What You Should Know About Your L.P. Gas System and It’s Proper Care

Typical L.P. Gas Hook Ups

Two Cylinder Hook Up.

Single Tank Hook Up.

The P.O.L.

The P.O.L. (precauto-litre) adapter, sometimes called a spud and nut, is required to convey the L.P. gas to the regulator. With a single tank the P.O.L. is inserted directly into the regulator inlet. With a two tank hookup, two pigtails of rubber or copper, with a P.O.L. on one end and an appropriate fitting on the other end, are used. The P.O.L. has a left-hand (counter-clockwise) thread. Turn it to the left to tighten, to the right to loosen. Since it is a brass-to-brass seal, it is not necessary to use pipe dope. However, be sure to test all connections with a soapy solution before lighting any appliance.

The Hoses

L.P.G. Hoses are manufactured to strict standards and are listed by Underwriters Laboratories and Canadian Gas Assoc. PICTAIRE are High Pressure Hoses used in pairs between two tanks and a two stage regulator. They are assembled from hose which has a rating of 350 PSI working pressure and a burst rating of 1750 PSI. Solid brass, seven bared P.O.L. and end fitting are cramped on each end and they must withstand a 400 lb. pull test. FUEL SUPPLY LINES and FLEXIBLE CONNECTORS may be Low Pressure Hose assemblies, rated at 1 PSI with a 125 PSI burst pressure and a 600 PSI burst strength, and a 200 lb. pull test strength. For additional safety we recommend and provide High Pressure Hose and Fittings on all Marine L.P.G. Hose Assemblies. EXTREME CAUTION should be used when installing Fuel Supply Lines in the boat and when connecting them to appliances, regulator or outlet. All connections should be wrench tight and pressure tested. The Mula Pipe Thread which connects to the regulator must have L.P.G. pipe dope or Teflon tape applied to its threads before connection. Fuel Supply Lines should be installed so that they can be periodically inspected for leaks, damage or aging and so they are not vulnerable to damage from abrasion, traffic, nails, heat (route away from engine room if possible), etc. The presence of a g.i. line on the hose assembly indicates it has been individually inspected, tested and U.L. listed.

FIRE RESISTANT SLEEVE

The Fire Resistant sleeve is a specially formulated conduct designed to provide additional fire resistance to the flexible L.P.G. Fuel Supply Lines so that they will be capable of withstanding the ABYC A-1.8-B. Flame fire test. It also provides additional protection from abrasion and the elements. To be effective the sleeve should slide over and completely cover the hose assembly. After installing that each end fitting is connected wrench tight and leak tested, secure each end of the sleeve with a stainless steel clamp.

IMPORTANT: We recommend that you read and comply with the attached ABYC "MARINE L.P.G. SYSTEMS"
The Regulator

Low Pressure Regulator

Two Stage Regulator

Automatic Changeover Regulator

WHAT IS A TWO-STAGE REGULATOR?

A two-stage regulator performs the same pressure-reducing function previously explained except that it does it in two stages. A two-stage regulation system uses two regulators, either separate ones or, in the case pictured above, both contained in one body. The first stage, or high pressure regulator, reduces the cylinder pressure to approximately 10 to 13 PSI and sends it along to the second stage low pressure regulator which then reduces it to 11 inches W.C. or 0.35 ounces per square inch.

Because cylinder pressure is reduced in two stages and because the second stage receives a consistent rather than varied inlet pressure, the regulator does not have to work as hard. The result is a more efficient, safer system with less chance of idiosyncratic problems such as pilot outage, freeze up, etc.

The tee check allows you to run two L.P. gas cylinders through one regulator by using a pigtail from each cylinder valve to the tee check. This converts your regulator to a manual changeover. That is, you open the valve on the cylinder and use it until empty or almost empty, then open the valve on the reserve cylinder, close the valve on the first cylinder, disconnect it and have it refilled. A disc check built into the tee will prevent gas from escaping when the empty cylinder is disconnected.

