2003 ENGINE PERFORMANCE

Removal & Installation

INTRODUCTION

CAUTION: When battery or Powertrain Control Module (PCM) is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until adaptation systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES - ISUZU article in GENERAL INFORMATION before disconnecting battery.

NOTE: Before replacing any component that scan tool suggests are faulty. Ensure that all wiring connections and electrical connectors are okay. Ensure that power and ground circuits are functioning properly. For circuit identification, see ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

NOTE: Not all procedures apply to all models. Most components are a simple unbolt and bolt-on procedure. For component locations, see COMPONENT LOCATIONS in SYSTEM & COMPONENT TESTING article.

Removal, overhaul and installation procedures (when given by manufacturer) are covered in this article. If component removal and installation is primarily an unbolt and bolt-on procedure, a torque specification may be all that is furnished.

COMPUTERIZED ENGINE CONTROL

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See appropriate COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

POWER TRAIN CONTROL MODULE

Removal & Installation (Ascender 4.2L)

CAUTION: Electronic components used in control systems are designed to carry very low voltages. As little as a 30-volt charge created by static electricity can cause a total or degrading failure in PCM or other electronic components containing integrated circuits. Before servicing PCM, technician must ground themself and the work area to discharge static electricity.

CAUTION: DO NOT remove part from packaging until ready to install. Ground any static-proof package before opening. DO NOT touch electrical terminals of components unless properly grounded. DO NOT lay electrical components on car seat, carpeting or dashboard. Use electrostatic protection mat and ground strap whenever possible.

NOTE: Before replacing PCM, carefully inspect all wiring and control components. Failure to test for short circuits may result in repeated PCM failure due to shorts and Quad-Driver failure. To prevent internal damage to PCM, ensure ignition switch is in OFF position when connecting or disconnecting PCM electrical connectors or any electrical components. Inspect PCM connector gaskets and ensure they are installed correctly. PCM connector gaskets prevent contaminants from entering PCM.

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Ensure ignition is off.
2. Disconnect negative battery cable.
3. Locate PCM at left front of engine, on intake manifold plenum. See **Fig. 1** .
4. Loosen PCM electrical connector bolts. Disconnect PCM electrical connectors.
5. Remove 4 PCM mounting bolts. Remove PCM from intake manifold plenum.
6. To install, reverse removal procedure. Tighten PCM electrical connector bolts to specification. See **TORQUE SPECIFICATIONS** . If NEW PCM has been installed, PCM MUST be programmed. See **POWERTRAIN CONTROL MODULE (ASCENDER)** under PROGRAMING.

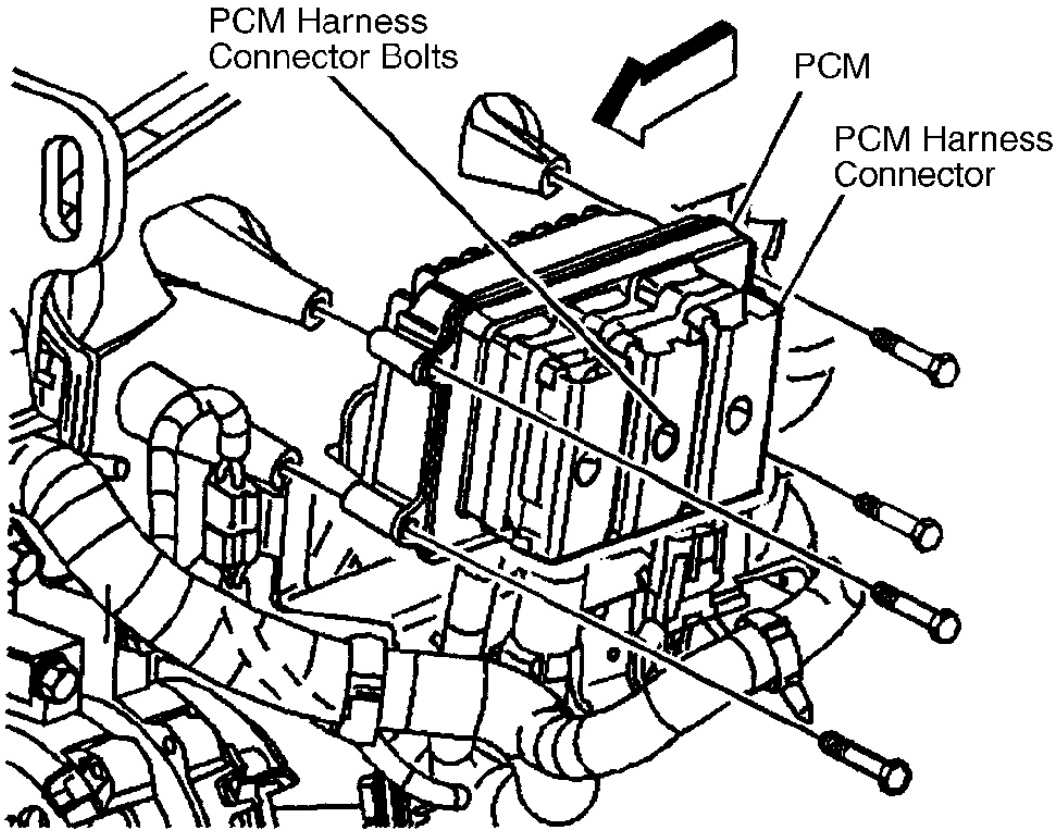

Fig. 1: Locating Powertrain Control Module (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

CAUTION: Electronic components used in control systems are designed to carry very low voltages. As little as a 30-volt charge created by static electricity can cause a total or degrading failure in PCM or other electronic components containing integrated circuits. Before servicing PCM, technician must ground themself and the work area to discharge static electricity.

CAUTION: DO NOT remove part from packaging until ready to install. Ground any static-proof package before opening. DO NOT touch electrical terminals of components unless properly grounded. DO NOT lay electrical components on car seat, carpeting or dashboard. Use electrostatic protection mat and ground strap whenever possible.

NOTE: Before replacing PCM, carefully inspect all wiring and control components. Failure to test for short circuits may result in repeated PCM failure due to shorts and Quad-Driver failure. To prevent internal damage to PCM, ensure ignition switch is in OFF position when connecting or disconnecting PCM electrical connectors or any electrical components. Inspect PCM connector gaskets and ensure they are installed correctly. PCM connector gaskets prevent contaminants from entering PCM.

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1. Disconnect the negative battery cable.
2. Remove the PCM cover retainers. See **Fig. 2** .
3. Remove the PCM cover.
4. Release the spring latch from the PCM.
5. Release the PCM mounting tabs from the PCM. See **Fig. 3** .
6. Remove the PCM.

CAUTION: Remove any debris from around the PCM connector surfaces before servicing the PCM. Inspect the PCM module connector gaskets when diagnosing or replacing the PCM. Ensure that the gaskets are installed correctly. The gaskets prevent contaminant intrusion into the PCM.

7. Loosen the PCM electrical connector bolts.
8. Disconnect the PCM electrical connectors. See **Fig. 4** .
9. Remove the PCM from the vehicle.
10. To install, reverse removal procedure. Tighten the PCM electrical connector bolts. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** . If the PCM was replaced the replacement PCM must be programmed. See **POWERTRAIN CONTROL MODULE (ASCENDER)** under PROGRAMMING.

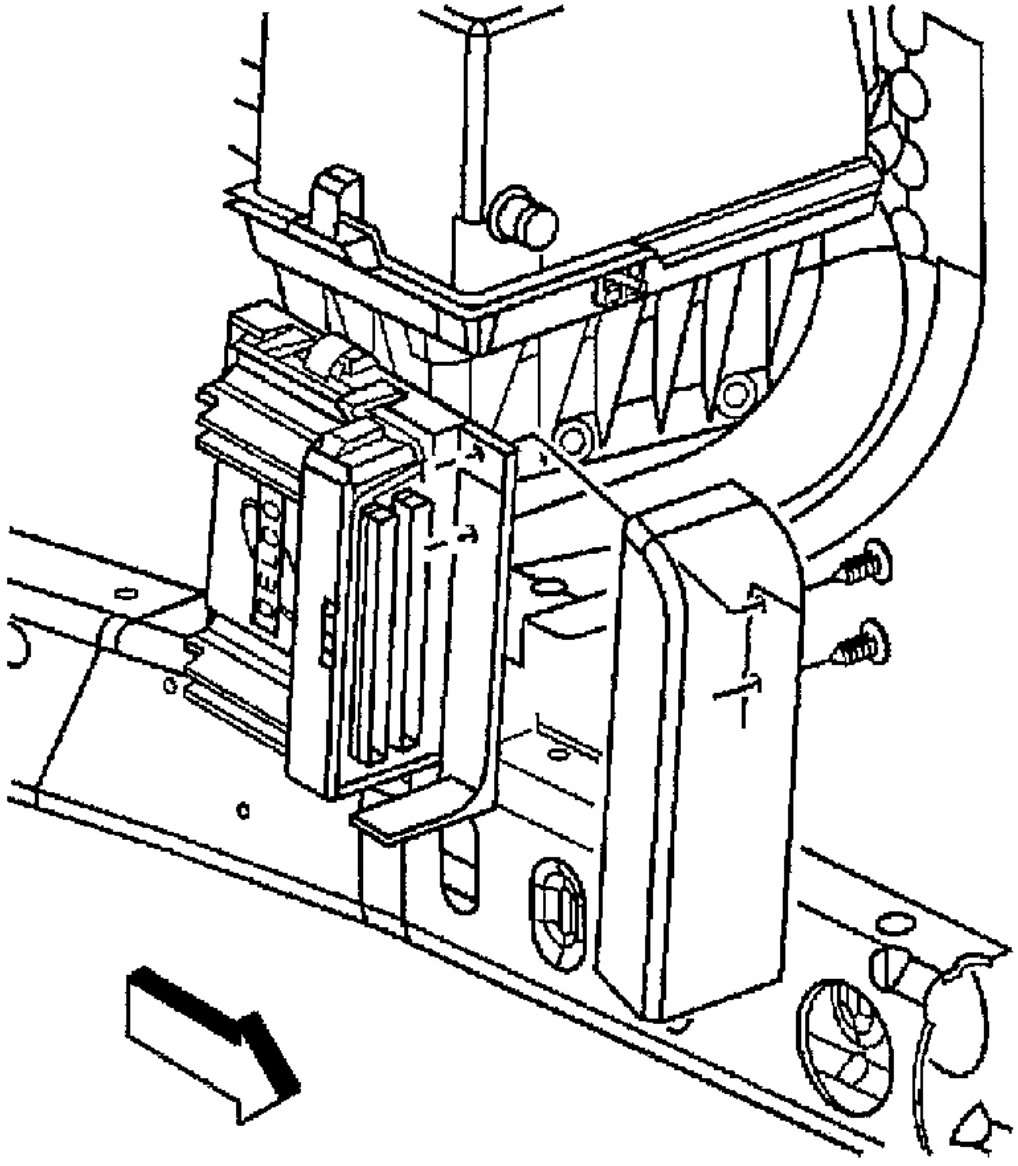

Fig. 2: Removing & Installing Powertrain Control Module Cover (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

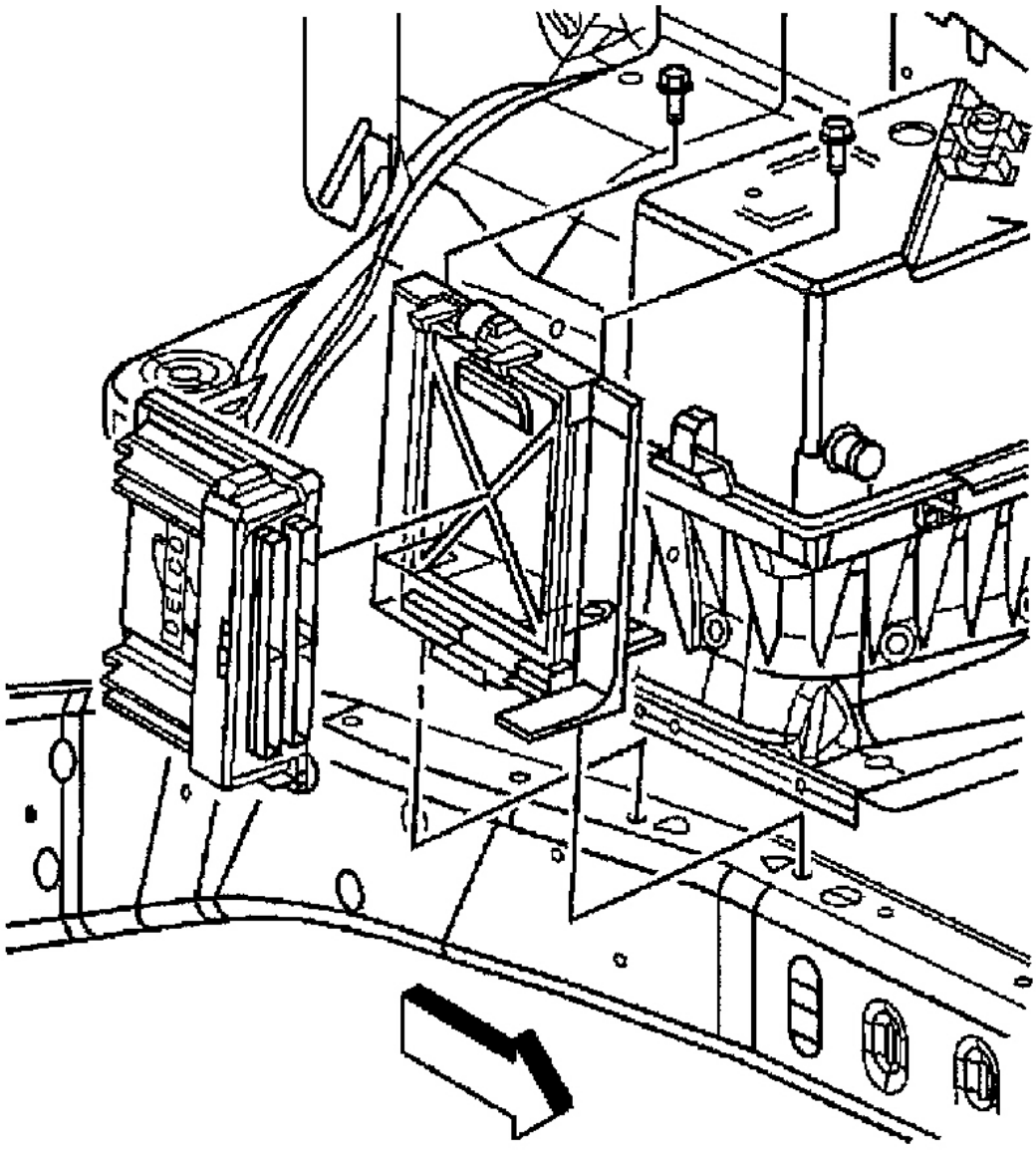

Fig. 3: Removing & Installing Powertrain Control Module (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

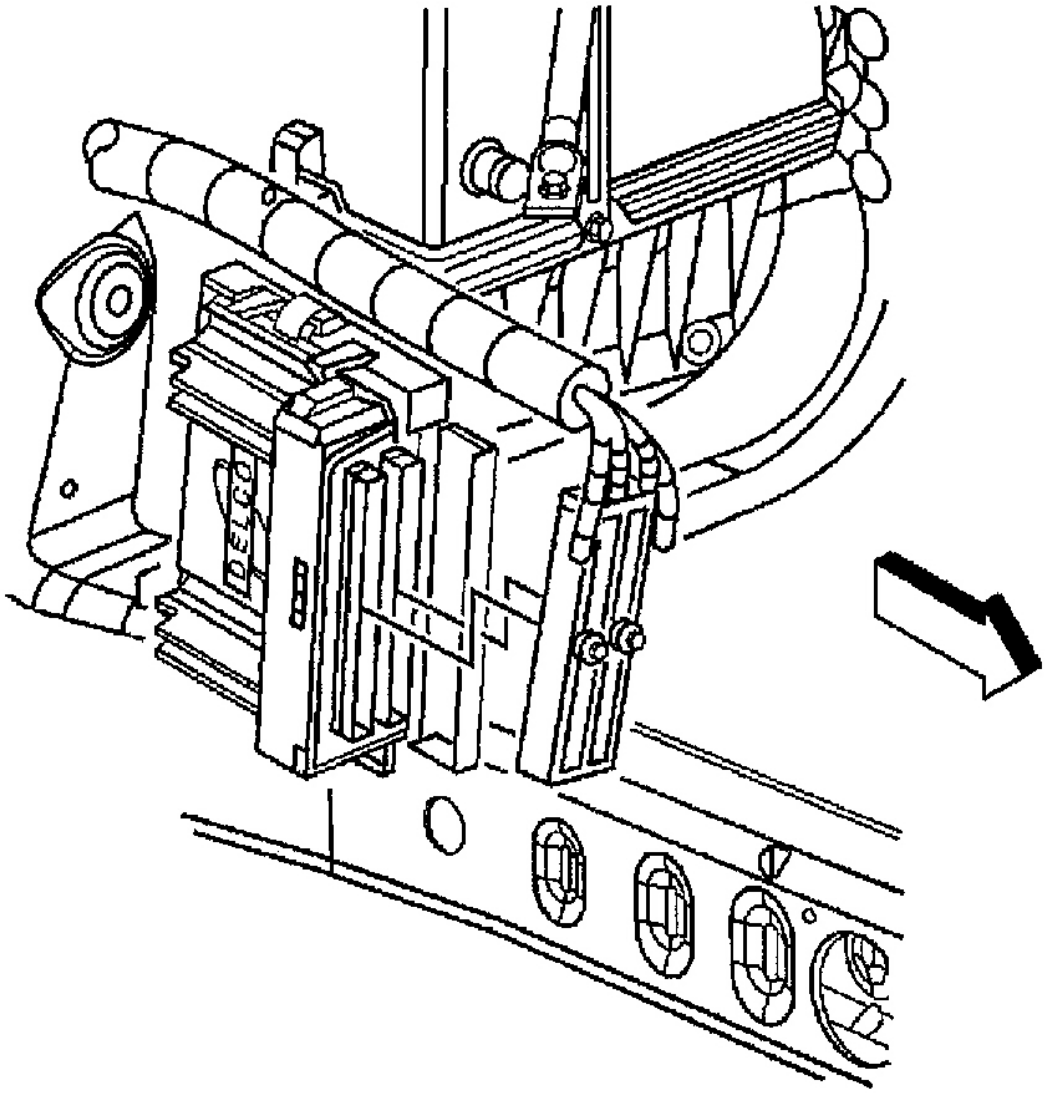

Fig. 4: Removing & Installing Powertrain Control Module Electrical Connectors (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

CAUTION: To prevent internal damage to PCM, ignition must be in OFF position before disconnecting battery or any electrical connectors.

NOTE: **Before replacing any component that scan tool suggests are faulty. Ensure that all wiring connections and electrical connectors are okay. Ensure that power and ground circuits are functioning properly. For circuit identification, see ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.**

NOTE: **To prevent possible electrostatic discharge damage to PCM, DO NOT touch PCM connector pins or soldered components on circuit board. DO NOT open replacement part package until part is ready to be installed. Before removing part from packaging, ground package to a known good ground on vehicle. If part has been handled while sitting in car, or while walking around, touch a known good ground before installing part.**

Service of PCM normally consists of replacement of or programming of EEPROM. If PCM is to be replaced, ensure that replacement part is correct one for application. New PCM EEPROM must be programmed. To program EEPROM, go to **EEPROM PROGRAMMING PROCEDURE** under PROGRAMMING. To replace PCM perform following steps:

1. Disconnect negative battery cable.
2. Block the wheels.
3. Remove 2 PCM electrical connector retaining screws. See **Fig. 5** .
4. Disconnect PCM 80-pin electrical connectors E-21 (Blue) and E-22 (Red).
5. Remove retaining clip, and remove PCM.
6. To install, reverse removal procedure. Program PCM. See **EEPROM PROGRAMMING PROCEDURE** under PROGRAMMING.

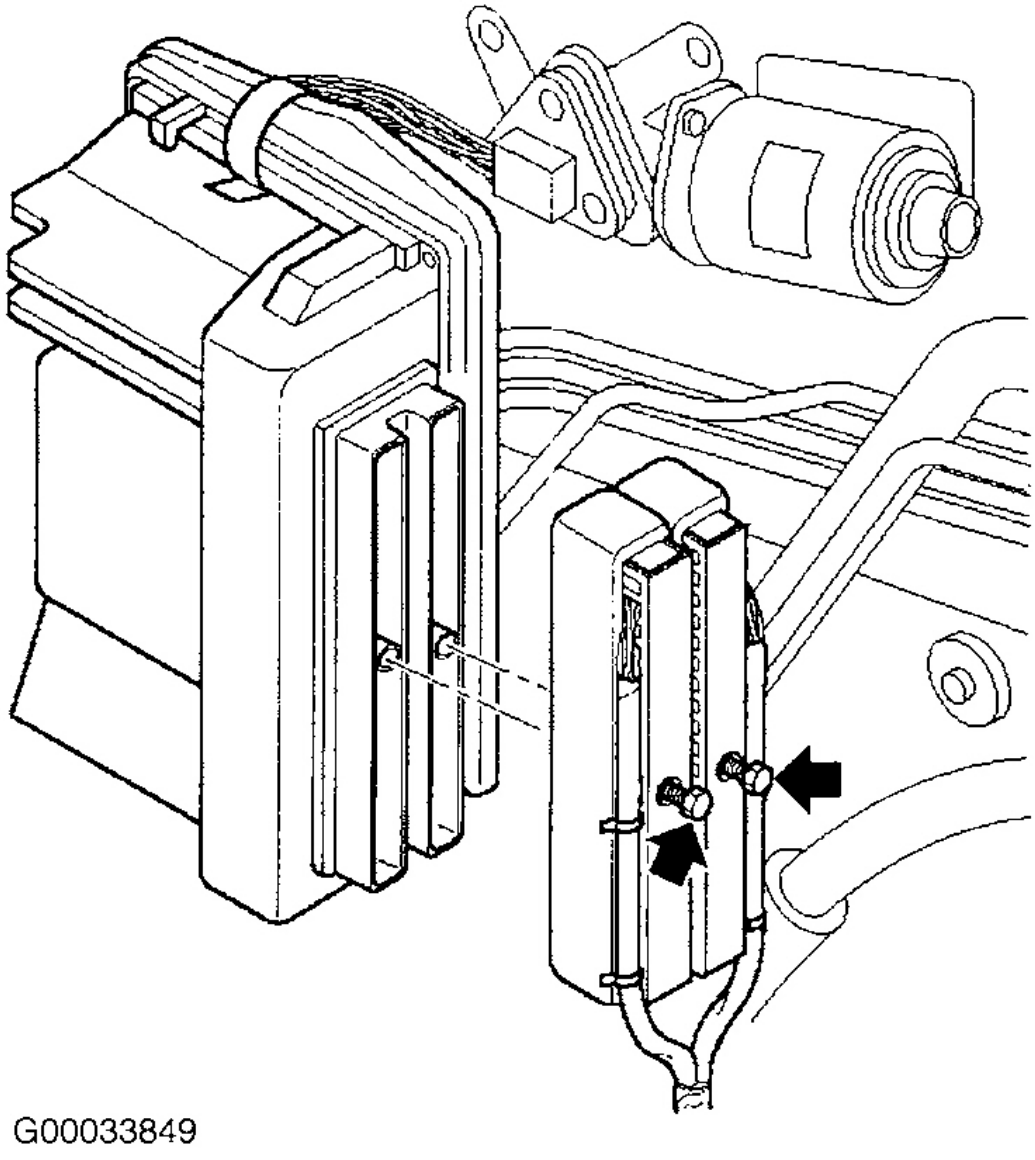

Fig. 5: Removing & Installing Powertrain Control Module (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

CAUTION: To prevent internal damage to PCM, ignition must be in OFF position before disconnecting battery or any harness connectors.

NOTE: **Before replacing any component that scan tool suggests are faulty. Ensure that all wiring connections and harness connectors are okay. Ensure that power and ground circuits are functioning properly. For circuit identification, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.**

NOTE: **To prevent possible electrostatic discharge damage to PCM, DO NOT touch PCM connector pins or soldered components on circuit board. DO NOT open replacement part package until part is ready to be installed. Before removing part from packaging, ground package to a known good ground on vehicle. If part has been handled while sitting in car, or while walking around, touch a known good ground before installing part.**

Service of PCM normally consists of replacement of or programming of EEPROM. If PCM is to be replaced, ensure that replacement part is correct one for application. New PCM EEPROM must be programmed. To program EEPROM, go to **EEPROM PROGRAMMING PROCEDURE** under PROGRAMMING. To replace PCM perform following steps:

1. Disconnect negative battery cable.
2. Block the wheels.
3. Remove ashtray liner.
4. Remove screw from behind ashtray. See **Fig. 6** .
5. Remove center console face trim panel.
6. Remove 2 screw from inside of center console storage box, and pull up on rear of center console.
7. Remove shift knob.
8. Remove 4 screws from front of center console, and left center console up and out of way.
9. Disconnect 3 PCM 32-pin harness connectors. See **Fig. 7** .
10. Remove 2 nuts from front, and 2 nuts from rear of PCM and pull PCM away from dash.
11. To install, reverse removal procedure. Program PCM. See **EEPROM PROGRAMMING PROCEDURE** under PROGRAMMING.

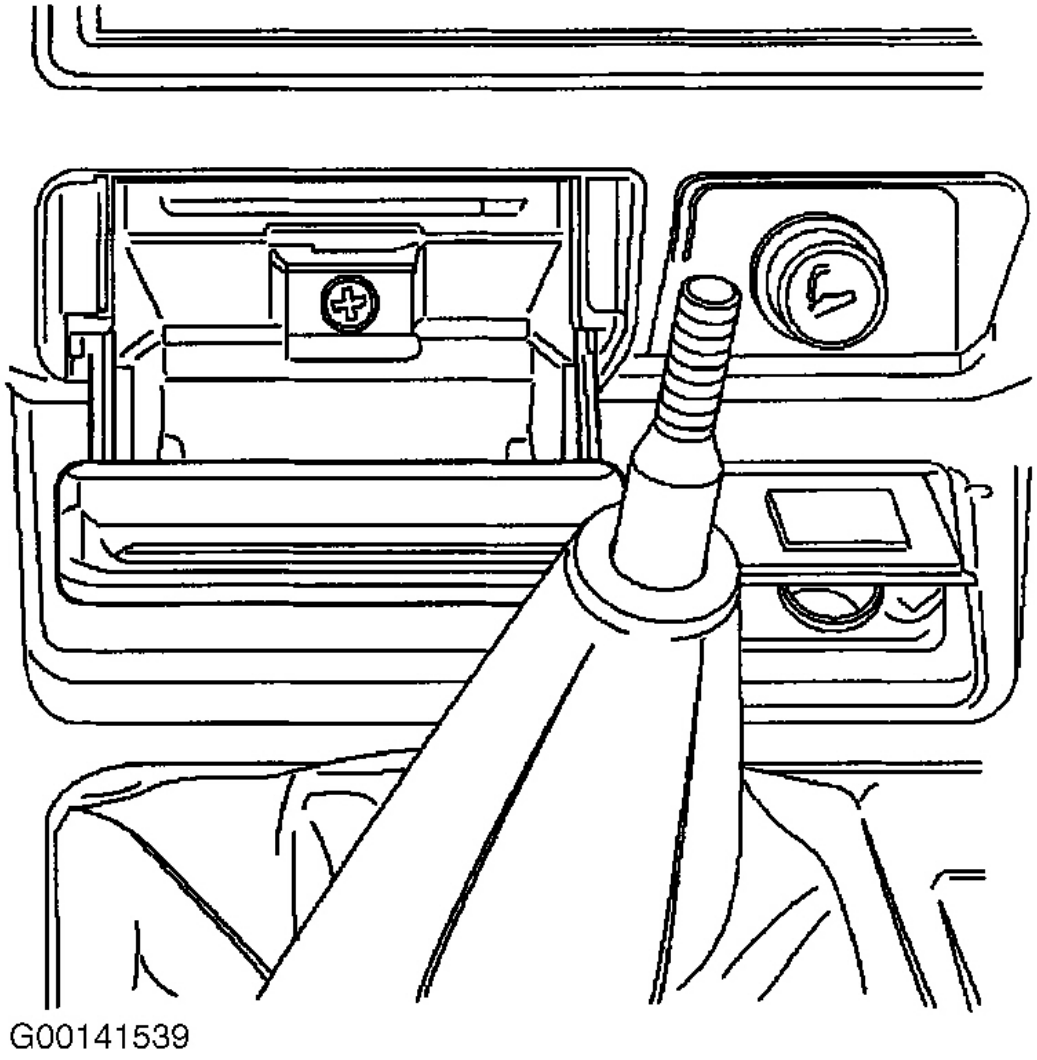

Fig. 6: Removing Center Console Trim (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

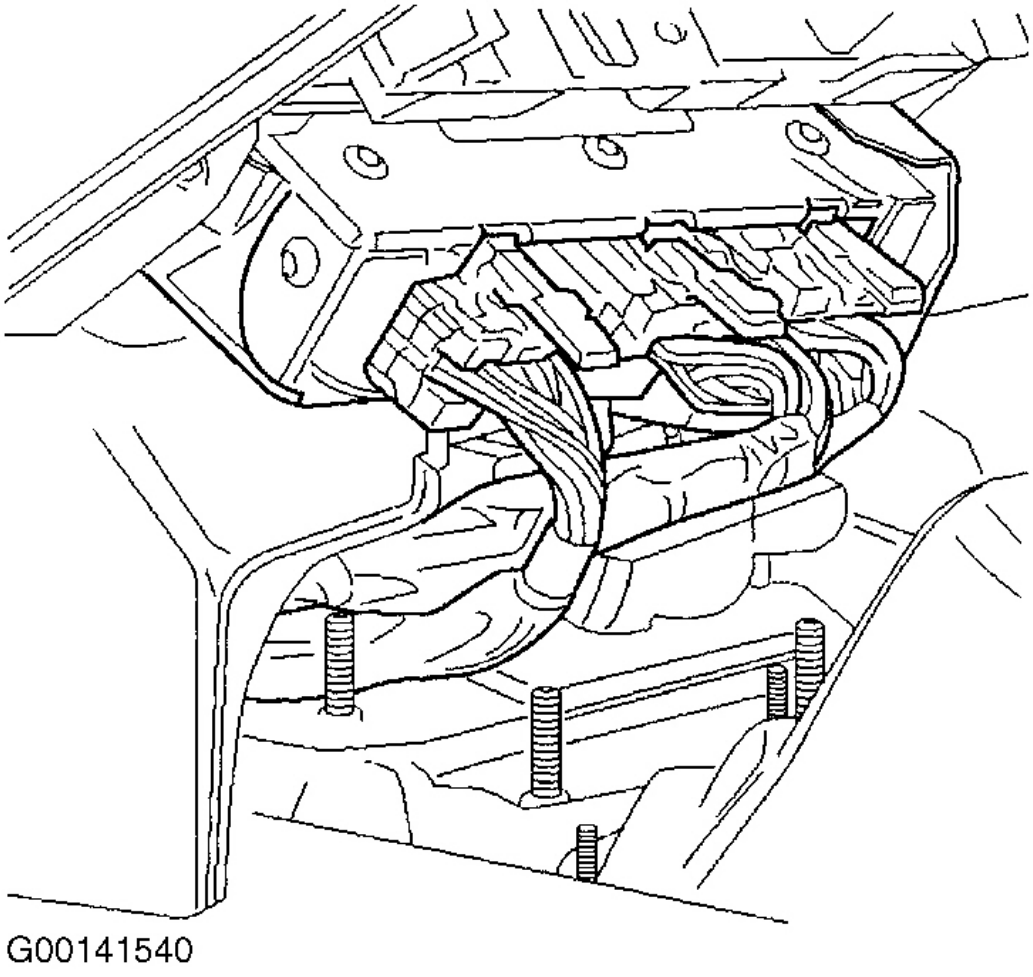

Fig. 7: Locating Powertrain Control Module (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

THROTTLE ACTUATOR CONTROL MODULE (ASCENDER 5.3L)

NOTE: Numbers in parentheses refer to numbers in illustrations.

Removal

1. Remove bulk connector from bracket, insert a small flat-bladed tool to disengage the clip.
2. Disconnect Instrument Panel (I/P) electrical connector. See **Fig. 8** .
3. Disconnect engine electrical connector. See **Fig. 9** .
4. Release the retaining tab on the side of the Throttle Actuator Control (TAC) module (3). See **Fig. 10** .

5. Remove the TAC module (3) from the retaining bracket (1).
6. If necessary, remove the TAC module bracket nuts (2) and bracket (1).

Installation

1. If necessary, install the TAC module bracket (1) and nuts (2). Tighten the nuts to specification. See **TORQUE SPECIFICATIONS** . See **Fig. 10** .
2. Install TAC module (3) to retaining bracket (1).
3. Snap TAC module (3) into retaining tab.
4. Connect engine electrical connector. See **Fig. 9** .
5. Connect I/P electrical connector. See **Fig. 8** .
6. Install bulk connector to bracket.

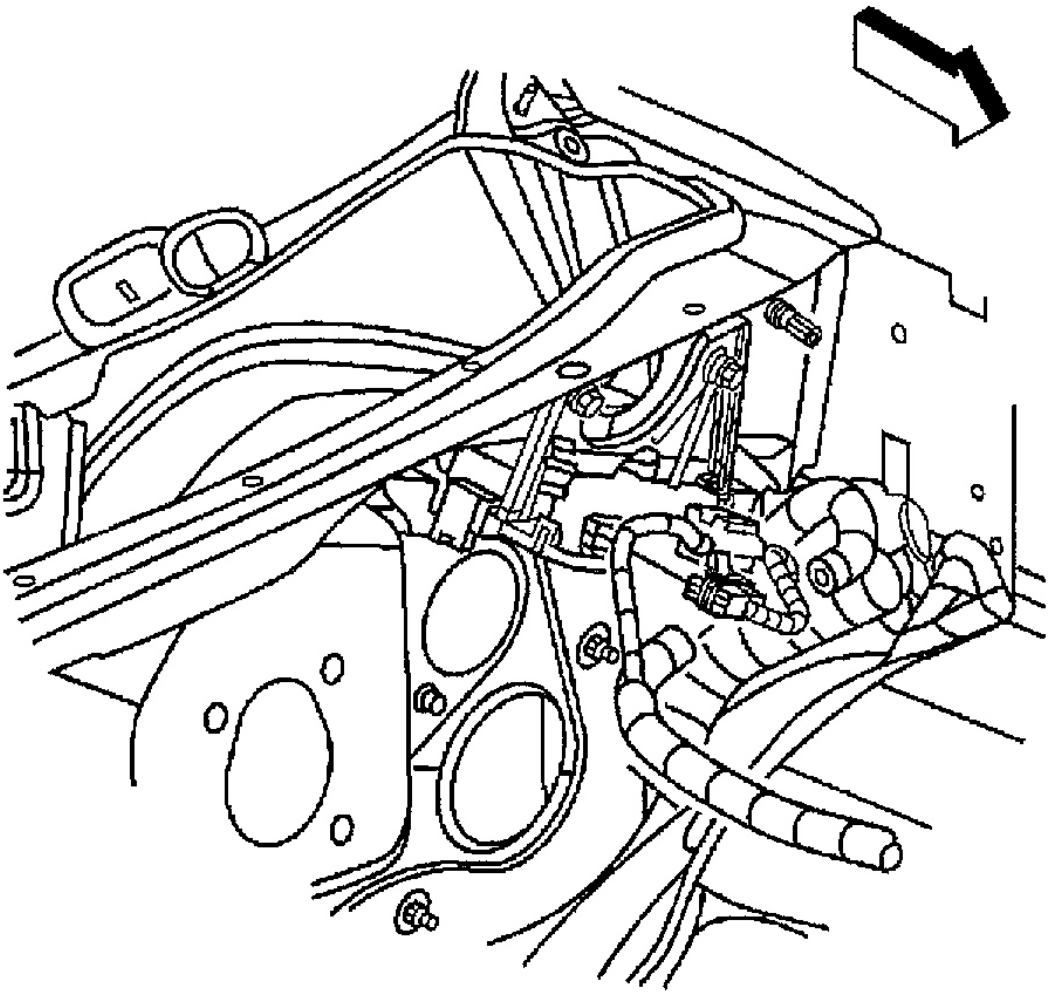

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Fig. 8: Locating Instrument Panel Electrical Connector (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

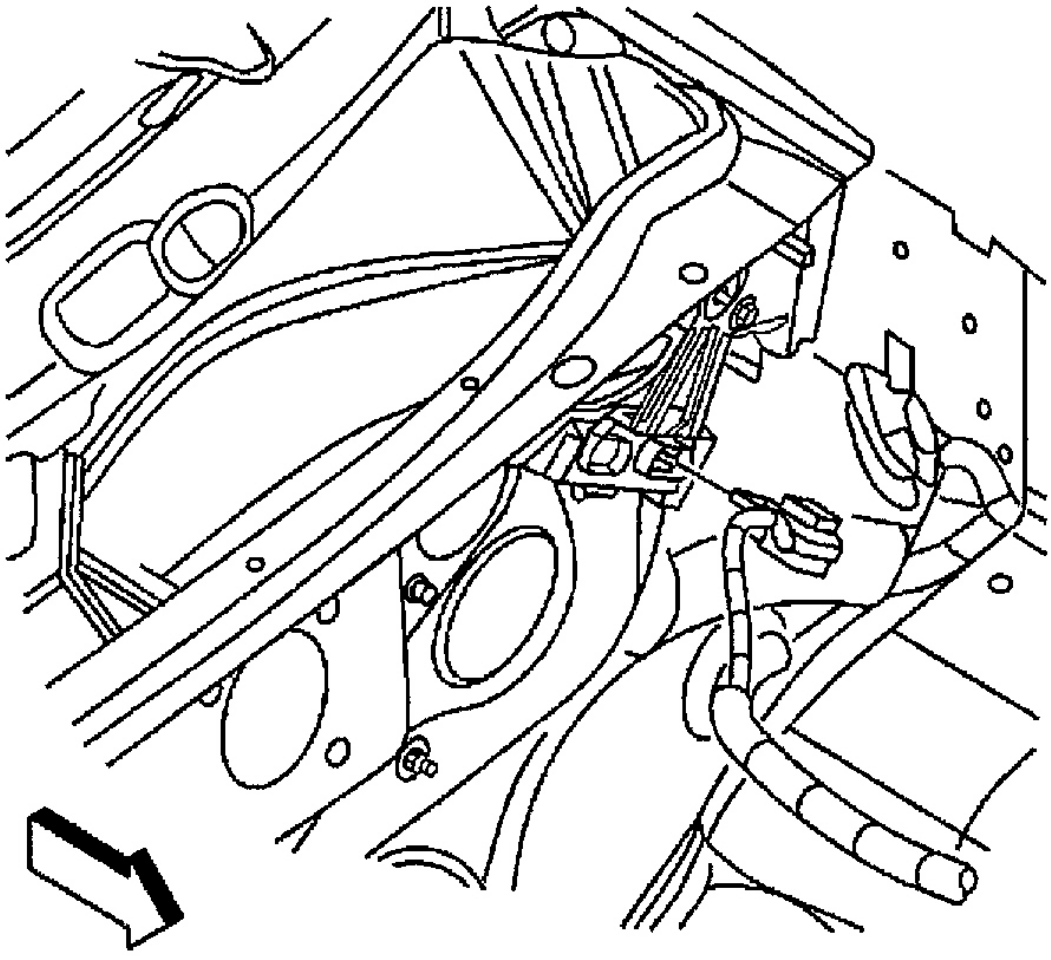

Fig. 9: Connecting & Disconnecting Electrical Connector At Throttle Actuator Control Module (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

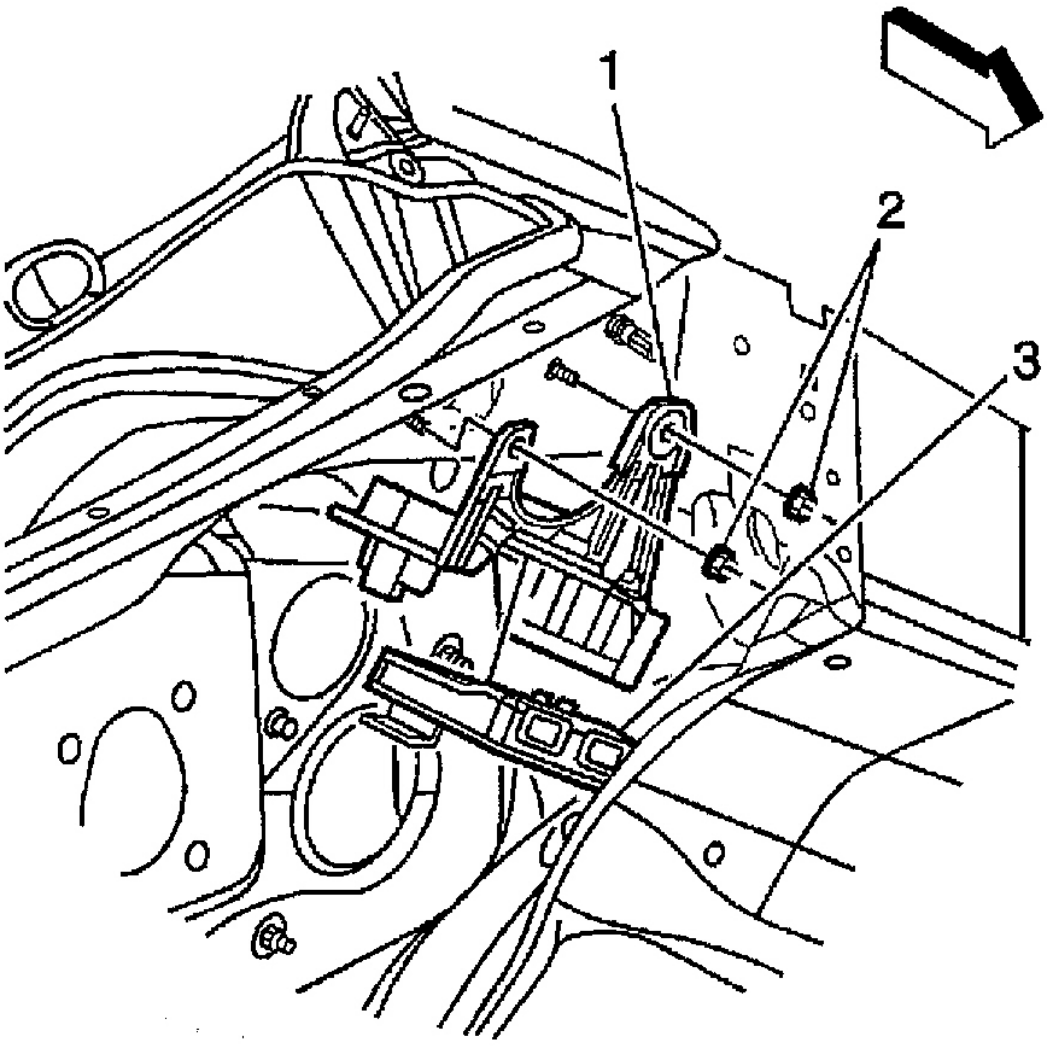

Fig. 10: Removing & Installing Throttle Actuator Control Module (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

PROGRAMMING

CKP SYSTEM VARIATION LEARN PROCEDURE

Ascender 4.2L

1. Install scan tool.
2. Using scan tool, monitor the PCM for DTCs. If other DTCs are set, except DTC P1336, see

DIAGNOSTIC TROUBLE CODE DEFINITIONS in SELF-DIAGNOSTICS - ASCENDER 4.2L article.

3. With scan tool, select the crankshaft position variation learn procedure.
4. Observe the fuel cut-off for the engine that you are performing the learn procedure on.
5. The scan tool instructs you to perform the following:
   - Block drive wheels.
   - Apply parking brake.
   - Cycle ignition from OFF to ON.
   - Apply and hold brake pedal.
   - Start and idle engine.
   - Turn OFF the A/C.
   - Place transmission in Park (A/T) or Neutral (M/T).
   - 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:
     A. Crankshaft Position (CKP) sensor activity. If there is a CKP sensor condition, refer to the applicable DTC that set. See **DIAGNOSTIC TROUBLE CODE DEFINITIONS** in SELF-DIAGNOSTICS - ASCENDER 4.2L article.
     B. Camshaft Position (CMP) sensor activity. If there is a CMP sensor condition, refer to the applicable DTC that set. See **DIAGNOSTIC TROUBLE CODE DEFINITIONS** in SELF-DIAGNOSTICS - ASCENDER 4.2L article.
     C. Engine Coolant Temperature (ECT). If engine coolant temperature is not warm enough, idle the engine until engine coolant temperature reaches correct temperature.
6. With scan tool, enable the crankshaft position system variation learn procedure.

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.

7. Slowly increase the engine speed to the RPM that you observed.
8. Immediately release the throttle when fuel cut-off is reached.
9. The scan tool displays Learn Status: Learned this ignition. If scan tool does NOT display this message and no additional DTCs set, see **DIAGNOSTIC STARTING POINT - ENGINE CONTROLS** under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - ASCENDER 4.2L article. If a DTC set, see **DIAGNOSTIC TROUBLE CODE DEFINITIONS** in SELF-DIAGNOSTICS - ASCENDER 4.2L article.
10. Turn ignition off for 30 seconds after the learn procedure is completed successfully.

Ascender 5.3L

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:

- **CKP sensor replacement.**
- **Engine replacement.**
- **PCM replacement.**
- **Harmonic balancer replacement.**
- **Crankshaft replacement.**
- **Any engine repairs which disturb the CKP sensor relationship.**

For additional diagnostic information, see DTC P0315: CRANKSHAFT POSITION SENSOR VARIATION NOT LEARNED under DIAGNOSTIC TESTS in SELF-DIAGNOSTICS - ASCENDER 5.3L article.

1. Install a scan tool to Data Link Connector (DLC).
2. With a scan tool, monitor the powertrain control module for DTCs. If only DTC P0315 is set, go to next step. If a DTC other than P0315 is set, diagnose that DTC first. See **DIAGNOSTIC TROUBLE CODE DEFINITIONS** in SELF-DIAGNOSTICS - ASCENDER 5.3L article.
3. With a scan tool, select the CRANKSHAFT POSITION VARIATION LEARN PROCEDURE.
4. The scan tool instructs you to perform the following:
   - Set parking brake.
   - Block drive wheels.
   - DO NOT apply brake pedal.
   - Observe fuel cut-off for applicable engine.
   - Accelerate to Wide Open Throttle (WOT).
   - Release throttle when fuel cut-off occurs.
   - Engine should not accelerate beyond calibrated RPM value.
   - Release throttle immediately if value is exceeded.
   - Cycle ignition from OFF to ON.
   - Apply and hold brake pedal.
   - Start and idle engine.
   - 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:
     A. Crankshaft Position (CKP) sensor activity. If there is a CKP sensor condition, refer to the applicable DTC that set. See **DIAGNOSTIC TROUBLE CODE DEFINITIONS** in SELF-DIAGNOSTICS - ASCENDER 5.3L article.
     B. Camshaft Position (CMP) sensor activity. If there is a CMP sensor condition, refer to the

applicable DTC that set. See **DIAGNOSTIC TROUBLE CODE DEFINITIONS** in SELF-DIAGNOSTICS - ASCENDER 5.3L article.

C. 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.

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.

5. With the scan tool, enable the crankshaft position system variation learn procedure.
6. Slowly increase the engine speed to the RPM that you observed.
7. Immediately release the throttle when fuel cut-off is reached.
8. The scan tool displays Learn Status: Learned this ignition. If the scan tool does NOT display this message and no additional DTCs set, see **DIAGNOSTIC SYSTEM CHECK - ENGINE CONTROLS** under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - ASCENDER 5.3L article. If a DTC set, see **DIAGNOSTIC TROUBLE CODE DEFINITIONS** in SELF-DIAGNOSTICS - ASCENDER 5.3L article.
9. Turn OFF the ignition for 30 seconds after the learn procedure is completed successfully.

EEPROM PROGRAMMING PROCEDURE

Axiom, Rodeo & Rodeo Sport

NOTE: Refer to latest Isuzu Technical Communication System (ITCS) information for reprogramming or flashing procedures. Programming PCM/EEPROM requires the use of a scan tool and special manufacturer equipment.

Connect TECH 2 scan tool to DLC and retrieve program information from PCM. Ensure that battery is fully charged. Turn ignition on. Ensure that Vehicle Interface Module cable connection is securely connected to DLC. Follow scan tool instructions to program EEPROM using latest software available from ITCS. If PCM fails to program, recheck PCM connections. Ensure that most recent ITCS information is being used. Attempt to program PCM. If it still can not be programmed properly, replace PCM. Reprogram new PCM, then perform ON-BOARD DIAGNOSTIC II SYSTEM CHECK under SELF-DIAGNOSTIC SYSTEM in appropriate SELF-DIAGNOSTICS article. Start engine and run for one minute. Use scan tool to check for any stored DTCs.

ENGINE OIL LIFE RESET

Ascender 4.2L

1. Turn ignition on, with engine off.
2. Fully push and release accelerator pedal slowly 3 times within 5 seconds.
3. If the CHANGE ENG OIL light flashes for 5 seconds, the system is reset. If light does not flash, repeat the procedure.

Ascender 5.3L

1. Turn the ignition key to the RUN position.
2. To reset the Oil Life System, use the FUEL button to reach the ENGINE OIL LIFE screen. Press and hold the SELECT button for five seconds while ENGINE OIL LIFE is displayed. OIL LIFE RESET will appear on the display for 10 seconds to let you know the system is reset.

POWERTRAIN CONTROL MODULE (ASCENDER)

NOTE: Programing Powertrain Control Module requires a compatible scan tool and a Techline(R) terminal. Procedure uses a Tech 2(tm) scanner.

Remote Programming

NOTE: DO NOT program a control module unless you are directed by a service procedure or you are directed by a technical service bulletin. Programming a control module at any other time will not permanently correct a customer's concern.

NOTE: Ensure control module is installed in vehicle and battery is fully charged before programming.

1. Connect Tech 2(tm) scan tool to vehicle and obtain the module information using the following procedures:
   A. Ensure engine and Tech 2(tm) is off. Connect Tech 2(tm) to Data Link Connector (DLC).
   B. Turn ON the Tech 2(tm).
   C. Press ENTER at the title screen.
   D. Turn ignition on, with engine off.
   E. Select SERVICE PROGRAMMING SYSTEM at the MAIN MENU.

      NOTE: Select REQUEST INFO again if a Vehicle Identification Number (VIN) was previously stored in scan tool.

   F. Select REQUEST INFO.
   G. Enter vehicle description by following the on-screen instructions.
   H. Turn OFF all accessories and select CONTINUE.

      NOTE: Select NO and write down the VIN if the VIN is incorrect.

   I. Verify that the correct VIN is entered on the Tech 2(tm) and select YES.
2. Turn off the Tech 2(tm) scan tool.
3. Disconnect Tech 2(tm) from vehicle.

4. Turn ignition off.
5. Transfer the data from the terminal to the Tech 2(tm) using the following procedure:
   A. Connect the Tech 2(tm) to the terminal.

      NOTE: The TIS supports service programming with the Tech 2(tm) scan tool only.

   B. Launch the TIS application at the terminal.
   C. Select the SERVICE PROGRAMMING SYSTEM at the main screen.
   D. Highlight the following information on the Select Diagnostic Tool and Programming Process Screen:
      - Select DIAGNOSTIC TOOL. Select Tech 2(tm).
      - Select PROGRAMMING PROCESS. Identify whether an existing module is being reprogrammed or a module is being replaced with a new one.
      - Select ECU LOCATION. Select vehicle.
   E. Select NEXT.
   F. Verify the connections and select NEXT.

      NOTE: You may receive a message stating that the control module could be a service control module if you selected NO to the VIN being correct. Click OK.

   G. Verify the VIN and select NEXT.
   H. Select the appropriate controller for the vehicle being serviced.

      NOTE: When selecting the Vehicle Configuration Index (VCI) programming type, a valid VCI number for the vehicle must be entered. This number may be obtained from the Techline Customer Support.

   I. Select the type of programming to be performed from the following categories:
      - NORMAL - Used for updating an existing calibration or programming a new controller.
      - VEHICLE CONFIGURATION INDEX (VCI) - Used for updating an existing controller or programming a new controller for newer vehicles whose VINs are not yet in the database.
      - RECONFIGURE - Used to reconfigure a vehicle for changes in tire size and axle ratios.
   J. Select NEXT.

      NOTE: Refer to service bulletins before service programming is performed if the bulletins are listed along with the calibration files.

   K. Select the appropriate calibration file for the vehicle being serviced.

NOTE: Select CANCEL if you receive a message stating that the calibration selected is already the current calibration in the control module and reprogramming with the same download is not allowed.

L. Select NEXT.
M. Verify your selection on the Summary screen.
N. Select NEXT.

6. Perform the CRANKSHAFT POSITION VARIATION RELEARN PROCEDURE using the SPECIAL FUNCTIONS feature, if applicable.
7. Close the application and return to the TIS APPLICATION SELECTION screen after the download is complete.
8. Turn OFF the Tech 2(tm).
9. Disconnect Tech 2(tm) from the terminal.
10. Transfer the data from the Tech 2(tm) to the control module using the following procedure:
    A. Connect the Tech 2(tm) to DLC, with engine and Tech 2(tm) OFF.
    B. Turn ON the Tech 2(tm).
    C. Press ENTER at the title screen.
    D. Turn ignition on, with engine off.
    E. Select SERVICE PROGRAMMING SYSTEM.
    F. Select the PROGRAM ECU function on the Tech 2(tm).
    G. Verify the VIN and calibration numbers, select CONTINUE.
    H. Follow the on-screen instructions and select CONTINUE.
    I. Select CONTINUE and exit the program after the Tech 2(tm) displays PROGRAMMING WAS SUCCESSFUL.
11. Turn ignition off.
12. Turn OFF the Tech 2(tm).

NOTE: Some vehicles will require that Idle Learn, TP Learn, Theft Deterrent Relearn or Crankshaft Variation Learn procedures be performed after programming.

13. Disconnect the Tech 2(tm) from the vehicle.
14. Turn ignition off for 30 seconds.
15. Start engine. Repeat the SERVICE PROGRAMMING SYSTEM procedure if vehicle does not start or starts but runs rough.

Pass-Thru Procedure

Pass-Thru programming allows scan tool to remain connected to the terminal and to the vehicle throughout the programming process. The vehicle must be in close proximity to the terminal while using Pass-Thru procedure.

NOTE: The TIS supports service programming with the Tech 2(tm) scan tool only.

1. Launch the TIS application at the terminal.
2. Select the SERVICE PROGRAMMING SYSTEM.
3. Highlight the following information on the Select Diagnostic Tool Programming Process screen:
   - Select DIAGNOSTIC TOOL. Select PASS-THRU.
   - Select PROGRAMMING PROCESS. Identify whether an existing module is being reprogrammed or a module is being replaced with a new one.
   - Select ECU LOCATION. Select vehicle.
4. Select NEXT.
5. Complete all terminal-directed data on the Preparing for Communication/Determine Vehicle screen until NEXT is highlighted.

   NOTE: In order to reduce the potential for signal loss, the RS-232 cable should not be more than 25 feet long.

6. Select NEXT.
7. Follow the instructions on the Preparing for Communication screen.
8. Select NEXT.

   NOTE: The correct Vehicle Identification Number (VIN) must be entered if the VIN does not appear correctly.

9. Verify the VIN on the Validate Vehicle Identification Number screen.
10. Select NEXT.

    NOTE: When selecting the Vehicle Configuration Index (VCI) programming type, a valid VCI number for the vehicle must be entered. This number may be obtained from the Techline Customer Support. The correct tire size and axle ratio must be highlighted and a valid VCI number entered if you select RECONFIGURE for your programming type.

11. If an option screen appears, verify the vehicle configuration and/or RPO information.
12. Select NEXT.
13. Highlight the appropriate control module and programming type on the SUPPORTED CONTROLLERS screen.
14. Select NEXT.

    NOTE: Select CANCEL if you receive a message stating that the calibration selected is already the current calibration in the control module and reprogramming with the same download is not allowed.

15. Select the proper calibrations on the CALIBRATION SELECTION screen.
16. Ensure all the folder tabs have a green check mark.
17. Select NEXT.
18. Verify the current calibrations with the selected calibrations.
19. Select NEXT.
20. The TRANSFER DATA screen will appear until the progress bar reaches 100 percent. This may take up to 30 minutes.

NOTE: Some vehicles will require that Idle Learn, Theft Deterrent Relearn, or Crankshaft Variation Learn procedures be performed after programming.

21. Complete all of the terminal-directed data on the PROGRAMMING COMPLETE screen.
22. Turn OFF the Tech 2(tm).
23. Disconnect the Tech 2(tm) from the vehicle.

Off-Board Remote Procedure

The Off-Board Programming Adapter Kit (J-41207-C) is required when a module must be programmed without having the vehicle present. The adapter allows the module to be turned ON and communicate with scan tool.

NOTE: Ensure Tech 2(tm) scan tool and terminal are both equipped with the latest software before performing programming.

1. Obtain the Vehicle Identification Number (VIN) of the vehicle for which the module is being programmed.

NOTE: The TIS supports service programming with the Tech 2(tm) scan tool only.

2. Launch the TIS application at the terminal.
3. Select the SERVICE PROGRAMMING SYSTEM.
4. Highlight the following information on the Select Diagnostic Tool and Programming Process screen:
   - Select DIAGNOSTIC TOOL. Select Tech 2(tm) scan tool.
   - Select PROGRAMMING PROCESS. Identify whether an existing module is being reprogrammed or replaced with a new one.
   - Select ECU LOCATION. Select OFF-BOARD PROGRAMMING ADAPTER.
5. Select NEXT.

NOTE: Ensure the correct connector for the control module is used.

6. Follow the directions on the Preparing for Communication screen for connecting the following components:
   - The control module.

- The Off-Board Programming Adapter (OBPA). Refer to TIS Users Guide for a listing of the OBPA.
- Tech 2(tm) scan tool.

7. Select the SERVICE PROGRAMMING REQUEST INFORMATION function on the Tech 2(tm).
8. Follow the Tech 2 instructions to obtain the module data and security information.
9. After the Tech 2(tm) has received the data from the module, exit the Request Info mode.
10. Disconnect the Tech 2(tm) from the OBPA.
11. Turn OFF the Tech 2(tm).
12. Connect the Tech 2(tm) to the terminal.
13. Turn ON the Tech 2(tm).
14. Select NEXT at the terminal after the Tech 2(tm) start-up screen appears.
15. Enter the VIN of the vehicle that will be receiving the control module.
16. Select NEXT.

NOTE: When selecting the Vehicle Configuration Index (VCI) programming type, a valid VCI number for the vehicle must be entered. This number may be obtained from Techline Customer Support.

17. Select the type of programming to be performed from the following categories:
    - NORMAL - Used for updating an existing calibration or programming a new controller.
    - VEHICLE CONFIGURATION INDEX (VCI) - Used for updating an existing controller or programming a new controller for newer vehicles whose VINs are not yet in the database.
    - RECONFIGURE - Used to reconfigure a vehicle for changes in tire size and axle ratios.
18. Select NEXT.
19. Select a calibration on the CALIBRATION SELECTION screen, if necessary.
20. Ensure all the desired folder tabs have a Green check mark.
21. Select NEXT.
22. Verify the current and the selected calibration of the control module on the SUMMARY screen.
23. Select NEXT.

NOTE: Select CANCEL if you receive a message stating that the calibration selected is already the current calibration in the control module and reprogramming with the same download is not allowed.

24. Select OK.
25. On model year 1996 and newer controllers, a Crankshaft Position (CKP) relearn procedure box may appear. Select OK.
26. Follow the on-screen instructions, if any, when the Program Controller/Programming Complete screen appears.
27. Select CLOSE.

28. Turn OFF the Tech 2(tm).
29. Disconnect the Tech 2(tm) from the terminal.
30. Connect the Tech 2(tm) to the OBPA.
31. Turn ON the Tech 2(tm).
32. Select ENTER at the title screen.
33. Select the SERVICE PROGRAMMING SYSTEM at the Main Menu.
34. Select the PROGRAM ECU function.
35. Select CONTINUE.
36. Follow the on-screen instructions.
37. Select CONTINUE.
38. Select EXIT when the programming is complete.
39. Turn OFF the OBPA.
40. Turn OFF the Tech 2(tm).

NOTE: Wait 30 seconds after the OBPA is turned OFF before disconnecting the control module.

41. Disconnect the OBPA from the Tech 2(tm) and the control module.

Off-Board Pass-Thru Procedure

The Off-Board Programming Adapter Kit (J-41207-C) is required when a module must be programmed without having the vehicle present. The adapter allows the module to be turned ON and communicate with scan tool.

NOTE: Ensure Tech 2(tm) scan tool and terminal are both equipped with the latest software before performing programming.

1. Launch the TIS application in the terminal.
2. Select the SERVICE PROGRAMMING SYSTEM.
3. Highlight the following information on the Select Diagnostic Tool and Programming Process Screen:
   - Select DIAGNOSTIC TOOL. Select PASS-THRU.
   - Select PROGRAMMING PROCESS. Identify whether an existing module is being reprogrammed, or a module is being replaced with a new one.
   - Select ECU LOCATION. Select OFF-BOARD PROGRAMMING ADAPTER.
4. Select NEXT.

NOTE: In order to reduce the potential for signal loss, the RS-232 cable should NOT be more than 25 feet long.

5. Complete all terminal-directed data at the Preparing for Communication/Determine Vehicle screen until NEXT is highlighted.

6. Select NEXT.
7. Follow the on-screen instructions for connecting the following components:
   - The control module.
   - The Off-Board Programming Adapter (OBPA). Refer to TIS user's guide for a listing of OBPA.
   - Tech 2(tm).
8. Select NEXT.
9. Pass-Thru displays the VIN stored in the control module. If a new control module is being programmed, enter the correct VIN of the vehicle.
10. Select NEXT.
11. Select the appropriate options if the OPTIONS screen appears.
12. Select NEXT.

NOTE: When selecting Vehicle Configuration Index (VCI) programming type, a valid VCI number for the vehicle must be entered. This number may be obtained from Techline(R) Customer Support.

13. Select the type of programming to be performed from the following categories:
    - NORMAL - Used for updating an existing calibration or programming a new controller.
    - VEHICLE CONFIGURATION INDEX (VCI) - Used for updating an existing controller or programming a new controller for newer vehicles whose VINs are not yet in the database.
    - RECONFIGURE - Used to reconfigure a vehicle for changes in tire size and axle ratios.
14. Select NEXT.
15. Select a calibration selection on the CALIBRATION SELECTION screen, if necessary.
16. Ensure all the desired calibration folder tabs have a Green check mark.
17. Select NEXT.
18. Verify the current and selected calibration of the control module on the Summary screen.
19. Select NEXT.

NOTE: Select CANCEL if you receive a message stating that the calibration selected is already the current calibration in the control module and reprogramming with the same download is not allowed.

NOTE: On 1996 and newer controllers, a Crankshaft Position (CKP) sensor relearn procedure box may appear.

20. Select OK.
21. Select OK.
22. When programming is complete, a Program Controller/Programming Complete screen appears. Follow the on-screen instructions, if any.
23. Select CLOSE.

24. Turn OFF the OBPA.
25. Turn OFF scan tool.

NOTE: Wait 30 seconds after the OBPA is shut OFF before disconnecting the control module.

26. Disconnect the OBPA from the Tech 2(tm) and the control module.

THEFT DETERRENT LEARN PROCEDURE (ASCENDER)

There are 2 available methods to perform the programming procedure:

- The 10-minute procedure which requires a Tech 2(tm) and a Techline(R) terminal.
- The 30-minute procedure which does not require the use of any tools.

10-Minute Learn Procedure

NOTE: Tools required are Tech 2(tm) scan tool and Techline(R) terminal with current Service Programming System (SPS) software.

1. Connect the Tech 2(tm) to vehicle.
2. Select REQUEST INFORMATION under SERVICE PROGRAMMING.
3. Disconnect the Tech 2(tm) from vehicle and connect it to a Techline(R) terminal.
4. On the Techline(tm) terminal, select THEFT MODULE RE-LEARN under SERVICE PROGRAMMING.
5. Disconnect the Tech 2(tm) from the Techline(tm) terminal and connect it to the vehicle.
6. Turn ignition on, with engine off.
7. Select VTD RE-LEARN under SERVICE PROGRAMMING
8. Attempt to start engine, then release the key to ON (vehicle will not start).
9. Observe the SECURITY telltale, after approximately 10 minutes the telltale will turn OFF (the vehicle is now ready to relearn the Passlock(tm) Sensor Data Code and/or password on the next ignition switch transition from OFF to CRANK).
10. Turn ignition OFF and wait 5 seconds.
11. Start engine (vehicle has now learned the password).
12. With Tech 2(tm) scan tool, clear any DTCs.

30-Minute Learn Procedure

1. Turn ignition on, with engine off.
2. Attempt to start engine, then release the key to ON (vehicle will not start).
3. Observe the SECURITY telltale, after approximately 10 minutes the telltale will turn OFF.
4. Turn ignition off and wait 5 seconds.

5. Repeat steps 1 -4 two more times for a total of 3 cycles/30 minutes (the vehicle is now ready to relearn the Passlock(tm) Sensor Data Code and/or passwords on the next ignition switch transition from OFF to CRANK).

NOTE: The vehicle learns the Passlock(tm) Sensor Data Code and/or password on the next ignition switch transition from OFF to CRANK. You must turn the ignition OFF before attempting to start engine.

6. Start engine (vehicle has now learned the Passlock(tm) Sensor Data Code and/or password).
7. With scan tool, clear any DTCs if needed (history DTCs will self clear after 100 ignition cycles).

TOOTH ERROR CORRECTION LEARN PROCEDURE (RODEO & RODEO SPORT 2.2L)

CAUTION: Appropriate safety measures should be taken to assure the safest conditions possible for all those people in nearby vicinity of where Tooth Error Correction (TEC) learn procedure is being performed.

NOTE: This procedure is very convenient because it can be done in the service bay.

Vehicle Preparation Requirements & Safety Issues

Ensure that vehicle has sufficient engine oil, automatic transmission fluid, manual transmission gear box oil, power steering fluid, coolant, and brake fluid. Engine noise and exhaust should be considered when deciding the location to perform TEC learn procedure. Proper safety precautions should be taken. Anticipate unusual events such as a manual transmission accidentally being bumped into gear or a foot slipping off a clutch at high engine speed. The vehicle may cause other vehicles to be hit. If transmission is in Park during high engine speeds, transmission park ratchet experiences excessive vibration and may momentarily slip. Vehicle is typically in Neutral and may roll, especially if vehicle is on an incline. When performing TEC learn procedure ensure that transmission will not slip into gear. Following summarizes engine preparation requirements for a TEC learn procedure:

1. Engine has been running 4 minutes or more, is required to have occurred at lest once during life of vehicle to insure that all oil passages are flushed of debris from machining, casting, and assembly.
2. At least 5 seconds of engine run time is required during same key cycle as TEC learn procedure to fill oil passages and provide proper lubrication. 10 seconds or more is preferred.
3. Engine coolant temperature is 148°F (65°C) or more. Engine oil temperature of 100°F (38°C) or more is required for lubrication. This is a recommendation to insure a sufficiently lubricated engine.
4. Vehicle must be in Park or Neutral. For a manual transmission vehicle, clutch does not need to be depressed. TEC learn procedure may be performed with either:
    - Transmission in Neutral, it does not matter if the clutch is depressed or not.
    - Transmission in gear and clutch depressed.

NOTE: The first option is the recommended option due to safety concerns. The second option has the risk of the operators foot slipping off of the clutch

with the vehicle being revved up and in gear

5. A/C should always be turned OFF before performing TEC learn procedure.
6. A Class II command from the scan tool is required to invoke TEC learn procedure.
7. No Camshaft and/or Crankshaft Sensor DTCs are set.

Tooth Error Learn Procedure

Following steps are required to learn the tooth error once above vehicle preparation requirements are met:

1. Ensure that TEC learn procedure has been invoked on scan tool, otherwise when throttle is pressed, engine RPM would go to high RPM fuel cutoff and not be cutoff at the lower TEC learning fuel cutoff limit.
2. Depress brake pedal for safety reasons.
3. Press throttle pedal to wide open throttle and keep the at 100% for duration of TEC learning process until TEC is learned or number of attempts to learn has been exceeded. RPM will be limited to the upper TEC RPM limit until one of the two above conditions are met and throttle is released to idle position. After this, the RPM limit will be normal redline RPM limit. TEC learning diagnostic will learn tooth error as engine decelerates in fuel cutoff. During TES learning procedure. TEC specific information on scan tool will indicate that TEC was properly learned and completed.

AIR INDUCTION SYSTEMS

AIR CLEANER ASSEMBLY

NOTE: Numbers in parentheses refer to numbers in illustrations.

Removal (Ascender 4.2L)

1. Remove radiator support cover.
2. Loosen 3 air cleaner cover/resonator retaining screws (2) and remove air cleaner cover/resonator. See **Fig. 11** .
3. Remove air cleaner element and move air duct out of the way.
4. Remove 2 retaining nuts (1) from mounting studs (3). See **Fig. 12** .
5. Disconnect all necessary washer pump electrical connectors.
6. Disconnect washer pump hoses and plug washer pump outlet ports to prevent loss of washer solvent.
7. Lift lower air filter housing/washer solvent tank assembly off of retaining studs (3) and remove assembly.

