- **Avoid sparks and any source of ignition.**
- **Use signs to alert others in the work area that fuel system work is in process.**

APPROVED EQUIPMENT FOR COLLISION REPAIR WARNING

WARNING: To avoid personal injury when exposed to welding flashes or to galvanized (Zinc Oxide) metal toxic fumes while grinding/cutting on any type of metal or sheet molded compound, you must work in a properly ventilated area, wearing an approved respirator, eye protection, earplugs, welding gloves, and protective clothing.

ASSISTANT DRIVING WARNING

WARNING: An assistant should drive the vehicle while the technician checks for the location of the reported condition. Otherwise, personal injury could result.

BATTERY DISCONNECT WARNING

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.

For Vehicles equipped with OnStar® (UE1) with Back Up Battery:

The Back Up Battery is a redundant power supply to allow limited OnStar® functionality in the event of a main vehicle battery power disruption to the VCIM (OnStar®module). Do not disconnect the main vehicle battery or remove the OnStar® fuse with the ignition key in any position other than OFF. Retained accessory power should be allowed to time out or be disabled (simply opening the driver door should disable retained accessory power) before disconnecting power. Disconnecting power to the OnStar® module in any way while the ignition is On or with retained accessory power activated may cause activation of the OnStar® Back-Up Battery system and will discharge and permanently damage the back-up battery. Once the Back-Up Battery is activated it will stay on until it has completely discharged. The back-up battery is not rechargeable and once activated the back-up battery must be replaced.

BRAKE DUST WARNING

- Radio Reception
- Speaker Operation
- Audio Amplifier (If equipped)
- Theft Deterrent
- Bluetooth ® (UP9) (if equipped)
- Applications (if equipped)
- Auxiliary Audio Input Jack (If equipped)
- USB Port (If equipped)
- Navigation System Components and Features (if equipped)
- OnStar ®
- Steering Wheel Controls (If equipped)
- Auto Volume Control

Radio Circuit Operation

Radio Power

The radio does not use a discrete ignition feed circuit for power moding. The power mode master provides the system power mode to the radio via serial data messages. The power mode master determines the system power mode by processing power mode information from ignition switch inputs. Serial data power modes supported by the radio are OFF, ACCESSORY, RUN, and CRANK REQUEST.

Radio Grounds

The vehicle harness provides a ground for the radio circuits. The radio may also be case grounded.

Radio Data Link Communication

The radio communicates with other modules via serial data.

Radio Audio Outputs

Each of the audio output channel circuits (+) and (-), at the radio have a DC bias voltage that is approximately one half of battery voltage. The audio being played on the system is produced by a varying AC voltage that is centered around the DC bias voltage on the same circuit. The AC voltage is what causes the speaker cone to move and produce sound. The frequency (Hz) of the AC voltage signal is directly related to the frequency of the input (audio source playing) to the audio system. Both the DC bias voltage and the AC voltage signals are needed for the audio system to properly produce sound.

Remote Enable Output

The remote enable circuit is a discrete 12 V signal supplied to infotainment system components when the radio is producing audio, needs the front display on, needs video entertainment system components on, or needs to produce chimes. This signal is used to control the power state of the components. There is no output on radio

1	**CAUTION:** **Refer to Fastener Caution .**
2	Rear Side Door Trim Panel Bracket
3	Rear Side Door Water Deflector **Procedure** Pull the water deflector from the door. Guide electrical connectors through the water deflector while removing it from the door.

REAR SIDE DOOR WINDOW GARNISH MOLDING REPLACEMENT

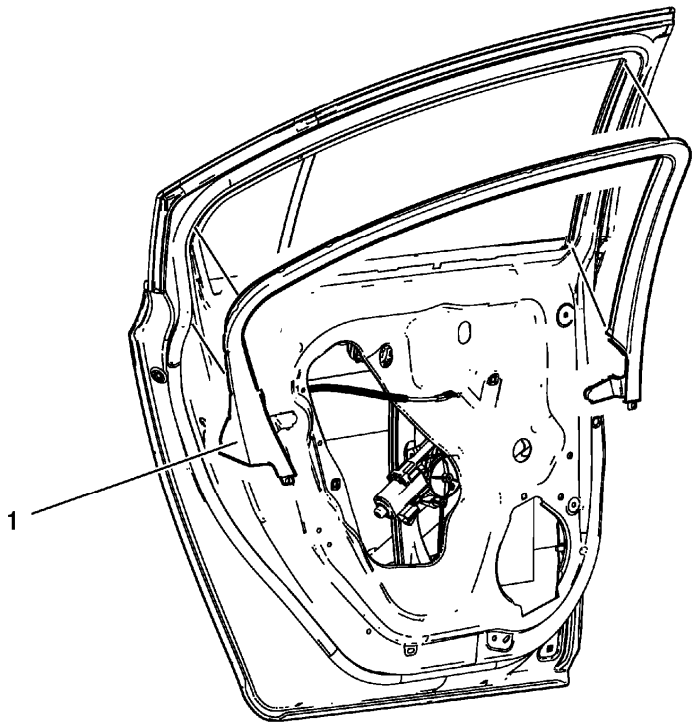

Fig. 8: Rear Side Door Window Garnish Molding
Courtesy of GENERAL MOTORS COMPANY

Rear Side Door Window Garnish Molding Replacement

Callout	Component Name
Preliminary Procedures Remove the rear side door trim. Refer to **Rear Side Door Trim Replacement**.	
1	Rear Side Door Window Garnish Molding

