

SECTION 6C

ENGINE FUEL

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All new General Motors vehicles are certified by the United States Environmental Protection Agency as conforming to the requirements of the regulations for the control of air pollution from new motor vehicles. This certification is contingent on certain adjustments being set to factory standards. In most cases, these adjustment points either have been permanently sealed and/or made inaccessible to prevent indiscriminate or routine adjustment in the field. For this reason, the factory procedure for temporarily removing plugs, caps, etc., for purposes of servicing the product must be strictly followed and, wherever practicable, returned to the original intent of the design.

For vehicles sold in Canada and equipped with non-closed loop engine, also refer to the appropriate Canadian Service Manual Supplement.

GENERAL

When working on the fuel system, there are several things to keep in mind.

- Any time fuel system is being worked on, disconnect the negative battery cable or cables except for those tests where battery voltage is required.
- Always keep a dry chemical (Class B) fire extinguisher near the work area.
- Always use a backup wrench when loosening or tightening a screw couple fitting.
- The torque on a screw fitting is 35 N·m (26 ft. lbs.).
- Two types of fuel pipes are used:
 1. Standard flared pipe is used on all carburetor systems.
 2. Pipe used on all MFI, SFI, and TBI fittings require the use of an O-ring.
The two pipe systems are not interchangeable. Replace all pipe with the same pipe and fittings that were removed.
- All fuel pipe must meet the GM Specification 124-M or its equivalent.
- All fuel hose must meet GM Specification 6163-M or its equivalent.

- Do not replace fuel pipe with fuel hose.
- **On MFI and TBI systems, always relieve the line pressure before servicing any fuel system components.**
- Do not do any repairs on the fuel system until you have read the copy and checked the pictures relating to that repair.
- Adhere to all Notices and Cautions.

All gasoline engines are designed to use only unleaded gasoline. Unleaded gasoline must be used for proper emission control system operation. Its use will also minimize spark plug fouling and extend engine oil life. Using leaded gasoline can damage the emission control system and could result in loss of emission warranty coverage.

All cars are equipped with an Evaporative Emission System. The purpose of the system is to minimize the escape of fuel vapors to the atmosphere. Information on this system will be found in Section 6E1, 6E2, 6E3 or 6E4.

FUEL METERING

Fuel Metering is accomplished in three manners: Carburetion, Throttle Body Injection, and Port Fuel Injection.

Carburetor

Some engines are equipped with either a 2-barrel or 4-barrel carburetor. The carburetor is attached to the intake manifold.

The carburetor vacuum fittings are identified by an alphabetical letter cast into the carburetor or base plate near the fitting.

Throttle Body Injection (TBI)

With Throttle Body Injection (TBI) an injection unit is placed on the intake manifold where the carburetor is normally mounted. The TBI unit is computer controlled and supplies the correct amount of fuel during all engine operating conditions.

Port Fuel Injection

The ECM is in control of this fuel delivery system during all driving conditions.

The intake manifold function, like that of a diesel, is used only to let air into the engine. The fuel is injected by separate injectors mounted over the intake valve.

The ECM monitors all the vehicle functions like the carbureted or TBI system. In addition to the normal sensors and inputs, this system utilizes a mass air flow sensor.

The mass air flow sensor measures the amount (weight) of air that goes through the intake manifold. It compensates for both temperature and pressure variations and is mounted between the air cleaner and throttle body. (See Figure 6C-1.)

With the **Port** Injection System, there is no need for a Thermoac, EFE, Map Sensor, **Baro** Sensor, A.I.R. System or Dual Bed Converter.

This system provides better cold driveability, less exhaust emissions as well as a better throttle response.

The two Port Fuel Injection systems are similar in operation. LN7 utilizes an injection system where the injectors turn on at every crankshaft revolution. LC2 utilizes a turbocharger and the injectors turn on independently of each other, once every two revolutions.

Two interchangeable O-rings are used on the injector that must be inspected when the injectors are removed. Check O-rings for cuts or other type of damage and replace as necessary.

The air cleaner is mounted near the right center part of the radiator. (See Figure 6C-1.) It is connected to the intake manifold by two pieces of air intake duct.

Also mounted between the air cleaner and intake, are the mass airflow sensor and throttle body.

The intake manifold is used to pass air only. It is tuned and offers approximately an 8-10% vehicle performance improvement.

With the throttle body design, cold driveability characteristics are greatly improved with the aid of the two hoses that supply engine coolant to the throttle body for rapid warm up.

The throttle body design is simple and handles only air. It also utilizes an integral Idle Air Control to govern idle speed and a Throttle Position Sensor (TPS). The IAC and TPS are both controlled by the ECM.

A large diameter fuel rail is attached to the top of the intake manifold and supplies fuel to the injectors.

A fuel pressure tap is located on the rail for quick pressure checks.

See Figure 6C-3

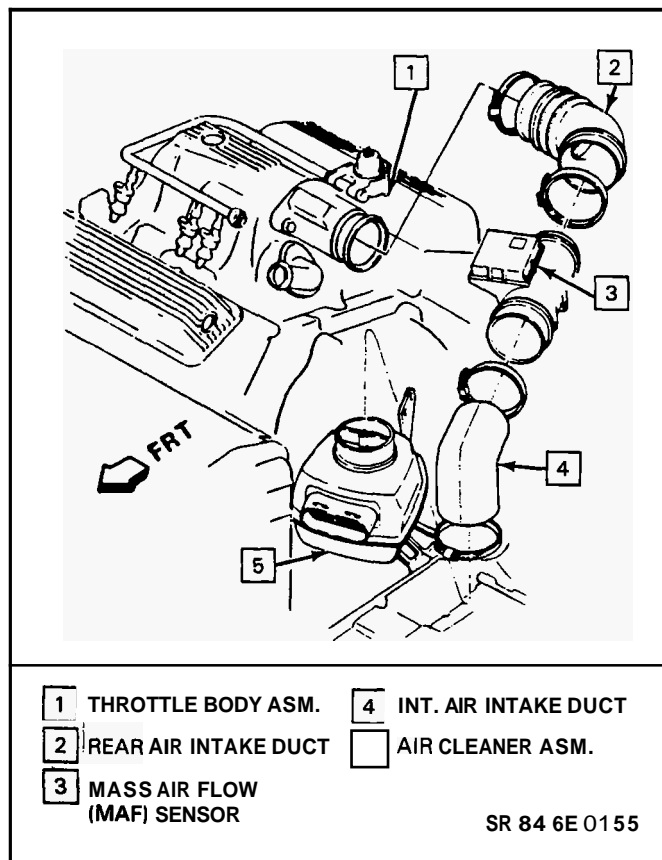


Figure 6C-1 Air System

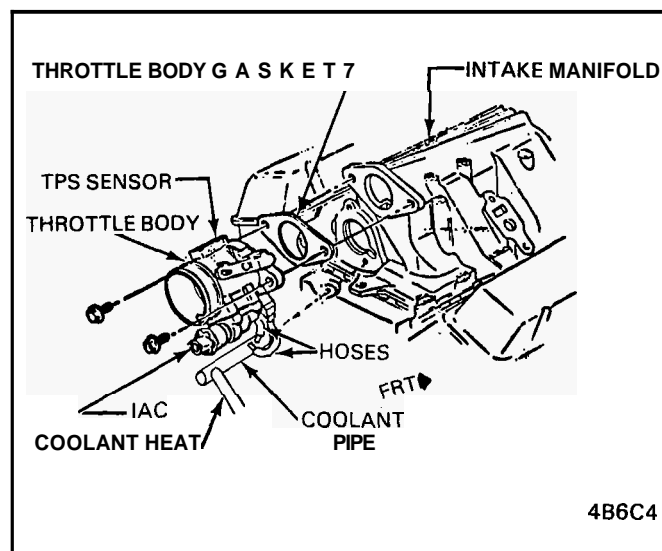


Figure 6C-2 Throttle Body

Fuel is recirculated through the rail continuously while the engine is running. This removes air and vapors from the fuel as well as keeping the fuel cool during hot weather operation.

The fuel pressure regulator that is mounted on the fuel rail maintains a constant pressure across the injectors under all operating conditions. It is accomplished by controlling the amount of fuel that is recirculated back to the fuel tank.

The pressure regulator also utilizes an O-ring seal. The O-ring used is the same size as used for the injectors.

LN7 also utilizes an accumulator that is located in the fuel feed line near the cowl area. It is used to dampen vibration caused by the pressurized fuel and the pulsing of the injector.

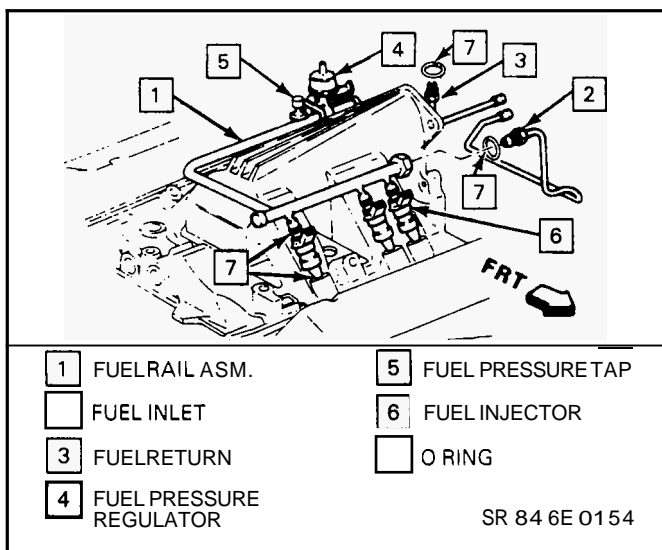


Figure 6C-3 Fuel Rail Components

See Section 6E for more information and diagnosis.