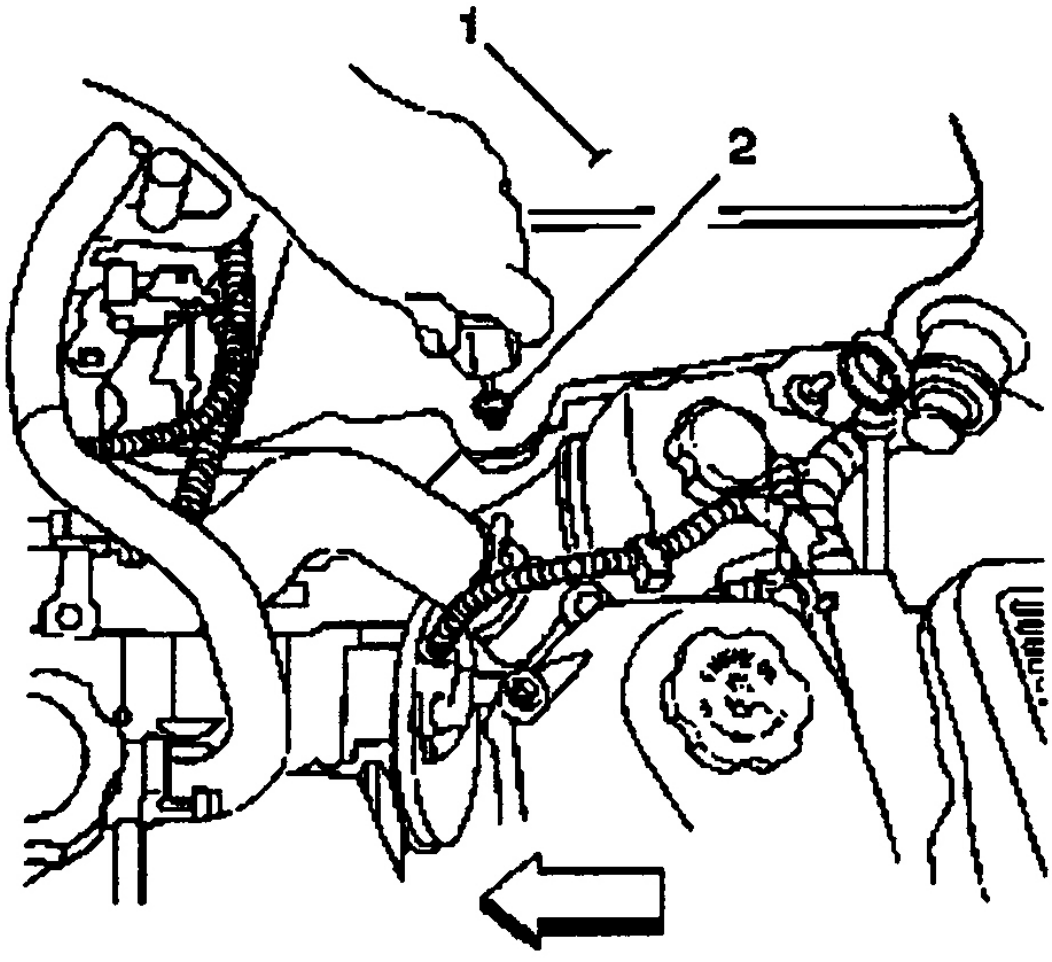

Fig. 11: Locating Air Cleaner/Resonator Retaining Screws (Ascender 4.2L)
Courtesy of ISUZU MOTOR CO.

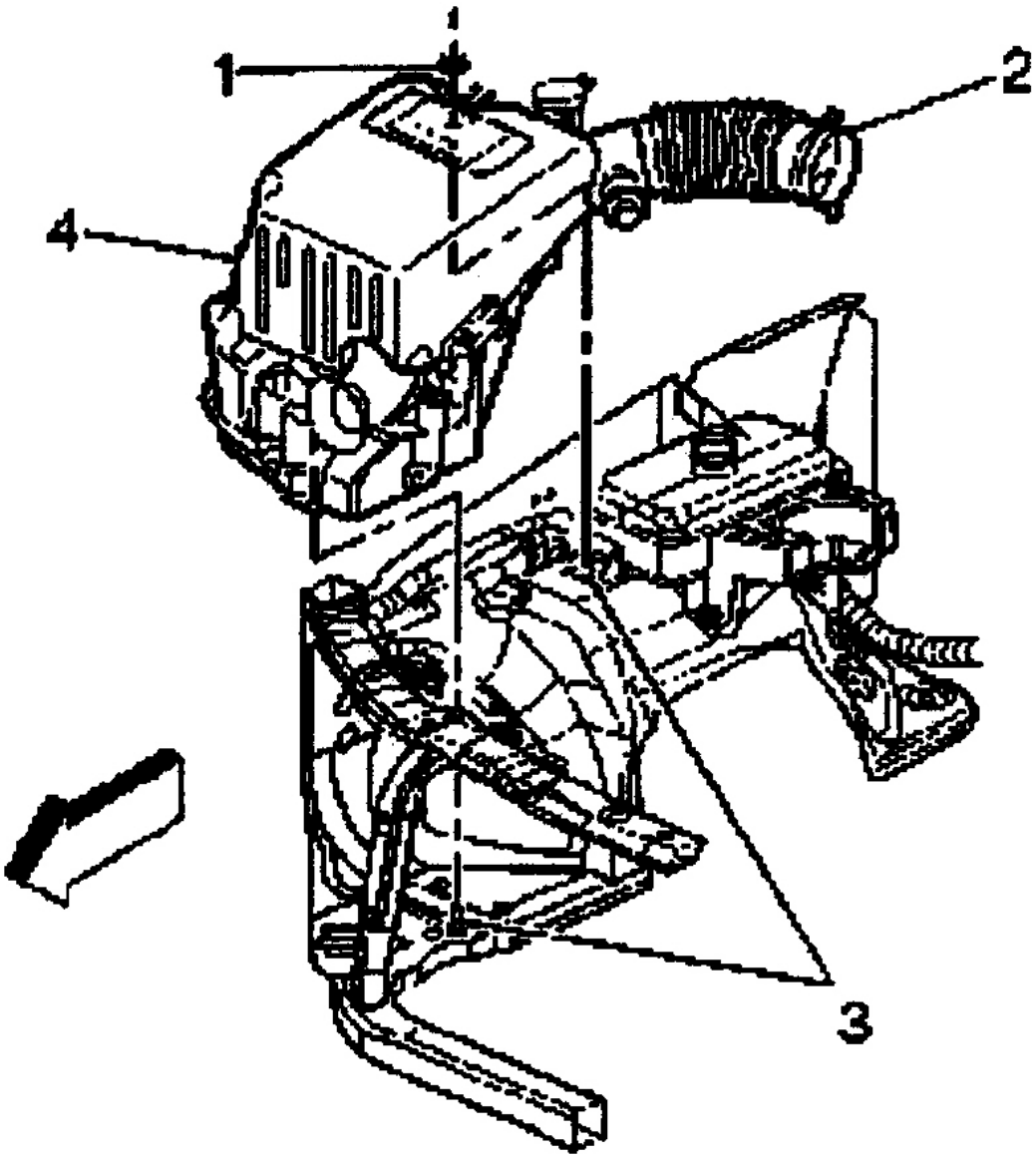

Fig. 12: Removing & Installing Air Filter Housing/Washer Solvent Tank (Ascender 4.2L)
Courtesy of ISUZU MOTOR CO.

Installation

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified

in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install lower air filter housing/washer solvent tank assembly onto the mounting studs. See **Fig. 12** .
2. Connect all washer pump hoses to washer pumps.
3. Connect all washer pump electrical connectors.
4. Install 2 air cleaner housing/washer solvent tank assembly retaining nuts to mounting studs. Tighten the nuts to specification. See **TORQUE SPECIFICATIONS** .
5. Install the air cleaner element and air duct to lower air cleaner housing/washer solvent tank assembly.
6. Install air cleaner cover/resonator assembly (1). Tighten 3 air cleaner cover/resonator retaining screws (2). See **Fig. 11** .
7. Install radiator support cover.

Removal (Ascender 5.3L)

1. Loosen clamps at Mass Air Flow/Intake Air Temperature (MAF/IAT) sensor and throttle body.
2. Remove air cleaner outlet duct bolt.
3. Remove air cleaner outlet duct. See **Fig. 13** .
4. Disconnect MAF/IAT sensor electrical connector. See **Fig. 14** .
5. Remove front end diagonal brace bolts and brace. See **Fig. 15** .
6. If equipped, disconnect headlamp washer pump hose. See **Fig. 16** .
7. Disconnect windshield washer pump and low fluid level electrical connectors. If equipped, disconnect headlamp washer and lift gate washer pump electrical connectors.
8. Remove the washer solvent level sensor wire harness from the wire harness retaining clips (3, 5). See **Fig. 17** .
9. Remove air cleaner assembly nuts.
10. Remove air cleaner assembly. See **Fig. 18** .
11. Loosen clamp securing MAF/IAT sensor to air cleaner assembly, if necessary.
12. Remove MAF/IAT sensor, if necessary.

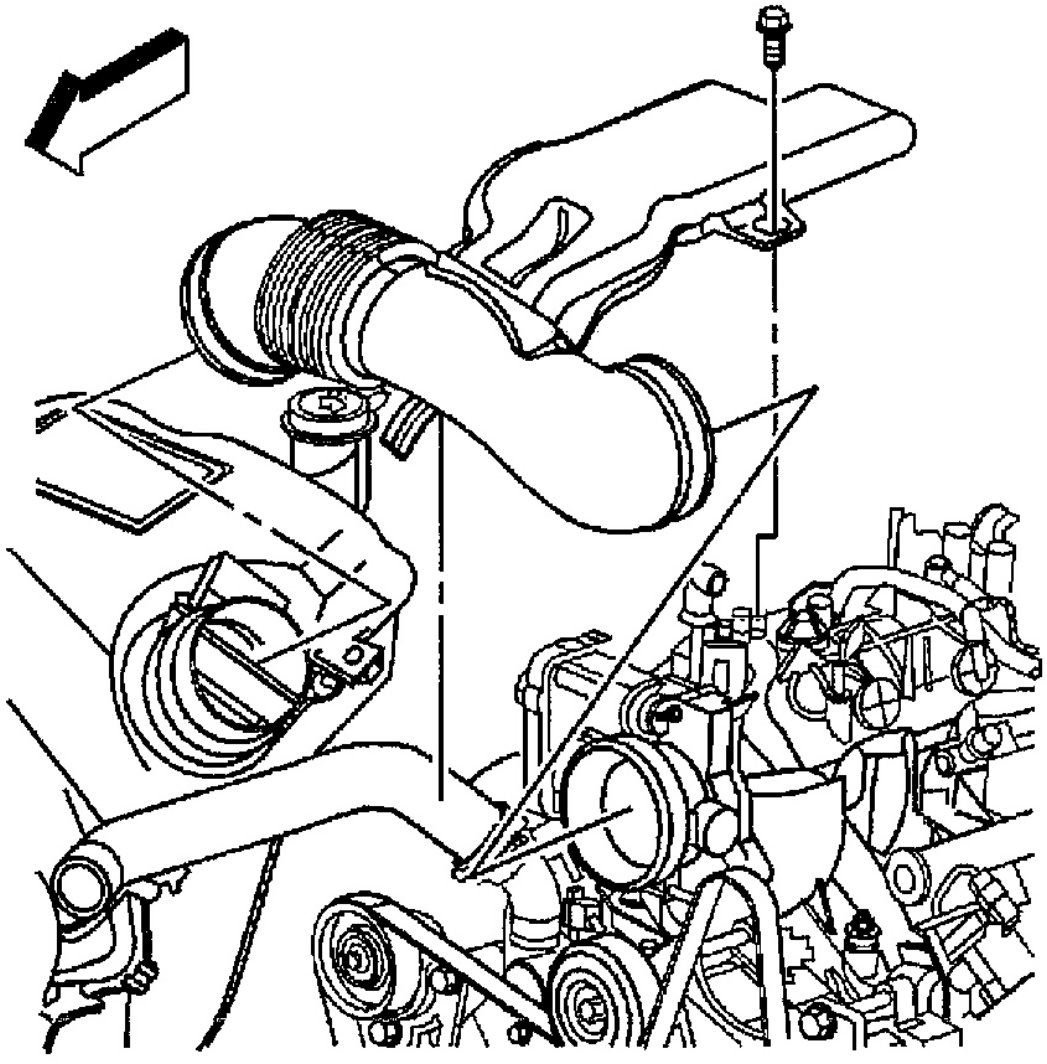

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Fig. 13: Removing & Installing Air Cleaner Resonator Outlet Duct (Ascender 5.3L)
Courtesy of DAIMLERCHRYSLER CORP.

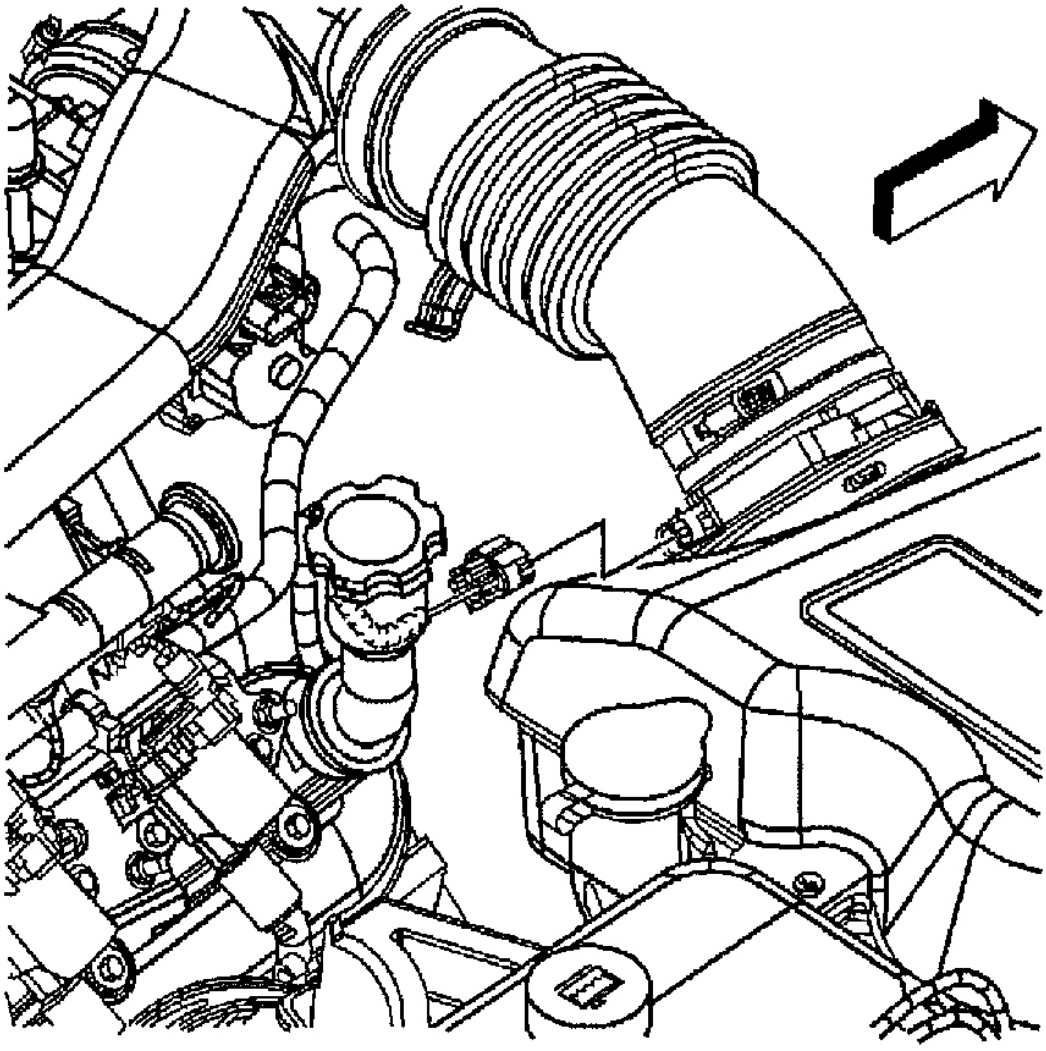

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Fig. 14: Locating Mass Air Flow/Intake Air Temperature Sensor (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

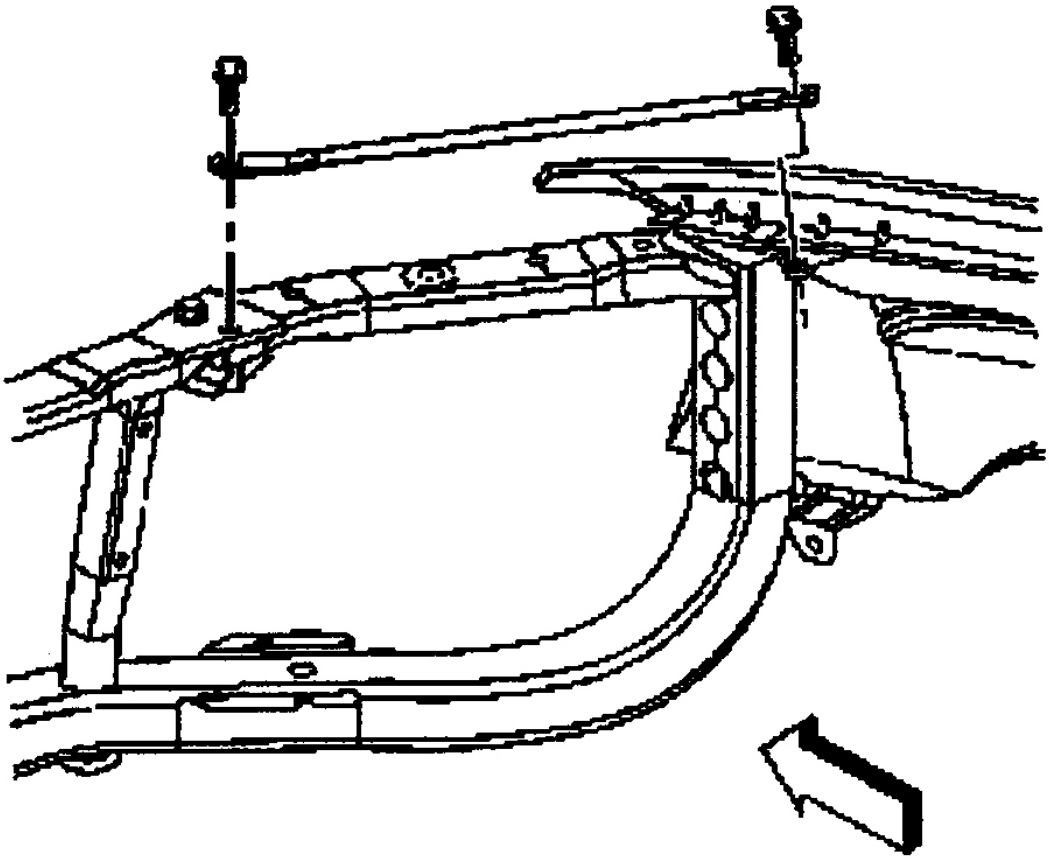

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Fig. 15: Locating Diagonal Brace (Ascender 5.3L)
Courtesy of ISUZU MOTOR CO.

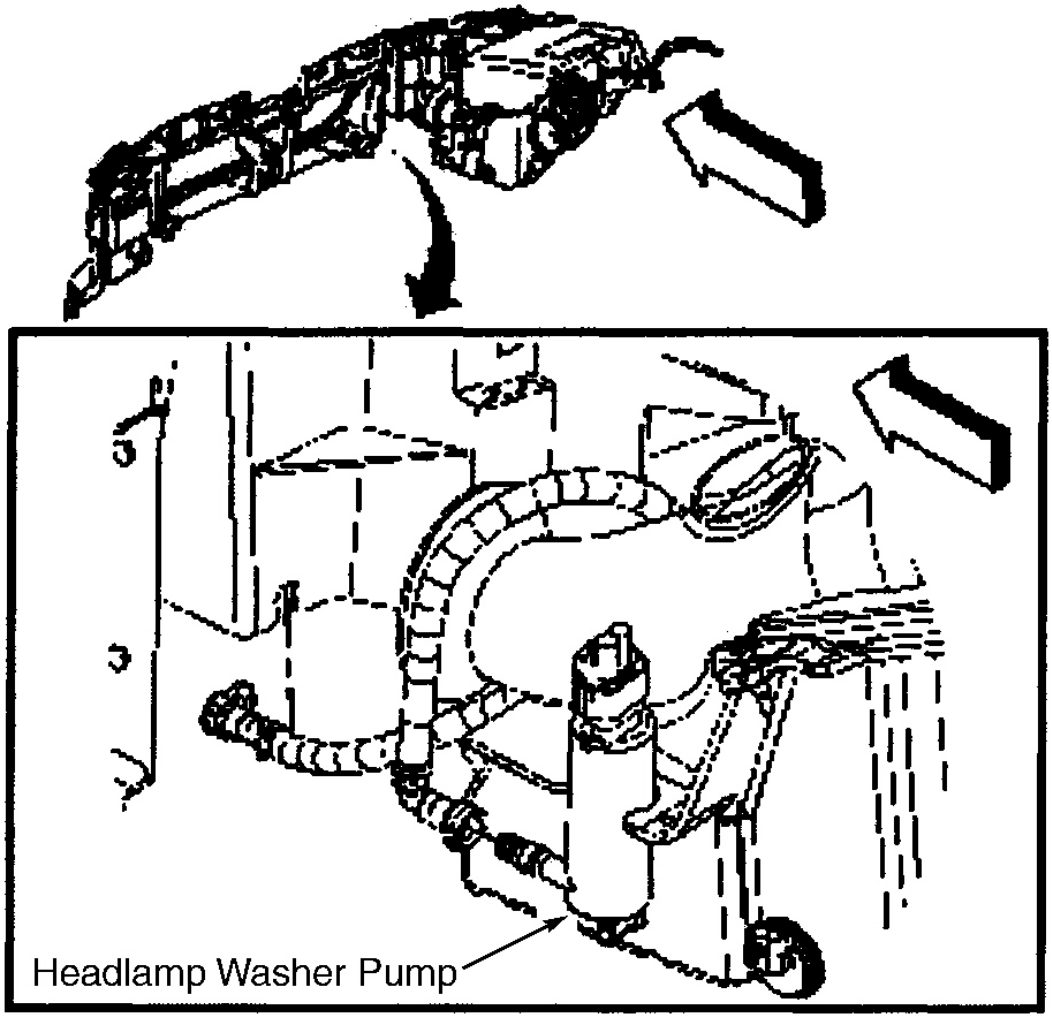

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Fig. 16: Locating Headlamp Washer Pump Hose (Ascender 5.3L)
Courtesy of ISUZU MOTOR CO.

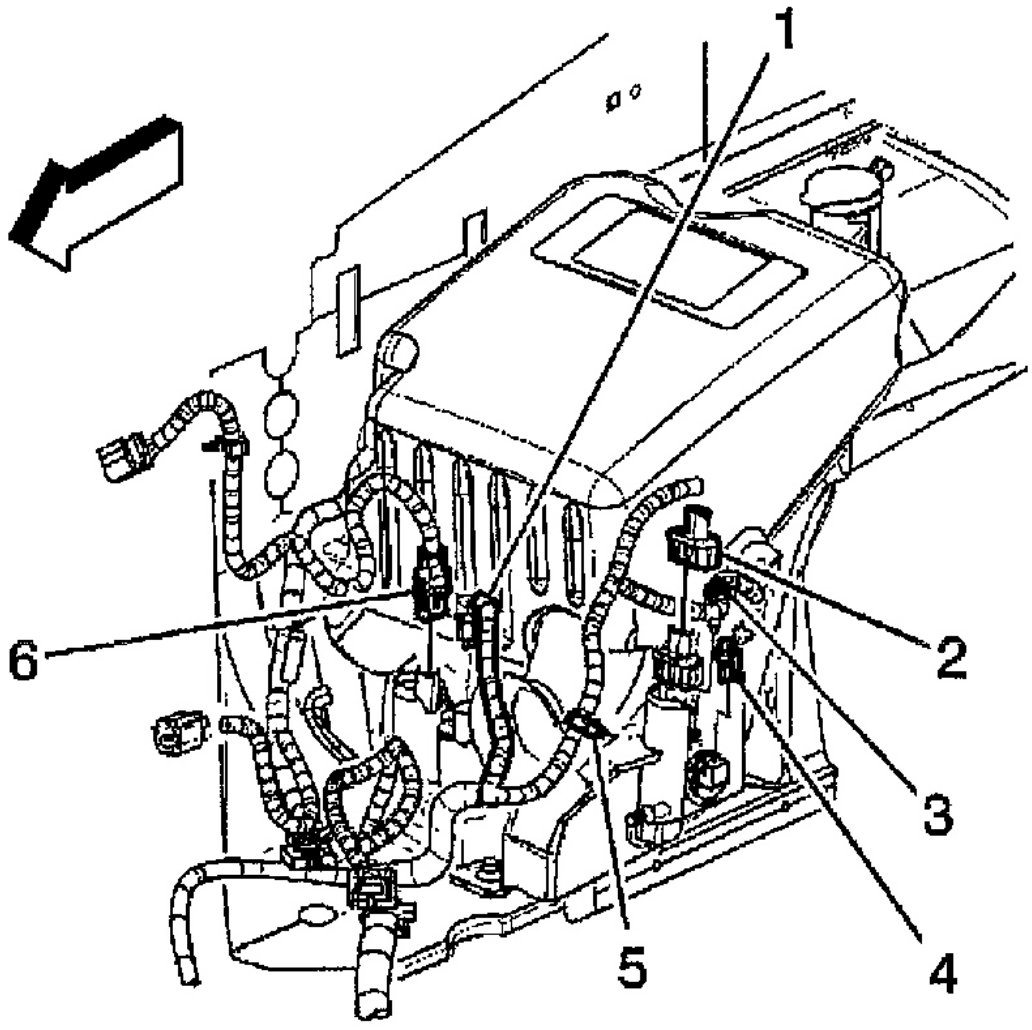

Fig. 17: Locating Air Cleaner Assembly Connectors (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

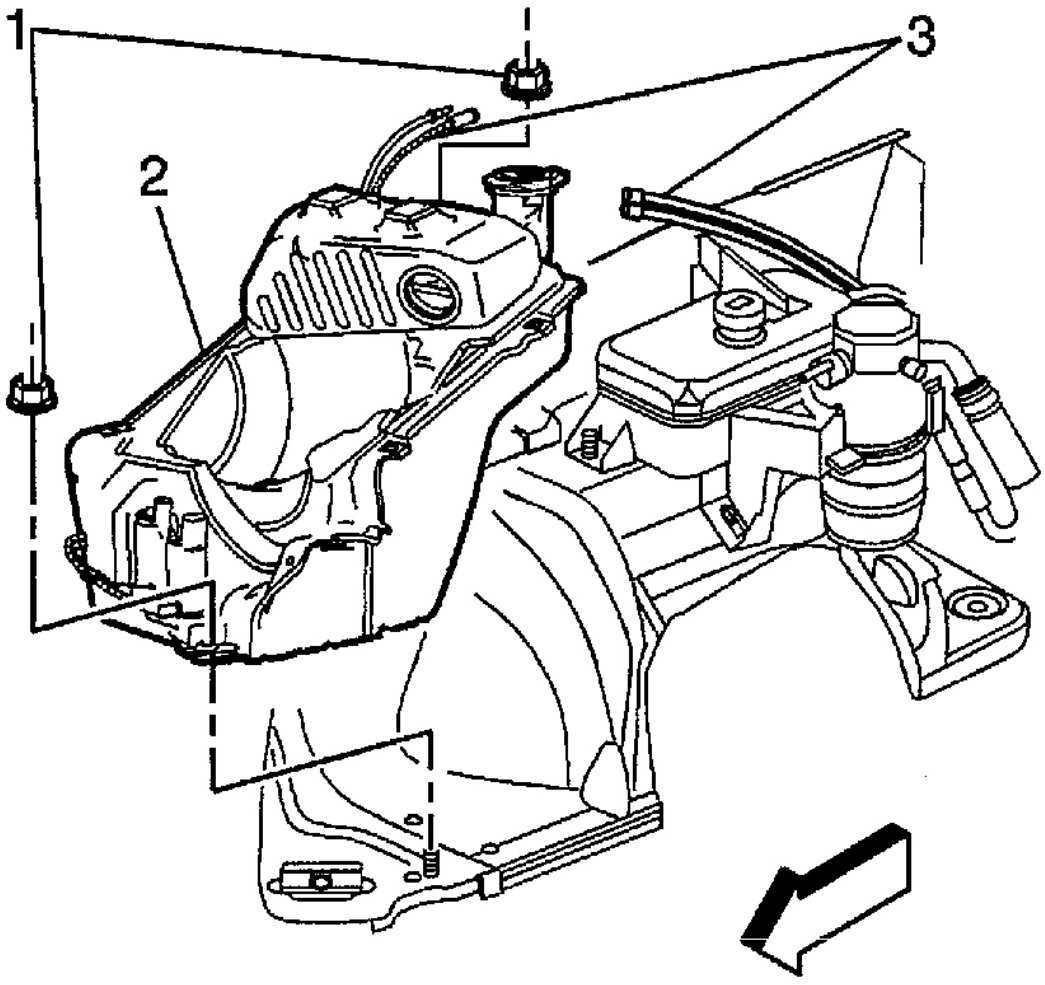

Fig. 18: Removing & Installing Air Cleaner (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Installation

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install MAF/IAT sensor to air cleaner assembly. See **MASS AIR FLOW SENSOR/INTAKE AIR TEMPERATURE SENSOR (ASCENDER 5.3L)** under SENSORS & SWITCHES.
2. Install air cleaner assembly. Tighten nuts to specification. See **TORQUE SPECIFICATIONS** .
3. Connect the washer pump hoses (3) to the washer pumps. See **Fig. 18** .
4. Install the 2 air cleaner housing/washer solvent tank assembly retaining nuts (1) to the mounting studs. Tighten the nuts to specification. See **TORQUE SPECIFICATIONS** .
5. Connect windshield washer pump (1) and low fluid level (4) electrical connectors. If equipped, connect headlamp washer pump (2) and lift gate washer pump (6) electrical connectors. See **Fig. 17** .
6. Install the washer solvent level sensor wire harness to the wire harness retaining clips (3, 5).
7. If equipped, connect headlamp washer hose to headlamp washer pump. See **Fig. 16** .
8. Install front end diagonal brace and bolts. See **Fig. 15** . Tighten bolts to specification See **TORQUE SPECIFICATIONS** .
9. Connect MAF/IAT sensor electrical connector. See **Fig. 14** .
10. Install air cleaner housing duct. See **Fig. 13** .
11. Tighten clamps at MAF/IAT sensor and at throttle body. Tighten clamps to specification. See **TORQUE SPECIFICATIONS** .

AIR CLEANER OUTLET RESONATOR (ASCENDER 4.2L)

NOTE: Numbers in parentheses refer to numbers in illustrations.

Removal

1. Disconnect air cleaner outlet duct. See **AIR CLEANER ASSEMBLY** .
2. Loosen throttle body clamp.
3. Disconnect fuel pressure regulator vacuum supply from air cleaner outlet resonator.
4. Remove the two air cleaner outlet resonator to engine bolts (4). See **Fig. 19** .
5. Disconnect the crankcase ventilation hose (1) from the valve cover port (2).
6. Remove the air cleaner outlet resonator assembly (5) from the engine.

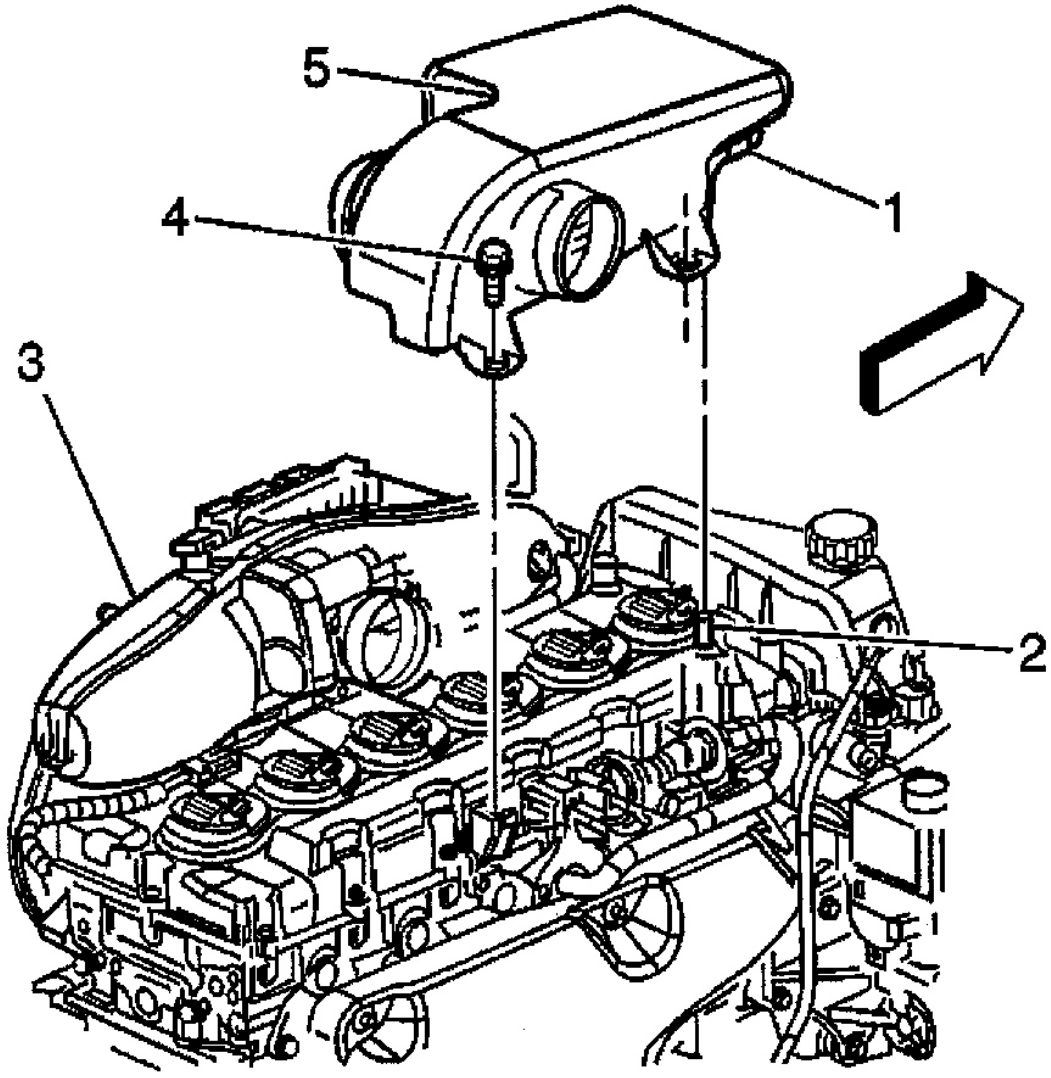

Fig. 19: Removing & Installing Air Cleaner Outlet Resonator (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Installation

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect

fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install air cleaner outlet resonator assembly (5) to engine. Ensure that crankcase ventilation hose (1) is connected to the valve cover port (2). See **Fig. 19** .
2. Install 2 air cleaner outlet resonator to engine bolts (4). Tighten the resonator to engine bolts to specification. See **TORQUE SPECIFICATIONS** .
3. Connect air cleaner outlet duct to air cleaner outlet resonator.
4. Properly position air cleaner outlet duct and air cleaner outlet resonator clamps (2). Ensure resonator is properly fit to throttle body assembly. See **Fig. 20** . Tighten the clamps (2) to specification. See **TORQUE SPECIFICATIONS** .
5. Connect fuel pressure regulator vacuum supply to air cleaner outlet resonator.

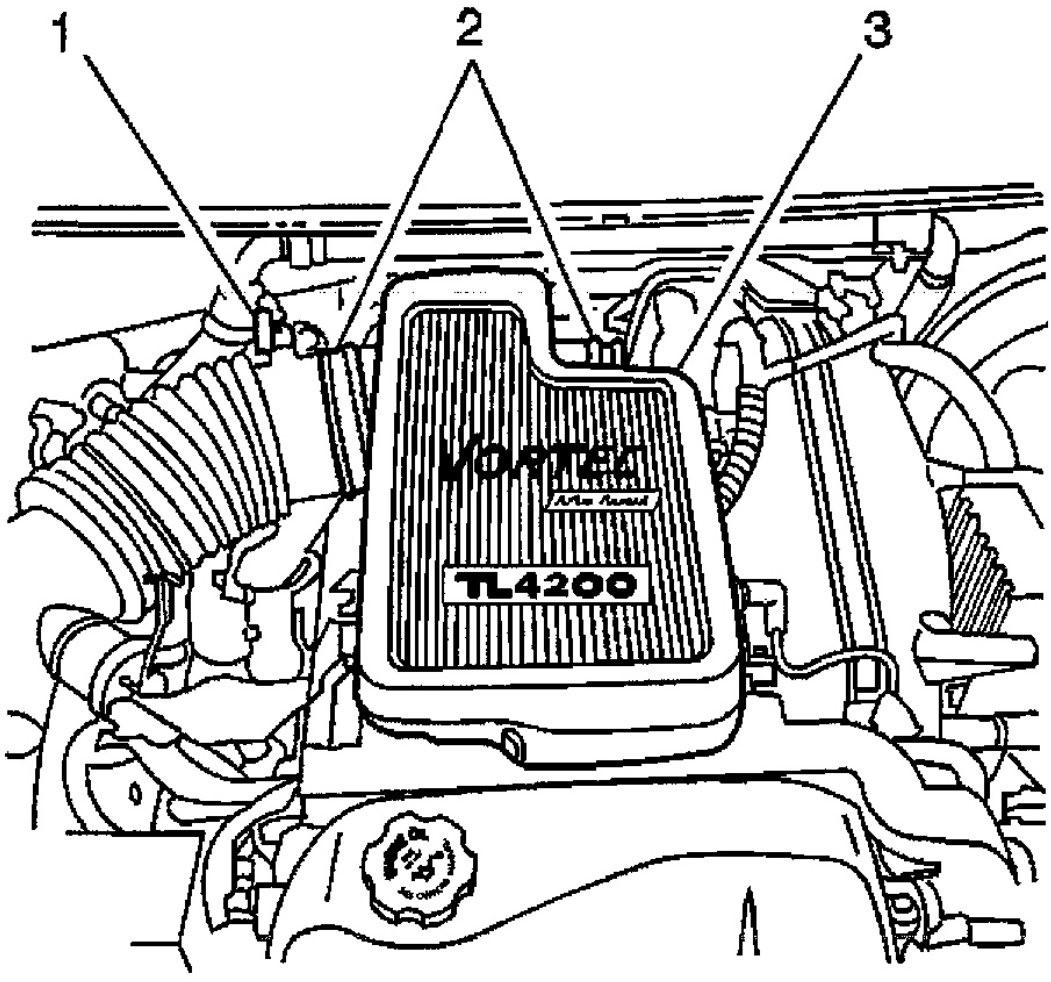

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Fig. 20: Removing & Installing Air Cleaner Resonator Outlet Duct (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

AIR CLEANER RESONATOR OUTLET DUCT

NOTE: Numbers in parentheses refer to numbers in illustrations.

Removal (Ascender 4.2L)

1. Remove the air cleaner element.
2. Disconnect electrical connector from Intake Air Temperature (IAT) sensor (1). See **Fig. 20** .
3. Loosen air cleaner outlet duct clamp (2) on air cleaner side of air cleaner outlet resonator (3).

4. Remove the air cleaner outlet duct.
5. If replacing the air cleaner outlet duct, remove the IAT sensor. See **INTAKE AIR TEMPERATURE SENSOR** under SENSORS & SWITCHES.

Installation

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. If IAT sensor was previously removed, install IAT sensor into air cleaner outlet duct. See **INTAKE AIR TEMPERATURE SENSOR** under SENSORS & SWITCHES.
2. Install air cleaner outlet duct onto air cleaner outlet resonator (3). See **Fig. 20** . Tighten clamp to specification. See **TORQUE SPECIFICATIONS** .
3. Connect IAT sensor electrical connector.
4. Install the air cleaner element.
5. Properly position the air cleaner outlet duct clamp (2) on the air cleaner side of the air cleaner outlet resonator (3). Tighten the clamp (2) to specification. See **TORQUE SPECIFICATIONS** .

Removal (Ascender 5.3L)

1. Loosen the clamps at Mass Air Flow/Intake Air Temperature (MAF/IAT) sensor and at throttle body.
2. Remove the air cleaner outlet duct bolt. See **Fig. 13** .
3. Remove the air cleaner outlet duct.

Installation

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install the air cleaner outlet duct.
2. Install the air cleaner outlet duct bolt. See **Fig. 13** . Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .

3. Tighten the clamps at MAF/IAT sensor and at throttle body. Tighten the clamps to specification. See **TORQUE SPECIFICATIONS** .

INTAKE AIR DUCT

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

1. Loosen clamp between air cleaner lid and Mass Air Flow sensor.
2. Release four latches securing lid to air cleaner housing.
3. Remove air cleaner lid.
4. Remove air filter element.
5. Remove retaining bolts and air cleaner housing from vehicle.
6. To install, reverse removal procedure.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Disconnect negative battery cable.
2. Disconnect electrical connector at Intake Air Temperature (IAT) sensor. Remove IAT sensor, if necessary. See **INTAKE AIR TEMPERATURE SENSOR** under SENSORS & SWITCHES.
3. Loosen retaining clamps at throttle body and at air filter box.
4. Disconnect brake booster vacuum hose at intake manifold and at brake booster.
5. Remove retaining nut at intake air duct bracket at top of valve cover.
6. Disconnect the intake air duct from the throttle body and at the air filter box.
7. To install, reverse removal procedure. When installing intake air duct bracket, ensure retaining hole is inserted to intake air duct bracket.

SENSORS & SWITCHES

ACCELERATOR POSITION SENSOR

Removal & Installation (Ascender 4.2L)

1. Turn ignition off.
2. Disconnect Accelerator Pedal Position (APP) sensor electrical connector.
3. APP sensor is located on bracket above accelerator pedal. See **Fig. 21** .
4. Remove 2 APP sensor retaining screws. Remove APP sensor.
5. To install, reverse removal procedure. Tighten screws to specification. See **TORQUE SPECIFICATIONS** .

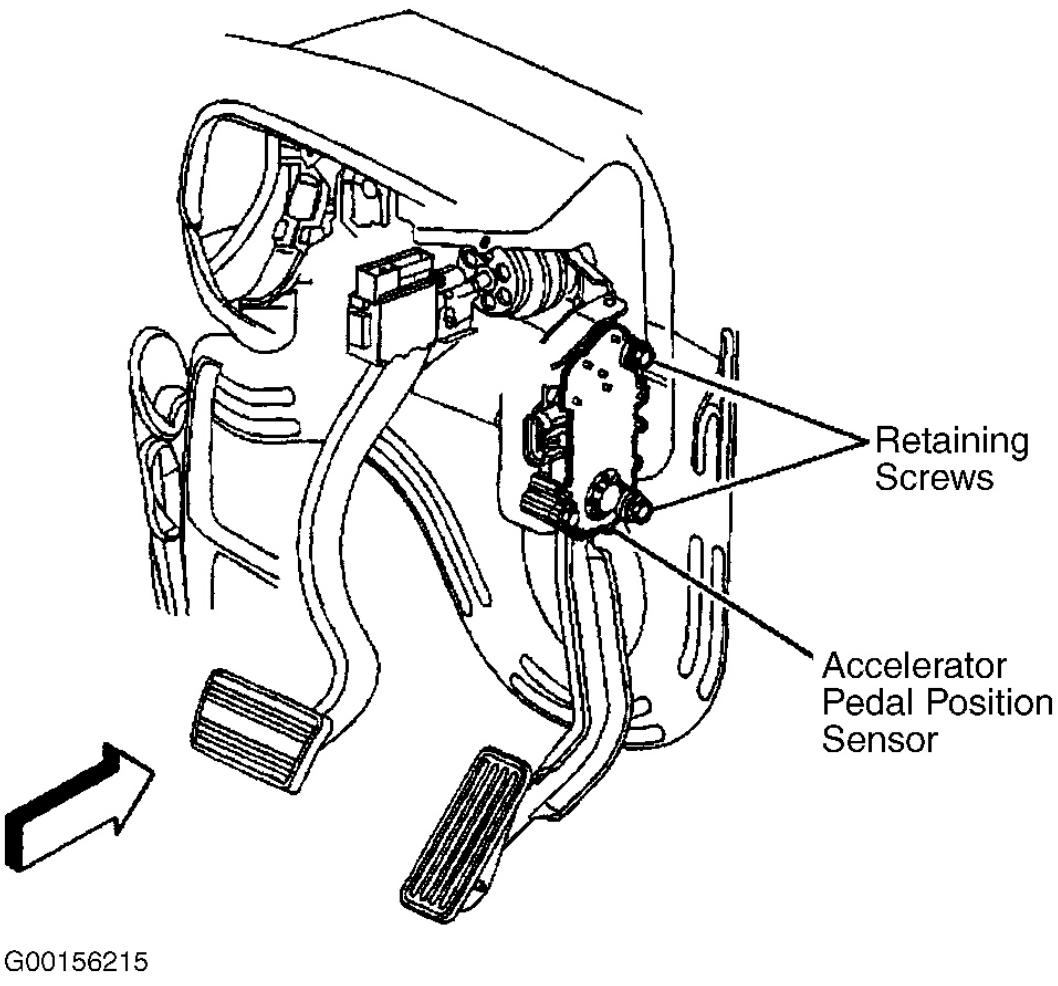


Fig. 21: Locating Accelerator Pedal Position Sensor (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal (Ascender 5.3L)

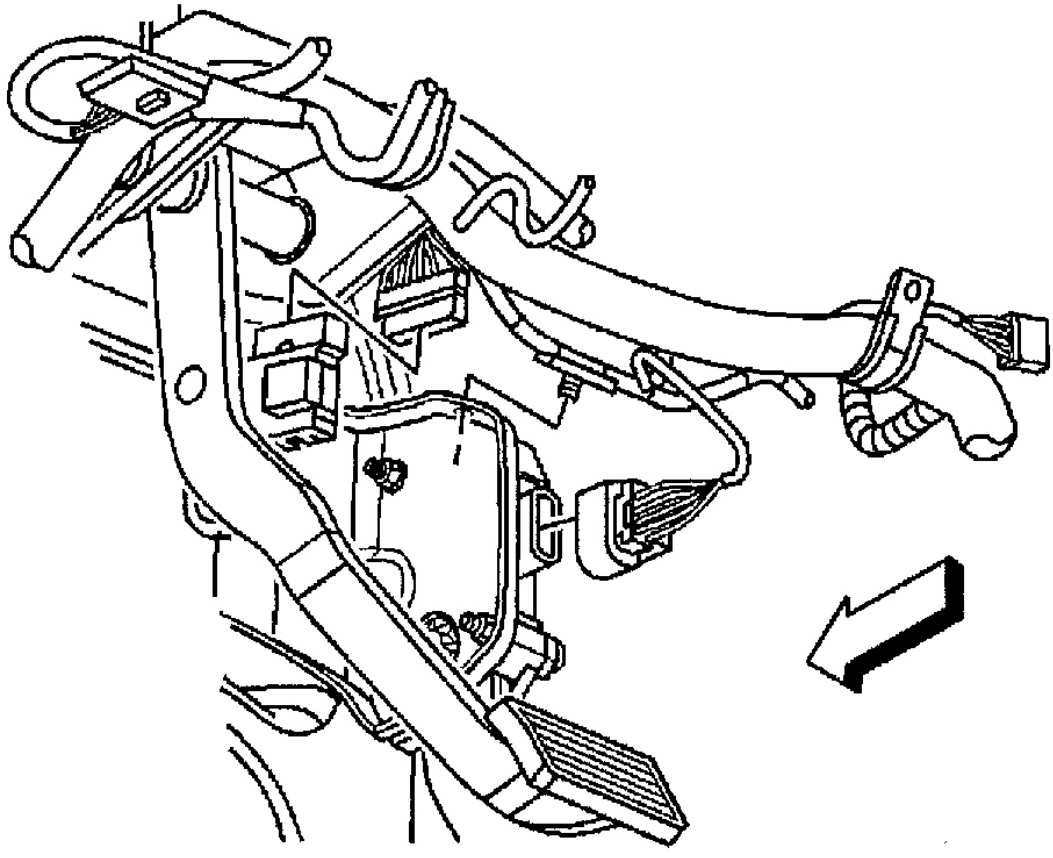
1. Disconnect accelerator pedal position (APP) sensor electrical connector. See **Fig. 22** .
2. Remove 3 APP sensor retaining bolts (1). See **Fig. 23** .
3. Remove APP sensor (2).

Installation

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors

on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Install APP sensor.
2. Install 3 APP sensor bolts (1). See **Fig. 23** . Tighten to specification. See **TORQUE SPECIFICATIONS** .
3. Connect APP sensor electrical connector. See **Fig. 22** .
4. Verify that vehicle meets the following conditions:
   - The vehicle is not in a reduced engine power mode.
   - The ignition is ON.
   - The engine is OFF.
5. Connect scan tool in order to test for proper throttle-opening and throttle-closing range.
6. Operate accelerator pedal and monitor throttle angles. Accelerator pedal should operate freely, without binding, between a closed throttle and a wide open throttle.



G00256480

Fig. 22: Locating Accelerator Pedal Position Sensor Electrical Connector (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

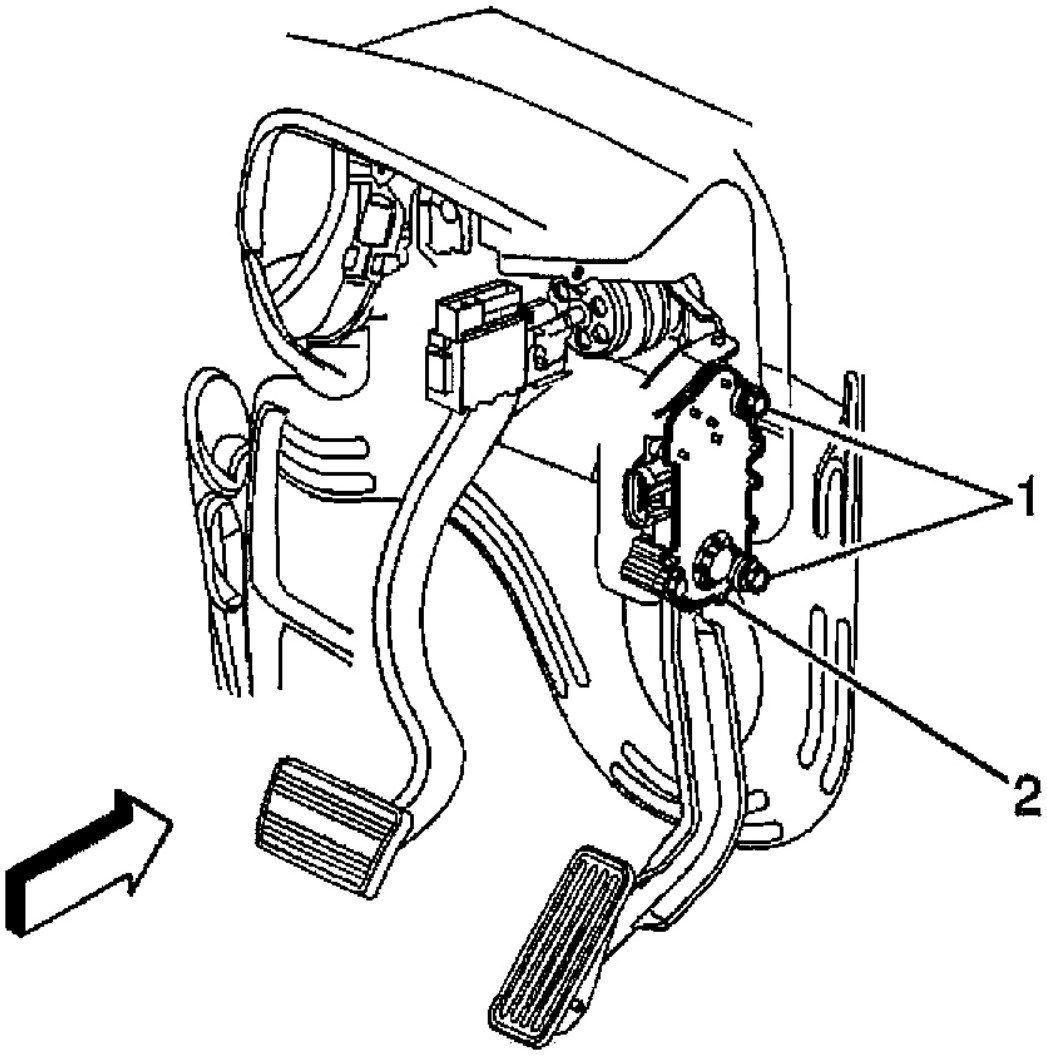


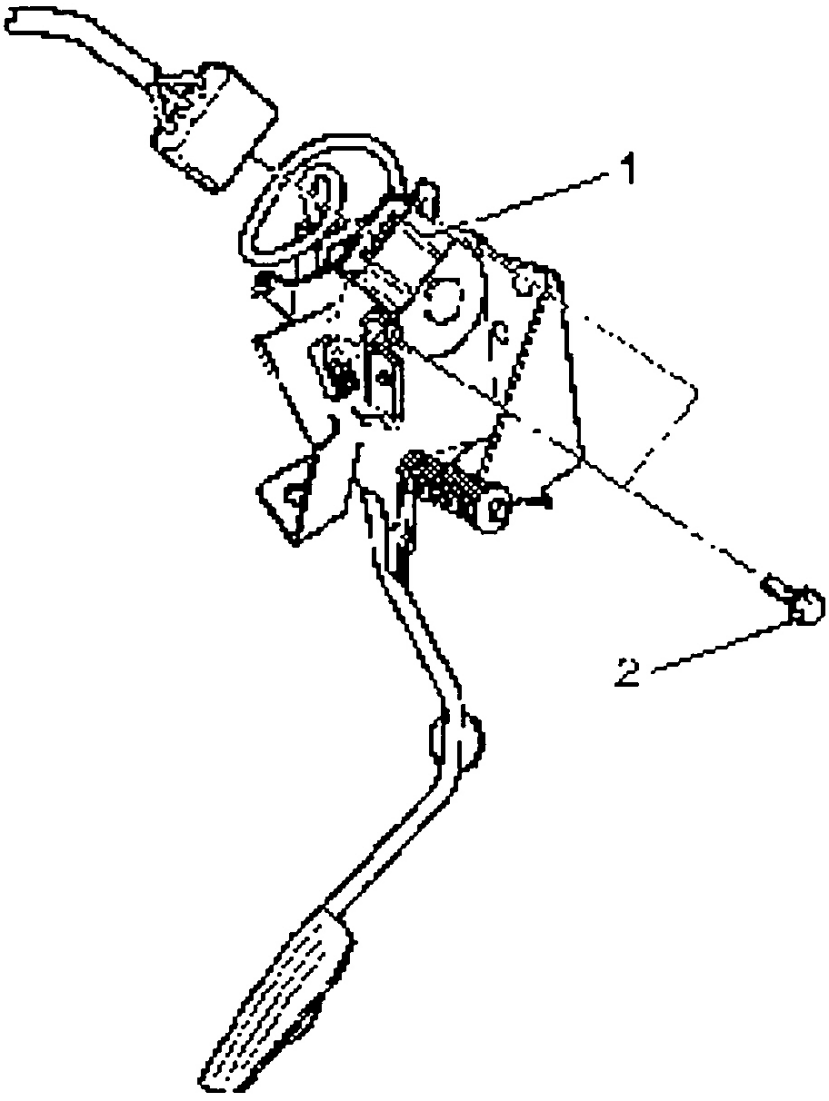
Fig. 23: Removing & Installing Accelerator Pedal Position Sensor (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

NOTE: Remove accelerator position sensor along with accelerator pedal.

1. Disconnect negative battery cable.
2. Disconnect accelerator position (AP) sensor electrical connector.
3. Remove 2 screws securing accelerator pedal to bulkhead. See **Fig. 24** .

4. Remove 2 screws securing AP sensor to accelerator pedal.
5. To install, reverse removal procedure. Adjust AP sensor. See **ACCELERATOR POSITION SENSOR** under ELECTRONIC THROTTLE CONTROL in ON-VEHICLE ADJUSTMENTS.



Legend	
(1)	AP Sensor
(2)	AP Screw

G00253028

Fig. 24: Locating Accelerator Position Sensor (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

CAMSHAFT POSITION SENSOR

Removal & Installation (Ascender 4.2L)

1. Disconnect camshaft position (CMP) sensor electrical connector. See **Fig. 25** .
2. Remove CMP sensor retaining bolt. Remove CMP sensor.
3. To install, reverse removal procedure. Tighten bolt to specification. See **TORQUE SPECIFICATIONS** .

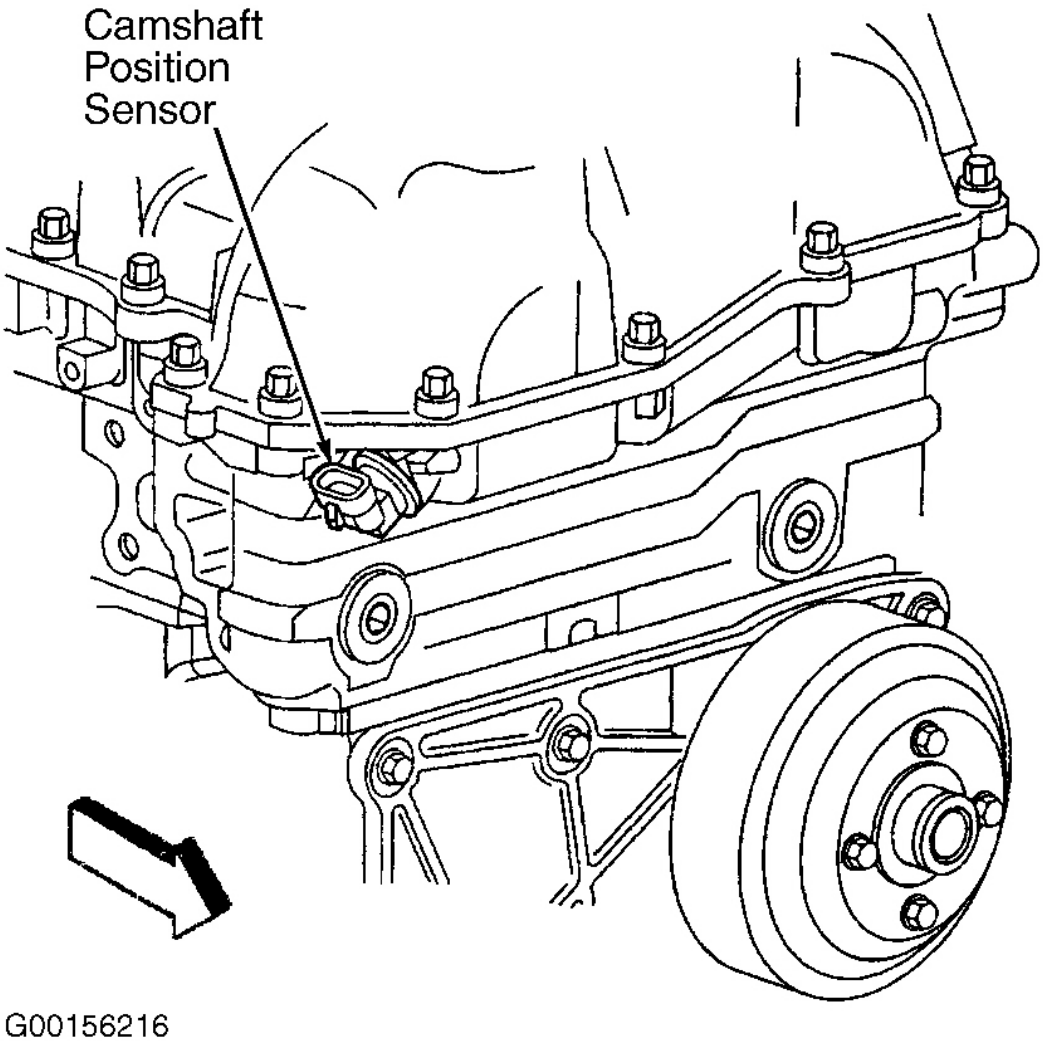


Fig. 25: Locating Camshaft Position Sensor (Ascender 4.2L)

Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

1. Remove intake manifold. See **INTAKE MANIFOLD** under FUEL SYSTEMS. Clean area around camshaft position (CMP) sensor before removal in order to prevent debris from entering engine. CMP sensor is located at top center rear of engine. See **Fig. 26** .
2. Disconnect CMP sensor electrical connector. Remove CMP sensor retaining bolt. Remove CMP sensor. See **Fig. 27** .
3. To install, reverse removal procedure. Tighten bolt to specification. See **TORQUE SPECIFICATIONS** .

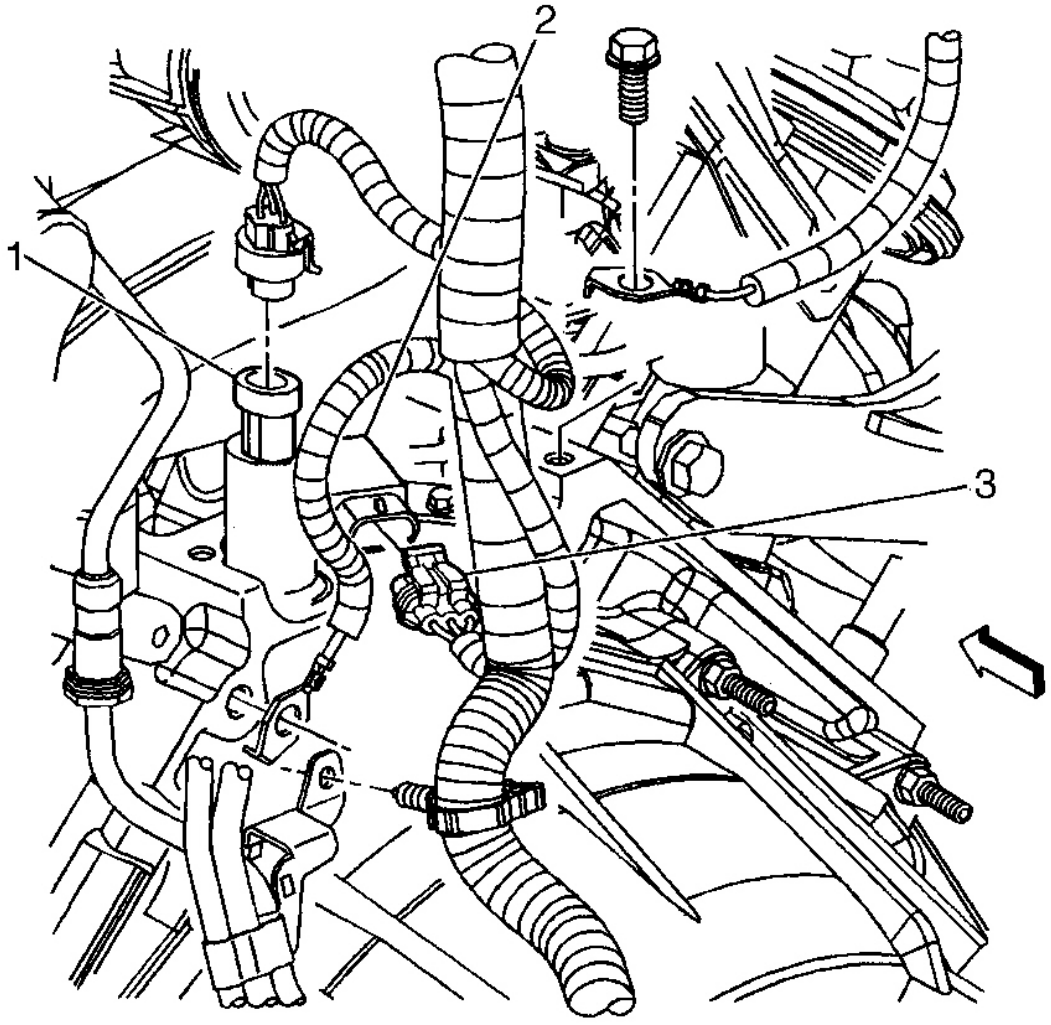


Fig. 26: Locating Camshaft Position Sensor & Engine Oil Pressure Sensor (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

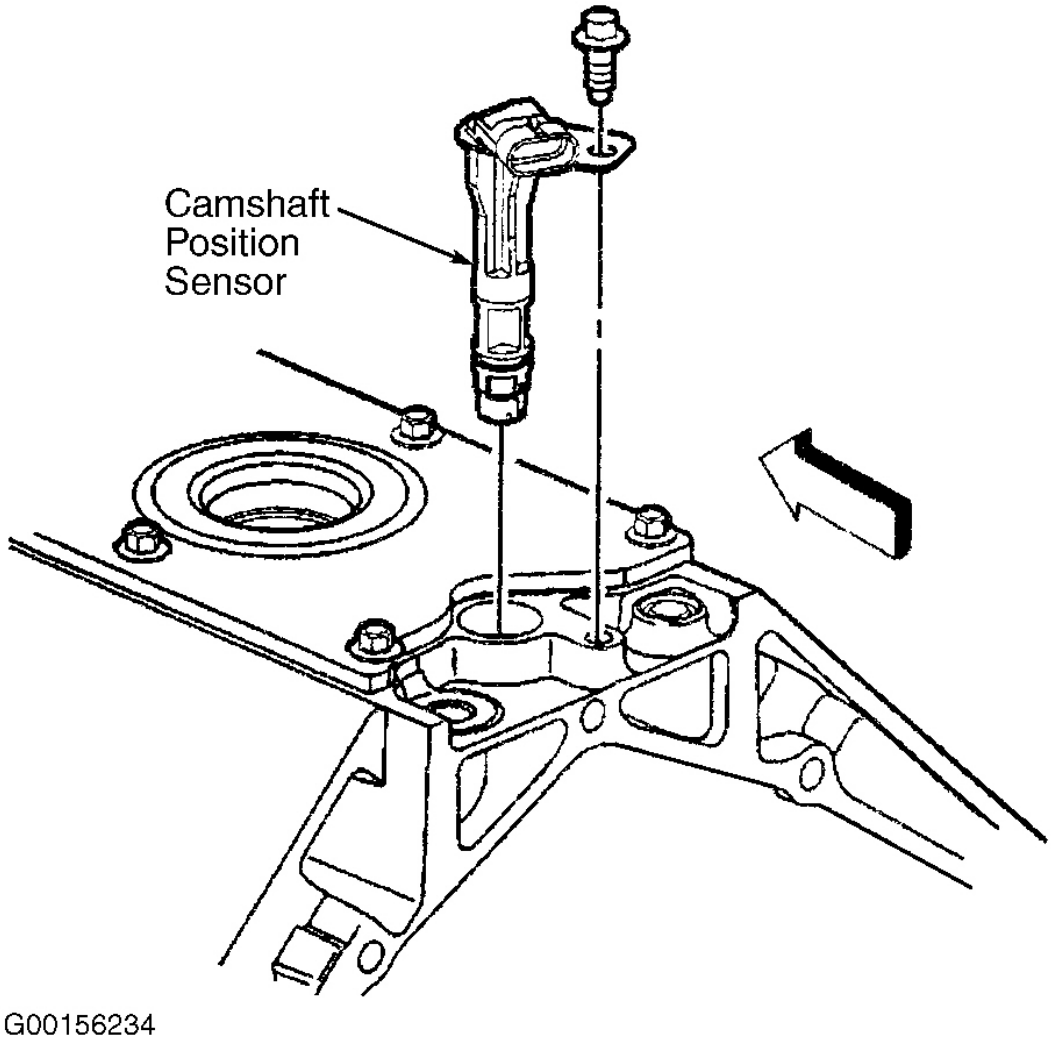


Fig. 27: Removing & Installing Camshaft Position Sensor (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Disconnect negative battery cable.
2. Remove spark plug cover on top of valve cover.
3. Disconnect Camshaft Position (CMP) sensor electrical connector.
4. Remove drive belt.
5. Remove crankshaft pulley.
6. Remove timing belt cover.
7. Remove top electrical cover on timing belt cover.

8. Remove CMP sensor mounting bolt. Remove CMP sensor.
9. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

CRANKSHAFT POSITION SENSOR

Removal & Installation (Ascender 4.2L)

NOTE: PCM must re-learn crankshaft position when crankshaft position (CKP) sensor is replaced. See CKP SYSTEM VARIATION LEARN PROCEDURE under PROGRAMMING.

1. Raise and support vehicle.
2. Disconnect crankshaft position (CKP) sensor electrical connector.
3. Remove CKP sensor retaining bolt. Remove CKP sensor.
4. To install, lubricate "O" ring with engine oil and reverse removal procedure. Replace "O" ring if necessary. Tighten bolt to specification. See **TORQUE SPECIFICATIONS** .

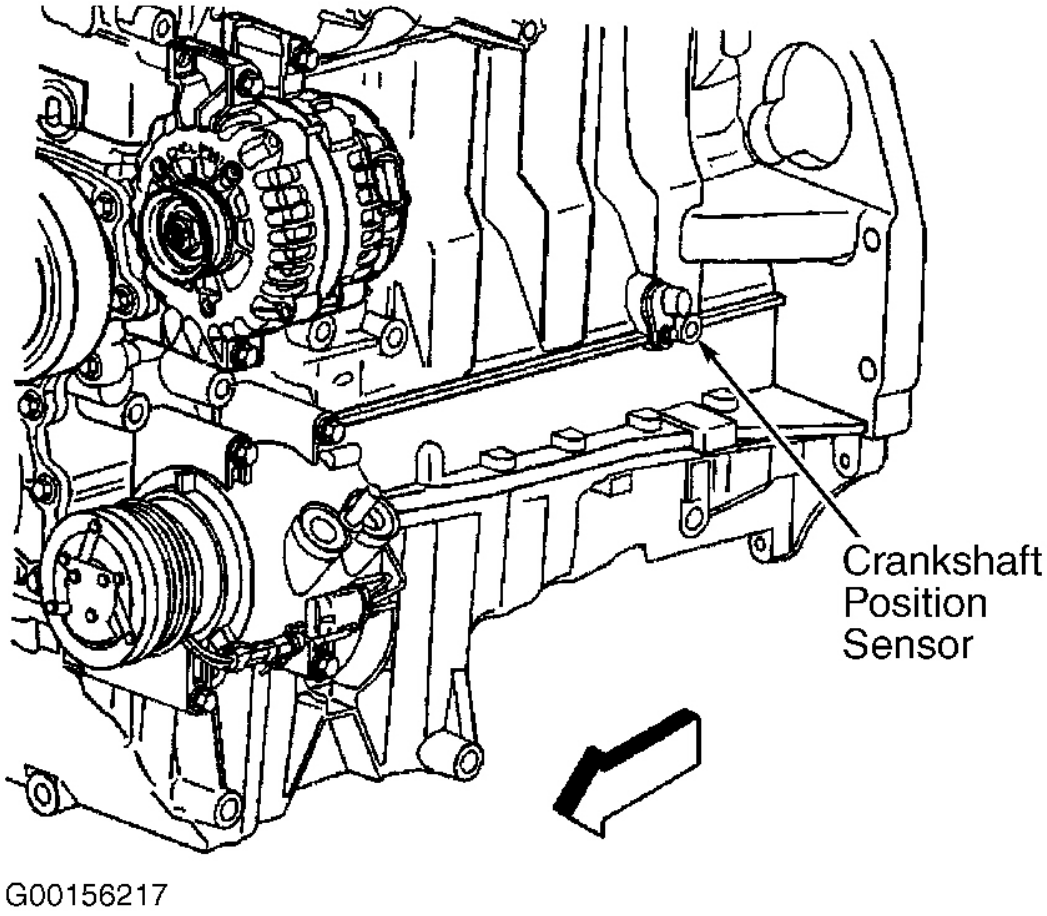


Fig. 28: Locating Crankshaft Position Sensor (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

NOTE: PCM must re-learn crankshaft position when crankshaft position (CKP) sensor is replaced. See CKP SYSTEM VARIATION LEARN PROCEDURE under PROGRAMMING.