FRONT SIDE DOOR WINDOW GARNISH MOLDING REPLACEMENT

F3DA: 3	**F3DA:** -	**F3DA:** F3DA Fuse	**F3DA:** 25A	**F3DA:** K9 Body Control Module
F4DA: 4	**F4DA:** -	**F4DA:** F4DA Fuse	**F4DA:** 20A	**F4DA:** A11 Radio
F5DA: 5	**F5DA:** -	**F5DA:** F5DA Fuse	**F5DA:** 7.5A	**F5DA:** A22 Radio Controls, K41 Parking Assist Control Module (UD7), P17 Info Display Module, T11 Multimedia Player Interface Module (KTA)
F6DA: 6	**F6DA:** -	**F6DA:** F6DA Fuse	**F6DA:** 20A	**F6DA:** E32 Cigarette Lighter Receptacle
F7DA: 7	**F7DA:** -	**F7DA:** F7DA Fuse	**F7DA:** 20A	**F7DA:** X80L Accessory Power Receptacle - Rear Console
F8DA: 8	**F8DA:** -	**F8DA:** F8DA Fuse	**F8DA:** 30A	**F8DA:** K9 Body Control Module
F9DA: 9	**F9DA:** -	**F9DA:** F9DA Fuse	**F9DA:** 30A	**F9DA:** K9 Body Control Module
F10DA: 10	**F10DA:** -	**F10DA:** F10DA Fuse	**F10DA:** 30A	**F10DA:** K9 Body Control Module
F11DA: 11	**F11DA:** -	**F11DA:** F11DA Fuse	**F11DA:** 40A	**F11DA:** K8 Blower Motor Control Module
F12DA: 12	**F12DA:** -	**F12DA:** F12DA Fuse	**F12DA:** -	**F12DA:** Not Used
F13DA: 13	**F13DA:** -	**F13DA:** F13DA Fuse	**F13DA:** 25A	**F13DA:** S64D Seat Adjuster Switch - Driver (ADS)
F14DA: 14	**F14DA:** -	**F14DA:** F14DA Fuse	**F14DA:** 7.5A	**F14DA:** X84 Data Link Connector
F15DA: 15	**F15DA:** -	**F15DA:** F15DA Fuse	**F15DA:** 10A	**F15DA:** K36 Inflatable Restraint Sensing and Diagnostic Module
F16DA: 16	**F16DA:** -	**F16DA:** F16DA Fuse	**F16DA:** 10A	**F16DA:** KR95B Rear Compartment Lid Release Relay
F17DA: 17	**F17DA:** -	**F17DA:** F17DA Fuse	**F17DA:** 15A	**F17DA:** K33 HVAC Control Module, S34 HVAC Controls Switch Assembly
F18DA: 18	**F18DA:** -	**F18DA:** F18DA Fuse	**F18DA:** -	**F18DA:** Not Used
F19DA: 19	**F19DA:** -	**F19DA:** F19DA Fuse	**F19DA:** -	**F19DA:** Not Used
F20DA: 20	**F20DA:** -	**F20DA:** F20DA Fuse	**F20DA:** -	**F20DA:** Not Used
F21DA: 21	**F21DA:** -	**F21DA:** F21DA Fuse	**F21DA:** 15A	**F21DA:** P16 Instrument Cluster
		F22DA: F22DA		