FUEL SYSTEM PRESSURE RELIEF

CAUTION: To reduce the risk of fire and personal injury, it is necessary to relieve the fuel system pressure before servicing fuel system components. To do this:

TBI Engines:

- o Remove "fuel pump" fuse from fuse block in passenger compartment.
- Crank engine - engine will start and run until fuel supply remaining in fuel lines is consumed. Engage starter for 3.0 seconds to assure relief of any remaining pressure.
- o With ignition "OFF," replace fuel pump fuse.

MFI Engines:

- o Disconnect fuel tank harness connector.
 - o Crank engine - engine will start and run until fuel supply remaining in fuel pipes is consumed.. Engage starter for 3.0 seconds to assure relief of any remaining pressure.
 - o With ignition "OFF" connect fuel tank harness connector.
- Unless this procedure is followed before servicing fuel pipes or connections, fuel spray could occur.

When repair to the fuel system has been completed, start engine and check all connections that were loosened for possible leaks.

Refer to Section 6 for additional diagnosis of engine fuel system.

FUEL FILTERS

Fuel filters fall into three categories: internal component filters, in line filters and sending unit filter socks.

Internal Filters

Internal filters are located in the inlet fitting on all carburetors. Elements are placed in the inlet hole with the gasket surface outward. A spring holds the element outward, sealing it by compressing a gasket surface against the inlet

fitting. A check valve is also built into the filter element. Refer to Figure 6C-4.

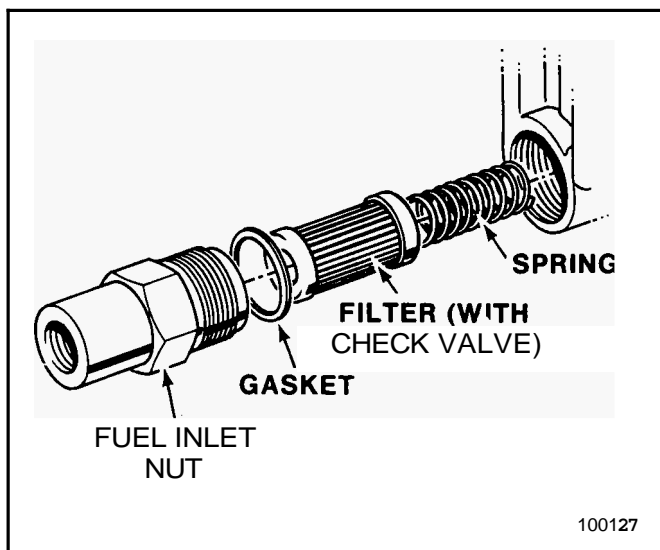


Figure 6C-4 Carburetor Fuel Filter

Replacement- LD5, LV2

1. Disconnect fuel line connection at fuel inlet filter nut.
2. Remove fuel inlet filter nut from carburetor.
3. Remove filter and spring.
4. If removed, install check valve in fuel inlet filter. The fuel inlet check valve must be installed in the filter to meet Motor Vehicle Safety Standards (M.V.S.S.) for roll-over. New service replacement filter must include the check valve.
5. Install fuel inlet filter spring, filter, and check valve assembly in carburetor. Check valve end of filter faces toward fuel line. Ribs on closed end of filter element prevent filter from being installed incorrectly unless forced.
6. Install nut in carburetor. Tighten nut to 62 N·m (46 lbs. ft.).
7. Install fuel line and tighten connection.
8. Start engine and check for leaks.

Inline Filters

CAUTION: To reduce the risk of fire and personal injury, it is necessary to relieve the fuel system pressure before servicing fuel system components. (See Fuel System Pressure Relief.)

Inline Filters can be found in the fuel feed line under the hood, attached to the frame rail or on the rear crossmember of the vehicle. See Figures 6C-5 through 6C-8 for the specific locations.

The J and N Series will use the same type of fuel filter. Refer to Figure 6C-8 if replacement is necessary.

Always use a backup wrench any time that the fuel filter is removed or installed. Also make sure that a good O-ring is used at all screw couple locations. Torque on fittings is 30 N·m (22 ft. lbs.).

In Tank Fuel Filters

A woven plastic filter is located on the lower end of the fuel pickup tube in the fuel tank. This filter prevents dirt from entering the fuel line and also stops water unless the filter becomes completely submerged in water. This filter is self-cleaning and normally requires no maintenance. Fuel

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stoppage at this point indicates that the fuel tank contains an abnormal amount of sediment or water: the tank should therefore be thoroughly cleaned.

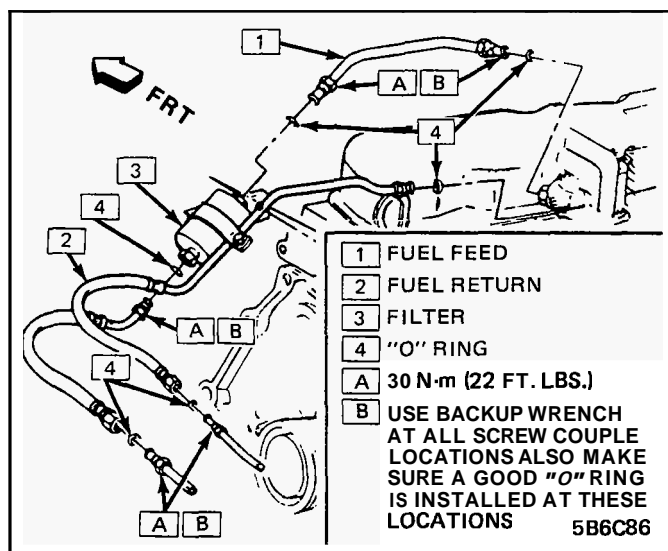


Figure 6C-5 Fuel Filter-2.5L

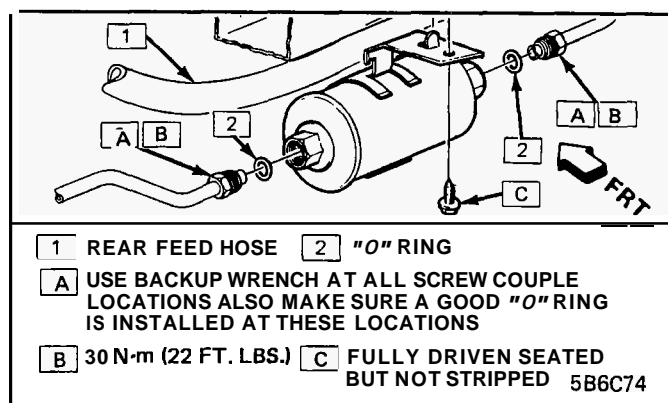


Figure 6C-7 "J & N" Fuel Filter

FUEL PUMP

The LD5 and LV2 engines use mechanical fuel pumps. All other engines have an electric fuel pump for fuel delivery.

Mechanical Fuel Pump

On engines with a mechanical fuel pump, it will be located either on the right or left front of the engine.

See Figures 6C-8 and 6C-9

It is a diaphragm type pump and is actuated by the rocker arm through a link and pull rod.

Some cars have a special fuel pump which has a metering outlet for a vapor return system. Any vapor which forms is returned to the fuel tank along with hot fuel through a separate line. This greatly reduces any possibility of vapor lock by keeping cool fuel from the tank constantly circulating through the fuel pump.

The pump delivers fuel to the carburetor only when the pressure in the outlet line is less than the pressure maintained by the diaphragm spring. Therefore, when more fuel is required, the spring will expand to move the diaphragm upward to force fuel past the outlet valve. When less fuel is required, the pump builds up pressure in the fuel chamber until the diaphragm spring is again compressed. The diaphragm will then remain stationary until more fuel is required.

Some pumps are equipped with a heat shield as shown in Figure 6C-25.

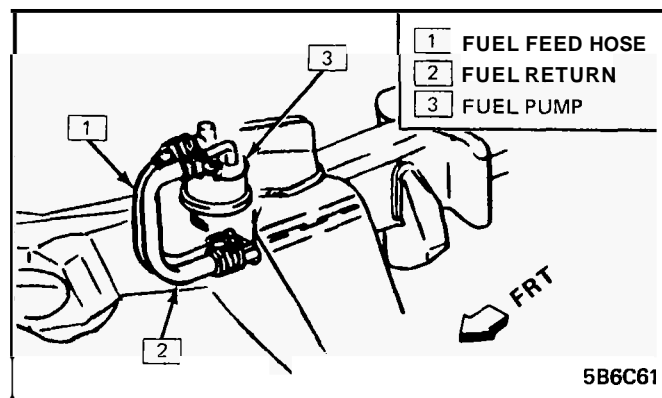


Figure 6C-8 "B" Series Fuel Pump-LV2

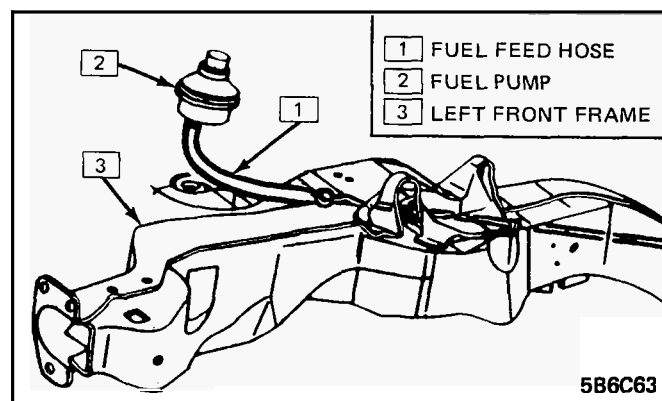


Figure 6C-9 "G" Series Fuel Pump-LD5

Electric Fuel Pump

The electric fuel pump used on gasoline engines is attached to the fuel sending unit.