1. Disconnect negative battery cable.
2. Raise and support vehicle.
3. Remove right transmission cover bolt. See **Fig. 29** .
4. Remove starter bolts.
5. Reposition starter and remove transmission cover and shield.
6. Position starter downward with electrical terminals facing front of vehicle.

7. Remove starter solenoid nut.
8. Remove starter lead wire from solenoid nut. Remove lead nut.
9. Remove positive cable from starter nut.
10. Remove starter.
11. Disconnect crankshaft position (CKP) sensor electrical connector.
12. Clean area around CKP sensor before removal in order to avoid debris from entering engine.
13. Remove CKP sensor bolt. Remove CKP sensor. See **Fig. 30** .
14. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

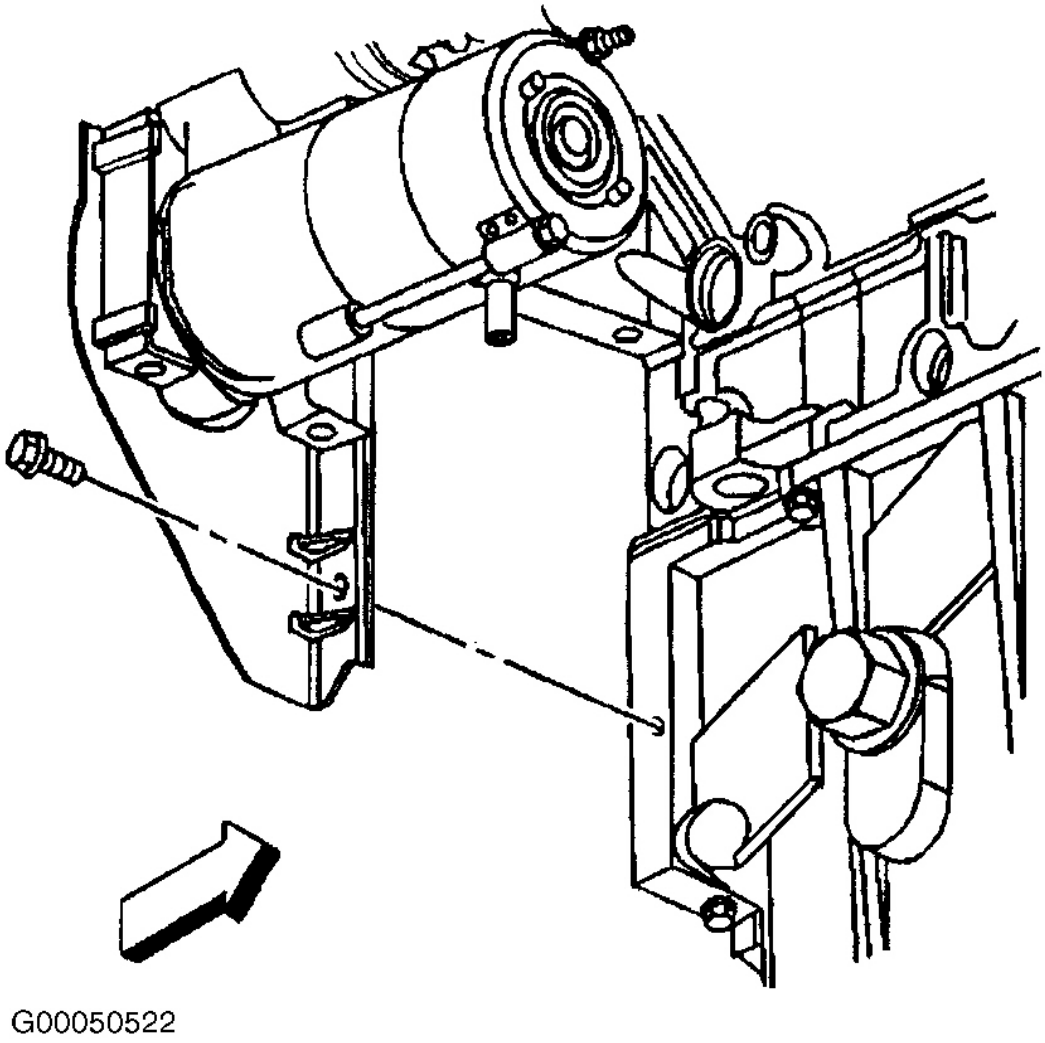


Fig. 29: Removing Flywheel Cover Bolt (Ascender 5.3L)

Courtesy of GENERAL MOTORS CORP.

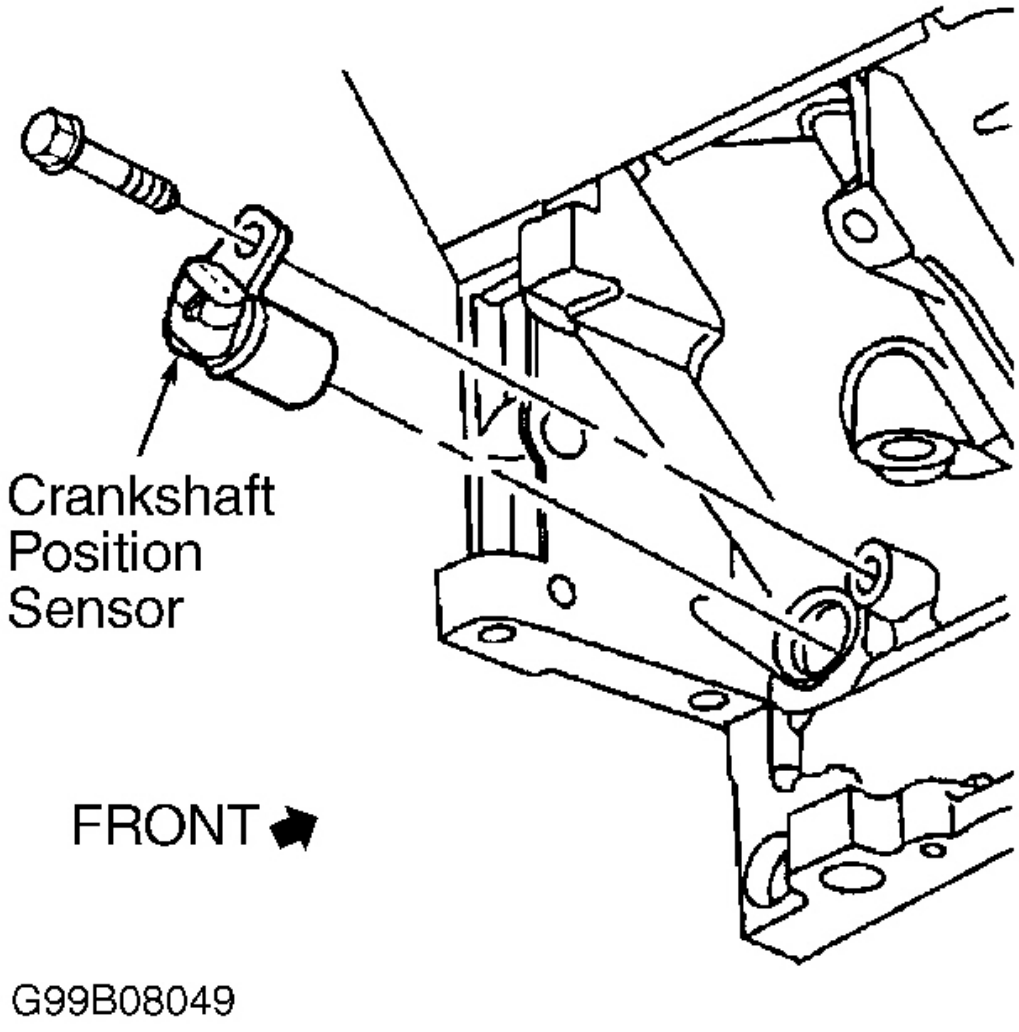


Fig. 30: Locating Crankshaft Position Sensor (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

1. Disconnect negative battery cable.
2. Remove crankshaft position (CKP) sensor 3-pin electrical connector. CKP sensor is located on right side of block, behind engine mount. See **Fig. 31** .
3. Remove CKP sensor mounting bolt and sensor. Before installing new CKP sensor, inspect "O" ring for

damaged or wear, and replace if necessary.

4. To install, lubricate "O" ring with engine oil and reverse removal procedure. Replace "O" ring if necessary. Tighten bolt to specification. See **TORQUE SPECIFICATIONS** .

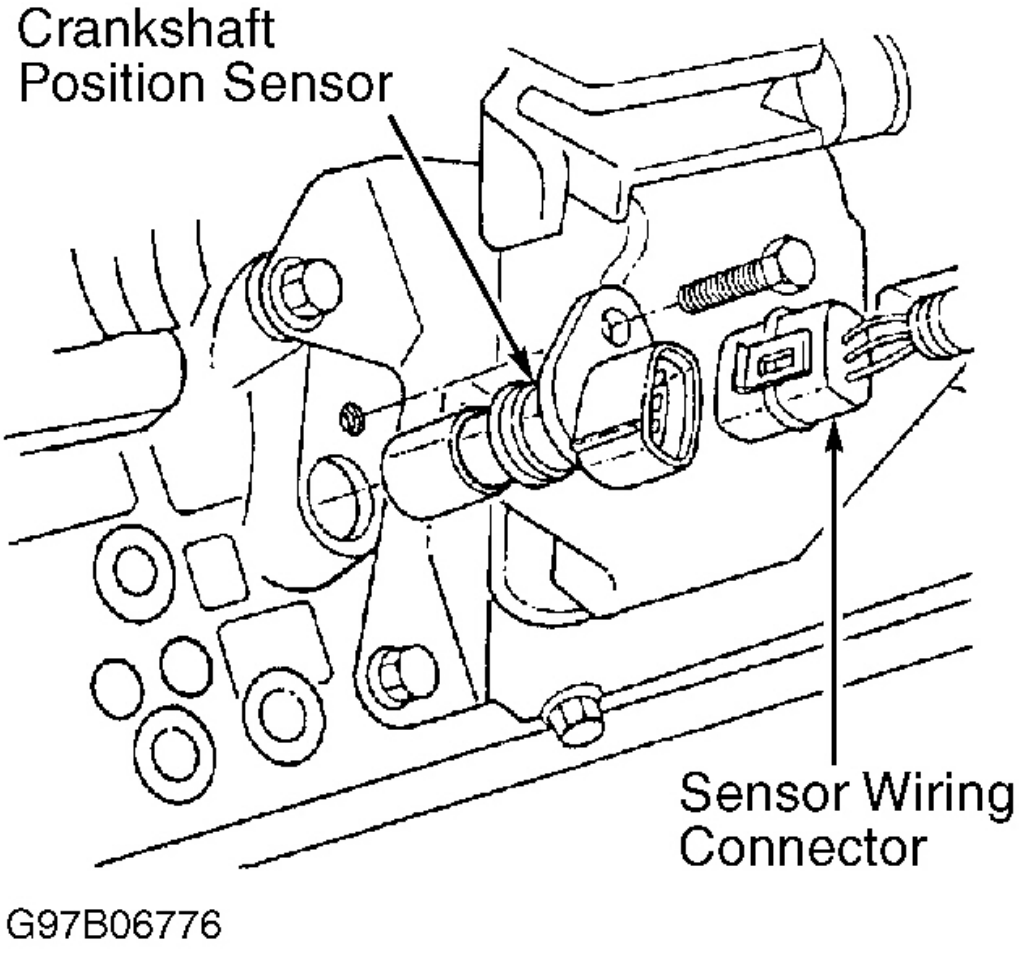


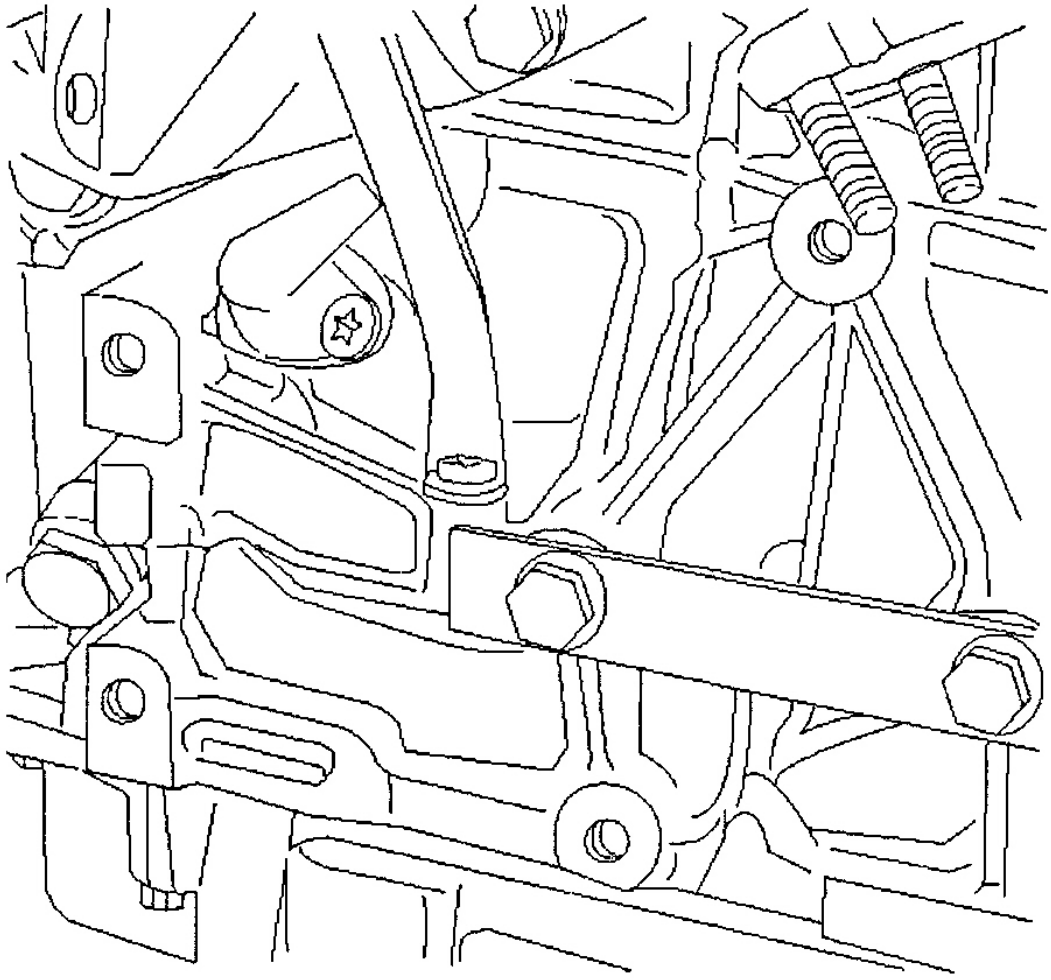
Fig. 31: Removing Crankshaft Position Sensor (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

NOTE: PCM must re-learn crankshaft position when crankshaft position (CKP) sensor is replaced. See TOOTH ERROR CORRECTION LEARN PROCEDURE under PROGRAMMING.

1. Disconnect negative battery cable.

2. Remove accessory drive belt.
3. Remove power steering pump and mounting bracket.
4. Disconnect CKP sensor electrical connector. See **Fig. 32** .
5. Remove CKP sensor mounting bolt. Remove CKP sensor, avoiding any hot oil that may drip out of engine.
6. To install, reverse removal procedure. Tighten bolt to specification. See **TORQUE SPECIFICATIONS** .



G00141550

Fig. 32: Removing & Installing Crankshaft Position Sensor (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

ENGINE COOLANT TEMPERATURE SENSOR

Removal (Ascender 4.2L)

1. Turn ignition off.
2. Drain coolant below level of Engine Coolant Temperature (ECT) sensor into a suitable container.
3. Disconnect negative battery cable.
4. Install a 3/8" drive breaker bar onto the drive belt tensioner. See **Fig. 33** . Turn breaker bar clockwise enough to relieve the tension on the drive belt.
5. Remove drive belt. Release tension on drive belt tensioner.
6. Remove generator positive post cable nut.
7. Remove A/C line bracket-to-engine lift hook bolt. Remove engine lift hook.
8. Remove 3 generator mounting bolts. See **Fig. 34** . Remove generator.
9. Disconnect ECT sensor electrical connector. See **Fig. 35** . ECT sensor is located on left front of engine, above thermostat housing. See **Fig. 36** . Remove ECT sensor.

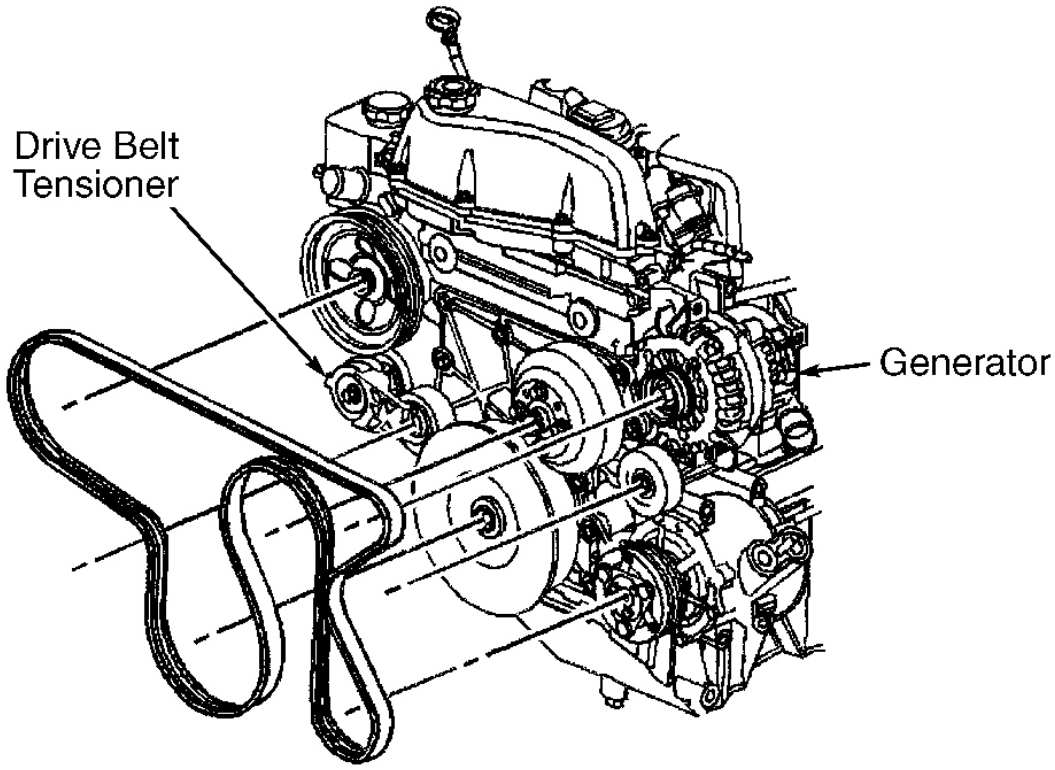


Fig. 33: Identifying Drive Belt Routing & Drive Belt Tensioner (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

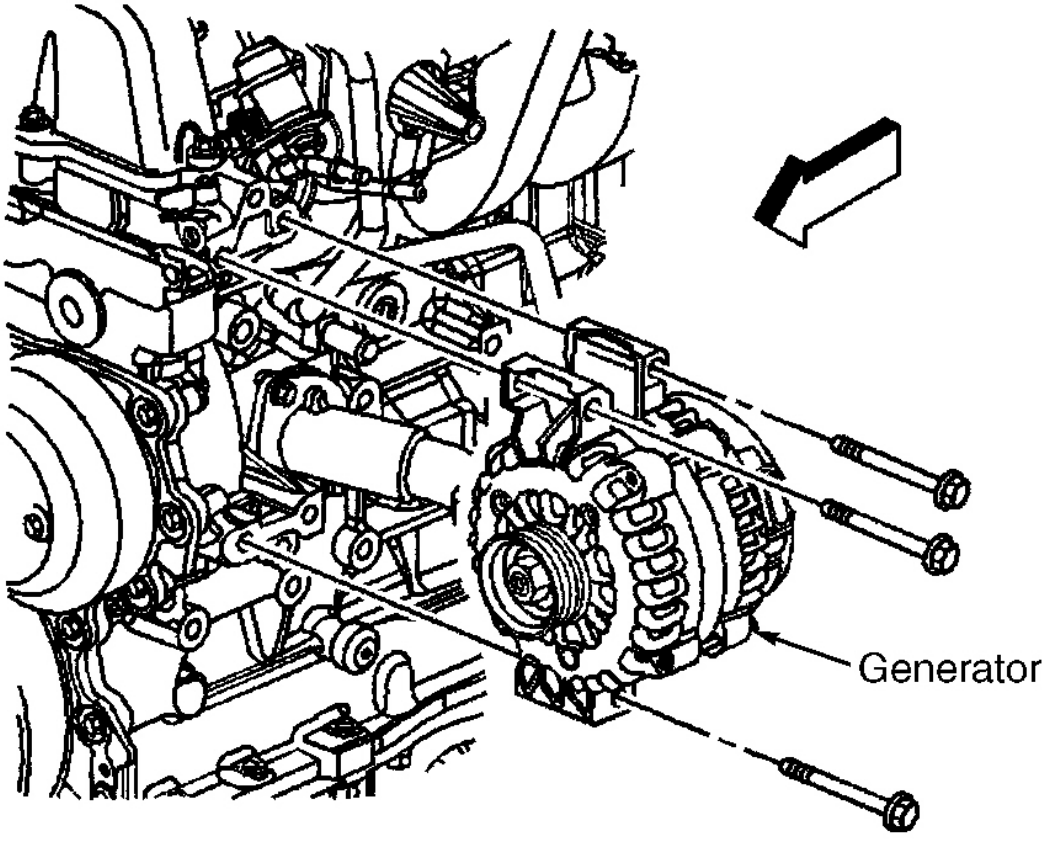


Fig. 34: Removing & Installing Generator (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

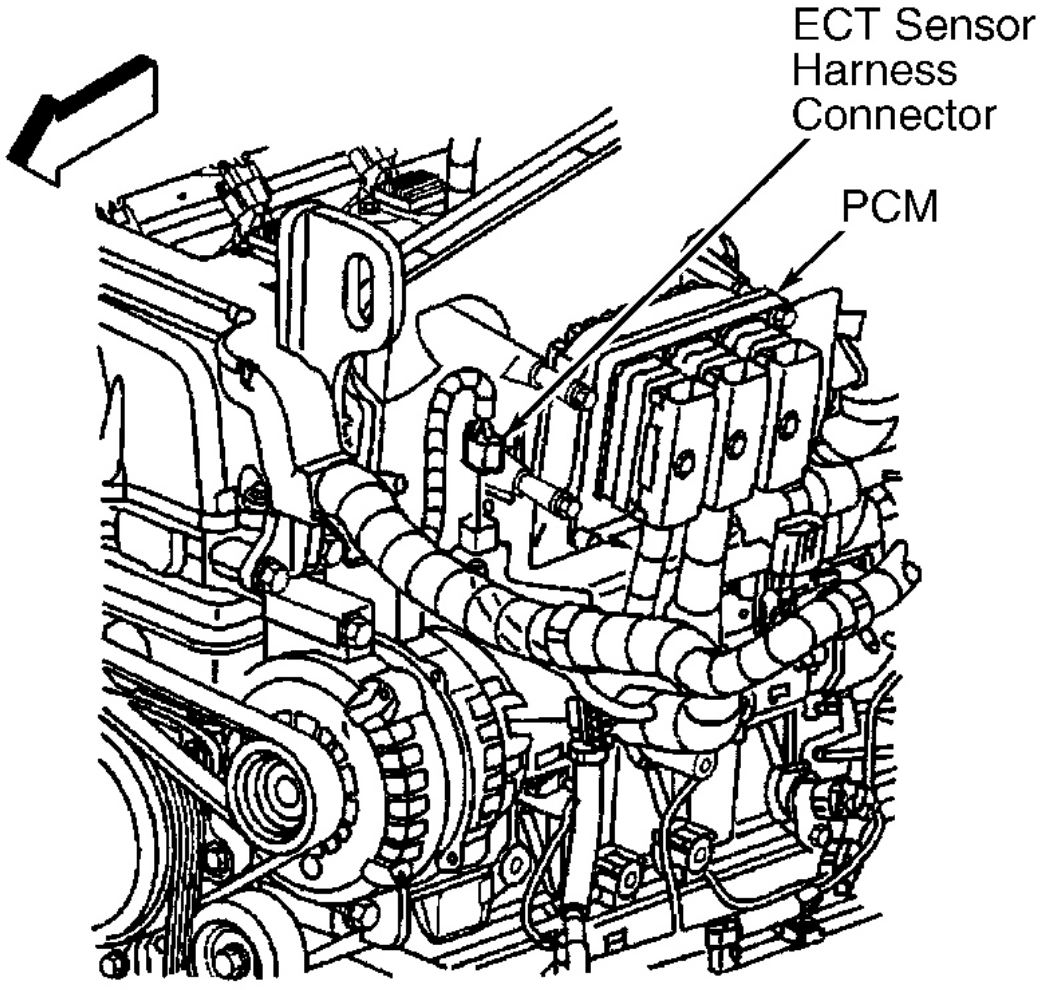


Fig. 35: Locating Engine Coolant Temperature Sensor Electrical Connector (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

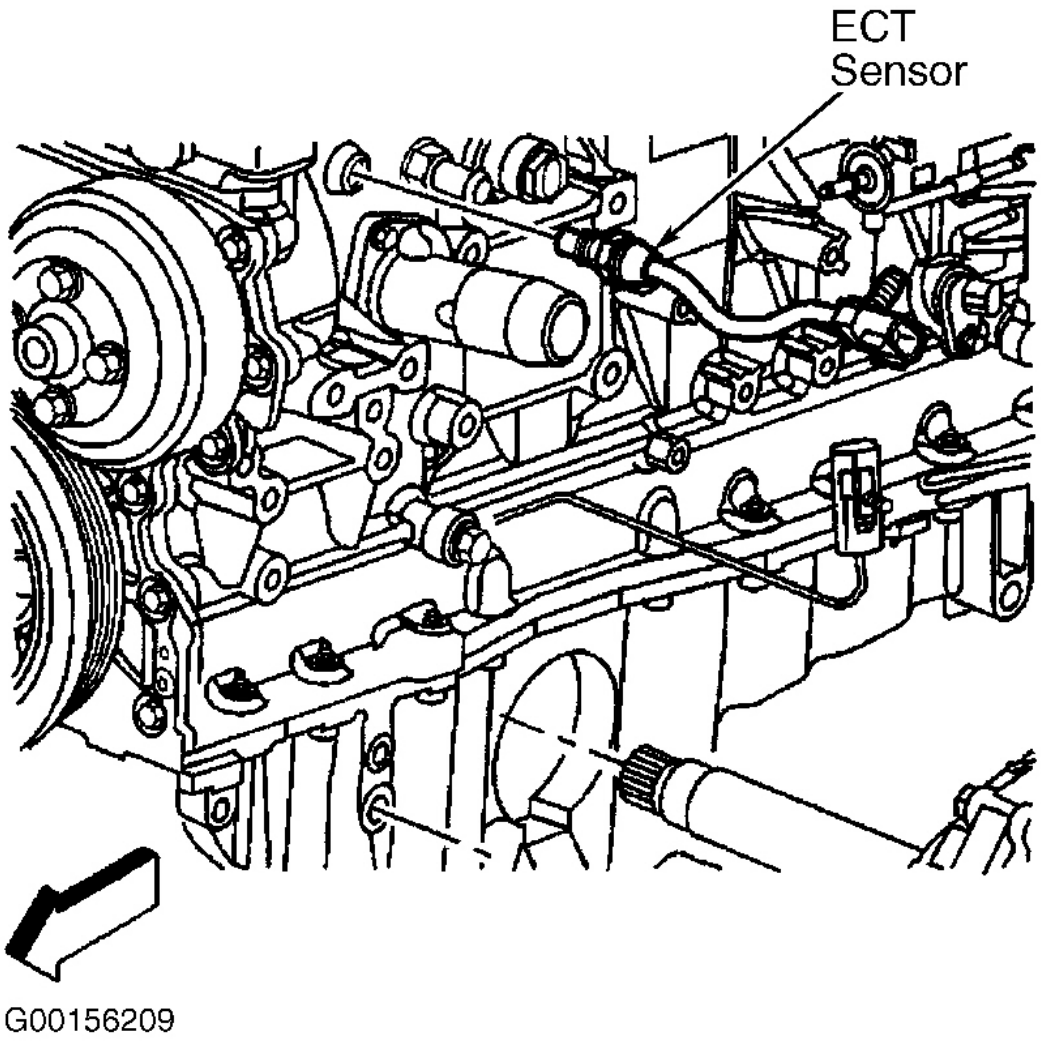


Fig. 36: Locating Engine Coolant Temperature Sensor (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Installation

NOTE: Replacement components must be the correct part number for the application. Components requiring the use of the thread locking compound, lubricants, corrosion inhibitors, or sealants are identified in the service procedure. Some replacement components may come with these coatings already applied. Do not use these coatings on components unless specified. These coatings can affect the final torque, which may affect the operation of the component. Use the correct torque specification when installing components in order to avoid damage.

NOTE: **Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.**

1. Whenever ECT sensor is removed, coat threads with Sealer (P/N 12346004 or equivalent) before reinstallation. Install ECT sensor into engine and tighten to specification. See **TORQUE SPECIFICATIONS** .
2. Reconnect electrical connector to ECT sensor.
3. Reinstall generator. Tighten generator mounting bolts to specification.
4. Connect cable to generator positive post and tighten nut to specification.
5. Reinstall engine lift hook. Reinstall A/C line bracket-to-engine lift hook bolt.
6. Install a 3/8" drive breaker bar onto the drive belt tensioner. See **Fig. 33** . Turn breaker bar clockwise enough to allow installation of drive belt.
7. Install drive belt. Release tension on drive belt tensioner.
8. Reconnect negative battery cable.
9. Fill and bleed cooling system.

Removal (Ascender 5.3L)

1. Turn OFF the ignition.
2. Raise and support the vehicle.
3. Drain coolant below level of Engine Coolant Temperature (ECT) sensor into a suitable container.
4. Lower the vehicle.
5. Disconnect the engine coolant temperature (ECT) sensor electrical connector (1). See **Fig. 37** .
6. Remove the ECT sensor. See **Fig. 38** .

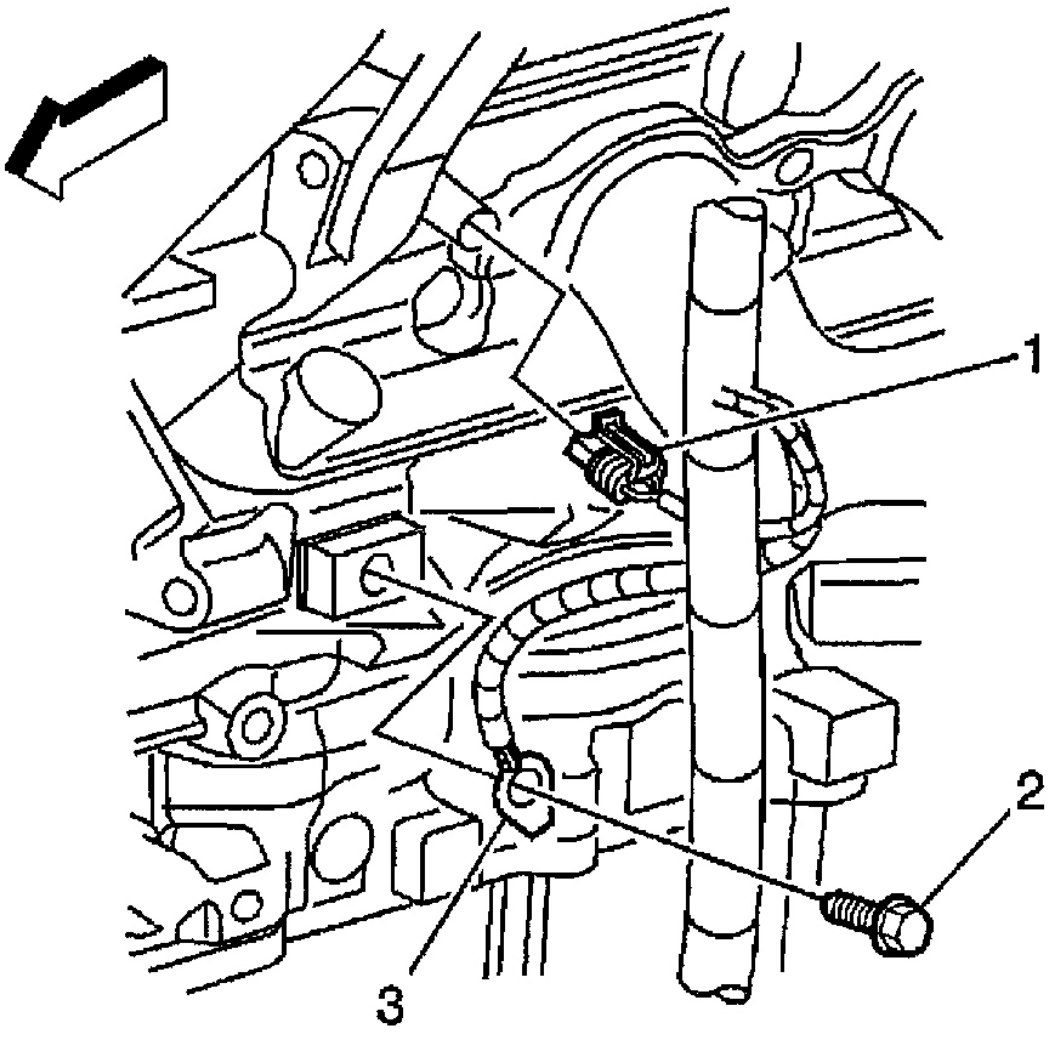


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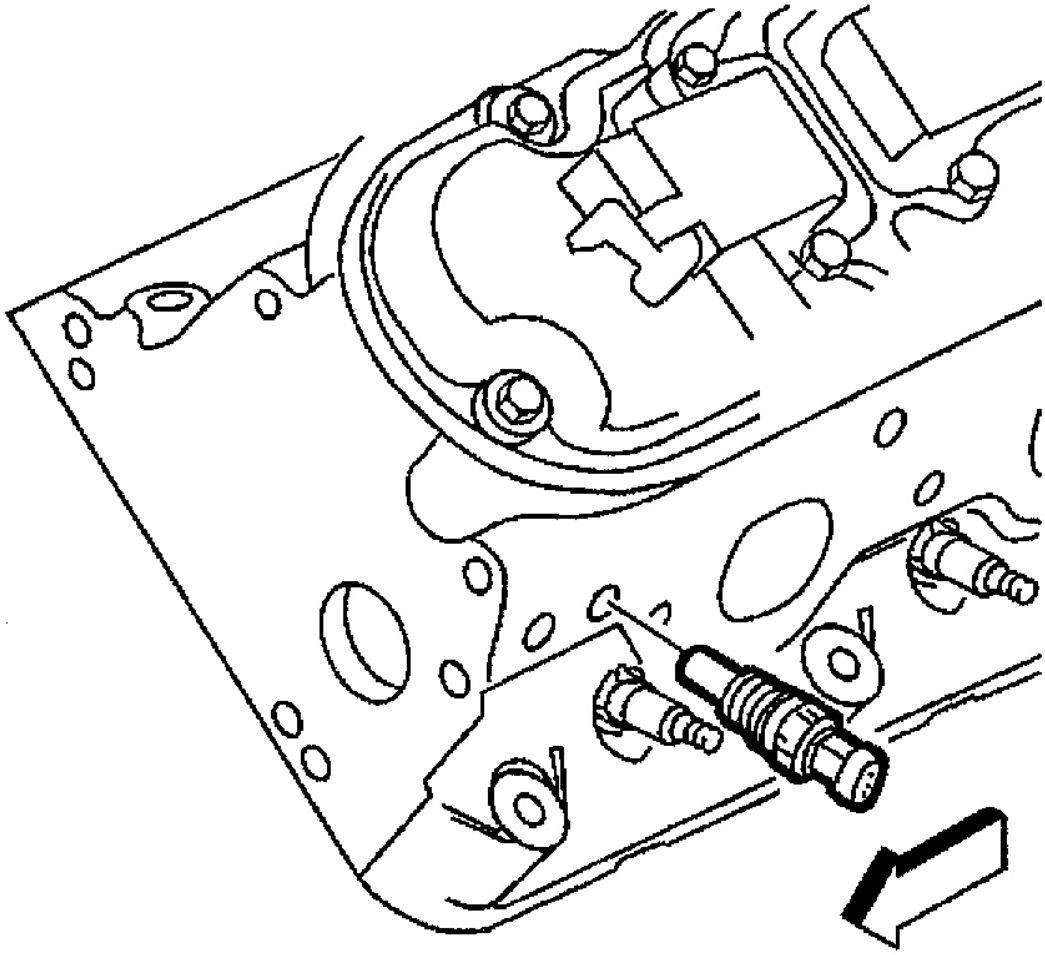
Fig. 37: Locating Engine Coolant Temperature Sensor electrical Connector (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.



G00256483

Fig. 38: Locating Engine Coolant Temperature Sensor (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Installation

NOTE: Replacement components must be the correct part number for the application. Components requiring the use of the thread locking compound, lubricants, corrosion inhibitors, or sealants are identified in the service procedure. Some replacement components may come with these coatings already applied. Do not use these coatings on components unless specified. These coatings can affect the final torque, which may affect the operation of the component. Use the correct torque specification when installing components in order to avoid damage.

NOTE: **Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.**

1. Coat the ECT sensor threads with Sealer (GM P/N 12346004 or equivalent).
2. Install the ECT sensor. See **Fig. 38** . Tighten the sensor to specification. See **TORQUE SPECIFICATIONS** .
3. Connect the ECT sensor electrical connector (1). See **Fig. 37** .
4. Fill and bleed cooling system.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

1. Disconnect negative battery cable.
2. Drain radiator coolant.
3. Disconnect ECT sensor electrical connector. ECT sensor is located in coolant crossover near upper radiator hose. See **Fig. 39** .
4. Remove ECT sensor.
5. To install, apply sealer to threads of ECT sensor. Install sensor to coolant crossover. Tighten ECT sensor to specification. See **TORQUE SPECIFICATIONS** .

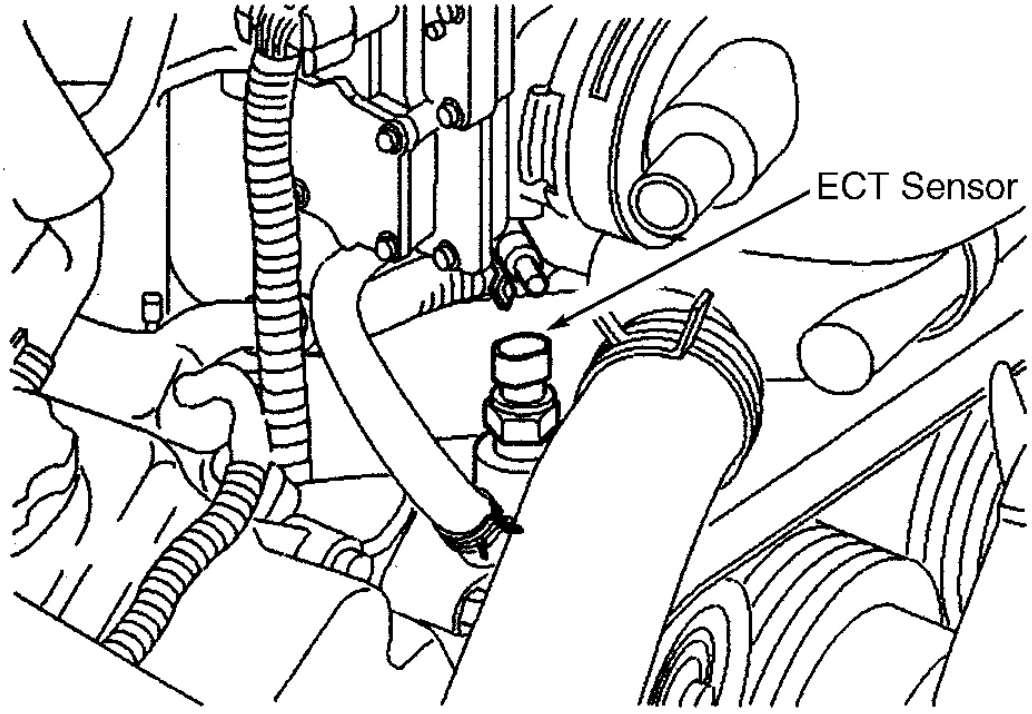


Fig. 39: Locating Engine Coolant Temperature Sensor (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Disconnect negative battery cable.
2. Drain radiator coolant enough that coolant level will be below ECT sensor.
3. Disconnect ECT sensor electrical connector. ECT sensor is located in intake manifold. See **Fig. 40** .
4. Remove ECT sensor.
5. To install, apply sealer to threads of ECT sensor. Install sensor to coolant crossover. Tighten ECT sensor to specification. See **TORQUE SPECIFICATIONS** .

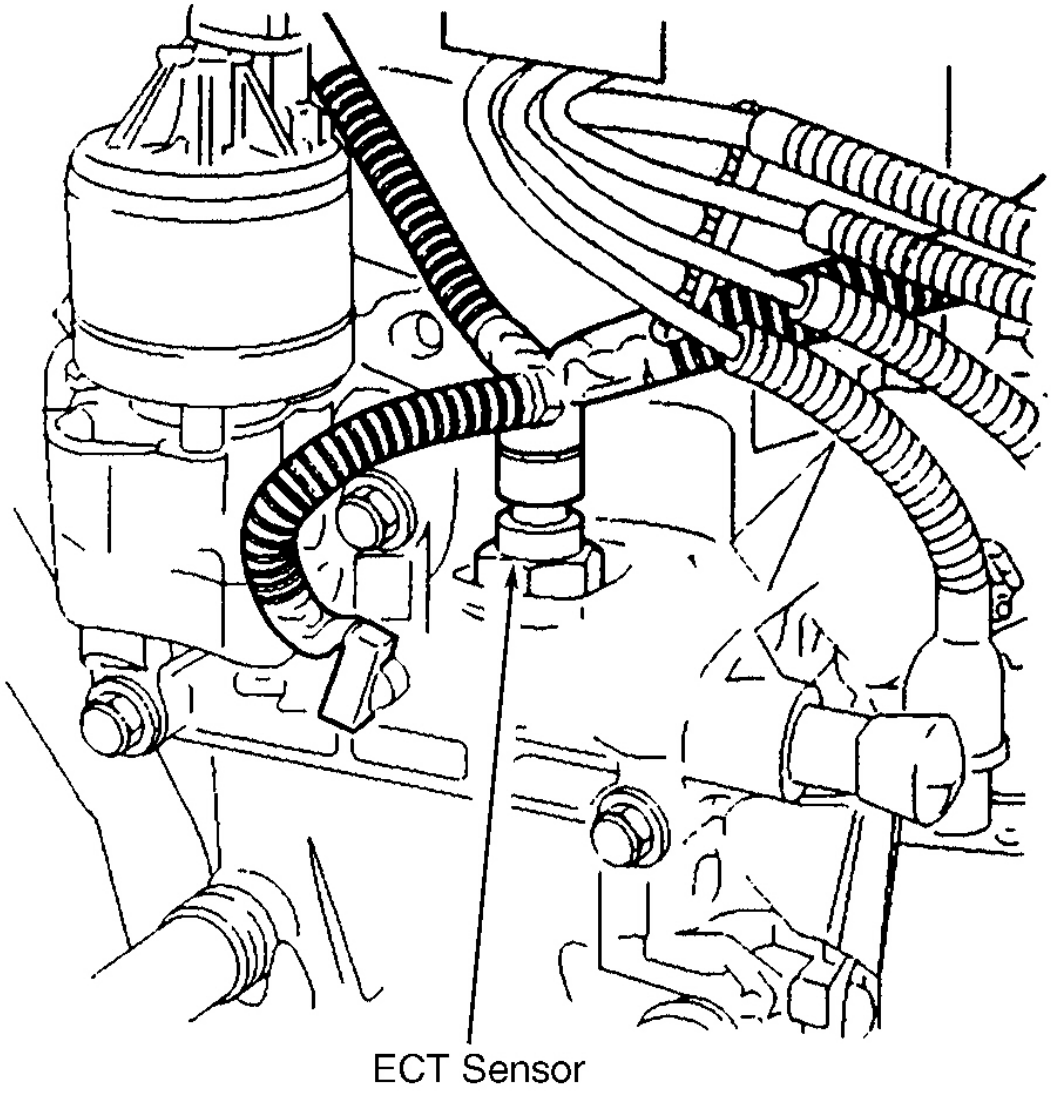


Fig. 40: Locating Engine Coolant Temperature Sensor (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

FUEL LEVEL SENSOR

Removal & Installation (Ascender)

1. Remove fuel pump assembly. See **FUEL PUMP** .
2. Disconnect fuel pump electrical connector. See **Fig. 41** .
3. Remove retaining clip from fuel level sensor electrical connector.

4. Disconnect electrical connector from under fuel sender cover.
5. Remove sensor retaining clip. Squeeze locking tangs and remove fuel level sensor.
6. To install, reverse removal procedure.

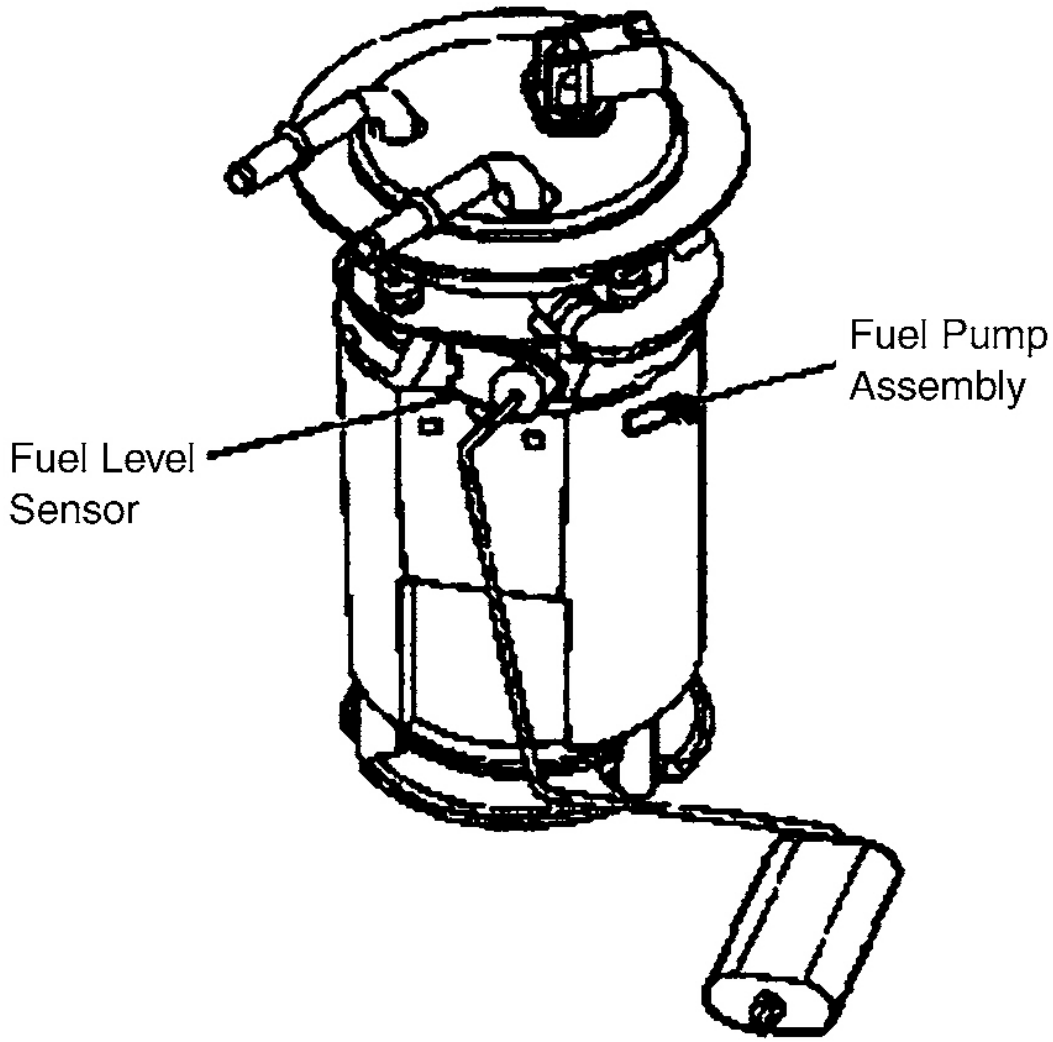


Fig. 41: Locating Fuel Level Sensor (Ascender)
Courtesy of ISUZU MOTOR CO.

FUEL TANK PRESSURE SENSOR

NOTE: Fuel tank pressure sensor may also be known as fuel vapor pressure sensor.

Removal & Installation (Ascender)

NOTE: Fuel vapor pressure sensor may also be known as fuel tank pressure sensor.

1. Raise and support the vehicle.
2. Disconnect the fuel tank pressure sensor electrical connector (3). See **Fig. 42** .
3. Open the retaining clip, if equipped.
4. Remove the fuel tank pressure sensor. To install, reverse removal procedure.

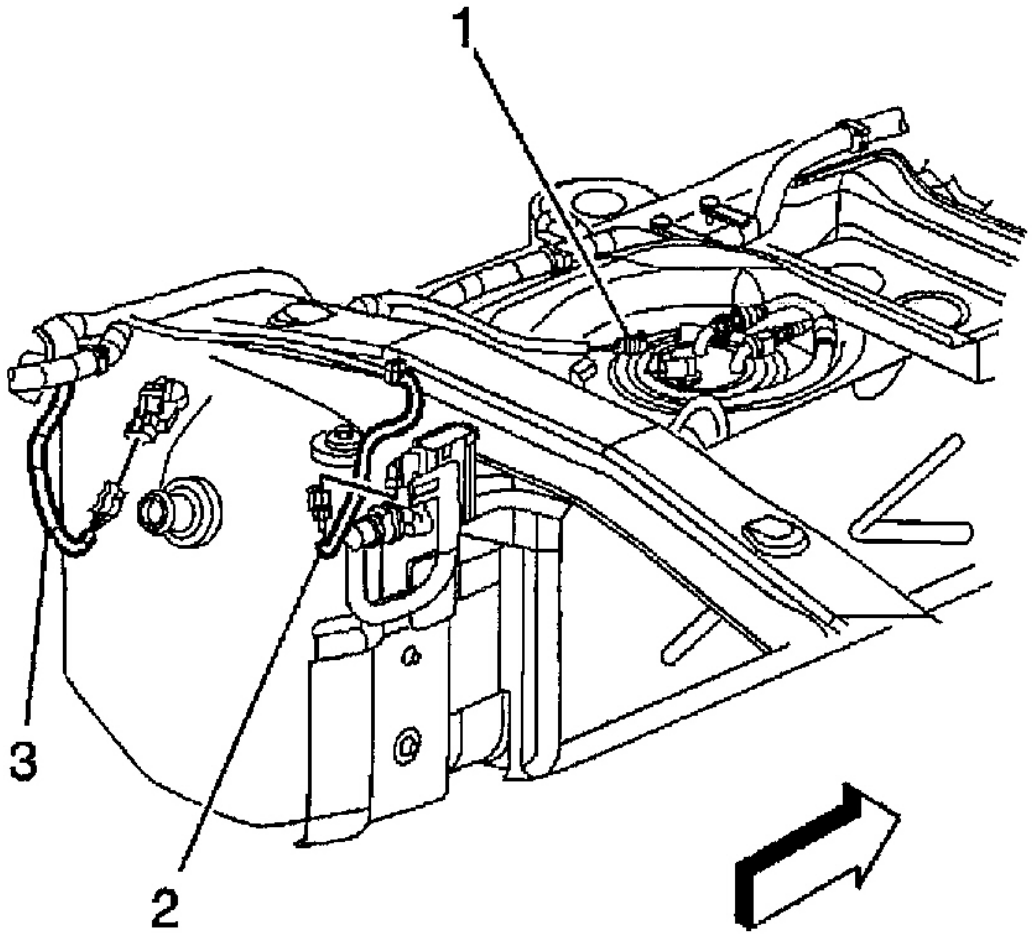
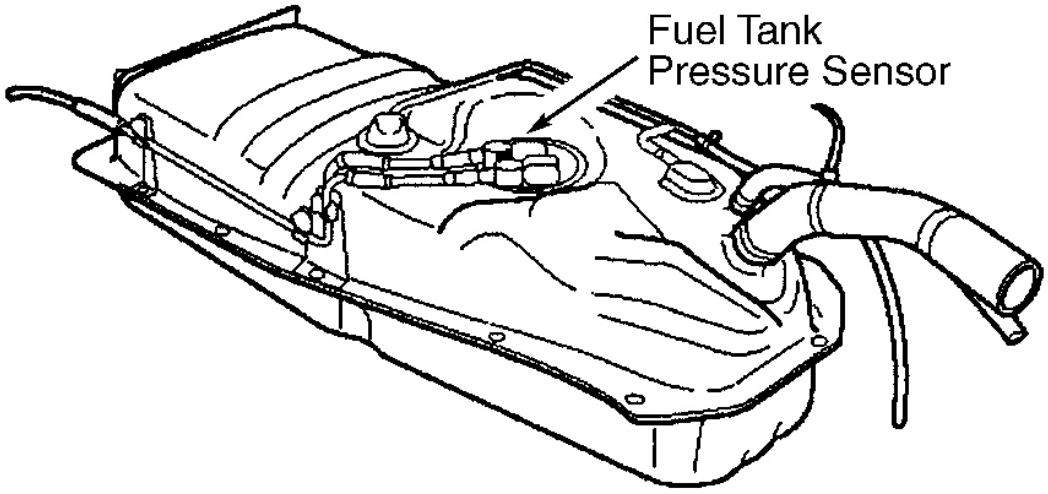


Fig. 42: Removing & Installing Fuel Tank Pressure Sensor (Ascender)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport)

1. Remove in-tank fuel pump assembly. See **FUEL PUMP** under FUEL SYSTEM.
2. Carefully pry Fuel Vapor Pressure (FVP) sensor from top of fuel tank. See **Fig. 43** .
3. Carefully inspect sensor and sensor grommet for cracks or tears.
4. Install grommet to fuel pump assembly.
5. Install FVP senor by inserting nipple firmly into grommet. Twist and push sensor until wide portion of sensor shows on other side of grommet.
6. Finish installation by reversing removal procedure.



G00253294

Fig. 43: Locating Fuel Vapor Pressure Sensor (Axiom, Rodeo & Rodeo Sport)
Courtesy of ISUZU MOTOR CO.

HEATED OXYGEN SENSOR

Removal & Installation (Ascender 4.2L - Sensor 1)

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

CAUTION: Correct tightening of oxygen sensor is critical to prevent crushing glass beads in graphite anti-seize compound. Crushing glass beads will cause sensor to seize in exhaust pipe. This may necessitate repair or replacement of exhaust pipe upon next removal.

NOTE: The Heated Oxygen Sensor 1 (HO2S 1) is located in the exhaust manifold. See

Fig. 44 . Heated Oxygen Sensor 2 (HO2S 2) is mounted in the exhaust pipe behind the catalytic converter. See Fig. 45 . Oxygen sensors are equipped with a permanent pigtail which must remain intact when removing sensor.

1. Turn ignition off.
2. Ensure oxygen sensor is free of contaminants. DO NOT use cleaning solvents of any type. Oxygen sensor may be difficult to remove when engine temperature is below 120°F (48°C). Excessive removal force may damage threads in exhaust manifold.
3. Disconnect harness connector from HO2S 1. Carefully remove HO2S 1 from exhaust manifold using Oxygen Sensor Tool (J-39194-B).
4. Whenever oxygen sensor is removed, coat threads with Anti-Seize Compound (5613695) before reinstallation. New oxygen sensors already have this compound applied to threads.
5. Install oxygen sensor into exhaust manifold. Tighten oxygen sensor to specification. See **TORQUE SPECIFICATIONS** . Reconnect harness connector to oxygen sensor.

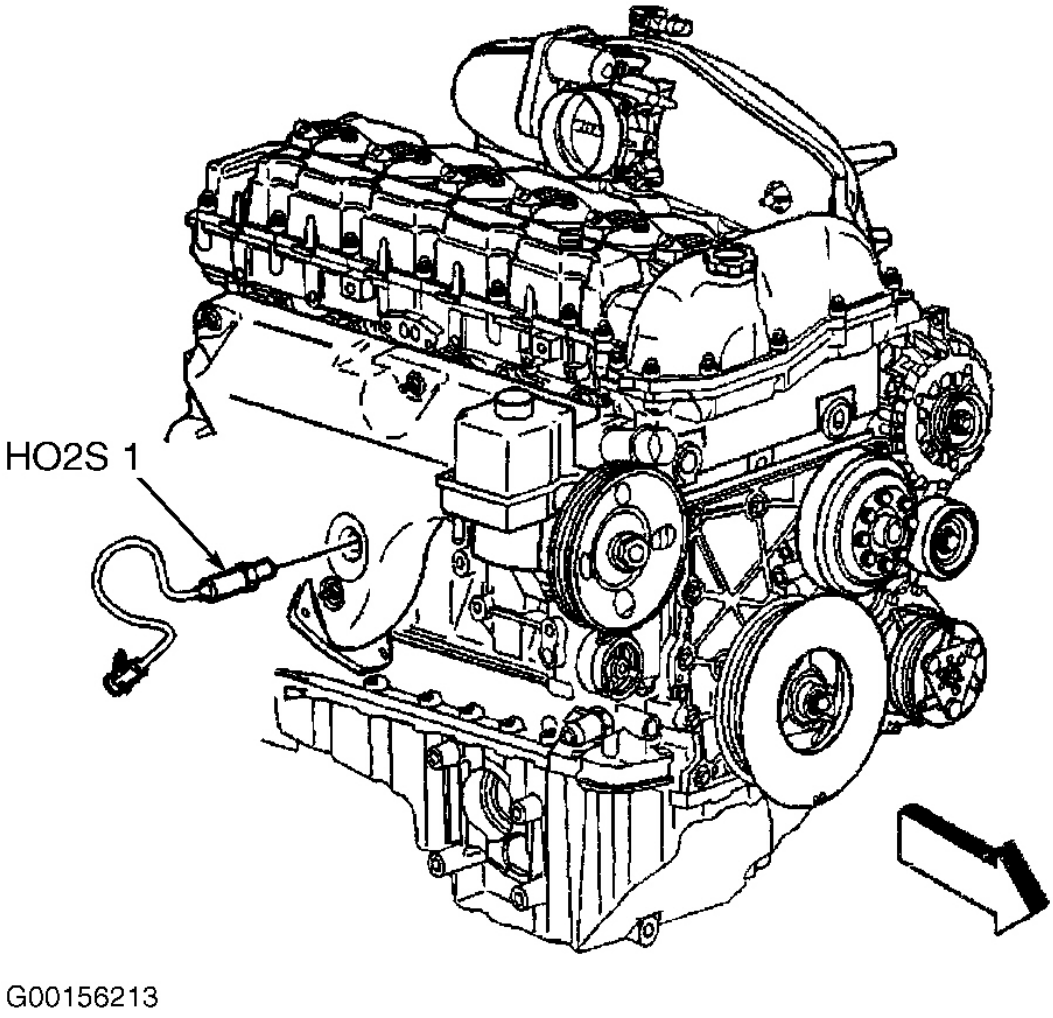


Fig. 44: Locating Heated Oxygen Sensor 1 (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

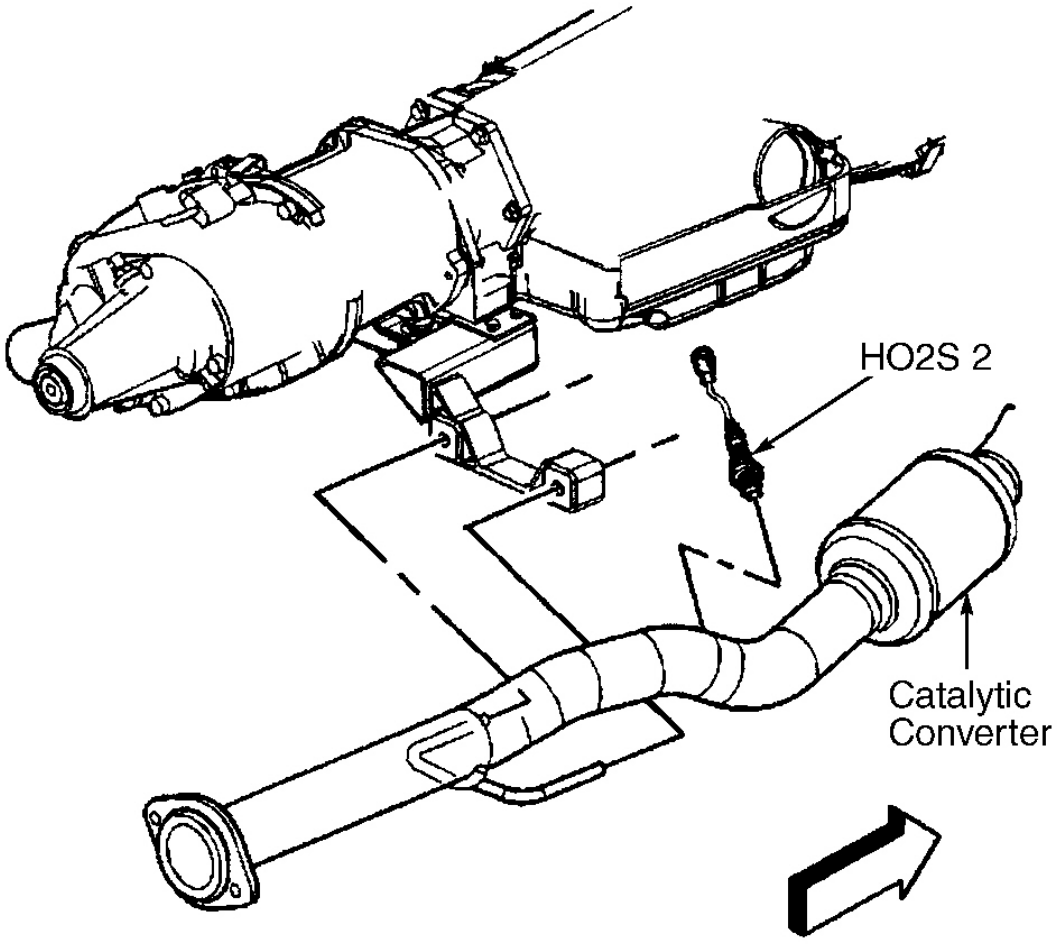


Fig. 45: Locating Heated Oxygen Sensor 2 (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 4.2L - Sensor 2)

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

CAUTION: Correct tightening of oxygen sensor is critical to prevent crushing glass beads in graphite anti-seize compound. Crushing glass beads will cause sensor to seize in exhaust pipe. This may necessitate repair or replacement of exhaust pipe upon next removal.

NOTE: The Heated Oxygen Sensor 1 (HO2S 1) is located in the exhaust manifold. See

Fig. 44 . Heated Oxygen Sensor 2 (HO2S 2) is mounted in the exhaust pipe behind the catalytic converter. See Fig. 45 . Oxygen sensors are equipped with a permanent pigtail which must remain intact when removing sensor.

1. Turn ignition off.
2. Raise and support vehicle.
3. Ensure oxygen sensor is free of contaminants. DO NOT use cleaning solvents of any type. Oxygen sensor may be difficult to remove when engine temperature is below 120°F (48°C). Excessive removal force may damage threads in exhaust pipe.
4. Disconnect harness connector from HO2S 2. Carefully remove HO2S 2 from exhaust pipe using Oxygen Sensor Tool (J-39194-B).
5. Whenever oxygen sensor is removed, coat threads with anti-seize compound (5613695) before reinstallation. New oxygen sensors already have this compound applied to threads.
6. Install oxygen sensor into exhaust pipe. Tighten oxygen sensor to specification. See **TORQUE SPECIFICATIONS** . Reconnect harness connector to oxygen sensor. Lower vehicle.

Removal & Installation (Ascender 5.3L - Banks 1 & 2, Sensor 1)

NOTE: The oxygen sensor may be difficult to remove when the engine temperature is below 120°F (48°C). Excessive force may damage threads in the exhaust manifold or the exhaust pipe.

1. Remove the catalytic converter.
2. Remove the Connector Position Assurance (CPA) retainer.
3. Disconnect the HO2S electrical connector (3). See **Fig. 46** and **Fig. 47** .
4. Connect the HO2S electrical connector (3). See **Fig. 46** .
5. Install the CPA retainer.
6. Install the catalytic converter.

NOTE: A special anti-seize compound is used on the HO2S threads. The compound consists of liquid graphite and glass beads. The graphite tends to burn away, but the glass beads remain, making the sensor easier to remove. New, or service replacement sensors already have the compound applied to the threads. If the sensor is removed from an exhaust component and if for any reason the sensor is to be reinstalled, the threads must have anti-seize compound applied before the reinstallation.

7. If reinstalling the old sensor, coat the threads with anti-seize compound GM P/N (12377953).

NOTE: If the HO2S sensor is connected to the main wiring harness during installation, rotate the HO2S sensor several turns counterclockwise before threading the HO2S sensor into the catalytic converter. This action of initially reverse winding of the pigtail wires will prevent a condition where

the HO2S sensor pigtail wires become severely twisted or binding once the HO2S sensor is installed into the catalytic converter.

8. Install the HO2S (2). See **Fig. 47** . Tighten the sensor to specification. See **TORQUE SPECIFICATIONS** .

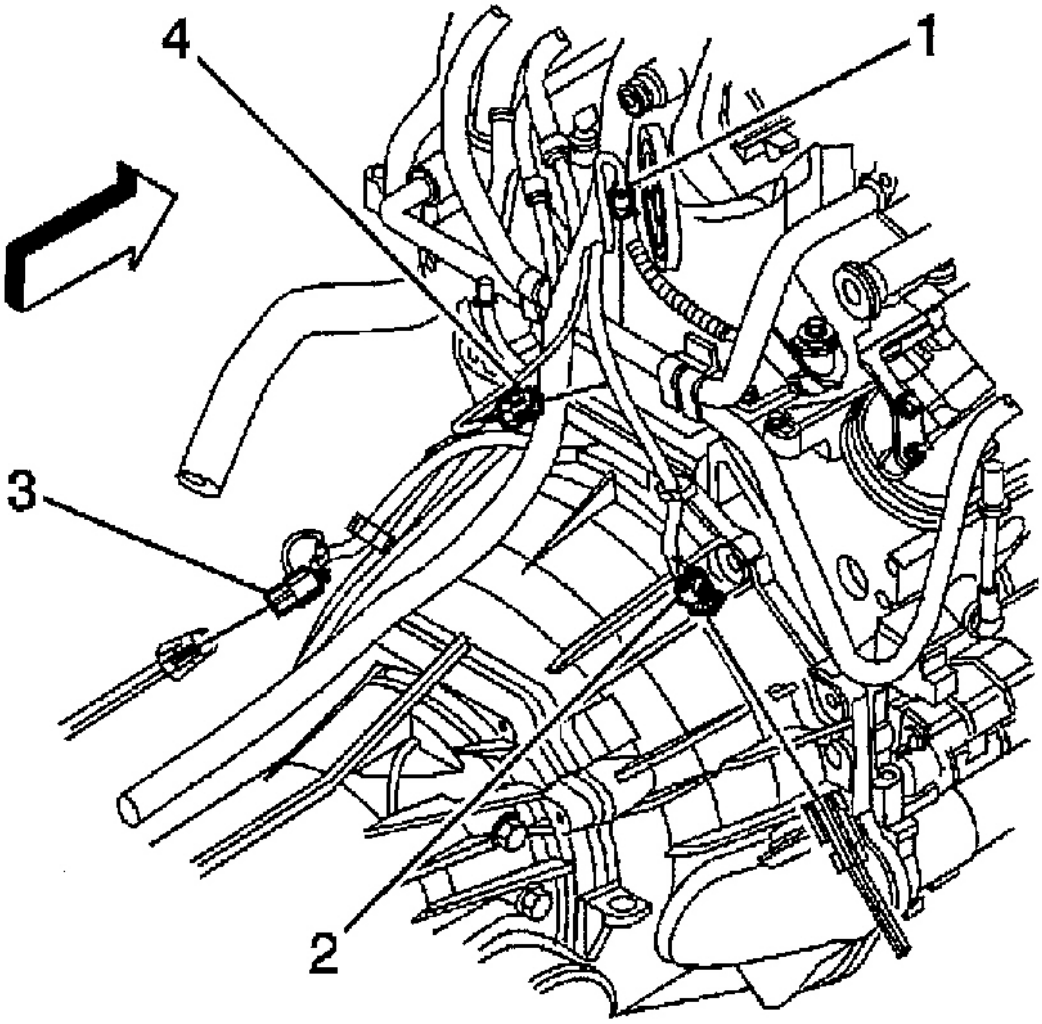


Fig. 46: Locating Heated Oxygen Sensor - Banks 1 & 2 Sensor 1 (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

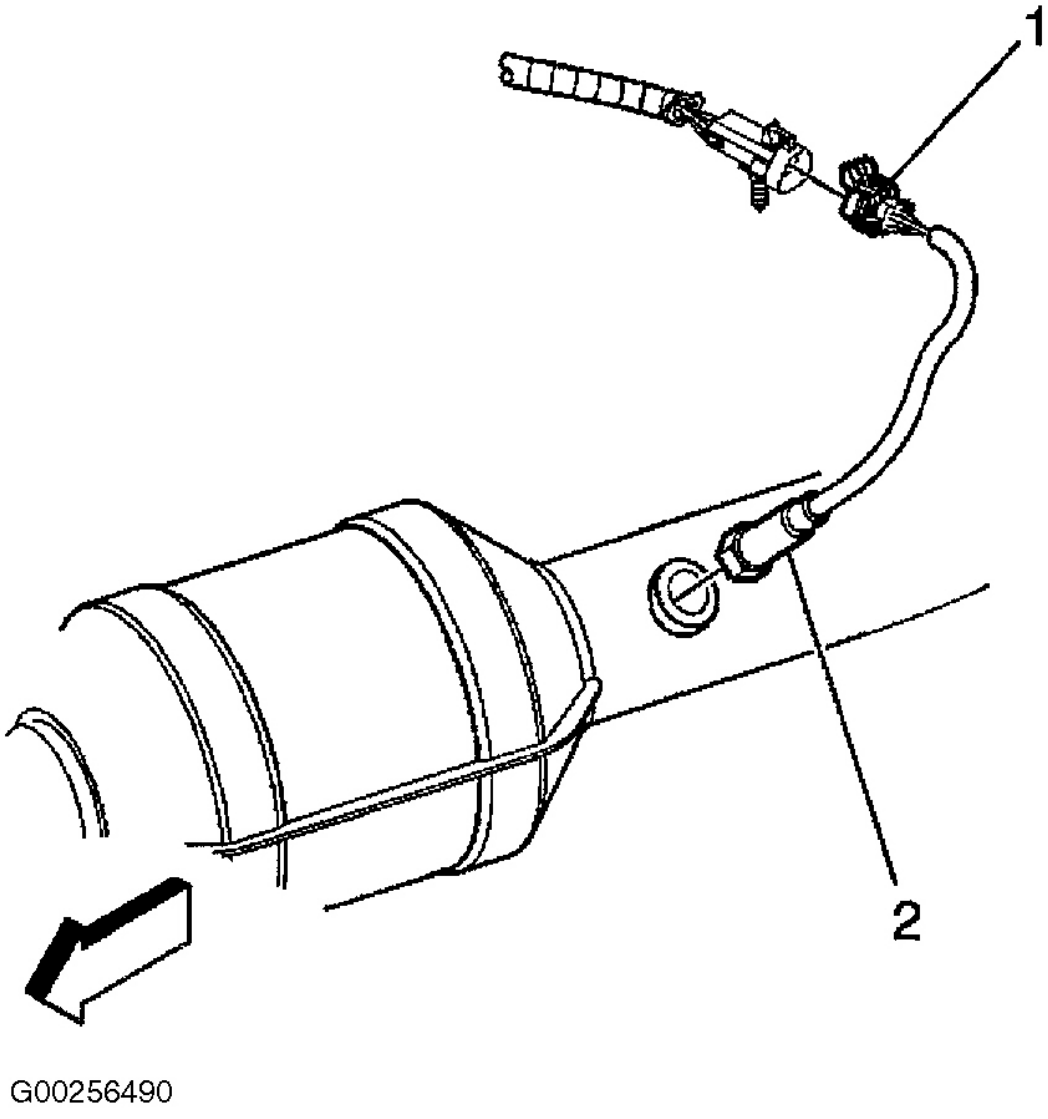


Fig. 47: Removing & Installing Heated Oxygen Sensor - Banks 1 & 2 Sensor 1 (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L - Banks 1 & 2, Sensor 2)

NOTE: The oxygen sensor may be difficult to remove when the engine temperature is below 120°F (48°C). Excessive force may damage threads in the exhaust manifold or the exhaust pipe.