HOW TO KEEP YOUR REGULATOR OPERATING EFFICIENTLY & SAFELY

Your regulator is equipped with a vent because it is constantly "breathing." That is, the diaphragm of the regulator moves down and draws air into the bonnet or adjustment spring housing. When the diaphragm moves up, air is expelled through the vent. In the event that excess pressure builds up in the lower housing or body of the regulator, a relief mechanism vents it to the atmosphere. So, it is imperative to check the vent frequently to be sure it is clean and free of water, corrosion or obstructions as clogging is the most common cause of regulator malfunction. Great care has been taken in the manufacture of your regulator and it has been thoroughly tested and U.L. listed. However, even a small piece of dirt, corrosion, pipe dope or other foreign matter which finds its way into the vent can result in higher than normal pressure (high back-up) and/or loss of fuel.

If the vent does become clogged it can easily be cleared with a toothbrush. In addition, your regulator should be checked periodically by a competent L.P. serviceman to be sure it is properly adjusted and in safe working condition. By following these simple precautions your regulator will give you years of trouble-free service.

WHAT IS AN AUTOMATIC CHANGEOVER REGULATOR?

An automatic changeover regulator is a two-stage regulator designed for use with two L.P. gas cylinders connected to the regulator with two pigtailed in the same manner as with a tee check. With the automatic changeover regulator, both cylinder valves should be open.

Automatic changeover regulators (such as Model 134-00 pictured) have a changeover knob with an arrow. The cylinder to which the arrow points is the "service" cylinder. The other is the "reserve" cylinder. As long as there is fuel in the service cylinder, an indicator on the top of the regulator will show white. When the service cylinder is empty, the regulator will automatically change to the reserve cylinder and the indicator will change to red.

At this point you should turn off the valve of the service cylinder and turn the changeover knob so that the arrow points to the reserve cylinder, thereby making it the "service" cylinder. The red indicator will change back to white as soon as you turn the knob. You may now disconnect the empty cylinder and have it refilled. When you reconnect it, it then becomes the "reserve" cylinder.

The Cover

A cover is required for certain types of regulators but it is a good idea for all regulators to be protected by some sort of cover whether it is required or not.

THE COVER

Regulator Cover for Control 2 Regulator

IMPORTANT: We recommend that you read and comply with the attached ABYC "MARINE L.P.G. SYSTEMS"
MARINE LPG—LIQUEFIED PETROLEUM GAS SYSTEMS

PROJECT A—1 A BYC A—179

Based on ABYC's statement of the state of existing technology and the problems associated with achieving the requirements of this standard, ABYC recommends compliance with this standard by December 15, 1978.

A-1.1 PURPOSE

These practices and standards are recommended as guides for the design, construction and installation of LPG, Liquefied Petroleum Gas Systems on boats.

A-1.2 SCOPE

These practices and recommended practices apply to all LPG, Liquefied Petroleum Gas Systems on all boats.

NOTE: Attention is directed to the U.S. Coast Guard Regulations which prohibit the use of LPG, Liquefied Petroleum Gas on certain vessels.

A-1.3 DEFINITIONS

a. ASME—AMERICAN SOCIETY OF MECHANICAL ENGINEERS—An association which has developed, among other standards, a Boiler and Pressure Vessel Code, which specifies design criteria for cylinders.

b. ASTM—AMERICAN SOCIETY FOR TESTING AND MATERIALS—ASTM develops and publishes standards on finished products and on materials used in manufacturing and construction.

c. CERTIFIED—Attained or by documentation as complying with specific regulations or recognized standards as indicated.

d. CGA—COMPRRESSED GAS ASSOCIATION—An industry sponsored association promoting standardization of cylinders and cylinder valves and connections.

(As of April, 1979)

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A-1.5 REQUIREMENTS—IN GENERAL

a. Comprehensive printed instructions and a labeled diagram covering details of proper installation and operation shall be furnished with such LPG system installed on a boat and it is recommended these be kept on board for ready reference.

b. Only systems using LPG cylinders of the vapor withdrawn type are permitted. Cylinders designed or assembled so as to admit liquefied gas into any other part of the system are prohibited.

c. The use of any storage of stove, heating devices, lighters or similar equipment with attached LPG containers is prohibited.

d. All liquefied petroleum gases shall be effectively isolated by an agent of such character that the presence of the gas is detectable by the senses and not in concentrations in air of over 10% by volume of the lower flammability limit. It should be recognized that no agent will be completely effective as a warning agent in every circumstance.