The fuel pumps used on all MFI-SFI and TBI Engines are higher pressure pumps. The pumps run between 28-36 psi.

Inspection

If the fuel system is suspected of delivering an improper amount of fuel, it should be inspected and tested in the vehicle, as follows:

1. Make certain that there is fuel in the tank.
2. With the engine running, inspect for leaks at all fuel feed pipe and hose connections from fuel tank to

injection pump. Tighten any loose connections. Inspect all hoses for flattening or kinks which would restrict the flow of fuel. Air leaks or restrictions on suction side of fuel pump will seriously affect pump output.

Fuel Pump Flow Test

1. Test fuel pump by connecting hose from carburetor to a suitable unbreakable container. On vehicles equipped with MFI, SFI, OR TBI, disconnect EFI fuel feed line.
 - a. Mechanical Fuel Pump. Crank engine.
 - b. MFI, SFI or TBI Electric Fuel Pump. Apply battery voltage to the fuel pump test terminal (terminal "G" of ALCL).
2. Fuel pump should supply 1 pint or more in 15 seconds.
3. If flow is below minimum, check for fuel restriction. If there is no restriction, check pump vacuum and/or pressure.

Fuel System Pressure Test

This test must be performed when diagnosing the fuel system.

CAUTION: To reduce the risk of fire and personal injury, it is necessary to relieve the fuel system pressure before servicing the fuel system components on the TBI system. To do this:

Throttle Body Injection Engines:

- o Remove "Fuel Pump" fuse from fuse block in passenger compartment.
- o Crank engine. Engine will start and run until fuel remaining in fuel lines is consumed. Crank the starter for three seconds to assure that any remaining pressure is relieved.
- o With the ignition off, replace the "Fuel Pump" fuse.

Multiport Injection Engines:

- o Disconnect fuel tank harness connector.
- o Crank engine - engine will start and run until fuel supply remaining in fuel pipes is consumed. Engine starter for 3.0 seconds to assure relief of any remaining pressure.
- o With ignition "OFF" connect fuel tank harness connector.

Unless this procedure is followed before servicing fuel pipes or connections, fuel spray could occur.

Pressure Test-2.5L "A" Series

1. Remove air cleaner and plug thermal vacuum port on throttle body unit.
2. Remove steel fuel pipe between Throttle Body Injector (TBI) unit and fuel filter. Use backup wrench to hold fuel nut on throttle body and fuel filter when removing the fuel line.
3. Install pipe and adapter assemblies 5-29658-02 on to gage assembly J-29658.
4. Install gage assembly between the TBI unit and the fuel filter.
5. Start car and observe fuel pressure reading. It should be 62-90 kPa (9-13 psi); if not, refer to EFI Diagnosis, Chart 5, in Section 6E2.
6. Remove fuel pressure gage (system must first be depressurized).

7. Reinstall steel fuel line from filter to throttle body and torque to 26-34 N·m (19-25 lbs.-ft.). Use new O-rings if required.
8. Start the engine and check for fuel leaks.
9. Remove plug covering thermal vacuum port on throttle body and install air cleaner.

Pressure Test-"J" & "N" Series

1. Obtain two sections of 3/8" steel tubing. Each should be about 254 mm (10 inches) long. Double-flare one end of each section.
2. Install a flare nut on each section. Connect each of the above sections of tubing into the "flare nut to flare nut adapters" that are included in 5-29658-82 Gage Adapters.
3. Attach the pipe and adapter assemblies to the J-29658 gage.
4. Hoist the car.
5. Disconnect front fuel feed hose from the fuel pipe on the body.
6. Install a 254 mm (10 inch) length of 3/8" fuel hose onto the fuel feed pipe on the body. Attach the other end of the hose onto one of the sections of pipe mentioned in Step 1. Secure the hose connections with clamps.
7. Attach the front fuel feed hose onto the other section of tubing mentioned in Step 1. Secure the hose connection with a clamp.
8. Start the engine and check for leaks.
9. Observe the fuel pressure reading. It should be 62 to 90 kPa (9 to 13 psi). If not, refer to the appropriate Emissions Section.
10. Depressurize the fuel system and remove the gage with adapters. Reconnect the fuel feed hose to the pipe and torque the clamp to 1.7 N·m (15 lbs. in.).
11. Lower the car. Start the engine and check for fuel leaks.

Fuel Pump Pressure Test

1. To check fuel pump pressure, disconnect inlet hose at pump and connect a vacuum gage. Run engine until maximum vacuum is reached. If the vacuum reading is less than 50.6 kPa (15" Hg.), replace pump. If more than 50.6 kPa (15" Hg.), go to Step 2.
2. Check fuel lines and hoses for splits, leaks or kinks by disconnecting each section of line and connecting a vacuum gage. Crank or run the engine until vacuum gage peaks. Vacuum should be at least 50.6 kPa (15" Hg.) If less, repair or replace the malfunctioning line or hose.
3. If fuel lines and pump check OK, remove tank unit, replace strainer and clean tank, if necessary.

Flow Test-TBI

1. Connect a hose from the TBI fuel feed line to a suitable unbreakable container.
2. For the 2.0 and 2.5L: Apply battery voltage to terminal "G" of the ALCL (see Section 6E2).
3. Fuel pump should supply 1/2 liter (1 pint) or more in 15 seconds.
4. If flow is less than this minimum, check for fuel restrictions.

Fuel System Pressure Test-3.0 MFI & 3.8L MFI

Fuel system diagnosis on this engine is in Section 6E3, Chart A-7.

Pump (Outlet) Pressure

Even if fuel flows in good volume from line at filter inlet or carburetor, it is advisable to make certain the pump is operating within limits.

- Disconnect fuel line at the carburetor or filter inlet fitting. Install a rubber hose approximately 203-254 mm (8"-10") long over the line and attach a low-reading pressure gage. Hold the gage up so that it is approximately 406 mm (16") above the fuel pump.

NOTICE: Hold carburetor fuel inlet nut while tightening the fuel line fitting to prevent carburetor damage.

Mechanical Fuel Pump

Removal

1. Disconnect fuel inlet hose from pump. Disconnect vapor return hose, if so equipped.
2. Disconnect fuel outlet pipe.
3. Remove two bolts holding fuel pump.
4. Remove fuel pump, push rod, gasket and mounting plate (if used).

Installation

1. Install push rod, gasket, mounting plate (if used) and fuel pump.
2. Install two hex head bolts, turning them alternately and evenly.
3. Install fuel outlet pipe. If it is difficult to start fitting, time can be saved by disconnecting upper end of pipe from carburetor. Tighten fitting securely, meanwhile holding fuel pump nut with a wrench. Install and tighten fitting at carburetor, if removed.
4. Install fuel inlet hose and clamp. Install vapor return hose and clamp, if so equipped.
5. Start engine and check for leaks.

Electric Fuel Pump

Removal

1. Relieve fuel system pressure on MFI, SFI and TBI (See Fuel System Pressure Relief).
2. Disconnect negative battery cable.
3. Raise car on hoist.
4. Remove the fuel tank (see "Fuel Tank Removal").
5. Remove fuel lever sending unit and pump assembly by turning cam lock ring counterclockwise. Lift assembly from fuel tank and remove fuel pump from fuel lever sending unit.
6. Pull fuel pump up into attaching hose while pulling outward away from bottom support. Take care to prevent damage to rubber insulator and strainer during removal. After pump assembly is clear of bottom support, pull pump assembly out of rubber connector for removal.

Installation

1. Inspect fuel pump attaching hose for any signs of deterioration. Replace as necessary. Also check rubber sound insulator at bottom of pump; replace if required.
2. Push fuel pump assembly into attaching hose.
3. Install fuel lever sending unit and pump assembly into tank assembly. Use new O-ring during reassembly.
4. Install cam lock over assembly and lock by turning clockwise.

5. Reverse fuel tank removal procedure to finish installing.

Fuel Pump Relay

To control fuel pump operation, a fuel pump relay is used.

When the ignition switch is turned to "RUN" position, the fuel pump relay activates the electric fuel pump for 1.5 to 2.0 seconds to prime the injector. If the ECM does not receive reference pulses from the distributor after this time, the ECM signals the relay to turn off the fuel pump. The relay will once again activate the fuel pump when the ECM receives distributor reference pulses. Refer to Figure 6C-12. Also see the electrical section of the manual for description and operation.