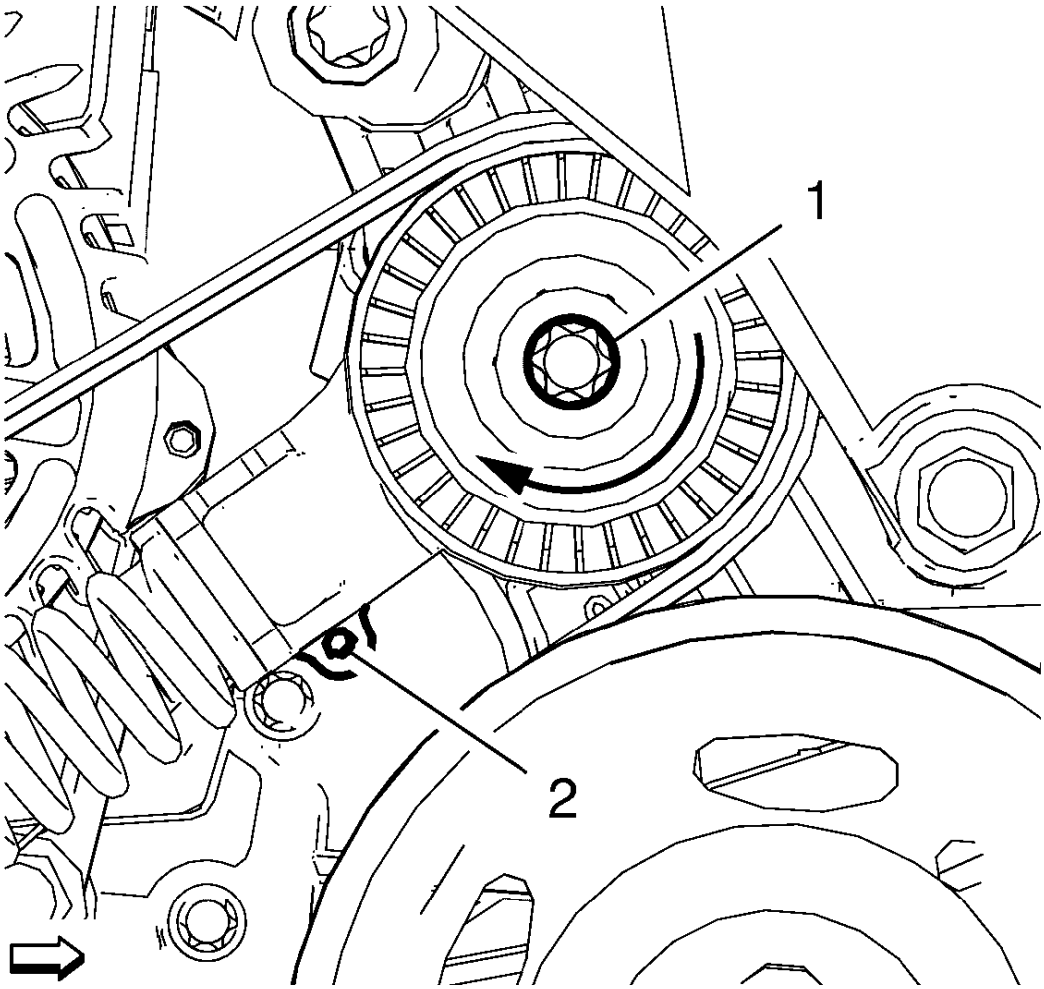

Fig. 30: Drive Belt Tensioner Pulley And Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Rotate the drive belt tensioner pulley bolt (1) in the direction shown until the punch can be removed, using a TORX wrench and hold in position.

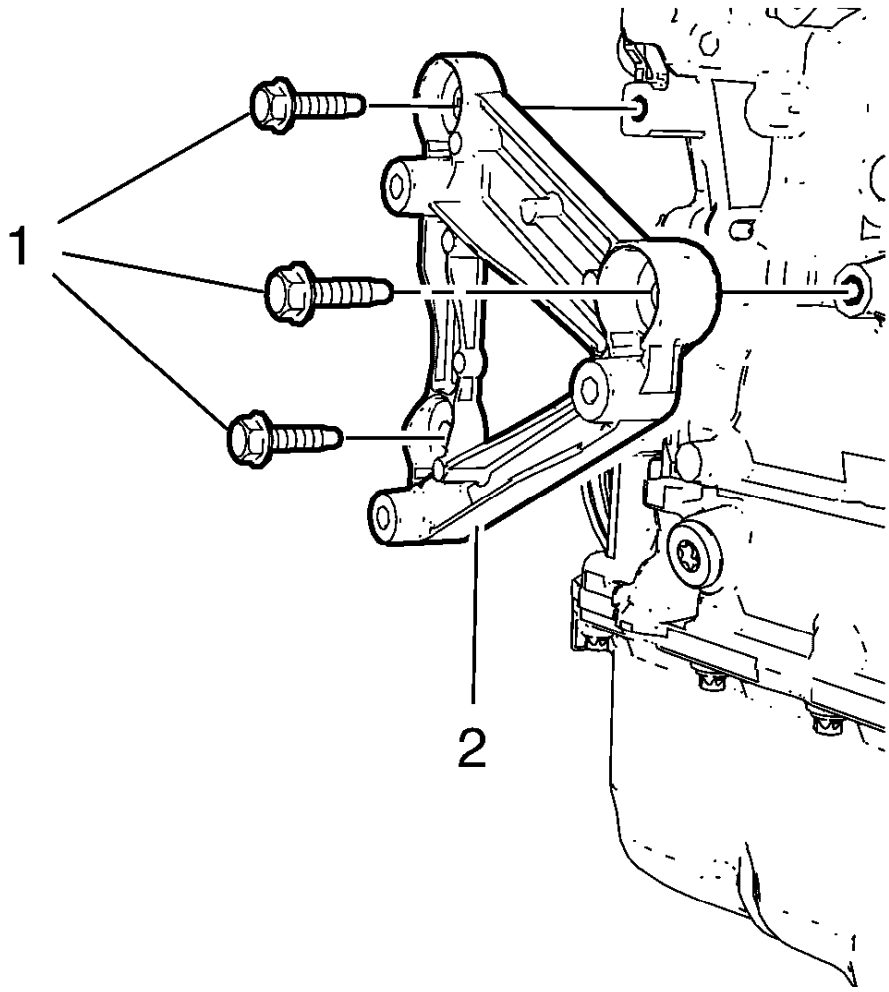

Fig. 502: Power Steering Pump Bracket/Air Conditioning Compressor Bracket And Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the air conditioning compressor bracket (2).

