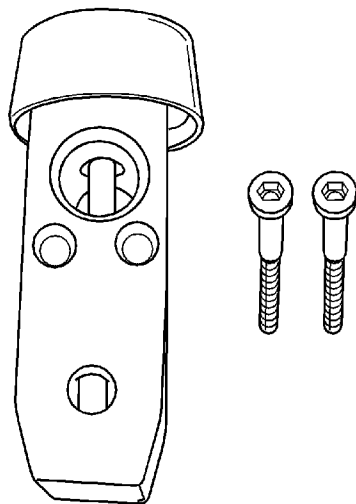


4. Remove the expansion valve connector block retaining bolts.
5. Remove the expansion valve.



6. Discard the O-rings.

## Installation Procedure



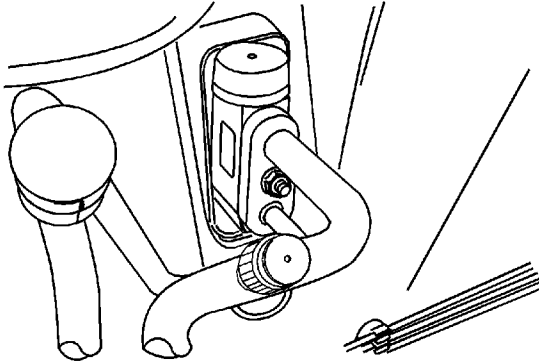
1. Clean the O-ring surface areas of dirt or contamination.
2. Install new O-rings on the evaporator tubes.
3. Install a new expansion valve onto the evaporator tubes.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the expansion valve retaining bolts.

**Tighten**

Tighten the expansion valve retaining bolts to 12 N·m (106 lb in).



5. Install the liquid evaporator pipe connecting block retaining nut at the cowl.

**Tighten**

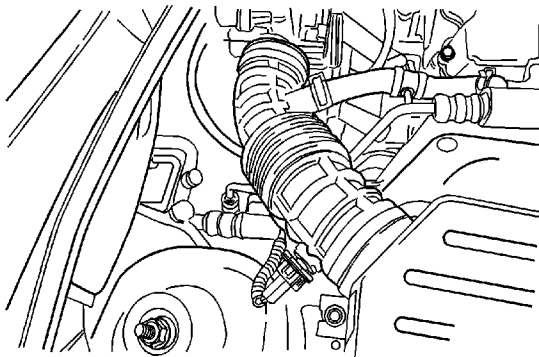
Tighten the liquid evaporator pipe connecting block retaining nut to 15 N·m (11 lb ft).

6. Connect the negative battery cable.
7. Evacuate and recharge the system. Refer to [Refrigerant Recovery and Recharging](#).

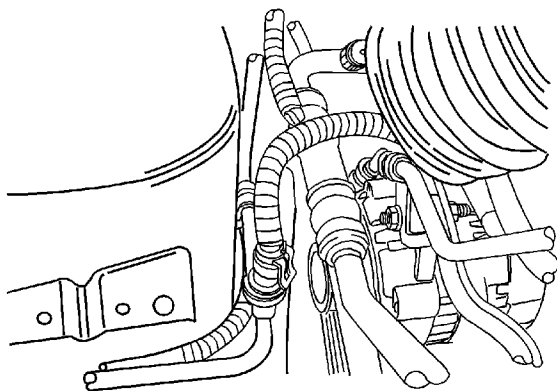
# Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement

## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



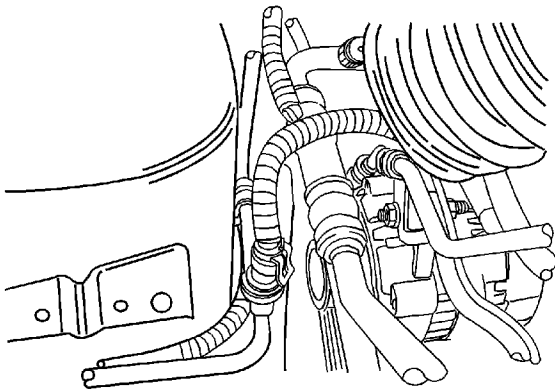
1. Disconnect the negative battery cable.
2. Remove the air cleaner housing bolts and the air filter housing assembly.





3. Release the connector lock and pull the air conditioning (A/C) pressure transducer wire connector out.
4. Hold the line fitting boss with one wrench and remove the A/C pressure transducer with another wrench.
5. Discard the O-ring seal.

## Installation Procedure



1. Install the new seal on the A/C pressure transducer.

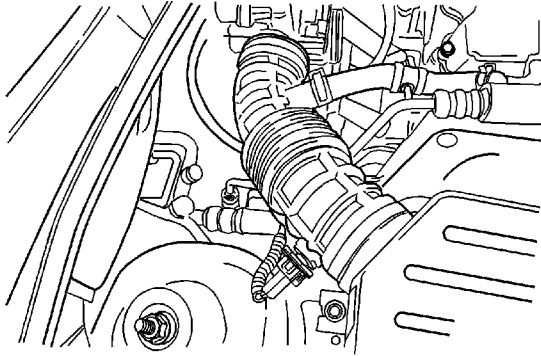
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the A/C pressure transducer.

### **Tighten**

Tighten the pressure transducer, using 2 wrenches, to 8 N·m (71 lb in).

3. Install the electrical connector.



4. Install the air cleaner housing bolts and the air filter housing assembly.

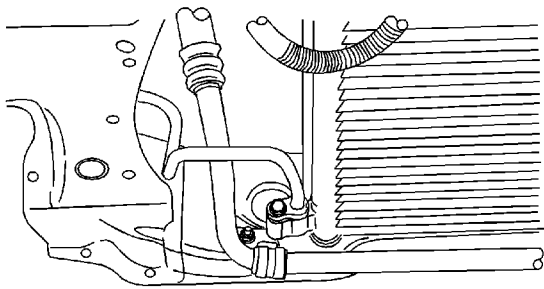
**Tighten**

Tighten the air cleaner housing assembly retaining bolts to 12 N·m (106 lb in).

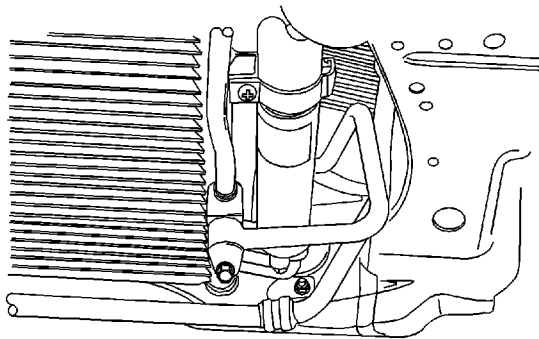
## Air Conditioning Condenser Replacement (Except North America)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

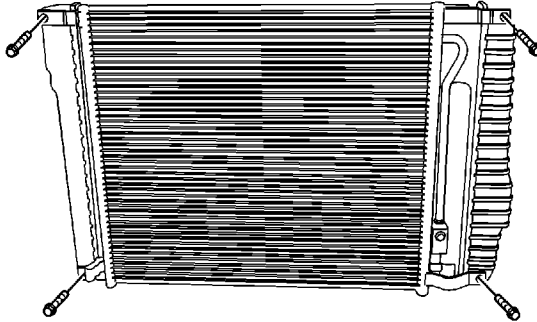


1. Disconnect the negative battery cable.
2. Discharge and recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
3. Remove the liquid pipe connector block to condenser retaining bolt.



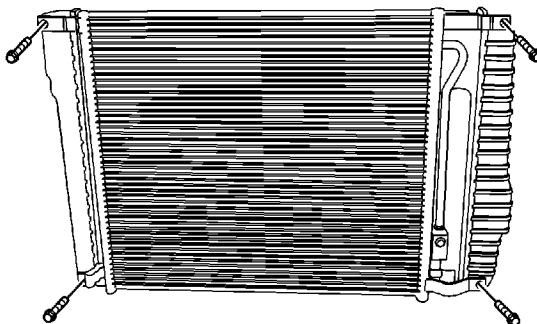


4. Remove the refrigerant discharge hose connector block bolt at the condenser.
5. Remove the radiator. Refer to [Radiator Replacement](#).
6. Cap all the openings to prevent contamination.



7. Remove the condenser mount bolts.
8. Remove the condenser from the radiator.

## Installation Procedure



1. Install new O-rings onto the receiver-dryer tube fittings.

2. Ensure that the condenser rubber mounts are in place.
3. Install the condenser to the radiator. The lower mount shock protectors must fit into the holes provided.

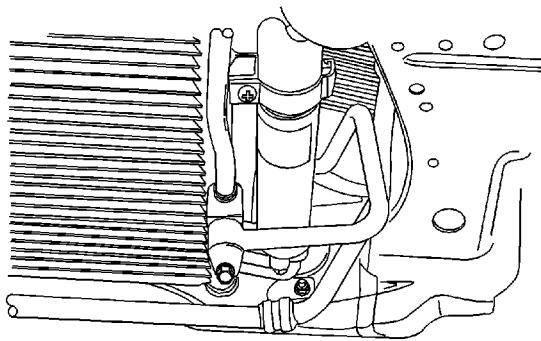
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the condenser mount bolts.

**Tighten**

Tighten the upper condenser bolts to 8 N·m (70 lb in).

5. Install the radiator. Refer to [Radiator Replacement](#).

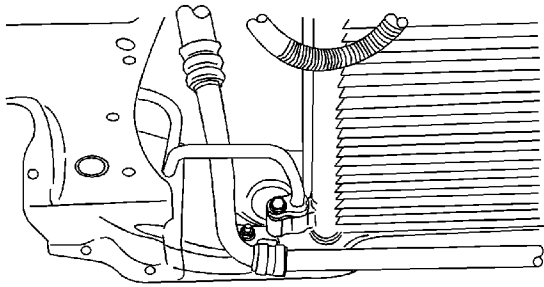


6. Install the refrigerant discharge hose connector block bolt at the condenser.

**Tighten**

Tighten the refrigerant discharge hose connector block bolt to 16 N·m (12 lb ft).





7. Install the liquid pipe connector block to condenser retaining bolt.

**Tighten**

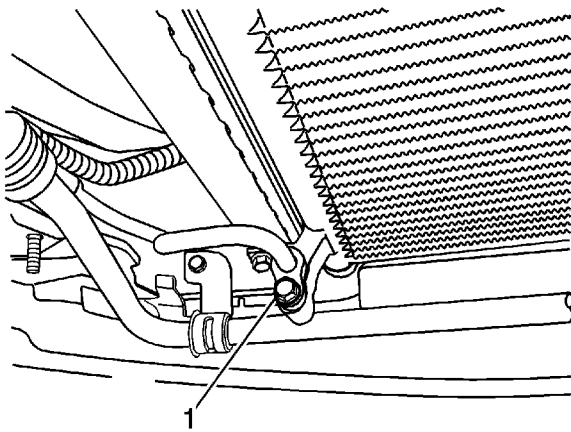
Tighten the liquid pipe connector block to condenser retaining bolt to 14 N·m (10 lb ft).

8. Connect the negative battery cable.
9. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).

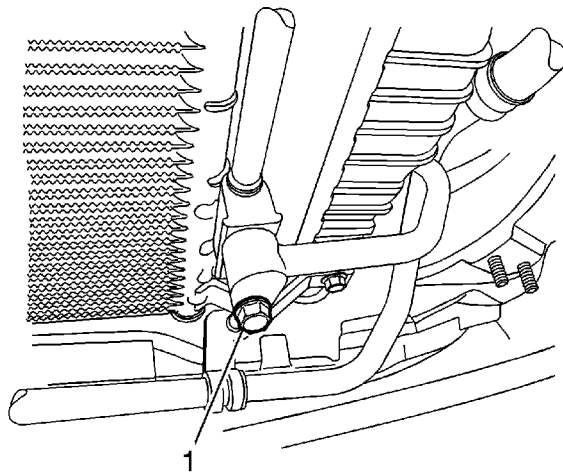
## Air Conditioning Condenser Replacement (North America)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

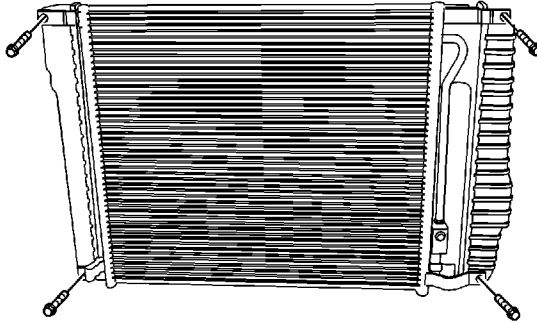


1. Disconnect the negative battery cable.
2. Discharge and recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
3. Remove the liquid pipe connector block to condenser retaining bolt.



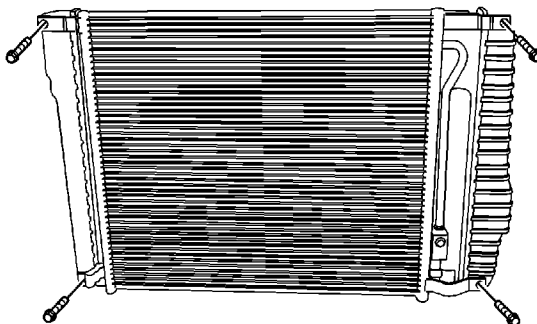


4. Remove the refrigerant discharge hose connector block bolt at the condenser.
5. Remove the radiator. Refer to [Radiator Replacement](#).
6. Cap all the openings to prevent contamination.



7. Remove the condenser mount bolts.
8. Remove the condenser from the radiator.

## Installation Procedure



1. Install new O-rings onto the receiver-dryer tube fittings.

2. Ensure that the condenser rubber mounts are in place.
3. Install the condenser to the radiator. The lower mount shock protectors must fit into the holes provided.

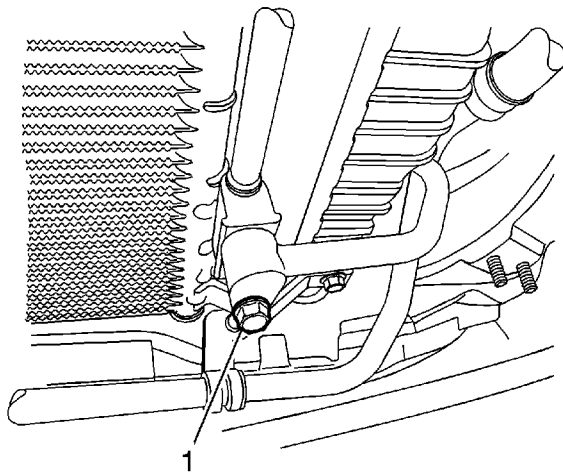
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the condenser mount bolts.

**Tighten**

Tighten the upper condenser bolts to 8 N·m (70 lb in).

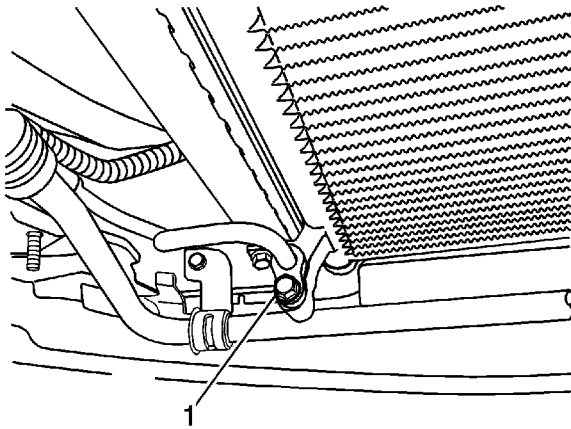
5. Install the radiator. Refer to [Radiator Replacement](#).



6. Install the refrigerant discharge hose connector block bolt at the condenser.

**Tighten**

Tighten the refrigerant discharge hose connector block bolt to 16 N·m (12 lb ft).



7. Install the liquid pipe connector block to condenser retaining bolt.

**Tighten**

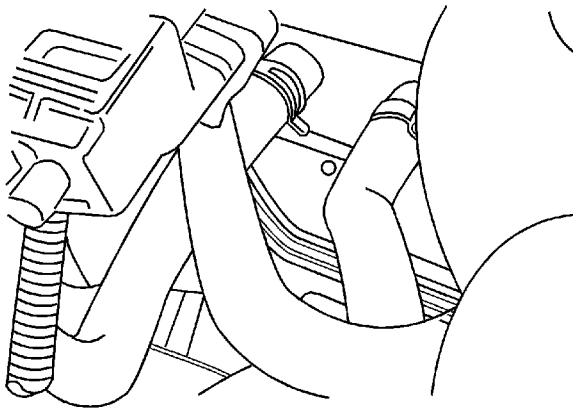
Tighten the liquid pipe connector block to condenser retaining bolt to 14 N·m (10 lb ft).

8. Connect the negative battery cable.
9. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).

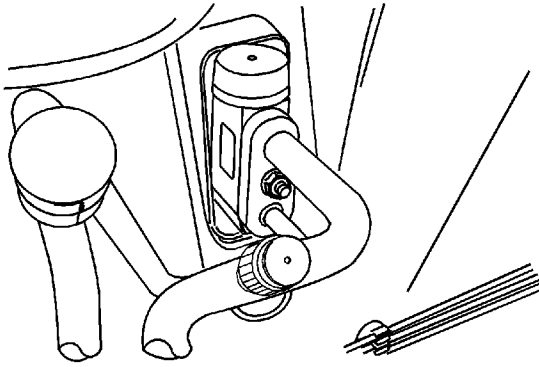
## HVAC Module Assembly Replacement

### Removal Procedure

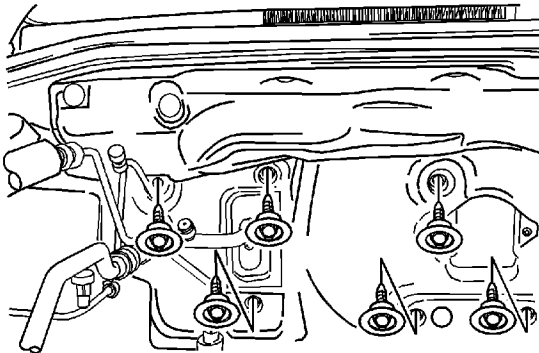
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).
3. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
4. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
5. Compress the heater hose clamps at the cowl and slide the clamps toward the engine.
6. Remove the 2 heater hoses from the core lines at the cowl.
7. Turn the condensation drain hose and pull the hose off.

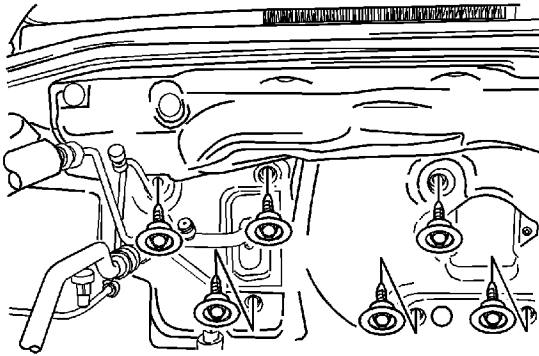


8. Remove the nuts that secure the A/C suction hose and liquid evaporator pipe connector block at the cowl.



9. From the engine side of the cowl, remove the screws that secure the heater/air distribution case assembly to the cowl.
10. Remove the heater/air distribution case assembly from the vehicle.

## Installation Procedure



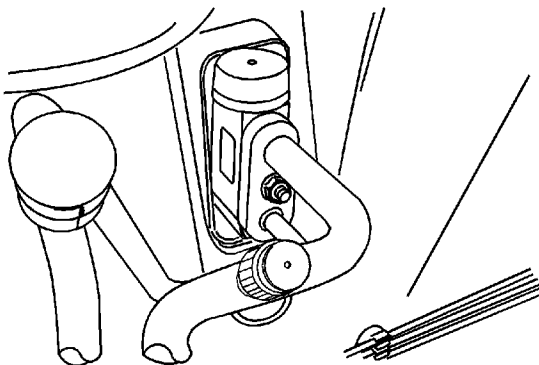
1. Clean the O-ring surface areas of dirt and contamination.
2. Install 2 new O-rings onto the A/C suction hose and the liquid evaporator pipe at the cowl in the engine compartment.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the heater/air distribution case assembly and tighten the screws.

#### **Tighten**

Tighten the heater/air distribution case assembly retaining screws on the cowl side to 8 N·m (71 lb in).

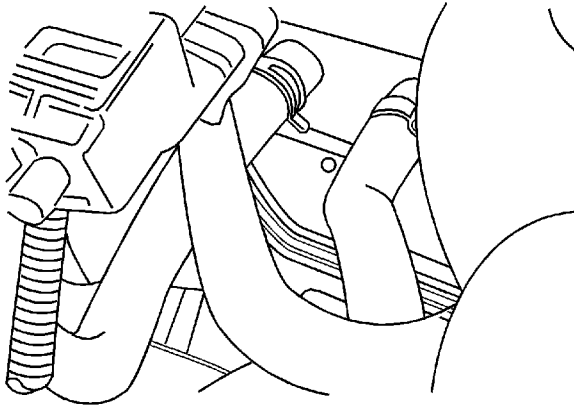




4. Install the A/C suction hose and liquid evaporator pipes onto the evaporator flange connector block and tighten the nut.

**Tighten**

Tighten the liquid evaporator pipe connector block nut to 15 N·m (11 lb ft).

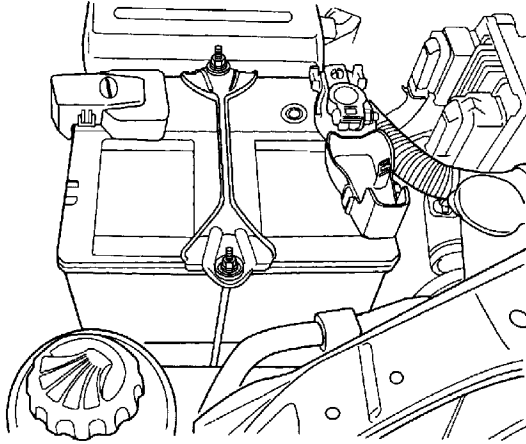


5. Connect the 2 heater hoses to the heater core tubes.
6. Slide the heater hose clamps into position.
7. Install the case condensation drain hose.
8. Install the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).
9. Fill the cooling system.
10. Connect the negative battery cable.
11. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).
12. Operate the HVAC control to verify the proper function of the heating and cooling systems.

## Air Conditioning Evaporator Core Replacement

### Removal Procedure

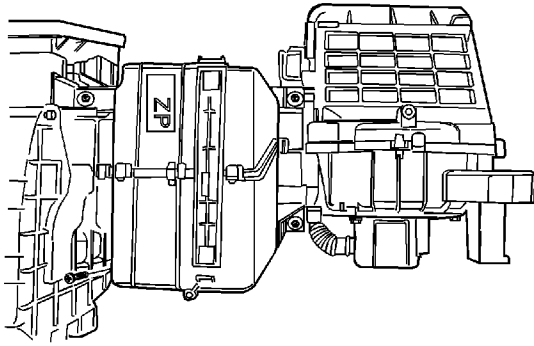
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



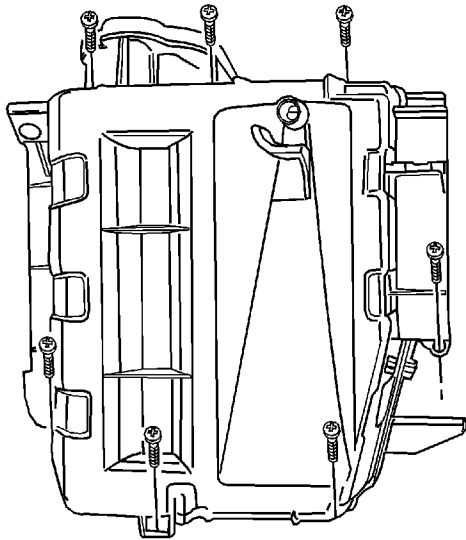
1. Disconnect the negative battery cable.
2. Remove the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).

**Caution:** Handle the case carefully to avoid damage to the door actuating linkage.

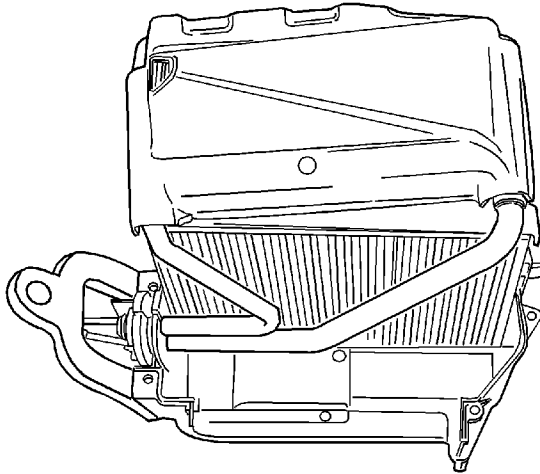
3. Remove the heater/air distribution case assembly. Refer to [HVAC Module Assembly Replacement](#).



4. Remove the screws that secure the evaporator case cover.

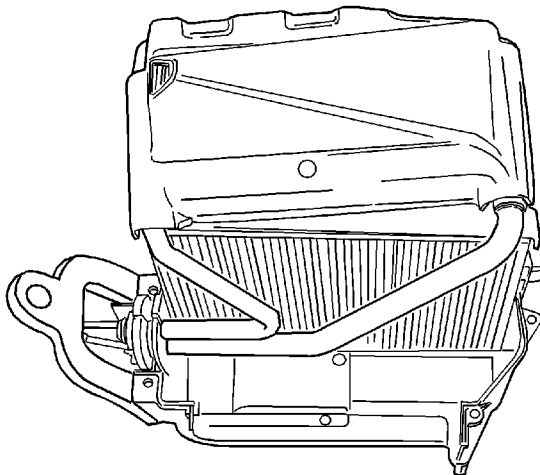


5. Remove the cover.

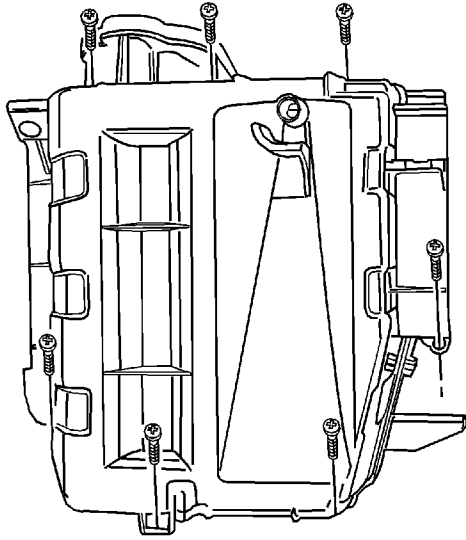


6. Slide the evaporator flange support plate upward to facilitate evaporator removal.
7. Remove the evaporator from the case.

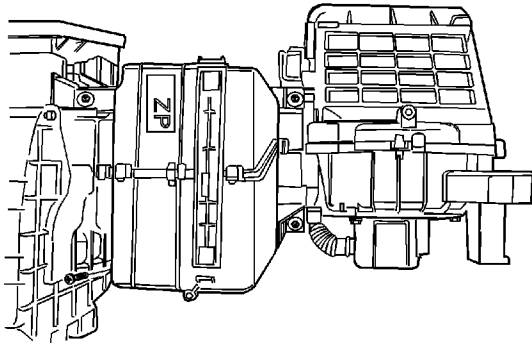
## Installation Procedure



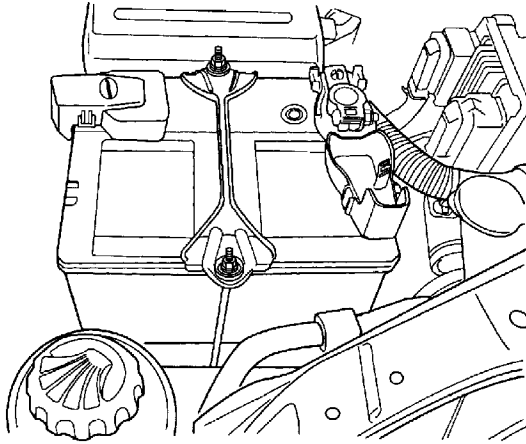
1. Install new O-rings onto the evaporator tubes.
2. Install the evaporator core into the case. Center the evaporator flange in the case opening.



3. Install the evaporator core case cover with the screws.



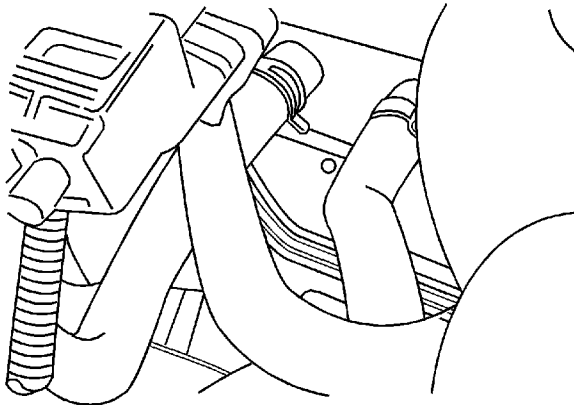
4. Install the heater/air distribution case. Refer to [HVAC Module Assembly Replacement](#).



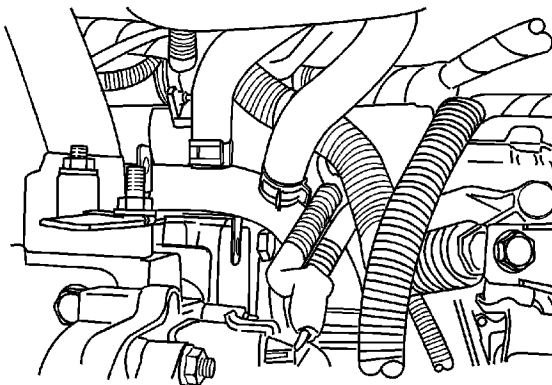
5. Install the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).
6. Connect the negative battery cable.
7. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).

## Heater Hoses Replacement (Hatchback)

### Removal Procedure



1. Partially drain the cooling system.
2. Compress and slide rearward the two heater hose spring clamps at the fire wall.

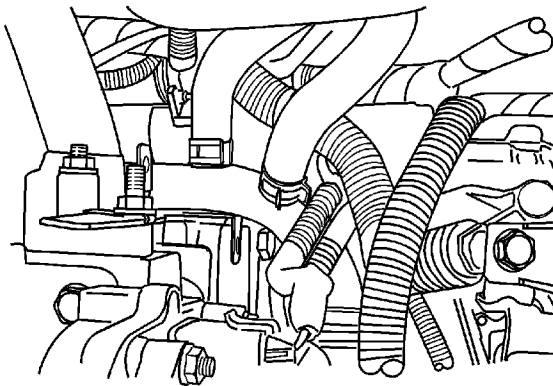


3. Gently twist the hose from the left to the right and back again to loosen the bond between the hose and the tube.
4. Remove the end of the hose from the tube.

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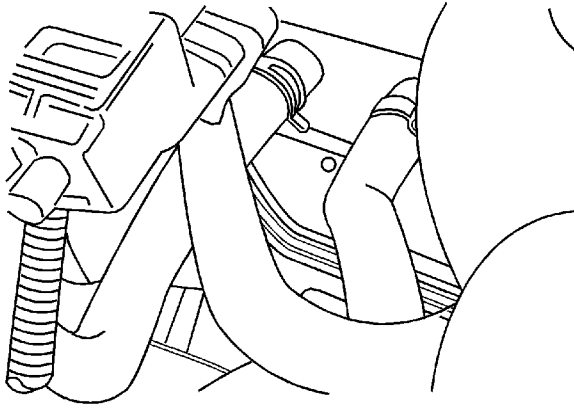
5. Repeat Steps 3 and 4 with the other hose.
6. Compress the heater hose spring clamp on the inlet coolant line and slide the clamp rearward.
7. Remove the hose from the vehicle.
8. Compress the heater hose spring clamp at the connection below the intake manifold and slide the clamp rearward.
9. Remove hose from the vehicle.

## Installation Procedure



1. Install the left heater hose to the coolant inlet line fitting. Slide the end of the heater hose over the coolant fitting until the hose is seated.
2. Install the right heater hose to the fitting below the intake manifold. Slide the end of the heater hose over the fitting until it is seated.
3. Install and seat the other end of each heater hose.
4. Compress and slide the spring clamps into position on the heater hoses and release the tension on the spring clamps.

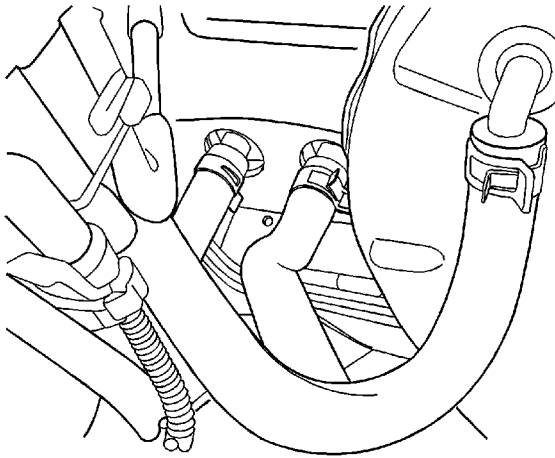




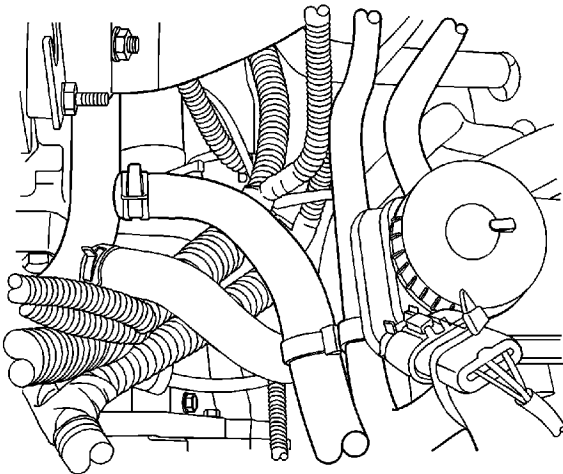
5. Filling the cooling system.
6. Check the hoses for leaks.

## Heater Hoses Replacement (Notchback)

### Removal Procedure



1. Partially drain the cooling system.
2. Compress and slide rearward the two heater hose spring clamps at the fire wall.

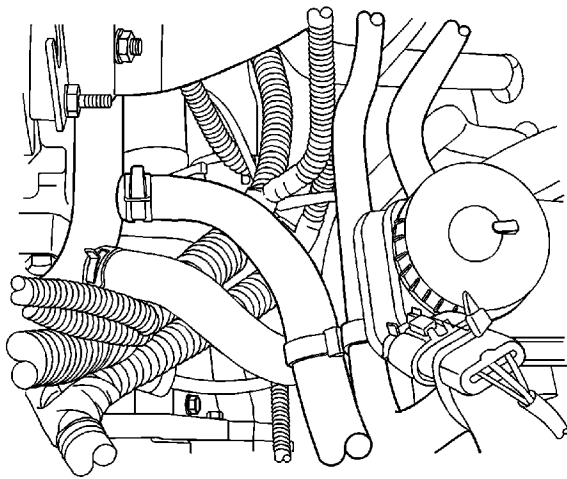


3. Gently twist the hose from the left to the right and back again to loosen the bond between the hose and the tube.
4. Remove the end of the hose from the tube.

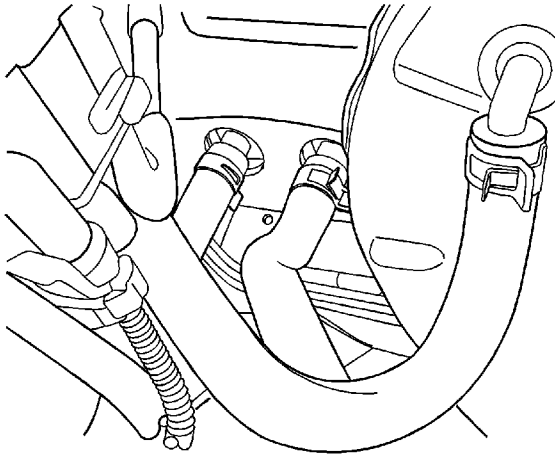
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5. Repeat Steps 3 and 4 with the other hose.
6. Compress the heater hose spring clamp on the inlet coolant line and slide the clamp rearward.
7. Remove the hose from the vehicle.
8. Compress the heater hose spring clamp at the connection below the intake manifold and slide the clamp rearward.
9. Remove hose from the vehicle.

## Installation Procedure



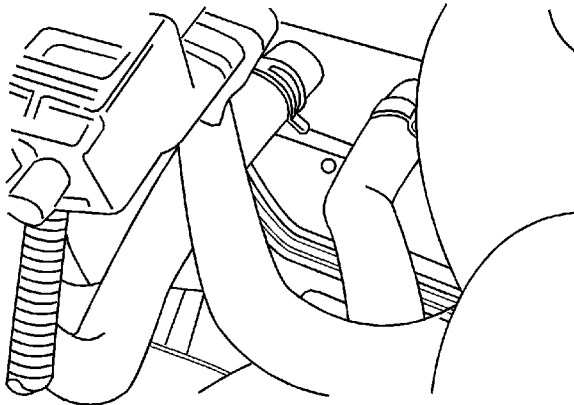
1. Install the left heater hose to the coolant inlet line fitting. Slide the end of the heater hose over the coolant fitting until the hose is seated.
2. Install the right heater hose to the fitting below the intake manifold. Slide the end of the heater hose over the fitting until it is seated.
3. Install and seat the other end of each heater hose.
4. Compress and slide the spring clamps into position on the heater hoses and release the tension on the spring clamps.



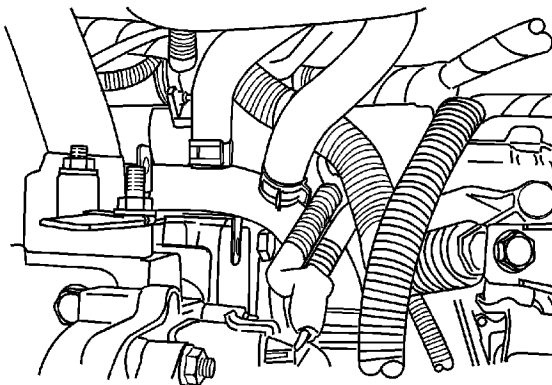
5. Filling the cooling system.
6. Check the hoses for leaks.

## Heater Hose Assembly Replacement (Hatchback)

### Removal Procedure



1. Partially drain the cooling system.
2. Compress and slide rearward the 2 heater hose spring clamps at the cowl.

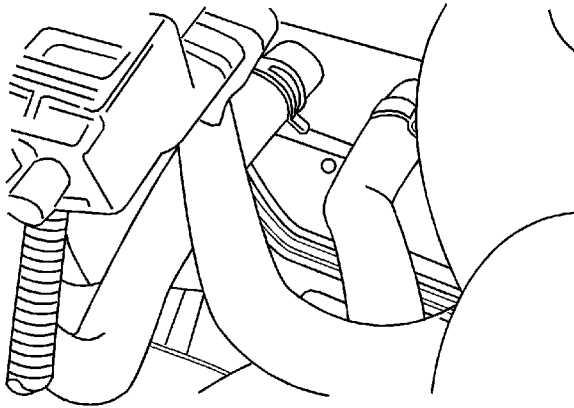


3. Gently twist the hose from left to right and back again to loosen the bond between the hose and the tube.
4. Remove the end of the hose from the tube.

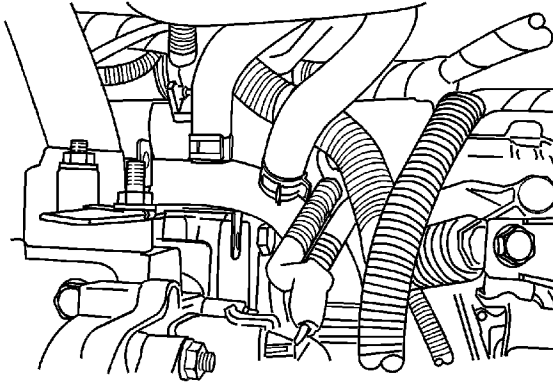
© 2010 General Motors Corporation. All rights reserved.

5. Repeat Steps 3 and 4 with the other hose.
6. Compress the heater hose spring clamp on the inlet coolant line and slide the clamp rearward.
7. Remove the hose from the vehicle.
8. Compress the heater hose spring clamp at the connection below the intake manifold and slide the clamp rearward.
9. Remove the hose from the vehicle.

## Installation Procedure



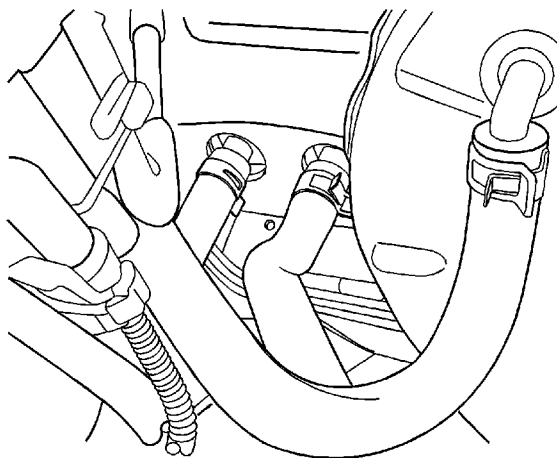
1. Install the left heater hose to the coolant inlet line fitting. Slide the end of the heater hose over the coolant fitting until the hose is seated.
2. Install the right heater hose to the fitting below the intake manifold. Slide the end of the heater hose over the fitting until it is seated.
3. Install and seat the other end of each heater hose.
4. Compress and slide the spring clamps into position on the heater hoses and release the tension on the spring clamps.



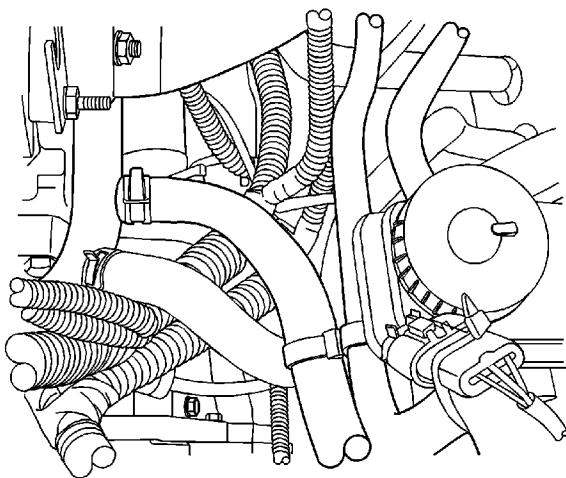
5. Fill the cooling system.
6. Inspect the hoses for leaks.

## Heater Hose Assembly Replacement (Notchback)

### Removal Procedure



1. Partially drain the cooling system.
2. Compress and slide rearward the 2 heater hose spring clamps at the cowl.



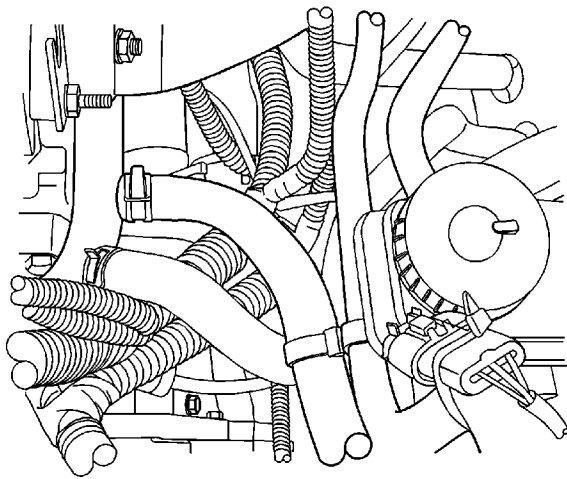
3. Gently twist the hose from left to right and back again to loosen the bond between the hose and the tube.
4. Remove the end of the hose from the tube.

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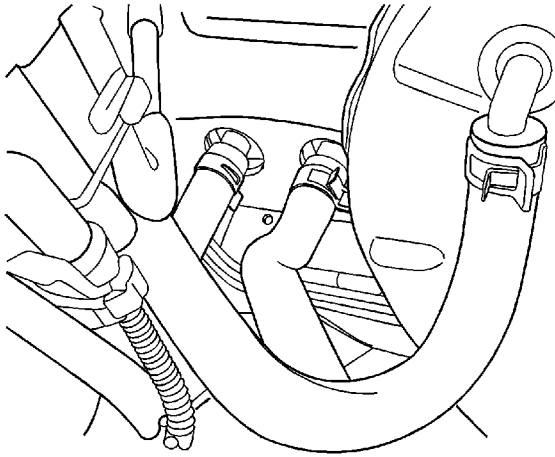


5. Repeat Steps 3 and 4 with the other hose.
6. Compress the heater hose spring clamp on the inlet coolant line and slide the clamp rearward.
7. Remove the hose from the vehicle.
8. Compress the heater hose spring clamp at the connection below the intake manifold and slide the clamp rearward.
9. Remove the hose from the vehicle.

## Installation Procedure



1. Install the left heater hose to the coolant inlet line fitting. Slide the end of the heater hose over the coolant fitting until the hose is seated.
2. Install the right heater hose to the fitting below the intake manifold. Slide the end of the heater hose over the fitting until it is seated.
3. Install and seat the other end of each heater hose.
4. Compress and slide the spring clamps into position on the heater hoses and release the tension on the spring clamps.

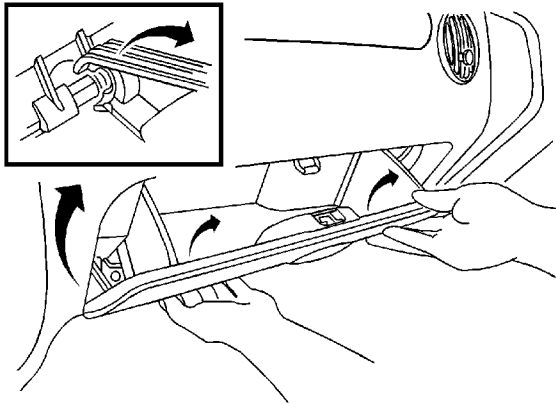


5. Fill the cooling system.
6. Inspect the hoses for leaks.

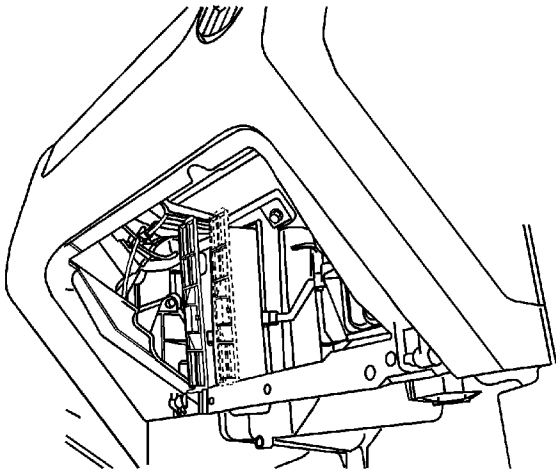
## Passenger Compartment Air Filter Replacement

### Removal Procedure

1. Open the instrument panel compartment.



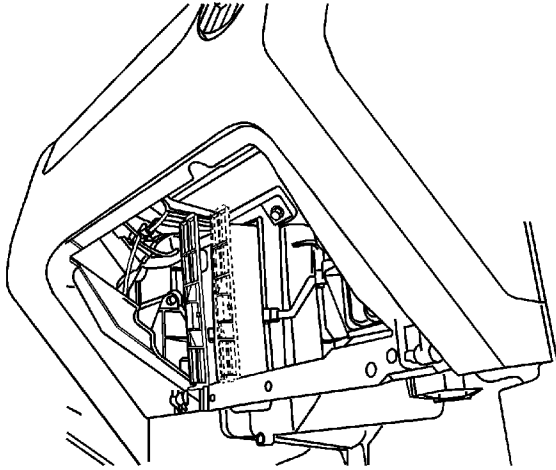
2. Grip the glove box by both the upper and lower sides and pull it out of its housing.



3. Remove the filter cover by pressing in on the bottom retaining tab and pulling the cover down.
4. Remove the old passenger compartment air filter.

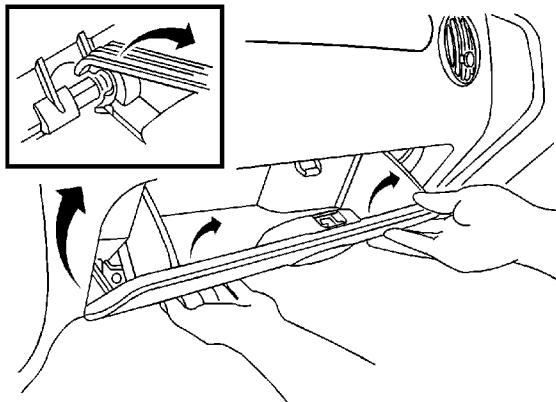
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## Installation Procedure



**Important:** View the air flow arrows on the filter before installing to ensure you install the filter correctly.

1. Install the filter into housing.
2. Install filter cover.

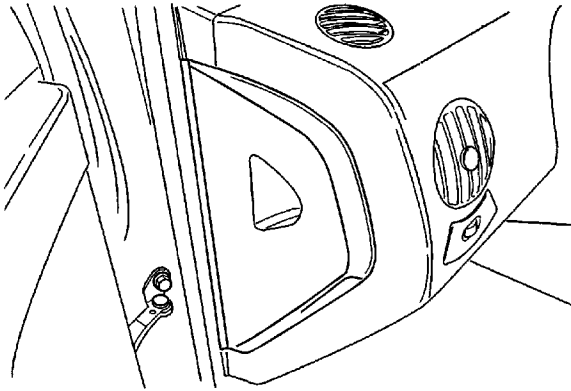


3. Position glove box to instrument panel, making sure retaining tabs are engaged.
4. Close glove box.

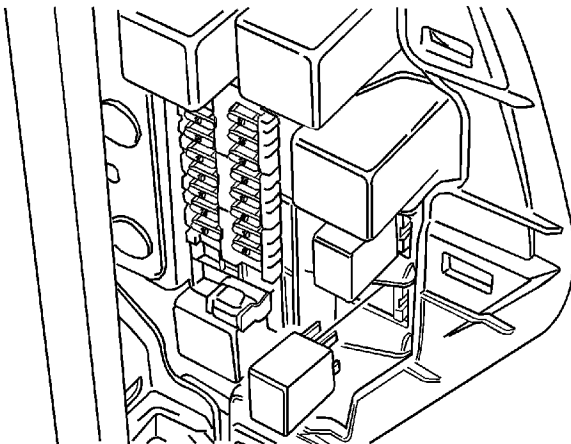
## Blower Motor Relay Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



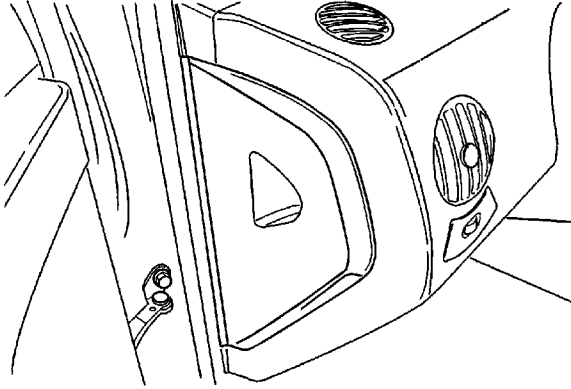
1. Disconnect the negative battery cable.
2. Remove the instrument panel fuse cover.



3. Pull out the relay at the front of the relay box.

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## Installation Procedure

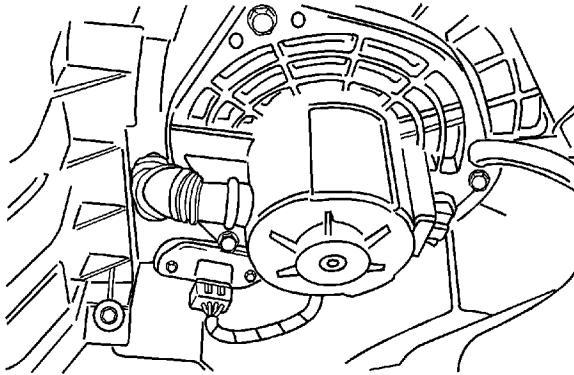


1. Align the relay contacts with the relay terminal slots.
2. Push the relay firmly into the base. The relay must be seated and flushed with the base edge.
3. Replace the instrument panel access panel.
4. Replace the remote mirror/lighting control panel.
5. Connect the negative battery cable.

## Blower Motor Resistor Replacement

### Removal Procedure

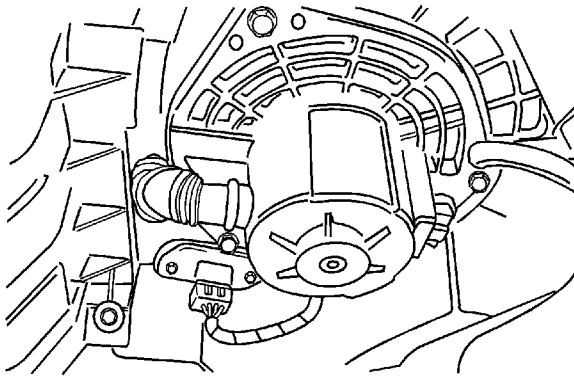
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the electrical connector at the resistor.
3. Remove the retaining screws from the resistor.
4. Remove the resistor by gently pulling it downward.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the new resistor into the heater/air distribution case with the screws.

**Tighten**

Tighten the blower resistor retaining screws to 6 N·m (53 lb in).

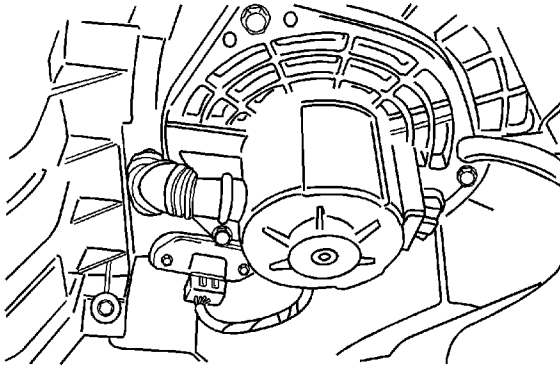
2. Connect the electrical connector at the resistor.
3. Connect the negative battery cable.
4. Confirm the proper performance of the blower.



## Blower Motor Replacement

### Removal Procedure

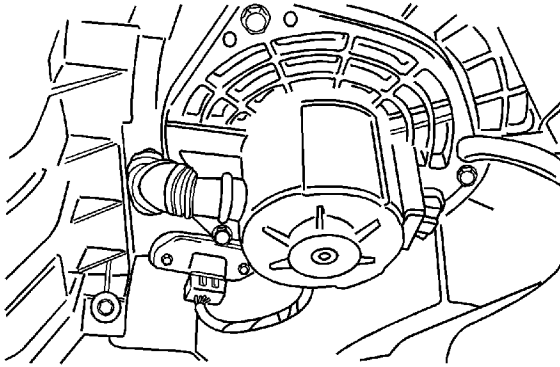
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the blower motor electrical connector.
3. Remove the blower cooling hose.
4. Remove the screws that secure the motor to the heater/air distribution case.
5. Remove the motor and the seal from the heater/air distribution case by gently pulling the motor straight down and out.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the blower motor and seal, with the shock mount pads, in the heater/air distribution case. Hold the blower motor in position.
2. Install the screws to secure the blower motor to the heater/air distribution case.

**Tighten**

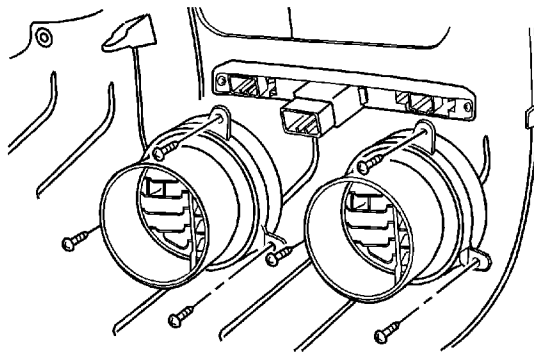
Tighten the blower motor retaining screws to 6 N·m (53 lb in).

3. Install the blower motor cooling hose.
4. Connect the electrical connector.
5. Connect the negative battery cable.
6. Confirm that the blower motor operates properly.

## Instrument Panel Air Deflector Replacement

### Removal Procedure

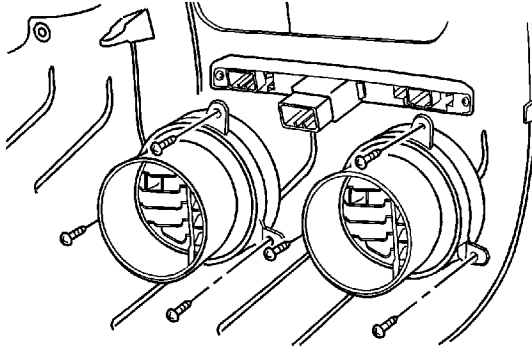
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the instrument panel center upper cover. Refer to [Instrument Panel Center Trim Panel Replacement](#).
3. Remove the screws and the air deflectors.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the air deflectors with the screws.

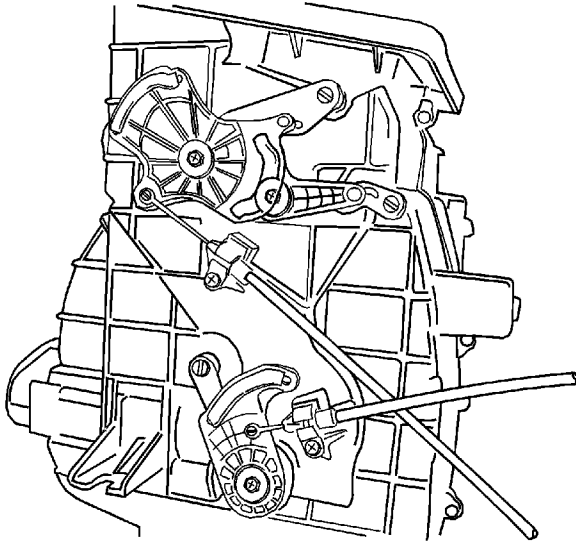
**Tighten**

Tighten the air deflector screws to 2 N·m (18 lb in).

2. Install the instrument panel center upper cover. Refer to [Instrument Panel Center Trim Panel Replacement](#).
3. Connect the negative battery cable.

## Heater Core Replacement (Hatchback)

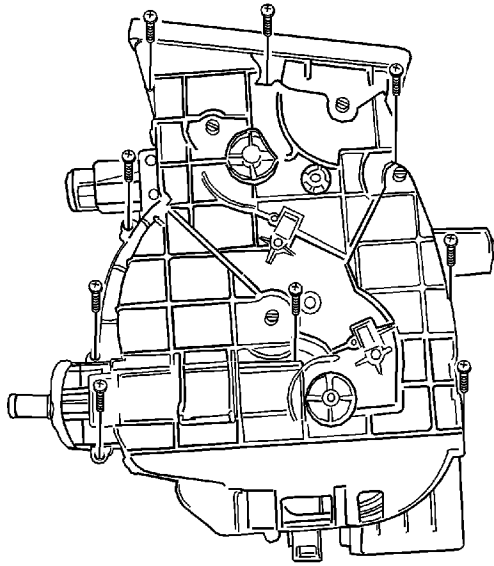
### Removal Procedure



1. Raise the hood.

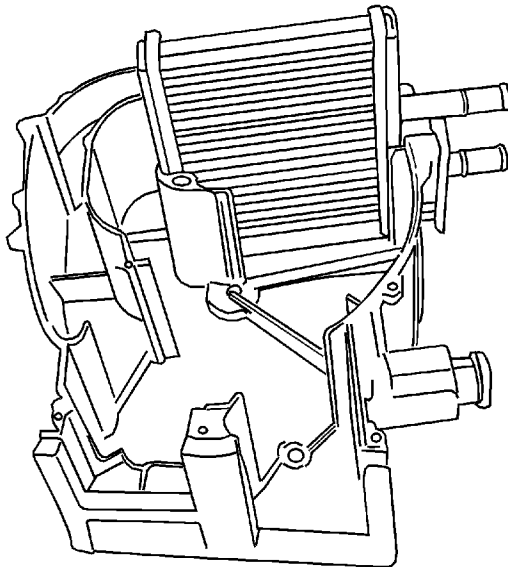
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the negative battery cable.
3. Remove the instrument panel assembly from the vehicle. Refer to [Instrument Panel Assembly Replacement](#).
4. Remove the heater/air distribution case from the vehicle. Refer to [HVAC Module Assembly Replacement](#).
5. Remove the linkage screw from the lower heater core cover post.
6. Remove the linkage lever. Note the position of all the levers to facilitate reassembly.



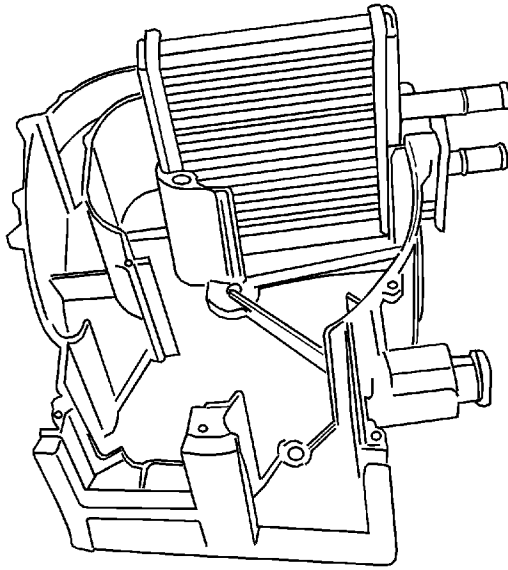
**Caution:** Handle the case carefully to avoid damage to the linkage levers.

7. Remove the screws that secure the heater core cover.

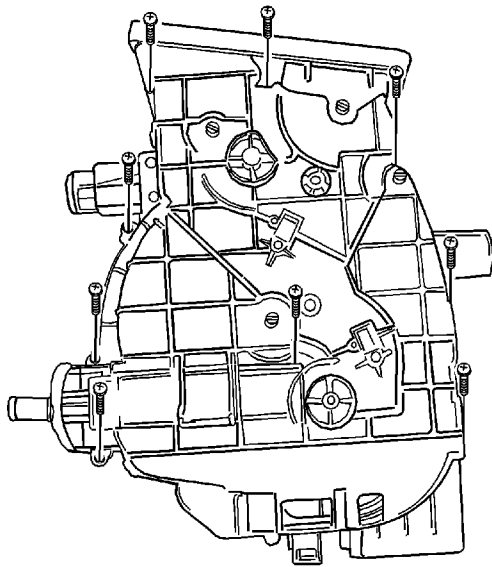


8. Slowly separate the lower heater core cover from the rest of the assembly. Retain the sealant.
9. Remove the screw and the bracket clamp that secure the heater core lines to the case.
10. Remove the spring clamp that secures the heater core body to the case.
11. Remove the heater core from the case.

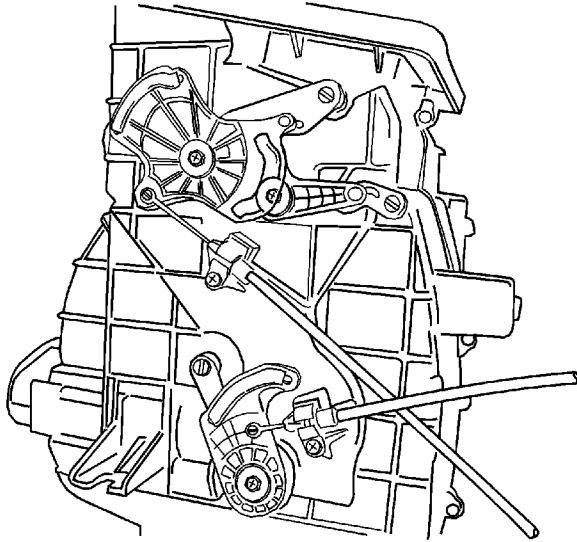
## Installation Procedure



1. Install the heater core into the case.
2. Secure the heater core lines to the case with the retaining bracket clamp and the screw.
3. Install the heater core body with the retaining spring clamp.
4. Reapply the sealant to the heater core cover mounting channel flange as removed.



5. Install the heater core cover.
6. Install the retaining screws.
7. Install the linkage lever onto the cover post with the screw.
8. Confirm proper operation of the actuating levers for the heater/air distribution case doors.

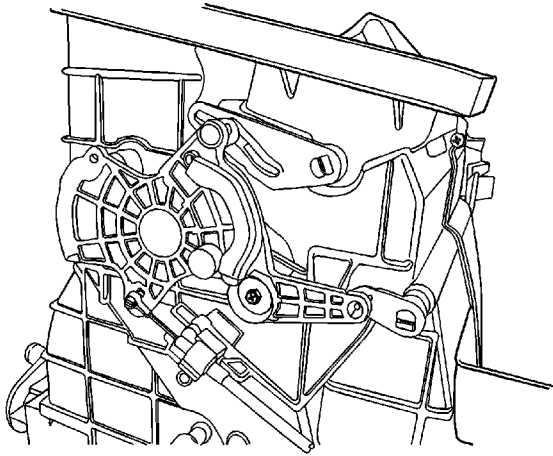


9. Install the heater/air distribution case. Refer to [HVAC Module Assembly Replacement](#).
10. Install the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).
11. Fill the cooling system.
12. Connect the negative battery cable.



## Heater Core Replacement (Notchback)

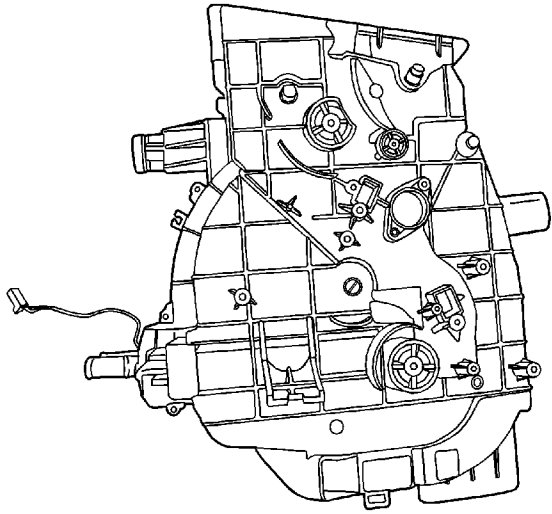
### Removal Procedure



1. Raise the hood.

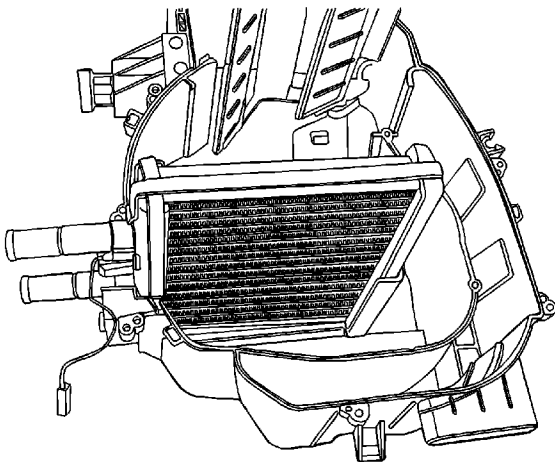
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

2. Disconnect the negative battery cable.
3. Remove the instrument panel assembly from the vehicle. Refer to [Instrument Panel Assembly Replacement](#).
4. Remove the heater/air distribution case from the vehicle. Refer to [HVAC Module Assembly Replacement](#).
5. Remove the linkage screw from the lower heater core cover post.
6. Remove the linkage lever. Note the position of all the levers to facilitate reassembly.



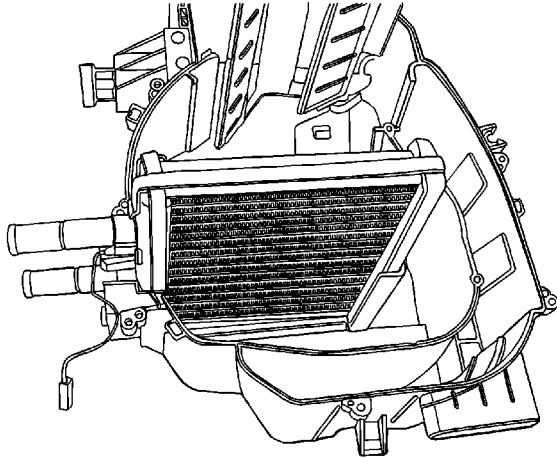
**Caution:** Handle the case carefully to avoid damage to the linkage levers.

7. Remove the screws that secure the heater core cover.

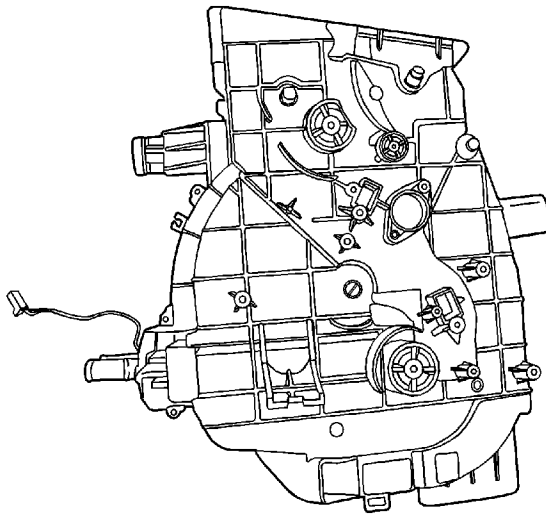


8. Slowly separate the lower heater core cover from the rest of the assembly. Retain the sealant.
9. Remove the screw and the bracket clamp that secure the heater core lines to the case.
10. Remove the spring clamp that secures the heater core body to the case.
11. Remove the heater core from the case.

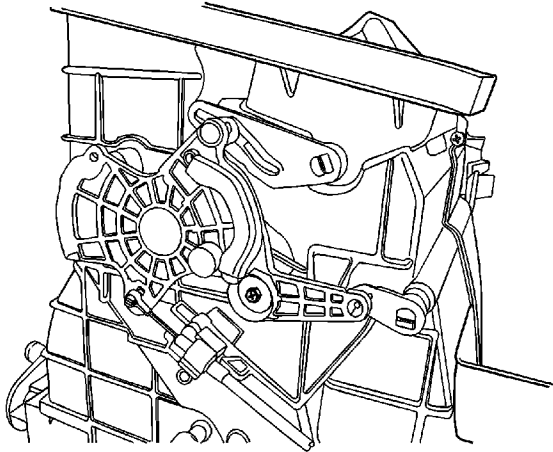
## Installation Procedure



1. Install the heater core into the case.
2. Secure the heater core lines to the case with the retaining bracket clamp and the screw.
3. Install the heater core body with the retaining spring clamp.
4. Reapply the sealant to the heater core cover mounting channel flange as removed.



5. Install the heater core cover.
6. Install the retaining screws.
7. Install the linkage lever onto the cover post with the screw.
8. Confirm proper operation of the actuating levers for the heater/air distribution case doors.



9. Install the heater/air distribution case. Refer to [HVAC Module Assembly Replacement](#).
10. Install the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#).
11. Fill the cooling system.
12. Connect the negative battery cable.

## Fastener Tightening Specifications

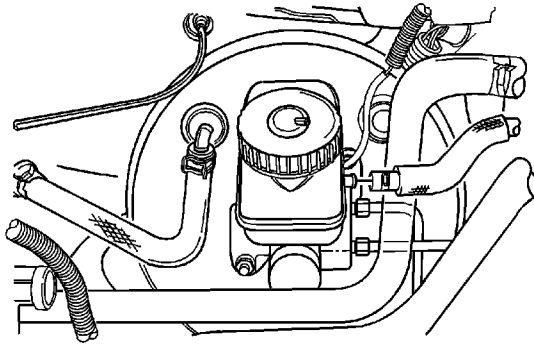
Application	Specification	
	Metric	English
Bleeder Screws	9 N·m	80 lb in
Bleeder Valves	6 N·m	53 lb in
Booster and Support Bracket-to-Dash Panel Nuts	24 N·m	18 lb ft
Booster Pushrod Hex Nut	16 N·m	12 lb ft
Booster-to-Support Bracket Nuts	12 N·m	9 lb ft
Brake Lines	16 N·m	12 lb ft
Brake Pedal-to-Pedal Bracket Hex Nut	22 N·m	16 lb ft
Caliper Mounting Bolt	100 N·m	74 lb ft
Dust Cover Screws	4.5 N·m	40 lb in
Front Brake Hose-to-Caliper Bolt	40 N·m	30 lb ft
Hub-to-Disc Screws	4.5 N·m	40 lb in
Master Cylinder Attaching Nuts	18 N·m	13 lb ft
Proportioning Valves	40 N·m	30 lb ft
Trim Panel Screws	7 N·m	62 lb in
Wheel Hub Caulking Nut -- Drum Brakes	190 N·m	140 lb ft

## Brake System Specifications

Application	Specification	
	Metric	English
Brake Drums		
┆ Inside Diameter - New	200 mm	7.87 in
┆ Maximum Inside Diameter	201 mm	7.91 in
┆ Maximum Radial Runout - Not Installed	0.04 mm	0.002 in
Wheel Cylinder Diameter - Rear	20.64 mm	0.81 in
Brake Rotors		
┆ Disc Type	Ventilated	
┆ Discard Thickness for 236 mm (9.29 in) Diameter Rotor	18 mm	0.709 in
┆ Discard Thickness for 256 mm (10.08 in) Diameter Rotor	22 mm	0.866 in
┆ Maximum Assembled Lateral Runout - Installed	0.06 mm	0.002 in
┆ Maximum Groove Depth	0.40 mm	0.016 in
┆ Maximum Lateral Runout - Not Installed	0.03 mm	0.001 in
┆ Maximum Thickness Variation	0.10 mm	0.004 in
┆ New Rotor Thickness - 236 mm (9.29 in) Diameter Rotor	20 mm	0.787 in
┆ New Rotor Thickness - 256 mm (10.08 in) Diameter Rotor	24 mm	0.945 in
┆ Rotor Diameter - Larger Size with SACL500 Stamping	256 mm	10.08 in
┆ Rotor Diameter - Smaller Size with SACL485F Stamping	236 mm	9.29 in
Booster Ratio	5:1	
Booster Size		
┆ 1.4L L95, 1.5L LV8, 1.6L LXT	241.3 mm	9.5 in
┆ 1.2L LMU, 1.4L LDT, 1.6L LXV	254 mm	10 in
Master Cylinder		
┆ Bore Diameter	22.22 mm	0.87 in
┆ Minimum Bore Diameter	20.64 mm	0.81 in
Caliper		
┆ Piston Minimum Diameter	54 mm	2.12 in

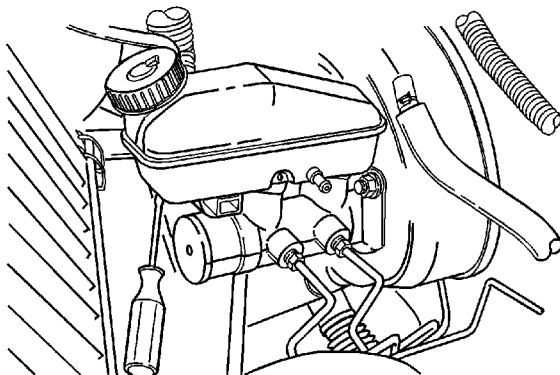
## Master Cylinder Reservoir Replacement

### Removal Procedure



**Note:** Remove the reservoir only when replacing a damaged or a leaking reservoir.

1. Disconnect the electrical connector from the reservoir.

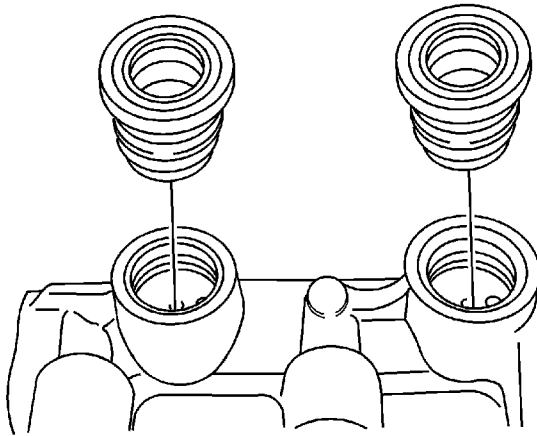


2. For vehicles with the manual transaxle, disconnect the clip to the clutch hose connection at

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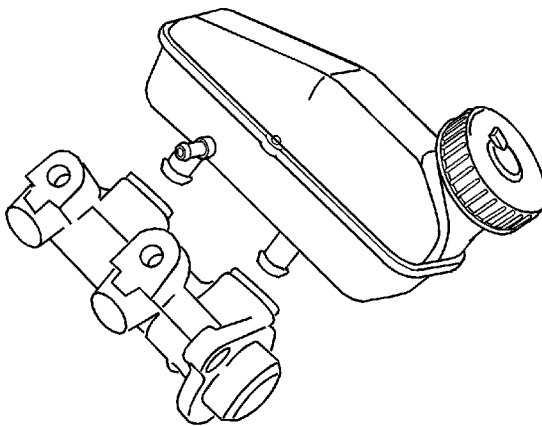
the master cylinder.

3. Gently pry upward with a screwdriver to release the reservoir.
4. Tilt the reservoir and pull it upward in order to remove it.



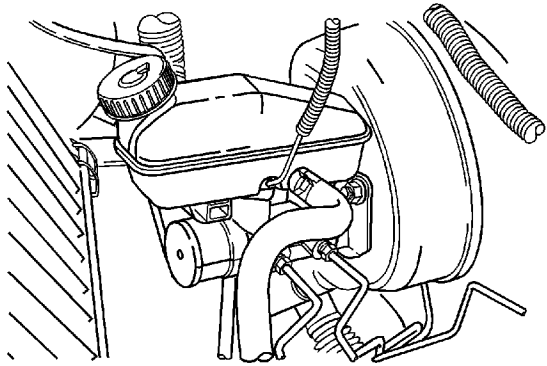
5. Remove the reservoir seals from the master cylinder body.

## Installation Procedure

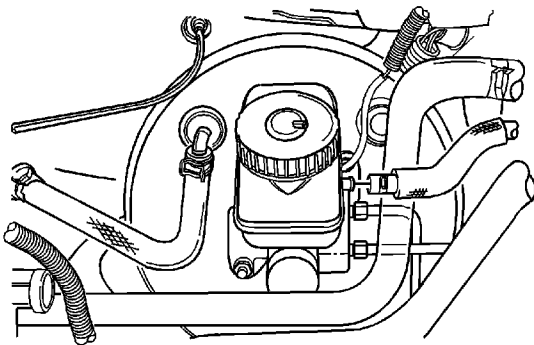


1. Lubricate the new seals with clean brake fluid. Install the seals into the cylinder body.
2. Install the reservoir on the master cylinder body.





3. For vehicles with the manual transaxle, connect the clip to the clutch hose connection at the master cylinder.



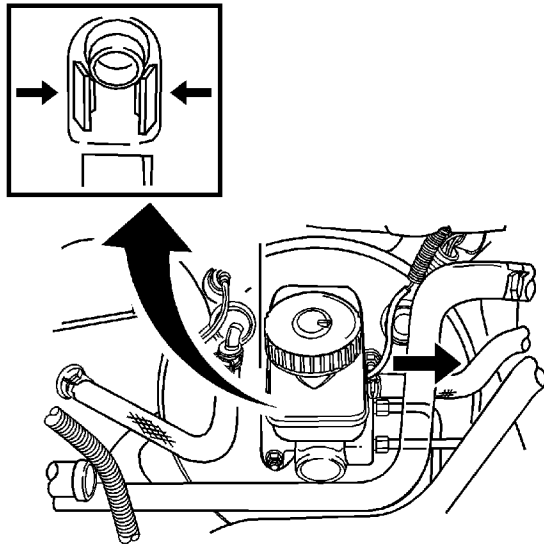
4. Add brake fluid.

**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.

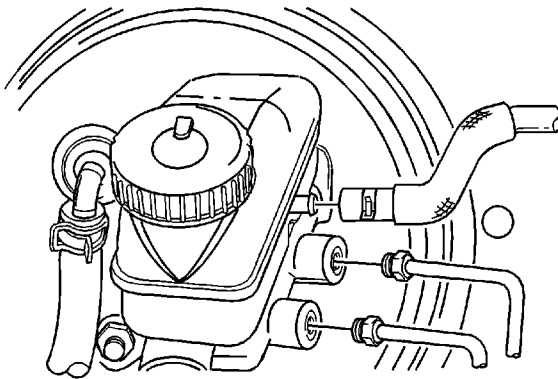
5. Raise and suitably support the vehicle.
6. Bleed the braking system. Refer to [Hydraulic Brake System Bleeding](#).
7. Lower the vehicle.
8. Connect the reservoir electrical connector.

## Master Cylinder Replacement

### Removal Procedure



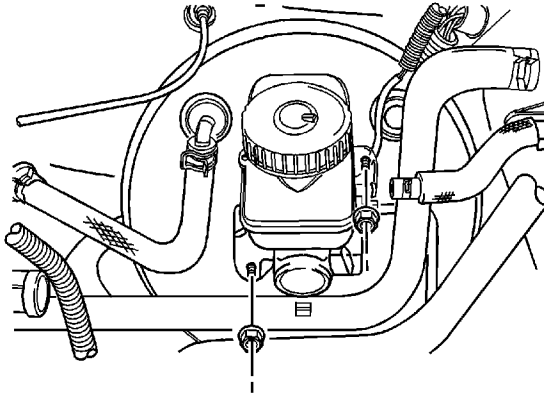
1. Disconnect the electrical connector from the reservoir.



2. For vehicles with the ABS braking system, disconnect the brake lines from the master cylinder body.
3. For vehicles with the non-ABS braking system, disconnect the brake lines from the proportioning valves.

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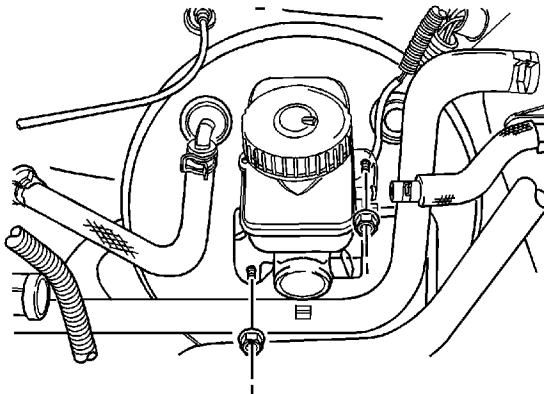
4. For vehicles with the manual transaxle, disconnect the clip to the clutch hose connection at the master cylinder.
5. Plug the opening to the brake lines to prevent fluid loss and contamination.



6. Remove the attaching nuts from the power booster.
7. Remove the master cylinder assembly.
8. Remove the seal from the booster housing. Discard the seal.
9. Drain the brake fluid.

## Installation Procedure

**Caution:** Refer to [Brake Fluid Effects on Paint and Electrical Components Caution](#) in the Preface section.





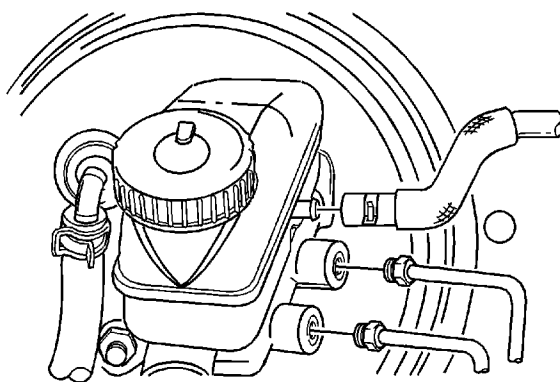
1. Install the master cylinder assembly with the new attaching nuts.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the new seal to the booster housing.

### **Tighten**

Tighten the master cylinder attaching nuts to 18 N·m (13 lb ft).



3. For vehicles with the ABS braking system (as shown), connect the brake lines to the cylinder body.
4. For vehicles with the non-ABS braking system, connect the brake lines to the proportioning valves.

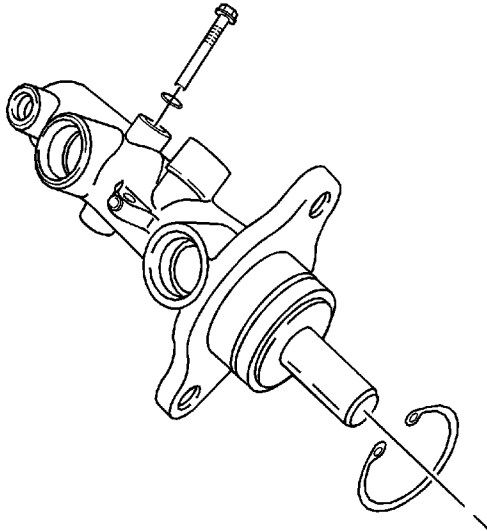
### **Tighten**

Tighten the brake lines to 16 N·m (12 lb ft).

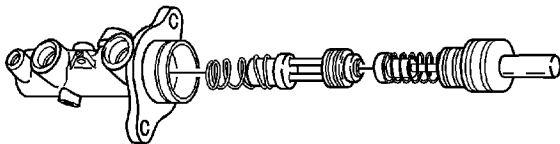
5. For vehicles with the manual transaxle, connect the clip to the clutch hose connection at the master cylinder.
6. Connect the electrical connector on the reservoir.
7. Add brake fluid.
8. Check for leaks and recheck the fluid level.
9. Bleed the brake system. Refer to [Hydraulic Brake System Bleeding](#).

## Master Cylinder Overhaul

### Disassembly Procedure



1. Remove the master cylinder. Refer to [Master Cylinder Replacement](#).
2. Remove the brake fluid reservoir. Refer to [Master Cylinder Reservoir Replacement](#).

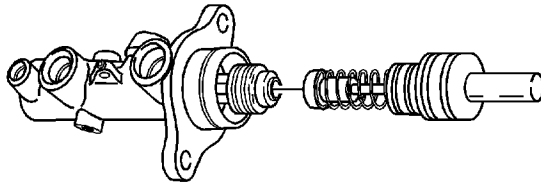


3. Remove the seal ring from the cylinder bore.
4. Press down the piston with a welding rod or an equivalent tool in a compensating port.

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**Caution:** Use care not to damage the piston bore or retainer groove during primary piston retainer ring removal.

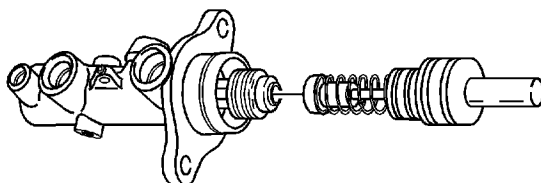
5. Remove and discard the retaining ring from the cylinder body. The non-ABS master cylinder body is shown.



6. Remove the primary piston. The ABS master cylinder body is shown.
7. Carefully remove the secondary piston assembly and the spring from the master cylinder bore.
8. Discard the rubber parts and the retaining rings.

## Assembly Procedure

**Warning:** Refer to [Brake Fluid Warning](#) in the Preface section.

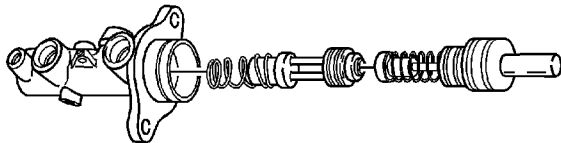




**Caution:** Do not hone the master cylinder bore. When the brake master cylinder is overhauled, it is recommended that the cylinder body be replaced rather than CLEANED UP by honing the bore. The master cylinder has a hard, highly polished BEARINGIZED surface, which is produced by diamond boring followed by ball or roller burnishing under heavy pressure. Honing will destroy this hard smooth surface and cause rapid wear of the rubber cups.

**Caution:** Use only approved solvents when cleaning or flushing the master cylinder and related components. Solvents which contain traces of mineral oil or other contaminants will damage the rubber parts in the system.

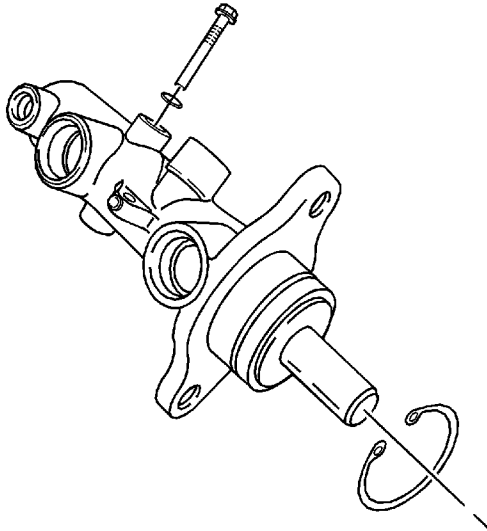
1. Clean the parts with denatured alcohol or clean brake fluid. Dry the parts with compressed air.
2. Inspect the master cylinder bore for scoring or corrosion. If scoring or corrosion is evident, replace the master cylinder body.
3. Lubricate the master cylinder bore with clean brake fluid.
4. Carefully insert the secondary piston assembly bore until the secondary piston contacts the base of the cylinder body. Use a wood or a plastic drift, if necessary.
5. Insert the primary piston.



6. Press the pistons into the cylinder bore using a wooden or a plastic drift. The non-ABS cylinder body is shown.

**Note:** When installing the new retaining ring, take care not to damage the cylinder bore.

7. Insert the new retaining ring into the groove in the cylinder bore. Remove the welding rod.
8. Move the pistons backward and forward after installation in order to inspect for free movement.

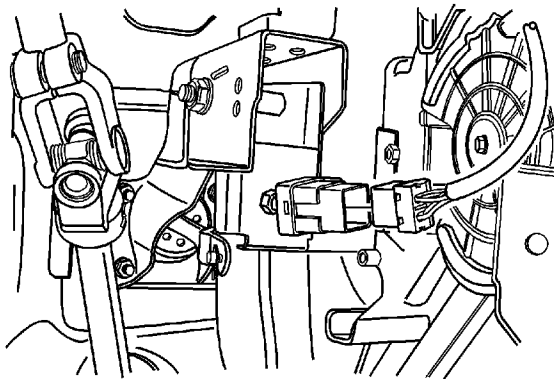


9. Lubricate the seal ring and insert the seal on the shaft into the cylinder bore. The open side must face outward until the seal rests on the piston.
10. Install the brake fluid reservoir to the master cylinder. Refer to [Master Cylinder Reservoir Replacement](#).
11. Install the master cylinder assembly. Refer to [Master Cylinder Replacement](#).
12. Bleed the braking system. Refer [Hydraulic Brake System Bleeding](#).

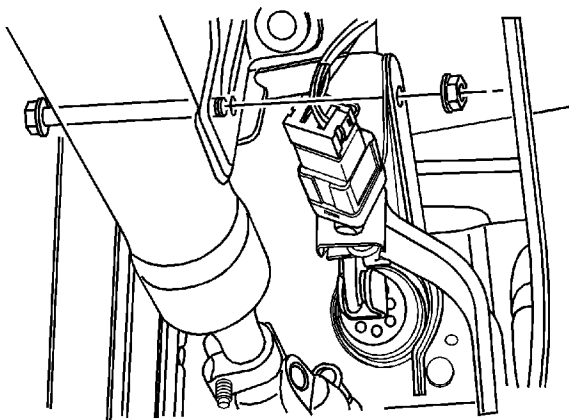


## Brake Pedal Assembly Replacement

### Removal Procedure

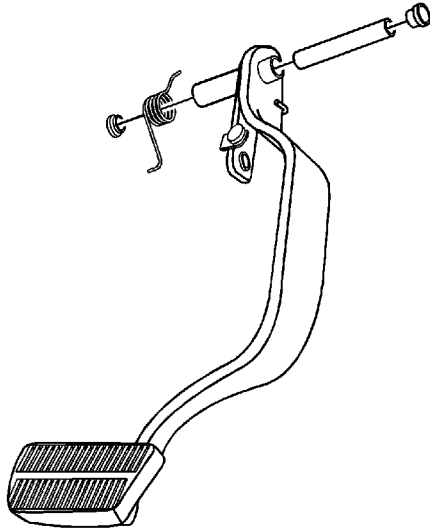


1. Remove the screws that hold the trim panel to the instrument panel.
2. Remove the trim panel.
3. Remove the stop lamp switch. Refer to [Stop Lamp Switch Replacement](#).
4. Disconnect the retaining ring, the pin, and the spring from the pushrod/brake pedal connection.



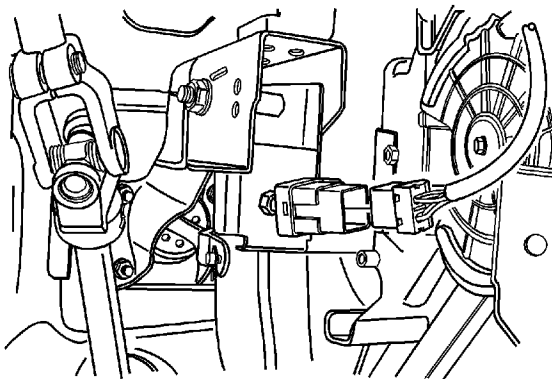


5. Remove the pedal mounting shaft and nut.
6. Remove the brake pedal, exposing the brake booster pushrod and the pedal-to-dash panel bracket.



7. Remove the brake pedal cover.

## Installation Procedure



1. Install a new brake pedal cover, if needed.
2. Coat the pedal shaft with grease.

3. Position the brake pedal on the pedal-to-dash panel bracket and the pedal shaft.

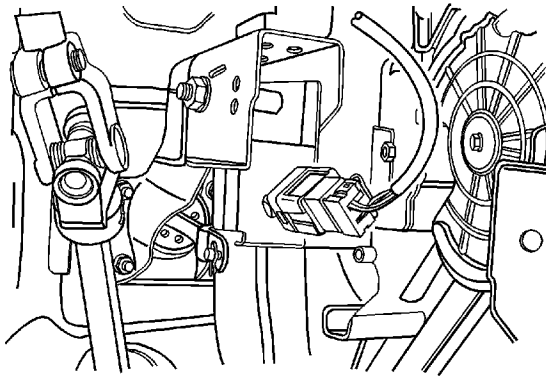
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Place the nut on the pedal mounting shaft.

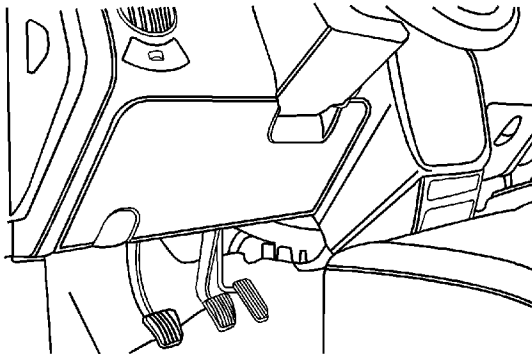
#### **Tighten**

Tighten the brake pedal-to-pedal bracket nut to 22 N·m (16 lb ft).

5. Install the pushrod to the pedal with the pin and the retaining ring.



6. Install the spring on the shaft in its original position.
7. Install the stop lamp switch. Refer to [Stop Lamp Switch Replacement](#).



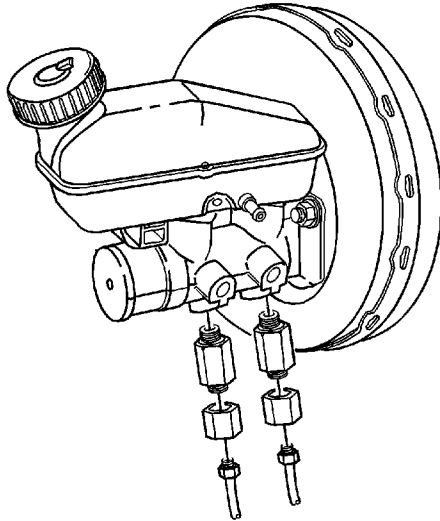
8. Install the trim panel with the screws.

**Tighten**

Tighten the trim panel screws to 7 N·m (62 lb in).

## Brake Proportion Valve Replacement

### Removal Procedure

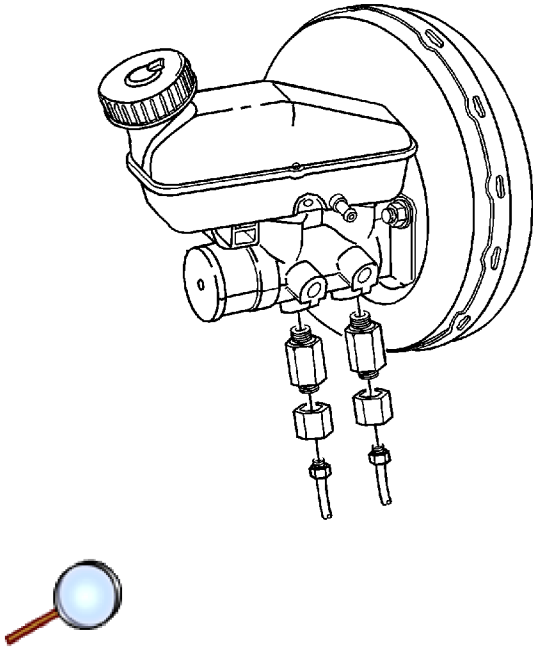


1. Disconnect the brake lines from the proportioning valves.
2. Remove the valves from the master cylinder body.

### Installation Procedure

**Warning:** Refer to [Brake Fluid Warning](#) in the Preface section.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



**Note:** Since these valves are adjusted in pairs to the correct control range, they must be replaced in pairs.

1. Install the proportioning valves to the cylinder body.

**Tighten**

Tighten the proportioning valves to 40 N·m (30 lb ft).

2. Connect the brake lines to the valves.

**Tighten**

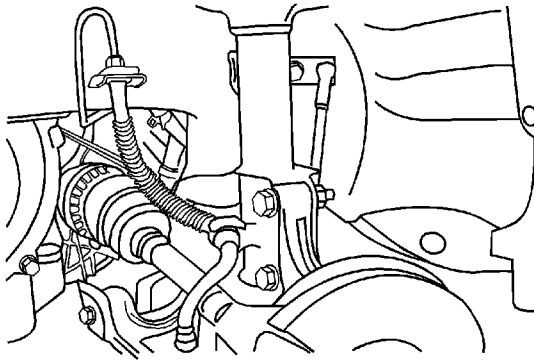
Tighten the brake lines to 16 N·m (12 lb ft).

3. Bleed the braking system. Refer to [Hydraulic Brake System Bleeding](#).

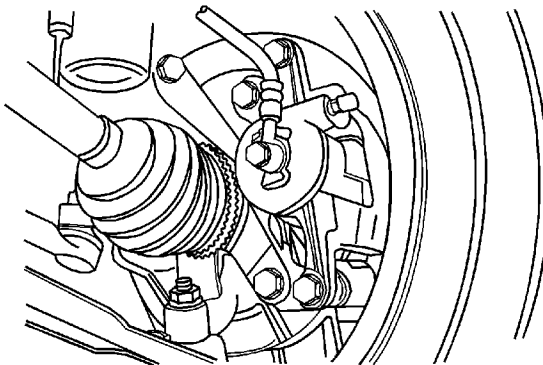
## Front Brake Hose Replacement

### Removal Procedure

**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.



1. Raise and support the vehicle.
2. Disconnect the brake line from the brake hose support bracket on the wheel housing.
3. Remove the E-ring retainer.
4. Remove the brake hose from the wheelhousing bracket.