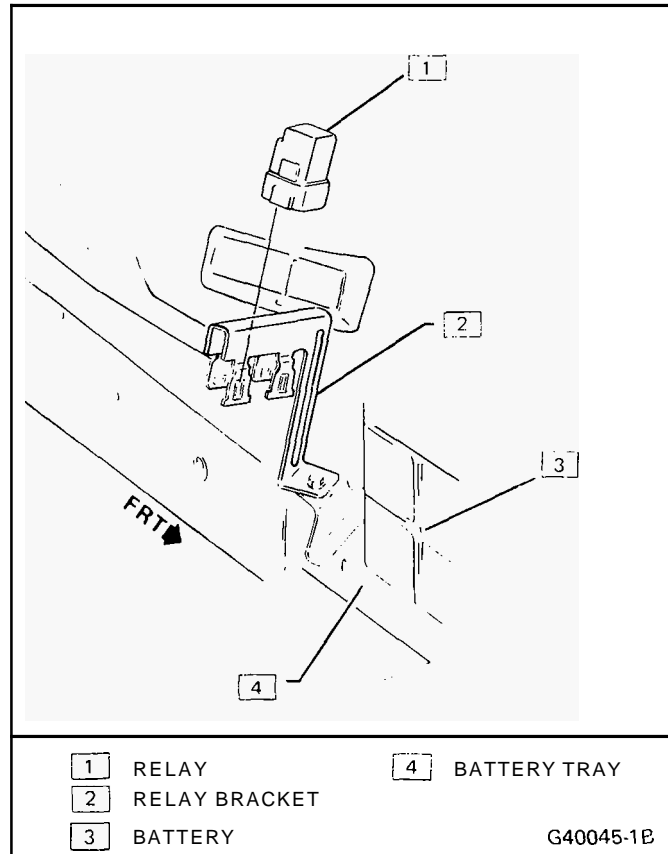


Figure 6C-10 "A" Series Fuel Pump Relay-LG3

FUEL TANK

The fuel tank is located under the rear of the vehicle and a number of shapes and sizes are used depending on the application.

The tank is held in place by two metal straps, that are attached to the underbody in two ways.

1. Bolted front and rear. In this type installation one bolt is bolted into the underbody (35 N·m or 26 ft. lbs), while the other bolt is bolted horizontally through the strap and underbody (11 N·m or 8 ft. lbs.) as shown in Figure 6C-17.
2. Bolted and hinged. In this installation, one end of the strap fits into an opening in the underbody support and the other end of the strap is bolted into the underbody (35 N·m or 26 ft. lbs.) as shown in Figure 6C-18.

Some tank strap attachments require the use of a spacer with the strap as shown in Figure 6C-19. In this type installation the insulator is wrapped all the way around the

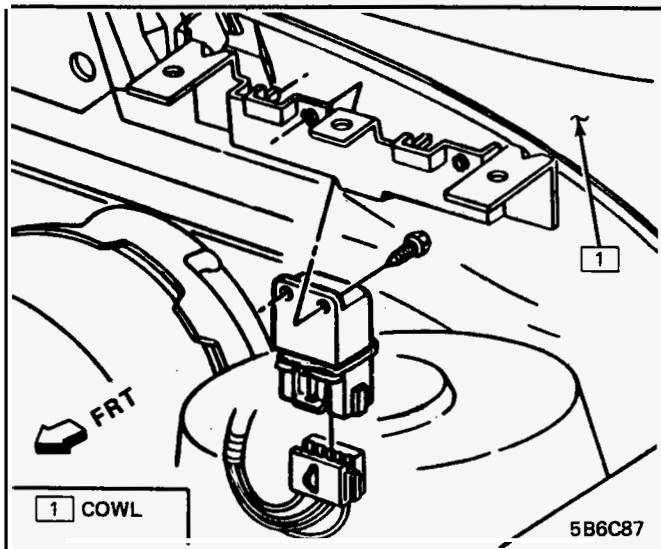


Figure 6C-11 "J" Series Fuel Pump Relay-LL8

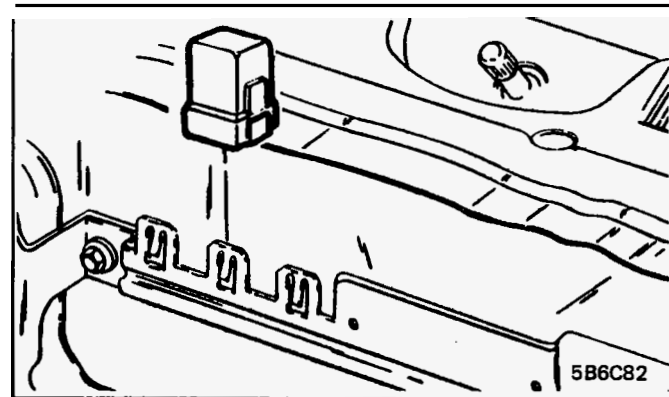


Figure 6C-14 "N" Series Fuel Pump Relay-LN7

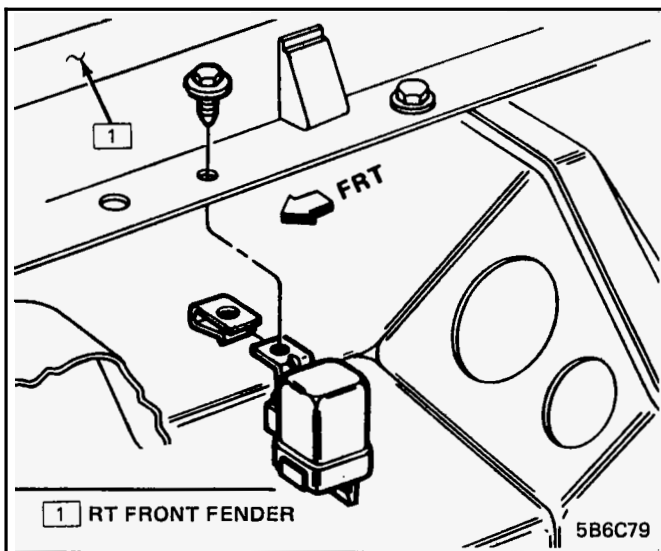


Figure 6C-12 "J" Series Fuel Pump Relay-LT2/LT3 With C41

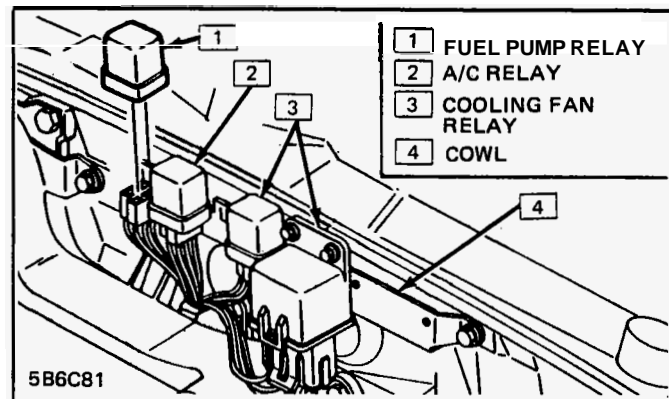


Figure 6C-15 "N" Series Fuel Pump Relay-L68

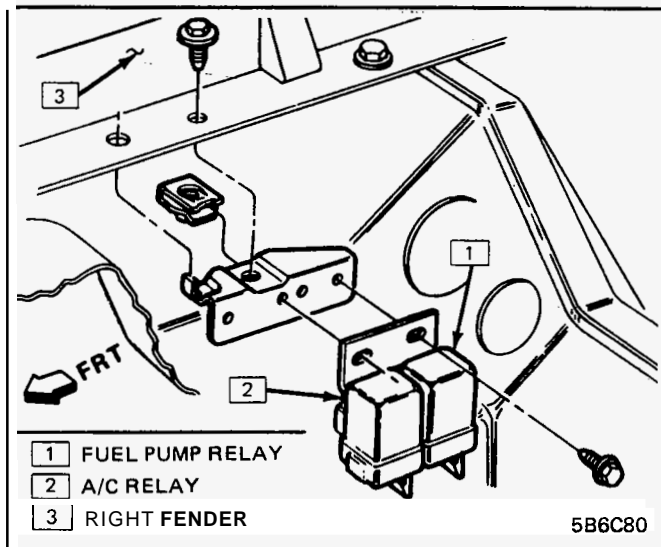


Figure 6C-13 "J" Series Fuel Pump Relay-LT2/LT3 With C60

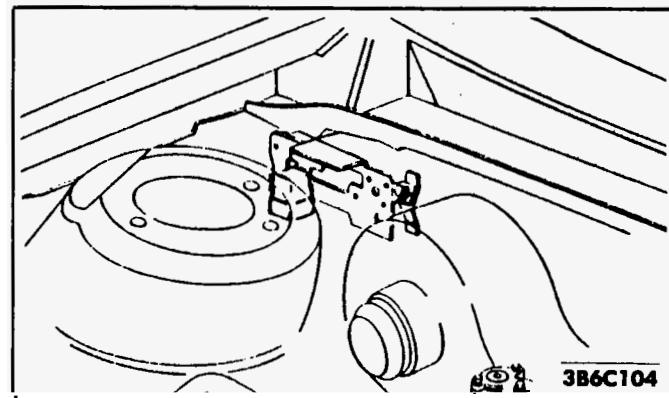


Figure 6C-16 Fuel Pump Relay-LR8

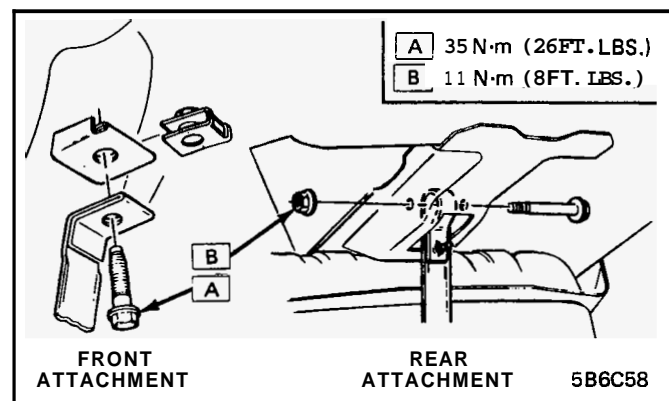


Figure 6C-17 Strap Attachment "B" Series Shown

tank. The insulators are installed to reduce chafing and tank noise and squeaking. For all service operations always make