CAUTION: Refer to Fastener Caution .

2. Install the 3 air conditioning compressor bracket bolts (1) and tighten to 22 N.m (16 lb ft).

DRIVE BELT TENSIONER INSTALLATION

- **If 2 ohms or greater**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
2. Test for less than 2 ohms in the low reference circuit end to end.
   - If 2 ohms or greater, repair the open or high resistance in the circuit.
   - If less than 2 ohms replace the K20 Engine Control Module.

- **If less than 2 ohms**

16. Ignition ON, test for 4.8-5.2 V between the signal circuit terminal 2 and ground.
    - **If less than 4.8 V**

    1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
    2. Test for infinite resistance between the signal circuit and ground.
       - If less than infinite resistance, repair the short to ground on the circuit.
       - If infinite resistance
    3. Test for less than 2 ohms in the signal circuit end to end.
       - If 2 ohms or greater, repair the open/high resistance in the circuit.
       - If less than 2 ohms, replace the K20 Engine Control Module.

    - **If greater than 5.2 V**

    NOTE: If the signal circuit is shorted to a voltage the engine control module or the sensor may be damaged.

    1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
    2. Ignition ON, test for less than 1 V between the signal circuit and ground.
       - If 1 V or greater, repair the short to voltage on the circuit.
       - If less than 1 V, replace the K20 Engine Control Module.

    - **If between 4.8-5.2 V**

17. Ignition ON, verify the scan tool IAT Sensor 3 parameter is colder than -39°C (-38°F).
    - **If warmer than -39°C (-38°F).**

    1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
    2. Test for infinite resistance between the signal circuit terminal 2 and ground.
       - If less than infinite resistance, repair the short to ground on the circuit.
       - If infinite resistance
    3. Test for less than 2 ohms in the signal circuit end to end.
       - If 2 ohms or greater, repair the open/high resistance in the circuit.
       - If less than 2 ohms, replace the K20 Engine Control Module.

    - **If colder than -39°C (-38°F).**

18. Ignition OFF, install a 3 A fused jumper wire between the signal circuit terminal 1 and the low reference circuit terminal 2.
19. Verify the scan tool IAT Sensor 3 parameter is warmer than 150°C (302°F).