1. Raise and support the vehicle.
2. Remove the Connector Position Assurance (CPA) retainer. See **Fig. 48** .

3. Disconnect the Heated Oxygen Sensor (HO2S) electrical connector.
4. Remove the HO2S (2). See **Fig. 49** and **Fig. 50** .

NOTE: **A special anti-seize compound is used on the HO2S threads. The compound consists of liquid graphite and glass beads. The graphite tends to burn away, but the glass beads remain, making the sensor easier to remove. New, or service replacement sensors already have the compound applied to the threads. If the sensor is removed from an exhaust component and if for any reason the sensor is to be reinstalled, the threads must have anti-seize compound applied before the reinstallation.**

5. If reinstalling the old sensor, coat the threads with Anti-Seize Compound GM P/N (12377953).
6. Install the HO2S (2). See **Fig. 49** and **Fig. 50** . Tighten the sensor to specification. See **TORQUE SPECIFICATIONS** .
7. Connect the HO2S electrical connector.
8. Install the CPA retainer. See **Fig. 48** .
9. Lower the vehicle.

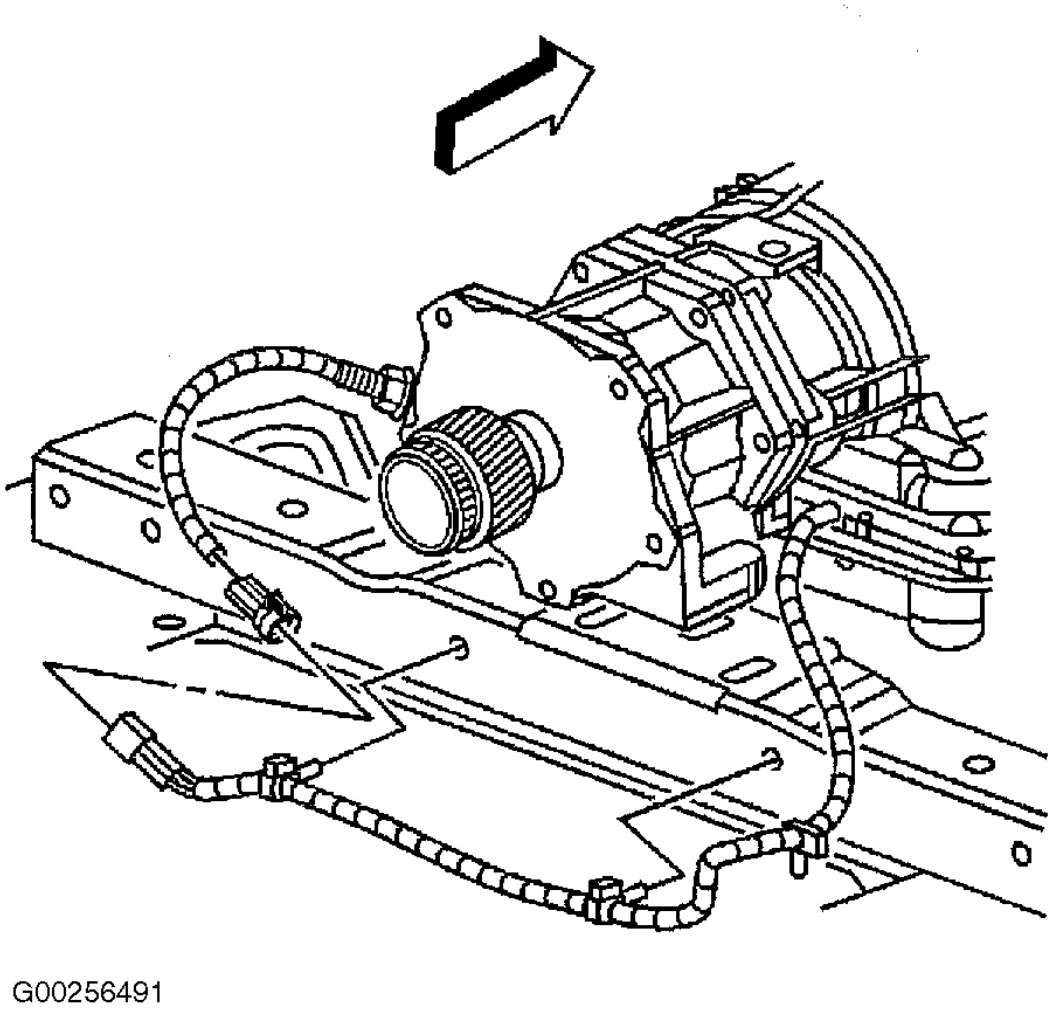


Fig. 48: Locating Connector Position Assurance Retainer (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

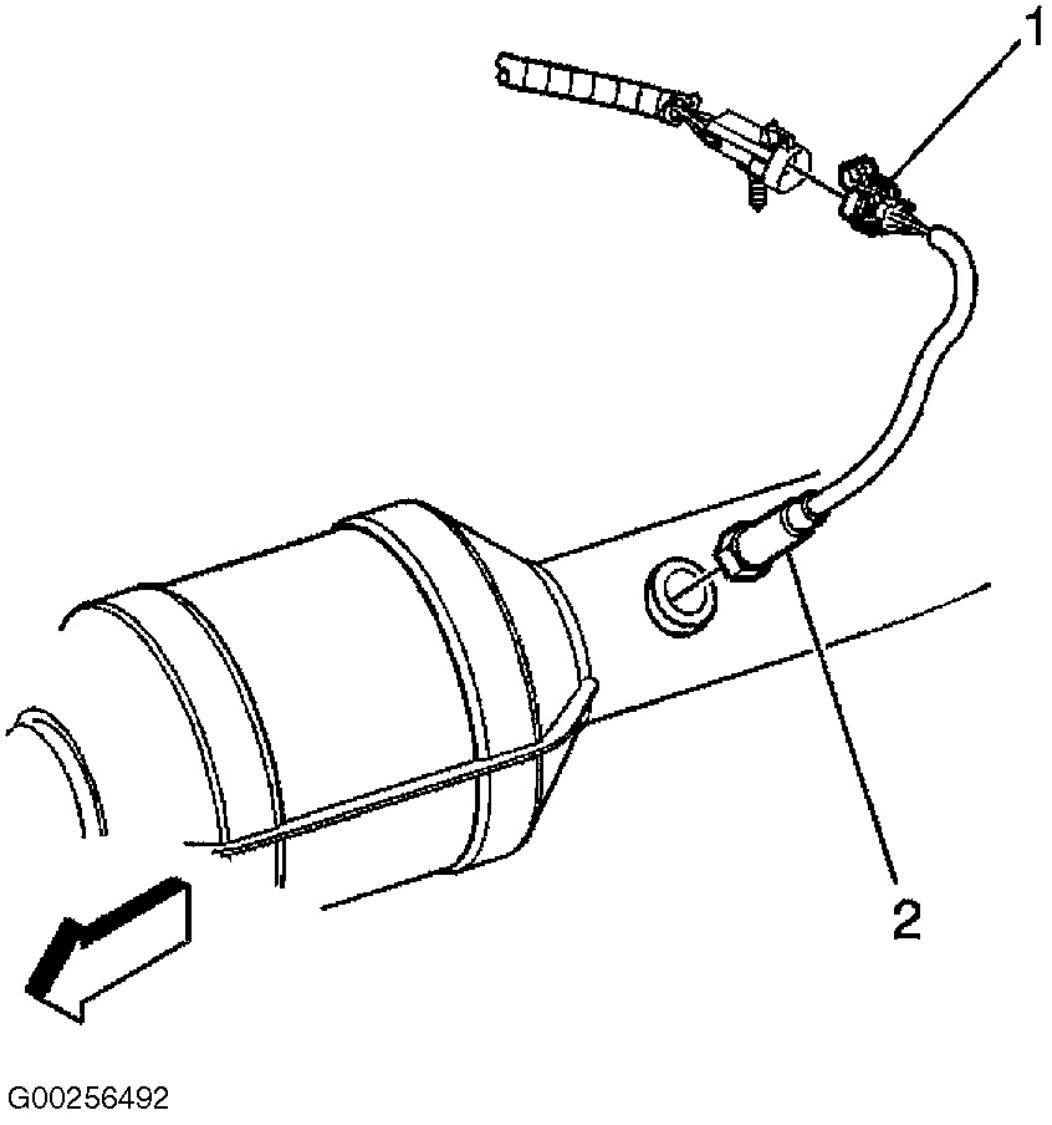


Fig. 49: Removing & Installing Heated Oxygen Sensor - Bank 1 Sensor 2 (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

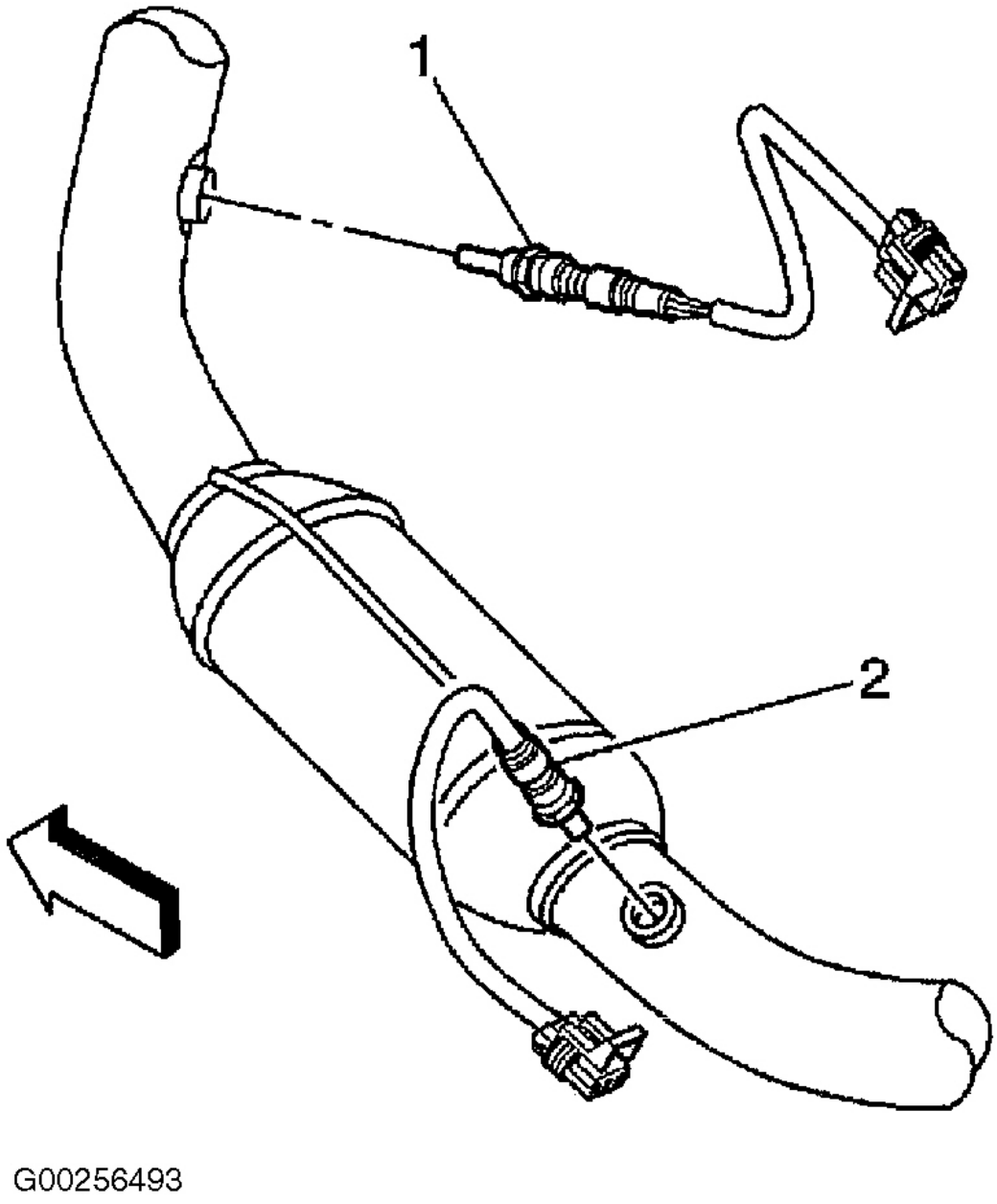


Fig. 50: Removing & Installing Heated Oxygen Sensor - Banks 1 &2 Sensor 2 (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

1. Disconnect negative battery cable.
2. Heated Oxygen Sensors (HO2S) are mounted in exhaust pipe before and after catalytic converters. See

Fig. 51 . HO2S is equipped with a permanent pigtail, which must be protected from damage when HO2S is removed.

3. Ensure HO2S is free of contaminants. Avoid using cleaning solvents of any type. HO2S may be difficult to remove if engine temperature is less than 120°F (48°C). If re-using HO2S, always use anti-seize compound on threads before installation. Tighten HO2S to specification. See **TORQUE SPECIFICATIONS** .

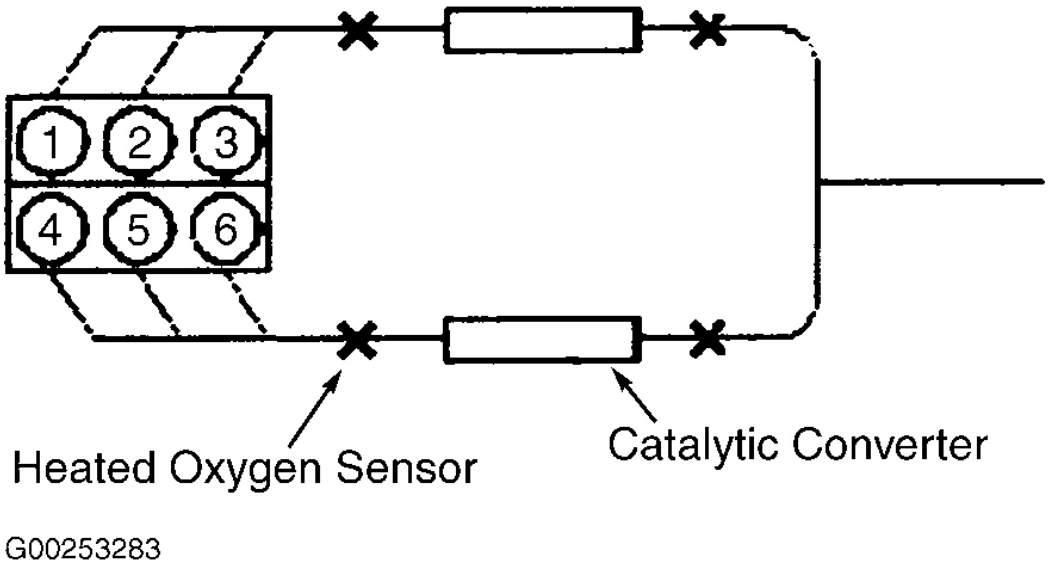


Fig. 51: Locating Heated Oxygen Sensors (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

INTAKE AIR TEMPERATURE SENSOR

Removal & Installation (All Models Except Ascender 5.3L)

1. IAT sensor is located in air intake pipe. See **Fig. 52** -**Fig. 54** . Disconnect IAT sensor electrical connector.
2. Remove sensor from grommet. Check grommet for cracks or tears, replace as necessary.
3. To install, reverse removal procedure.

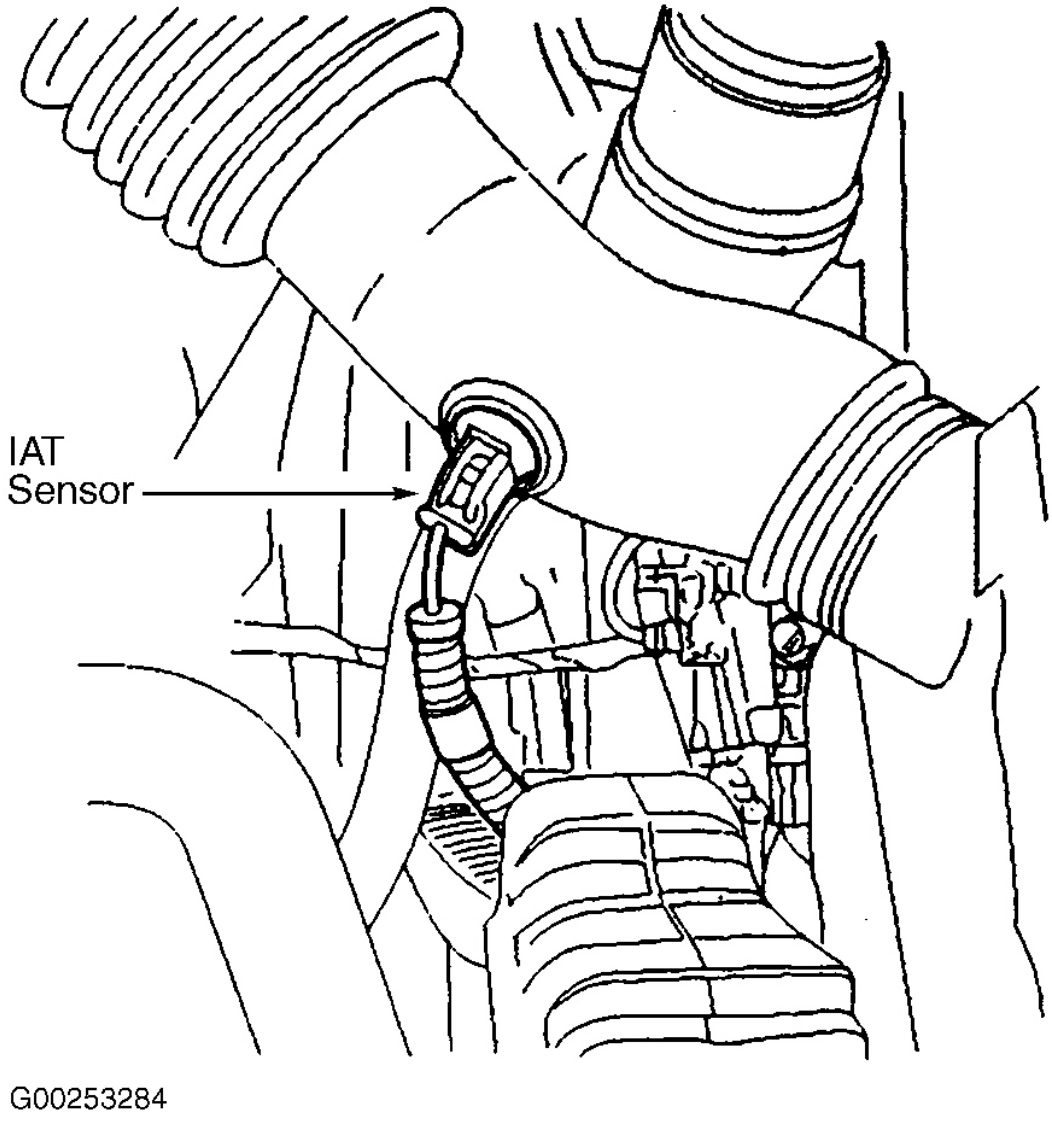


Fig. 52: Locating Intake Air Temperature Sensor (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

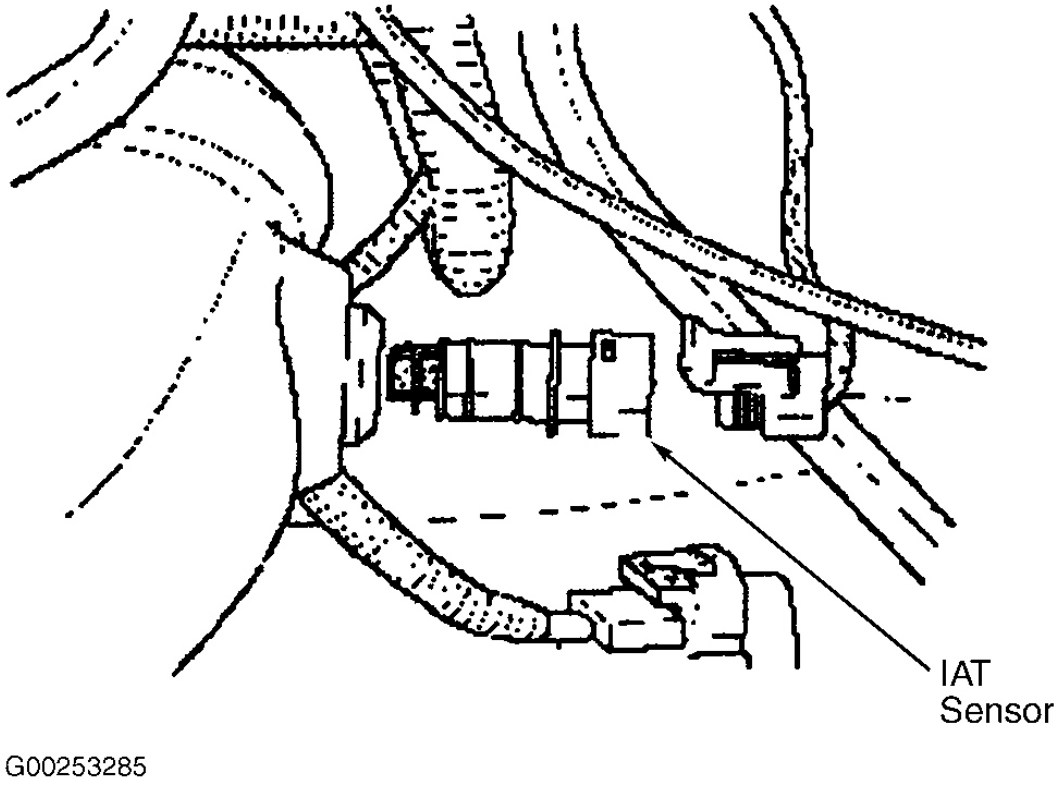


Fig. 53: Locating Intake Air Temperature Sensor (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

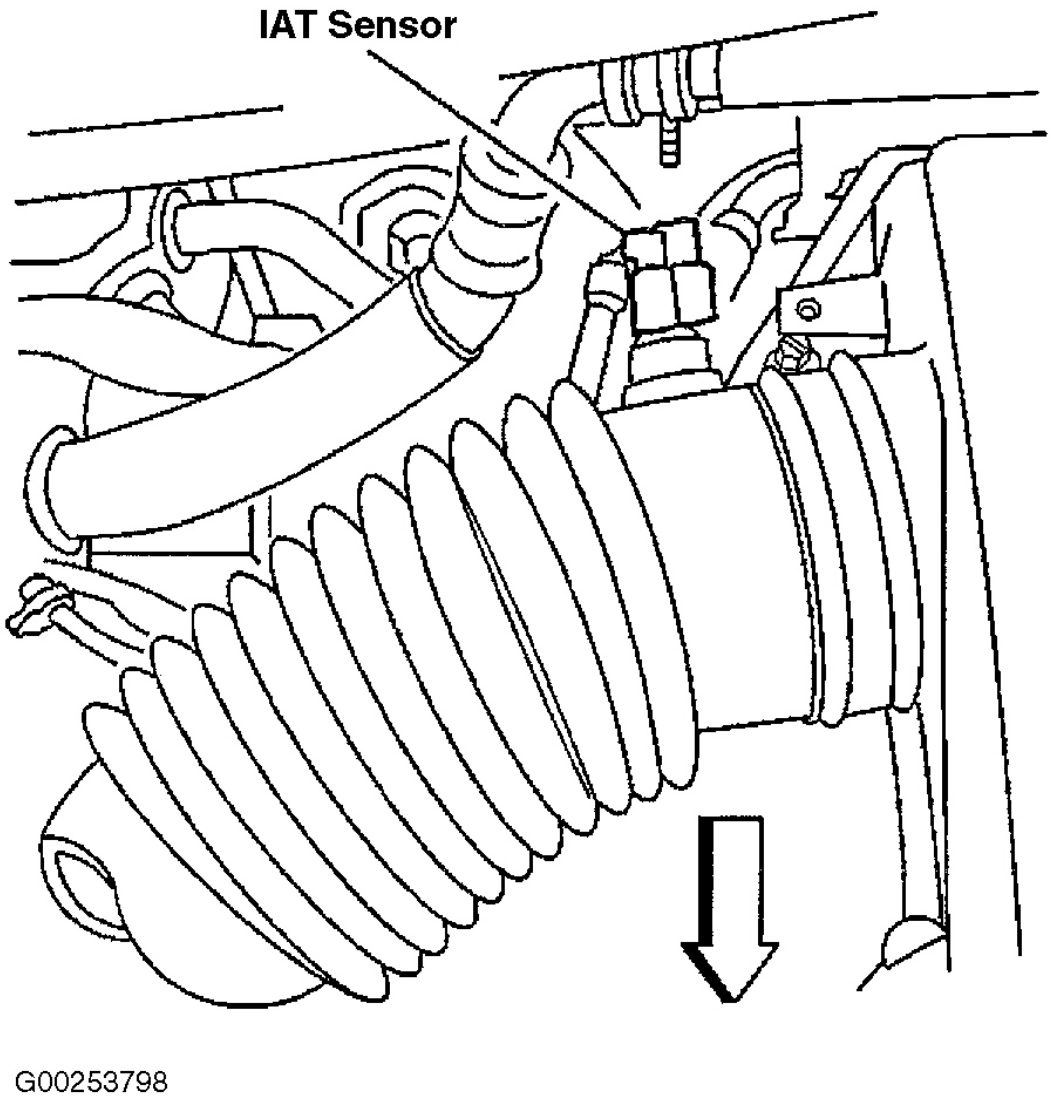


Fig. 54: Locating Intake Air Temperature Sensor (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

Intake Air Temperature (IAT) sensor is integral with Mass Air Flow (MAF) sensor. See **MASS AIR FLOW SENSOR/INTAKE AIR TEMPERATURE SENSOR** .

ION SENSING MODULE (AXIOM, RODEO & RODEO SPORT 3.2L)

Removal & Installation

1. Disconnect negative battery cable.
2. Disconnect 3 ION sensing module electrical connectors.
3. Remove 3 bolts holding module to intake manifold. Remove module. See **Fig. 55** .
4. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

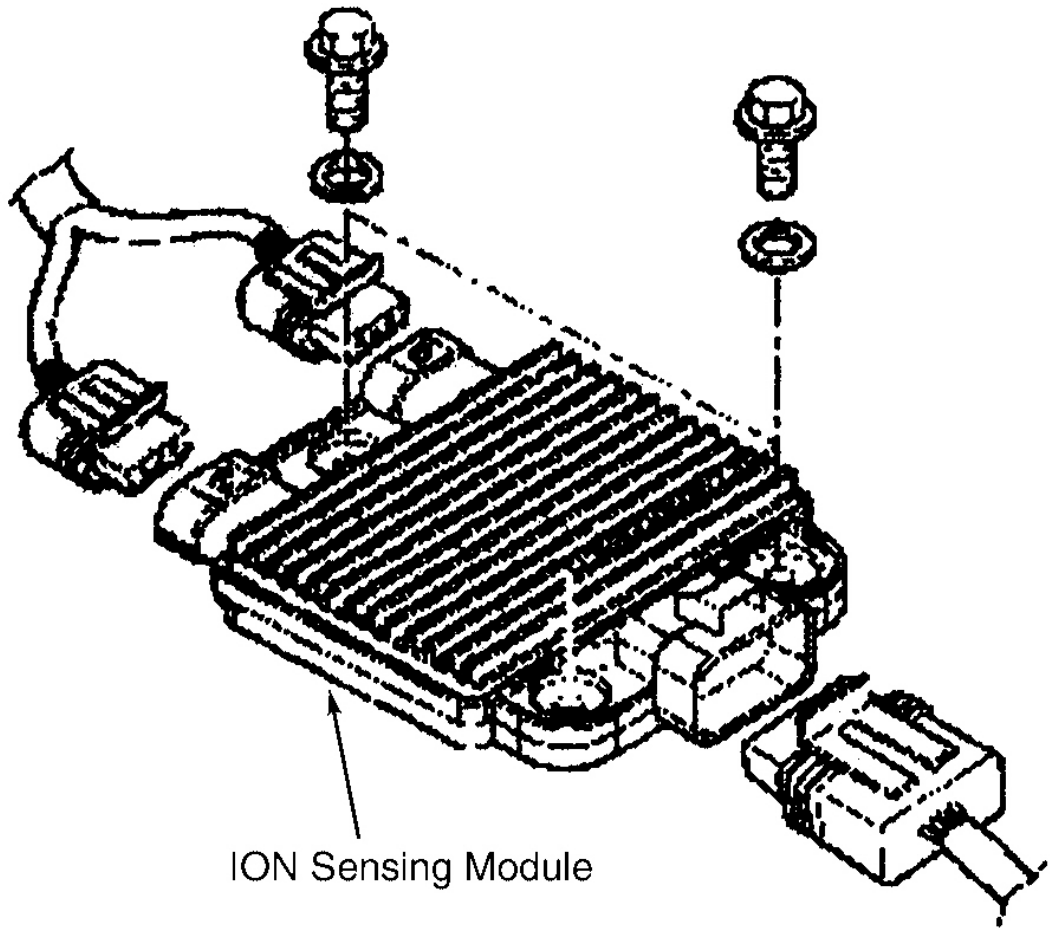


Fig. 55: Removing & Installing ION Sensing Module (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

KNOCK SENSOR

Removal & Installation (Ascender 4.2L)

1. Turn ignition off.
2. Disconnect negative battery cable.
3. Raise and support vehicle.
4. Disconnect knock sensor harness connector(s). See **Fig. 56** .
5. Remove knock sensor retaining bolt and knock sensor.
6. To install, reverse removal procedure. Tighten knock sensor retaining bolt(s) to specification. See **TORQUE SPECIFICATIONS** .

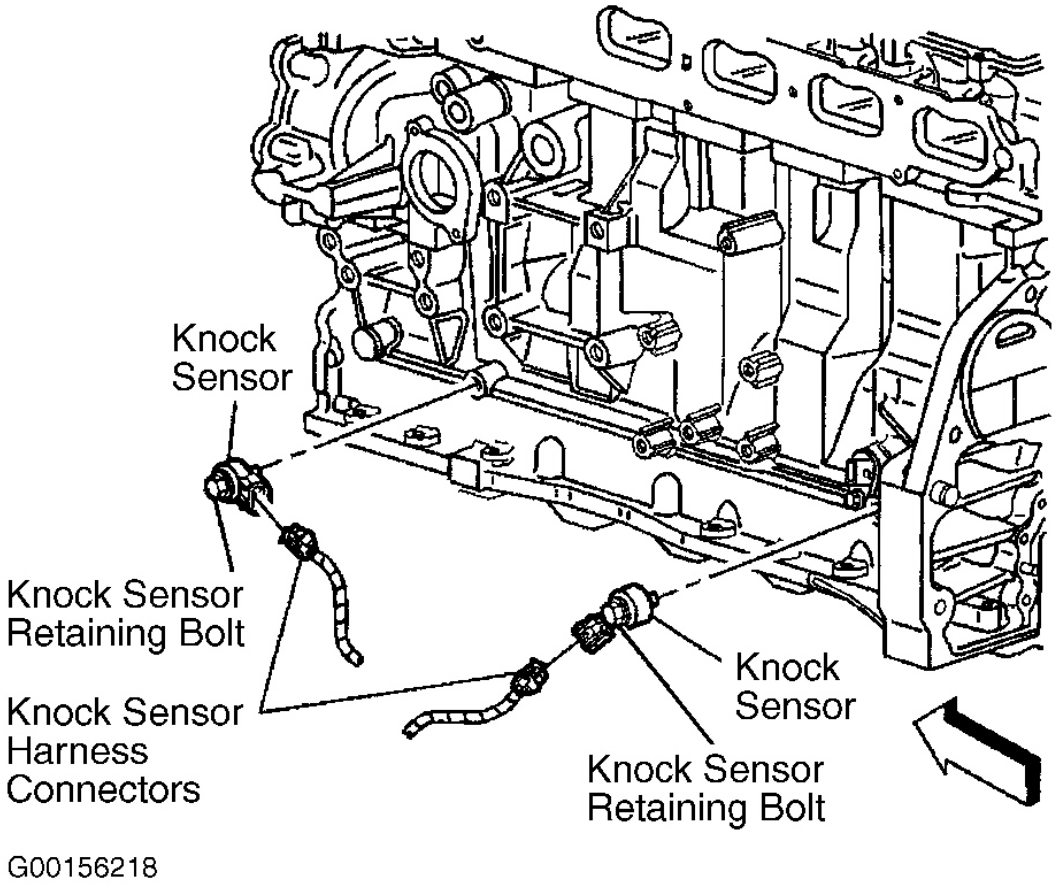


Fig. 56: Locating Knock Sensors (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

1. Remove the intake manifold. See **INTAKE MANIFOLD** under FUEL SYSTEMS.
2. Gently pry up the knock sensor rubber covers. See **Fig. 57** .
3. Disconnect knock sensor harness connectors. Remove knock sensors. See **Fig. 58** .

4. To install, reverse removal procedure. Tighten knock sensors to specification. See **TORQUE SPECIFICATIONS**

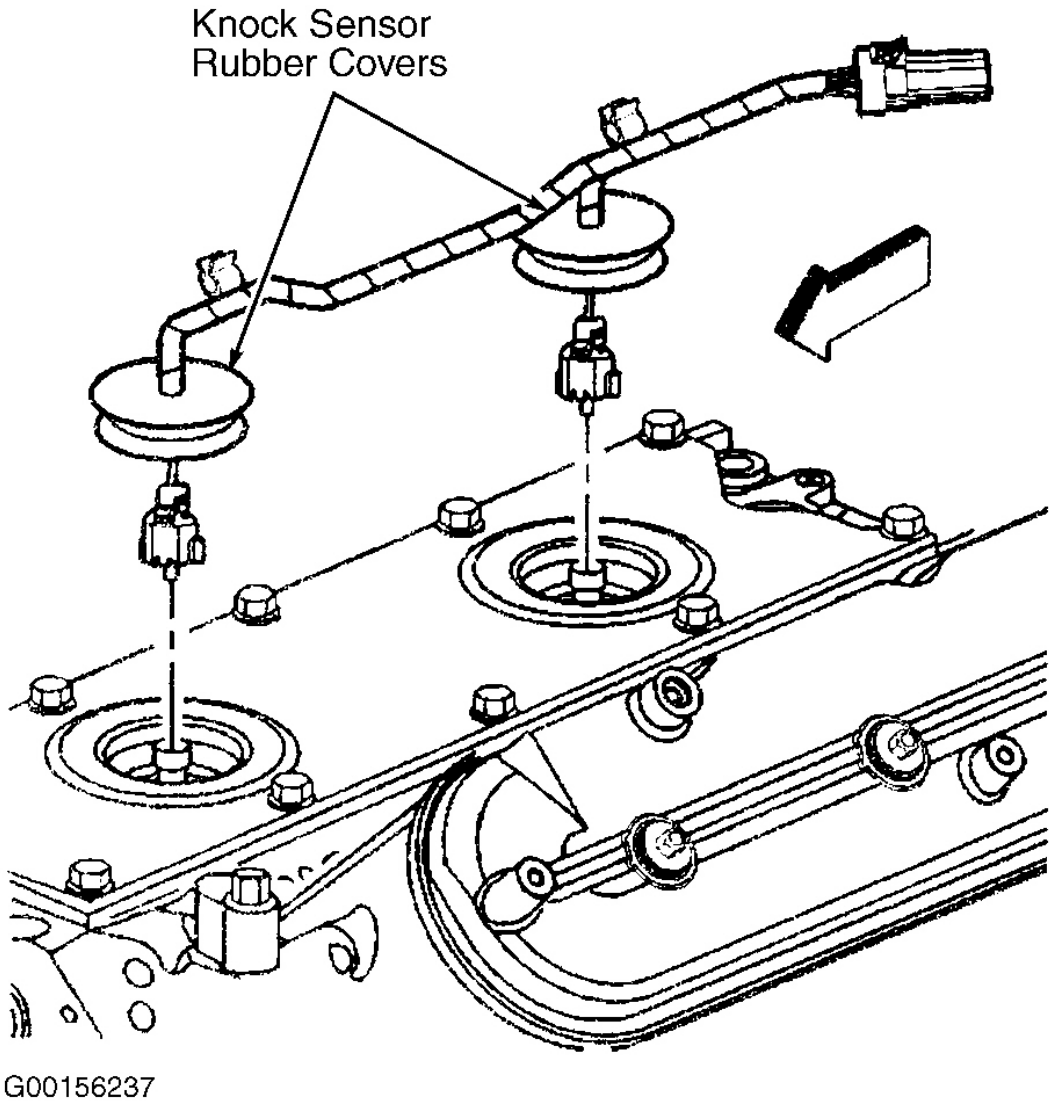


Fig. 57: Disconnecting Knock Sensor Harness Connectors (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

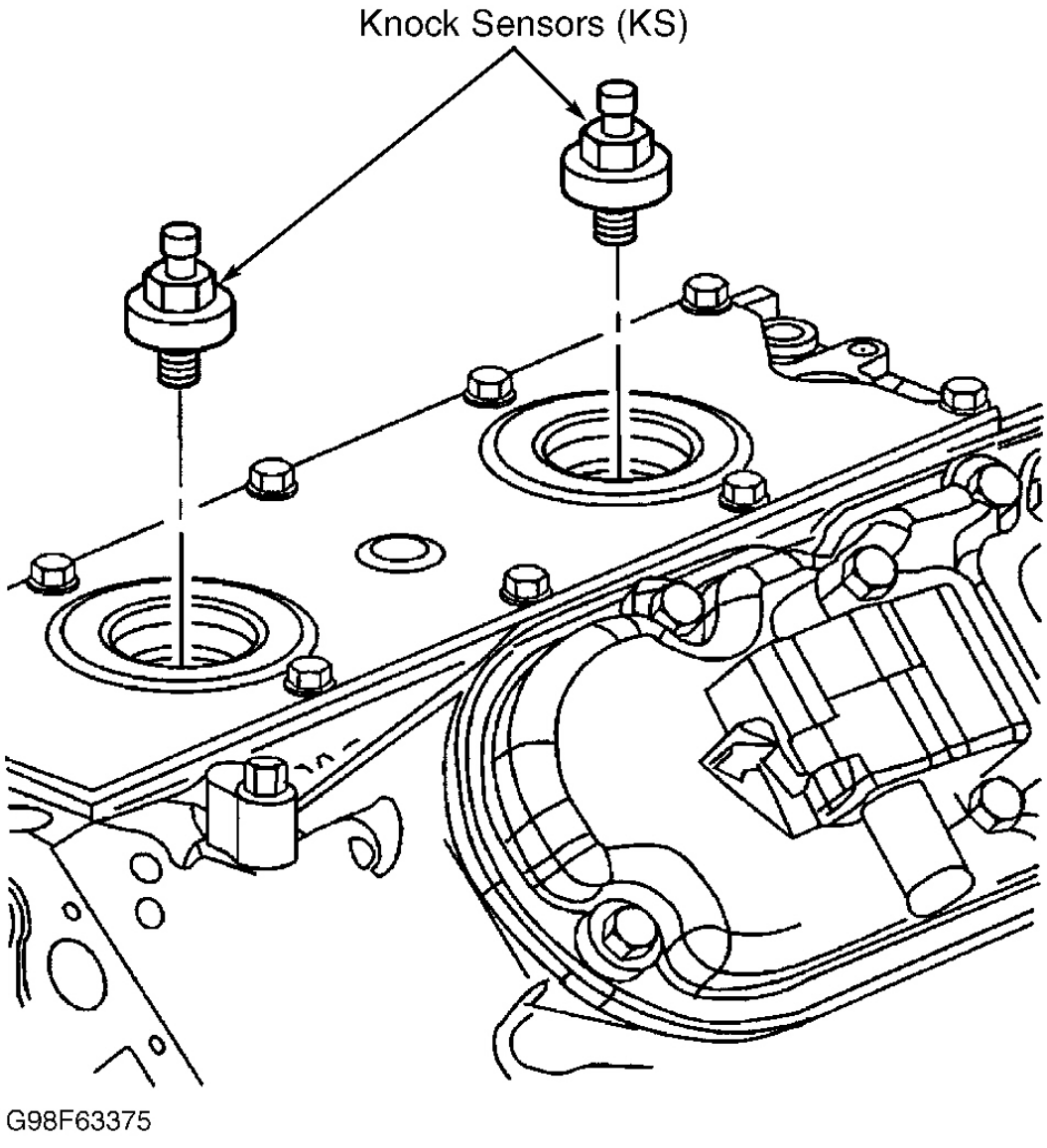


Fig. 58: Locating Knock Sensors (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Disconnect negative battery cable.
2. Disconnect Knock Sensor (KS) electrical connector. See **Fig. 59** . Remove KS with mounting bolt.
3. To install, reverse removal procedure.

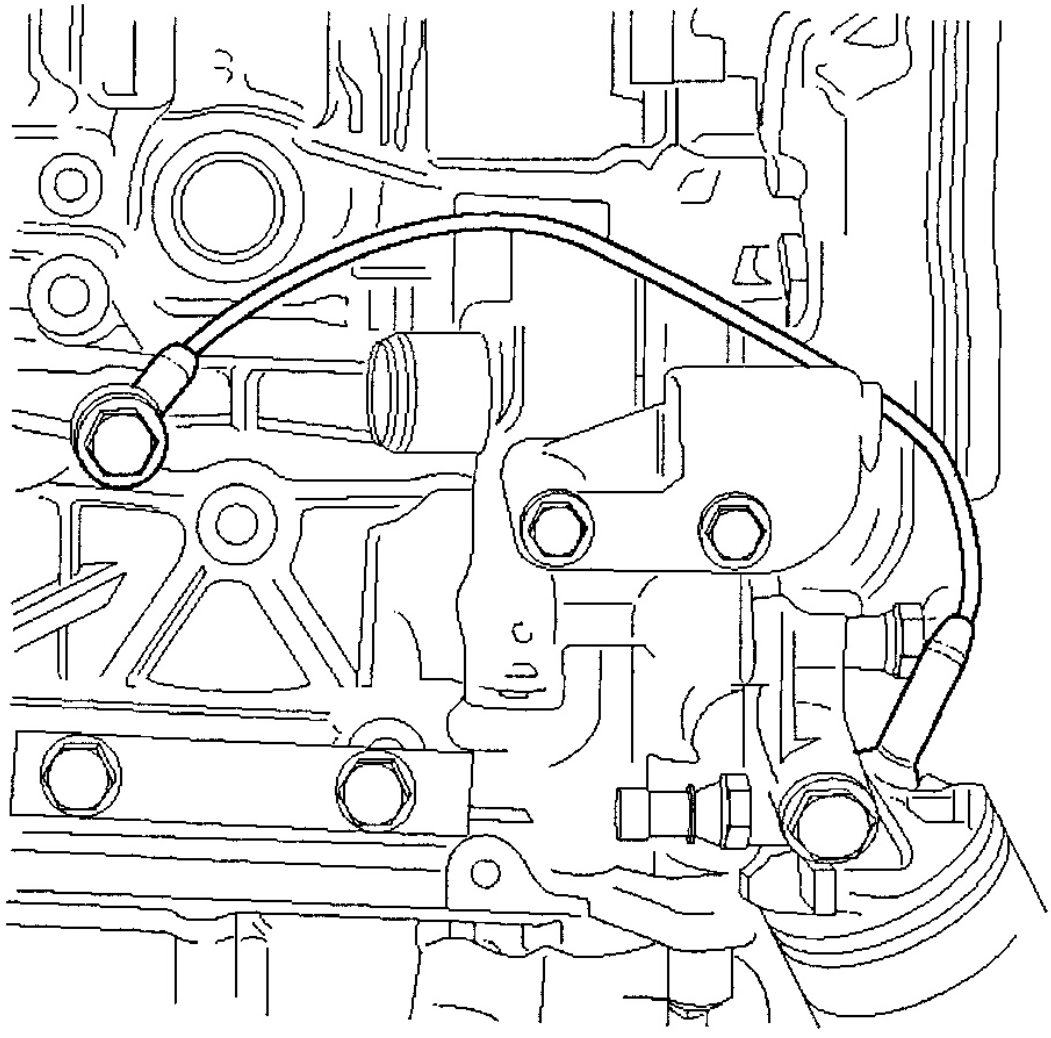


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Fig. 59: Removing & Installing Knock Sensor (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

MANIFOLD ABSOLUTE PRESSURE SENSOR

Removal & Installation (Ascender 4.2L)

1. Turn ignition off.
2. Disconnect Manifold Absolute Pressure (MAP) sensor harness connector. See **Fig. 60** . MAP sensor is located on top left of engine.
3. Press MAP sensor retainer locking tabs inward and pull upward to remove retainer from intake manifold. Remove MAP sensor from intake manifold.

4. To install, reverse removal procedure. Replace MAP sensor seal as necessary.

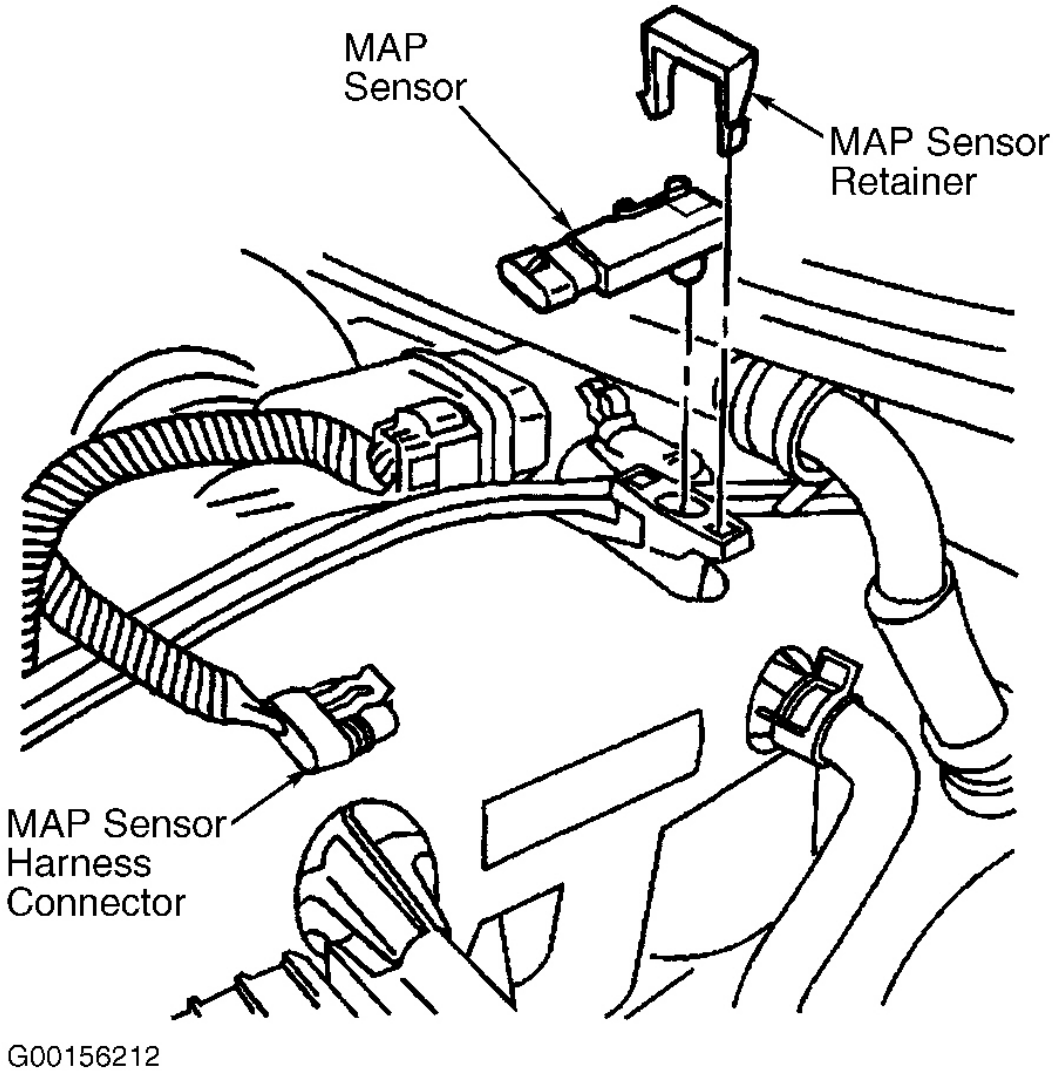

Fig. 60: Removing & Installing Manifold Absolute Pressure Sensor (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

NOTE: Numbers in parentheses refer to numbers in illustrations.

1. Disconnect the manifold absolute pressure (MAP) sensor electrical connector (3). See **Fig. 61** .
2. Remove the MAP sensor (1) from the intake manifold. See **Fig. 62** .

3. To install, reverse removal procedure. Lightly coat the MAP sensor seal with clean engine oil before installing the sensor.

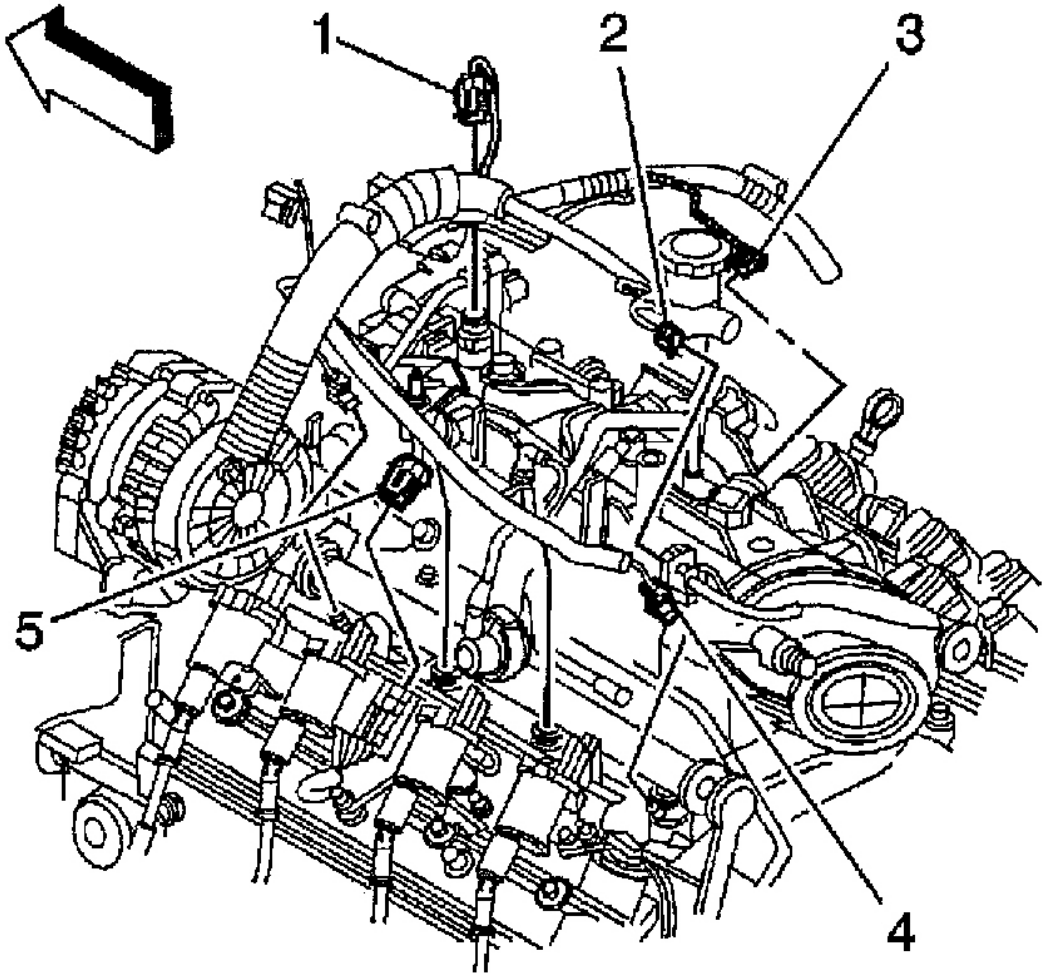

Fig. 61: Locating Manifold Absolute Pressure Sensor (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

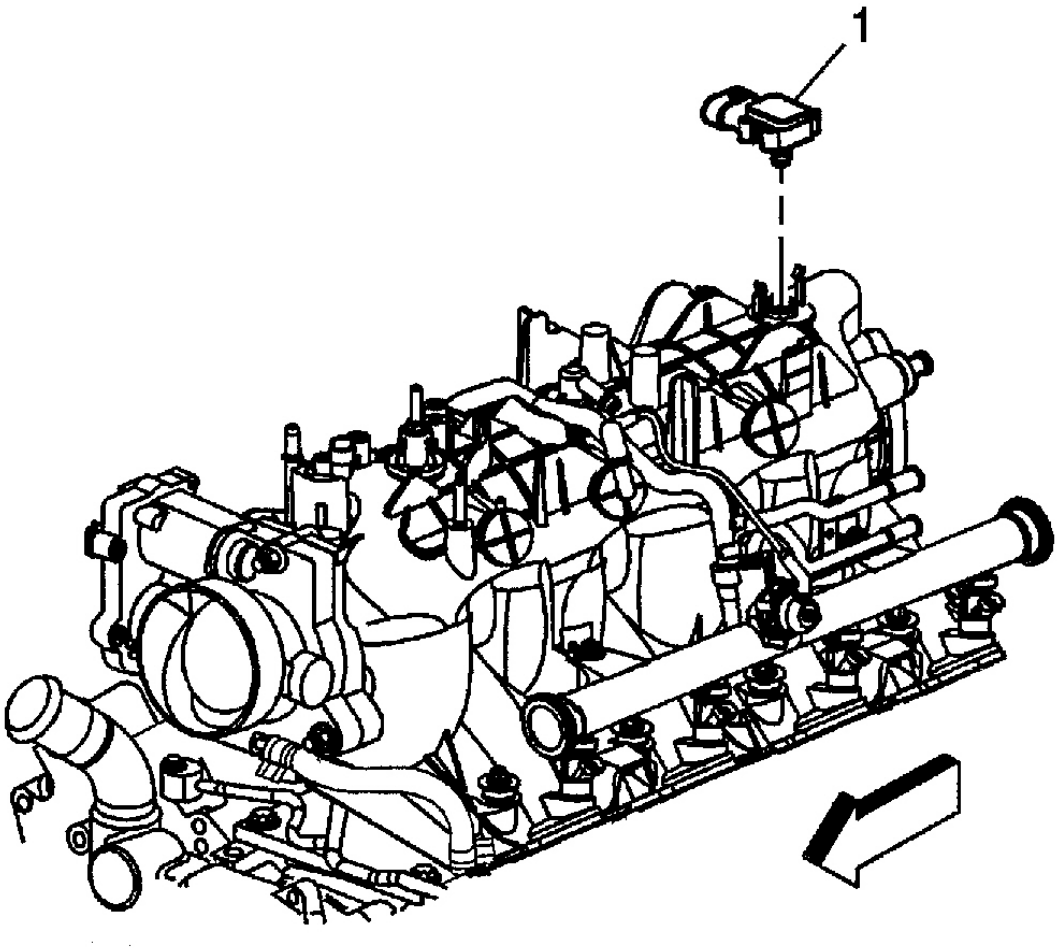

Fig. 62: Removing & Installing Manifold Absolute Pressure Sensor (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

1. Disconnect negative battery cable.
2. Disconnect electrical connector from manifold absolute pressure (MAP) sensor.
3. Remove the bolt securing MAP sensor to mounting bracket on common chamber. See **Fig. 63** .
4. Remove the MAP sensor from mounting bracket.
5. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

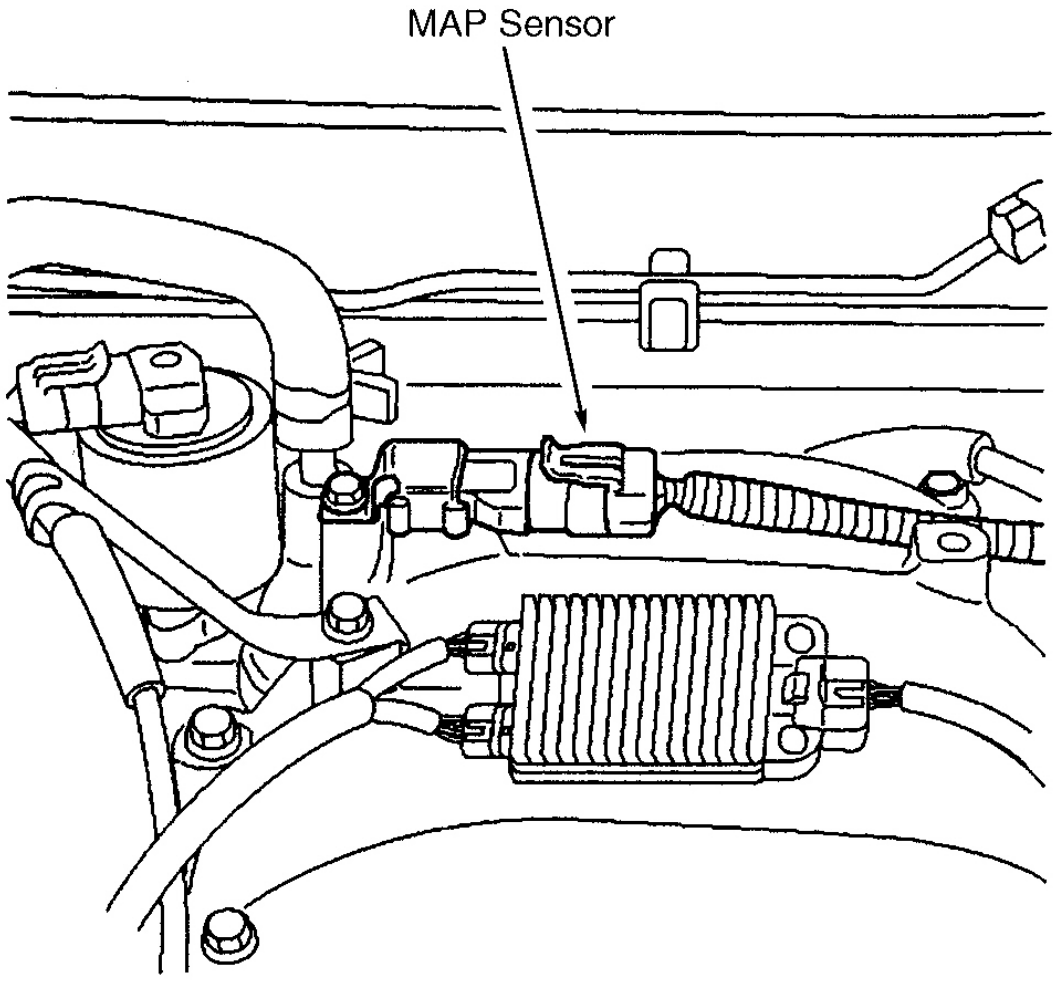

Fig. 63: Locating Manifold Absolute Pressure Sensor (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Disconnect negative battery cable.
2. Disconnect manifold absolute pressure (MAP) sensor electrical connector from sensor. MAP sensor is located on intake manifold behind throttle body.
3. Remove mounting bolt securing sensor to manifold. Remove sensor.
4. To install, reverse removal procedure.

MASS AIR FLOW SENSOR/INTAKE AIR TEMPERATURE SENSOR (ASCENDER 5.3L)

CAUTION: Use care when handling the Mass Air Flow/Intake Air Temperature (MAF/IAT) sensor. Do not dent, puncture, or otherwise damage the honeycell located at the air inlet end of the MAF/IAT. Do not touch the sensing elements or allow anything including cleaning solvents and lubricants to come in contact with them. Use a small amount of a non-silicone based lubricant, on the air duct only, to aid in installation.

Removal & Installation

NOTE: Numbers in parentheses refer to numbers in illustrations.

1. Disconnect mass air flow/intake air temperature (MAF/IAT) sensor electrical connector. See **Fig. 14** .
2. Loosen clamps at MAF/IAT sensor and throttle body. See **Fig. 64** .
3. Remove air cleaner outlet duct bolt.
4. Remove air cleaner outlet duct.
5. Loosen clamp attaching MAF/IAT sensor to air cleaner housing.
6. Remove MAF/IAT sensor from air cleaner housing.
7. To install reverse removal procedure. Locate air flow direction arrow (2) on MAF/IAT sensor connector. The embossed arrow on MAF/IAT sensor indicates the proper air flow direction. The arrow must point toward engine. See **Fig. 65** . Tighten bolt to specification. See **TORQUE SPECIFICATIONS** .

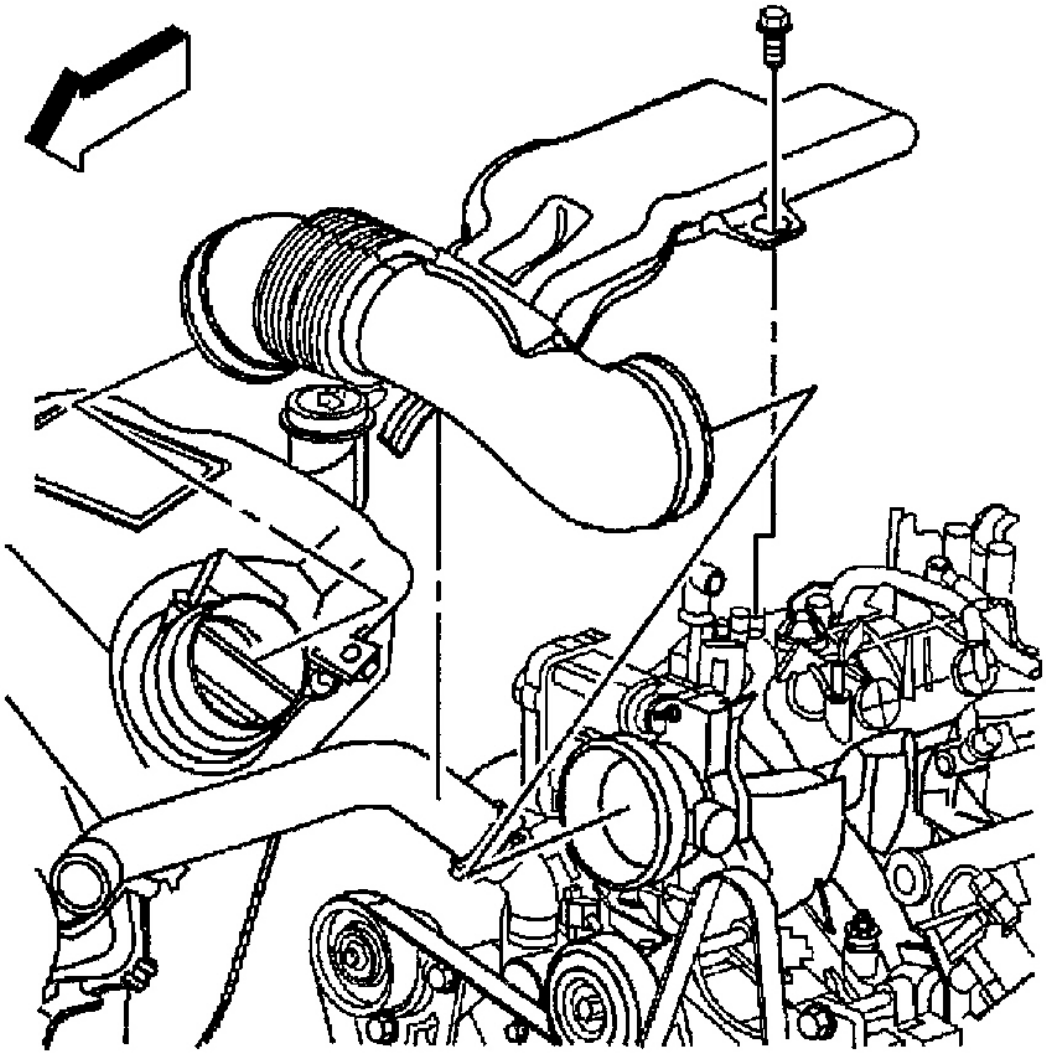

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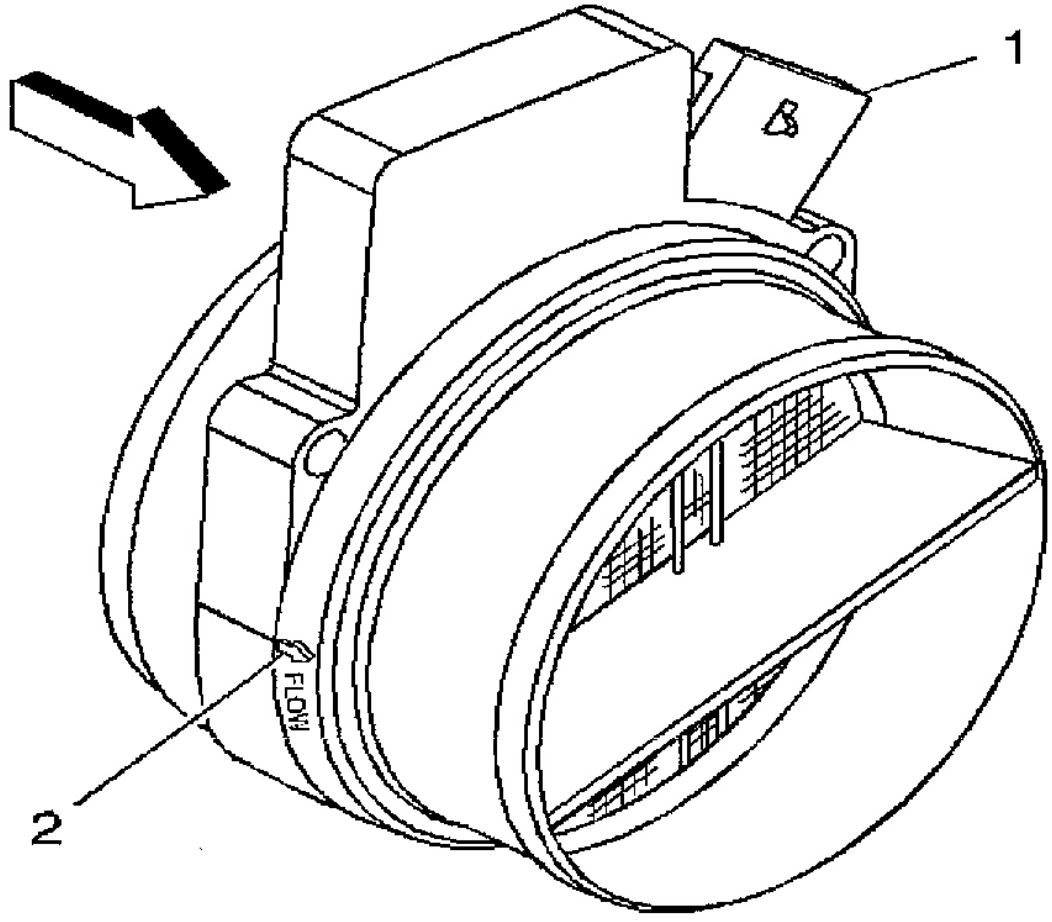
Fig. 64: Removing & Installing Air Cleaner Outlet Duct (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.



