

VAPOR LOCK CAUSE AND CURE

The following information has been compiled from extensive research and testing performed by Chevrolet Engineering and RV manufacturers concerning fuel handling problems of the Class A Motor Home (during 1982 and 1983). Chevrolet and the RV manufacturers examined typical "problem units" furnished by various owners in order to better understand "real-world" vapor lock problems in the highly customized Class A Motor Home and develop corrective actions.

This information is presented as an aid to the motor home owner in understanding the problems associated with vapor lock and their suggested solutions.

Fuel System Plumbing

As determined from initial studies, Chevrolet engineers and RV manufacturing representatives determined that part of the problem concerning vapor lock involved the RV manufacturers' approach to the fuel system plumbing. Examination of problem units identified considerable plumbing errors, such as:

- Four feet of rubber hose added in the middle of the stretch chassis.
- A length of hose positioned over the top of the tank to the pickup.
- Total rubber plumbing which is tied to the rear hot water lines with zip straps so that there was a tendency for the fuel to boil and the lines to "suck shut" or kink at each zip strap.
- Vehicles equipped with a defective switch valve so that the ports did not line up properly and some of the valves would only switch occasionally. (Ports that did not line up caused restriction as did units that had two additional fuel filters and a stretch chassis. All of these factors add to the load on the mechanical fuel pump.)
- An electric fuel pump installed in the return line rather than the suction line.
- Incorrect tank cap venting.
- And so on.

Chevrolet and the RV manufacturers' representatives determined that 100 percent of the motor homes produced with plumbing errors such as those above could have vapor locking problems. Investigation showed that a properly plumbed fuel system down the inside of the frame rail was also not a 100 percent cure for the problem.

Fuel Properties

As part of the investigation, Chevrolet Fuel and Lubrication Engineers conducted a nationwide survey examining the possibility that fuels could cause vapor lock. Results of the survey show that oil companies have contributed

to the cause of vapor lock by the addition of alcohol to the fuel without informing the public or advertising the fuel as gasohol. Also, it was determined that butane was added to "cover up" lower grade crudes and to increase octane ratings. The result of the fuel being adjusted and the octane modifiers was a general increase in the Reid vapor pressure (RVP) of the fuels (the higher the Reid vapor pressure the greater the possibility of vapor lock). The average Reid vapor pressure of regular unleaded gasoline was 9.3 in 1980, 9.8 in 1981 and 10.3 in 1982 (with individual locations showing a reading of 12 and 13). With fuel changes toward the higher Reid vapor pressure fuels, some motor home owners who have never experienced any problems could have vapor lock problems that did not exist a year or so ago. Also, it was determined that mountains, steep grades and overloaded vehicles tend to aggravate the vapor lock problem, as recorded in a park survey at Pikes Peak. Vapor lock at Pikes Peak is the single most recorded mechanical problem encountered.

Results of Vapor Lock Investigation

During the week of October 17, 1983, Chevrolet invited all Class A Motor Home manufacturers to the GM Proving Grounds in Phoenix, Arizona. The purpose of this meeting was to discuss the findings of the investigation into the cause of vapor lock and to make specific corrective recommendations for current and future production vehicles (including changes in truck emissions). The meeting was attended by 34 of 36 RV manufacturers. Chevrolet suggested that the RV manufacturers incorporate the following recommendations into current and future vehicle building, as well as develop some adaptation for problem units already existing in the field. The following recommendations were presented:

- A one-half inch steel fuel line mounted on the outside of the frame rail, protected against rub and chafe (see Figure A7-7-2).
- Also recommended is a pump bypass line along with a check valve. The 12-801 is a positive displacement pump and will not allow fuel flow if it stops running. The bypass, which closes under fuel pressure, will allow the engine mounted mechanical pump to pull fuel from the tank in the event of an electric pump failure. (See figure A7-7-1).
- The fuel requirements for the 454 engine at wide-open throttle are 25 gallons per hour at 2 PSI minimum and 3 PSI maximum. If fuel line lengths or routings create a situation where this cannot be met, an electric pump should be added at the fuel tank to supply fuel to the mechanical pump on the engine. Pressure in the supply line will further reduce the chance of bubbles forming versus a negative pressure situation with a mechanical pump only. (See Pressurized Fuel System Diagnosis Chart in Figure A7-7-8.)