The designer of the LPG system shall be SUITABLE for marine use.

f. CYLINDER—Any vessel or container used to transport or store LPG.

g. DOT—DEPARTMENT OF TRANSPORTATION—The U.S. Government agency which promulgates rules and regulations for the construction, periodic inspection, and shipment through inter-state commerce of portable gas cylinders.

h. LPG—LIQUEFIED PETROLEUM GAS—Includes any product, predominately composed of any of the following hydrocarbons: propane, propylene, butane (normal butane or isobutane), butadiene, or a mixture thereof and conforms to other physical properties as further set forth in ABYC A—1.

i. SUITABLE—Appropriate for intended purpose and reasonably foreseeable use in the marine environment without necessity of being CERTIFIED.

j. SYSTEM—The arrangement of cylinders, safety devices, regulators, connections, valves, piping, tubing, hoses, fittings and devices intended to start, supply, meter, control or control the flow of fuel gas to appliances, and the appliances.

A-1.4 PROPERTIES OF GASES

NOTE: In the interest of safety, it is important that the properties of LPG, Liquefied Petroleum Gas, must be understood and that safety practices for its use be followed. It is also important that the differences in properties between LPG, Liquefied Petroleum Gas, and CGA, Compressed Natural Gas, as covered in ABYC A—22 “Marine CNCG—Compressed Natural Gas System”, be confirmed to distinguish between these two types of fuel and their respective hazards.

a. LPG—Liquefied Petroleum Gas is a two-phasé (liquid/vapor) fuel with a higher calorific value than CGA, Compressed Natural Gas, and is stored at a lower cylinder pressure than CGA.

b. LPG is heavier than air and will roll on or leak if released. CGA, natural gas, is lighter than air and if released will rise and dissipate into the atmosphere. If adequate means of overhead ventilation is provided, and it shall be provided.

c. LPG and CNCG in their natural state, are non-toxic and invisible.

d. Commercially available LPG and CNCG, by law, have an odorant added to facilitate leak detection.

(1) LPG is a two-phasé (liquid/vapor) fuel, having an odor concentration which can vary depending on the volume of fuel remaining in the cylinder.

(2) CNCG is always in the vapor phase and has an odor concentration which will not change.

The properties of LPG, liquefied petroleum gases must be understood. They are gases at normal room temperature and atmospheric pressure. Under reduced pressure they liquefy, readily vaporizing upon release of pressure. It is this property which permits the convenience of transporting and storing these hydrocarbons in concentrated form while normally using them in a vapor form.

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(As of April, 1979)
A.13. CYLINDER VALVES AND SAFETY DEVICES:

a. Each LPG cylinder shall have a safety relief device, either a safety relief valve or a safety relief device specifically designed for LPG as required by DOT regulations.

b. Cylinder valves and safety relief devices shall be installed on the low-pressure side of the cylinder manifold.

c. Exhaust of the relief safety valve shall be vented away from the cylinder into the open atmosphere or to prevent exhaustion of excess gas onto the container.

A.1.9. FUEL SUPPLY LINE:

a. The fuel line system and its components, as installed, shall be designed to be compatible with LPG and to withstand the stresses and exposure to the marine environment.

b. The LPG fuel supply line and its fittings, as installed in a boat, shall be capable of withstanding an internal pressure of 2.5 psi for 120 minutes of free burning without leakage, while the supply line is pressurized internally with LPG at the system's designed delivery pressure, without failure resulting in leakage of LPG. The surface of the heptane must be smooth and, where the component is being tested, the heptane must be in a container large enough to permit the surface of the heptane to extend beyond the critical perimeter of the component being tested.

c. A flammable section can be used to allow the free flow of gas into the boat. The flammable section must be suitable for marine use with LPG and comply with ABYC A-1.9.a and ABYC A-1.9.b.

d. All low pressure distribution tubing, hose, or piping between the regulator or tank detector and the appliance shall be suitable for LPG in marine use.