G00256488

Fig. 65: Locating Air Flow Direction Arrow On Mass Air Flow/Intake Air Temperature Sensor (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

THROTTLE POSITION SENSOR

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

1. Disconnect negative battery cable.
2. Disconnect throttle position (TP) sensor electrical connector. See **Fig. 66** . TP sensor is located on throttle body.
3. Remove TP sensor bolts.
4. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

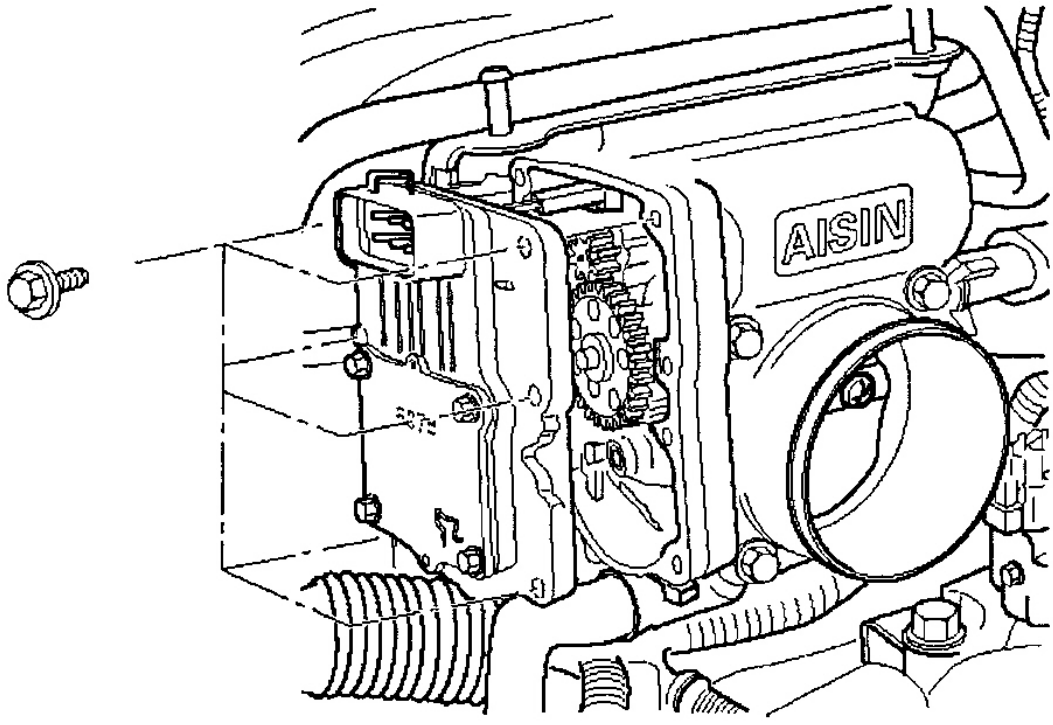


Fig. 66: Removing & Installing Throttle Position Sensor (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Disconnect negative battery cable.
2. Disconnect throttle position (TP) sensor electrical connector. See **Fig. 67** . TP sensor is located on throttle body.
3. Remove TP sensor bolts.
4. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

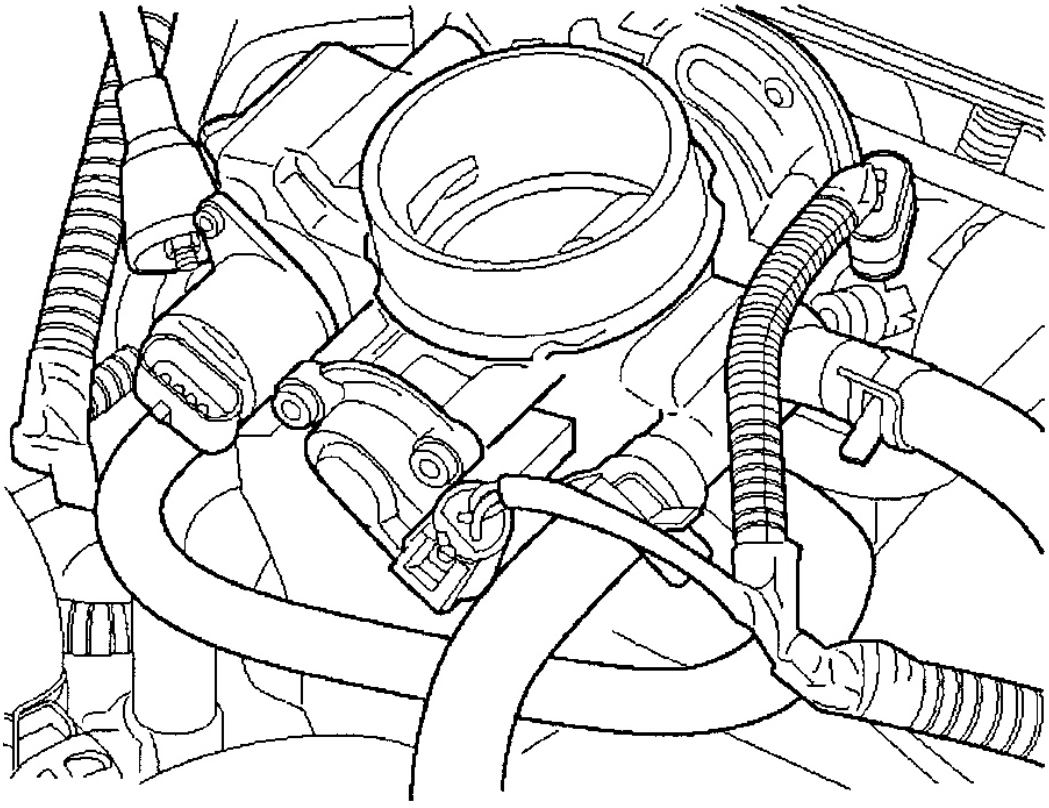


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Fig. 67: Removing & Installing Throttle Position Sensor (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

VEHICLE SPEED SENSOR

Removal & Installation (Axiom, Rodeo & Rodeo Sport)

1. Disconnect negative battery cable.
2. Disconnect vehicle speed sensor (VSS) electrical connector. VSS is located on right side transmission extension housing.
3. Remove bolt and clamp securing VSS and remove VSS.
4. Carefully check "O" ring seals, replace as necessary.
5. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** . Check transmission oil level and add as necessary.

MOTORS, RELAYS & SOLENOIDS

CAMSHAFT POSITION ACTUATOR SOLENOID VALVE (ASCENDER 4.2L)

Removal & Installation

1. Install a 3/8" drive breaker bar onto the drive belt tensioner. See **Fig. 33** . Turn breaker bar clockwise enough to relieve the tension on the drive belt. Remove drive belt. Release tension on drive belt tensioner.
2. Remove 3 power steering pump mounting bolts and set power steering pump aside. Disconnect camshaft position actuator solenoid valve harness connector. Remove camshaft position actuator solenoid valve mounting bolt. See **Fig. 68** .
3. Remove camshaft position actuator solenoid valve. Clean any debris from camshaft position actuator solenoid valve mounting hole. To install, reverse removal procedure. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

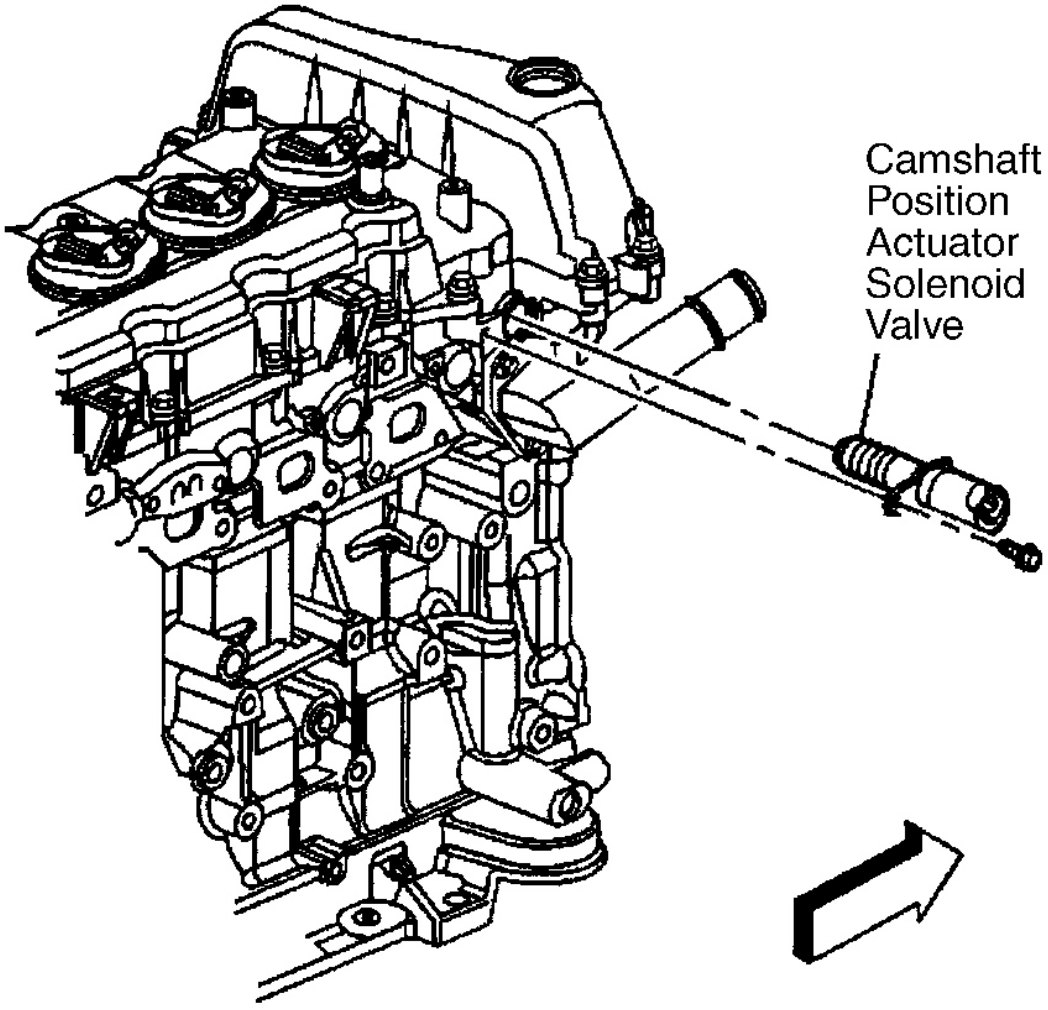


Fig. 68: Locating Camshaft Position Actuator Solenoid Valve (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

THROTTLE ACTUATOR CONTROL MOTOR (ASCENDER)

Removal & Installation

The Throttle Actuator Control (TAC) motor is mounted to the throttle body assembly. See **THROTTLE BODY** under FUEL SYSTEMS.

IDLE AIR CONTROL MOTOR (ASCENDER 4.2L)

Removal & Installation

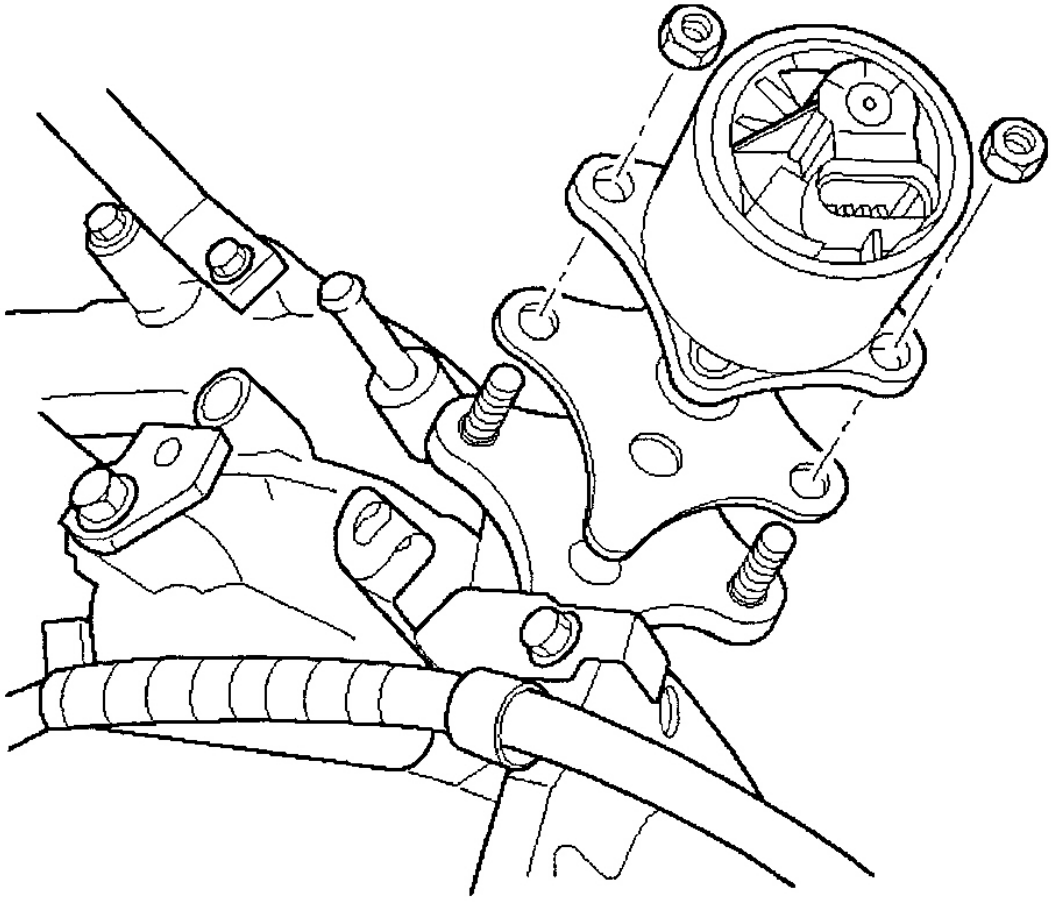
The Idle Air Control motor is mounted permanently to the throttle body assembly and is not serviceable separately. See **THROTTLE BODY** under FUEL SYSTEMS.

EMISSIONS SYSTEMS

EXHAUST GAS RECIRCULATION VALVE

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Disconnect negative battery cable.
2. Disconnect EGR valve electrical connector.
3. Disconnect IAT sensor electrical connector.
4. Remove air intake duct.
5. Remove crankcase breather hose.
6. Remove EGR valve bolts. See **Fig. 69** .
7. Remove EGR valve and gasket.
8. To install, place NEW gasket on intake manifold. Install EGR valve. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
9. To complete installation, reverse remaining removal procedure.



G00141554

Fig. 69: Removing & Installing Exhaust Gas Recirculation Valve (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

NOTE: It is possible to install EGR valve 180° from correct position. Ensure that base of valve is placed so that it aligns properly to mounting flange.

1. Disconnect negative battery cable.
2. Disconnect EGR valve electrical connector.
3. Remove EGR valve bolts. Remove EGR valve and gasket. See **Fig. 70** .
4. To install, place NEW gasket on intake manifold. Install EGR valve. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
5. To complete installation, reverse remaining removal procedure.

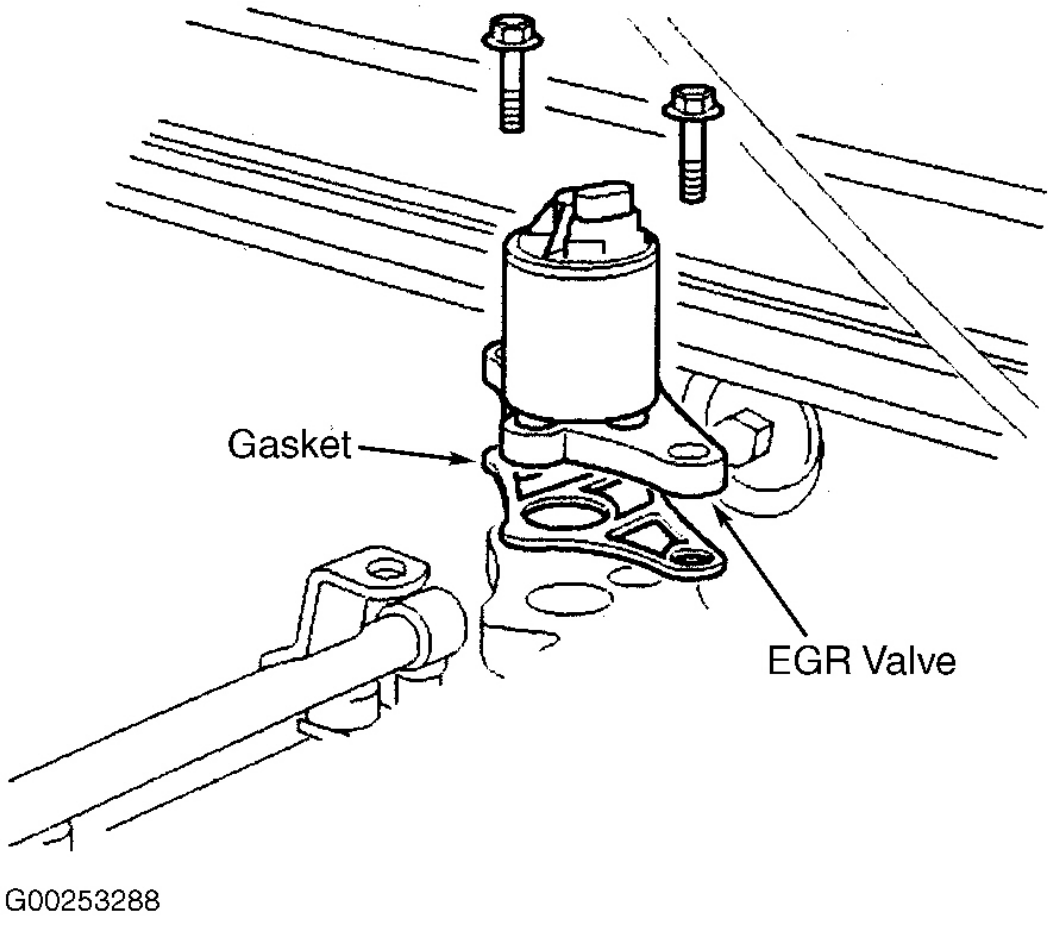


Fig. 70: Removing & Installing Exhaust Gas Recirculation Valve (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

EVAP CANISTER

Removal & Installation (Ascender 4.2L & 5.3L)

1. Raise the vehicle.
2. Remove the fuel tank. See **FUEL TANK** .
3. Disconnect the evaporative emission (EVAP) vapor pipe (2) from the EVAP canister. See **Fig. 71** .
4. Disconnect the EVAP vent pipe (1) from the EVAP canister.
5. Disconnect the EVAP purge pipe from the EVAP canister. The purge pipe is the small pipe next to the vapor pipe (2).

CAUTION: Do not pry against the surface of the evaporative emissions canister.

This could damage the canister.

6. Remove the EVAP canister from the tabs of the canister bracket by inserting a flat head screwdriver into the center slots of the tabs as indicated in the illustration. See **Fig. 72** .
7. Pry the canister away from the tabs as indicated in the illustration.
8. Slide the canister away from the single tab side to disengage the EVAP canister from the bracket.

NOTE: Considerable force may be necessary to install the EVAP canister into the two tab side.

9. To install, slide the EVAP canister into the single tab side and press the canister into the two tab side. Ensure the tabs have completely engaged. To complete installation, reverse removal procedure.

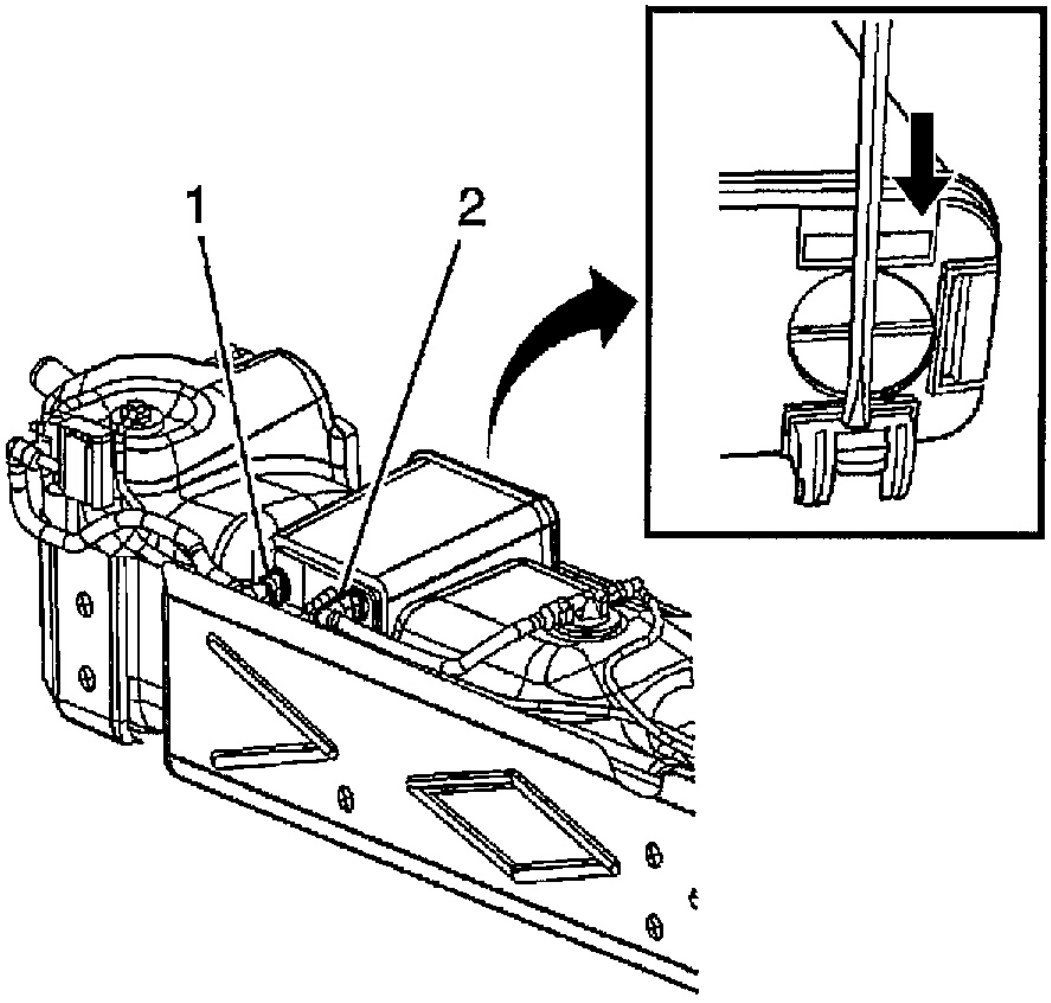


Fig. 71: Locating EVAP Canister Components (Ascender 4.2L & 5.3L)
Courtesy of GENERAL MOTORS CORP.

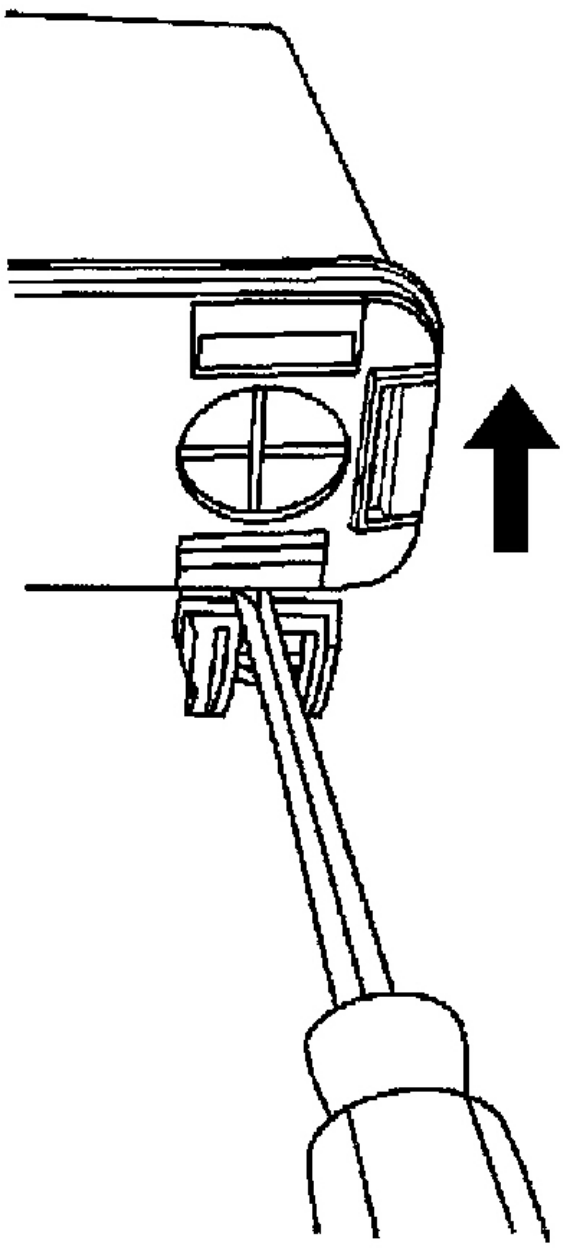


Fig. 72: Removing & Installing EVAP Canister (Ascender 4.2L & 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport)

1. EVAP canister is attached to frame rail under rear of vehicle. See **Fig. 73** and **Fig. 74** .
2. Remove hoses from canister.
3. Remove bracket bolts and remove canister.
4. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

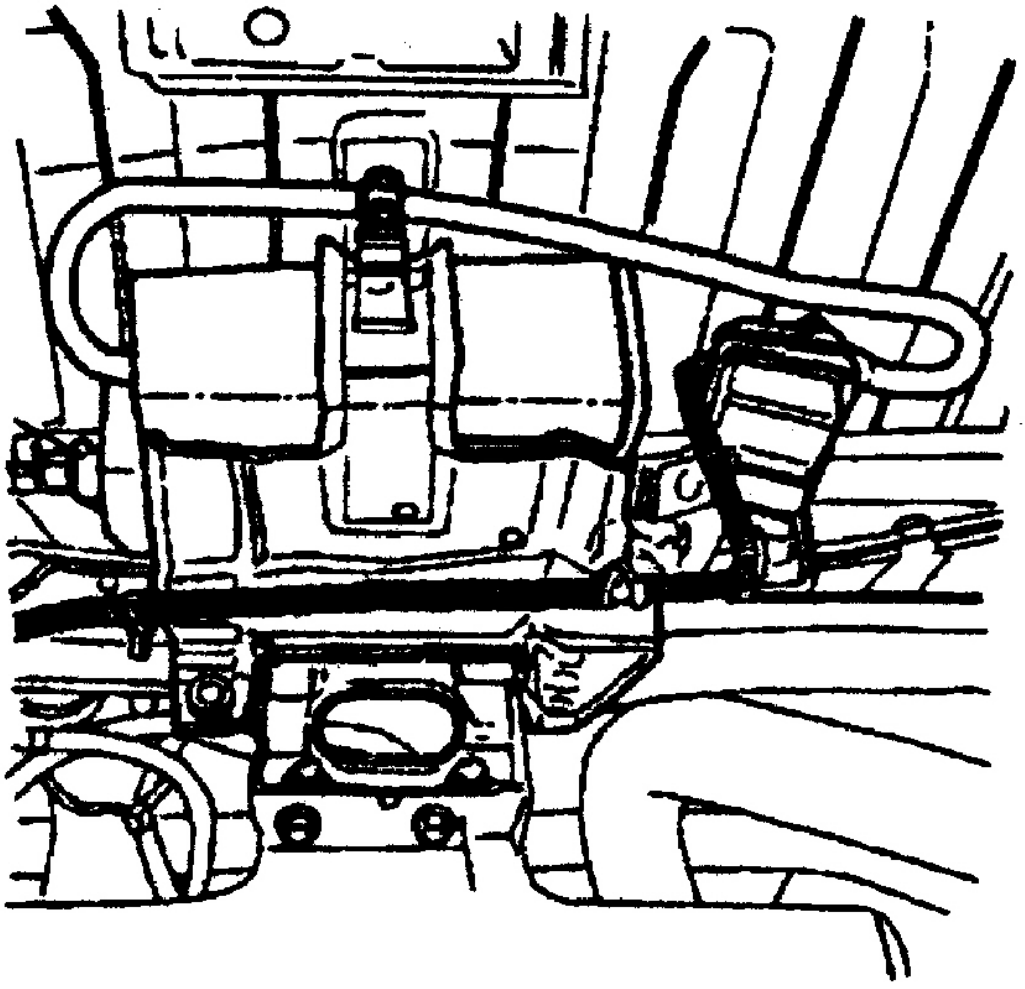


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Fig. 73: Locating EVAP Canister (Axiom, Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

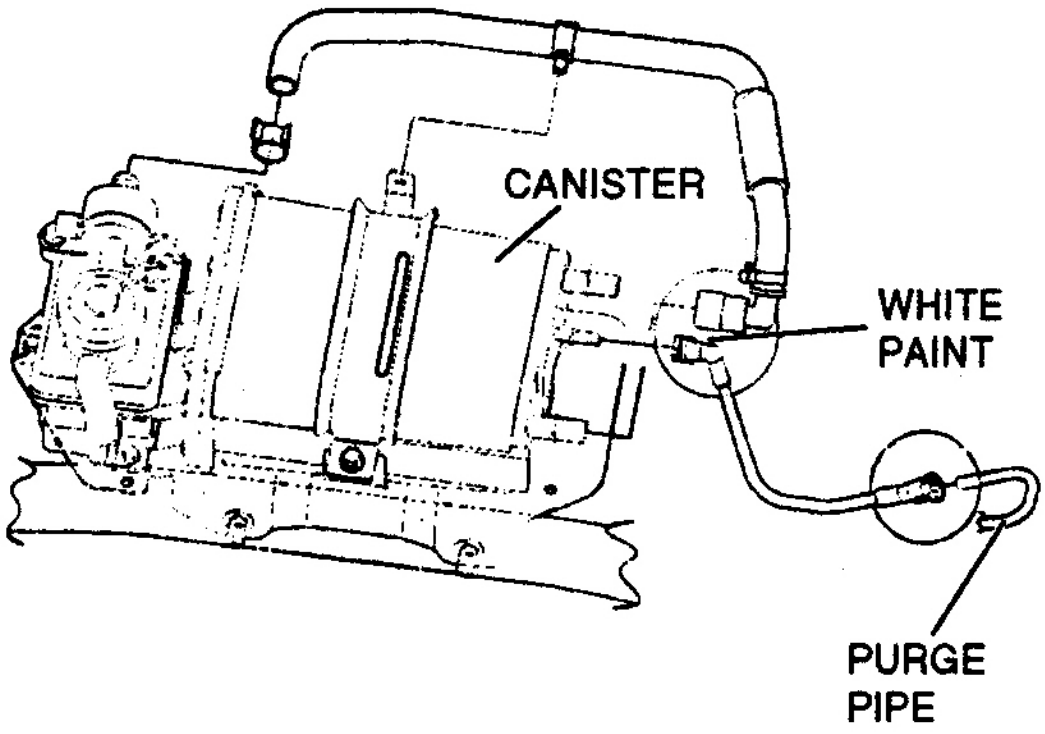

Fig. 74: Locating EVAP Canister (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

EVAP CANISTER PURGE SOLENOID

Removal & Installation (Ascender 4.2L)

1. Raise and support vehicle. Disconnect EVAP canister purge solenoid harness connector. See **Fig. 75** . EVAP canister purge solenoid is located on left side center of engine, below intake manifold.
2. Disconnect EVAP purge pipe and engine vacuum pipe from EVAP canister purge solenoid. Bend tab on EVAP canister purge solenoid bracket and remove EVAP canister purge solenoid from EVAP canister purge solenoid bracket.
3. To install, reverse removal procedure.

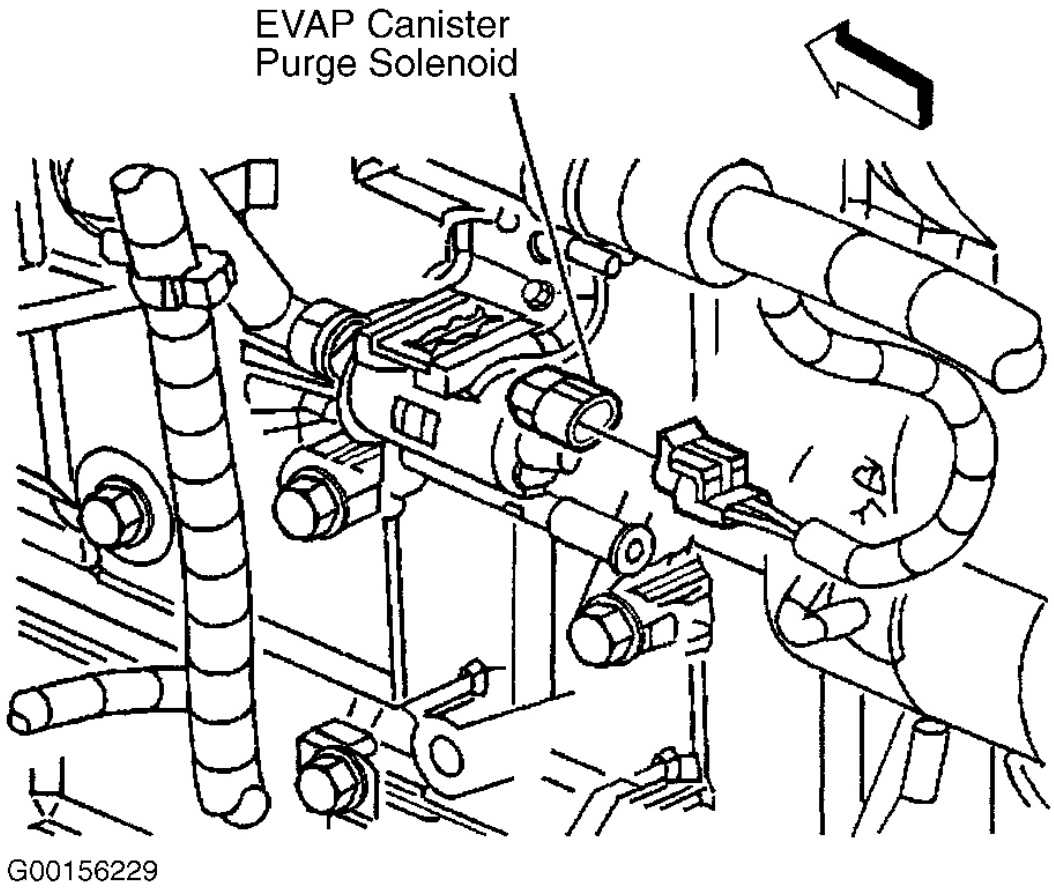

Fig. 75: Locating EVAP Canister Purge Solenoid (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

NOTE: Numbers in parentheses refer to numbers in illustrations.

1. Push the Evaporative emission (EVAP) pipe quick connect fitting retainer inward. See **Fig. 76** .
2. Disconnect the EVAP pipe from the EVAP purge solenoid. See **Fig. 133** .
3. Disconnect the EVAP purge solenoid electrical connector (1). See **Fig. 128** .
4. Remove the EVAP purge solenoid bolt (2). See **Fig. 77** .
5. Remove the EVAP purge solenoid (3) and insulator (1).

NOTE: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or

sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

6. To install, reverse removal procedure. Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** .

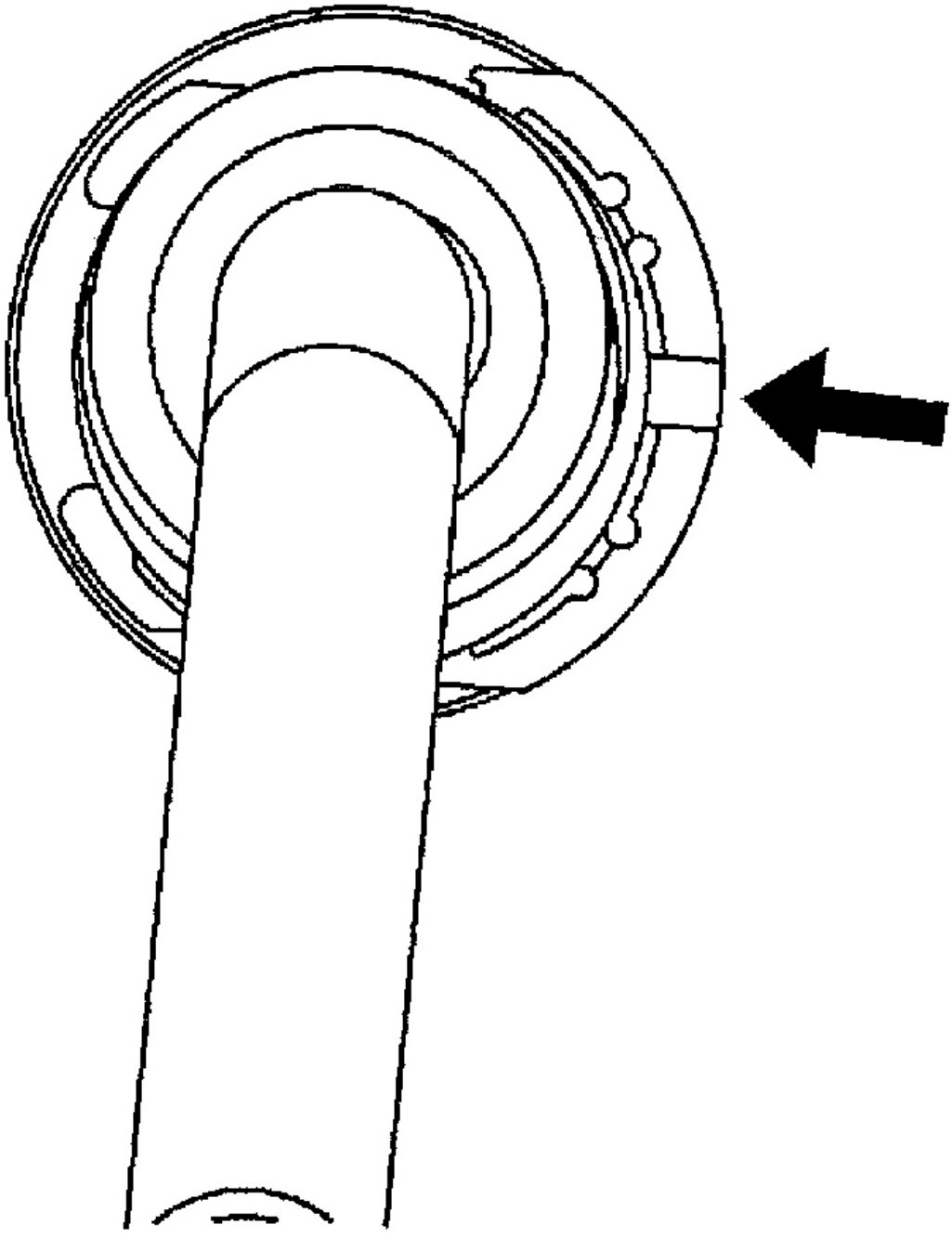

Fig. 76: Locating EVAP Canister Purge Solenoid (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

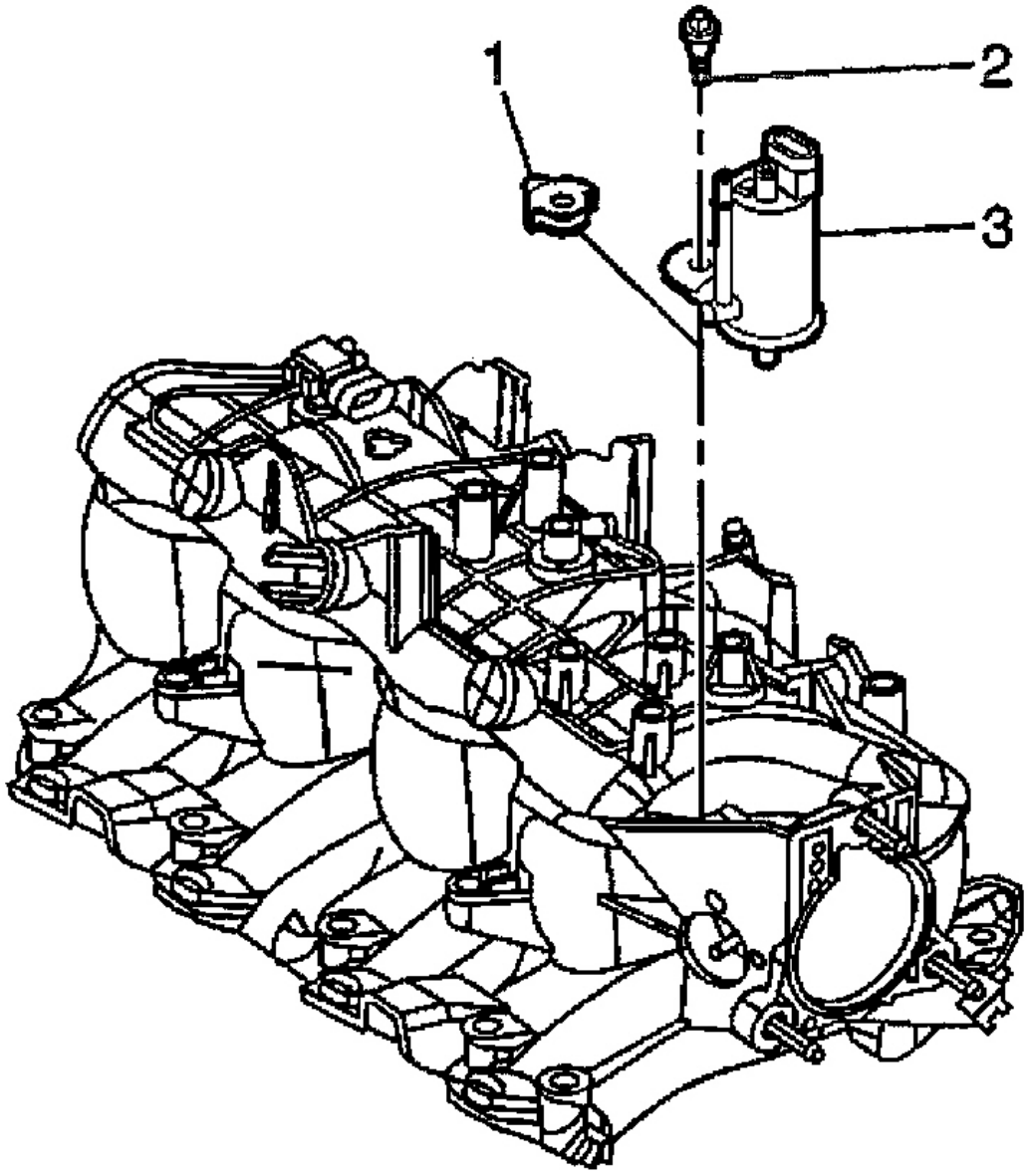

Fig. 77: Removing & Installing EVAP Canister Purge Solenoid (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

1. EVAP canister purge solenoid is located on intake manifold near throttle body. See **Fig. 78** .

2. Disconnect electrical connector and vacuum hoses.
3. Remove retaining bolt and remove solenoid.
4. To install, reverse removal procedure. Tighten bolt to specification. See **TORQUE SPECIFICATIONS** .

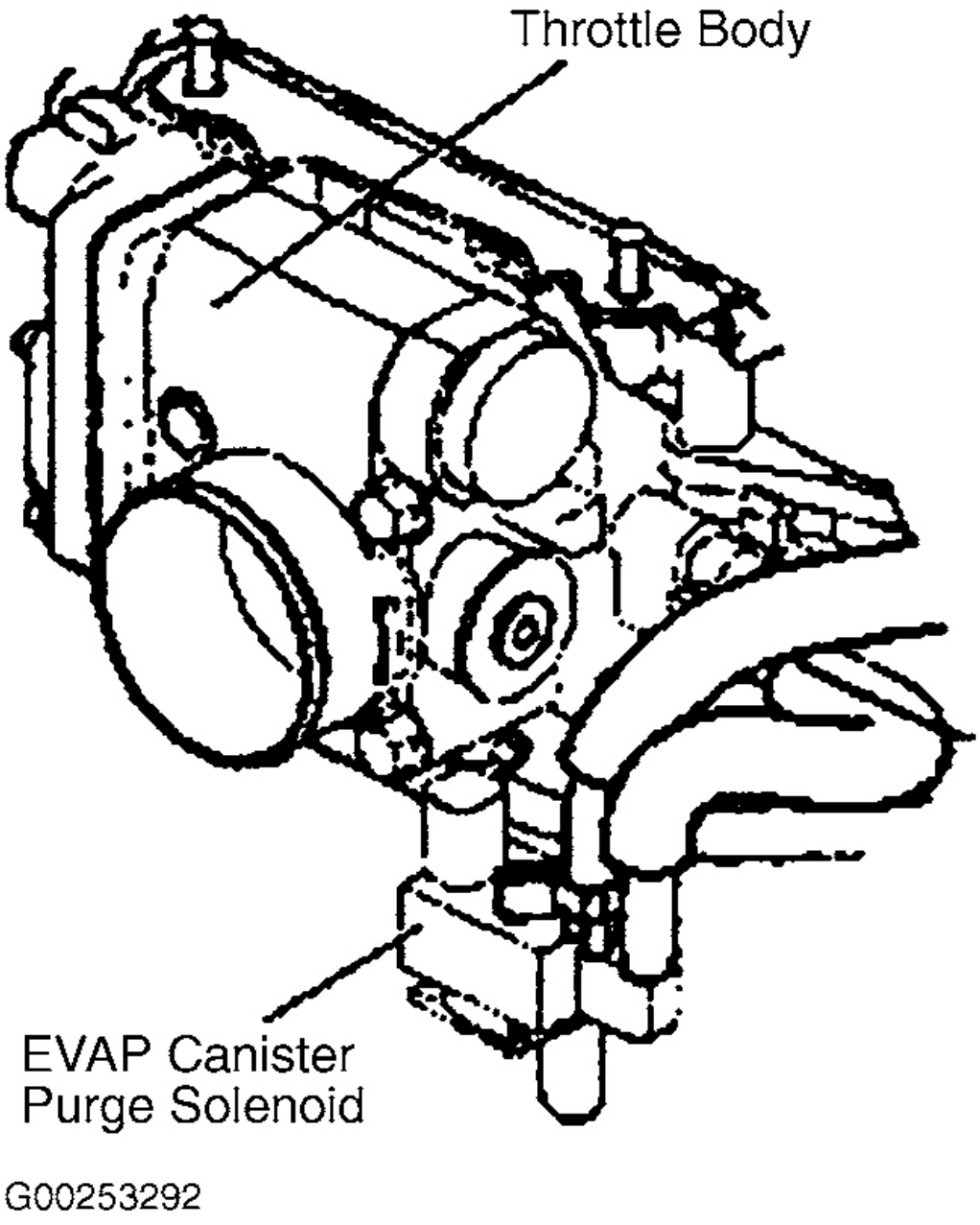

Fig. 78: Locating EVAP Canister Purge Solenoid (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Disconnect EVAP purge solenoid electrical connector. Purge solenoid is located between ignition coil and cylinder head.
2. Disconnect purge solenoid vacuum hoses.
3. Remove 3 ignition coil bracket bolts. See **Fig. 79** .
4. Remove ignition coil bracket along with EVAP purge solenoid.
5. Insert small flat-bladed tool into catch holding purge solenoid to coil bracket. Remove purge solenoid from bracket.
6. To install, reverse removal procedure. Tighten bolt to specification. See **TORQUE SPECIFICATIONS** .

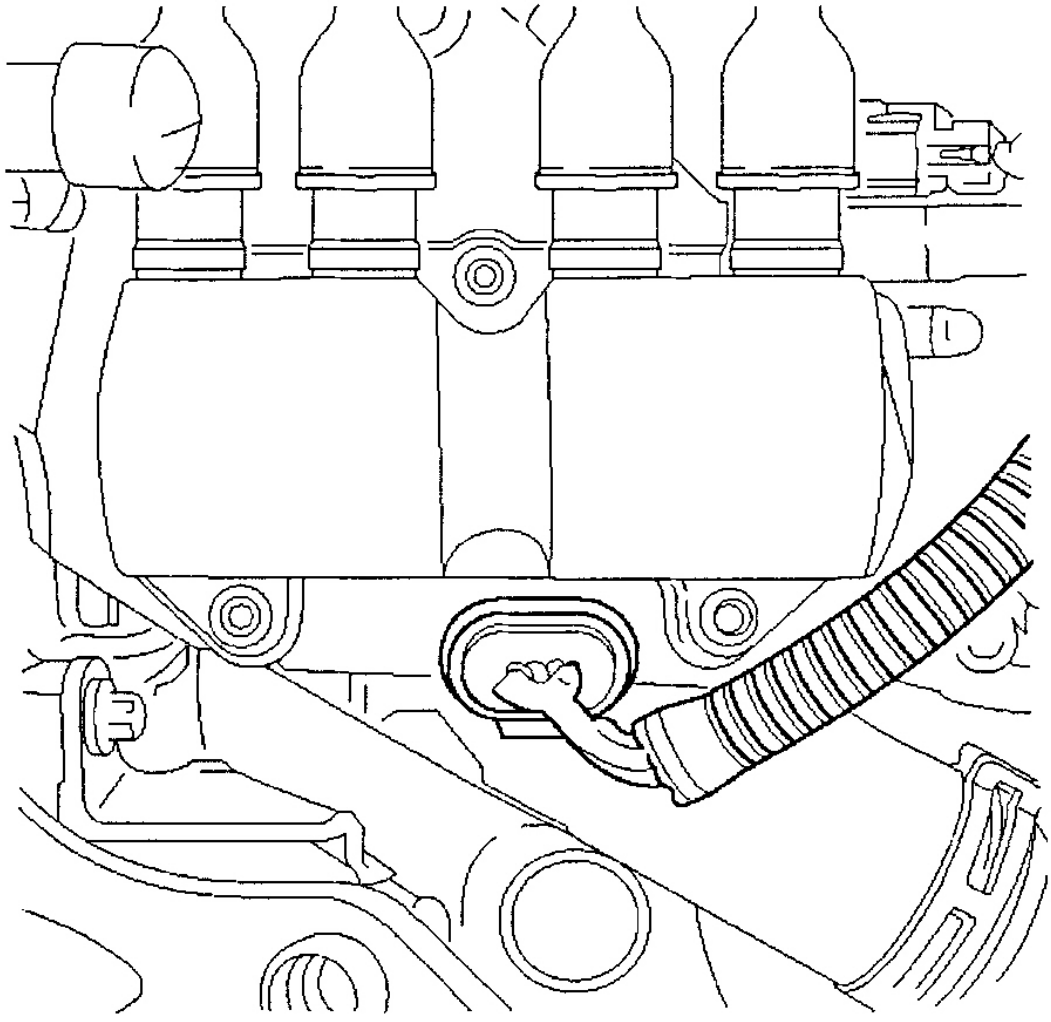

Fig. 79: Locating EVAP Purge Solenoid (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

EVAP CANISTER VENT SOLENOID

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

1. Slide EVAP canister vent solenoid from mounting bracket. Canister vent solenoid is located under vehicle near EVAP canister.
2. Disconnect electrical connector and vacuum hose. See **Fig. 80** .
3. To install, reverse removal procedure.

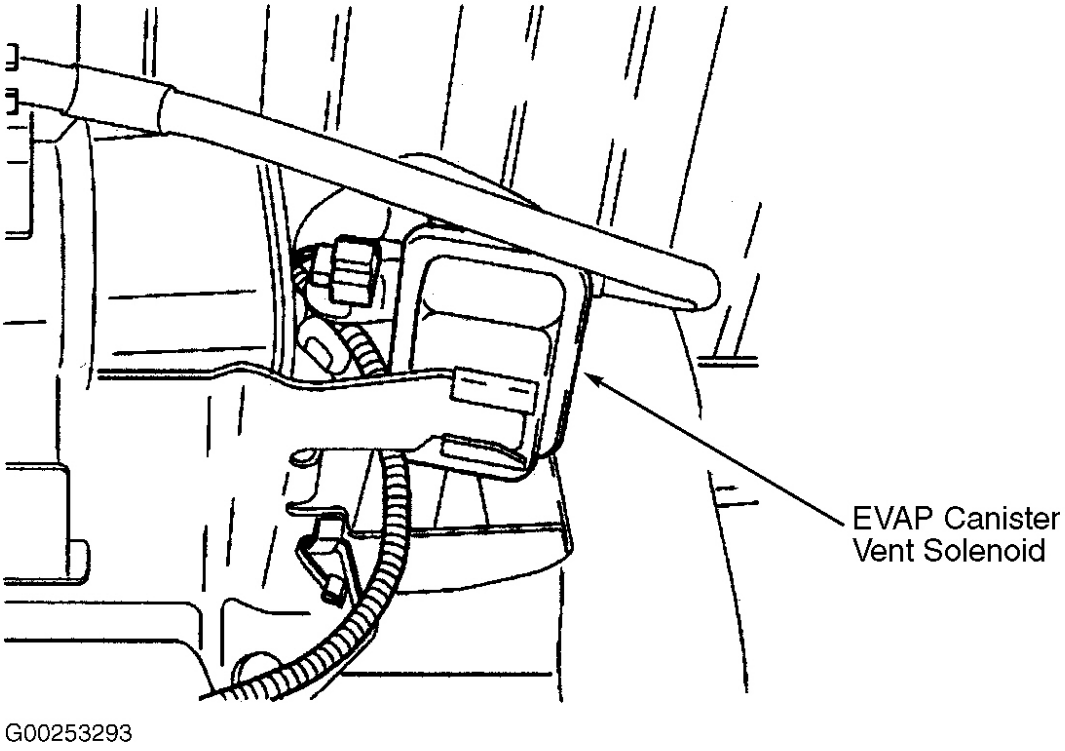

Fig. 80: Locating EVAP Canister Vent Solenoid (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Slide EVAP canister vent solenoid from mounting bracket. Canister vent solenoid is located under vehicle near EVAP canister.
2. Disconnect electrical connector and vacuum hose. See **Fig. 81** .
3. To install, reverse removal procedure.

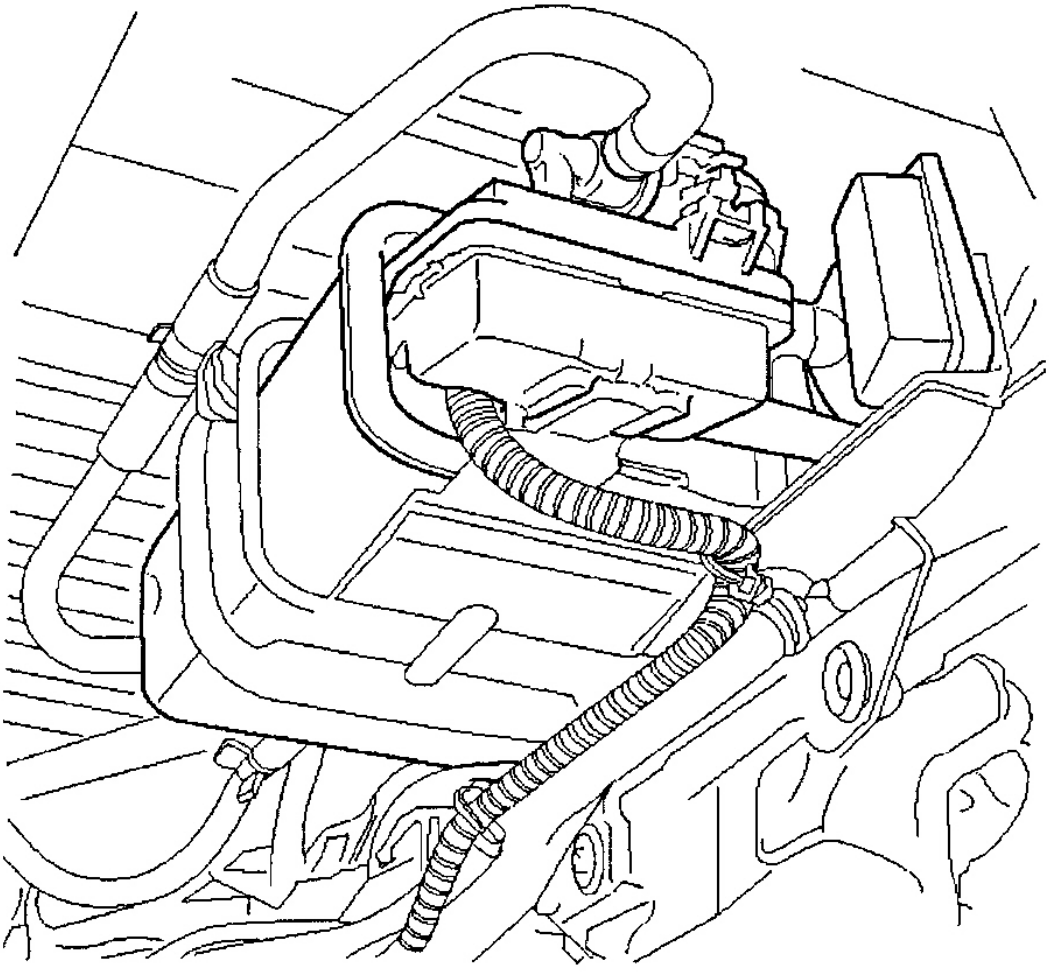

Fig. 81: Removing & Installing EVAP Canister Vent Solenoid (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

EVAP CANISTER VENT VALVE

Removal & Installation (Ascender 4.2L)

1. Raise and support vehicle. Disconnect EVAP canister vent valve harness connector. EVAP canister vent valve is located near right rear corner of fuel tank. See **Fig. 82** .
2. Disconnect EVAP vent pipe from EVAP canister vent valve. See **Fig. 82** . Bend tab on EVAP canister vent valve bracket and remove EVAP canister vent valve from EVAP canister vent valve bracket. To install, reverse removal procedure.

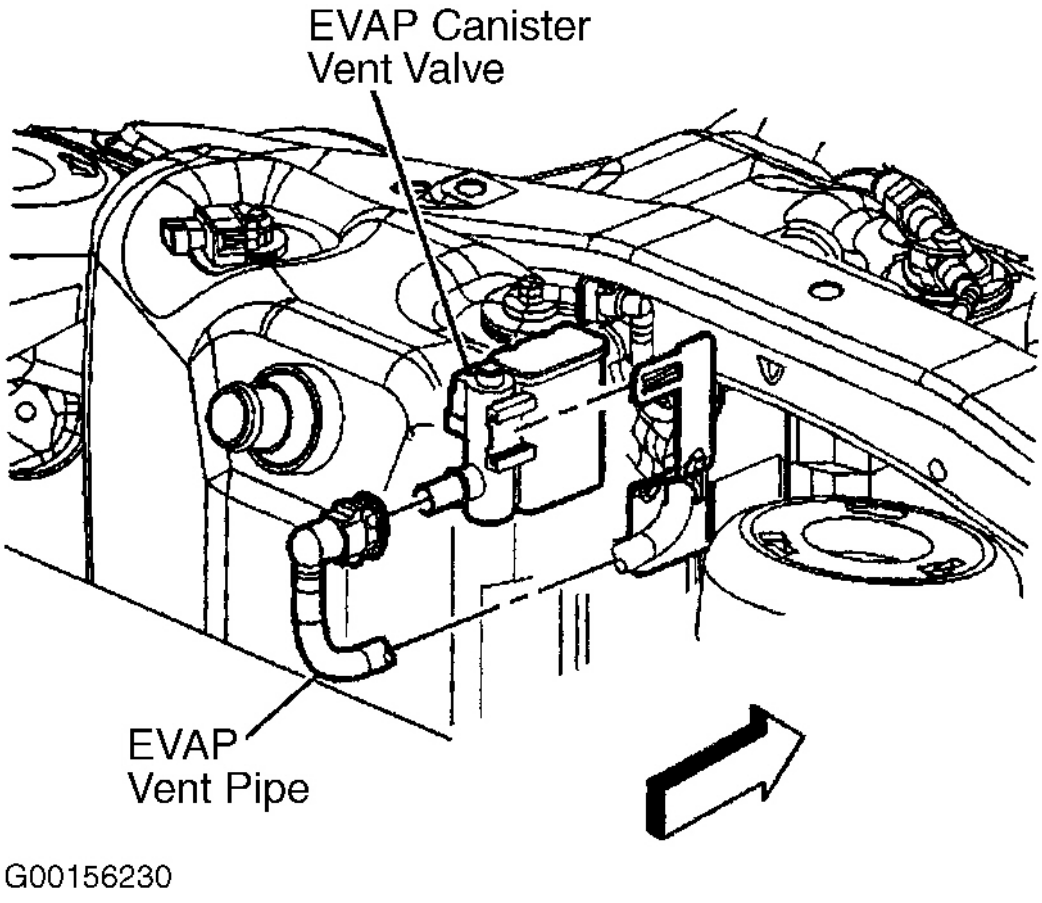

Fig. 82: Removing & Installing EVAP Canister Vent Valve (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

1. Raise and support the vehicle.
2. Disconnect the Evaporative emission (EVAP) canister vent valve electrical connector. See **Fig. 83** .
3. Disconnect the EVAP vent pipe from the canister vent valve.
4. Disengage the bracket retaining tab and remove the EVAP canister vent valve.
5. To install, reverse removal procedure.

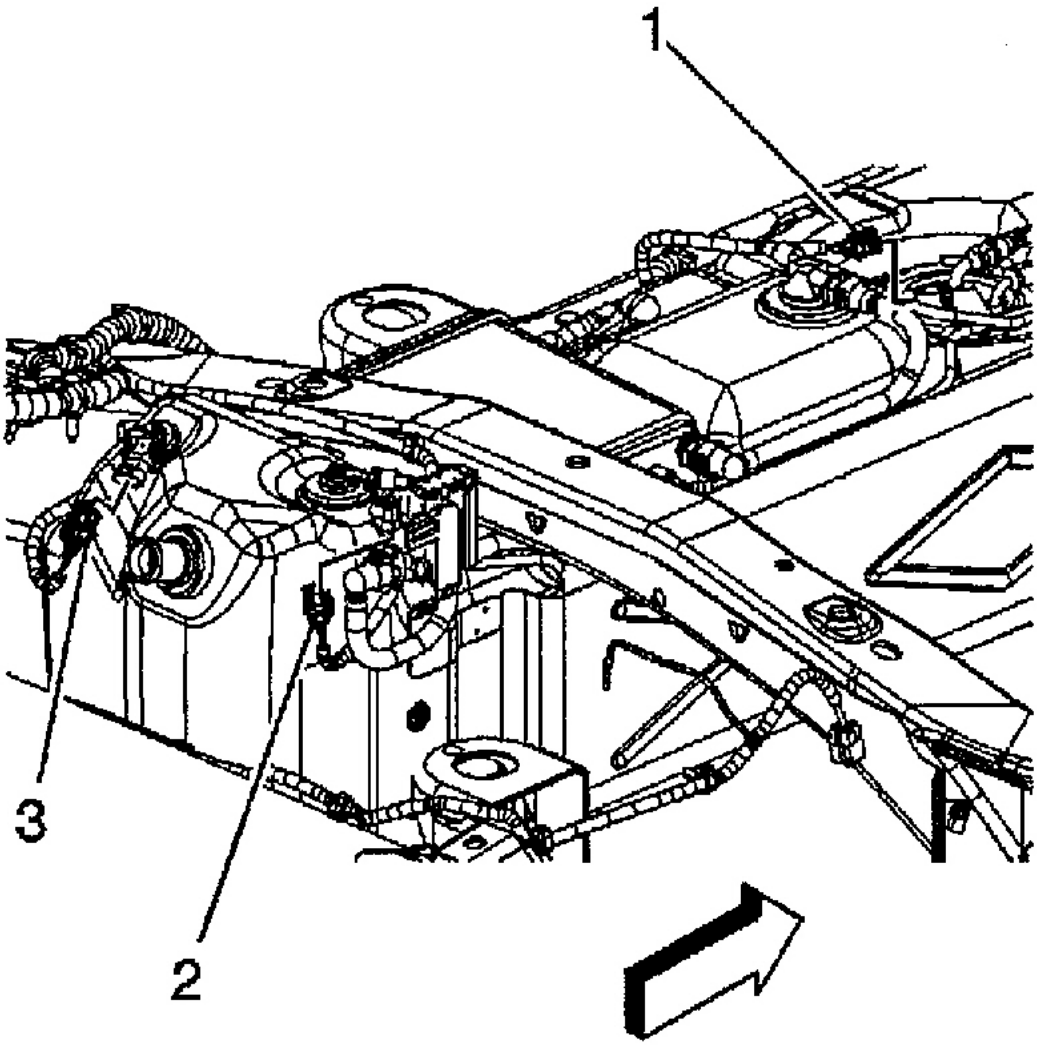

Fig. 83: Locating EVAP Vent Valve, Fuel Tank Pressure Sensor & Fuel Sender Electrical Connectors (Ascender)
Courtesy of GENERAL MOTORS CORP.

EVAP SYSTEM CLEANING (ASCENDER)

Inspection Procedure

NOTE: DO NOT perform this procedure unless instructed by an Evaporative Emission (EVAP) diagnostic.

NOTE: Use EVAP Pressure/Purge Diagnostic Station (J-41413) in order to provide a clean, dry, low pressure gas source.

1. Turn ignition off. Remove EVAP canister purge solenoid. See **EVAP CANISTER PURGE SOLENOID** . Lightly tap the EVAP canister purge solenoid on a clean, hard surface. Inspect for carbon particles exiting either of the vacuum ports. If no carbon particles are found, reinstall EVAP canister purge solenoid and perform **CLEANING PROCEDURE** .
2. If carbon particles are found during the inspection procedure, replace EVAP canister purge solenoid and perform **CLEANING PROCEDURE** . If you were instructed to replace the EVAP canister purge solenoid, and no carbon particles are found, return to the EVAP diagnostic procedure. DO NOT perform the **CLEANING PROCEDURE** .

Cleaning Procedure

1. Remove EVAP canister. See **EVAP CANISTER** . Turn main valve to OFF position on EVAP Pressure/Purge Diagnostic Station. Disconnect hose from EVAP Pressure/Purge Diagnostic Station pressure regulator. Using a section of vacuum hose, connect one end to EVAP Pressure/Purge Diagnostic Station pressure regulator. Connect other end of vacuum hose to EVAP canister side of purge pipe.
2. Turn main nitrogen cylinder valve to ON and continue to discharge nitrogen for 15 seconds. If the nitrogen does not dislodge the carbon particles, replace the purge pipe. Replace EVAP canister. Continue with DTC test.

FUEL TANK PRESSURE SENSOR

For servicing of fuel tank pressure sensor, see **FUEL TANK PRESSURE SENSOR** under SENSORS & SWITCHES.

FUEL SYSTEM

WARNING: Always relieve fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact electrical parts while testing fuel system components.

FUEL SYSTEM PRESSURE RELEASE

Ascender 4.2L

1. Remove fuel tank cap.
2. Remove fuel pump relay from underhood junction block. See **Fig. 84** .
3. Crank engine.
4. Allow engine to start and stall.
5. Crank engine an additional 3 seconds.
6. Turn ignition off.
7. Disconnect negative battery cable.

8. Install and tighten fuel filler cap.
9. Install fuel pump relay.

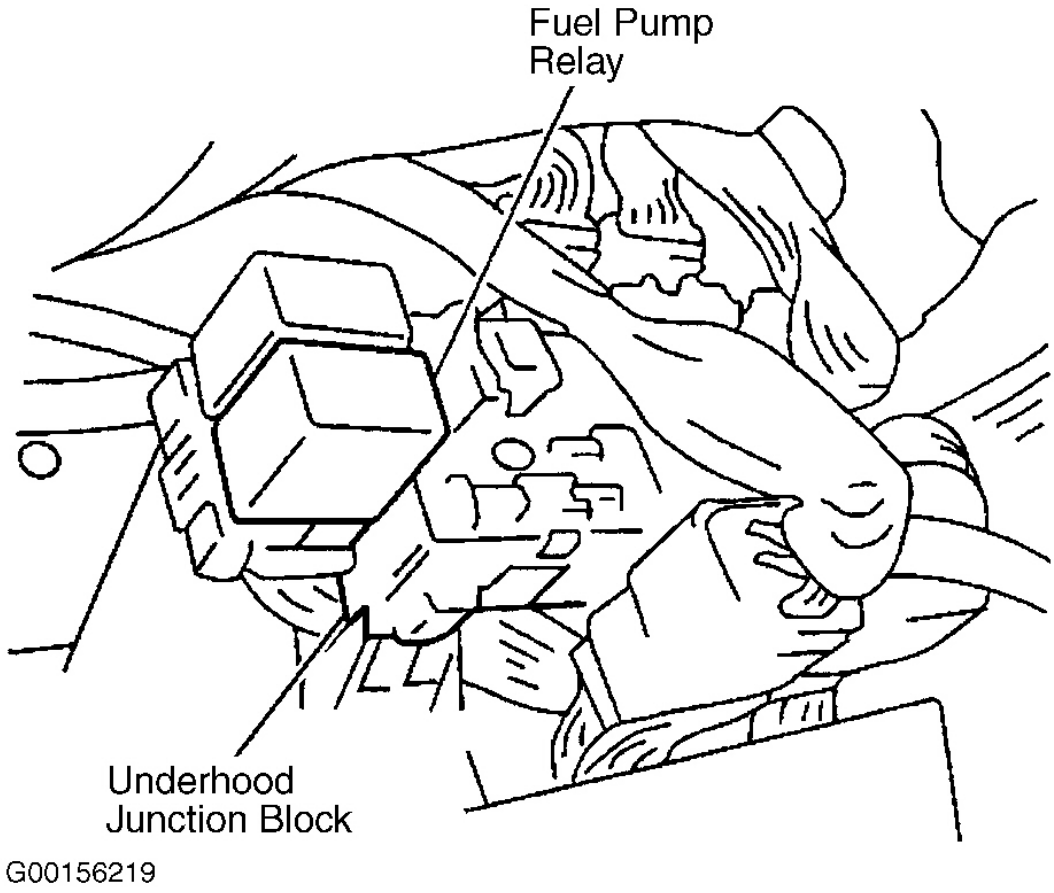

Fig. 84: Locating Fuel Pump Relay (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Ascender 5.3L

1. Disconnect the negative battery cable.
2. Install the Fitting Tool Set (J 34730-1A).
3. Loosen the fuel fill cap in order to relieve the fuel tank vapor pressure.
4. Open the valve on Fitting Tool Set in order to bleed the system pressure. The fuel connections are now safe for servicing.
5. Drain any fuel remaining in the gauge into an approved container.
6. Once the system pressure is completely relieved, remove the Fitting Tool Set.

Axiom, Rodeo & Rodeo Sport

1. Loosen gas cap to relieve tank pressure.
2. Remove fuel pump relay. Fuel pump relay is located in underhood fuse/relay box.
3. Start engine and allow it to run until it stalls.
4. Crank engine for 30 seconds.
5. Disconnect negative battery cable.

FUEL LINE DISCONNECT FITTINGS (ASCENDER)

NOTE: Fuel line disconnect fittings may contain metal or plastic collar. See Fig. 85 and Fig. 86 . Determine type of disconnect fitting used and use proper procedure for type of disconnect fitting being serviced.

Removal & Installation (Metal Collar)

1. Release fuel pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
2. Remove retainer from disconnect fitting.

CAUTION: Use safety glasses when using compressed air to prevent eye injury.

3. Blow any dirt out of the disconnect fitting using compressed air.
4. Choose correct size fitting tool from Disconnect Fitting Tool Set (J-37088-A). Insert disconnect fitting tool into female connector, then push inward to release the locking tabs. See **Fig. 85** .
5. Pull connection apart.

NOTE: If necessary, remove rust or burrs from fuel pipes with an emery cloth. Use a radial motion with fuel pipe end in order to prevent damage to "O" ring sealing surface.

6. Using a clean shop towel, wipe off male tube ends. Clean or replace components and/or assemblies as necessary.
7. Inspect both ends of fitting for dirt and burrs. Clean or replace components as required.
8. To install, ensure fuel line and disconnect fitting are clean. Lubricate fuel line and disconnect fitting with clean engine oil.
9. Push both sides of disconnect fitting together to cause retaining tabs to snap into place.
10. After connecting fitting, ensure connection is secure by pulling on both sides of disconnect fitting.
11. Install retainer into disconnect fitting.

