

1975-79 FUEL SYSTEMS

Century Liquefied Petroleum Gas Systems

2-139

1975-78 International Harvester 304" & 345" LPG Engine Equipped Models

LPG APPLICATIONS

INTERNATIONAL HARVESTER

Application	Century Model No. (Carburetor)
1975-77 345"	
Non-Governed	443129-C91
Governed	443130-C91
1978	
304" (Non-Governed)	¹ 443129-C91
345" (Governed)	² 443130-C91

¹ - Holley 2527 2-barrel carburetor.

² - Holley 2251E 2-barrel carburetor.

SAFETY PRECAUTIONS

NOTE: State, county and city laws and regulations covering the utilization of liquid petroleum gas must be adhered to when servicing a vehicle equipped with an LPG system.

NOTE: Before performing any work on vehicle, exhaust fuel system by closing main valves at tank and allowing engine to run, or by bleeding the fuel system outside the shop area. Remove or store vehicle outside of shop when work is not being performed. After completing servicing, raise hood allowing air to circulate to remove possible accumulated gas before starting engine. All threaded fittings should be treated with an insoluble sealer and checked for leaks with a soap lather. Pay particular attention to short rubber hoses used in the system which relieve stress and vibration.

NOTE: DO NOT use LPG for cleaning parts, blowing horns or any other compressed air use. DO NOT perform work on LPG fuel tanks. All necessary work on fuel tanks should be performed by qualified personnel normally servicing such containers.

NOTE: Working area should be well ventilated with no open flame devices in area. "DANGER" signs should be displayed and a fire extinguisher (dry powder or CO-2) should be placed close by. In case of LPG fire, shut off source of gas, if possible, before extinguishing fire. If shut off is not accomplished, an explosion may result.

DESCRIPTION

The Liquid Petroleum Gas (LPG) system consists of a fuel tank, fuellock-strainer assembly, converter (regulator), carburetor and governor. The liquid fuel is stored in tank under pressure, flows through the fuellock-strainer and into the converter.

Inside the converter the pressure is lowered and the liquid vaporizes. The vapor is then drawn to the metering valve type carburetor where it is mixed with air in the correct proportions for maximum engine efficiency.

CONVERTER (REGULATOR)

Liquid fuel enters converter from strainer at high pressure jet (fuel inlet), passing through high pressure valve and into the surge chamber. When incoming fuel pressure is approximately 6 psi against the high pressure diaphragm, the diaphragm lifts closing the high pressure valve. The fuel then progresses from the surge chamber through the fuel passages, where heat from the water within the water passages expands the liquid fuel changing it to a vapor.

This vapor then passes through the low pressure valve and into the low pressure chamber when the converter diaphragm activates the low pressure valve lever in one of the following ways: (1) Engine vacuum draws diaphragm down; (2) Solenoid primer activates diaphragm electrically (push button on instrument panel); or (3) When solenoid primer plunger is manually depressed at solenoid. After reaching the low pressure chamber, the vapor is drawn through the fuel outlet and into the carburetor.

OPERATION

FUELOCK-STRAINER ASSEMBLY

Fuel from the tank enters through lower hose. Solenoid actuated plunger blocks fuel passage when ignition is off. When ignition is on, the plunger is lifted by the solenoid and fuel is allowed to pass through the filter pack, from the strainer body and out the upper hose to the converter. The filter pack keeps foreign material from entering high and low pressure valves in converter.

CARBURETOR

Vaporized fuel enters the carburetor below the throttle plate through a metering valve. Operation of valve is through a direct link with throttle blade, meaning a precise air/fuel ratio at all times. The 345" engine uses a governor to limit high engine speed by controlling the throttle blade and in turn, the metering valve.

GOVERNOR

The governor consist of two units; a vacuum operated throttle actuating mechanism, attached to the carburetor throttle shaft and a speed controlling unit connected to the distributor. The vacuum operated throttle actuating mechanism consists of a diaphragm assembly, governor lever, and governor spring. This unit is connected to the throttle shaft in such a way that tension of the governor spring tends to open the throttle valve as the accelerator pedal is depressed.