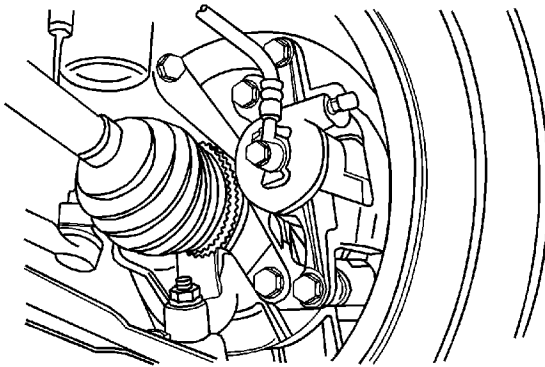




5. Remove the bolt from the brake caliper.
6. Remove the seal rings and the brake hose.

## **Installation Procedure**

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

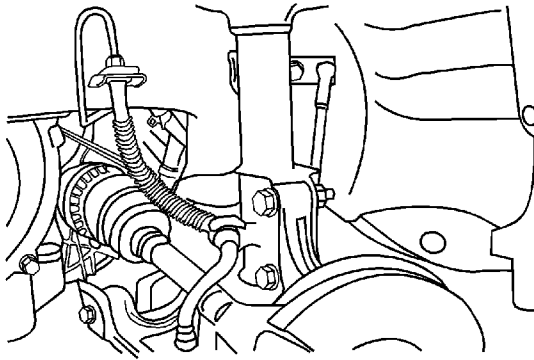


1. Install the new brake hose to the caliper with new seal rings and the bolt.

### **Tighten**

Tighten the front brake hose-to-caliper bolt to 40 N·m (30 lb ft).





2. Install the brake hose and the E-ring retainer to the wheelhousing bracket.
3. Connect the brake line to the brake hose.

### **Tighten**

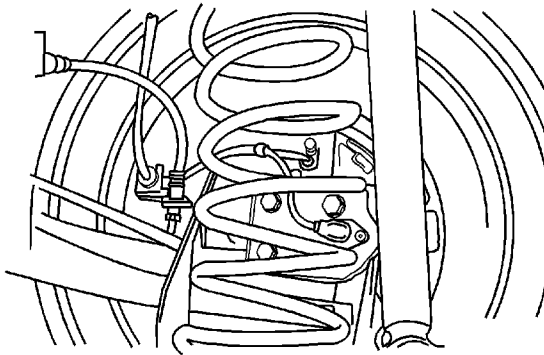
Tighten the brake line to 16 N·m (12 lb ft).

4. Lower the vehicle.
5. Bleed the brake system. Refer to [Hydraulic Brake System Bleeding](#).
6. Check the brake system for leaks.

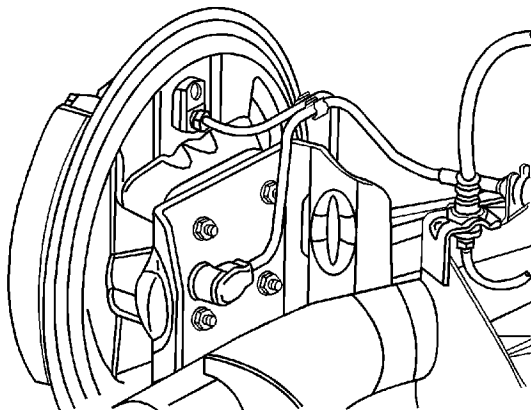
## Rear Brake Hose Replacement

### Removal Procedure

**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.



1. Raise and support the vehicle.
2. Disconnect the brake lines from the brake hoses at the body and the rear axle brackets.

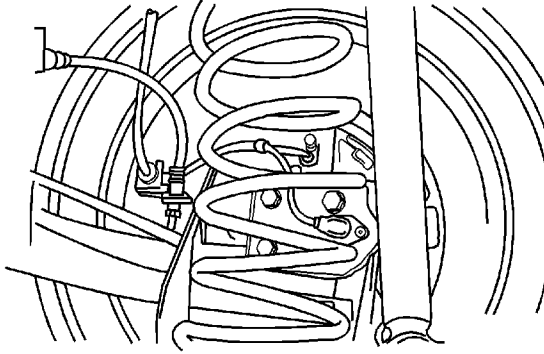


3. Remove both brake hose E-ring retainers.

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4. Remove the brake hoses from the brackets.

## Installation Procedure



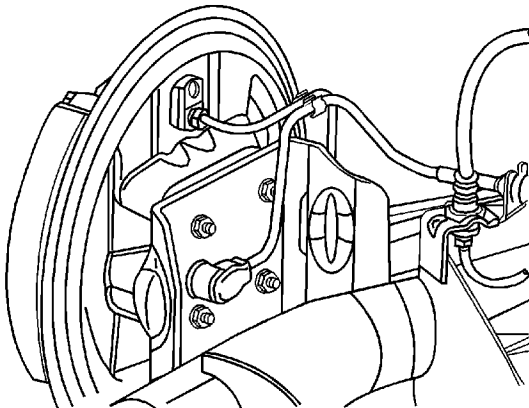
1. Install the brake hoses to the body and the rear axle brackets.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Connect the brake lines to the brake hose.

### **Tighten**

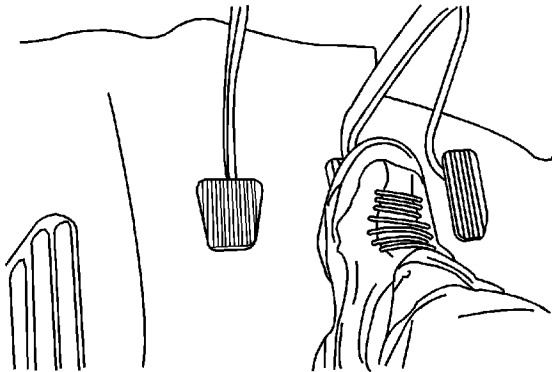
Tighten the brake lines to 16 N·m (12 lb ft).



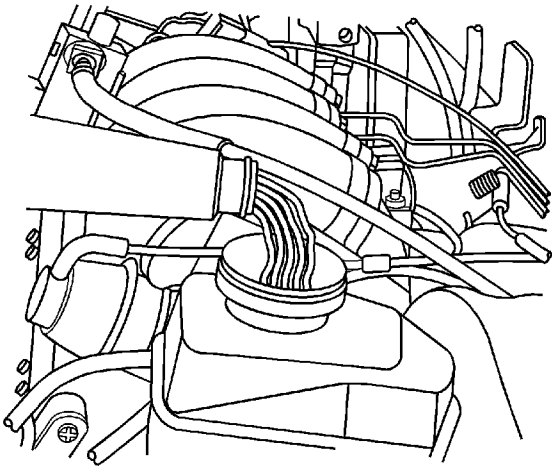


3. Install the brake hose retainers.
4. Lower the vehicle.
5. Bleed the brake system. Refer to [Hydraulic Brake System Bleeding](#).
6. Check the brake system for leaks.

## Hydraulic Brake System Bleeding

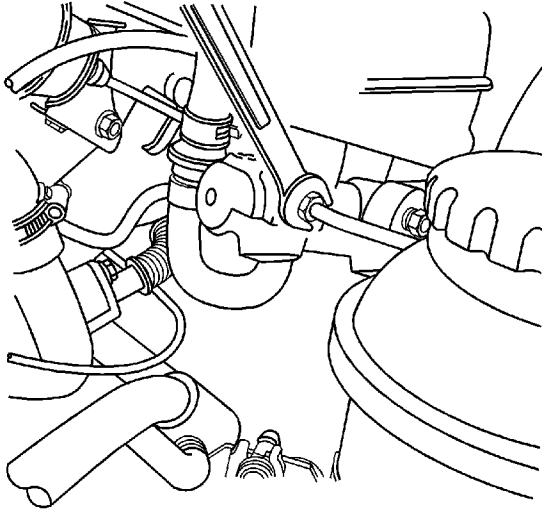


1. Remove the booster reserve by applying the brakes several times with the engine OFF until all the reserve is depleted.



**Note:** If the master cylinder is known or suspected to have air in the bore, then it must be bled before any wheel cylinder or caliper is bled.

2. Fill the master cylinder reservoir with brake fluid. Keep the master cylinder at least 1/2 full of fluid during the bleeding operation.



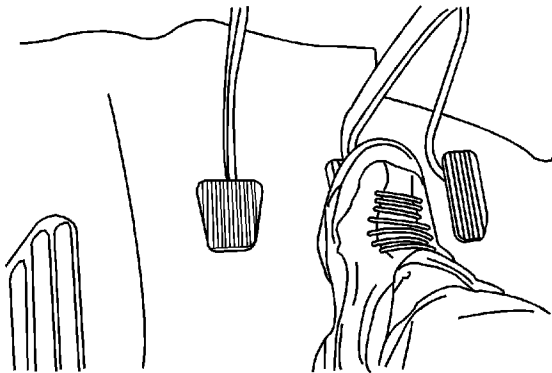
3. Disconnect the front brake lines at the master cylinder.
4. Allow the brake fluid to fill the master cylinder until it begins to flow from the front pipe connector port.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

5. Connect the front brake lines to the master cylinder.

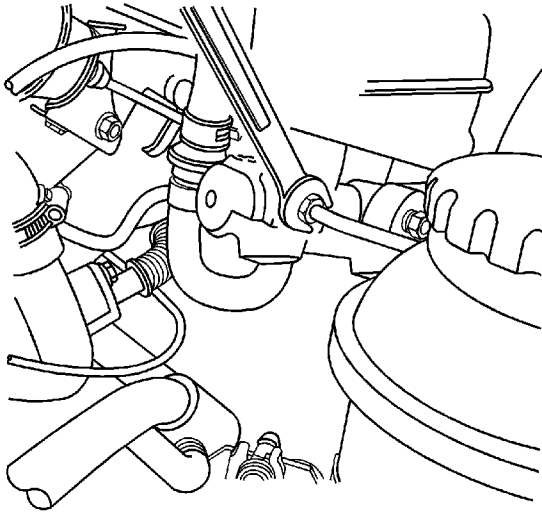
### **Tighten**

Tighten the brake lines to 16 N·m (12 lb ft).





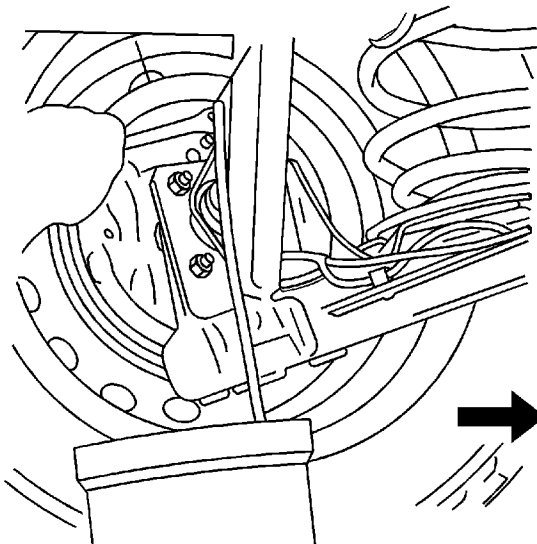
6. Slowly push and hold the brake pedal one time.



7. Loosen the front brake line at the master cylinder to purge all air from the cylinder.
8. Tighten the brake line as in step 5, and then release the brake pedal slowly. Wait 15 seconds before proceeding to the next step.
9. Repeat the sequence, including the 15 second wait, until all the air is removed from the master cylinder bore.

**Caution:** Refer to [Brake Fluid Effects on Paint and Electrical Components Caution](#) in the Preface section.

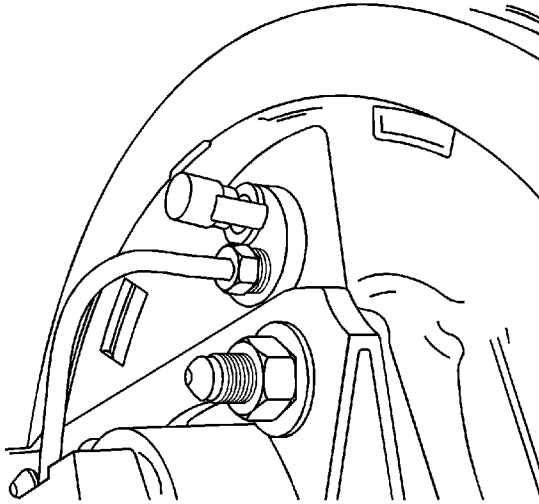
10. After all the air has been removed at the forward connections, bleed the master cylinder at the rear air inlet connections in the same manner as with the front connections.





**Note:** The bleeding sequence is as follows: right rear, left front, left rear, and right front.

11. Attach a transparent tube over the valve. Allow the tube to hang submerged in brake fluid in a transparent container.



12. Slowly push and hold the brake pedal one time.
13. Remove the bleeder cap and loosen the bleeder screw to purge the air from the cylinder.
14. Tighten the bleeder screw.

#### **Tighten**

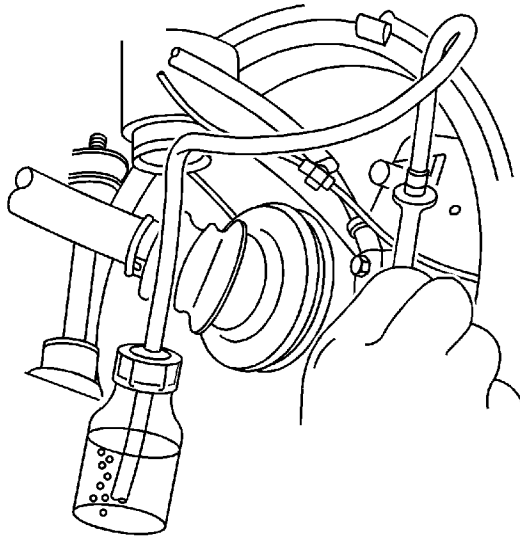
Tighten the bleeder screw to 9 N·m (80 lb in).

15. Slowly release the brake pedal. Wait 15 seconds before proceeding with the next step.

**Note:** Rapid pumping of the brake pedal pushes the master cylinder secondary piston down the bore in a manner that makes it difficult to bleed the system.

16. Repeat the sequence, including the 15 second wait, until all the air is removed. It may be necessary to repeat the sequence 10 or more times to remove all the air.
17. Locate the front bleeder caps.

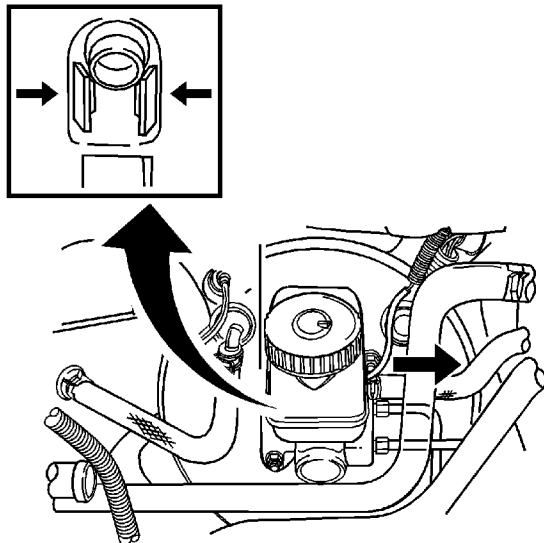




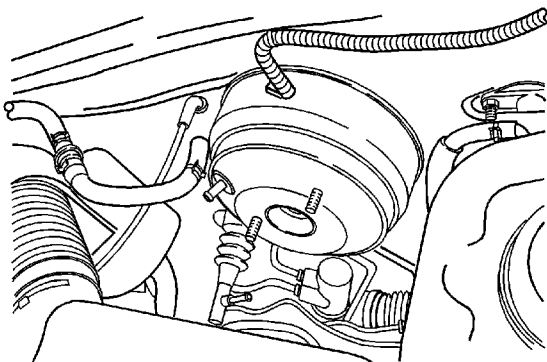
18. Proceed to bleed the front brakes following the appropriate sequence, beginning with step 12.
19. Check the brake pedal for sponginess. Repeat the entire bleeding procedure to correct this condition.

## Power Vacuum Brake Booster Replacement

### Removal Procedure

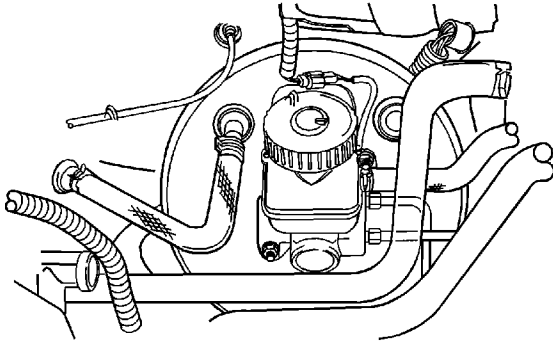


1. Disconnect the electrical connector from the reservoir.

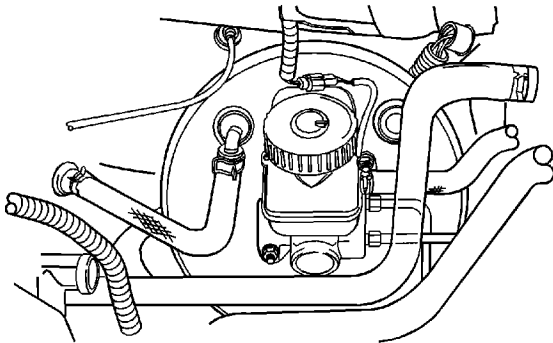


2. For vehicles with a manual transaxle, disconnect the clip on the clutch hose connection to the master cylinder.
3. Plug the clutch hose and the master cylinder so that the fluid does not escape.

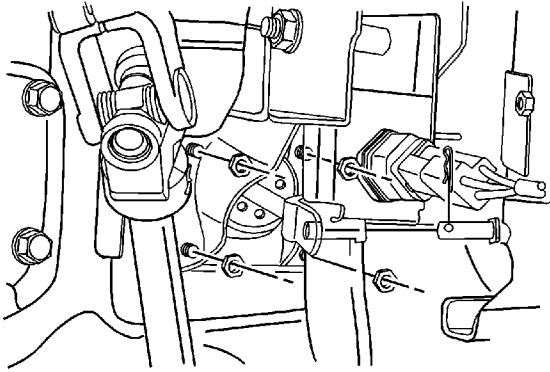
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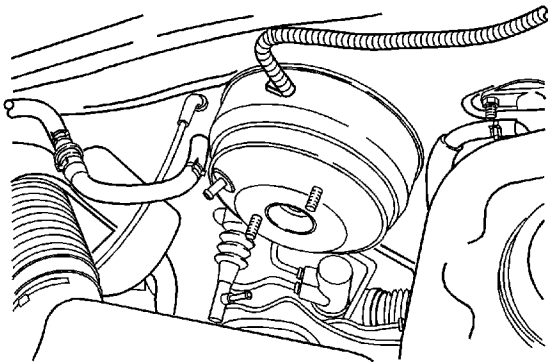
4. Remove the master cylinder attaching nuts.
5. Push the master cylinder forward slightly and move it out of the way. Do not disconnect the brake lines.
6. Remove and discard the booster housing seal.



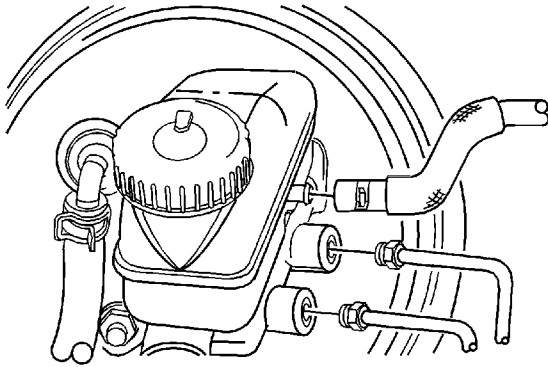
7. Remove the clip on the vacuum hose connection to the booster, DOHC engine connection shown.
8. Disconnect the brake lamp switch.
9. Remove the brake pedal spring.
10. Disconnect the clip and the pushrod pin from the pedal bracket assembly. Refer to [Brake Pedal Assembly Replacement](#).



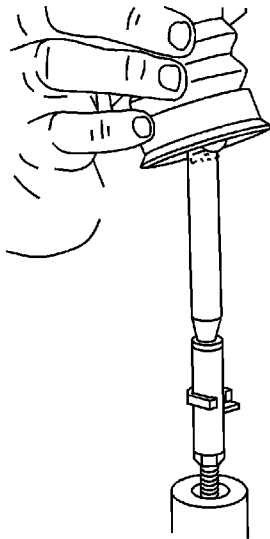
11. Remove the booster and the support bracket-to-dash panel nuts.



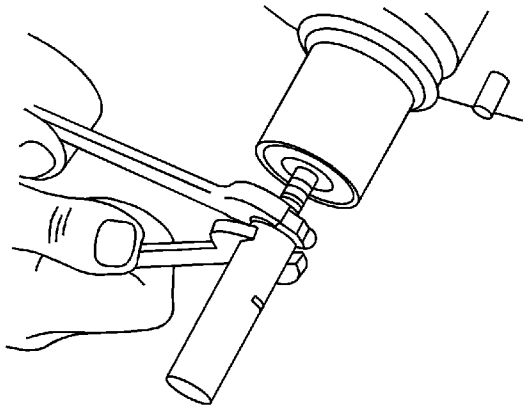
12. Remove the booster and the bracket assembly from the dash panel.



13. Remove the bracket nuts from the booster and remove the booster.



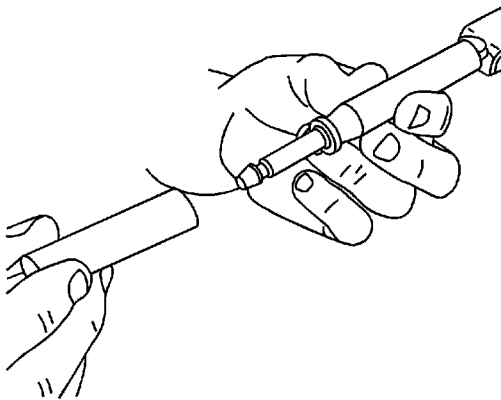
14. Remove the rubber boot and the retainer.



15. Remove the pushrod.
16. Remove the adjustment sleeve from the pushrod.
17. Remove the hex nut.

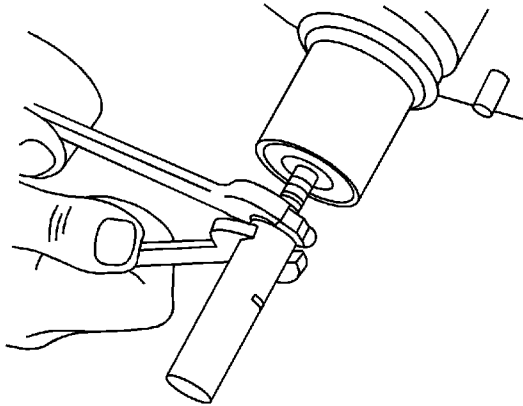
## Installation Procedure

**Caution:** Refer to [Brake Fluid Effects on Paint and Electrical Components Caution](#) in the Preface section.



1. Inspect the pushrod and the adjustment sleeve for damage and proper fit.

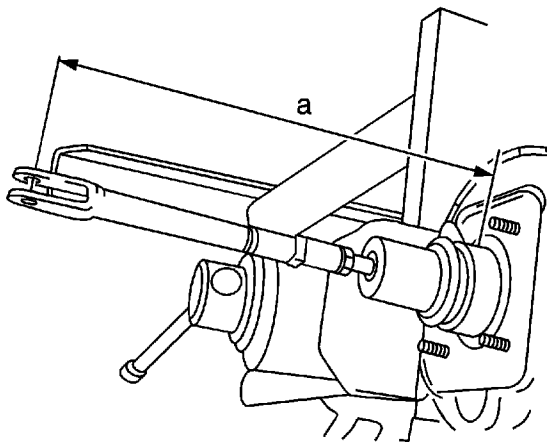
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



2. Install the hex nut and the adjustment sleeve on the booster.

**Tighten**

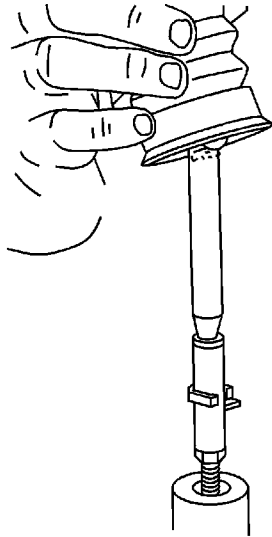
Tighten the booster pushrod hex nut and the adjustment sleeve to 16 N·m (12 lb ft).



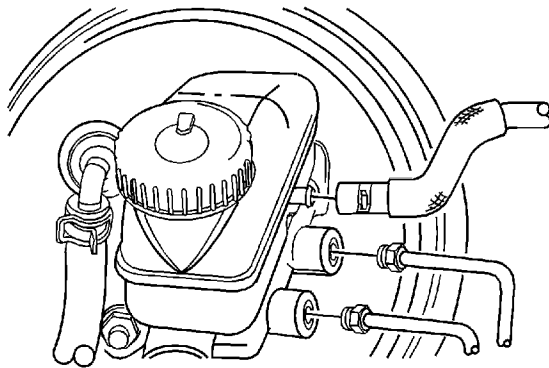
3. Insert the pushrod in the adjustment sleeve and mount the retainer.

**Note:** This measurement (a) should be 278.5 mm (10 in).

4. Measure the distance from the booster to the center of the fork bin bore.



5. Install the rubber boot on the booster.

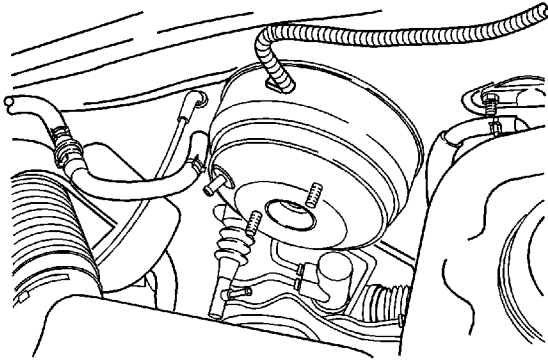


6. Install the brackets to the booster.

**Tighten**

Tighten the booster-to-support bracket nuts to 12 N·m (9 lb ft).

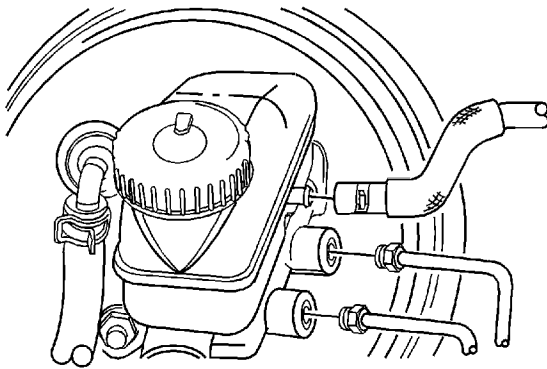




7. Install the booster and the bracket assembly to the dash panel.

**Tighten**

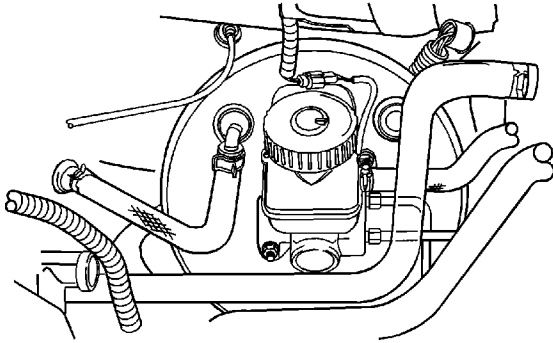
Tighten the booster and support bracket-to-dash panel nuts to 24 N·m (18 lb ft).



8. Connect the master cylinder to the booster and install a new booster housing seal.

**Tighten**

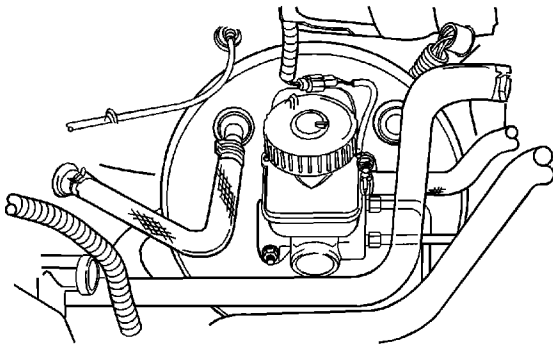
Tighten the master cylinder attaching nuts to 24 N·m (18 lb ft).



9. Install the new vacuum hose to the booster, DOHC engine connection shown. Refer to [Power Brake Booster Vacuum Check Valve and Hose Replacement](#).
10. Install new hose clamps on the vacuum hose.
11. Install the pushrod pin to the brake pedal bracket assembly and connect the clip and the spring. Refer to [Brake Pedal Assembly Replacement](#).
12. Install the brake lamp switch.

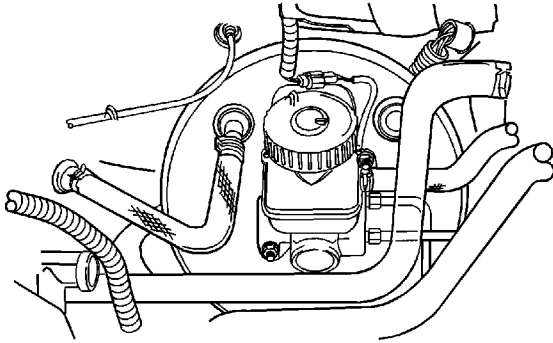
## Power Brake Booster Vacuum Check Valve and Hose Replacement

### Removal Procedure



1. For vehicles with a DOHC engine, remove the clip on the vacuum hose connection at the intake manifold.
2. Pull the hose from the union nut connection. If the hose does not remove easily or is deteriorated, pry off and discard the hose.
3. For vehicles with a SOHC engine, similarly remove the clip on the vacuum hose nut connection to the intake manifold.
4. Pull the hose from the union nut connection. If the hose does not remove easily or is deteriorated, pry off and discard the hose.
5. Remove the clip on the vacuum hose connection to the brake booster.
6. Remove the vacuum hose.

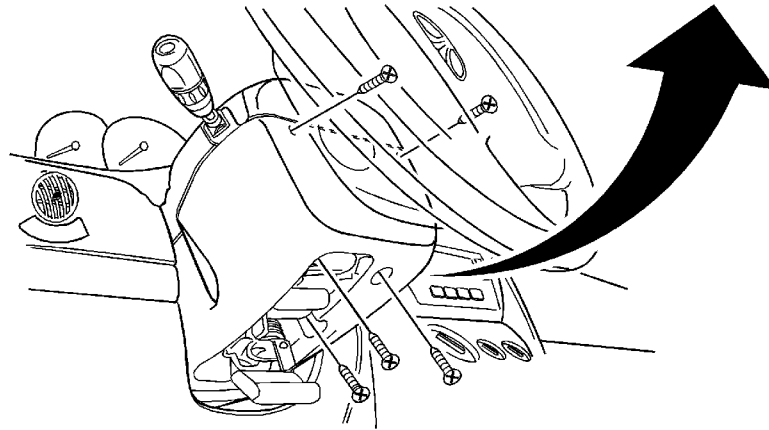
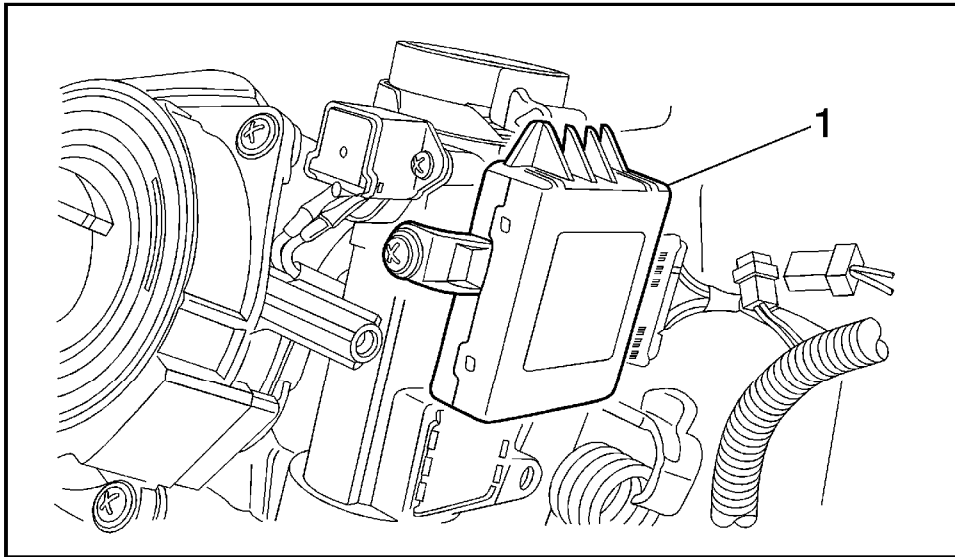
### Installation Procedure



1. Mount the vacuum hose, DOHC engine connection shown, and make sure the connections are tight on each end.
2. Install the vacuum hose clips.

## Immobilizer Component Views

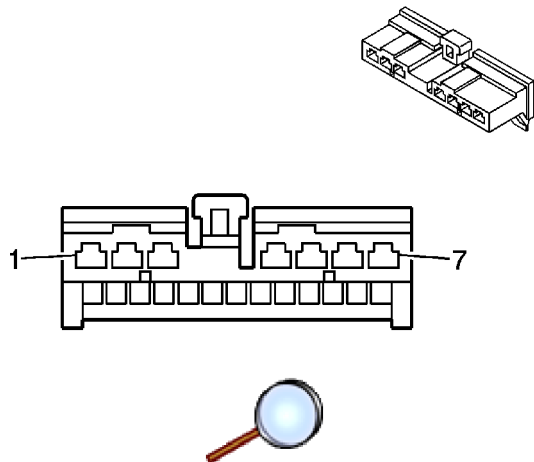
### Immobilizer



(1) Immobilizer

## Immobilizer Connector End Views

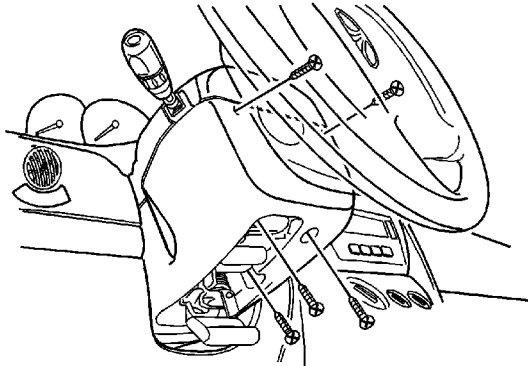
### Immobilizer

			
Connector Part Information		<ul style="list-style-type: none"><li>• 35508-0700</li><li>• 7-Way F (WH)</li></ul>	
Pin	Wire	Circuit	Function
1	PK	--	Ignition 1 Voltage
2	RD/WH	--	Battery Positive Voltage
3	--	--	Not Used
4	BK	--	Ground
5	L-BU/WH	--	Serial Data
6	BK/WH	--	Serial Data
7	YE	--	Security Indicator Control

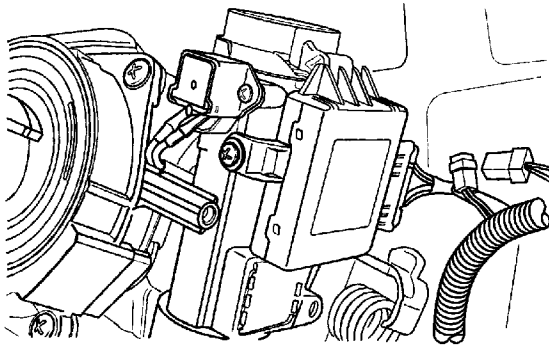
## Theft Deterrent Module Replacement

**Caution:** Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

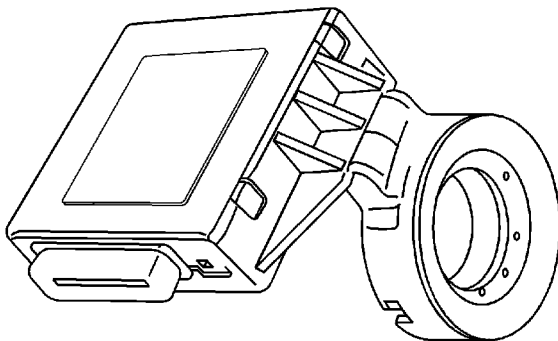
### Removal Procedure



1. Remove the lower steering column cover panel screws.
2. Turn the steering wheel in order to access the upper steering column panel screws. Remove the upper steering column cover panel screws.
3. Remove the upper and the lower steering column cover panels.



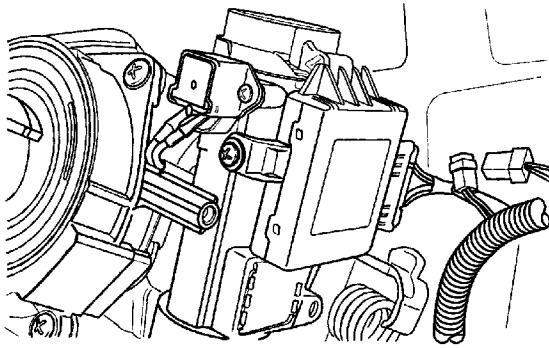
4. Disconnect the electrical connector from the immobilizer control unit.



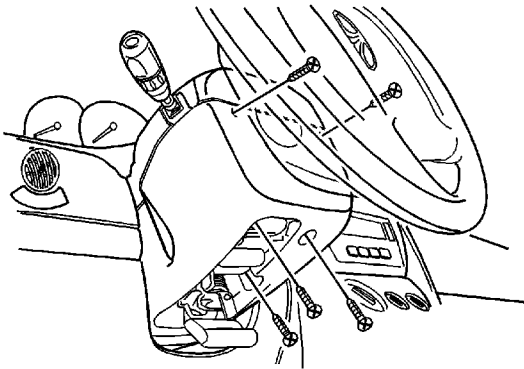
5. Remove the immobilizer control unit.

## Installation Procedure





1. Install the immobilizer control unit.
2. Connect the electrical connector to the immobilizer control unit.



**Important:** After replacing the immobilizer, the keys must be re-authorized using the key coding procedure. Refer to [Programming Theft Deterrent System Components](#) .

3. Install the upper and the lower steering column cover panels.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

4. Install the lower steering column cover panel screws.

**Tighten**

Tighten the lower steering column cover panel screws to 3 N·m (27 lb in).

5. Turn the steering wheel in order to access the upper steering column panel screw holes. Install the upper steering column cover panel screws.

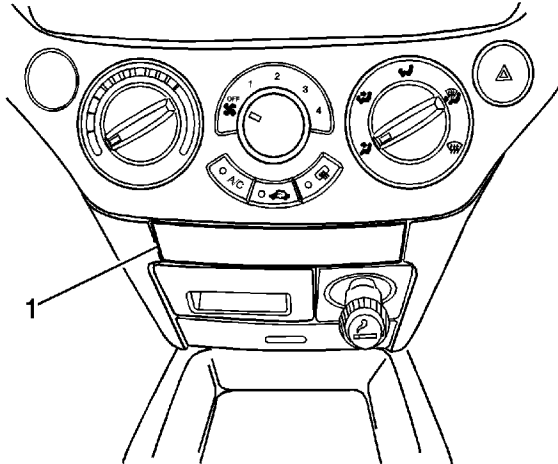
**Tighten**

Tighten the upper steering column cover panel screws to 3 N·m (27 lb in).

6. Connect the negative battery.

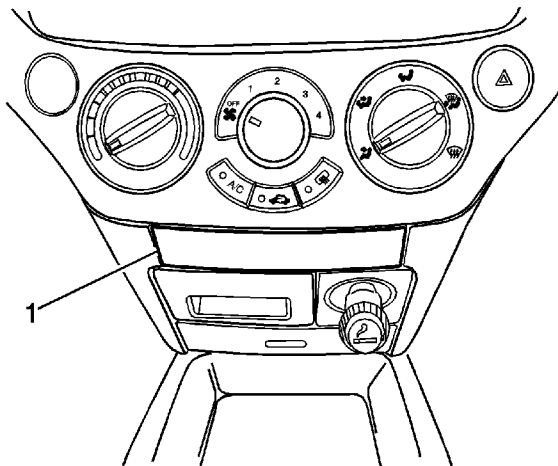
## Instrument Panel Lower Center Trim Replacement

### Removal Procedure



Remove the instrument panel lower center trim panel (1) using a taped flat-bladed tool.

### Installation Procedure

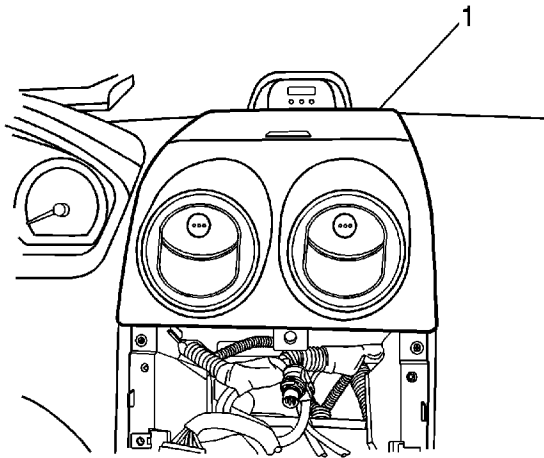




Install the instrument panel lower center trim panel (1).

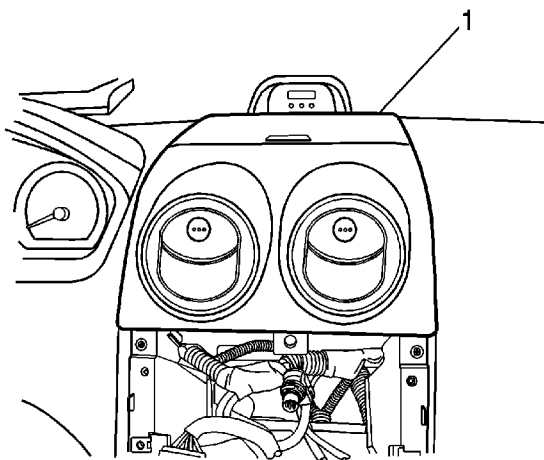
## Instrument Panel Center Trim Panel Replacement

### Removal Procedure



1. Remove the instrument panel lower trim panel. Refer to [Instrument Panel Lower Trim Panel Replacement](#).
2. Using a taped flat-bladed tool, remove the instrument panel center trim panel (1).

### Installation Procedure

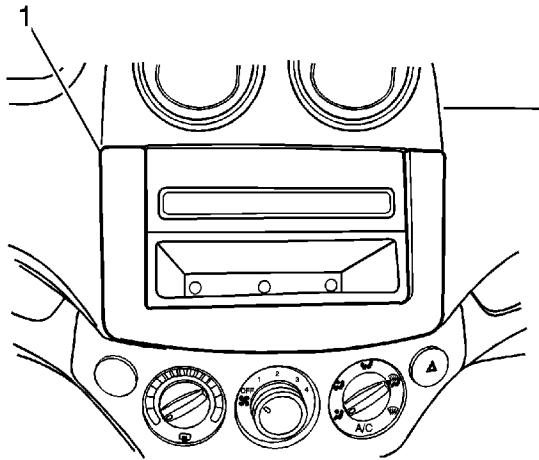




1. Install the instrument panel center trim panel (1).
2. Install the instrument panel lower trim panel. Refer to [Instrument Panel Lower Trim Panel Replacement](#).

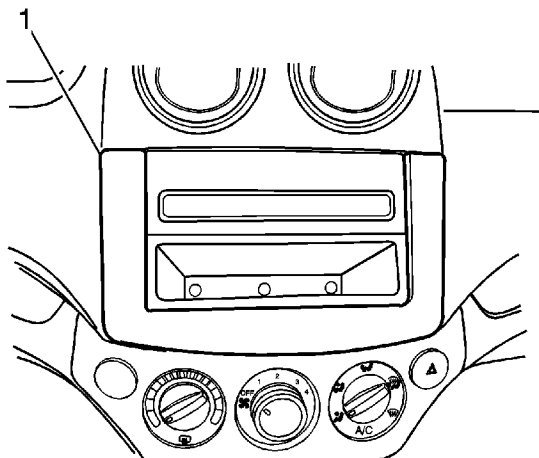
## Instrument Panel Lower Trim Panel Replacement

### Removal Procedure



Remove the instrument panel lower trim panel (1) using a taped flat-bladed tool.

### Installation Procedure



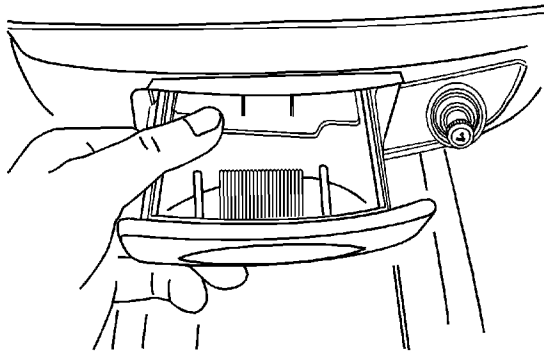


Install the instrument panel lower trim panel (1).



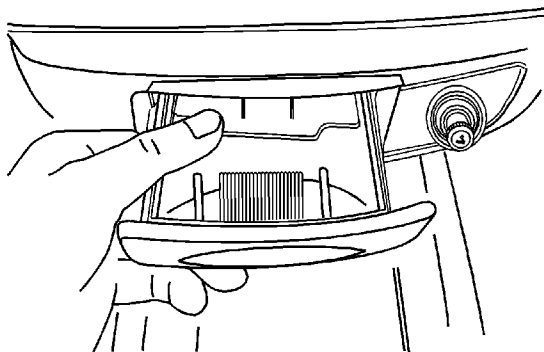
## Ashtray Replacement

### Removal Procedure



Remove the ashtray.

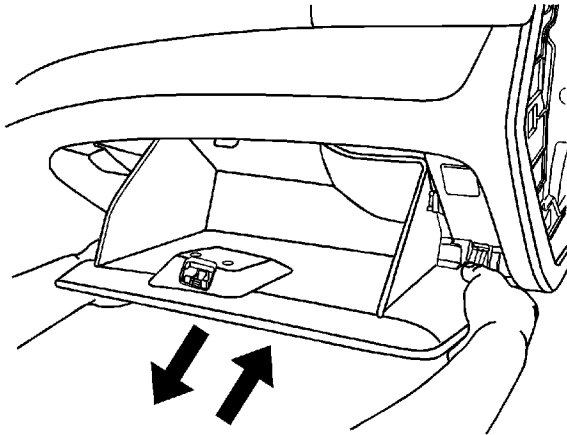
### Installation Procedure





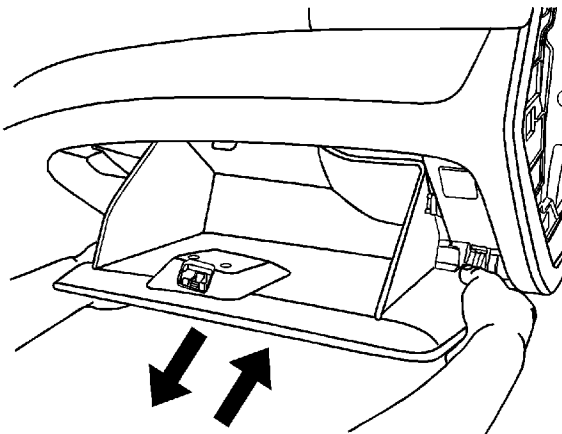
Install the ashtray.

## Instrument Panel Storage Compartment Replacement Removal Procedure



Open and remove the glove box.

## Installation Procedure





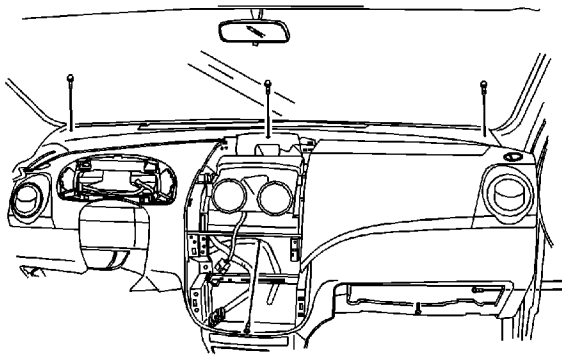
1. Position the glove box in the instrument panel.
2. Install the glove box.

# Instrument Panel Assembly Replacement (Notchback)

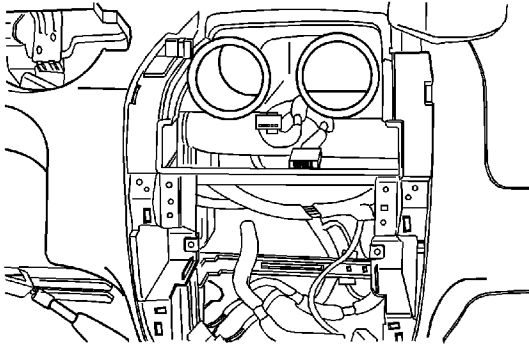
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

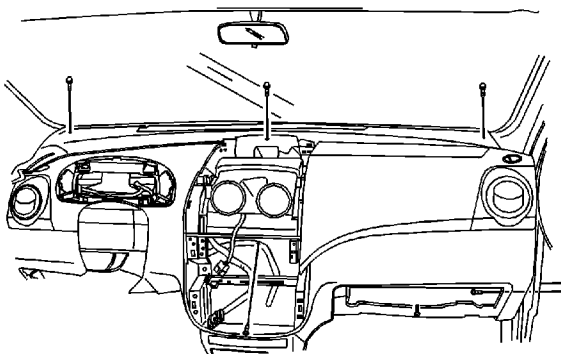
1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the driver air bag module from the steering wheel, if equipped. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#).
3. Remove the steering wheel from the steering column. Refer to [Steering Wheel Replacement](#).
4. Remove the steering column trim cover. Refer to [Steering Column Replacement](#).



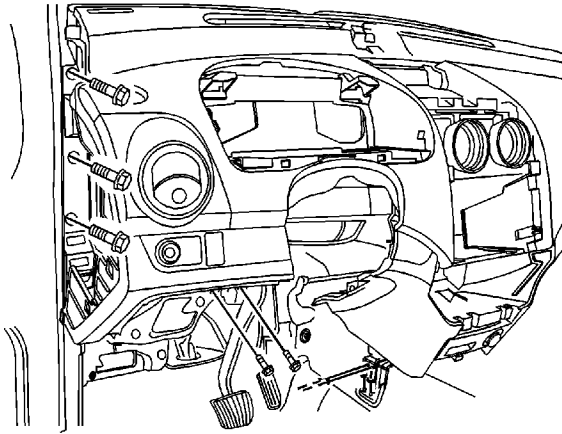
5. Remove the signal lamp switch and the wiper switch. Refer to [Turn Signal Multifunction Switch Replacement](#) and [Windshield Wiper and Washer Switch Replacement](#).
6. Remove the windshield pillar garnish moldings. Refer to [Windshield Pillar Garnish Molding Replacement](#).
7. Remove the instrument cluster assembly. Refer to [Instrument Cluster Replacement](#).
8. Remove the side cover.
9. Using a taped flat-bladed tool, gently pry and remove the instrument panel lower cover.
10. Remove the instrument panel center vent panel.
11. Remove the cigar lighter and ashtray. Refer to [Cigar Lighter Housing Replacement](#) and [Ashtray Replacement](#).
12. Remove the cupholder. Refer to [Cupholder Replacement](#).



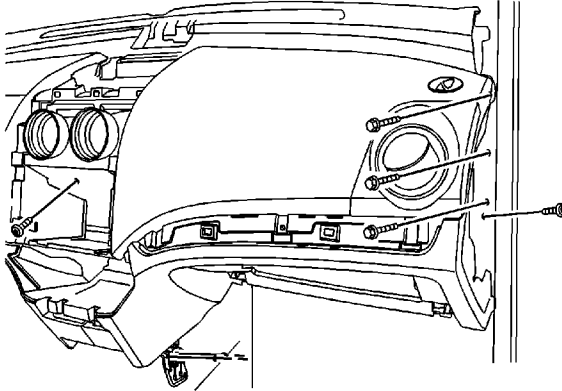
13. Remove the A/C controller from the instrument panel. Refer to [Heater and Air Conditioning Control Replacement](#).
14. Remove the audio system from the instrument panel. Refer to [Radio Replacement](#).
15. Remove the digital clock. Refer to [Clock Replacement](#).
16. Remove the glove box assembly from the instrument panel. Refer to [Instrument Panel Storage Compartment Replacement](#).
17. Remove the screws from the ALDL connector.
18. Disconnect the necessary electrical connectors.



19. Remove the three bolts from the upper instrument panel.



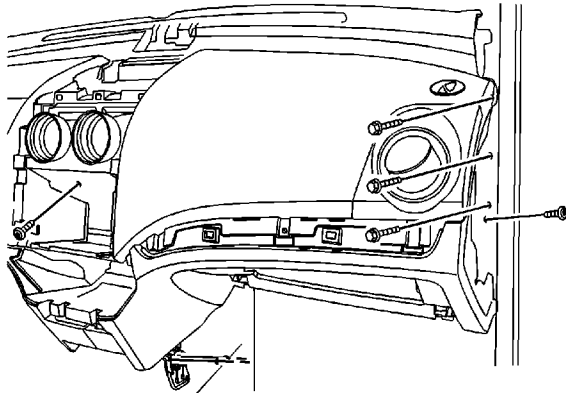
20. Remove the instrument panel screw behind the HVAC controls.
21. Remove the instrument panel bolts above the steering column.
22. Remove the instrument panel bolts from the ends of the instrument panel.
23. Remove the two nuts from the lower left center of the instrument panel.



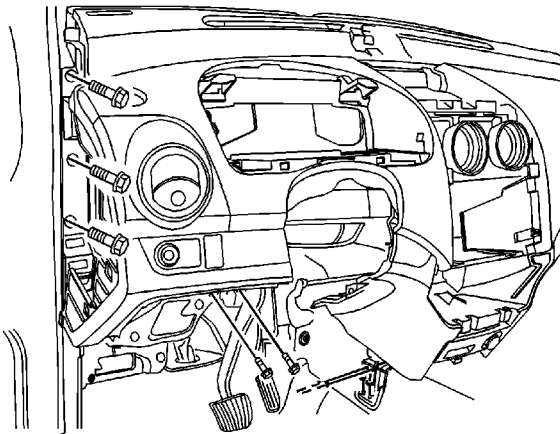
24. Remove the instrument panel end screws.
25. Remove the two nuts from the lower right center of the instrument panel.
26. Remove the tie-bar retaining bolts.
27. Disconnect the wire harness from the instrument panel.
28. Remove the instrument panel from the vehicle.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

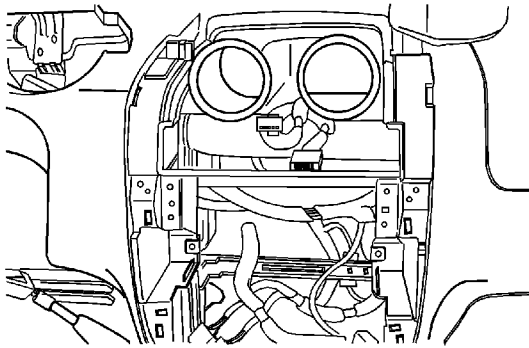


1. Install the instrument panel assembly with the right side end screws and tighten to **20 N·m (15 lb ft)**.
2. Install the tie bar retaining bolts and tighten to **20 N·m (15 lb ft)**.
3. Connect the wire harness to the instrument panel.
4. Install the two nuts to the lower right center of the instrument panel.
5. Connect the ALDL connector with the screws.

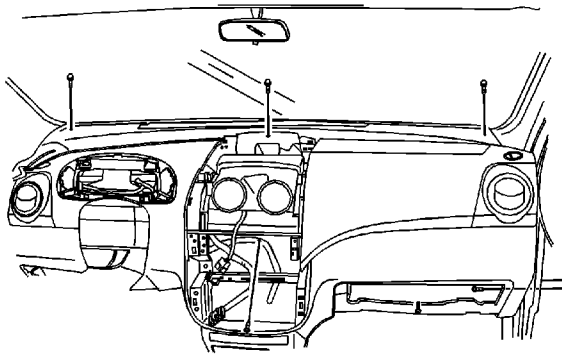


6. Install the instrument panel bolts to the left side of the instrument panel and tighten to **20 N·m (15 lb ft)**.
7. Install the two nuts to the lower left center of the instrument panel.
8. Install the instrument panel bolts above the steering column and tighten to **20 N·m (15 lb ft)**.
9. Install the instrument panel screw behind the HVAC assembly and tighten to **4 N·m (35 lb in)**.





10. Install the digital clock. Refer to [Clock Replacement](#).
11. Install glove box assembly to the instrument panel. Refer to [Instrument Panel Storage Compartment Replacement](#).
12. Install the audio system to the instrument panel. Refer to [Radio Replacement](#).
13. Install the A/C controller to the instrument panel. Refer to [Heater and Air Conditioning Control Replacement](#).
14. Install the cupholder. Refer to [Cupholder Replacement](#).
15. Install the cigar lighter and ashtray. Refer to [Cigar Lighter Housing Replacement](#) and [Ashtray Replacement](#).



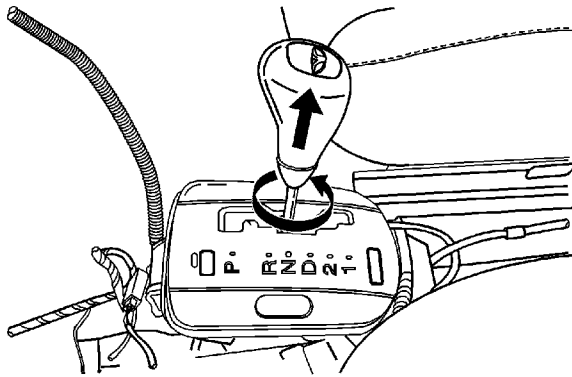
16. Install the instrument panel center vent panel.
17. Install the instrument panel lower cover.
18. Connect the necessary electrical connectors.
19. Install the side cover.
20. Install the instrument cluster assembly. Refer to [Instrument Cluster Replacement](#).

21. Install the windshield pillar garnish molding. Refer to [Windshield Pillar Garnish Molding Replacement](#).
22. Install the signal lamp switch and the wiper switch. Refer to [Turn Signal Multifunction Switch Replacement](#) for signal, and refer to [Windshield Wiper and Washer Switch Replacement](#).
23. Install the steering column trim cover. Refer to [Steering Column Replacement](#).
24. Install the steering wheel to the steering column. Refer to [Steering Wheel Replacement](#).
25. Install the driver air bag module to the steering wheel, if equipped. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#).
26. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

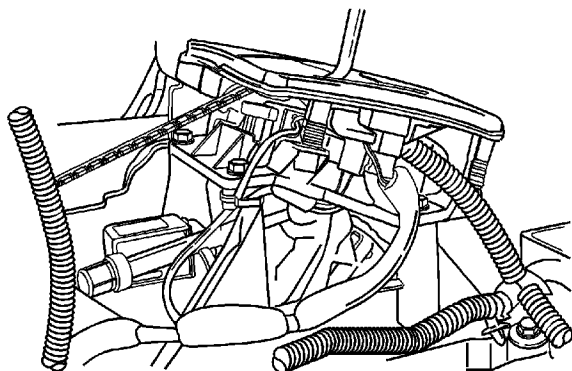
## Console Shift Lever Bezel Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



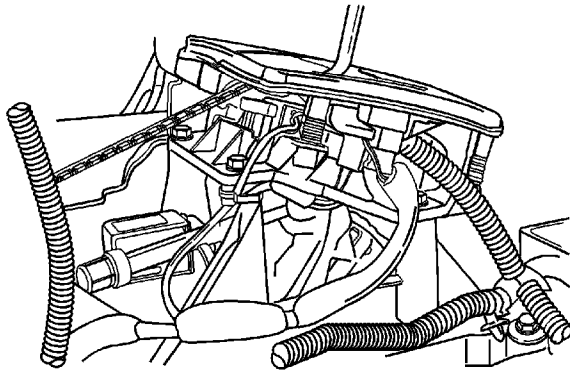
1. Disconnect the negative battery cable.
2. Remove the floor console. Refer to [Front Floor Console Replacement](#).
3. Remove the shift select lever knob.



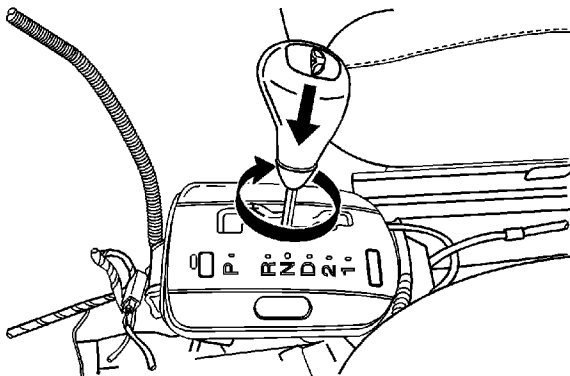
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4. Disconnect the connectors.
5. Remove the shift select cover from the shift select housing.

## **Installation Procedure**



1. Connect the connectors to the shift select cover.
2. Install the shift select cover to the hole.

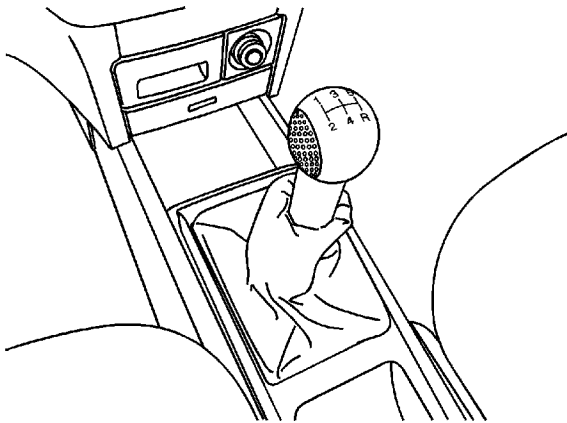


3. Install the shift select lever knob.
4. Install the floor console. Refer to [Front Floor Console Replacement](#).
5. Connect the negative battery cable.

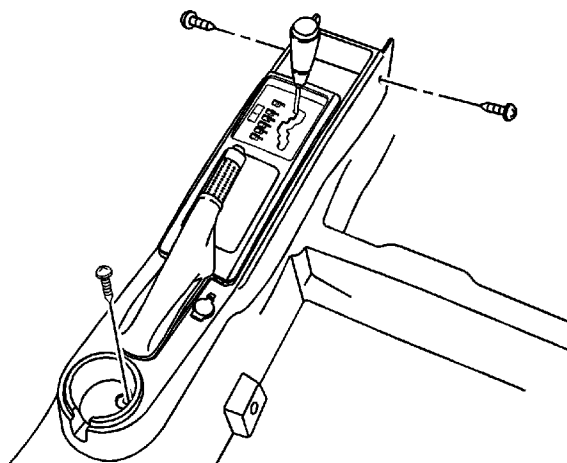
## Front Floor Console Replacement (Notchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the gearshift lever boot, if equipped.

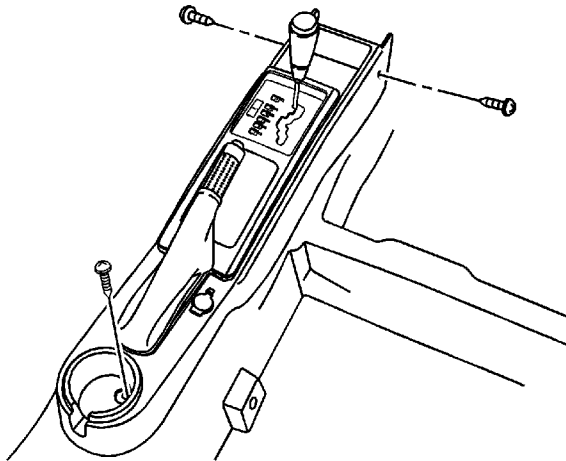


3. Remove the screws from the floor console.

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4. Remove the floor console cover.
5. Remove the parking brake cover.
6. Disconnect the electrical connector.
7. Remove the floor console.

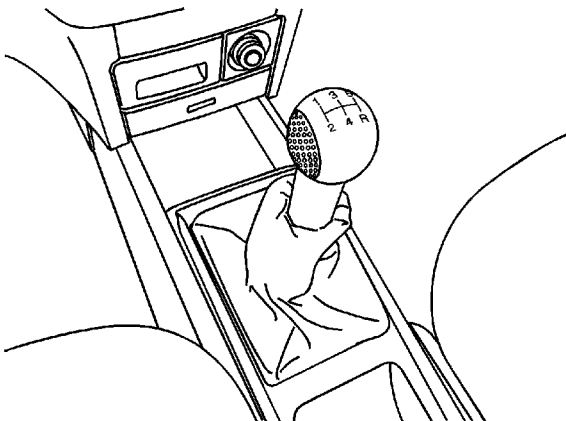
## Installation Procedure



1. Connect the electrical connector.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the floor console with the screws and tighten to **4 N·m (35 lb in)**.
3. Install the parking brake cover.
4. Install the floor console cover.





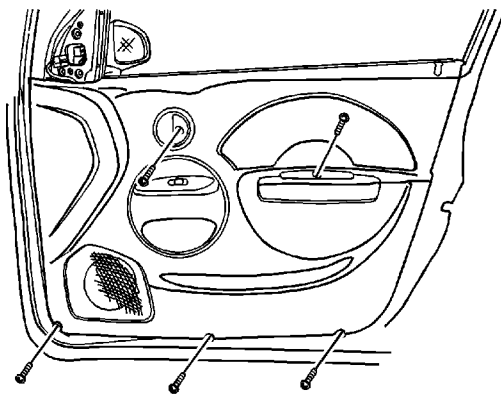
5. Install the gearshift lever boot, if equipped.
6. Connect the negative battery cable.

## Front Side Door Trim Panel Replacement (Hatchback)

### Special Tools

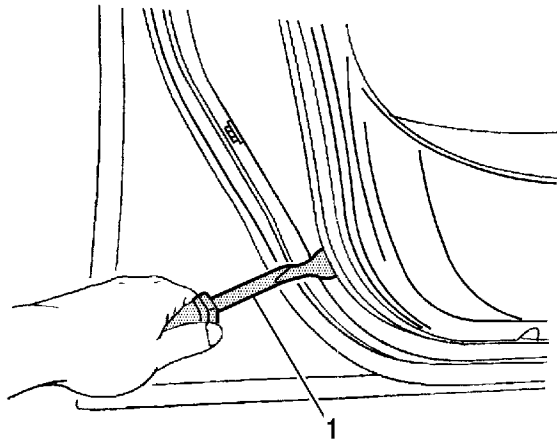
[J 21104-B](#) (KM 475-B) Weatherstrip Remover Universal

### Removal Procedure



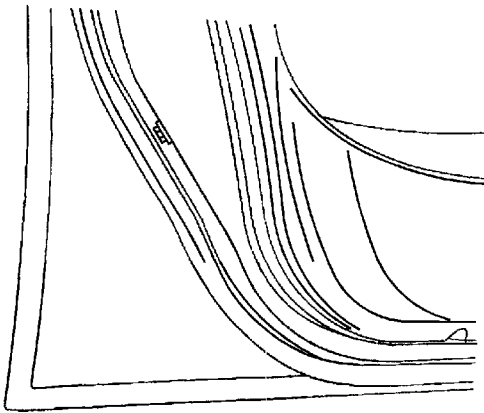
1. Lower the front window.
2. Remove the door pull screw.
3. Remove the inside door handle.
4. Remove the screws at the base of the trim panel.





5. Pry off the trim panel using the trim remover [J 21104-B](#) (1).

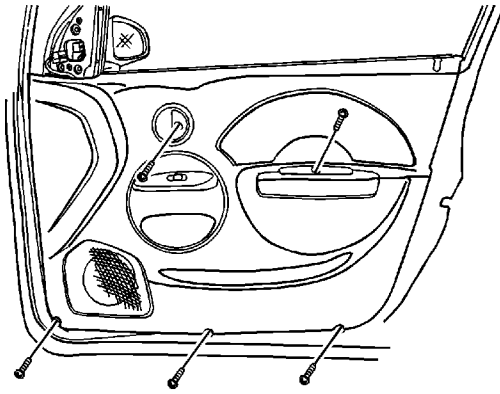
## Installation Procedure



1. Install the trim panel.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

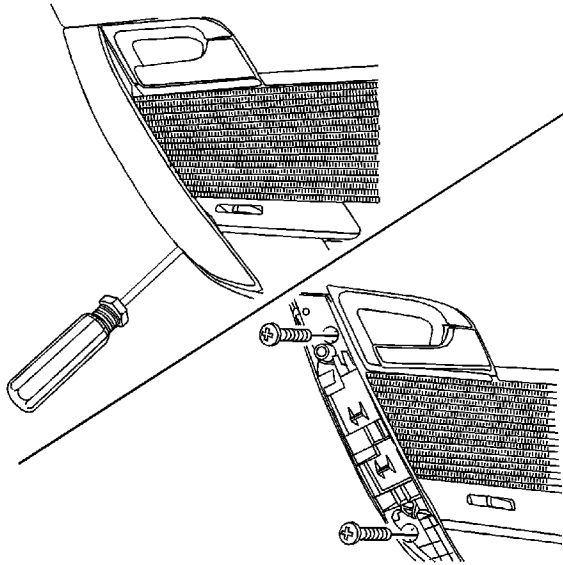
2. Install the screws at the base of the trim panel and tighten to **3.5 N·m (31 lb in)**.
3. Install the inside door handle.



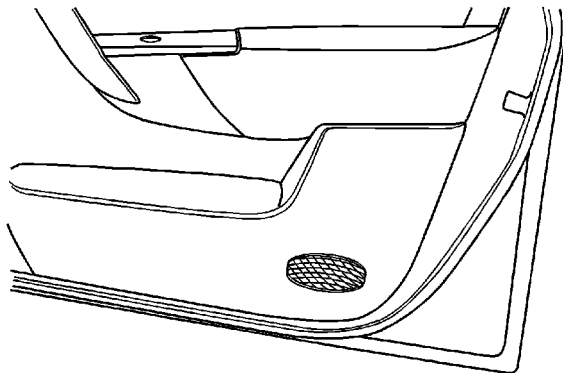
4. Install the door pull screw and tighten to **3.5 N·m (31 lb in)**.
5. Raise the window.

## Front Side Door Trim Panel Replacement (Notchback)

### Removal Procedure



1. Lower the front window.
2. Remove the window regulator handle, if equipped.
3. Remove the door pull screws.
4. Using a flat-bladed tool, gently pry off the inside door pull handle cover.



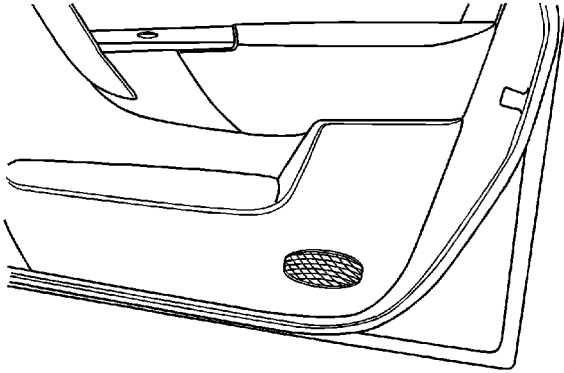
5. Pry off the trim panel.

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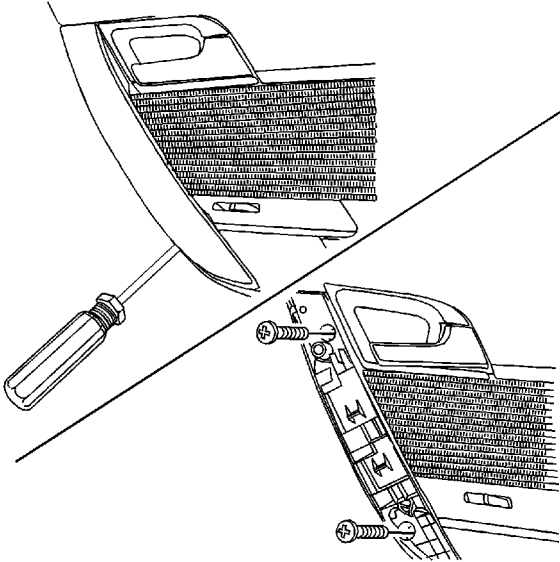
6. Disconnect the necessary electrical connectors, if equipped.

## **Installation Procedure**

1. Connect the necessary electrical connectors, if equipped.



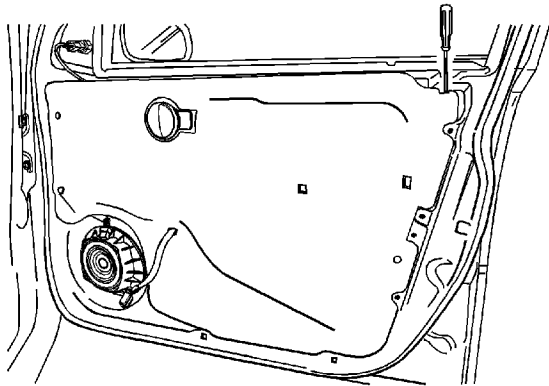
2. Install the trim panel.



3. Install the door pull screw.
4. Install the door pull trim cover.
5. Install the window regulator handle, if equipped.
6. Raise the window.

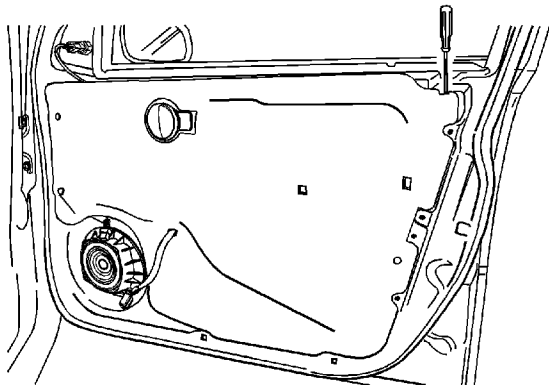
## Door Water Deflector Replacement

### Removal Procedure



1. Remove the door trim panel. Refer to [Front Side Door Trim Panel Replacement](#).
2. Remove the screws and the door pull bracket.
3. Remove the door seal trim.

### Installation Procedure





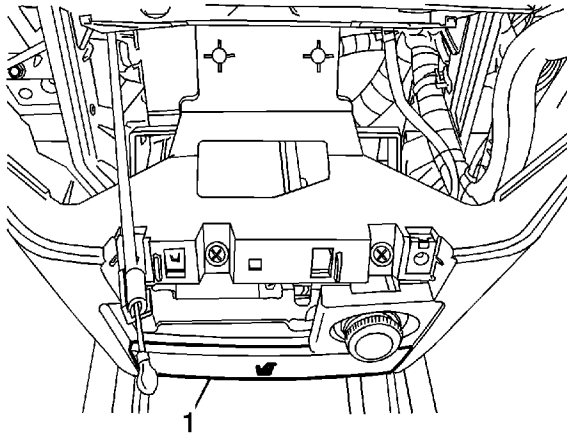
1. Install the door seal trim.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the door pull bracket with the screws and tighten to **3.5 N·m (31 lb in)**.
3. Install the door trim panel. Refer to [Front Side Door Trim Panel Replacement](#).

## Cupholder Replacement

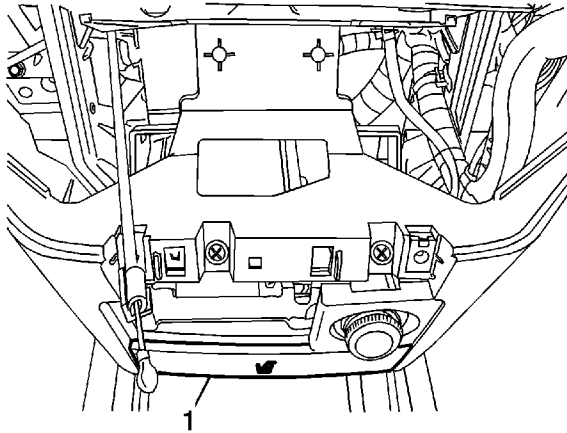
### Removal Procedure



1. Remove the center console. Refer to [Front Floor Console Replacement](#).
2. Remove the heating and air conditioning controls. Refer to [Heater and Air Conditioning Control Replacement](#).
3. Remove the four screws and the cupholder assembly (1) from the instrument panel.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

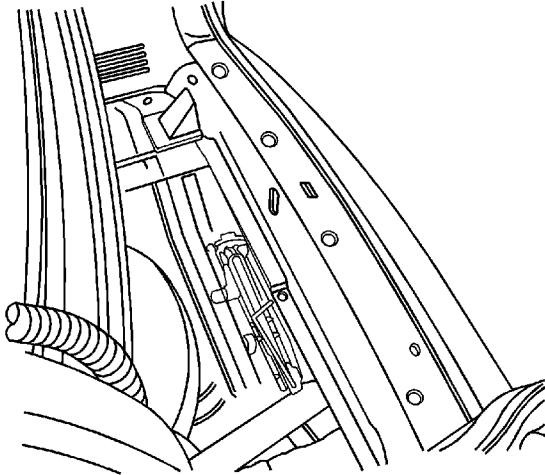


1. Install the cupholder assembly (1) with the four screws and tighten to **2.5 N·m (22 lb in)**.
2. Install the heating and air conditioning controls. Refer to [Heater and Air Conditioning Control Replacement](#).
3. Install the center console. Refer to [Front Floor Console Replacement](#).



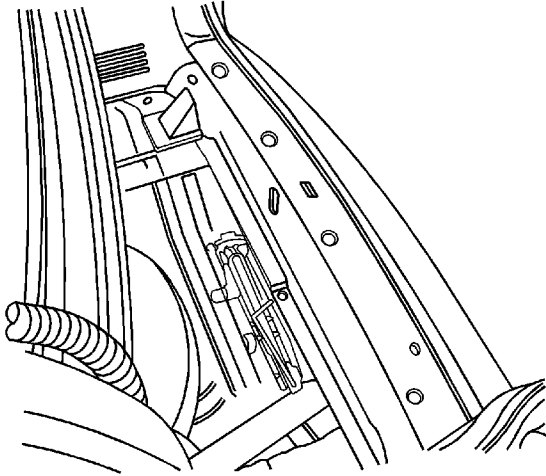
## Rear Compartment Trim Panel Replacement (Hatchback)

### Removal Procedure



Remove the plastic retaining clips and the rear trim panel.

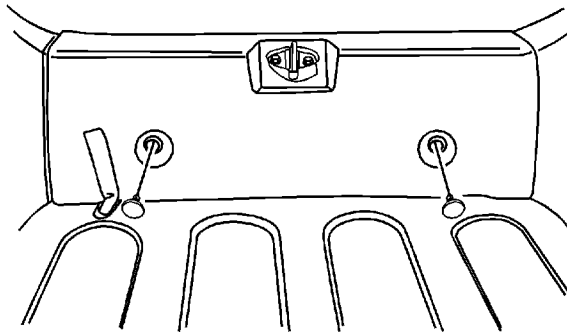
### Installation Procedure



Install the rear trim panel with the plastic retaining clips.

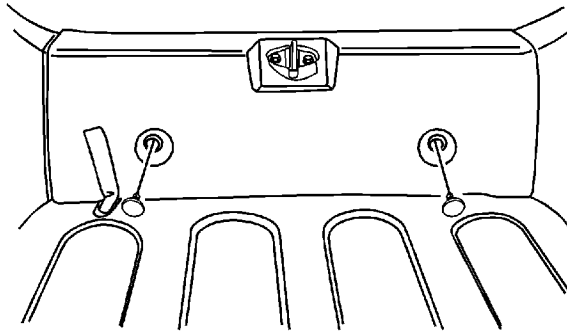
## Rear Compartment Trim Panel Replacement (Notchback)

### Removal Procedure



Remove the plastic retaining clips and the rear trim panel.

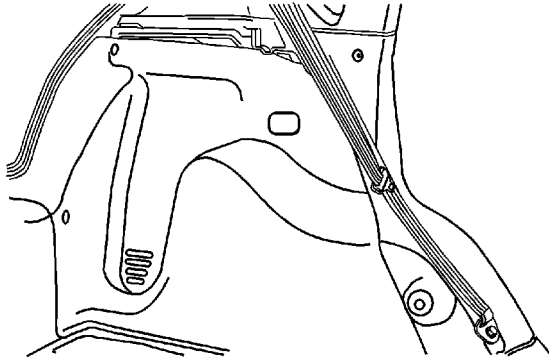
### Installation Procedure



Install the rear trim panel with the plastic retaining clips.

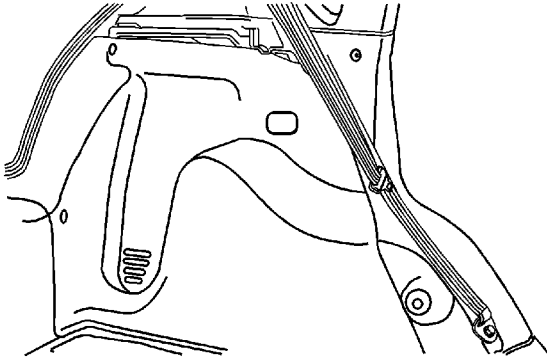
## Cargo Area Side Trim Panel Replacement (Hatchback)

### Removal Procedure



1. Remove the rear compartment trim panel. Refer to [Rear Compartment Trim Panel Replacement](#)
2. Remove the clips and the cargo area side trim panel.

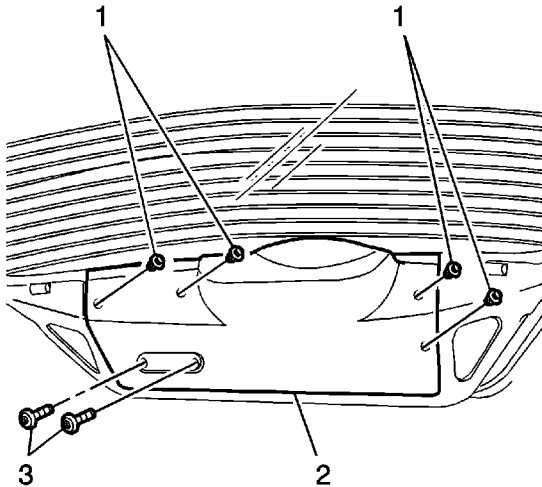
### Installation Procedure



1. Install the cargo area side trim panel with the clips.
2. Install the rear compartment trim panel. Refer to [Rear Compartment Trim Panel Replacement](#) .

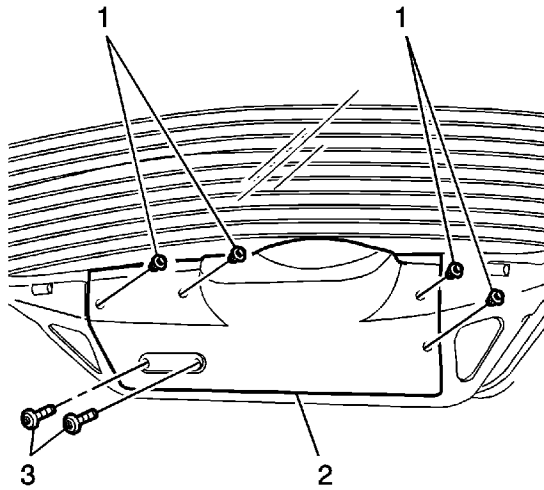
## Liftgate Lower Garnish Molding Replacement

### Removal Procedure



1. Open the liftgate.
2. Remove the lower garnish molding clips (1).
3. Remove the screws (3).
4. Remove the liftgate lower garnish molding (2).

### Installation Procedure



1. Install the liftgate lowerer garnish molding (2).
2. Install the screws (3).
3. Install the lower garnish molding clips (1).
4. Close the liftgate.

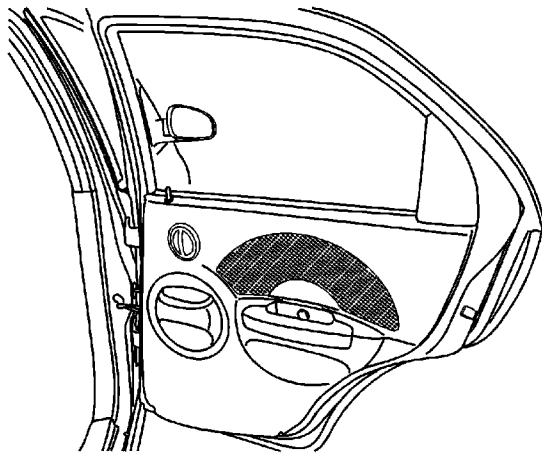


## Rear Door Trim Panel Replacement (Hatchback)

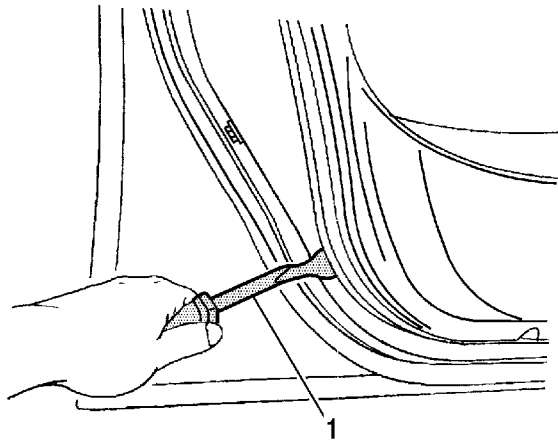
### Special Tools

[J 21104-B](#) (KM 475-B) Weatherstrip Remover Universal

### Removal Procedure

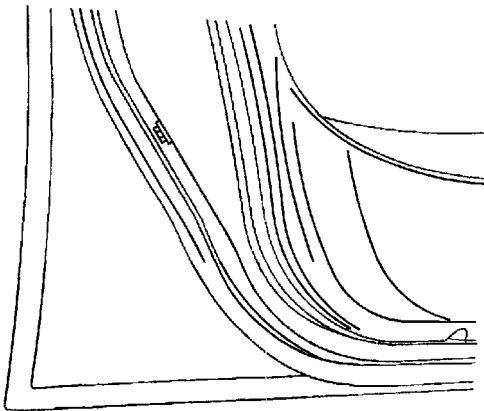


1. Lower the rear window.
2. Remove the rear window regulator handle. Refer to [Door Window Regulator Handle Replacement](#).
3. Remove the door pull screw.
4. Remove the inside door handle.



5. Remove the rear door interior garnish molding.
6. Remove the screws at the base of the trim panel.
7. Pry off the trim panel using the trim remover [J 21104-B](#) (1).

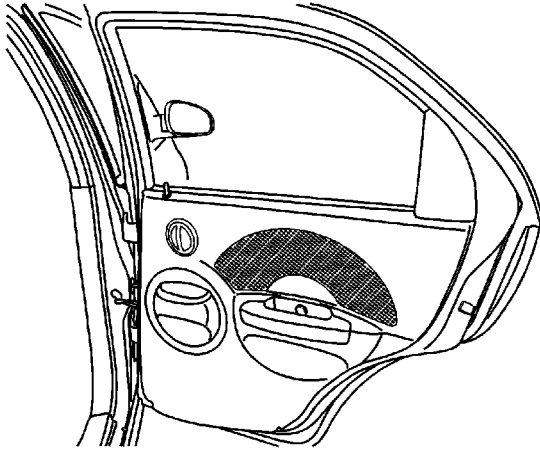
## Installation Procedure



1. Install the trim panel.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

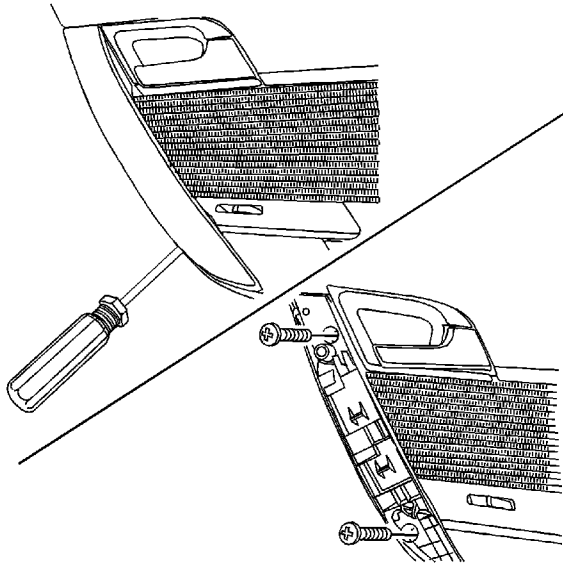
2. Install the screws at the base of the trim panel and tighten to **3.5 N·m (31 lb in)**.



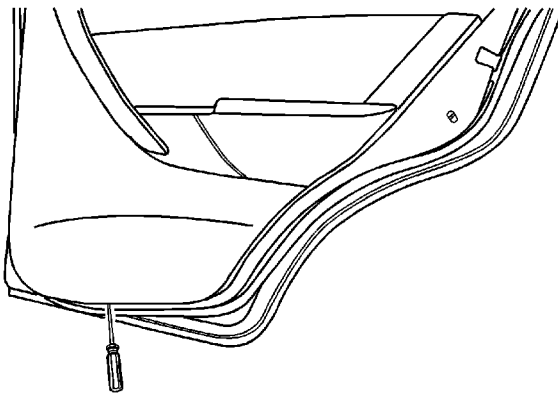
3. Install the rear door interior garnish molding.
4. Install the inside door handle.
5. Install the door pull screw and tighten to **3.5 N·m (31 lb in)**.
6. Install the rear window regulator handle. Refer to [Door Window Regulator Handle Replacement](#).
7. Raise the window.

## Rear Door Trim Panel Replacement (Notchback)

### Removal Procedure



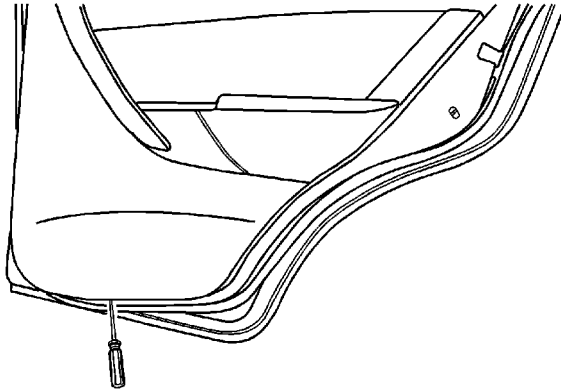
1. Lower the rear window.
2. Remove the rear window regulator handle. Refer to [Door Window Regulator Handle Replacement](#).
3. Remove the door pull screw.
4. Remove the inside door handle.



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5. Remove the rear door interior garnish molding.
6. Remove the screws at the base of the trim panel.
7. Pry off the trim panel.

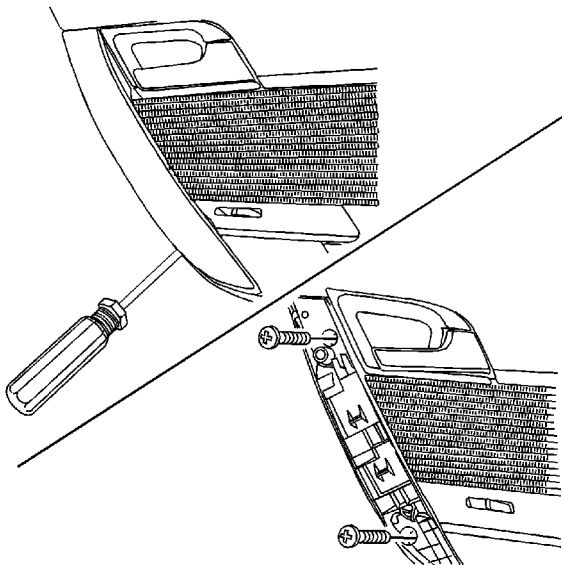
## Installation Procedure



1. Install the trim panel.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the screws at the base of the trim panel and tighten to **3.5 N·m (31 lb in)**.

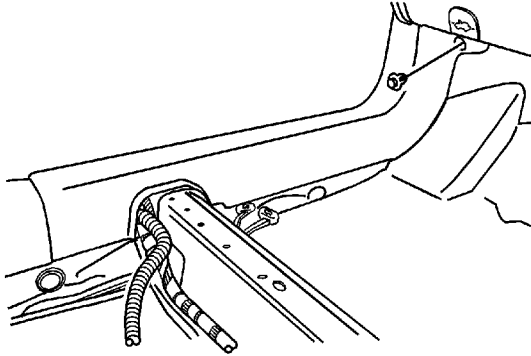


3. Install the rear door interior garnish molding.

4. Install the inside door handle.
5. Install the door pull screw and tighten to **3.5 N·m (31 lb in)**.
6. Install the rear window regulator handle. Refer to [Door Window Regulator Handle Replacement](#).
7. Raise the window.

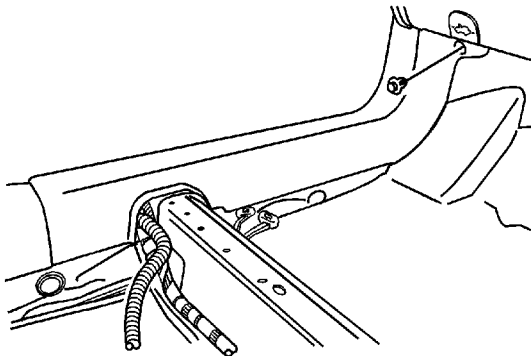
## Front Side Door Sill Trim Plate Replacement

### Removal Procedure



1. Remove the screw securing the front rocker trim panel.
2. Pry off the front rocker trim panel.

### Installation Procedure



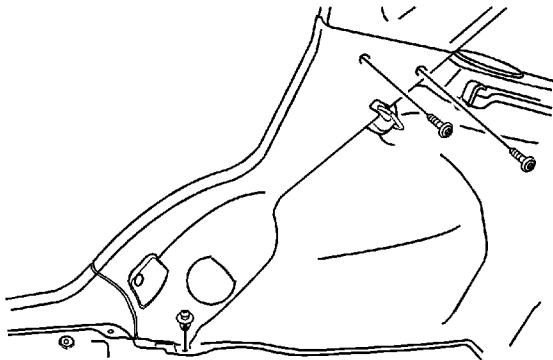


Install the front rocker trim panel with the screw.



## Rear Side Door Sill Trim Plate Replacement (Hatchback)

### Removal Procedure

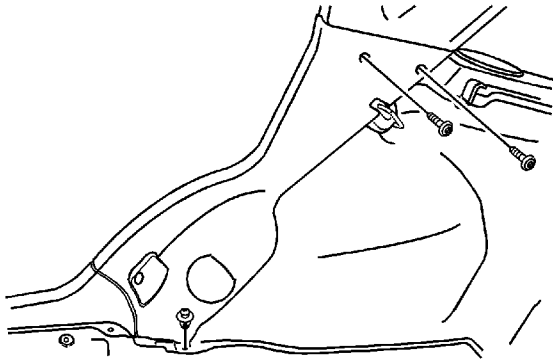


1. Remove the rear seat cushion and the rear seat back.

Refer to [Rear Seat Cushion Replacement](#).

2. Remove the screw securing the rear rocker trim panel.
3. Pry off the rear rocker trim panel.

### Installation Procedure



1. Install the rear rocker trim panel.
2. Install the rear rocker trim panel with the screw.

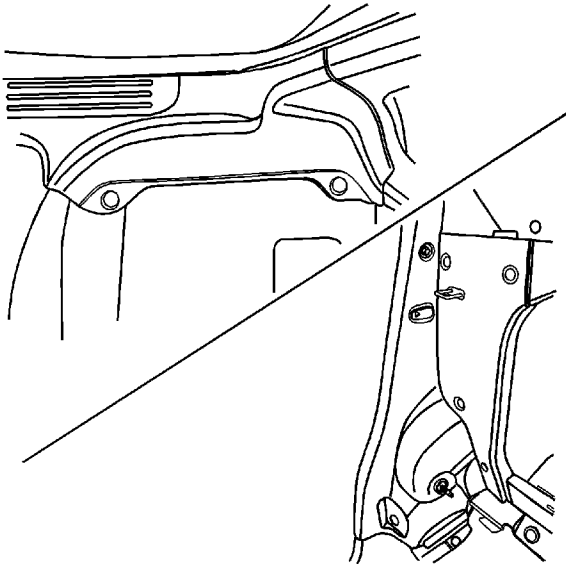
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the rear seat back with the bolt and tighten to **25 N·m (18 lb ft)**.
4. Install the rear seat cushion.

Refer to [Rear Seat Cushion Replacement](#).

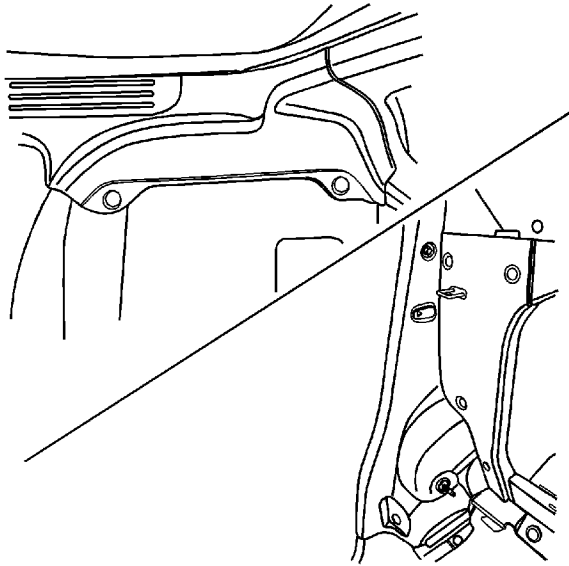
## Rear Side Door Sill Trim Plate Replacement (Notchback)

### Removal Procedure



1. Remove the rear seat cushion and the rear seat back. Refer to [Rear Seat Cushion Replacement](#).
2. Remove the screw securing the rear rocker trim panel.
3. Pry off the rear rocker trim panel.

### Installation Procedure



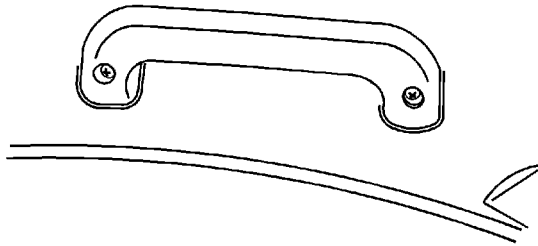
1. Install the rear rocker trim panel.
2. Install the rear rocker trim panel with the screw.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the rear seat back with the bolt and tighten to **25 N·m (18 lb ft)**.
4. Install the rear seat cushion. Refer to [Rear Seat Cushion Replacement](#).