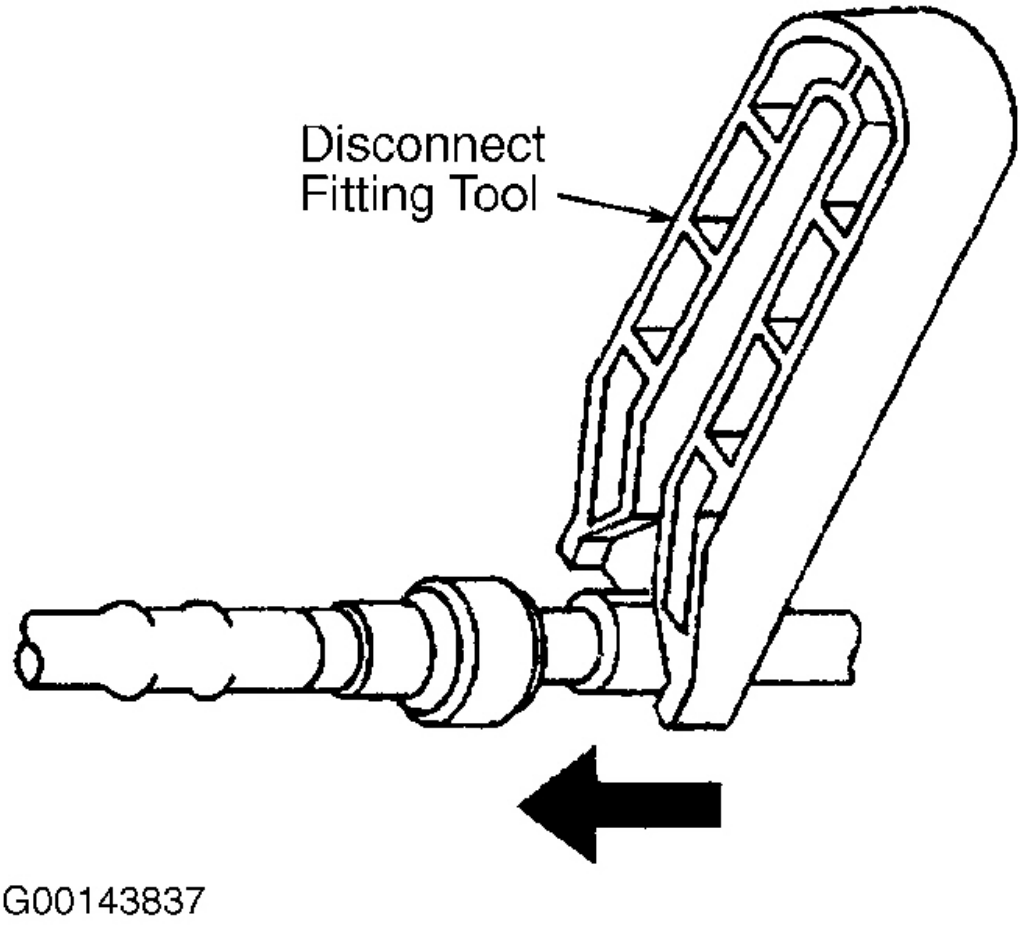

Fig. 85: Disconnecting Fuel Fitting With Metal Collar (Ascender)
Courtesy of GENERAL MOTORS CORP.

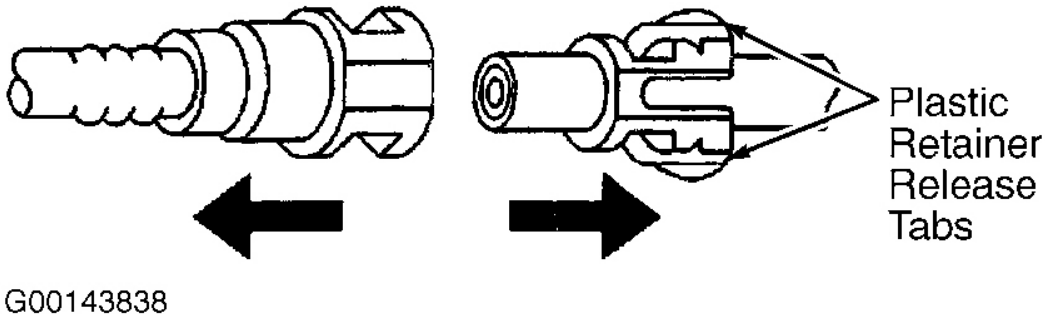

Fig. 86: Disconnecting Fuel Fitting With Plastic Collar (Ascender)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Plastic Collar)

CAUTION: Use safety glasses when using compressed air to prevent eye injury.

1. Release fuel pressure. See **FUEL SYSTEM PRESSURE RELEASE** .

CAUTION: Use safety glasses when using compressed air to prevent eye injury.

2. Blow any dirt out of disconnect fitting using compressed air.
3. Squeeze 2 plastic retainer release tabs and pull connection apart. See **Fig. 86** .
4. To install, ensure fuel line and disconnect fitting are clean. Lubricate fuel line and disconnect fitting with clean engine oil.
5. Push both sides of disconnect fitting together to cause plastic retainer release tabs to snap into place.
6. After connecting fitting, ensure connection is secure by pulling on both sides of disconnect fitting.

FUEL FILTER

Removal & Installation (Ascender 4.2L)

1. Release fuel pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
2. Raise and support vehicle.
3. Remove fuel tank shield (if equipped). See **Fig. 87** . Fuel filter is mounted on or near front of fuel tank.
4. Before removal, clean fuel filter connections with a spray type engine cleaner, such as GM X-30A. DO NOT use any solvent that contains Methyl Ethyl Ketone (MEK). Solvents containing MEK may damage fuel system components.

5. Disconnect fuel filter inlet and outlet disconnect fittings. See **FUEL LINE DISCONNECT FITTINGS (ASCENDER)** . Cap fuel lines to prevent contamination.
6. Remove fuel filter bracket screw. Remove fuel filter from the bracket. See **Fig. 89**
7. Drain any remaining fuel into an approved container.
8. To install, reverse removal procedure. Tighten fuel filter bracket screw and fuel tank shield bolts to specification. See **TORQUE SPECIFICATIONS** .
9. Turn ignition switch to ON position for 2 seconds. Turn ignition switch to OFF position for 10 seconds. Turn ignition switch to ON position. Check for fuel leaks. Repair as necessary.

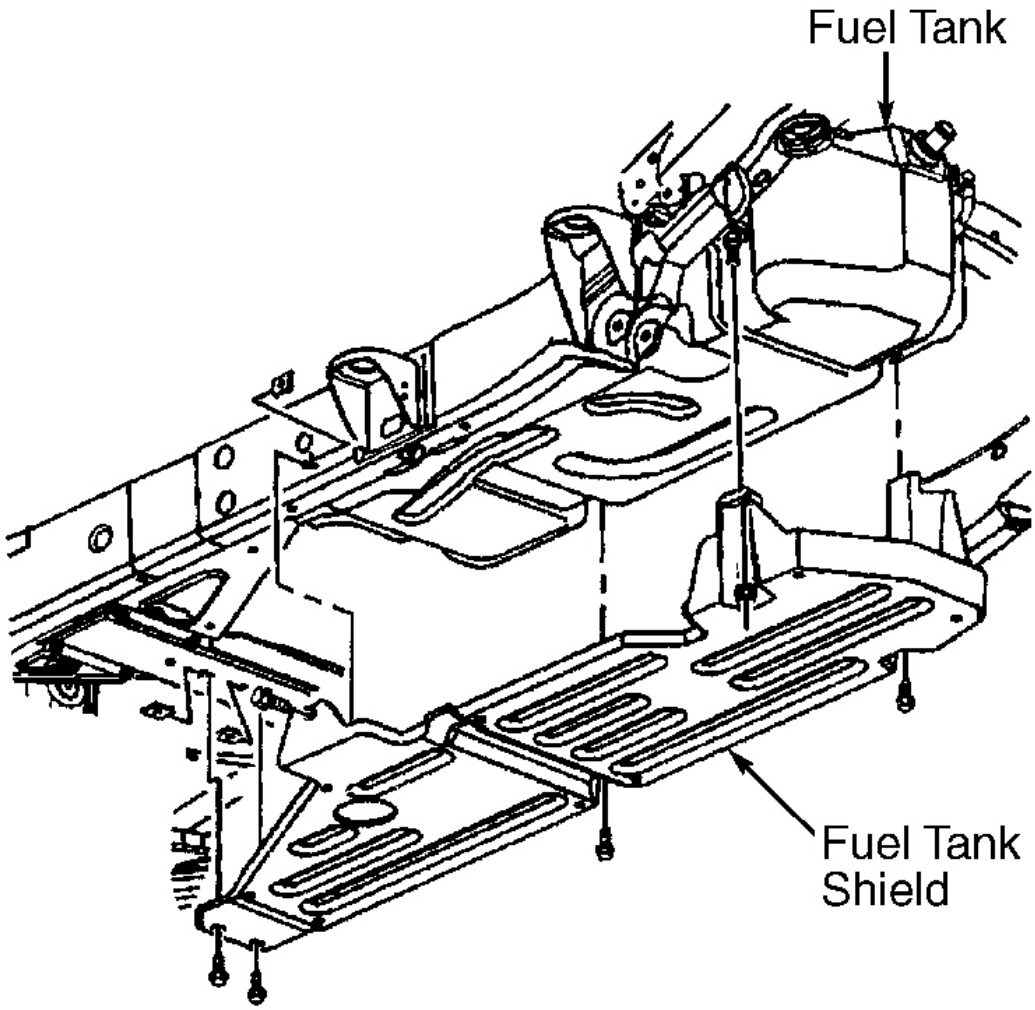

Fig. 87: Removing & Installing Fuel Tank Shield (Ascender 4.2L)

Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

NOTE: Inspect the fuel tank internally and clean the fuel tank if you find a restricted fuel filter.

1. Relieve the fuel system pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
2. Raise and support the vehicle.
3. Remove the fuel tank shield, if equipped.
4. Clean all the fuel filter connections and the surrounding areas before disconnecting the fuel lines in order to prevent possible contamination of the fuel system.
5. Disconnect the quick connect fittings at the fuel filter. See **FUEL LINE DISCONNECT FITTINGS (ASCENDER)** . See **Fig. 88** .
6. Cap the fuel pipes in order to prevent possible fuel system contamination.
7. Remove the fuel filter bracket screw. See **Fig. 89** .
8. Remove the fuel filter from the bracket.
9. To install, reverse removal procedure. Tighten fuel filter bracket screw and fuel tank shield bolts to specification. See **TORQUE SPECIFICATIONS** .
10. Turn ignition switch to ON position for 2 seconds. Turn ignition switch to OFF position for 10 seconds. Turn ignition switch to ON position. Check for fuel leaks. Repair as necessary.

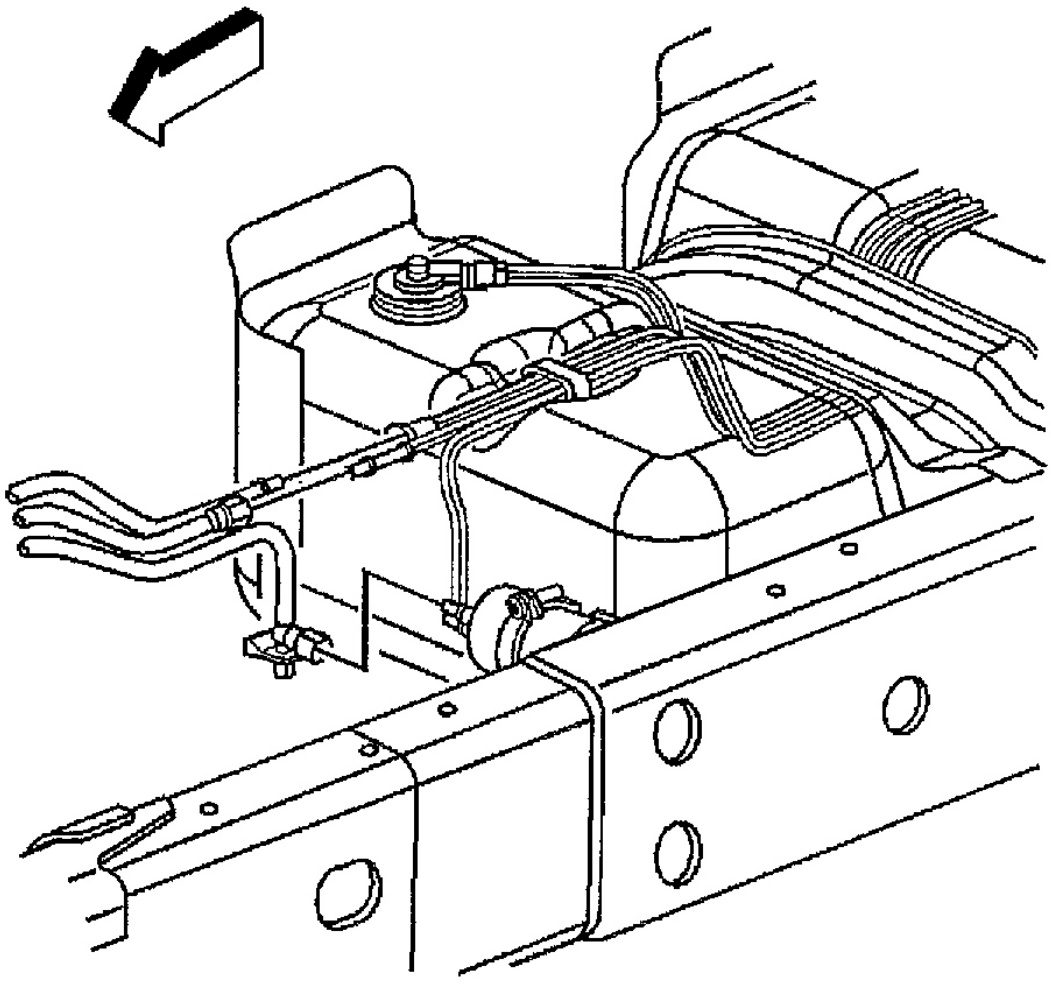

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Fig. 88: Locating Quick Connect Fittings At Fuel Filter (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

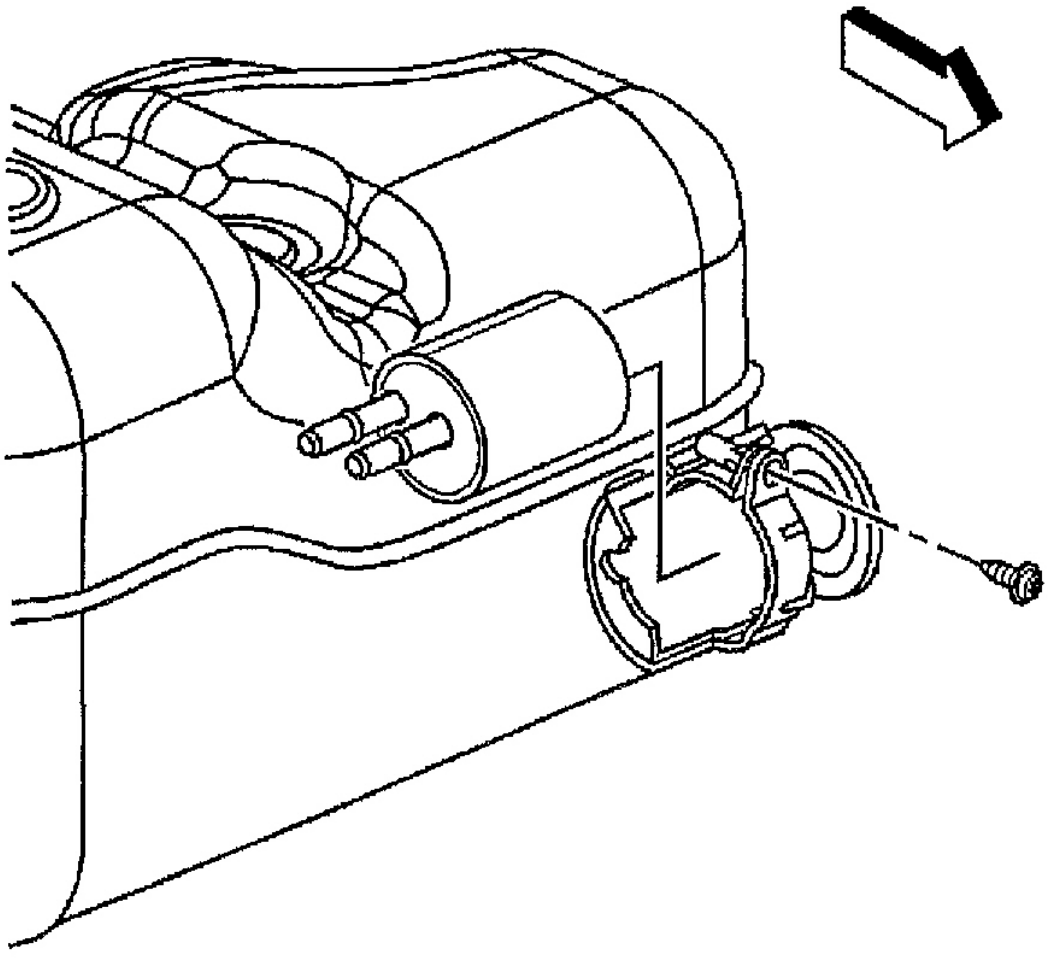

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Fig. 89: Locating Fuel Filter (Ascender)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport)

1. Release fuel pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
2. Loosen hose clamps and remove fuel hoses.
3. Remove bracket bolts and remove filter. Filter is located on left front frame rail below drivers seat. See **Fig. 90** and **Fig. 91** .
4. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

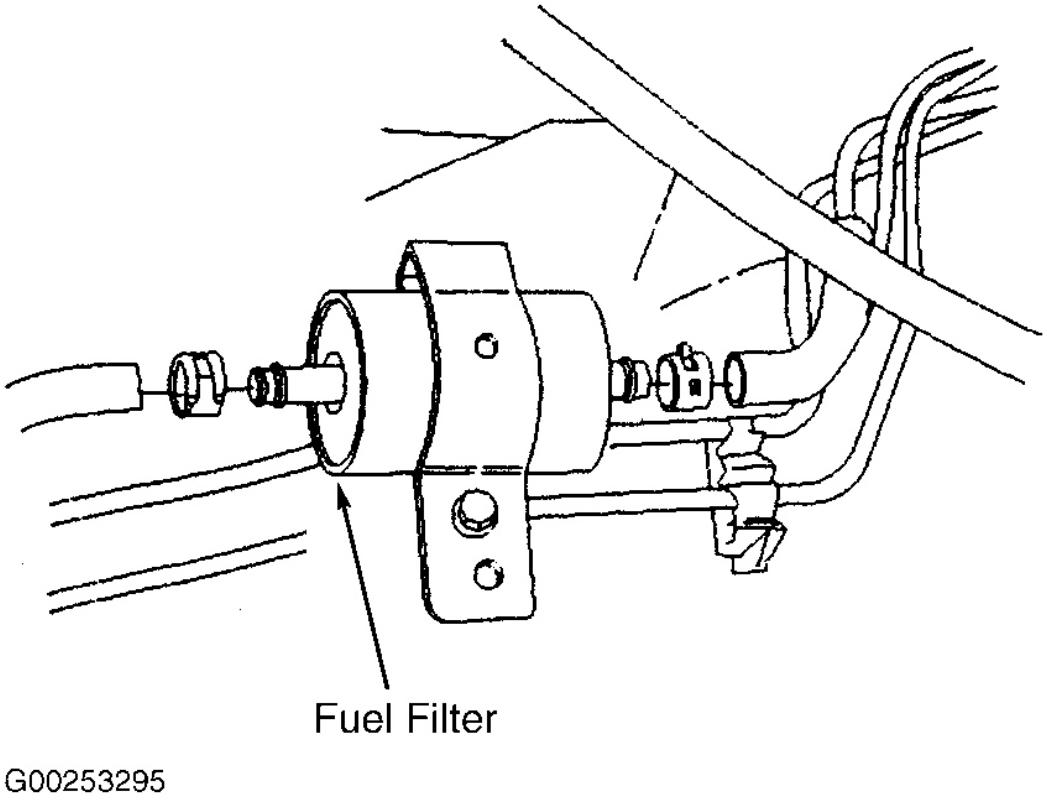


Fig. 90: Locating Fuel Filter (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

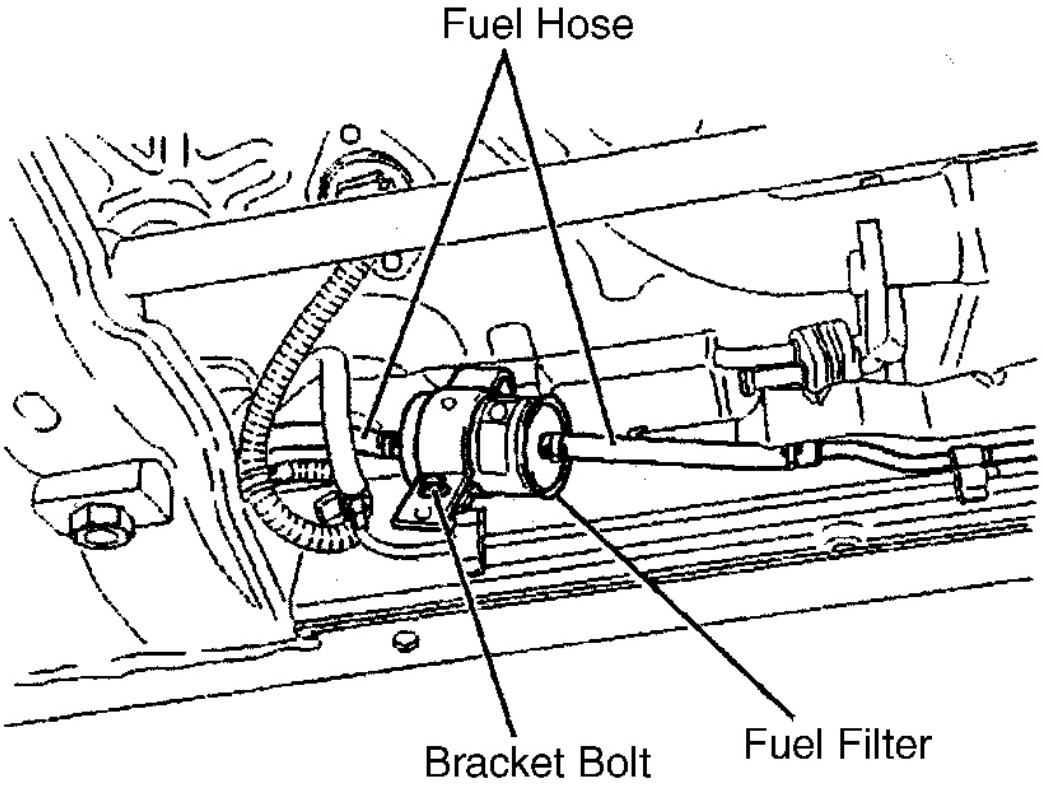


Fig. 91: Locating Fuel Filter (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

FUEL LEVEL SENDER

Removal & Installation (All Models)

NOTE: Fuel level sender may also be known as fuel pump.

For servicing of fuel level sender, see **FUEL PUMP** .

FUEL LEVEL SENSOR

For servicing of fuel level sensor, see **FUEL LEVEL SENSOR** under SENSORS & SWITCHES.

FUEL PUMP

Removal (Ascender)

CAUTION: Use safety glasses when using compressed air to prevent eye injury.

1. Fuel pump is located in fuel tank and is integral with fuel sending unit assembly. See **Fig. 92** . Remove fuel tank. See **FUEL TANK** .
2. Using compressed air, clean area at top of fuel tank around fuel sending unit.

NOTE: DO NOT handle the fuel sending unit assembly by the fuel pipes. The amount of leverage generated by handling the fuel sending unit assembly by the fuel pipes could damage the joints.

3. Remove fuel sending unit assembly retaining ring using Retaining Ring Remover/Installer (J-44402).
4. Lift fuel sending unit assembly from fuel tank.
5. Drain any remaining fuel from the fuel sending unit into an approved container.
6. Remove and discard fuel sending unit "O" ring.

NOTE: Fuel pump strainer must be in a horizontal position when installing fuel tank sending unit into fuel tank. Ensure fuel pump strainer does not block the travel of the fuel sensing unit float arm.

7. To install, reverse removal procedure. Clean fuel sending unit sealing area. Check for fuel leaks.

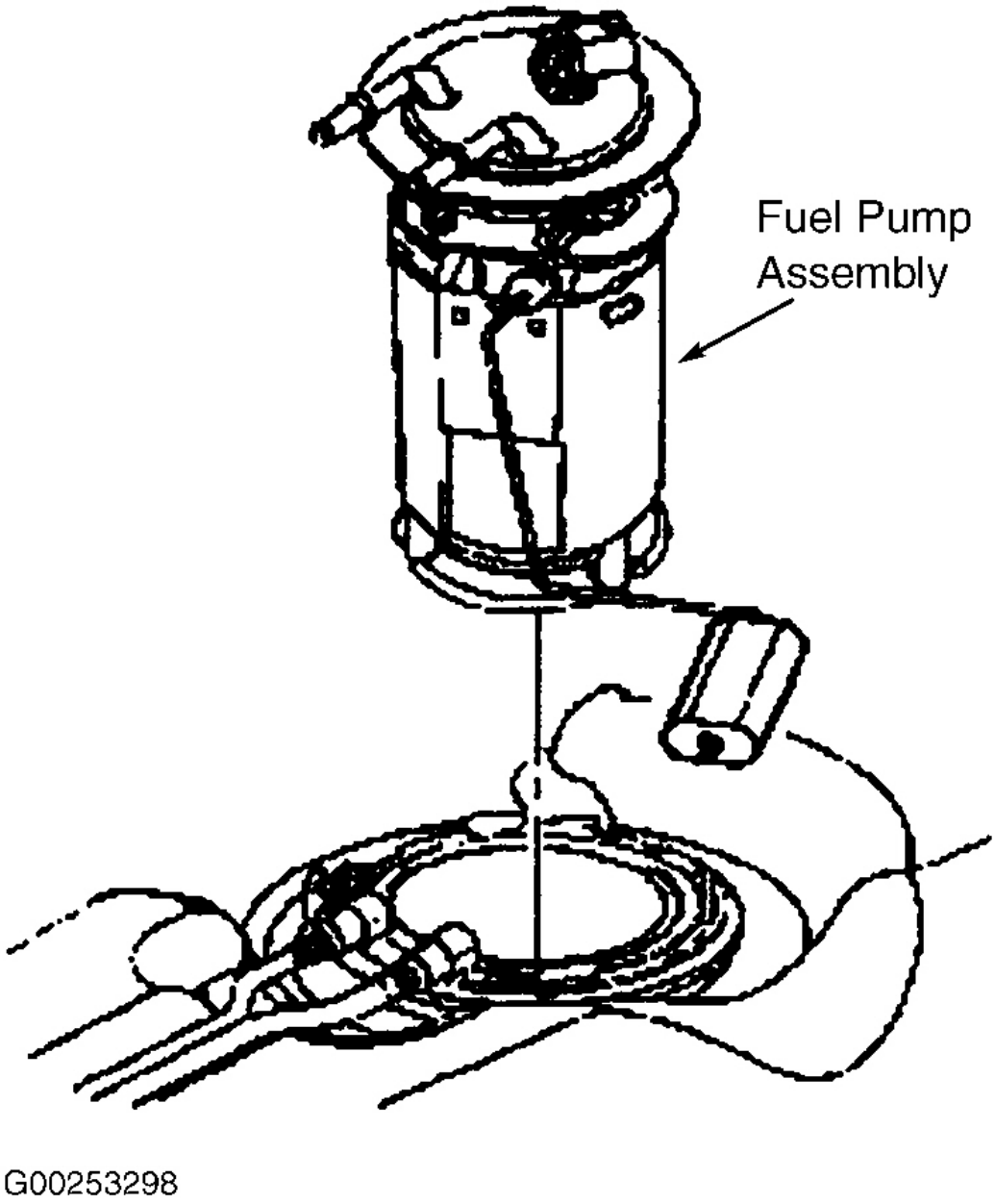
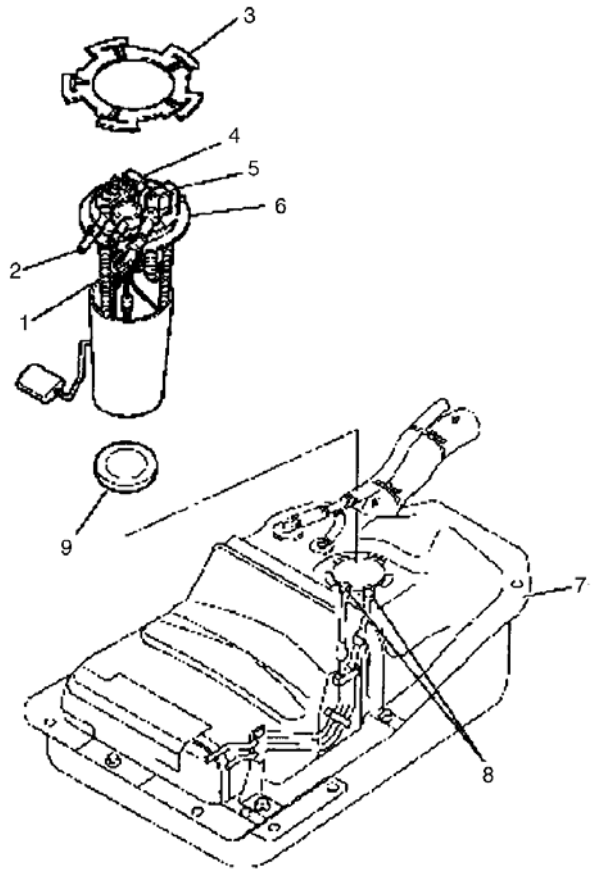


Fig. 92: Locating Fuel Pump (Ascender)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Axiom, Rodeo & Rodeo Sport)

1. Release fuel system pressure. See **FUEL SYSTEM PRESSURE RELEASE** .

2. Remove fuel tank. See **FUEL TANK** .
3. Remove fuel feed and fuel return hoses at top of fuel tank. See **Fig. 93** and **Fig. 94** .
4. Using Fuel Pump Lock Retainer Tool (J-39765) remove fuel pump lock retainer. See **Fig. 95** .
5. To install, reverse removal procedure. When installing fuel pump, twist fuel pump assembly clockwise until fuel pump lock retainer is in locked position.
6. Run vehicle and check for fuel leaks.



Legend	
(1)	Fuel Feed Port
(2)	Fuel Return Port
(3)	Retainer (Fuel Pump Lock)
(4)	Connector; Tank Pressure Sensor
(5)	Connector; Fuel Feed Pump & Sender
(6)	Fuel Pump and Sender (FPS) Assembly
(7)	Fuel Tank Assembly
(8)	Quick Connector
(9)	Seal; Fuel pump

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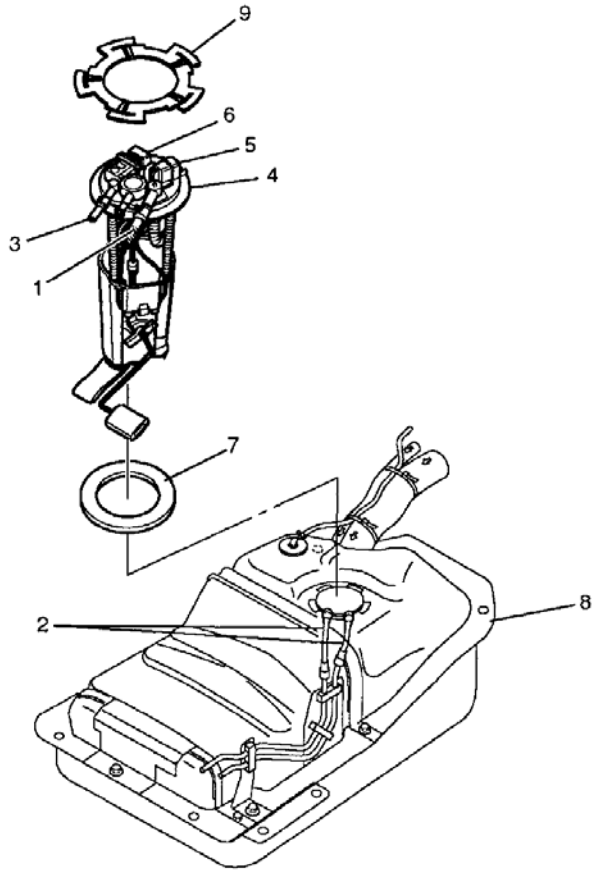
Fig. 93: Locating Fuel Pump Components (Axiom & Rodeo)
Courtesy of ISUZU MOTOR CO.



Legend	
(1)	Fuel Feed Port
(2)	Fuel Tube/Quick Connector
(3)	Fuel Return Port
(4)	Fuel Pump and Sender (FPS) Assembly
(5)	Connector; Fuel Feed Pump
(6)	Connector; Fuel Tank Pressure Sensor
(7)	Seal; Fuel Pump
(8)	Fuel Tank Assembly
(9)	Fuel Pump Lock Retainer

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Fig. 94: Locating Fuel Pump Components (Rodeo Sport)
Courtesy of ISUZU MOTOR CO.

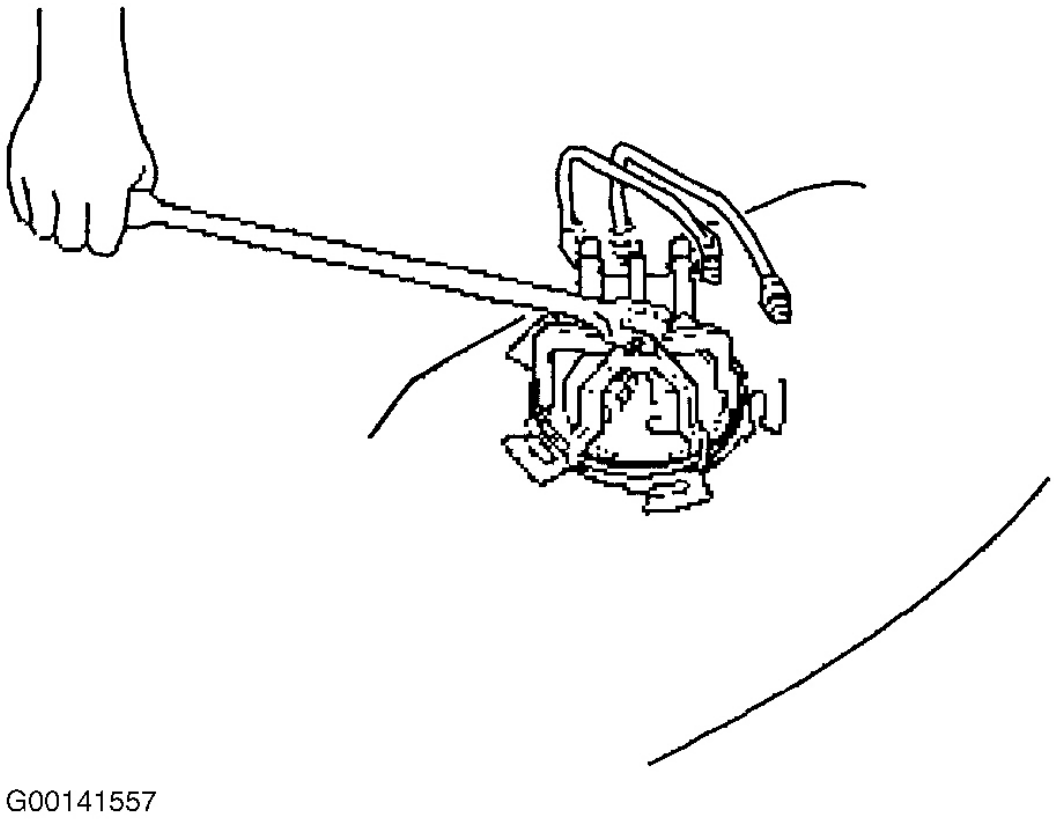

Fig. 95: Removing Fuel Pump Lock Retainer (Axiom, Rodeo & Rodeo Sport)
Courtesy of ISUZU MOTOR CO.

FUEL RAIL & FUEL INJECTORS

WARNING: To reduce risk of fire, verify lower small "O" ring of each injector does not remain in lower manifold. If "O" ring is not removed with injector, replacement injector, with NEW "O" rings, will not seat properly in injector socket and could cause a fuel leak.

CAUTION: To prevent damage to fuel injectors retaining bracket and/or fuel injectors, DO NOT try to remove fuel injectors by lifting up fuel injector retaining bracket while fuel injectors are still installed in bracket slots. DO NOT attempt to remove bracket without first removing fuel pressure regulator.

NOTE: Each injector is calibrated for a specific flow rate. When replacing fuel injectors, order replacements with identical part number as old injectors.

Removal & Installation (Ascender 4.2L)

CAUTION: The engine oil may be contaminated with fuel if the fuel injectors are leaking.

NOTE: Use care in removing the fuel injectors in order to prevent damage to the fuel injector electrical connector pins or the fuel injector nozzles. Do not immerse the fuel injector in any type of cleaner. The fuel injector is an electrical component and may be damaged by this cleaning method.

NOTE: Numbers in parentheses refer to numbers in illustrations.

1. Relieve the fuel system pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
2. Remove the intake manifold. See **INTAKE MANIFOLD** .
3. Before removal, clean the fuel rail assembly and the cylinder head with a spray type engine cleaner, GM (X-30A). Follow the package instructions. Do not soak the fuel rail in liquid cleaning solvent.
4. Disconnect the fuel pressure regulator vacuum line. See **Fig. 96** .
5. Disconnect the fuel feed and return pipes (1, 2) from the fuel rail. See **Fig. 97** . See **FUEL LINE DISCONNECT FITTINGS (4.2L)** .
6. Disconnect the fuel injector harness in-line connector.
7. Remove the fuel rail attaching bolts. See **Fig. 98** .

NOTE: Remove the fuel rail assembly carefully in order to prevent damage to the injector electrical connector terminals and the injector spray tips. Support the fuel rail after the fuel rail is removed in order to avoid damaging the fuel rail components. Cap the fittings and plug the holes when servicing the fuel system in order to prevent dirt and other contaminants from entering open pipes and passages.

8. Remove the fuel rail assembly.
9. Disconnect the fuel injector harness connector from the fuel injectors.
10. Remove the injector retainer clip. See **Fig. 99** .
11. Remove the fuel injector from the fuel rail.
12. Discard the injector retainer clip.
13. Remove the injector "O" ring seals from both ends of the injector. Discard the "O" ring seals. See **Fig. 99** .
14. To install, reverse removal procedure. If ordering new fuel injectors, be sure to order the correct injector for the application being serviced. The fuel injector assembly (1) is stamped with a part number identification (2). A four digit build date code (3) indicates the month (4), day (5), year (6), and the shift (7) that built the injector. See **Fig. 100** . Install fuel injectors with new "O" rings and new injector retainer clip. Lubricate new "O" rings with clean engine oil. Ensure fuel injector electrical connector faces outward when installing. Tighten bolts/nuts to specification. See **TORQUE SPECIFICATIONS** .

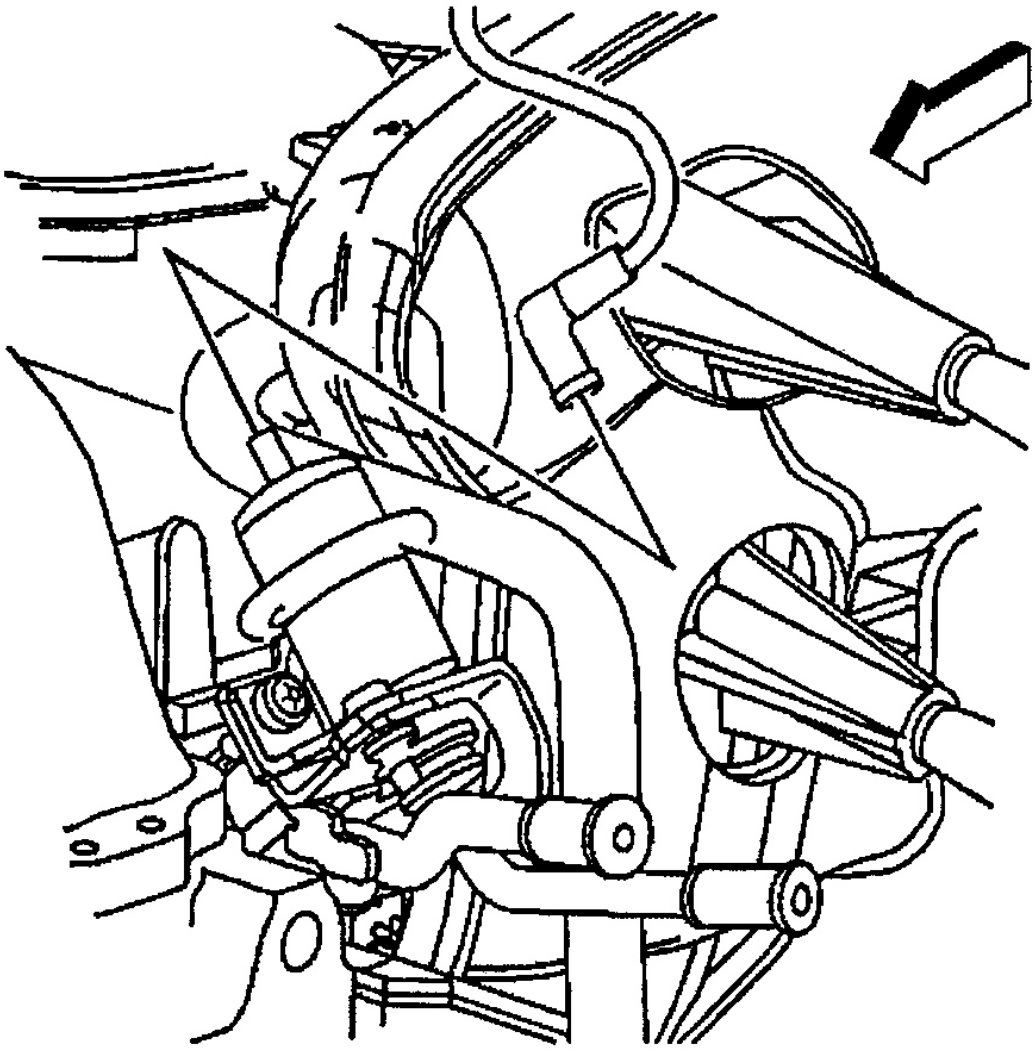

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Fig. 96: Locating Fuel Pressure Regulator Vacuum Line (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

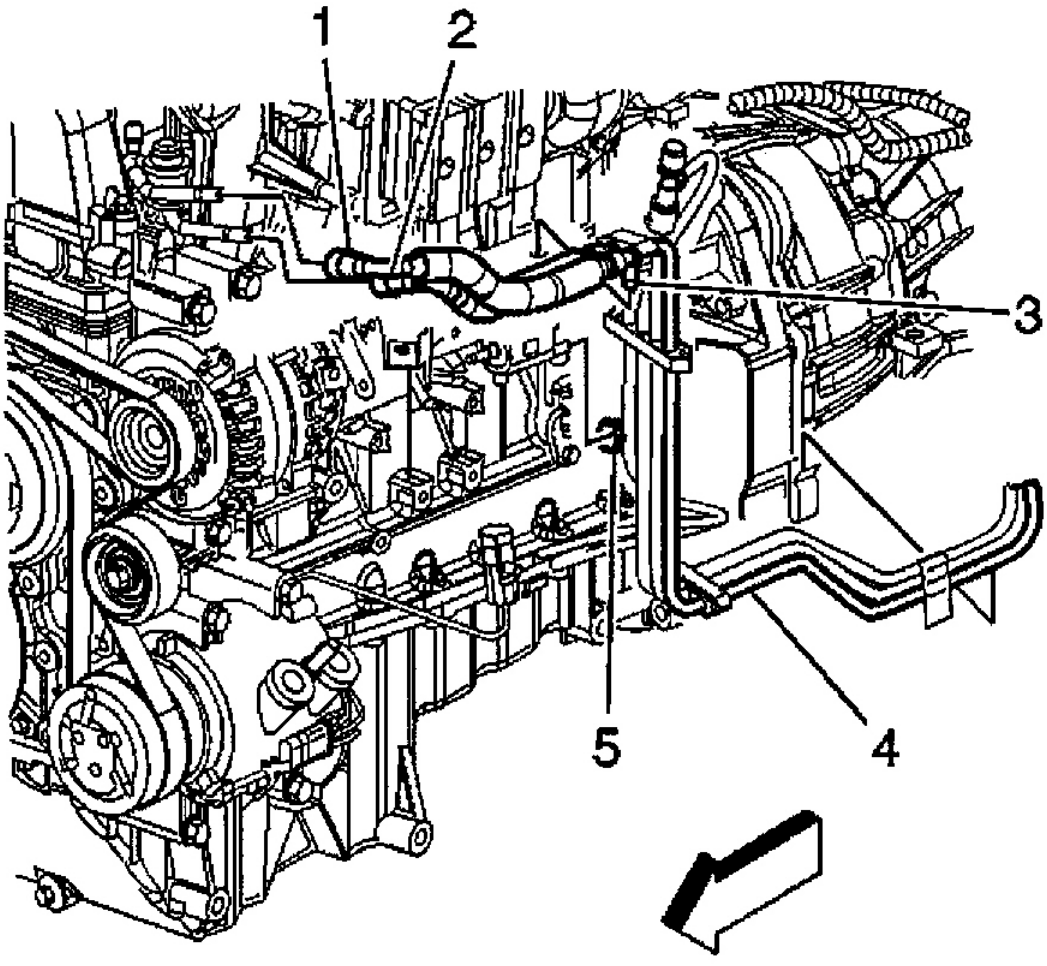

Fig. 97: Locating Fuel Feed & Return Lines (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

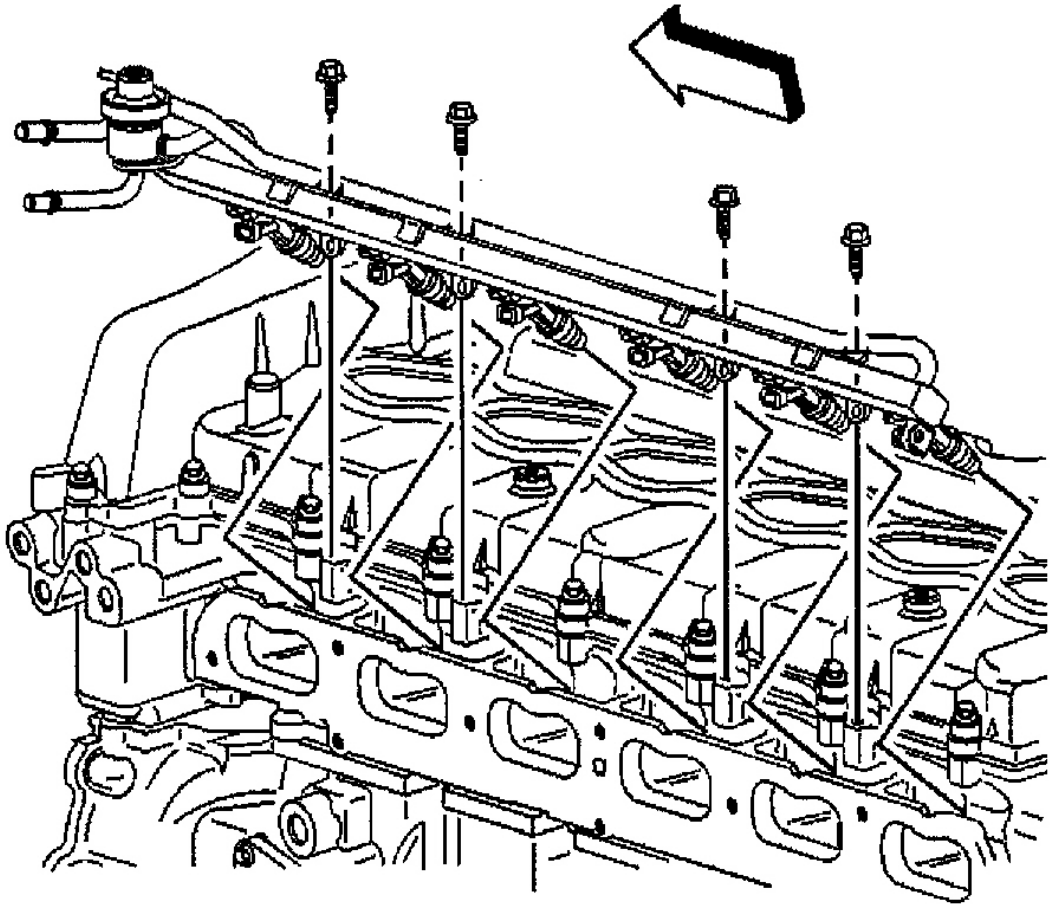

Fig. 98: Removing & Installing Fuel Rail Assembly (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

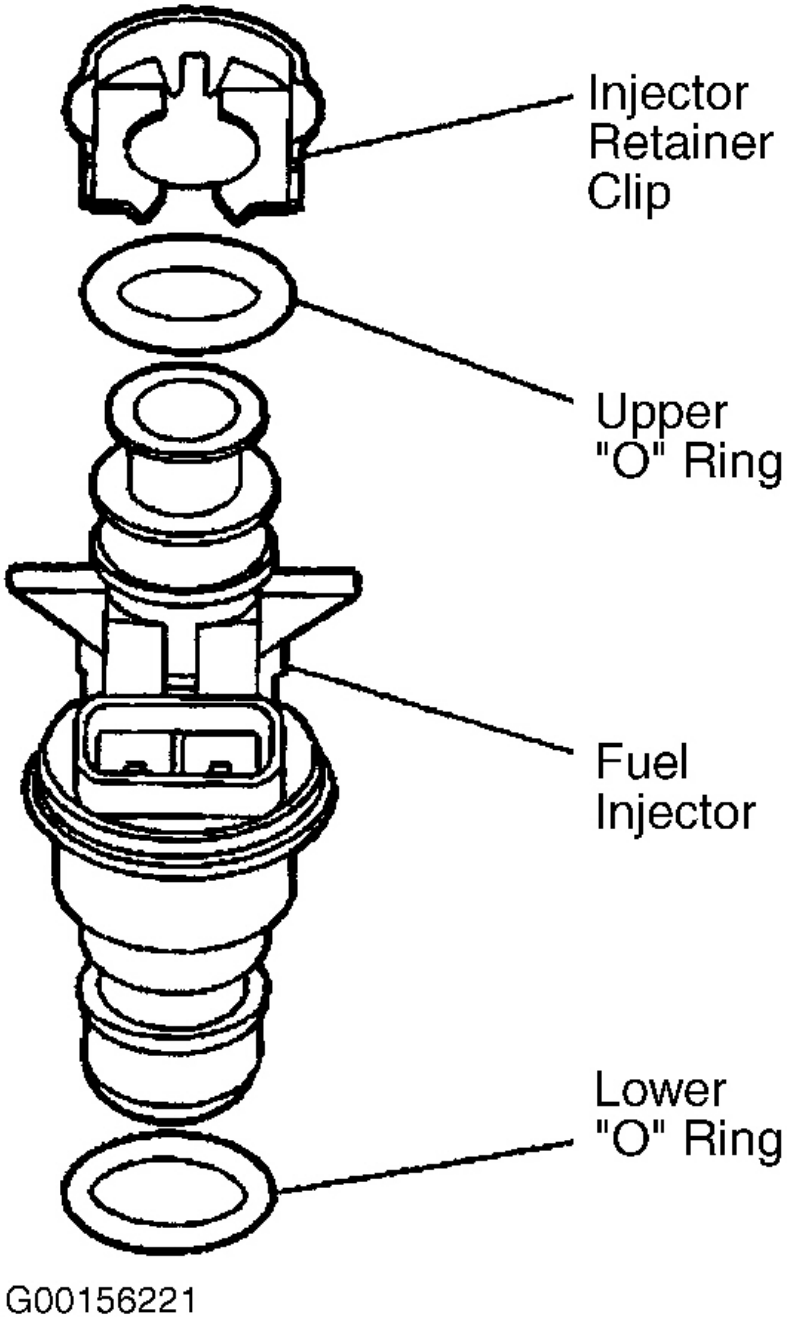

Fig. 99: Exploded View Of Fuel Injector (Ascender 4.2L & 5.3L)
Courtesy of GENERAL MOTORS CORP.

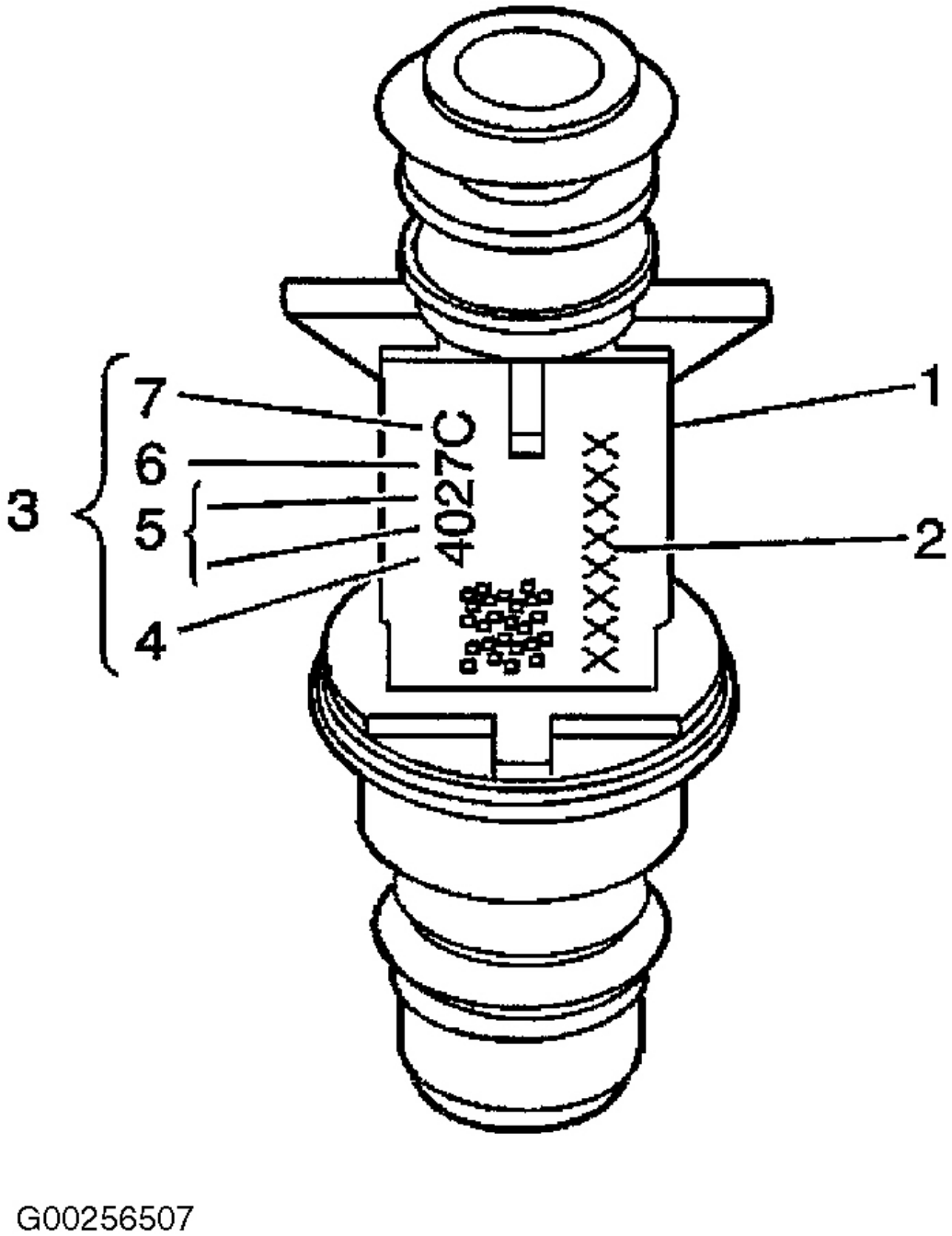

Fig. 100: Identifying Fuel Injector Serial Number (Ascender 4.2L & 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

CAUTION: The engine oil may be contaminated with fuel if the fuel injectors are leaking.

NOTE: Use care in removing the fuel injectors in order to prevent damage to the fuel injector electrical connector pins or the fuel injector nozzles. Do not immerse the fuel injector in any type of cleaner. The fuel injector is an electrical component and may be damaged by this cleaning method.

1. Loosen air cleaner clamp bolts at throttle body and at Mass Air Flow/Intake Air Temperature (MAF/IAT) sensor. Remove outlet duct bolt. Remove the air cleaner outlet duct.

NOTE: An eight-digit identification number (1) is located on the fuel rail. Refer to this model identification number if servicing or part replacement is required. See Fig. 101 .

2. Relieve fuel system pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
3. Disconnect air conditioning (A/C) compressor pressure switch electrical connector (2). See **Fig. 102** .
4. Remove wire harness from clip (1) on cylinder head.
5. Disconnect MAF/IAT sensor electrical connector (1). See **Fig. 14** .
6. Disconnect the following electrical connectors on the right hand side of the engine:
   - Main coil electrical harness (1). See **Fig. 127** .
   - Electronic throttle control (ETC) (2).
   - Fuel injectors (3).
7. Remove harness clips from fuel rail.
8. Disconnect generator electrical connector.
9. Disconnect the following electrical connectors on the left hand side of the engine:
   - Evaporative emission (EVAP) purge solenoid (1). See **Fig. 128** .
   - Knock sensor (2).
   - Manifold absolute pressure (MAP) sensor (3).
   - Main coil (5).
   - Fuel injectors (4).
10. Remove harness clips fromfuel rail
11. Perform the following steps in order to disconnect fuel injector electrical connectors:
    - Mark connectors to their corresponding injectors to ensure correct reassembly.
    - Pull the connector position assurance (CPA) retainer (2) on the connector up 1 click. See **Fig. 129** .
    - Push the tab (1) on the connector in.
    - Disconnect the fuel injector electrical connector.
    - Repeat the steps for each injector electrical connector.
12. Remove the positive crankcase ventilation (PCV) hose (with valve). See **Fig. 131** .

13. Remove heater water shutoff valve actuator inlet hose from intake manifold.
14. Remove EVAP purge solenoid vent tube from solenoid. Reposition vent tube.
15. Remove electrical harness from clips on ignition coil bracket.
16. Remove upper engine wire harness retainer nut (1). See **Fig. 135** .
17. Reposition upper engine wire harness aside.
18. Disconnect fuel feed and return pipes (1) from fuel rail. See **Fig. 103** . See **FUEL LINE DISCONNECT FITTINGS (ASCENDER 4.2L & 5.3L)** .
19. Disconnect fuel pressure regulator vacuum line.
20. Remove fuel rail bolts. See **Fig. 104** .

NOTE: Remove the fuel rail assembly carefully in order to prevent damage to the injector electrical connector terminals and the injector spray tips. Support the fuel rail after the fuel rail is removed in order to avoid damaging the fuel rail components. Cap the fittings and plug the holes when servicing the fuel system in order to prevent dirt and other contaminants from entering open pipes and passages.

CAUTION: Before removal, clean the fuel rail with a spray type engine cleaner, GM X-30A or equivalent, if necessary. Follow the package instructions. Do not soak the fuel rail in liquid cleaning solvent.

21. Remove the fuel rail.
22. Remove and discard the fuel injector retainer clip (19). See **Fig. 105** .
23. Remove the fuel injector (17).
24. Remove and discard the fuel injector retainer clip. See **Fig. 99** .
25. Remove and discard the fuel injector "O" ring seals.
26. To install, reverse removal procedure. If ordering new fuel injectors, be sure to order the correct injector for the application being serviced. The fuel injector assembly (1) is stamped with a part number identification (2). A four digit build date code (3) indicates the month (4), day (5), year (6), and the shift (7) that built the injector. See **Fig. 100** . Install fuel injectors with new "O" rings and new injector retainer clip. Lubricate new "O" rings with clean engine oil. Ensure fuel injector electrical connector faces outward when installing. Tighten bolts/nuts to specification. See **TORQUE SPECIFICATIONS** .

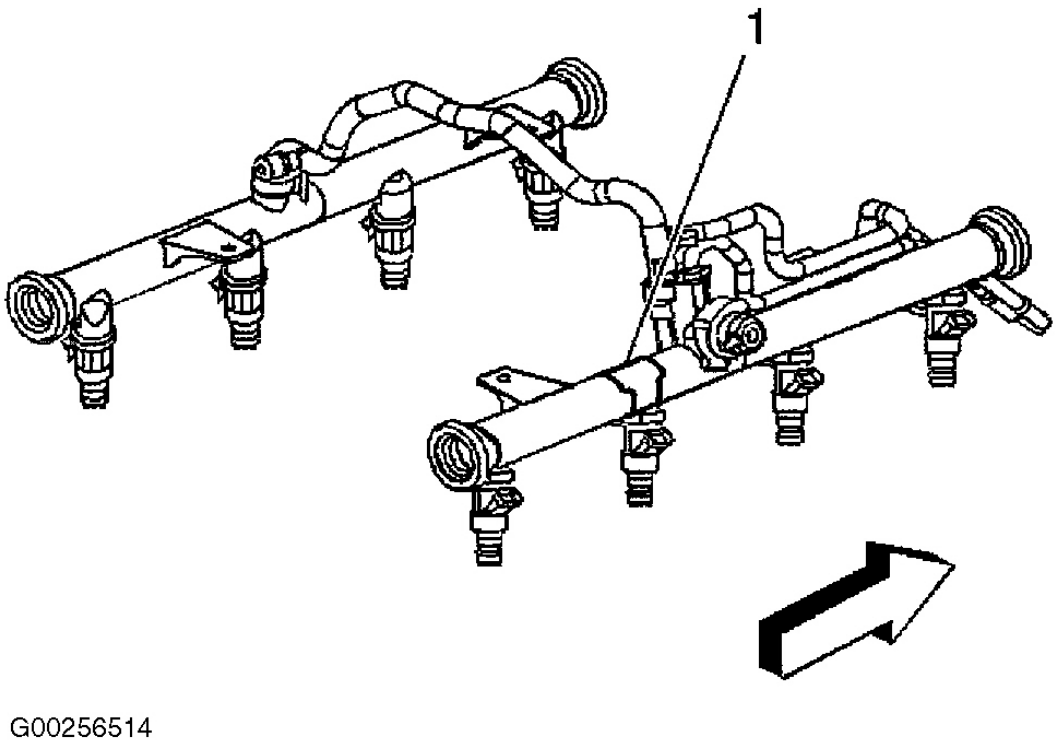

Fig. 101: Locating Fuel Rail Model Identification Number (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

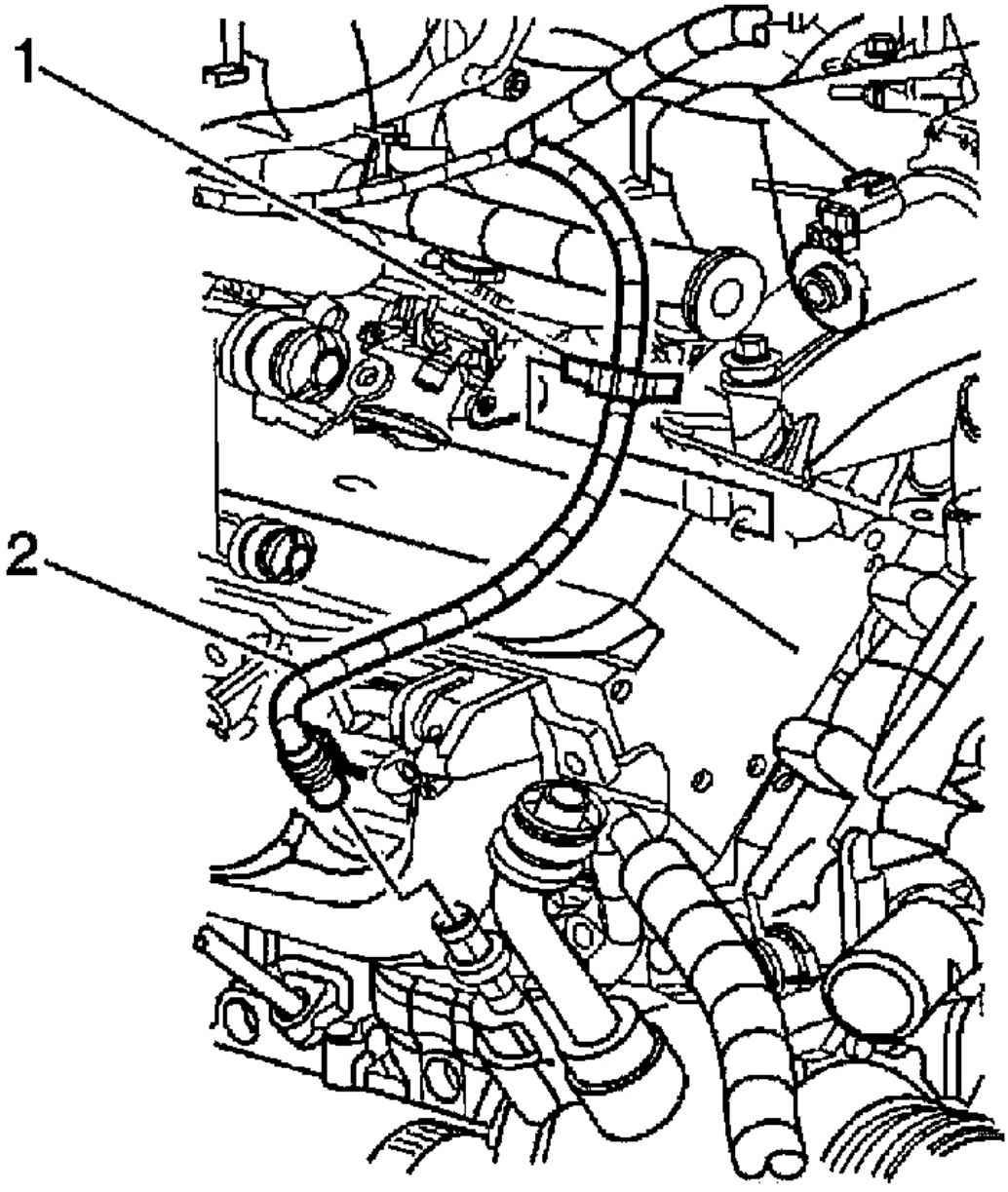

Fig. 102: Locating A/C Compressor Pressure Switch (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

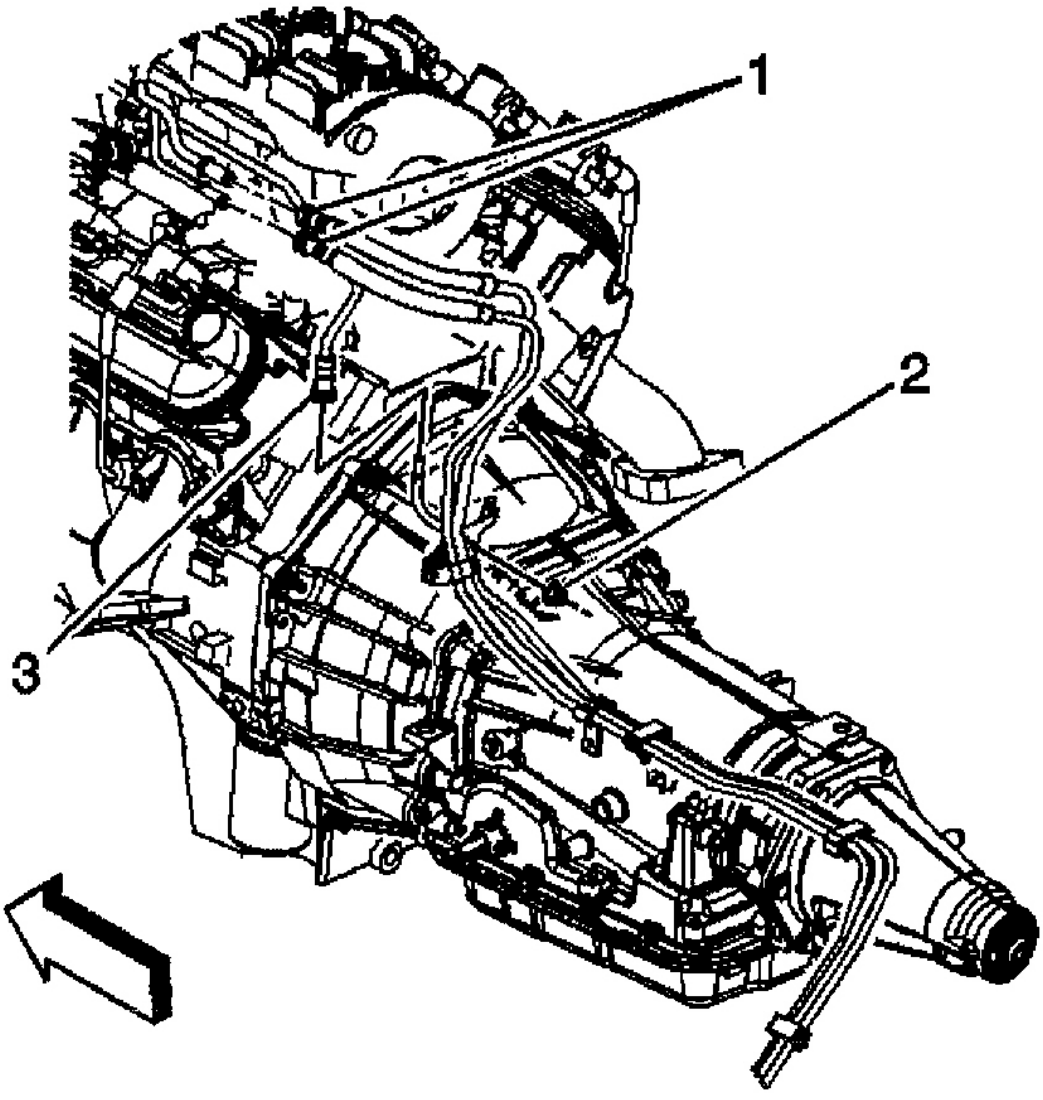

Fig. 103: Locating Fuel Feed & Return Lines (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

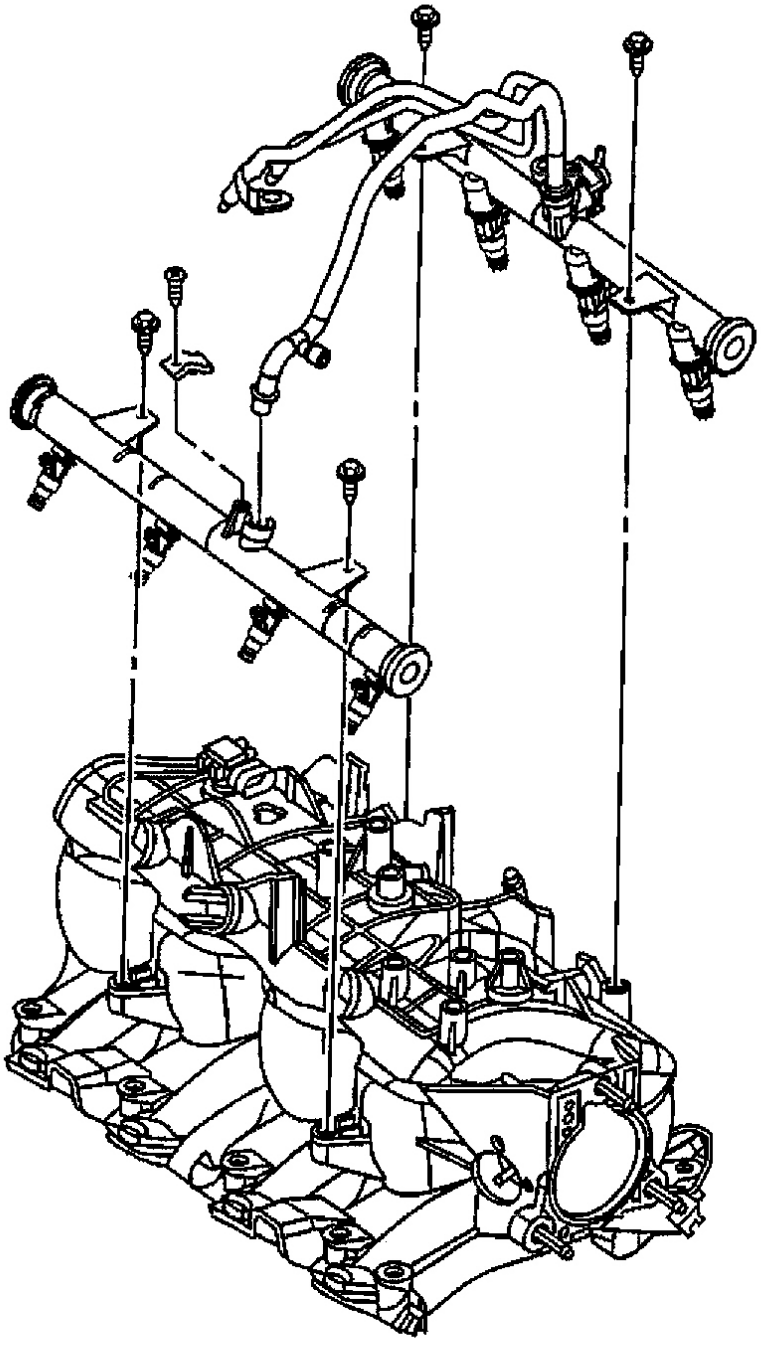

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Fig. 104: Removing & Installing Fuel Rail Assembly (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

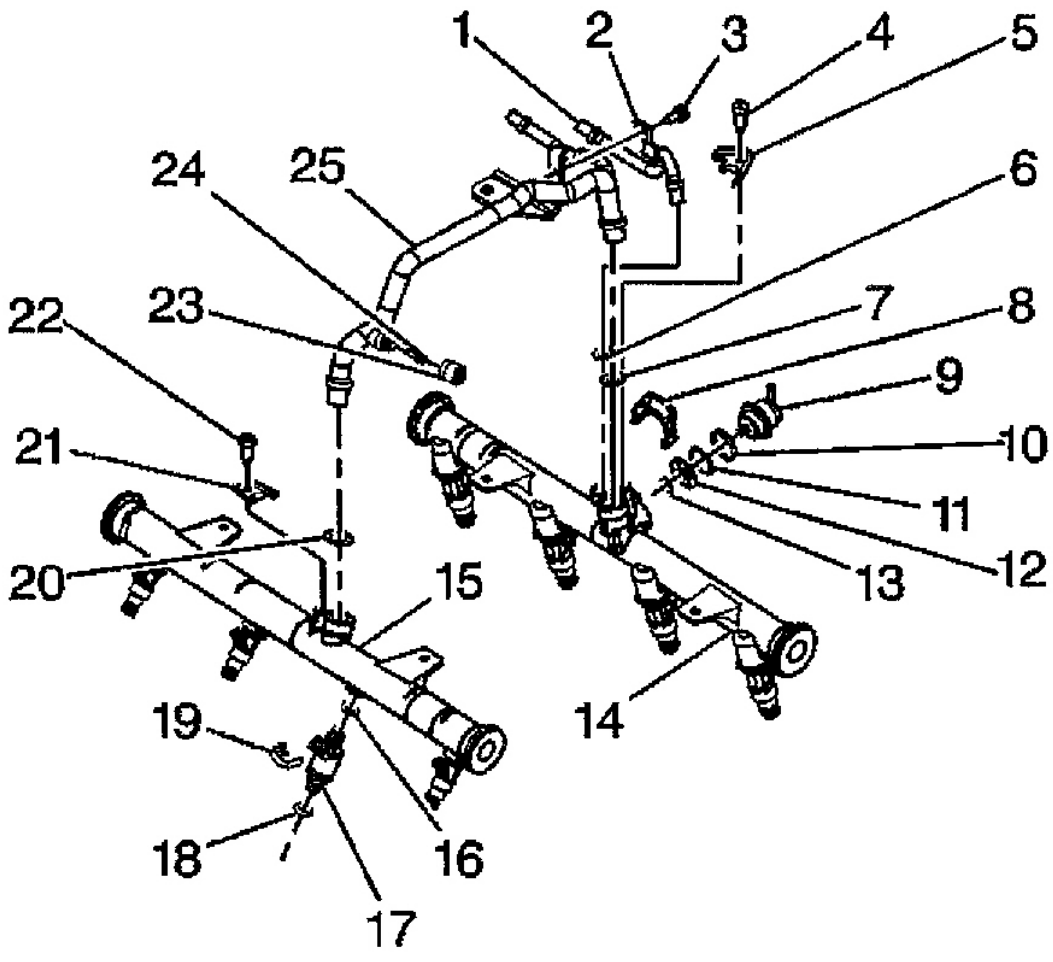

Fig. 105: Exploded View Of Fuel Rail Components (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

NOTE: Removal of fuel injectors requires removal of intake manifold.