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- A single in-line filter should be placed between the tank and the electric fuel pump. (One filter choice is AC Part No. GF62C.)
- A 3/8-inch rubber fuel line connection should be made at the mechanical fuel pump and at the fuel pump sending unit.
- Power for the electric fuel pump should be controlled through a relay or special oil pressure switch to assure shut-down in the event of vehicle upset (see Figure A7-7-3). Consideration could be given to a manual priming override in the event the system has totally run out of fuel. Normal starts would occur with the fuel remaining in the carburetor and upon starting as oil pressure came up the special switch or relay and would turn on the electric pump. (See installation instructions in Figure A7-7-4.)
- AC electric fuel pump (AC Part No. EP89) can also be used and does not require a fuel pressure regulator. The wiring remains the same.

Chevrolet invited all RV manufacturers to the Phoenix meeting to share the findings and test information, as it would be difficult for a singular RV manufacturer (or customer) to produce these tests on their own. Chevrolet informed the RV manufacturers that all necessary steps would be taken to correct any vapor lock problem on any chassis with a 137-, 158-, 178-inch wheelbase with a 100 percent factory system. As an additional commitment to the 1983 meeting, Chevrolet has informed all RV manufacturers that all necessary steps will be taken to correct any vapor lock problem for the 208-inch wheelbase Model CP32032 entering production for the 1988 model year with a 100 percent factory system. Additionally, Chevrolet requested that the RV manufacturers correct any field problems that are reported to them on any units that have been modified by the RV manufacturer — such as stretch chassis, dual tanks, dual fuel, oversize tanks, etc., as the individual manufacturers are more knowledgeable of their own systems and are in a better position to make their own modifications for the various models, years and options.

NOTE: Chevrolet has completed testing of a new 60-gallon tank. With the start of 1985 production, new fuel lines were installed on the outside of the frame rail. In the spring of 1985, a complete system was in production with in-tank electric pusher pump and external regulator adjustable by the RV manufacturer for an oversize wheelbase. (See Figure A7-7-5.)

Check Valve Installation

To install a fuel line anti-siphon check valve into the system, a 3/8" bypass line must be installed around the electric fuel pump and regulator (See Figure A7-7-1.) The valve is manufactured by Aluminum Fabricated Products (AFP 200) and must be fitted with 3/8" hose connector, available from Parker-Hannifin Corporation (Part No. 126HBL-6-6.) These parts are usually available from marine hardware suppliers.

Install as follows:

- Install one 3/8" T-fitting in the fuel line between the regulator and the mechanical fuel pump and one 3/8" T-fitting between the electric fuel pump and the fuel tank.
- Connect a 3/8" hose to the T's.
- If the bypass fuel line is already in place, remove 1-1/2 inches of 3/8 fuel line and insert check valve.
- Insert valve side in line toward mechanical fuel pump; insert fitting side into line from fuel tank.
- Secure bypass line and valve with 3/8" hose clamps.