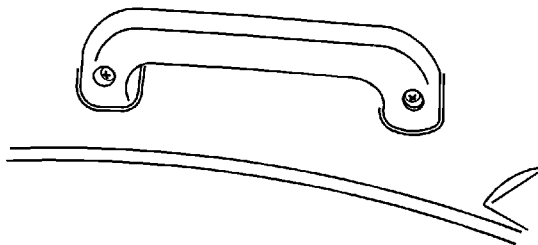
## Assist Handle Replacement

### Removal Procedure



Remove the screws and the assist handle from the headliner.

### Installation Procedure



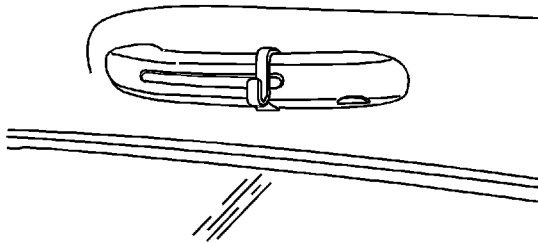


**Caution:** Refer to [Fastener Caution](#) in the Preface section.

Install the assist handle to the headliner with the screws and tighten to **3.5 N·m (31 lb in)**.

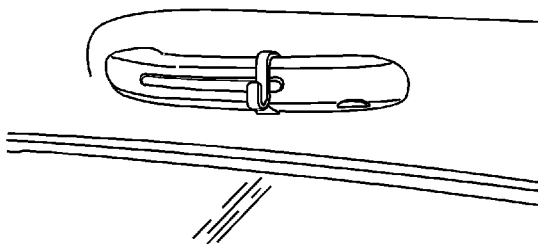
## Coat Hook Replacement

### Removal Procedure



Remove the coat hook from the passenger assist handle.

### Installation Procedure



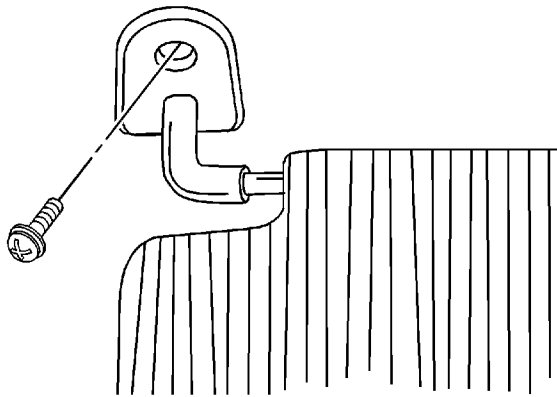


Install the coat hook to the passenger assist handle.

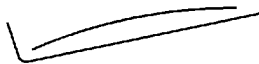


## Sunshade Replacement

### Removal Procedure



1. Remove the screws and the sun visor from the headliner.

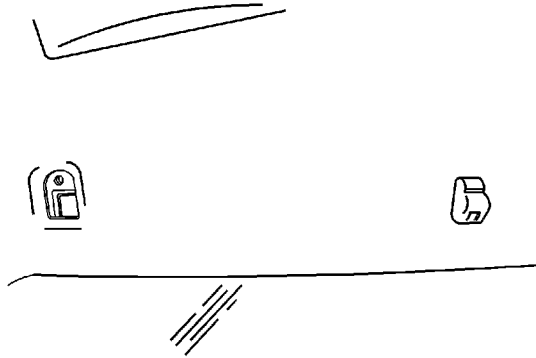


2. Remove the screw and the sun visor support from the headliner.

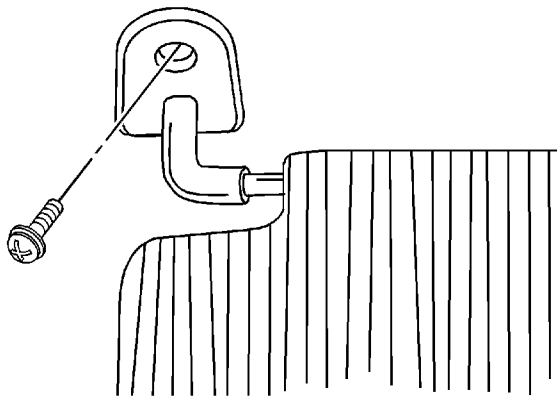
### Installation Procedure

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**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the sun visor support to the headliner with the screw and tighten to **1.5 N·m (13 lb in)**.



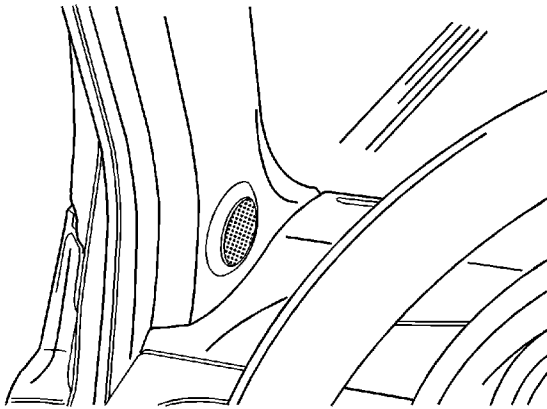
2. Install the sun visor to the headliner with the screws.

**Tighten**

Tighten the sun visor screws to 1.5 N·m (13 lb in).

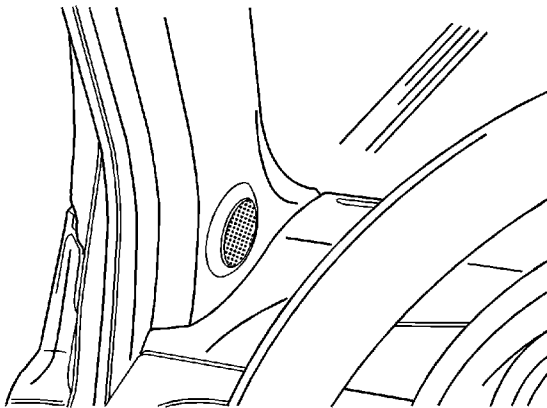
## Windshield Pillar Garnish Molding Replacement

### Removal Procedure



1. Carefully pry off the windshield pillar garnish molding.
2. Disconnect the electrical connector.
3. Remove the tweeter, if necessary.

### Installation Procedure

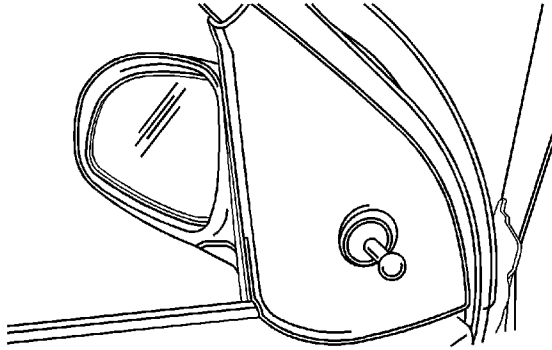




1. Install the tweeter to the windshield garnish molding, if removed.
2. Connect the electrical connector.
3. Install the windshield pillar garnish molding.

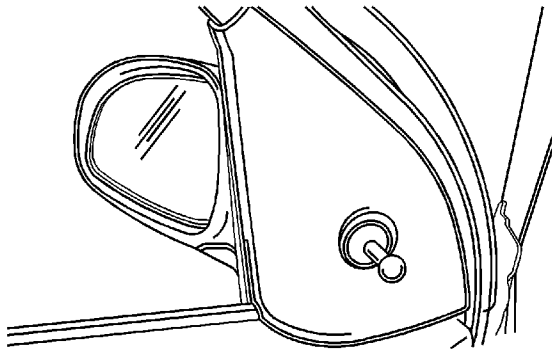
## Side Door Upper Garnish Molding Replacement

### Removal Procedure



Pry off the escutcheon.

### Installation Procedure

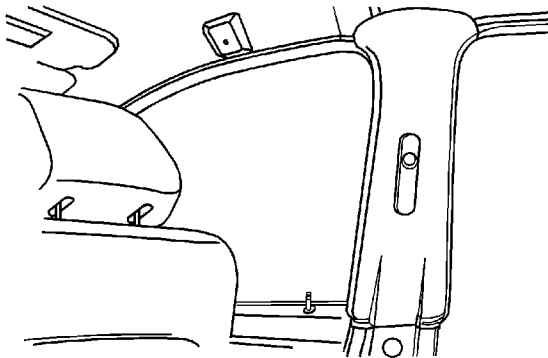




Install the escutcheon.

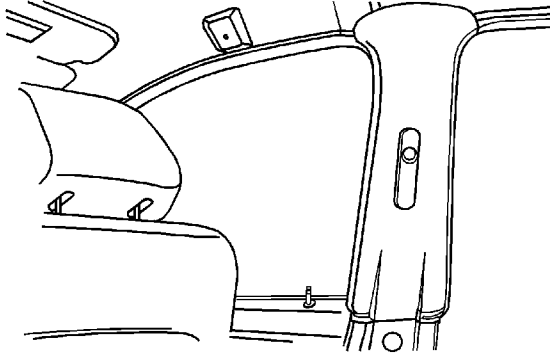
## Center Pillar Upper Trim Panel Replacement (Notchback)

### Removal Procedure



1. Remove the bolt and the upper front seat belt anchor.
2. Remove the lower center pillar trim panel. Refer to [Center Pillar Lower Trim Panel Replacement](#).
3. Pry off the upper center pillar trim panel.

### Installation Procedure



1. Install the upper center pillar trim panel.
2. Install the lower center pillar trim panel. Refer to [Center Pillar Lower Trim Panel Replacement](#).

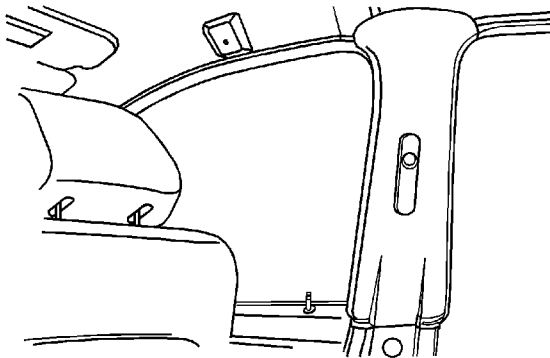
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the upper front seat belt anchor with the bolt and tighten to **38 N·m (28 lb ft)**.

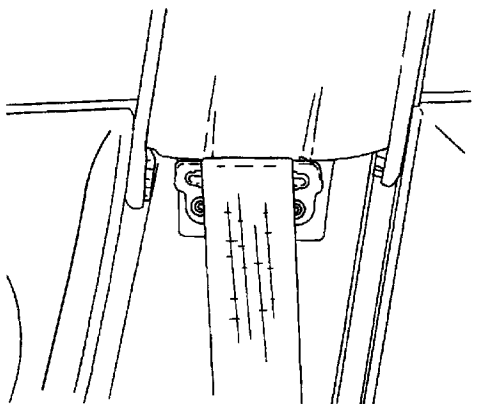


## Center Pillar Upper Trim Panel Replacement (Hatchback)

### Removal Procedure



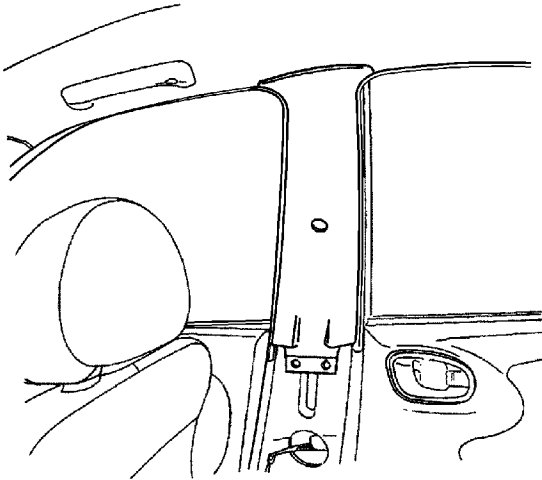
1. Remove the bolt and the upper front seat belt anchor.



2. Remove the lower center pillar trim panel. Refer to [Center Pillar Lower Trim Panel Replacement](#).

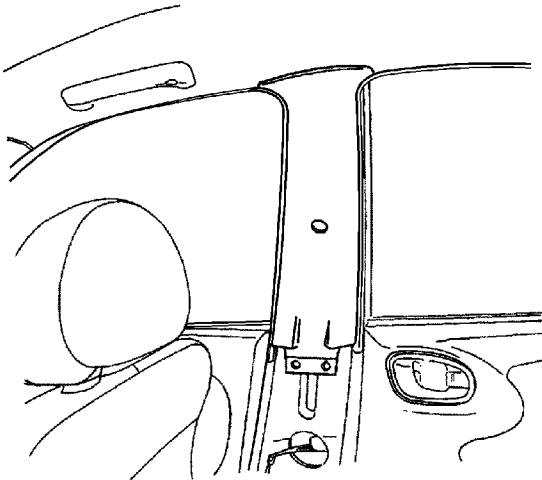
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3. Remove the screws and the seat belt bracket.



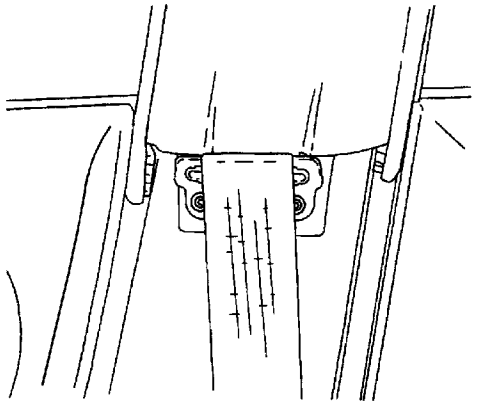
4. Pry off the upper center pillar trim panel.

## Installation Procedure

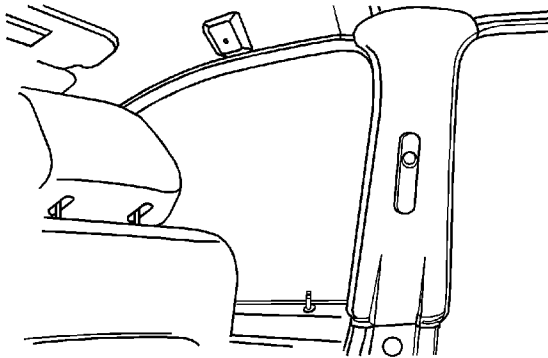


1. Install the upper center pillar trim panel.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



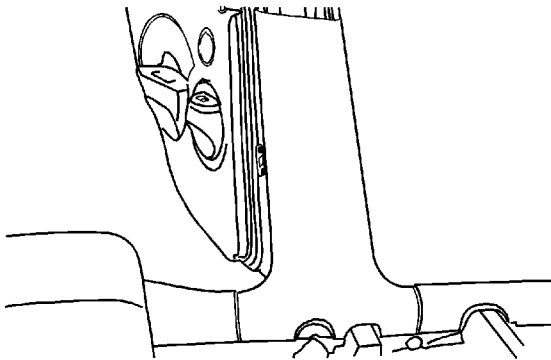
2. Install the seat belt bracket with the screws and tighten to **10 N·m (89 lb in)**.



3. Install the lower center pillar trim panel. Refer to [Center Pillar Lower Trim Panel Replacement](#).
4. Install the upper front seat belt anchor with the bolt and tighten to **38 N·m (28 lb ft)**.

## Center Pillar Lower Trim Panel Replacement (Hatchback)

### Removal Procedure



1. Reposition the rear portion of the front rocker trim panel and the front portion of the rear rocker trim panel.
2. Pry off the lower center pillar trim panel.

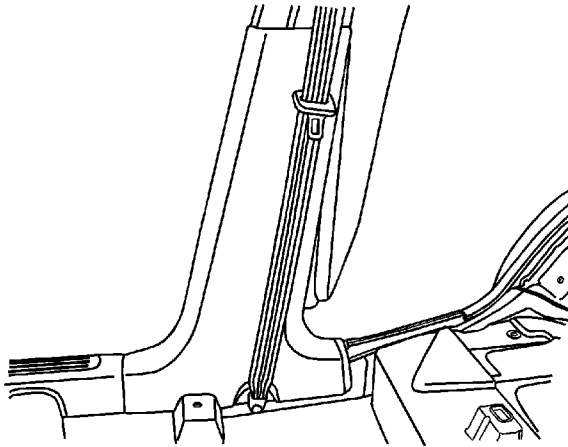
### Installation Procedure



1. Install the lower center pillar trim panel.
2. Install the front rocker trim panel.
3. Install the rear rocker trim panel to its original position.

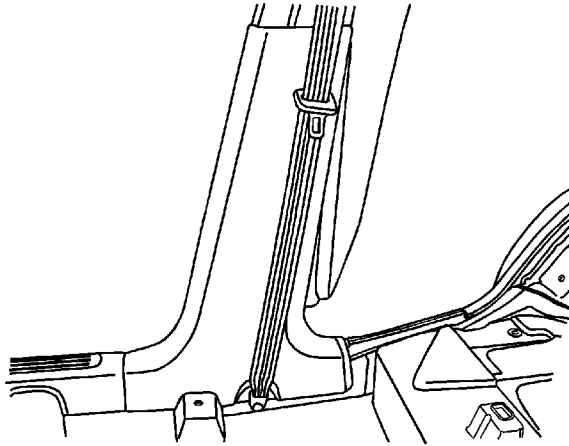
## Center Pillar Lower Trim Panel Replacement (Notchback)

### Removal Procedure



1. Reposition the rear portion of the front rocker trim panel and the front portion of the rear rocker trim panel.
2. Pry off the lower center pillar trim panel.

### Installation Procedure

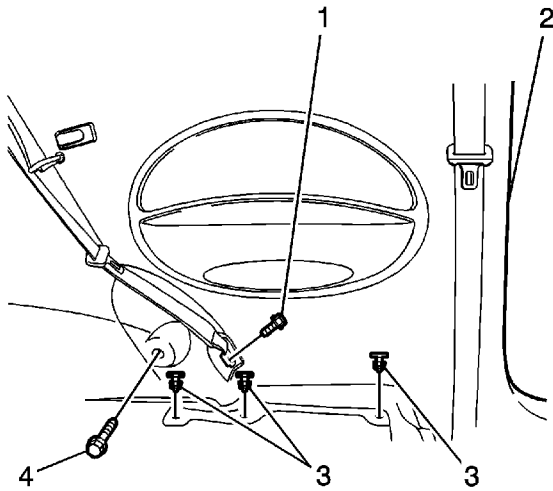


1. Install the lower center pillar trim panel.
2. Install the front rocker trim panel.
3. Install the rear rocker trim panel to its original position.

## Rear Quarter Trim Panel Replacement (3 Door Hatchback)

### Removal Procedure

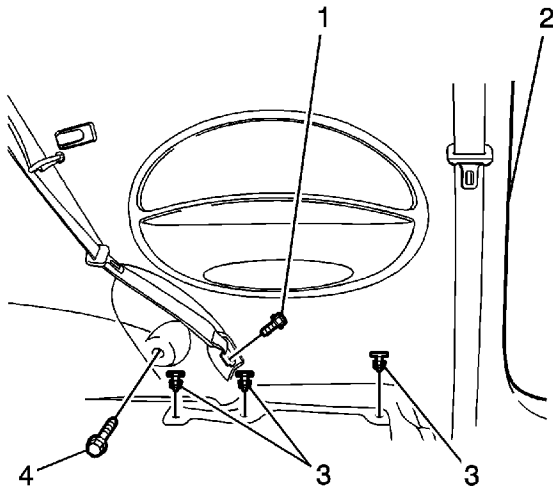
1. Remove the rear seat cushion. Refer to [Rear Seat Cushion Replacement](#).
2. Remove the rear seat back. Refer to [Rear Seat Back Replacement](#).
3. Remove the door sill plate. Refer to [Front Side Door Sill Plate Replacement](#).



4. Remove the 3 quarter trim panel retaining clips (3).
5. Remove the seat belt lower anchor bolt (1).
6. Remove the rear seat locking pin (4).
7. Remove the quarter trim panel (2) from the vehicle.

### Installation Procedure





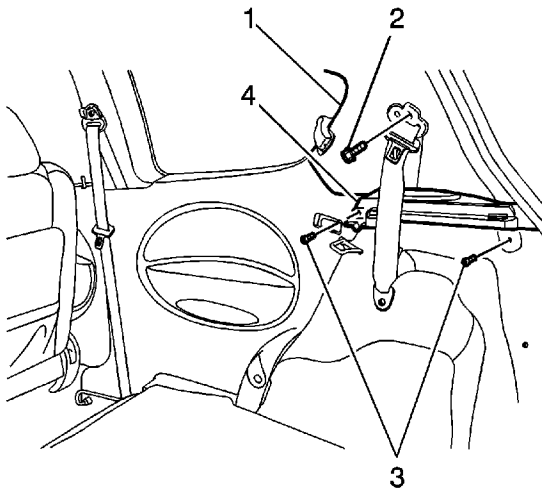
1. Install the quarter trim panel (2), to the vehicle.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the rear seat locking pin (4) and tighten to **38 N·m (28 lb ft)**.
3. Install the rear seat belt lower anchor and bolt (1) and tighten to **38 N·m (28 lb ft)**.
4. Install the 3 quarter trim panel retaining clips (3).
5. Install the rear seat back. Refer to [Rear Seat Back Replacement](#).
6. Install the rear seat cushion. Refer to [Rear Seat Cushion Replacement](#).
7. Install the door sill plate. Refer to [Front Side Door Sill Plate Replacement](#).

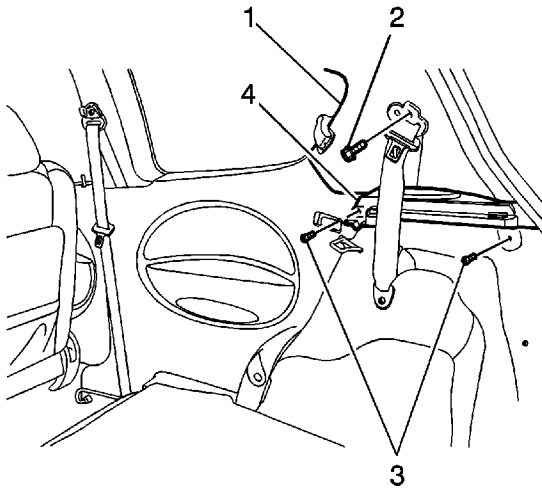
## Quarter Upper Trim Panel Replacement (3 Door Hatchback)

### Removal Procedure



1. Remove the rear quarter trim panel. Refer to [Rear Quarter Trim Panel Replacement](#).
2. Remove the seat belt upper anchor bolt (3).
3. Remove the two screws (3) from the rear compartment side cover (4).
4. Remove the rear compartment side cover (4).
5. Remove the upper quarter trim panel (1) from the vehicle.

### Installation Procedure



1. Install the upper quarter trim panel (1) to the vehicle.
2. Install the rear compartment side cover (4).
3. Install the two screws (3) to the rear compartment side cover (4).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the seat belt upper anchor bolt (3).

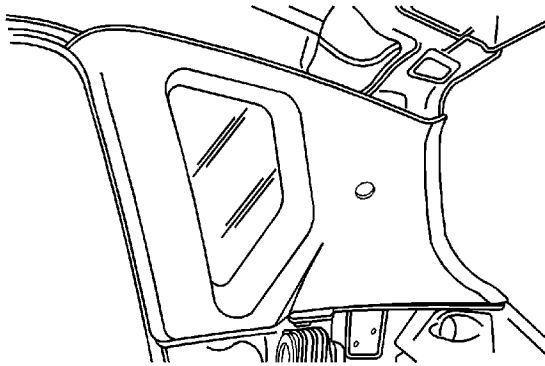
#### **Tighten**

Tighten the seat belt upper anchor bolt (3) to 38 N·m (28 lb ft).

5. Remove the rear quarter trim panel. Refer to [Rear Quarter Trim Panel Replacement](#).

## Quarter Upper Trim Panel Replacement (5 Door Hatchback)

### Removal Procedure

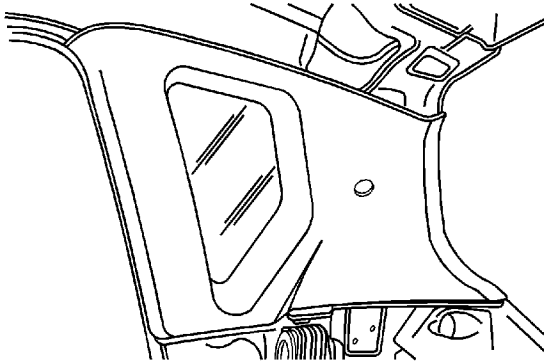


1. Remove the seat belt from the rear quarter upper trim panel.
2. Remove the rear rocker trim panel.

Refer to [Rear Side Door Sill Plate Replacement](#)

3. Remove the rear quarter upper trim panel.

### Installation Procedure



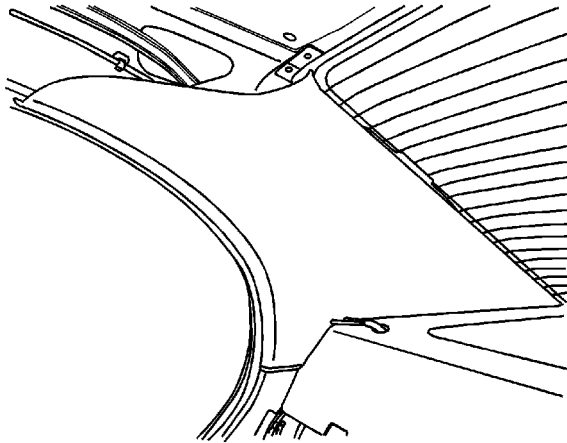
1. Install the rear quarter upper trim panel.
2. Install the rear rocker trim panel.

Refer to [Rear Side Door Sill Plate Replacement](#) .

3. Install the seat belt from the rear quarter upper trim panel.

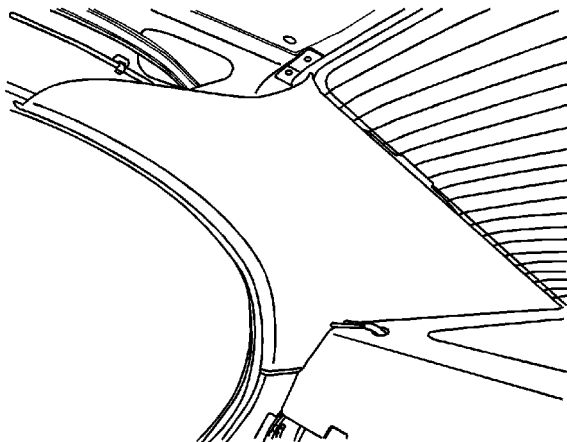
## Quarter Upper Trim Panel Replacement (Notchback)

### Removal Procedure



1. Remove the seat belt from the rear quarter upper trim panel.
2. Remove the rear quarter upper trim panel.

### Installation Procedure

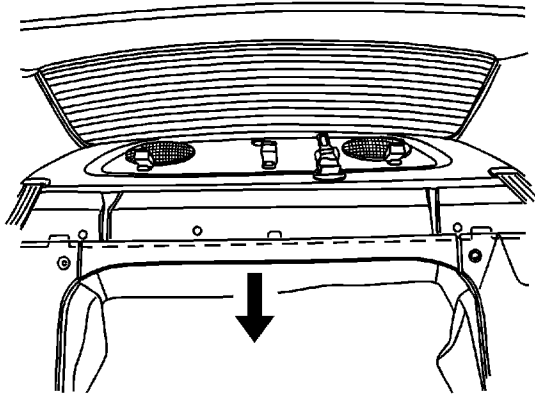




1. Install the rear quarter upper trim panel.
2. Install the seat belt from the rear quarter upper trim panel.

## Rear Window Shelf Trim Panel Replacement

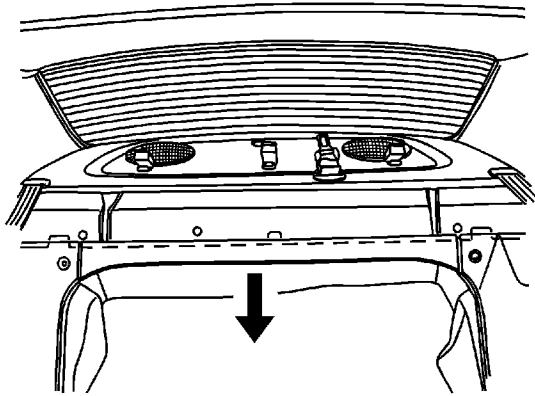
### Removal Procedure



1. Fold down the rear seat back.
2. Remove the C-pillar trim.
3. Remove the rear seat belt lower anchor bolts. Refer to [Shoulder Belt Replacement - Rear](#).
4. Remove the center high mounted stop lamp. Refer to [High Mount Stop Lamp Inoperative](#).
5. Remove the child seat anchors. Refer to [Child Restraint Tether Anchor Replacement](#).
6. Remove the back panel upper cover.
7. Remove the plastic retaining clips.
8. Slide the deck lid sill plate cover forward to remove.

### Installation Procedure





1. Install the rear deck lid sill plate cover with the plastic retaining clips.
2. Install the back panel upper cover.
3. Install the child seat anchors. Refer to [Child Restraint Tether Anchor Replacement](#).
4. Install the center high mounted stop lamp. Refer to [High Mount Stop Lamp Inoperative](#).
5. Install the rear seat belt lower anchor bolts. Refer to [Shoulder Belt Replacement - Rear](#).
6. Install the C-pillar trim panel.
7. Put back the rear seat back.

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Body Systems](#) | [Lighting](#) | [Specifications](#) |

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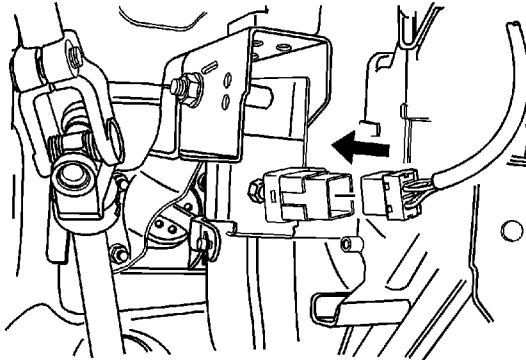
## Fastener Tightening Specifications

Application	Specification	
	Metric	English
CHMSL Mounting Screws	3 N·m	27 lb in
Cupholder Screws	2 N·m	18 lb in
Daytime Running Lamp Module Screws	2.5 N·m	22 lb in
Door Jamb Switch Screw	4.5 N·m	40 lb in
Headlamp Assembly Bolts	6 N·m	53 lb in
Interior Courtesy Lamp Housing Screws	2 N·m	18 lb in
License Plate Lamp Screws	1.5 N·m	13 lb in
Tail Lamp Assembly Screws	3 N·m	27 lb in

## Stop Lamp Switch Adjustment

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the negative battery cable.
2. Remove the stop lamp switch. Refer to [Stop Lamp Switch Replacement](#).

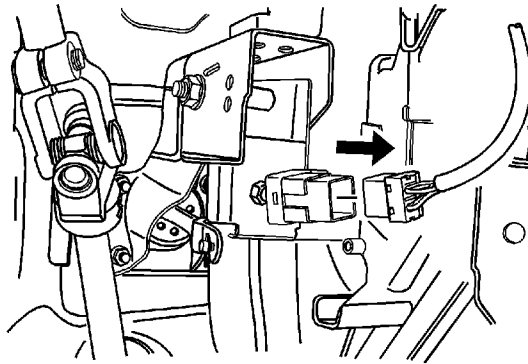


3. Pull out the shaft of the stop lamp switch to its maximum setting point.
4. Connect the stop lamp switch electrical connector.
5. Depress the brake pedal to the bottom.
6. Install the stop lamp switch in the brake pedal bracket hole by twisting.
7. Release the brake pedal slowly until reaching the end of the stop lamp switch shaft, the stop lamp switch will be adjusted of itself by the reaction force of the brake pedal.
8. Connect the negative battery cable.

## Stop Lamp Switch Replacement

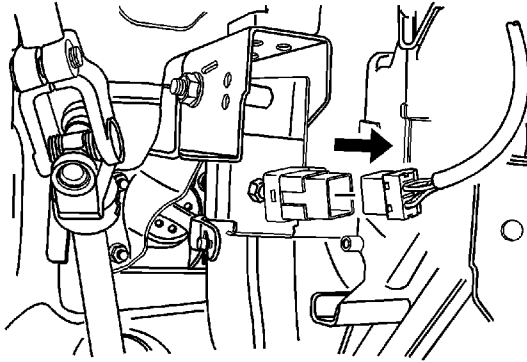
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the stoplamp switch electrical connector.
3. Twist the switch, and remove the switch from the brake pedal bracket.

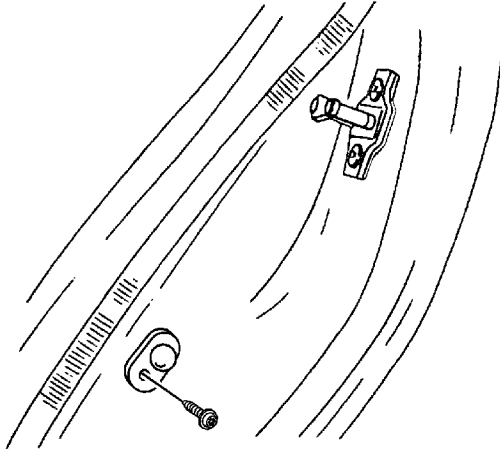
### Installation Procedure



1. Adjust the stoplamp switch. Refer to [Stop Lamp Switch Adjustment](#).
2. Connect the negative battery cable.

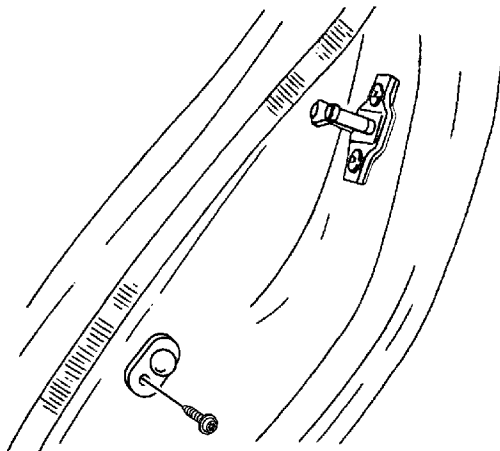
## Door Jamb Switch Replacement

### Removal Procedure



1. Remove the screw and the door jamb switch.
2. Disconnect the electrical connector.

### Installation Procedure





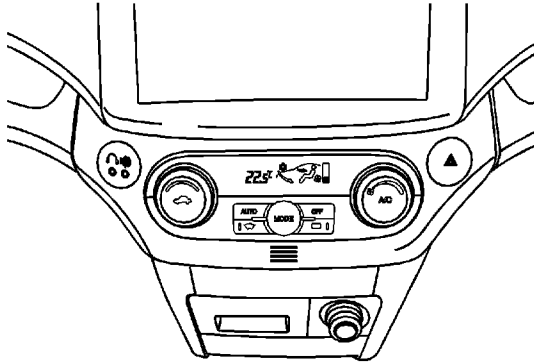
1. Connect the electrical connector.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the door jamb switch with the screw and tighten to **4.5 N·m (40 lb in)**.

## Hazard Warning Switch Replacement

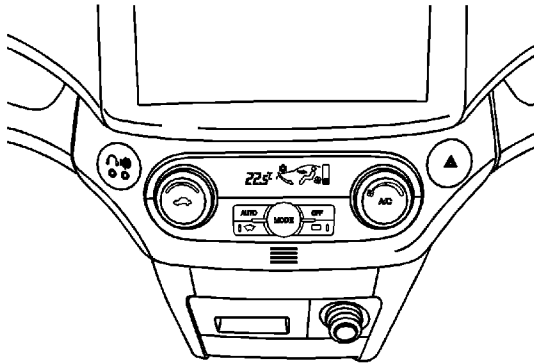
### Removal Procedure



1. Remove the HVAC control assembly. Refer to [Heater and Air Conditioning Control Replacement](#).
2. Depress the retaining tabs.
3. Remove the hazard warning switch from the HVAC control assembly.

### Installation Procedure



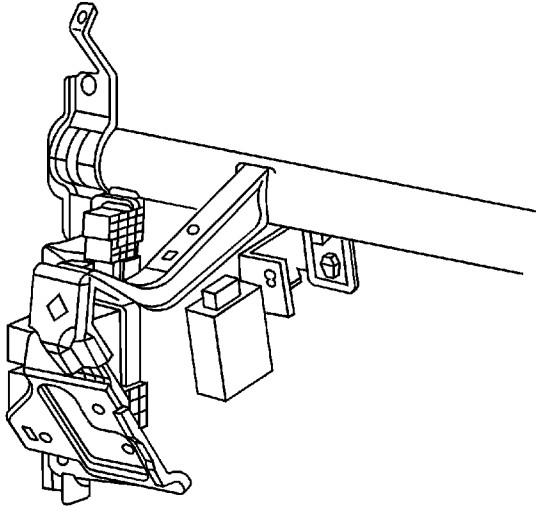


1. Install the hazard warning switch to the HVAC control assembly.
2. Install the HVAC control assembly. Refer to [Heater and Air Conditioning Control Replacement](#).

## Lamp Control Module Replacement

### Replacement Procedure

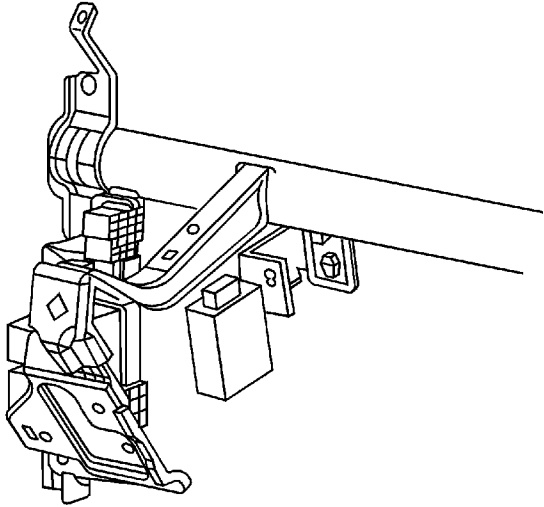
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the instrument panel low cover.
3. Remove the screws and the lamp control module.
4. Disconnect the electrical connector.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

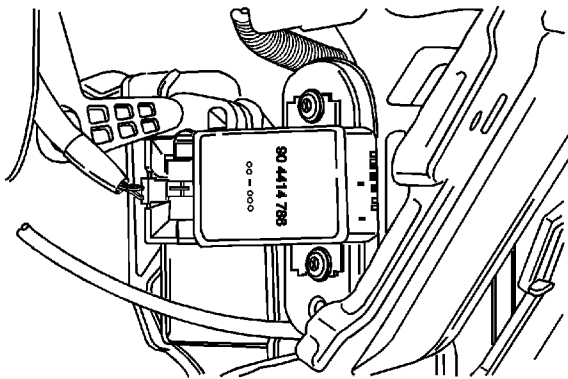


1. Install the lamp control module with the screws.
2. Connect the electrical connector.
3. Install the instrument panel low cover.
4. Connect the negative battery cable.

# Daytime Running Lights (DRL) Control Module Replacement

## Removal Procedure

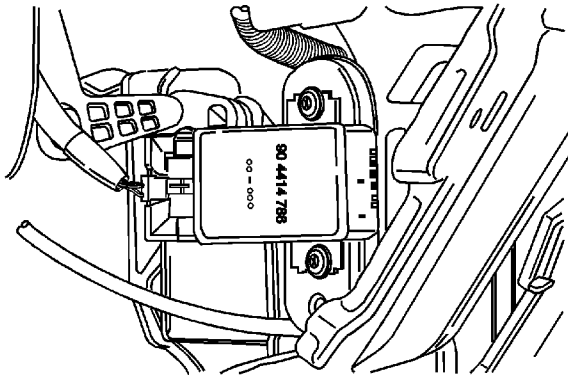
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the instrument panel lower cover.
3. Reach underneath the instrument panel and remove the bolts and the daytime running lamp module.
4. Disconnect the electrical connector.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

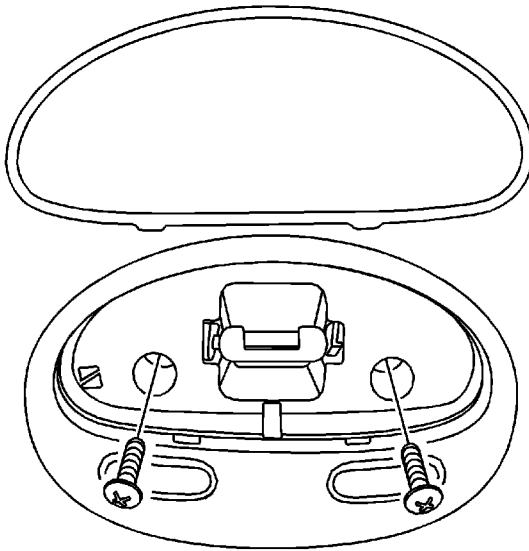


1. Install the daytime running lamp module with the bolts and tighten to **2.5 N·m (22 lb in)**.
2. Connect the electrical connector.
3. Install the instrument panel lower cover.
4. Connect the negative battery cable.

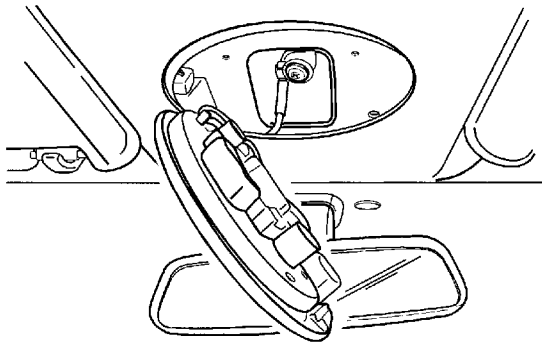
## Interior Courtesy Lamp Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



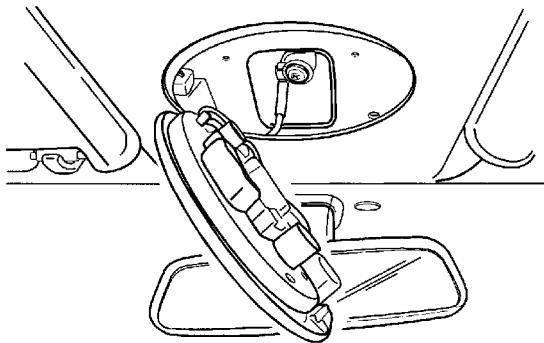
1. Disconnect the negative battery cable.
2. Gently pry off the interior courtesy lamp lens by inserting a screwdriver into the recess along the edge of the lens.
3. Remove the screws and the interior courtesy lamp housing from the headliner.





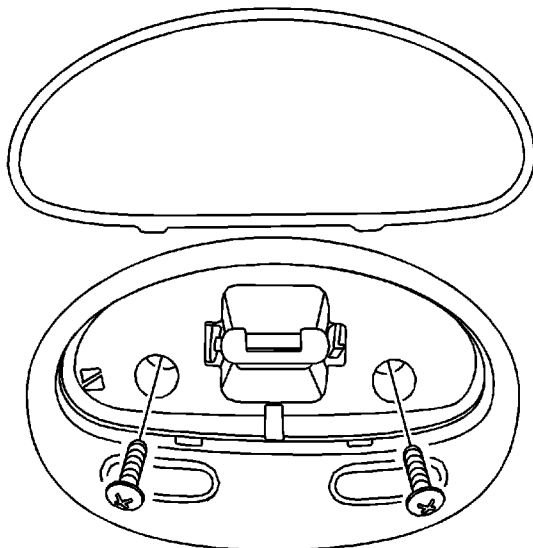
4. Disconnect the electrical connector.
5. Remove the bulb.

## **Installation Procedure**



1. Install a new bulb.
2. Connect the electrical connector.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



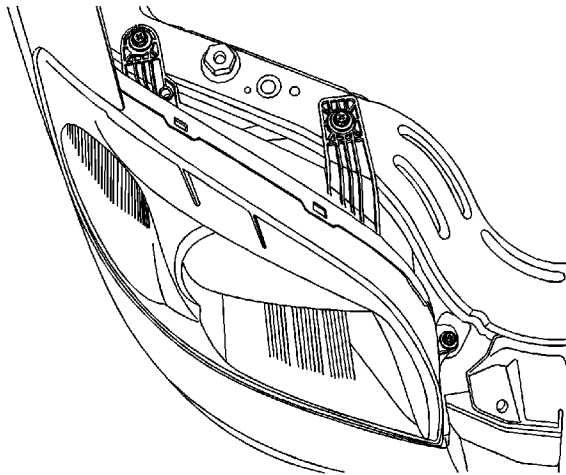


3. Install the interior courtesy lamp housing to the headliner with the screws and tighten to **2.5 N·m (22 lb in)**.
4. Press the courtesy lamp lens onto the housing.
5. Connect the negative battery cable.

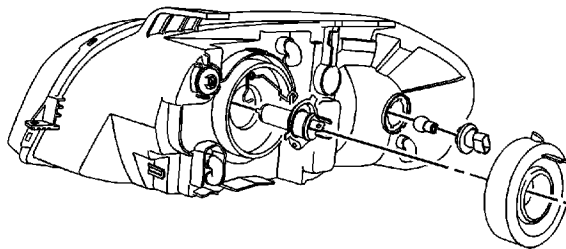


## Headlamp Replacement (Notchback)

### Removal Procedure



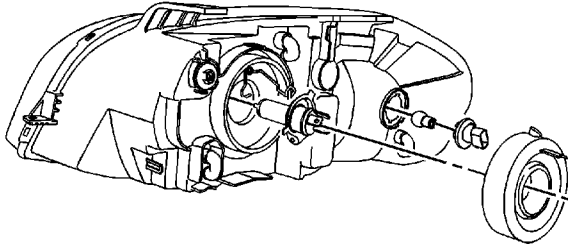
1. Remove the headlamp mounting bolts.
2. Disconnect the electrical connectors.



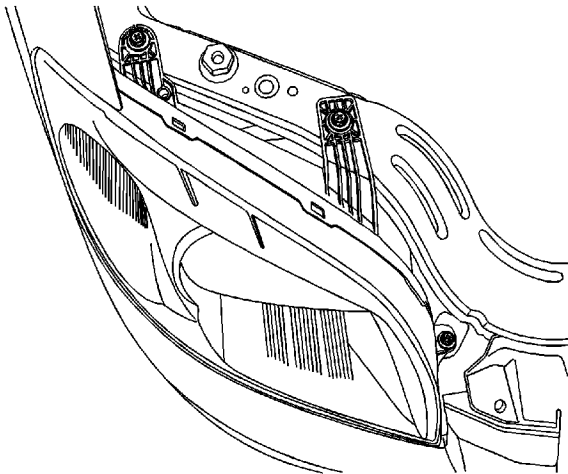
3. Remove the headlamp assembly.
  4. Remove the cap concealing the headlamp bulb.
  5. Disconnect the headlamp bulb electrical connector.
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6. Remove the retaining wire.
7. Remove the headlamp bulb.

## Installation Procedure



1. Install the headlamp bulb.
2. Install the retaining wire.
3. Connect the headlamp bulb electrical connector.
4. Install the cap concealing the headlamp bulb.



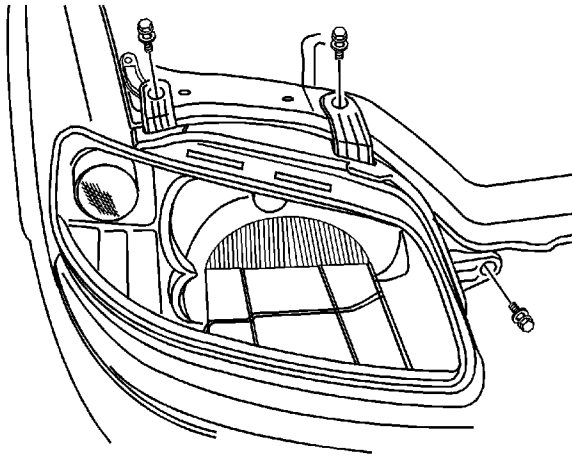
5. Connect the electrical connectors.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

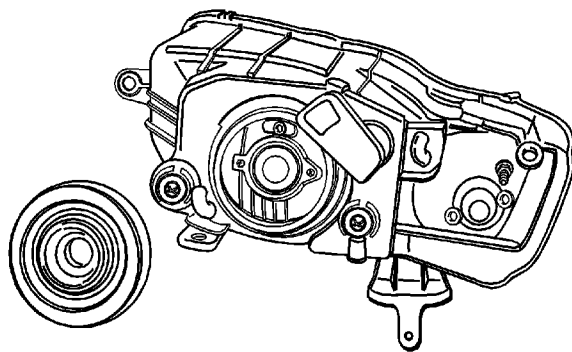
6. Install the headlamp assembly with the bolts and tighten to **6 N·m (53 lb in)**.

## Headlamp Replacement (Hatchback)

### Removal Procedure



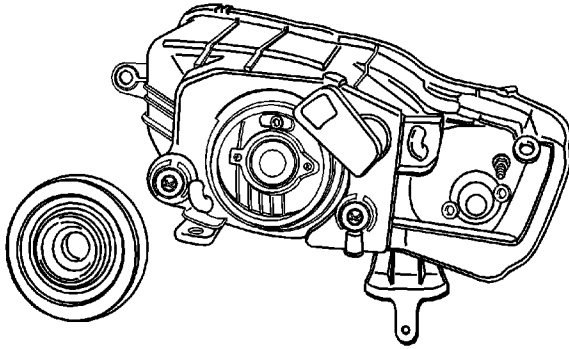
1. Remove the headlamp mounting bolts.
2. Disconnect the electrical connectors.



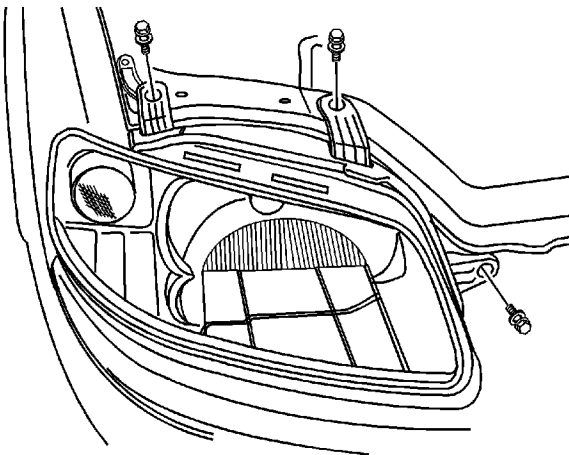
3. Remove the headlamp assembly.
  4. Remove the cap concealing the headlamp bulb.
  5. Disconnect the headlamp bulb electrical connector.
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6. Remove the retaining wire.
7. Remove the headlamp bulb.

## Installation Procedure



1. Install the headlamp bulb.
2. Install the retaining wire.
3. Connect the headlamp bulb electrical connector.
4. Install the cap concealing the headlamp bulb.



5. Connect the electrical connectors.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

6. Install the headlamp assembly with the bolts and tighten to **6 N·m (53 lb in)**.

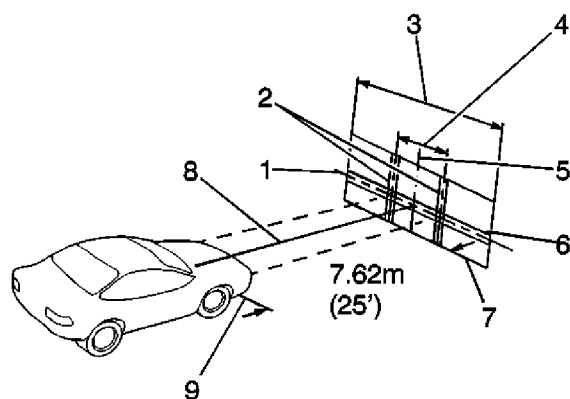
## Headlamp Aiming

### Visual Aiming Preparation Procedure

**Important:** Some state and local laws specify requirements for headlamp aim. All of these laws must be complied with when performing any headlamp aiming operations

Headlamp aim should be inspected for the following conditions:

- When a new headlamp capsule is installed
- If service or repairs to the front end have, or may have, disturbed the headlamps or their mounting
- The area will consist of a level surface large enough to allow for a vehicle and an additional 7.62 m (25 ft) measured from face lamps to the front of the aiming screen
- The screen will be 1.52 m (5 ft) high x 3.66 m (12 ft) wide with a matte white surface well shaded from extraneous light and properly adjusted to the floor on which the vehicle stands. Provisions should be made to align the screen parallel with the vehicle.
- The screen shall be provided with a fixed vertical centerline, two laterally adjustable vertical tapes, and one vertically adjustable horizontal tape.
- If a regular commercial aiming screen is not available, the screen may consist of a vertical wall having a clear uninterrupted area approximately 1.83 m (6 ft) high and 3.66 m (12 ft) wide. The surface should be finished with a washable non-gloss white paint.

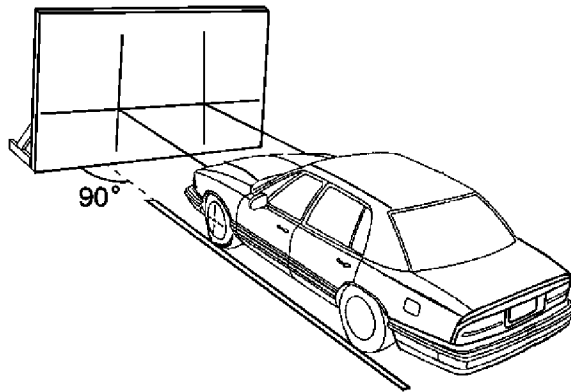


After the aiming screen has been setup in its permanent location, paint a reference line on the floor directly under the lens of the lamps to indicate the proper location of the headlamps when they are being aimed:

- Distance between headlamps (1)
- Center line of screen (2)
- Adjustable vertical pointer (3)
- Adjustable horizontal tape (4)
- Diagram of light screen (5)
- Vertical center line ahead of right headlamp pointer position (6)
- 7.62 m (25 ft) (7)
- Car Axis (8)
- Adjustable vertical pointer
- Horizontal center line of lamps
- Vertical center line ahead of left headlamp

Prior to aiming the headlamps, the following steps must be taken:

1. Remove any snow, ice or mud from the vehicle.
2. The vehicle must have a full tank of gas.
3. Stop all other work on the vehicle.
4. If any service has been performed on the vehicle make sure that all of the components are back in their original place.
5. The vehicle must be on a level surface.



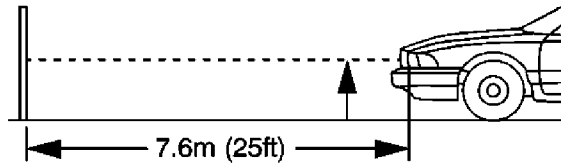
6. The vehicle left tires must be aligned with the reference line extending from the screen with the headlamps aligned with the reference line.
7. Do not load any cargo in the vehicle.
8. The vehicle must contain one person or 72.56 kg (160 lb) on the driver's seat.
9. Inflate the tires to the proper pressure.
10. Simulate the vehicle loads if the intended use of the vehicle is for hauling heavy loads or towing a trailer.
11. Rock the vehicle in order to stabilize the suspension.
12. Turn on the headlamps to low beam and observe the left and the top edges of the high intensity zone on the screen. The edges of the high intensity zone should fall within the



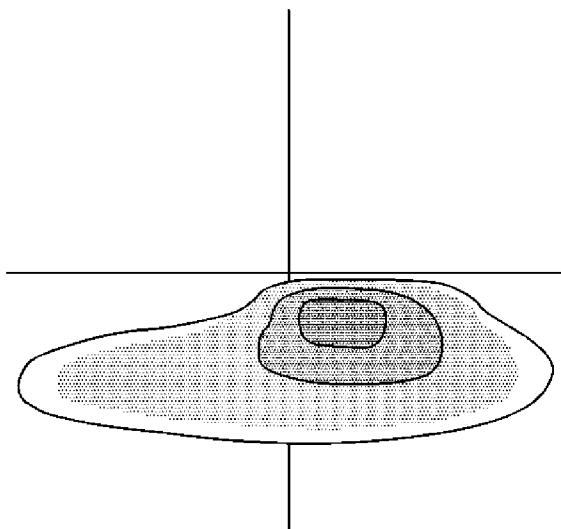
specifications.

## Headlamp Aiming Procedure

1. Open the hood.

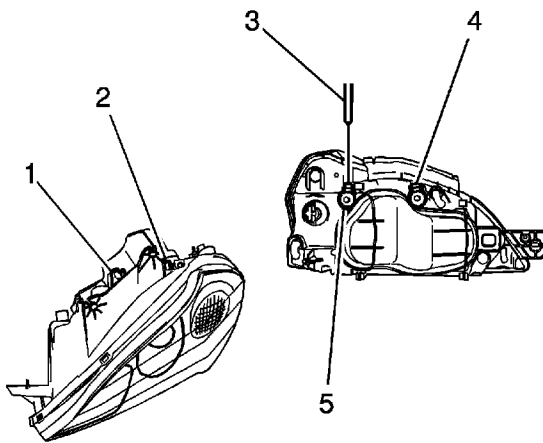


2. Measure from the floor to the center of the headlamp bulb.
3. At the screen, measure from the floor and place horizontal tape at the measured distance.
4. Measure from the reference line on the floor to the left headlamp bulb centerline.
5. At the screen, measure from the reference line and place the vertical tape at the measured distance.
6. Measure from the reference on the floor to the right headlamp bulb centerline.
7. At the screen, measure from the reference line and place the vertical tape at the measured distance.



**Important:** DO NOT cover the headlamp, this may cause excessive heat buildup.

8. Turn on the low beam headlamps and block the light from projecting onto the screen from the passenger side headlamp.

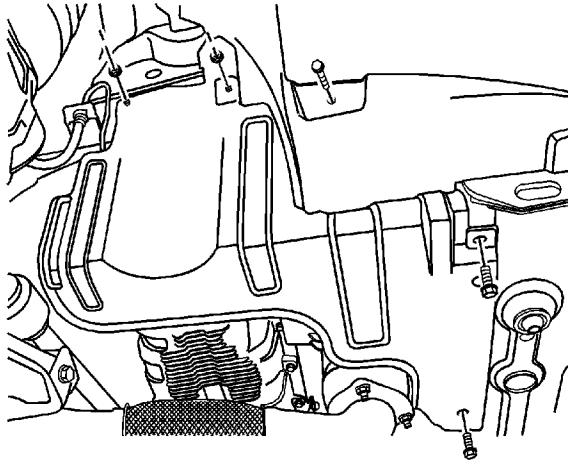


9. In order to adjust the horizontal aim, remove the horizontal aiming hold cap (2) and insert the screwdriver (3) and turn the horizontal headlamp adjusting screw (4).
10. In order to adjust the vertical aim, remove the horizontal aiming hold cap (1) and insert the screwdriver (3) and turn the vertical headlamp adjusting screw (4).
11. Repeat the aiming procedure for the passenger side headlamp while blocking the light from projecting onto the screen from the driver side headlamp.
12. Turn the headlamps OFF.
13. Close the hood

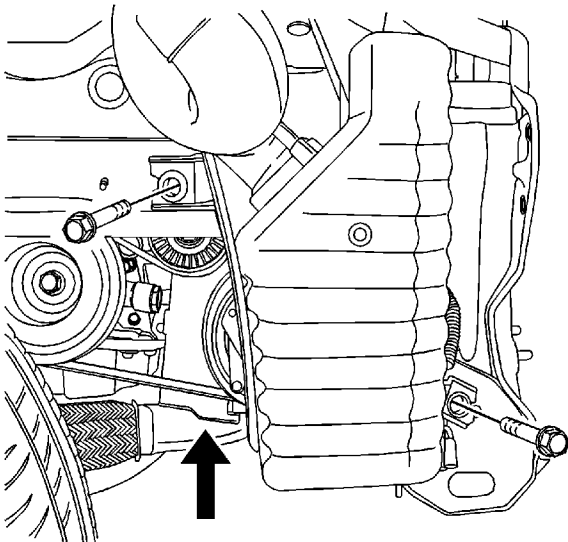
## Front Fog Lamp Replacement (Notchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

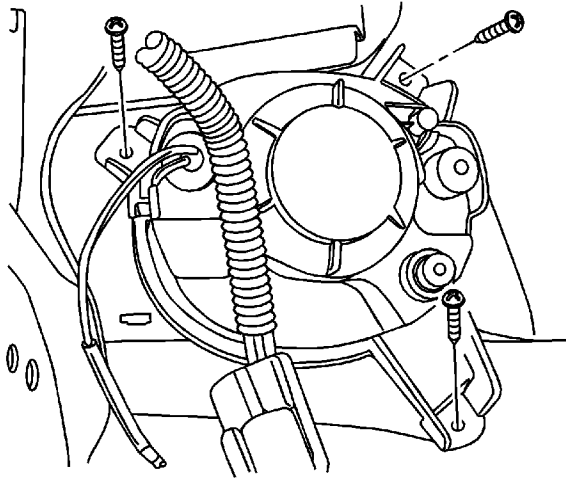


1. Disconnect the negative battery cable.
2. Remove the nuts and the engine under cover.



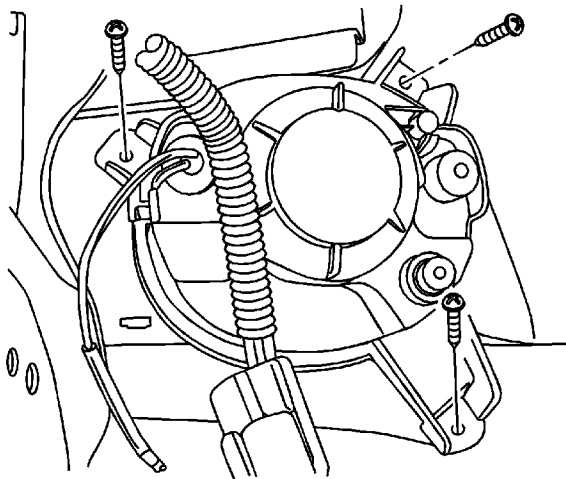
3. Remove the bolts and the resonator.

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4. Remove the nuts securing the fog lamp assembly.
5. Remove the fog lamp assembly.
6. Disconnect the electrical connector.
7. Remove the bulb.

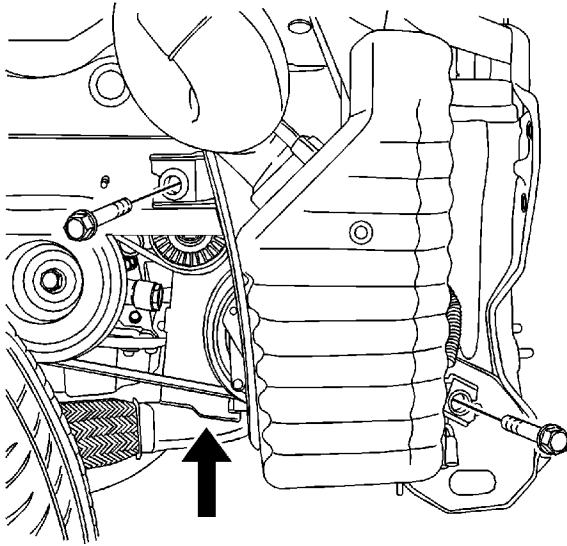
## **Installation Procedure**



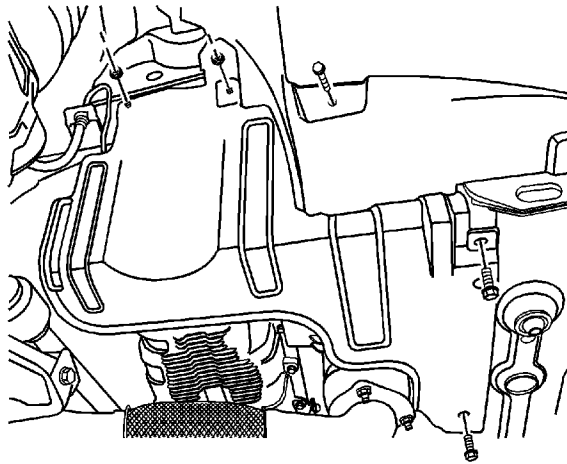
1. Install the bulb.
2. Connect the electrical connector.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the fog lamp with the screws and tighten to **5 N·m (44 lb in)**.



4. Install the resonator with the bolts.

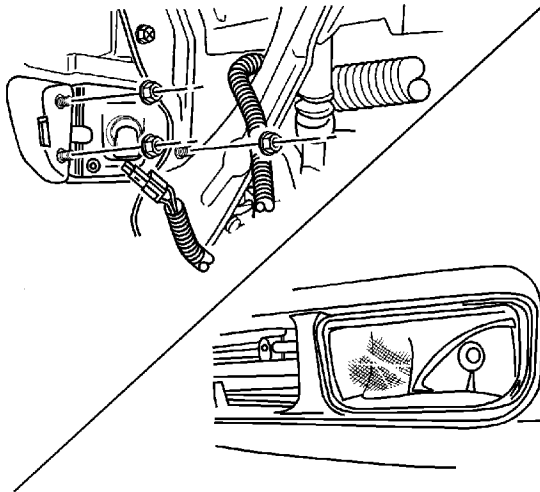


5. Install the engine under cover with the bolts.
6. Connect the negative battery cable.

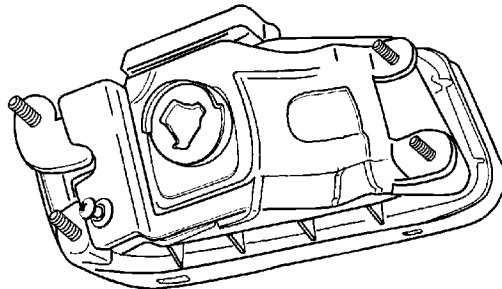
## Front Fog Lamp Replacement (Hatchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



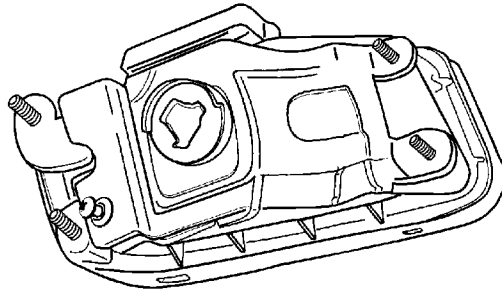
1. Disconnect the negative battery cable.
2. Remove the nuts securing the fog lamp assembly.
3. Remove the fog lamp assembly.
4. Disconnect the electrical connector.



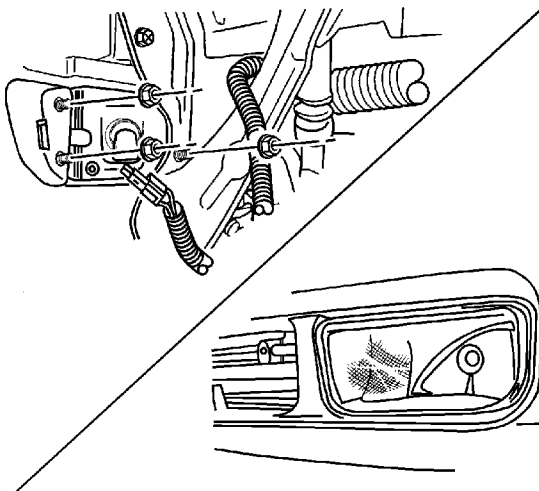


5. Remove the bulb.

## Installation Procedure



1. Install the bulb.
2. Connect the electrical connector.

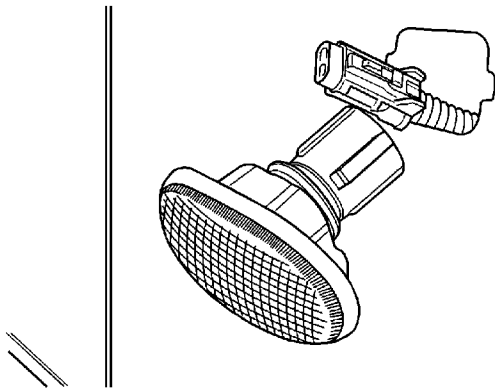


3. Install the fog lamp assembly.
4. Secure the fog lamp assembly with the nuts.
5. Connect the negative battery cable.

## Repeater Lamp Replacement

### Removal Procedure

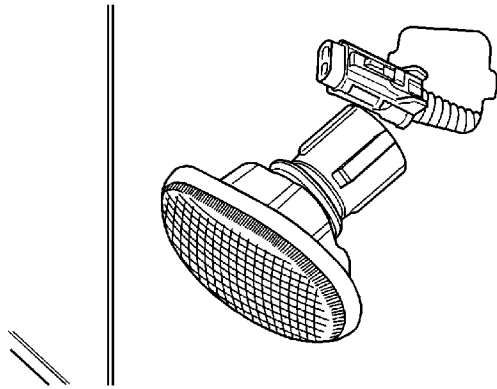
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Slide the side turn signal lamp rearward.
3. Remove the lamp.
4. Disconnect the electrical connector.

### Installation Procedure



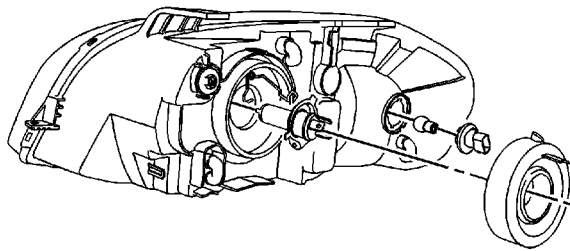


1. Connect the electrical connector.
2. Install the side turn signal lamp.
3. Connect the negative battery cable.

## Front Side Marker Lamp Replacement

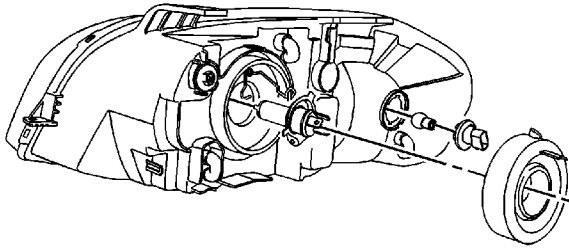
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the headlamps. Refer to [Headlamp Replacement](#).
3. Disconnect the electrical connector.
4. Remove the side marker bulb from the headlamp assembly.
5. Remove the side marker bulb from the socket.

### Installation Procedure

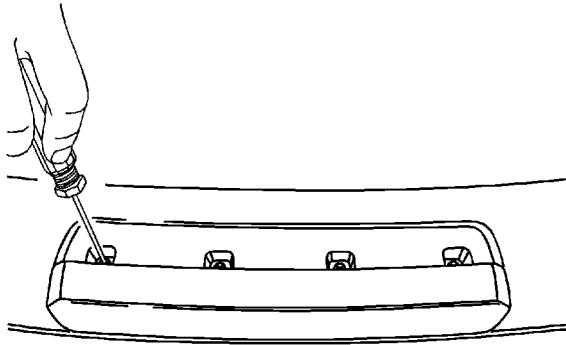


1. Install the side marker bulb to the socket.
2. Install the side marker bulb into the headlamp assembly.
3. Connect the electrical connector.
4. Install the headlamp. Refer to [Headlamp Replacement](#).
5. Connect the negative battery cable.

## High Mount Stop Lamp Replacement (Rear Spoiler)

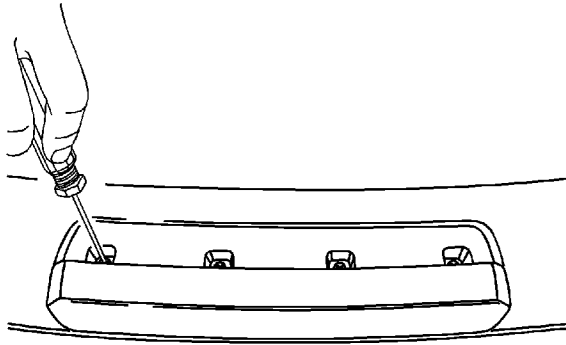
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the spoiler. Refer to [Rear Spoiler Replacement](#).
3. Remove the screws and the spoiler CHMSL.
4. Disconnect the electrical connector.

### Installation Procedure



1. Connect the electrical connector.

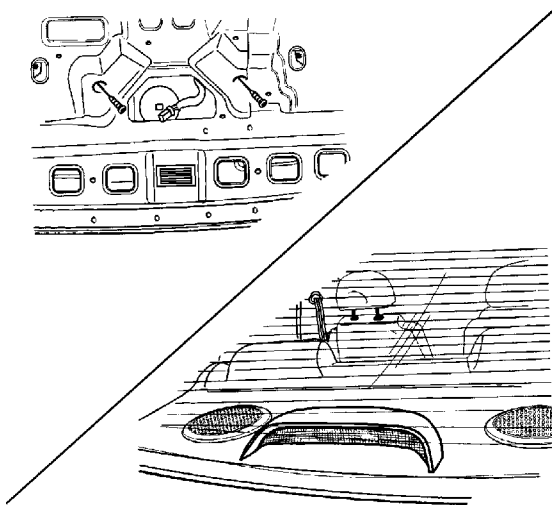
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the spoiler CHMSL with the screws and tighten to **3 N·m (27 lb in)**.
3. Install the spoiler. Refer to [Rear Spoiler Replacement](#).
4. Connect the negative battery cable.

## High Mount Stop Lamp Replacement (Notchback)

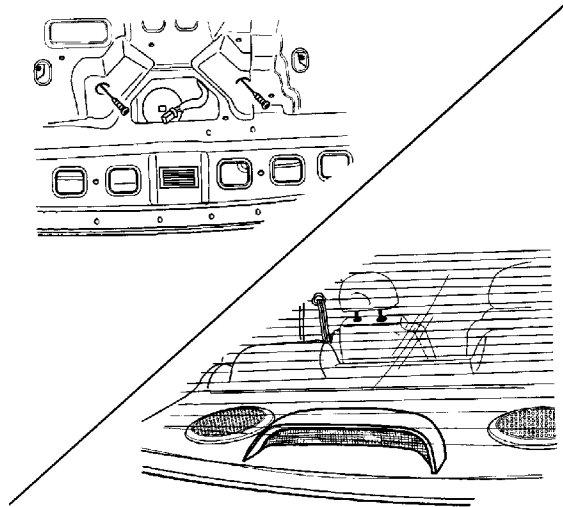
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Open the rear deck lid.
3. Remove the screws and the center high-mounted stop lamp (CHMSL).
4. Remove the CHMSL bulb.

### Installation Procedure

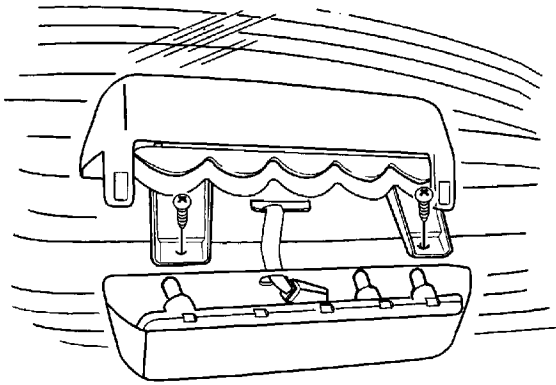


1. Install the CHMSL bulb.
2. Install the CHMSL with the screws.
3. Connect the negative battery cable.

## High Mount Stop Lamp Replacement (Hatchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

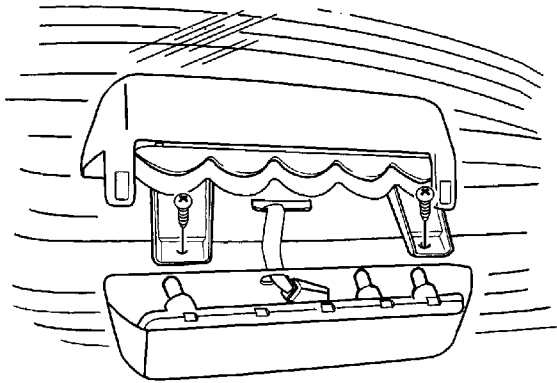


1. Disconnect the negative battery cable.
2. Open the hatchback door.
3. Pry open the center high-mounted stop lamp (CHMSL) access cover with a screwdriver.
4. Disconnect the electrical connector.
5. Remove the screws and the CHMSL.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

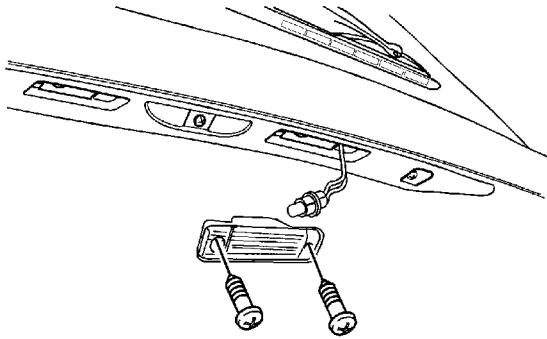




1. Install the CHMSL with the screws and tighten to **3 N·m (27 lb in)**.
2. Connect the electrical connector.
3. Close the CHMSL access cover.
4. Connect the negative battery cable.

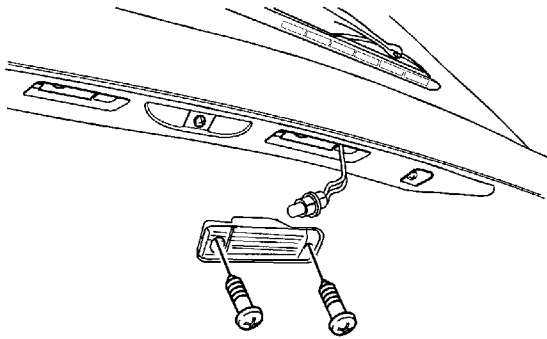
## Rear License Plate Lamp Replacement (Typical)

### Removal Procedure



1. Remove the screws.
2. Disconnect the electrical connector.
3. Remove the lamp assembly.
4. Remove the bulb.

### Installation Procedure



1. Install a new bulb.
2. Connect the electrical connector.

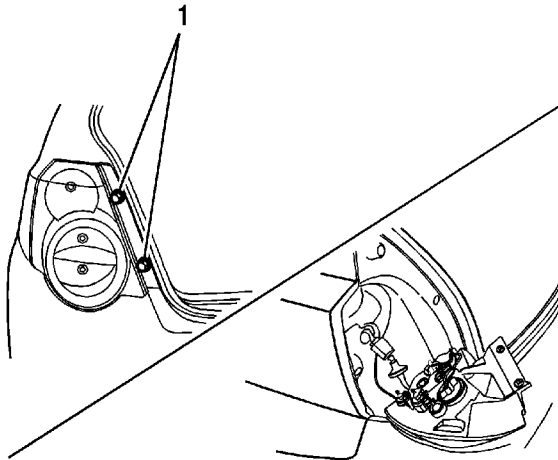
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the lamp assembly with the screws and tighten to **1.5 N·m (13 lb in)**.

## Tail Lamp Replacement (Hatchback)

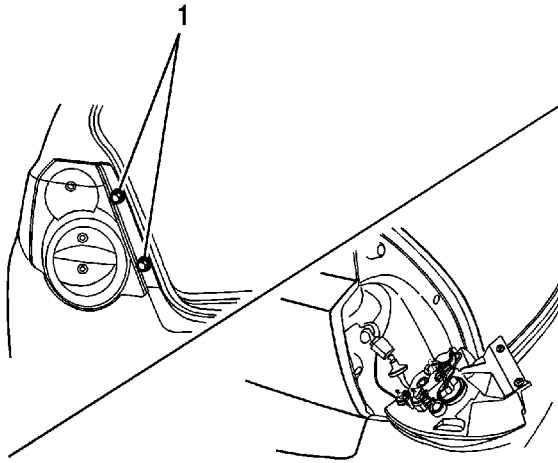
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the tail lamp assembly screws (1).
3. Slide the tail lamp assembly toward the hatch opening and remove it.
4. Remove the bulbs.

### Installation Procedure



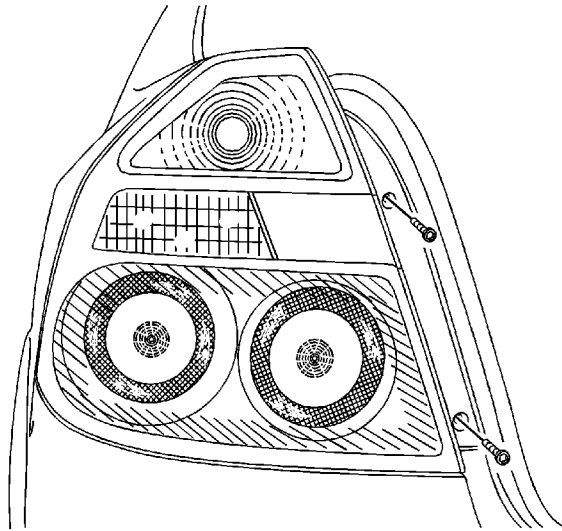
1. Install the bulbs.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the tail lamp assembly with the screws (1) and tighten to **3 N·m (27 lb in)**.
3. Connect the negative battery cable.

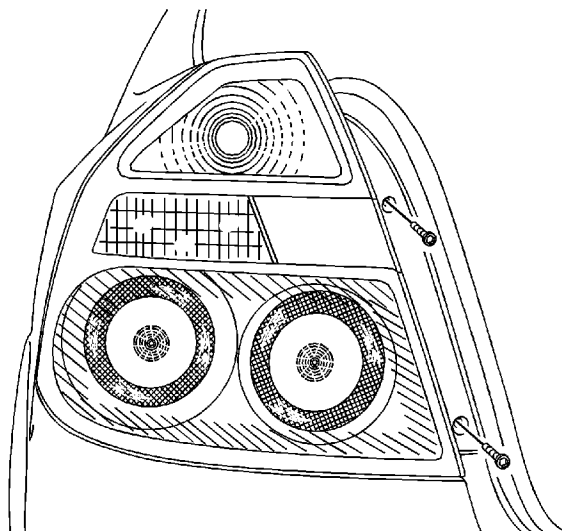
## Tail Lamp Replacement (Notchback)

### Removal Procedure



1. Remove the screws and the lamp assembly.
2. Remove the bulbs.

### Installation Procedure





1. Install the bulbs.

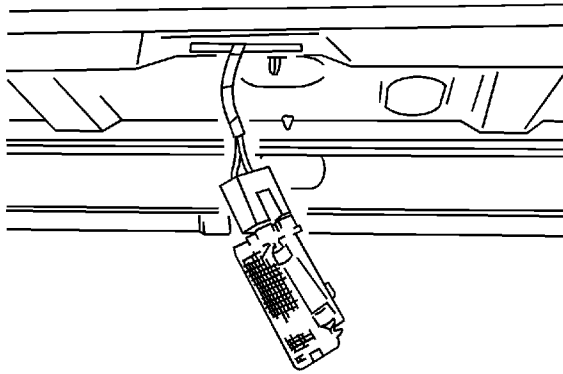
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the lamp assembly with the screws and tighten to **3 N·m (27 lb in)**.

## Rear Compartment Courtesy Lamp Replacement

### Removal Procedure

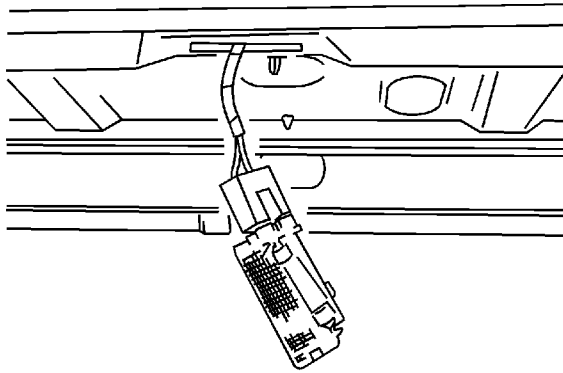
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Gently pry the luggage compartment lamp off by inserting a flathead screwdriver into the recess on the edge of the lamp.
3. Disconnect the electrical connector.
4. Remove the bulb.

### Installation Procedure





1. Install a new bulb.
2. Connect the electrical connector.
3. Insert the luggage compartment lamp into the recess and press the lens into place.
4. Connect the negative battery cable.

[2008 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Steering](#) | [Manual Steering](#) | [Specifications](#) |

Document ID: 1284378

## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Adjuster Plug Locknut	70 N·m	52 lb ft
Ball Joint Hex Nut	45 N·m	33 lb ft
Crossmember-to-Underbody Bolts	150 N·m	111 lb ft
Outer Tie Rod Hex Nuts	45 N·m	33 lb ft
Outer Tie Rod Lock Nuts	54 N·m	40 lb ft
Pinion Preload	0.9-1.7 N·m	8-15 lb in
Stabilizer Shaft-to-Knuckle Bolts	45 N·m	33 lb ft
Steering Gear Retaining Bracket Nuts	50 N·m	37 lb ft

[2008 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Steering](#) | [Manual Steering](#) | [Specifications](#) |

Document ID: 1284377

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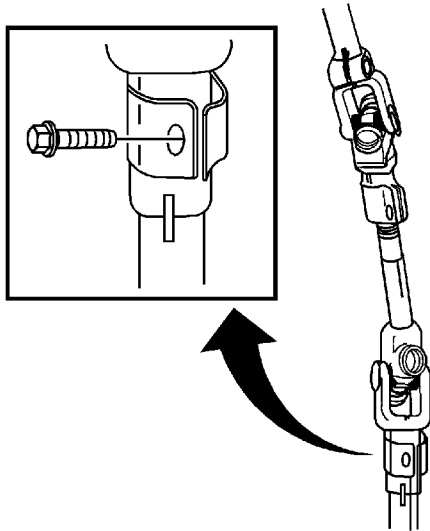
## Manual Steering Specifications

Application	Specification	
	Metric	English
Gear Type	Rack and Pinion	
Manual Steering Gear Ratio	21.5:1	
Rack Bending Limit	0.1 mm	0.004 in
Rack Gain	32.17 mm/rev	1.267 in/rev
Rack Stroke	139 mm $\pm$ 1 mm	5.472 in $\pm$ 0.039 in

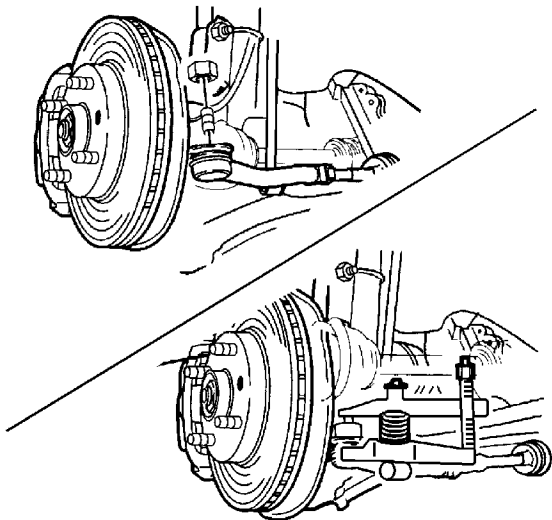
## Rack and Pinion Replacement

### Removal Procedure

**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.

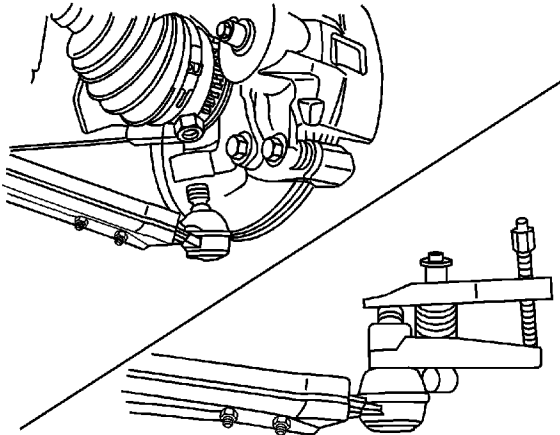


1. Disconnect the negative battery cable.
2. Position the tires straight ahead by turning the steering wheel.
3. Remove the intermediate shaft.
4. Remove the front tires.

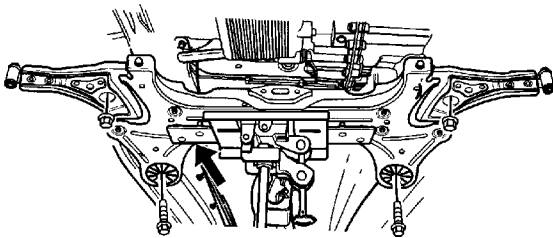




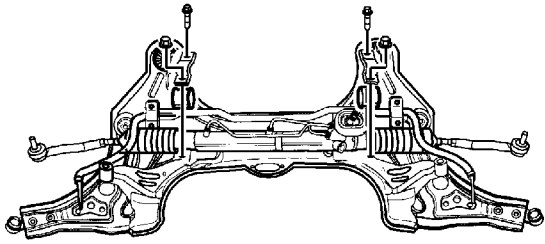
5. Remove the outer tie rod hex nuts. Refer to [Rack and Pinion Outer Tie Rod End Replacement](#) .



6. Remove the ball joint hex nuts and disconnect the stabilizer shaft from the knuckle by removing the stabilizer shaft link assembly. Refer to [Stabilizer Shaft Replacement](#) .



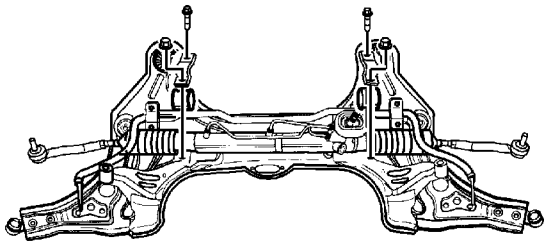
7. Remove the cross member by removing the nuts and bolts to the underbody.



8. Remove the rack and pinion assembly by disconnecting the steering gear retaining bracket nuts.

## Installation Procedure

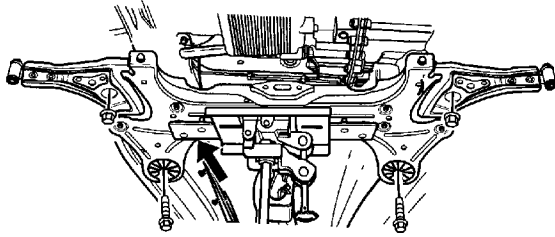
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the rack and pinion assembly by connecting the steering gear retaining bracket nuts.

### **Tighten**

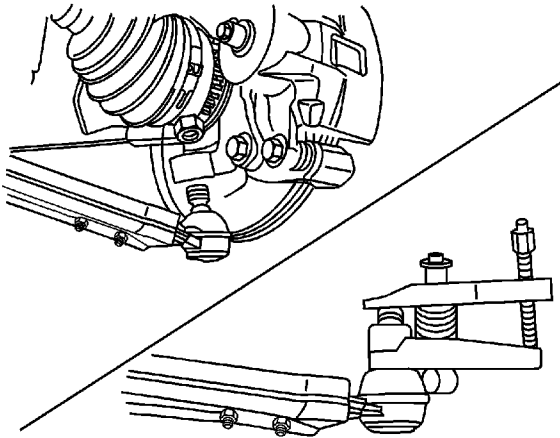
Tighten the steering gear retaining bracket nuts to 50 N·m (37 lb ft).



2. Install the cross member by tightening the nuts and bolts to the underbody.

**Tighten**

Tighten the cross member by tightening the nuts and bolts to the underbody to 150 N·m (111 lb ft).

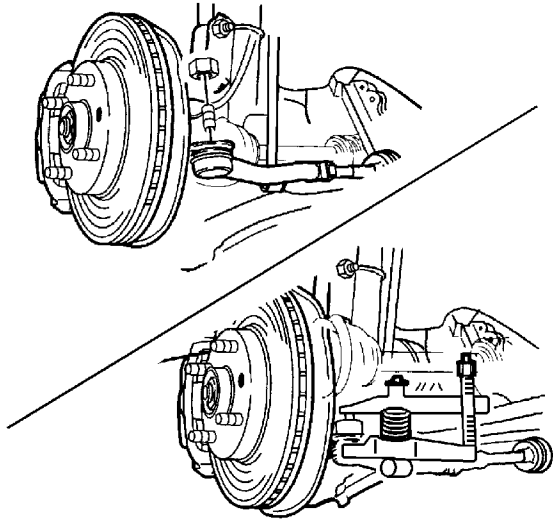


3. Install the ball joint hex nuts and connect the stabilizer shaft to the knuckle by tightening the bolt with stabilizer shaft link assembly. Refer to [Stabilizer Shaft Replacement](#).

**Tighten**

- Tighten the ball joint hex nuts to knuckle to 45 N·m (33 lb ft).

- Tighten the bolts of stabilizer shaft to the knuckle to 45 N·m (33 lb ft).

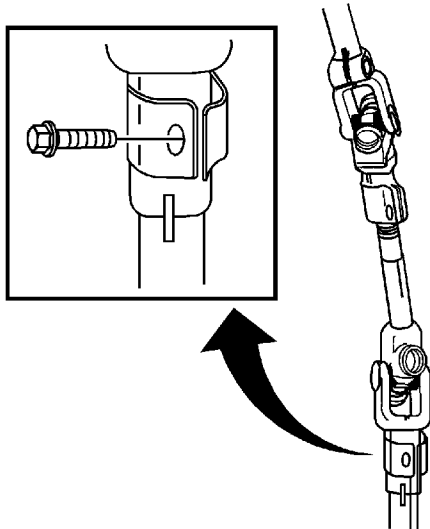


4. Install the outer tie rod hex nuts.

**Tighten**

Tighten the outer tie rod hex nuts to 45 N·m (33 lb ft).

5. Install the front tires. Refer to [Tire and Wheel Removal and Installation](#).



6. Install the intermediate shaft.
7. Install the steering wheel and column.
8. Connect the negative battery cable.
9. Inspect the vehicle. Refer to [Preliminary Alignment Inspection](#).
10. Measure the wheel alignment.



11. If necessary, adjust the front toe. Refer to [Front Toe Adjustment](#) .

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Body Systems](#) | [Mirrors](#) | [Specifications](#) |

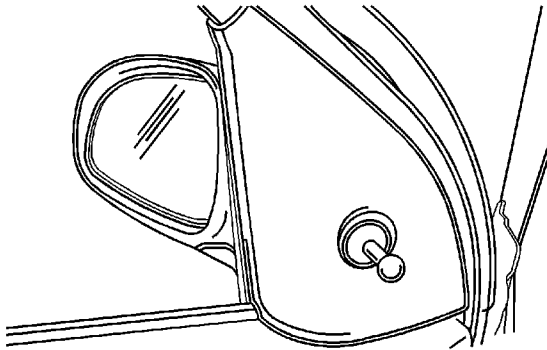
Document ID: 1736621

## Fastener Tightening Specifications

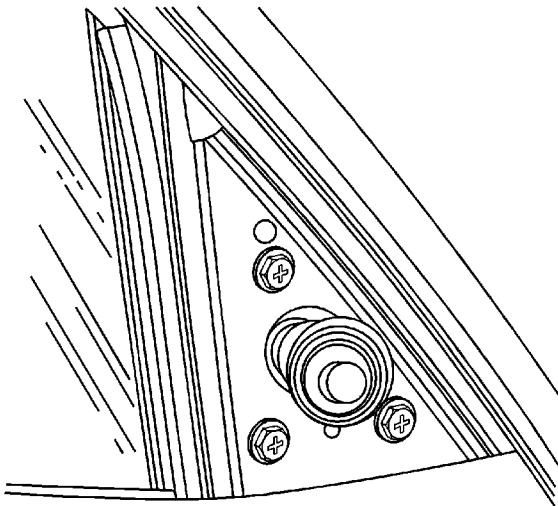
Application	Specification	
	Metric	English
Outside Rear View Mirror Screws	4.5 N·m	40 lb in

## Outside Rearview Mirror Replacement

### Removal Procedure



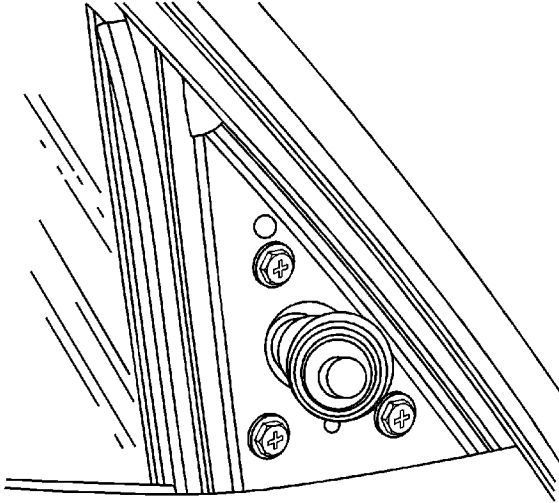
1. Remove the front door escutcheon. Manual remote control mirror shown.



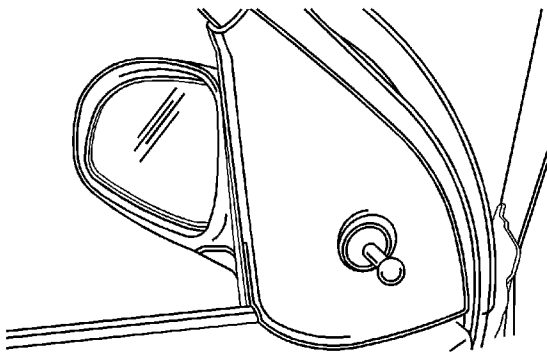
2. Disconnect the electric control rearview mirror electrical connector, if equipped.
3. Remove the screws and the outside rearview mirror assembly from the door. Manual remote control mirror shown.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the outside rearview mirror assembly screws. Tighten the outside rearview mirror assembly screws to **4.5 N·m (40 lb in)**.
2. Connect the electric control rearview mirror electrical connector, if equipped.

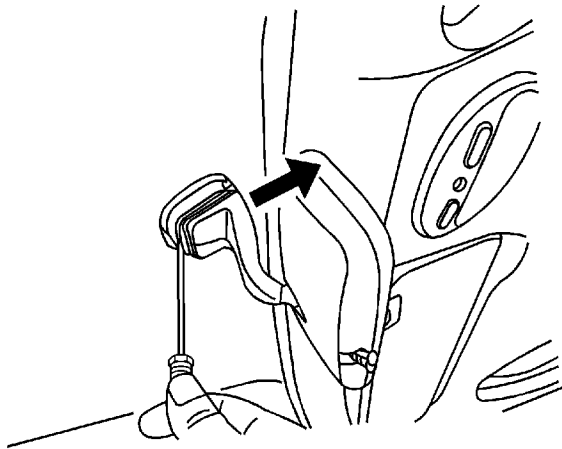


3. Install the escutcheon. Manual remote control mirror shown.

## Inside Rearview Mirror Replacement

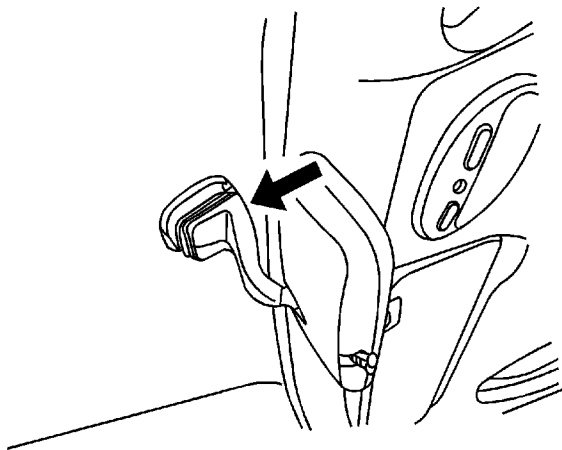
### Removal Procedure

1. Open the door.



2. Using a small flat-bladed tool, remove the rearview mirror from the rearview mirror support and slide it back.

### Installation Procedure





1. Install the rearview mirror into the rearview mirror support.

Ensure that the mirror is fully seated.