A.1.8. REGULATING SYSTEM:

a. Each LPG system shall be provided with a regulating device, specifically designed for use with LPG, and so adjusted as to deliver gas at any and all appliances, under varying appliance loads, at a pressure not in excess of 12 inches water column, approximately 0.431 pounds per square inch gauge.

b. Each regulating device shall be fitted with a pressure gauge. The gauge shall be on the cylinder pressure side of the regulating device. The purpose of the gauge is to provide a quick and easy way to test the system for leakage.

c. It is recommended that the test be made after any emergency every time the cylinder supply valve is opened for use, and at least every two weeks.

With the appliance valve off, open the cylinder supply valve. Close the cylinder supply valve. Observe the pressure gauge needle. The pressure indication should remain constant for at least 15 minutes. If any leakage is indicated by a pressure drop, check the entire system with a soapy water or detergent solution. No leakage shall be detected, as per before operating system.

NEVER USE FLAME TO CHECK FOR LEAKS

c. In addition to, but not substituting for the pressure gauge in ABYC A-1.8.b, a leak detector may be installed in the system.

d. A low-side pressure relief device shall be integral with each regulating system. It shall discharge at between two and three times the delivery pressure of the regulator.

e. All relief valve outlets shall discharge to the open atmosphere. The point of discharge shall be at least 2 feet distant from any opening on a cabin or hull interior or from an engine exhaust which is below the level of the low relief device.

f. All relief valve discharge outlet shall be located and designed to prevent water from entering the relief valve port.

American Boats and Yachts Council.

A.1.10. APPLIANCE AND CYLINDER PRECAUTIONS:

a. All LPG consuming appliances shall be CERTIFIED for marine use.

b. A cooking stove is considered to be an appliance however, a cooking stove with an oven shall incorporate an oven flame safety device that will prevent gas from flowing to the oven burner if flame is not present at the oven burner.

c. Appliances designed for unattended operation such as service water heaters and cabin heaters which operate with a continuously lighted pilot light or a continuously energized glow plug shall have been provided to prevent ignition of external vapors and addition of further combustible material to these vapors.

d. Cabin space heaters, service water heaters and other appliances designed for unattended operation shall be of the sealed combustion chamber type, designed to provide complete separation of the combustion products from the atmosphere in the boat.

A.1.11. LOCATION AND INSTALLATION:

a. LPG gas cylinders, regulating equipment and safety equipment shall be suitably secured, readily accessible and so located that escaping vapor cannot reach the bilges, machinery spaces, accommodations or other enclosed spaces.

b. Each installation shall be confined to open decks, cabins, or enclosed spaces.

Equipment shall be protected from contact with gas by a housing welded and unobstructed to the open air, with at least two vents having an aggregate free area equal to one square inch for each 7 pounds of the total LPG capacity of the cylinder, the vents being equally divided on top and bottom. The bottom edge of the lower vent(s) of the door or wall shall be at the floor level.

(1) Boat construction or design preventing the escape, the cylinder, regulating equipment and safety equipment shall be mounted in a locker or housing, or in the bilge, locker or housing located above the waterline or in an open cockpit, the housing or housing root be constructed of or covered with corrosion resistant materials, must not extend only from the top and have a cover which area a gas escape. The cover should be tightly fixed and, if properly made, provide opening and does fit around the cylinder, valves, and for testing of the system for leakage and to permit viewing of the pressure gauge.

American Boats and Yachts Council.

A.1.19. NEVER USE FLAME TO CHECK FOR LEAKS

a. All devices and appliances using LPG shall be substantially secured as to prevent impact or displacement that will place strain upon fuel distribution systems or appliance connections, bearing in mind the great forces placed upon the appliances and devices by the operation of the boat in rough water conditions, or by the boat's motion while at anchor or moored.

American Boats and Yachts Council.