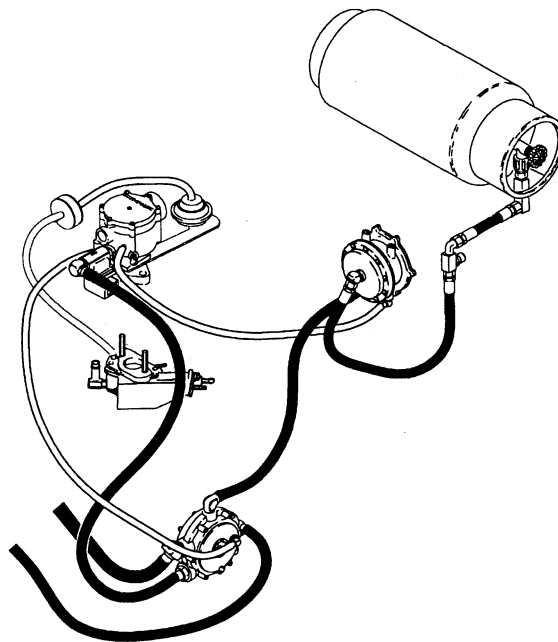


**LPG  
FUEL SYSTEM**  
**MAZDA M4-2.0G Engine**  
**S/H1.50-1.75XM,  
S/H2.00XMS  
(S/H25-35XM, H40XMS)  
S/H2.00-3.20XM (S/H40-65XM)**



***HYSTER***

# SAFETY PRECAUTIONS

## MAINTENANCE AND REPAIR

- When lifting parts or assemblies, make sure that all slings, chains or cables are correctly fastened and that the load being lifted is balanced. Make sure that the crane, cables and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand. Use a lifting mechanism.
- Wear safety glasses.
- **DISCONNECT THE BATTERY CONNECTOR** before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See “How To Put The Lift Truck On Blocks” in the **OPERATING MANUAL** or the **PERIODIC MAINTENANCE** section.
- Keep the unit and working area clean and in order.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure that all nuts, bolts, snap rings and other fastening devices are removed before using force to remove parts.
- Always fasten a **DO NOT OPERATE** sign to the controls of the unit when making repairs or if the unit needs repairs.
- Make sure you follow the **DANGER, WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), and Diesel are flammable fuels. Make sure that you follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area has ventilation.

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<p style="text-align: center;">This section is for the following models:</p> <p style="text-align: center;">S/H1.50-1.75XM, S/H2.00XMS (S/H25-35XM, H40XMS)  S/H2.00-3.20XM (S/H40-65XM)</p>
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# INTRODUCTION

## GENERAL

This section has the description, operation and the repair procedures for the parts of the LPG fuel system used on the MAZDA M4-2.0G engine.

## DESCRIPTION AND OPERATION.

The LPG fuel system has a fuel tank and valve, hydro-

static relief valve, fuel filter and fuel valve unit, vaporizer, carburetor, solenoid valve, fuel pressure sensor and indicator lamp, and a governor. The LPG arrangement for the S/H1.50-1.75XM, S/H2.00XMS (S/H25-35XM, H40XMS) units is shown FIGURE 1. The LPG arrangement for the S/H2.00-3.20XM (S/H40-65XM) units is shown FIGURE 2.

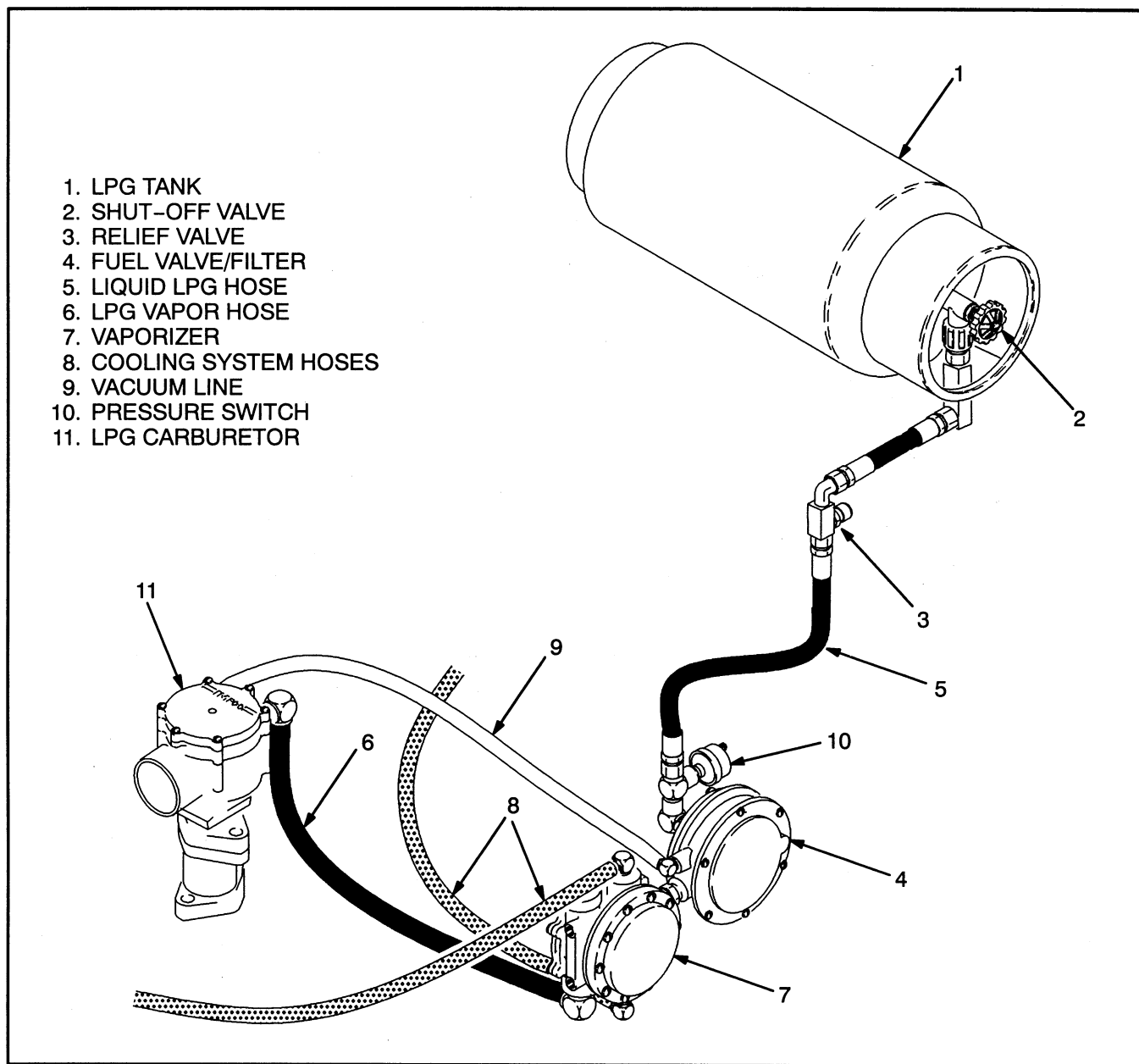


FIGURE 1. LPG SYSTEM, S/H1.50-1.75XM, S/H2.00XMS (S/H25-35XM, H40XMS)

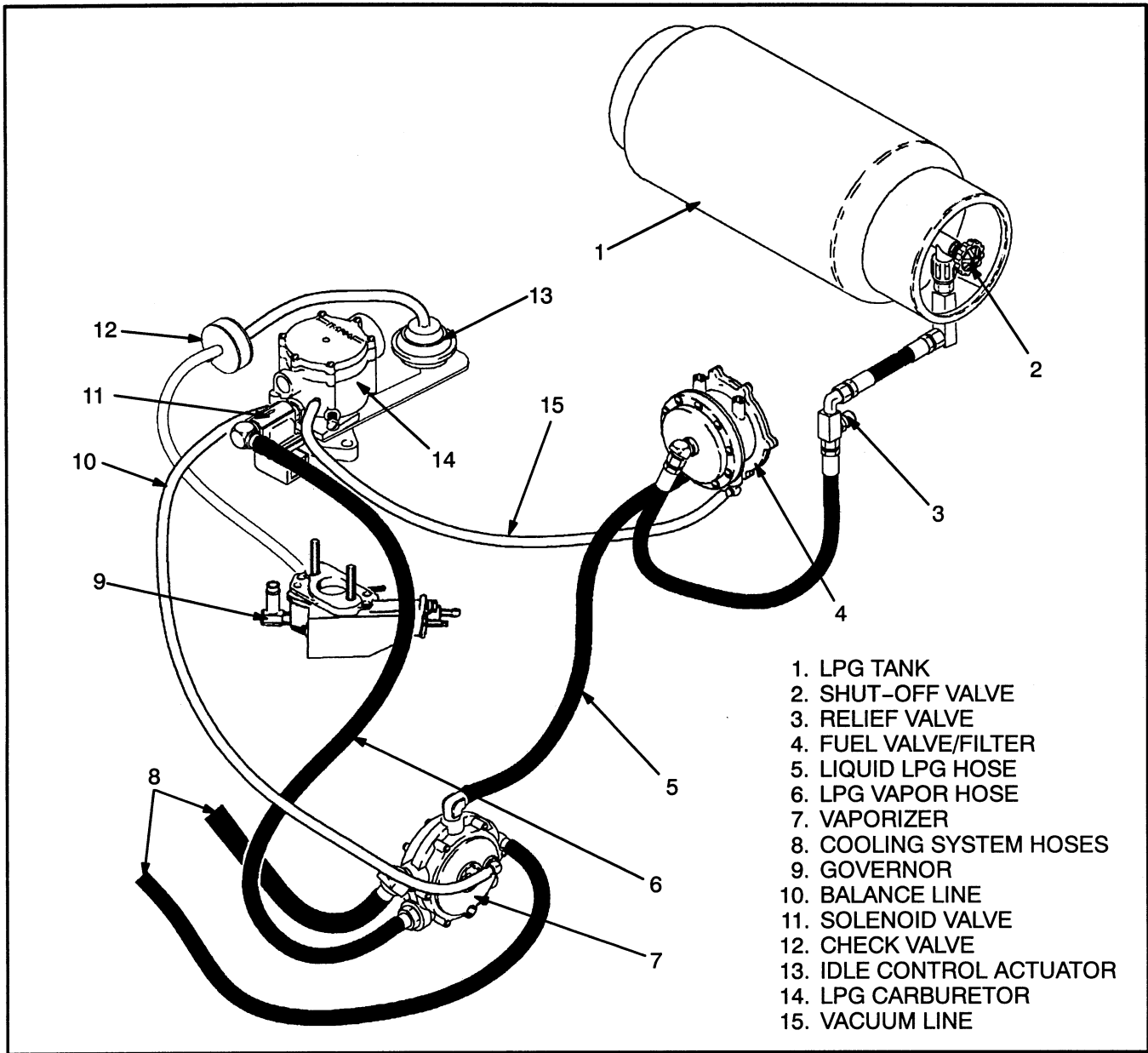


FIGURE 2. LPG SYSTEM, S/H2.00-3.20XM (S/H40-65XM)

### Fuel Tank (See FIGURE 3.)

The fuel tank is the reservoir for the LPG system. The fuel tank keeps the fuel in the liquid condition. The pressure of the fuel is 1.7 MPa (240 psi) when the tank is full at an temperature of 27°C (80°F). The tank has a pressure relief valve that is set at 3.4 MPa (480 psi). The inlet tube for the pressure relief valve is in the vapor area at the top of the tank.

The tank has a fuel gauge that measures the percentage of fuel that is in the tank. A liquid level valve near the pressure relief valve is used to indicate the maximum liquid level that is permitted. The tank is filled until liquid fuel and flows from the liquid level valve. One end

of the outlet tube inside the tank is near the lower surface of the tank. The other end of the tube is fastened to the outlet port. A shut-off valve is connected to the outlet port of the tank. The shut-off valve can prevent fuel from leaving the tank when the outlet line is disconnected. A quick disconnect fitting is installed for easy tank removal. The tank has a guard for the valves and fittings. The guard has a hole for the alignment dowel on the mount. The tank is fastened to the lift truck by metal straps with latches. A fuel pressure sensor in the line from the tank energizes an indicator light on the instrument panel when the tank is nearly empty and the fuel pressure decreases.