2. Close the door.

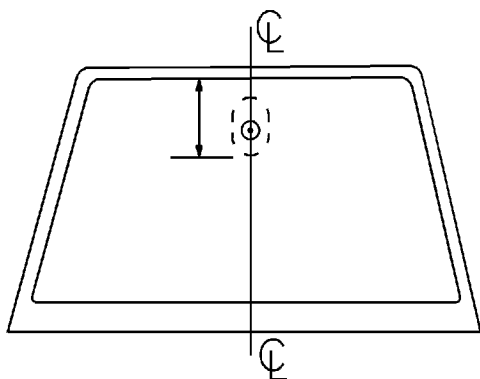
## Rearview Mirror Support Installation

The inside rearview mirror is attached to a support which is secured to the windshield glass. The support is installed by the glass supplier using a plastic-polyvinyl butyl adhesive.

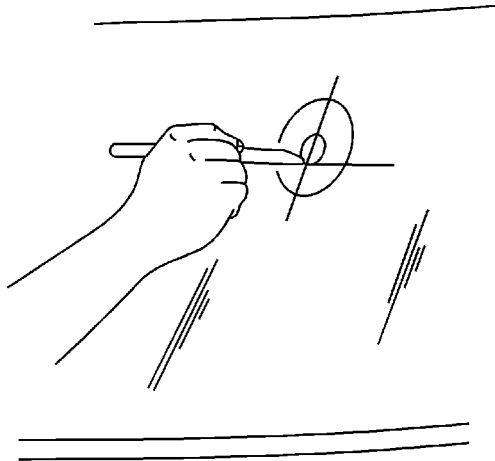
Service replacement windshield glass has the mirror support bonded to the glass assembly. In order to install a detached mirror support or install a new part, the following items will be needed:

- LOCTITE® Minute-Bond Adhesive
- Original or replacement mirror support
- Wax marking pencil or crayon
- Rubbing alcohol
- Clean paper towel
- Fine grit sandpaper, grit #320 or #360
- 2 mm Allen wrench

### Installation Procedure



1. Measure the distance from the headliner to the bottom of the mirror support will be mounted on the windshield.



2. Mark this position on the outside of the glass with a wax pencil or crayon. Draw a large diameter circle on the outside of the glass around the mirror support location.
3. Clean the inside surface of the glass with paper towels and a domestic scouring cleanser, a glass cleaning solution, or a polishing compound. Rub the glass until the area is completely dry. When the area is dry, clean the area with an alcohol-saturated paper towel in order to remove any traces of scouring powder or glass cleaning solution.
4. If the mirror support is new, clean the bonding surface with fine grit sandpaper #320 or #360. If the original mirror support is being used, all traces of factory installed adhesive must be removed prior to reinstallation.
5. Wipe the sanded mirror support with a clean paper towel saturated with rubbing alcohol. Allow the support to dry.
6. Follow the adhesive kit manufacturer's directions for adhesive application and mirror support preparation before installing the mirror support to the glass.
7. Position the mirror support to its premarked position. Use steady pressure and press the support against the glass for 30 seconds.
8. After 5 minutes, remove the excess adhesive with an alcohol-moistened towel or a glass cleaning solution.
9. Install the inside rearview mirror. Refer to [Inside Rearview Mirror Replacement](#).

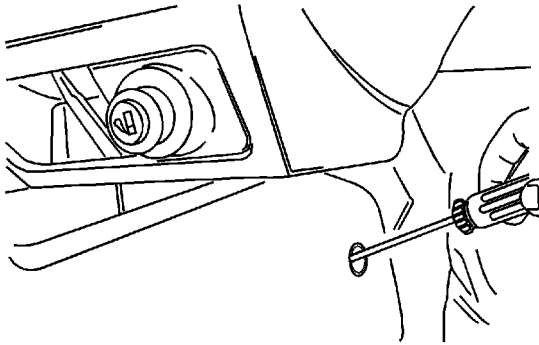


## Fastener Tightening Specifications

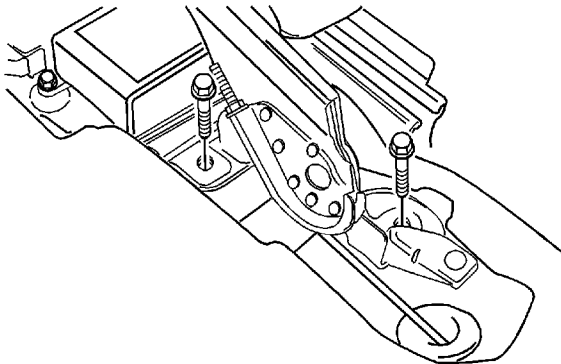
Application	Specification	
	Metric	English
Parking Brake Cable-to-Rear Axle Bracket Bolt	12 N·m	106 lb in
Parking Brake Cable-to-Underbody Side and Near Side Bracket Bolts	12 N·m	106 lb in
Parking Brake Console Hood-to-Tunnel Bracket Screws	2.5 N·m	22 lb in
Parking Brake Lever-to-Vehicle Underbody Bolts	20 N·m	15 lb ft
Parking Brake Switch-to-Parking Brake Lever Screw	4 N·m	35 lb in
Rear Brake Drum Caulking Nut	190 N·m	140 lb ft

## Parking Brake Lever Replacement

### Removal Procedure



1. Release the parking brake.
2. Move the front seats forward.
3. Pry off the plastic caps that cover the access holes to the parking brake console hood-to-tunnel bracket screws.
4. Remove the screws that secure the parking brake console hood-to-tunnel brackets. Raise the console hood.





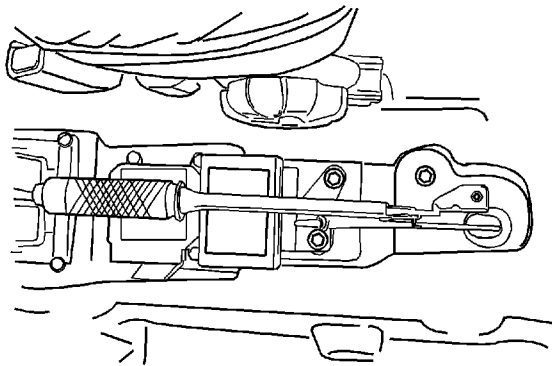
5. Measure the thread length from the end of the pushrod to the adjustment nut before removing the adjustment nut.
6. Remove the complete parking brake lever assembly and the cable from the assembly by unfastening the parking brake lever-to-vehicle underbody bolts and removing the adjustment nut.
7. Disconnect the parking brake warning lamp switch connector.

**Note:** The parking brake switch should be replaced if BRAKE warning light in the instrument panel cluster does not glow when the parking brake is applied with the ignition switch ON.

8. Remove the parking brake switch, which is attached to the parking brake lever assembly by a small screw, if necessary.
9. Inspect the parking brake lever cable and the lever grip for damage, and replace if necessary.

## Installation Procedure

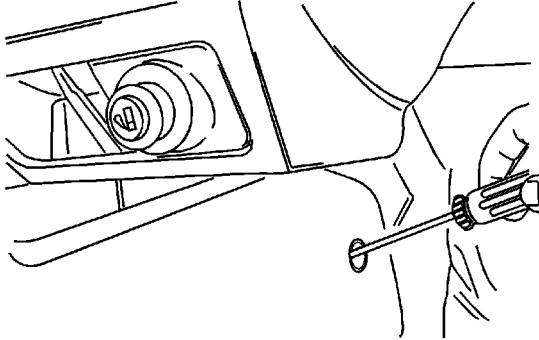
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



**Caution:** Replace the complete parking brake lever assembly if the parking brake lever is bent or damaged or if a new grip is required. This includes a new parking brake switch and lever cable.

1. Fasten the parking brake switch-to-parking brake lever with the screw and tighten to **4 N·m (35 lb in)**.
2. Fasten the parking brake lever assembly to the vehicle underbody. Insert the cable to the pushrod.
3. Tighten the hex adjusting nut on the pushrod approximating the measurement noted in the

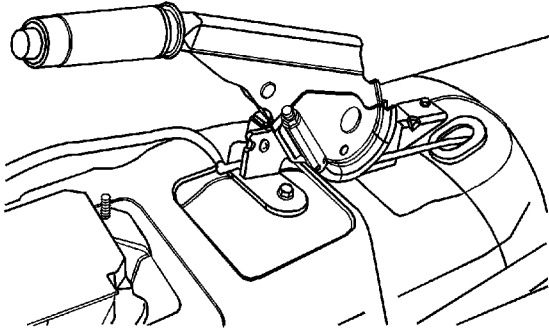
removal procedure. Tighten the parking brake lever-to-vehicle under body bolts to **20 N·m (15 lb ft)**.



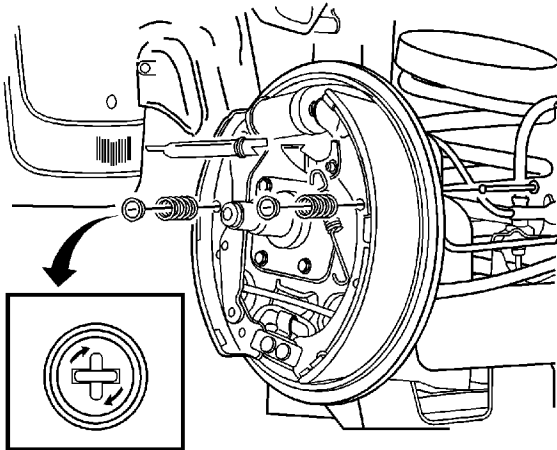
4. Connect the parking brake warning lamp switch connector.
5. Install the screws that secure the parking brake console hood to the tunnel brackets and tighten to **2.5 N·m (22 lb in)**.
6. Install the plastic caps that cover the access holes to the parking brake console hood-to-tunnel bracket screws.

## Parking Brake Cable Replacement

### Removal Procedure



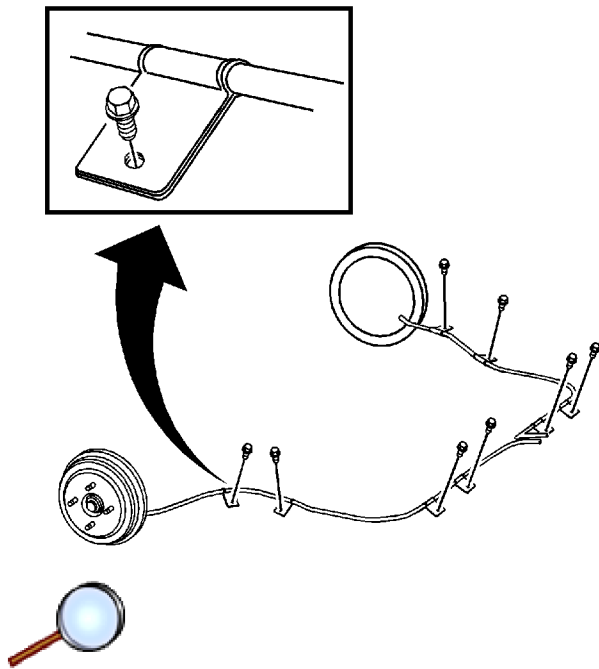
1. Release the parking brake lever.
2. Remove the rear wheels. Refer to [Tire and Wheel Removal and Installation](#) .



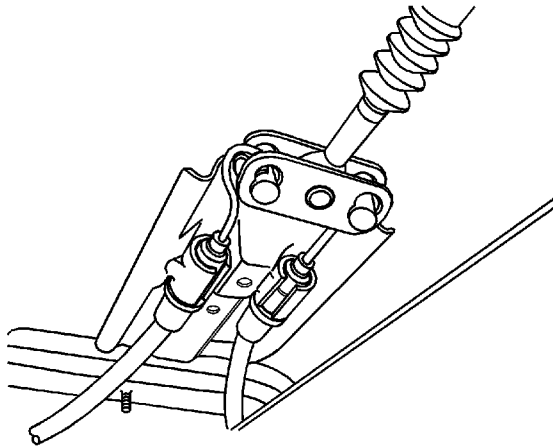
3. Remove the retaining ring for the parking brake cable on each side of the vehicle.
4. Remove the plastic sleeve.
5. Remove the brake drums and the shoes. Refer to [Brake Shoe Replacement](#) .

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6. Remove the brake cable from the parking brake shoe lever and from the brake backing plate.

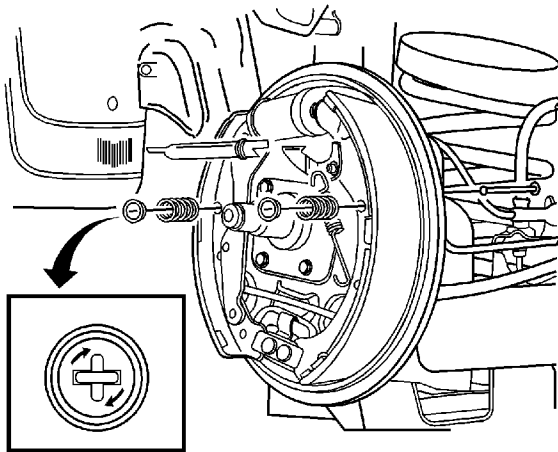


7. Remove the bolts that fasten the brake cable to the holding bracket on the rear axle.
8. Remove the bolts from the rear axle mounting bracket on each side of the vehicle.
9. Remove the bolt that fastens the brake cable to the underbody side bracket on each side of the vehicle. Remove the cable.

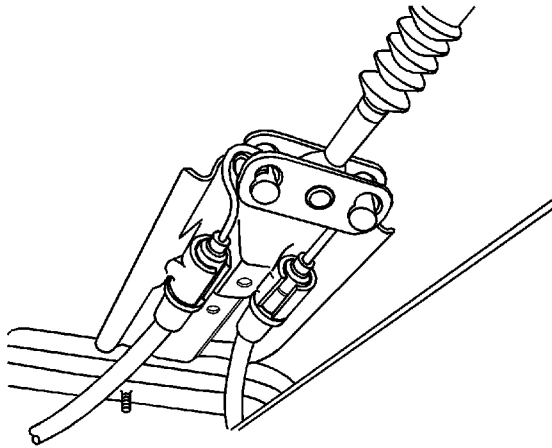


10. Remove the parking brake cables from the welded body bracket.

## Installation Procedure



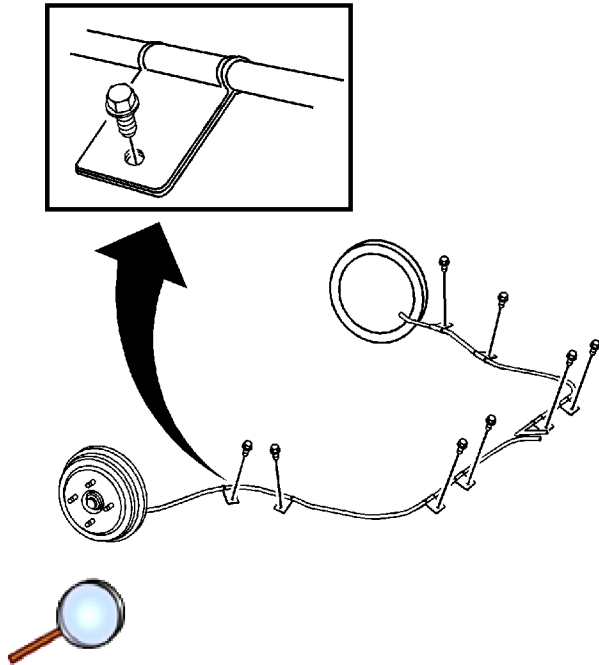
1. Install the new parking brake cable through the brake backing plate. Use a new cable if the original is frayed or damaged. Attach the cable to the parking brake shoe lever.
2. Install the brake shoes and the drums. Refer to [Brake Shoe Replacement](#) .
3. Insert the plastic sleeve into the brake backing plate and press in the retaining ring. Ensure the parking brake cable is routed correctly.
4. Install the rear wheels. Refer to [Tire and Wheel Removal and Installation](#) .



5. Install the parking brake cable to the underbody side brackets on each side of the vehicle, and a bracket near the underbody side bracket.

**Tighten**

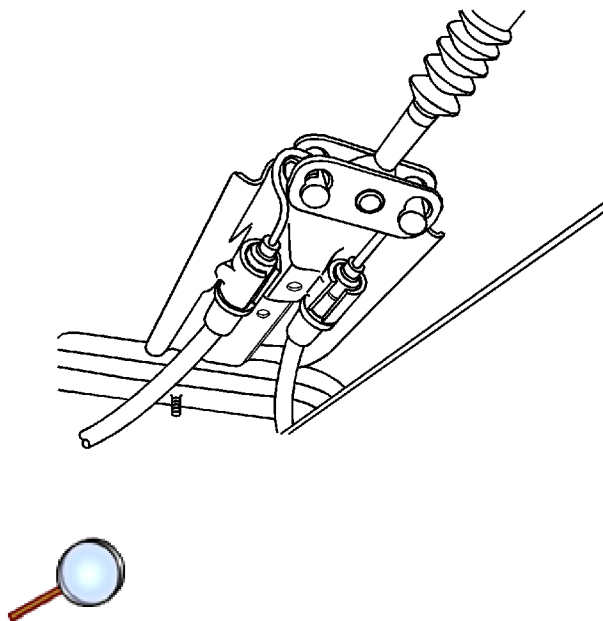
Tighten the parking brake cable-to-underbody side and near side bracket bolts to 12 N·m (106 lb in).



6. Install the parking cable on the rear axle brackets on each side of the vehicle.

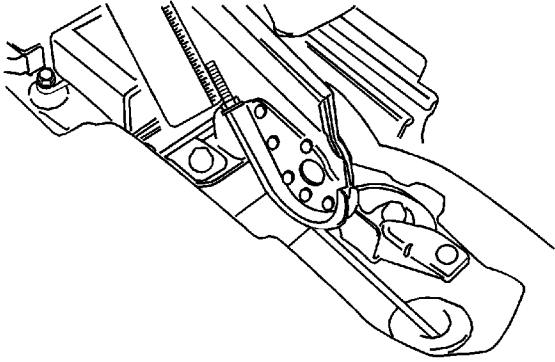
**Tighten**

Tighten the parking brake cable-to-rear axle bracket bolt to 12 N·m (106 lb in).



7. Insert the parking brake cables through the welded body bracket.

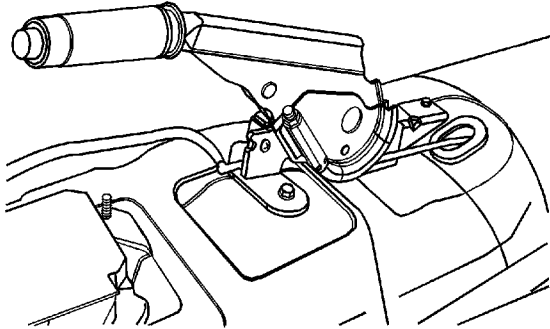




8. Adjust the length of parking brake cable. Refer to [Park Brake Adjustment](#) .

## Parking Brake Adjustment

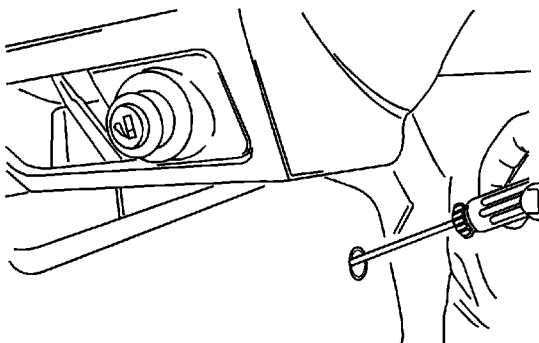
### Adjustment Procedure



1. Adjust the rear brakes. Refer to [Drum Brake Adjustment](#).
2. Release the parking brake.

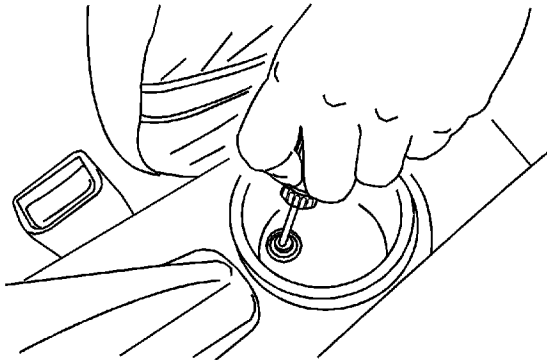
**Caution:** Refer to [Vehicle Lifting and Jacking Caution](#) in the Preface section.

3. Raise and suitably support the vehicle.
4. Check the parking brake cables for free movement.

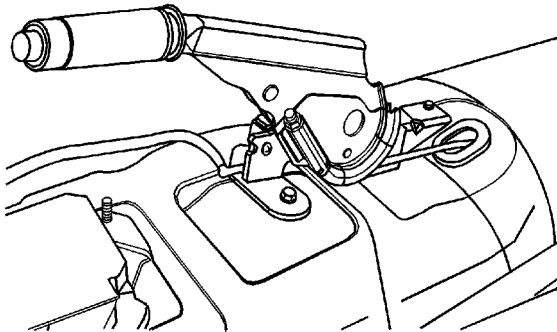




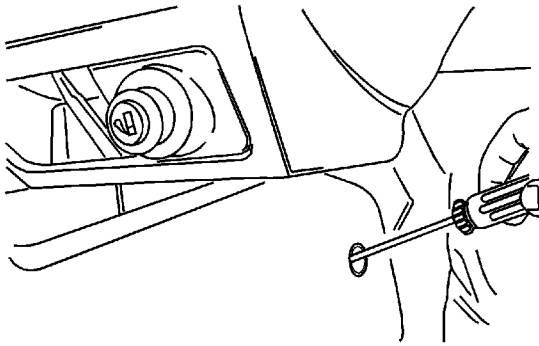
5. Lower the vehicle.
6. Move the front seats backward to ensure there is enough working space.
7. Pry off the plastic caps that cover the access holes to the parking brake console hood-to-tunnel bracket-screws.
8. Unfasten the screws that secure the parking brake console hood to the tunnel brackets.



9. Raise the console hood to expose the parking brake lever assembly and the adjustment nut.



10. Partially raise and suitably support the vehicle.
11. Turn the adjustment nut on the lever assembly until the wheels are difficult to turn.
12. Loosen the nut until the rear wheels are just free to turn.



13. Lower the vehicle.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

14. Position the parking brake console hood and fasten it to the tunnel brackets with the screws. Tighten to **2.5 N·m (22 lb in)**.
15. Snap in the plastic caps that cover the access holes to the parking brake console hood-to-tunnel bracket screws.
16. Adjust the front seats to their previous position.

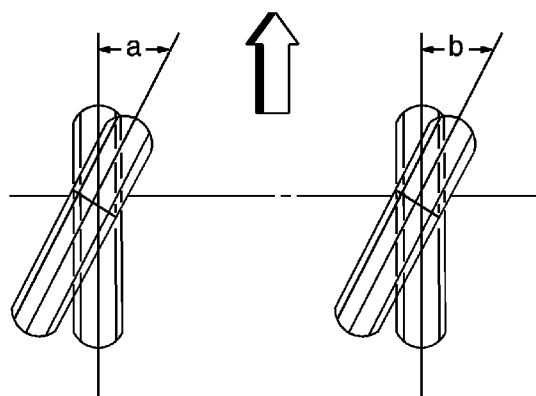
## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Adjuster Plug	12 N·m	106 lb in
Adjuster Plug Locknut (Tighten)	70 N·m	52 lb ft
Adjuster Plug Locknut (Loosen)	10 N·m	88 lb in
Air Cleaner Housing Bolts	12 N·m	106 lb in
Alternator Adjusting Bolts	20 N·m	15 lb ft
Ball Joint Hex Nut	45 N·m	33 lb ft
Crossmember to Underbody Nut	150 N·m	111 lb ft
Outer Tie Rod Nuts	54 N·m	40 lb ft
Outer Tie Rod Hex Nut	45 N·m	33 lb ft
Pinion Locknut	30 N·m	22 lb ft
Pinion Preload	0.9-1.7 N·m	8-15 lb in
Power Steering Fluid Reservoir Attaching Bolts	7 N·m	62 lb in
Power Steering Line Fittings-Cylinder End	28 N·m	21 lb ft
Power Steering Line Fittings-Valve End	18 N·m	13 lb ft
Power Steering Pump Pressure Line Union Nut	28 N·m	21 lb ft
Power Steering Pump Pulley Bolts	25 N·m	18 lb ft
Power Steering Pump Retaining Bolts	25 N·m	18 lb ft
Stabilizer Shaft to Knuckle Bolts	45 N·m	33 lb ft
Steering Gear Inlet and Outlet Fitting Nuts	28 N·m	21 lb ft
Steering Gear Inlet Pipe Fittings	28 N·m	21 lb ft
Steering Gear Outlet Pipe Fittings	22 N·m	16 lb ft
Steering Gear Retaining Bracket Nuts	50 N·m	37 lb ft
Steering Gear Yoke Plug	5 N·m - 45°	44 lb in - 45°
Steering Gear Yoke Plug Lock Nut	44 N·m	32 lb ft
Tie Rod	100 N·m	75 lb ft

## Straight Ahead Inspection

### Inspection Procedure

1. After completing all the necessary procedures on the steering gear, inspect the position of the front wheels and the steering wheel.
2. With the vehicle on the floor, place the steering wheel in the straight-ahead position.
3. Mark the centerline of the front tires on the floor.
4. Turn the steering wheel all the way to the right.
5. Mark the new centerline of the front tires on the floor.
6. Measure the turning angle of each tire.



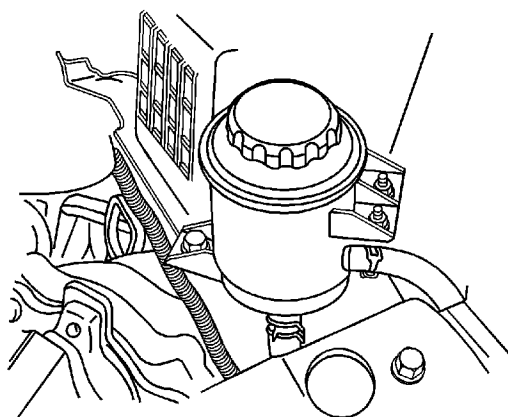
7. Compare the measurements to the specifications.

### **Specifications**

- The outside angle (a) is 34 degrees  $\pm$  1 degree 30 minutes.
- The inside angle (b) is 39 degrees 5 minutes  $\pm$  1 degree 30 minutes.

## Power Steering System Bleeding

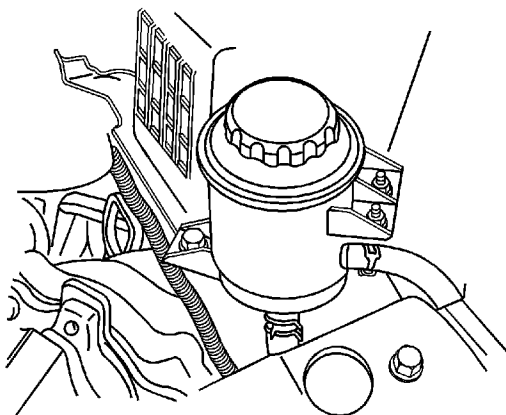
**Notice:** Refer to [Air in the Power Steering System Notice](#) in the Preface section.



**Notice:** When adding fluid or making a complete fluid change, always use a power steering fluid meeting GM Spec. No. 9985010 or equivalent. Fluid for cold climates is also available through GM Dealerships; refer to Specifications for further information. Failure to use the proper power steering fluid can cause power steering hose and seal damage, fluid leaks and pump failure.

1. Turn the wheels all the way to the left and add the power steering fluid to the MIN mark on the fluid level indicator.
2. Start the engine. With the engine running at fast idle, recheck the fluid level. If necessary, add fluid to bring the level up to the MIN mark.
3. Bleed the system by turning the wheels from side to side without reaching the stop at either end. Keep the fluid level at the MIN mark. The air must be eliminated from the fluid before normal steering action can be obtained.
4. Return the wheels to the center position. Continue running the engine for 2-3 minutes.
5. Road test the car to be sure the steering functions normally and is free from noise.
6. Recheck the fluid level. Ensure the fluid level is at the MAX mark after the system has stabilized at its normal operating temperature. Add fluid if necessary.

## Checking and Adding Power Steering Fluid



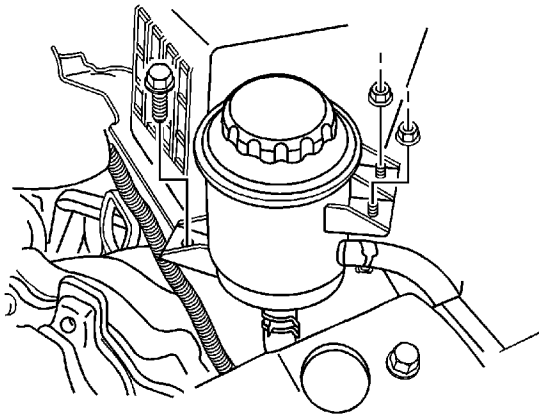
**Notice:** When adding fluid or making a complete fluid change, always use a power steering fluid meeting GM Spec. No. 9985010 or equivalent. Fluid for cold climates is also available through GM Dealerships; refer to Specifications for further information. Failure to use the proper power steering fluid can cause power steering hose and seal damage, fluid leaks and pump failure.

1. The power steering fluid level is indicated either by marks on a see-through fluid reservoir or by marks on a fluid level indicator on the fluid reservoir cap.
2. If the fluid is warmed up to 66°C (150°F), the fluid level should be between the MAX and MIN marks. Add fluid if necessary.
3. If the fluid is cool, 21°C (70°F), the fluid level should be at the MIN mark. Add fluid if necessary.



## Power Steering Fluid Reservoir Replacement

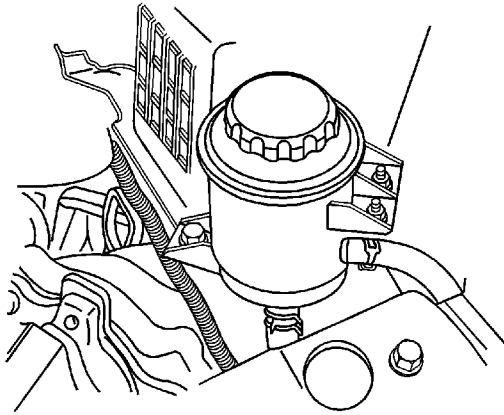
### Removal Procedure



1. Siphon the power steering fluid from the fluid reservoir.
2. Loosen the hose clamps and remove both hoses.
3. Plug the hoses in order to prevent contaminants from entering the power steering system.
4. Remove the fluid reservoir attaching bolts and remove the fluid reservoir.

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Attach the fluid reservoir with the power steering fluid reservoir attaching bolts.

**Tighten**

Tighten the power steering fluid reservoir attaching bolts to 7 N·m (62 lb in).

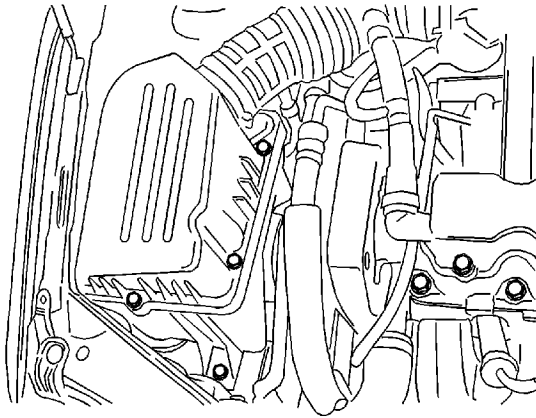
2. Connect both hoses and secure the hose clamps.

**Notice:** When adding fluid or making a complete fluid change, always use a power steering fluid meeting GM Spec. No. 9985010 or equivalent. Fluid for cold climates is also available through GM Dealerships; refer to Specifications for further information. Failure to use the proper power steering fluid can cause power steering hose and seal damage, fluid leaks and pump failure.

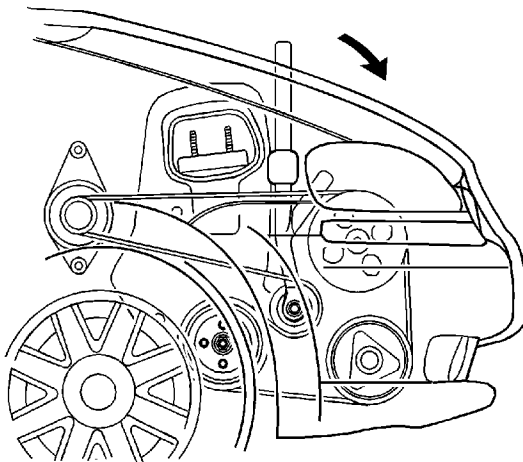
3. Fill the fluid reservoir with power steering fluid.
4. Inspect for leaks. If there are leaks, correct the cause of the leaks and bleed the system. Refer to [Power Steering System Bleeding](#) .

## Power Steering Pump Replacement (1.4L Engine)

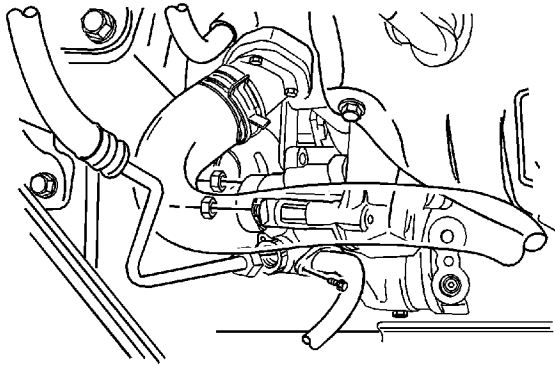
### Removal Procedure



1. Remove the air cleaner housing by removing the housing bolts and loosening the clamp.



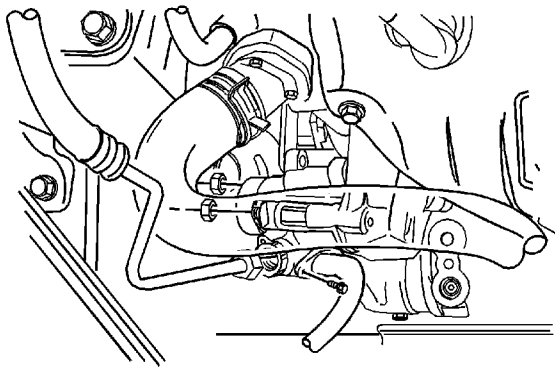
2. Remove the pump drive belt from the pulley by moving the autotensioner.



3. Drain the power steering fluid by disconnecting the pressure and supply lines from the pump.
4. Remove the pump assembly by removing the steering pump retaining nuts.

## Installation Procedure

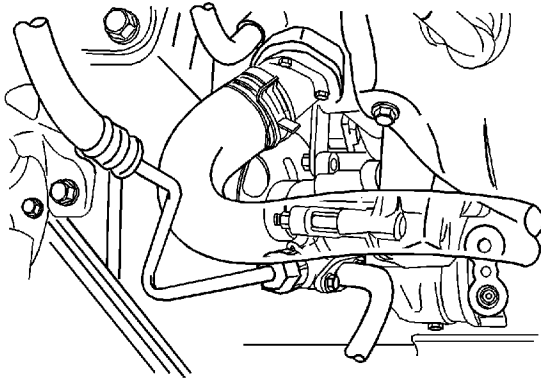
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the pump to the A/C compressor bracket and tighten the steering pump retaining nuts.

### **Tighten**

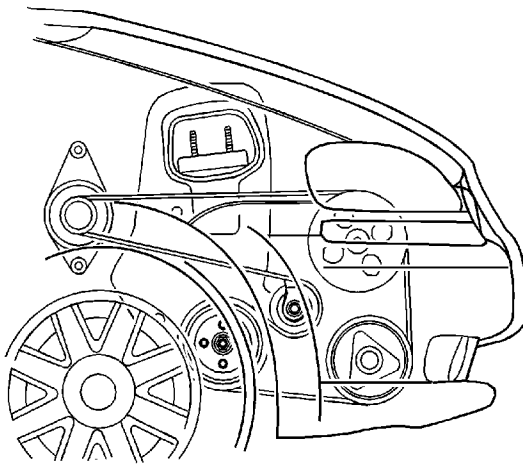
Tighten the steering pump retaining nuts to 25 N·m (18 lb ft).



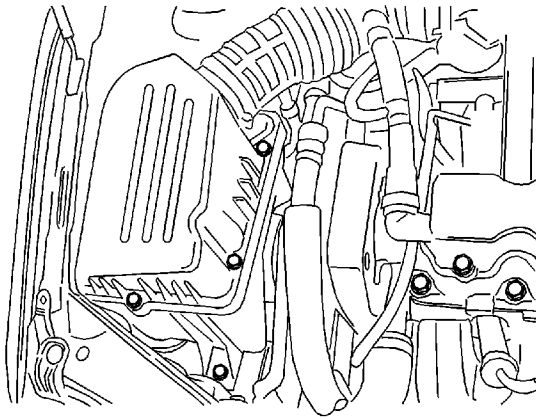
2. Connect the pressure and supply lines to the power steering pump.

**Tighten**

Tighten the pressure line union nut to 28 N·m (21 lb ft).



3. Install the pump drive belt onto the pulley by moving the autotensioner.



4. Install the air cleaner housing with the housing bolts and the clamp.

**Tighten**

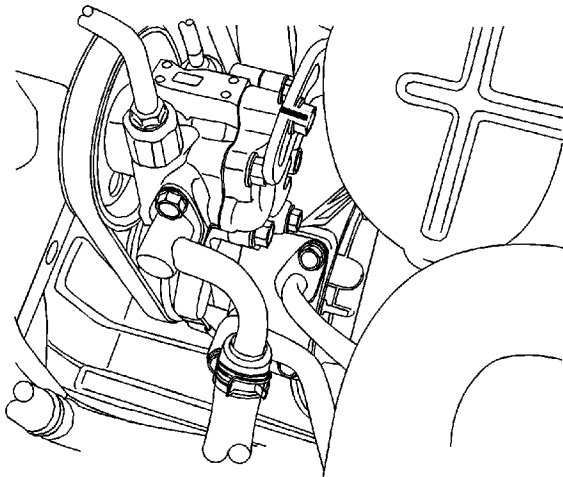
Tighten the air cleaner housing bolts to 12 N·m (106 lb in).

**Notice:** Refer to [Using Proper Power Steering Fluid Notice](#) in the Preface section.

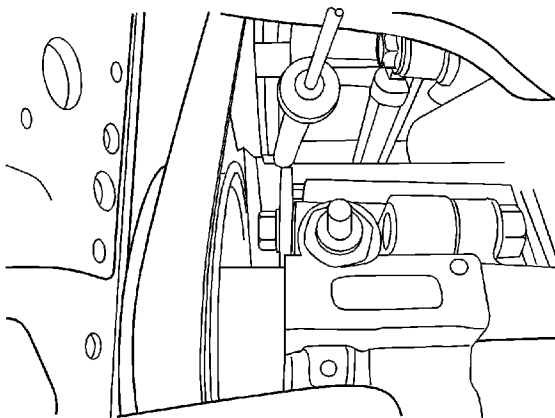
5. Refill the pump with new fluid and bleed the air from the system. Refer to [Power Steering System Bleeding](#)
6. Inspect for leaks. If leaks are found, correct the cause of the leak and bleed the system.

## Power Steering Pump Replacement (1.2L Engine)

### Removal Procedure



1. Use paint in order to place match marks on the pump and on the rear shackle.
2. Drain the power steering fluid by disconnecting the pressure and supply lines from the pump.
3. Remove the rear shackle bolt.
4. Remove the pump retaining bolt.
5. Disconnect the pressure switch connector.



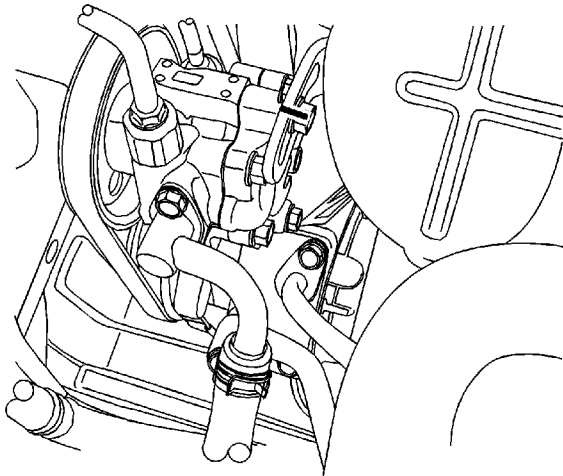
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6. Remove the front shackle bolt.
7. Remove the pump assembly.

## **Installation Procedure**

1. Position the pump assembly in the vehicle.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



2. Loosely install the rear shackle bolt.
3. Loosely install the pump retaining bolt.
4. Position the belt on the pump pulley.
5. Align the match marks and adjust the tension on the belt.
6. Tighten the rear shackle bolt.

### **Tighten**

Tighten the rear shackle bolt to 22 N·m (16 lb ft).

7. Tighten the pump retaining bolt.

### **Tighten**

Tighten the pump retaining bolt to 22 N·m (16 lb ft).

8. Install the front shackle bolt.

### **Tighten**

Tighten the front shackle bolt to 20 N·m (15 lb ft).

9. Connect the pressure and supply lines to the pump.

### **Tighten**



Tighten the pressure line union nut to 28 N·m (21 lb ft).

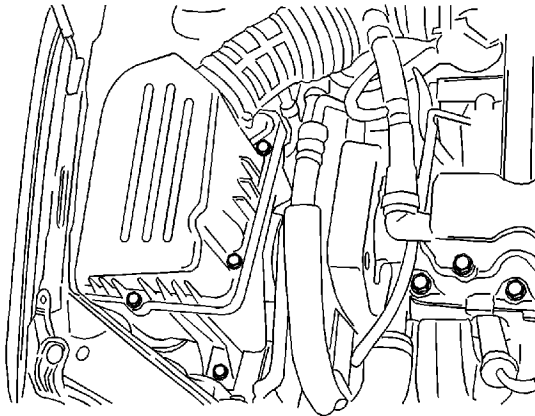
10. Connect the pressure switch connector.

**Notice:** Refer to [Using Proper Power Steering Fluid Notice](#) in the Preface section.

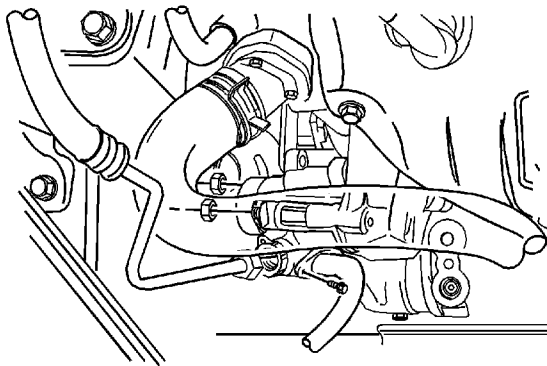
11. Refill the pump with new fluid and bleed the air from the system. Refer to [Power Steering System Bleeding](#).
12. Inspect for leaks. If leaks are found, correct the cause of the leaks and bleed the system.

## Power Steering Pump Replacement (1.6L Engine)

### Removal Procedure



1. Remove the air cleaner housing by removing the housing bolts and loosening the clamp.



2. Drain the power steering fluid by disconnecting the pressure and supply lines from the pump.
3. Remove the air conditioning A/C compressor. Refer to [Air Conditioning Compressor Replacement](#)
4. Remove the right front wheel. [Tire and Wheel Removal and Installation](#)

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5. Remove the right side engine under cover. [Engine Shield Replacement](#)
6. Remove the A/C compressor mounting bracket.
7. Remove the pump assembly from the A/C compressor mounting bracket by removing the steering pump retaining nuts.

## **Installation Procedure**

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

1. Install the pump to the A/C compressor bracket and tighten the steering pump retaining nuts.

### **Tighten**

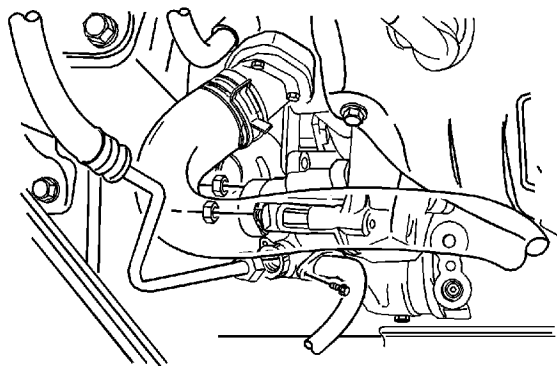
Tighten the steering pump retaining nuts to 25 N·m (18 lb ft).

2. Install the A/C compressor mounting bracket and tighten the bolts to.

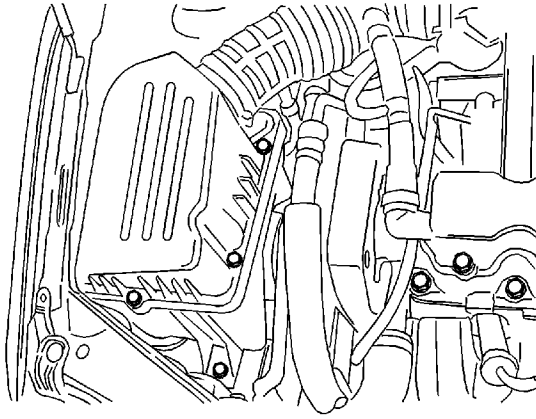
### **Tighten**

Tighten the A/C compressor mounting bracket bolts to 50 N·m (37 lb ft).

3. Install the A/C compressor to the bracket. [Air Conditioning Compressor Replacement](#)
4. Install the right side engine under cover. [Engine Shield Replacement](#)
5. Install the right front tire. [Tire and Wheel Removal and Installation](#)
6. Lower the vehicle.



7. Connect the pressure and supply lines to the power steering pump.



8. Install the air cleaner housing with the housing bolts and the clamp.

**Tighten**

Tighten the air cleaner housing bolts to 12 N·m (106 lb in).

**Notice:** Refer to [Using Proper Power Steering Fluid Notice](#) in the Preface section.

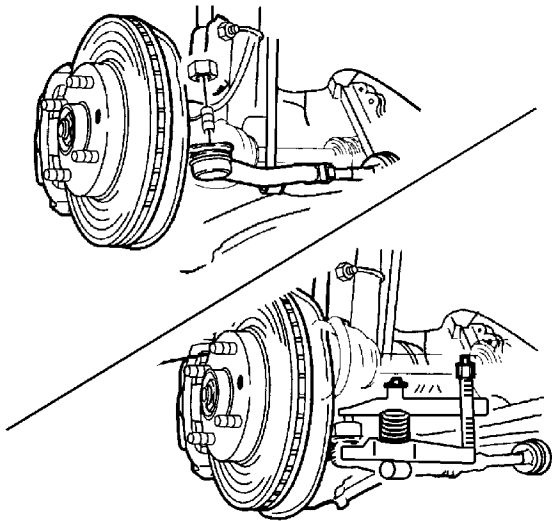
9. Refill the pump with new fluid and bleed the air from the system. Refer to [Power Steering System Bleeding](#)
10. Inspect for leaks. If leaks are found, correct the cause of the leak and bleed the system.

## Steering Linkage Outer Tie Rod Replacement

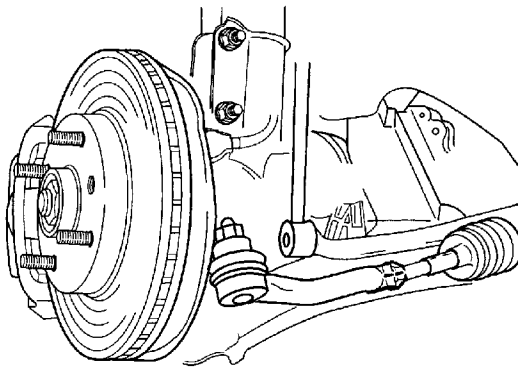
### Tools Required

[KM-507-C](#) Ball Joint Remover

### Removal Procedure



1. Remove the outer tie rod hex nut and disconnect the outer tie rod from the steering knuckle using the [KM-507-C](#).



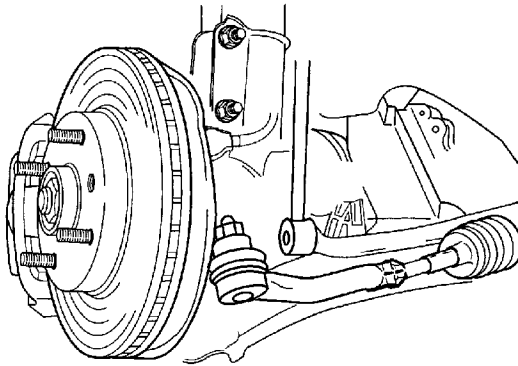


**Important:** Before loosening the tie rod lock nut, mark the position of the lock nut for easy alignment after the installation procedure.

2. Loosen the tie rod lock nuts and remove the outer tie rod.

## Installation Procedure

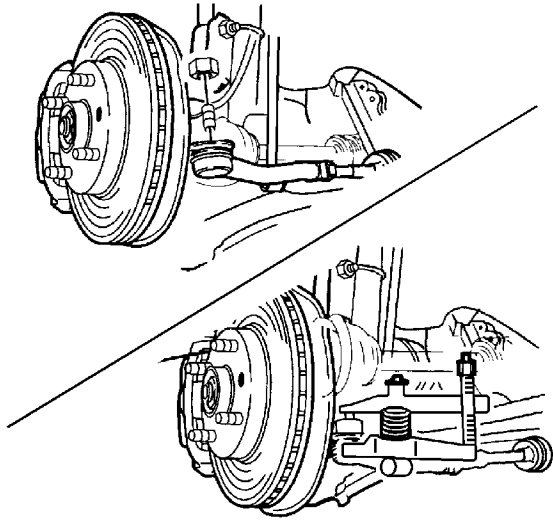
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the outer tie rod with the lock nuts.

### **Tighten**

Tighten the lock nuts to 54 N·m (40 lb ft).



2. Install the outer tie rod with the hex nut.

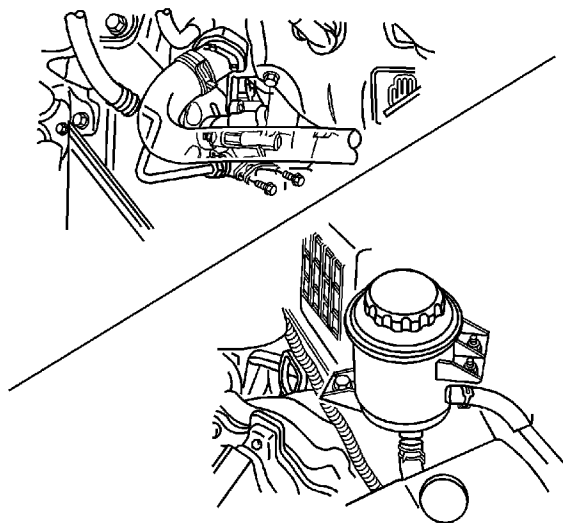
**Tighten**

Tighten the hex nut to 45 N·m (33 lb ft).

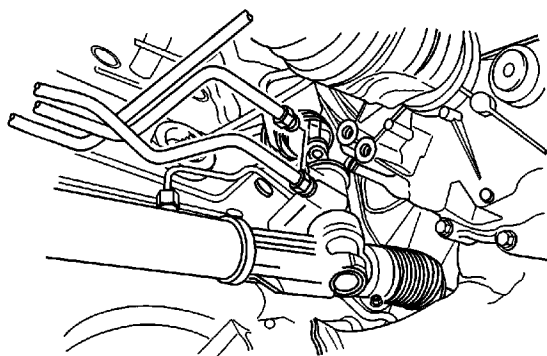
3. Inspect the vehicle. Refer to [Preliminary Alignment Inspection](#) and [Straight Ahead Inspection](#) .
4. Measure the wheel alignment.
5. If necessary, adjust the front toe. Refer to [Front Toe Adjustment](#) .

## Power Steering Pump Hoses and Pipes Replacement

### Removal Procedure



1. Siphon the power steering fluid from the fluid reservoir.
2. Disconnect the pressure line pipe and the supply line hose from the inlet and outlet connections on the power steering pump.
3. Remove the air cleaner housing, if needed.

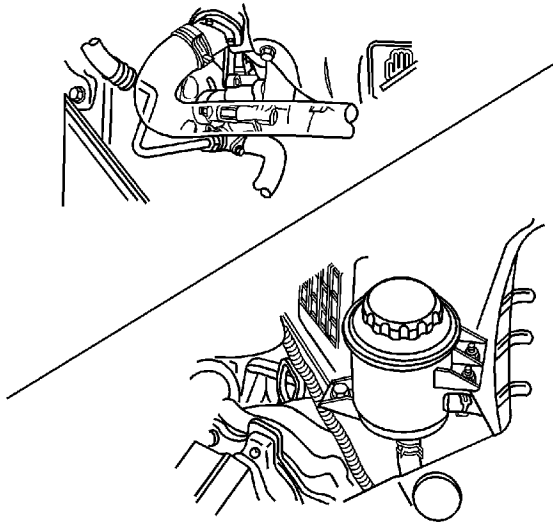


4. Disconnect the pressure line and return line hoses from the retaining clips at the bottom and

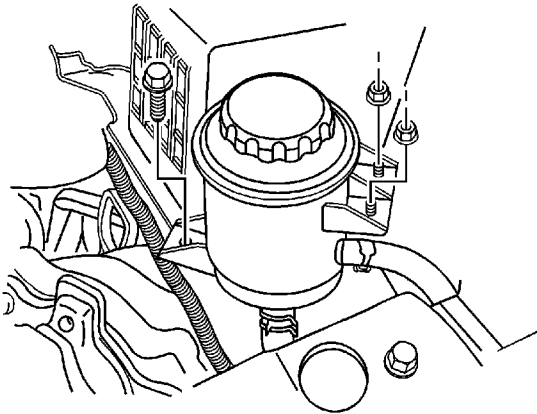
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the side of the radiator.

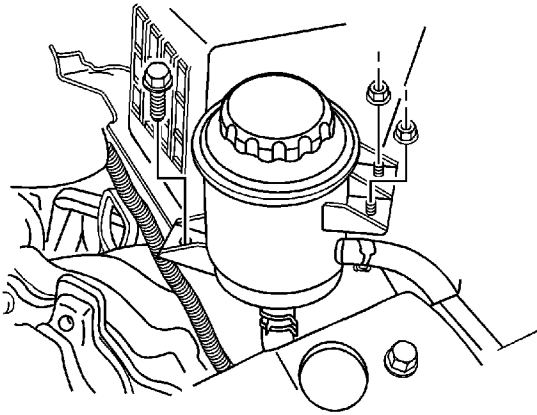


5. Disconnect the pressure line inlet pipe from the steering gear.



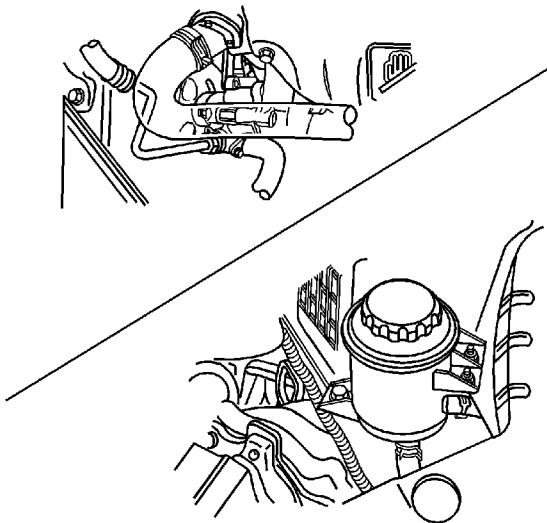
6. Disconnect the supply line hose from the power steering fluid reservoir.
7. Remove the power steering pump pressure line and return line.

## Installation Procedure



1. Install the power steering pump pressure line and return line.
2. Connect the supply line hose to the power steering fluid reservoir.

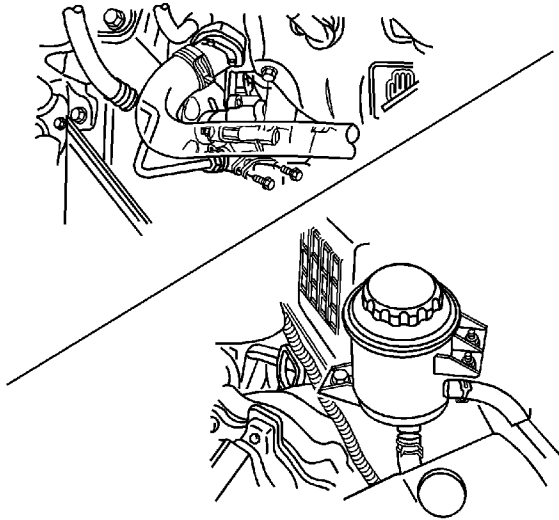
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



3. Connect the pressure line inlet pipe to the steering gear.

**Tighten**

Tighten the steering gear inlet pipe fitting to 28 N·m (21 lb ft).



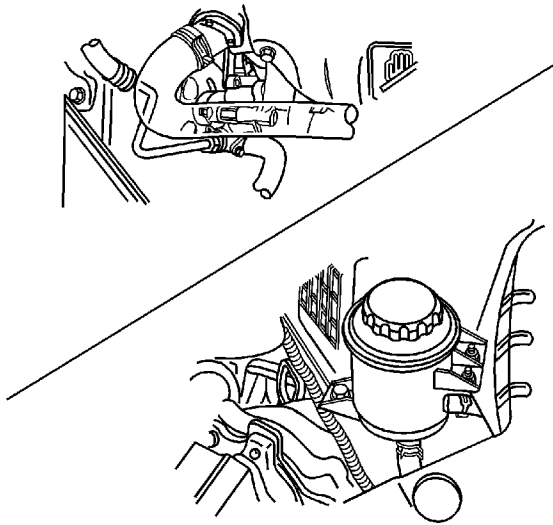
4. Connect the pressure line and return line hoses to the retaining clips at the bottom and the side of the radiator.
5. Connect the pressure line pipe and the supply line hose to the inlet and outlet connections on the power steering pump.
6. On dual overhead cam (DOHC) engines, install the air cleaner housing, if removed.

#### **Tighten**

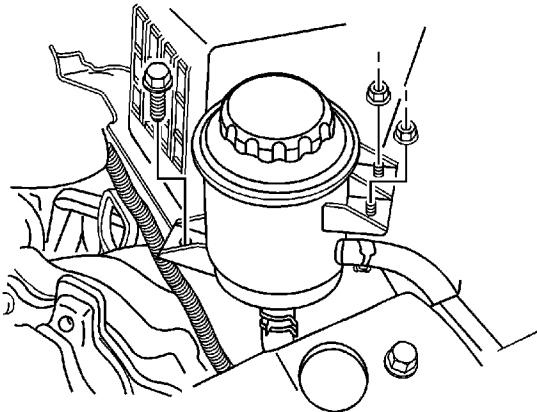
- Tighten the air cleaner housing bolts to 12 N·m (106 lb in).
  - Tighten the power steering pump pressure line union nut to 28 N·m (21 lb ft).
7. Fill the fluid reservoir with power steering fluid.
  8. Inspect for leaks. If there are leaks, correct the cause of the leaks and bleed the system. Refer to [Power Steering System Bleeding](#).

## Power Steering Return Hose Replacement

### Removal Procedure

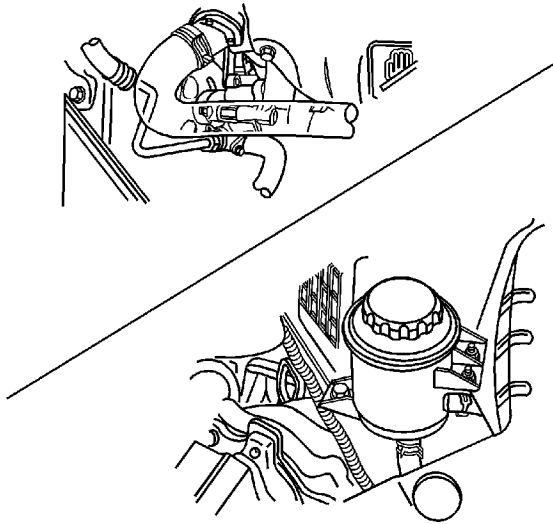


1. Siphon the power steering fluid from the fluid reservoir.
2. Disconnect the return line pipe from the outlet connection at the steering gear.



3. Disconnect the fluid reservoir hose from the fluid reservoir.
4. Remove the fluid reservoir hose.

## Installation Procedure



1. Connect the fluid reservoir hose at the fluid reservoir.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

2. Connect the fluid reservoir pipe to the outlet connection at the steering gear.

### Tighten

Tighten the steering gear outlet pipe fittings to 28 N·m (21 lb ft).

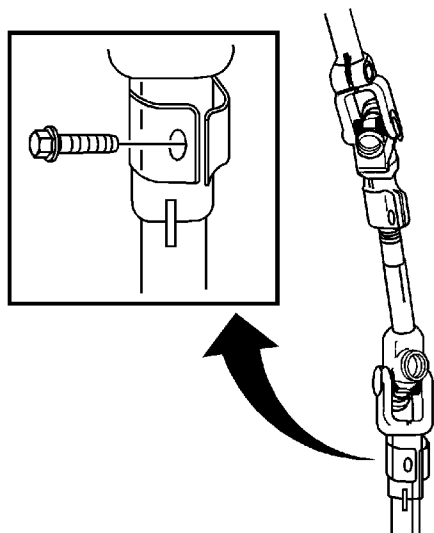
**Notice:** When adding fluid or making a complete fluid change, always use a power steering fluid meeting GM Spec. No. 9985010 or equivalent. Fluid for cold climates is also available through GM Dealerships; refer to Specifications for further information. Failure to use the proper power steering fluid can cause power steering hose and seal damage, fluid leaks and pump failure.

3. Fill the fluid reservoir with power steering fluid.
4. Inspect for leaks. If there are leaks, correct the cause of the leaks and bleed the system. Refer to [Power Steering System Bleeding](#).

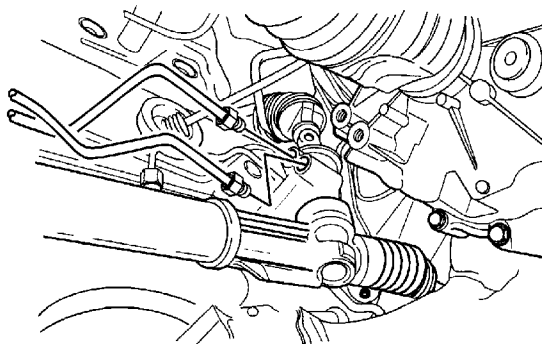
## Steering Gear Replacement

### Removal Procedure

1. Position the tires in the straight ahead position by turning the steering wheel.

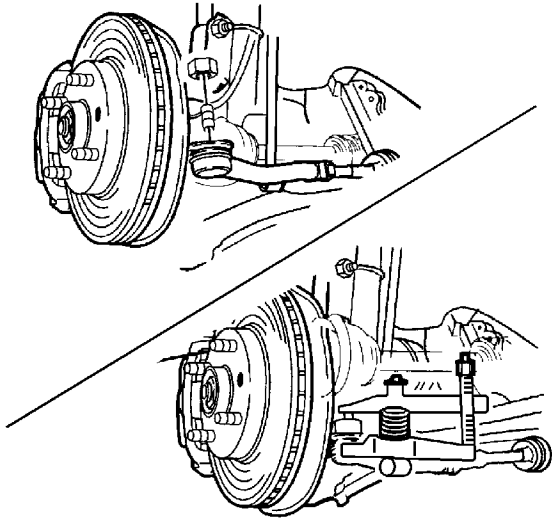


2. Remove the intermediate shaft.

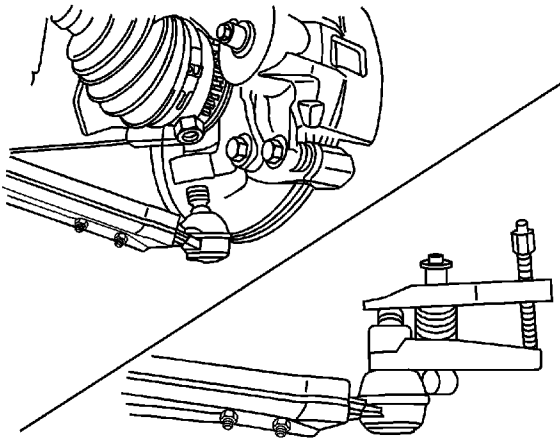


3. Remove the front tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#).
4. Drain the power steering fluid from the rack and pinion.
5. Disconnect the steering gear inlet and outlet pipe fittings.

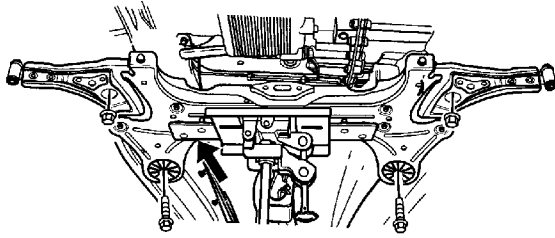
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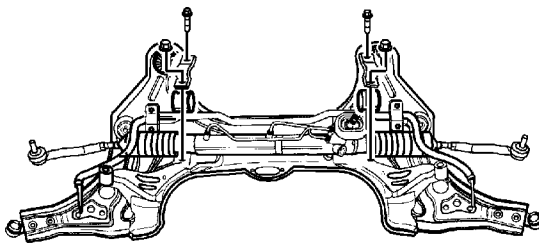
6. Remove the outer tie rod hex nuts. Refer to [Rack and Pinion Outer Tie Rod End Replacement](#) .



7. Remove the ball joint hex nuts and disconnect the stabilizer shaft from the knuckle by removing the stabilizer shaft link assembly. Refer to [Stabilizer Shaft Link Replacement](#) .



8. Remove the cross member by removing the nuts and bolts to the underbody.

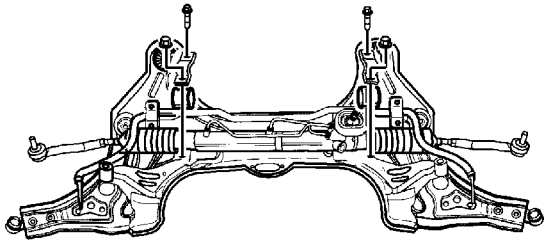


9. Remove the rack and pinion assembly by disconnecting the steering gear retaining bracket nuts.

## Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

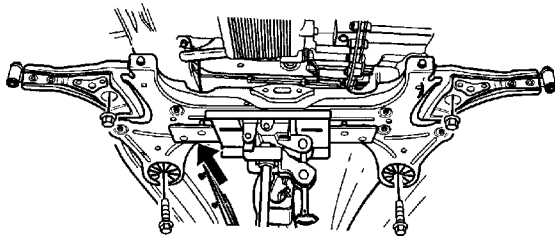




1. Install the rack and pinion assembly by connecting the steering gear retaining bracket nuts.

**Tighten**

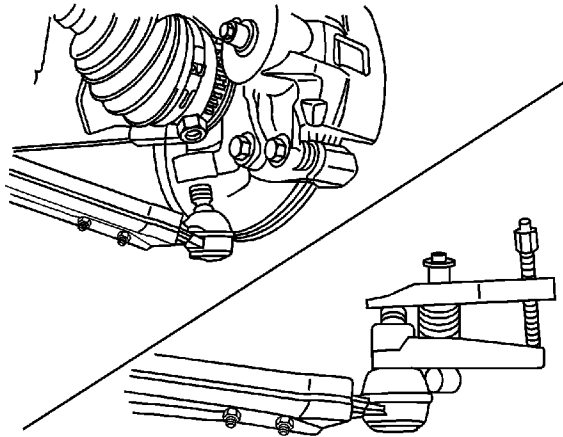
Tighten the steering gear retaining bracket nuts to 50 N·m (37 lb ft).



2. Install the cross member by tightening the nuts and bolts to the underbody.

**Tighten**

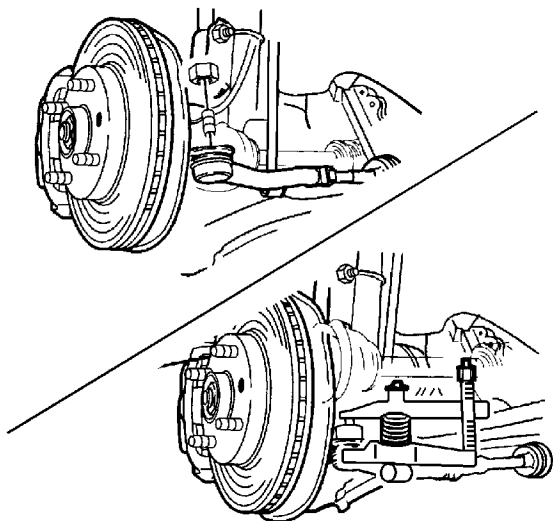
Tighten the cross member by tightening the nuts and bolts to the underbody to 150 N·m (111 lb ft).



3. Install the ball joint hex nuts and connect the stabilizer shaft to the knuckle by tightening the bolt with stabilizer shaft link assembly. Refer to [Stabilizer Shaft Link Replacement](#).

#### **Tighten**

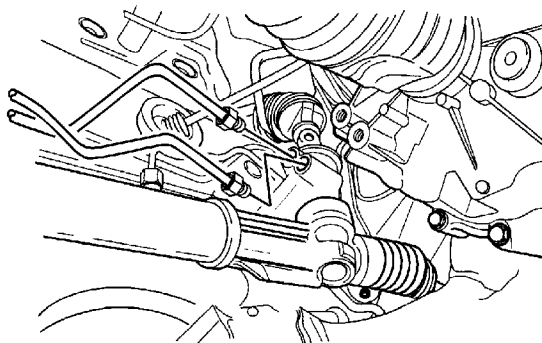
- Tighten the ball joint hex nuts to knuckle to 45 N·m (33 lb ft).
- Tighten the bolts of the stabilizer shaft to the knuckle to 45 N·m (33 lb ft).



4. Install the outer tie rod hex nuts. Refer to [Rack and Pinion Outer Tie Rod End Replacement](#).

#### **Tighten**

Tighten the outer tie rod hex nuts to 45 N·m (33 lb ft).



5. Connect the steering gear inlet and outlet pipe fittings.

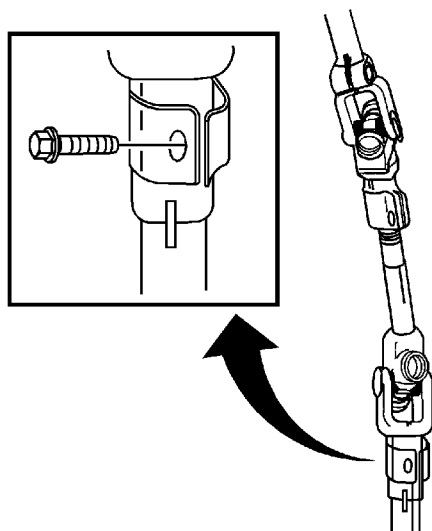
#### **Tighten**

Tighten the nuts of the steering gear inlet and outlet pipe fittings to 22 N·m (16 lb ft).

6. Install the front tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#).

**Notice:** When adding fluid or making a complete fluid change, always use a power steering fluid meeting GM Spec. No. 9985010 or equivalent. Fluid for cold climates is also available through GM Dealerships; refer to Specifications for further information. Failure to use the proper power steering fluid can cause power steering hose and seal damage, fluid leaks and pump failure.

7. Refill the power steering fluid.





8. Install the intermediate shaft.
9. Inspect the vehicle. Refer to [Preliminary Alignment Inspection](#) and [Straight Ahead Inspection](#) .
10. Measure the wheel alignment.
11. If necessary, adjust the front toe. Refer to [Front Toe Adjustment](#) .

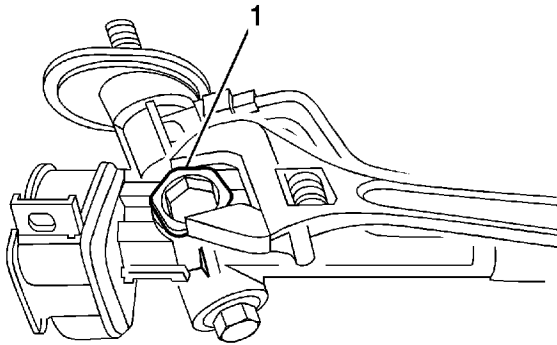
## Steering Gear Yoke Adjustment

### Tools Required

[GE-42910](#) Yoke Adjusting Tool

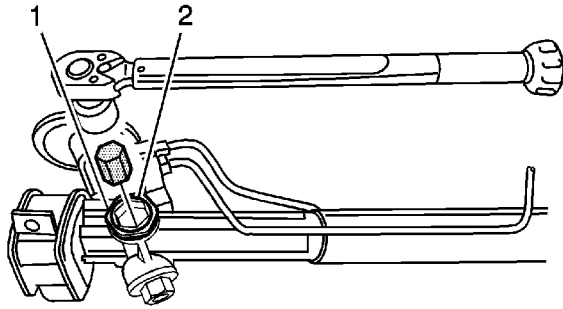
### Adjustment Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Ensure the steering wheel and the front wheels are in the straight ahead position.
3. Remove the steering gear. Refer to [Steering Gear Replacement](#).



4. Loosen the locknut (1).

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

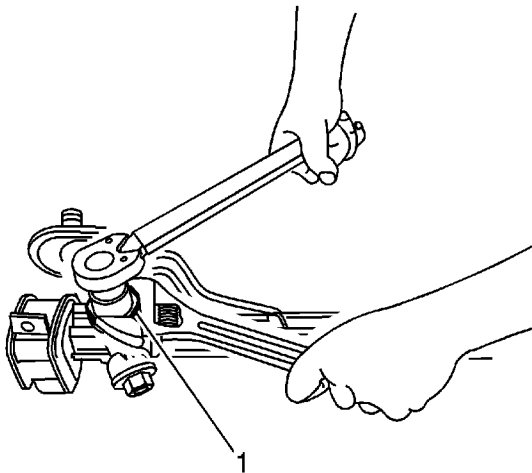


5. Use the [GE-42910](#) in order to tighten the yoke plug (2).

**Tighten**

Tighten the yoke plug to 5 N·m (44 lb in).

6. Loosen the yoke plug by 45 degrees.



7. Hold the yoke plug stationary and tighten the locknut (1).

**Tighten**

Tighten the locknut to 44 N·m (32 lb ft).

8. Install the steering gear. Refer to [Steering Gear Replacement](#).
9. Drive the vehicle and ensure the steering system returns to the straight ahead position.

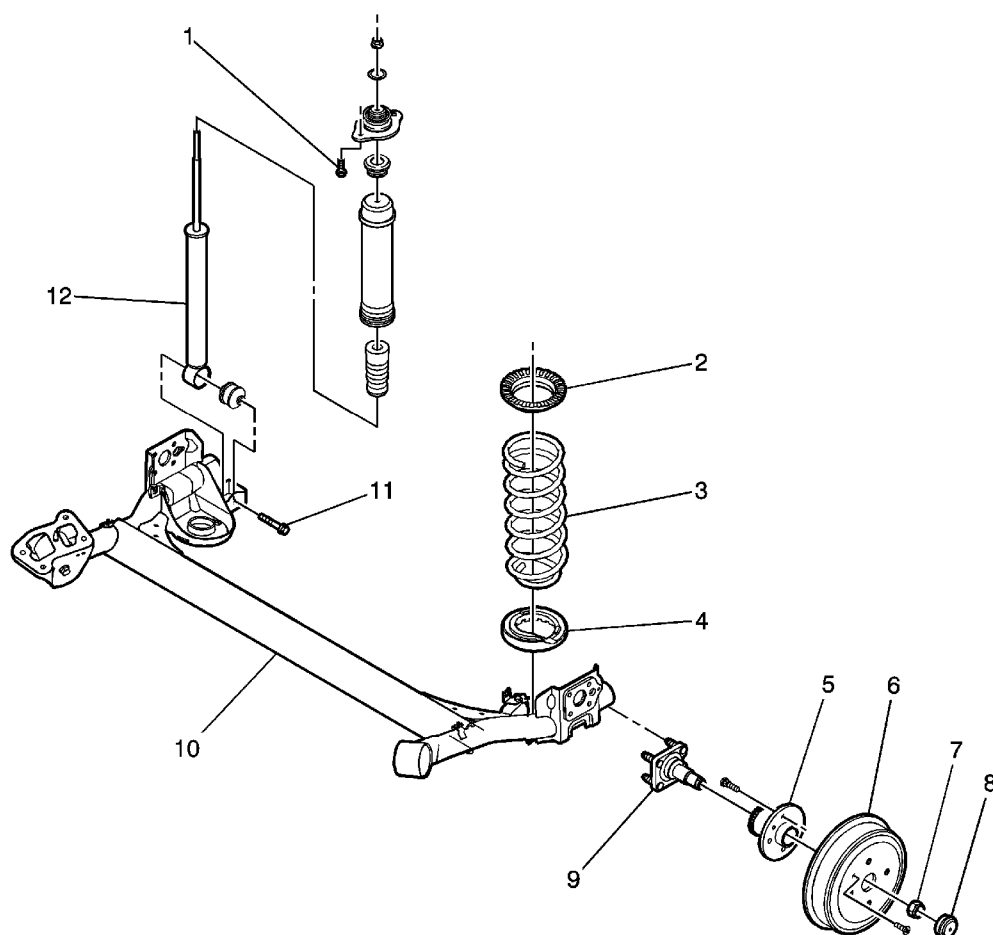
[2008 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Suspension](#) | [Rear Suspension](#) | [Specifications](#)  
| Document ID: 1294218

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## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Rear Axle to Body Bracket Bolt	115 N·m	85 lb ft
Rear Axle Mounting Bracket Bolts	70 N·m	52 lb ft
Rear Hub Caulking Nut	190 N·m	140 lb ft
Shock Absorber-to-Axle Bolt - Lower	72 N·m	53 lb ft
Shock Absorber-to-Body Bolts - Upper	50 N·m	37 lb ft

## Rear Suspension Components



- (1) Shock Absorber Upper Bolt
- (2) Spring Upper Insulator
- (3) Coil Spring
- (4) Spring Lower Insulator
- (5) Rear Wheel Bearing and Hub Assembly
- (6) Brake Drum
- (7) Caulking Nut
- (8) Spindle Cap
- (9) Spindle
- (10) Rear Axle
- (11) Shock Absorber Lower Bolt
- (12) Shock Absorber

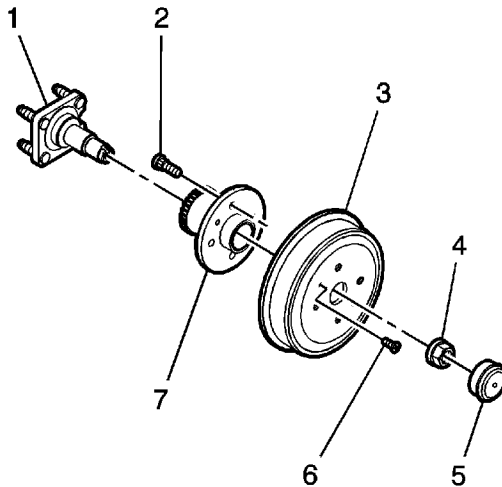
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## Rear Wheel Bearing and Hub Replacement

### Removal Procedure

1. Remove the rear wheel speed sensor, if equipped. Refer to [Rear Wheel Speed Sensor Replacement](#).
2. Remove the brake drum. Refer to [Brake Drum Replacement](#).

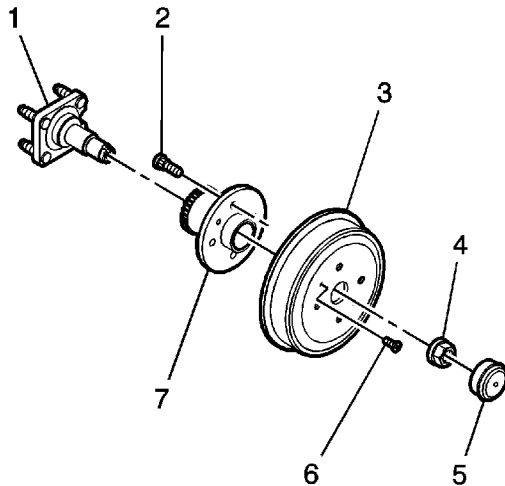


3. Unstake the caulking nut (4).
4. Remove the caulking nut.

**Important:** Pull the wheel bearing and hub assembly straight off the spindle. The 2 inner wheel bearing races may not be secure.

5. Remove the wheel bearing and hub assembly (7) from the spindle (1).

### Installation Procedure



**Important:** Slide the wheel bearing and hub assembly straight onto the spindle. Use care in order to properly position the wheel bearing races on the spindle.

1. Install the wheel bearing and hub assembly (7) to the spindle (1).

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

2. Install the caulking nut (4) to the spindle.

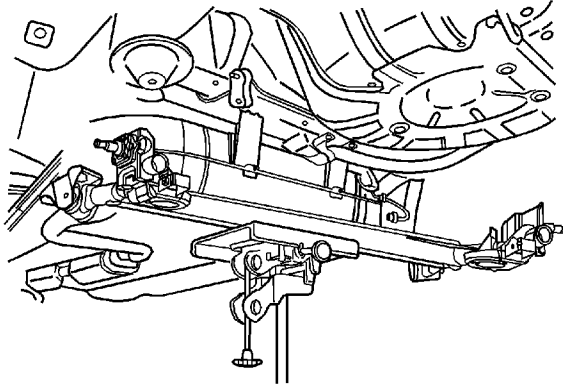
#### **Tighten**

Tighten the nut to 190 N·m (140 lb ft).

3. Stake the caulking nut.
4. Install the brake drum. Refer to [Brake Drum Replacement](#).
5. Install the rear wheel speed sensor, if equipped. Refer to [Rear Wheel Speed Sensor Replacement](#).

## Shock Absorber Replacement

### Removal Procedure



**Notice:** Remove only one shock at a time when both shocks are being replaced. Do not suspend the rear axle by the brake hoses. Damage to the brake hoses may result.

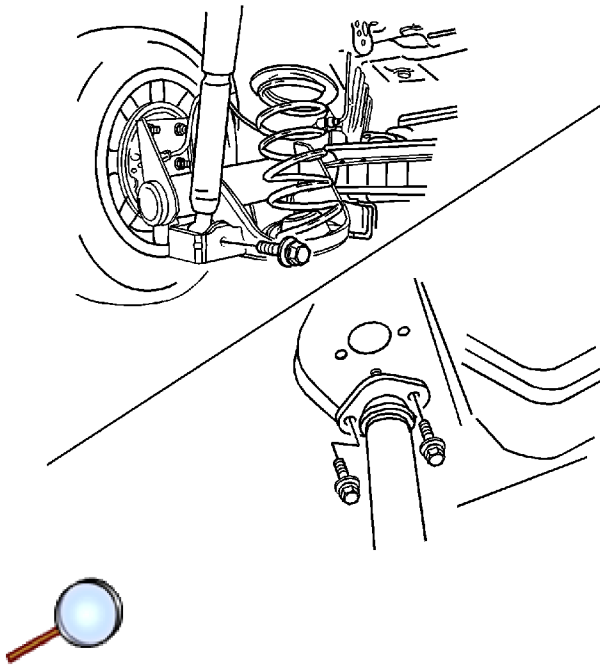
1. Remove the shock absorber-to-body bolts - upper.

**Notice:** Refer to [Vehicle Lifting and Jacking Notice](#) in the Preface section.

**Important:** When lifting the vehicle with a body hoist, it will be necessary to support the rear axle with adjustable jack stands.

2. Raise the vehicle and support the rear axle assembly.
3. Remove the lower shock absorber-to-axle bolt.
4. Remove the shock absorber.

### Installation Procedure



**Important:** It will be necessary to bring the axle assembly to trim height prior to tightening the shock absorber attachment bolts.

1. Insert the lower shock absorber-to-axle bolt through the shock absorber lower attachment bracket and into the axle.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

2. Lower the vehicle enough to guide the upper shock stud on the body opening and loosely install the attaching bolts.

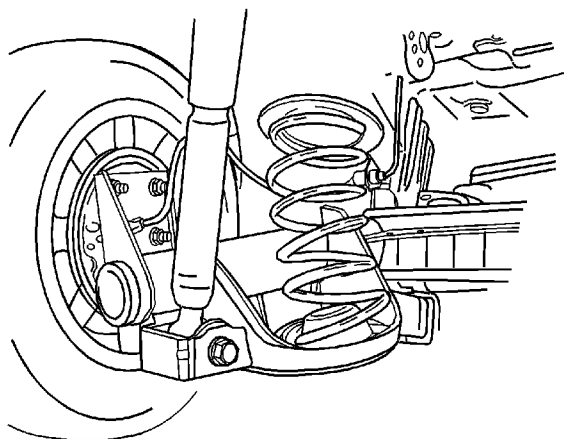
### Tighten

- Tighten the lower shock absorber-to-axle bolt to 72 N·m (53 lb ft).
- Tighten the upper shock absorber-to-body bolt to 50 N·m (37 lb ft).

## Coil Spring Replacement

### Removal Procedure

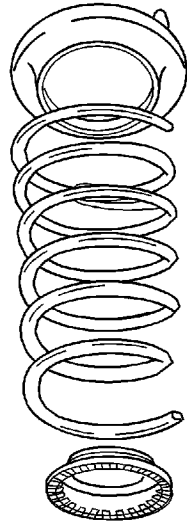
**Notice:** Refer to [Vehicle Lifting and Jacking Notice](#) in the Preface section.



**Caution:** When removing the rear springs, do not use a twin-post type hoist. The swing arch tendency of the rear axle assembly when certain fasteners are removed may cause it to slip from the hoist which may cause personal injury.

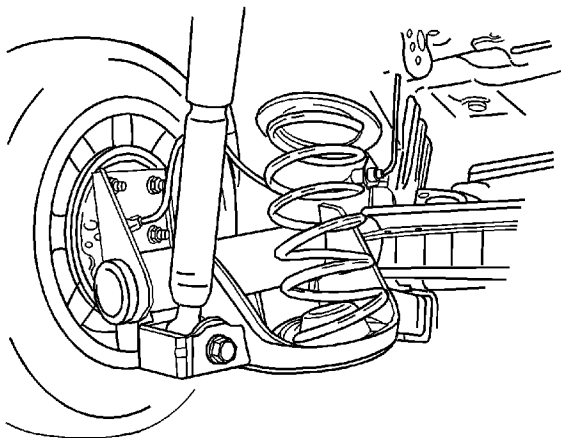
1. Raise and suitably support the vehicle. Use a frame contact hoist if possible and support the rear control arms with jack stands. If it becomes necessary to lift the vehicle with a twin-post hoist, lift the body and support the control arms with jack stands.
2. Remove the wheel. Refer to [Tire and Wheel Removal and Installation](#) .
3. Remove the right and the left shock absorber bolts. Refer to [Shock Absorber Replacement](#) .
4. Lower the rear axle and remove the springs and the top insulator.

### Installation Procedure



**Important:** Prior to installing the springs, it will be necessary to install the upper insulators to the body and adhesive to keep them in position while raising the axle assembly and the springs.

1. Install the upper insulator and seat the lower bumper.



2. Install the springs and raise the axle.
3. Install the shock absorbers. Refer to [Shock Absorber Replacement](#) .

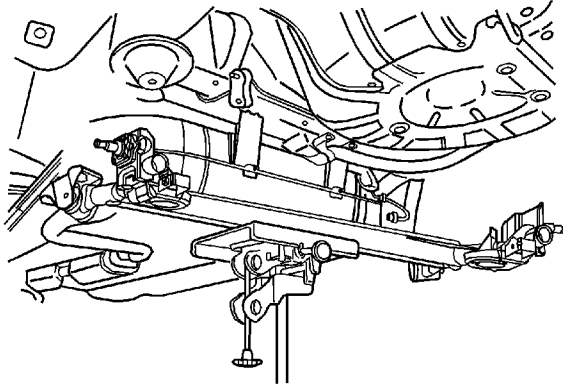
**Important:** It will be necessary to bring the axle assembly to trim height prior to tightening the shock absorber attachment bolts.

4. Install the wheel. Refer to [Tire and Wheel Removal and Installation](#) .

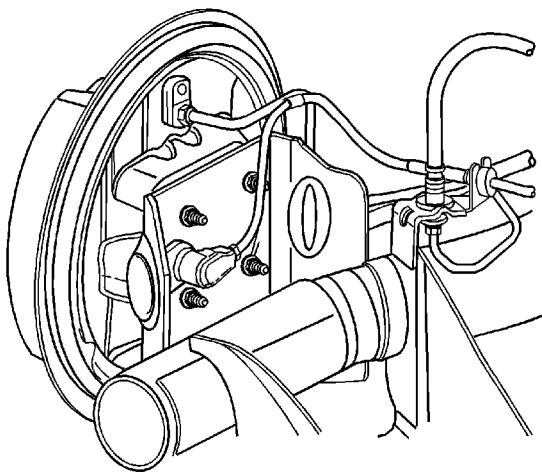
5. Remove the jack stands and lower the vehicle.

## Rear Axle Replacement

### Removal Procedure



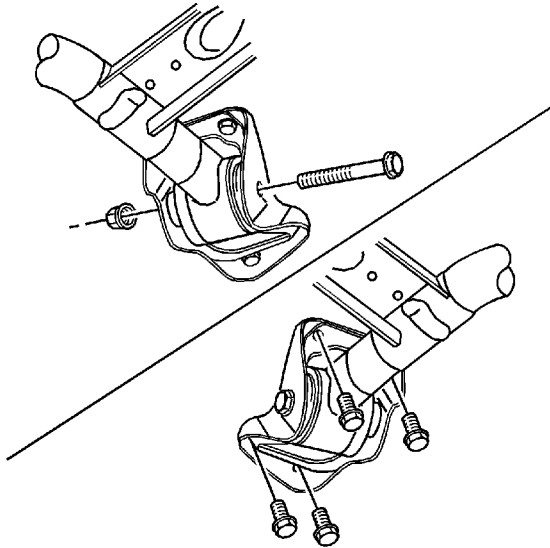
1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the rear tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#) .
3. Remove the brake shoes. Refer to [Brake Shoe Replacement](#) .
4. Remove the park brake cable from the rear axle. Refer to [Park Brake Cable Replacement](#) .
5. Disconnect the wheel speed sensor connector, if equipped.







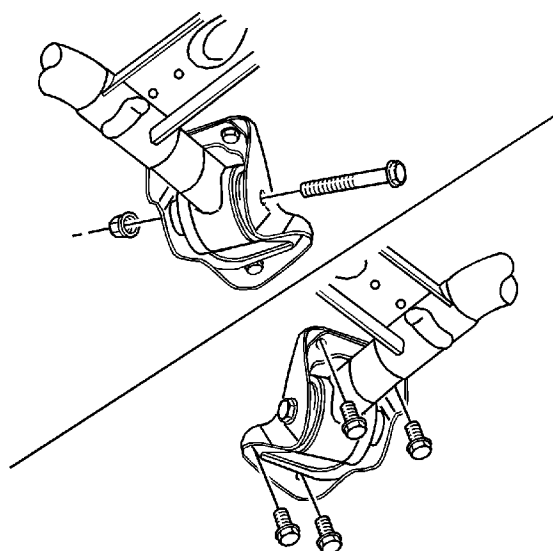
6. Remove the brake pipes from the brake hoses at the rear axle brackets. Cap or tape the brake hose openings to prevent entry of foreign matter.
7. Remove the retaining clips from the brake hoses.
8. Unclip the brake hoses from the rear axle brackets.
9. Place support jacks under the arms of the rear axle and raise the rear axle arms slightly.
10. Remove the shock absorbers. Refer to [Shock Absorber Replacement](#).
11. Lower the support jacks and remove the rear springs. Refer to [Coil Spring Replacement](#).



12. Remove the left axle-to-bracket nut and bolt from the bracket. Pry the rear axle slightly, if necessary.
13. Remove the right axle mounting bracket bolts from the underbody.
14. Remove the rear axle from the vehicle.
15. Remove the right axle-to-bracket nut and bolt from the bracket.
16. Remove the right axle bracket from the axle.
17. Remove the remaining drum brake components from the axle. Refer to [Rear Brake Backing Plate Replacement](#).

## Installation Procedure

1. Install the backing plate and the wheel cylinder to the axle. Refer to [Rear Brake Backing Plate Replacement](#).



2. Install the right axle bracket to the axle.
3. Loosely install the right axle-to-bracket nut and bolt to the right axle bracket.
4. Raise and support the rear axle.
5. Loosely install the left axle-to-bracket nut and bolt to the left axle bracket.
6. Apply blue medium strength threadlocker, GM P/N 12345382, or equivalent, to the right axle mounting bracket bolts.

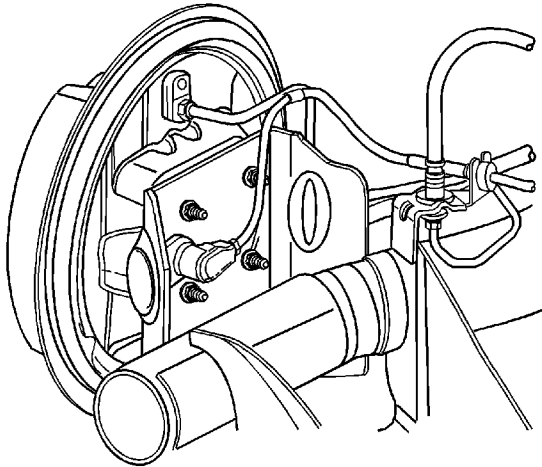
**Notice:** Refer to [Fastener Notice](#) in the Preface section.

7. Install the right axle mounting bracket bolts to the underbody.

### **Tighten**

Tighten the axle mounting bracket bolts to 70 N·m (52 lb ft).

8. Install the rear springs and insulators. Refer to [Coil Spring Replacement](#) .
9. Install the shock absorbers to the axle with the lower attachment bolts. Refer to [Shock Absorber Replacement](#) .
10. Install the brake hoses to the brackets on the rear axle.
11. Install the retaining clips to the brake hoses.
12. Install the brake pipes to the brake hoses.
13. Install the park brake cable to the rear axle. Refer to [Park Brake Cable Replacement](#) .
14. Install the brake shoes. Refer to [Brake Shoe Replacement](#) .
15. Connect the wheel speed sensor connector, if equipped.



16. Bleed the brake system and inspect for leaks. Refer to [Hydraulic Brake System Bleeding](#) .
17. If necessary, adjust the park brake. Refer to [Park Brake Adjustment](#) .
18. Lower the vehicle slightly and install the rear tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#) .
19. Lower the vehicle.
20. Raise the vehicle on an alignment rack. Refer to [Lifting and Jacking the Vehicle](#) .
21. With the weight of the vehicle on the tires, tighten the lower shock absorber-to-axle bolts.

**Tighten**

Tighten the lower shock absorber-to-axle bolts to 72 N·m (53 lb ft).

22. Tighten the axle-to-bracket nuts and bolts.

**Tighten**

Tighten the axle-to-bracket nuts and bolts to 115 N·m (85 lb ft).

23. Lower the vehicle.

## Wheel Stud Replacement

### Removal Procedure

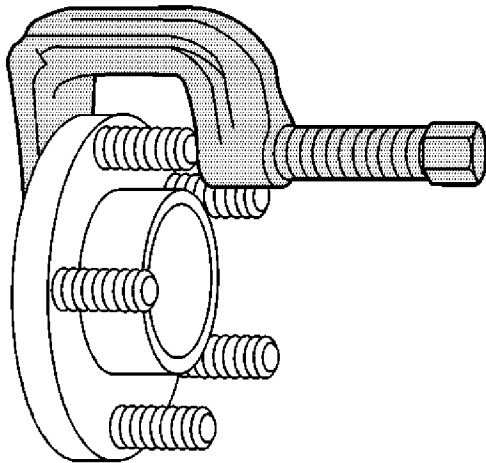
#### Tools Required

[J 43631](#) Ball Joint Remover

1. Remove the brake drum. Refer to [Brake Drum Replacement](#).

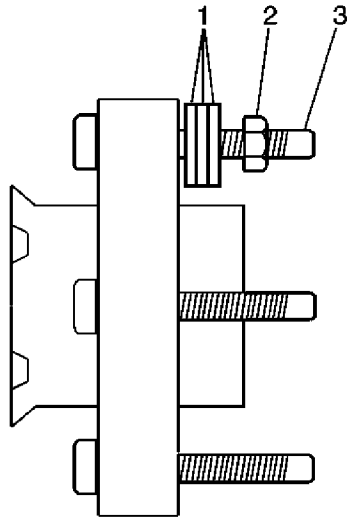
**CAUTION::** If one stud is damaged, replace all the studs. A loose-running wheel may cause only one stud to break, but the other studs could have internal fatigue. Replacing only the broken stud and remounting the wheel may cause further damage and personal injury. If the stud holes in the wheels have become enlarged or distorted, replace the wheel.

2. Install 2 wheel nuts onto 2 wheel studs.
3. Use a pry bar on the 2 nuts in order to prevent the hub from turning.



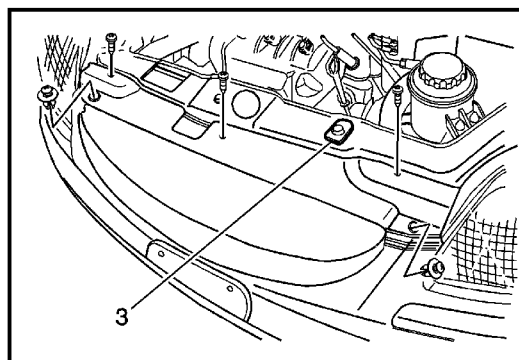
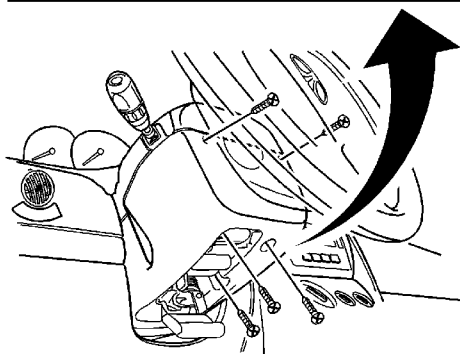
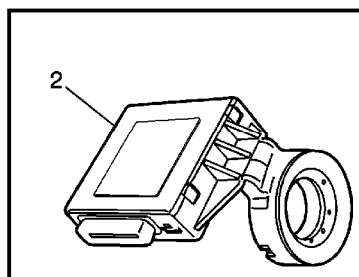
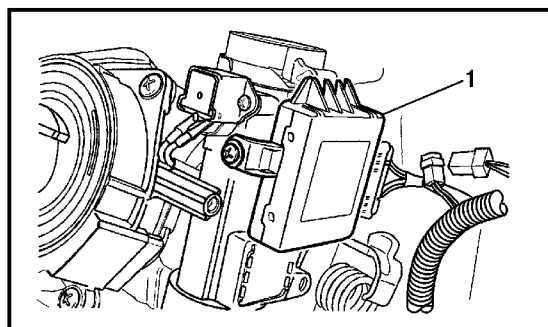
4. Use the [J 43631](#) in order to remove the stud.