The diaphragm operation is controlled by two calibrated jets; one from the venturi and one from intake manifold vacuum. The distributor unit consists of a rotating centrifugally operated valve, which is driven by the distributor shaft at one half the engine speed. The tension of the valve spring hold the valve open. As rotational speed increases, centrifugal force, acting on the valve weight, overcomes spring tension and closes the valve.

FUEL TANK

All tanks must conform to national pressure vessel codes, be inspected, and bear the code stamp. All valves and fittings should be replaced with approved components. See Fig. 2.

CAUTION: Engine must be OFF when checking the fuel tanks.

SAFETY VALVES

Excess Flow Valve - Located in fuel supply line to engine. When fuel flow through this valve exceeds a pre-determined rate, valve automatically shuts off further fuel flow. About 50 seconds are required for valve to relieve pressure.

Fuel Line Relief Valve - Located at a point within the fuel supply line where it can sense the pressure from all tanks. When pressure exceeds a given amount, valve automatically exhausts pressure through valve and out vent pipe.

Tank Relief Valve - Located in top of each tank. When tank pressure exceeds a given amount, valve automatically bleeds pressure off through valve and out vent pipe.

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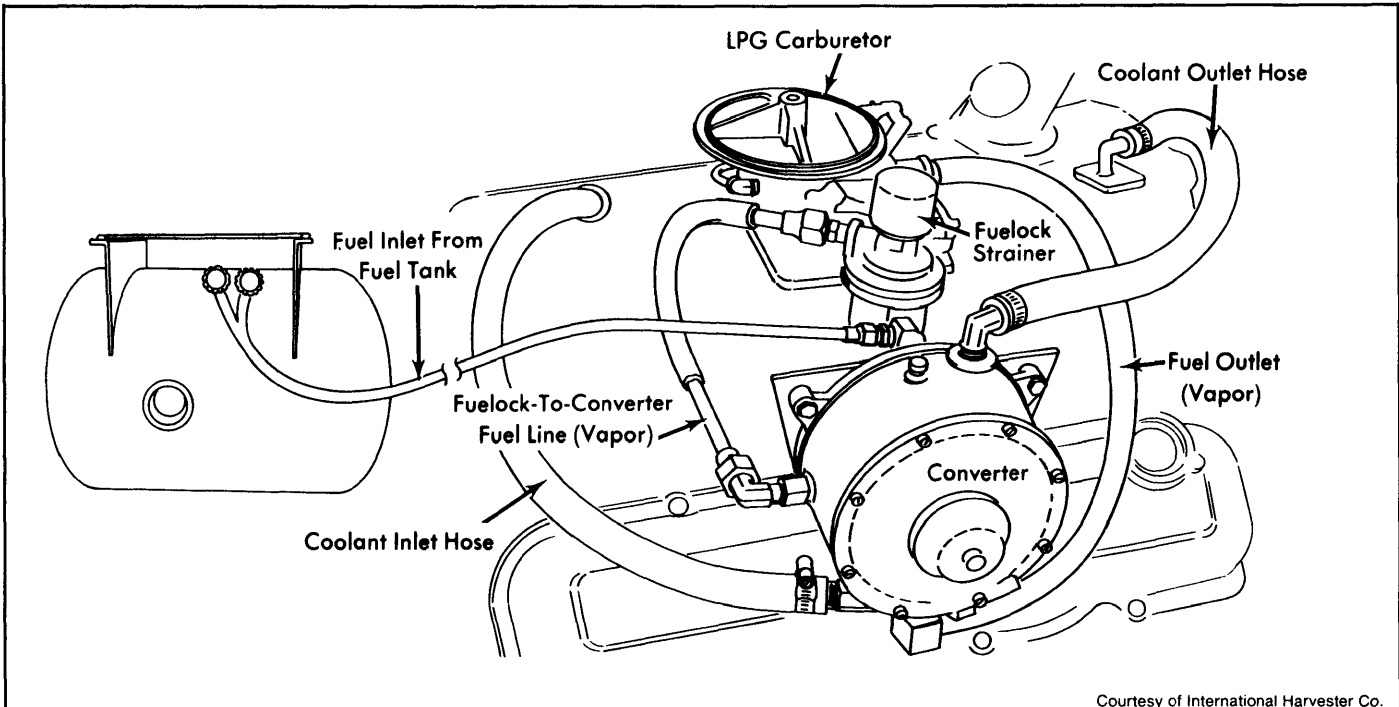


Fig. 1: Liquefied Petroleum Gas System

SUPPLY VALVES

Vapor Valve and Liquid Valve – Located on the fuel tank and specially designed to incorporate an excess flow valve. In case of valve damage or line or tubing failure, the excess flow valve will automatically close to prevent an excess of gas from escaping into the atmosphere.