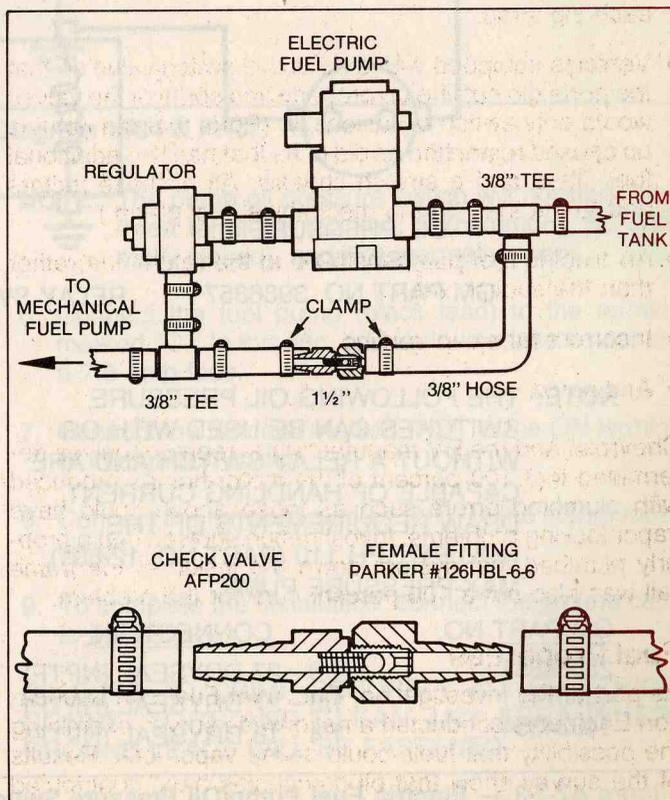


Figure A7-7-1

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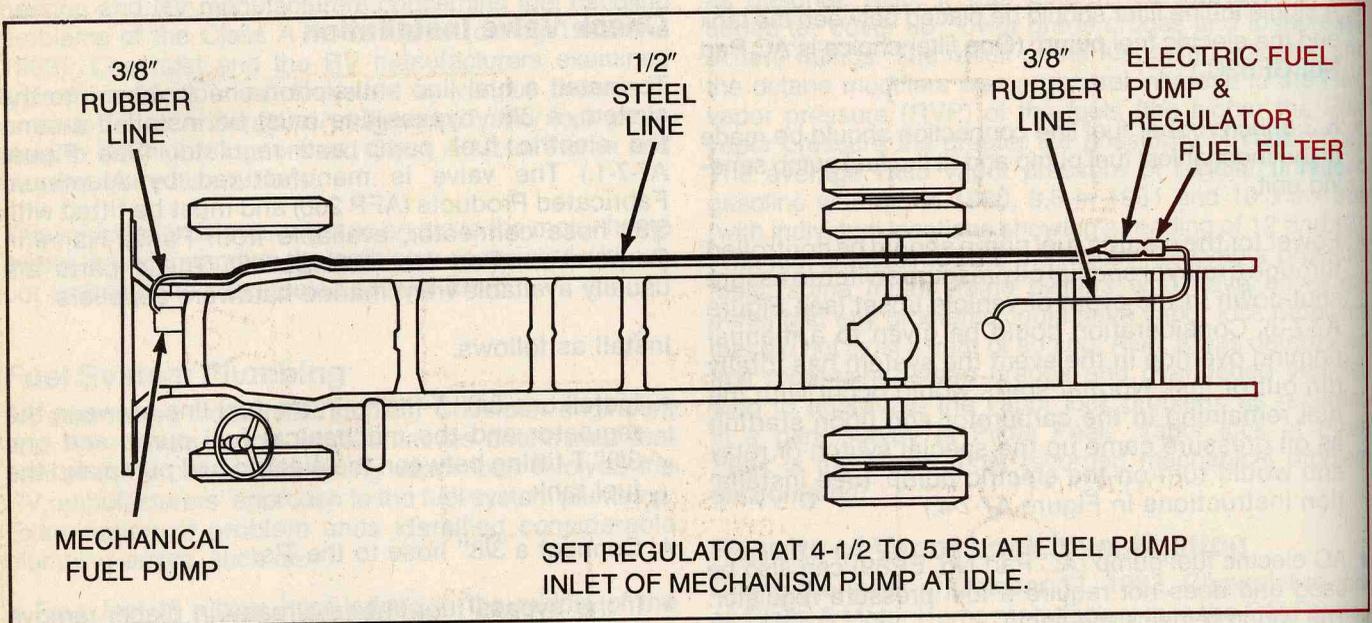