### Installation Procedure



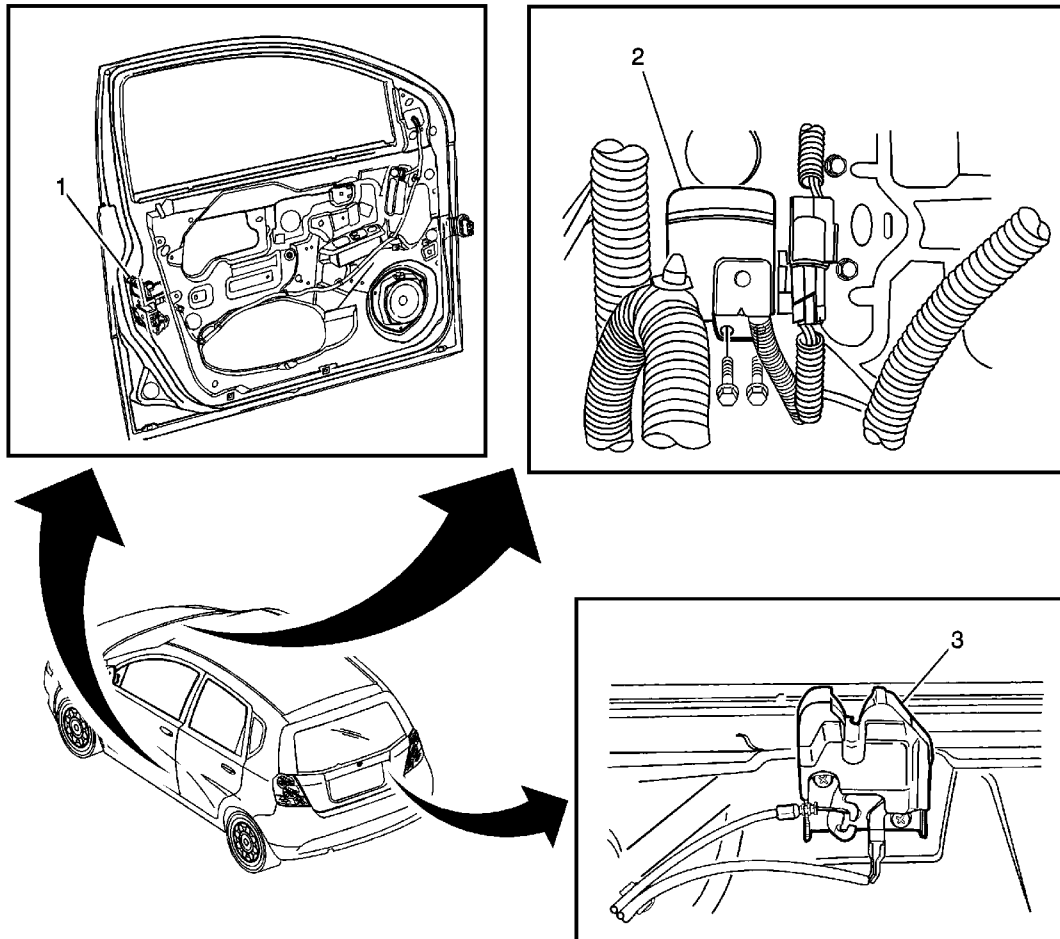
1. Install the wheel stud (3) into the stud hole.
2. Install 3 washers (1) and a wheel nut (2) onto the stud.
3. Install 2 wheel nuts onto 2 studs.
4. Use a pry bar on the 2 nuts in order to prevent the hub from turning.
5. Tighten the wheel nut in order to seat the stud.
6. Remove the 3 wheel nuts and the 3 washers.
7. Install the brake drum. Refer to [Brake Drum Replacement](#).

## Vehicle Theft Deterrent System Components



- (1) Theft Deterrent Control Module
- (2) Theft Deterrent Control Module (removed)
- (3) Hood Ajar Switch

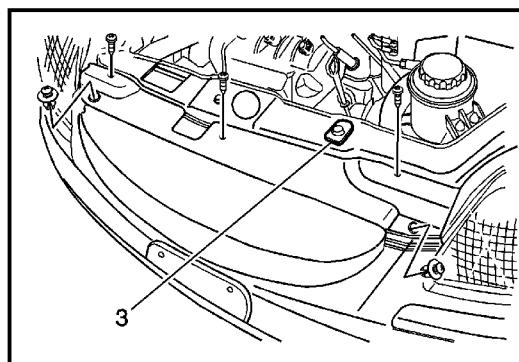
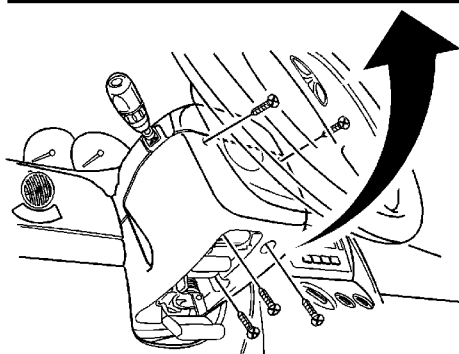
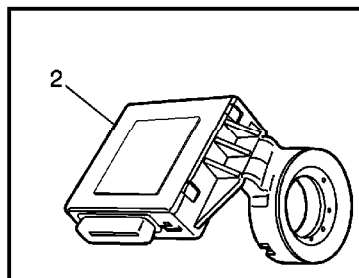
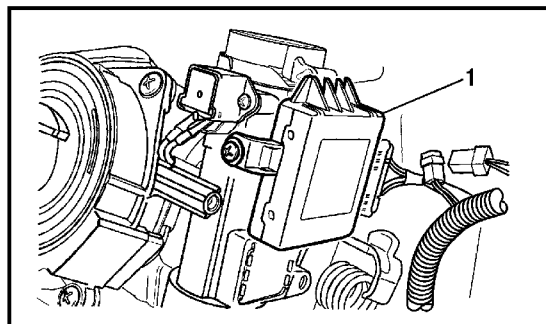
## Content Theft Components



- (1) Door Latch Left - Right Similar
- (2) Theft Deterrent Alarm
- (3) Lock Cylinder Switch - Rear Compartment Lid

## Remote Function Component Views (Hatchback)

### Vehicle Theft Deterrent System Components

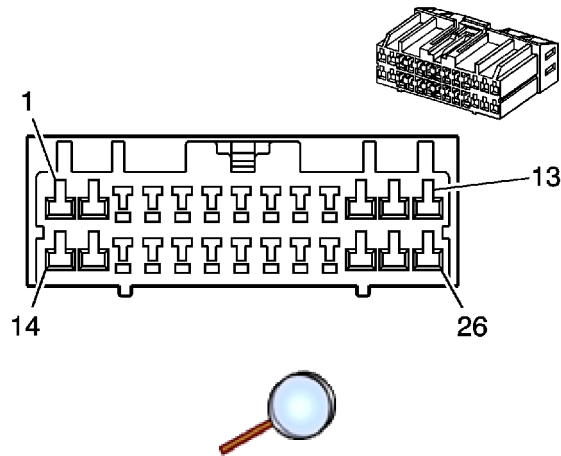


- (1) Theft Deterrent Control Module
- (2) Theft Deterrent Control Module (removed)
- (3) Hood Ajar Switch



## Remote Function Connector End Views (Notchback)

### Remote Control Door Lock Receiver (RCDLR)/Theft Deterrent Control Module



#### Connector Part Information

- KET MG 611336
- 26-Way F PCB Connector (WH)

Pin	Wire	Circuit	Function
1	YE	--	Arm Alarm Signal
2	BK	--	Ground
3	--	--	Not Used
4	PU	--	Rear Compartment Lid Switch Signal
5	OG/BK	--	Rear Compartment Lid Ajar Switch Signal
6	--	--	Not Used
7	PK/D-BU	--	Hood Ajar Switch Signal
8	WH	--	Door Ajar Signal
9	L-BU	--	Door Lock Control
10	GY/D-GN	--	Driver Door Lock Relay Lock Control
11	YE	--	Driver Door Lock Relay Unlock Control
12	PU	--	Door Latch Switch Signal
13	D-BU	--	Right Turn Signal Lamps Supply Voltage
14	BN	--	Rear Compartment Lid Switch Signal
15	PK	--	Ignition 1 Voltage
16	--	--	Not Used
17	BK/WH	--	Serial Data
18	L-GN	--	Key In Ignition Switch Signal
19	YE	--	Security Indicator Control
20	PU	--	Door Latch Switch Signal

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21-24	--	--	Not Used
25	RD/WH	--	Battery Positive Voltage
26	L-BU	--	Left Turn Signal Lamps Supply Voltage

## Remote Function Connector End Views (Hatchback)

Table 1: [Hood Ajar Switch](#)

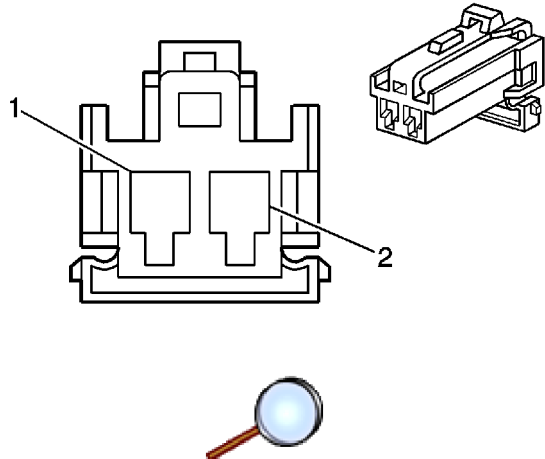
Table 2: [Lock Cylinder Switch - Rear Compartment](#)

Table 3: [Remote Control Door Lock Receiver \(RCDLR\)](#)

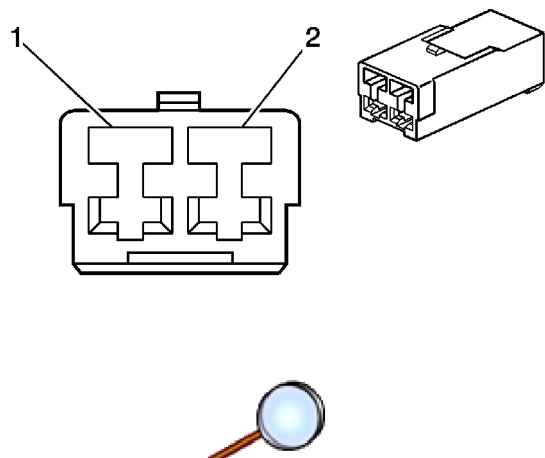
Table 4: [Theft Deterrent Alarm](#)

Table 5: [Theft Deterrent Control Module](#)

### Hood Ajar Switch

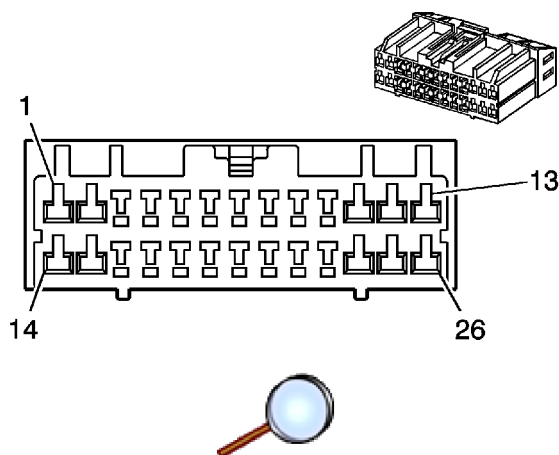
			
Connector Part Information		<ul style="list-style-type: none"><li>• KET MG 610392</li><li>• 2-Way F Series Sealed (WH)</li></ul>	
Pin	Wire	Circuit	Function
1	BN/BK	109	Hood Ajar Switch Signal
2	OG	1440	Battery Positive Voltage

### Lock Cylinder Switch - Rear Compartment

			
		<ul style="list-style-type: none"><li>• KET MG 610070</li></ul>	
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Connector Part Information		• 2-Way F 090 (2.3 mm) Series (WH)	
Pin	Wire	Circuit	Function
1	D-BU	737	Rear Compartment Lid Ajar Switch Signal
2	BK	850	Ground

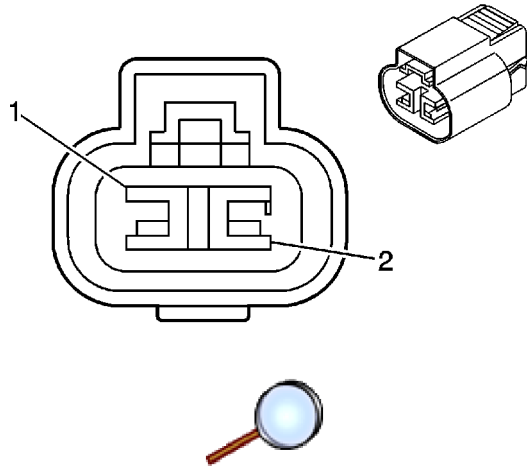
### Remote Control Door Lock Receiver (RCDLR)



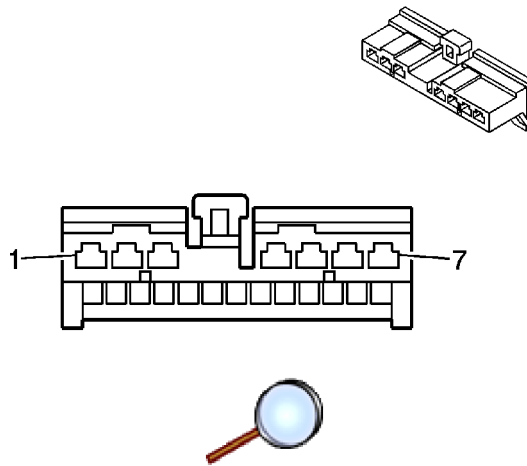
Connector Part Information		<ul style="list-style-type: none"> <li>• KET MG 611336</li> <li>• 26-Way F PCB Connector (WH)</li> </ul>	
Pin	Wire	Circuit	Function
1	D-GN/WH	261	Arm Alarm Signal
2	BK	650	Ground
3	--	--	Not Used
4	D-BU	49	Tamper Switch Signal (4-Door)
5	OG/BK	737	Rear Compartment Lid Ajar Switch Signal
6	--	--	Not Used
7	BN/BK	109	Hood Ajar Switch Signal
8	D-GN/WH	157	Courtesy Lamp Control
9	GY	195	Door Lock Control
10	GY/D-GN	355	Low Speed Cooling Fan Relay Control
11	YE/D-GN	356	Driver Door Lock Relay Unlock Control
12	D-BU	49	Tamper Switch Signal
13	D-BU	15	Right Turn Signal Lamps Supply Voltage
14	--	--	Not Used
15	PK	239	Ignition 1 Voltage
16	--	--	Not Used
17	BK/WH	2051	Serial Data
18	L-GN	80	Key In Ignition Switch Signal
19	YE	749	Security Indicator Control
20	D-BU	49	Tamper Switch Signal

21-24	--	--	Not Used
25	OG	1340	Battery Positive Voltage
26	L-BU	14	Left Turn Signal Lamps Supply Voltage

### Theft Deterrent Alarm

			
Connector Part Information		<ul style="list-style-type: none"> <li>• KUM PB 625-02027</li> <li>• 2-Way F NMWP 04F-B Assembly (BK)</li> </ul>	
Pin	Wire	Circuit	Function
1	D-GN/WH	261	Arm Alarm Signal
2	BN	641	Ignition 3 Voltage

### Theft Deterrent Control Module

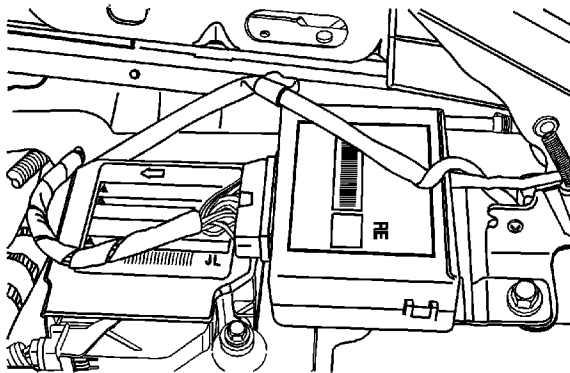
			
Connector Part Information		<ul style="list-style-type: none"> <li>• SD 35508-0700</li> <li>• 7-Way Connector F (WH)</li> </ul>	
Pin	Wire	Circuit	Function
1	PK	239	Ignition 1 Voltage
2	OG	240	Battery Positive Voltage
3	--	--	Not Used

4	BK	450	Ground
5	D-BU/WH	1800	Battery Positive Voltage
6	BK/WH	2051	Serial Data
7	YE	749	Security Indicator Control

## Remote Control Door Lock Receiver Replacement (Hatchback)

### Removal Procedure

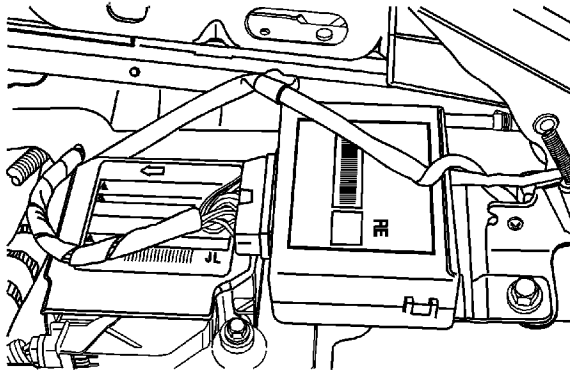
**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.



**Important:** Remote keyless transmitters must be programmed when remote control module/receiver is replaced.

1. Disconnect the negative battery cable.
2. Remove the floor console. Refer to [Front Floor Console Replacement](#) .
3. Disconnect the control module/receiver electrical connector.
4. Slide the control module/receiver away from its mounting bracket.

### Installation Procedure



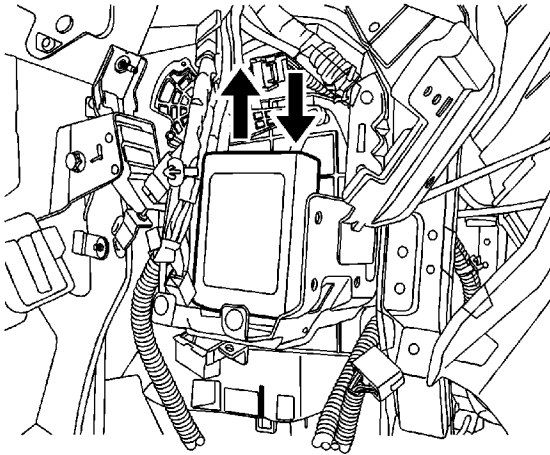
1. Install the control module/receiver on its mounting bracket.
2. Connect the control module/receiver electrical connector.
3. Install the floor console. Refer to [Front Floor Console Replacement](#) .
4. Connect the negative battery cable.
5. Complete remote keyless transmitter programming. Refer to [Transmitter Programming](#)



## Remote Control Door Lock Receiver Replacement (Notchback)

### Removal Procedure

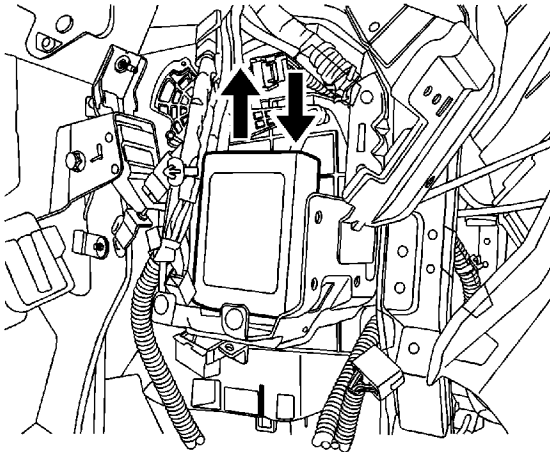
**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.



**Important:** Remote keyless transmitters must be programmed when remote control module/receiver is replaced.

1. Disconnect the negative battery cable.
2. Separate the hood release cable from the hood latch release handle.
3. Carefully pull the instrument panel under cover until the mounting clips are released and the instrument panel under the cover.
4. Remove the bolts from the driver's side knee bolster.
5. Disconnect the control module/receiver electrical connector.
6. Slide the control module/receiver away from its mounting bracket.

### Installation Procedure



1. Install the control module/receiver on its mounting bracket.
2. Connect the control module/receiver electrical connector.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

3. Install the knee bolster with bolts.

#### **Tighten**

Tighten the driver's side knee bolster mounting bolts to 10 N m (89 lb in).

4. Install the instrument panel under cover.
5. Connect the hood release cable to the hood latch release handle.
6. Install the screws.
7. Connect the negative battery cable.
8. Complete remote keyless transmitter programming. Refer to [Transmitter Programming](#)

---

## Transmitter Programming

### Remote Keyless Entry Transmitter Programming

The remote keyless entry system allows for the use of as many as five (5) transmitters for each vehicle. Replacement remote keyless entry system transmitters must first be programmed to specific vehicle using the Secan tool. This process is completed using serial data communication between the scan tool and the remote keyless entry control unit and is the only method available for programming transmitters.

All transmitters for a specific vehicle must be programmed at same time. Once the programming function of the remote keyless entry system is activated, any transmitter (existing or new) that is not programmed (or reprogrammed) during the programming procedure will no longer operate the remote keyless entry system of that vehicle. Ensure that the doors, hood and trunk/tailgate hatch are closed prior to starting the programming procedure.

Ensure that transmitters from other vehicles in the immediate area are not activated during programming procedure. Turn the ignition to ON before installing in the scan tool. Failure to connect in this procedure may cause communication errors and the programming procedure will not complete.

Any keys that are not programmed at this time will no longer function.

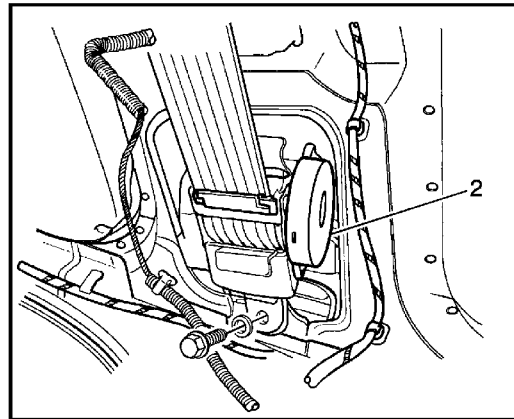
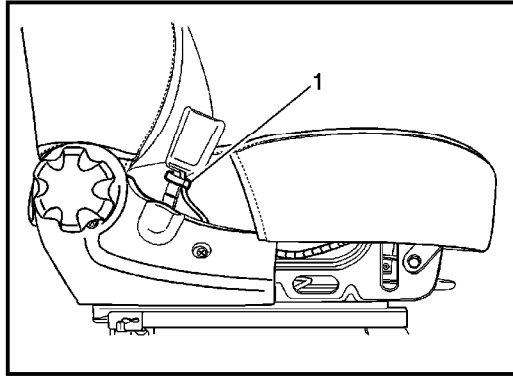
1. Turn ON the ignition, with the engine OFF.
2. Install the scan tool.
3. Select PROGRAMMING KEY FOBS from the BODY menu.
4. Follow the scan tool instruction with each key until all keys are programmed.
5. Turn the ignition to the LOCK position, disconnect the Tech 2 and test all the keys.

## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Child Seat Tether Anchor Bolt (Except 4-Door North America Vehicles)	25 N·m	18 lb ft
Child Seat Tether Anchor Bolt (4-Door North America Vehicles)	38 N·m	28 lb ft
Seat Belt Anchor Bolt	38 N·m	28 lb ft
Seat Belt Buckle Bolt	38 N·m	28 lb ft
Seat Belt Height Adjuster Bolts	27 N·m	20 lb ft
Seat Belt Retractor Bolt	38 N·m	28 lb ft

## Seat Belt Component Views

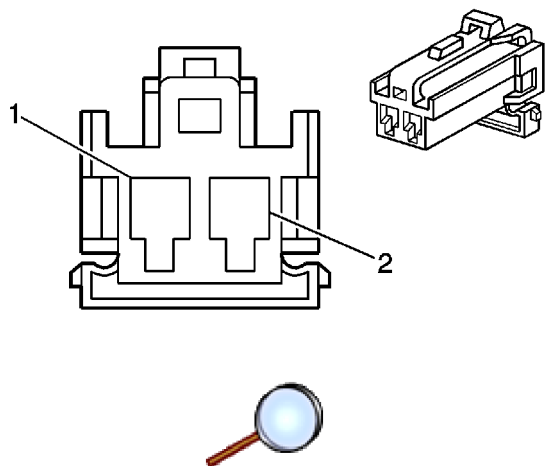
### Seat Belt Assembly



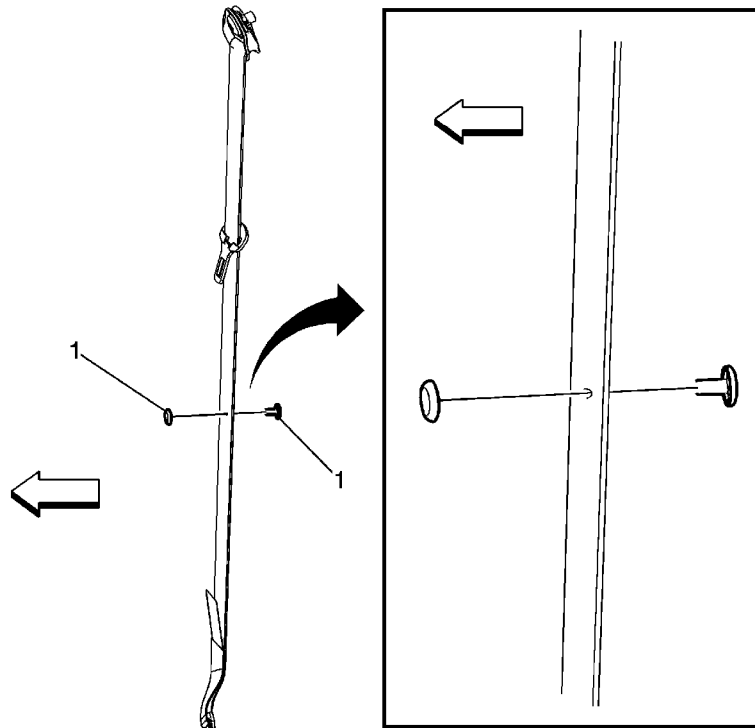
- (1) Seat Belt Switch - Left
- (2) Seat Belt Pretensioner - Left and Right

## Seat Belt Connector End Views

### Seat Belt Switch

			
<b>Connector Part Information</b>		<ul style="list-style-type: none"><li>• KET MG 610392</li><li>• 2-Way F Series Sealed (WH)</li></ul>	
Pin	Wire	Circuit	Function
1	BN/WH	--	Seat Belt Switch - Driver (Notchback)
	D-GN	238	Seat Belt Switch - Driver (Hatchback)
2	BK	650	Ground

## Seat Belt Latch Stop Installation



Callout	Component Name
<b>Preliminary Procedure</b>	
<ol style="list-style-type: none"><li>1. Locate the hole in the seat belt webbing where the original seat belt stop button was located.</li><li>2. If the original hole in the seat belt webbing is not visible, perform the following:<ul style="list-style-type: none"><li>• If either the right or left stop button is missing use the opposing seat belt as a reference.</li><li>• With the opposing seat belt fully stowed, measure the distance between the seat belt lower anchor and the stop button.</li><li>• Using the measurement obtained above, measure and mark the location of the missing stop button on the center of the seat belt webbing.</li></ul></li><li>3. Ensure the seat belt latch plate is located above the mark or original hole.</li></ol>	
1	<p>Seat Belt Stop Button</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"><li>1. Work the male half of the stop button through the hole in the webbing or at the marked location.</li><li>2. Align the female half of the stop button with the male half of the stop button.</li></ol>

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3. Snap the two halves together.
4. Trim off any excess of the male half of the stop button flush with the female half of the stop button.

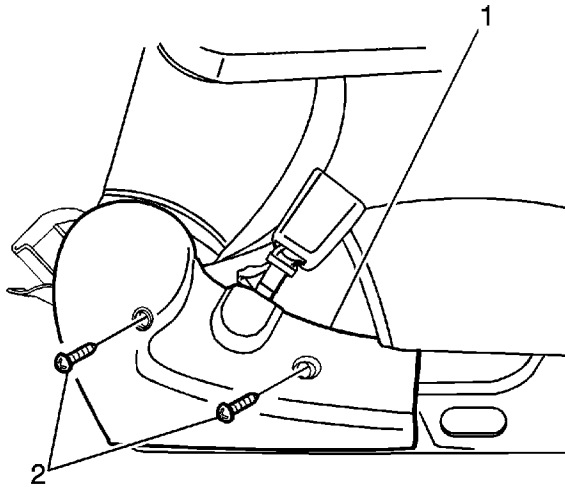
**Tip**

Ensure the male half of the stop button is facing forward in the vehicle in order to ensure the stop button will not snag customers clothing.

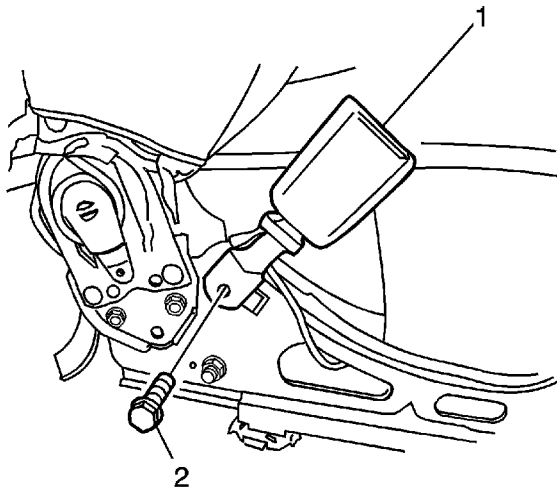


## Driver or Passenger Seat Belt Buckle Replacement (Lever Type Recliner)

### Removal Procedure



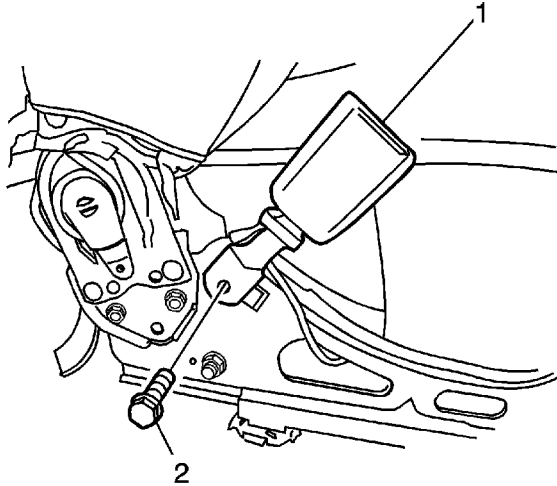
1. Remove the screws (2) and the trim cover (1).



2. Remove the bolt (2) and the seat belt buckle (1).

## Installation Procedure

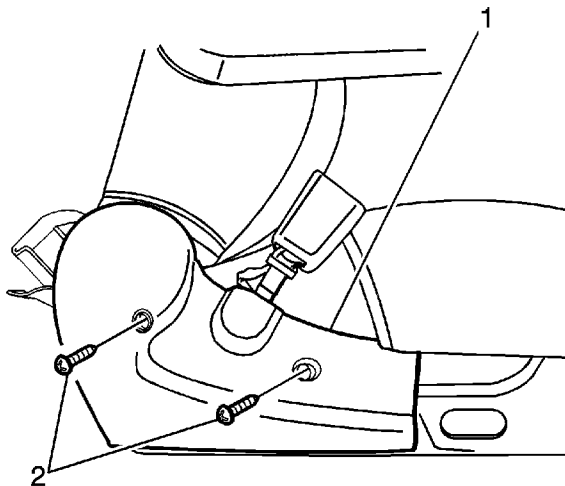
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the seat belt buckle (1) and secure with bolt (2).

### Tighten

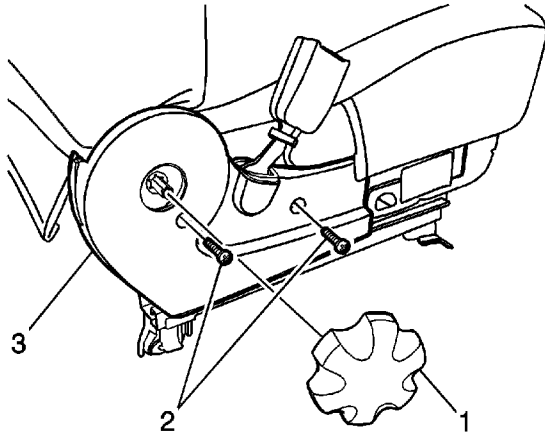
Tighten the seat belt retractor bolt to 38 N·m (28 lb ft).



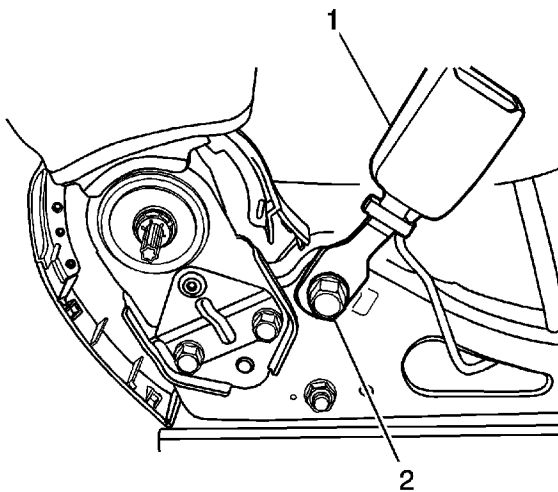
2. Install the trim cover (1) and secure with the screws (2).

## Driver or Passenger Seat Belt Buckle Replacement (Knob Type Recliner)

### Removal Procedure



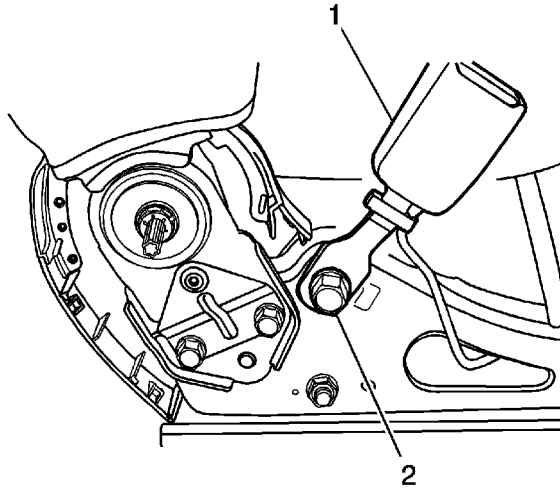
1. Remove the knob (1), screws (2) and the trim cover (3).



2. Remove the bolt (2) and the seat belt buckle (1).

## Installation Procedure

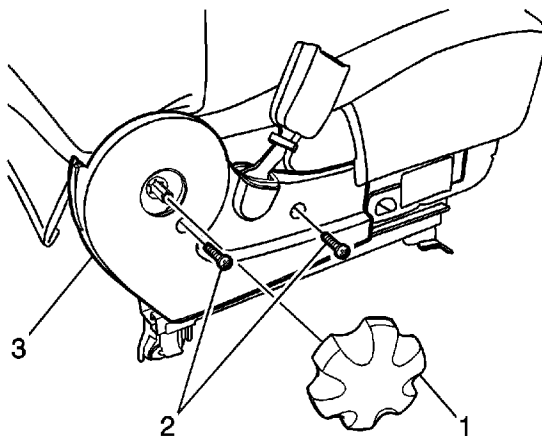
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the seat belt buckle (1) and secure with bolt (2).

### Tighten

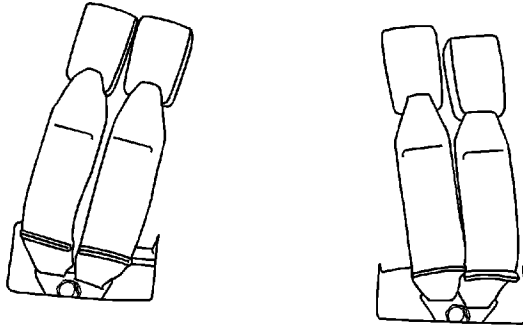
Tighten the seat belt retractor bolt to 38 N·m (28 lb ft).



2. Install the trim cover (3) and secure with the screws (2).
3. Install the knob (1).

## Rear Seat Belt Buckle Replacement

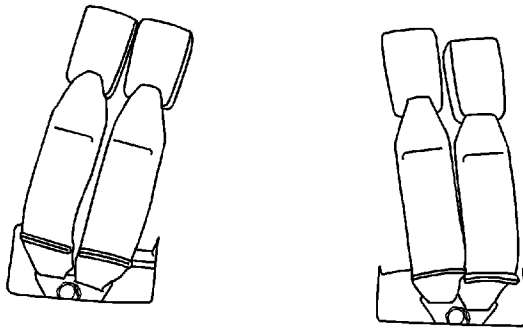
### Removal Procedure



1. Remove the rear seat cushion. Refer to [Rear Seat Cushion Replacement](#).
2. Remove the bolt and the seat belt buckle.

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the seat belt buckle and secure with bolt.

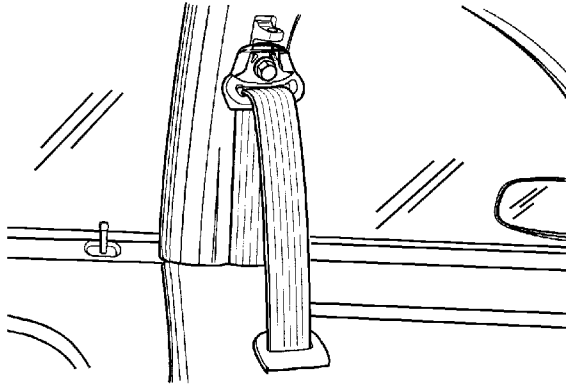
**Tighten**

Tighten the seat belt retractor bolt to 38 N·m (28 lb ft).

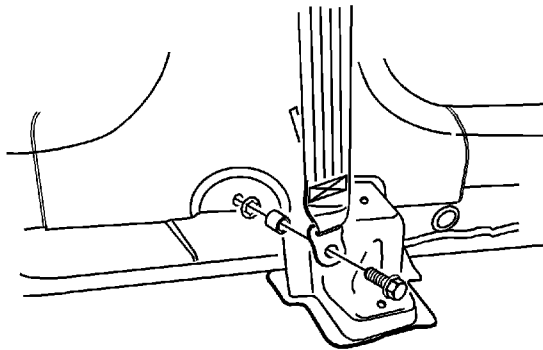
2. Install the rear seat cushion. Refer to [Rear Seat Cushion Replacement](#).

## Front Seat Belt Replacement

### Repair Procedure

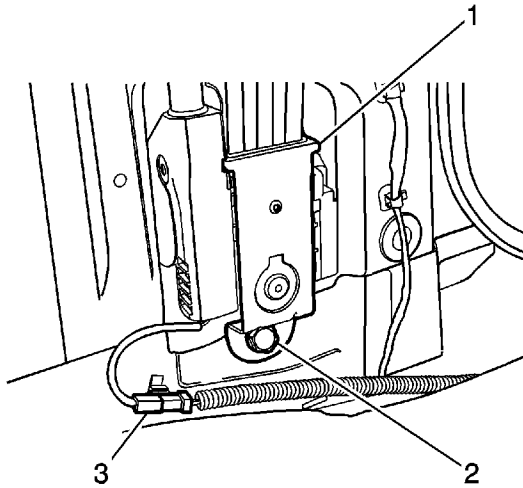


1. Remove the bolt cover, bolt and the seat belt anchor on the upper center pillar.



2. Remove the lower center pillar trim panel. Refer to [Center Pillar Lower Trim Panel Replacement](#).
3. Remove the bolt and the seat belt anchor on the lower center pillar.

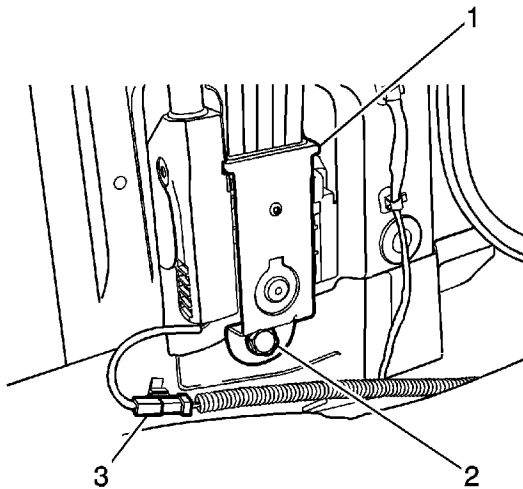
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4. Disconnect the pretensioner connector (3).
5. Remove the bolt (2) and the seat belt retractor (1).

## Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



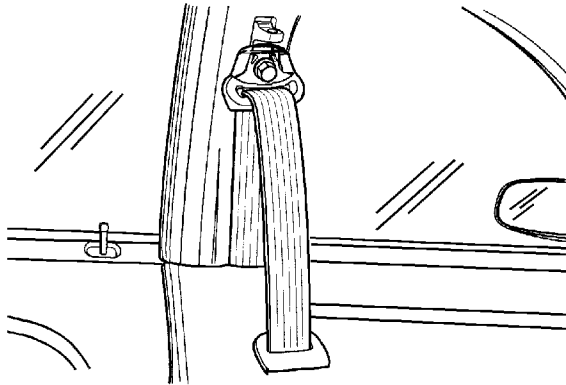
1. Install the seat belt retractor (1) with the bolt (2).

### Tighten

Tighten the seat belt retractor bolt to 38 N·m (28 lb ft).



2. Connect the pretensioner connector (3).

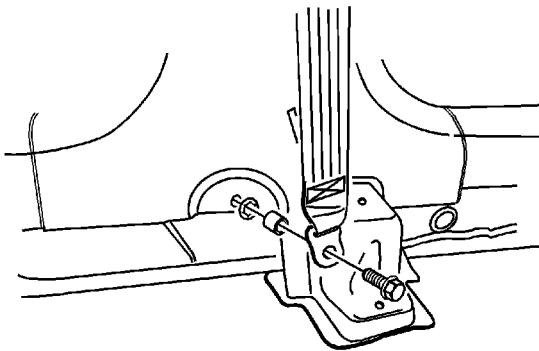


3. Install the seat belt anchor to the upper center pillar with the bolt.

**Tighten**

Tighten the seat belt anchor bolt to 38 N·m (28 lb ft).

4. Install the bolt cover.



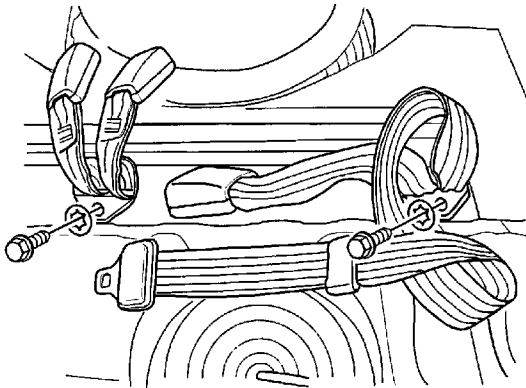
5. Install the lower center pillar trim panel. Refer to [Center Pillar Lower Trim Panel Replacement](#).
6. Install the seat belt anchor to the lower center pillar with the bolt.

**Tighten**

Tighten the seat belt anchor bolt to 38 N·m (28 lb ft).

## Seat Belt Replacement - Center Rear

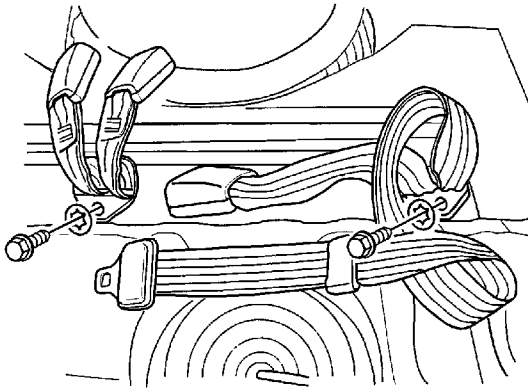
### Removal Procedure



1. Pull the rear seat knob and fold the rear seat cushion.
2. Remove the bolts and the seat belt anchors.
3. Remove the left rear cargo area trim panel and remove the bolt from the rear center seat belt retractor.

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the seat belt anchors with the bolts.

**Tighten**

Tighten the seat belt anchor bolts to 38 N·m (28 lb ft).

2. Install the rear center seat belt retractor with the bolt.

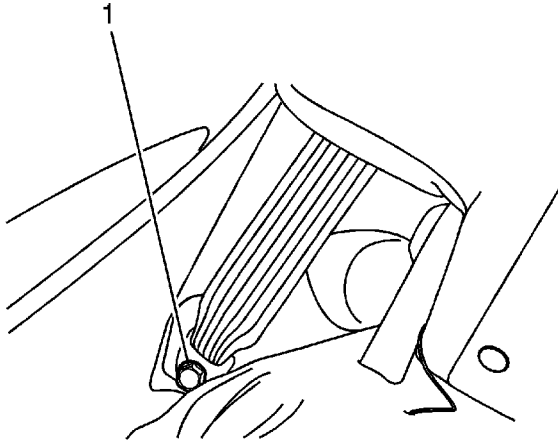
**Tighten**

Tighten the rear center seat belt retractor bolt to 38 N·m (28 lb ft).

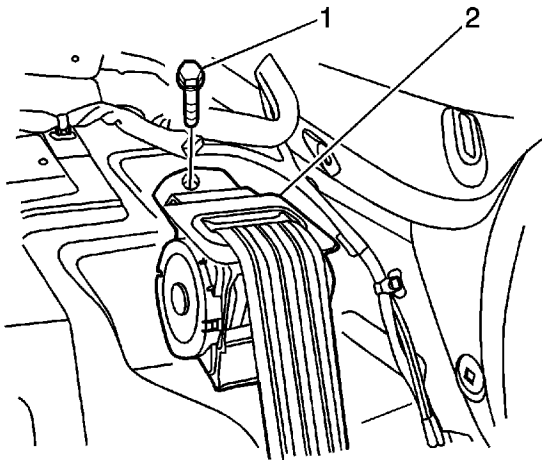
3. Install the rear cargo area trim panel and unfold the rear seat.

## Shoulder Belt Replacement - Rear

### Removal Procedure



1. Remove the bolt (1) and the seat belt anchor on the wheelhouse trim panel.

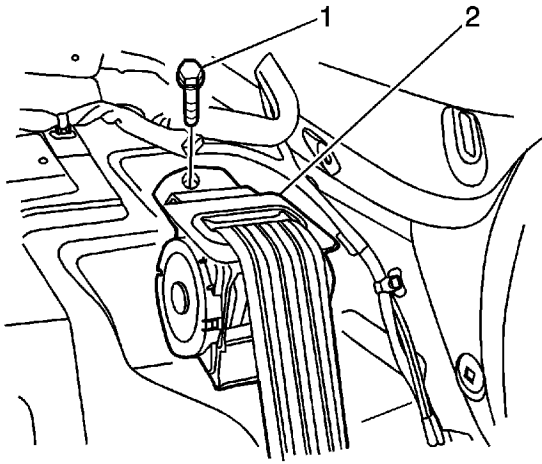


2. Remove the upper back panel shelf. Refer to [Rear Window Shelf Trim Panel Replacement](#).
3. Remove the bolt (1) and the seat belt retractor (2).

### Installation Procedure

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**Notice:** Refer to [Fastener Notice](#) in the Preface section.

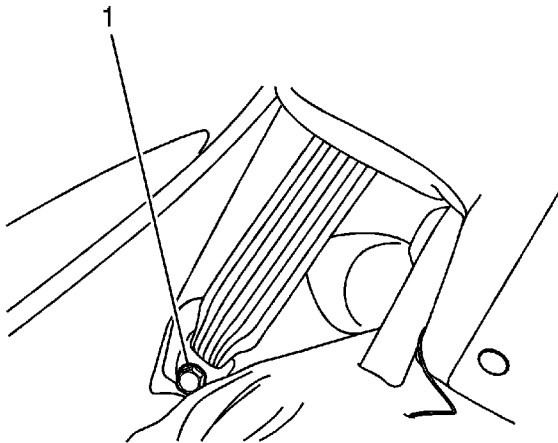


1. Install the seat belt retractor (2) with the bolt (1).

**Tighten**

Tighten the seat belt retractor bolt to 38 N·m (28 lb ft).

2. Install the upper back panel shelf. Refer to [Rear Window Shelf Trim Panel Replacement](#).



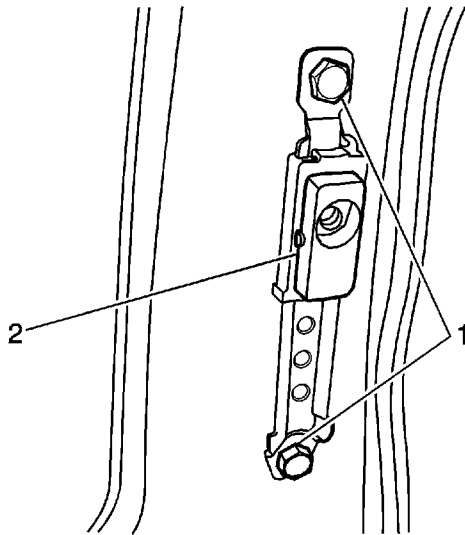
3. Install the seat belt anchor to the upper wheelhouse trim panel with the bolt (1).

**Tighten**

Tighten the seat belt anchor bolt to 38 N·m (28 lb ft).

## Seat Belt Height Adjuster Replacement - Front

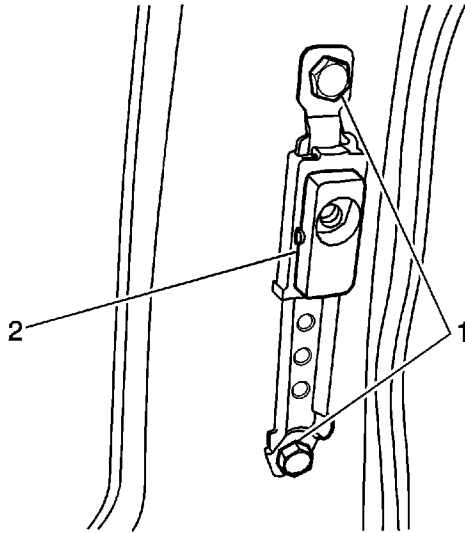
### Removal Procedure



1. Remove the upper center pillar trim panel. Refer to [Center Pillar Upper Trim Panel Replacement](#).
2. Remove the bolts (2) and the seat belt height adjuster (1).

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



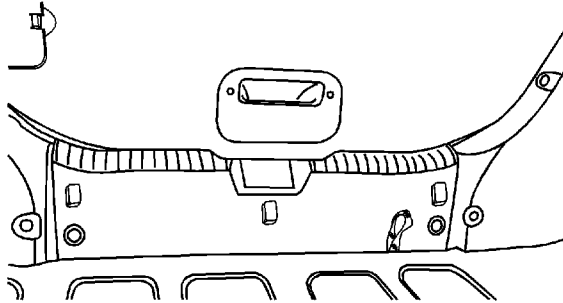
1. Install the seat belt height adjuster (1) with the bolts (2).

**Tighten**

Tighten the seat belt height adjuster bolts to 27 N·m (20 lb ft).

2. Install the upper center pillar trim panel. Refer to [Center Pillar Upper Trim Panel Replacement](#) .

## Child Restraint Tether Anchor Replacement (Five Door) Removal Procedure

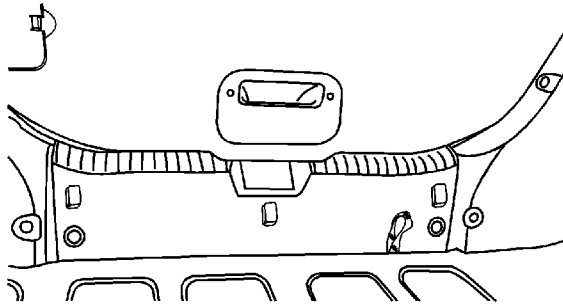


1. Open the tether anchor access cap.
2. Remove the bolt and the tether anchor.

## Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.





1. Install the tether anchor with the bolt.

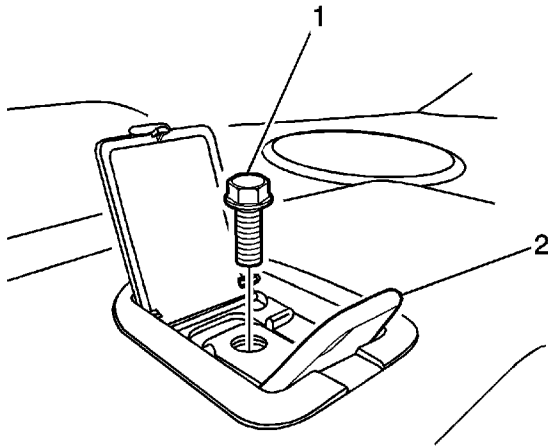
**Tighten**

Tighten the child seat tether anchor bolt to 25 N·m (18 lb ft).

2. Close the tether anchor access cap.

## Child Restraint Tether Anchor Replacement (Four Door North America)

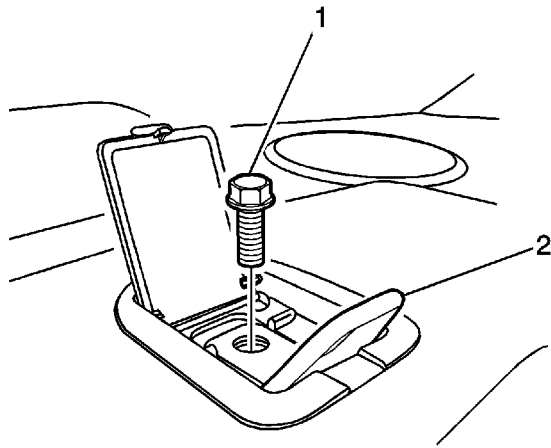
### Removal Procedure



1. Open the tether anchor cover.
2. Remove the bolt (1) and the tether anchor (2).

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the tether anchor (2) with the bolt (1).

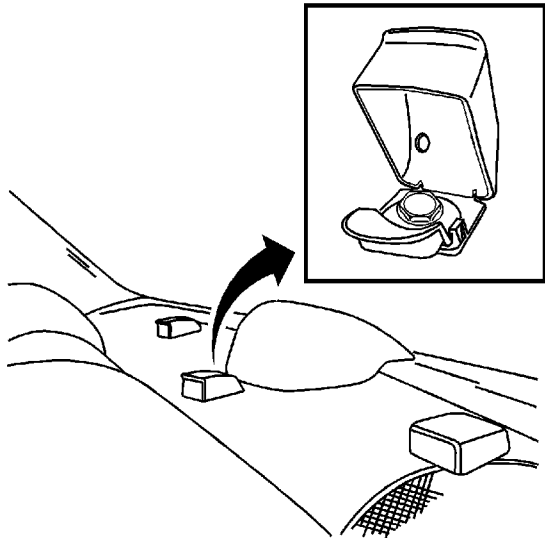
**Tighten**

Tighten the child seat tether anchor bolt to 38 N·m (28 lb ft).

2. Close the tether anchor cover.

## Child Restraint Tether Anchor Replacement (Four Door Except North America)

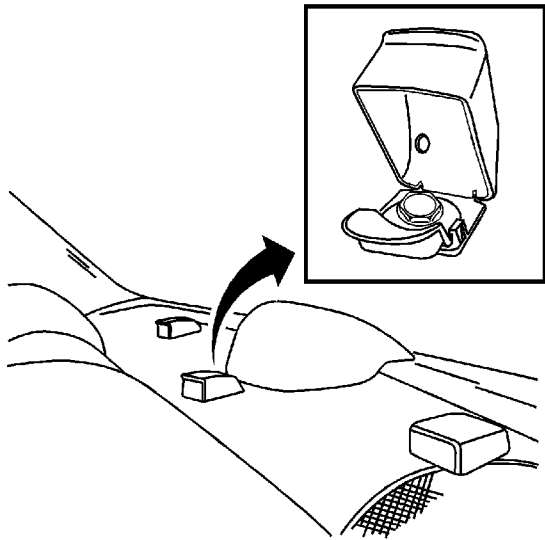
### Removal Procedure



1. Open the tether anchor access cap.
2. Remove the bolt and the tether anchor.

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the tether anchor with the bolt.

**Tighten**

Tighten the child seat tether anchor bolt to 25 N·m (18 lb ft).

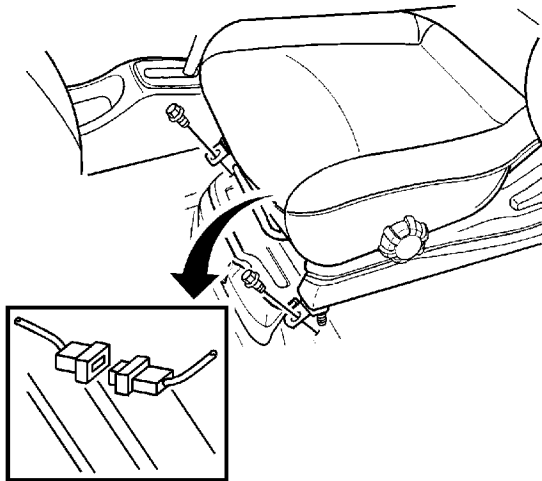
2. Close the tether anchor access cap.

## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Child Seat Anchor	25 N·m	18 lb ft
Front Bucket Seat Bolts	25 N·m	18 lb ft
Front Seat Back Bolts	25 N·m	18 lb ft
Front Seat Belt Buckle Bolt	38 N·m	28 lb ft
Front Seat Cover Screw	12 N·m	106 lb in
Front Seat Cushion Bolts	25 N·m	18 lb ft
Front Seat Recliner Knob Screw (Lever Type)	12 N·m	106 lb in
Lock Assembly Screws	20 N·m	15 lb ft
Lock Striker Bolts	24 N·m	18 lb ft
Lower Rear Seat Belt Anchor Bolt	38 N·m	28 lb ft
Rear Seat Back Bolts	25 N·m	18 lb ft
Rear Seat Bolts	25 N·m	18 lb ft
Rear Seat Cushion Bolt	25 N·m	18 lb ft

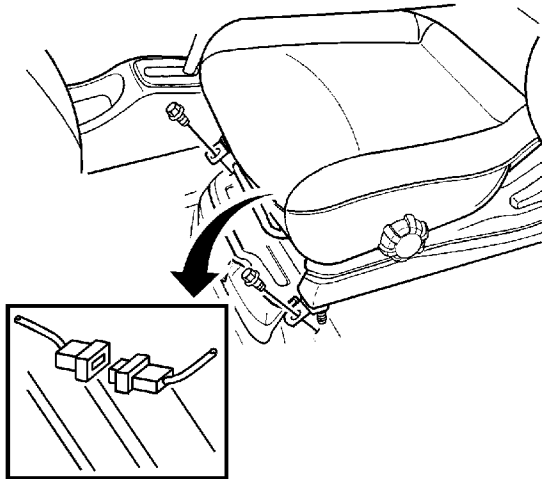
## Front Seat Replacement - Bucket

### Removal Procedure



1. Remove the bolts that secure the rear portion of the seat to the floor.
2. Remove the bolts that secure the front portion of the front seat to the floor.
3. Disconnect the electrical connector from the driver seat.
4. Remove the seat.

### Installation Procedure



1. Connect the electrical connector to the driver seat.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

2. Install the bolts into the front and rear portion of the front seat.

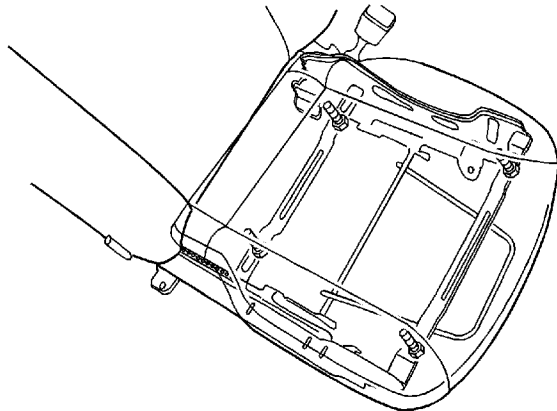
**Tighten**

Tighten the front and rear bucket seat bolts to 25 N·m (18 lb ft).



## Front Seat Adjuster Replacement (Horizontal)

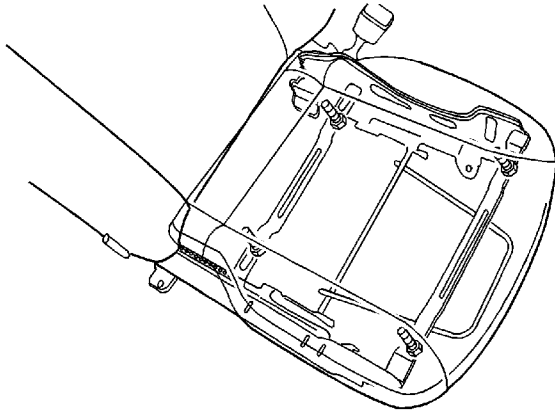
### Removal Procedure



1. Remove the seat back. Refer to [Front Seat Back Replacement](#) .
2. Remove the seat cushion bolts and the front seat adjusters from the seat cushion.

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the front seat adjusters to the seat cushion with the bolts.

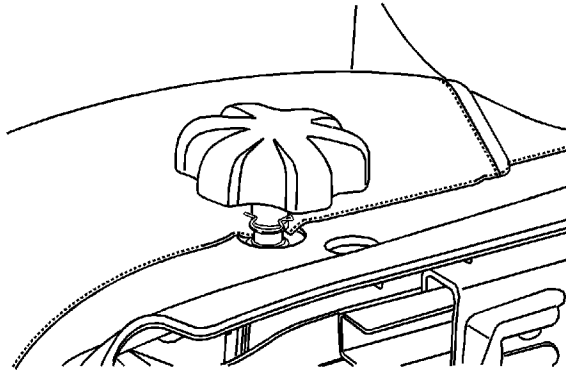
**Tighten**

Tighten the front seat cushion bolts to 25 N·m (18 lb ft).

2. Install the seat back. Refer to [Front Seat Back Replacement](#) .

## Front Seat Adjuster Replacement (Vertical)

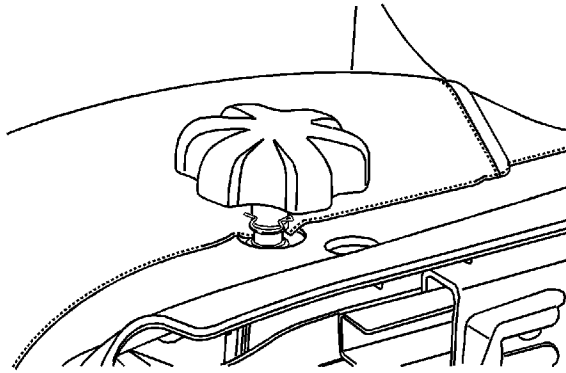
### Removal Procedure



1. Pry off the metal clip.
2. Remove the height adjustment knob.

### Installation Procedure

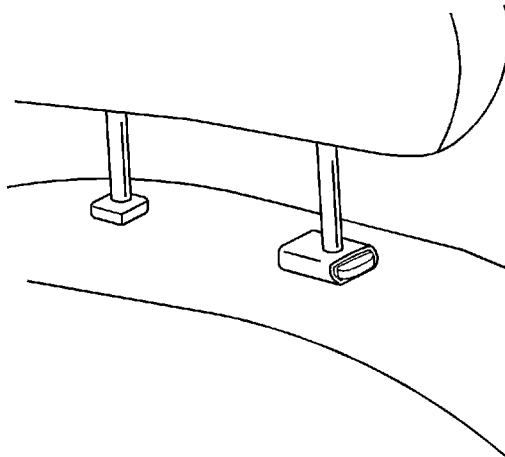
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



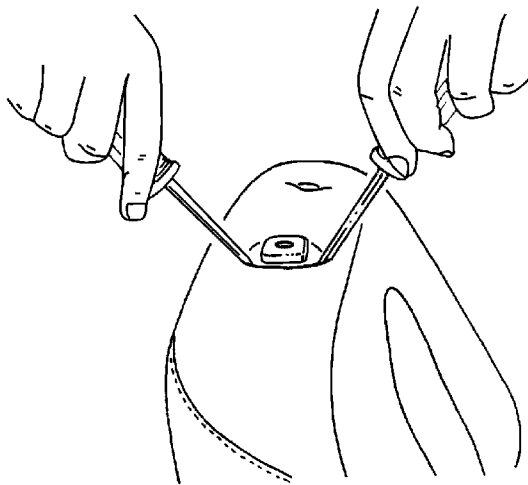
1. Install the height adjuster knob.
2. Install the metal clip.

## Head Restraint Replacement

### Removal Procedure



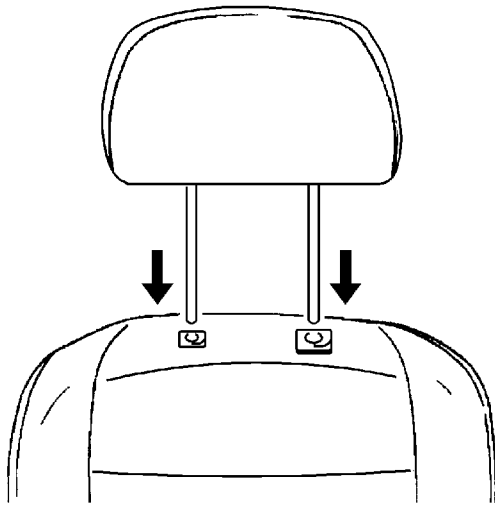
1. Press the head restraint adjust button and remove the head restraint from the seat back.



2. Insert 2 flathead screwdrivers down the front and the back side of the guide sleeves.
3. With the screwdrivers, press in the retaining latches and remove the guide sleeves.

### Installation Procedure

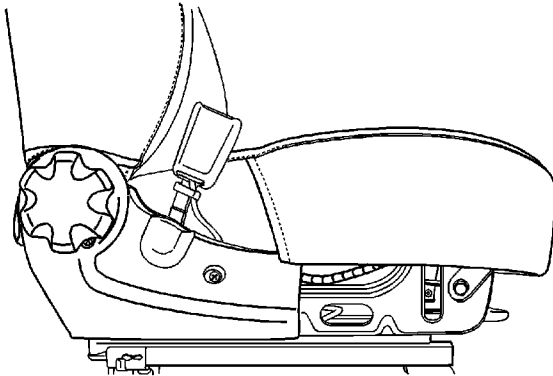
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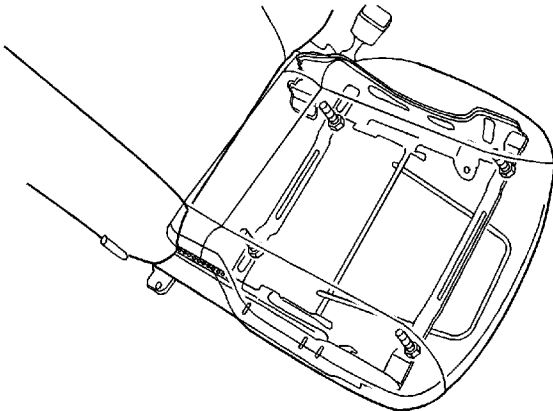
1. Install the guide sleeves into the seat back, making sure the angle of the guide sleeves is parallel to the seatback. Press down in order to engage the guide sleeve retaining latches.
2. Install the head restraint into the guide sleeves. Press down in order to engage the stop pin.

## Front Seat Cushion Replacement

### Removal Procedure



1. Remove the seat back. Refer to [Front Seat Back Replacement](#).

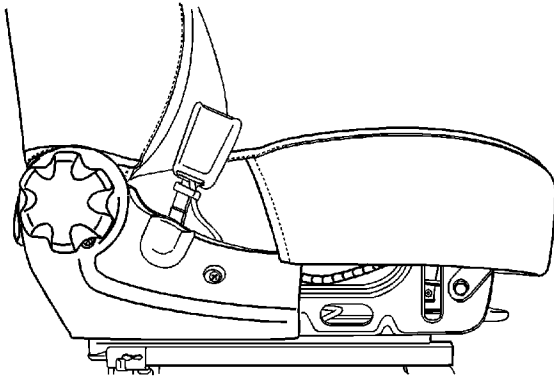


2. Remove the seat cushion bolts.
3. Remove the cushion from the seat adjuster.

### Installation Procedure

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**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the seat cushion to the seat adjuster with the bolts.

**Tighten**

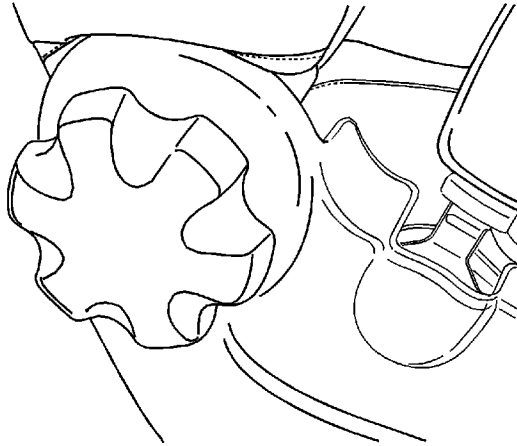
Tighten the seat cushion bolts to 25 N·m (18 lb ft).

2. Install the seat back. Refer to [Front Seat Back Replacement](#) .

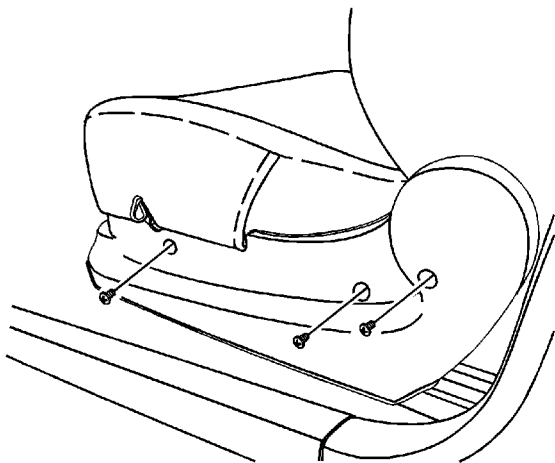


## Seat Cushion Outer Trim Panel Replacement (Dial Type)

### Removal Procedure



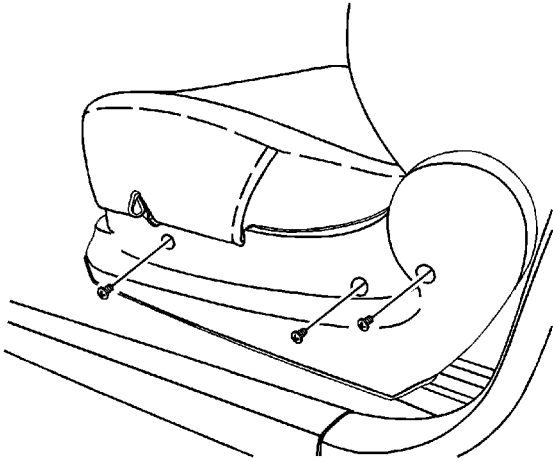
1. Remove the front bucket seat from the vehicle. Refer to [Front Seat Replacement - Bucket](#) .
2. Remove the height adjustment knob. Refer to [Front Seat Adjuster Replacement](#) .
3. Remove the recliner adjustment knob.



4. Remove the screws and the front seat inner and outer cover from the seat.

## **Installation Procedure**

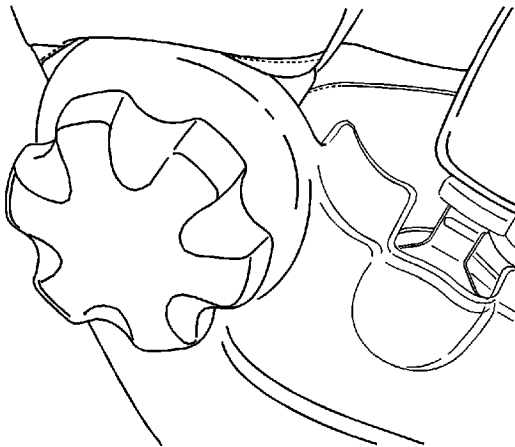
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the front seat inner and outer cover with the screws.

### **Tighten**

Tighten the front seat cover screws to 12 N·m (106 lb in).

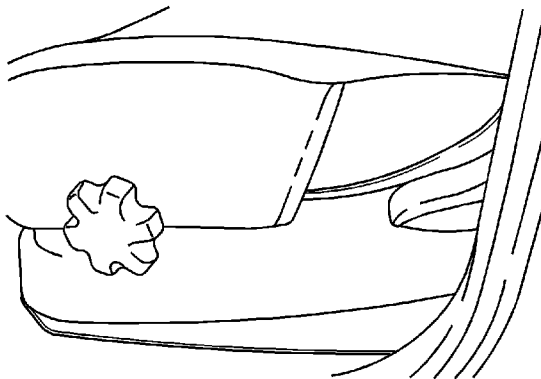




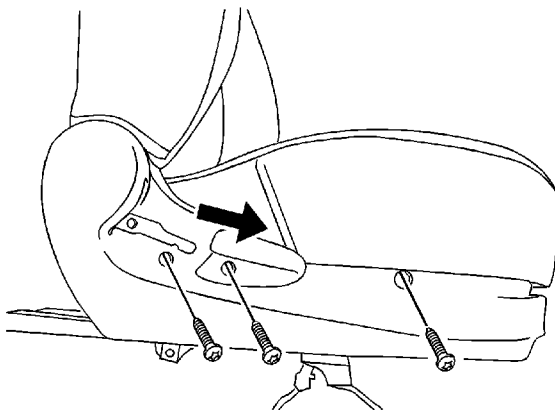
2. Install the recliner adjustment knob.
3. Install the height adjustment knob. Refer to [Front Seat Adjuster Replacement](#) .
4. Install the front bucket seat in the vehicle. Refer to [Front Seat Replacement - Bucket](#) .

## Seat Cushion Outer Trim Panel Replacement (Lever Type)

### Removal Procedure



1. Remove the front bucket seat from the vehicle. Refer to [Front Seat Replacement - Bucket](#) .
2. Remove the height adjustment knob. Refer to [Front Seat Adjuster Replacement](#) .



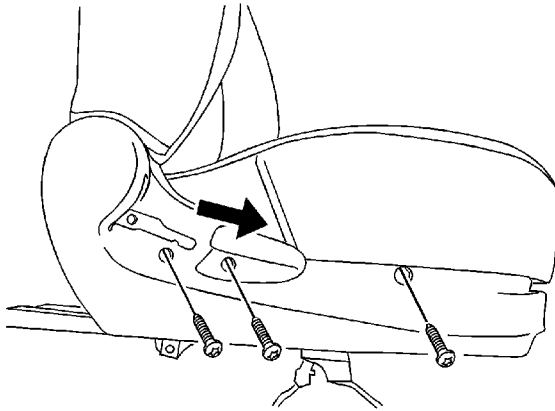
3. Remove the screw and reclining knob.

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4. Remove the screws and the front seat inner and outer cover from the seat.

## Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

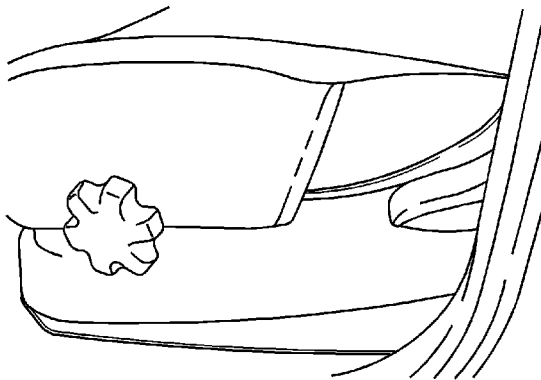


1. Install the front seat inner and outer cover with the screws.

### **Tighten**

Tighten the front seat cover screws to 12 N·m (106 lb in).

2. Install the reclining knob.

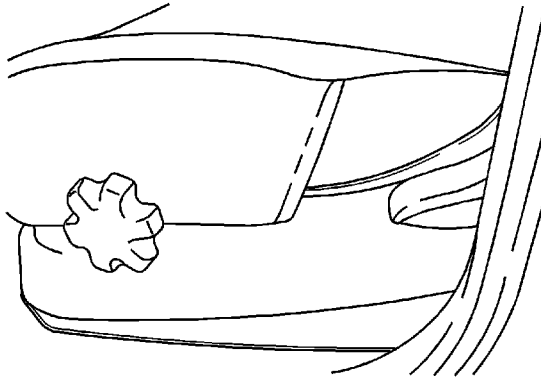




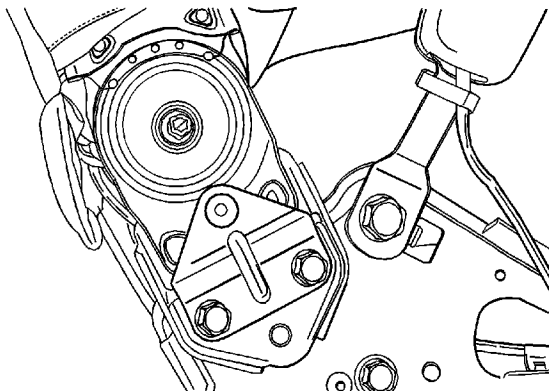
3. Install the height adjustment knob. Refer to [Front Seat Adjuster Replacement](#) .
4. Install the front bucket seat in the vehicle. Refer to [Front Seat Replacement - Bucket](#) .

## Front Seat Back Replacement (Lever Type)

### Removal Procedure



1. Remove the front bucket seat from the vehicle. Refer to [Front Seat Replacement - Bucket](#) .
2. Remove the height adjustment knob. Refer to [Front Seat Adjuster Replacement](#) .
3. Remove the recliner lever and the front seat inner and outer cover from the front seat. Refer to [Seat Cushion Outer Trim Panel Replacement](#) .



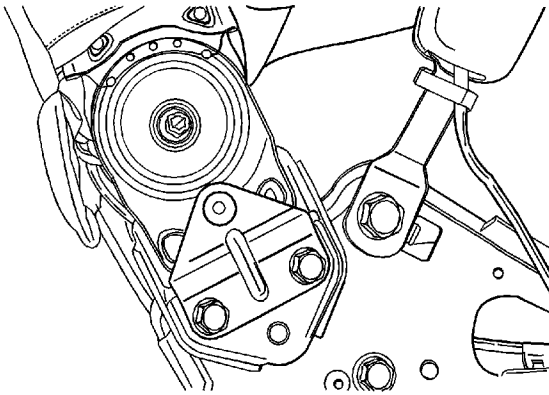
4. Remove the seat back bolts from the seat cushion.

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5. Remove the seat back.

## **Installation Procedure**

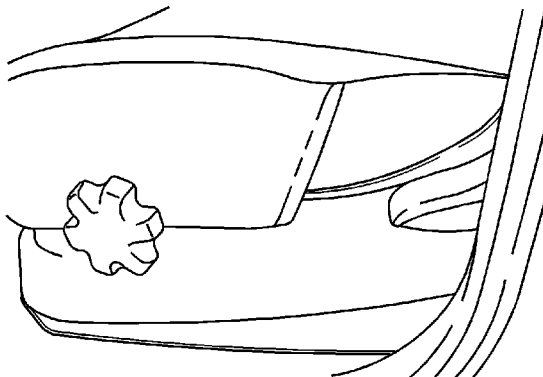
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the seat back onto the seat cushion.
2. Install the seat back bolts to the seat cushion.

### **Tighten**

Tighten the seat back bolts to 25 N·m (18 lb ft).



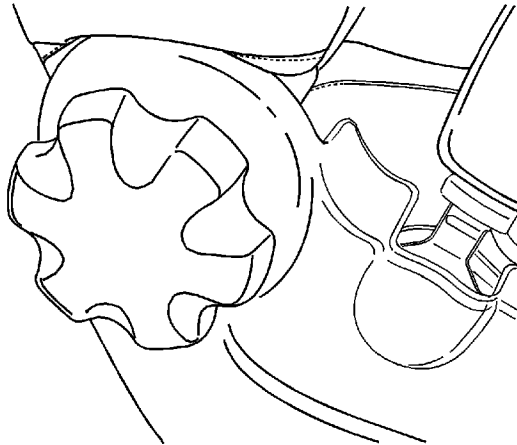




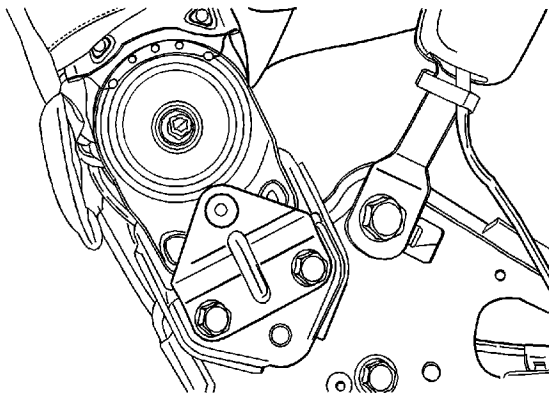
3. Install the recliner lever and the front inner and outer cover. Refer to [Seat Cushion Outer Trim Panel Replacement](#) .
4. Install the height adjustment knob. Refer to [Front Seat Adjuster Replacement](#) .
5. Install the front bucket seat in the vehicle. Refer to [Front Seat Replacement - Bucket](#) .

## Front Seat Back Replacement (Dial Type)

### Removal Procedure



1. Remove the front bucket seat from the vehicle. Refer to [Front Seat Replacement - Bucket](#) .
2. Remove the recliner adjustment knob.

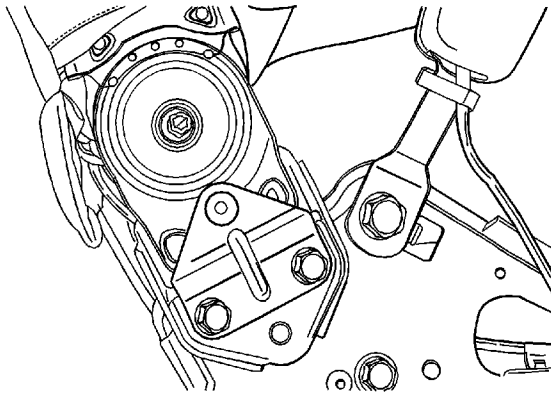


3. Remove the recliner cover from the front seat.
4. Remove the seat back bolts from the seat cushion.
5. Remove the seat back.

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## Installation Procedure

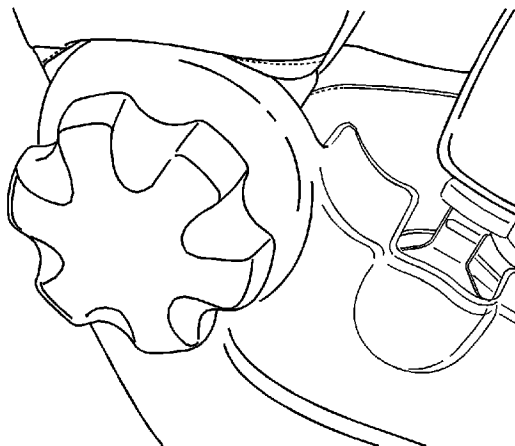
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the seat back bolts to the seat cushion.

### Tighten

Tighten the seat back bolts to 25 N·m (18 lb ft).

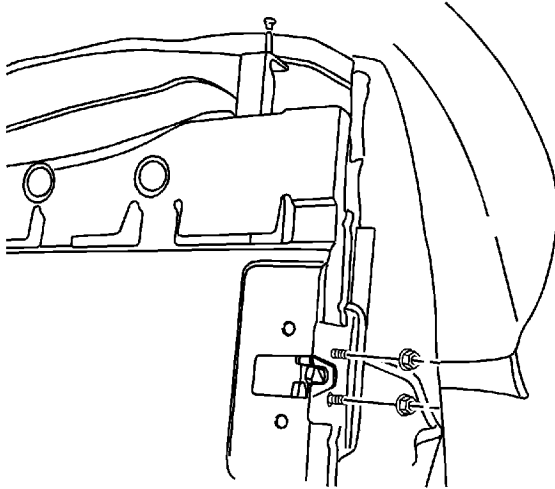


2. Install the recliner cover.
3. Install the recliner adjustment knob.

4. Install the front bucket seat in the vehicle. Refer to [Front Seat Replacement - Bucket](#) .

## Rear Folding Seat Lock Replacement

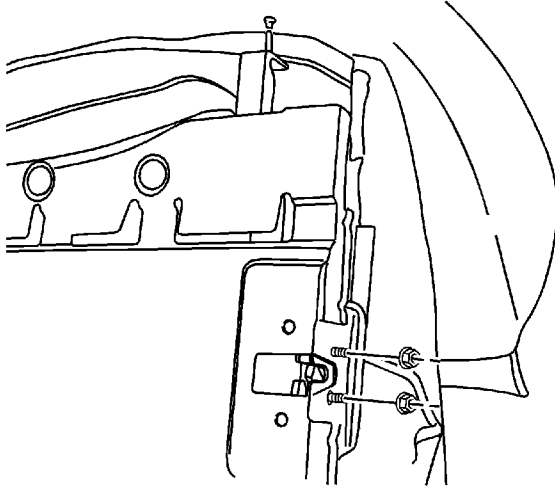
### Removal Procedure



1. Remove the rear seatback lock release knob.
2. Reposition the rear seatback cover.
3. Remove the screws and the lock assembly.

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the rear seatback lock assembly with the screws.

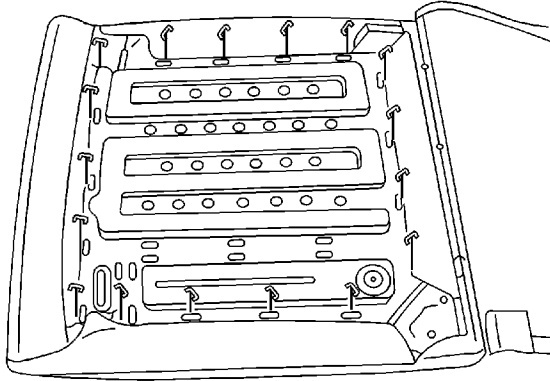
**Tighten**

Tighten the rear seat back lock assembly screws to 20 N·m (15 lb ft).

2. Install the rear seatback cover to its original position.
3. Install the rear seatback lock release knob.

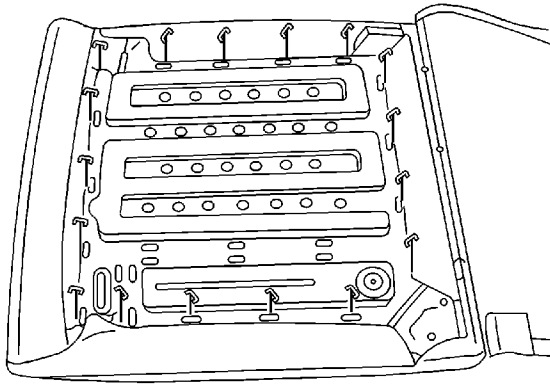
## Rear Seat Cushion Cover Replacement

### Removal Procedure



1. Remove the seat back and/or the seat cushion. Refer to [Front Seat Back Replacement](#) , [Front Seat Cushion Replacement](#) , [Rear Split Folding Seat Back Replacement](#) and/or [Rear Seat Back Replacement](#) .
2. Remove the hog rings or the retaining clips from the seat back and/or the seat cushion.
3. Remove the seat cover from the seat back and/or the seat cushion.

### Installation Procedure

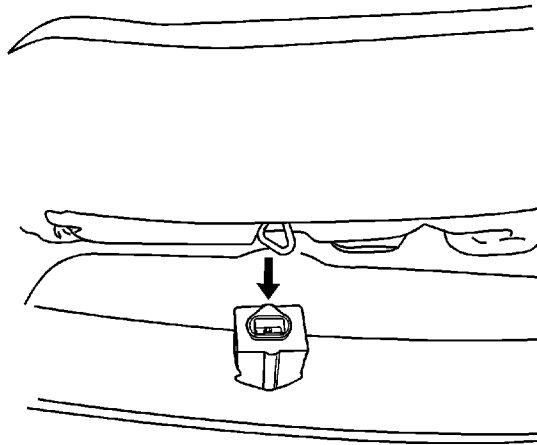


1. Install the seat cover onto the seat back and/or the seat cushion with the retaining clips or the new hog rings.
2. Install the seat back and/or the seat cushion. Refer to [Front Seat Back Replacement](#) , [Front Seat Cushion Replacement](#) , [Rear Split Folding Seat Back Replacement](#) and/or [Rear Seat Back Replacement](#) .



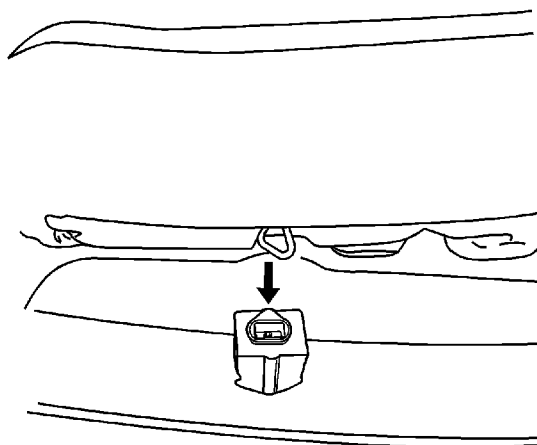
## Rear Seat Cushion Replacement

### Removal Procedure



Lift and remove the rear seat cushion.

### Installation Procedure

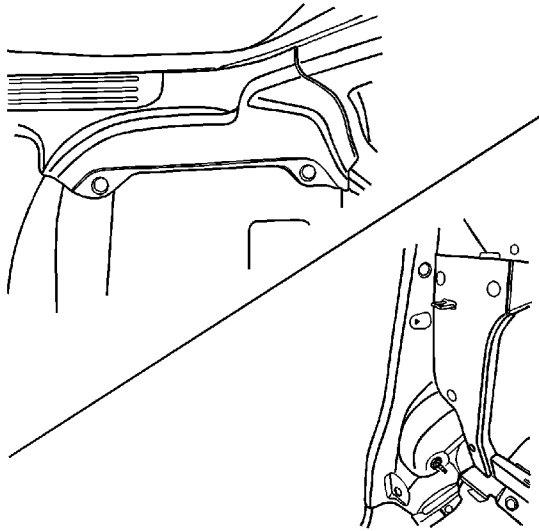




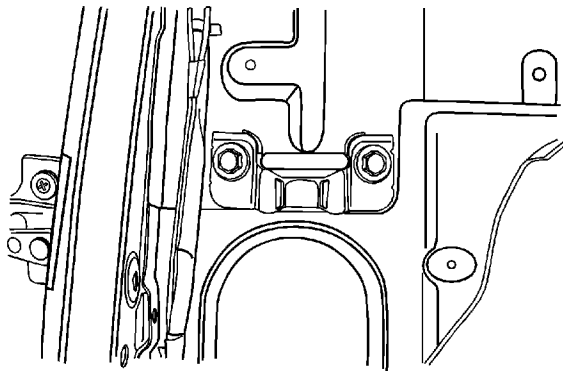
Insert the wire loops along the front edge of the rear seat cushion into the recesses in the floor pan.

## Rear Seat Back Cushion Latch Striker Replacement

### Removal Procedure



1. Remove the seat cushion. Refer to [Rear Seat Cushion Replacement](#) .
2. Remove the rear seat back. Refer to [Rear Split Folding Seat Back Replacement](#) .
3. Remove the rear rocker panel cover.



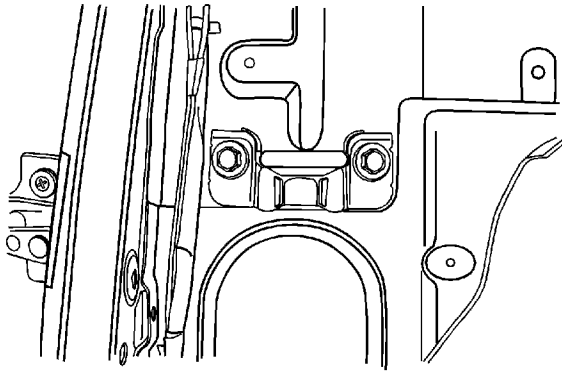
4. Remove the front wheelhouse trim.
5. Remove the wheelhouse brace trim.

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6. Remove the bolts and the rear seat back cushion latch striker.

## Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

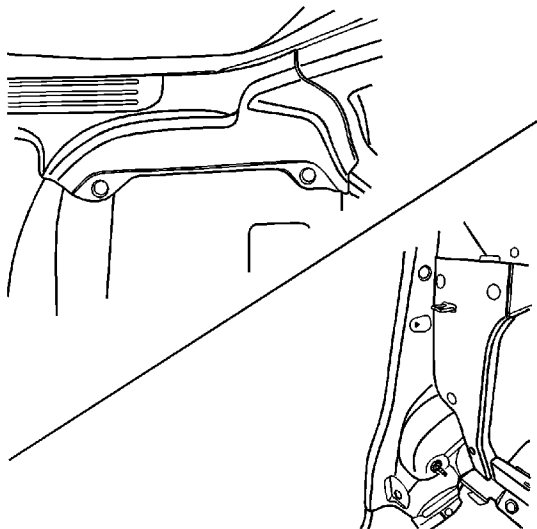


1. Install the rear seat back cushion latch striker with the bolts.

### **Tighten**

Tighten the rear seat back cushion latch striker bolts to 24 N·m (18 lb ft).

2. Install the wheelhouse brace trim.
3. Install the front wheelhouse trim.

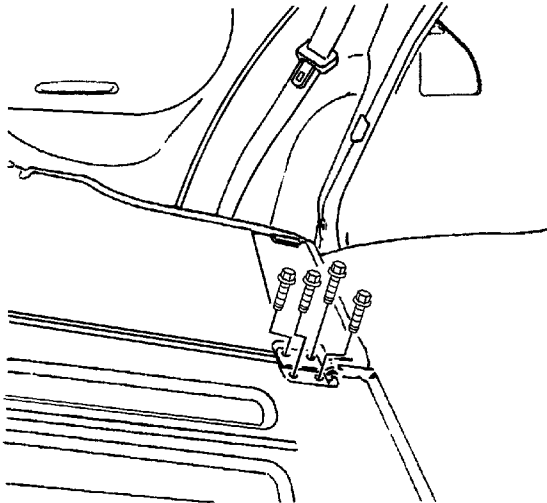




4. Install the rear rocker panel cover.
5. Install the rear seat back. Refer to [Rear Split Folding Seat Back Replacement](#) .
6. Install the rear seat cushion. Refer to [Rear Seat Cushion Replacement](#) .

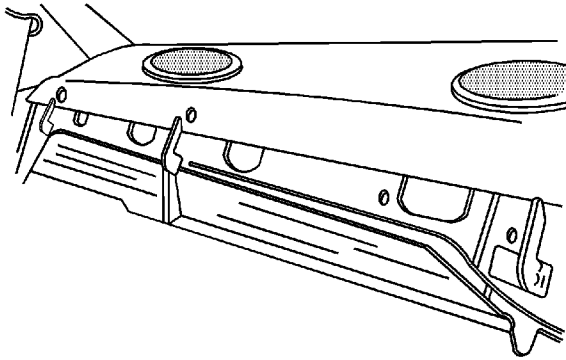
## Rear Seat Back Cushion Replacement

### Removal Procedure



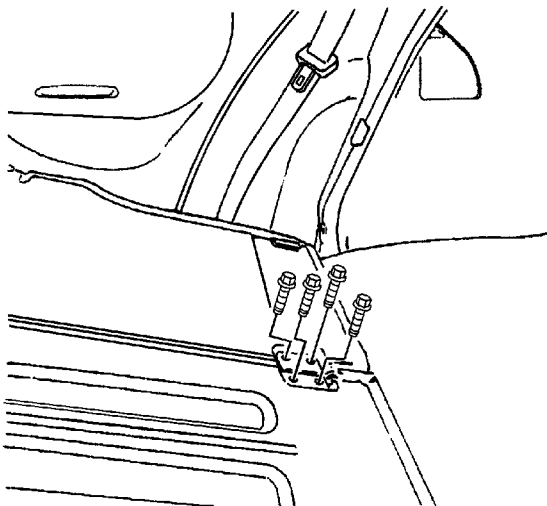
1. Remove the rear cushion. Refer to [Rear Seat Cushion Replacement](#) .
2. Remove the bolts that seat back.
3. Remove the rear seat back by pulling the base of the seat back out and sliding the seat back up.

### Installation Procedure



1. Insert the rear seat back by inserting the metal loops over the hooks.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



2. Install the rear seat back with the bolts.

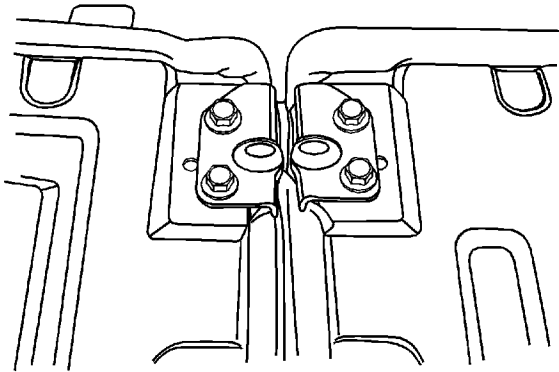
**Tighten**

Tighten the rear seat back bolt to 25 N·m (18 lb ft).

3. Install the rear seat cushion. Refer to [Rear Seat Cushion Replacement](#).

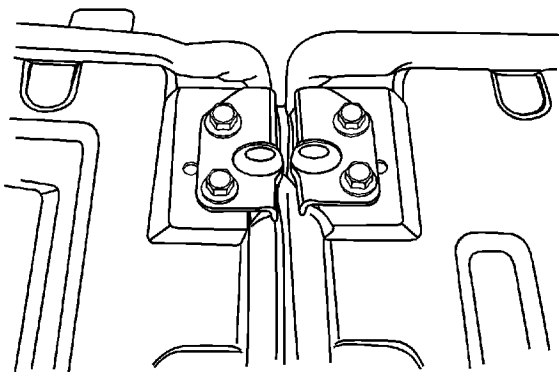
## Rear Split Folding Seat Back Replacement

### Removal Procedure



1. Lower the rear seat backs.
2. Remove the bolts that secure the rear seat backs to the hinges.
3. Remove the rear seat backs by pulling the seat hinge posts out of the front wheelhouse trim.