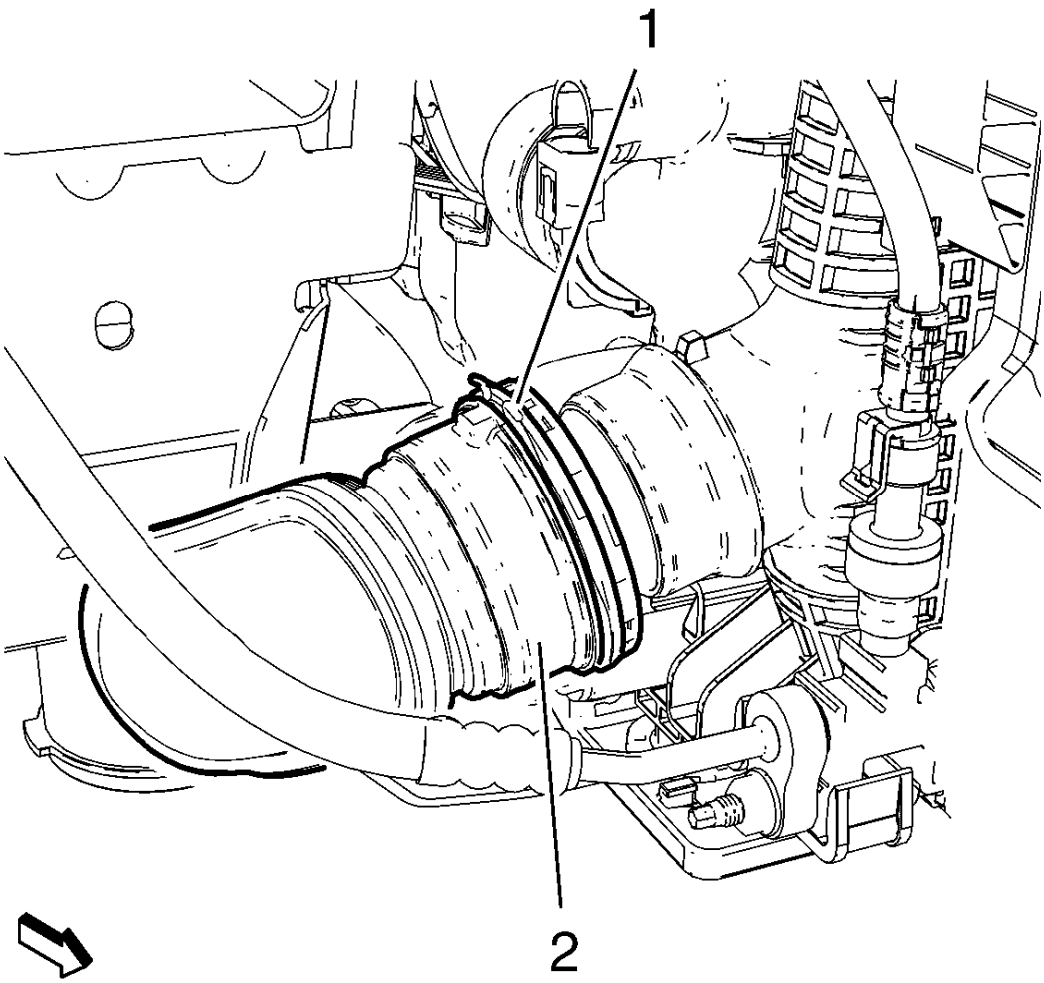

Fig. 179: Charge Air Cooler Inlet Air Hose Quick Connector
Courtesy of GENERAL MOTORS COMPANY

6. Unlock the charge air cooler inlet air hose quick connector (1).
7. Remove the charger air cooler inlet air hose (2).

Installation Procedure

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

Circuit/System Verification

NOTE: Before starting vehicle, review freeze frame data to determine if misfire sets during cold start or warmed up operation. If the vehicle has a cold start problem and the vehicle is started, the vehicle will require to be not started for many hours before next attempt to operate the vehicle within the fail conditions.

1. Engine idling at the normal operating temperature.
2. Verify there is no abnormal engine noise.
   - **If there is an engine noise**

     Refer to **Symptoms - Engine Mechanical** .

   - **If there is no abnormal engine noise**
3. Verify no DTCs other than P0300-P0304 are set.
   - **If any DTCs other than P0300-P0304 are set**

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

   - **If only DTCs P0300-P0304 are set**

     Refer to Circuit/System Testing below.

   - **If no DTCs are set**
4. Verify the scan tool Cylinder 1-4 Current Misfire Counter Misfire parameters are not incrementing.
   - **If Misfire Current Counters are incrementing**

     Refer to Circuit/System Testing below.

   - **If Misfire Current Counters are not incrementing**
5. Engine idling.
6. Verify the engine speed changes when performing the Cylinder Power Balance Test with a scan tool.
   - **If engine speed does not change**

     Refer to Circuit/System Testing below.

   - **If the engine speed changes**
7. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
8. Verify the DTCs are not set.
   - **If any of the DTCs set**

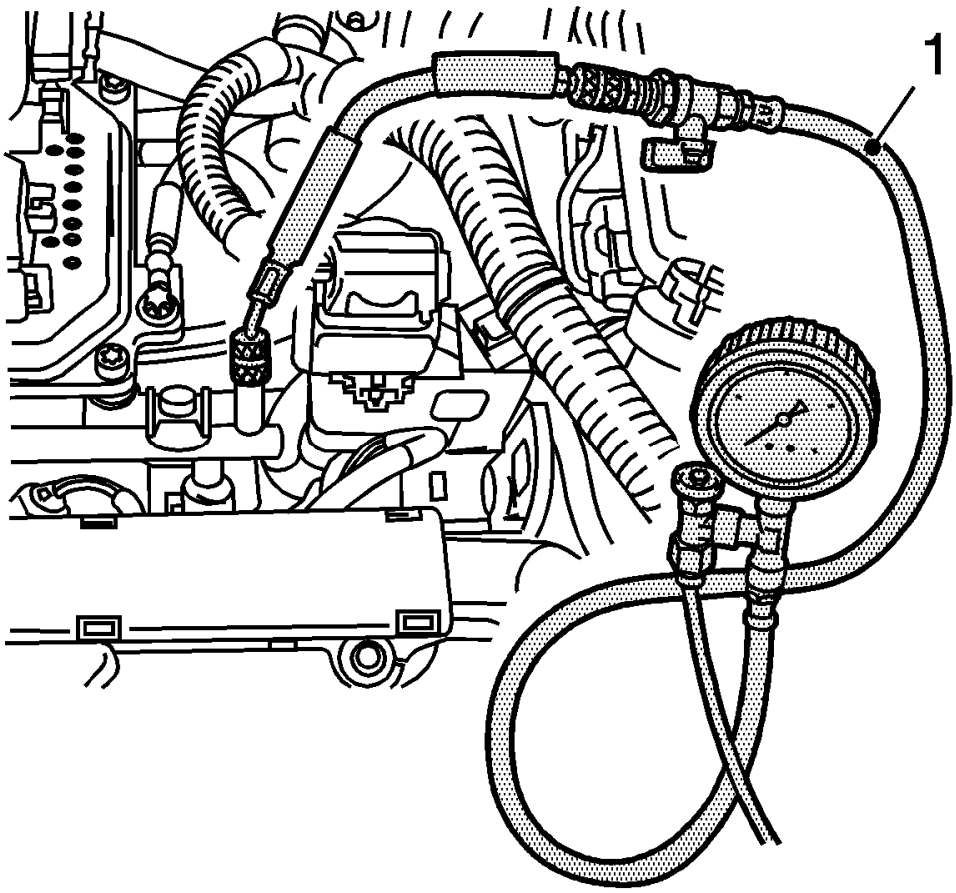

Fig. 26: View Of Fuel Pressure Tester
Courtesy of GENERAL MOTORS COMPANY

2. Remove the protective cap from the test connection.
3. Relieve the fuel pressure, using the **EN-34730-91** Pressure Tester (1).