Figure A7-7-2 — 1984 Recommended Field Fix

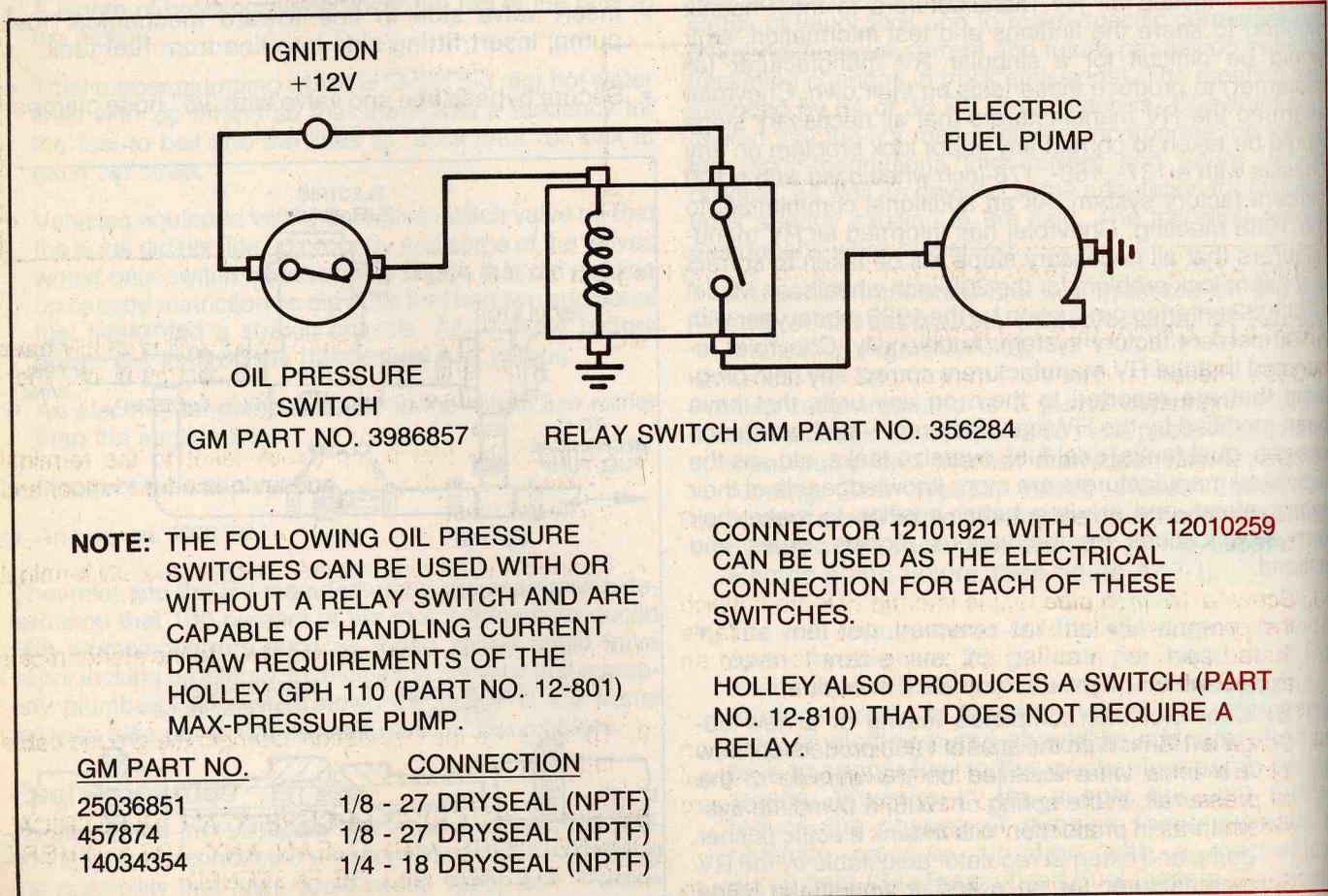


Figure A7-7-3 — Electric Fuel Pump/Oil Pressure Switch Relay

VAPOR LOCK CAUSE AND CURE (Cont'd)

