

# SECTION B

## FUEL PUMP

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## DIVISION II

### DESCRIPTION AND OPERATION

#### 64-9 DESCRIPTION AND OPERATION OF FUEL PUMPS

##### a. Description of Mechanical Pump

An AC fuel pump is used on all engines. The pump assembly is mounted on the timing chain cover in an inverted position, and the pump rocker arm is actuated by an eccentric mounted on front end of the camshaft.

The fuel pump is a diaphragm type pump and is actuated by the rocker arm through a link and a pull rod. See Figure 64-9.

##### b. Operation of Mechanical Fuel Pump

The fuel pump draws gasoline from the tank and supplies it to the carburetor in sufficient quantity to

meet engine requirements under all operating conditions. The principal parts of the fuel pump are shown in Figure 64-9.

The rocker arm spring holds the rocker arm in constant contact with the eccentric on the engine camshaft so that the rocker arm swings up and down as the camshaft rotates. As the arm swings downward, it bears against a shoulder on the link which is pivoted on the rocker arm pin. The link swings upwards, thereby pulling the fuel diaphragm upward by means of the connecting pull rod.

Upward movement of the fuel diaphragm compresses the diaphragm spring and also creates a vacuum in the fuel chamber under the diaphragm. The vacuum causes the outlet valve to close and causes fuel from the gasoline tank to enter the fuel chamber through the inlet valve.

As the rotating eccentric permits the rocker arm to swing upward, the arm releases the fuel link; it cannot move the link downward. The compressed diaphragm spring then exerts pres-

sure on the diaphragm and the fuel in the chamber below diaphragm. This pressure closes the inlet valve and forces fuel out through the outlet valve to the carburetor.

Since the fuel diaphragm is moved downward only by the diaphragm spring, 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. The condition arises when the carburetor float needle valve is not seated and the fuel passage from the pump into the carburetor float chamber is open. When the needle valve is closed and held in place by the pressure of the fuel on the float, the pump builds up pressure in fuel chamber until it overcomes the pressure of the diaphragm spring. This pressure results in almost complete stoppage of diaphragm movement until more fuel is needed.

The air space in the bottom of the fuel pump provides a pocket in which fuel under pressure can compress a certain volume of air. When the pressure is relieved (pump on suction stroke) the pocket of

compressed air pushes the fuel on to its destination. The air pocket minimizes flow variation experienced with two-cycle pump stroke and increases the pump output.

### c. Description and Operation of Electric Fuel Pump

#### 1. Description of Fuel Supply System.

The electric fuel pump is located in the fuel tank. It is an integral part of the tank unit assembly, which includes the fuel gage variable resistor. Both the variable resistor and the pump are positioned and supported by the fuel tube of the tank unit.

The fuel pump consists of a rotating turbine-type hydraulic pump directly coupled to a permanent magnet motor. Fuel is drawn into the pump from the fuel tank, through a woven plastic filter, then forced under pressure through the fuel line to the

carburetor. A paper filter element is located in the inlet fitting of the carburetor.

#### 2. Description of Control Switch.

A single pole, double throw control switch is located near the oil filter and is hydraulically connected to the engine oil system so that the oil pressure actuates the diaphragm of the switch. At approximately 3 psi, one electrical circuit is broken and another circuit is established. Three fixed connections are provided on the switch to make contact with a matching three terminal wiring connector in a splash-proof boot.

#### 3. Operation of the Control System.

During cranking of the engine, the starter solenoid is energized from the battery through the ignition switch. Current is taken from the starter solenoid and supplied to the fuel pump through the normally closed contacts of the control switch

as long as the starter is energized and the engine oil pressure remains below 3 psi.

During normal running of the engine, with normal oil pressure, the fuel pump is energized through the ignition switch, the gauges fuse, control switch and in-line pump fuse. Turning off the ignition switch de-energizes the pump circuit.

If the engine should stop or stall, the oil pressure will immediately drop below 3 psi, the oil pressure switch contacts will return to normal position, there will be no voltage applied to the ground side of the oil light and the oil light will come on. If, during engine operation, the oil pressure should drop below 3 psi (due to lack of oil, etc.), the oil light will immediately come on, the fuel pump will immediately stop due to no voltage to the pump, and the engine will stop running as soon as the fuel from the carburetor bowl is burned.