PLASTIC COLLAR QUICK CONNECT FITTING SERVICE

Plastic Quick Connect Fitting Type Identification

Plastic Quick Connect Fitting Type A

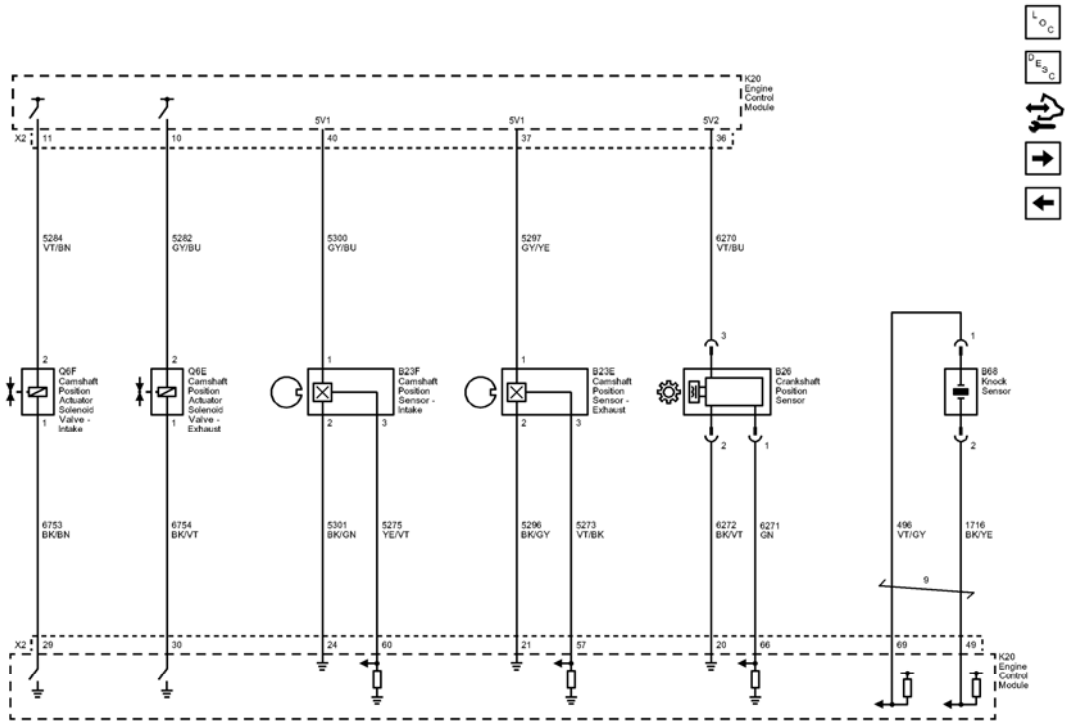

Fig. 7: Camshaft, Crankshaft, and Knock Sensors, Camshaft Actuators Wiring Schematics
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
5284	Camshaft Phaser Intake Solenoid (1)
5284 VT/BN	5284 VT/BN
CAV_2	2
CAV_11	11
CONN_X2	X2
5282	Camshaft Phaser Exhaust Solenoid (1)
5282_GY/BU	5282 GY/BU
CAV_2	2
CAV_10	10
5300	Camshaft Position Intake Sensor Supply Voltage (1)
5300_GY/BU	5300 GY/BU
CAV_1	1
CAV_40	40
5297	Camshaft Position Exhaust Sensor Supply Voltage (1)
5297_GY/YE	5297 GY/YE
CAV_1	1
CAV_37	37