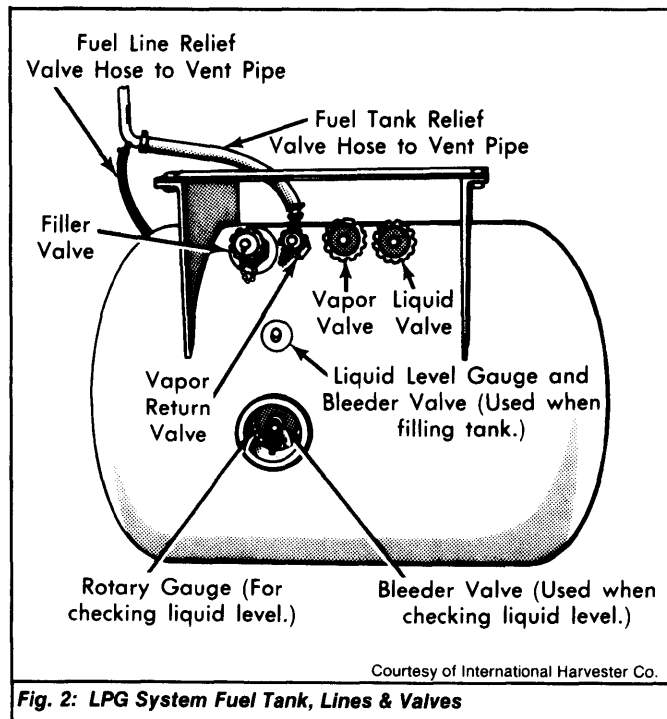


Fig. 2: LPG System Fuel Tank, Lines & Valves

TROUBLE SHOOTING

SLOW STARTING

Check ignition system, tune-up items, battery and starter.

SLOW CRANKING SPEED

- 1) Check starter current draw. Check lubrication oil for proper viscosity. Check for freeze-up in fuel system caused by a low coolant level or air lock in converter water jacket.
- 2) If necessary, bleed off air by loosening water hose at top of converter. Check cooling system hoses, water pump, thermostat, and reversed coolant circulation. Inlet water hose should be at bottom of converter. Converter should be piped independent of engine.

FROST ON FUELOCK-STRAINER ASSEMBLY

Liquid Outlet Valve On Tank Opened Too Rapidly – Close valve until click is heard, then open slowly until hiss can no longer be heard, then turn valve to full open position.

Water In Tank – Purge filler hose of gas, then pour one pint of alcohol in hose and attach hose to tank. Open valve on hose to inject alcohol into tank. Alcohol will act as antifreeze and will dissipate water through engine.

POWER LOSS

- 1) Check ignition system and all tune-up items. Check LPG level in tank. If LPG level is correct but does not flow through liquid valve, dip tube on liquid outlet is ruptured or broken.
- 2) Check entire fuel system for proper valve operation, fuel delivery and vaporization. Check operation of governor and throttle. Check for overheated manifold or restricted exhaust.

POOR ECONOMY

Check all items listed under POWER LOSS. Check calibration of fuel tank gauge. At time of refueling, check for proper refueling procedure and that metering device at fuel supply pump is accurate.

ROUGH IDLE

Check ignition system and all tune-up items. Check for vacuum leaks. Check for lean mixture.

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FLAT SPOT OFF IDLE

Idle set too slow. Air leaks in vapor line or punctured low pressure diaphragm. Lean mixture caused by reduced hoses or fittings. Lean mixture caused by incorrect carburetor calibration.

LACK OF FUEL AT CARBURETOR

Stop engine, turn ignition "ON", hold throttle open and press primer. A hiss should be heard if fuel is flowing. If hiss is not heard, check system as outlined under Power Loss.