1. Relieve fuel pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
2. Remove intake manifold. See **INTAKE MANIFOLD** .
3. Lift up fuel rail with fuel injectors. Unless fuel injectors are to be replaced, DO NOT separate fuel injectors from fuel rail. Drain residual fuel into appropriate container.
4. Remove fuel injector retainer clip. Remove fuel injector assembly. Remove "O" rings from injector. See **Fig. 106** .

5. To install, reverse removal procedure. Install NEW "O" rings on injector and lube with engine oil. Install injector into fuel rail using NEW retainer clips. Coat end of injector with engine oil. Install fuel rail. Install intake manifold. Tighten nuts and bolts to specification. See **TORQUE SPECIFICATIONS** .

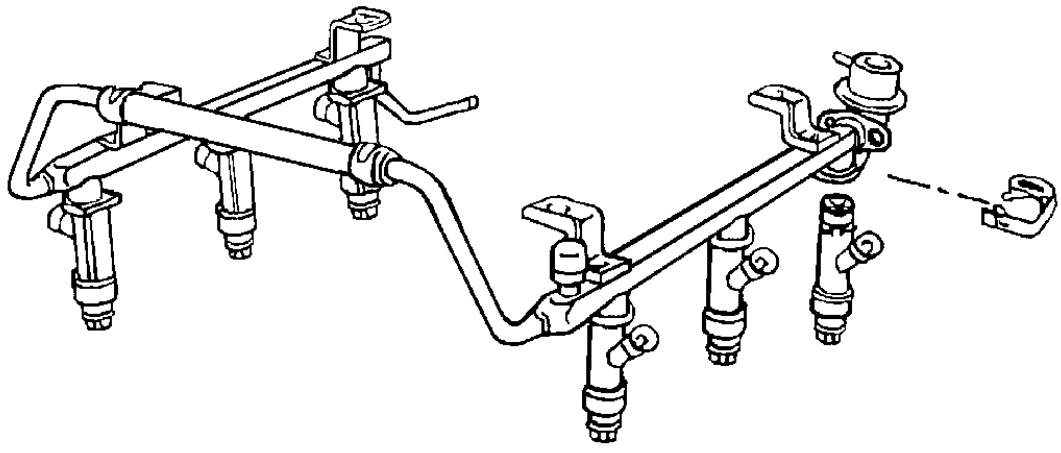

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Fig. 106: Exploded View Of Fuel Rail Assembly (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Relieve fuel pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
2. Disconnect negative battery cable.
3. Disconnect fuel inlet and return lines.
4. Disconnect fuel injector electrical connectors. Remove fuel rail wiring electrical nuts. Remove fuel rail-to-intake manifold bolts. See **Fig. 107** .
5. Lift up fuel rail with fuel injectors. Unless fuel injectors are to be replaced, DO NOT separate fuel injectors from fuel rail.
6. Drain residual fuel into appropriate container.
7. Remove fuel injector retaining clip. Remove fuel injector from fuel rail. Remove "O" ring seals.
8. Install NEW "O" rings on injector and lube with engine oil. Install injector into fuel rail using NEW retainer clips. Coat end of injector with engine oil. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

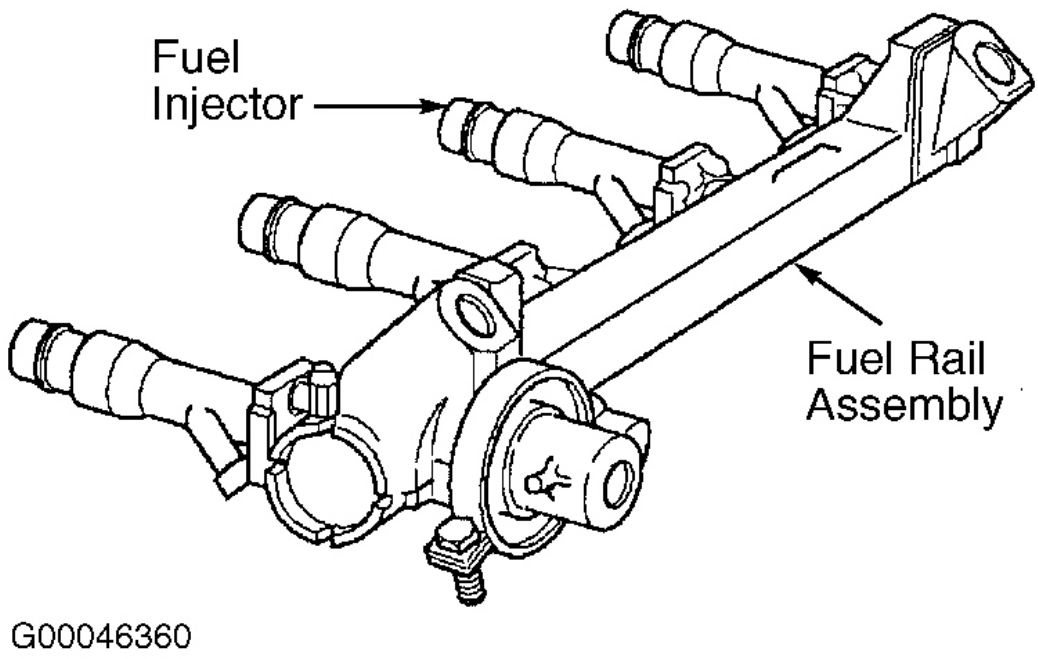

Fig. 107: Identifying Fuel Rail And Injectors (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

FUEL TANK

CAUTION: Before attempting fuel tank leak check, place a dry chemical (Class B) fire extinguisher near work area. Before removing fuel tank, ensure fuel hoses and fuel sender gasket are not leaking onto tank.

Removal & Installation (Ascender)

1. Relieve the fuel system pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
2. Raise and support vehicle.
3. Remove frame brace.
4. Remove the fuel tank shield, if equipped.
5. Loosen the fuel hose clamp (1) at the fuel tank. See **Fig. 108** .
6. Separate the fuel hose (2) from the fuel tank.
7. Drain the fuel tank.
8. Disconnect the fuel tank pressure sensor electrical connector (3). See **Fig. 83** .
9. Disconnect the evaporative emission (EVAP) vent valve electrical connector (2).
10. Disconnect the fuel feed, return and EVAP pipes. See **FUEL LINE DISCONNECT FITTINGS**

(ASCENDER 4.2L & 5.3L) .

11. Cap the fuel and EVAP pipes in order to prevent possible fuel system contamination.
12. With the aid of an assistant, support the fuel tank.
13. Remove the fuel tank strap bolts (1). See **Fig. 109** .

NOTE: Do not bend the fuel tank straps. Bending the fuel tank straps may damage the straps.

14. Remove the fuel tank straps (2).
15. Carefully lower the fuel tank.
16. Disconnect the fuel sender electrical connector (1). See **Fig. 83** .
17. Remove the fuel tank.
18. Place the fuel tank in a suitable work area.
19. To install, reverse removal procedure. Tighten all bolts/nuts to specification. See **TORQUE SPECIFICATIONS** .
20. After fuel tank is installed, inspect for leaks:
    - Turn the ignition ON, with the engine OFF for 10 seconds.
    - Turn the ignition OFF for 10 seconds.
    - Turn the ignition ON, with the engine OFF.
    - Inspect for fuel leaks.

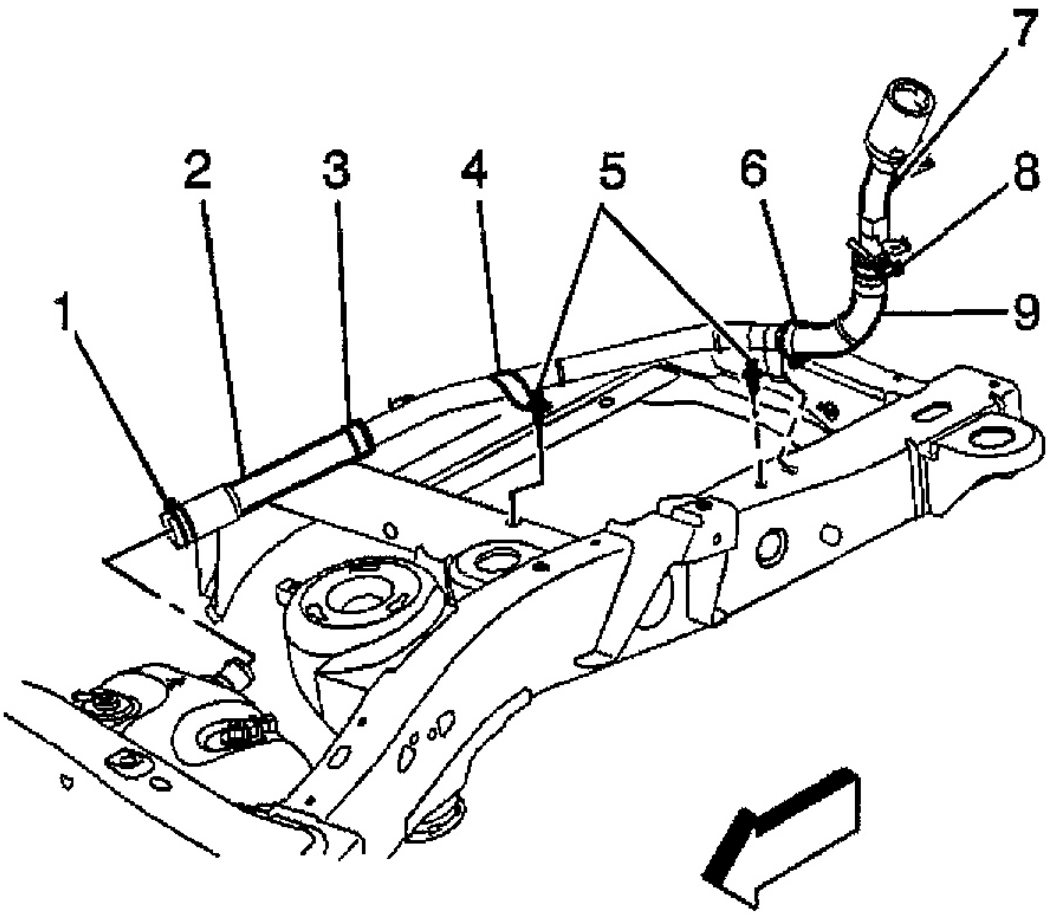

Fig. 108: Locating Fuel Fill Hose (Ascender)
Courtesy of GENERAL MOTORS CORP.

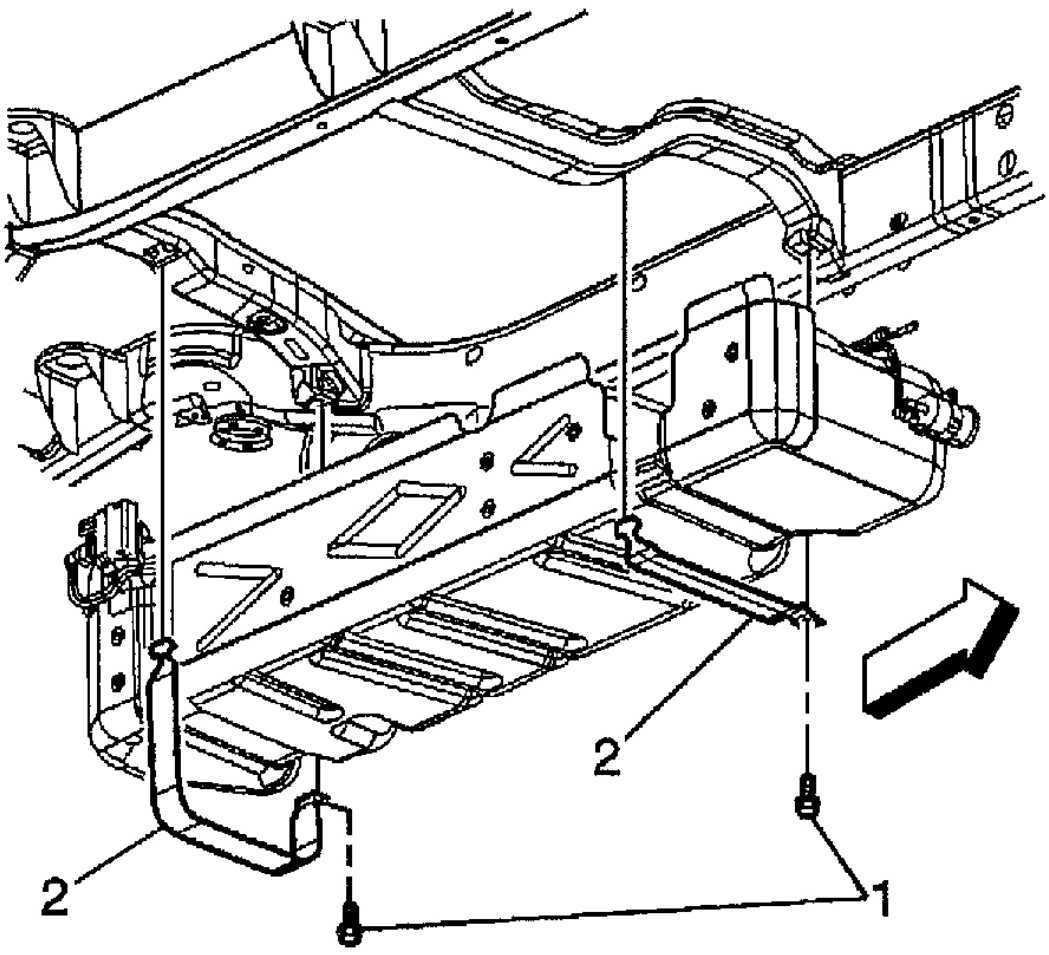

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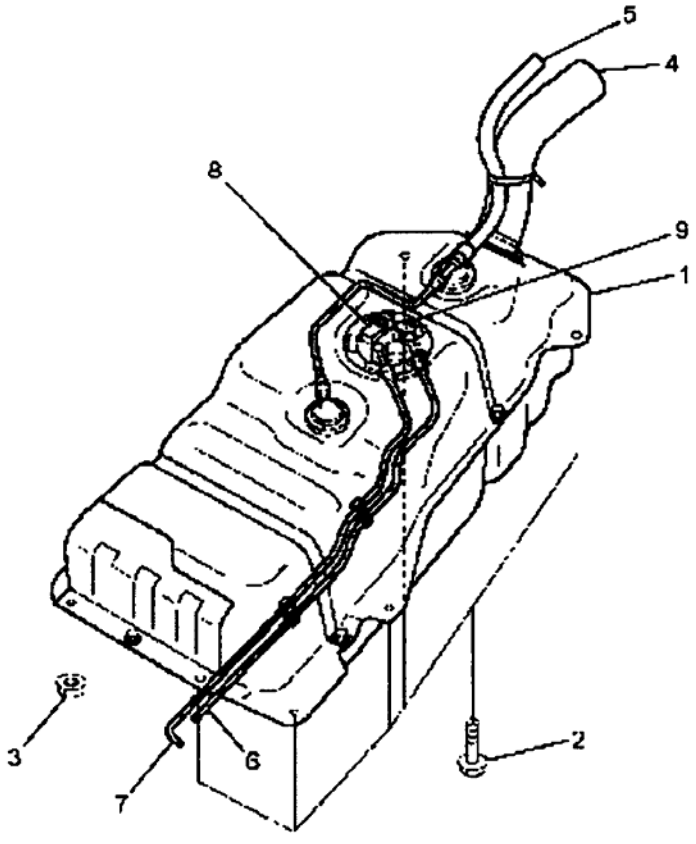
Fig. 109: Removing & Installing Fuel Tank (Ascender)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport)

1. Drain fuel tank. See **FUEL PUMP FLOW TEST** under FUEL SYSTEMS in BASIC DIAGNOSTIC PROCEDURES article.
2. Disconnect negative battery cable.
3. Loosen gas cap.
4. Support fuel tank with an appropriate lifter.
5. Disconnect EVAP fuel hose from EVAP canister. See **Fig. 110** and **Fig. 111** .
6. Disconnect fuel feed and fuel return hose at couplings near fuel filter.

7. Disconnect air breather and fuel filler hoses at filler neck.
8. Remove 5 fuel tank retaining bolts.
9. Lower fuel tank enough to disconnect electrical connectors. Remove tank.
10. To install, reverse removal procedure. Tighten nuts and bolts to specification. See **TORQUE SPECIFICATIONS** .
11. After fuel tank is installed. Start engine and observe fuel tank and hoses for any leaks. Repair as necessary.



Legend	
(1)	Fuel Tank Assembly
(2)	Fuel Tank Fixing Bolt (QTY: 5)
(3)	Fuel Tank fixing Nut (QTY: 1)
(4)	Fuel Filler Hose
(5)	Fuel Breather Hose
(6)	Fuel Feed Hose
(7)	Fuel Return Hose
(8)	Tank Pressure Sensor Connector
(9)	Fuel Feed Pump Connector

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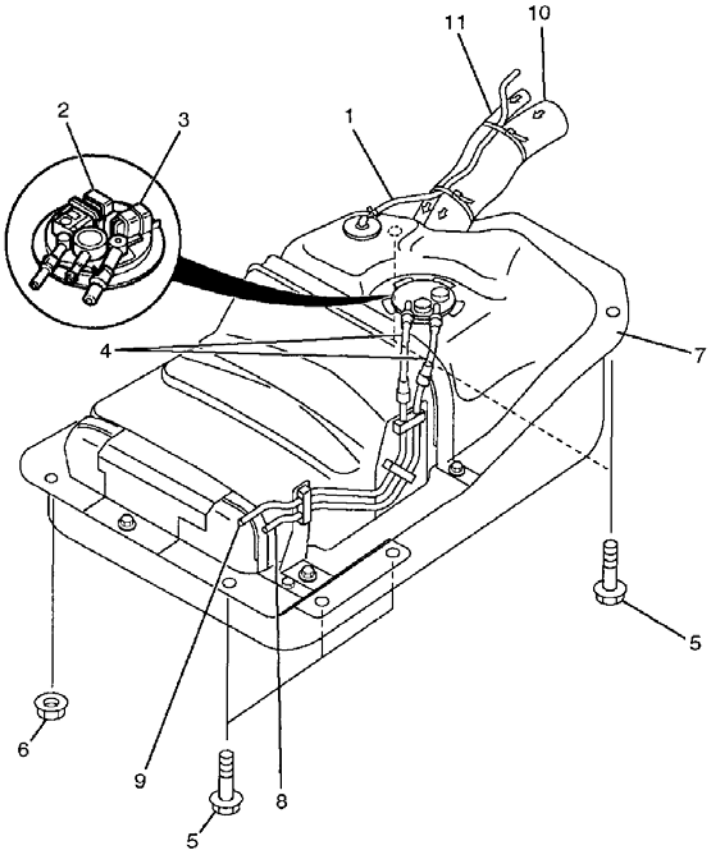
Fig. 110: Locating Fuel Tank Components (Axiom & Rodeo)
Courtesy of ISUZU MOTOR CO.



Legend	
(1)	Hose; Evaporative Fuel
(2)	Connector; Fuel Tank Pressure Sensor
(3)	Connector; Fuel Feed Pump
(4)	Fuel Tube/Quick Connector
(5)	Bolt; Fuel Tank Asm. Fixing (QTY:5)
(6)	Nut; Fuel Tank Asm. Fixing (QTY:1)
(7)	Fuel Tank Assembly
(8)	Hose; Fuel Feed
(9)	Hose; Fuel Return
(10)	Fuel Filler Hose
(11)	Air Breather Hose

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Fig. 111: Locating Fuel Tank Components (Rodeo Sport)
Courtesy of ISUZU MOTOR CO.

THROTTLE BODY

CAUTION: To avoid damaging throttle body and intake manifold gasket surfaces DO NOT use solvent of any kind to clean throttle body gasket surface.

Removal & Installation (Ascender 4.2L)

1. Remove air cleaner resonator from top of engine.
2. Disconnect EVAP canister purge line from throttle body.
3. Disconnect throttle body harness connector.
4. Remove 4 throttle body-to-intake manifold bolts. See **Fig. 112** . Remove throttle body. Remove flange gasket and discard.
5. Clean gasket surface.
6. To install, reverse removal procedure. Replace gaskets as necessary. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

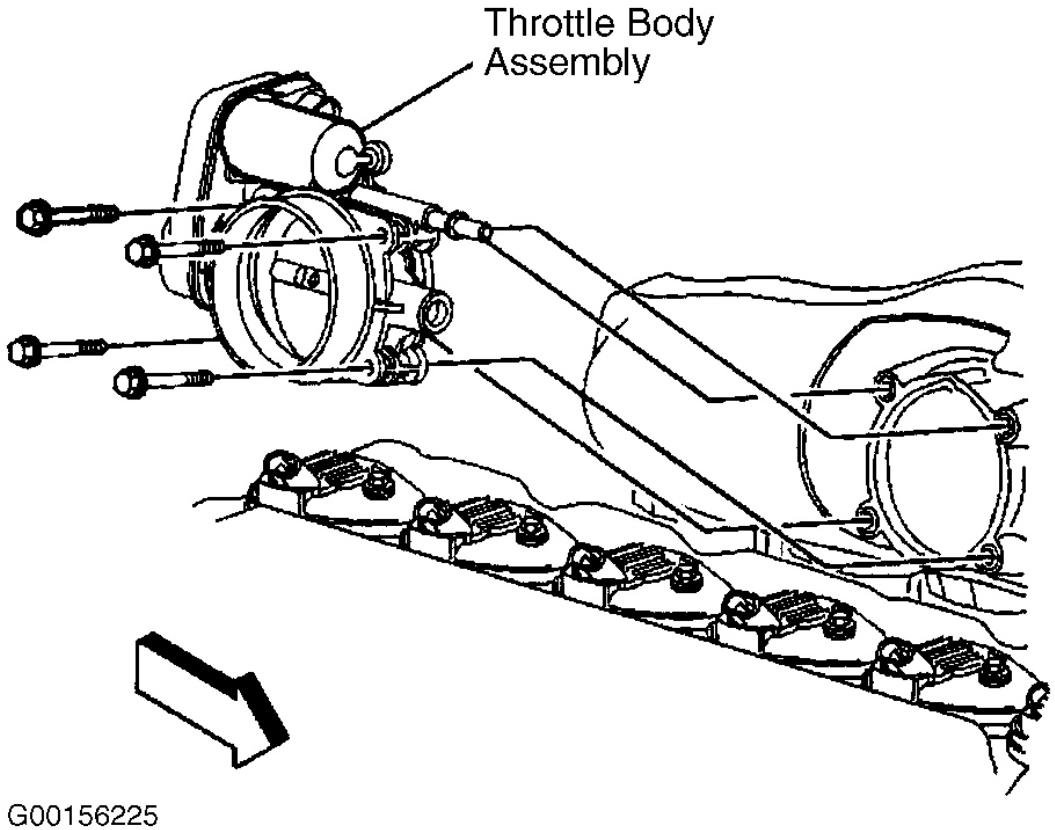

Fig. 112: Removing & Installing Throttle Body Assembly (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

NOTE: An eight digit part identification number is stamped on the throttle body casting. Refer to this number if servicing, or part replacement is required.

NOTE: The intake manifold, throttle body, fuel injection rail, and fuel injectors may be removed as an assembly. If not servicing the individual components, remove the manifold as a complete assembly.

1. Partially drain cooling system in order to allow hose at throttle body to be removed.
2. Loosen clamps at MAF/IAT sensor and throttle body.
3. Remove air cleaner outlet duct. See **Fig. 64** .
4. Disconnect throttle actuator motor electrical connector (2). See **Fig. 127** .
5. Reposition throttle body hose clamp.
6. Remove throttle body hose from throttle body. See **Fig. 113**
7. Remove throttle body bolts.
8. Remove electrical wire harness connectors from throttle body.
9. Remove engine coolant air bleed hose and clamp.
10. Remove throttle body nuts. See **Fig. 114** .
11. Remove throttle body.
12. Remove throttle body gasket. See **Fig. 115** .
13. Discard gasket.
14. Remove throttle body studs, if required. To install, reverse removal procedure.

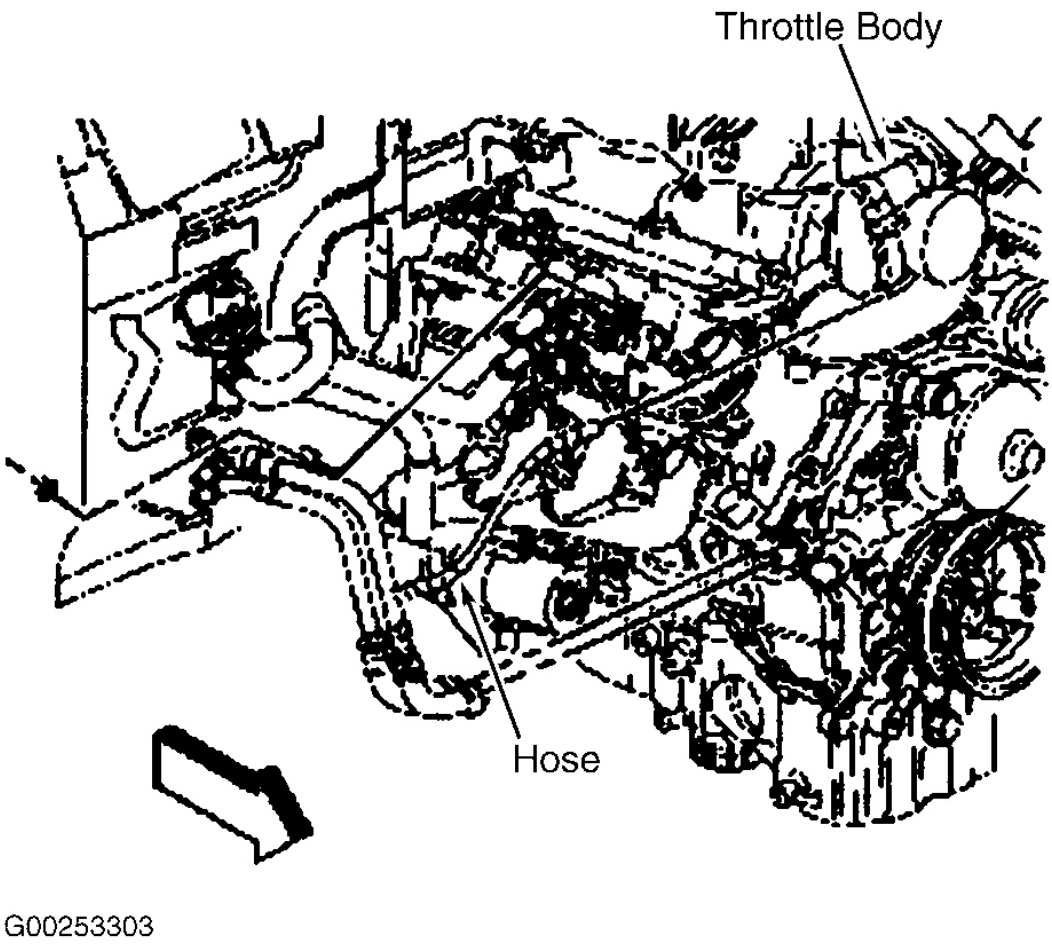

Fig. 113: Removing & Installing Throttle Body Hose (Ascender 5.3L)
Courtesy of ISUZU MOTOR CO.

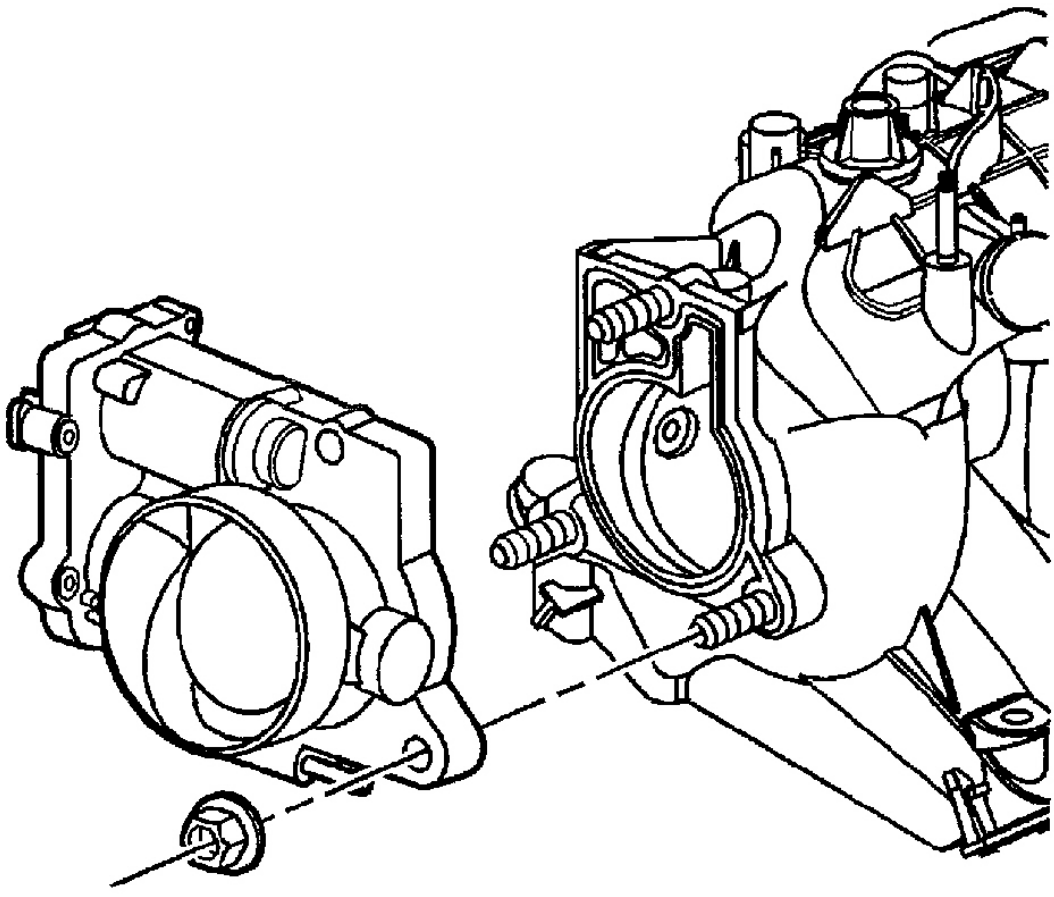

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Fig. 114: Removing & Installing Throttle Body (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

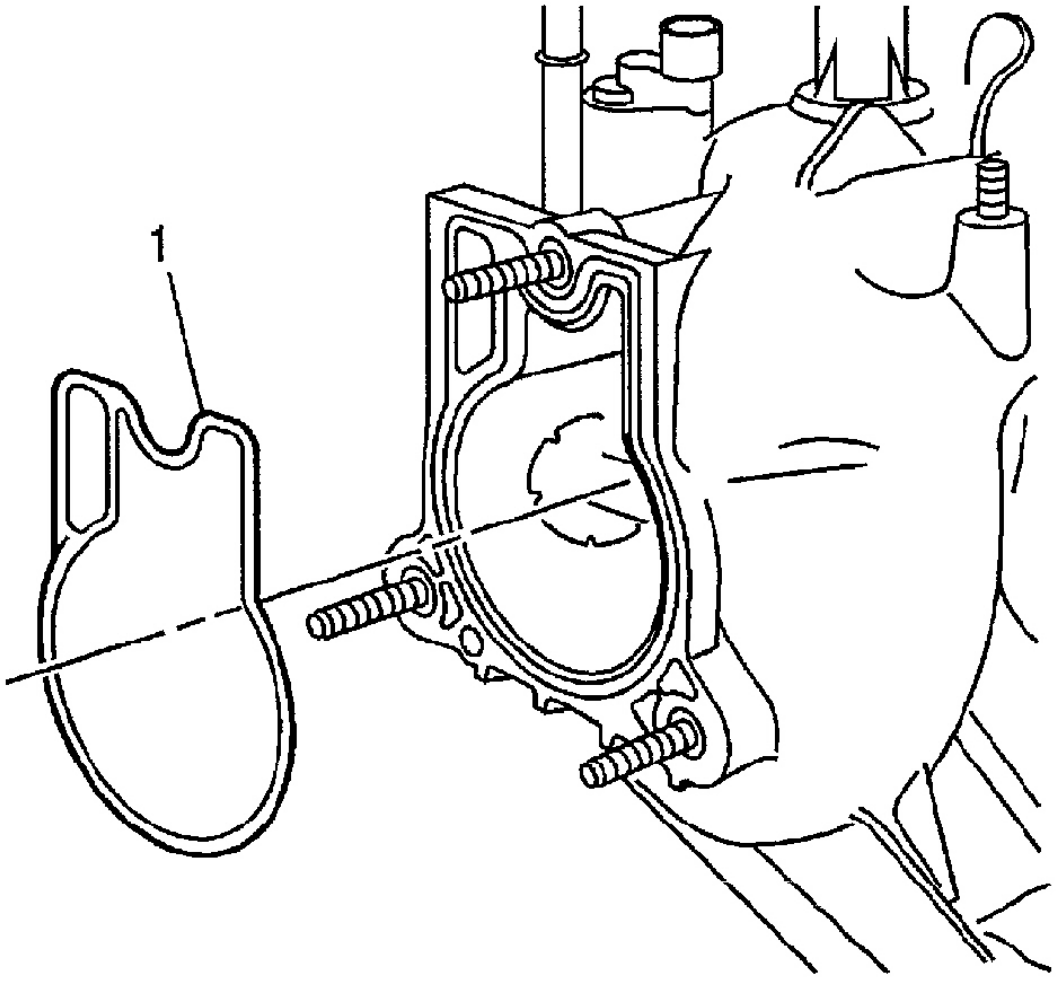


Fig. 115: Removing & Installing Throttle Body Gasket (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

1. Disconnect negative battery cable.
2. Drain cooling system.
3. Disconnect TP sensor and IAT sensor electrical connectors.
4. Disconnect vacuum hoses below air horn.
5. Disconnect air cleaner duct from throttle body.
6. Disconnect coolant lines.
7. Remove 4 throttle body-to-intake manifold and remove throttle body from manifold. Remove TP sensor

from throttle body. See **Fig. 116** .

8. To install, reverse removal procedure. Replace gaskets as necessary. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

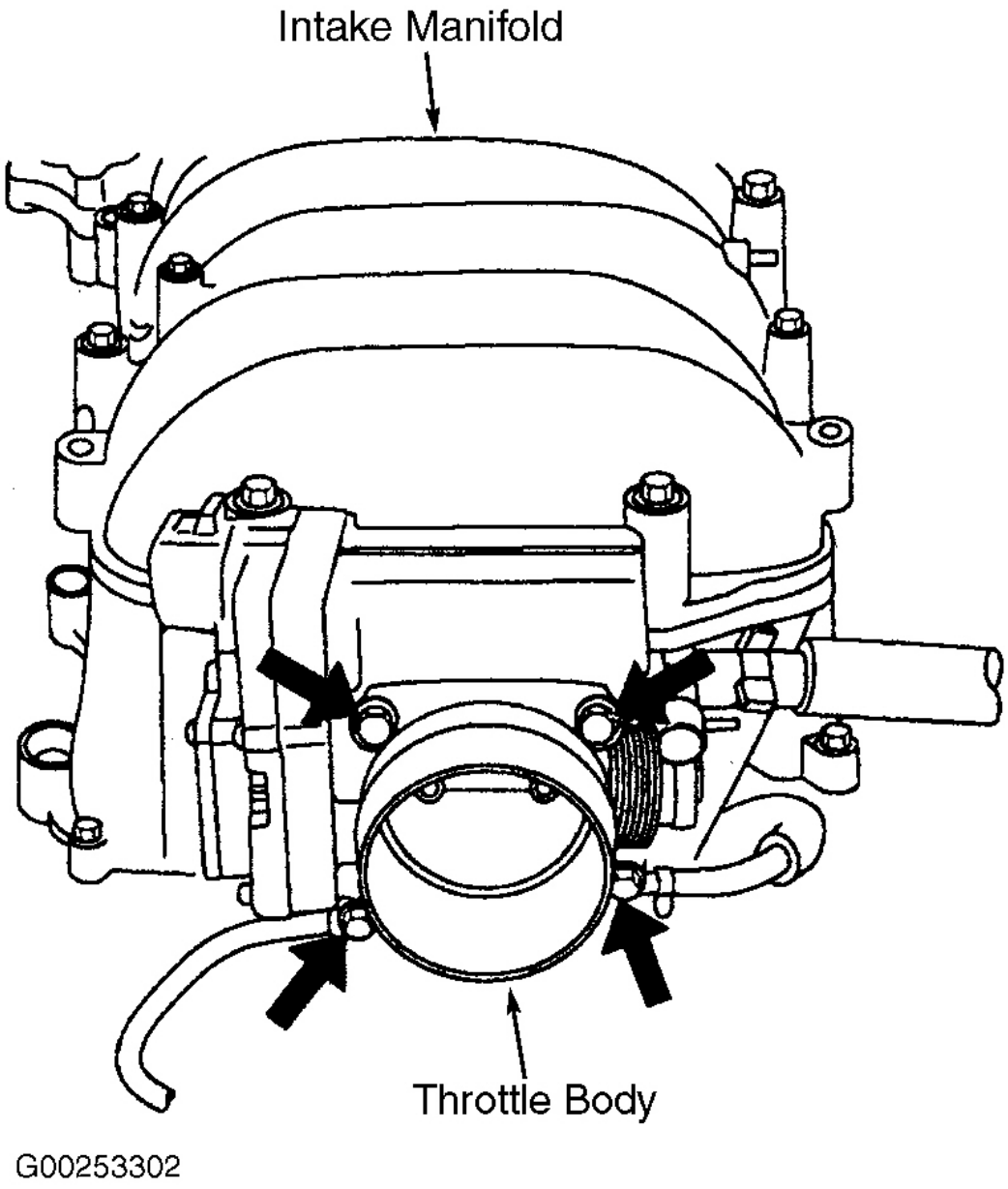


Fig. 116: Locating Intake Manifold & Throttle Body (Axiom, Rodeo & Rodeo Sport 3.2L)
Courtesy of ISUZU MOTOR CO.

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

1. Disconnect negative battery cable.
2. Drain cooling system.
3. Disconnect air cleaner duct from throttle body.
4. Disconnect accelerator cable from throttle lever. See **Fig. 117** .
5. Disconnect TP sensor and IAC valve electrical connectors.
6. Disconnect vacuum hoses below air horn.
7. Disconnect coolant lines.
8. Remove 4 throttle body-to-intake manifold bolts and remove throttle body from manifold. If replacing throttle body remove TP sensor and IAC valve from throttle body.
9. To install, reverse removal procedure. Replace gaskets as necessary. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

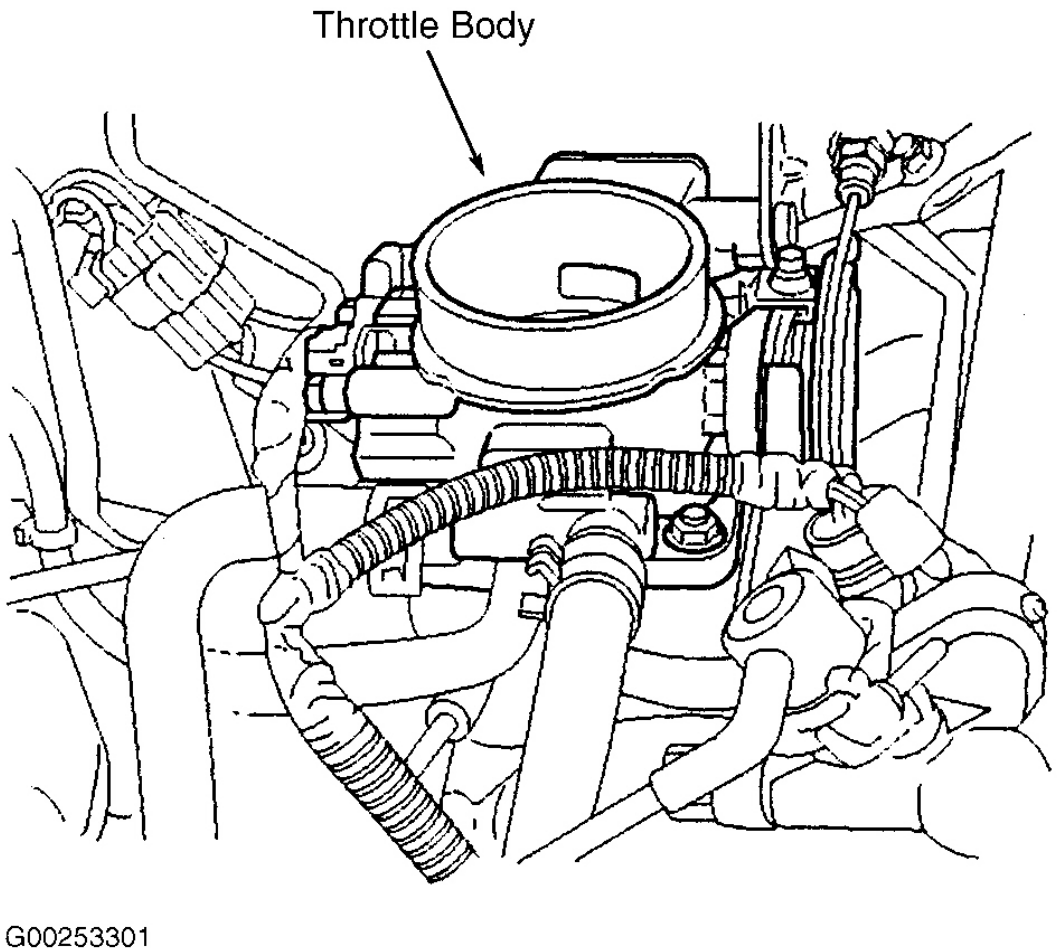
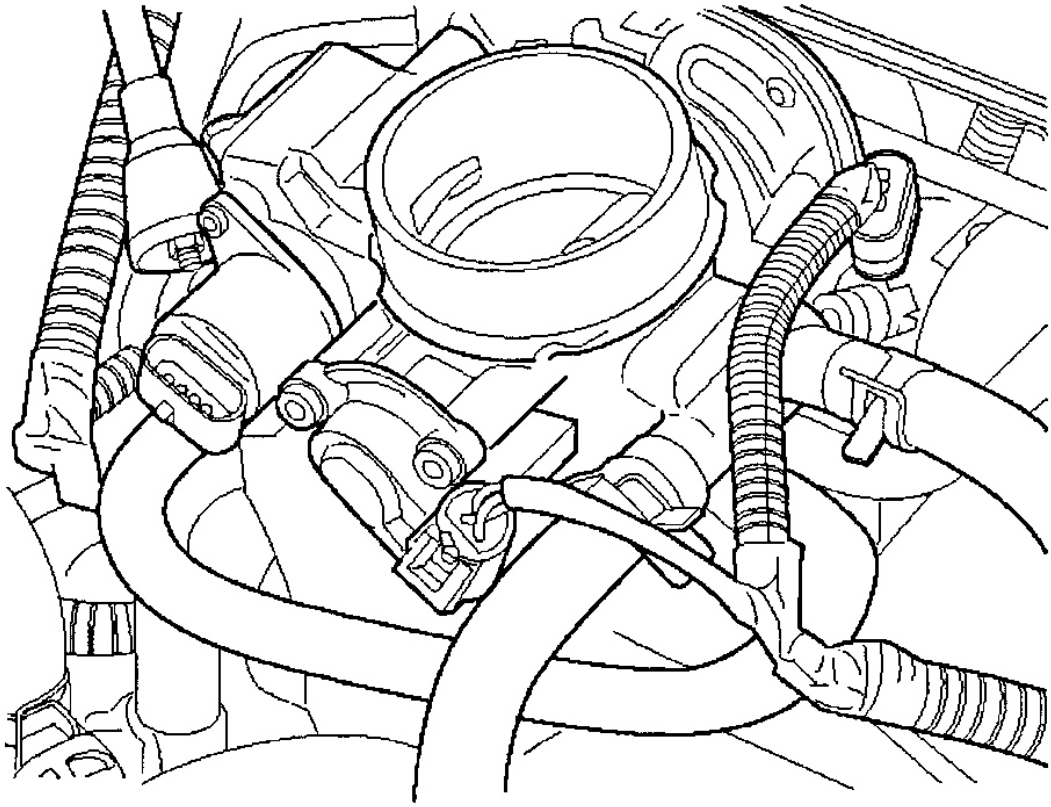


Fig. 117: Locating Throttle Body (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

IDLE AIR CONTROL VALVE (RODEO & RODEO SPORT 2.2L)

Removal & Installation

1. Disconnect negative battery cable.
2. Disconnect Idle Air Control (IAC) valve electrical connector. See **Fig. 118** .
3. Remove 2 screws and IAC valve from throttle body.
4. Using carburetor cleaner, clean IAC valve "O" ring sealing surface, pintle valve seat and air passage.
5. Before installing IAC valve, inspect IAC valve "O" ring. If problem is found, replace as necessary. When installing new IAC valve, check distance between tip of pintle and mounting flange. If measurement is 1.1" (28 mm) or more, apply finger pressure and retract valve to 1.1" (28 mm). See **Fig. 119** . If measurement is less than specified, install valve. DO NOT push or pull on pintle of old IAC valve, or damage may occur to valve. To install, reverse removal procedure and tighten bolts to specification. See **TORQUE SPECIFICATIONS** .



G00141560

Fig. 118: Removing & Installing Idle Air Control Valve (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

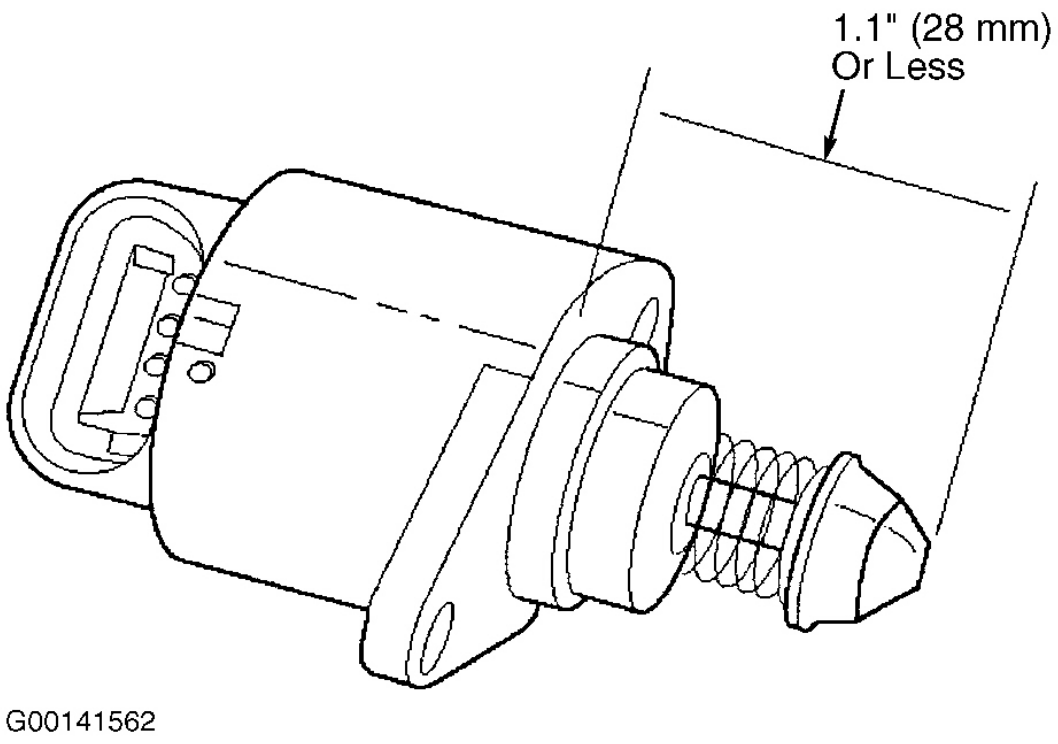


Fig. 119: Checking Idle Air Control Valve Adjustment (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

ACCELERATOR CABLE (RODEO & RODEO SPORT 2.2L)

Removal & Installation

1. Disconnect air cleaner duct from throttle body. Loosen adjusting nut on throttle body cable bracket. Remove cable clip. Remove accelerator cable from throttle lever.
2. Working under dash inside of vehicle, remove cable from accelerator pedal. Push rubber grommet through firewall, and pull accelerator cable through firewall.
3. Check cable for ease of movement, kinks or bends and damage to cable housing. Replace as necessary. To install, reverse removal procedure. After installing cable to throttle body adjust cable. See **ACCELERATOR CABLE ADJUSTMENT** .

Accelerator Cable Adjustment

1. Loosen cable adjusting and jam nuts. Pull on cable while fully closing throttle valve. Tighten adjusting and jam nuts. See **Fig. 120** .
2. Loosen adjusting nut 3 turns. Tighten jam nut. Valve lever must return upward to stopper screw. If throttle valve lever does not reach stopper screw, repeat adjustment procedure.

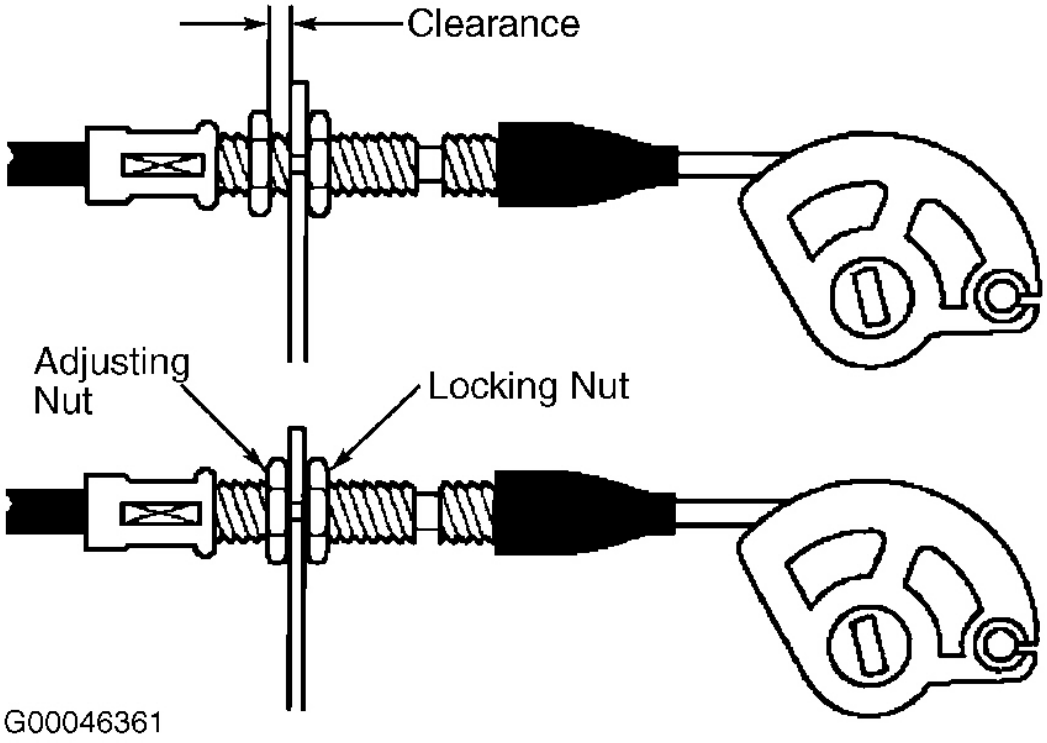
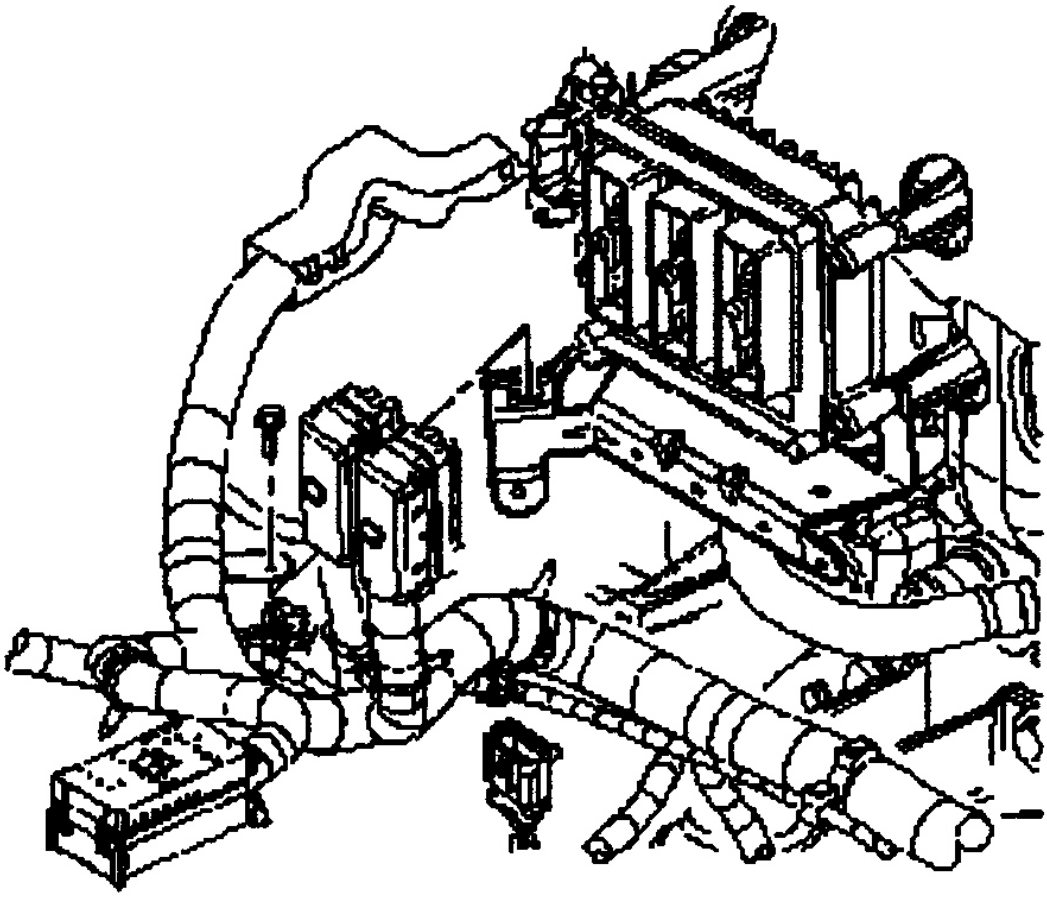


Fig. 120: Adjusting Accelerator Cable (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

INTAKE MANIFOLD

Removal & Installation (Ascender 4.2L)

1. Remove throttle body assembly. See **THROTTLE BODY** .
2. Remove Powertrain Control Module (PCM) retaining bolts and nuts. See **Fig. 1** . See **POWER TRAIN CONTROL MODULE** under COMPUTERIZED ENGINE CONTROLS.
3. Disconnect electrical connectors and all wire harnesses from harness bracket. See **Fig. 121** .
4. Remove front differential vent hose from bracket clip.
5. Remove engine harness bracket bolt and remove bracket. See **Fig. 122** .
6. Disconnect MAP sensor electrical connector.
7. Disconnect crankcase ventilation hose. See **Fig. 123** .
8. Disconnect the brake hose at the booster.
9. Remove generator. See appropriate GENERATORS & REGULATORS article in ELECTRICAL.
10. Loosen and remove the intake manifold bolts. Remove the intake manifold. See **Fig. 124** .



G00253308

Fig. 121: Removing & Installing Wiring Harness (Ascender 4.2L)
Courtesy of ISUZU MOTOR CO.

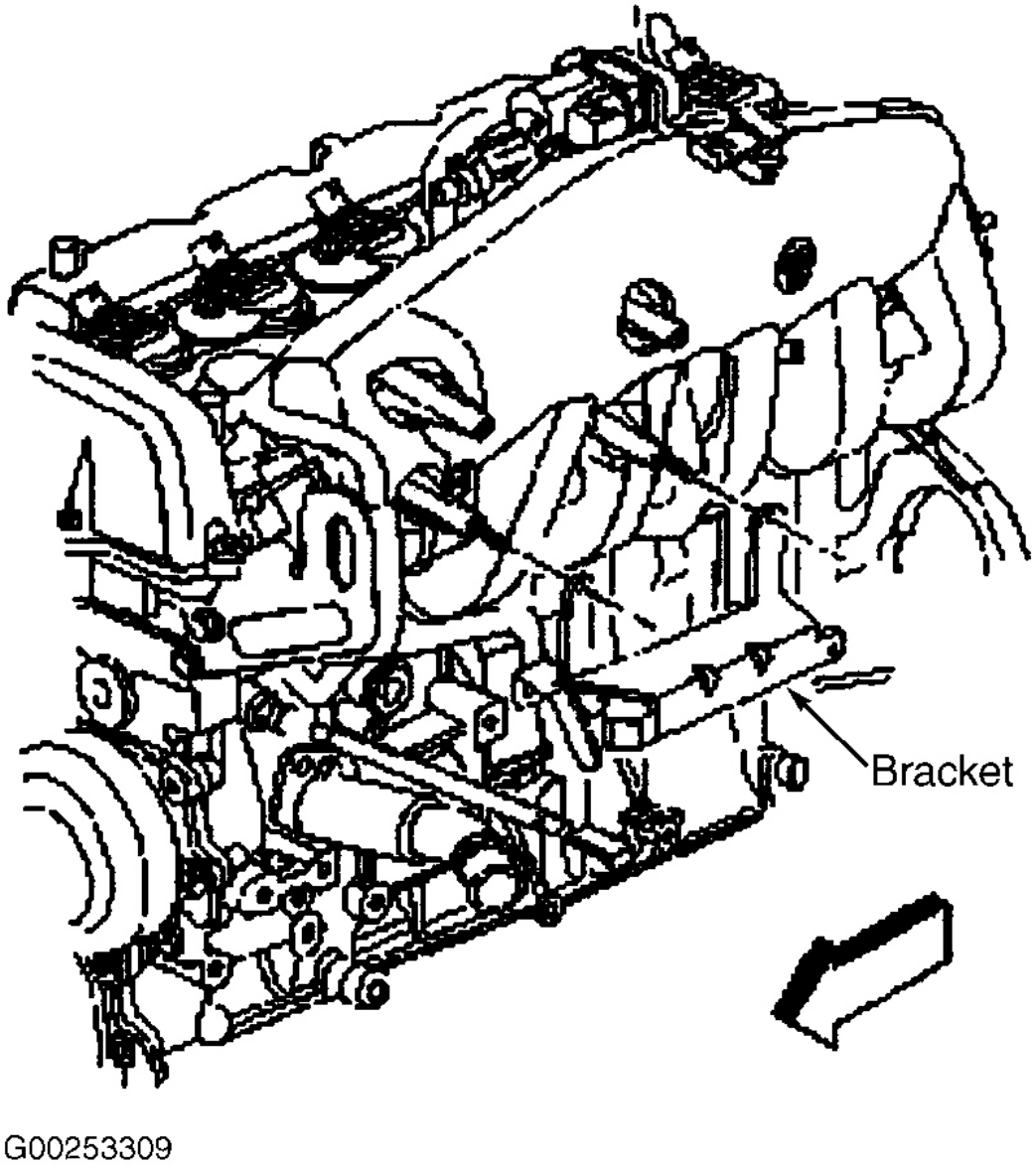
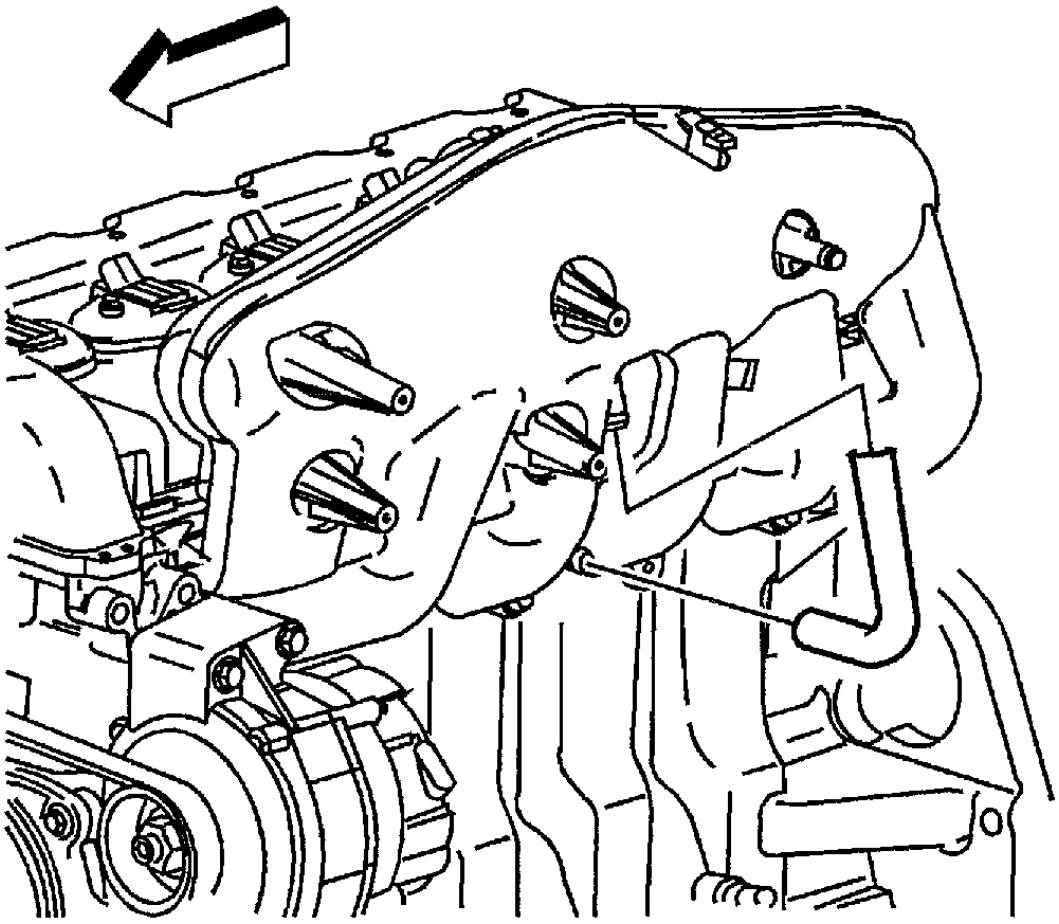
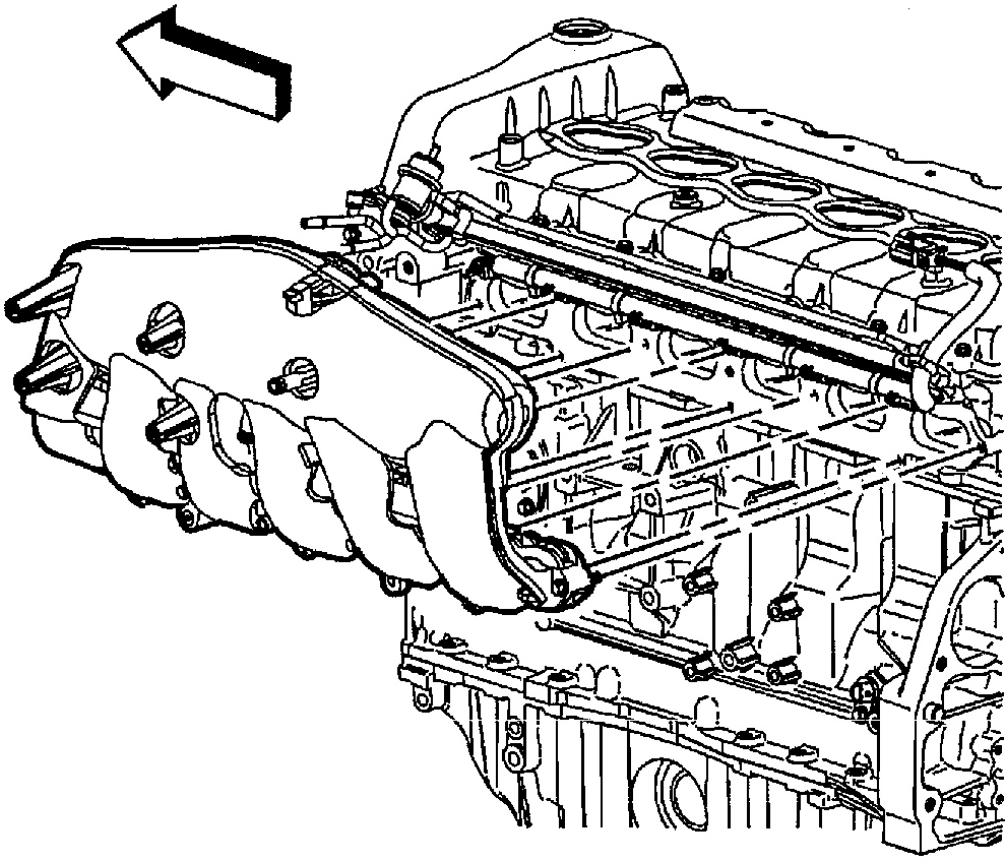


Fig. 122: Locating Wiring Harness Bracket (Ascender 4.2L)
Courtesy of ISUZU MOTOR CO.