### Installation Procedure







1. Install the rear seatback by inserting the seat hinge posts into the front wheelhouse trim.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

2. Install the seat backs to the hinges with the bolts.

**Tighten**

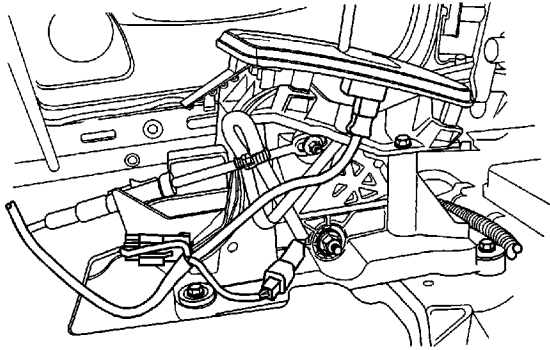
Tighten the seatback bolts to 25 N·m (18 lb ft).

3. Raise the rear seat backs in the upright position.

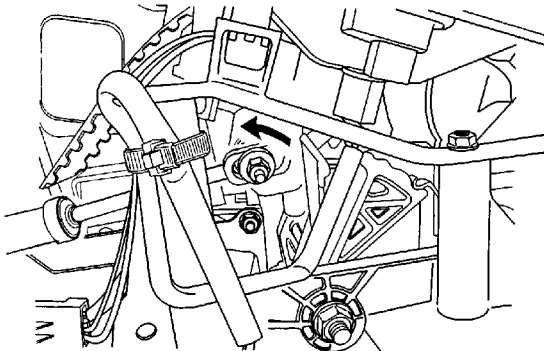
## Shift Lock Control Solenoid Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

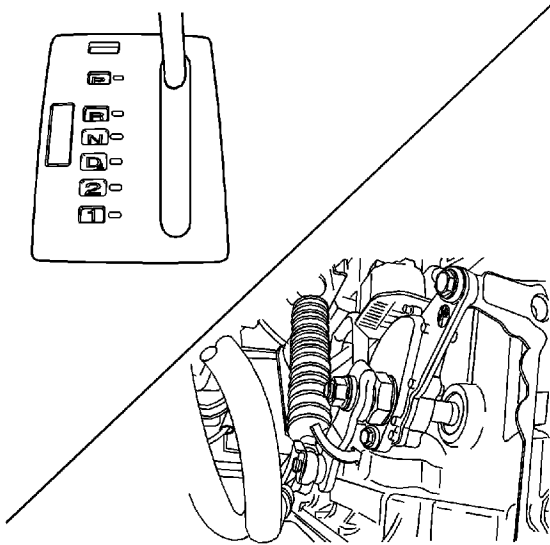


1. Disconnect the negative battery cable.
2. Remove the floor console. Refer to [Front Floor Console Replacement](#).
3. Disconnect the wiring harness connectors from the shift control lever.

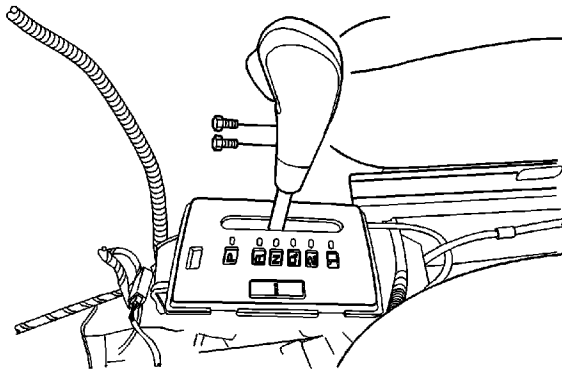


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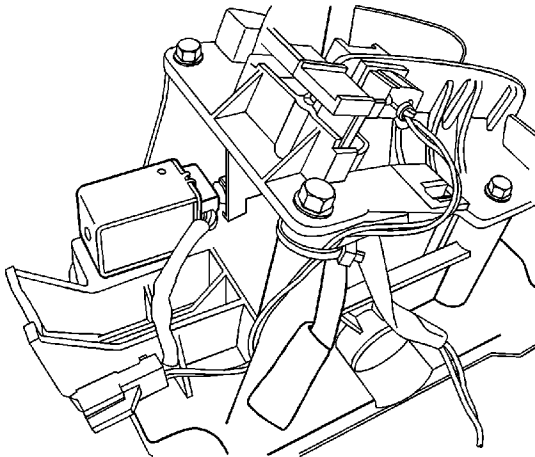
4. Loosen the control cable adjusting nut.
5. Disconnect the control cable from the shift control lever assembly.



6. Remove the shift control lever assembly mounting bolts.
7. Remove the shift control lever assembly.



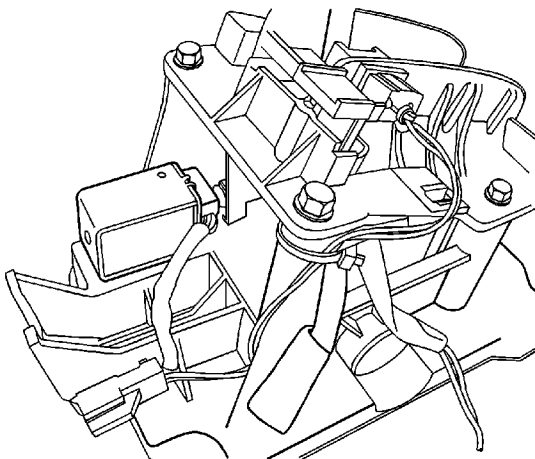
8. Remove the two shift lever control knob retaining bolts and knob from the assembly.
9. Carefully remove the shift select cover from the lever assembly.



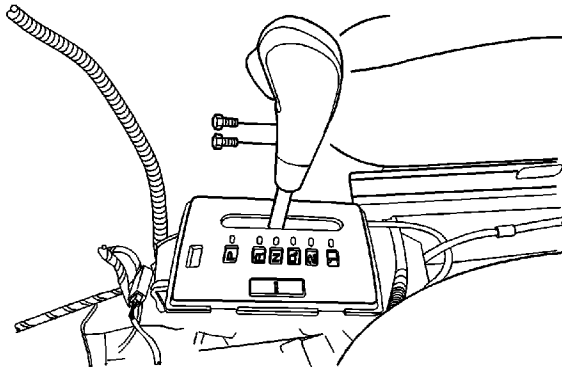
10. Remove the shift lock solenoid retaining bolts.
11. Remove the solenoid from the assembly.

## **Installation Procedure**

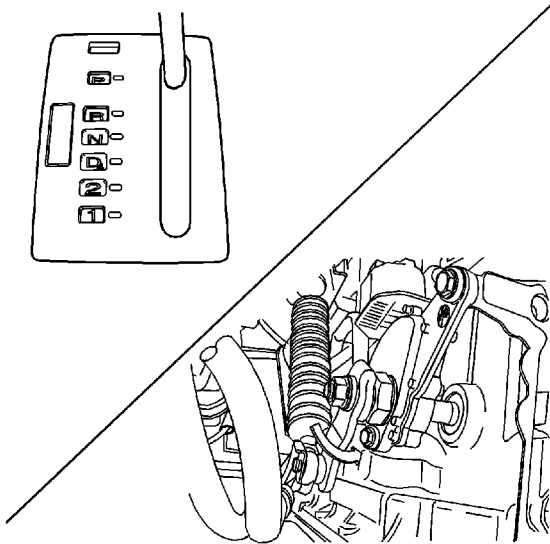
1. Install the shift lock solenoid on the assembly.



2. Install the shift lock solenoid retaining bolts.
3. Carefully install the shift select cover to the lever assembly.



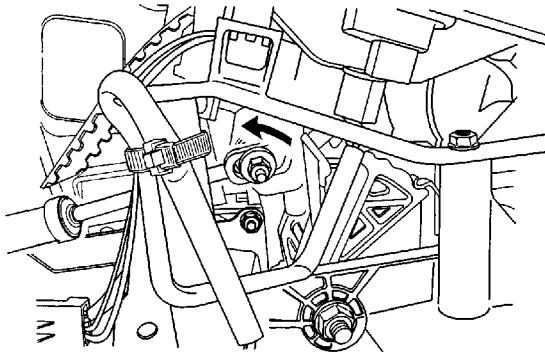
4. Install the shift lever control knob and retaining bolts.



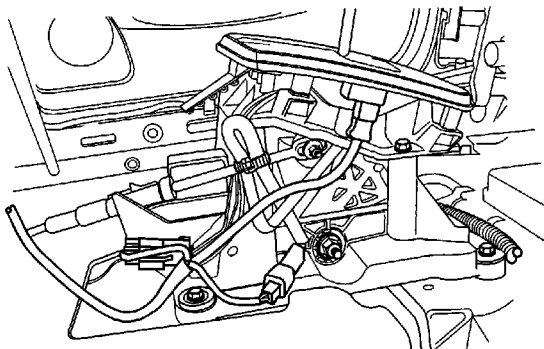
5. Install the shift control lever assembly.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

6. Install the shift control lever assembly mounting bolts and tighten to **8 N·m (71 lb in)**.



7. Connect the control cable to the shift control lever assembly.
8. Install the control cable adjusting nut and tighten to **8 N·m (71 lb in)**.

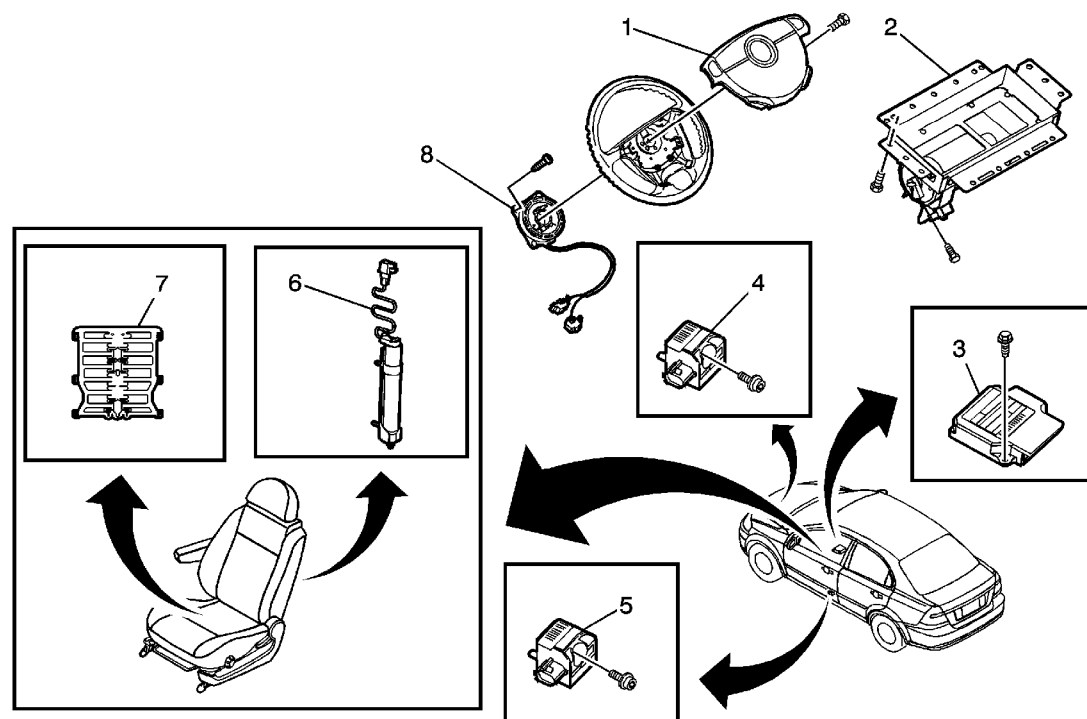


9. Connect the harness connector.
10. Adjust the control cable. Refer to [Range Selector Lever Cable Adjustment](#).
11. Install the floor console. Refer to [Front Floor Console Replacement](#).
12. Connect the negative battery cable.

## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front End Sensors	10 N·m	89 lb in
I/P Module Mounting M5 Bolts	6 N·m	53 lb in
I/P Module Mounting M8 Bolts	15 N·m	11 lb ft
Sensing and Diagnostic Module (SDM) Mounting Bolts	15 N·m	11 lb ft
Side Impact Sensor Mounting Bolts	10 N·m	89 lb in
Steering Wheel Module Coil Retaining Screws	1 N·m	11 lb in
Steering Wheel Module Mounting Bolts	15 N·m	11 lb ft

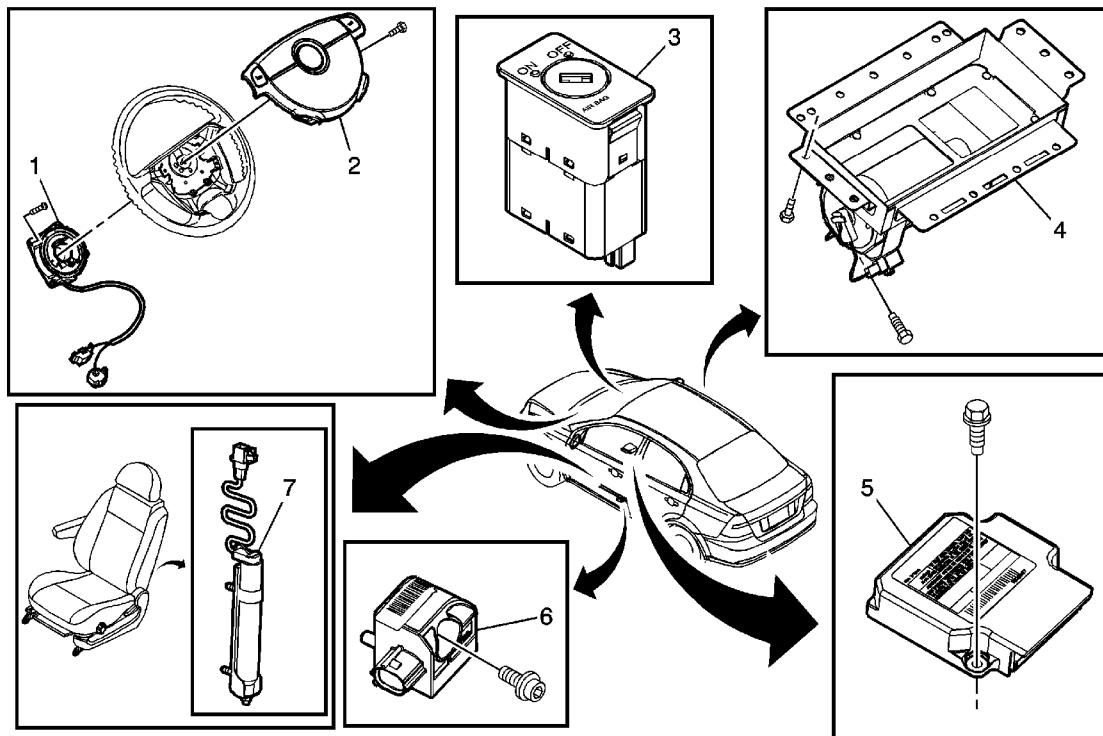
## North America Vehicles



- (1) Inflatable Restraint Steering Wheel Module  
 (2) Inflatable Restraint I/P Module  
 (3) Inflatable Restraint Sensing and Diagnostic Module (SDM)  
 (4) Inflatable Restraint Front End Sensor (Left Hand Shown, Right Side Similar)  
 (5) Inflatable Restraint Side Impact Sensor (Left Hand Shown, Right Side Similar)  
 (6) Inflatable Restraint Side Impact Module (Left Side Shown, Right Side Similar)  
 (7) Occupant Classification (OC) Sensor  
 (8) Inflatable Restraint Steering Wheel Module Coil

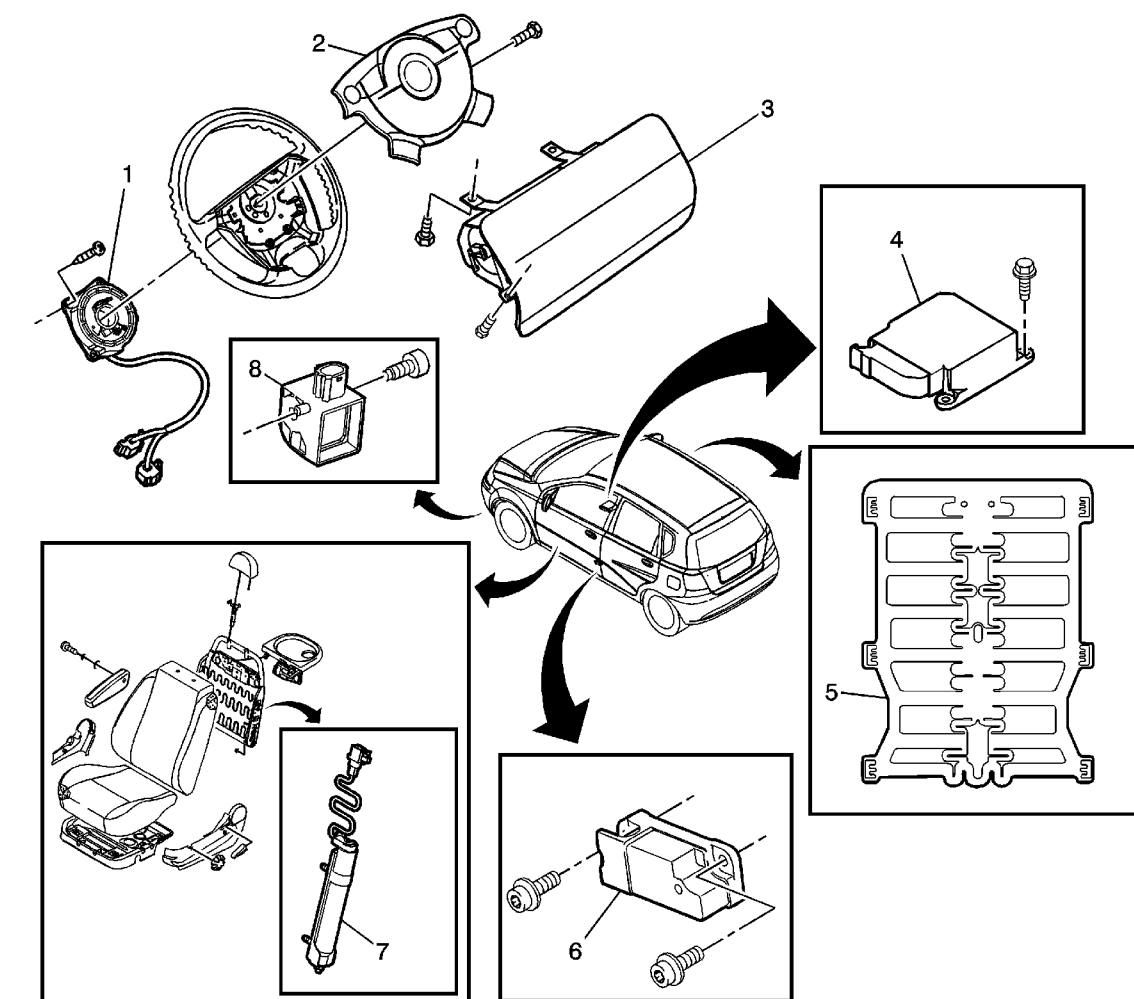


## Except North America Vehicles



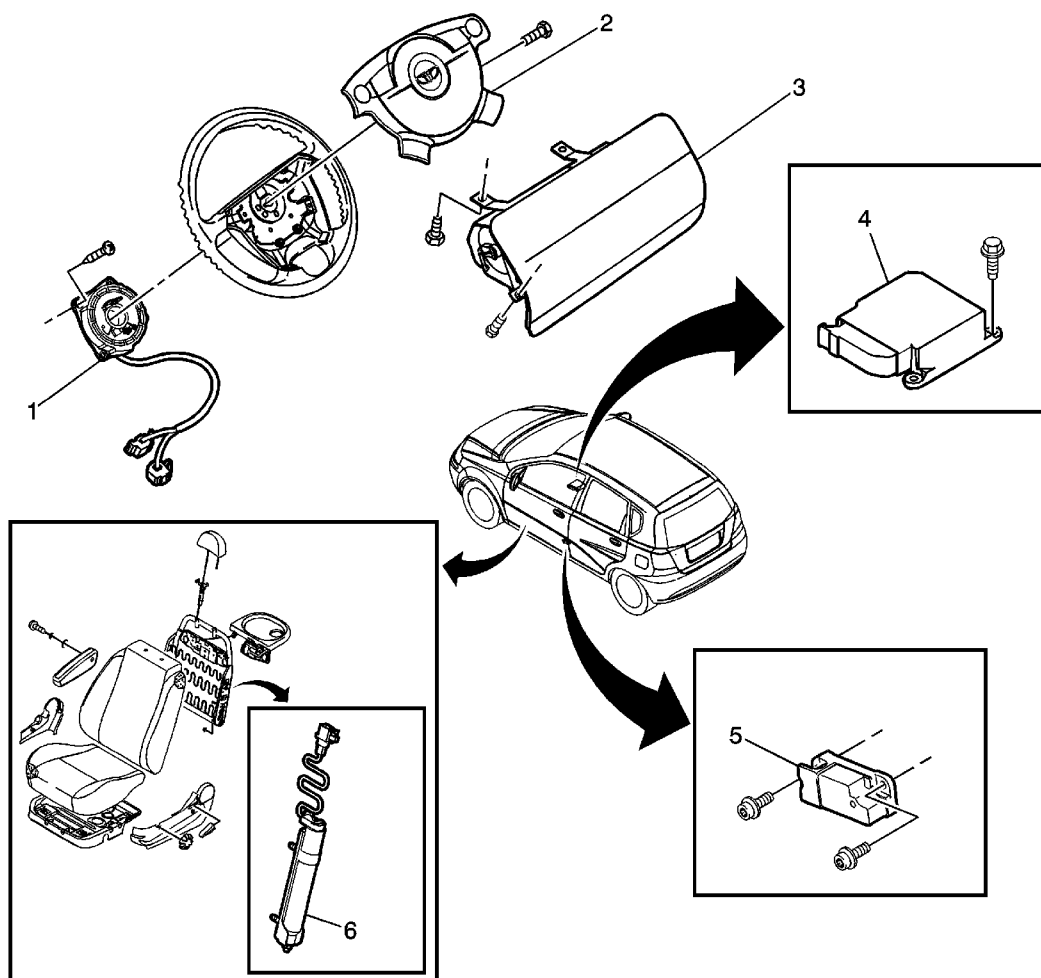
- (1) Inflatable Restraint Steering Wheel Module Coil
- (2) Inflatable Restraint Steering Wheel Module
- (3) Inflatable Restraint I/P Module
- (4) Inflatable Restraint Sensing and Diagnostic Module (SDM)
- (5) Passenger Air Bag Disable Switch
- (6) Inflatable Restraint Side Impact Sensor - Except North America Models (Left Hand Shown, Right Side Similar)
- (7) Inflatable Restraint Side Impact Module - Except North America Models (Left Side Shown, Right Side Similar)

## North America Vehicles



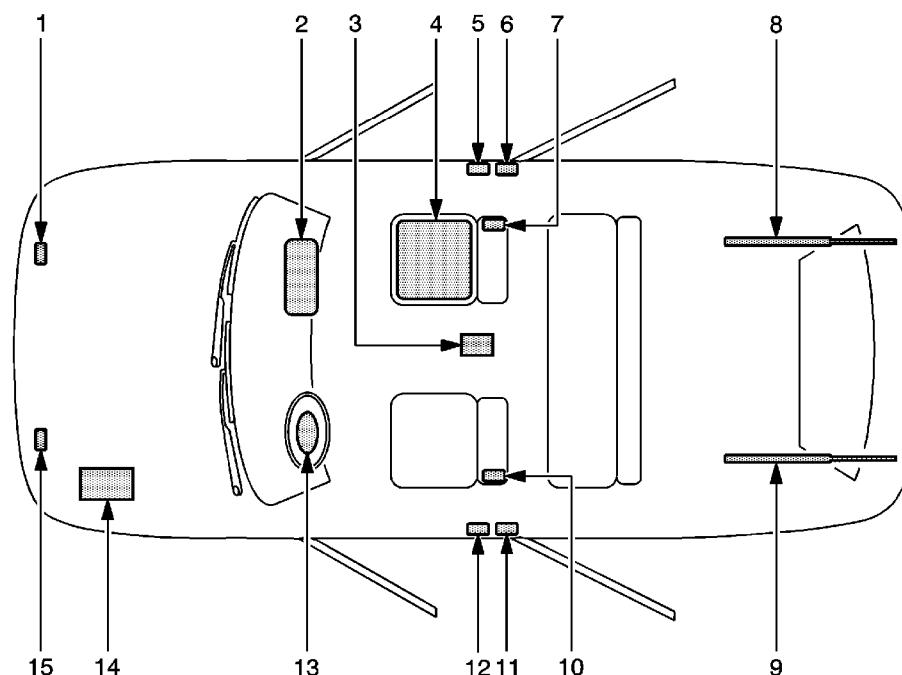
- (1) Inflatable Restraint Steering Wheel Module Coil
- (2) Inflatable Restraint Steering Wheel Module
- (3) Inflatable Restraint I/P Module
- (4) Inflatable Restraint Sensing and Diagnostic Module (SDM)
- (5) Occupant Classification (OC) Sensor
- (6) Inflatable Restraint Side Impact Sensor (Left Hand Shown, Right Side Similar)
- (7) Inflatable Restraint Side Impact Module (Left Side Shown, Right Side Similar)
- (8) Inflatable Restraint Front End Sensor (Left Hand Shown, Right Side Similar)

## Except North America Vehicles



- (1) Inflatable Restraint Steering Wheel Module Coil
- (2) Inflatable Restraint Steering Wheel Module
- (3) Inflatable Restraint I/P Module
- (4) Inflatable Restraint Sensing and Diagnostic Module (SDM)
- (5) Inflatable Restraint Side Impact Sensor -- Except North America Models (Left Hand Shown, Right Side Similar)
- (6) Inflatable Restraint Side Impact Module -- Except North America Models (Left Side Shown, Right Side Similar)

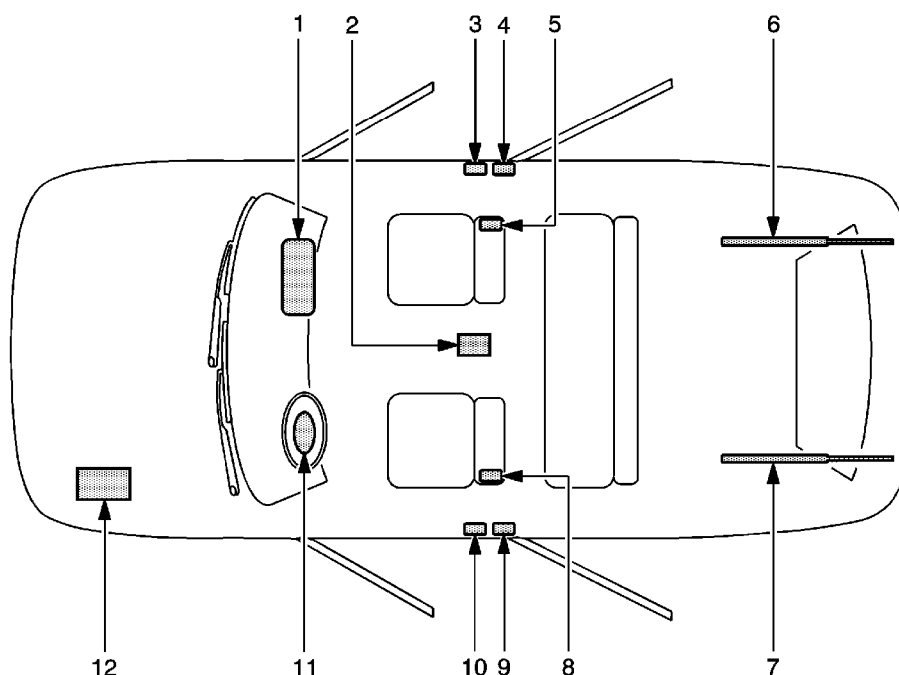
## North American Models



- (1) Right Front End Sensor--Located on the right front of the vehicle in the engine compartment
- (2) I/P Air Bag--Located at the top right under the instrument panel
- (3) Sensing and Diagnostic Module (SDM)--Located underneath the center console
- (4) Passenger Presence System (PPS)--Located on the passenger front seat underneath the seat bottom trim
- (5) Seat Belt Pretensioner--Located under the center pillar trim near the bottom
- (6) RH Side Impact Sensor (SIS)--Located under the center pillar trim near the bottom
- (7) RF Side Impact Air Bag--Located on the seat back of passenger seat
- (8) Rear Compartment Lid Assist Rod--A gas shock is located under the rear trunk lid on the passenger side (Hatchback Models)
- (9) Rear Compartment Lid Assist Rod--A gas shock is located under the rear trunk lid on the driver side (Hatchback Models)
- (10) LF Side Impact Air Bag--Located on the seat back of driver seat
- (11) LH Side Impact Sensor (SIS)--Located under the center pillar trim near the bottom
- (12) Seat Belt Pretensioner--Located under the center pillar trim near the bottom
- (13) Steering Wheel Air Bag--Located on the steering wheel
- (14) Vehicle Battery--Located under the hood on the right side
- (15) Left Front End Sensor--Located on the left front of the vehicle in the engine compartment

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## Except North American Models

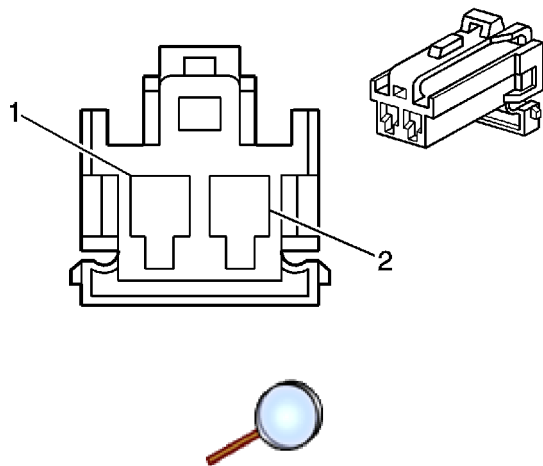


- (1) I/P Air Bag--Located at the top right under the instrument panel
- (2) Sensing and Diagnostic Module (SDM)--Located underneath the center console
- (3) Seat Belt Pretensioner--Located under the center pillar trim near the bottom
- (4) RH Side Impact Sensor (SIS)--Located under the center pillar trim near the bottom
- (5) RF Side Impact Air Bag--Located on the seat back of passenger seat
- (6) Rear Compartment Lid Assist Rod--A gas shock is located under the rear trunk lid on the passenger side (Hatchback Models)
- (7) Rear Compartment Lid Assist Rod--A gas shock is located under the rear trunk lid on the driver side (Hatchback Models)
- (8) LF Side Impact Air Bag--Located on the seat back of driver seat
- (9) LH Side Impact Sensor (SIS)--Located under the center pillar trim near the bottom
- (10) Seat Belt Pretensioner--Located under the center pillar trim near the bottom
- (11) Steering Wheel Air Bag--Located on the steering wheel
- (12) Vehicle Battery--Located under the hood on the right side

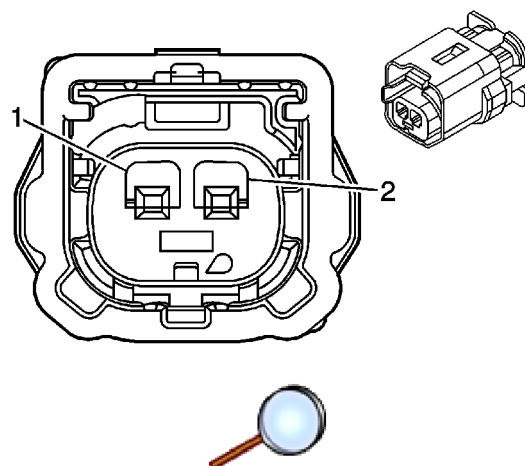
## SIR Connector End Views (Notchback)

Table 1:	<a href="#">Glove Box Switch</a>
Table 2:	<a href="#">Inflatable Restraint Front Discriminating Sensor - Left</a>
Table 3:	<a href="#">Inflatable Restraint Front Discriminating Sensor - Right</a>
Table 4:	<a href="#">Inflatable Restraint I/P Module (w/o Passenger Presence System) (PPS)</a>
Table 5:	<a href="#">Inflatable Restraint I/P Module (w/Passenger Presence System (PPS))</a>
Table 6:	<a href="#">Inflatable Restraint Sensing and Diagnostic Module (SDM)</a>
Table 7:	<a href="#">Inflatable Restraint Side Impact Module - Left</a>
Table 8:	<a href="#">Inflatable Restraint Side Impact Module - Right</a>
Table 9:	<a href="#">Inflatable Restraint Side Impact Sensor (SIS) - Left</a>
Table 10:	<a href="#">Inflatable Restraint Side Impact Sensor (SIS) - Right</a>
Table 11:	<a href="#">Inflatable Restraint Steering Wheel Module (w/o Passenger Presence System (PPS))</a>
Table 12:	<a href="#">Inflatable Restraint Steering Wheel Module Coil C1 (w/Passenger Presence System (PPS))</a>
Table 13:	<a href="#">Passenger Airbag Disable Switch</a>
Table 14:	<a href="#">Passenger Presence System (PPS) Sensor</a>
Table 15:	<a href="#">Seat Belt Pretensioner - Left</a>
Table 16:	<a href="#">Seat Belt Pretensioner - Right</a>

### Glove Box Switch

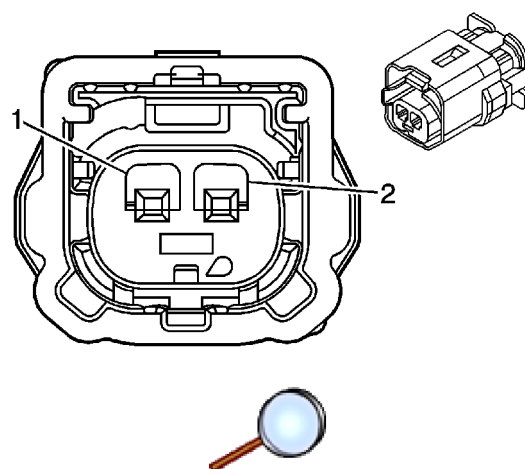
			
Connector Part Information		<ul style="list-style-type: none"> <li>• AK5306</li> <li>• 2-Way F Connector</li> </ul>	
Pin	Wire	Circuit	Function
1	YE	--	Ignition 1 Voltage
2	PU	--	Manual Cutoff Switch

### Inflatable Restraint Front Discriminating Sensor - Left

**Connector Part Information**

- 7283-6507-70
- 2-Way F 040 III Series (YE)

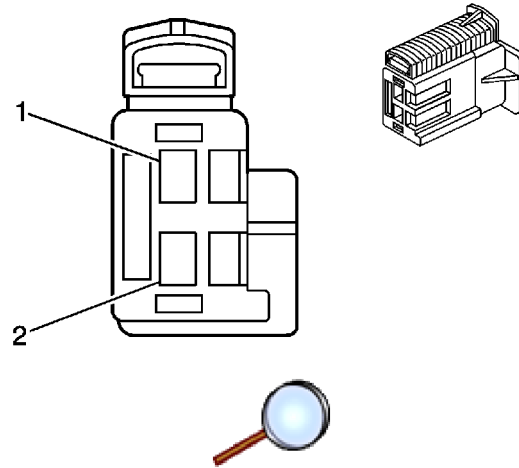
Pin	Wire	Circuit	Function
1	YE/BK	--	Front Discriminating Sensor - Left - Low
2	YE	--	Front Discriminating Sensor - Left - High

**Inflatable Restraint Front Discriminating Sensor - Right****Connector Part Information**

- 7283-6507-70
- 2-Way F 040 III Series (YE)

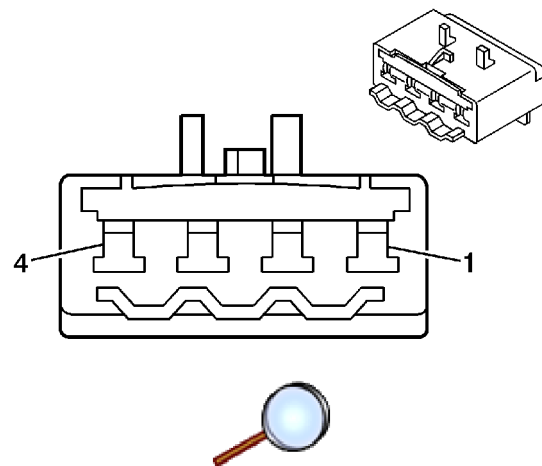
Pin	Wire	Circuit	Function
1	L-GN	--	Front Discriminating Sensor - Left - Low
2	BN/WH	--	Front Discriminating Sensor - Left - High

**Inflatable Restraint I/P Module (w/o Passenger Presence System) (PPS)**



Connector Part Information		<ul style="list-style-type: none"> <li>• FC 160201724</li> <li>• 2-Way Connector (YE)</li> </ul>	
Pin	Wire	Circuit	Function
1	WH/D-GN	--	I/P Module - High Control
2	D-GN/WH	--	I/P - Low Control

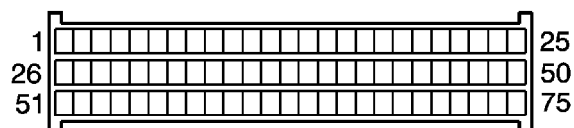
### Inflatable Restraint I/P Module (w/Passenger Presence System (PPS))



Connector Part Information		<ul style="list-style-type: none"> <li>• FC 154550400</li> <li>• 4-Way F Connector (YE)</li> </ul>	
Pin	Wire	Circuit	Function
1	D-GN/WH	--	I/P Module - Stage 2 - Low Control
2	WH/BK	--	I/P Module - Stage 2 - High Control
3	GY	--	I/P Module - Stage 1 - Low Control
4	PU	--	I/P Module - Stage 1 - High Control

### Inflatable Restraint Sensing and Diagnostic Module (SDM)



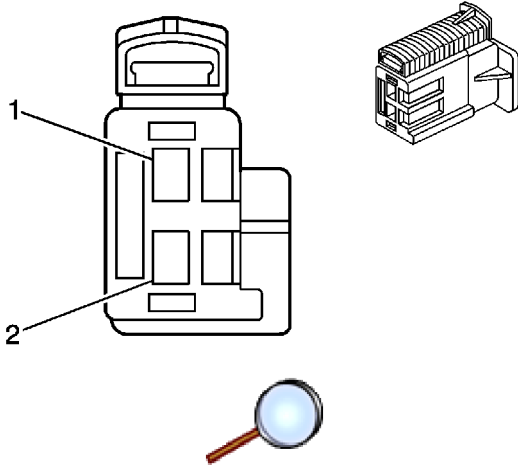


Connector Part Information		<ul style="list-style-type: none"> <li>• 1417642</li> <li>• 75-Way</li> </ul>	
Pin	Wire	Circuit	Function
1-25	--	--	Not Used
26	PK	--	Ignition Voltage
27	BN	--	SIR Indicator Lamp Control
28	BK	--	Ground
29	D-GN	--	Steering Wheel Module High Control (w/o PPS)
			Steering Wheel Module - Stage 1 - Low Control (w/PPS)
30	WH	--	Steering Wheel Module Low Control (w/o PPS)
			Steering Wheel Module - Stage 1 - High Control (w/PPS)
31	WH/BK	--	I/P Module High Control (w/o PPS)
			I/P Module - Stage 1 - High Control (w/PPS)
32	GN/WH	--	I/P Module Low Control (w/o PPS)
			I/P Module - Stage 1 - Low Control (w/PPS)
33	OG/WH	--	Seat Belt Pretensioner - Left Low Control (LHD/PPS)
	OG	--	Seat Belt Pretensioner - Right High Control (RHD w/o PPS)
34	BN/WH	--	Seat Belt Pretensioner - Left High Control (LHD/PPS)
	L-GN	--	Seat Belt Pretensioner - Right Low Control (RHD w/o PPS)
35	L-GN	--	Seat Belt Pretensioner - Right Low Control (LHD/PPS)
	BN/WH	--	Seat Belt Pretensioner - Left High Control (RHD w/o PPS)
36	GY	--	Seat Belt Pretensioner - Right High Control (LHD w/o PPS)
	OG/WH	--	Seat Belt Pretensioner - Left Low Control (RHD w/o PPS)
	OG	--	Seat Belt Pretensioner - Right High Control (w/PPS)

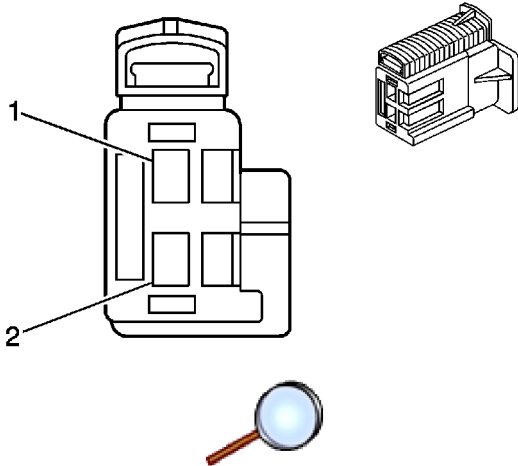
37	BN	--	Side Impact Module - Left - High Control (LHD/PPS)
	D-BU	--	Side Impact Module - Right - Low Control (RHD w/o PPS)
38	D-GN	--	Side Impact Module - Left - Low Control (LHD/PPS)
	GY	--	Side Impact Module - Right - High Control (RHD w/o PPS)
39	GY	--	Side Impact Module - Right - High Control (LHD/PPS)
	D-GN	--	Side Impact Module - Left - Low Control (RHD w/o PPS)
40	D-BU	--	Side Impact Module - Right - Low Control (LHD/PPS)
	BN	--	Side Impact Module - Left - High Control (RHD w/o PPS)
41	PK	--	Steering Wheel Module - Stage 2 - Low Control (w/PPS)
42	WH	--	Steering Wheel Module - Stage 2 - High Control (w/PPS)
43	GY	--	I/P Module - Stage 2 - Low Control (w/PPS)
44	PU	--	I/P Module - Stage 2 - High Control (w/PPS)
45-51	--	--	Not Used
52	YE	--	Seat Belt Indicator Control
53	--	--	Not Used
54	L-BU	--	Serial Data
55	--	--	Not Used
56	D-GN/WH	--	Passenger Airbag OFF Indicator Control (w/o PPS)
57	L-BU	--	Vehicle Speed Signal
58	--	--	Not Used
59	L-GN	--	Multifunction Chime Control Signal
60	D-GN	--	Occupant Sensor - Indicator Status - Off
61	D-GN	--	Seat Belt Switch Signal
62-63	--	--	Not Used
64	D-BU/WH	--	SIR Defeat Indicator Lamp Output - Passenger
65-66	--	--	Not Used
67	GY/BK	--	Passenger Airbag ON Indicator Control
68	L-GN/WH	--	Side Impact Sensor - Right - Signal (LHD)
	GY/BK	--	Side Impact Sensor - Right - Signal (RHD)
69	L-BU/BK	--	Side Impact Sensor - Right - Signal (LHD)
	D-GN/WH	--	Side Impact Sensor - Right - Signal (RHD)
70	D-GN/WH	--	Side Impact Sensor - Left - Signal (LHD)
	L-BU/BK	--	Side Impact Sensor - Left - Signal (RHD)
71	GY/BK	--	Side Impact Sensor - Left - Signal (LHD)
	L-GN/WH	--	Side Impact Sensor - Left - Signal (RHD)
72	D-GN	--	Front Discriminating Sensor - Right - Low

73	BK	--	Front Discriminating Sensor - Right - High
74	PU	--	Front Discriminating Sensor - Left - High
75	RD	--	Front Discriminating Sensor - Left - Low

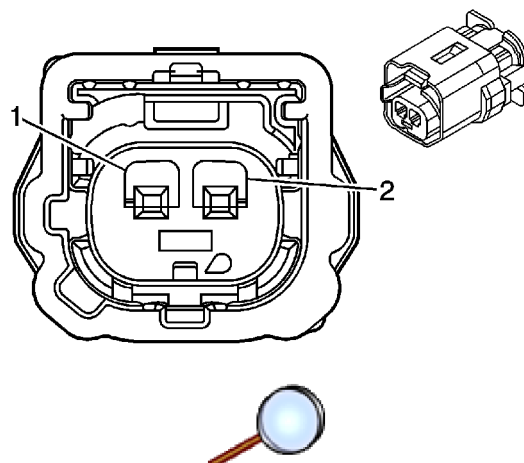
### Inflatable Restraint Side Impact Module - Left

			
Connector Part Information		<ul style="list-style-type: none"> <li>• 7C83-5524-70</li> <li>• 2-Way Connector (YE)</li> </ul>	
Pin	Wire	Circuit	Function
1	D-BU	--	Side Impact Module - Left - High Control
2	GY	--	Side Impact Module - Left - Low Control

### Inflatable Restraint Side Impact Module - Right

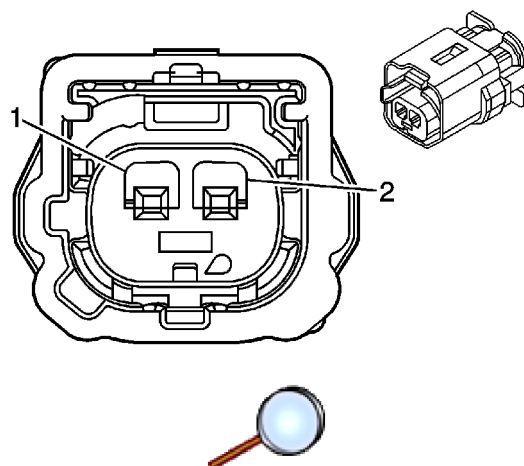
			
Connector Part Information		<ul style="list-style-type: none"> <li>• 7C83-5524-70</li> <li>• 2-Way</li> </ul>	
Pin	Wire	Circuit	Function
1	D-GN	--	Side Impact Module - Right - Low Control
2	BN	--	Side Impact Module - Right - High Control

### Inflatable Restraint Side Impact Sensor (SIS) - Left

**Connector Part Information**

- 7283-6502-50
- 2-Way F 040 III Series Sealed (OG)

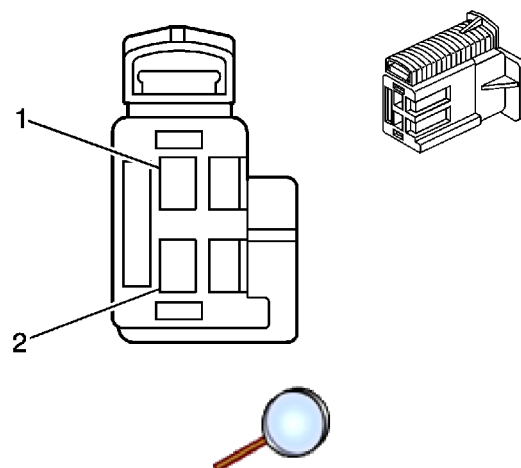
Pin	Wire	Circuit	Function
1	GY/BK	--	Sensor Low
2	D-GN/WH	--	Sensor High

**Inflatable Restraint Side Impact Sensor (SIS) - Right****Connector Part Information**

- 7283-6502-50
- 2-Way F 040 III Series Sealed (OG)

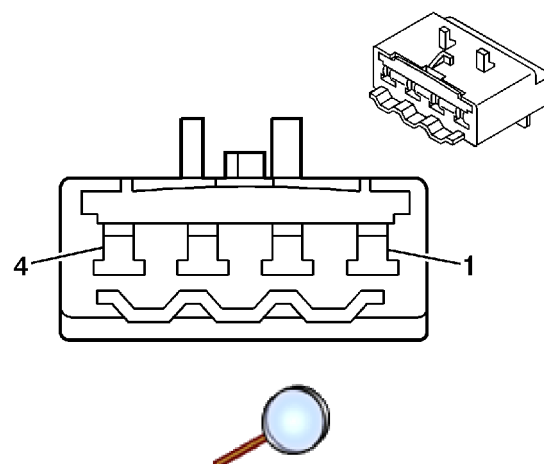
Pin	Wire	Circuit	Function
1	L-GN/WH	--	Sensor Low
2	L-BU/BK	--	Sensor High

**Inflatable Restraint Steering Wheel Module (w/o Passenger Presence System (PPS))**



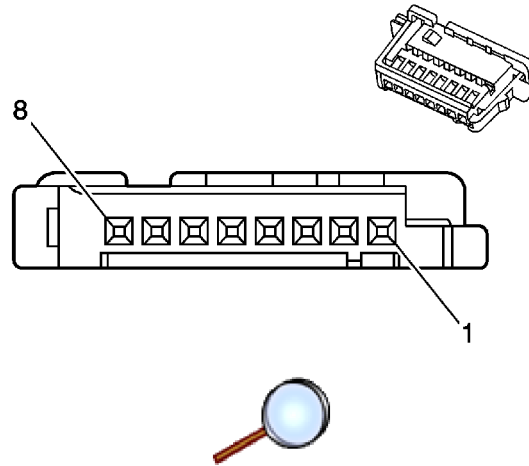
Connector Part Information		<ul style="list-style-type: none"> <li>• FC 160201724</li> <li>• 2-Way Connector (YE)</li> </ul>	
Pin	Wire	Circuit	Function
1	D-GN	--	I/P Module - High Control
2	WH	--	I/P - Low Control

### Inflatable Restraint Steering Wheel Module Coil C1 (w/Passenger Presence System (PPS))



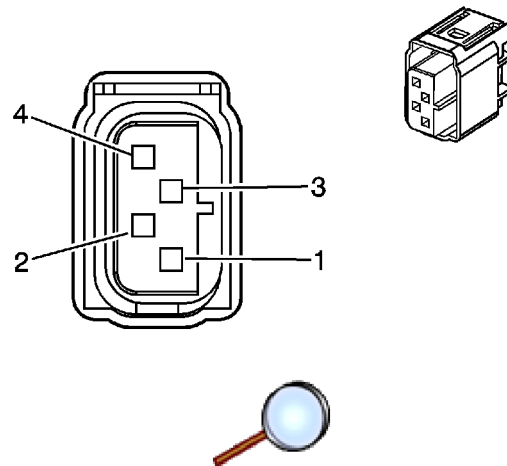
Connector Part Information		<ul style="list-style-type: none"> <li>• FC 154550400</li> <li>• 4-Way F Connector (YE)</li> </ul>	
Pin	Wire	Circuit	Function
1	WH	--	I/P Module - Stage 2 - High Control
2	PK	--	I/P Module - Stage 2 - Low Control
3	WH	--	I/P Module - Stage 1 - High Control
4	D-GN	--	I/P Module - Stage 1 - Low Control

### Passenger Airbag Disable Switch

**Connector Part Information**

- 0-1743282-1
- 8-Way F 0.64 MQS Series (BK)

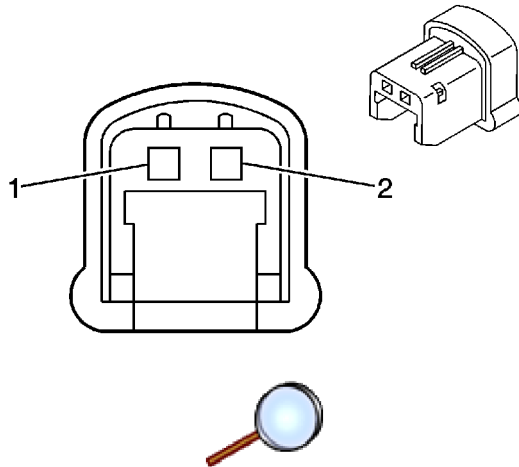
Pin	Wire	Circuit	Function
1	D-GN/WH	--	Passenger Airbag OFF Indicator Control
2	BK	--	Ground
3	D-GN	--	Occupant Sensor - Indicator Status - Off
4	PU	--	Manual Cutoff Switch
5	BK	--	Ground
6-8	--	--	Not Used

**Passenger Presence System (PPS) Sensor****Connector Part Information**

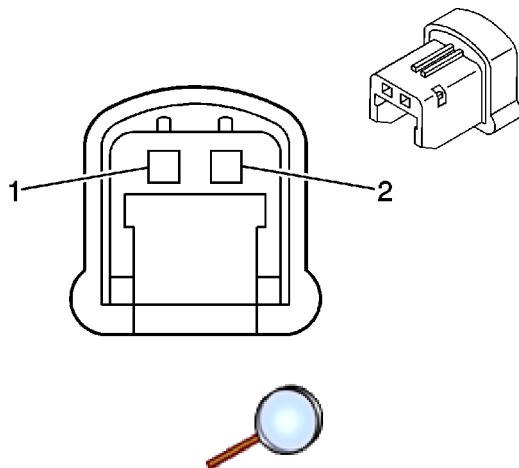
- 1-0967640-1
- 4-Way F Connector (BK)

Pin	Wire	Circuit	Function
1	PK	--	Ignition 1 Voltage
2	D-BU/WH	--	SIR Defeat Indicator Lamp Output - Passenger
3	BK	--	Ground
4	--	--	Not Used

## Seat Belt Pretensioner - Left

			
Connector Part Information		<ul style="list-style-type: none"> <li>• V23540-M5302-Y22</li> <li>• 2-Way Connector (GN)</li> </ul>	
Pin	Wire	Circuit	Function
1	BN/WH	--	Seat Belt Pretensioner - Left - High Control
2	OG/WH	--	Seat Belt Pretensioner - Left - Low Control

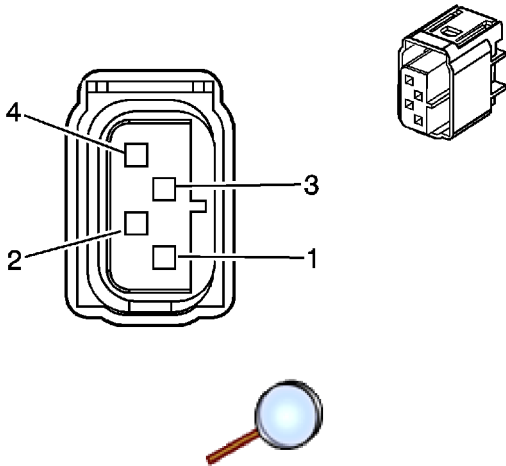
## Seat Belt Pretensioner - Right

			
Connector Part Information		<ul style="list-style-type: none"> <li>• V23540-M5302-Y22</li> <li>• 2-Way Connector (GN)</li> </ul>	
Pin	Wire	Circuit	Function
1	L-GN	--	Seat Belt Pretensioner - Right - Low Control
2	GY	--	Seat Belt Pretensioner - Right - High Control (LHD w/o PPS)
	OG	--	Seat Belt Pretensioner - Right - High Control (RHD/PPS)

## SIR Connector End Views (Hatchback)

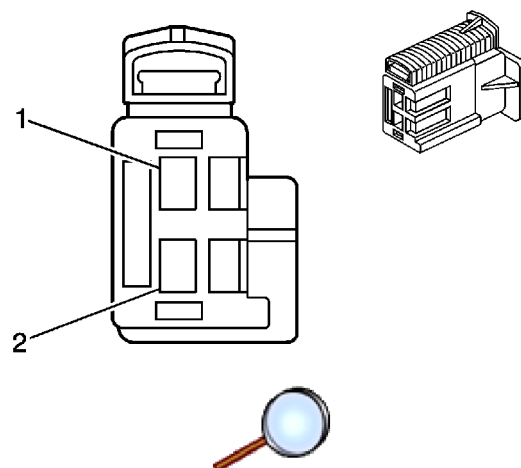
- Table 1: [Inflatable Restraint Front Passenger Presence Sensor \(PPS\) \(OCS\)](#)  
 Table 2: [Inflatable Restraint I/P Module](#)  
 Table 3: [Inflatable Restraint Sensing and Diagnostic Module \(SDM\) LHD](#)  
 Table 4: [Inflatable Restraint Sensing and Diagnostic Module \(SDM\) RHD](#)  
 Table 5: [Inflatable Restraint Sensing and Diagnostic Module \(SDM\) \(North America\)](#)  
 Table 6: [Inflatable Restraint Side Impact Module - Left](#)  
 Table 7: [Inflatable Restraint Side Impact Module - Right](#)  
 Table 8: [Inflatable Restraint Side Impact Sensor \(SIS\) - Left](#)  
 Table 9: [Inflatable Restraint Side Impact Sensor \(SIS\) - Right](#)  
 Table 10: [Inflatable Restraint Steering Wheel Module](#)  
 Table 11: [Inflatable Restraint Steering Wheel Module Coil - C1 \(Except North America\)](#)  
 Table 12: [Inflatable Restraint Steering Wheel Module Coil - C1 \(North America\)](#)  
 Table 13: [Inflatable Restraint Steering Wheel Module Coil - C2](#)  
 Table 14: [Seat Belt Pretensioner - Left Front](#)  
 Table 15: [Seat Belt Pretensioner - Right Front](#)

### Inflatable Restraint Front Passenger Presence Sensor (PPS) (OCS)

			
Connector Part Information		<ul style="list-style-type: none"> <li>• 1-0967640-1</li> <li>• 4-Way F Connector (BK)</li> </ul>	
Pin	Wire	Circuit	Function
1	PK	739	Ignition 1 Voltage
2	D-BU/WH	355	Communication
3	BK	250	Ground
4	--	--	Not Used

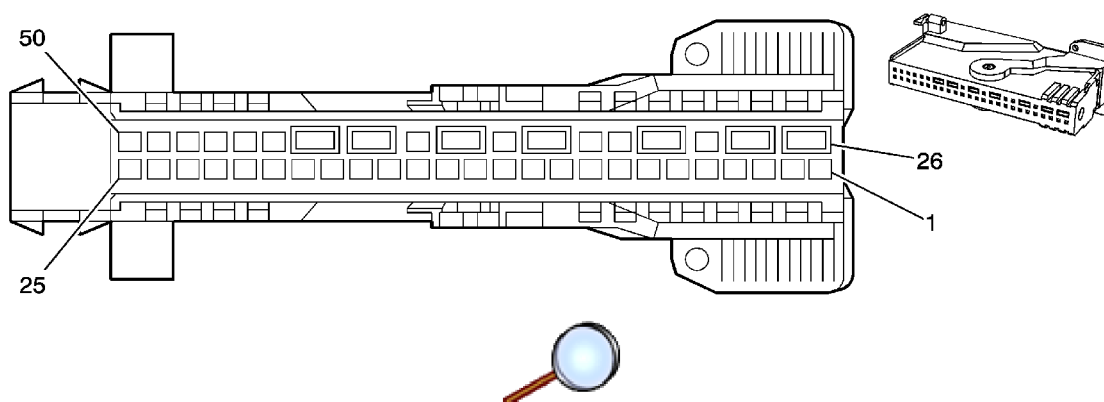
### Inflatable Restraint I/P Module



**Connector Part Information**

- 160201704
- 2-Way Connector (YE)

Pin	Wire	Circuit	Function
1	D-GN	347	Instrument Panel Module - High Control
2	BN	348	Instrument Panel - Low Control

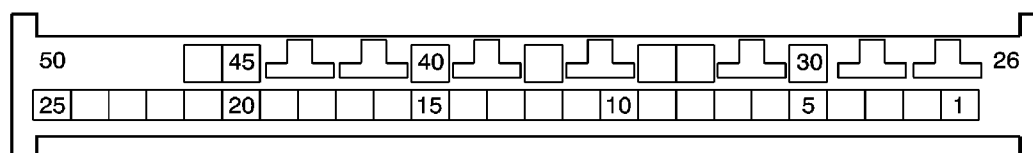
**Inflatable Restraint Sensing and Diagnostic Module (SDM) LHD****Connector Part Information**

- 4-368231
- 50-Way (RD)

Pin	Wire	Circuit	Function
1	YE	2117	Seat Belt Pretensioner Right - High Control
2	GY	2116	Seat Belt Pretensioner Right - Low Control
3	D-GN/RD	2119	Seat Belt Pretensioner Left - Low Control
4	WH/BK	2118	Seat Belt Pretensioner Left - High Control
5	PK	139	Ignition 1 Voltage
6	BK	250	Ground
7	D-GN/WH	358	Air Bag Indicator Control
8	--	--	Not Used
9	BN	337	SIR Serial Data

10	GY	1403	Steering Wheel Module - High Control
11	L-BU	1404	Steering Wheel Module - Low Control
12	--	--	Not Used
13	D-GN	347	I/P Module - High Control
14	BN	348	I/P Module - Low Control
15	--	--	Not Used
16	D-GN/WH	1423	Side Impact Module - Passenger - Low Control (Side Air Bags)
17	PU	1422	Side Impact Module - Passenger - High Control (Side Air Bags)
18	L-BU	1421	Side Impact Module - Driver - High Control (Side Air Bags)
19	GY	1420	Side Impact Module - Driver - Low Control (Side Air Bags)
20	BN/BK	1424	Side Impact Sensing Module - Left - Voltage (Side Air Bags)
21	L-GN/RD	1425	Side Impact Sensing Module - Right - Voltage (Side Air Bags)
22-44	--	--	Not Used
45	BK/WH	754	Side Impact Sensing Module - Left - Signal (Side Air Bags)
46	BN/WH	715	Side Impact Sensing Module - Right - Signal (Side Air Bags)
47-50	--	--	Not Used

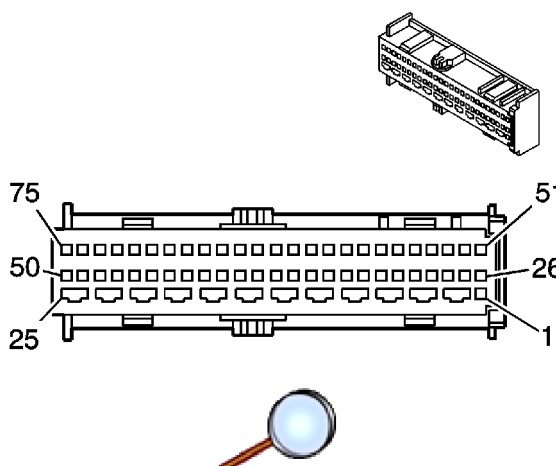
### Inflatable Restraint Sensing and Diagnostic Module (SDM) RHD



Connector Part Information		<ul style="list-style-type: none"> <li>• 4-368231</li> <li>• 50-Way</li> </ul>	
Pin	Wire	Circuit	Function
1	GY	2119	Seat Belt Pretensioner Right - Low Control
2	WH/BK	2118	Seat Belt Pretensioner Right - High Control
3	YE	2117	Seat Belt Pretensioner Left - High Control
4	GY	2116	Seat Belt Pretensioner Left - Low Control
5	PK	139	Ignition 1 Voltage
6	BK/WH	351	Ground
7	D-GN/WH	358	Air Bag Indicator Control
8	--	--	Not Used

9	BN	337	SIR Serial Data
10	GY	1403	Steering Wheel Module - High Control
11	L-BU	1404	Steering Wheel Module - Low Control
12	--	--	Not Used
13	D-GN	347	I/P Module - High Control
14	BN	348	I/P Module - Low Control
15	--	--	Not Used
16	GY	1420	Side Impact Module - Driver - Low Control (Side Air Bags)
17	L-BU	1421	Side Impact Module - Driver - High Control (Side Air Bags)
18	PU	1422	Battery Positive Voltage
19	D-GN/WH	1423	Side Impact Module - Passenger - Low Control (Side Air Bags)
20	L-GN/RD	1425	Side Impact Sensing Module - Right - Voltage (Side Air Bags)
21	BN/BK	1424	Side Impact Sensing Module - Left - Voltage (Side Air Bags)
22-44	--	--	Not Used
45	BK/WH	715	Side Impact Sensing Module - Right - Signal (Side Air Bags)
46	BN/WH	754	Side Impact Sensing Module - Left - Signal (Side Air Bags)
47-50	--	--	Not Used

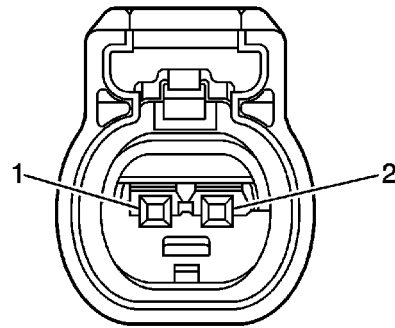
### Inflatable Restraint Sensing and Diagnostic Module (SDM) (North America)

			
<b>Connector Part Information</b>		<ul style="list-style-type: none"> <li>• 0-1393359-2</li> <li>• 75-Way F Connector (OG)</li> </ul>	
<b>Pin</b>	<b>Wire</b>	<b>Circuit</b>	<b>Function</b>
1	--	--	Not Used
2-25	--	--	Not Used (Shorting Bar)
26	PK	139	Ignition 1 Voltage
27	D-GN/WH	358	Air Bag Indicator Control
28	BK	250	Ground

29	L-BU	1404	Steering Wheel Module - Stage 1 - Low Control
30	GY	1403	Steering Wheel Module - Stage 1 - High Control
31	D-GN	347	I/P Module - Stage 1 - High Control
32	BN	348	I/P Module - Stage 1 - Low Control
33	WH/BK	2118	Seat Belt Pretensioner - Driver - High Control
34	D-GN/RD	2119	Seat Belt Pretensioner - Driver - Low Control
35	YE	2117	Seat Belt Pretensioner - Passenger - High Control
36	D-BU/WH	2116	Seat Belt Pretensioner - Passenger - Low Control
37	GY	1420	Side Impact Module - Driver High Control
38	L-BU	1421	Side Impact Module - Driver Low Control
39	PU	1422	Side Impact Module - Passenger Low Control
40	D-GN/WH	1423	Side Impact Module - Passenger High Control
41	PK	3022	Steering Wheel Module - Stage 2 - High Control
42	WH	3023	Steering Wheel Module - Stage 2 - High Control
43	GY	3027	IP Module - Stage 2 - High Control
44	PU	3026	IP Module - Stage 2 - Low Control
45-53	--	--	Not Used
54	BN	337	Serial Data
55	--	--	Not Used
56	PU	1358	Driver Information Center (DIC) Switch Signal
57-63	--	--	Not Used
64	D-BU/WH	355	Communication
65-67	--	--	Not Used
68	BN/WH	715	Side Impact Sensor - Passenger Signal
69	L-GN/RD	1425	Side Impact Sensor - Passenger Voltage
70	BN/BK	1424	Side Impact Sensor - Driver Voltage
71	BK/WH	754	Side Impact Sensor - Driver Signal
72	L-GN	6777	Discriminating Sensor - Right - Signal
73	BN/WH	6776	Discriminating Sensor - Right - Signal
74	YE	6168	Discriminating Sensor - Left - Signal
75	D-GN/WH	6169	Discriminating Sensor - Left - Signal

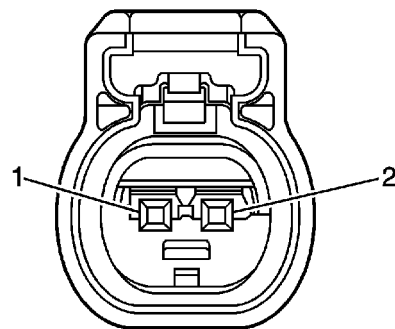
### **Inflatable Restraint Side Impact Module - Left**

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**Connector Part Information**

- 7283-5524-70
- 2-Way F 040 III Series, Sealed (YE)

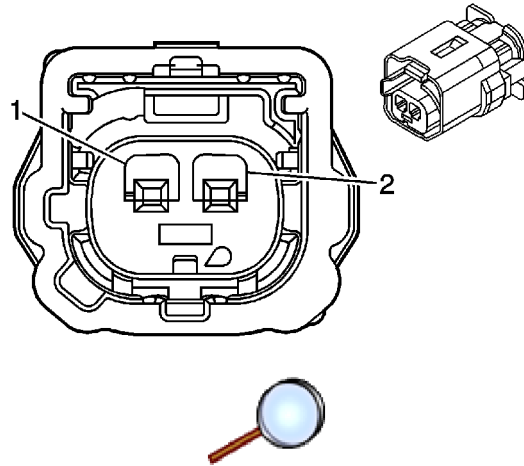
Pin	Wire	Circuit	Function
1	GY	1420	Side Impact Module - Driver - Low Control
2	L-BU	1421	Side Impact Module - Driver - High Control

**Inflatable Restraint Side Impact Module - Right****Connector Part Information**

- 7283-5524-70
- 2-Way F 040 III Series, Sealed (YE)

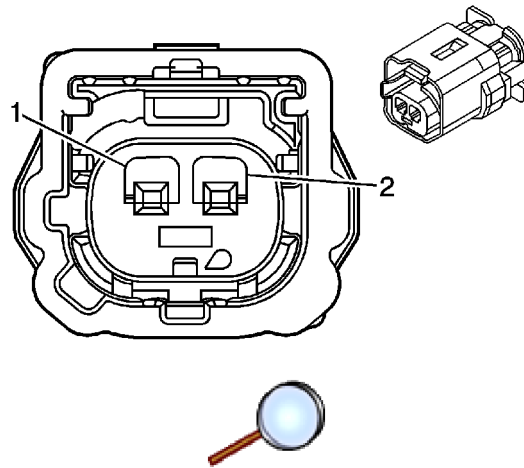
Pin	Wire	Circuit	Function
1	D-GN/WH	1423	Side Impact Module - Passenger - Low Control
2	PU	1422	Side Impact Module - Passenger - High Control

**Inflatable Restraint Side Impact Sensor (SIS) - Left**

**Connector Part Information**

- 7283-6502-50
- 2-Way F 040 III Series, Sealed (OG)

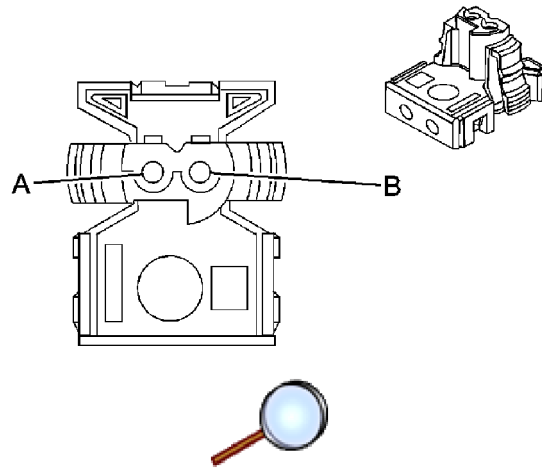
Pin	Wire	Circuit	Function
1	BK/WH	754	Side Impact Sensing Module (SIS) - Left - Signal
2	BN/BK	1424	Side Impact Sensing Module (SIS) - Left - Voltage

**Inflatable Restraint Side Impact Sensor (SIS) - Right****Connector Part Information**

- 7283-6502-50
- 2-Way F 040 III Series, Sealed (OG)

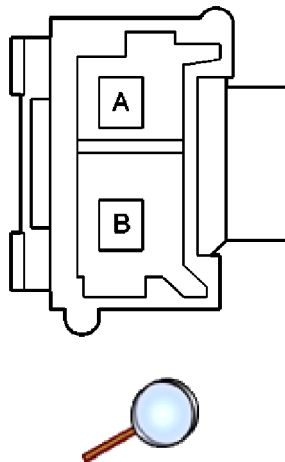
Pin	Wire	Circuit	Function
1	BK/WH	715	Side Impact Sensing Module (SIS) - Right - Signal
2	L-GN/RD	1425	Side Impact Sensing Module (SIS) - Right - Voltage

**Inflatable Restraint Steering Wheel Module**

**Connector Part Information**

- 54560210
- 2-Way F ABX-3 (YE)

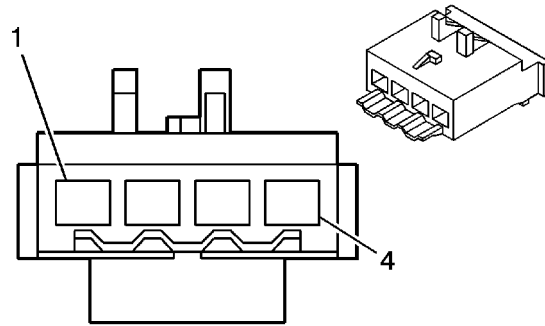
Pin	Wire	Circuit	Function
A	WH	1404	Steering Wheel Module - High Control
B	D-GN	1403	Steering Wheel Module - Low Control

**Inflatable Restraint Steering Wheel Module Coil - C1 (Except North America)****Connector Part Information**

- 12162794
- 2-Way F Metri-Pack 280 Series, Unsealed (YE)

Pin	Wire	Circuit	Function
A	D-GN	348	Steering Wheel Module - Low Control
B	WH	347	Steering Wheel Module - High Control

**Inflatable Restraint Steering Wheel Module Coil - C1 (North America)**

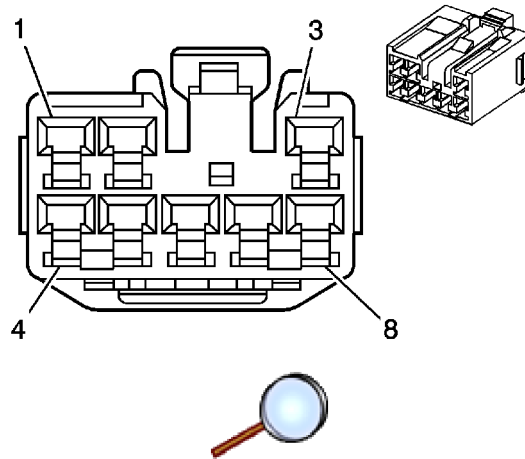


#### Connector Part Information

- 54550400
- 4-Way F Apex 2.8 Series, Unsealed (YE)

Pin	Wire	Circuit	Function
1	WH	3023	Steering Wheel Module Stage 2 High Control
2	PK	3022	Steering Wheel Module Stage 2 Low Control
3	GY	347	Steering Wheel Module Stage 1 High Control
4	L-BU	348	Steering Wheel Module Stage 1 Low control

### Inflatable Restraint Steering Wheel Module Coil - C2



#### Connector Part Information

- MG651050
- 8-Way F 090 II Series, Unsealed (NA)

Pin	Wire	Circuit	Function
1	WH/D-BU	1796	Steering Column Radio Control Signal
2	WH/RD	372	Remote Radio Audio (-)
3	D-GN	29	Horn Control
4	D-GN/WH	397	Cruise Control On Switch Signal
5-6	--	--	Not Used
7	D-GN/WH	718	Low Reference

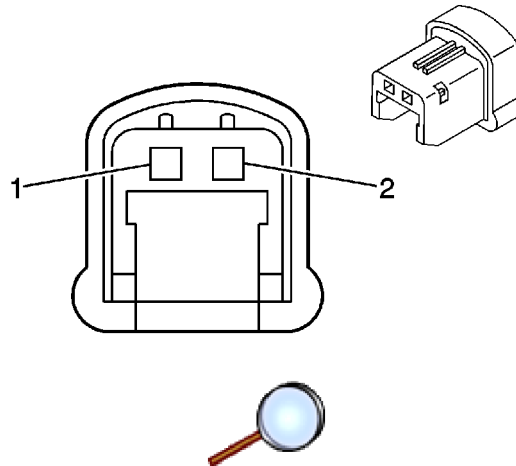


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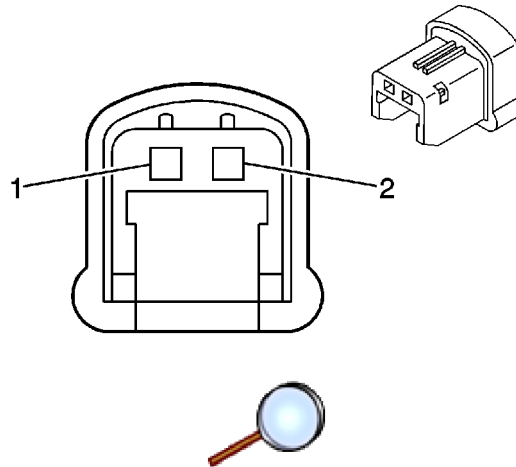
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Not Used

**Seat Belt Pretensioner - Left Front****Connector Part Information**

- V23540-M5302-Y22
- 2-Way Connector (GN)

Pin	Wire	Circuit	Function
1	GY	2119	Seat Belt Pretensioner - Left - Low Control
2	GY	2118	Seat Belt Pretensioner - Left - High Control

**Seat Belt Pretensioner - Right Front****Connector Part Information**

- V23540-M5302-Y22
- 2-Way Connector (GN)

Pin	Wire	Circuit	Function
1	YE	2117	Seat Belt Pretensioner - Right - High Control
2	GY	2116	Seat Belt Pretensioner - Right - Low Control

## SIR Service Precautions

**Caution:** Refer to [Servicing the SIR System Caution](#) in the Preface section.

**Caution:** Refer to [Sensing and Diagnostic Module Voltage after Ignition is Turned Off Caution](#) in the Preface section.

**Caution:** Refer to [SIR Caution](#) in the Preface section.

The inflatable restraint sensing and diagnostic module (SDM) maintains a reserved energy supply. The reserved energy supply provides deployment power for the air bags. Deployment power is available for as much as 2 minutes after disconnecting the vehicle power. Disabling the SIR system prevents deployment of the air bags from the reserved energy supply.

## General Service Instructions

The following are general service instructions which must be followed in order to properly repair the vehicle and return it to its original integrity:

- Do not expose inflator modules to temperatures above 65°C (150°F).
- Verify the correct replacement part number. Do not substitute a component from a different vehicle.
- Use only original GM replacement parts available from your authorized GM dealer. Do not use salvaged parts for repairs to the SIR system.

Discard any of the following components if it has been dropped from a height of 91 cm (3 ft) or greater:

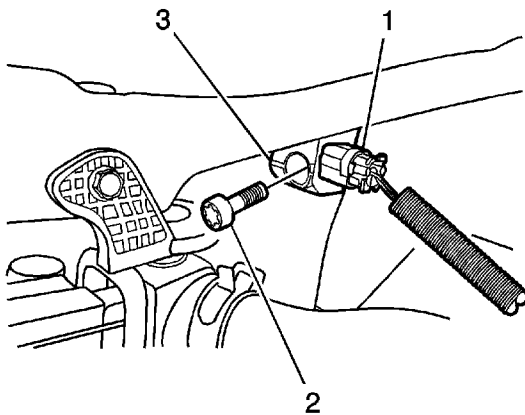
- Inflatable restraint SDM
- Inflatable restraint front end sensors
- Inflatable restraint instrument panel (I/P) module
- Inflatable restraint steering wheel module
- Inflatable restraint steering wheel module coil
- Inflatable restraint side impact modules
- Inflatable restraint side impact sensors (SIS)
- Inflatable restraint seat belt pretensioners

# Inflatable Restraint Front End Sensor Replacement

## Removal Procedure

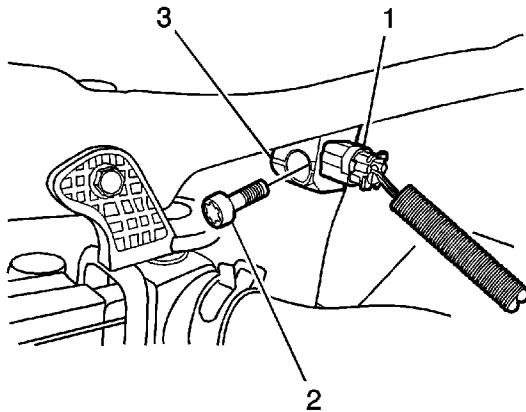
**Caution:** Refer to [Sensing and Diagnostic Module Voltage after Ignition is Turned Off Caution](#) in the Preface section.

**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Disconnect the connector (1) from the front air bag sensor (3).
3. Remove the front air bag sensor mounting bolt (2).
4. Remove the front air bag sensor.

## Installation Procedure



1. Install the front air bag sensor.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

2. Install the front air bag sensor mounting bolt (2).

#### **Tighten**

Tighten the side air bag sensor mounting bolts to 10 N·m (89 lb in).

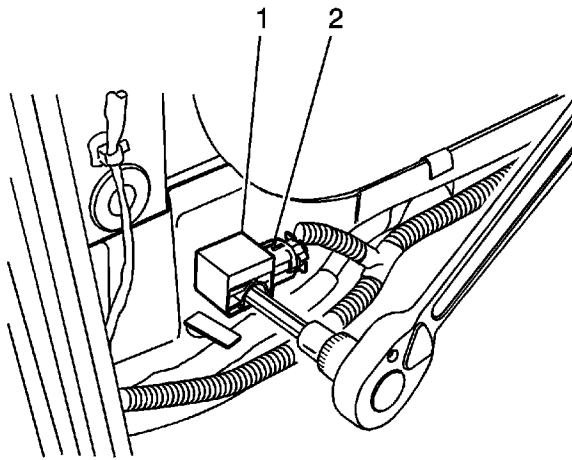
3. Connect the connector (1) to the front air bag sensor (3).
4. Connect the negative battery cable.

## Inflatable Restraint Side Impact Sensor Replacement

### Removal Procedure

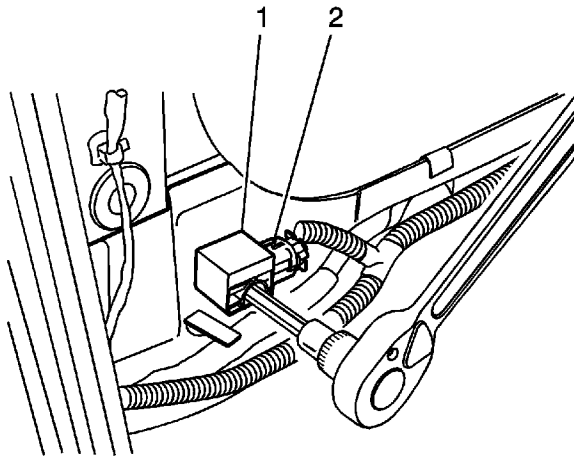
**Caution:** Refer to [Sensing and Diagnostic Module Voltage after Ignition is Turned Off Caution](#) in the Preface section.

**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the lower trim from the center pillar. Refer to [Center Pillar Lower Trim Panel Replacement](#).
3. Disconnect the side air bag sensor connector (2).
4. Remove the side air bag sensor mounting bolt.
5. Remove the side air bag sensor (1).

### Installation Procedure



1. Install the side air bag sensor (1).

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

2. Install the side air bag sensor mounting bolt.

#### **Tighten**

Tighten the side air bag sensor mounting bolt to 10 N·m (89 lb in).

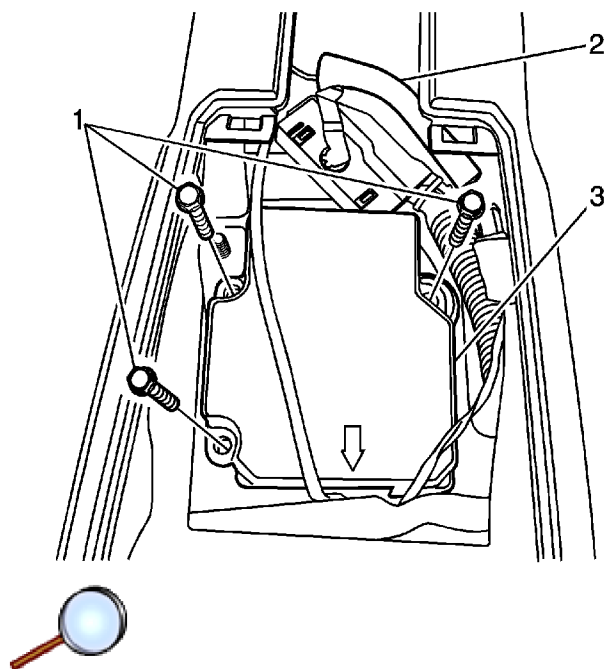
3. Connect the side air bag sensor connector (2).
4. Install the lower trim to the center pillar. Refer to [Center Pillar Lower Trim Panel Replacement](#).
5. Connect the negative battery cable.

# Inflatable Restraint Sensing and Diagnostic Module Replacement

## Removal Procedure

**Caution:** Refer to [Sensing and Diagnostic Module Handling Caution](#) in the Preface section.

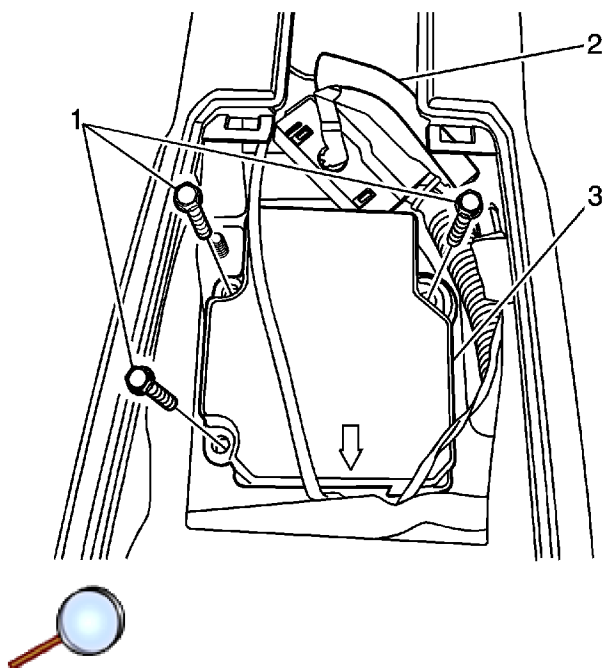
**Caution:** Refer to [SIR Caution](#) in the Preface section.



**Caution:** If the vehicle interior is exposed to moisture and becomes soaked up to the level of the sensing and diagnostic module (SDM), the SDM and SDM harness connector must be replaced. The SDM could be activated when powered, which could cause airbag deployment and result in personal injury.

1. Disable the supplemental inflatable restraints (SIR). Refer to [SIR Disabling and Enabling](#).
2. Remove the floor console trim bezel. Refer to [Front Floor Console Replacement](#).
3. Remove the connector position assurance lock, which is tethered to the SDM connector.
4. Disconnect the SDM electrical connector (2).
5. Remove the SDM mounting bolts (1).
6. Remove the SDM (3).

## Installation Procedure



1. Install the SDM (3).

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

**Caution:** Be careful when you handle a sensor. Do not strike or jolt a sensor. Before applying power to a sensor:

- Remove any dirt, grease, etc. from the mounting surface.
- Position the sensor horizontally on the mounting surface.
- Point the arrow on the sensor toward the front of the vehicle.
- Tighten all of the sensor fasteners and sensor bracket fasteners to the specified torque value.

Failure to follow the correct procedure could cause air bag deployment, personal injury, or unnecessary SIR system repairs.

2. Install the SDM mounting bolts (1).

#### **Tighten**

Tighten the SDM mounting bolts to 10 N·m (89 lb in).

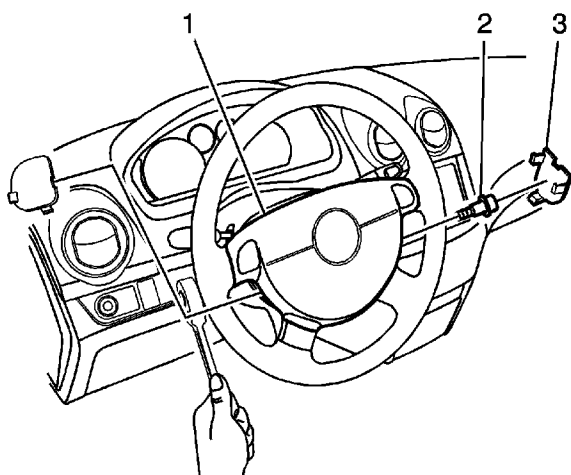
3. Connect the SDM electrical connector (2).
4. Install the connector position assurance lock, which is tethered to the SDM connector.
5. Install the floor console trim bezel. Refer to [Front Floor Console Replacement](#).
6. Enable the SIR. Refer to [SIR Disabling and Enabling](#).



# Steering Wheel Inflatable Restraint Module Replacement

## Removal Procedure

**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the steering wheel control switches, if equipped. Refer to [Steering Wheel Control Switch Assembly Replacement](#).

**Caution:** The sensing and the diagnosis module (SDM) can maintain sufficient voltage to deploy the airbags and pretensioners for up to 1 minute after the ignition has been turned OFF and the fuse has been removed. If the airbags and pretensioners are not disconnected, do not begin service until one minute has been passed after disconnecting power to the SDM. Failure to do so may cause personal injury.

3. Remove 2 driver air bag module mounting bolts (2) and discard them.
4. Remove the connector from the horn terminal and the driver air bag module.

**Caution:** When you are carrying an undeployed inflator module:

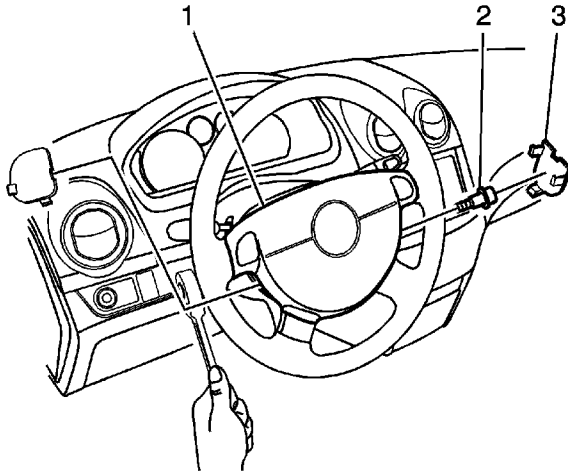
- Do not carry the inflator module by the wires or connector on the inflator module
- Make sure the bag opening points away from you

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

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5. Remove the driver air bag module (1).

## Installation Procedure



1. Install the connectors to the horn terminal and the driver air bag module.
2. Install the driver air bag module (1).

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

3. Install the new driver air bag mounting bolts (2).

### **Tighten**

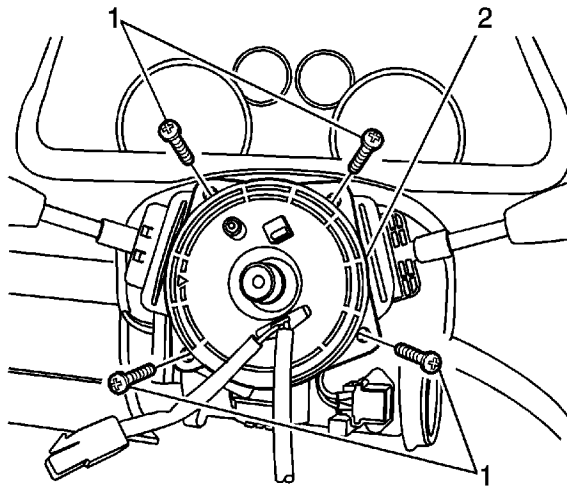
Tighten the driver air bag module mounting bolts to 15 N·m (11 lb ft).

4. Install the steering wheel control switches, if equipped. Refer to [Steering Wheel Control Switch Assembly Replacement](#).
5. Connect the negative battery cable.

# Steering Wheel Inflatable Restraint Module Coil Replacement

## Removal Procedure

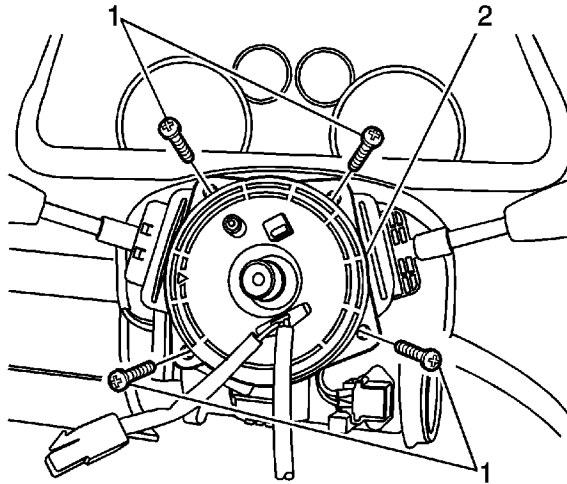
**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.



**Caution:** The sensing and the diagnosis module (SDM) can maintain sufficient voltage to deploy the airbags and pretensioners for up to 1 minute after the ignition has been turned OFF and the fuse has been removed. If the airbags and pretensioners are not disconnected, do not begin service until one minute has been passed after disconnecting power to the SDM. Failure to do so may cause personal injury.

1. Disconnect the negative battery cable.
2. Remove the steering wheel. Refer to [Steering Wheel Replacement](#) .
3. Remove the screws from the upper and lower steering column covers, and remove the covers.
4. Remove the driver side knee bolster or instrument panel lower cover.
5. Disconnect the driver air bag, and horn connectors from the lower steering column.
6. Remove the screws (1) and discard them.
7. Remove the clock spring (2) from the steering shaft.

## Installation Procedure



1. Install the clock spring (2) to the steering shaft.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

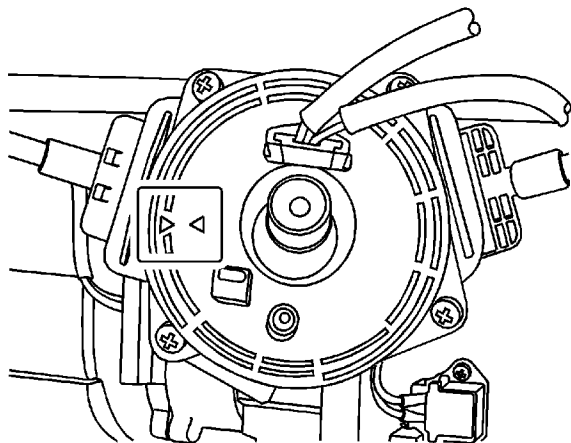
2. Install the new screws (1).

#### **Tighten**

Tighten the clock spring screws to 1.25 N·m (11 lb in).

3. Ensure the clock spring (2) is centered. Refer to [Inflatable Restraint Steering Wheel Module Coil Centering](#).
4. Connect the driver air bag and horn connectors at the lower steering column.
5. Install the driver side knee bolster or instrument panel lower cover.
6. Install the upper and lower steering column covers, and install the screws.
7. Install the steering wheel. Refer to [Steering Wheel Replacement](#).
8. Connect the negative battery cable.

## Inflatable Restraint Steering Wheel Module Coil Centering



**Caution:** When servicing the steering column, the Supplemental Inflatable Restraint (SIR) System clock spring must be centered for proper steering wheel operation. Failure to properly center the SIR clock spring may result in reduced turnability of the steering wheel causing the vehicle to improperly maneuver and may cause the SIR system to be inoperative.

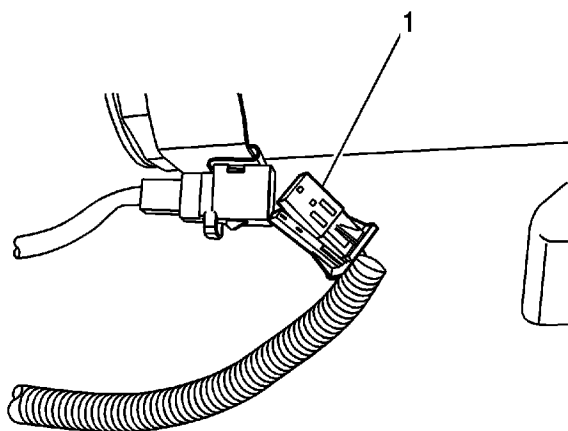
**Notice:** Do not rotate the steering wheel or move the position of the steering gear once the intermediate shaft is disconnected. This will uncenter the Inflatable Restraint coil in the steering column. If the Inflatable Restraint coil becomes uncentered, it may be damaged during vehicle operation.

1. Turn the front wheels straight ahead.
2. Turn the lobe of the clock spring clockwise to lock. Do not force.
3. Turn the lobe of the clock spring counterclockwise approximately 3 turns to the Neutral position, with the front of the wheels straight ahead.
4. Properly align the pointed marks on the components of the clock spring.

## Instrument Panel Inflatable Restraint Module Replacement (Notchback)

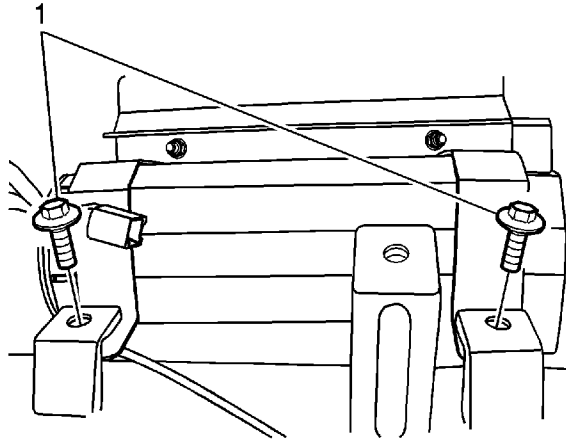
### Removal Procedure

**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.

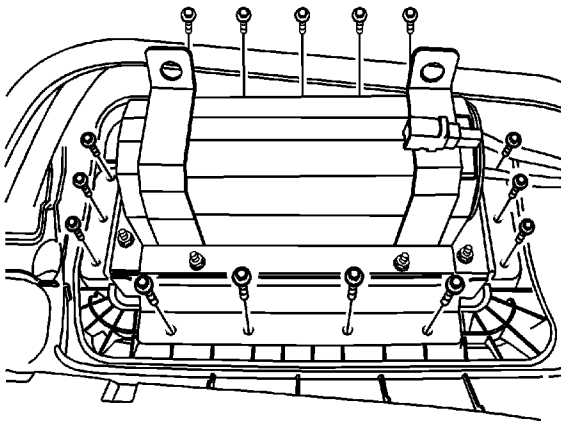


**Caution:** The sensing and the diagnosis module (SDM) can maintain sufficient voltage to deploy the airbags and pretensioners for up to 1 minute after the ignition has been turned OFF and the fuse has been removed. If the airbags and pretensioners are not disconnected, do not begin service until one minute has been passed after disconnecting power to the SDM. Failure to do so may cause personal injury.

1. Disconnect the negative battery cable.
2. Remove the glove box. Refer to [Instrument Panel Storage Compartment Replacement](#).
3. Disconnect the passenger air bag yellow electrical connector (1).
4. Remove the instrument panel. Refer to [Instrument Panel Assembly Replacement](#).



5. Remove the air bag module mounting bolts (1) from the tie bar.

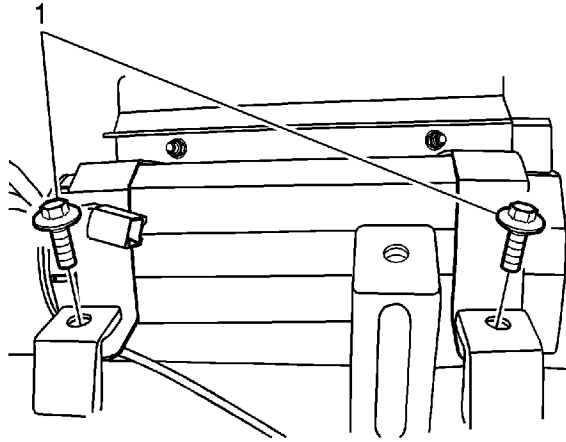


6. Remove the passenger air bag module by removing the mounting bolts from the upper instrument panel.

## Installation Procedure

1. Install the passenger air bag module.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

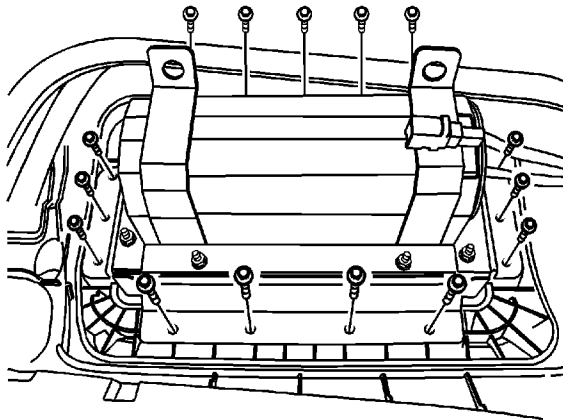


2. Install the passenger air bag module mounting bolts to the tie bar.

**Tighten**

Tighten the passenger air bag module mounting bolts to 15 N·m (11 lb ft).