ENGINE WILL NOT IDLE

Check fuel flow through vapor hose. Check low pressure regulator parts. Check ignition system and all tune-up items. Check all points of vacuum for vacuum leaks.

OVERHEATING

Check cooling system and all related components. Check for lean air/fuel mixture.

SLUGGISH METERING VALVE ON CARBURETOR

Remove pin screw on metering valve and brass plug from opposite side. Remove and clean metering valve. Lubricate ends of metering valve and install metering valve in housing.

DEFECTIVE SOLENOID PRIMER

Connect jumper from hot side of battery to insulated post on solenoid primer. With ignition "ON" and throttle wide open, solenoid should react. If solenoid reacts with jumper installed, trouble is in wiring or primer switch.

OVERHAUL

CAUTION: Before performing any work on system, shut off main valves at fuel tank and allow engine to run until all fuel between tank and engine is exhausted. If engine is not running, shut off main valves at tank and bleed fuel from all lines and components between tank and engine.

ELECTRICAL COMPONENTS

Fuellock-strainer solenoid, converter solenoid primer, and converter solenoid primer switch (on instrument panel) cannot be overhauled. Replace these electrical components as a unit. See Fig. 3.

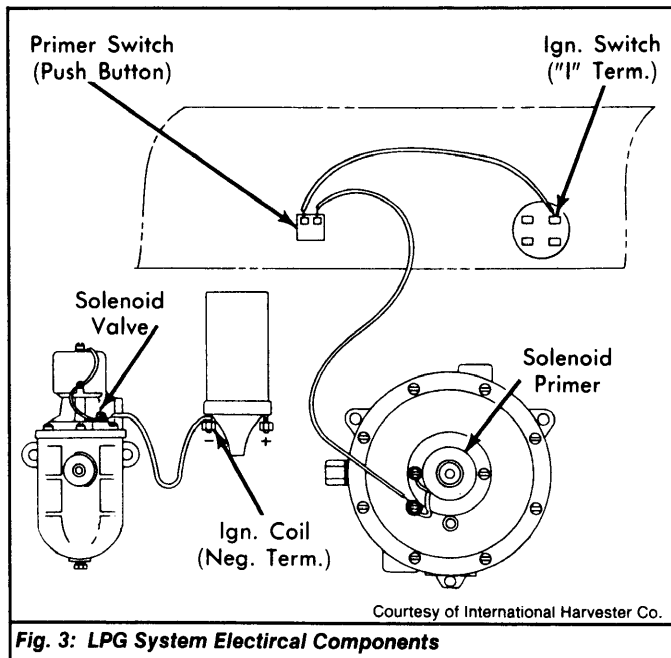


Fig. 3: LPG System Electrical Components

FUEL TANKS, VALVES & LINES

All necessary work on fuel tanks should be performed by qualified personnel normally servicing such containers. All valves and lines should be replaced (if required) with approved components.

FUELOCK-STRAINER ASSEMBLY

Disassembly - 1) Remove unit from engine by disconnecting electrical lead, removing fuel lines and two mounting bolts. Separate base and cover assembly from strainer body by removing six cover-to-strainer screws.

2) Remove filter pack and retaining ring only if replacement is required as damage will occur when removed. See Fig. 4.

3) Remove solenoid and case by removing the two screws which attach electrical leads. Remove plunger housing from base by removing the 4 attaching screws. Remove plunger, spring, and "O" ring from base.

Reassembly - To assemble, reverse disassembly procedure. Install a new filter pack and retaining ring (if required).