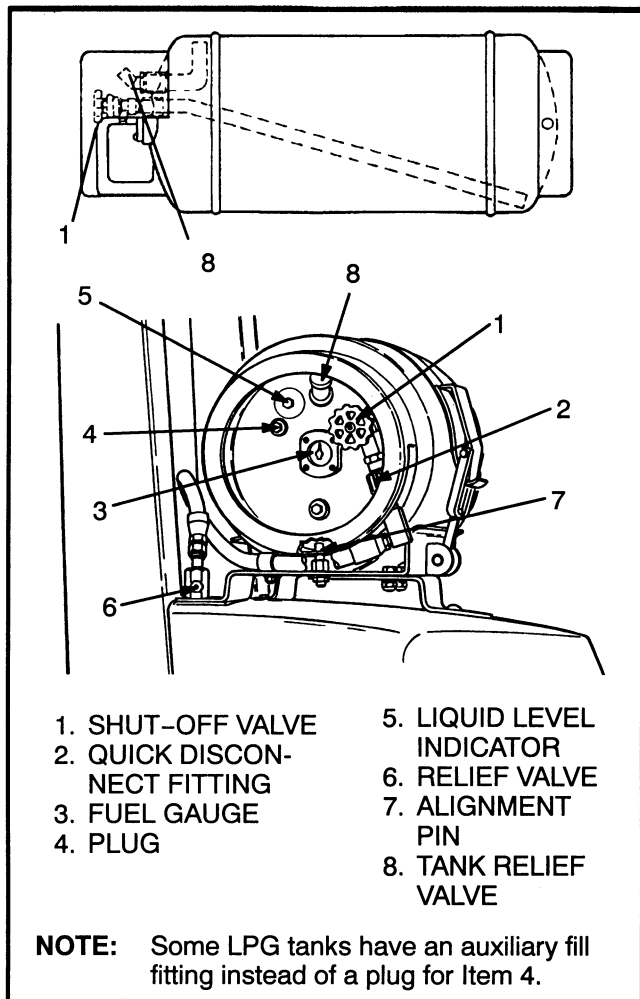


FIGURE 3. LPG TANK

### Fuel Filter and Fuel Valve Unit (See FIGURE 4.)

A fuel line connects the fuel tank to the fuel filter. The fuel filter prevents dirt from entering the vaporizer and has a fuel valve that is operated by engine vacuum. The fuel valve prevents fuel from entering the vaporizer unless the engine is being started or is running. The fuel valve has a leaf spring that holds a polyurethane pad against the seat. A diaphragm is used to open the fuel valve. Air pressure pushes on the vent side of the diaphragm. The other side of the diaphragm has inlet manifold vacuum and a lever and plunger that open the fuel valve. When the engine starts, the air pressure on the lever side of the diaphragm decreases. Then the air pressure on the vent side of the diaphragm moves the diaphragm, lever and pin to move the valve pad from the

seat. Liquid LPG then flows through the fuel valve to the vaporizer.

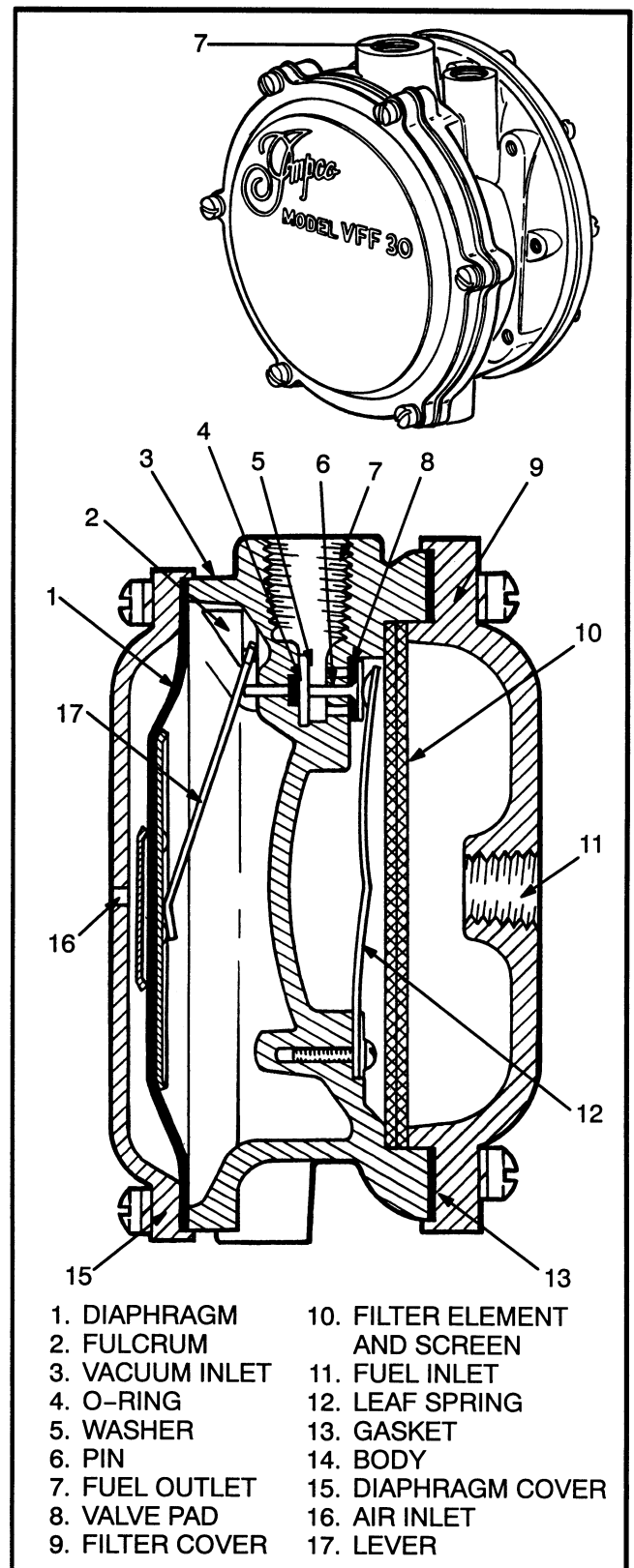


FIGURE 4. FUEL FILTER AND FUEL VALVE

## Vaporizer (See FIGURE 5. and FIGURE 6.)

The function of the vaporizer is to change the liquid fuel to a vapor (gas) and to control the pressure of the vapor. The LPG fuel changes from a liquid to a vapor inside the expansion chamber. A liquid needs heat to change to a gas. Heat is removed from the vaporizer when the pressure of the liquid LPG is quickly decreased in the expansion chamber. The vaporizer must be heated by the engine coolant to replace the heat that is lost to the fuel. Coolant passages in the vaporizer prevent the vaporizer from being too cold to operate.

The vaporizer also controls the pressure of the gas that goes to the carburetor. The pressure reducer valve keeps the pressure of the gas in the expansion chamber at 38 mm (1.5 in) of water. When gas is required at the carburetor, there is a vacuum in the vapor chamber. The vacuum opens the vapor valve and permits the gas to flow to the carburetor.

Liquid fuel enters the vaporizer inlet from the filter unit. The pressure reducer valve has a polyurethane pad and a seat. When the pad is against the seat, the liquid fuel cannot enter the expansion chamber.

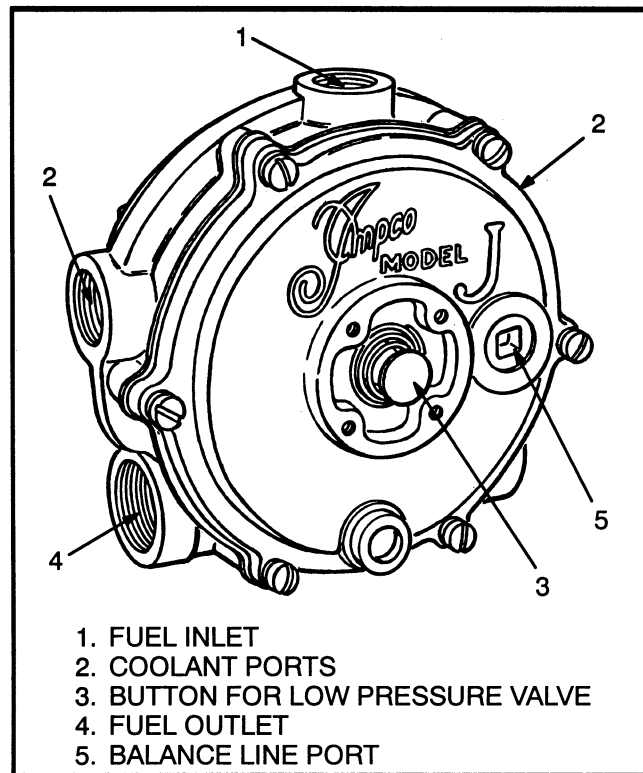


FIGURE 5. VAPORIZER

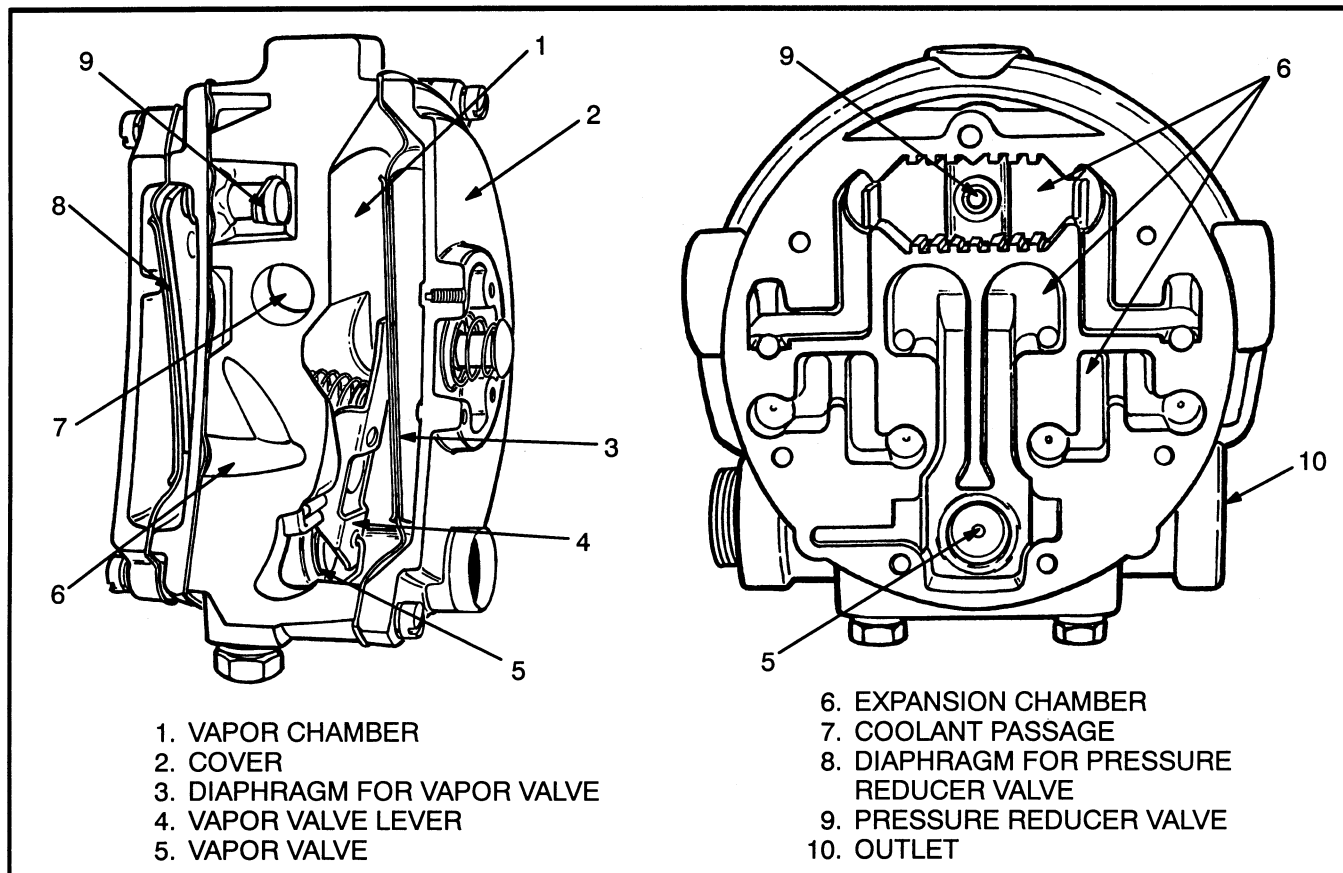


FIGURE 6. INSIDE THE VAPORIZER



When the liquid fuel enters through the pressure reducer valve, the pressure of the fuel pushes on the diaphragm. The diaphragm immediately moves and closes the valve. Because only a very low pressure is needed to close the valve, the fuel pressure in the expansion chamber is very low. The sudden decrease in pressure causes the fuel to change from a liquid to a vapor. This change of condition takes heat from the surfaces of the expansion chamber. Warm coolant flows next to the surfaces of the chamber to replace the heat.

The LPG vapor is kept in the expansion chamber by the vapor valve. When the engine starts, the gas in the vapor chamber leaves the vapor chamber to flow through the carburetor. The pressure on the vapor diaphragm then decreases. Air pressure on the other side of the vapor diaphragm pushes on the diaphragm and opens the vapor valve. The gas flows from the expansion chamber to the vapor chamber and then to the solenoid valve and carburetor. The pressure in the expansion chamber decreases and again the pressure reducer valve opens to repeat the operation. When the carburetor throttle is closed, the vacuum in the vapor chamber decreases and the vapor valve closes. The pressure in the vapor chamber stays at 10.3 kPa (1.5 psi).