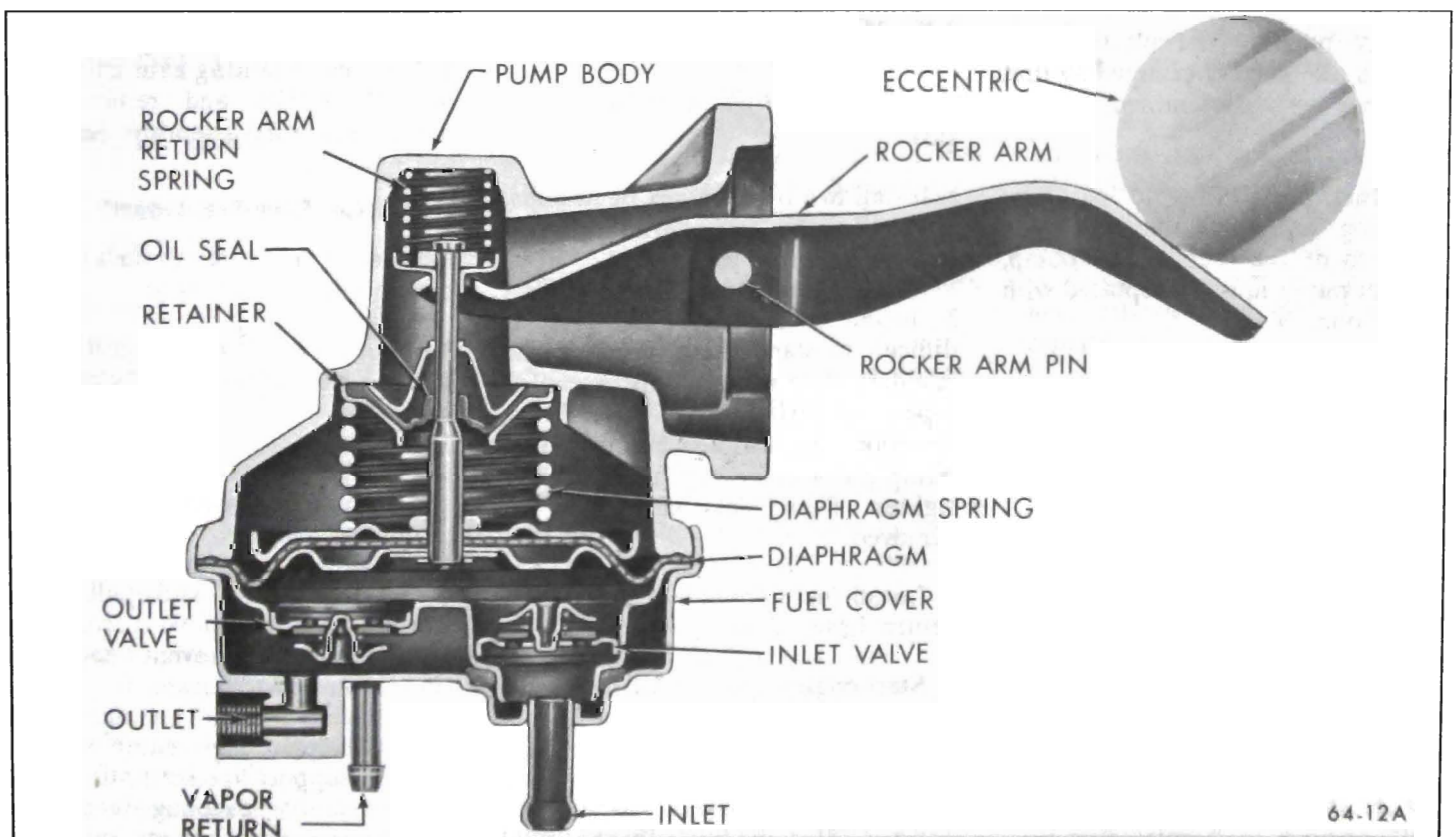


Figure 64-9 - Fuel Pump

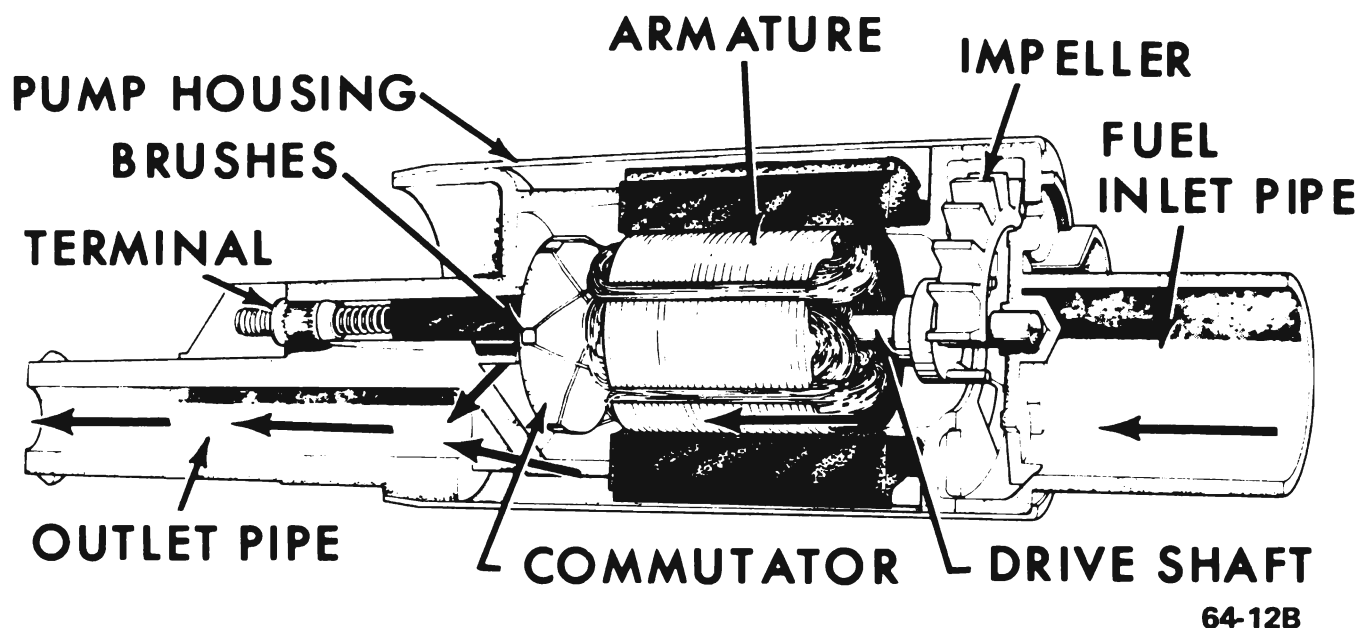


Figure 64-10 - Electric Fuel Pump

**d. Fuel Pump Repairs**

Because fuel pump covers for both mechanical pumps are crimped onto the pump body at the factory, it is not possible to disassemble the pump for any repairs. The electric fuel pump is also factory crimped so that it cannot be disassembled for repairs.

If a fuel pump fails to pass the following tests and the failure is found to be the fault of the pump, the fuel pump must be replaced with a new one.

**DIVISION III****SERVICE PROCEDURES****64-9A FUEL PUMP REMOVAL AND INSTALLATION****a. 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 1/2 inch hex head

bolts, using a 3/8 inch drive deep socket and a ratchet handle.

4. Remove old fuel pump.

**b. Mechanical Fuel Pump Installation**

1. Install new fuel pump with new gasket.
2. Install two 1/2 inch hex head bolts, driving them in 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. Install vapor return hose, if so equipped.
5. Start engine and check for leaks.

**c. Electric Fuel Pump Removal**

1. Raise car. Disconnect two-terminal connector at fuel tank. Remove ground wire screw.

2. Lower car. Pull back trunk floor carpeting. Remove five screws from access hole cover and remove cover.

3. Disconnect fuel hose from tank unit.

4. Unscrew retaining cam ring using Wrench J-21518 and remove fuel pump-tank unit assembly. See Figure 64-11.

**Electric Fuel Pump Replacement**

1. Remove flat wire conductor from plastic clip on fuel tube.
2. Squeeze clamp and pull pump straight back approximately one-half inch.
3. Remove two nuts and lockwashers and conductor wires from pump terminals.
4. Squeeze clamp and pull pump straight back to remove it from tank unit--take care to prevent bending of circular support bracket.
5. Slide replacement pump through circular support bracket until it rests against rubber coupling--make sure pump has rubber isolator and saran strainer attached (supplied in service package).

6. Attach two conductor wires to pump terminals, using the two lockwashers and nuts furnished--make certain flat conductor is attached to terminal located on side away from float arm.