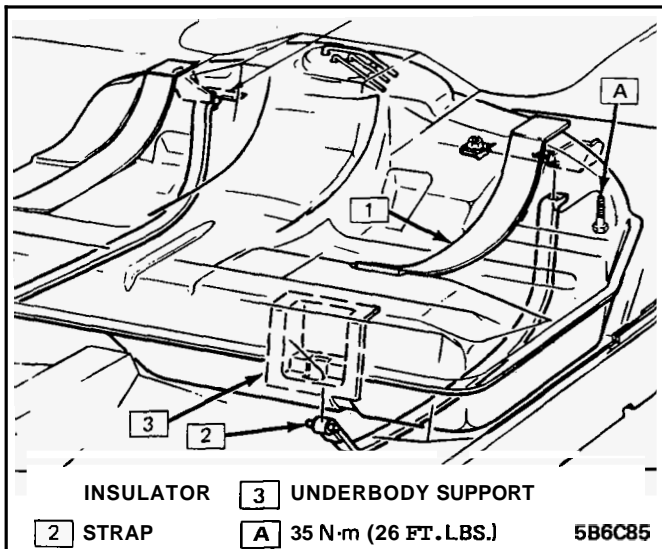
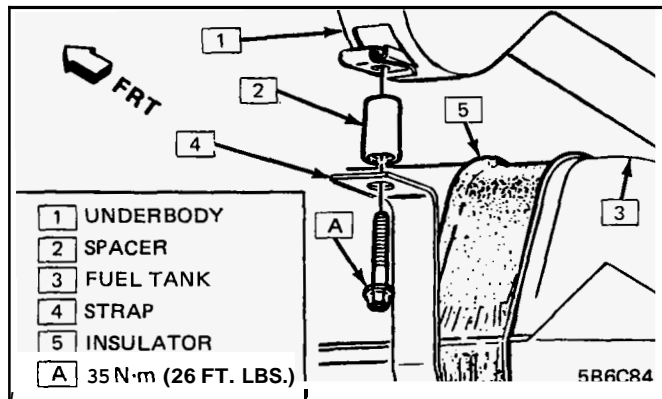


Figure 6C-18 Fuel Tank Strap & Insulator "C" Series Shown

sure that all spacers and insulators are installed into their original location.



The fuel tank, cap and lines should be inspected for road damage, which could cause leakage. Inspect fuel cap for correct sealing and indications of physical damage. Replace any damaged or malfunctioning parts.

Before attempting service of any type on the fuel tank, always (1) remove negative battery cable from battery, (2) place "no smoking" signs near work areas, (3) be sure to have CO₂ fire extinguisher on hand, (4) wear safety glasses and (5) siphon or pump fuel into an explosion proof container.

Fuel Tank Filler Neck

To help prevent refueling with leaded gasoline, the fuel filler neck on gasoline engine cars has a built-in restrictor and deflector. The opening in the restrictor will only admit the smaller unleaded gas nozzle spout, which must be fully inserted to bypass the deflector. Attempted refueling with a leaded gas nozzle or failure to fully insert the unleaded gas nozzle will result in gasoline splashing back out of the filler neck.

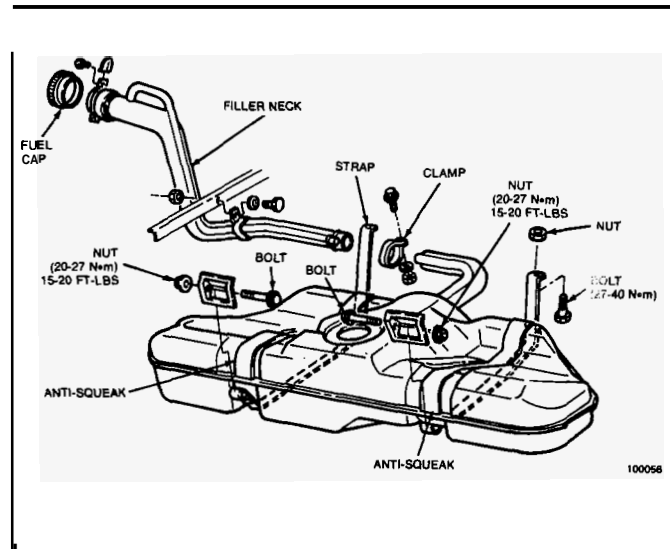


Figure 6C-20 Fuel Tank

Draining Fuel Tank

1. Disconnect the negative battery cable. Also have a dry chemical (Class B) fire extinguisher near the work area.
2. Use a hand operated pump to drain as much fuel through the filler tube as possible.
3. If a hand operated pump device cannot be used to complete the draining process, use a siphon at the main (not return) fuel pipe, at the fuel pump, or the fuel tank gage unit.

CAUTION: Never drain or store gasoline in an open container due to the possibility of fire or explosion.

4. Reinstall any removed hoses, lines and cap.

Fuel Tank Replacement

1. Remove all fuel, see Draining Fuel Tank.
2. Support fuel tank and disconnect the two fuel tank retaining straps.
3. Lower tank enough to disconnect sending unit wire, hoses, and ground strap if so equipped.
4. Remove tank from vehicle.
5. Remove sending unit, see Fuel Gage Sending Unit Replacement.

Installation

1. Reverse removal procedure.
2. Always replace O-ring when tank unit has been removed.
3. When reinstalling fuel tank be sure to reinstall anti-squeak pieces on top of the tank to reduce rattles and other annoying noises.
4. Tighten fuel tank retaining strap bolts or screws. (See Torque Specifications.)

Fuel System Cleaning

CAUTION: This procedure will NOT remove all fuel vapor. Do not attempt any repair on tank or filler neck where heat or flame is required, as an explosion resulting in personal injury could occur.

If trouble is due to contaminated fuel or foreign material that is in the tank, it can usually be cleaned. If tank is rusted internally, it should be replaced.

1. Disconnect negative battery cable.
2. Disconnect engine harness connector on HEI distributor if so equipped. Have dry chemical (Class B) fire extinguisher near the work area.
3. Relieve fuel system pressure (see "Fuel System Pressure Relief") on LT2 and LR8.
4. Drain fuel tank (see "Draining Fuel Tank").
5. Remove fuel tank (see "Fuel Tank Removal").
6. Remove external fuel filter and inspect for contamination. If filter is plugged, replace.
7. Locate tank away from heat, flame or other source of ignition. Remove fuel gage sending unit and pump assembly if so equipped and inspect condition of strainer. If strainer is contaminated, a new strainer should be installed upon reassembly.
8. Complete draining of tank by rocking it and allowing fuel to run out of fuel meter/pump assembly opening.
9. Flush fuel tank with running hot water for at least five minutes. Pour water out of fuel sending unit opening. (Rock tank to be sure that removal of water is complete.)
10. Disconnect fuel feed pipe and use air pressure to clean fuel line. Apply air pressure in the opposite direction fuel normally flows through the line. On vehicles equipped with a fuel return line, clean line in similar manner. Disconnect pipe at throttle body unit and apply air pressure to clean return line. Reconnect and torque all pipes to 30 N·m (22 lb. ft.).
11. Use low air pressure to clean pipes on fuel gage sending assembly unit.
12. Install new strainer on fuel meter sending unit pump assembly, if required. Install fuel gage sending unit and pump if so equipped with new gasket into tank and install fuel tank. Connect fuel gage wire harness to body harness. Connect all fuel lines except feed line to external fuel filter.
13. Disconnect fuel feed hose to chassis pipe at front on vehicles with MFI, SFI and TBI. On vehicles equipped with mechanical fuel pumps, disconnect line at carburetor. Connect a hose to front end of chassis fuel feed pipe and insert other end of hose into a one gallon fuel can.
14. Connect battery cable.
15. Put six gallons of clean fuel into fuel tank and apply 12 volts to Terminal "G" of ALCL to pump two quarts of fuel into fuel can. This will purge fuel pump.
16. Remove hose and connect fuel hose to chassis pipe.
17. Check all connections for leaks; tighten all hose clamps.