A balance line connects the air pressure side of the vapor diaphragm to an air inlet port at the carburetor. If the air filter has a restriction, the pressure decreases in the carburetor and in the vapor chamber of the vaporizer. When a balance line is not installed, this decrease can cause the diaphragm to move and open the vapor valve. When a balance tube is connected, the restriction causes an equal decrease on both sides of the diaphragm. The balance line prevents an increase in the fuel mixture in the carburetor. A button in the housing can be used to manually open the vapor valve. LPG vapor then flows to the carburetor for starting the engine.

### Carburetor

(See FIGURE 7. through FIGURE 10.)

The carburetor has only two moving parts. There is a throttle plate and a diaphragm with the air measuring and fuel metering valves. A fuel tube in the center of the air passage is the seat for the fuel metering valve. The seat for the air measuring valve is a tube that is around the fuel tube. Four small passages in the valve permit air

to flow from the vacuum chamber above the diaphragm to the inside of the air tube. There is clearance between the air measuring plate and the fuel metering valve. The clearance permits air to flow through holes in the diaphragm if there is an explosion in the inlet manifold.

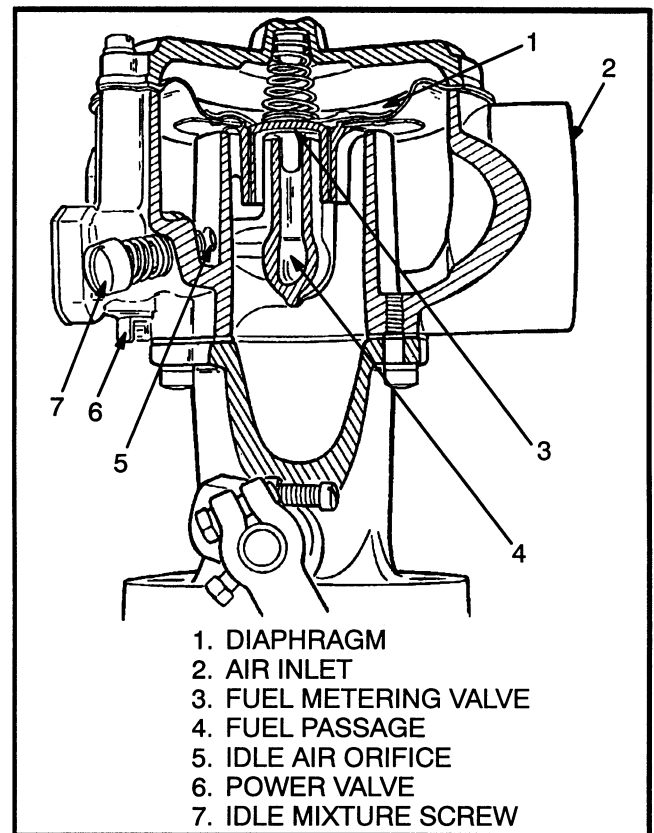


FIGURE 7. INSIDE THE CARBURETOR

When the engine starts, the air in the air tube and in the vacuum chamber flows to the engine. Air pressure on the outside of the air tube pushes the diaphragm against the metering spring and moves the valves from their seats. Air then flows from the outside of the air tube to the inside of the tube. At the same time, the fuel valve is lifted from its seat. The fuel pressure moves the LPG vapor from the fuel tube to mix with the air flowing through the air tube. Because the air measuring valve causes a restriction, the pressure in the inside of the tube is always less than the outside of the tube. The difference in pressure changes when the amount of air flowing through the air tube changes. The diaphragm and valve move according to the air flow. The amount of fuel that can flow through the fuel valve is controlled by the amount of air flowing into the air tube.

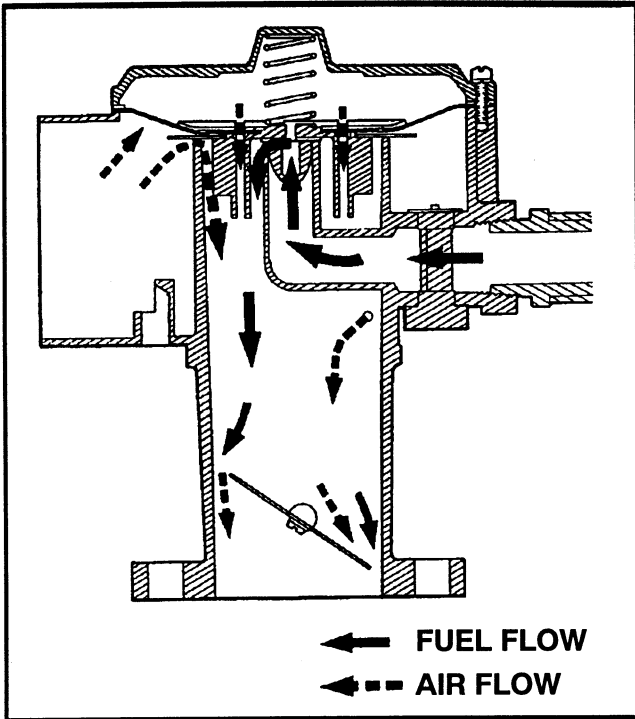


FIGURE 8. AIR AND FUEL FLOW AT IDLE

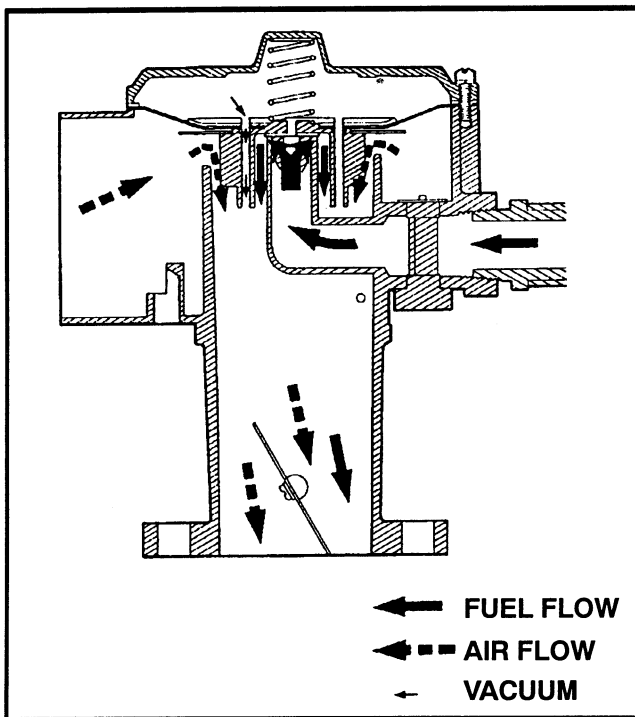


FIGURE 9. AIR FUEL FLOW AT HIGH SPEED

When the throttle plate is near the closed position, the pressure difference decreases. The metering spring pushes the valves toward their seats. Flow through the fuel valve decreases. An air screw for idle permits adjustment of the mixture of the air fuel at low engine speed.

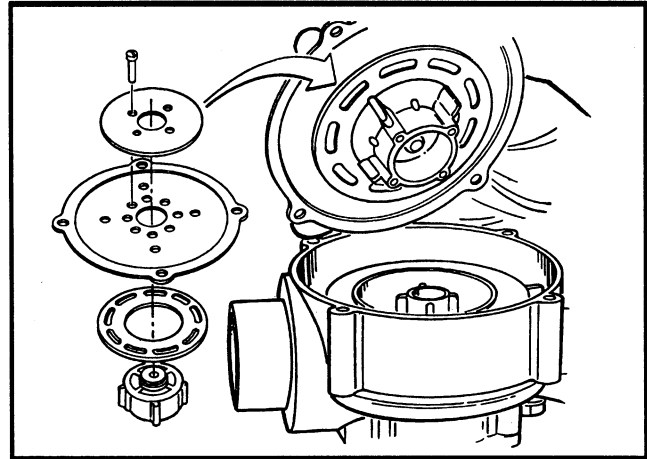


FIGURE 10. DIAPHRAGM AND FUEL VALVE ASSEMBLY

When the throttle plate is fully open at high engine speeds, the fuel metering valve is at the top of its travel. See FIGURE 9. The carburetor has an adjustable valve that controls the amount of LPG vapor that goes to the fuel metering valve. The restriction in fuel flow by this valve is small when the fuel flow is low. When more fuel flows through the valve, the valve becomes an orifice. Adjusting the valve opening changes the mixture of fuel and air when the engine is operated at high speed with a load.

#### Solenoid Valve (See FIGURE 2.)

The solenoid valve is installed at the fuel inlet of the carburetor. The valve opens to let fuel to the carburetor when the key switch is ON. When the key switch is OFF, the valve closes and fuel cannot flow to the carburetor.

#### Idle Control Actuator (See FIGURE 2.)

**NOTE:** Only the H2.00-3.20XM (H40-65XM) units use the idle control actuator.

The idle control actuator is a vacuum controlled device that increases idle speed when there is a load on the engine. The idle control actuator is mounted on the carburetor and acts directly on the throttle linkage. The vacuum line is connected to the governor and senses manifold vacuum. A check valve in the vacuum line keeps the vacuum at the actuator.

During normal operation, vacuum holds the actuator rod away from the throttle linkage. When the engine is at idle speed and the throttle is depressed, manifold vacuum decreases. The decrease in vacuum lets the actuator rod extend and increase the idle speed.

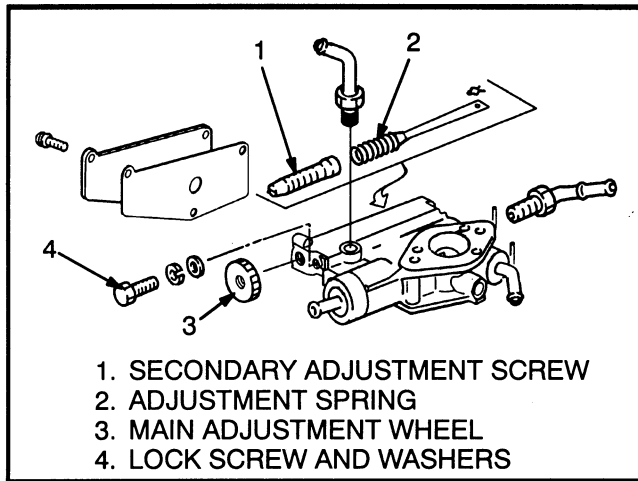


FIGURE 11. GOVERNOR

## Governor (See FIGURE 11.)

The governor is installed between the carburetor and the intake manifold. The governor helps control the maximum speed of the engine.

## REPAIRS

### REPLACEMENT OF THE HOSES

The hoses installed on LPG systems are special. Hoses that are made for use with hydraulic oil are damaged by LPG. When replacing the LPG hoses, make sure to use only Hyster Approved LPG hose. Make sure to use the correct size of hose. When replacing the hose to the quick disconnect fitting, make sure that it is the same length as the hose it replaces. A hose that is the wrong length permits the tank to be installed in a position that is not correct.

### LPG TANK

Removal (See FIGURE 12.)

#### **⚠ WARNING**

Before disconnecting any part of the LPG fuel system, close the shut-off valve on the fuel tank. Run the engine until the fuel lines are empty and the engine stops. If the engine will not run, close the shut-off valve on the fuel tank and release the fuel slowly in a non-hazardous area.

LPG can cause an explosion even when the tanks are empty. When replacing the tanks, do not weld, cause sparks or permit flammable material on or near the tanks. Do not change tanks when the engine is running. Tanks must be filled by authorized personnel. Follow all the safety rules. Do not remove any parts from the tank. Use a cloth to protect your hands from cold metal.

Frost on the surface of the tank, the valves or fittings and the odor of LPG fuel indicates a leak. Inspect the LPG system and repair a leak immediately. An LPG

fuel leak creates an explosion and fire hazard. Do not attempt to start the engine if there is a leak in the LPG fuel system.

LPG tanks are heavy. The weight of an LPG tank can exceed the maximum recommended weight for safe lifting by an individual. Get assistance when lifting or lowering an LPG tank. Use correct lifting procedures.

Do not store LPG tanks near heat or an open flame. For complete instructions on the storage of LPG fuels, refer to ANSI/NFPA 58 & 505.

#### **⚠ WARNING**

Do not use any LPG tank that is damaged. Damaged tanks must be removed from service.

1. Move the lift truck to the area where tanks are changed.
2. Turn the shut-off valve clockwise until the valve is completely closed.
3. Run the engine until it stops, then turn the key to the OFF position.
4. Disconnect the quick disconnect fitting.

#### **⚠ WARNING**

LPG is very cold. Always wear gloves to protect your hands from the cold fittings. Do not permit LPG to contact the skin.