7. Squeeze clamp and push pump into rubber coupling.

8. Replace flat wire conductor in plastic clip on fuel pick-up tube.

#### e. Electric Fuel Pump Installation

1. Install fuel pump-tank unit assembly in fuel tank. Install retaining cam ring using Wrench J- 21518.

2. Connect fuel hose on tank unit pipe.

3. Install access hole cover using five screws. Reinstall trunk floor carpeting.

4. Raise car. At fuel tank, connect two-way connector. Connect ground wire to frame using screw. Lower car.

## DIVISION IV

### TROUBLE DIAGNOSIS

#### 64-10 FUEL PUMP INSPECTION AND TEST

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

##### a. Inspection of Fuel System

1. Make certain that there is gasoline in the tank.

2. With engine running, inspect for leaks at all gasoline feed hose connections from fuel tank to carburetor. 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 mechanical fuel pump will seriously affect pump output.*

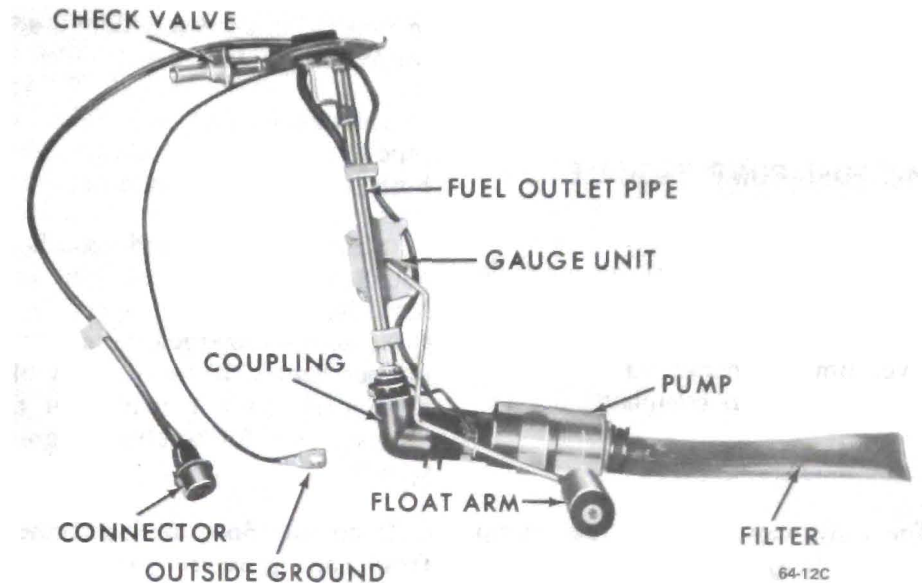


Figure 64-11 Electric Fuel Pump and Fuel Gauge Tank Unit Assembly

3. Inspect for leaks at fuel pump diaphragm flange (mechanical pump only).

4. Disconnect feed pipe near carburetor. Ground distributor terminal of coil with jumper wire so that engine can be cranked without firing. Place suitable container at end of pipe and crank engine a few revolutions. If no gasoline, or only a little flows from pipe, the feed line is clogged or fuel pump is inoperative. Before condemning the fuel pump, disconnect feed line at both ends and blow through it with air hose to make sure that it is clear.

5. If gasoline flows in good volume from pipe at carburetor it may be assumed that the fuel pump and feed line are okay; however, it is advisable to make the following pressure and volume tests to make certain that fuel pump is operating within specifications.

##### b. Fuel Pump Pressure Test

1. Disconnect gasoline line near carburetor and connect a suitable pressure gage (such as Pressure-Leakdown Tester J-22109).

2. Start engine and check pressure with engine running at slow idle

speed and with electrical accessories turned off on Riviervas. Fuel pump pressure on 250 and 350 engines should be 3 lbs. minimum; on 455 engines it should be 4 1/2 lbs. minimum. On cars equipped with a vapor return system, squeeze off the return hose so that an accurate reading can be obtained.

3. If fuel pump pressure is below minimum, mechanical pump must be replaced. On electric pump cars, check supply voltage and for proper ground at pump. If voltage to pump is 12 volts or more but pressure is low, electric fuel pump must be replaced.

##### c. Fuel Pump Flow Test

1. Disconnect fuel line from carburetor. Run fuel line into a suitable measuring container.

2. While observing the sweep second hand of a clock or watch, run the engine at idle until there is one pint of fuel in the container. One pint should be pumped in 30 seconds or less.

3. If flow is below minimum, check for a restriction in the line (or for low voltage to an electric fuel pump). If line is clear, and voltage to an

**64-20 FUEL PUMP**

electric fuel pump is 12 volts or more, fuel pump is defective and must be replaced.

**64-II FUEL PUMP TROUBLE DIAGNOSIS**

Complete diagnosis of all possible causes of the trouble prior to replacement of the fuel pump will save time, expense and possibly prevent a repeat complaint.