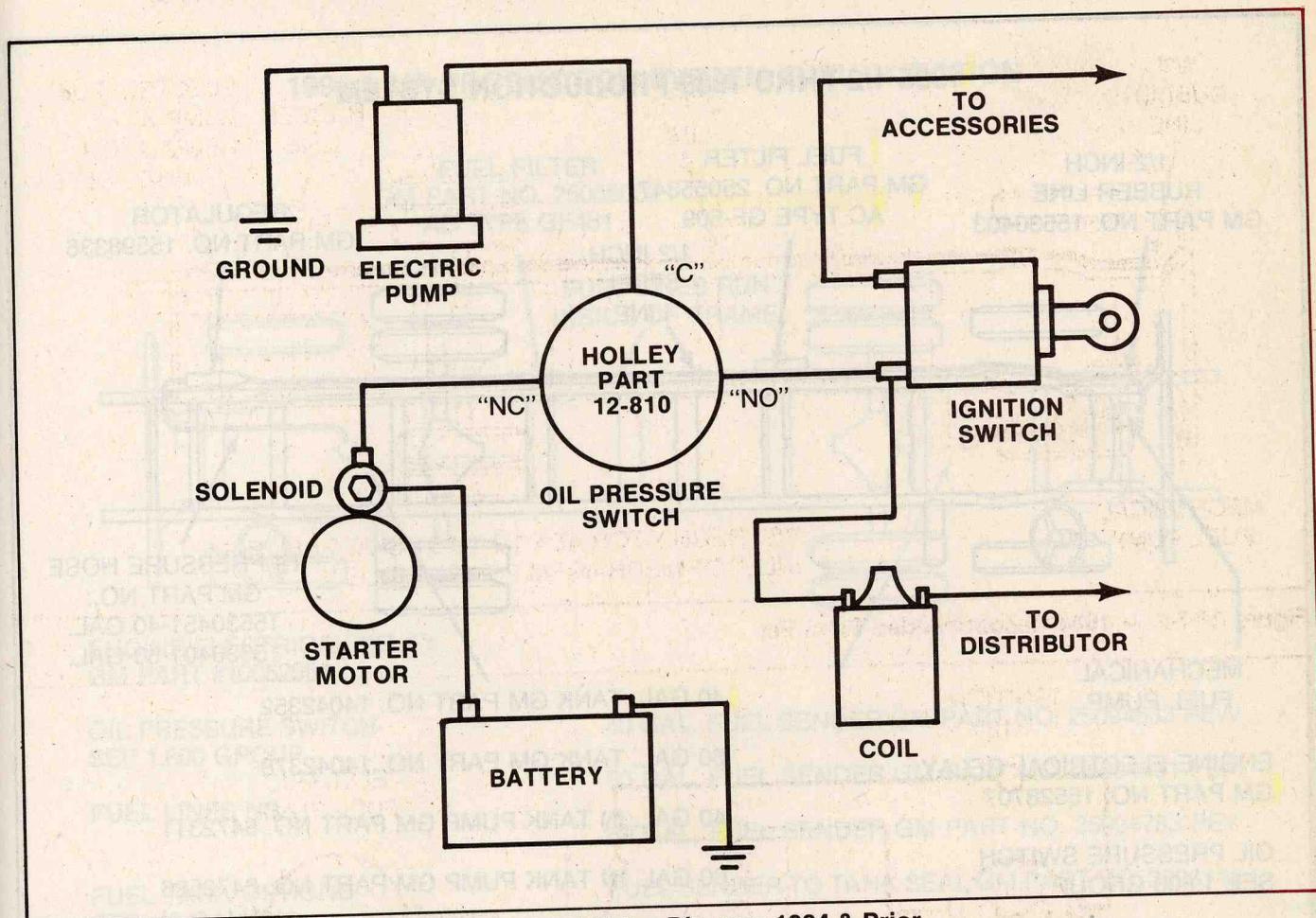


Figure A7-7-4 — Oil Pressure Switch — Typical Wiring Diagram 1984 & Prior

INSTALLATION INSTRUCTIONS

NOTE: Please read instructions completely before making installation.

1. Disconnect cable from battery.
2. Remove original equipment oil pressure switch and retain.
3. Screw a 1/8-inch pipe nipple into the hole from which the pressure switch was removed. Use any suitable thread sealant on all fittings, taking care to avoid an excess which might contaminate the engine.
4. Screw a 1/8-inch pipe tee onto the nipple and position it in a manner to facilitate the installation of the original oil pressure switch and the new fuel pump pressure switch in the remaining two holes.
5. Screw in the two switches and reconnect the lead to the original equipment oil pressure switch.

NOTE: The pump oil pressure switch will normally have three terminals marked: C (common), NC (normally closed), and NO (normally open).

6. Connect the fuel pump (black lead) to the terminal marked "C." In this line, add an in-line fuse holder and a 7.5-amp fuse.
7. Connect the terminal marked "NO" to the ON terminal of the ignition switch.
8. Connect the terminal marked "NC" to the starter motor circuit.
9. To complete the installation, connect the ground cable to the battery.

BE SURE TO CRIMP SECURELY ALL ELECTRICAL CONNECTORS AND CLEAN ANY AREA WHERE GROUND LEADS WILL BE FASTENED.