Fuel Tank Purging Procedure

1. Remove fuel gage unit and drain all remaining fuel from tank.
2. Visually inspect interior cavity of tank. If any fuel is evident, drain again.
3. Move tank to flushing area (wash rack).
4. Fill tank completely with tap water, agitate vigorously and drain.
5. Add gasoline emulsifying agent to the tank, refill with water, agitate mixture for 10 minutes, drain tank completely.
For correct gasoline emulsifying agent to water mixture, refer to the manufacturer's specifications. Use an available emulsifying agent, such as "Product-Sol No. 913" or equivalent.
6. When empty, refill to overflowing with water. Completely flush out remaining mixture and empty tank.

7. If available, an explosion meter should be used to check for negative reading.

Fuel Tank Leak Test Procedure

Plug all outlets. Before removing a fuel tank for a suspected fuel leak, make sure that it is not one of the fuel hoses that is leaking onto the tank.

On Car Test

If fuel is leaking from tank, replace tank.

Off Car

Apply a small amount of air pressure to tank through vent tube (approximately 7 to 10 kPa or 1 to 1-1/2 lbs. of pressure)

Test repaired area for leaks with soap solution or by submersion. If leak is noted, replace tank.

Fuel Gage Sending Unit

The fuel gage sending unit is attached to the top of the fuel tank. It is held in place with a cam lock ring and a gasket is used between the tank and sending unit.

Some sending units have two and others have three place to attach hoses. One line is for the fuel feed line. The second line is connected to the vapor canister, to keep fuel vapor from getting into the air (see Section 6E). The third line is used as a fuel return line to the tank.

On some sending units a wire is attached to the unit. On other the connectors attach directly to the sender.

When a fuel gage sending unit is removed always make sure to install the gasket and any power on ground leads that were removed. Figure 6C-21 shows a typical sending unit without an electrical fuel pump.

Removal of Tank and Tank Unit- All Series

1. Drain tank.
2. Hoist car, see Section OA.
3. Disconnect tank unit wire from connector.
CAUTION: To help avoid personal injury when a vehicle is on a hoist, provided additional support for the vehicle at the opposite end from which components are being removed. This will reduce the possibility of the vehicle falling off of the hoist.
4. Remove ground wire retaining screw from underbody, if used.
5. Disconnect hoses from tank unit.
6. Disconnect hoses at tank from filler and vent pipes.
7. Support fuel tank and disconnect the two fuel tank retaining straps.
8. Remove tank from car.
9. Remove fuel gage retaining cam, using Tool J-24187 (Figure 6C-47).
10. Remove tank unit from tank.

Installation

1. Reverse removal procedure.
2. Always replace O-ring when tank unit has been removed.
3. Tighten the front fuel tank retaining strap bolts to 34 N·m (25 lbs. ft.) and the rear strap nut to 24 N·m (17 lbs. ft.).

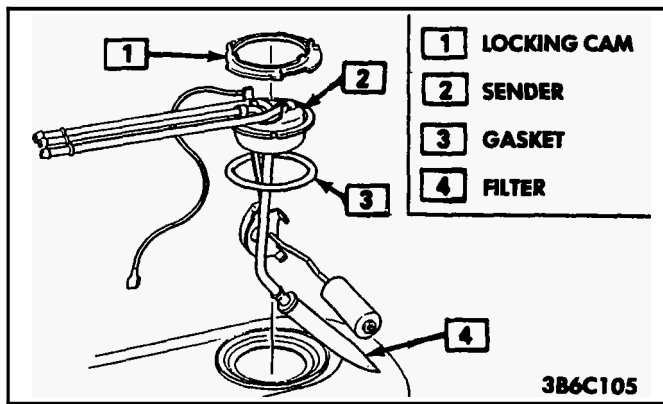


Figure 6C-21 Fuel Gage Sending Unit

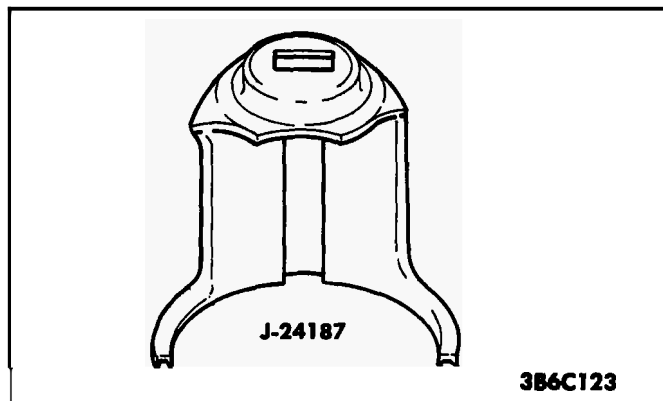


Figure 6C-22 Locking Cam Tool

Fuel Filler Cap

The fuel tank filler neck is equipped with a screw-type cap. The threaded part of the cap requires several turns counterclockwise to remove. The long threaded area was designed to allow any remaining fuel tank pressure to escape while the cap was being removed. A built-in torque-limiting device prevents overtightening. To install, turn the cap clockwise until a clicking noise is heard. This signals that the correct torque has been reached and the cap is fully seated.

NOTICE: If a fuel filler cap requires replacement, use only a cap with the same features. Failure to use the correct cap can result in a serious malfunction of the system.

Available on some models is an electric locking fuel filler cap. Information on this option will be found in Section 9E.

NOTICE: Fuel and vapor hoses and pipes are specially manufactured. If replacement becomes necessary, it is important to use replacement hoses or pipe meeting GM Specifications. Hoses and pipes not meeting GM Specification could cause early failure or failure to meet emission standard.

Fuel Feed and Return Pipe

When replacing fuel feed and return pipes, always replace them with welded steel tubing meeting GM Specification 124M or its equivalent. The replacement pipe must utilize the same type of fittings as the original pipes to ensure the integrity of the connection.

NOTICE: Do not replace fuel pipe with fuel hose or any other type of tubing such as copper or aluminum. Only tubing meeting the 124M specification is capable of meeting all the pressure and vibration characteristics necessary to ensure the durability standard required.

- o Always check and replace any O-rings and or washers that appear damaged.
- o Fuel feed and return pipes are secured to the underbody with clamps and screw assemblies. The pipes should be inspected occasionally for leaks, kinks or dents.
- o Follow the same routing as the original pipe.
- o Pipes must be properly secured to the frame to prevent chafing. A minimum of 6 mm (1/4") clearance must be maintained around a pipe to prevent contact and chafing.

Fuel and Vapor Hoses

NOTICE: Fuel and vapor hoses are specially manufactured. If replacement becomes necessary, it is important to use only replacement hoses meeting GM Specification 6163-M. These hoses are identified with the words "Fluoroelastomer" on them. Hoses not so marked could cause early failure or fail to meet emission standards.

- o Do not use rubber hose within 4" of any part of the exhaust system or within 10" of the catalytic converter.

MFI, SFI and TBI Fuel Pipes

Due to the fact that the fuel pipes are under high pressure, these systems require special consideration for service.

Many of the feed and return pipes use screw couplings with O-rings. Any time these fittings are loosened to service or replace components ensure that:

- o A backup wrench is used to loosen and tighten the fitting.
- o Check all O-rings at these locations (if applicable) for cuts or any damage and replace any that appear worn or damaged.
- Use correct torque when tightening these fittings.
- o If pipes are replaced always use original equipment parts, or parts that meet the GM specification for those parts.

ACCELERATOR CONTROLS

The accelerator control system is cable type. There are no linkage adjustments.

As there are no adjustments, the specific cable, for each application must be used. Only the specific replacement part will work.

When work has been performed on accelerator controls, always check to ensure that all components are installed as removed and that all linkage and cables are not rubbing or binding.

Accelerator Control Cable

Refer to Figures 6C-26 thru 6C-34 for removal and installation of accelerator control cable.

When performing service on the accelerator control cable, observe the following:

- o Retainer must be installed with tangs secured over head of stud.