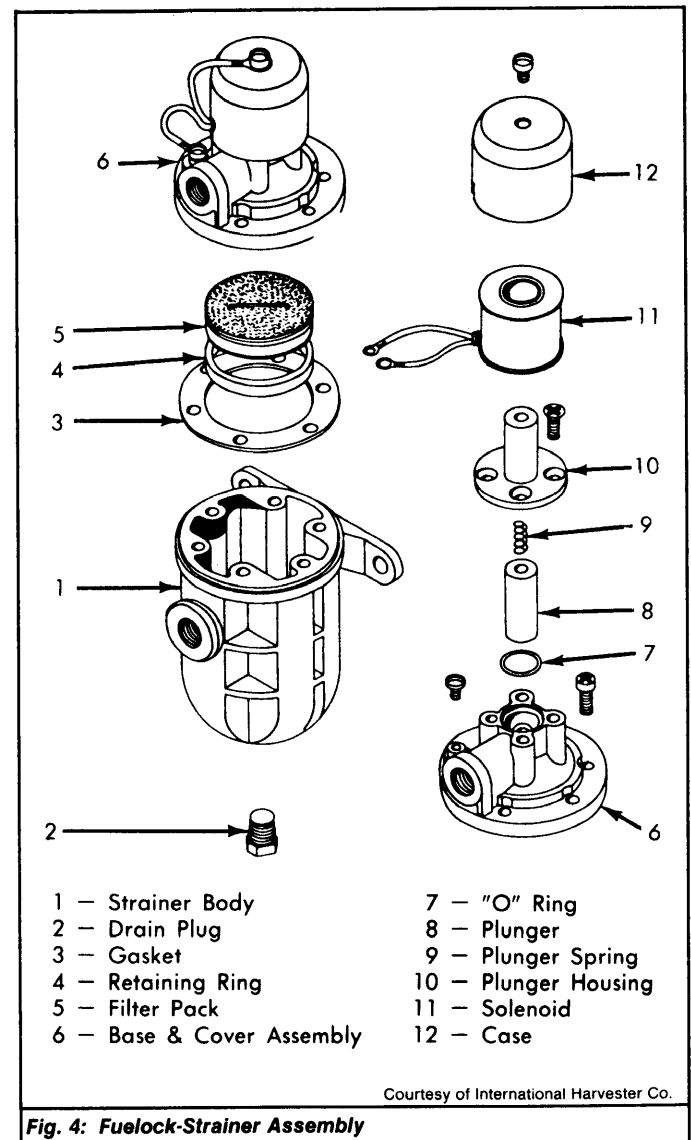


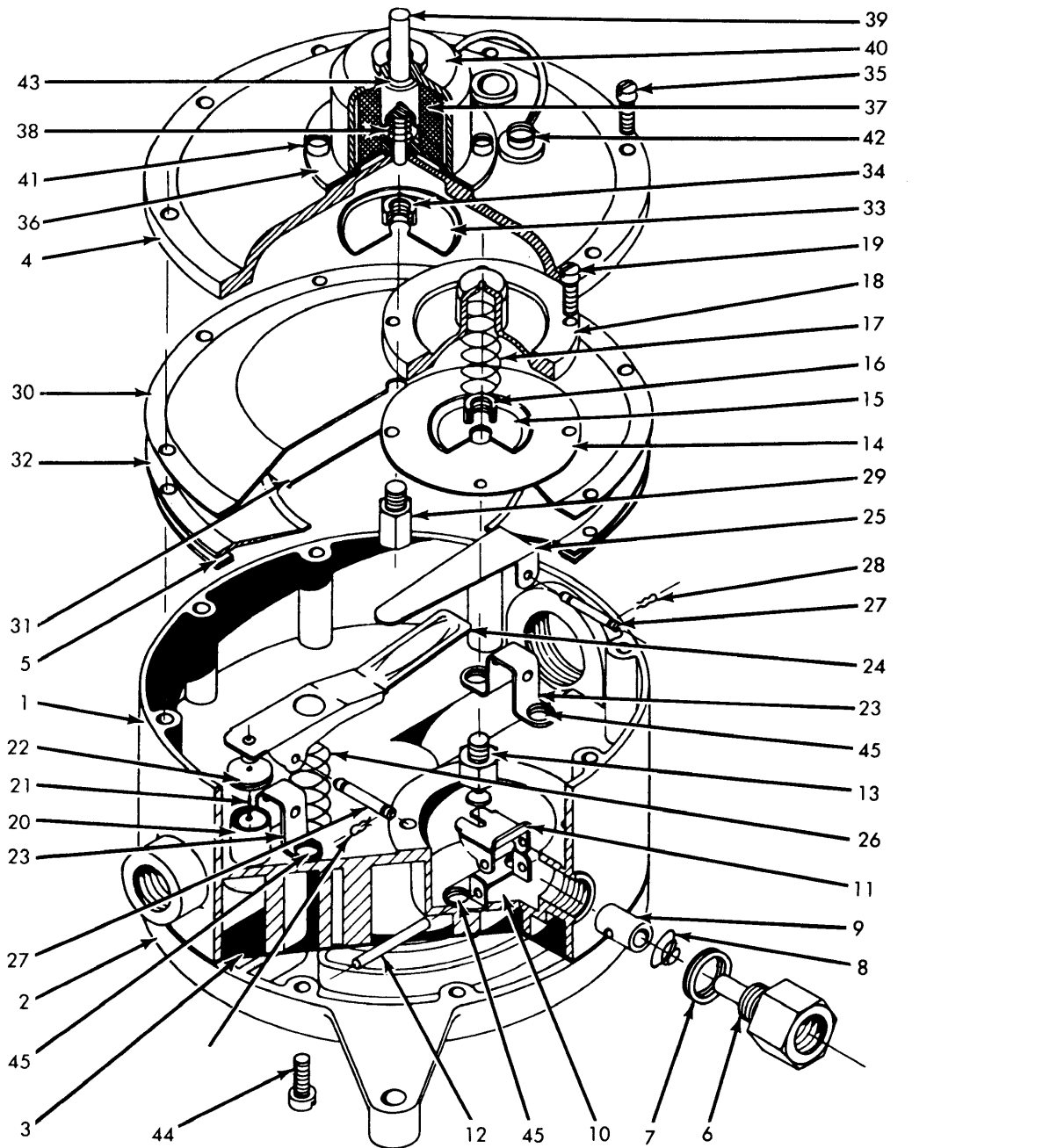
Fig. 4: Fuellock-Strainer Assembly

CONVERTER (REGULATOR)

Disassembly - 1) Remove unit from engine by disconnecting electrical lead, removing fuel lines and mounting bolts. Scribe alignment marks on cover and main body (for reassembly) and remove 8 cover-to-body screws and remove cover.

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|--------------------------------|--------------------------------|-------------------------------|
| 1 - Main Body | 16 - Diaphragm Link Nut | 31 - Large Diaphragm Plate |
| 2 - Back Cover | 17 - Diaphragm Spring | 32 - Diaphragm Backing Plate |
| 3 - Gasket | 18 - High Pressure Valve Cover | 33 - Small Diaphragm Plate |
| 4 - Front Cover | 19 - Valve Cover Screw | 34 - Diaphragm Button Nut |
| 5 - Diaphragm Plate Gasket | 20 - Low Pressure Valve Body | 35 - Cover-to-Body Screw |
| 6 - High Pressure Valve Jet | 21 - Low Pressure Seat Pin | 36 - Base Washer |
| 7 - Gasket | 22 - Low Pressure Valve Seat | 37 - Coil |
| 8 - Valve Spring | 23 - Lever Perch | 38 - Plunger Spring |