5. Release the tank latch and remove the tank from the bracket.

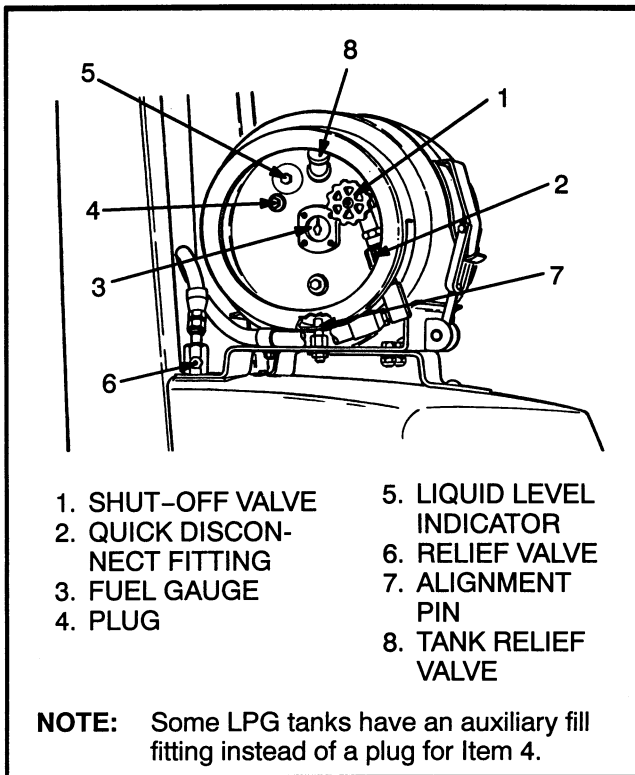


FIGURE 12. LPG TANK

**Installation (See FIGURE 12.)**

1. Before the tank is installed on the lift truck, check the operation of the fuel gauge. Look at the fuel gauge and move the tank. The needle of the gauge must move when the fuel moves. If the needle does not move, a new tank must be installed.

**WARNING**

Make sure the alignment pin extends through the correct hole in the rim of the LPG tank. The hose or fittings can be damaged if the LPG tank is not installed in the correct position. A damaged hose or fitting can release LPG fuel and cause an explosion and fire hazard.

2. Install the LPG tank in its bracket so that the alignment pin is in the correct hole in the bracket. Close the latches.

3. Connect the quick disconnect fitting to the shut-off valve on the tank. Use your hand to tighten the fitting.

4. Turn the shut-off valve counter clockwise to open the valve.

5. Inspect the fuel system for leaks when the shut-off valve is open. Frost on the surface of the tank, valves or fittings or a strong odor of LPG fuel indicates a leak.

**WARNING**

The shut-off valve on the tank must be closed when the truck is not being used.

**HYDROSTATIC RELIEF VALVE**

**Removal and Installation**

**WARNING**

LPG can cause an explosion. Do not cause sparks or permit flammable material near the LPG system. Close the fuel valve on the tank. Disconnect the negative battery cable to prevent sparks.

1. Close the shut-off valve on the tank.

2. Slowly loosen the hose fitting for the relief valve. Let the fuel drain from the fitting before removing the relief valve.

**WARNING**

LPG is flammable. Make sure there are no sparks or flames in the area when the fuel lines are drained.

3. The valve cannot be repaired. If the valve is damaged, install a new valve. After installation, open the shut-off valve slowly and inspect the system for leaks.

**FILTER UNIT**

**NOTE:** Use a liquid thread sealant on all fittings with threads at the filter unit.

**Replacement Of The Fuel Filter Element (See FIGURE 13.)**

1. Close the shut-off valve on the tank. Slowly loosen the hose fitting to the filter. Let the fuel drain from the fitting before disassembling the filter unit.

**WARNING**

LPG is flammable. Make sure there are no sparks or flames in the area when the fuel lines are drained.

2. Remove the ten screws and the filter cover. Replace the filter element.

3. Install the cover and gasket. Tighten the screws for the cover. Tighten the hose fitting.

2. Remove the ten screws from the filter cover. Remove the filter and screen. Remove the six screws from the diaphragm cover. Remove the covers and gaskets.

**Replacement of the Diaphragm and Fuel Valve (See FIGURE 13.)**

1. Close the shut-off valve on the tank. Slowly disconnect the fittings for the inlet and outlet hoses and let the

LPG drain from the lines. Remove the vacuum hose and the mount capscrews.

3. Remove the diaphragm. Remove the filter and screen. Remove the screw for the leaf spring. Remove the valve pad. Pull the pin from its bore.

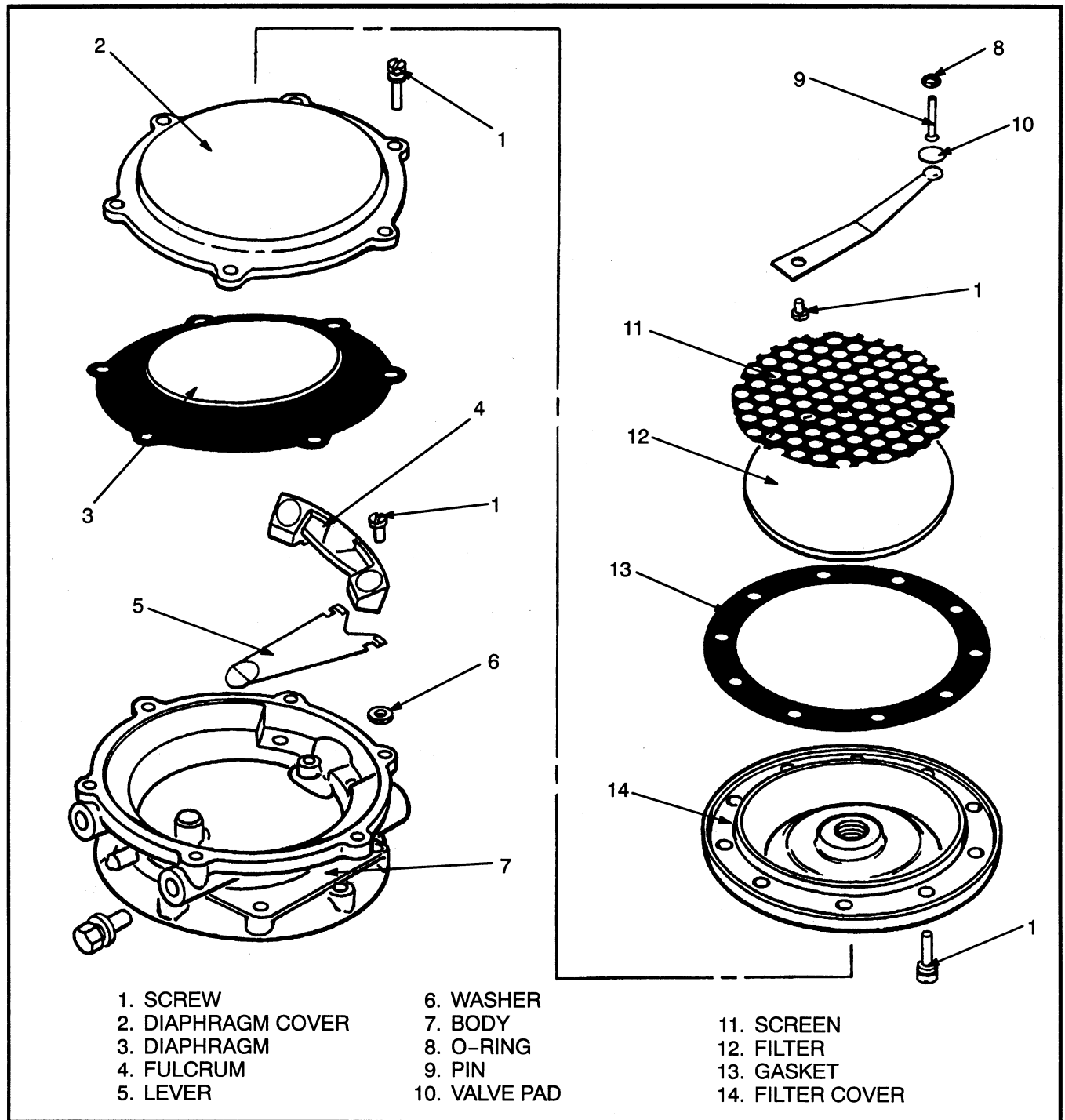


FIGURE 13. FUEL VALVE AND FUEL FILTER

4. Remove the fitting from the fuel outlet port. Remove the washer and O-ring through the outlet port.
5. Install a new O-ring in its bore. Align the washer with the O-ring and install the pin through the washer and O-ring.
6. Install the valve pad with the side with the polyurethane pad toward the bore. Install the leaf spring, lock washer and screw.
7. Install the screen and filter element. Put the gasket on the body and install the filter cover and the ten screws and lock washers.
8. Replace the diaphragm. Install the diaphragm so that the large plate is toward the valve. Install the cover and tighten the six screws and lock washers.
9. Install the capscrews for the mount. Connect the vacuum line. Connect the lines for the tank and the vaporizer.
10. Open the shut-off valve on the tank and check for leaks in the line to the filter unit. Start the engine and inspect for leaks on the outlet side of the filter unit.

## VAPORIZER (See FIGURE 14.)

### Removal

#### **WARNING**

**LPG can cause an explosion. Do not permit any sparks or flames in the work area.**

1. Close the shut-off valve on the tank. Run the engine until it stops. Slowly disconnect the fitting from the filter unit on the vaporizer. Disconnect the hose to the carburetor.
2. Put a drain pan under the drain valve for the radiator. Open the drain valve so that the coolant drains in the pan.

3. Disconnect the coolant fittings to the vaporizer. Remove the balance line from the vaporizer. Remove the capscrews at the mount for the vaporizer.

### Disassembly

1. Remove the seven screws that hold the high pressure cover and plate to the vaporizer body. Remove the cover and pressure reducer diaphragm. Remove the pin and spring from the plate.
2. Remove the plate and gasket. Remove the pressure reducer valve.
3. Remove the six screws that hold the cover for the vapor chamber to the vaporizer. Remove the cover. Move the diaphragm toward the inlet port to release it from the lever.
4. Remove the screw that holds the lever pin. Cut the wire that holds the vapor valve pad to the lever. Remove the pad.

### Cleaning

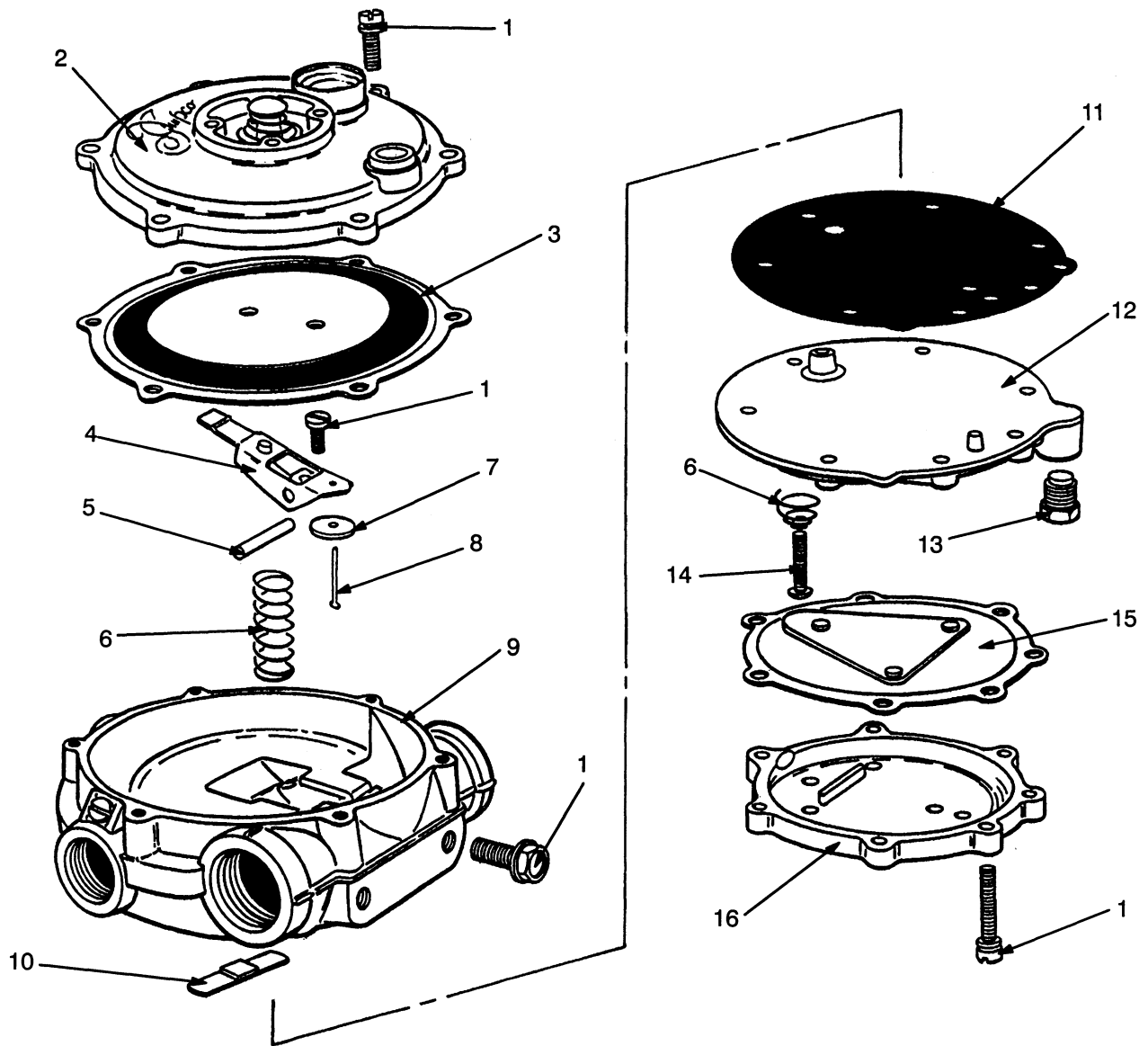
#### **WARNING**

**Cleaning solvents can be flammable and toxic, and can cause skin irritation. When using cleaning solvents, always follow the recommendations of the manufacturer.**

Wash all parts of the assembly, except the diaphragms in solvent. Use compressed air to dry the parts. Do not use compressed air on the diaphragms.