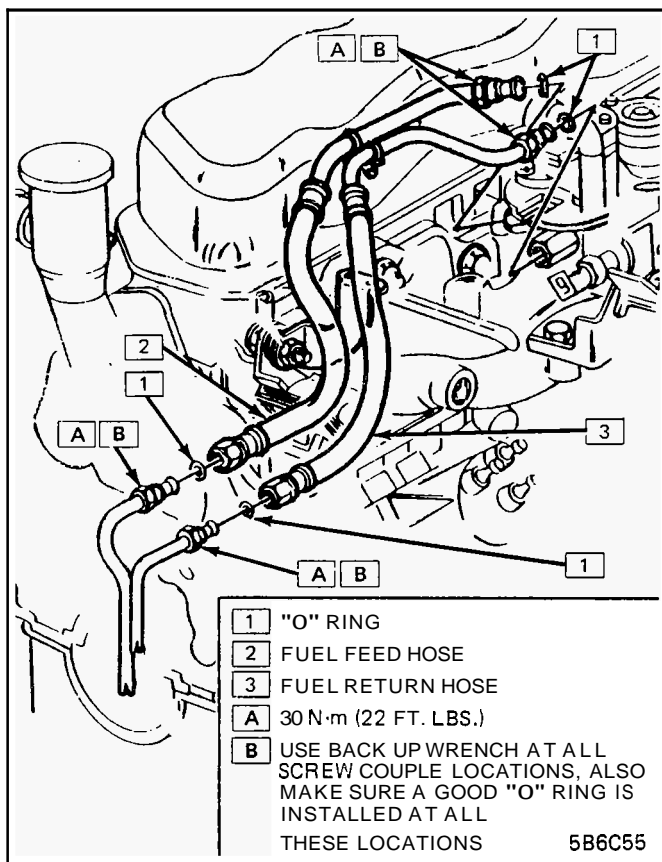


Figure 6C-23 Fuel Pipes and Hoses-L68

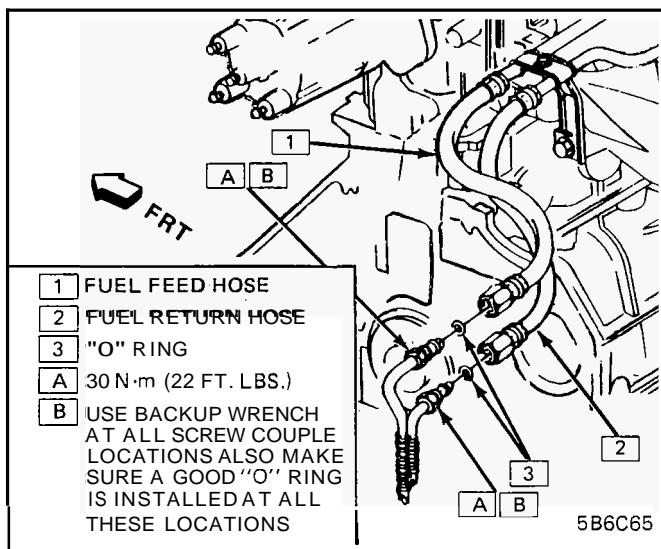


Figure 6C-24 Fuel Pipes and Hoses-LT2

- o Conduit fitting at both ends of cable must have locking tangs expanded and locked in attaching holes.
- o The braided portion of the accelerator cable assembly must not come in contact with the front of dash sealer during assembly, repair or replacement of the assembly.
- o Flexible components (hoses, wires, conduits, etc.) must be routed within 50.0mm (2.0 in.) of moving

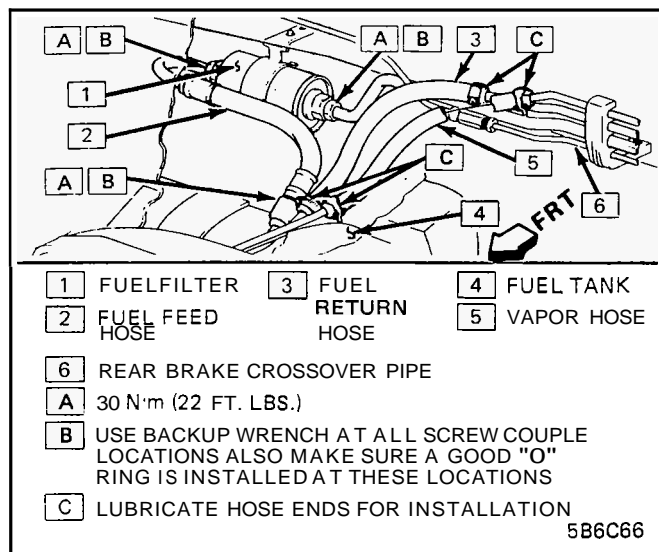


Figure 6C-25 "J" & "N" Series Fuel Pipes & Hoses

parts of accelerator linkage outboard of support unless routing is positively controlled.

Whenever disconnecting or replacing parts, lube pivot points with Accelerator Linkage Lubricant, 1052541 or equivalent.

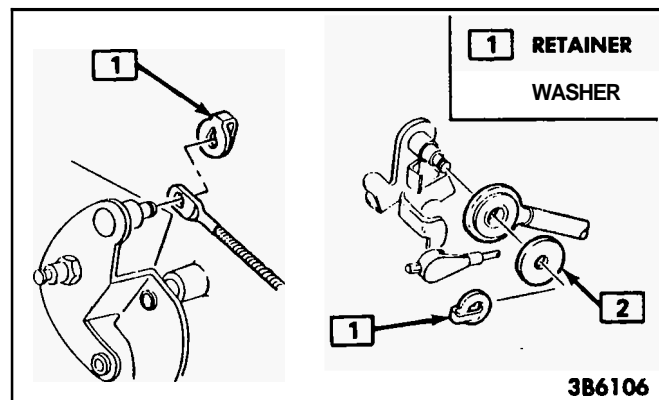


Figure 6C-26 Control Cable Attachment

Accelerator Pedal

When performing service on the accelerator pedal, observe the following:

- o The mounting surface between support and dash panel must be free of insulation. The carpet and padding in pedal and tunnel area must be positioned to lay flat and be free of wrinkles and bunches.
- o Slip accelerator control cable through slot in rod and then install retainer in rod, being sure it is seated. Care must be utilized in pressing the retainer into hole in rod to assure the cable is not kinked or damaged in any way.
- o After secured all components of the accelerator linkage, linkage must operate freely without binding between full closed throttle and full wide open throttle.
- o Wire, hoses, cables or other obstructions must not be placed within 13mm (33/64 in.) of cable or rod at any point in their travel.

Refer to Figure 6C-27 for replacement of accelerator linkage.

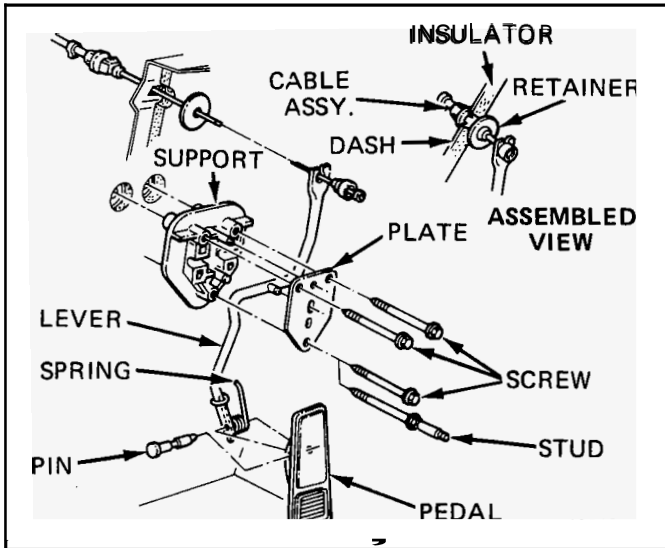


Figure 6C-27 Accelerator Pedal Assembly

CAUTION: CARE MUST BE UTILIZED IN PRESSING CABLE RETAINER INTO HOLE IN DASH PANEL AND CARB LEVER BRACKET, TO PREVENT DAMAGE. CABLE IS NOT TO BE KINKED OR DAMAGED IN ANY WAY DURING ASSEMBLY OPERATION. HAVING SECURED ALL COMPONENTS OF THE ACCELERATOR LINKAGE AS SPECIFIED, LINKAGE MUST OPERATE FREELY BETWEEN FULL CLOSED THROTTLE AND FULL WIDE OPEN.