| 9 - High Pressure Valve | 24 - Low Pressure Valve Lever | 39 - Solenoid Plunger |
| 10 - Lever Perch | 25 - Secondary Lever | 40 - Solenoid Case |
| 11 - High Pressure Valve Lever | 26 - Valve Lever Spring | 41 - Solenoid-to-Cover Screws |
| 12 - Lever Pin | 27 - Lever Pin | 42 - Terminal Screw |
| 13 - Diaphragm Link | 28 - Lever Pin Clip | 43 - "O" Ring |
| 14 - High Pressure Diaphragm | 29 - Diaphragm Button | 44 - Main Body Screws |
| 15 - Diaphragm Plate | 30 - Diaphragm | 45 - Lever Perch Screws |

Courtesy of International Harvester Co.

Fig. 5: Exploded View Of LPG Converter Assembly

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2) Remove diaphragm, backing plate, and gasket. Disassemble diaphragm (if required) by removing nut from diaphragm button and separating small and large diaphragm plate from diaphragm. See Fig. 5.

3) Remove high pressure valve from main body along with washers, spring and jet. Remove 4 high pressure valve cover screws and remove cover, diaphragm spring and high pressure diaphragm.

4) Disassemble diaphragm (if required) by removing link nut from diaphragm link and separating diaphragm from plate.