G00253847

Fig. 123: Locating Crankcase Ventilation Hose (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.



G00253849

Fig. 124: Removing Intake Manifold (Ascender 4.2L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Ascender 5.3L)

1. Loosen air cleaner outlet duct clamps at throttle body and at mass airflow/intake air temperature (MAF/IAT) sensor.
2. Remove outlet duct bolt. Remove air cleaner outlet duct. See **Fig. 64** .
3. Relieve fuel system pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
4. Disconnect air conditioning (A/C) compressor pressure switch electrical connector (2). See **Fig. 125** .
5. Remove harness clip from cylinder head.
6. Disconnect the MAF/IAT sensor electrical connector (1). See **Fig. 126** .
7. Remove the harness clips from the fuel rail.
8. Disconnect the following electrical connectors:
    - Main coil (1). See **Fig. 127** .

- Electronic throttle control (ETC) (2).
- Fuel injectors (3).

9. Perform the following steps in order to disconnect the fuel injector electrical connector:
   - Mark the connectors to their corresponding injectors to ensure correct reassembly.
   - Pull the Connector Position Assurance (CPA) retainer (2) on the connector up 1 click. See **Fig. 129** .
   - Push the tab (1) on the connector in.
   - Disconnect the fuel injector electrical connector.
   - Repeat the steps for each injector electrical connector.
10. Disconnect the generator electrical connector. See **Fig. 130** .
11. Disconnect the following electrical connectors:
    - Evaporative emission (EVAP) purge solenoid (1). See **Fig. 128** .
    - Knock sensor (2).
    - Manifold Absolute Pressure (MAP) sensor (3).
    - Main coil (5).
    - Fuel injectors (4).
12. Remove the electrical harness clips from the fuel rail.
13. Remove the knock sensor harness electrical connector from the intake manifold.
14. Remove the Positive Crankcase Ventilation (PCV) hose. See **Fig. 131** .
15. Remove the heater water shutoff valve actuator inlet hose from the intake manifold. See **Fig. 132** .
16. Remove the Evaporative emission (EVAP) purge solenoid vent tube by performing the following:
    - Remove the EVAP tube end from the solenoid. See **Fig. 133** .
    - Squeeze the EVAP pipe quick connect fitting retainer together.
    - Remove the EVAP tube end from the vapor pipe.
17. Remove the vacuum brake booster hose from the rear of the intake manifold. See **Fig. 134** .
18. Remove the upper engine wire harness retainer nut (1). See **Fig. 135** .
19. Reposition the upper engine wire harness aside.
20. Remove the intake manifold bolts.
21. Remove the intake manifold. See **Fig. 136** .
22. Remove the intake manifold gaskets (1) from the intake manifold. See **Fig. 137** .
23. Discard the old intake manifold gaskets.
24. If necessary, clean and inspect the intake manifold.
25. To install, use new intake manifold gasket when installing intake manifold. Apply a 0.20 in (5 mm) bead of threadlock (GM P/N 12345382), or equivalent, to threads of intake manifold bolts. Install intake manifold bolts and tighten in two passes to specification. See **Fig. 138** . See **TORQUE SPECIFICATIONS** . To complete installation, reverse removal procedure.

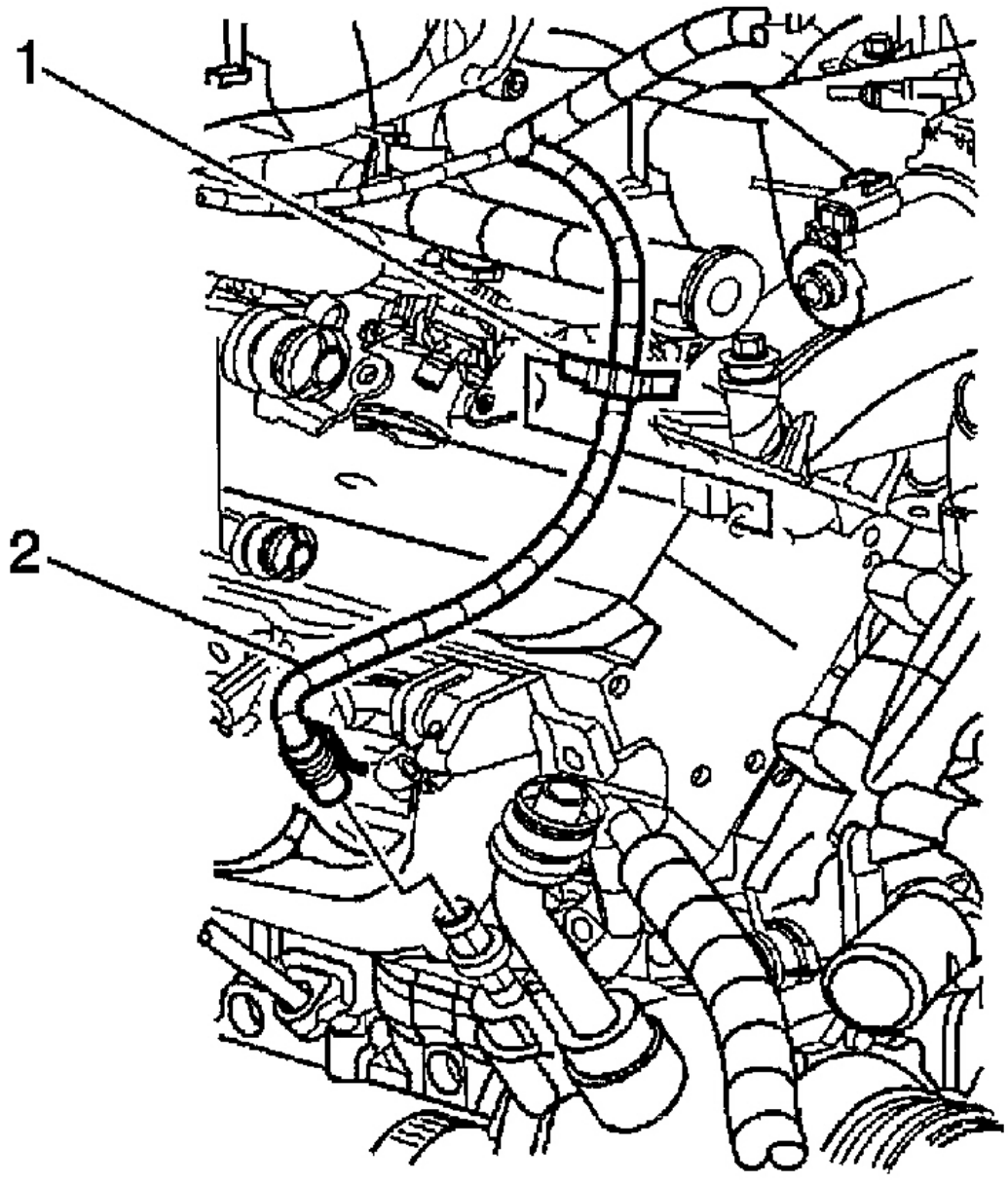
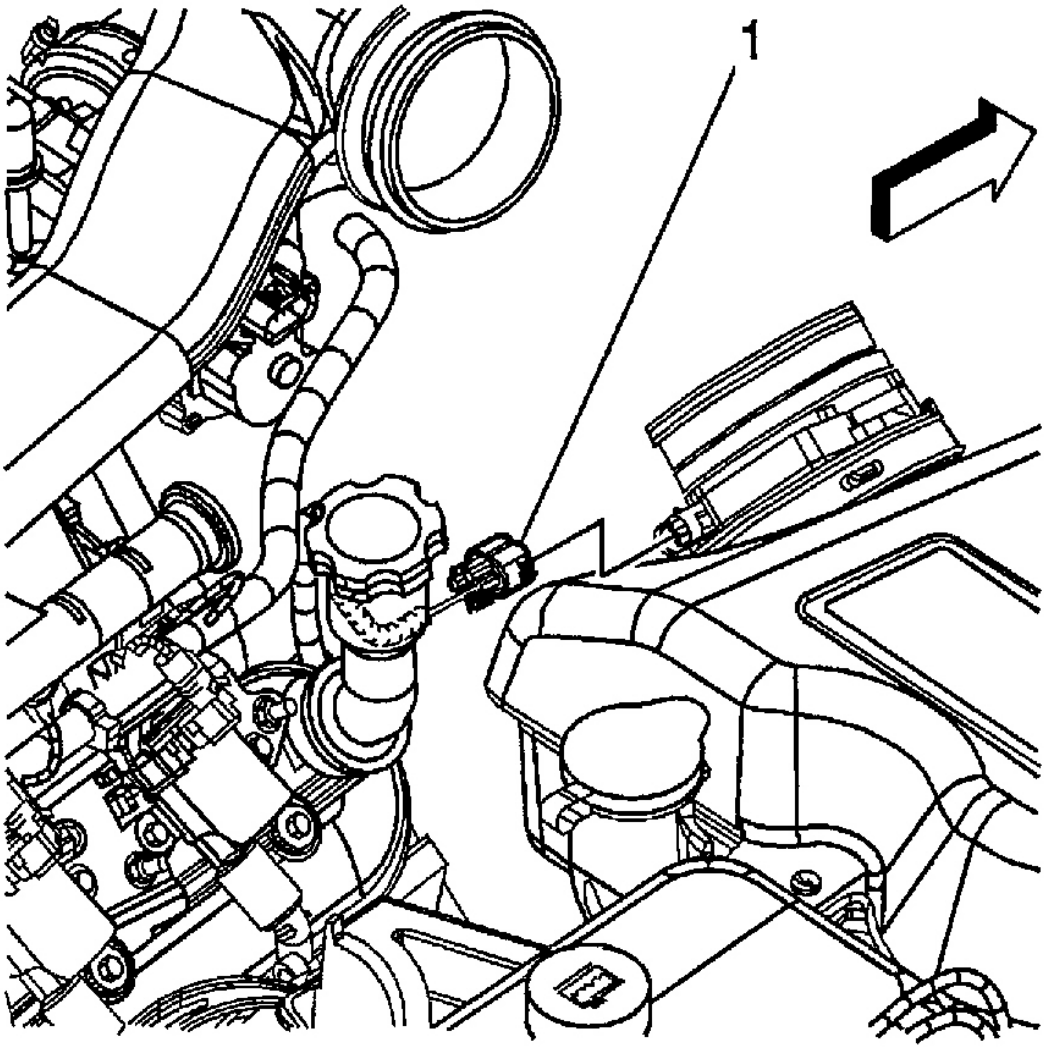


Fig. 125: Locating A/C Compressor Pressure Switch (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.



G00253858

Fig. 126: Locating MAF/IAT Sensor (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

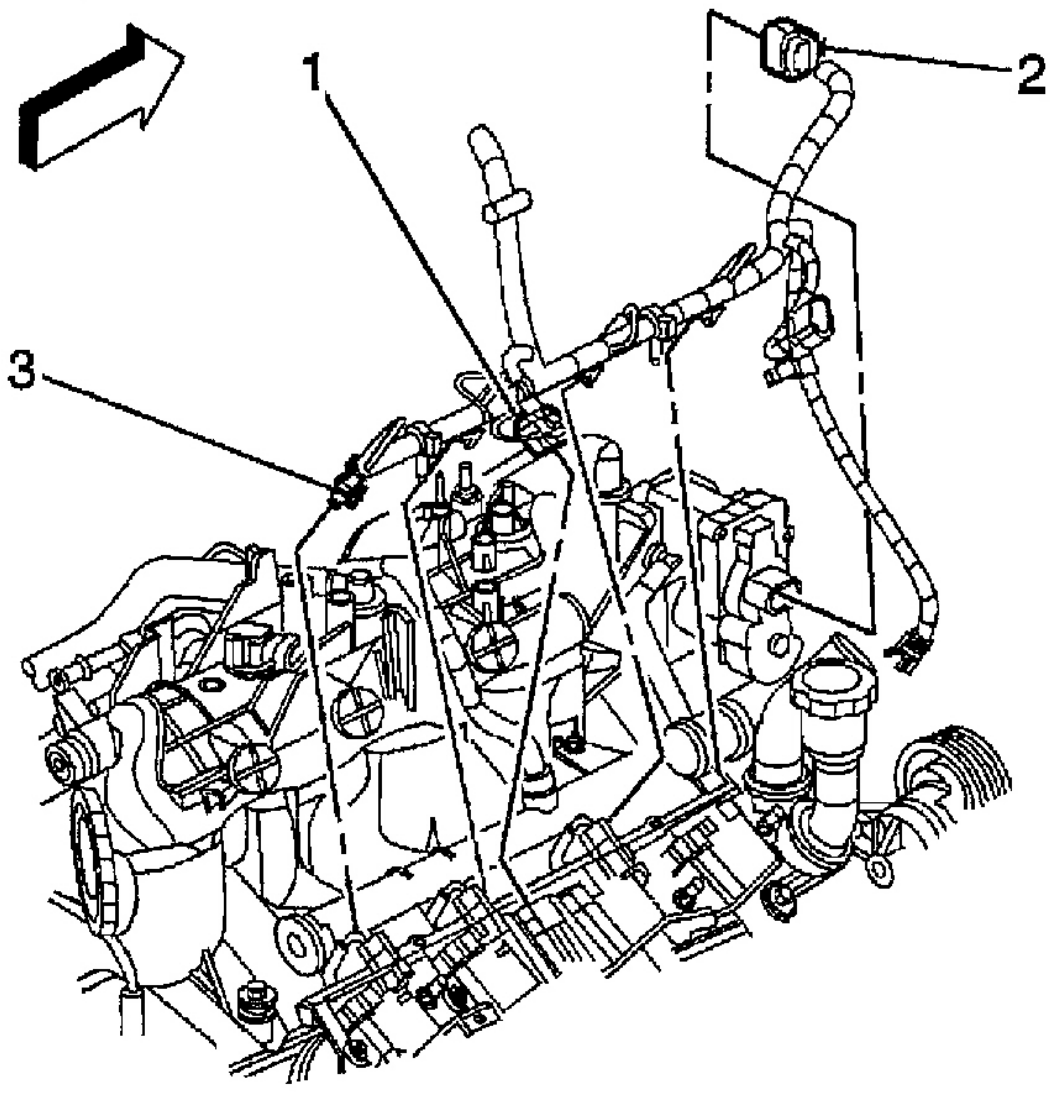


Fig. 127: Locating Electrical Connectors (Ascender 5.3L - 1 of 2)
Courtesy of GENERAL MOTORS CORP.

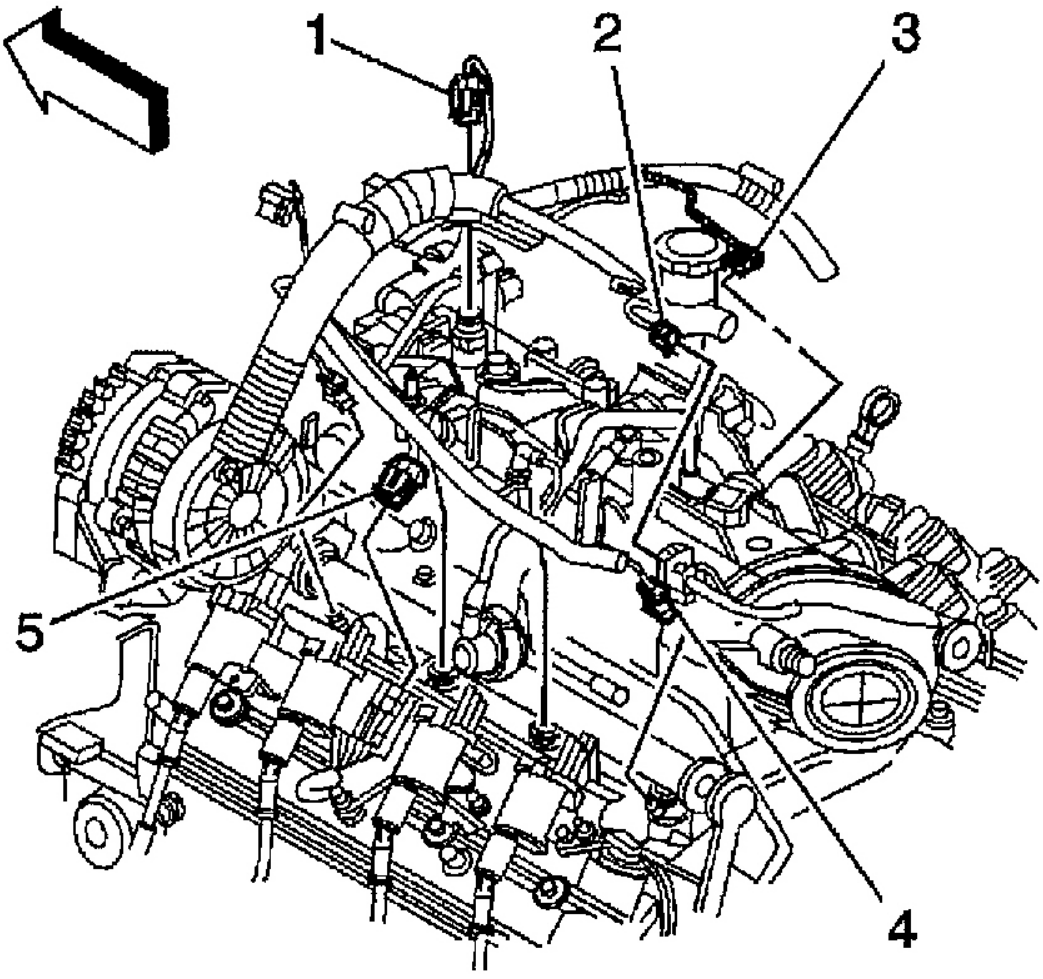


Fig. 128: Locating Electrical Connectors (Ascender 5.3L - 2 Of 2)
Courtesy of GENERAL MOTORS CORP.

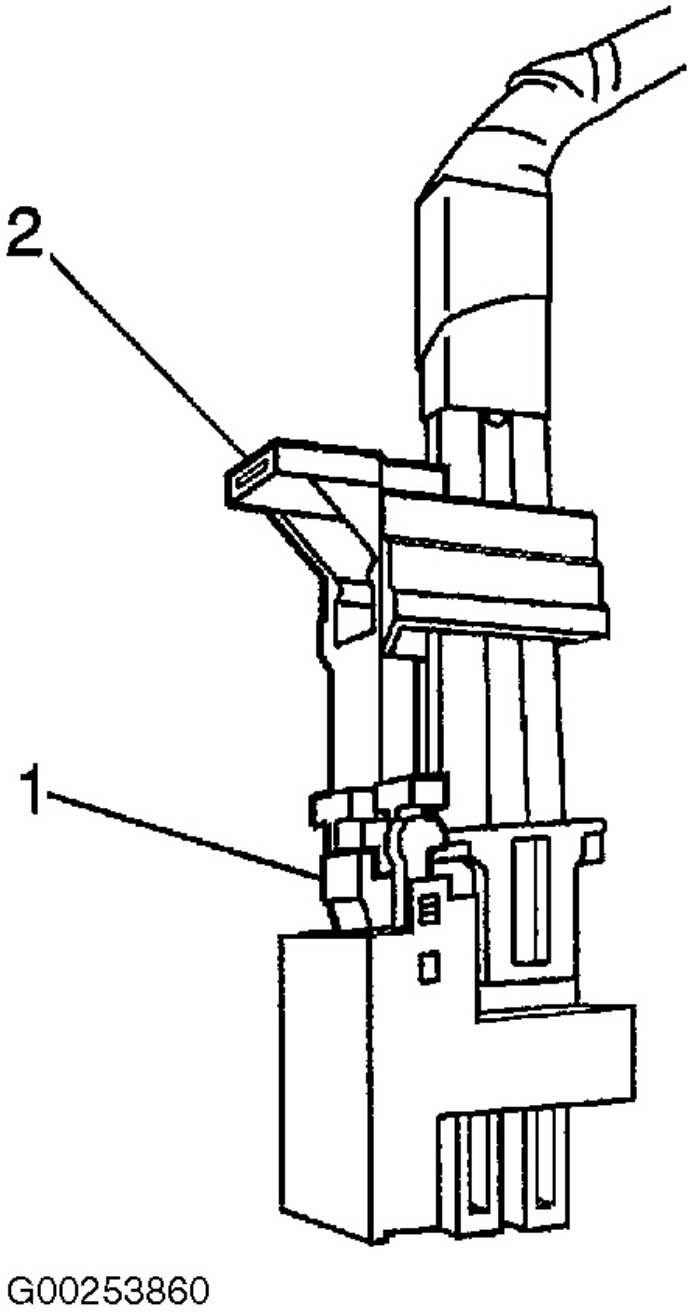


Fig. 129: Removing & Installing Connect Position Assurance Retainer (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

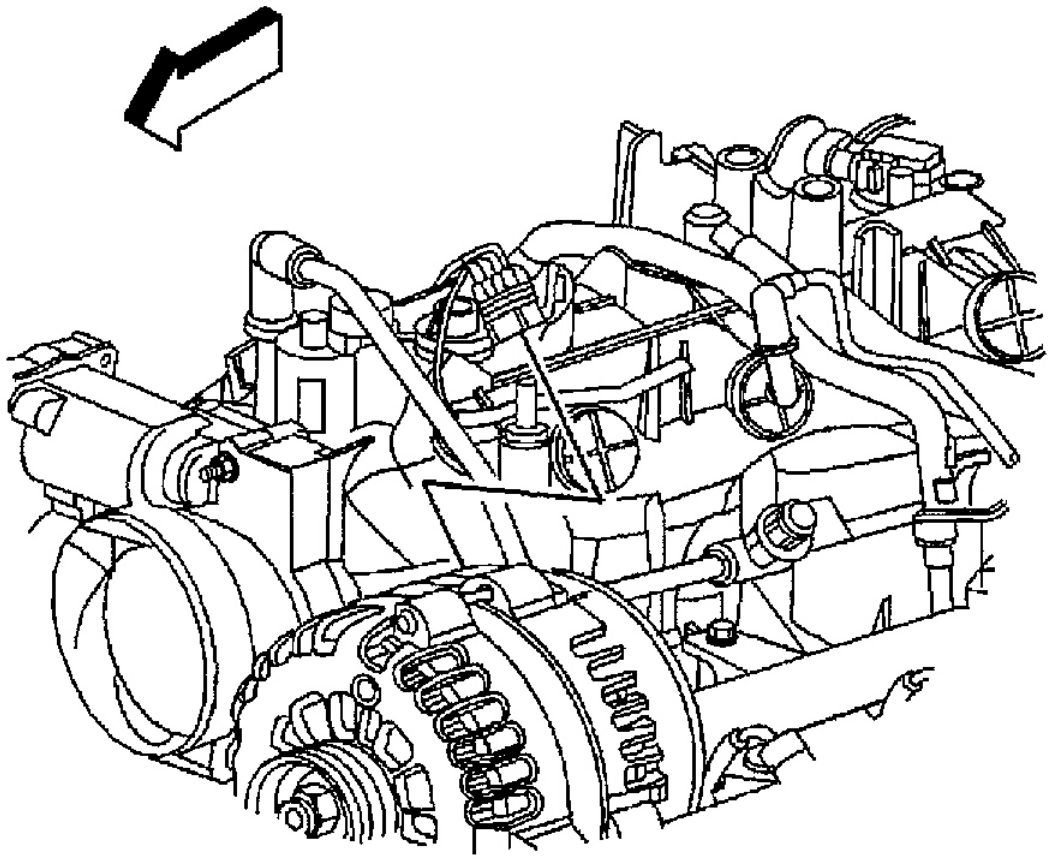


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Fig. 130: Locating Generator Electrical Connector (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

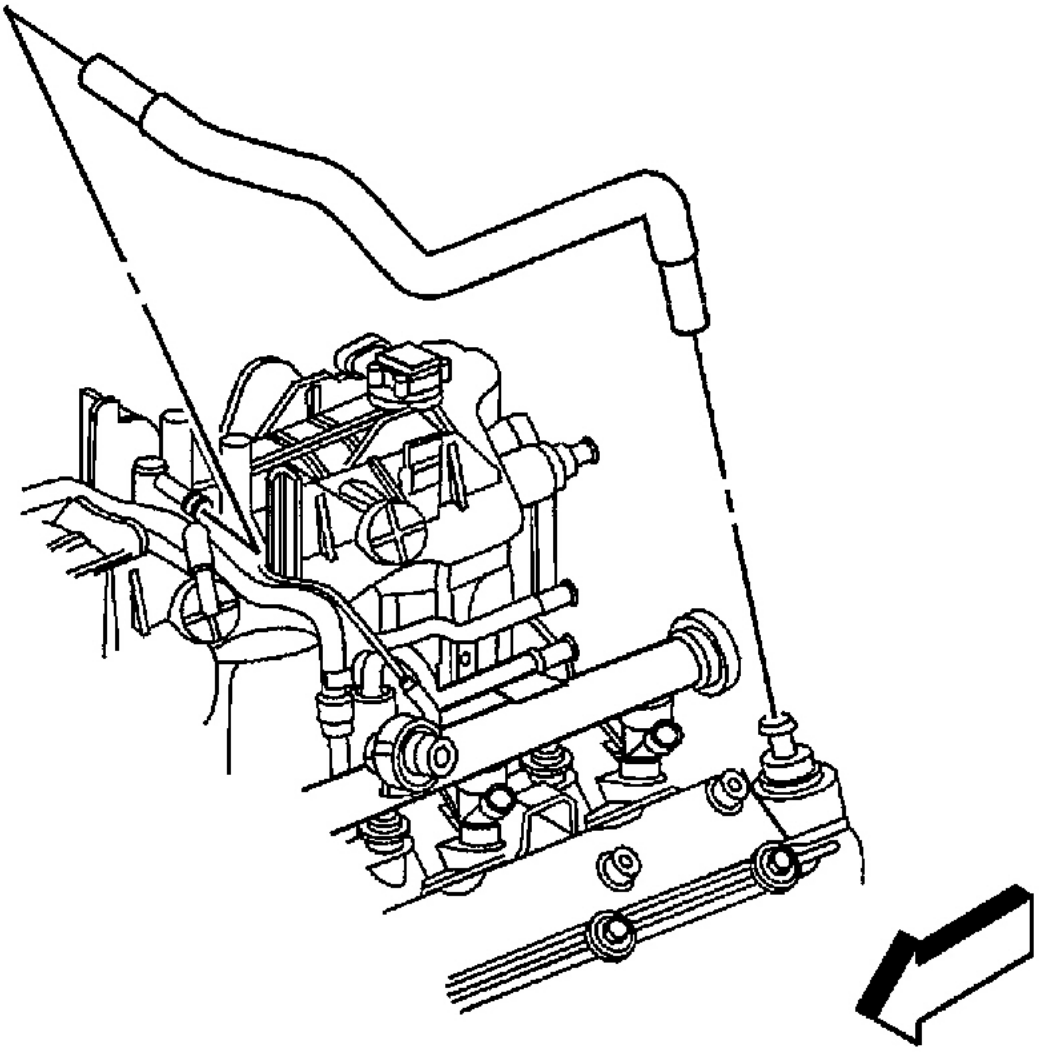
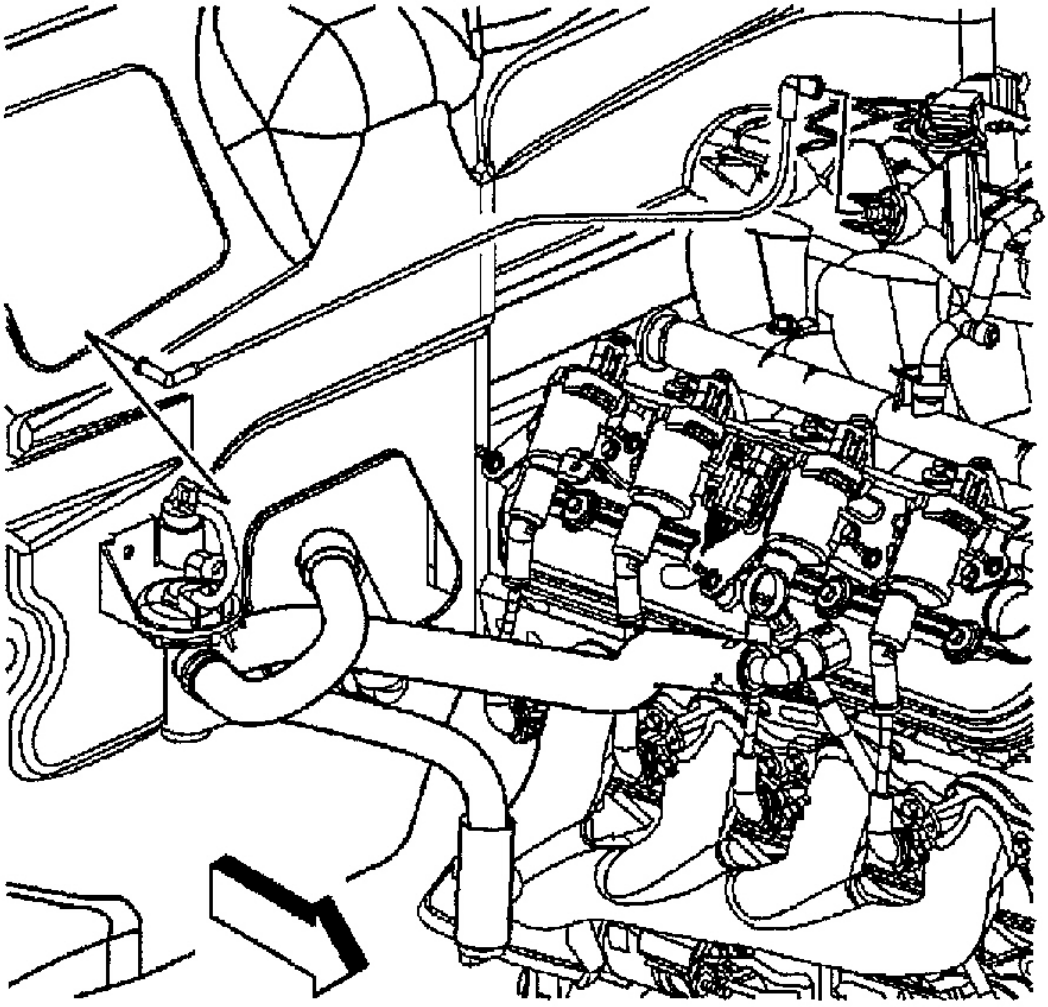


Fig. 131: Removing & Installing PCV Hose (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.



G00253864

Fig. 132: Locating Heater Water Shutoff Valve Actuator Inlet Hose (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

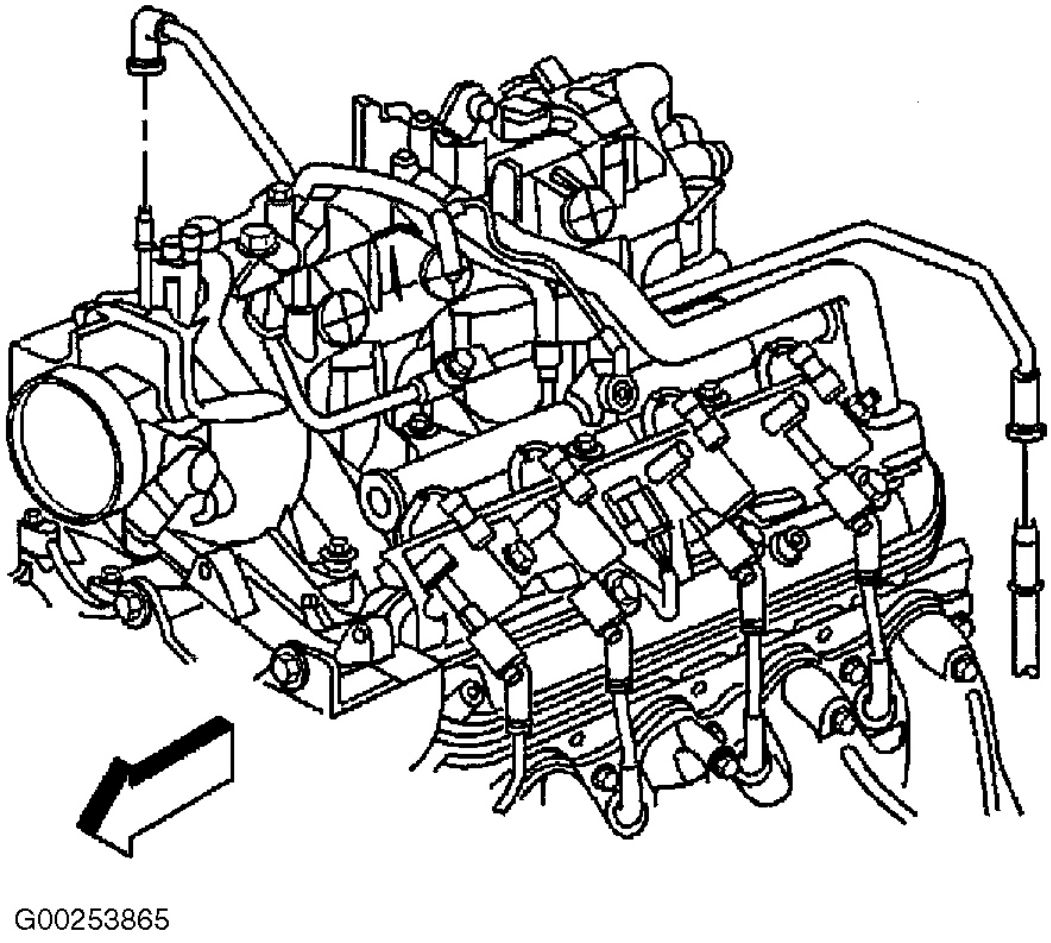
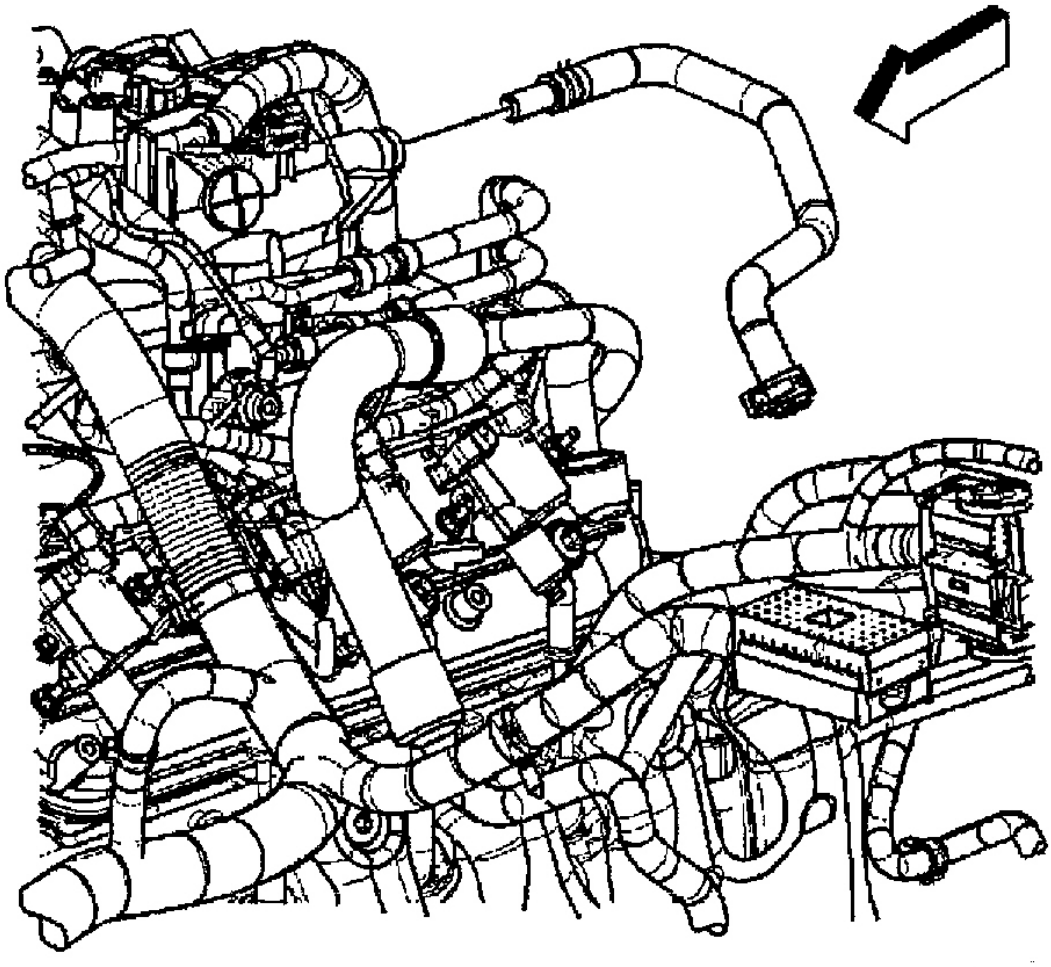


Fig. 133: Removing & Installing EVAP Purge Valve Vent Tube (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.



G00253866

Fig. 134: Removing & Installing Vacuum Brake Booster Hose (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

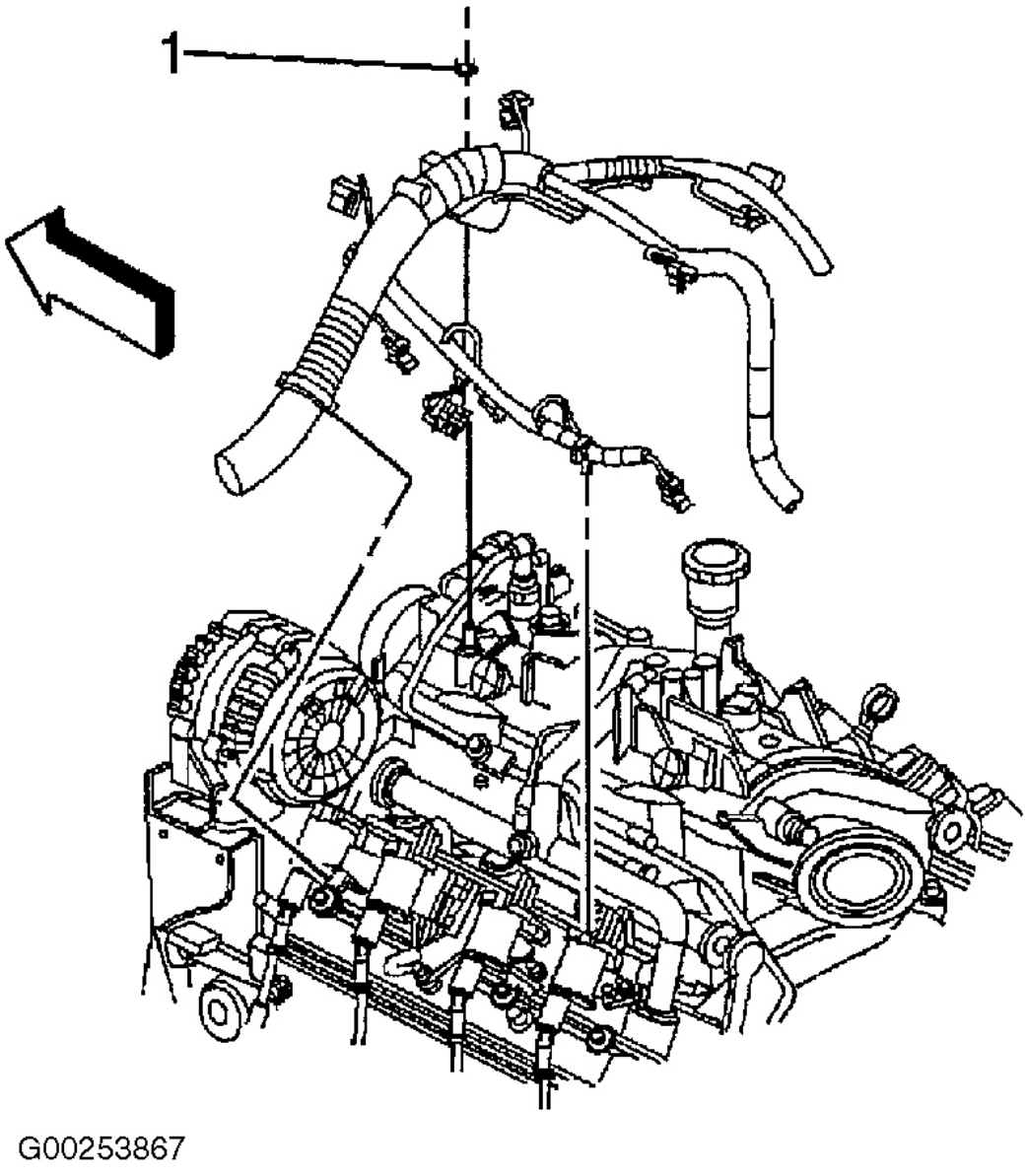


Fig. 135: Removing & Installing Upper Engine Wire Harness Retainer (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

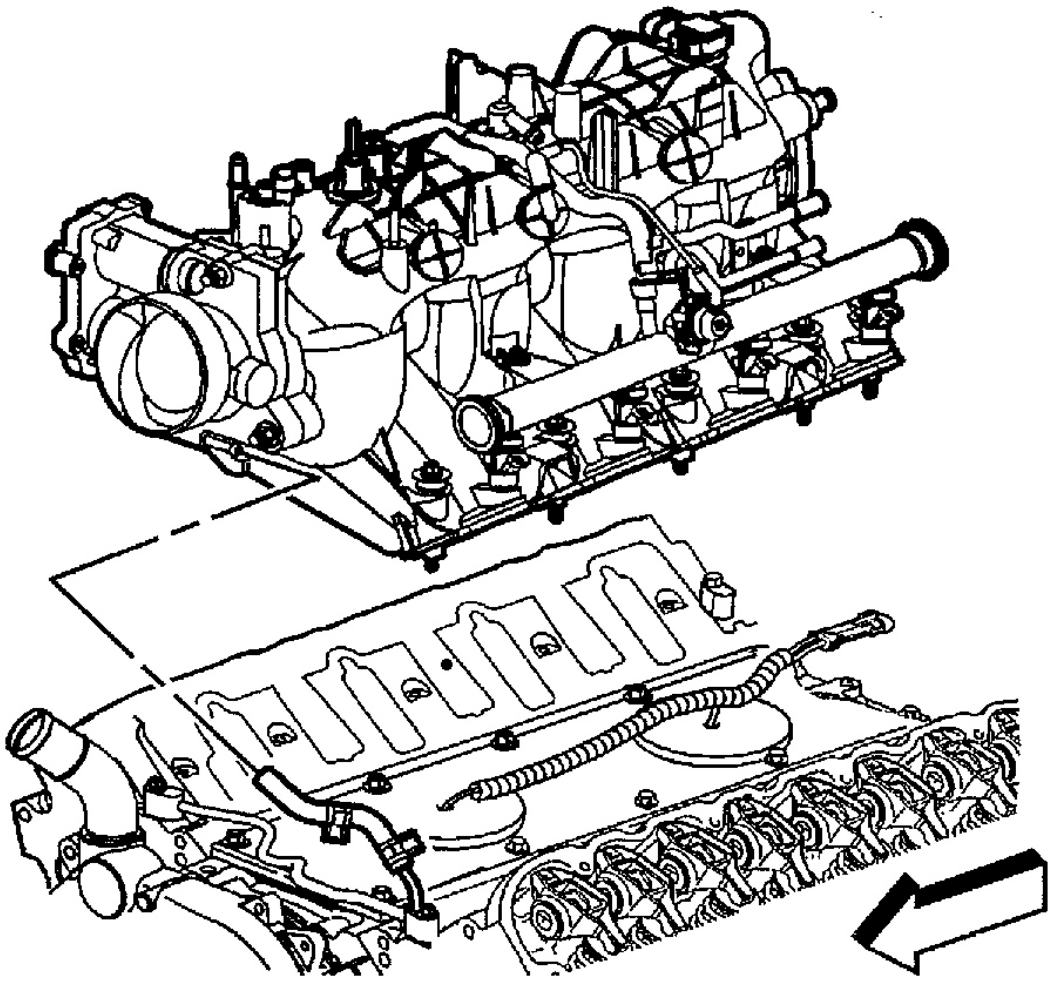


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Fig. 136: Removing & Installing Intake Manifold (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

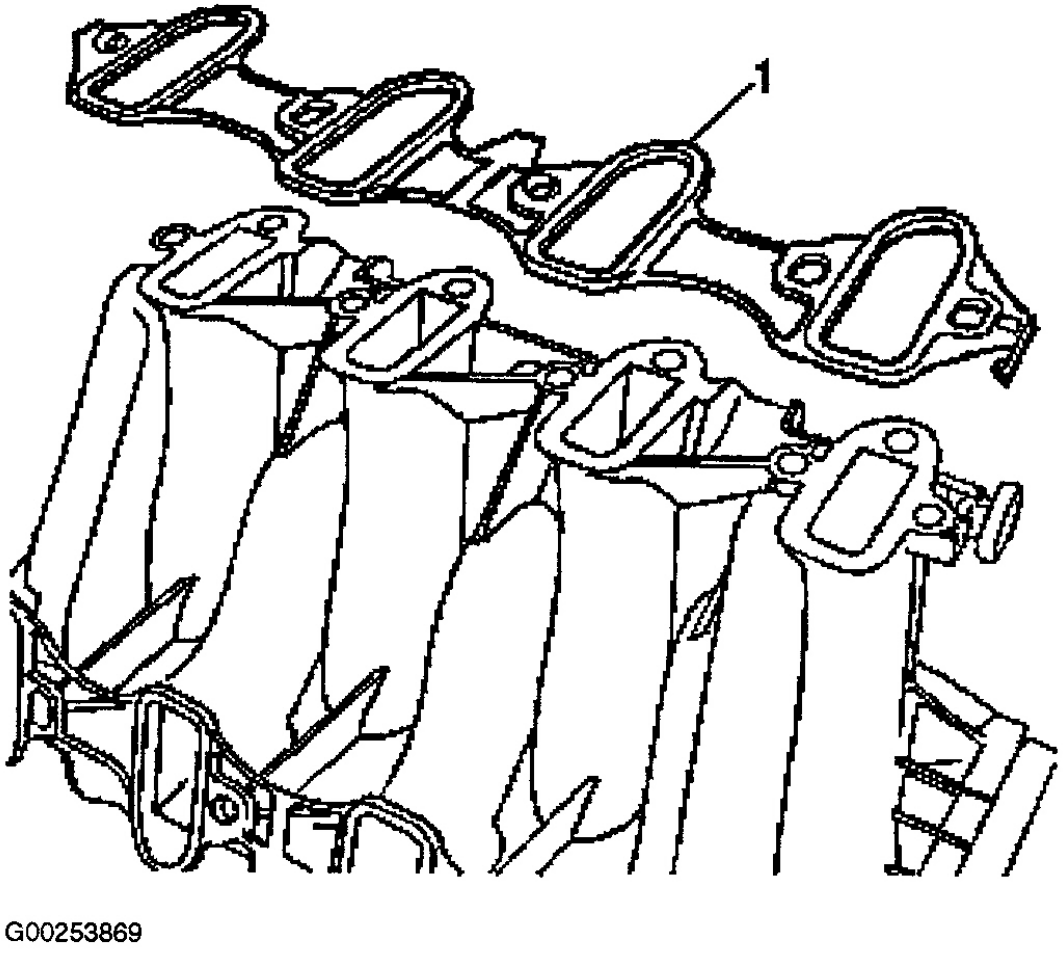

Fig. 137: Removing & Installing Intake Manifold Gaskets (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

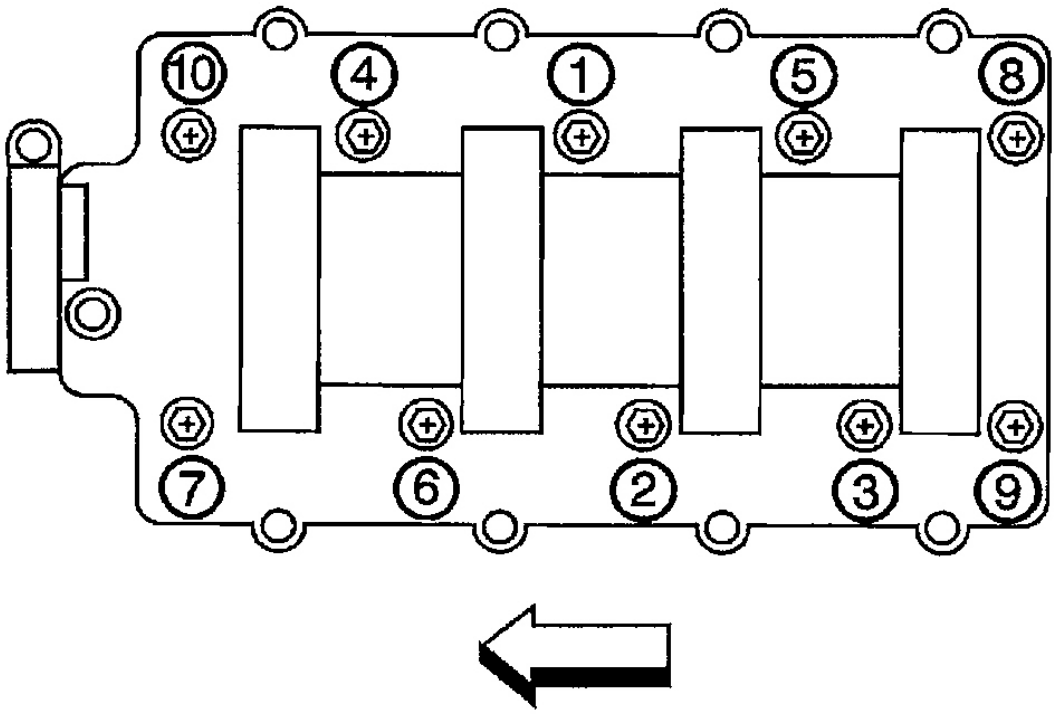

Fig. 138: Intake Manifold Tightening Sequence (Ascender 5.3L)
Courtesy of GENERAL MOTORS CORP.

Removal & Installation (Axiom, Rodeo & Rodeo Sport 3.2L)

NOTE: Intake manifold may also be referred to as intake plenum or common chamber.

1. Disconnect negative battery cable.
2. Remove air cleaner duct assembly.
3. Disconnect power brake booster vacuum hose.
4. Disconnect necessary electrical connectors.
5. Disconnect vacuum hose on EVAP VSV canister and PCV ventilation hose.
6. Remove ventilation hose from throttle valve and intake duct and remove water hose.
7. Remove 4 bolts securing throttle body to intake manifold. See **Fig. 116** .
8. Remove EGR valve nut and bolt, and remove EGR valve.
9. Remove 2 bolts at rear of intake manifold and remove fuel hose bracket.
10. Remove remaining intake manifold nuts and bolts. Remove intake manifold.
11. To install, reverse removal procedure. Tighten nuts and bolts to specification. See **TORQUE**

SPECIFICATIONS .

Removal & Installation (Rodeo & Rodeo Sport 2.2L)

NOTE: Numbers in parentheses refer to numbers in illustrations.

1. Disconnect battery ground cable.
2. Remove PCV hose from air intake duct.
3. Remove nut from air intake duct bracket and loosen hose clamp on throttle body.
4. Remove air intake duct assembly with air cleaner cover.
5. Drain engine coolant.
6. Remove water hoses from throttle body.
7. Disconnect the connector for throttle position sensor, idle air control valve sensor from throttle body.
8. Remove fuel pipe joint eye bolts from fuel rail and disconnect wire harness from fuel injector. See **Fig. 139** .
9. Disconnect hose from fuel pressure regulator then remove fuel rail assembly.
10. Remove throttle valve control cable from throttle body.
11. Remove mounting bolts for generator brackets (1) and (2). See **Fig. 140** .
12. Remove water pipe fixing bolt then remove water pipe.
13. Remove mounting bolt from intake manifold bracket (1). See **Fig. 141** .
14. Remove ignition coil bracket fixing bolt.
15. Remove the brake booster vacuum hose.
16. Remove the four throttle body nuts.
17. Remove bolt and seven nuts, and remove intake manifold (1). See **Fig. 142** .
18. To install, reverse removal procedure. Replace gaskets as necessary. Tighten all bolts/nuts to specification. See **TORQUE SPECIFICATIONS** .

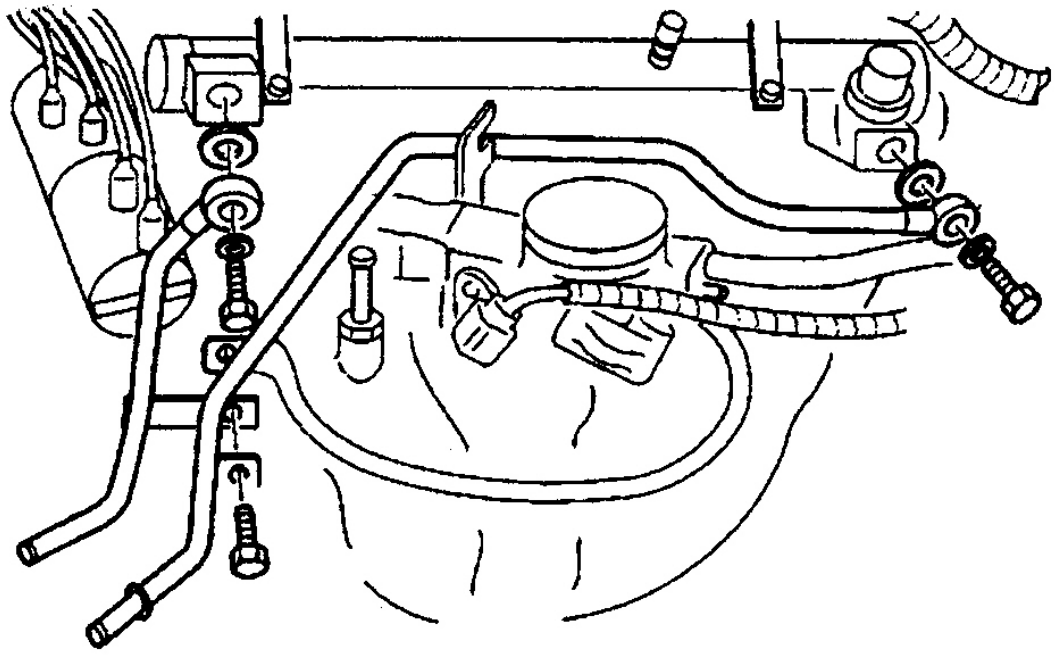

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Fig. 139: Removing & Installing Fuel Pipes (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

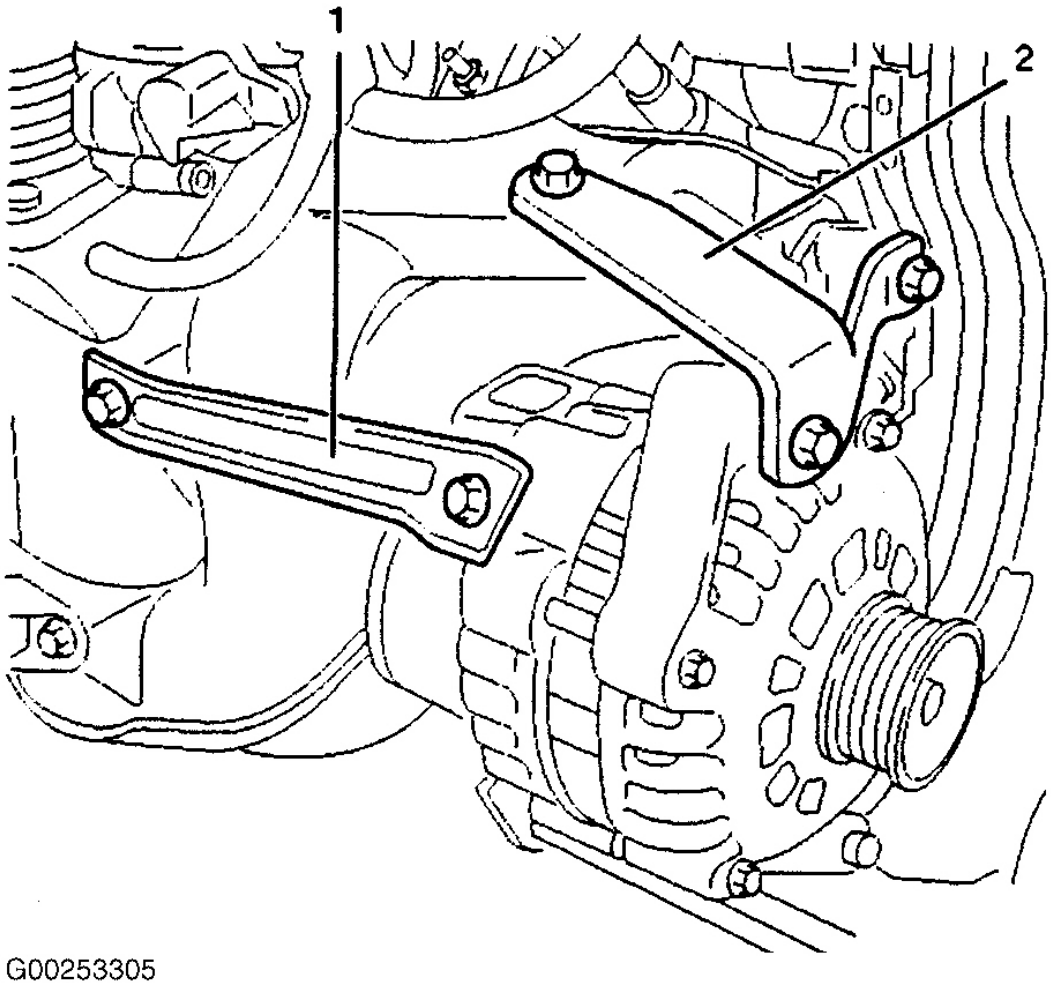

Fig. 140: Locating Generator Bracket Mounting Bolts (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

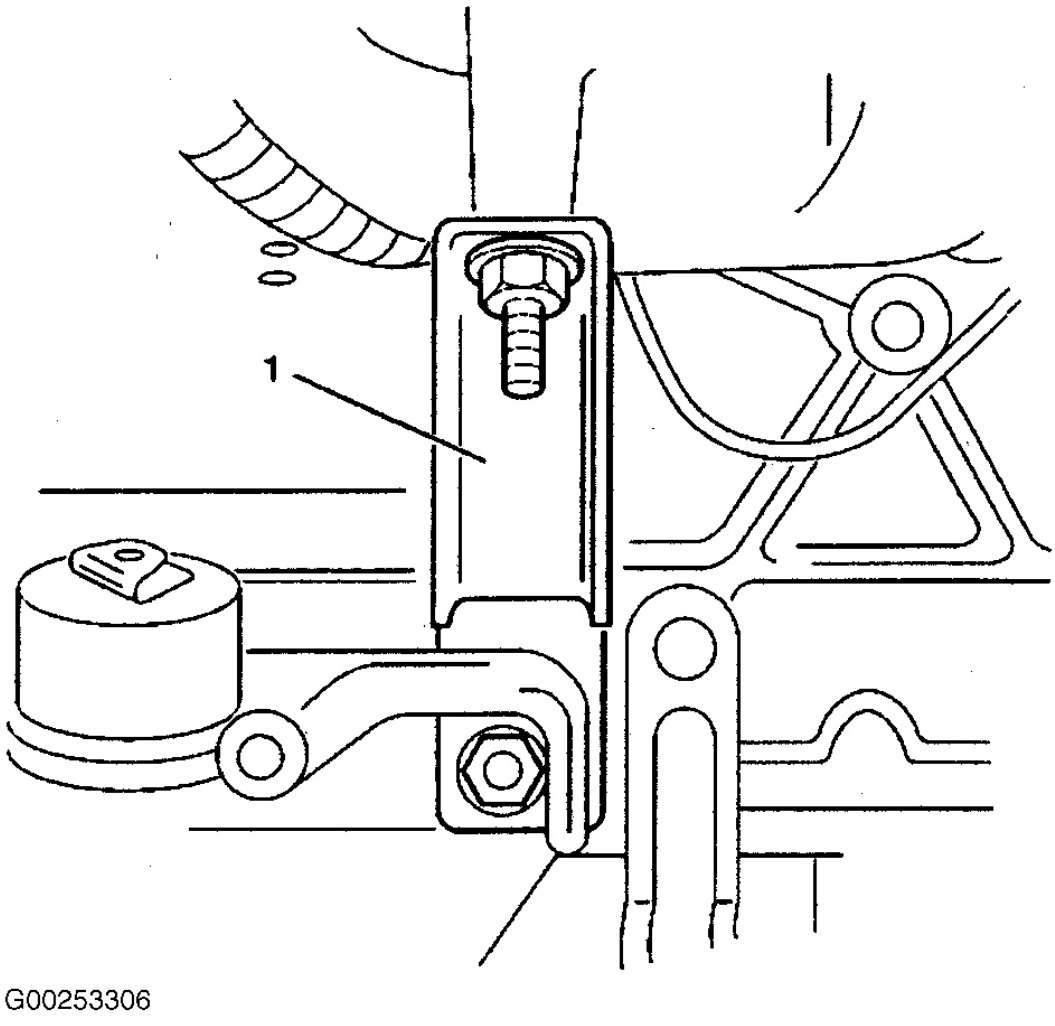

Fig. 141: Locating Intake Manifold Bracket (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

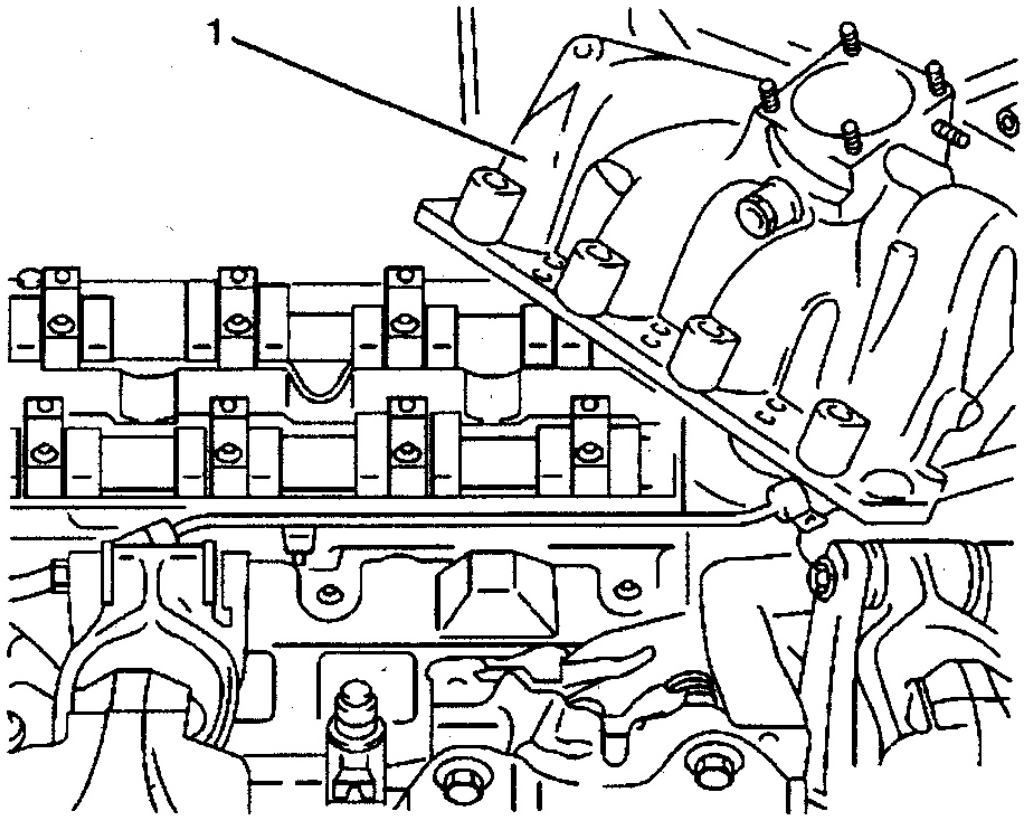

Fig. 142: Removing & Installing Intake Manifold (Rodeo & Rodeo Sport 2.2L)
Courtesy of ISUZU MOTOR CO.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Ascender 4.2L	
ECT Sensor	12 (16)
Engine Lift Hook Bolt	37 (50)
Fuel Tank Shield Bolt	18 (25)
Fuel Tank Strap Retaining Bolt	24 (32)
Generator Mounting Bolt	37 (50)
Heated Oxygen Sensor	30 (41)
Intake Manifold Retaining Bolt	12 (16)
Knock Sensor Bolt	18 (25)

Power Steering Pump Mounting Bolt	18 (25)
Ascender 5.3L	
Accelerator Pedal Position Sensor Bolt	15 (20)
Camshaft Position Sensor Bolt	21 (29)
Crankshaft Position Sensor Bolt	18 (25)
ECT Sensor	15 (20)
Engine Lift Hook Bolt	37 (50)
Front Diagonal Brace Bolt	18 (25)
Fuel Tank Shield Bolt	18 (25)
Fuel Tank Strap Retaining Bolt	24 (32)
Generator Mounting Bolt	37 (50)
Heated Oxygen Sensor	31 (42)
Knock Sensor Bolt	15 (20)
Power Steering Pump Mounting Bolt	18 (25)
Starter Bolt	37 (50)
Axiom, Rodeo & Rodeo Sport 3.2L	
Coolant Pipe Rear Mounting Bolt	12 (16)
EGR Valve Assembly Bolt	18 (25)
Engine Coolant Temperature Sensor	22 (30)
EVAP Canister Purge Solenoid Bracket Bolt	16 (20)
Fuel Rail Bolt	18 (25)
Fuel Tank Drain Plug	15 (20)
Fuel Tank Undercover Retaining Bolt	27 (36)
Intake Manifold Bolt & Nut	18 (25)
Heated Oxygen Sensor	41 (55)
Manifold Absolute Pressure Sensor Bracket Bolt	15 (20)
Vehicle Speed Sensor Bolt	12 (16)
Rodeo & Rodeo Sport 2.2L	
Crankshaft Pulley Bolt	15 (20)
Engine Coolant Temperature Sensor	22 (30)
EGR Valve Assembly Bolt	10 (14)
Fuel Pipe Eye Bolt	18 (25)
Generator Bracket Bolt	(1)
Heated Oxygen Sensor	41 (55)
Ignition Coil Bracket Bolt	15 (20)
Intake Manifold Bracket Bolt	18 (25)
Intake Manifold Bolt	16 (22)
Knock Sensor Bolt	15 (20)
Throttle Body Mounting Bolt	10 (13)
Vehicle Speed Sensor Bolt	10 (13)

	INCH Lbs. (N.m)
Ascender 4.2L	
Accelerator Pedal Position Sensor Screw	89 (10)
A/C Line Bracket-To-Engine Lift Hook Bolt	89 (10)
Air Cleaner Outlet Duct-To-Air Cleaner Outlet Resonator Clamp Bolt	35 (4)
Air Cleaner Resonator Mounting Bolt	53 (6)
Air Cleaner Resonator-To-Throttle Body Clamp Bolt	35 (4)
Air Filter Housing/Washer Solvent Tank Nut	89 (10)
Camshaft Position Actuator Solenoid Valve Mounting Bolt	89 (10)
Camshaft Position Sensor Bolt	89 (10)
Crankshaft Position Sensor Bolt	89 (10)
Engine Wire Harness Bracket Nut	89 (10)
EVAP Canister Purge Solenoid Bolt	89 (10)
Fuel Filter Bracket Screw	18 (2)
Fuel Hose To Fuel Tank Clamp Bolt	18 (2)
Fuel Pressure Regulator Retaining Screw	71 (8)
Fuel Rail Retaining Bolt	71 (8)
Fuel Return Line Retaining Screw	71 (8)
Fuel Return Pipe Attaching Screw	44 (5)
Generator Positive Cable Nut	80 (9)
PCM Harness Connector Fastener	71 (8)
PCM Mounting Bolt	62 (7)
Throttle Body Clamp Bolt	62 (7)
Throttle Body Mounting Bolt	89 (10)
Ascender 5.3L	
Air Cleaner Assembly Nut	106 (12)
Air Cleaner Outlet Duct Bolt	89 (10)
Air Cleaner Resonator Mounting Bolt	53 (6)
Air Cleaner Outlet Duct Clamp Bolt	62 (7)
Crossover Fuel Pipe Retainer Clip Attaching Screw	35 (4)
EVAP Canister Purge Solenoid Bolt	97 (11)
Fuel Filter Bracket Screw	106 (12)
Fuel Hose-To-Fuel Tank Clamp Bolt	18 (2)
Fuel Pressure Regulator Retaining Screw	(2)
Fuel Rail Retaining Bolt	89 (10)
Fuel Return Line Retaining Screw	71 (8)
Fuel Return Pipe Attaching Screw	44 (5)
Intake Manifold Retaining Bolt	(3)
Mass Air Flow/Intake Air Temperature Sensor Clamp Bolt	62 (7)
PCM Harness Connector Fastener	71 (8)

PCM Mounting Bolt	(2)
Right Transmission Cover Bolt	80 (9)
Starter Solenoid Lead Nut	80 (9)
Starter Solenoid Nut	27 (3)
TAC Module Bracket Nut	89 (10)
Throttle Body Clamp Bolt	62 (7)
Throttle Body Mounting Bolt	89 (10)
Upper Engine Wire Harness Retainer Nut	44 (5)
Axiom	
Crankshaft Position Sensor Bolt	80 (9)
Fuel Hose Bracket	89 (10)
Fuel Pressure Regulator Screw	27 (3)
Idle Air Control Valve	9 (1)
ION Sensing Module Bolt	35 (4)
Throttle Body Mounting Bolt	89 (10)
Rodeo & Rodeo Sport 2.2L	
Camshaft Position Sensor Bolt	52 (6)
Crankshaft Position Sensor Bolt	80 (9)
Fuel Pressure Regulator Screw	58 (6.5)
Fuel Rail Bolt	62 (7)
Idle Air Control Valve	9 (1)
Intake Air Duct Clamp Bracket Bolt	61 (7)
Ignition Coil Bracket Bolt	89 (10)
Timing Belt Cover Bolt	52 (6)
Rodeo & Rodeo Sport 3.2L	
Crankshaft Position Sensor Bolt	80 (9)
Idle Air Control Valve	9 (1)
ION Sensing Module Bolt	35 (4)
Throttle Body Mounting Bolt	89 (10)

(1) Tighten long bolt to 25 Ft. Lbs (35 N.m) and tighten short bolt to 15 Ft. Lbs. (20 N.m)

(2) Information is not provided by manufacturer.

(3) On first pass, tighten bolts to 44 INCH Lbs. (5 N.m) in sequence. On second pass, tighten bolts to 89 INCH Lbs. (10 N.m) in sequence. See **Fig. 138**