### Inspection

Make sure the vaporizer housing does not have cracks or damage. Inspect the threads for damage. The diaphragms, valve pads, and gaskets are included in the repair kit.



- 1. SCREW
- 2. COVER FOR VAPOR VALVE DIAPHRAGM
- 3. VAPOR VALVE DIAPHRAGM
- 4. VAPOR VALVE LEVER
- 5. PIVOT PIN

- 6. SPRING
- 7. VAPOR VALVE PAD
- 8. PIN
- 9. HOUSING
- 10. PAD FOR PRESSURE REDUCER VALVE

- 11. GASKET
- 12. PLATE
- 13. PLUG
- 14. ACTUATING PIN
- 15. DIAPHRAGM FOR PRESSURE REDUCER VALVE
- 16. COVER

FIGURE 14. PARTS OF THE VAPORIZER

## Assembly (See FIGURE 15.)

Follow the procedures shown in FIGURE 15. Always use a HYSTER Approved repair kit when assembling the vaporizer.

## Installation

**NOTE:** Use a liquid thread sealant on all fittings with threads at the vaporizer.

Install the mount capscrews. Connect all the lines to the fittings. Fill the radiator with coolant. Check for leaks.

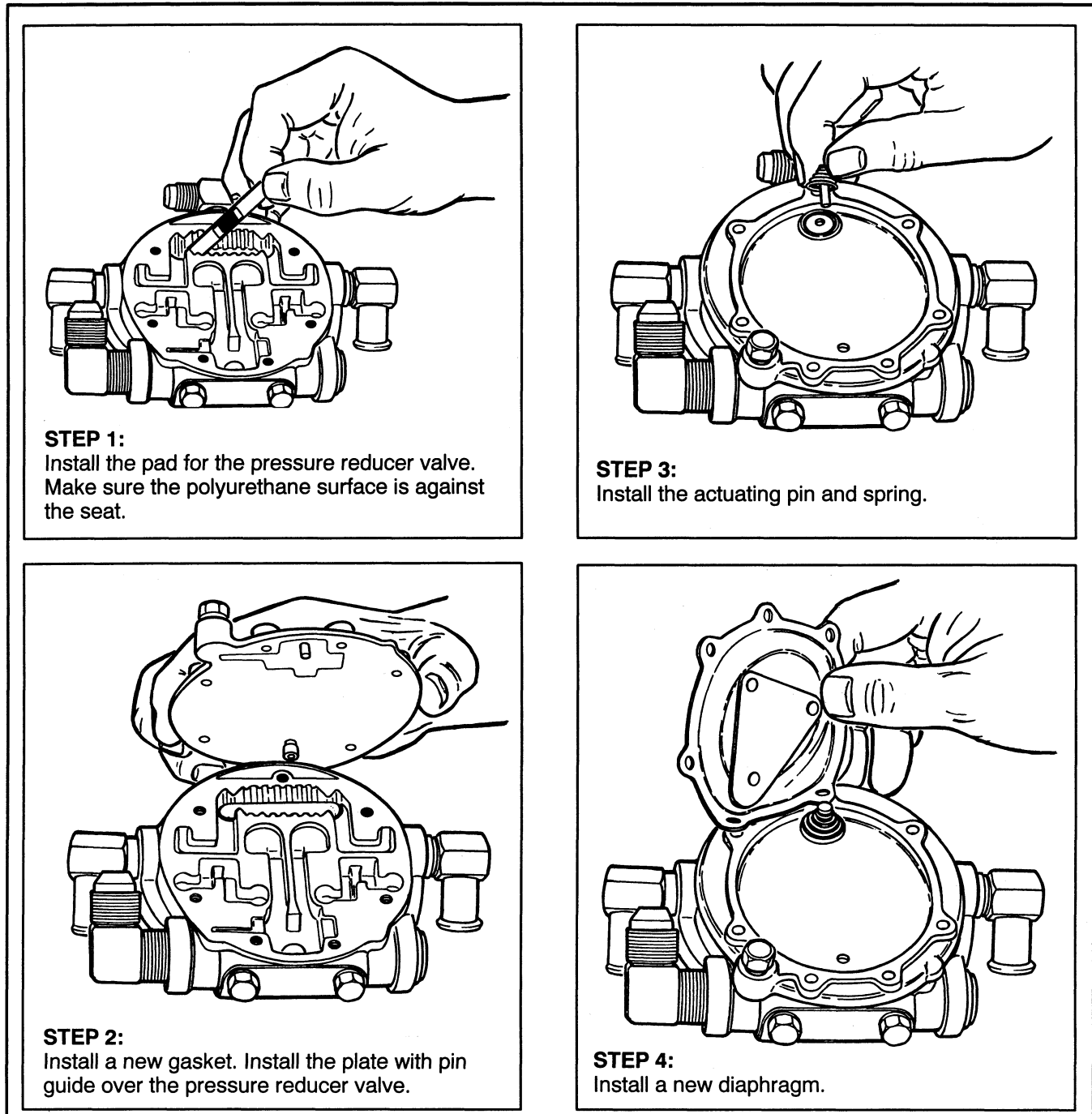
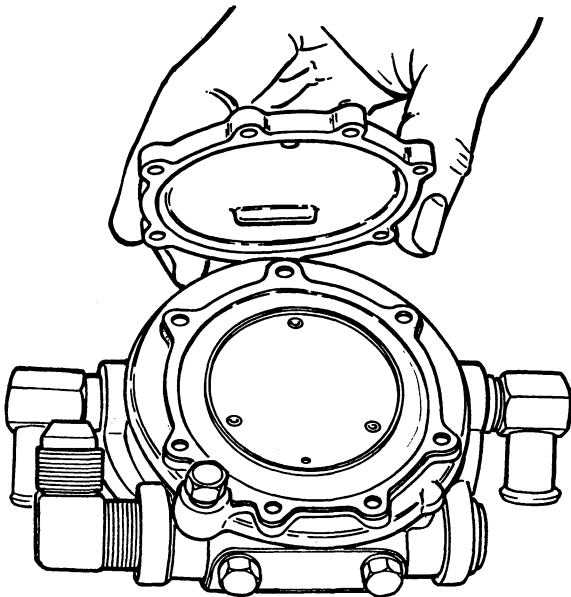
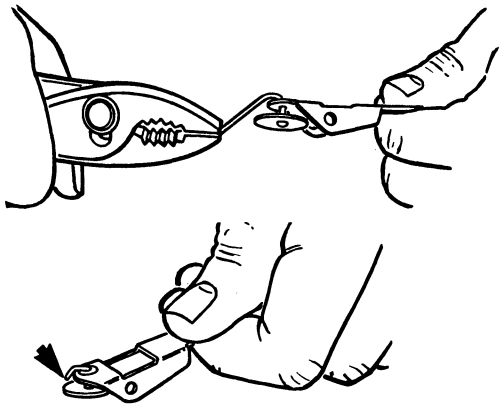


FIGURE 15. ASSEMBLY OF THE VAPORIZER (1 OF 3)

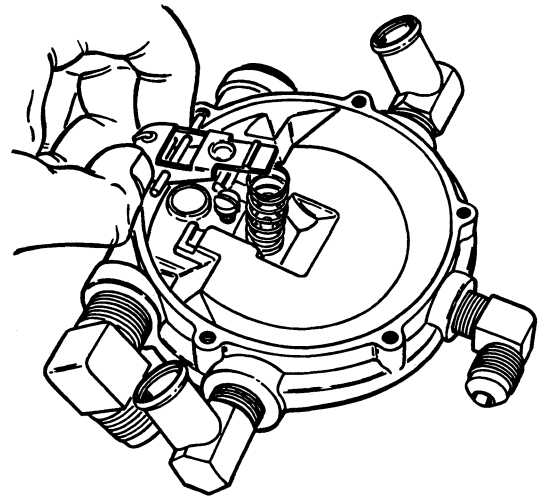




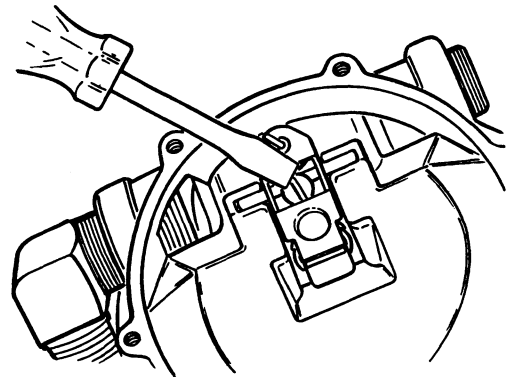
**STEP 5:** Install the cover. Tighten the screws.



**STEP 6:**  
Remove the vapor valve pad from the valve lever. Install a new valve pad in the lever. Leave the pad loose enough against the lever so that the pad can tilt for alignment against the seat. Bend and cut the pin shown.



**STEP 7:**  
Put the valve spring in position on the housing. Put the lever assembly over the spring. Install the screw so that the head of the screw is holding the pivot pin.



**STEP 8:**  
Tighten the screw. Make sure the lever moves freely.

FIGURE 15. ASSEMBLY OF THE VAPORIZER (2 OF 3)

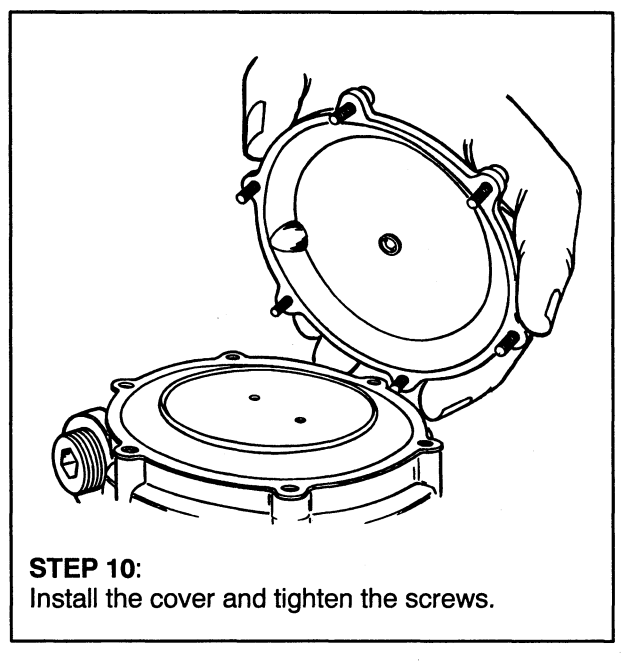
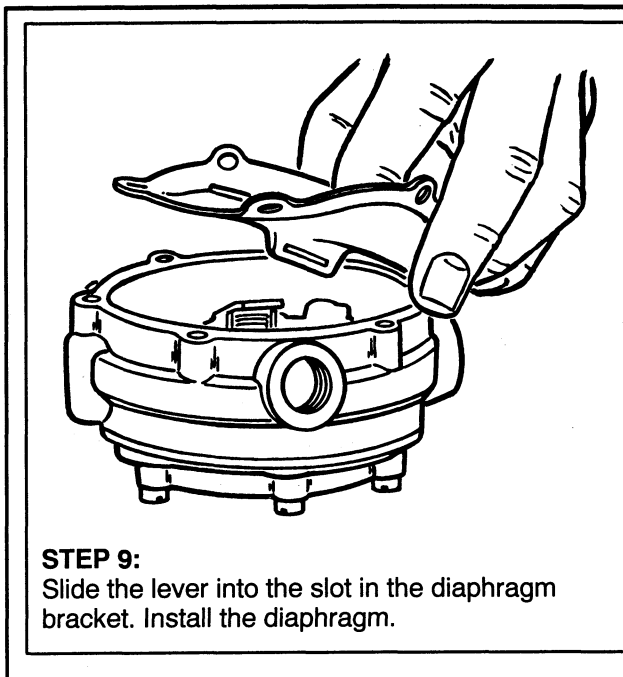


FIGURE 15. ASSEMBLY OF THE VAPORIZER (3 OF 3)

## CARBURETOR

### Removal

1. Remove the hose from the air cleaner at the carburetor inlet. Disconnect the wires to the solenoid valve. Remove the fuel inlet hose at the solenoid valve. Remove the hose to the idle control actuator. Remove the fuel filter hose and vaporizer hose.

2. Disconnect the throttle cable at the carburetor. Remove the carburetor from the governor.

### Disassembly

(See FIGURE 16. and FIGURE 17.)