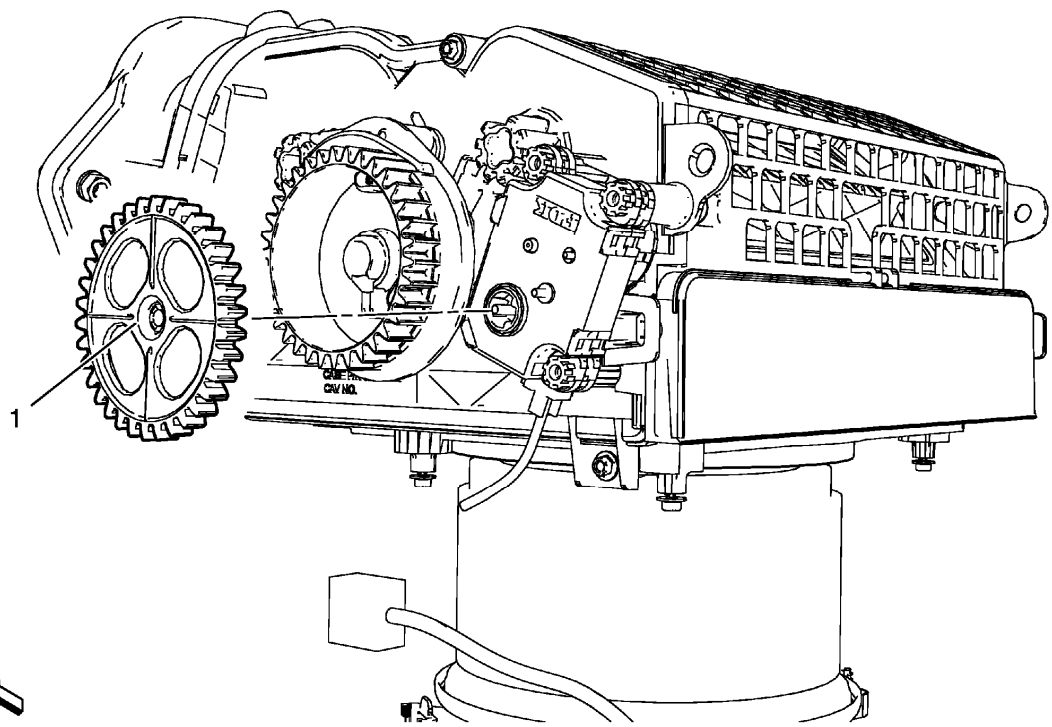

Fig. 34: Air Inlet Valve Actuator Gear (Left Hand Drive)
Courtesy of GENERAL MOTORS COMPANY

Air Inlet Valve Actuator Gear Replacement

Callout	Component Name
Preliminary Procedure Remove instrument panel compartment. Refer to **Instrument Panel Compartment Replacement** .	
1	Air Inlet Valve Actuator Gear **Procedure** Pull air inlet valve actuator gear from air inlet valve actuator.

AIR INLET VALVE ACTUATOR REPLACEMENT

Exterior Lighting Systems Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Right Turn Signal Switch and Left Turn Signal Switch parameters change between Active and Inactive while cycling the turn signal switch between the right and left positions.
   - **If the parameters do not change**

     Refer to Turn Signal/Multifunction Switch Malfunction below.

   - **If the parameters change**
3. Verify the left front turn signal lamps turn ON and OFF while commanding the Left Front Turn Signal Lamp ON and OFF with a scan tool.
   - **If the left front turn signal lamps do not turn ON and OFF**

     Refer to Turn Signal Lamps Malfunction below.

   - **If the left front turn signal lamps turn ON and OFF**
4. Verify the right front turn signal lamps turn ON and OFF while commanding the Right Front Turn Signal Lamp ON and OFF with a scan tool.
   - **If the right front turn signal lamps do not turn ON and OFF**

     Refer to Turn Signal Lamps Malfunction below.

   - **If the right front turn signal lamps turn ON and OFF**
5. Verify the left rear turn signal lamps turn ON and OFF while commanding the Left Rear Turn Signal Lamp ON and OFF with a scan tool.
   - **If the left rear turn signal lamps do not turn ON and OFF**

     Refer to Turn Signal Lamps Malfunction below.