**a. Low Pressure Complaint**

The only way to check fuel pump pressure is by connecting an accurate pressure gauge to the fuel line at carburetor level. Never replace a fuel pump without first making this simple check. See Paragraph 64-10, b.

**b. Not Enough Fuel Flow Complaint**

When an engine has a "starving-out" condition, many mechanics jump to the conclusion that the fuel pump is not pumping enough fuel. Many times the "starving" condition is actually due to a weakness in the ignition system, since these two troubles are very hard to separate. Even when an engine is starving for fuel, the cause is more likely to be a plugged fuel filter or a restricted fuel line than a defective fuel pump. See Paragraph 64-10, c.

**c. Engine Won't Run (Electric Fuel Pump) (See Figure 64-12)**

1. Turn ignition switch on and make sure oil and generator lights are lit. If not, check "GAUGES" fuse on fuse block, using a test light. Replace fuse if burned.

2. Make sure oil light goes out while cranking engine. If not, remove fuse from in-line fuse holder in dark blue wire just above brake master cylinder; replace with a new 4 ampere-5/8 inch fuse and again check to make sure oil light goes out during cranking.

3. Make sure there is sufficient fuel

in tank. If there is any doubt, add a couple of gallons.

4. Disconnect fuel hose from steel pipe at right rocker arm cover. Insert hose in a suitable container.

5. Crank engine and check for adequate fuel flow (one pint in 30 seconds). If cranking speed is too slow, install a charged battery or use jumper cables. If fuel flow is okay, check carburetor inlet filter; if filter is okay, look for trouble in ignition system.

6. If no fuel flow, unplug connector from oil pressure switch. With ignition switch on, check two parallel slots of connector with a test light. If test light lights in one slot, place jumper wire between two parallel slots and again check for fuel flow.

7. If no fuel flow, leave ignition on and jumper in place. Reinstall fuel hose. Raise car. Unplug connector at fuel tank and check dark blue wire terminal with test light. If test light lights and ground connection to frame is clean and secure, remove rubber hose from tank unit tube and again check for flow. If fuel flow is OK, check fuel lines for restriction. If no fuel flow, replace pump.

**d. Engine Cuts Out - Heavy Acceleration or High Speed (Electric Fuel Pump)**

1. Disconnect fuel hose from steel pipe at right rocker arm cover and install pressure gauge.

2. With engine idling, fuel pump pressure must be 4-1/2 pounds minimum.

3. If fuel pump pressure is okay, make a fuel flow test by inserting fuel hose in a suitable container. With engine idling, a pint measure should be filled in 30 seconds or less.

4. If fuel pump pressure is low, check voltage at the fuel tank connector; if voltage is 12 volts or more, ground connection is clean and tight, and

fuel level is OK, fuel pump is defective.

5. If only fuel flow is low, remove rubber hose from tank unit tube and repeat flow check. If flow is still low, and fuel level in tank is OK, replace pump. If fuel flow from tank unit tube is OK, check for a dented, pinched or kinked fuel line.

6. If fuel pump pressure and flow are both okay, check carburetor inlet filter. If inlet filter is okay, engine cutting-out must be caused by an ignition system defect rather than a fuel system defect.

**e. Dead Pumps**

1. Check "Gages" fuse located in the fuse block.

2. Check in-line fuse located in the in-line fuse holder in the dark blue wire at front of cowl just above brake master cylinder. Care must be taken to separate fuse holder by a *straight pull*, not wiggling connector. Wiggling can cause fuse holder or fuse breakage.

**f. In-Line Fuse Continues to Blow Repeatedly**

1. Disconnect the multiple connector, under car, from the pump-tank unit. If fuse in-line blows, the problem is pinched wire someplace in the body.

2. Replace with a four-ampere, 5/8" fuse. If fuse does not blow, the problem is likely to be a piece of solder laying across the pump terminals.

3. Remove tank unit and correct. Do not replace the entire tank unit assembly when a pump is found defective. Replace pump and filter unit only.

**CAUTION:** *When removing tank unit, DO NOT ATTEMPT to disconnect the wires from the unit. This is a permanent connection-- disconnecting here destroys the unit. Always disconnect the two-terminal connector forward of the fuel tank.*

**g. No Flow or Intermittent Flow**

l. Rubber elbow between fuel pick-up tube and pump could have a loose piece of rubber flash inside. Remove elbow and inspect carefully.