**NOTE:** Disassemble the throttle body and throttle shaft assembly only if the gaskets or seals must be replaced.

1. Remove the four screws from the diaphragm cover. Remove the cover and metering spring.

2. Remove the metering valve assembly from the carburetor body. Remove the four screws from the diaphragm back-up plate and disassemble the valve. The valve assembly includes a fuel metering valve, air measuring plate, diaphragm and back-up plate.

3. Remove the solenoid valve and the idle control actuator. Remove the idle mixture screw and spring.

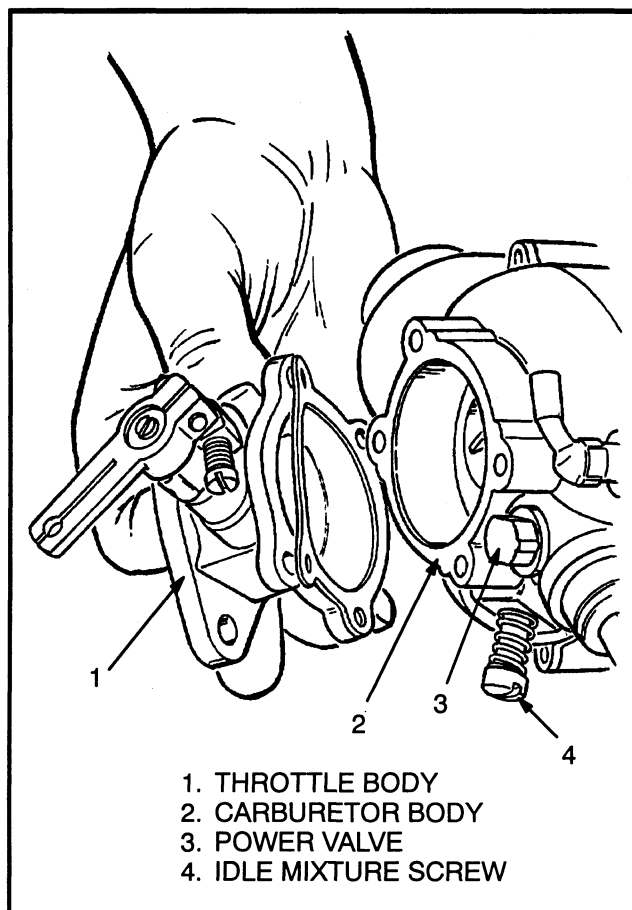


FIGURE 16. THROTTLE BODY REMOVAL

4. Disconnect the throttle springs from the attachment plate. Remove the four screws that connect the throttle

body to the carburetor body. Remove the throttle body and attachment plate.

5. Remove the two screws that connect the throttle plate to the throttle shaft and remove the throttle plate. Remove the retainer, spring guides and springs from the throttle shaft. Remove the throttle shaft from the throttle body.

6. Remove the seal retainers and seals from the throttle body. If necessary remove the bearings from the throttle body.

## Cleaning

### **⚠ WARNING**

Cleaning solvents can be flammable and toxic, and can cause skin irritation. When using cleaning solvents, always follow the recommendations of the manufacturer.

Make sure all the carburetor parts are clean before assembly. Wash all the parts, except the diaphragm, in solvent. Make sure the air passages in the metering valve are clean.

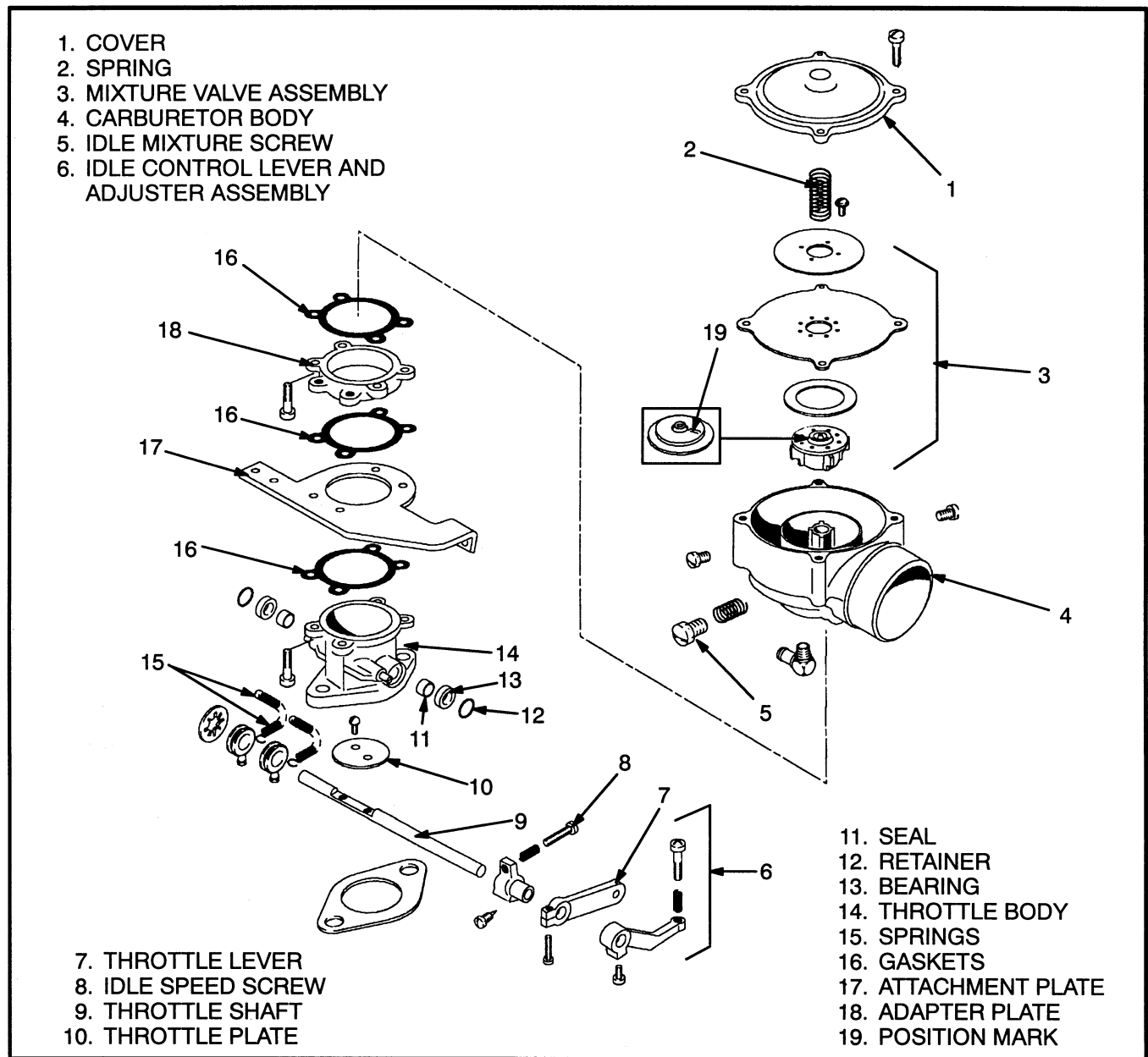


FIGURE 17. PARTS OF THE CARBURETOR, S/H2.00-3.20XM (S/H40-65XM)

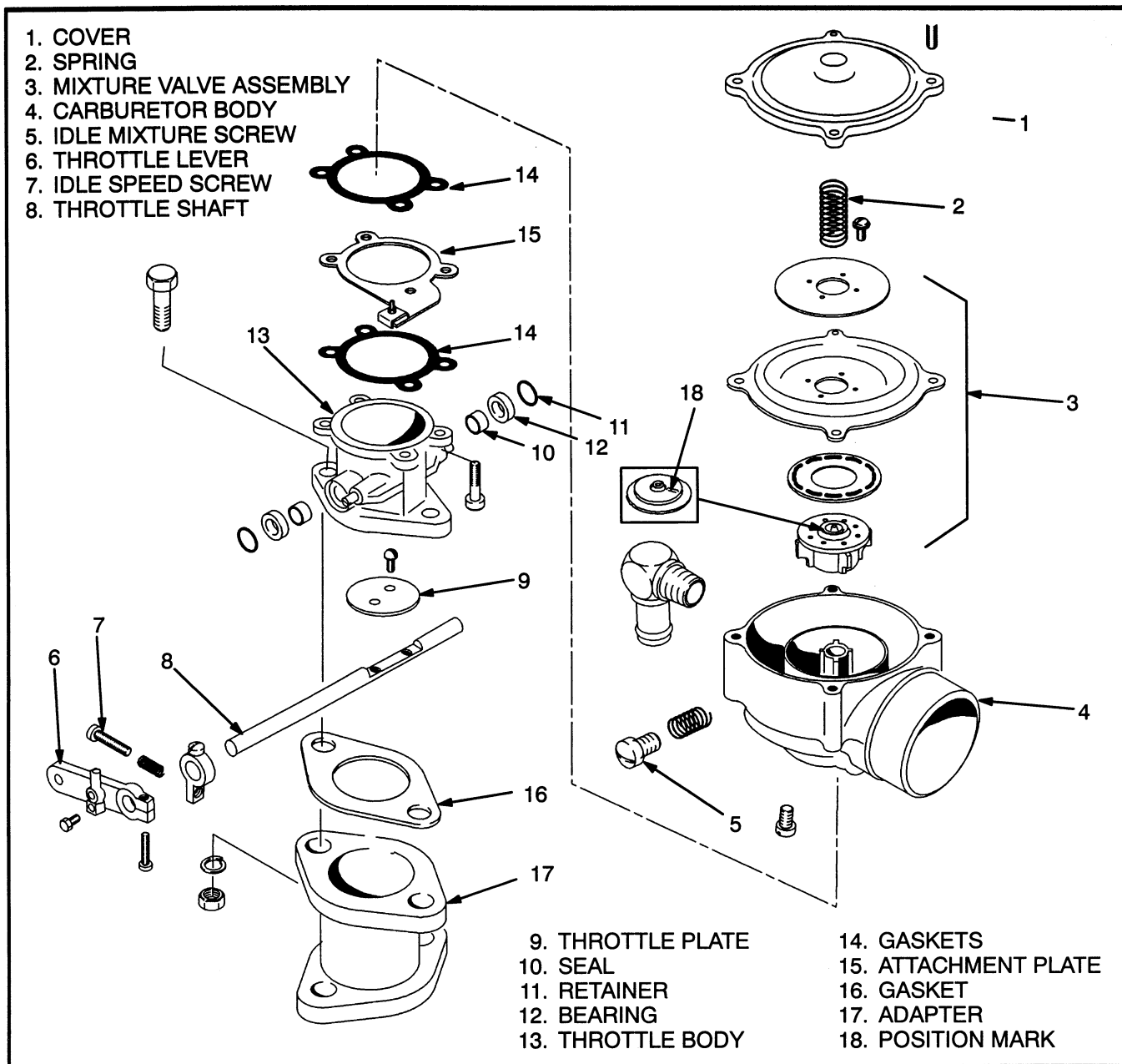


FIGURE 18. PARTS OF THE CARBURETOR, S/H1.50-1.75XM, S/H2.00XMS (S/H25-35XM, H40XMS)

**Assembly (See FIGURE 16. and FIGURE 17.)**

1. Install new bearings as needed in the throttle body. Install new seals in the throttle body. Install the seal retainers and the throttle shaft. Install the throttle plate to the throttle shaft using lock washers with the screws. Install the spring guides, springs and retainer on the throttle shaft.

2. Install the throttle body and attachment plate with new gaskets to the carburetor body. Connect the springs to the attachment plate. Install the idle mixture spring and screw. Install the idle control actuator and solenoid valve.

3. Assemble the the metering valve, air measuring plate, diaphragm and back-up plate. Align the position mark on the metering valve of the mixture valve assembly with the fuel inlet, and install the mixture valve assembly in the carburetor. Install the metering spring and cover. Make sure the spring is in the correct position before installing the cover.

**Installation (See FIGURE 2.)**

**NOTE:** Use a liquid thread sealant on all fittings with threads at the carburetor.

1. Install a new gasket on the governor. Install the carburetor on the governor. Install the idle control actuator on the bracket.
2. Install the balance line and the fuel hose. Install the vacuum hose and check valve for the idle control actuator. The GRAY side of the check valve must be toward the idle control actuator.
3. Connect the throttle linkage. Connect the wires at the solenoid valve.
4. Connect the hose to the air cleaner.
5. Check and adjust the carburetor, throttle linkage and idle control actuator as described in CHECKS AND ADJUSTMENTS.

### SOLENOID VALVE (See FIGURE 2.)

The solenoid valve cannot be repaired. If the solenoid valve does not operate it must be replaced.

1. Disconnect the hose from the air cleaner to the carburetor inlet. Remove the fuel inlet hose. Disconnect the wires at the solenoid valve. Remove the solenoid valve.
2. Use a liquid thread sealant and install the solenoid valve on the carburetor. Connect the wires and fuel hose. Connect the hose to the air cleaner. Turn the key switch ON and OFF to check the operation of the solenoid valve. Start the engine and check for leaks.

### GOVERNOR

Remove and install the governor as described in the procedures for the CARBURETOR. When the governor is removed or replaced, adjust the governor and throttle linkage as described in CHECKS AND ADJUSTMENTS.