   - **If the left rear turn signal lamps turn ON and OFF**

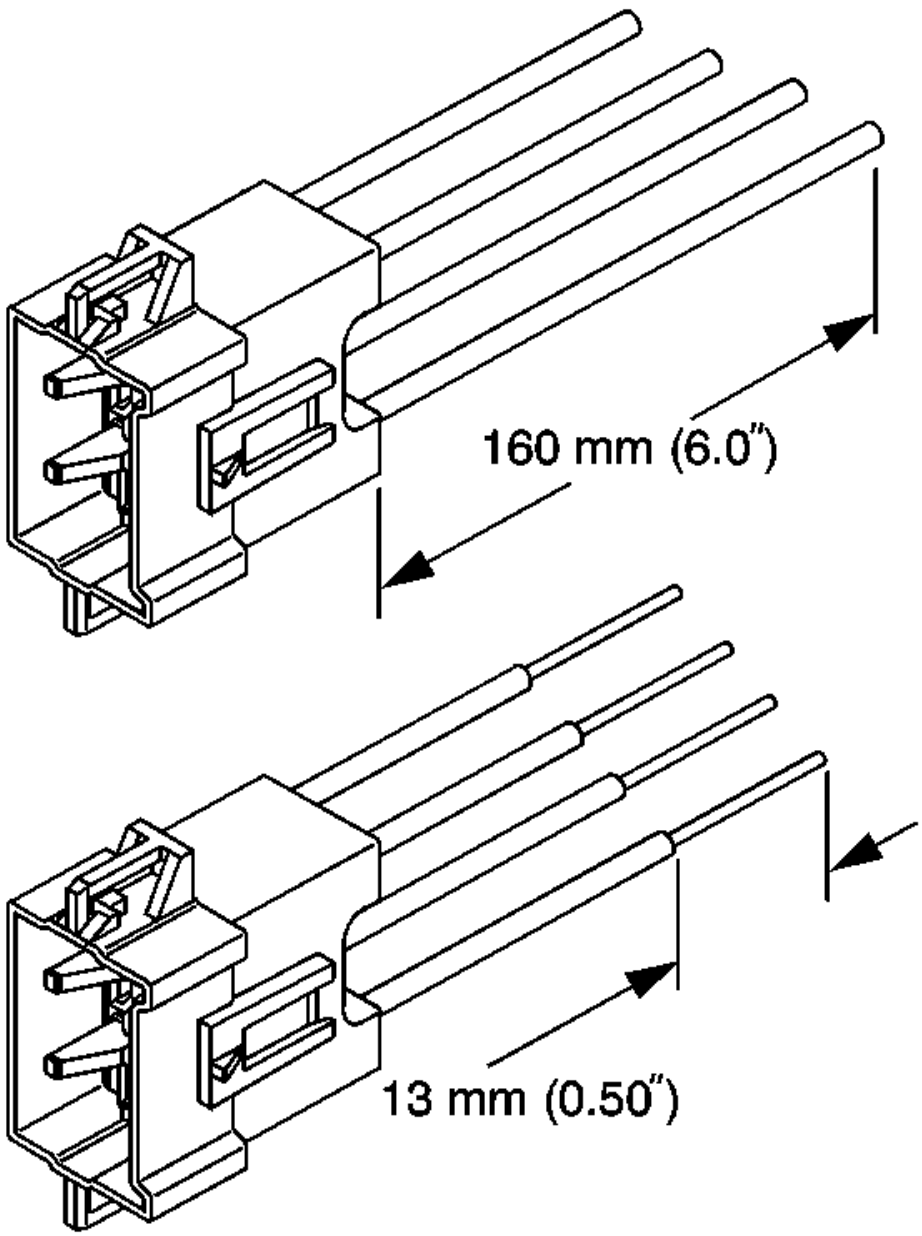

Fig. 37: Stripping SIR Wires
Courtesy of GENERAL MOTORS COMPANY

NOTE: If the vehicle is equipped with dual stage air bags the steering wheel air

605	Park Pawl Actuator Guide Seal
606	Park Pawl Actuator Guide
607	Park Pawl Actuator Assembly
608	Manual Shift Detent Lever Shaft
609	Manual Shift Detent (w/Shaft Position Switch) Lever Assembly
610	Manual Shift Detent Lever Pin
611	Manual Shift Shaft Pin

COMPONENT LOCATION

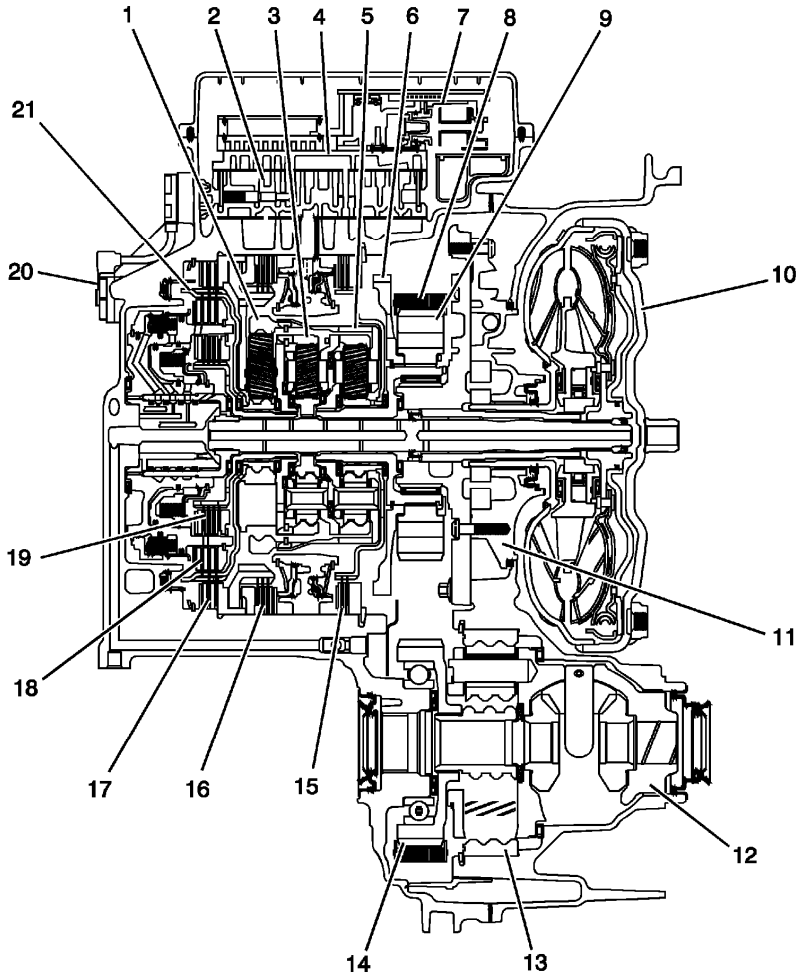

Fig. 28: Identifying Component Location
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Reaction Carrier Assembly
2	Control Valve Body Assembly
3	Input Carrier Assembly