5) Remove low pressure valve lever pin clip and pin, and remove low pressure valve lever, and seat assembly along with valve lever spring. Remove valve seat by straightening valve seat pin.

6) Remove secondary low pressure valve lever by removing pin clip and pin, and remove back cover and gasket by removing nine cover retaining screws.

Reassembly - To assemble, reverse disassembly procedure. Install new parts as required.

CARBURETOR

CAUTION: Use extreme care when servicing governed LPG carburetors equipped with redundant throttle return linkage. Whenever the throttle return spring is disconnected at either end, the throttle will snap shut with sufficient force to cause personal injury. To prevent personal injury, it is essential that all instructions be followed in stated order and hands be kept clear of carburetor throttle linkage when connecting or disconnecting throttle linkage.

Disassembly - 1) If carburetor is so equipped, remove redundant throttle closing linkage safety return spring retaining nut, washer, spring drum and spacer washer. Unhook and remove safety spring, trip lever and retaining lever. See Fig. 6. Remove two screws securing throttle operating housing to carburetor body.

2) Remove bolt retaining clutch lever to throttle operating housing. Slide throttle lever shaft out of housing. Remove air/fuel mixture drag link. Before attempting to remove metering valve lever, scribe line on lever and metering valve shaft end to insure correct placement on reassembly. Remove four screws holding metering valve housing to carburetor.

3) Remove metering valve housing, metering jet and gasket. Discard gasket. Disassemble metering valve assembly. See Fig. 7. Remove idle air/fuel (RPM) mixture adjusting screw, located just below metering valve housing.

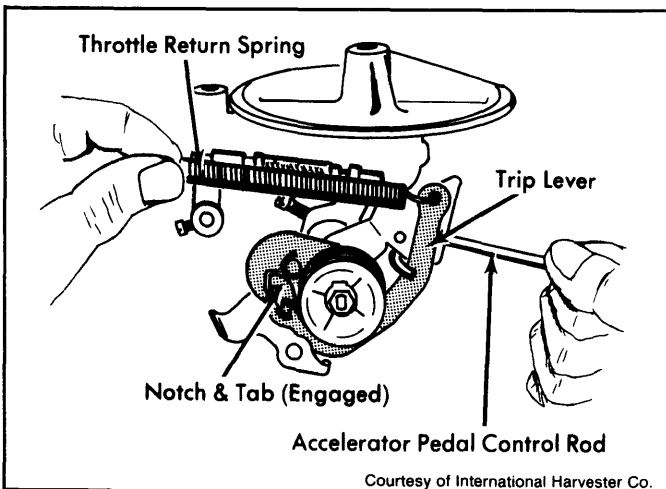


Fig. 6: Unloading Throttle Redundant Closing Linkage

4) Remove and discard governor housing seal. Remove diaphragm rod retainer and governor lever. Remove diaphragm cover and diaphragm. Remove governor line fittings. Remove three mounting screws holding governor housing to carburetor body and remove housing.

5) Remove air horn and discard gasket. Remove spark valve by using Socket (SE-1969-1). Remove five screws holding carburetor mounting flange to throttle body. Remove flange and discard gasket.

6) If necessary to remove throttle plates, lightly scribe throttle plates along throttle shaft and mark both plates and their corresponding bores with a number or letter. File off staking from ends of throttle plate screws to prevent damaging threads on screw removal. Remove screws and throttle plates.

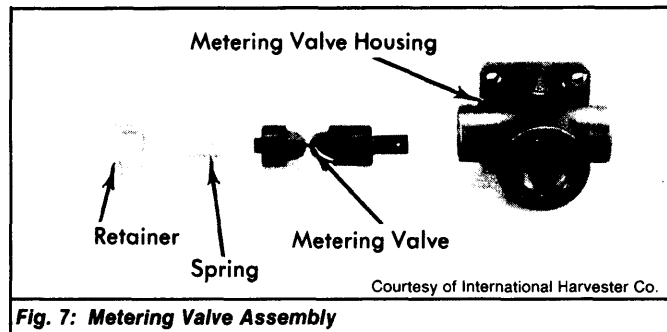


Fig. 7: Metering Valve Assembly

Cleaning & Inspection - 1) Soak all parts in suitable carburetor cleaner. If commercial cleaner is not available, denatured alcohol or laquer thinner may be used. Rinse parts in hot water and blow dry with compressed air.