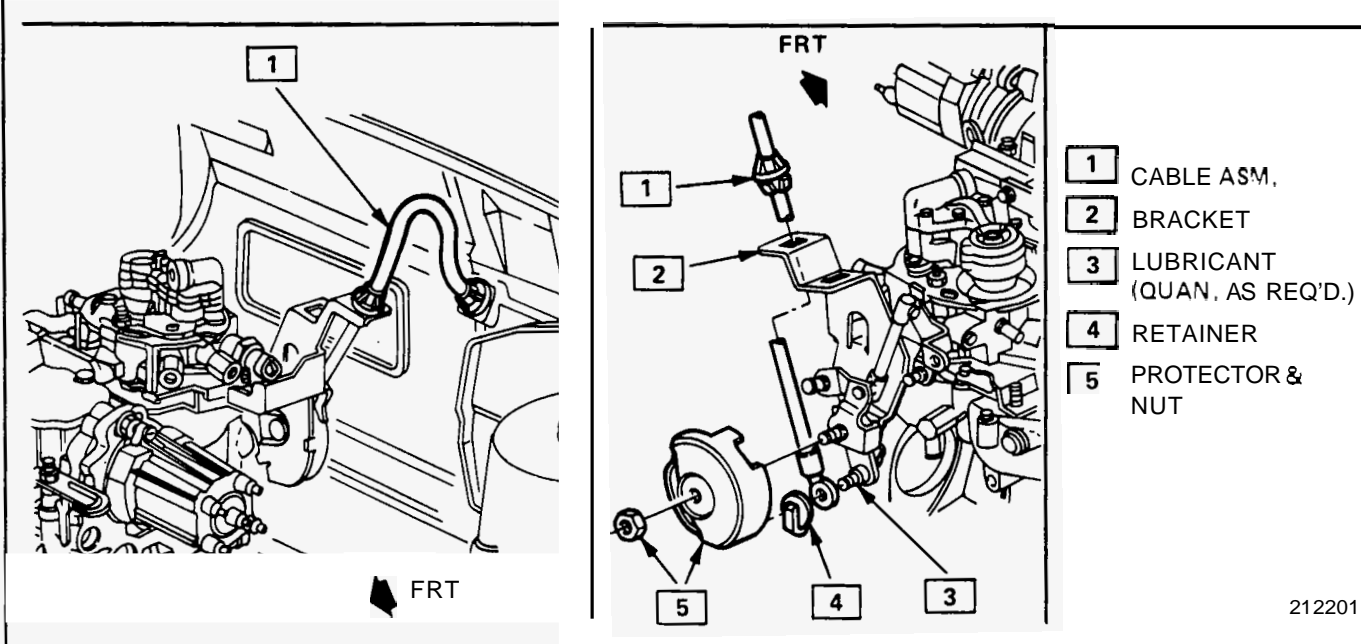


Figure 6C-28 Accelerator Control Cable-LT2/LT3

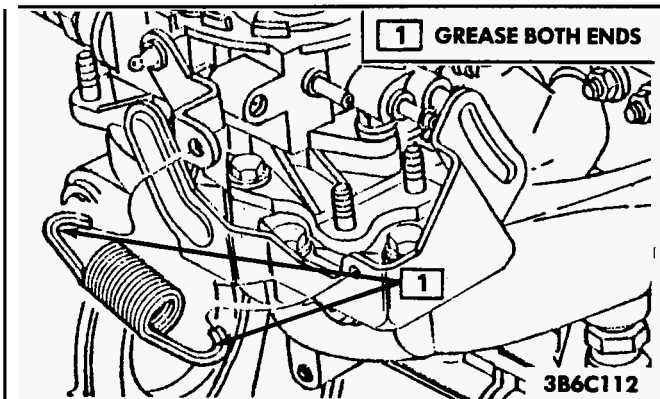
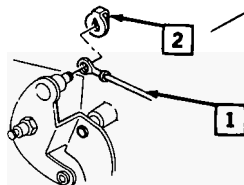
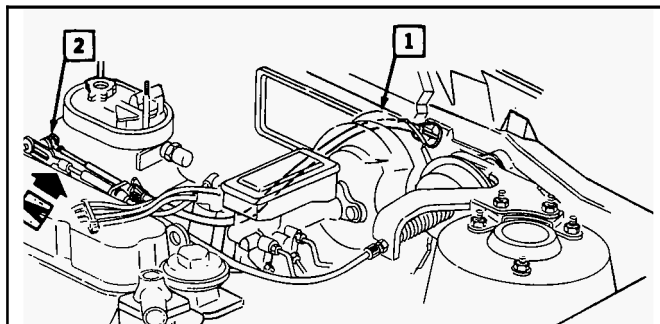


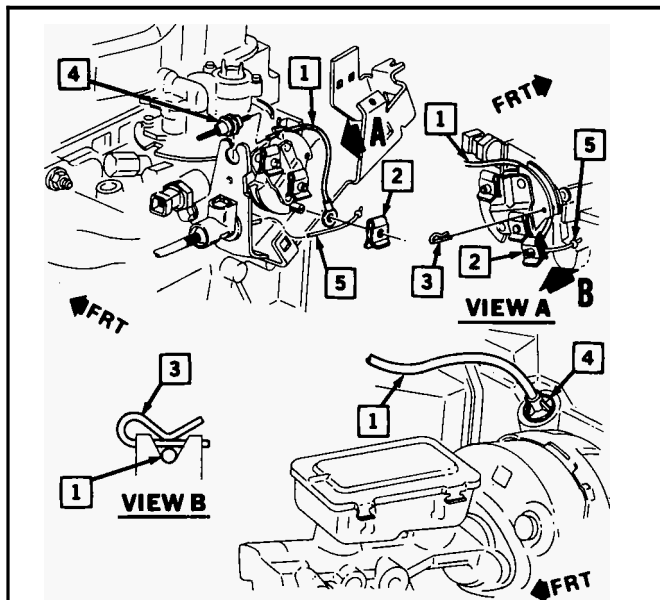
Figure 6C-29 Accelerator Return Spring-LT2/LT3



VIEW A

- CABLEASM.
 - RETAINER
- RETAINER MUST BE INSTALLED WITH TANG SECURED OVER END OF STUD. CARE MUST BE UTILIZED IN PRESSING CABLE RETAINER INTO HOLE IN DASH PANEL AND HOLE IN BRACKET TO PREVENT DAMAGE. CABLE IS NOT TO BE KINKED OR DAMAGED IN ANY WAY DURING ASSEMBLY. HAVING SECURED ALL COMPONENTS OF THE ACCELERATOR LINKAGE AS SPECIFIED, LINKAGE MUST OPERATE FREELY BETWEEN FULL CLOSED THROTTLE AND FULL WIDE OPEN. CABLE MUST BE ROUTED UNDER SPARK PLUG WIRES TO PREVENT GROUNDING OUT AGAINST BRACKET. 384082954

Figure 6C-31 Accelerator Control Cable-LL8

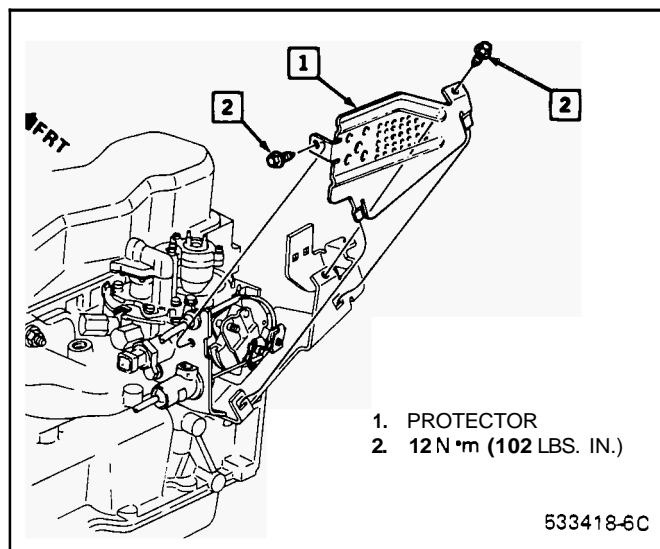


1. CABLE
2. RETAINER
3. RETAINER - INSTALL IN DIRECTION SHOWN
4. MUST BE FULLY SEATED
5. TRANSAXLE THROTTLE VALVE CABLE

CABLE MUST NOT BE KINKED OR DAMAGED

384072829

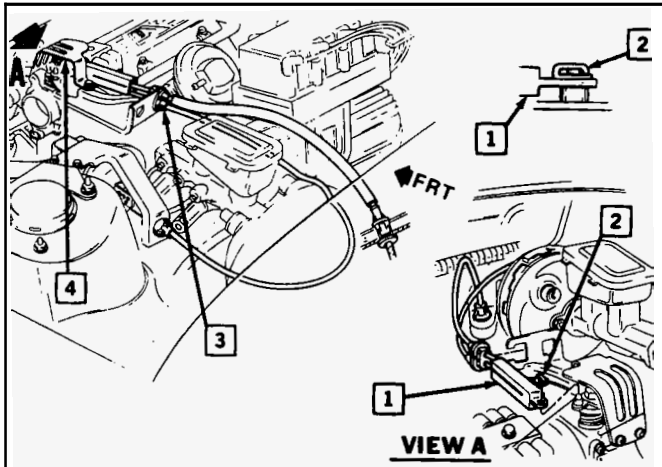
Figure 6C-30 Accelerator Control Cable-2.5L-N Series



1. PROTECTOR
2. 12 N*m (102 LBS. IN.)

533418-6C

Figure 6C-32 N Series Accelerator Control Cable-Protector-2.5 L

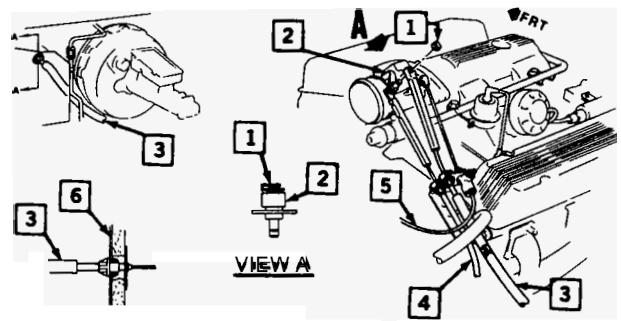


1. ACCELERATOR CONTROL & CRUISE CONTROL SERVO CABLE
2. RETAINER - RETAINER MUST BE INSTALLED WITH TANG SECURED OVER HEAD OF STUD.
3. CONDUIT FITTING AT BOTH ENDS MUST HAVE LOCKING TANGS EXPANDED & LOCKED IN ATTACHING HOLES.
4. PROTECTOR

ACCELERATOR CABLE MUST NOT BE SUBJECTED TO SHARP BENDS DURING INSTALLATION. ACCELERATOR CABLE MUST BE ROUTED SMOOTHLY & FREELY OF WIRES, HOSES OR OTHER OBSTRUCTIONS BETWEEN CONDUIT FITTINGS.

384072831

Figure 6C-33 N Series Accelerator Control Cable-3.0L



SECTION A-A

CONDUIT FITTING AT BOTH ENDS MUST HAVE LOCKING TANGS EXPANDED AND LOCKED IN ATTACHING HOLES

1. RETAINER
2. THROTTLE LEVER
3. ACCELERATOR CONTROL
4. CRUISE CONTROL CABLE
5. TRANS. T.V. CABLE
6. COWL

383121000

Figure 6C-34 3.8L-A & C Series