**h. Dead or Intermittent Pump**

l. The plastic connector which is installed on the oil pressure switch

could have excess plastic on surface of terminals. If terminals are not free of plastic, clean with sharp knife. This type of condition could show up as a temperature related problem--pump runs satisfactorily when cold but cuts out when under-hood temperatures are high.

**i. Pump Will Not Pump When New One Is Installed, But Pump Runs**

l. Wires to pump were reversed and pump is running backwards. The black round wire (ground) should be attached to the pump terminal closest to the tank unit float.

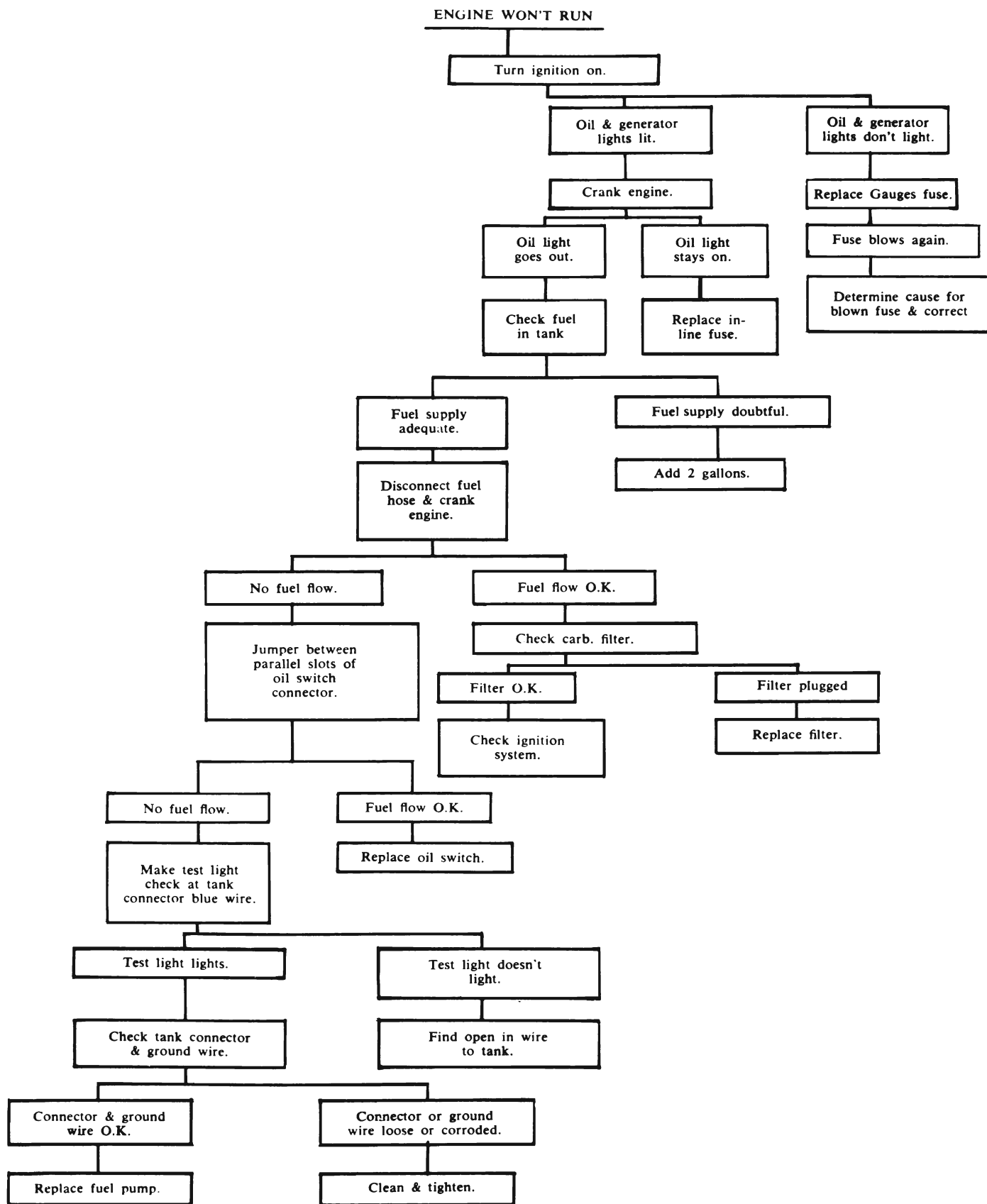


Figure 64-12 - Electric Fuel Pump Trouble Diagnosis