2) Carburetor jets and passages should never be cleaned with a drill, stiff wire or other similar object. Never remove carbon deposits with wire wheel or sharp instrument. Parts such as "O" rings, gaskets and diaphragms should never be subjected to cleaning solvents.

Reassembly - 1) To assemble, reverse disassembly procedure. Use new screws, gasket and diaphragms. If throttle shaft was removed, align throttle plates according to scribed marks.

2) Before tightening new retaining screws, close throttle so that throttle plates are perfectly aligned in their bores (so that no light appears when carburetor body is held up to light source).

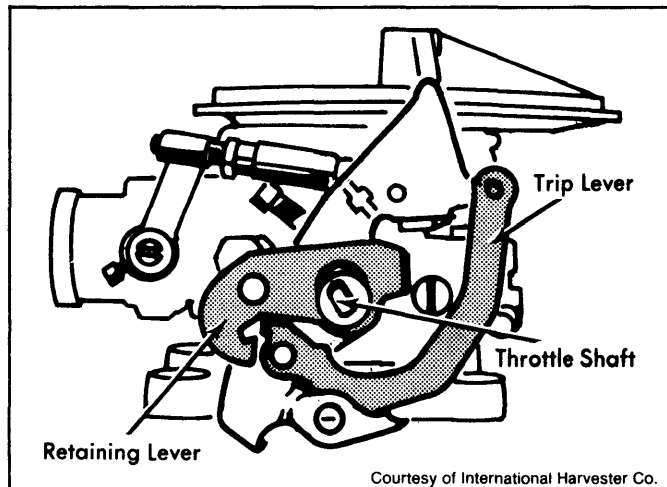


Fig. 8: Installing Throttle Levers

3) If carburetor was equipped with redundant throttle return spring, install redundant throttle closing linkage retaining lever and trip lever onto throttle shaft. See Fig. 9.

4) Install safety spring over throttle lever shaft such that it will force the notch and tab apart and hold throttle lever in idle position. Place spacer washer, safety return spring drum, retaining washer and nut on throttle lever shaft. Tighten nut securely.

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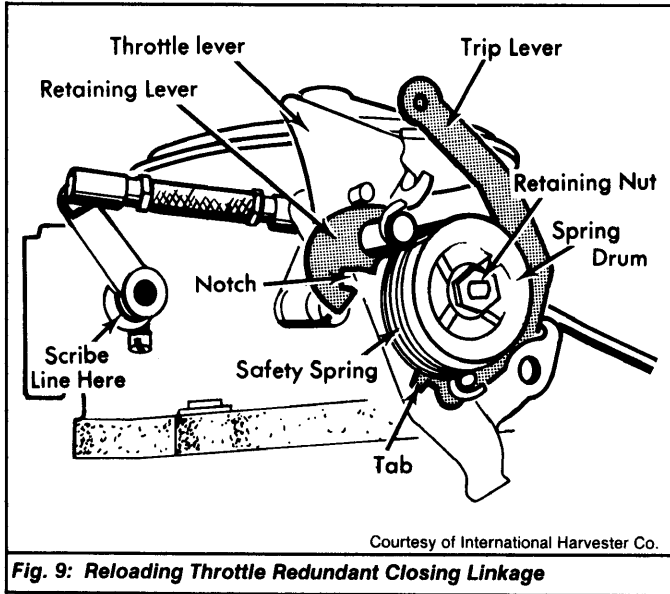


Fig. 9: Reloading Throttle Redundant Closing Linkage

ADJUSTMENTS

HOT (SLOW) IDLE RPM

See appropriate article in TUNE-UP PROCEDURES section.

SYNCHRONIZING THROTTLE PLATE & METERING VALVE

Proper adjustment of idle speed will also synchronize the throttle plate and metering valve. The air/fuel ratio should be 13.0 on gasoline scale or 14.4 on propane scale. Check air/fuel ratio at wide open throttle and engine under load.

GOVERNOR

See appropriate article in TUNE-UP PROCEDURES section.