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



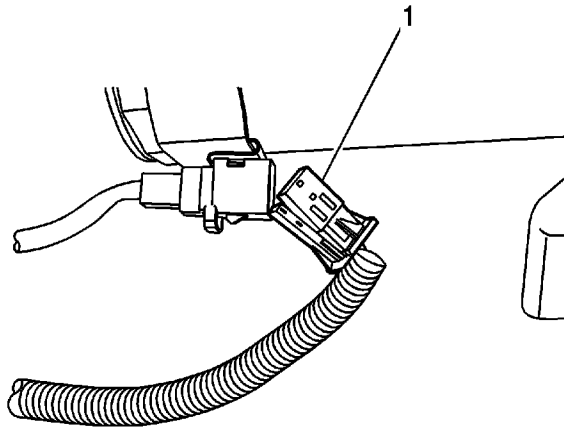
3. Install the passenger air bag module mounting bolts to the upper instrument panel.

**Tighten**

Tighten the passenger air bag module mounting bolts to 6 N·m (53 lb in).



4. Install the instrument panel. Refer to [Instrument Panel Assembly Replacement](#) .

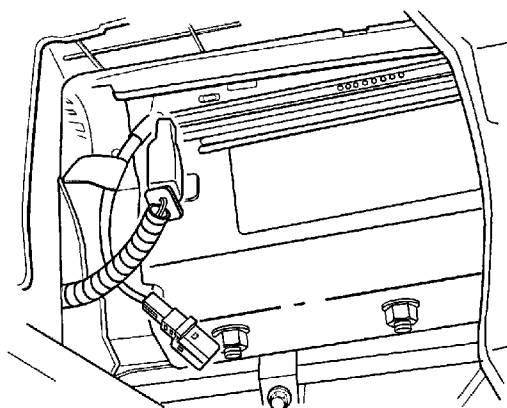


5. Connect the passenger air bag yellow electrical connector (1).
6. Install the glove box. Refer to [Instrument Panel Storage Compartment Replacement](#) .
7. Connect the negative battery cable.

## Instrument Panel Inflatable Restraint Module Replacement (Hatchback)

### Removal Procedure

**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.

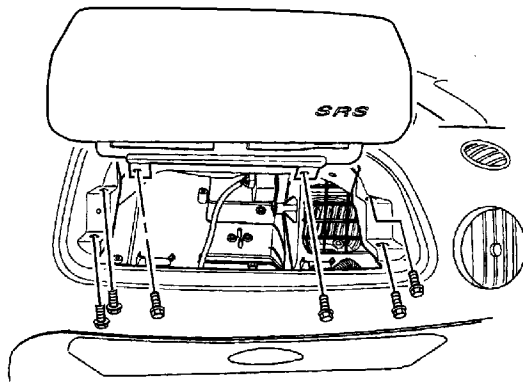


**Caution:** The sensing and the diagnosis module (SDM) can maintain sufficient voltage to deploy the airbags and pretensioners for up to 1 minute after the ignition has been turned OFF and the fuse has been removed. If the airbags and pretensioners are not disconnected, do not begin service until one minute has been passed after disconnecting power to the SDM. Failure to do so may cause personal injury.

1. Disconnect the negative battery cable.
2. Remove the glove box. Refer to [Instrument Panel Storage Compartment Replacement](#) .
3. Disconnect the passenger air bag yellow electrical connector.
4. Remove the passenger air bag module by removing the mounting bolts from the air bag bracket.

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the passenger air bag module by installing the mounting bolts to the air bag bracket.

**Tighten**

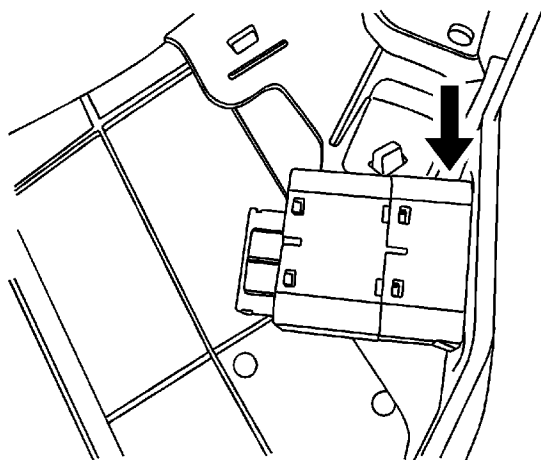
Tighten the passenger air bag module mounting bolt to 11 N·m (97 lb in).

2. Connect the passenger air bag yellow electrical connector.
3. Install the glove box. Refer to [Instrument Panel Storage Compartment Replacement](#) .
4. Connect the negative battery cable.

# Instrument Panel Inflatable Restraint Module Switch Replacement

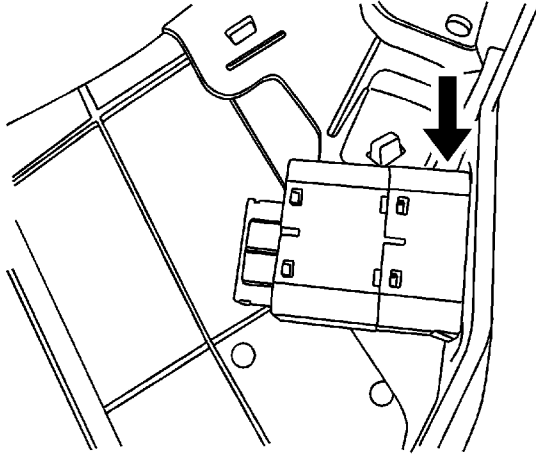
## Removal Procedure

**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the glove box. Refer to [Instrument Panel Storage Compartment Replacement](#)
3. Disconnect the passenger air bag disable switch connector.
4. Remove the passenger air bag disable switch by pushing the tab on the upper side of the switch housing.

## Installation Procedure



1. Install the passenger air bag disable switch.
2. Connect the passenger air bag disable switch connector.
3. Connect the negative battery cable.

## Repairs and Inspections Required After a Collision

**Caution:** Proper operation of the SIR sensing system requires that any repairs to the vehicle structure return the vehicle structure to the original production configuration. Not properly repairing the vehicle structure could cause non-deployment in a collision or deployment for conditions less severe than intended.

- If any supplemental inflatable restraints (SIR) components are damaged, they must be replaced. If SIR components mounting points are damaged, they must be repaired or replaced.
- Never use SIR parts from another vehicle. This does not include remanufactured parts purchased from an authorized source.
- Do not attempt to service the sensing and diagnostic module (SDM), the steering wheel module coil, or other air bag modules, these items must be replaced if they are defective.
- Verify the part number of replaced air bag modules. Some inflator modules look identical but contain different internal components.

## Accident with Deployment Component Replacements

All SIR components must be replaced after a frontal crash involving air bag deployment. After deployment, a powdery residue may be on the surface of the air bag. The powder consists primarily of cornstarch, used to lubricate the bag as it inflates, and by-products of the chemical reaction. The sodium hydroxide then quickly reacts with atmospheric moisture and is converted to sodium bicarbonate, also known as baking soda. Therefore, it is unlikely that sodium hydroxide will be present after deployment. Replace the following SIR components.

**Caution:** Safety precautions must be followed when handling a deployed inflator module (air bag). After deployment, the inflator module (air bag) surface may contain a small amount of sodium hydroxide, a by-product of the deployment reaction, that is irritating to the skin and eyes. Most of the powder on the inflator module (air bag) is harmless. as a precaution, wear gloves and safety glasses when handling a deployed inflator module (air bag), and wash your hands with mild soap and water afterwards.

- The SDM
- Air bag modules (as needed) and pretensioners
- SIR wiring
- Clock spring

## Accident without Deployment Component Inspection

The following inspections must be performed after any crash, whether the air bag has deployed or not:

- The steering column must be dimensionally inspected.
- Inspect the knee bolsters and mounting points for distortion, bending and cracking or other damages.
- Inspect the instrument panel (I/P) and steering column reinforcement plate for distortion,

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bending and cracking or other damage.

- Inspect the I/P braces for distortion, bending and cracking or other damage.
- Inspect the seat belt and mounting points. Refer to [Seat Belt System Description and Operation](#) .

## Inflator Module Handling and Scrapping

### Air Bag Module Deployment - Inside of Vehicle

**Caution:** When deploying an airbag inside the vehicle, make sure the vehicle doors are closed and the side windows are fully open. Wear safety glasses throughout the entire procedure. Make sure the deployment area in the vehicle is clear of people, or loose objects. Failure to follow these guidelines could result in personal injury or vehicle damage.

Deploy the air bags before disposing them. If a vehicle is to be scrapped, the air bag may be deployed inside the vehicle.

**CAUTION:** When you are deploying an inflator module for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

- Before deploying the air bags, remove all loose objects from the air bags expansion area.
- Deploy the air bags with the vehicles doors closed and the side windows open.
- Deploy the air bags only in an evacuated area. Service personnel who must be present during the deployment should be at least 10 m (33 ft) in front of the vehicle.
- Do not connect the voltage source until after having completed all other preparations for the deployment of air bags.
- Allow a deployed air bag module or pretensioner cool for 30 minutes before handling.
- Wear gloves and eye protection during the disposal procedure.
- If the deployment fails, disconnect the voltage source and wait 5 minutes before approaching the vehicle.

### Deployment Procedure

**Caution:** Refer to [Sensing and Diagnostic Module Voltage after Ignition is Turned Off Caution](#) in the Preface section.

**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.

1. Disconnect both battery cables and place the battery at least 10 m (33 ft) from the vehicle.
2. Remove the driver side knee bolster or instrument panel lower cover from the steering column.
3. At the lower steering column, cut the 2 wires leading from the supplemental inflatable restraints (SIR) harness to the steering wheel module coil.
4. Strip 13 mm (0.5 in) of the insulation from the end of the wires leading to the steering wheel module coil.
5. Use 2 additional wires, each at least 10 m (33 ft) long, to reach from the deployment battery to the inflator module.
6. Strip 13 mm (0.5 in) of the insulation from the end of these 2 additional wires.
7. Twist the 2 wires together at one end.
8. Place the twisted ends of the 2 wires near the deployment battery. Do not connect the wires to the battery at this time.
9. Using the free ends of the 10 m (33 ft) wires leading to the steering wheel module coil, make

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- 2 splices, one at each wire from the air bag modules.
10. Wrap the wires with insulation tape.
11. Now that the free ends of the 10 m (33 ft) wires are spliced to the air bag module wires, and the ends that are twisted together are near the deployment battery, clear the area.
12. Untwist the wires that near the deployment battery.
13. Touch one wire to the positive battery terminal and touch the other wire to the negative battery terminal. The air bag will deploy.
14. Repeat this procedure for the passenger air bag, side air bags, and pretensioners.
15. Using proper precautions, dispose of the deployed air bags/pretensioners. Refer to Deployed Air Bag Module Disposal Procedure.

## Air Bag Module Deployment - Outside of Vehicle

If the vehicle is within the warranty period, contact the General Motors regional service manager for approval or special instructions before deploying the air bag modules.

Deploy air bag modules in following situations:

- The vehicle is to be scrapped--Refer to [Inflator Module Handling and Scrapping](#) .
- If an air bag module is damaged during transit, storage, or service

**CAUTION:** When you are deploying an inflator module for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

- Deploy the air bags only in an evacuated area. Service personnel who must be present during the deployment should be at least 10 m (33 ft) in front of the vehicle.
  - Do not connect the voltage source until after having completed all other preparations for the deployment of air bags.
  - Allow a deployed air bag module or pretensioner cool for 30 minutes before handling.
  - Wear gloves and eye protection during the disposal procedure.
  - If the deployment fails, disconnect the voltage source and wait 5 minutes before approaching the vehicle.
1. Position the air bag module face up, on flat ground outdoors, at least 10 m (33 ft) from any obstacles or people.
  2. Place a vehicle battery at least 10 m (33 ft) away from the air bag module.
  3. Deploy the air bag module.
  4. Perform the Air Bag Module Deployment procedure as follows.
  5. Cut the yellow wires to the air bag module/pretensioner.
  6. Strip 13 mm (0.5 in) of the insulation from the end of the wires leading to the air bag module/pretensioner.
  7. Use 2 additional wires, each at least 10 m (33 ft) long, to reach from the deployment battery to the air bag module/pretensioner.
  8. Strip 13 mm (0.5 in) of the insulation from the ends of these 2 additional wires.
  9. Twist the 2 wires together at one end.
  10. Place the twisted ends of the 2 wires near the deployment battery. Do not connect the wires to the battery at this time.
  11. Using the free ends of the 10 m (33 ft) wires leading to the air bag module/pretensioner, make 2 splices, one at each wires from the air bag module/pretensioner.
  12. Wrap the splices with insulating tape.
  13. Now that the free ends of the 10 m (33 ft) wires are spliced to the air bag

module/pretensioner wires, and the ends that are twisted together are near the deployment battery, clear the area.

14. Untwist the wires that are near the deployment battery.
15. Touch one wire to the positive battery terminal and touch the other wire to the negative battery terminal. The air bag will deploy.
16. Using proper precautions, dispose of the deployed air bags/pretensioners. Refer to the Deployed Air Bag Module Disposal Procedure.

## Deployed Air Bag Module Disposal Procedure

**Caution:** Safety precautions must be followed when handling a deployed inflator module (air bag). After deployment, the inflator module (air bag) surface may contain a small amount of sodium hydroxide, a by-product of the deployment reaction, that is irritating to the skin and eyes. Most of the powder on the inflator module (air bag) is harmless. as a precaution, wear gloves and safety glasses when handling a deployed inflator module (air bag), and wash your hands with mild soap and water afterwards.

**Caution:** Approved safety glasses and gloves should be worn when performing this procedure to reduce the chance of personal injury.

**Caution:** Immediately following the deployment of an air bag, the metal surfaces of the inflator module are very hot. Do not place the deployed inflator module near any flammable objects. Wait for about ten minutes before touching any metal surface of the inflator module. Disregarding these precautions may cause fire or personal injury.

Deploy an air bag or pretensioner before disposing of it.

This includes those in a whole vehicle being scrapped. If the vehicle is still within the warranty period contact the General Motors regional service manager for approval or special instructions before deploying an air bag module or a pretensioner. Deployed air bag module or pretensioner should be disposed of in the same manner as other scrap parts, with the addition of the following steps:

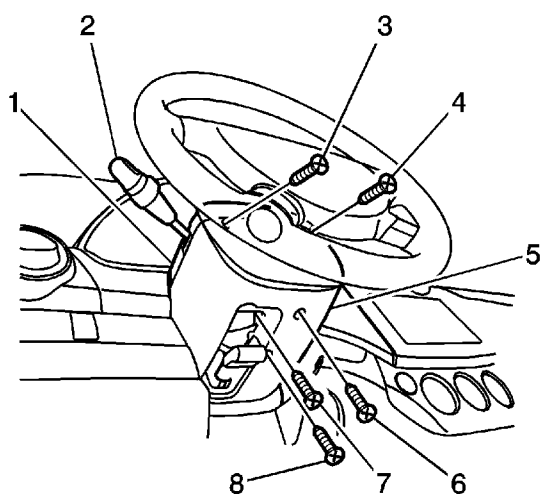
1. Place the deployed air bag or pretensioner in a sturdy plastic bag.
2. Seal the plastic bag securely.
3. Wash your hands and rinse them with water after handling a deployed air bag.

## Fastener Tightening Specifications

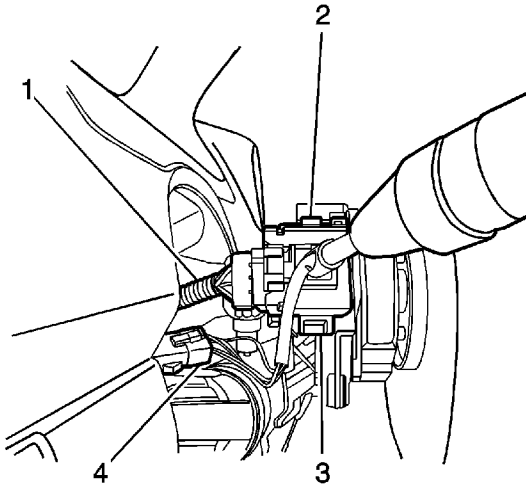
Application	Specification	
	Metric	English
Coupling Flange Pinch Bolt	22 N·m	16 lb ft
Ignition Switch Housing Sheer Bolts	11 N·m	97 lb in
Ignition Switch Retaining Screw	2 N·m	18 lb in
Key Interlock Solenoid Screws	2 N·m	18 lb in
Key Reminder Switch Screws	2 N·m	18 lb in
Lower Instrument Trim Panel Screws	3 N·m	27 lb in
Lower Steering Column Cover Panel Screws	3 N·m	27 lb in
Steering Column Jacket Assembly Bracket Nuts	22 N·m	16 lb ft
Steering Wheel Nut	38 N·m	28 lb ft
Support Housing Screws	16 N·m	12 lb ft
Tilt Steering Lever Cap Screw	4 N·m	35 lb in
Turn Signal Switch Housing Screws	3 N·m	27 lb in
Upper and Lower Steering Column Cover Panel Screws	3 N·m	27 lb in

## Turn Signal Multifunction Switch Replacement (Notchback)

### Removal Procedure

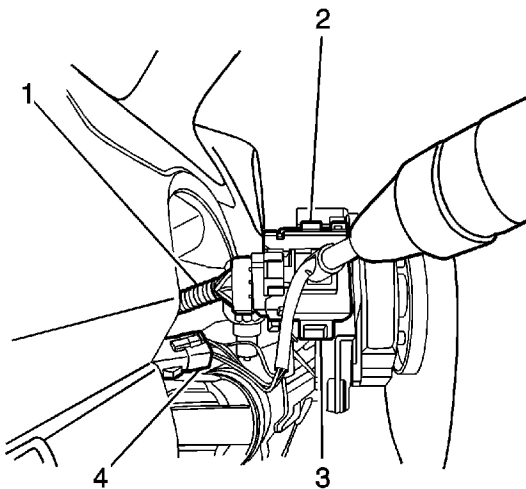


1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the lower steering column cover panel screws (6, 7, 8).
3. Turn the steering wheel in order to access the upper steering column cover panel screws (3, 4). Remove the upper steering column cover panel screws.
4. Remove the upper steering column cover panel (1) and the lower steering column cover panel (5).

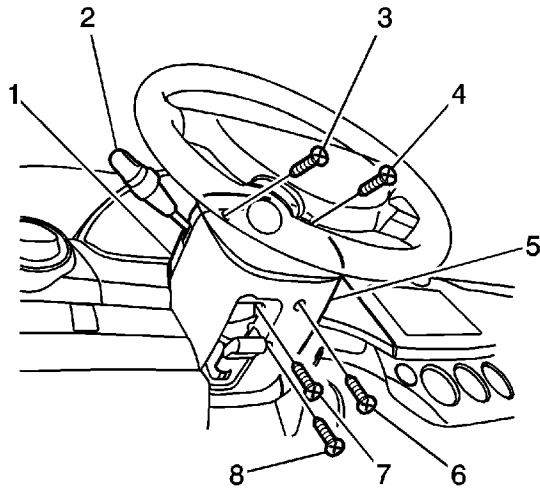


5. Remove the turn signal switch by pushing in on the tabs (2, 3) on either side of the switch housing.
6. Disconnect the electrical connectors (1, 4) from the turn signal switch.

## Installation Procedure



1. Connect the electrical connectors (1, 4) to the turn signal switch.
2. Install the turn signal switch into the switch housing.



3. Install the upper steering column cover panel (1) and the lower steering column cover panel (5).

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

4. Install the lower steering column cover panel screws (6, 7, 8).

**Tighten**

Tighten the lower steering column cover panel screws to 3 N·m (27 lb in).

5. Turn the steering wheel in order to access the upper steering column cover panel screw holes. Install the upper steering column cover panel screws (3, 4).

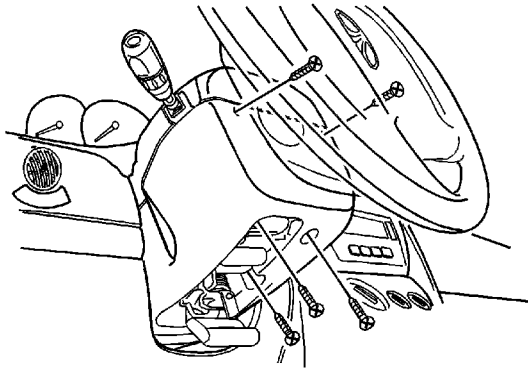
**Tighten**

Tighten the upper steering column cover panel screws to 3 N·m (27 lb in).

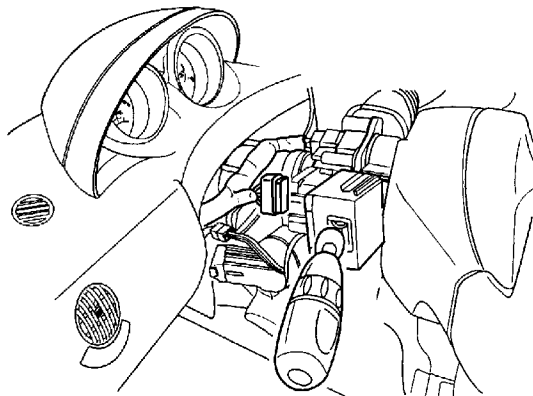
6. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Turn Signal Multifunction Switch Replacement (Hatchback)

### Removal Procedure



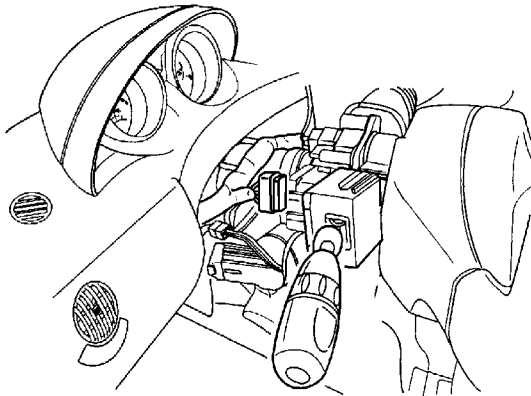
1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the lower steering column cover panel screws.
3. Turn the steering wheel in order to access the upper steering column cover panel screws. Remove the upper steering column cover panel screws.
4. Remove the upper and the lower steering column cover panels.



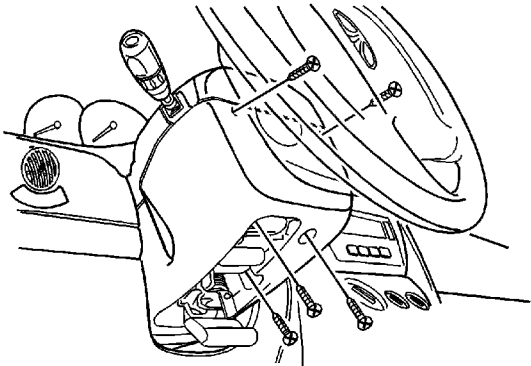


5. Remove the turn signal switch by pushing in on the tabs on either side of the switch housing.
6. Disconnect the electrical connectors from the turn signal switch.

## **Installation Procedure**



1. Connect the electrical connectors to the turn signal switch.
2. Install the turn signal switch into the switch housing.



3. Install the upper and the lower steering column cover panels.



**Notice:** Refer to [Fastener Notice](#) in the Preface section.

4. Install the lower steering column cover panel screws.

**Tighten**

Tighten the lower steering column cover panel screws to 3 N·m (27 lb in).

5. Turn the steering wheel in order to access the upper steering column cover panel screw holes. Install the upper steering column cover panel screws.

**Tighten**

Tighten the upper steering column cover panel screws to 3 N·m (27 lb in).

6. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#) .

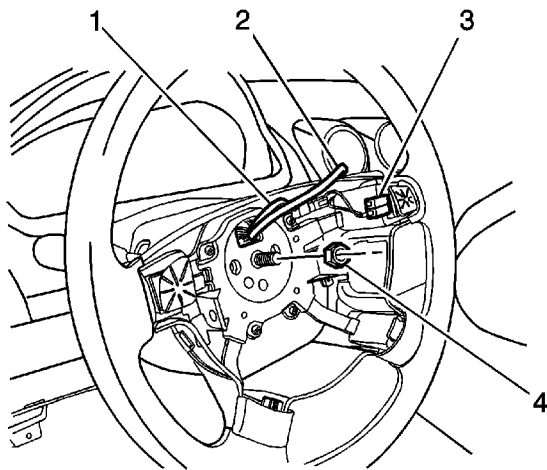
## Steering Wheel Replacement (Notchback)

### Tools Required

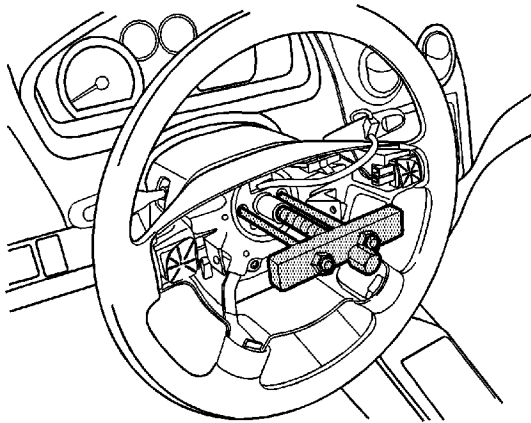
[KM-210-A](#) Steering Wheel Puller

### Removal Procedure

1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the SIR module. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#).



3. Place match marks on the steering wheel and on the steering column shaft.
4. Disconnect the horn connector.
5. Remove the steering wheel nut (4) and the retaining clip.

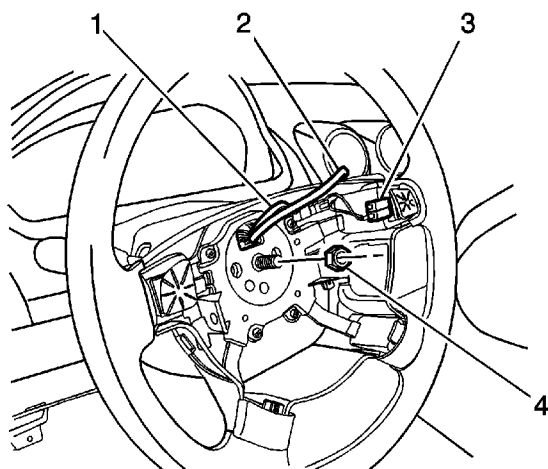


6. Remove the steering wheel using the [KM-210-A](#).
7. Unclip the contact ring from the steering wheel, if necessary.

## Installation Procedure

1. Clip the contact ring on the steering wheel, if necessary.
2. Align the match marks on the steering wheel and the steering column shaft. Turn the signal-canceling cam on the wheel to the left.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



3. Install the retaining clip and the steering wheel nut (4).

**Tighten**

Tighten the steering wheel nut to 38 N·m (28 lb ft).

4. Bend the tabs to secure the retaining clip.
5. Install the SIR module. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#).
6. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

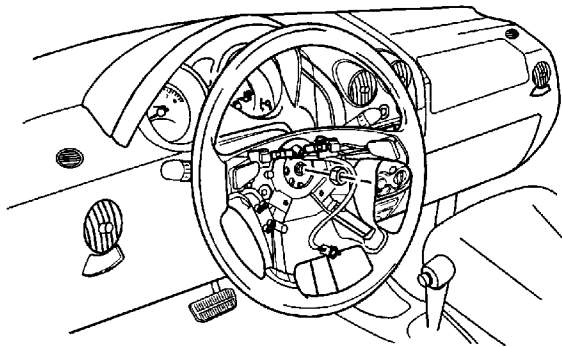
## Steering Wheel Replacement (Hatchback)

## Tools Required

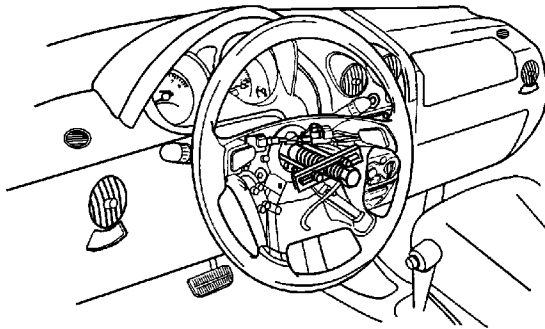
- [KM-210-A](#) Steering Wheel Puller
- [J 36541-A](#) Steering Wheel Puller Legs
- [J 1859-A](#) Steering Wheel Puller

## Removal Procedure

1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the SIR module. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#).

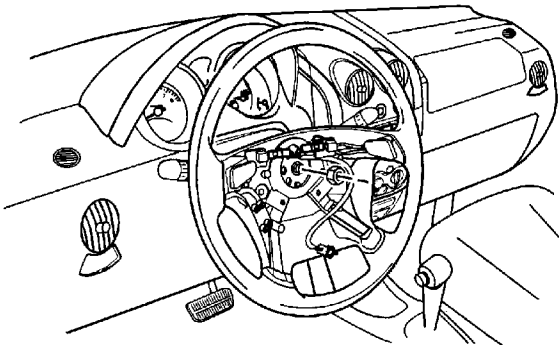


3. Place match marks on the steering wheel and on the steering column shaft.
4. Remove the steering wheel nut and the retaining clip.



5. Remove the steering wheel using the [KM-210-A](#) or the [J 1859-A](#) with the [J 36541-A](#) .
6. Unclip the contact ring from the steering wheel, if necessary.

## Installation Procedure



1. Clip the contact ring on the steering wheel, if necessary.
2. Align the match marks on the steering wheel and the steering column shaft. Turn the signal-canceling cam on the wheel to the left.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

3. Install the retaining clip and the steering wheel nut.

**Tighten**

Tighten the steering wheel nut to 38 N·m (28 lb ft).

4. Bend the tabs to secure the retaining clip.
5. Install the SIR module. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#) .
6. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Steering Column Replacement (Notchback)

**Important:** Remove the steering column only if:

- The steering column requires replacement.
- The steering and the ignition lock housing require replacement.
- Another operation requires the removal of the steering column.

### Removal Procedure

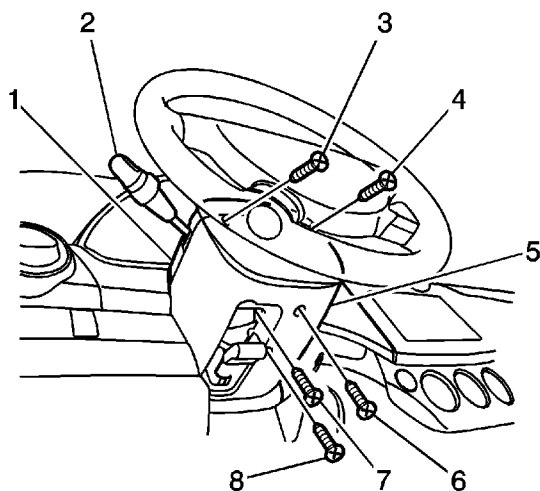
**Notice:** Refer to [Steering Column in Lock Position Notice](#) in the Preface section.

**Important:** Ensure the front wheels are in the straight-ahead position.

1. Adjust the steering wheel to the straight-ahead position.

**Caution:** The sensing and the diagnosis module (SDM) can maintain sufficient voltage to deploy the airbags and pretensioners for up to 1 minute after the ignition has been turned OFF and the fuse has been removed. If the airbags and pretensioners are not disconnected, do not begin service until one minute has been passed after disconnecting power to the SDM. Failure to do so may cause personal injury.

2. Disconnect the negative battery cable and let the vehicle sit for 1 minute. Refer to [Battery Negative Cable Disconnection and Connection](#).



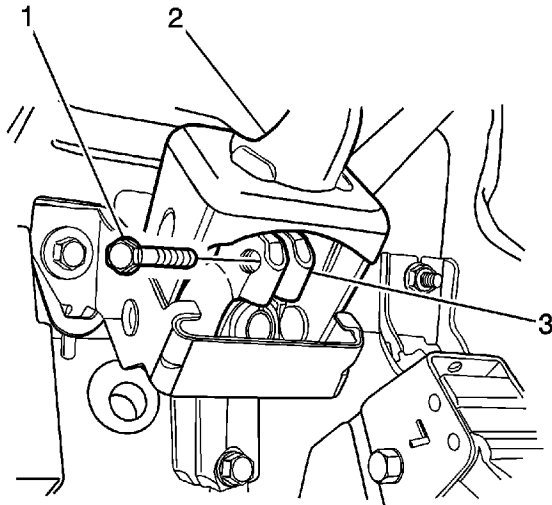
3. Remove the lower steering column cover panel screws (6, 7, 8).
4. Turn the steering wheel in order to access the upper steering column cover panel screws (3, 4). Remove the upper steering column cover panel screws.
5. Remove the upper steering column cover panel (1) and the lower steering column cover panel (5).
6. Remove the switch levers. Refer to [Turn Signal Multifunction Switch Replacement](#) and to

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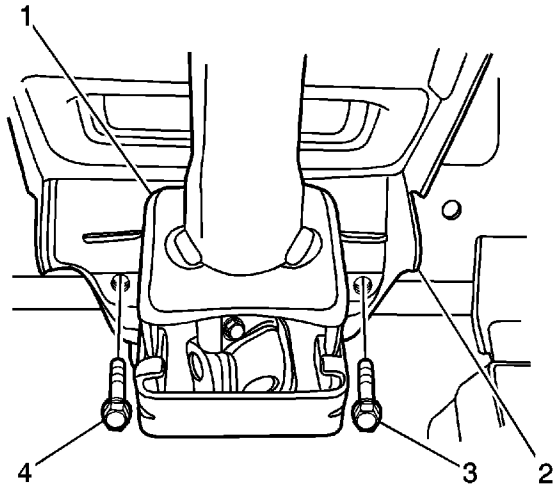


[Windshield Wiper and Washer Switch Replacement.](#)

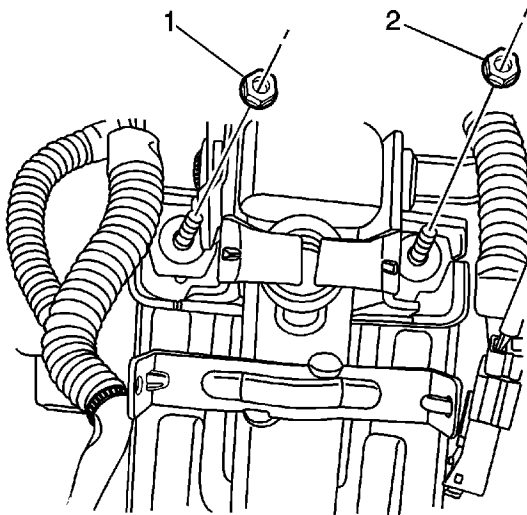
7. Using a taped flat-bladed tool, gently pry and remove the instrument panel lower cover in order to access the steering column.
8. Remove the inflatable restraint steering wheel module. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#).
9. Remove the steering wheel. Refer to [Steering Wheel Replacement](#).
10. Remove the inflatable restraint steering wheel module coil. Refer to [Inflatable Restraint Steering Wheel Module Coil Replacement](#).
11. Remove the theft deterrent control module. Refer to [Theft Deterrent Module Replacement](#).
12. Remove the following components. Refer to [Ignition Lock Cylinder Replacement](#).
  - 12.1. The key reminder switch screws
  - 12.2. The key reminder switch
  - 12.3. The key hole illumination screw
  - 12.4. The key hole illumination
  - 12.5. The ignition switch
  - 12.6. The ignition lock cylinder



13. Remove the pinch bolt (1) from the upper steering shaft coupling flange (3).



14. Remove the bolts (3, 4) holding the steering column jacket assembly lower bracket.



15. Remove the nuts (1, 2) holding the steering column jacket assembly upper bracket.

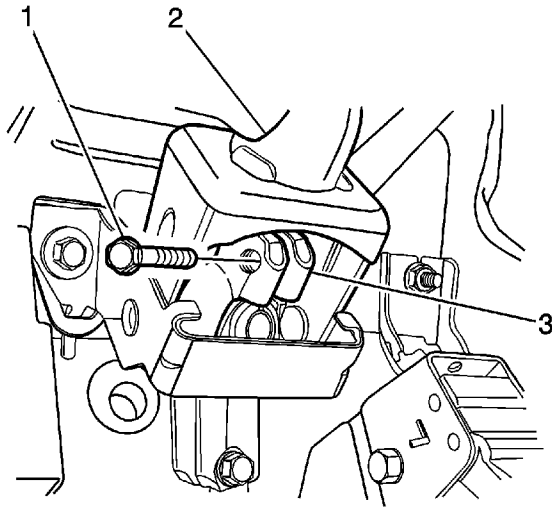
**Notice:** Once the steering column is removed from the vehicle, the column is extremely susceptible to damage. Dropping the column assembly on the end could collapse the steering shaft or loosen the plastic injections, which maintain column rigidity. Leaning on the column assembly could cause the jacket to bend or deform. Any of the above damage could impair the columns collapsible design. Do NOT hammer on the end of the shaft, because hammering could loosen the plastic injections, which maintain column rigidity. If you need to remove the steering wheel, refer to the Steering Wheel Replacement procedure in this section.

16. Guide the steering column assembly out of the steering shaft flange and carefully lay down the assembly.

## Installation Procedure

**Important:** For proper installation of the steering column, ensure the front wheels are in the straight-ahead position.

1. Place the alignment bushing onto the end of the steering column shaft.



**Important:** Provide support for the steering column assembly until the mounting nuts are fastened. Do not let the steering column assembly hang unsupported.

2. Carefully guide the steering shaft into the steering shaft coupling flange (3).

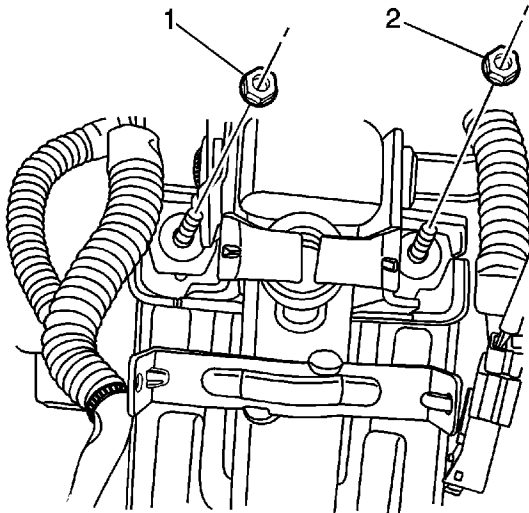
**Notice:** Refer to [Fastener Notice](#) in the Preface section.

3. Install the pinch bolt (1) into the non-threaded hole of the flange.

### Tighten

Tighten the pinch bolt to 22 N·m (16 lb ft).

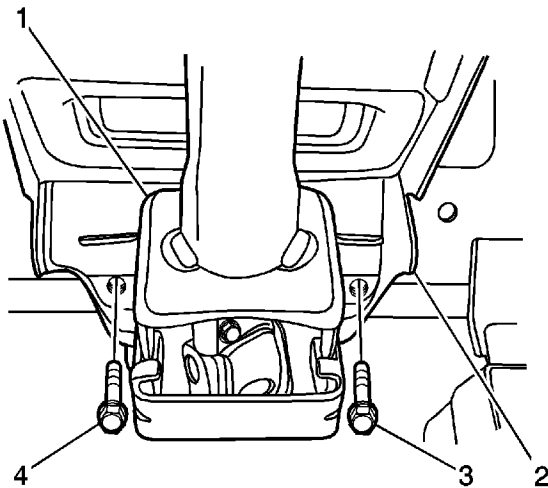
4. Slide the alignment bushing into the steering column housing.



5. Install the nuts (1, 2) to the of the steering column jacket assembly front bracket.

**Tighten**

Tighten the nuts to 22 N·m (16 lb ft).



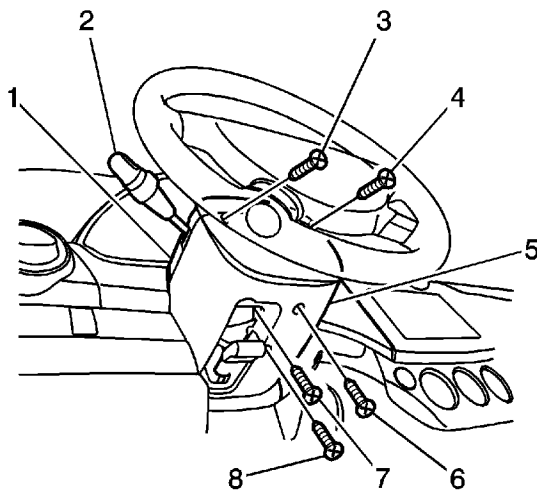
6. Install the bolts (3, 4) to the rear bracket of the steering column jacket assembly.

**Tighten**

Tighten the bolts to 22 N·m (16 lb ft).

7. Install the following components. Refer to [Ignition Lock Cylinder Replacement](#).
- 7.1. The ignition lock cylinder

- 7.2. The ignition switch
- 7.3. The key hole illumination
- 7.4. The key hole illumination screw
- 7.5. The key reminder switch
- 7.6. The key reminder switch screws
8. Install the theft deterrent control module. Refer to [Theft Deterrent Module Replacement](#).
9. Install the inflatable restraint steering wheel module coil. Refer to [Inflatable Restraint Steering Wheel Module Coil Replacement](#).
10. Install the steering wheel. Refer to [Steering Wheel Replacement](#).
11. Install the inflatable restraint steering wheel module. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#).
12. Install the instrument panel lower cover.
13. Install the switch levers. Refer to [Turn Signal Multifunction Switch Replacement](#) and to [Windshield Wiper and Washer Switch Replacement](#).



14. Install the upper steering column cover panel (1) and the lower steering column cover panel (5).
15. Install the lower steering column cover panel screws (6, 7, 8).

### **Tighten**

Tighten the lower steering column cover panel screws to 3 N·m (27 lb in).

16. Turn the steering wheel in order to access the upper steering column cover panel screw holes. Install the upper steering column cover panel screws (3, 4).

### **Tighten**

Tighten the upper steering column cover panel screws to 3 N·m (27 lb in).

17. Verify the steering wheel is in the straight-ahead position. Refer to [Straight Ahead Inspection](#).
18. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Steering Column Replacement (Hatchback)

**Important:** Remove the steering column only if:

- The steering column requires replacement.
- The steering and the ignition lock housing require replacement.
- Another operation requires the removal of the steering column.

### Removal Procedure

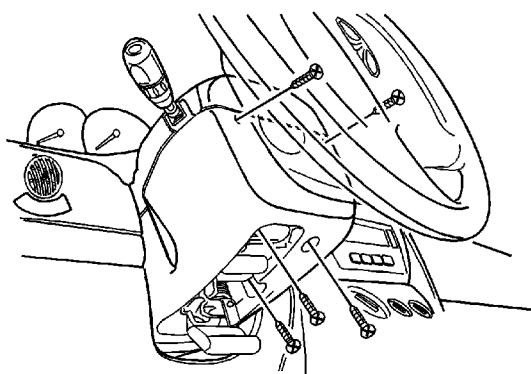
**Notice:** Refer to [Steering Column in Lock Position Notice](#) in the Preface section.

**Important:** Ensure the front wheels are in the straight-ahead position.

1. Adjust the steering wheel to the straight-ahead position.

**Caution:** The sensing and the diagnosis module (SDM) can maintain sufficient voltage to deploy the airbags and pretensioners for up to 1 minute after the ignition has been turned OFF and the fuse has been removed. If the airbags and pretensioners are not disconnected, do not begin service until one minute has been passed after disconnecting power to the SDM. Failure to do so may cause personal injury.

2. Disconnect the negative battery cable and let the vehicle sit for 1 minute. Refer to [Battery Negative Cable Disconnection and Connection](#).

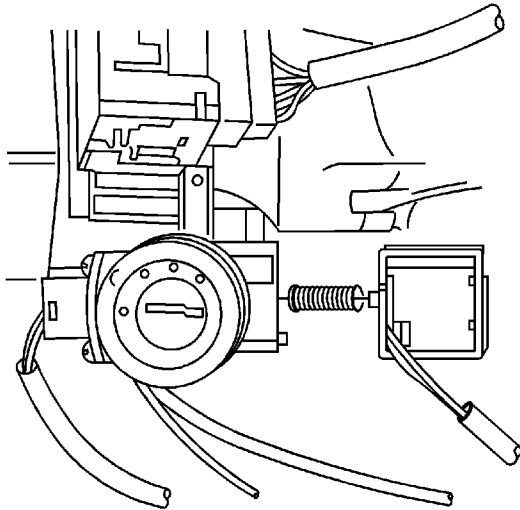


3. Remove the lower steering column cover panel screws.
4. Turn the steering wheel in order to access the upper steering column cover panel screws. Remove the upper steering column cover panel screws.
5. Remove the upper steering column cover panel and the lower steering column cover panel.
6. Remove the switch levers. Refer to [Turn Signal Multifunction Switch Replacement](#) and to

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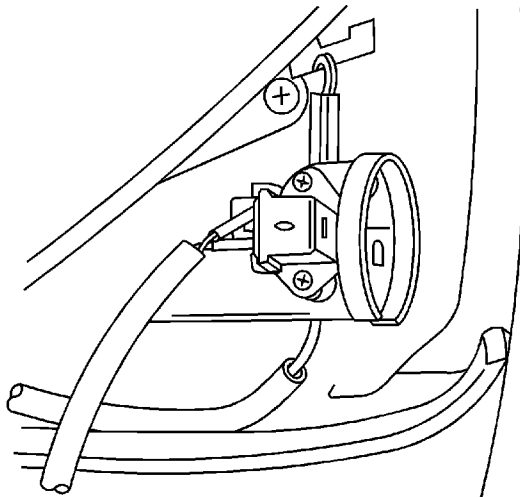
[Windshield Wiper and Washer Switch Replacement](#) .

7. Remove the screws and the lower instrument trim panel.
8. Remove the inflatable restraint steering wheel module. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#) .
9. Remove the steering wheel. Refer to [Steering Wheel Replacement](#) .
10. Remove the inflatable restraint steering wheel module coil. Refer to [Inflatable Restraint Steering Wheel Module Coil Replacement](#) .
11. Remove the theft deterrent control module. Refer to [Theft Deterrent Module Replacement](#) .

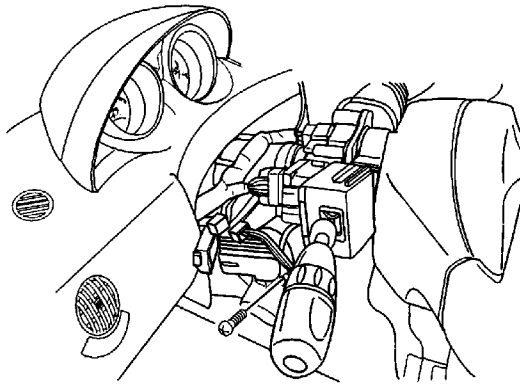


**Important:** Do not drop the key interlock solenoid spring.

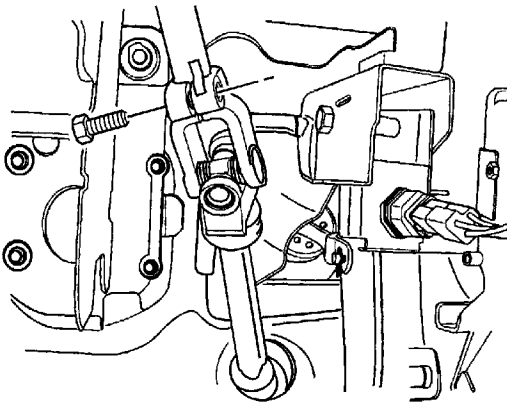
12. Remove the key interlock solenoid screws and the key interlock solenoid.



13. Remove the key reminder switch screws and the key reminder switch.

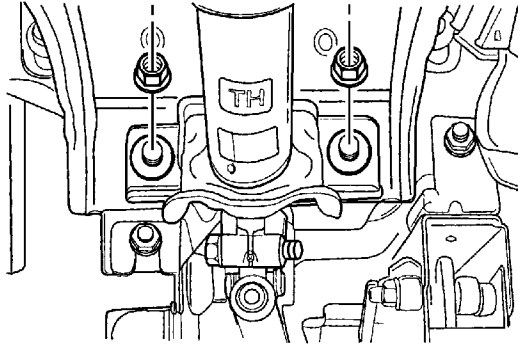


14. Disconnect the ignition switch electrical connector.

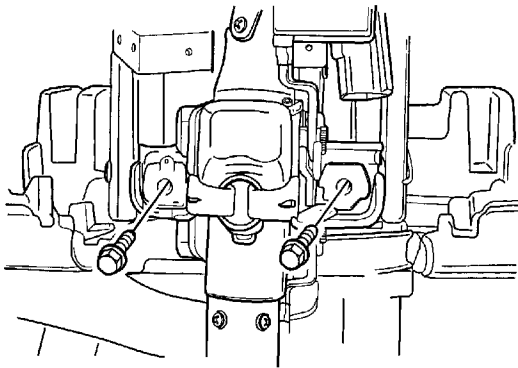


15. Remove the pinch bolt from the upper steering shaft coupling flange.





16. Remove the nuts holding the steering column jacket assembly rear bracket.

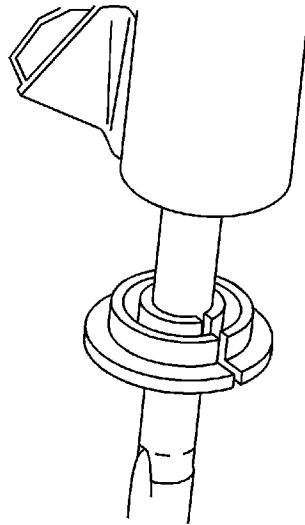


17. Remove the bolts holding the steering column jacket assembly front bracket.

**Notice:** Once the steering column is removed from the vehicle, the column is extremely susceptible to damage. Dropping the column assembly on the end could collapse the steering shaft or loosen the plastic injections, which maintain column rigidity. Leaning on the column assembly could cause the jacket to bend or deform. Any of the above damage could impair the columns collapsible design. Do NOT hammer on the end of the shaft, because hammering could loosen the plastic injections, which maintain column rigidity. If you need to remove the steering wheel, refer to the Steering Wheel Replacement procedure in this section.

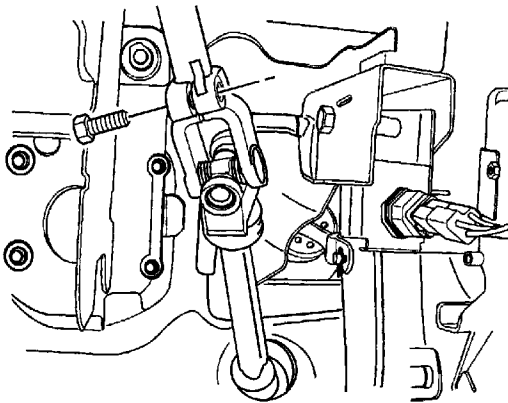
18. Guide the steering column assembly out of the steering shaft flange and carefully lay down the assembly.

## Installation Procedure



**Important:** For proper installation of the steering column, ensure the front wheels are in the straight-ahead position.

1. Place the alignment bushing onto the end of the steering column shaft.



**Important:** Provide support for the steering column assembly until the mounting nuts are fastened. Do not let the steering column assembly hang unsupported.

2. Carefully guide the steering shaft into the coupling flange.

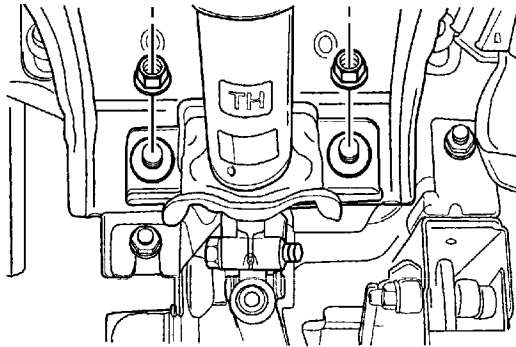
**Notice:** Refer to [Fastener Notice](#) in the Preface section.

3. Install the pinch bolt into the non-threaded hole of the flange.

**Tighten**

Tighten the pinch bolt to 22 N·m (16 lb ft).

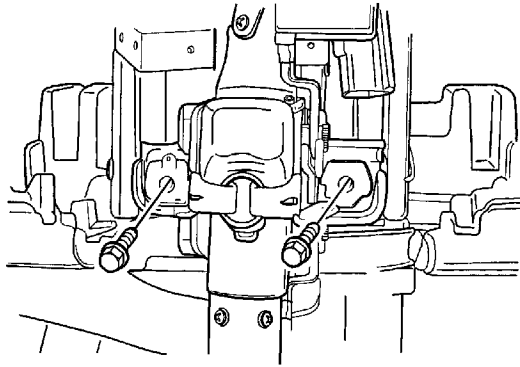
4. Slide the alignment bushing into the steering column housing.



5. Install the nuts for the rear bracket of the steering column jacket assembly.

**Tighten**

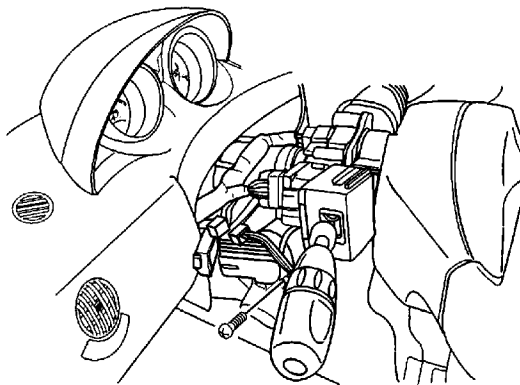
Tighten the nuts to 22 N·m (16 lb ft).



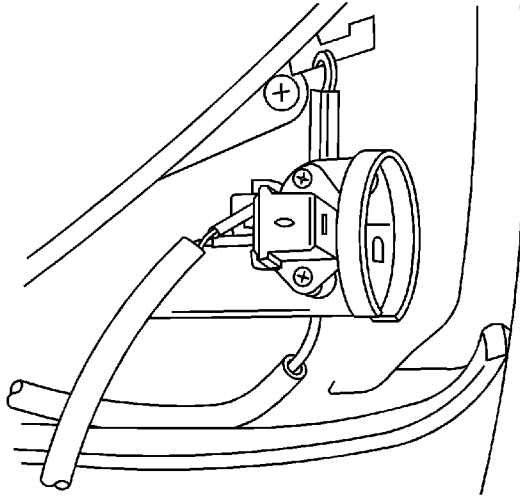
6. Install the bolts for the steering column jacket assembly front bracket.

**Tighten**

Tighten the bolts to 22 N·m (16 lb ft).



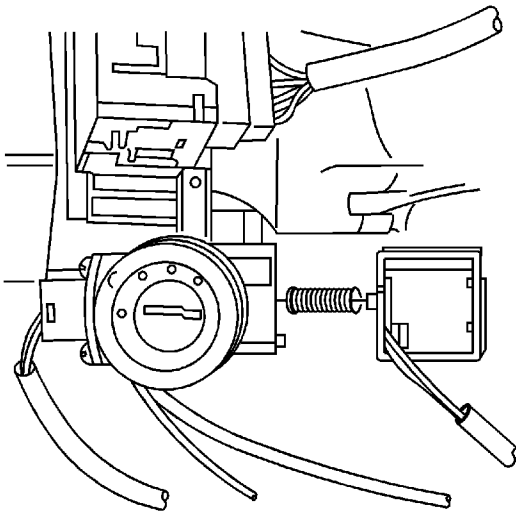
7. Connect the ignition switch electrical connector.



8. Install the key reminder switch and the key reminder switch screws.

**Tighten**

Tighten the screws to 2 N·m (18 lb in).



9. Install the key interlock solenoid and the key interlock solenoid screws.

**Tighten**

Tighten the screws to 2 N·m (18 lb in).

10. Install the theft deterrent control module. Refer to [Theft Deterrent Module Replacement](#) .  
11. Install the inflatable restraint steering wheel module coil. Refer to [Inflatable Restraint](#)

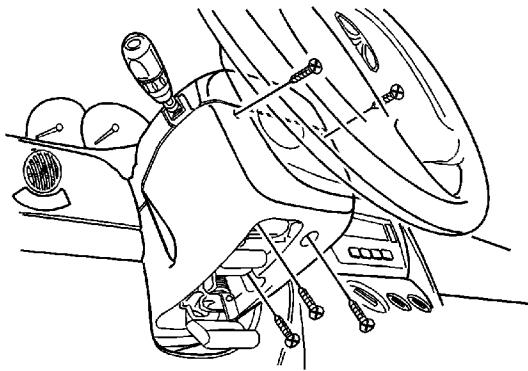
[Steering Wheel Module Coil Replacement](#) .

12. Install the steering wheel. Refer to [Steering Wheel Replacement](#) .
13. Install the inflatable restraint steering wheel module. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#) .
14. Install the lower instrument trim panel and the screws.

**Tighten**

Tighten the screws to 3 N·m (27 lb in).

15. Install the switch levers. Refer to [Turn Signal Multifunction Switch Replacement](#) and to [Windshield Wiper and Washer Switch Replacement](#) .



16. Install the upper steering column cover panel and the lower steering column cover panel.
17. Install the lower steering column cover panel screws.

**Tighten**

Tighten the lower steering column cover panel screws to 3 N·m (27 lb in).

18. Turn the steering wheel in order to access the upper steering column cover panel screw holes. Install the upper steering column cover panel screws.

**Tighten**

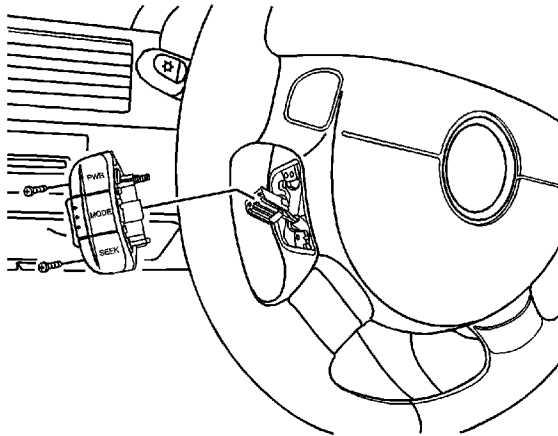
Tighten the upper steering column cover panel screws to 3 N·m (27 lb in).

19. Verify the steering wheel is in the straight-ahead position. Refer to [Straight Ahead Inspection](#) .
20. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#) .

## Steering Wheel Control Switch Assembly Replacement

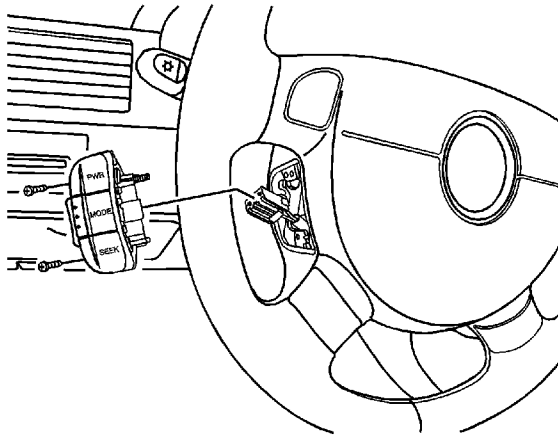
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the screws and the audio remote controller.

### Installation Procedure



1. Install the audio remote controller with the screws.
2. Connect the negative battery cable.



[2008 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Roof](#) | [Sunroof](#) | [Specifications](#) |

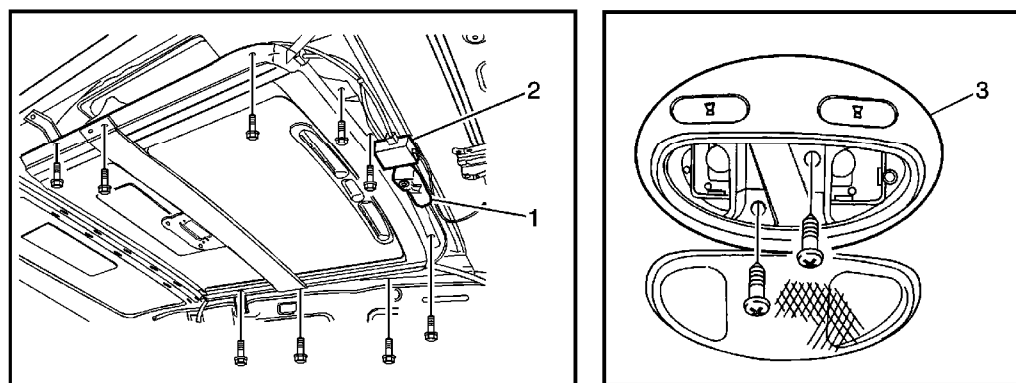
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## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Interior Courtesy Lamp/Power Sunroof Control Switch Screws	4 N·m	35 lb in
Passenger Assist Handle Screws	3.5 N·m	31 lb in
Sun Visor Screws	1.5 N·m	13 lb in
Sun Visor Support Screw	1.5 N·m	13 lb in
Sunroof Glass Screws	7 N·m	62 lb in
Sunroof Housing Bolts	7 N·m	62 lb in
Sunroof Motor Screws	5 N·m	44 lb in
Upper/Center Seat Belt Bolts	38 N·m	28 lb ft

## Sunroof Component Views

### Sunroof Components

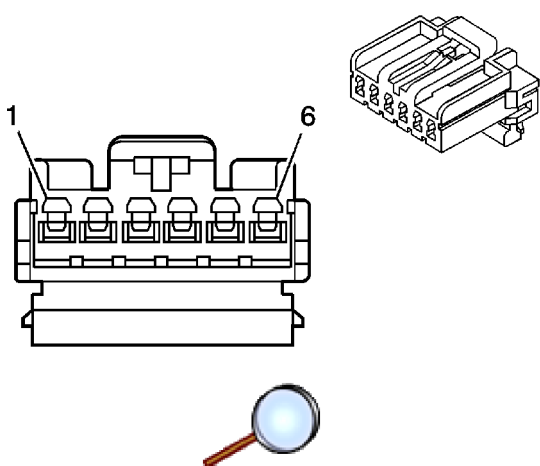


- (1) Sunroof Motor
- (2) Sunroof Module
- (3) Sunroof Switch/Dome Lamp

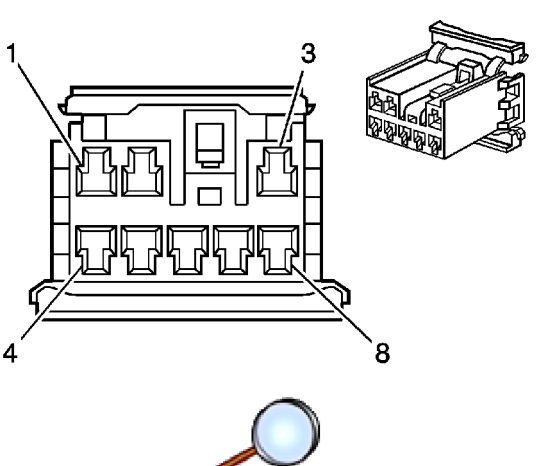
## Sunroof Connector End Views (Notchback)

Table 1: [Sunroof Module](#)Table 2: [Sunroof Switch](#)

### Sunroof Module

			
Connector Part Information		<ul style="list-style-type: none"> <li>• AMP 174923</li> <li>• 6-Way F 070 Multi-Lock Connector (WH)</li> </ul>	
Pin	Wire	Circuit	Function
1	YE	--	Sunroof Down Signal
2	RD/WH	--	Ignition 3 Voltage
3	--	--	Not Used
4	BK	--	Ground
5	--	--	Not Used
6	BN	--	Sunroof Up Signal

### Sunroof Switch

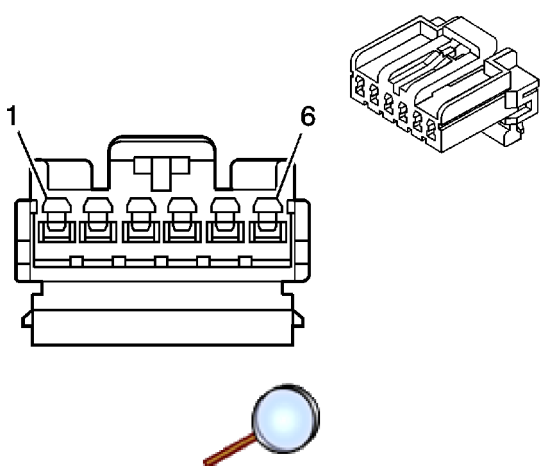
			
--	--	--	--

Connector Part Information		<ul style="list-style-type: none"><li>• KET MG 610402</li><li>• 8-Way F Sealed Series (WH)</li></ul>	
Pin	Wire	Circuit	Function
1	BN	--	Sunroof Up Signal
2	YE	--	Sunroof Down Signal
3	BN	--	Ignition 2 Voltage
4	BK	--	Ground
5	GY	--	Dome Lamp Control
6	--	--	Not Used
7	RD/WH	--	Battery Voltage
8	--	--	Not Used

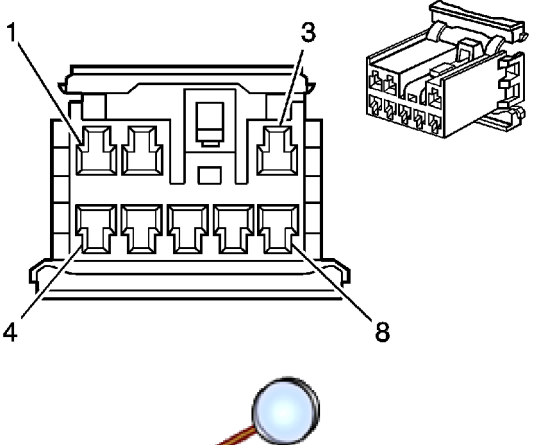
## Sunroof Connector End Views (Hatchback)

Table 1: [Sunroof Module](#)Table 2: [Sunroof Switch](#)

### Sunroof Module

			
<b>Connector Part Information</b>		<ul style="list-style-type: none"><li>• AMP 174923</li><li>• 6-Way F 070 Multi-Lock Connector (WH)</li></ul>	
Pin	Wire	Circuit	Function
1	RD	132	Sunroof Limit Switch Soft Stop Signal
2	--	--	Not Used
3	BN	741	Ignition 3 Voltage
4	BK	850	Ground
5	--	--	Not Used
6	YE	133	Sunroof Limit Switch Low Reference

### Sunroof Switch

			
--	--	--	--

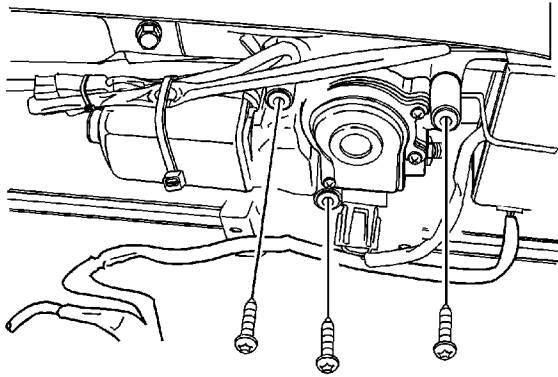
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Connector Part Information		<ul style="list-style-type: none"><li>• KET MG 610402</li><li>• 8-Way F Sealed Series (WH)</li></ul>	
Pin	Wire	Circuit	Function
1	YE	133	Sunroof Limit Switch Low Reference
2	RD	132	Sunroof Limit Switch Soft Stop Signal
3	RD	441	Ignition 3 Voltage
4	BK	850	Ground
5	WH	156	Courtesy Lamp Control
6	--	--	Not Used
7	BN	541	Ignition 3 Voltage
8	--	--	Not Used

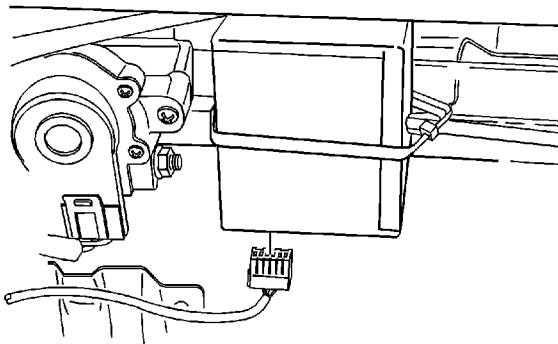
## Sunroof Module Assembly Replacement

### Removal Procedure

**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.

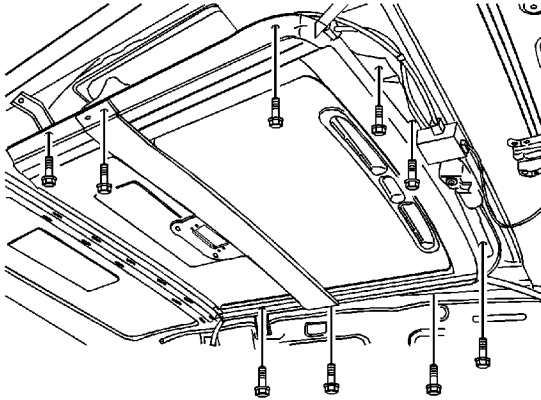


1. Disconnect the negative battery cable.
2. Remove the headliner. Refer to [Headlining Trim Panel Replacement](#) .
3. Remove the drain hoses.
4. Remove the strap.
5. Disconnect the electrical connector.
6. Remove the bolts and the motor.

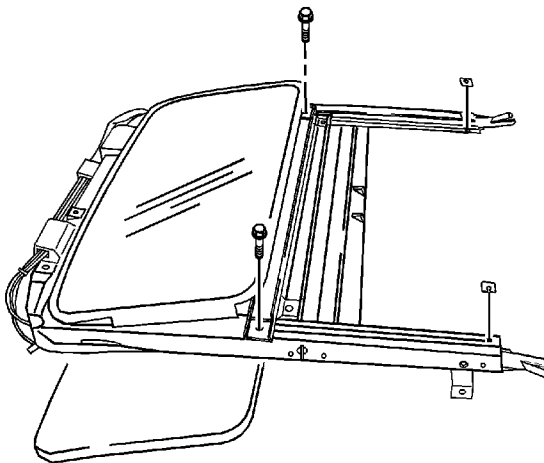




7. Disconnect the electrical connector.
8. Remove the strap.
9. Remove the motor control module.



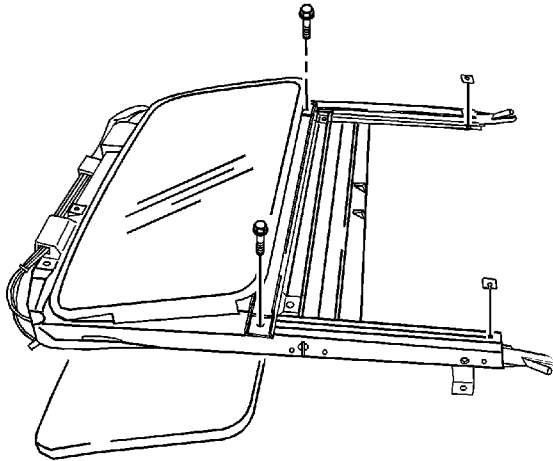
10. Remove the bolts and the sunroof housing from the vehicle.



11. Remove the drain channel.
12. Remove the sunshade.

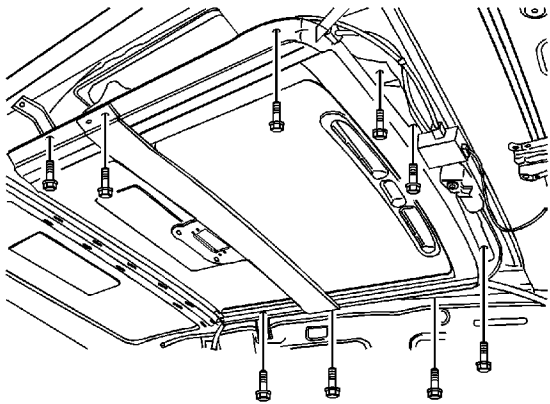
## Installation Procedure





1. Install the sunshade.

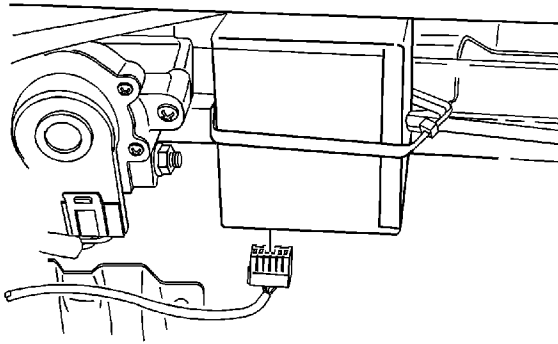
**Notice:** Refer to [Fastener Notice](#) in the Preface section.



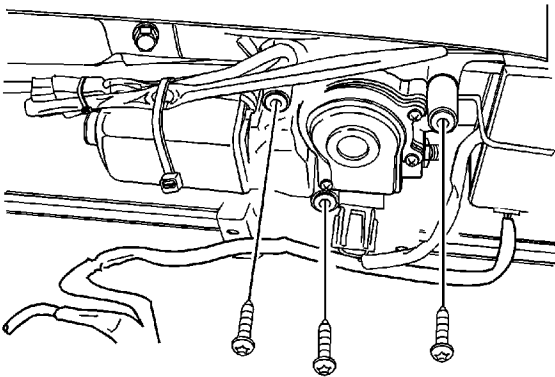
2. Install the sunroof housing.

**Tighten**

Tighten the sunroof housing bolts to 7 N·m (62 lb in).



3. Install the motor control module.
4. Manually position the sunroof glass in the fully closed position.



**Important:** The sunroof motor assembly must be in the fully closed position before installation.

5. Install the motor.

**Tighten**

Tighten the sunroof motor screws to 5 N·m (44 lb in).

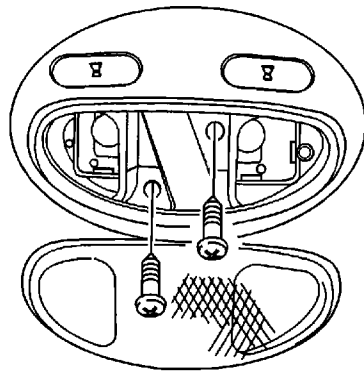
6. Install the drain hoses.
7. Install the headliner. Refer to [Headlining Trim Panel Replacement](#).

8. Connect the negative battery cable.

## Sunroof Switch Replacement

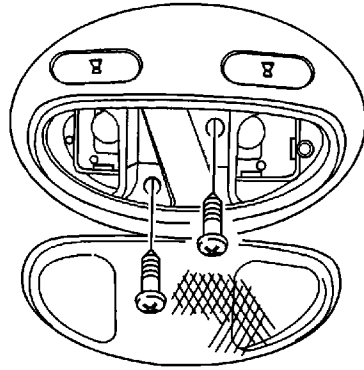
### Removal Procedure

**Caution:** Refer to [Battery Disconnect Caution](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Pry off the interior courtesy lamp lens.
3. Remove the screws and the lamp/power sunroof control switch.
4. Disconnect the electrical connector.

### Installation Procedure



1. Connect the electrical connector.

**Notice:** Refer to [Fastener Notice](#) in the Preface section.

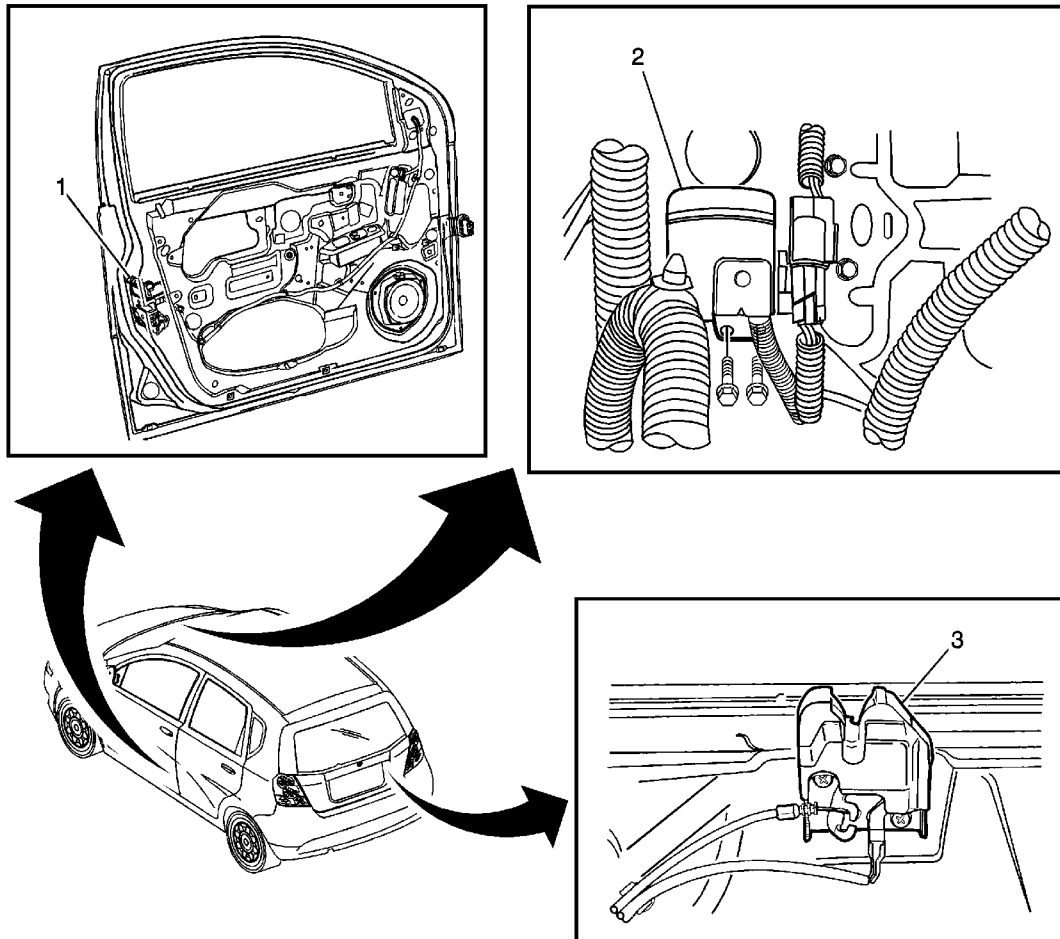
2. Install the lamp/power sunroof control switch with the screws.

**Tighten**

Tighten the interior courtesy lamp/power sunroof control switch screws to 4 N·m (35 lb in).

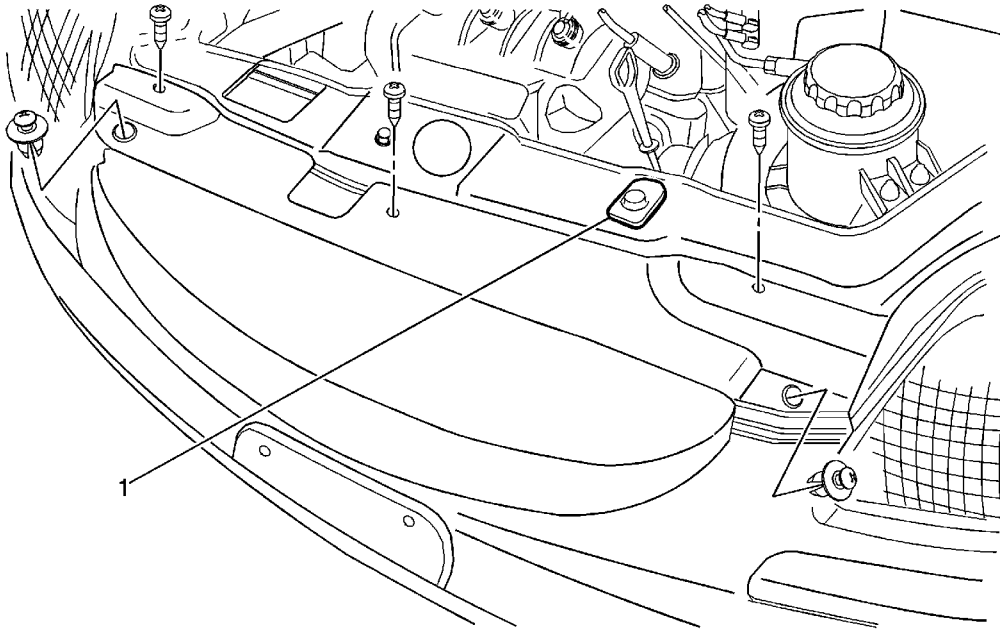
3. Install the interior courtesy lamp lens.
4. Connect the negative battery cable.

## Content Theft Components



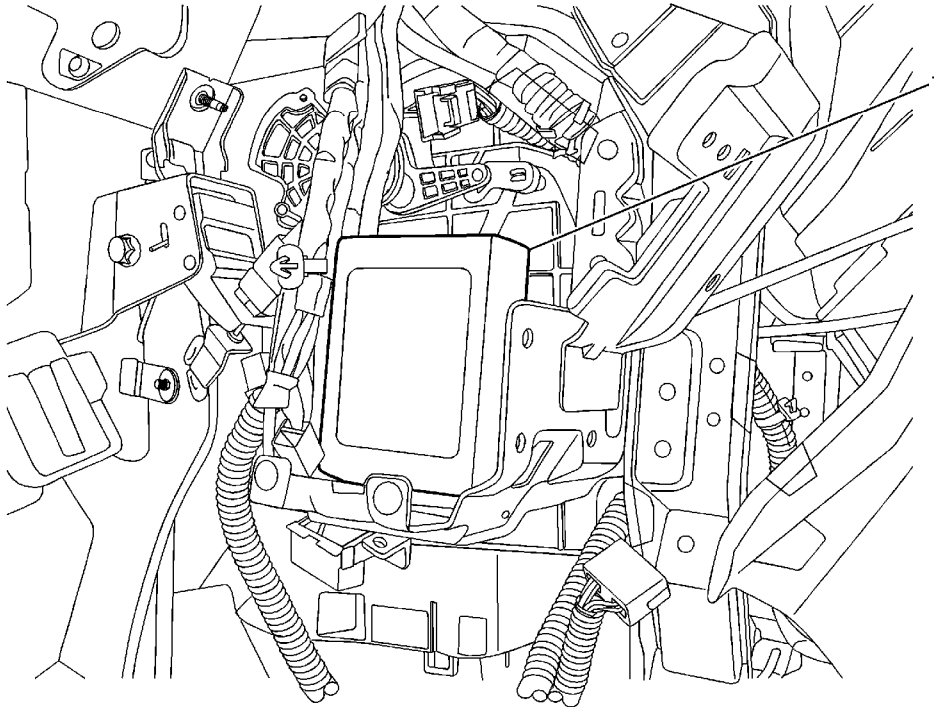
- (1) Door Latch Left - Right Similar
- (2) Theft Deterrent Alarm
- (3) Lock Cylinder Switch - Rear Compartment Lid

## Front of Vehicle



(1) Hood Ajar Switch (Except North America)

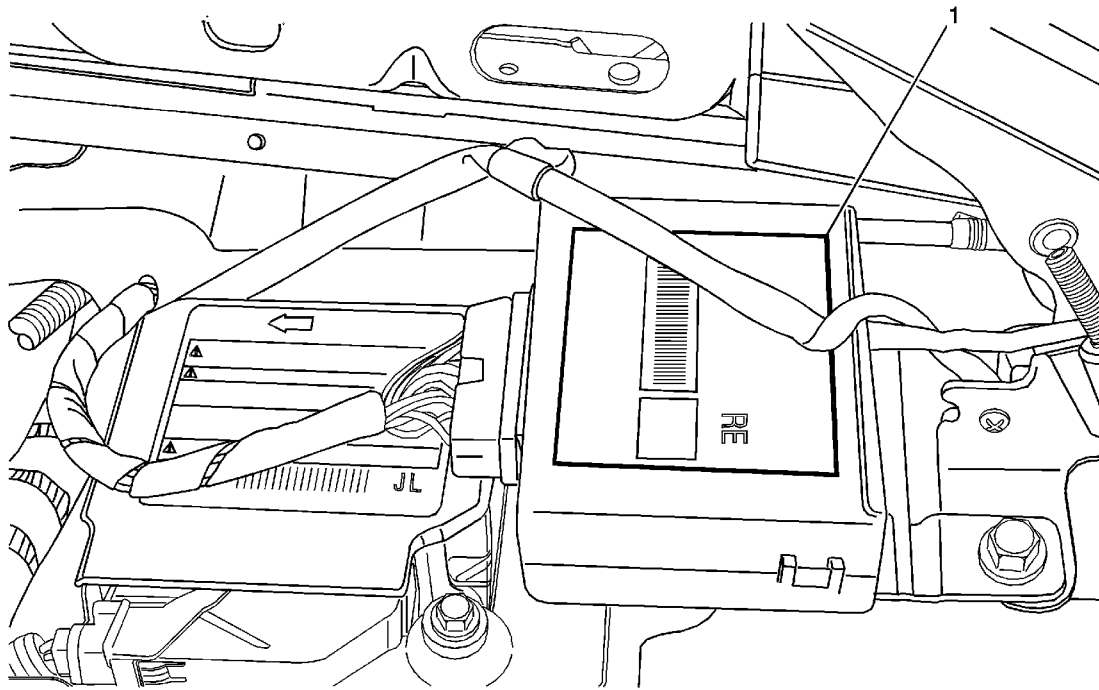
## **Remote Control Door Lock Receiver (Notchback)**



(1) Remote Control Door Lock Receiver (RCDLR)/Theft Deterrent Control Module



## **Remote Control Door Lock Receiver (RCDLR) (Hatchback)**



(1) Remote Control Door Lock Receiver (RCDLR)

## Theft Deterrent System Connector End Views (Notchback)

Table 1: [Door Handle Switch - Left \(LHD\)](#)

Table 2: [Door Handle Switch - Left \(RHD\)](#)

Table 3: [Door Handle Switch - Right \(LHD\)](#)

Table 4: [Door Handle Switch - Right \(RHD\)](#)

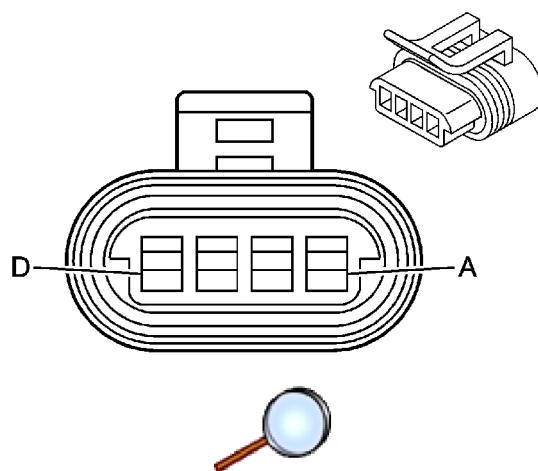
Table 5: [Hood Ajar Switch](#)

Table 6: [Rear Compartment Lid Tamper Switch](#)

Table 7: [Remote Control Door Lock Receiver \(RCDLR\)/Theft Deterrent Control Module](#)

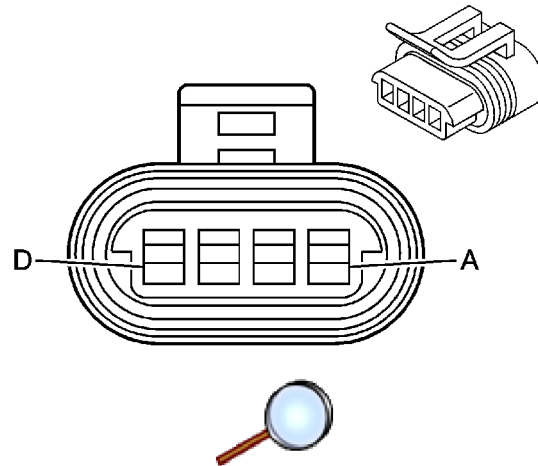
Table 8: [Theft Deterrent Alarm](#)

### Door Handle Switch - Left (LHD)



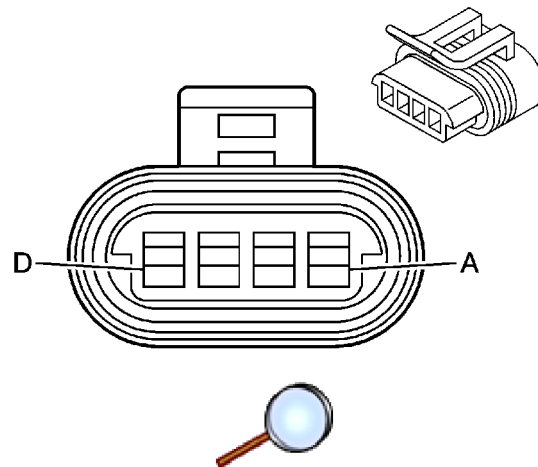
Connector Part Information		<ul style="list-style-type: none"><li>• AK 32421</li><li>• 4-Way M (GY)</li></ul>	
Pin	Wire	Circuit	Function
A	L-BU	--	Lock Signal
B	BK	--	Ground
C	WH	--	Unlock Signal
D	L-GN	--	Door Latch Switch Signal

### Door Handle Switch - Left (RHD)



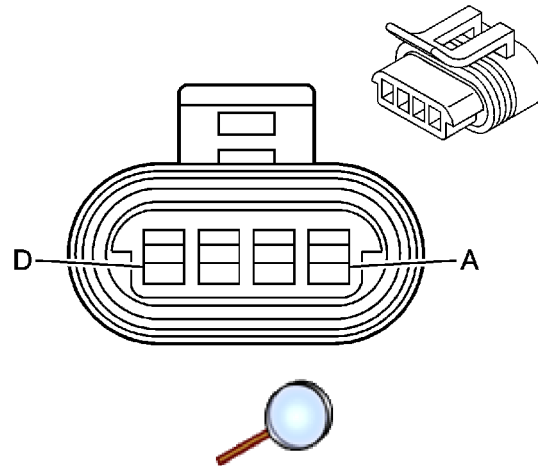
Connector Part Information		<ul style="list-style-type: none"> <li>• AK 32421</li> <li>• 4-Way M (GY)</li> </ul>	
Pin	Wire	Circuit	Function
A	--	--	Not Used
B	BK	--	Ground
C	--	--	Not Used
D	D-BU/RD	--	Door Latch Switch Signal

### Door Handle Switch - Right (LHD)



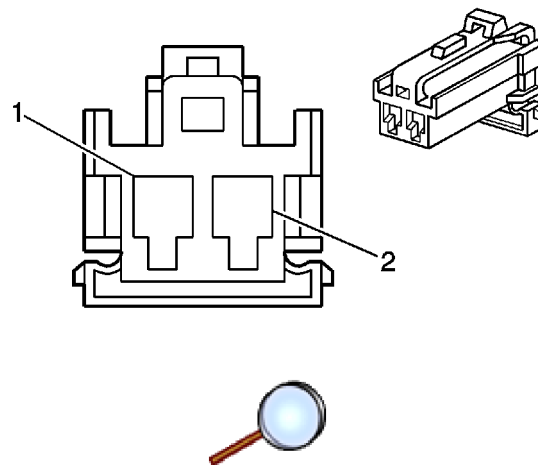
Connector Part Information		<ul style="list-style-type: none"> <li>• AK 32421</li> <li>• 4-Way M (GY)</li> </ul>	
Pin	Wire	Circuit	Function
A	--	--	Not Used
B	BK	--	Ground
C	--	--	Not Used
D	D-BU/RD	--	Door Latch Switch Signal

### Door Handle Switch - Right (RHD)



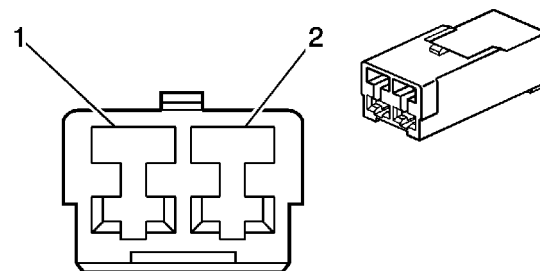
Connector Part Information		<ul style="list-style-type: none"> <li>• AK 32421</li> <li>• 4-Way M (GY)</li> </ul>	
Pin	Wire	Circuit	Function
A	L-GN	--	Door Latch Switch Signal
B	WH	--	Unlock Signal
C	BK	--	Ground
D	L-BU	--	Lock Signal

### Hood Ajar Switch



Connector Part Information		<ul style="list-style-type: none"> <li>• KET MG 610392</li> <li>• 2-Way F Series, Sealed (WH)</li> </ul>	
Pin	Wire	Circuit	Function
1	PK/D-BU	--	Hood Ajar Switch Signal
2	RD/WH	--	Battery Positive Voltage

### Rear Compartment Lid Tamper Switch

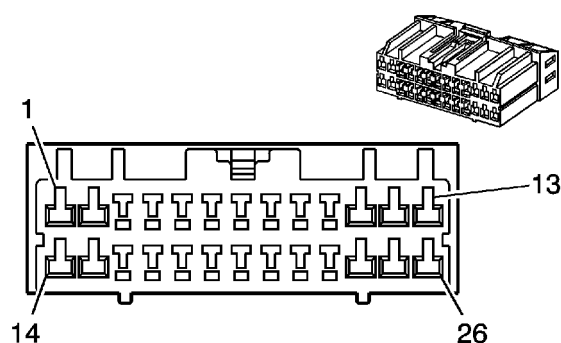


#### Connector Part Information

- KET MG 610070
- 2-Way F 090 (2.3 mm) Series (WH)

Pin	Wire	Circuit	Function
1	PU	--	Rear Compartment Lid Switch Signal
2	BK	--	Ground

### Remote Control Door Lock Receiver (RCDLR)/Theft Deterrent Control Module



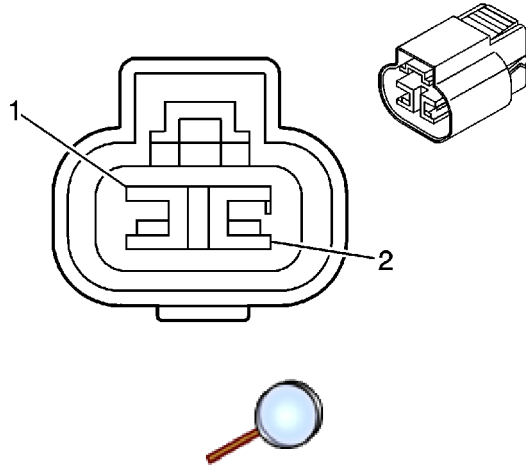
#### Connector Part Information

- KET MG 611336
- 26-Way F PCB Connector (WH)

Pin	Wire	Circuit	Function
1	YE	--	Arm Alarm Signal
2	BK	--	Ground
3	--	--	Not Used
4	PU	--	Rear Compartment Lid Switch Signal
5	OG/BK	--	Rear Compartment Lid Ajar Switch Signal
6	--	--	Not Used
7	PK/D-BU	--	Hood Ajar Switch Signal

8	WH	--	Door Ajar Signal
9	L-BU	--	Door Lock Control
10	GY/D-GN	--	Driver Door Lock Relay Lock Control
11	YE	--	Driver Door Lock Relay Unlock Control
12	PU	--	Door Latch Switch Signal
13	D-BU	--	Right Turn Signal Lamps Supply Voltage
14	BN	--	Rear Compartment Lid Switch Signal
15	PK	--	Ignition 1 Voltage
16	--	--	Not Used
17	BK/WH	--	Serial Data
18	L-GN	--	Key In Ignition Switch Signal
19	YE	--	Security Indicator Control
20	PU	--	Door Latch Switch Signal
21-24	--	--	Not Used
25	RD/WH	--	Battery Positive Voltage
26	L-BU	--	Left Turn Signal Lamps Supply Voltage

### Theft Deterrent Alarm

			
<b>Connector Part Information</b>		<ul style="list-style-type: none"> <li>• KUM PB 625-02027</li> <li>• 2-Way F NMWP 04F-B Assembly (BK)</li> </ul>	
<b>Pin</b>	<b>Wire</b>	<b>Circuit</b>	<b>Function</b>
1	YE	--	Arm Alarm Signal
2	RD/WH	--	Battery Positive Voltage

## Theft Deterrent System Connector End Views (Hatchback)

Table 1: [Hood Ajar Switch](#)

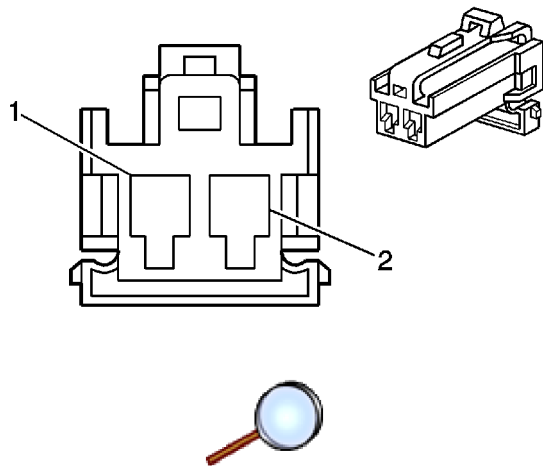
Table 2: [Lock Cylinder Switch - Rear Compartment](#)

Table 3: [Remote Control Door Lock Receiver \(RCDLR\)](#)

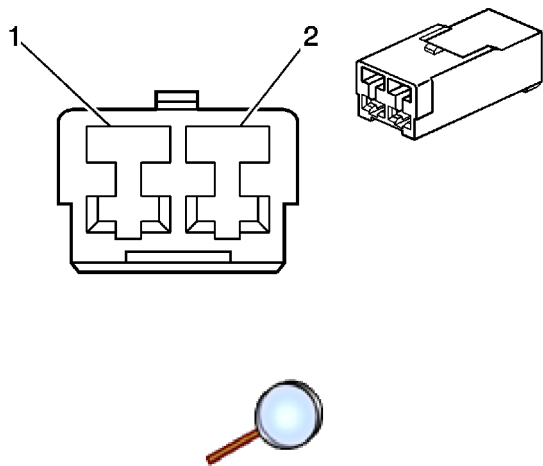
Table 4: [Theft Deterrent Alarm](#)

Table 5: [Theft Deterrent Control Module](#)

### Hood Ajar Switch

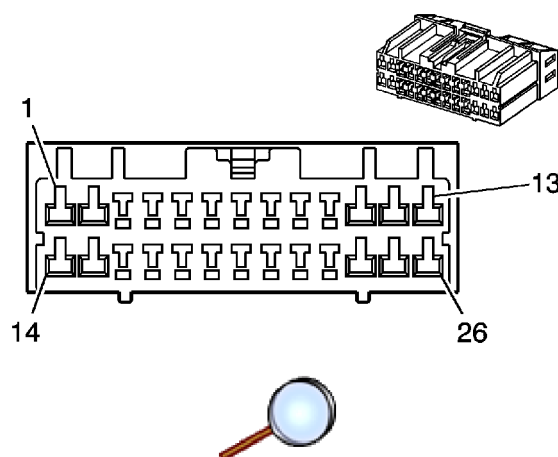
			
Connector Part Information		<ul style="list-style-type: none"><li>• KET MG 610392</li><li>• 2-Way F Series Sealed (WH)</li></ul>	
Pin	Wire	Circuit	Function
1	BN/BK	109	Hood Ajar Switch Signal
2	OG	1440	Battery Positive Voltage

### Lock Cylinder Switch - Rear Compartment

			
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Connector Part Information		<ul style="list-style-type: none"> <li>• KET MG 610070</li> <li>• 2-Way F 090 (2.3 mm) Series (WH)</li> </ul>	
Pin	Wire	Circuit	Function
1	D-BU	737	Rear Compartment Lid Ajar Switch Signal
2	BK	850	Ground

### Remote Control Door Lock Receiver (RCDLR)

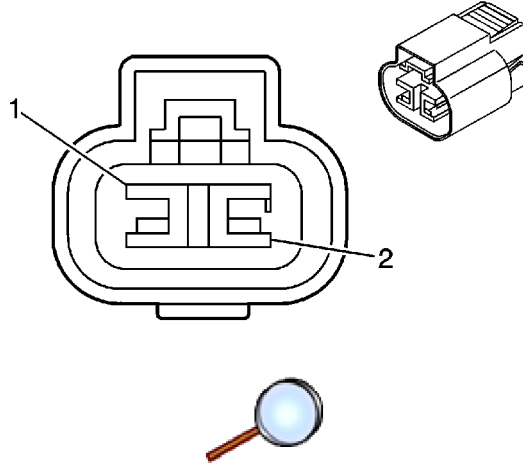


Connector Part Information		<ul style="list-style-type: none"> <li>• KET MG 611336</li> <li>• 26-Way F PCB Connector (WH)</li> </ul>	
Pin	Wire	Circuit	Function
1	D-GN/WH	261	Arm Alarm Signal
2	BK	650	Ground
3	--	--	Not Used
4	D-BU	49	Tamper Switch Signal (4 Door)
5	OG/BK	737	Rear Compartment Lid Ajar Switch Signal
6	--	--	Not Used
7	BN/BK	109	Hood Ajar Switch Signal
8	D-GN/WH	157	Courtesy Lamp Control
9	GY	195	Door Lock Control
10	GY/D-GN	355	Low Speed Cooling Fan Relay Control
11	YE/D-GN	356	Driver Door Lock Relay Unlock Control
12	D-BU	49	Tamper Switch Signal
13	D-BU	15	Right Turn Signal Lamps Supply Voltage
14	--	--	Not Used
15	PK	239	Ignition 1 Voltage
16	--	--	Not Used
17	BK/WH	2051	Serial Data
18	L-GN	80	Key In Ignition Switch Signal
19	YE	749	Security Indicator Control

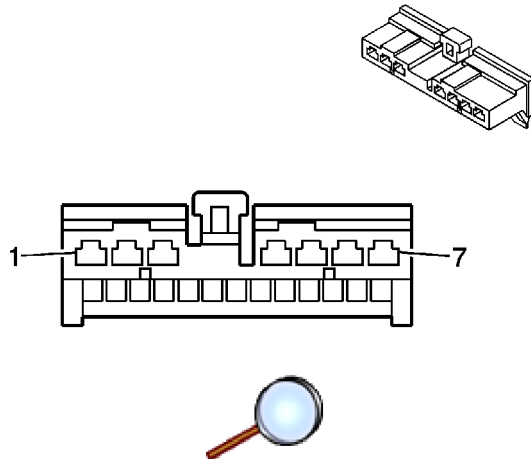


20	D-BU	49	Tamper Switch Signal
21-24	--	--	Not Used
25	OG	1340	Battery Positive Voltage
26	L-BU	14	Left Turn Signal Lamps Supply Voltage

### Theft Deterrent Alarm

			
Connector Part Information		<ul style="list-style-type: none"> <li>• KUM PB 625-02027</li> <li>• 2-Way F NMWP 04F-B Assembly (BK)</li> </ul>	
Pin	Wire	Circuit	Function
1	D-GN/WH	261	Arm Alarm Signal
2	BN	641	Ignition 3 Voltage

### Theft Deterrent Control Module

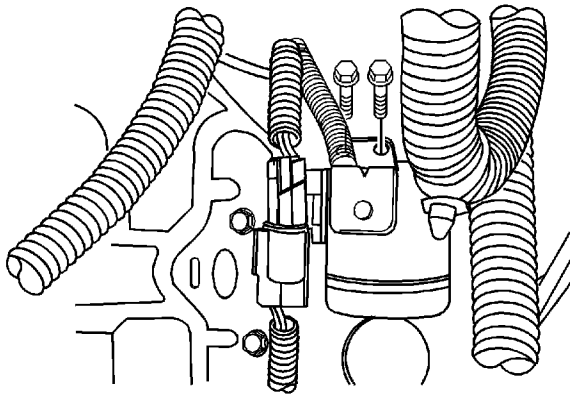
			
Connector Part Information		<ul style="list-style-type: none"> <li>• SD 35508-0700</li> <li>• 7-Way Connector F (WH)</li> </ul>	
Pin	Wire	Circuit	Function
1	PK	239	Ignition 1 Voltage
2	OG	240	Battery Positive Voltage

3	--	--	Not Used
4	BK	450	Ground
5	D-BU/WH	1800	Battery Positive Voltage
6	BK/WH	2051	Serial Data
7	YE	749	Security Indicator Control

## Theft Deterrent Alarm Replacement

**Caution:** Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

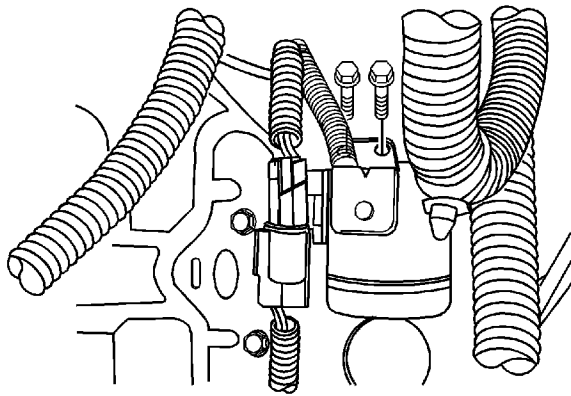
### Removal Procedure



1. Remove the theft deterrent alarm electrical connector.
2. Remove the theft deterrent alarm bracket mounting bolts and the theft deterrent alarm.