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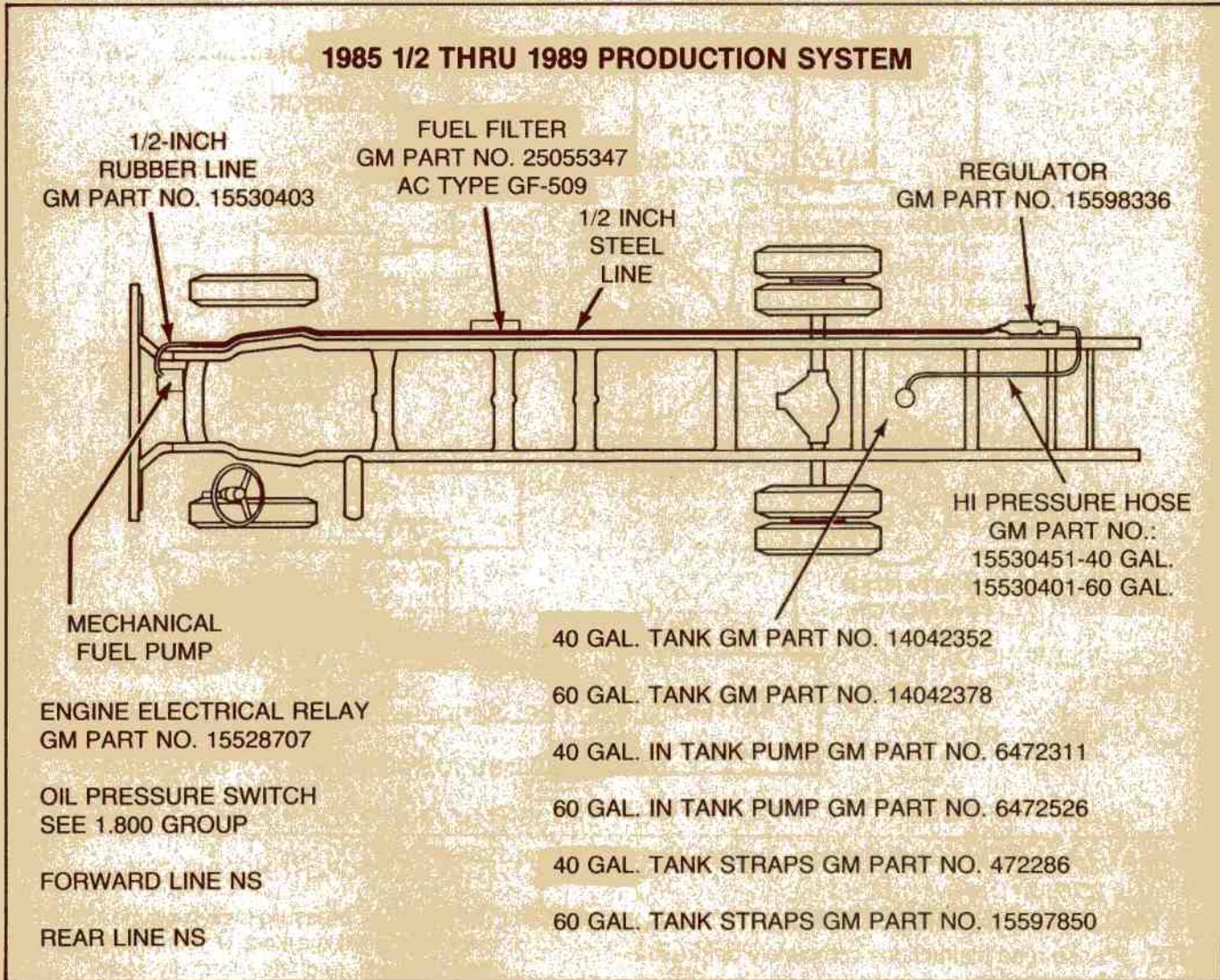


Figure A7-7-5 — 1985 1/2 to 1989 Pressurized Fuel System Components

NOTE: In July, 1985, GM began production of a new pressurized fuel system. From production, the RV manufacturer may choose a 40-gallon standard system, an optional 60-gallon system (Option No. NN4) or specify Option No. 9H2. Option No. 9H2 deletes Chevrolet's system and requires the manufacturer to install its own system. Check the Service Parts Identification Label for appropriate option number. See page 1-3.

NOTE: The factory electric in-tank fuel pump has an activating relay that is shipped loose in the parts box to the RV manufacturer. The wire harness is located at the left front corner of the engine compartment. There are two studs on the engine side of the tow pan for mounting the relay. See Figure A7-17-2 for mounting location.