**NOTE:** The vacuum hoses installed on the carburetor and governor are made of special high-temperature material. If any of the hoses are replaced, make sure the correct hoses are installed.

## CHECKS AND ADJUSTMENTS

### WARNING

LPG can cause an explosion. Do not permit any sparks or open flames in work area.

### CHECK THE FILTER UNIT

1. Make sure there is fuel in the tank and that the tank valve is open.
2. Check the operation of the fuel valve/filter. Loosen the fitting for the liquid LPG hose where it enters the vaporizer. Check for a leak. A leak will be indicated by frost on the fitting. If there is frost at the fitting, repair or replace the fuel valve/filter.
3. If there is no frost at the fitting, disconnect the vacuum line at the fuel valve/filter. Connect a hand operated vacuum pump to the fitting on the fuel valve/filter. Apply just enough vacuum to permit fuel to escape from the fitting loosened in step 1.
4. If frost does not appear at the fitting loosened in step 1 when a vacuum is applied to the fitting for the vacuum line, repair or replace the fuel valve/filter.
5. If frost appears at the fitting loosened in step 1 when a vacuum is applied to the fitting for the vacuum line, check the vacuum hose for restrictions.

### CHECK THE VAPORIZER

#### Pressure Reducer Valve

1. Connect a pressure gauge that can measure with accuracy a pressure below 35 kPa (5 psi) to the test port of the vaporizer. The gauge must indicate 10.5 kPa (1.5 psi) when the engine is at idle. If the gauge indicates a pressure greater than 10.5 kPa (1.5 psi), the pressure reducer valve is damaged.

#### Vapor Valve

1. Run the engine until it is warm.
2. To check for leaks, stop the engine and disconnect the hose from the fuel inlet port at the carburetor. Put the end of the hose just below the surface of water in a container. If bubbles are seen, the vapor valve is damaged or is dirty.
3. To check the vapor diaphragm, remove the inlet hose to the vaporizer. Remove the inlet hose at the carburetor. Put the end of the hose below the surface of the water in a container. Remove the balance line from the carburetor and apply air pressure to the line. If bubbles continue to be seen in the water, the diaphragm is damaged.

## ADJUST THE CARBURETOR

### Idle Mixture (See FIGURE 19.)

1. When the engine is not running, turn the idle mixture screw clockwise until it stops. In this position, the idle mixture screw prevents air from entering the air tube through the idle air port.
2. Turn the idle mixture screw four turns counterclockwise.
3. Start the engine and run until warm. Adjust the mixture screw clockwise (up to 2 full turns) as needed until the idle is smooth. Turning the screw clockwise increases the ratio of fuel to air.

### Idle Adjustments (See FIGURE 19.)

**NOTE:** Only the H2.00–3.20XM (H40–65XM) units use the idle control actuator.

1. The engine must be at the normal operating temperature. Connect a tachometer to the engine.
2. Turn the idle speed screw until the idle speed of the engine is  $725 \pm 25$  rpm.
3. Turn the idle mixture screw (2)  $4 \frac{1}{2} \pm \frac{1}{2}$  turns from the full IN position. Check and adjust the idle speed as necessary.
4. Check the idle control adjustment as follows:
  - a. Adjust the idle speed and mixture as described above.
  - b. Put the transmission in NEUTRAL and disconnect the vacuum hose from the idle control actuator (4). Put a plug in the vacuum hose. Adjust the engine idle speed to  $1400 \pm 50$  rpm with the idle control screw (3).
  - c. Install the vacuum hose and clamp to the idle control actuator (4).
  - d. Check the idle speed. If the idle speed is higher than specifications, make the adjustment at the idle control screw (3).

5. Check that the engine runs at its governed speed when the accelerator pedal or the MONOTROL pedal reaches the floor plate. If necessary, adjust the throttle cable at the bracket on the engine. Loosen the lock nuts and move the cable as necessary. Check that the maximum engine speed is 2600 to 2700 rpm.

## CAUTION

The adjustment of the throttle cable must be correct or the cable can break during operation. The accelerator pedal or the MONOTROL pedal must reach the pedal stop (floor plate) by the time the throttle plate in the carburetor is fully open.

### Power Mixture Adjustment (See FIGURE 19.)

The power mixture valve controls the flow of fuel to the carburetor when the engine is running near full load. Set the power mixture valve on the center notch. This setting will be correct for most conditions. If further adjustment is needed, the engine speed must not be permitted to increase to the governor limit.

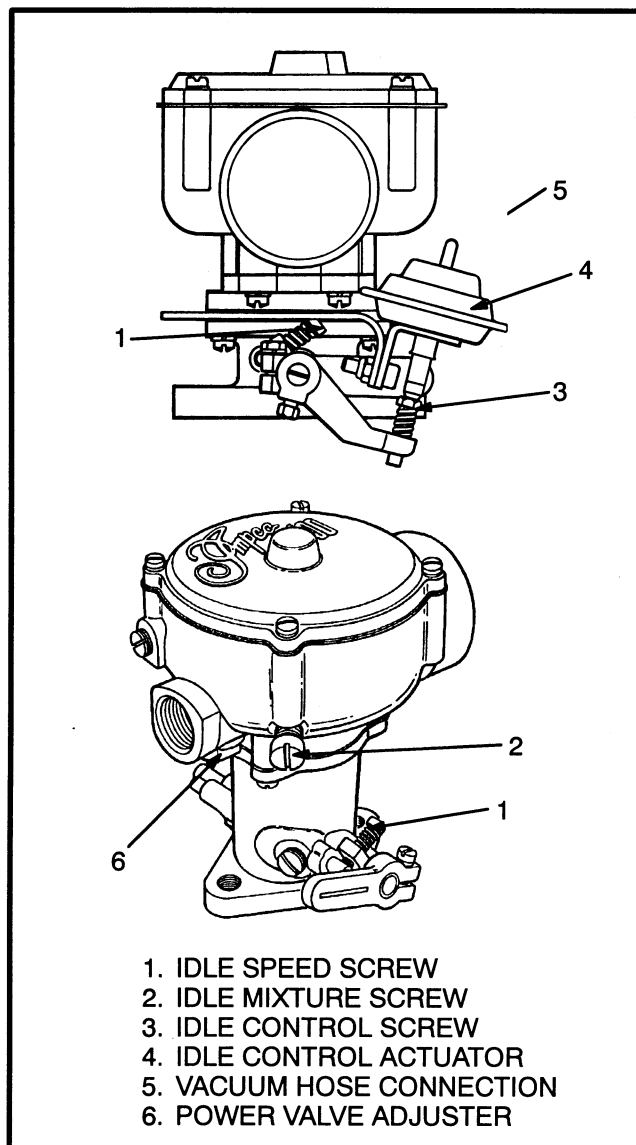


FIGURE 19. LPG CARBURETOR

## **⚠ CAUTION**

**During this test the mast must be fully extended. Make sure there is enough overhead clearance in the building or do the test outdoors.**

1. Operate the lift truck until the engine, transmission and hydraulic system are at normal operating temperatures. Apply the parking brake.
2. Install an exhaust gas analyzer in the exhaust pipe. Connect a tachometer to the engine. Start the engine and fully extend the mast. Pull back on the LIFT lever to put a load on the engine. Fully depress the accelerator pedal and turn the power mixture valve until the reading on the exhaust gas analyzer is 0.5 to 1.0% CO (carbon monoxide) maximum. If an exhaust analyzer is not available adjust the power mixture valve until the highest engine speed is reached.

### **GOVERNOR (See FIGURE 20.)**

The governor does not normally need adjustment. If adjustment is necessary, do not turn the adjustment screws more than 1/4 turn at a time. If the adjustment screws are turned more than this the governor can be difficult to adjust.

#### **Checks**

Before making any adjustments to the governor, check the following:

1. Make sure the mechanical, electrical and fuel systems are operating correctly.

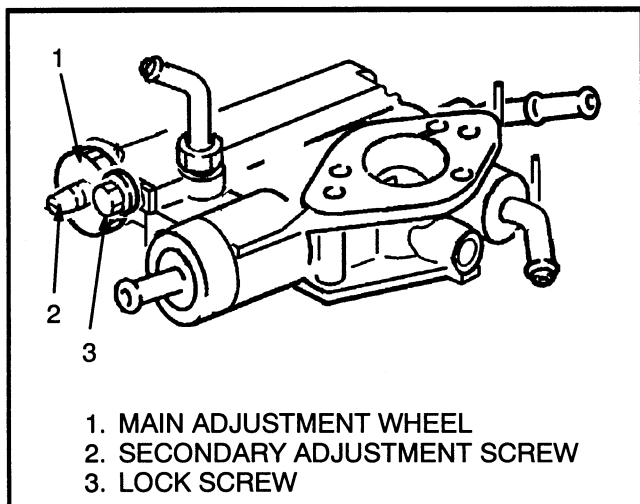


FIGURE 20. GOVERNOR ADJUSTMENT

2. Make sure the tachometer will work with the ignition system.
3. Make sure the air filter is clean and connected to the carburetor.

#### **Adjustments**

With the engine at operating temperature, adjust the governor as follows:

1. Remove the lock wire from the governor lock screw. Loosen the governor lock screw. Apply the parking brake.
2. With no load on the engine, run the engine at full open throttle to obtain maximum engine speed. To adjust the maximum no load speed, hold the secondary adjustment screw and turn the main adjustment wheel. Turn the main adjusting screw clockwise to increase engine speed and counterclockwise to decrease engine speed. Set the maximum engine speed to 2600 to 2700 rpm.
3. Tighten the lock screw for the governor.
4. Run the engine with the throttle fully open, then pull on the Tilt lever to load the engine. The governor setting is correct when the engine runs smoothly (without speed changes), and the difference in speed between the load and no load conditions is within the limits of the specifications.
5. If the engine speed changes, loosen the lock screw and turn the secondary adjustment screw 1/4 turn clockwise. Set the maximum no load engine speed by turning the main adjustment wheel counterclockwise. Repeat this procedure until the engine speed is steady.
6. If the engine speed difference between the load and no load conditions is greater than specified, turn the main adjustment wheel 1/4 turn clockwise. Set the maximum no load engine speed by turning the secondary adjustment screw counterclockwise. Repeat this procedure until the engine runs correctly.
7. When the governor adjustment is correct, tighten the lock screw and install wire between the lock screw and the secondary adjustment screw.

#### **ADJUST THE THROTTLE LINKAGE, S/H2.00-3.20XM (S/H40-65XM) (See FIGURE 21. and FIGURE 22.)**

**NOTE:** Each time the throttle system is disassembled, it is important to adjust the throttle cables.

1. Adjust the idle speed as described in Idle Adjustments.
2. Make sure the throttle linkage at the pedal assembly is in the correct position.
3. Push the Monotrol or throttle pedal until it stops against the floor plate. Adjust the throttle cable so that the pedal stops on the floor plate just as the throttle plate reaches the wide open position. Use the nuts at the pedal end of the cable housing to change the adjustment of the cable.

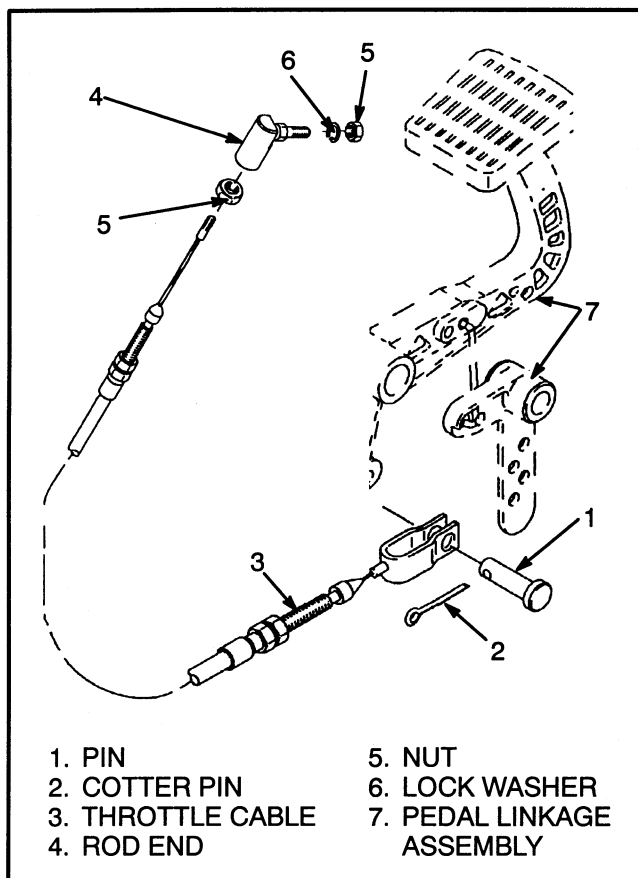


FIGURE 21. THROTTLE CABLE ARRANGEMENT

4. Adjust the pedal return stop (see FIGURE 22.) so that there is no tension on the throttle cable at the idle position. Do the following to check this adjustment:
  - a. Run the engine at idle speed. Make sure the rod on the idle control actuator is retracted and the throttle linkage is against the idle speed screw.
  - b. When the pedal return stop is in the correct position, tighten the capscrew that holds the stop to the bracket.