### Installation Procedure

**Notice:** Refer to [Fastener Notice](#) in the Preface section.



1. Install the theft deterrent alarm with the mounting bolts.

**Tighten**

Tighten the theft deterrent alarm bracket mounting bolts to 11 N·m (97 lb in).

2. Connect the theft deterrent alarm electrical connector.

## Programming Theft Deterrent System Components (Tech 2)

**Important:** To confirm if the vehicle has an immobilizer system, please check the vehicle SPID label or the VIN in GMVIS for the presence of RPO BAH (engine immobilizer).

**Important:** Turn ON the ignition before installing in the scan tool. Failure to connect in this procedure may cause communication errors and the programming procedure will not complete. Any keys that are not programmed at this time will no longer function.

**Important:** Try to obtain all the keys. At least 2 keys are necessary to successfully program the immobilizer system.

A maximum of 5 keys may be programmed.

### Conditions

Use these procedures after replacing:

- Theft deterrent control module (Immobilizer)
- Engine control module (ECM)
- Any key

### Immobilizer Programming Procedure

1. Turn the ignition switch to the ON position.
2. Install the scan tool.
3. Select IMMOBILIZER PROGRAMMING FUNCTION from the BODY menu.
4. Follow the scan tool instructions with each key until all keys are programmed.
5. Turn the ignition to the LOCK position, disconnect the scan tool and test all the keys.
6. If any key does not function, perform this procedure again with all keys.
7. If any key does not accept the programming, replace it with a new key and perform this procedure again with all the keys.

[2009 Chevrolet Aveo](#) | [Aveo, Wave, G3, Barina \(VIN S/T\) Service Manual](#) | [Body Systems](#) | [Vehicle Access](#) | [Specifications](#)  
| Document ID: 1736588

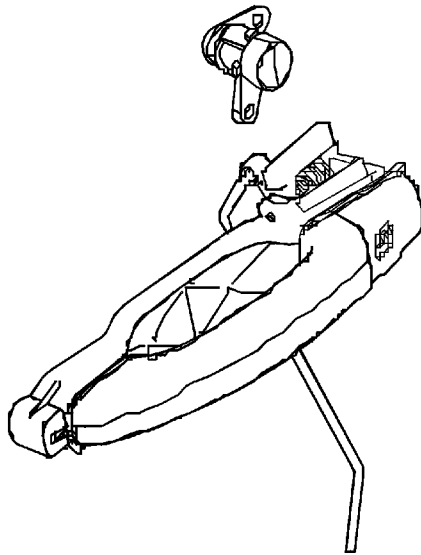
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## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Door Lock Screw	8 N·m	71 lb in
Door Lock Striker Screws	24 N·m	18 lb ft
Inside Door Handle Screw	3 N·m	27 lb in
Outside Door Handle Bolts	4.5 N·m	40 lb in
Luggage Compartment Lock Cylinder Nuts	3 N·m	27 lb in
Luggage Compartment Lock Screws	6 N·m	53 lb in
Luggage Compartment Lock Striker Bolts	8 N·m	71 lb in

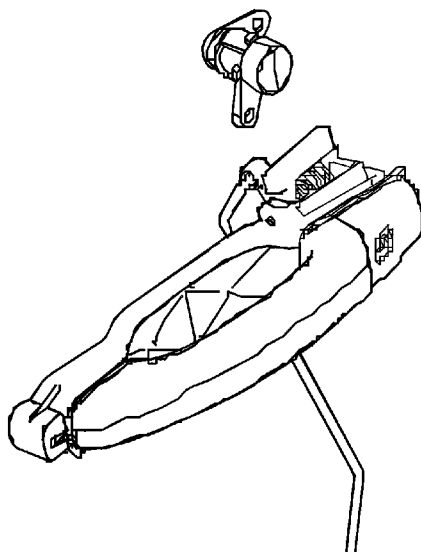
## Door Lock Cylinder Replacement

### Removal Procedure



1. Remove the water deflector. Refer to [Door Water Deflector Replacement](#) .
2. Disconnect the outside door handle and the lock rods.
3. Remove the retaining clip and the lock cylinder.

### Installation Procedure



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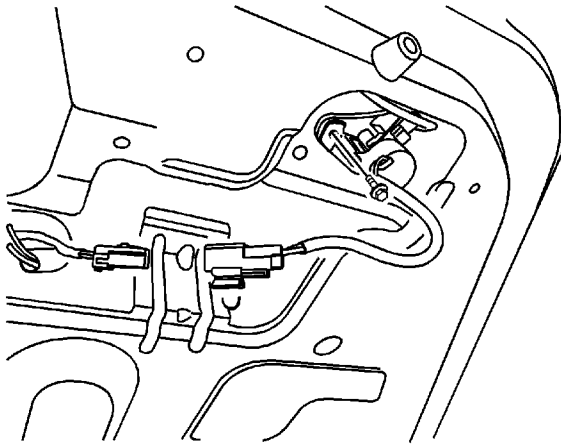
1. Install the lock cylinder with the retaining clip.
2. Connect the outside door handle and the lock rods.
3. Install the water deflector. Refer to [Door Water Deflector Replacement](#) .



## Rear Compartment Lid Lock Cylinder Replacement (Notchback)

### Removal Procedure

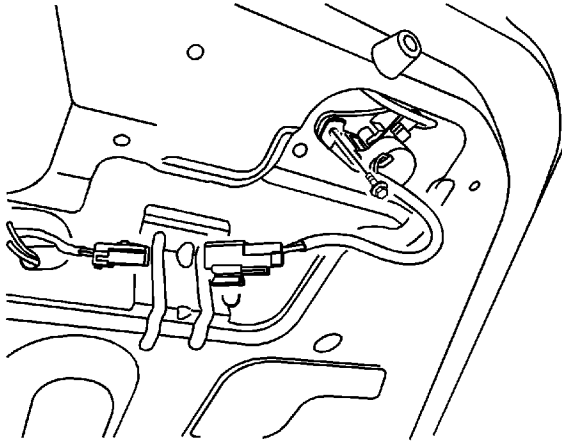
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Remove the clips and the rear compartment lid trim.
3. Disconnect the electrical connector.
4. Disconnect the lock rod.
5. Remove the bolt and the lock cylinder.

### Installation Procedure

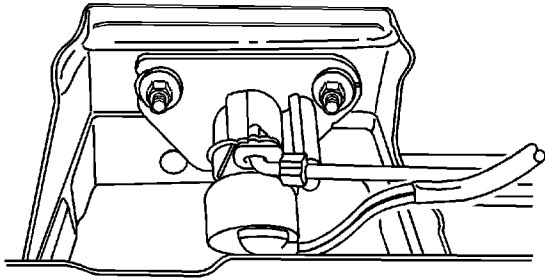
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the lock cylinder with the bolt and tighten to **4 N·m (35 lb in)**.
2. Connect the lock rod.
3. Install the rear compartment lid trim with the clips.
4. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

## Rear Compartment Lid Lock Cylinder Replacement (Hatchback)

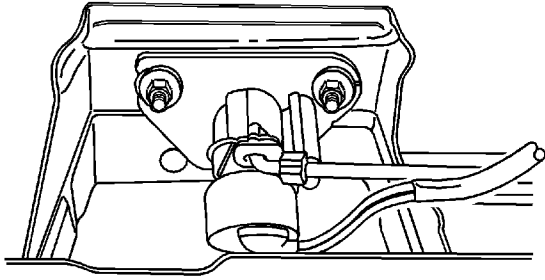
### Removal Procedure



1. Remove the hatchback door lower garnish molding, if equipped.
2. Disconnect the lock rod.
3. Remove the nuts and the lock cylinder.

### Installation Procedure

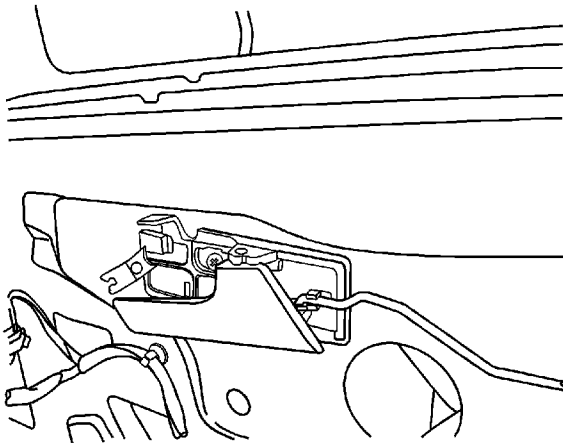
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the lock cylinder with the nuts and tighten to **3 N·m (27 lb in)**.
2. Connect the lock rod.
3. Install the hatchback door lower garnish molding, if equipped.

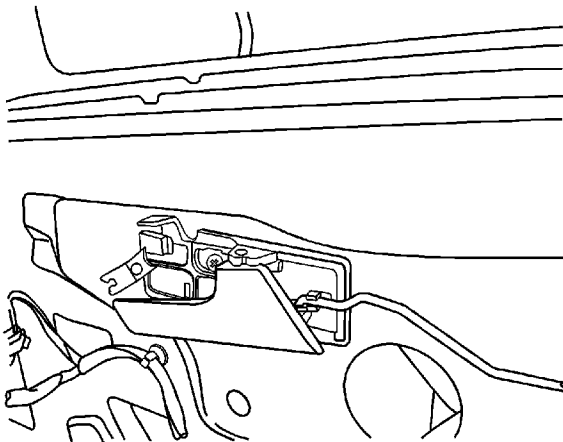
## Door Inside Handle Replacement (Notchback)

### Removal Procedure



1. Remove the water deflector. Refer to [Door Water Deflector Replacement](#).
2. Remove the screw securing the door handle to the door.
3. Disconnect the inside door handle and the lock rods.

### Installation Procedure





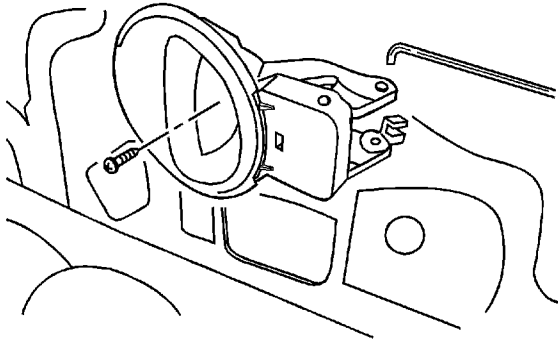
1. Connect the inside door handle and the lock rods.
2. Insert the inside door handle into the slots in the door.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the inside door handle screw and tighten to **3 N·m (27 lb in)**.
4. Install the water deflector. Refer to [Door Water Deflector Replacement](#).

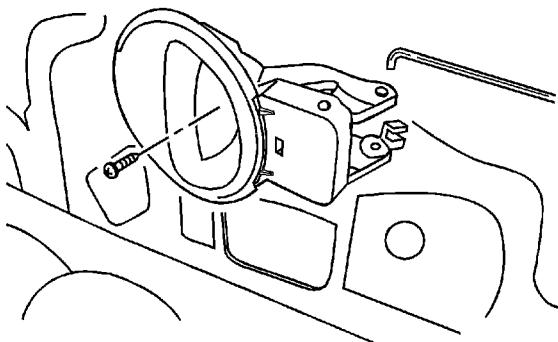
## Door Inside Handle Replacement (Hatchback)

### Removal Procedure



1. Remove the door seal trim. Refer to [Door Water Deflector Replacement](#).
2. Remove the screw securing the door handle to the door.
3. Disconnect the inside door handle and the lock rods.

### Installation Procedure





1. Connect the inside door handle and the lock rods.
2. Insert the inside door handle into the slots in the door.

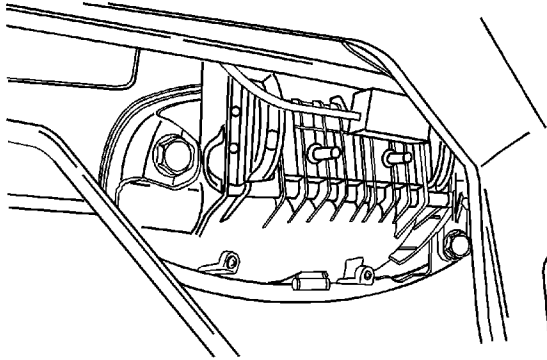
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the inside door handle screw and tighten to **3 N·m (27 lb in)**.
4. Install the door seal trim. Refer to [Door Water Deflector Replacement](#).



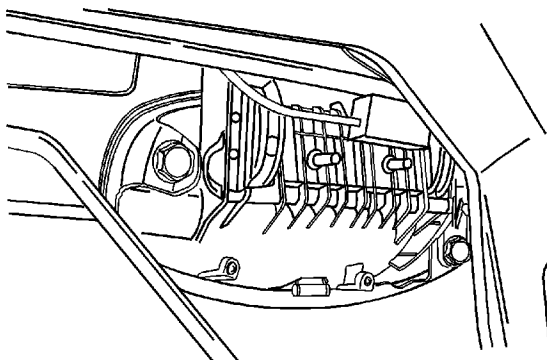
## Door Outside Handle Replacement (Hatchback)

### Removal Procedure



1. Remove the door seal trim. Refer to [Door Water Deflector Replacement](#).
2. Disconnect the outside door handle and the lock rods.
3. Remove the bolts and the door handle.

### Installation Procedure





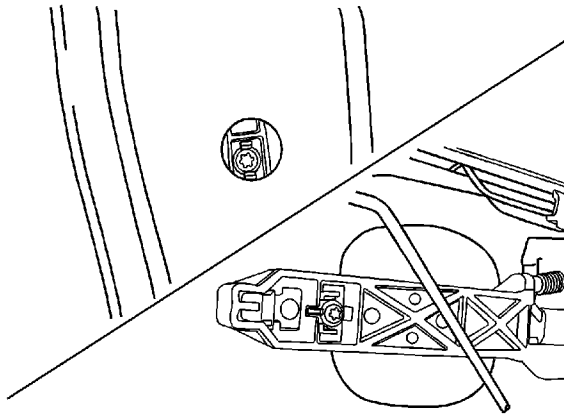
1. Connect the outside door handle and the lock rods.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the door handle with the bolts and tighten to **4.5 N·m (40 lb in)**.
3. Install the door seal trim. Refer to [Door Water Deflector Replacement](#).

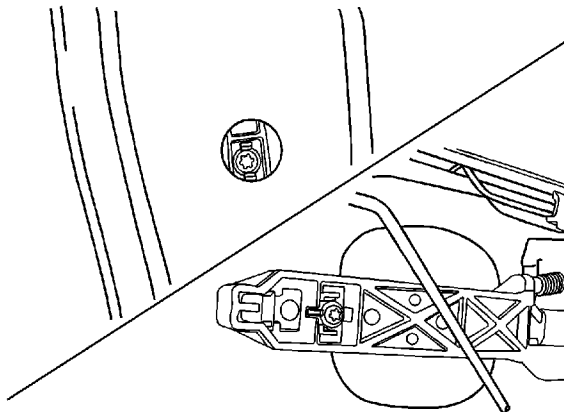
## Door Outside Handle Replacement (Notchback)

### Removal Procedure



1. Remove the water deflector. Refer to [Door Water Deflector Replacement](#).
2. Disconnect the outside door handle and the lock rods.
3. Remove the bolts and the door handle.

### Installation Procedure





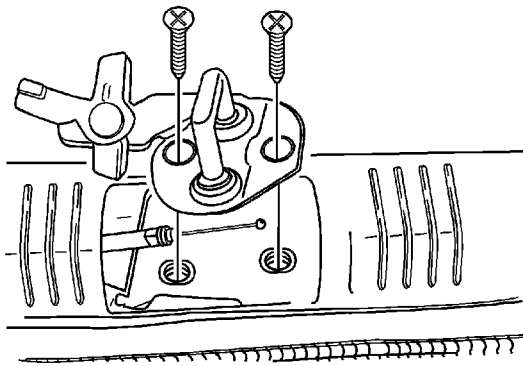
1. Connect the outside door handle and the lock rods.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

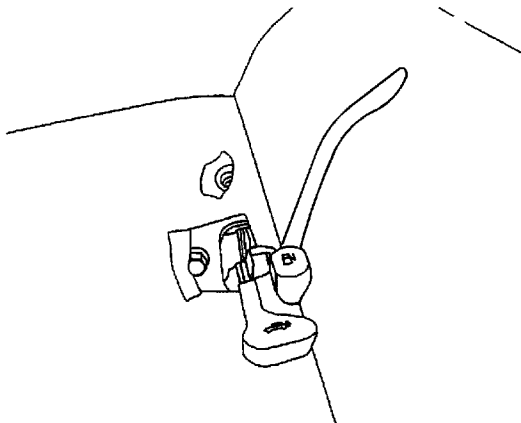
2. Install the door handle with the bolts and tighten to **4.5 N·m (40 lb in)**.
3. Install the water deflector. Refer to [Door Water Deflector Replacement](#).

## Rear Compartment Lid Interior Release Latch Handle Replacement

### Removal Procedure

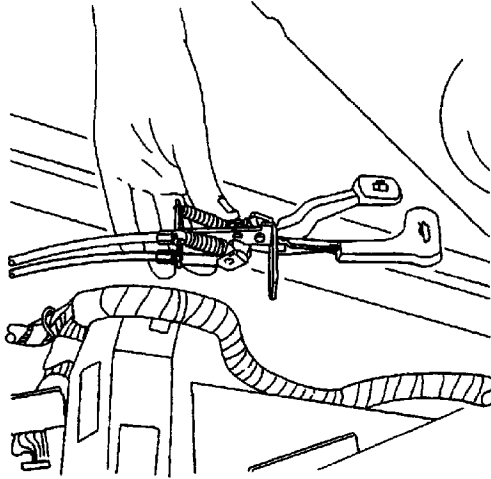


1. Open the luggage compartment.
2. Remove the luggage compartment rear trim panels. Refer to [Rear Compartment Trim Panel Replacement](#).
3. Remove the lock striker. Refer to [Rear Compartment Lid Latch Striker Replacement](#).
4. Disconnect the cable from the lock striker.



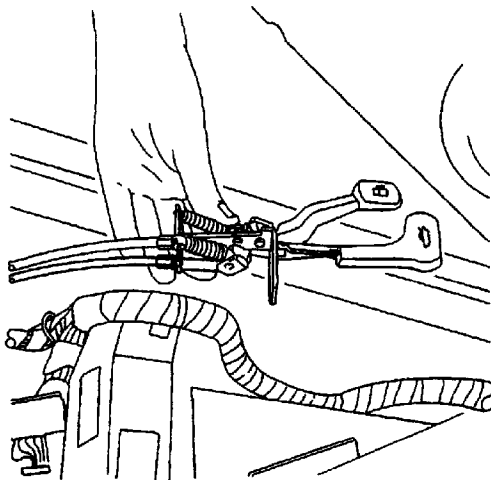


5. Remove the driver front and the rear seats. Refer to [Front Seat Replacement - Bucket](#) and [Rear Seat Back Replacement](#).
6. Reposition the floor carpet on the left side of the vehicle.
7. Remove the bolt and the handle.



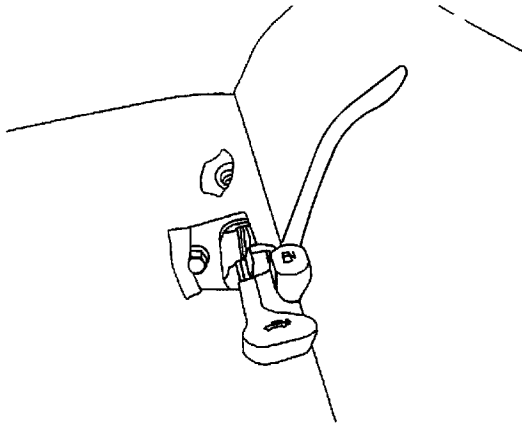
8. Disconnect the cable from the handle.
9. Remove the cable.

## Installation Procedure

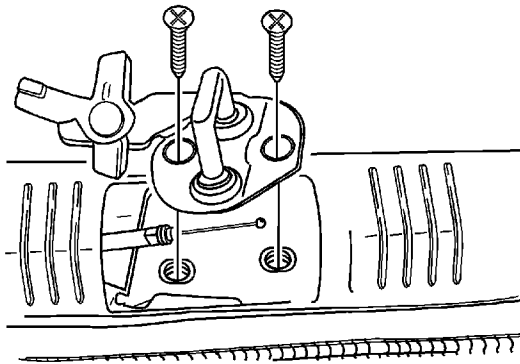


1. Feed the cable from the luggage compartment to the passenger compartment.
2. Connect the cable to the handle.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



3. Install the handle with the bolt and tighten to **8 N·m (71 lb in)**.



4. Install the floor carpet to its original position.
5. Install the front and the rear seats. Refer to [Front Seat Replacement - Bucket](#) and [Rear Seat Back Replacement](#).
6. Connect the cable to the lock striker.
7. Install the lock striker. Refer to [Rear Compartment Lid Latch Striker Replacement](#).
8. Install the luggage compartment rear trim panels. Refer to [Rear Compartment Trim Panel](#)

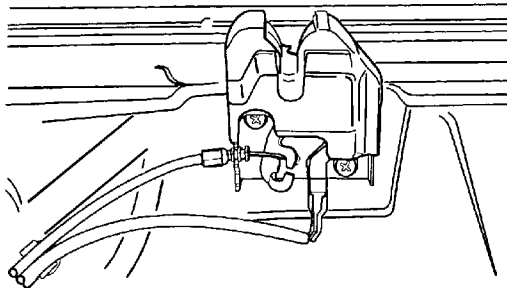
[Replacement.](#)



## Rear Compartment Lid Latch Replacement

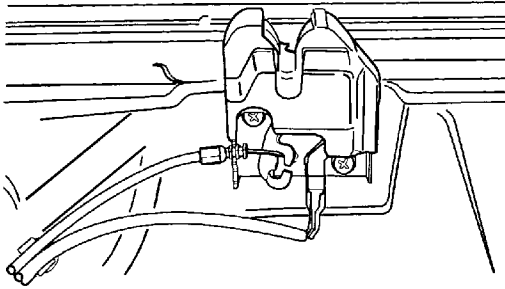
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the screws and the luggage compartment lock.
3. Disconnect the electrical connector.
4. Disconnect the lock rod.
5. Disconnect the cable from the lock.

### Installation Procedure



1. Connect the cable to the lock.
2. Connect the lock rod.
3. Connect the electrical connector.

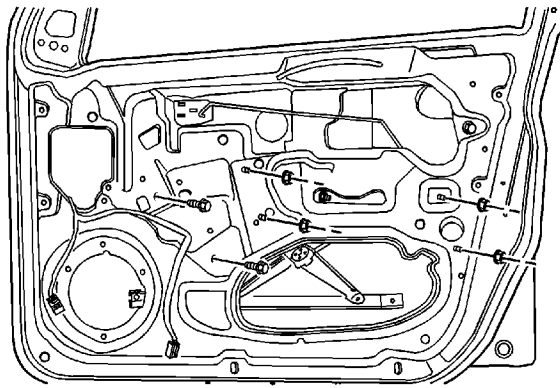
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the luggage compartment lock with the screws and tighten to **6 N·m (53 lb in)**.
5. Connect the negative battery cable.

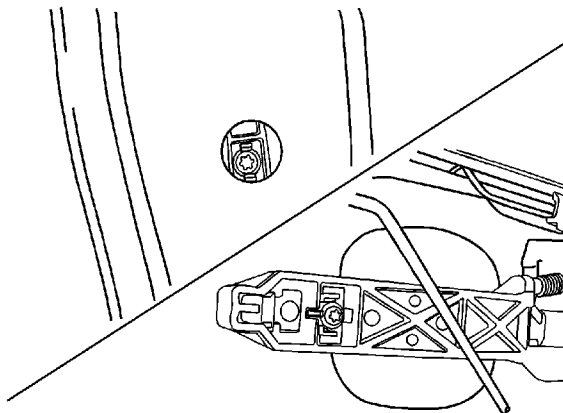
## Front Side Door Lock Replacement (Notchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

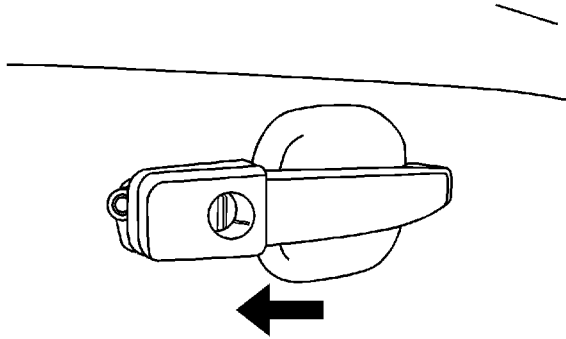


1. Disconnect the negative battery cable.
2. Remove the water deflector. Refer to [Door Water Deflector Replacement](#).
3. Disconnect the inside door handle and the lock rods.

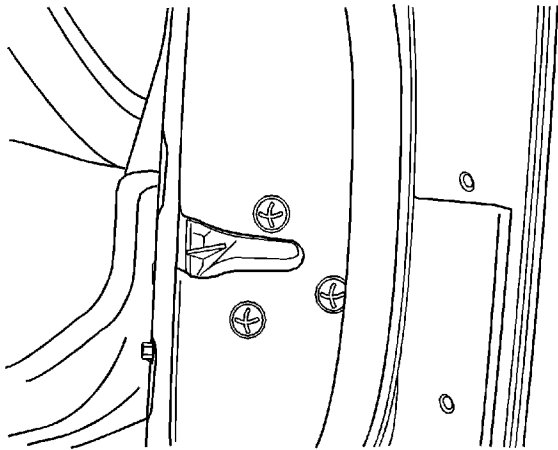


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4. Disconnect the outside door handle and the lock rods.

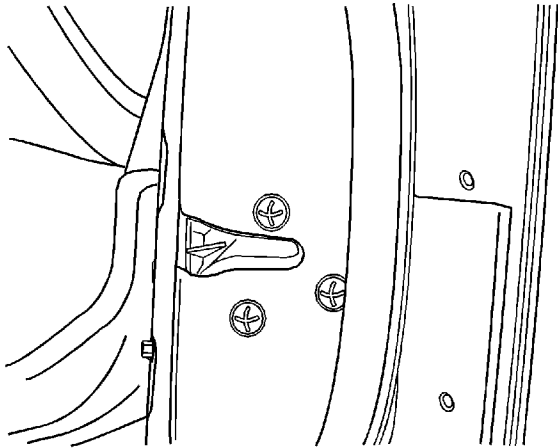


5. Remove the outside door handle.



6. Remove the bolts and the guide rail.
7. Remove the screws and the front door lock.
8. Disconnect the electrical connector.

## Installation Procedure



1. Connect the electrical connector.
2. Connect the inside door handle and the lock rods.
3. Connect the outside door handle and the lock rods.

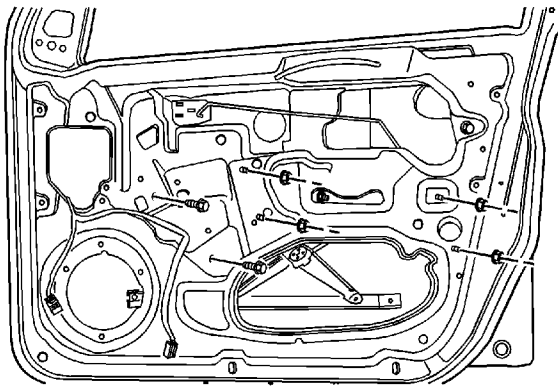
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the front door lock with the screws and tighten to **8 N·m (71 lb in)**.
5. Install the guide rail with the bolts and tighten to **7 N·m (62 lb in)**.
6. Install the water deflector. Refer to [Door Water Deflector Replacement](#).
7. Connect the negative battery cable.

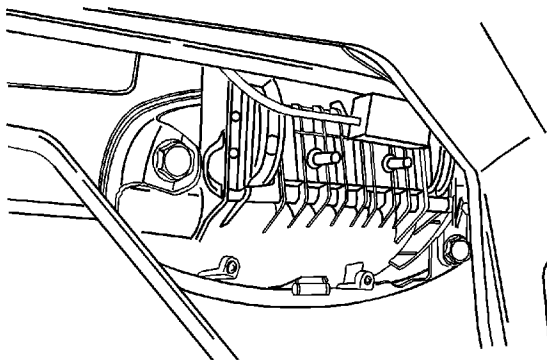
## Front Side Door Lock Replacement (Hatchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

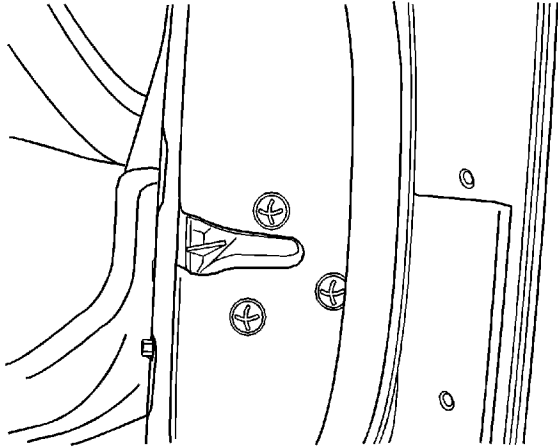


1. Disconnect the negative battery cable.
2. Remove the door water deflector. Refer to [Door Water Deflector Replacement](#).
3. Disconnect the inside door handle and the lock rods.



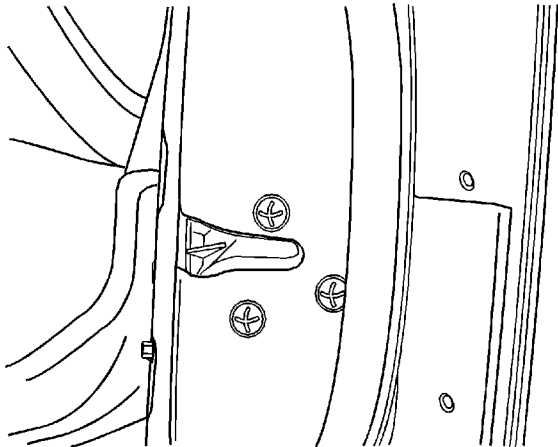
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4. Disconnect the outside door handle and the lock rods.



5. Remove the bolts and the guide rail.
6. Remove the screws and the front door lock.
7. Disconnect the electrical connector.

## Installation Procedure



1. Connect the electrical connector.
2. Connect the inside door handle and the lock rods.
3. Connect the outside door handle and the lock rods.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

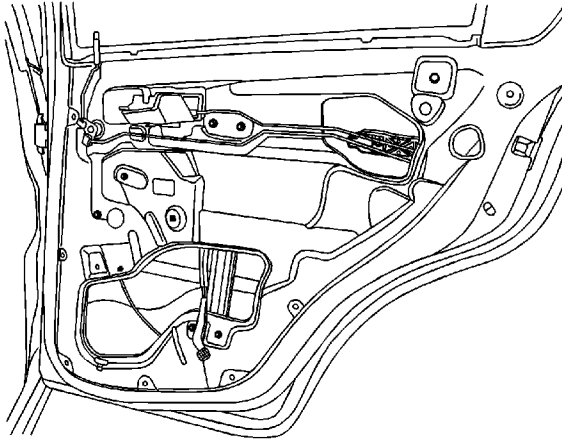
4. Install the front door lock with the screws and tighten to **8 N·m (71 lb in)**.
5. Install the guide rail with the bolts and tighten to **7 N·m (62 lb in)**.
6. Install the door water deflector. Refer to [Door Water Deflector Replacement](#).
7. Connect the negative battery cable.



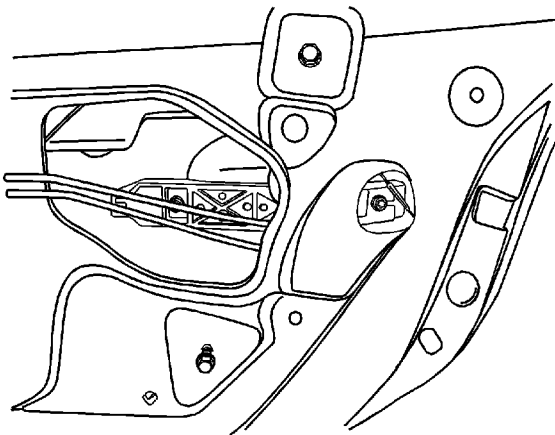
## Rear Door Lock Replacement (Notchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

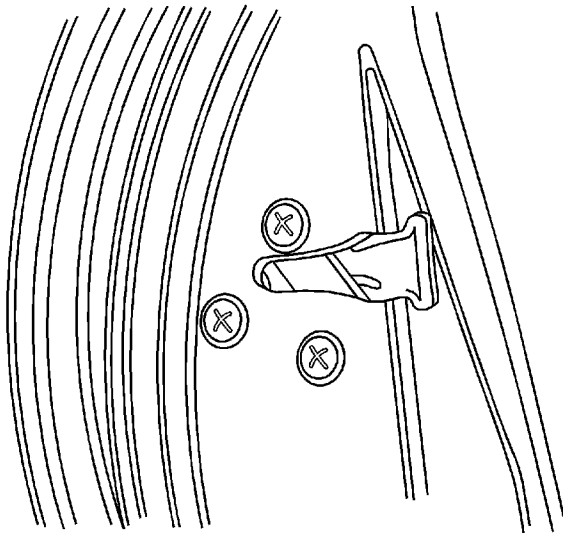


1. Disconnect the negative battery cable.
2. Remove the water deflector. Refer to [Door Water Deflector Replacement](#).
3. Disconnect the inside door handle and the lock rods.



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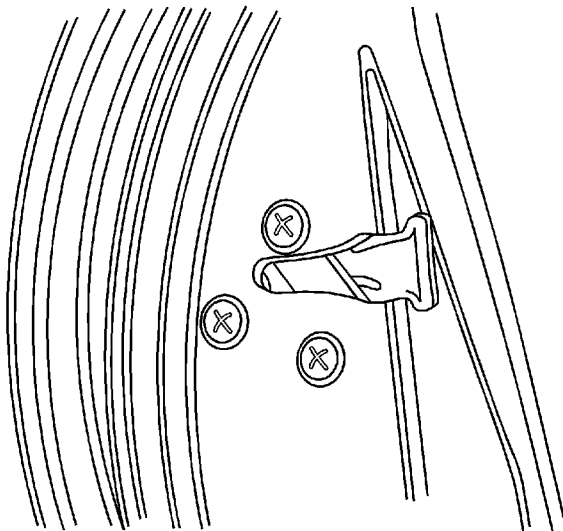
4. Disconnect the outside door handle and the lock rods.
5. Remove the bolts and the guide rail.



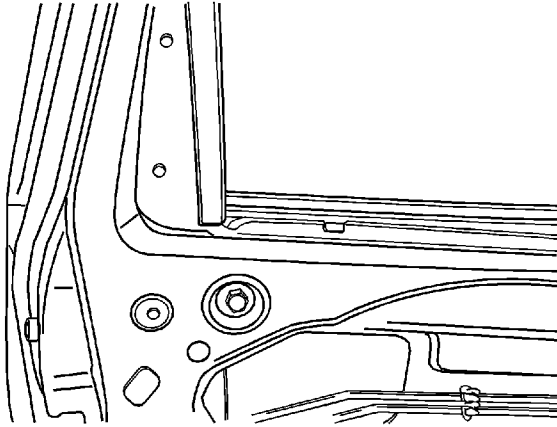
6. Remove the screws and the lock.
7. Disconnect the electrical connector.
8. Disconnect the lock rods at the lock.

## Installation Procedure

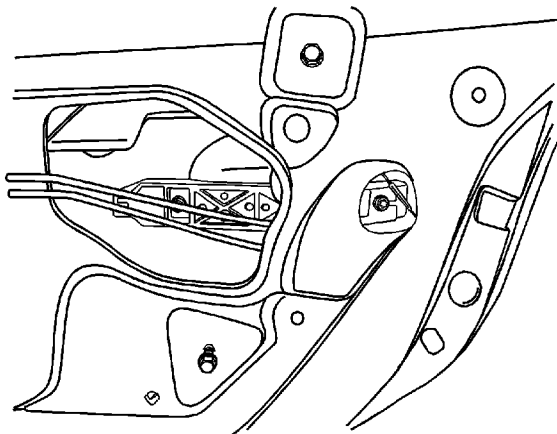
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



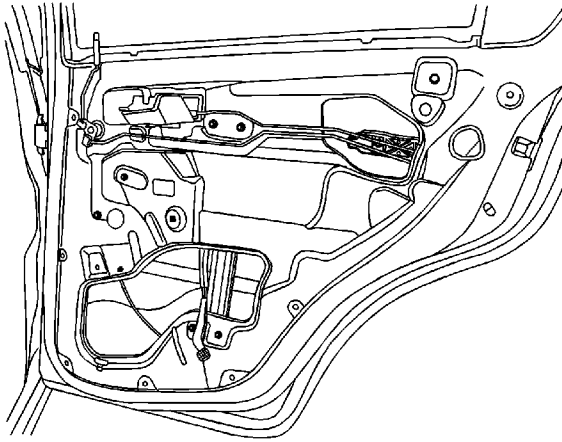
1. Install the rear door lock with the screws and tighten to **8 N·m (71 lb in)**.



2. Connect the electrical connector.
3. Install the guide rail with the bolts and tighten to **7 N·m (62 lb in)**.



4. Connect the outside door handle and the lock rods.

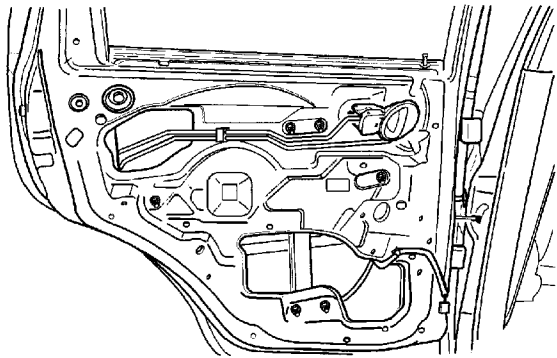


5. Connect the inside door handle and the lock rods.
6. Install the water deflector. Refer to [Door Water Deflector Replacement](#).
7. Connect the negative battery cable.

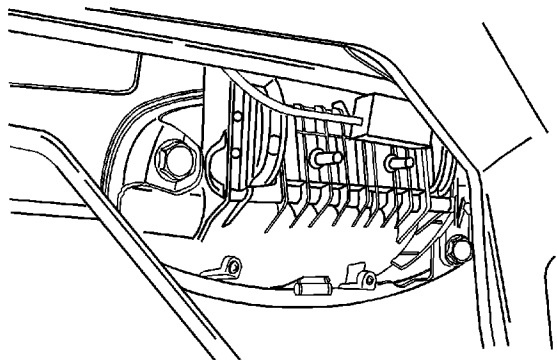
## Rear Door Lock Replacement (Hatchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

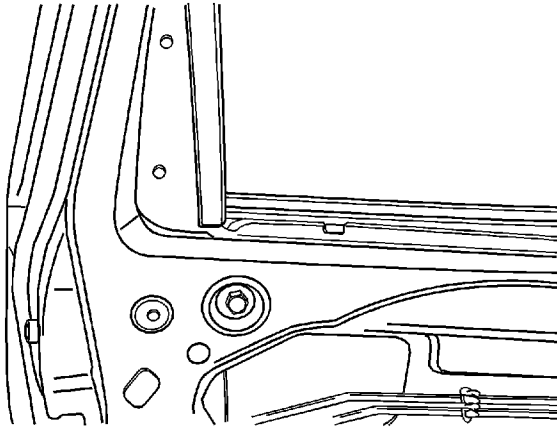


1. Disconnect the negative battery cable.
2. Remove the door water deflector. Refer to [Door Water Deflector Replacement](#).
3. Disconnect the inside door handle and the lock rods.

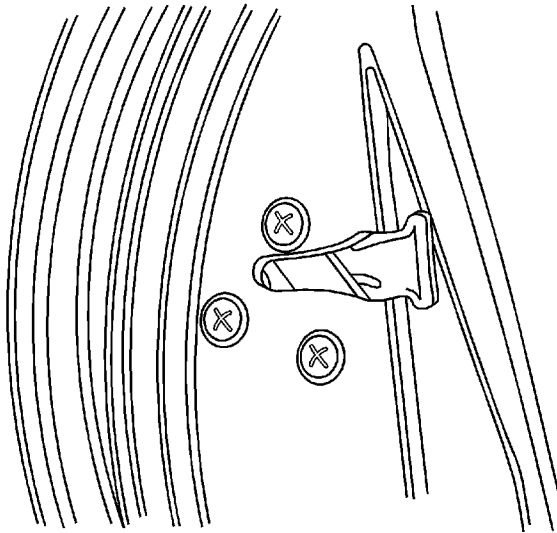


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4. Disconnect the outside door handle and the lock rods.



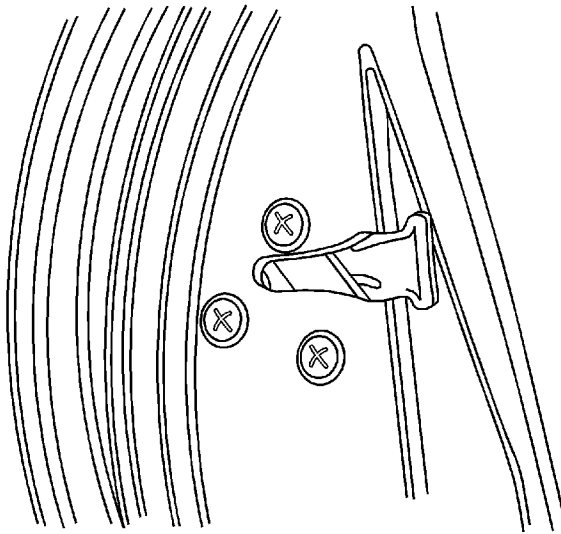
5. Remove the bolts and the guide rail.



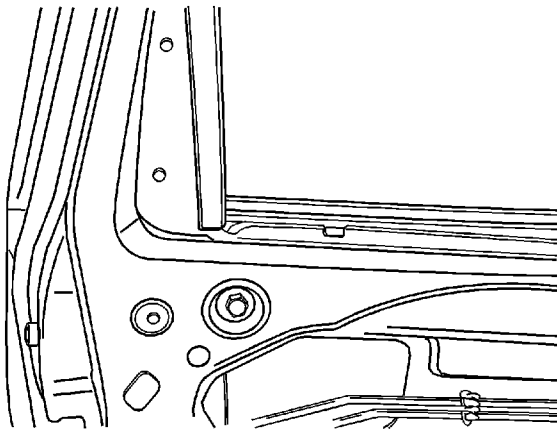
6. Remove the screws and the lock.
7. Disconnect the electrical connector.
8. Disconnect the lock rods at the lock.

## Installation Procedure

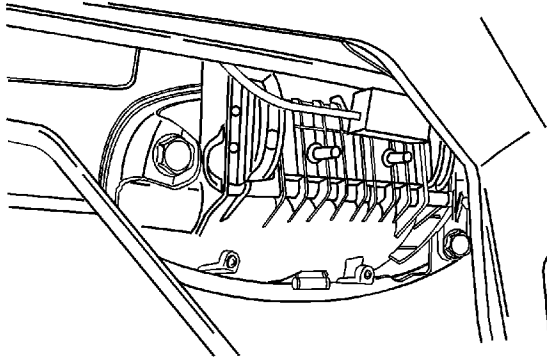
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



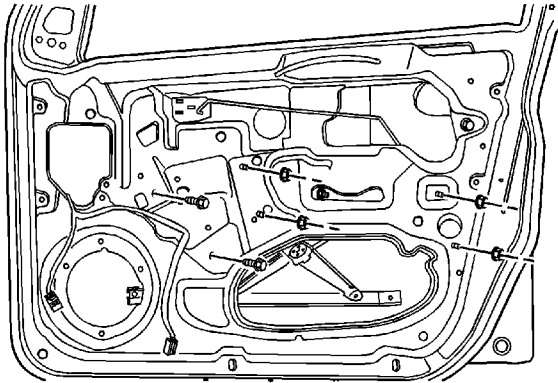
1. Install the rear door lock with the screws and tighten to **8 N·m (71 lb in)**.



2. Connect the electrical connector.
3. Install the guide rail with the bolts and tighten to **7 N·m (62 lb in)**.



4. Connect the outside door handle and the lock rods.

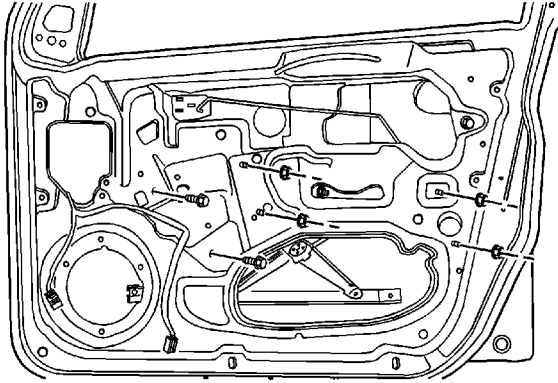


5. Connect the inside door handle and the lock rods.
6. Install the door water deflector. Refer to [Door Water Deflector Replacement](#).
7. Connect the negative battery cable.



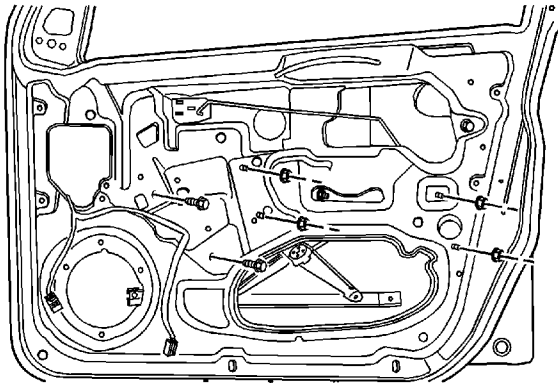
## Front Side Door Locking Rod Replacement

### Removal Procedure



1. Remove the inside door handle. Refer to [Door Inside Handle Replacement](#).
2. Disconnect the inside lock rods from the door handle and the lock.

### Installation Procedure





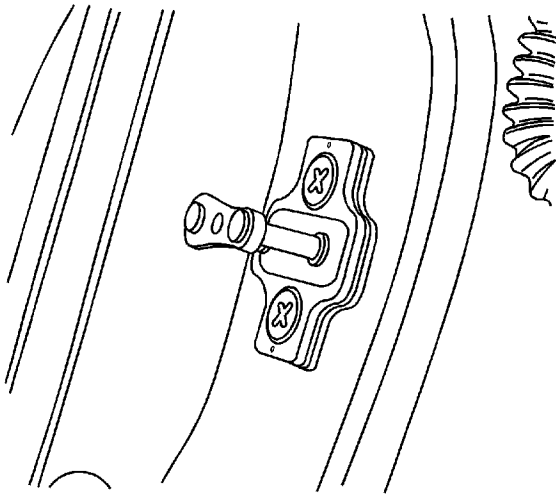
1. Connect the inside lock rods to the door handle and the lock.
2. Install the inside door handle. Refer to [Door Inside Handle Replacement](#).

## Door Lock Striker Adjustment

**Caution:** When replacing the door lock striker, only use the manufactures replacement part. Do not use a replacement part of a lesser quality or a substitute design. The use of a lesser quality part could lead to an improperly operating door retention system.

The door lock striker consists of a striker with 2 screws that are threaded into a tapped, floating cage plate located in the appropriate body pillar. This floating cage plate allows the striker to be easily adjusted in or out and up or down. The door is secured in the closed position when the door lock fork snaps over and engages the striker.

### Fore/Aft Adjustment Procedure



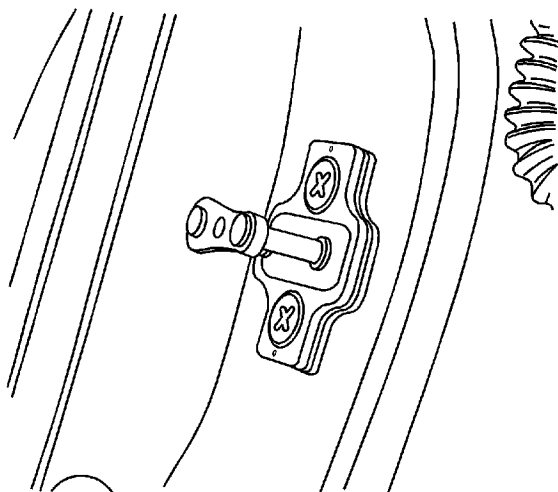
1. The door must be properly aligned.
2. Close the door until the lock fork contacts the striker.
3. Stand next to the door opening and move the door slowly in and out, just touching the striker each time.
4. The alignment of the lock fork and the striker can be easily seen. The lock fork should be perpendicular to and fall near the middle of the striker between the B-pillar and the end of the striker.
5. If a fore or aft adjustment is required, use the following steps:
  - 5.1. Remove the striker screws.
  - 5.2. Remove the spacer in order to move the striker toward the rear of the vehicle.
  - 5.3. Add a 2 mm (0.08 in) spacer in order to move the striker toward the front of the vehicle.
  - 5.4. Install the striker screws.
6. Perform the following up/down or the in/out adjustment.

## Up/Down or In/Out Adjustment Procedure

An adjustment of the striker in the up/down or in/out directions may be necessary for a number of reasons:

- Vehicle frame damage as the result of a collision
- Installation of new door weatherstripping
- Customer complaints of excessive windnoise
- Difficulty in opening or closing the door

In order to adjust the door striker in an up/down or in/out direction, perform the following procedure:



1. The door must be properly aligned.
2. Loosen the striker screws.
3. The floating cage plate can be moved slightly using the ends of the striker screws. Move the floating cage plate to the desired position.

**Caution:** In order to oblong the striker mounting hole to assist in further striker adjustment, use a die grinder with a flat-headed grinding bit. This type of bit will help to prevent damage to the tapered floating cage plate. The striker and the tapped floating cage plate are important attaching parts that could affect operation of the door closing and latching systems.

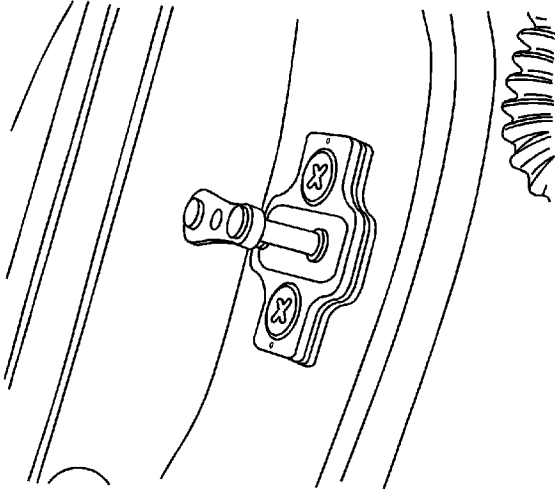
4. If proper adjustment requires that the floating cage plate be moved more than is possible, use an electric hand drill and a 3/8 inch rotary file with a flat head in order to enlarge the body opening in the direction required.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

5. Tighten the striker screws to the correct position and tighten to **24 N·m (18 lb ft)**.

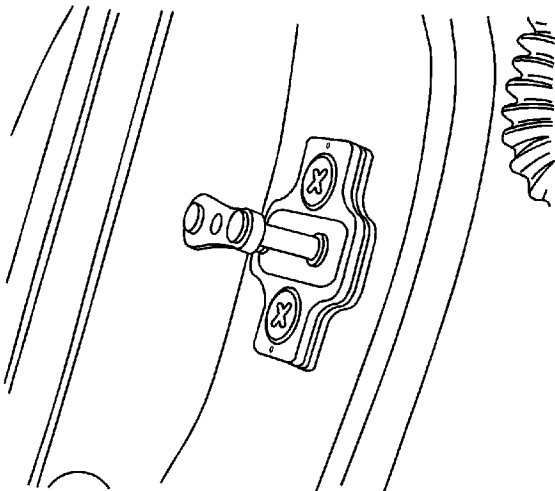
## Door Striker Replacement

### Removal Procedure



Remove the screws and the door lock striker.

### Installation Procedure



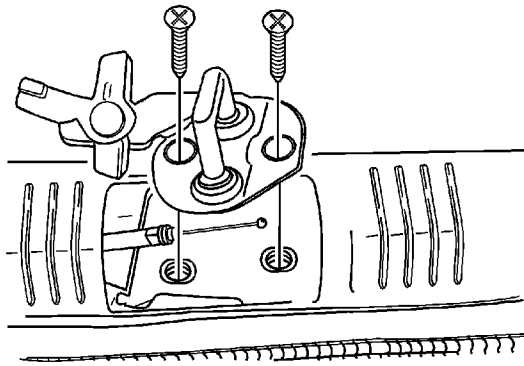


**Caution:** Refer to [Fastener Caution](#) in the Preface section.

Install the screws and the door lock striker and tighten to **24 N·m (18 lb ft)**.

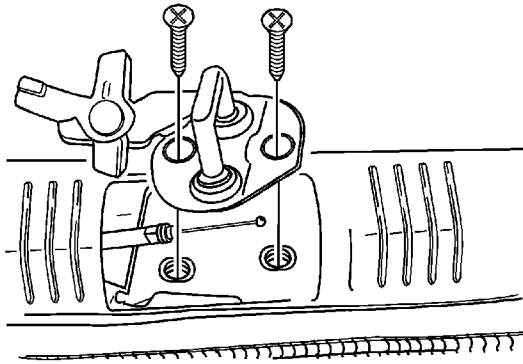
## Liftgate Lock Striker Replacement

### Removal Procedure



1. Open the hatchback door.
2. Remove the luggage compartment rear trim panel. Refer to [Rear Compartment Trim Panel Replacement](#).
3. Remove the screws that secure the lock striker.
4. Disconnect the cable from the lock striker.

### Installation Procedure



1. Connect the cable to the lock striker.

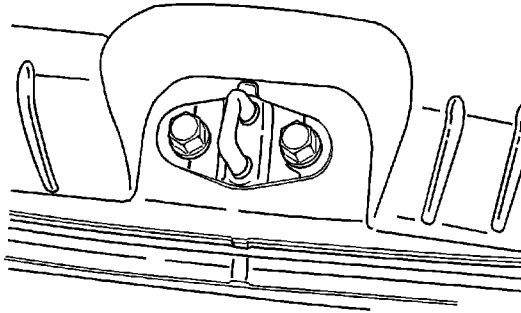
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the lock striker with the screws. Tighten the hatchback door lock striker screws to **20 N·m (15 lb ft)**.
3. Install the luggage compartment rear trim panel. Refer to [Rear Compartment Trim Panel Replacement](#).
4. Close the hatchback door.



## Rear Compartment Lid Latch Striker Replacement

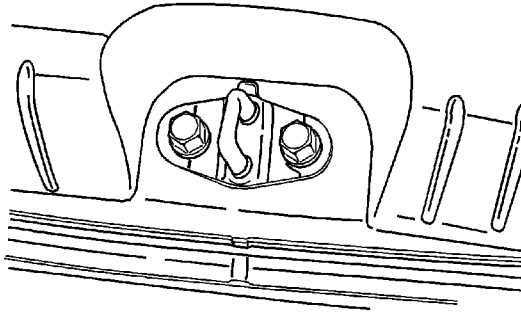
### Removal Procedure



1. Open the luggage compartment.
2. Remove the luggage compartment rear trim panel. Refer to [Rear Compartment Trim Panel Replacement](#).
3. Remove the bolts that secure the lock striker.
4. Pull the lock striker out.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the lock striker with the bolts and tighten to **8 N·m (71 lb in)**.
2. Instal the luggage compartment rear trim panel. Refer to [Rear Compartment Trim Panel Replacement](#).

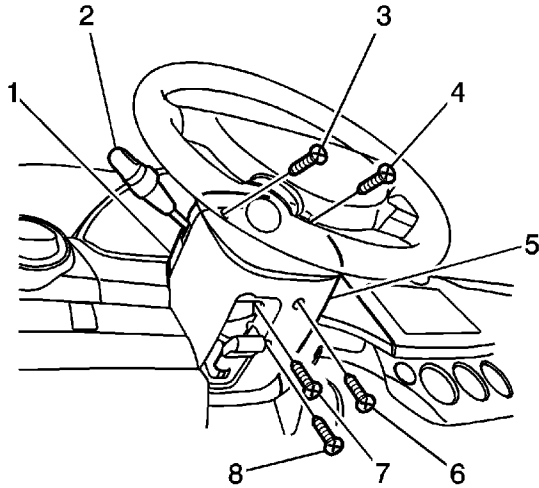
## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Wheel Well Splash Shield Screws	1.5 N·m	13 lb in
Washer Fluid Reservoir Bolts and Nuts	9 N·m	80 lb in
Wiper Arm Linkage Nut	8.5 N·m	75 lb in
Wiper Arm Nut Front	15 N·m	11 lb ft
Wiper Arm Nut Rear	11 N·m	97 lb in
Wiper Motor Bolts	9 N·m	80 lb in

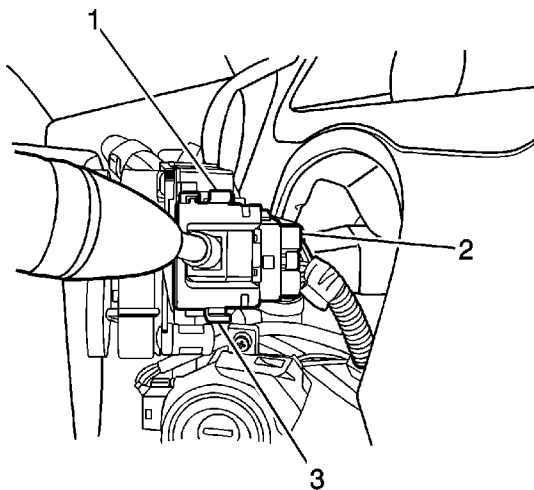
## Windshield Wiper and Washer Switch Replacement

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



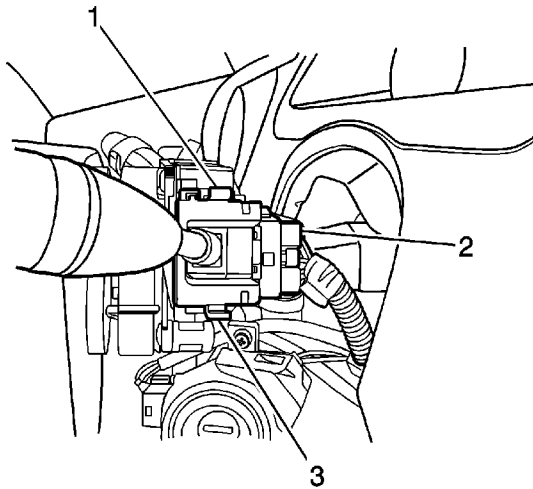
1. Disconnect the negative battery cable.
2. Remove the lower steering column cover panel screws (6, 7, 8).
3. Turn the steering wheel in order to access the upper steering column cover panel connecting screws (3, 4). Remove the upper steering column cover panel screws.
4. Remove the upper steering column panel (1) and the lower steering column cover panel (5).



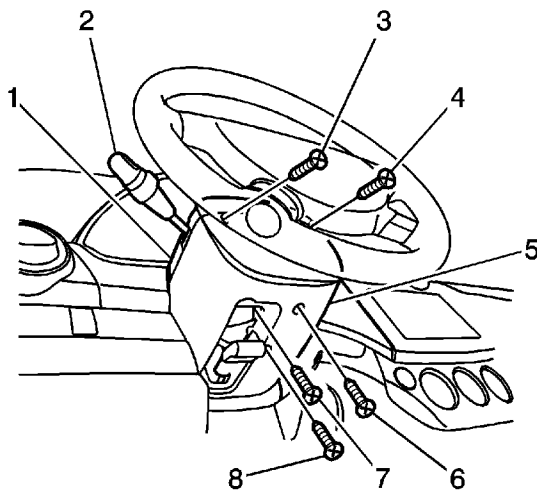


5. Remove the wiper switch by pushing in on the tabs (1, 3) on either side of the switch housing.
6. Disconnect the electrical connector (2) from the wiper switch.

## Installation Procedure



1. Connect the electrical connector (2) to the wiper switch.
2. Install the wiper switch into the switch housing with the tabs (1, 3) on either side of the switch housing.



3. Install the upper steering column cover panel (1) and the lower steering column cover panel (5).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the lower steering column cover panel screws (6, 7, 8).

**Tighten**

Tighten the lower steering column cover panel screws to 3 N·m (27 lb in).

5. Turn the steering wheel in order to access the upper steering column cover panel screw holes. Install the upper steering column cover panel screws (3, 4).

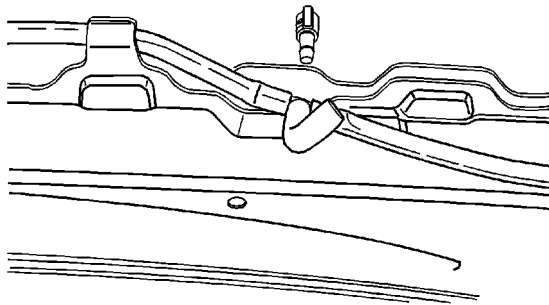
**Tighten**

Tighten the upper steering column cover panel screws to 3 N·m (27 lb in).

6. Connect the negative battery cable.

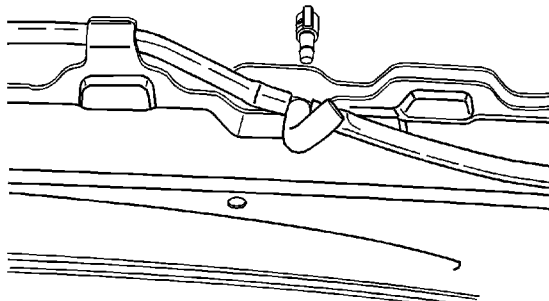
## Windshield Washer Nozzle Replacement

### Removal Procedure



1. Open the hood.
2. Disconnect the washer hose from the nozzle.
3. Remove the nozzle from the hood.

### Installation Procedure



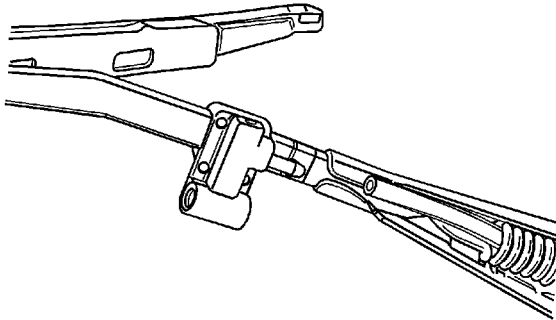


1. Install the nozzle onto the hood.
2. Connect the washer hose to the nozzle.
3. Close the hood.



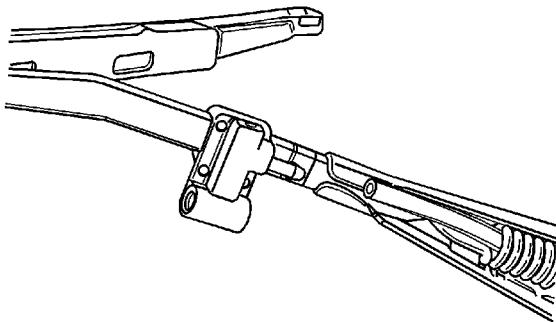
## Rear Window Washer Nozzle Replacement

### Removal Procedure



1. Remove the washer hose from the nozzle.
2. Remove the washer nozzle.

### Installation Procedure

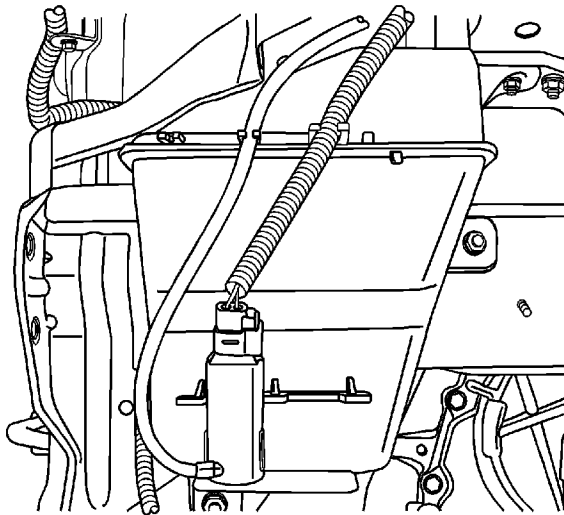




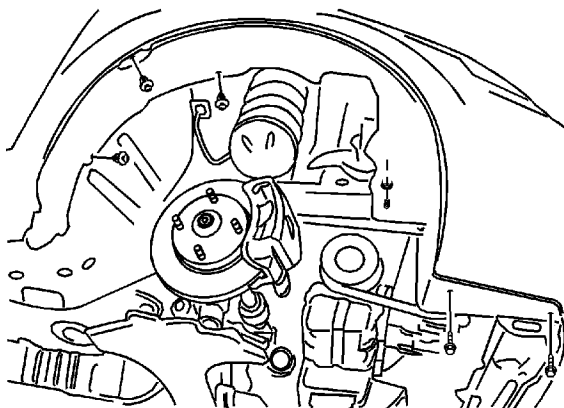
1. Install the washer nozzle.
2. Install the washer hose to the nozzle.

## Windshield Washer Hose Replacement

### Removal Procedure

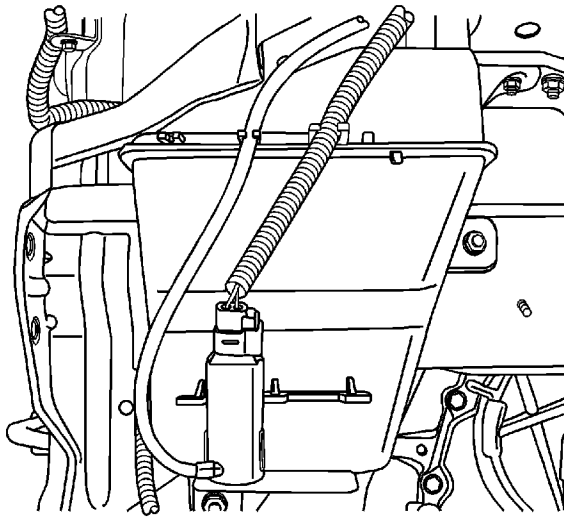


1. Open the hood.
2. Disconnect the windshield washer hose from the washer nozzles on the hood.
3. Remove the front left wheel. Refer to [Tire and Wheel Removal and Installation](#).



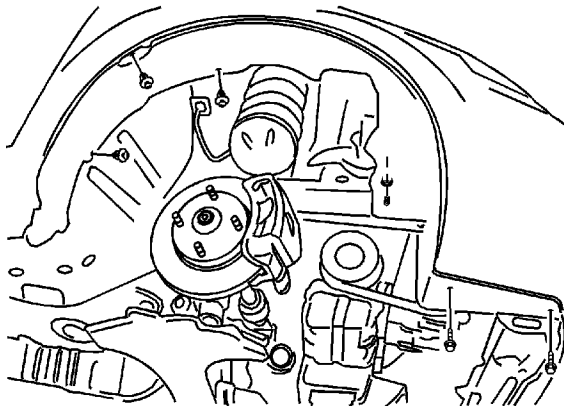
4. Remove the bolts and the front wheel well splash shield.
  5. Disconnect the washer hose from the washer reservoir.
- © 2010 General Motors Corporation. All rights reserved.

## Installation Procedure



1. Route the washer hose to the washer reservoir.
2. Connect the washer hose to the washer reservoir.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



3. Install the front wheel well splash shield with the bolts.

### Tighten

Tighten the front wheel well splash shield bolts to 1.5 N·m (13 lb in).

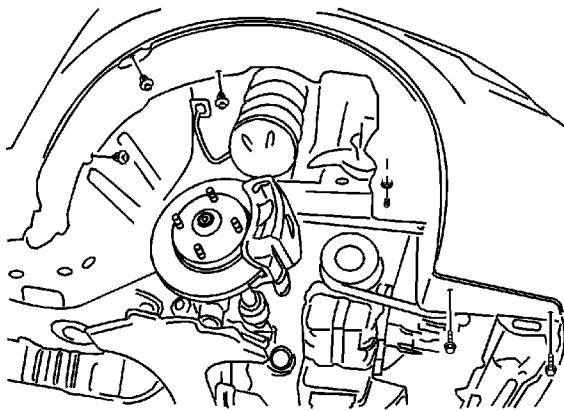
4. Install the front left wheel. Refer to [Tire and Wheel Removal and Installation](#).
5. Connect the windshield washer hose to the washer nozzles on the hood.
6. Close the hood.

# Windshield Washer Solvent Container and Pump Replacement

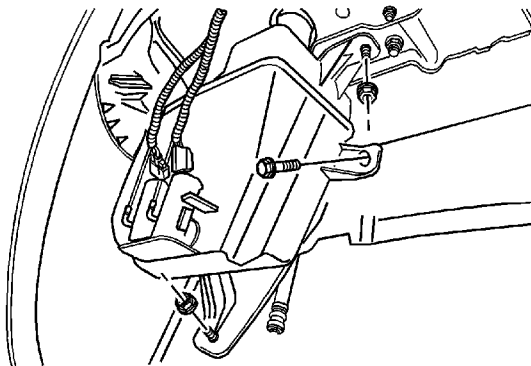
## Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.

1. Disconnect the negative battery cable.
2. Remove the front left wheel. Refer to [Tire and Wheel Removal and Installation](#).



3. Remove the bolts and the front wheel well splash shield.

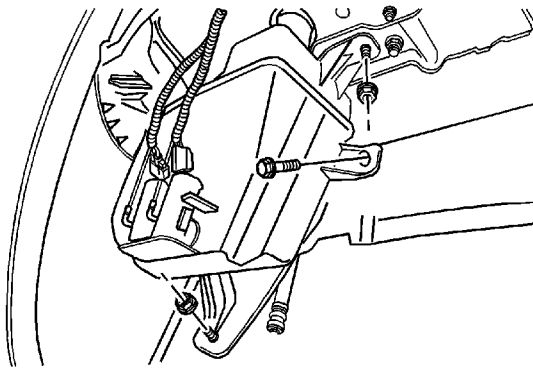




4. Disconnect the washer hoses from the reservoir.
5. Disconnect the reservoir pump electrical connectors.
6. Remove the bolts, the nuts and the reservoir.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

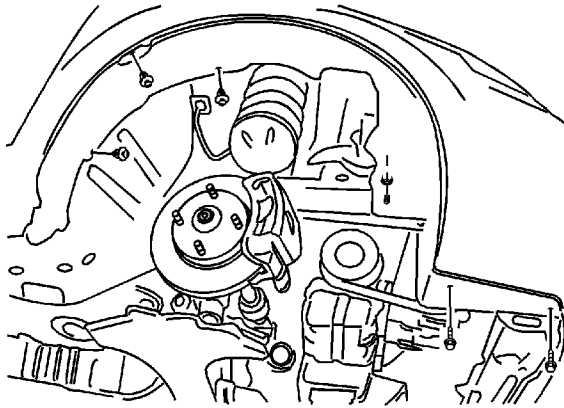


1. Install the reservoir with the nuts and the bolts.

### **Tighten**

Tighten the washer fluid reservoir nuts and bolts to 9 N·m (80 lb in).

2. Connect the reservoir pump electrical connectors.
3. Connect the washer hoses to the reservoir.



4. Install the front wheel well splash shield with the bolts.

**Tighten**

Tighten the front wheel well splash shield bolts to 1.5 N·m (13 lb in).

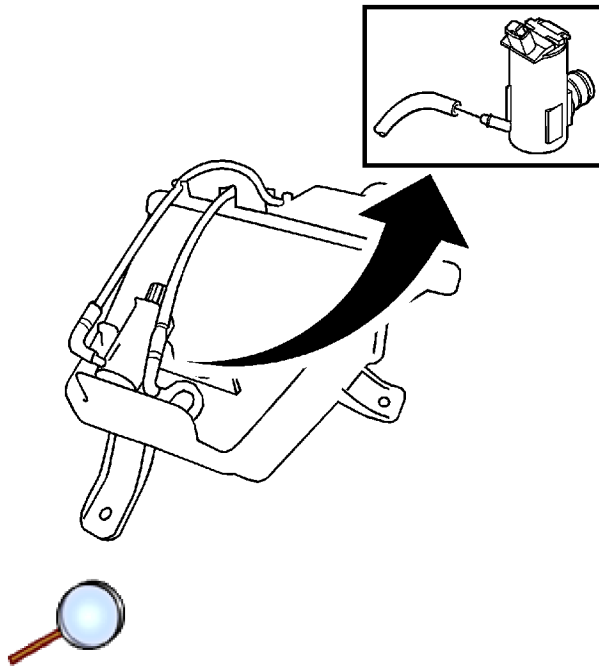
5. Install the front left wheel. Refer to [Tire and Wheel Removal and Installation](#).
6. Connect the negative battery cable.



## Washer Pump Replacement (Typical)

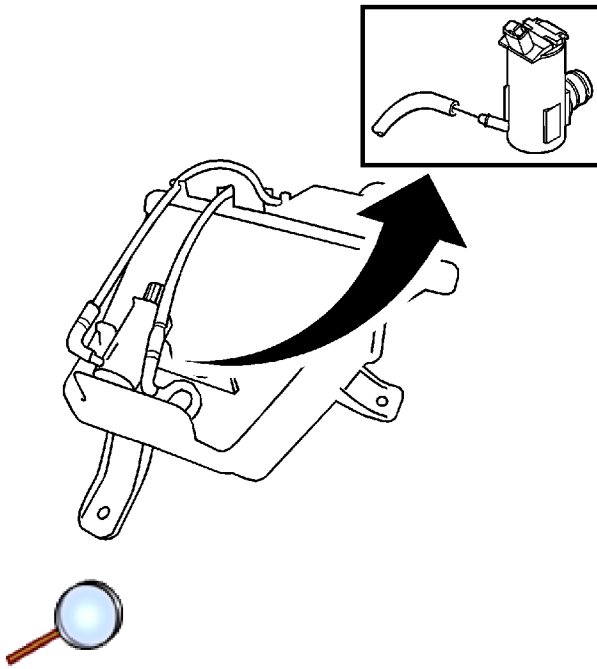
### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the left front left wheel. Refer to [Tire and Wheel Removal and Installation](#).
3. Remove the screws and the front wheel well splash shield.
4. Disconnect the electrical connector.
5. Disconnect the washer hose.
6. Remove the washer pump.

### Installation Procedure



1. Install the washer pump.
2. Connect the washer hose.
3. Connect the electrical connector.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

4. Install the front wheel well splash shield with the screws.

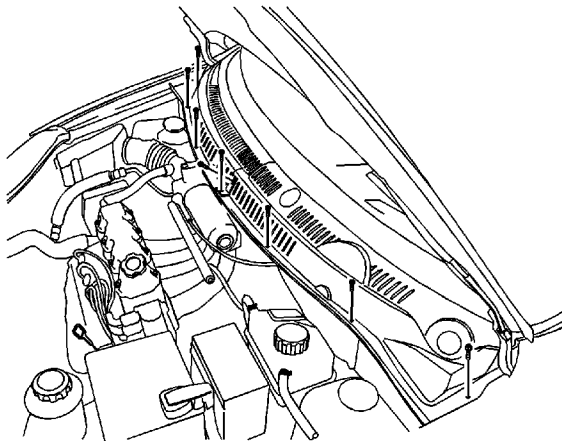
#### **Tighten**

Tighten the front wheel well splash shield screws to 1.5 N·m (13 lb in).

5. Install the front left wheel. Refer to [Tire and Wheel Removal and Installation](#).
6. Connect the negative battery cable.

## Air Inlet Grille Panel Replacement

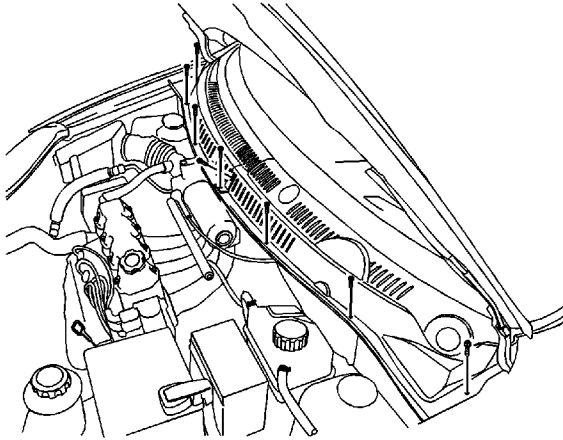
### Removal Procedure



1. Raise the hood and support it with the hood prop.
2. Remove the nuts and the wiper arms. Refer to [Windshield Wiper Arm Replacement](#).
3. Remove the air inlet grille screws and the 2-piece grille.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the 2-piece grille and the air inlet grille screws.

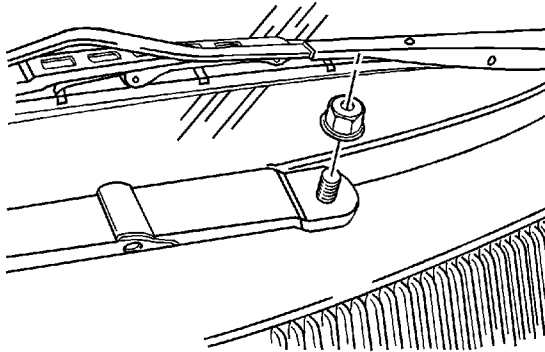
**Tighten**

Tighten the air inlet grille screws to 2 N·m (18 lb in).

2. Install the nuts and the wiper arms. Refer to [Windshield Wiper Arm Replacement](#).

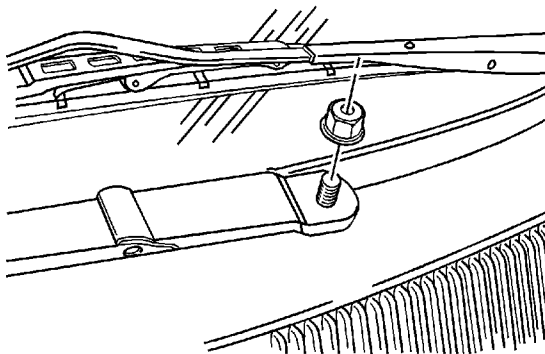
## Windshield Wiper Arm Replacement

### Removal Procedure



1. Open the hood.
2. Remove the nut from the wiper arm.
3. Pull the wiper arm off.

### Installation Procedure





1. Install the wiper arm.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Secure the wiper arm with the nut.

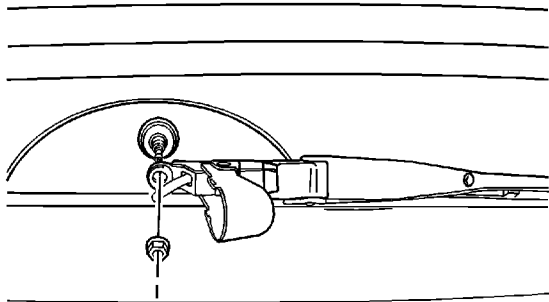
**Tighten**

Tighten the wiper arm nut to 15 N·m (133 lb in).

3. Close the hood.

## Rear Window Wiper Arm Replacement

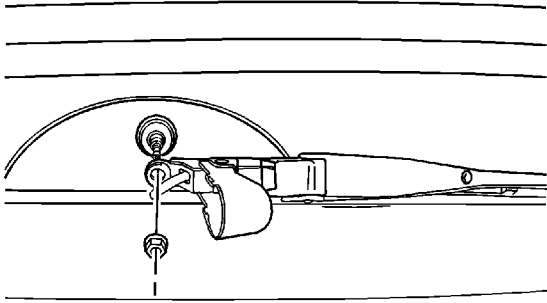
### Removal Procedure



1. Open the wiper arm access cap.
2. Remove the nut and the rear wiper arm.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the rear wiper arm with the nut.

**Tighten**

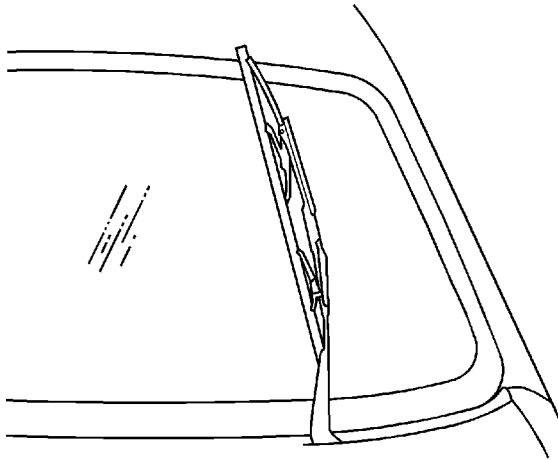
Tighten the wiper arm nut to 11 N·m (97 lb in).

2. Close the wiper arm access cap.



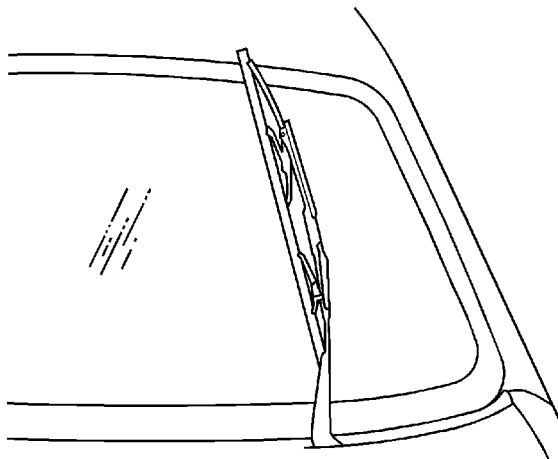
## Windshield Wiper Blade Replacement (Typical)

### Removal Procedure



1. Rotate the wiper blade on the arm.
2. Pull the wiper blade off the arm.

### Installation Procedure

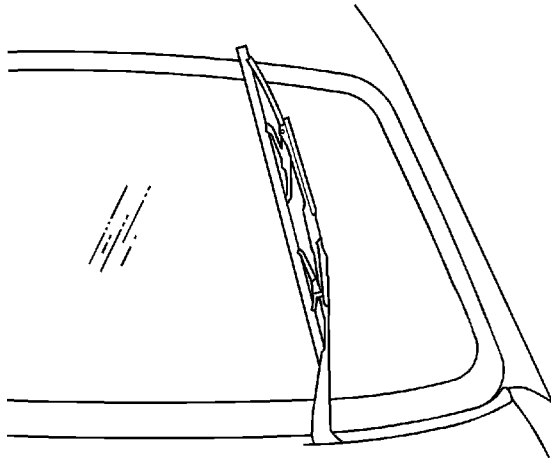




Push the wiper blade onto the arm.

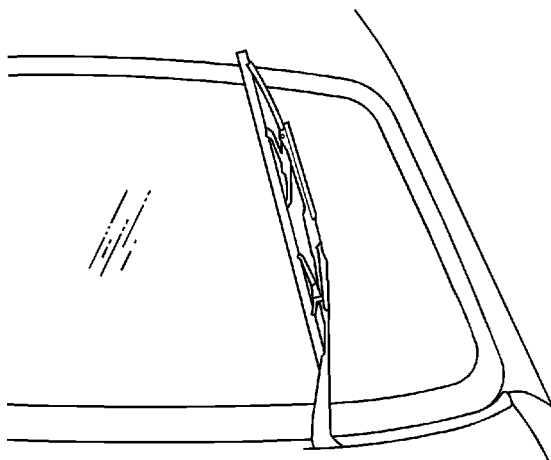
## Wiper Blade Element Replacement (Typical)

### Removal Procedure



Slide the insert out of the wiper blade.

### Installation Procedure



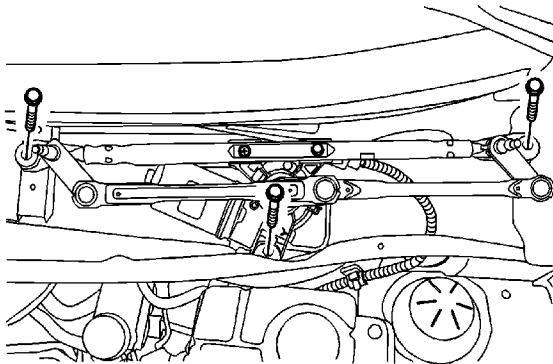


Slide the insert into the wiper blade.

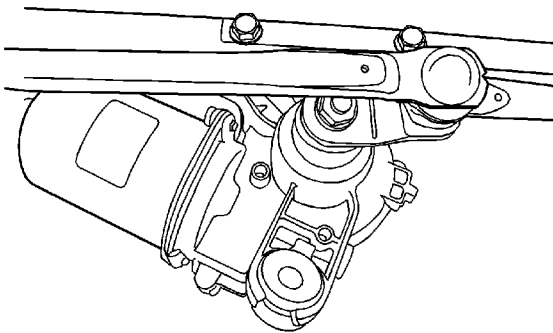
## Windshield Wiper Motor Replacement (Notchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Put the wiper arms in the upright position.
3. Remove the left side portion of the air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
4. Remove the nut securing the wiper arm linkage to the motor drive shaft.

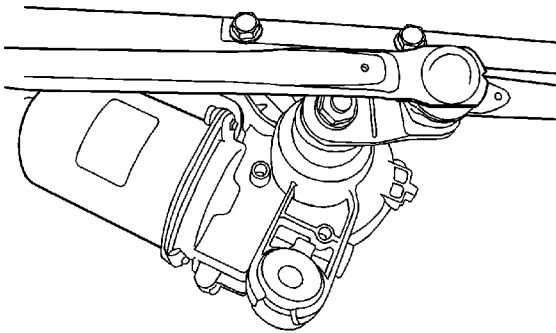




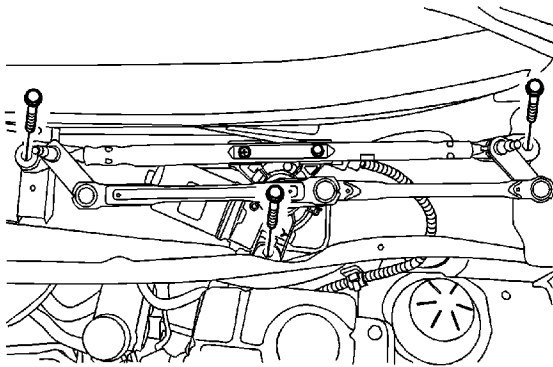
5. Pry the wiper arm linkage off the motor drive shaft.
6. Disconnect the electrical connectors.
7. Remove the bolts and the wiper motor.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the wiper motor with the bolts and tighten to **10 N·m (88 lb in)**.
2. Connect the electrical connector.



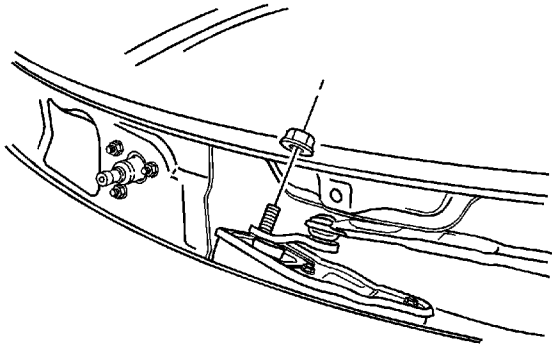


3. Press the wiper arm linkage onto the motor drive shaft.
4. Install the wiper arm linkage to the motor drive shaft with the nut and tighten to **10 N·m (88 lb in)**.
5. Install the left side portion of the air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
6. Connect the negative battery cable.

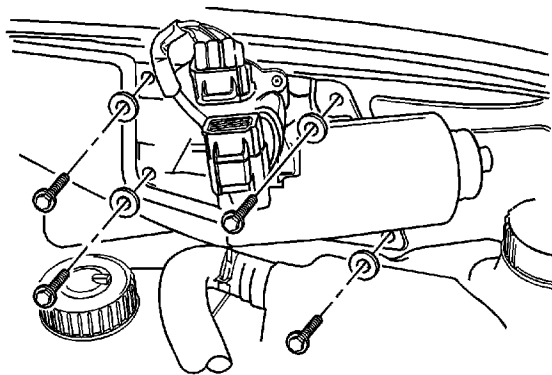
## Windshield Wiper Motor Replacement (Hatchback)

### Removal Procedure

**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Put the wiper arms in the upright position.
3. Remove the left side portion of the air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
4. Remove the nut securing the wiper arm linkage to the motor drive shaft.



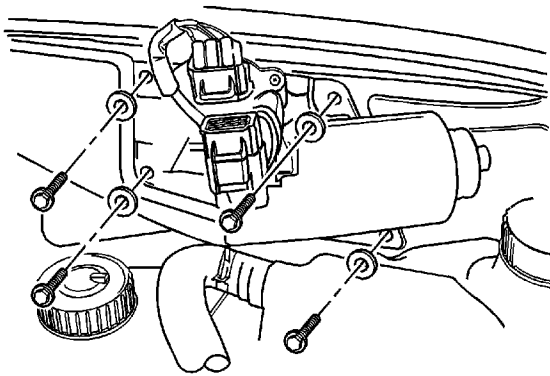




5. Pry the wiper arm linkage off the motor drive shaft.
6. Disconnect the electrical connectors.
7. Remove the bolts and the wiper motor.

## Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

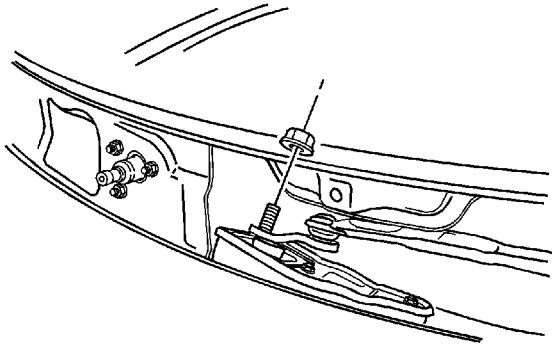


1. Install the wiper motor with the bolts.

### **Tighten**

Tighten the wiper motor bolts to 9 N·m (80 lb in).

2. Connect the electrical connector.



3. Press the wiper arm linkage onto the motor drive shaft.
4. Install the wiper arm linkage to the motor drive shaft with the nut.

**Tighten**

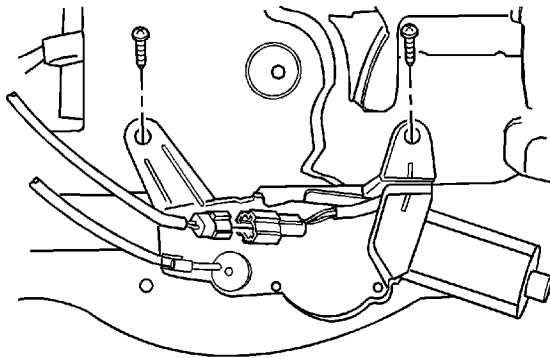
Tighten the wiper arm linkage nut to 8.5 N·m (75 lb in).

5. Install the left side portion of the air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
6. Connect the negative battery cable.

## Rear Window Wiper Motor Replacement

### Removal Procedure

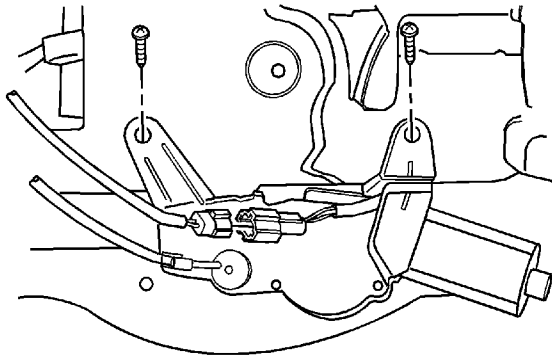
**Warning:** Refer to [Battery Disconnect Warning](#) in the Preface section.



1. Disconnect the negative battery cable.
2. Remove the rear window wiper arm. Refer to [Rear Window Wiper Arm Replacement](#).
3. Remove the hatchback door lower garnish molding.
4. Remove the bolts and the rear wiper motor.
5. Disconnect the electrical connector.

### Installation Procedure

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Connect the electrical connector.
2. Install the rear wiper motor with the bolts.

**Tighten**

Tighten the wiper motor bolts to 9 N·m (80 lb in).

3. Install the hatchback door lower garnish molding.
4. Install the rear window wiper arm. Refer to [Rear Window Wiper Arm Replacement](#).
5. Connect the negative battery cable.