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1990 & UP PRODUCTION SYSTEM FUEL INJECTION

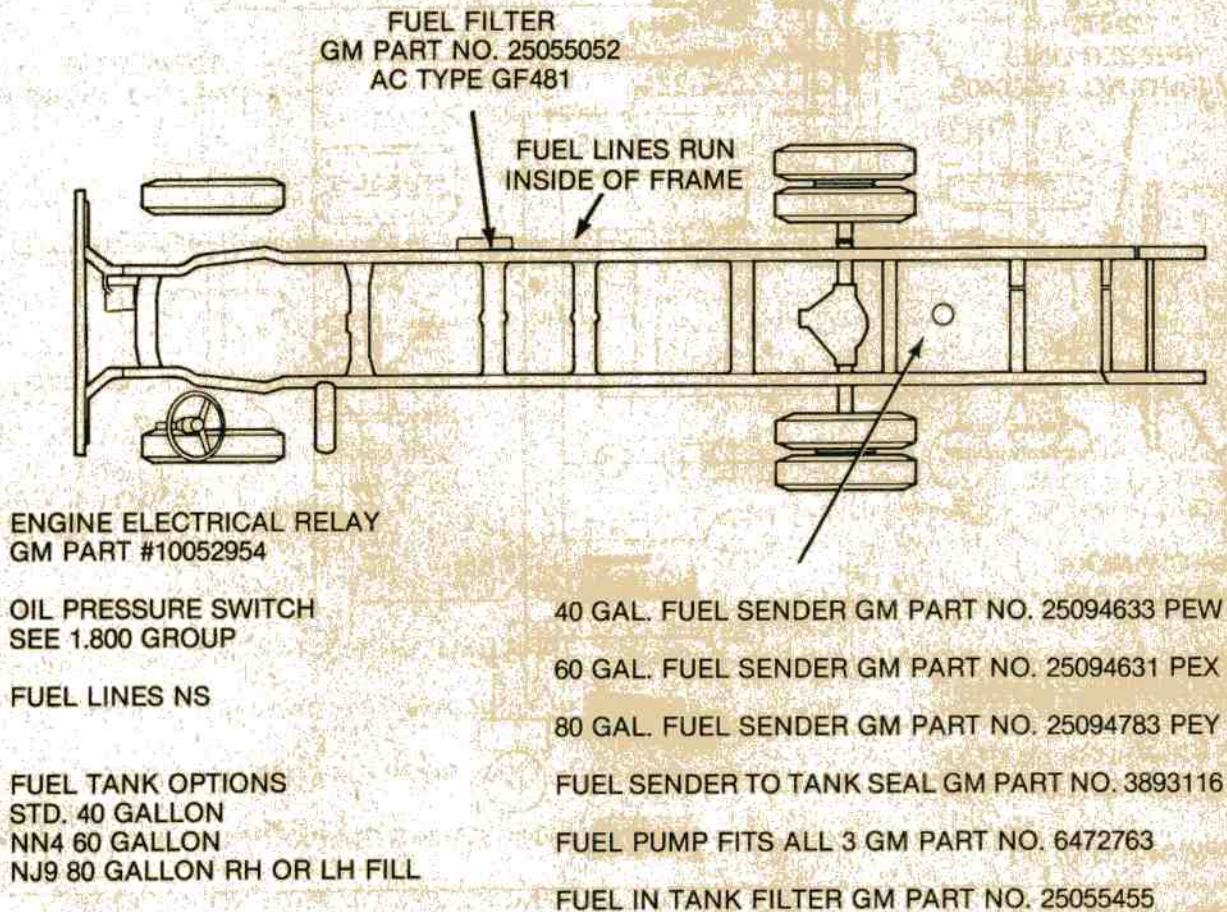


Figure A7-7-6

NOTE: Viton hose and clamp Kit #25028041 for short hose between electric fuel pump and fuel meter in tank.

Fuel Hoses 1990-92

- Pressure line tank to rail line 15666408
- Pressure line, rail to injector 15613689
- Return line, injector to rail line 15613690
- Return line, rail line to tank 15666409

1994 - 30 PSI

- 40 GAL. GM PART NO. 25093676
- 60 GAL. GM PART NO. 25093322
- 80 GAL. GM PART NO. 25094781
- 1993 & PRIOR
- 40 GAL. FUEL SENDER GM PART NO. 25028266
- 60 GAL. FUEL SENDER GM PART NO. 25028269
- 80 GAL. FUEL SENDER GM PART NO. 25028272
- FUEL PUMP GM PART NO. 6443146
- 1994 6.2 DIESEL
- 40 GAL. FUEL SENDER GM PART NO. 25027045
- 60 GAL. FUEL SENDER GM PART NO. 25004132
- 80 GAL. FUEL SENDER GM PART NO. 25029695
- LIFT PUMP GM PART NO. 6442656

Temporary fuel line usage was eliminated SOP 5-31-91.