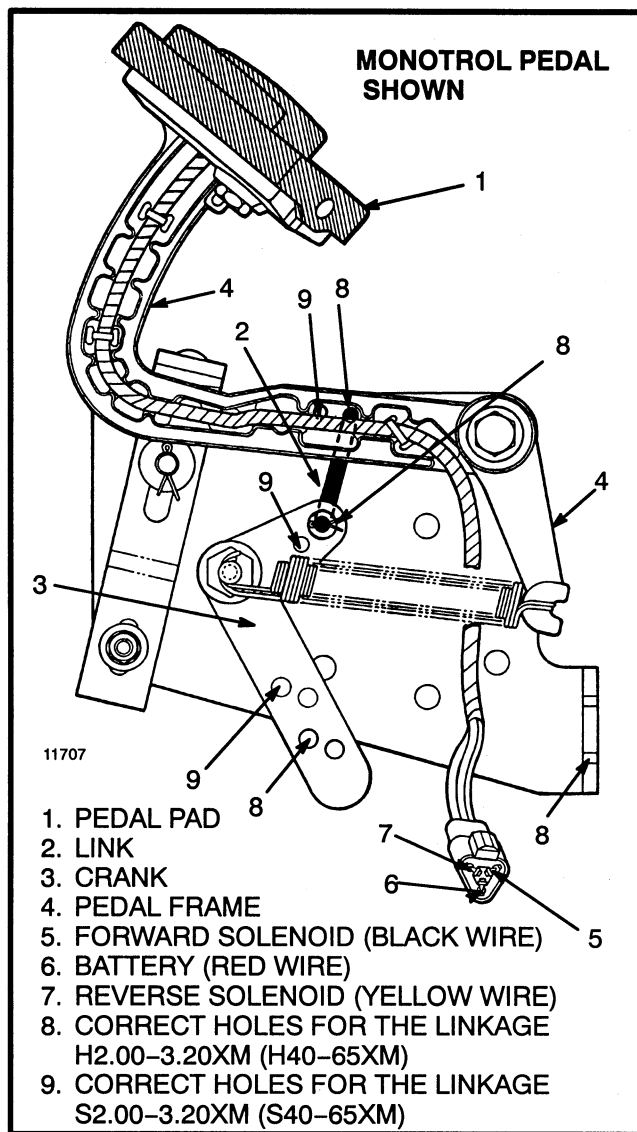


FIGURE 22. THROTTLE ARRANGEMENT, S/H2.00-3.20XM (S/H40-65XM)

**ADJUST THE THROTTLE LINKAGE, S/H1.50-1.75XM, S/H2.00XMS (S/H25-35XM, H40XMS) (See FIGURE 23.)**

**NOTE:** Each time the throttle linkage is disassembled, it is important to adjust the throttle cable.

1. Connect the throttle cable at the pedal. Tighten the jam nut at the pedal bracket (7).
2. Adjust the idle speed of the engine. The idle adjustment screw on the carburetor controls the idle speed. The correct idle speed is  $725 \pm 25$  rpm.
3. Adjust the pedal height to 41.3 mm (1.63 in) using the pedal stop (4).



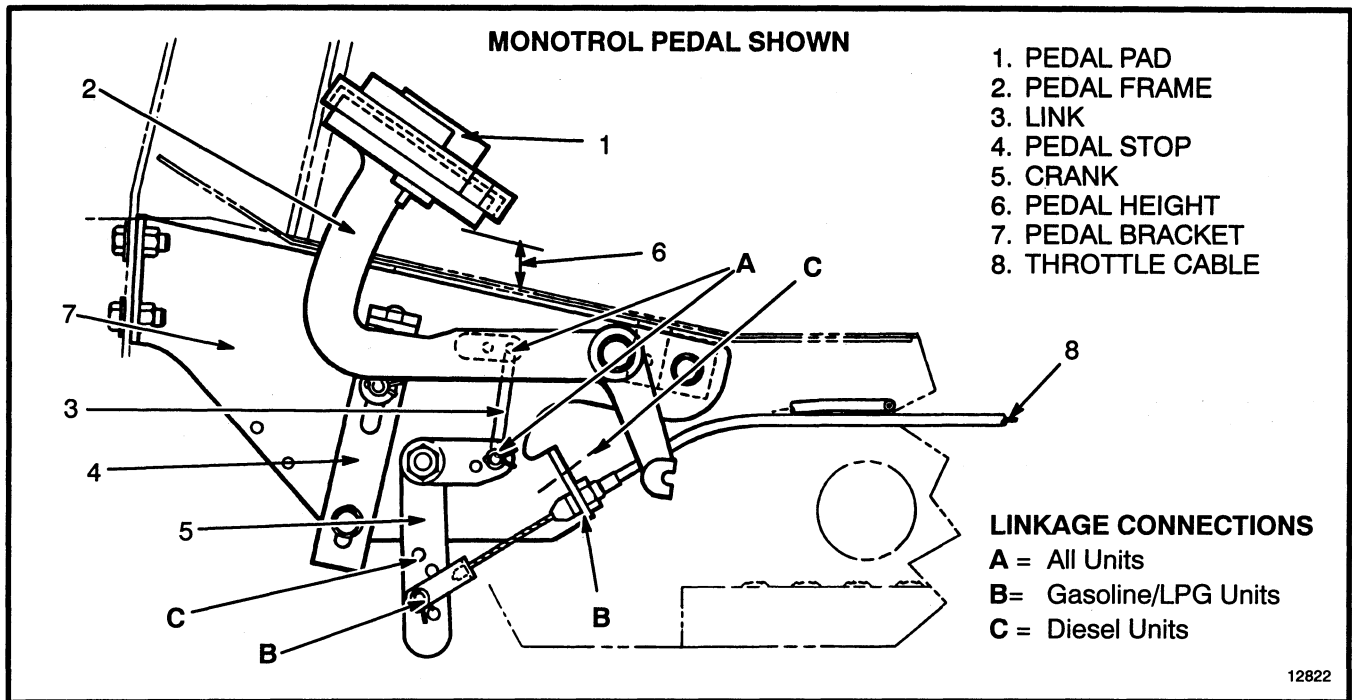


FIGURE 23. THROTTLE ARRANGEMENT, S/H1.50-1.75XM, S/H2.00XMS (S/H25-35XM, H40XMS)

4. Connect the cable at the carburetor. Adjust the length of the cable housing so that the cable is not loose. With the engine running at the correct idle speed, change the position of the cable housing with the nuts at the bracket.

**CHECK THE MONOTROL PEDAL (See FIGURE 22.)**

Slowly move the Monotrol pedal pad from Forward to Reverse and Reverse to Forward. There must be some movement of the pedal pad before the pedal frame moves and the throttle opens.

**TROUBLESHOOTING**

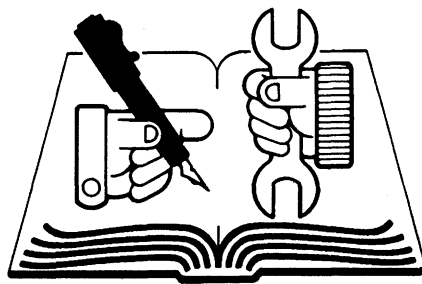
PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
The engine will not start easily. The vaporizer is freezing.	Low coolant level.	Check coolant level at radiator and coolant recovery reservoir. Fill to correct level.
	Water hoses have a restriction or are too small.	Make sure there is adequate water flow to vaporizer. Install larger hoses.
	Air lock in coolant line to the vaporizer.	Remove air from coolant line.
	Belt for water pump is loose or broken.	Adjust tension. Install new drive belt.
	Hose from vaporizer to carburetor has a leak.	Find and repair leak. Install new hose.
	Thermostat is not operating correctly.	Install new thermostat.
	Idle mixture screw is not adjusted correctly.	Adjust idle mixture screw.
Fuel valve in carburetor is damaged.	Install new fuel valve. Overhaul carburetor. Install new carburetor.	

## TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
The engine will not start easily. The vaporizer is freezing.	<p>Solenoid valve is disconnected or does not operate correctly.</p> <p>Air filter is dirty.</p> <p>Balance line is disconnected.</p> <p>Accelerating too soon after engine is started.</p>	<p>Connect wire to solenoid. Install new solenoid valve.</p> <p>Check air restriction indicator. Clean or install new filter element.</p> <p>Connect balance line.</p> <p>Allow longer warm-up time before starting operation.</p>
Engine does not idle smoothly	<p>Idle mixture screw is not adjusted correctly.</p> <p>Diaphragm in carburetor is damaged.</p> <p>Air leak between carburetor and governor or between governor and intake manifold.</p> <p>PCV system has a restriction.</p> <p>Air leak at throttle shaft.</p> <p>Hose from vaporizer to carburetor is damaged.</p> <p>Balance line is disconnected.</p> <p>Pressure reducer diaphragm has a hole.</p> <p>Low pressure valve in vaporizer is damaged.</p> <p>Idle speed is too low.</p> <p>Idle speed screw is loose.</p> <p>Water in fuel.</p> <p>Fuel tank is installed in the wrong position.</p> <p>Fuel valve on the tank is in the wrong port.</p> <p>Idle control actuator is not adjusted correctly or the vacuum hose is disconnected.</p>	<p>Adjust idle mixture screw.</p> <p>Install new diaphragm or carburetor.</p> <p>Fix air leak.</p> <p>Remove restriction. Install new PCV valve.</p> <p>Repair or install new carburetor.</p> <p>Install new hose.</p> <p>Connect balance line.</p> <p>Install new diaphragm.</p> <p>Install new low pressure valve or new vaporizer.</p> <p>Adjust idle speed.</p> <p>Tighten screw and adjust idle speed.</p> <p>Check fuel supply and tank filling procedure. Clean system.</p> <p>Install fuel tank in correct position.</p> <p>Install fuel valve in the correct port.</p> <p>Connect vacuum hose. Adjust the idle control actuator.</p>
Engine idle speed is too high.	<p>Idle mixture screw is not adjusted correctly.</p> <p>Idle speed screw is loose.</p> <p>Idle control actuator is not adjusted correctly or the vacuum hose is disconnected.</p>	<p>Adjust idle mixture screw.</p> <p>Tighten screw and adjust idle speed.</p> <p>Connect vacuum hose. Adjust the idle control actuator.</p>

## TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
Engine does not run smoothly.	<p>The governor is damaged.</p> <p>Low pressure diaphragm or valve in vaporizer is damaged.</p> <p>Wrong or damaged fuel valve in carburetor.</p> <p>PCV system has a restriction.</p> <p>Air leaks in the intake manifold.</p> <p>Balance line has a restriction.</p>	<p>Install new governor.</p> <p>Repair or install new vaporizer.</p> <p>Repair or install new carburetor.</p> <p>Remove restriction. Install new PCV valve.</p> <p>Repair leaks.</p> <p>Remove restriction.</p>
Loss of power.	<p>Air filter is dirty.</p> <p>PCV system has a restriction.</p> <p>Governor is damaged.</p> <p>Power mixture valve is not adjusted correctly.</p> <p>Hose from vaporizer to carburetor has leaks.</p> <p>Diaphragm in carburetor is damaged.</p> <p>Wrong type of fuel.</p> <p>Hose from vaporizer to carburetor has a restriction or is too small.</p> <p>Vaporizer is damaged.</p>	<p>Check air restriction indicator. Clean or install new filter element.</p> <p>Remove restriction. Install new PCV valve.</p> <p>Install new governor.</p> <p>Adjust power mixture valve.</p> <p>Repair leak or install new hose.</p> <p>Install new diaphragm.</p> <p>Clear system of wrong fuel. Fill tank with correct fuel..</p> <p>Remove restriction or install new or larger hose.</p> <p>Repair or install new vaporizer.</p>
Engine stops running.	<p>Valve on fuel tank is closed.</p> <p>Fuel tank is empty.</p> <p>Hose from fuel tank is too close to the exhaust pipe.</p> <p>Vacuum line to filter unit is disconnected.</p> <p>Filter unit is damaged.</p> <p>Vaporizer is damaged.</p> <p>Carburetor is damaged.</p> <p>Hose to carburetor is damaged.</p> <p>Idle speed is too low.</p> <p>Water in the fuel.</p> <p>Fuel filter is dirty.</p> <p>Governor is damaged.</p> <p>Air leak at the intake manifold.</p> <p>Solenoid valve is disconnected or does not operate correctly.</p>	<p>Open fuel valve at the tank.</p> <p>Install tank that has fuel.</p> <p>Locate hose away from excessive heat. Install new hose.</p> <p>Connect vacuum line.</p> <p>Install new filter unit.</p> <p>Repair or install new vaporizer.</p> <p>Install new carburetor.</p> <p>Install new hose.</p> <p>Adjust idle speed.</p> <p>Check fuel supply and tank filling procedure. Clean system.</p> <p>Clean fuel filter.</p> <p>Repair or install new governor.</p> <p>Repair leak.</p> <p>Connect wire to solenoid. install new solenoid valve.</p>



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