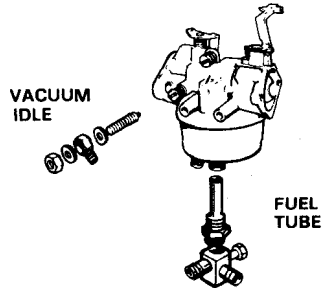


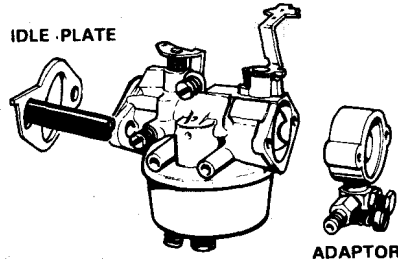
# IMPCO-GARRETSON

# CONVERSION KIT INSTALLATION INSTRUCTIONS

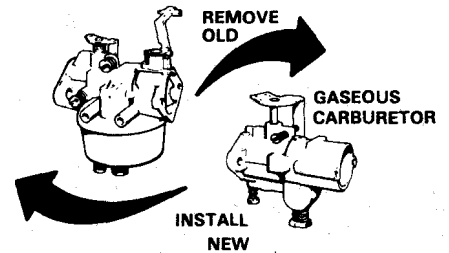
## SPUD-IN METHOD



## ADAPTOR METHOD



## REPLACEMENT METHOD



## GENERAL INFORMATION

PLEASE READ THE ENTIRE INSTRUCTION PROCEDURE BEFORE ATTEMPTING TO COMPLETE THE INSTALLATION

The Impco-Garretson gaseous fuel conversion kits have been designed to provide a basic set of equipment to convert an internal combustion engine to gaseous fuel. Most of the conversions can be accomplished in 30-40 minutes using common hand tools. There are a few instances where an electric drill or threading equipment are need-ed.

As an aid to installation, this procedure is divided into four parts. The first section concerns the actual conversion of the carburetor. The next section concerns proper placement of the zero governor. This is followed by a

series of diagrams showing the recommended piping for various types of systems. The last section details a procedure for first time starting and normal operation.

Although most of the kits are designed for a particular engine model, there is always a chance that because of the specific engine application the conversion cannot be installed as the instructions show. If there appears to be no alternate way to install the kit, either write or call us as we may be able to recommend how to modify the kit or suggest another set of equipment.

## ! WARNING !

THE STANDARD KITS AS SHIPPED CONFORM TO THE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) PAMPHLET 58 REQUIREMENTS FOR USE OF GASEOUS FUELS AS A MOTOR FUEL OUTDOORS. IF THE CONVERTED ENGINE IS TO BE HOUSED IN AN ENCLOSURE OR USED INDOORS, ADDITIONAL EQUIPMENT IS REQUIRED TO POSITIVELY SHUT OFF THE FUEL SUPPLY IF THE ENGINE SHOULD FAIL WHILE UNATTENDED.

ADDITIONALLY, IF ANY MODIFICATION OF THE PIPING SYSTEM FROM THE ZERO GOVERNOR TO THE FUEL SUPPLY IS REQUIRED, CONSULT THE LOCAL GAS SUPPLIER OR THE MOST RECENT COPY OF NFPA PAMPHLET 58.

FOR A COPY OF PAMPHLET 58, WRITE THE NATIONAL FIRE PROTECTION ASSOCIATION, BATTERY-MARCH PARK, QUINCY, MA 02269.

## ! CAUTION !

(1) Thread sealing compound should be used on all pipe thread fittings between the zero governor and the fuel supply, being careful not to get any inside the fittings. This could allow excess compound to collect on valve seats and orifices and cause hazardous leakage and poor performance.

(2) If copper tubing is used, it should be "K" or "L" having a minimum wall thickness of 0.032 inches.

(3) After piping is complete, turn on the gas and use a soap solution to check all fittings for leaks.

# CARBURETOR CONVERSION

The installation procedure for the carburetor section is detailed on an enclosed sheet. After completion of this procedure continue with the next section.

## ZERO GOVERNOR MOUNTING

PLEASE READ THE FRONT PAGE WARNINGS

The Zero Governor should be located according to the recommendations included with it. If this sheet is not available, please follow the following suggestions.

The Zero Governor should be mounted as close to the carburetor as possible with the diaphragm oriented in a vertical plane. This helps to minimize the effects of gravity on diaphragm travel. The unit should also be placed for easy access to the lock-off adjusting screw and primer if provided.

Refer to the piping diagram for the recommended piping system; and before installing the fuel supply line, be sure that the gas pressure is no more than the maximum inlet pressure shown on the cover of the zero governor. If the pressure is greater, leakage could result in a fire hazard and or hard starting.

Flexible piping to the inlet should be used to prevent cracking from vibration if the zero governor is mounted on the engine or

other vibrating surface. Also piping to the inlet should be of sufficient size to allow full flow to the zero governor. This is very important in natural gas installations as any restrictions smaller than the zero governor orifice can affect engine performance. If a solenoid valve is used ahead of the zero governor in the low pressure line, it should have an orifice at least as big as the orifice in the zero governor.

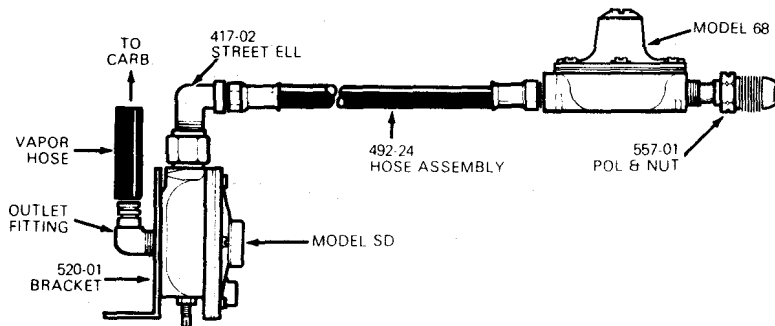
When an electric solenoid primer is used, follow the wiring and adjusting instructions furnished separately.

Select and install the outlet fitting into the zero governor taking care not to allow any dirt to enter the outlet. Some zero governors may already have a fitting installed at the factory.

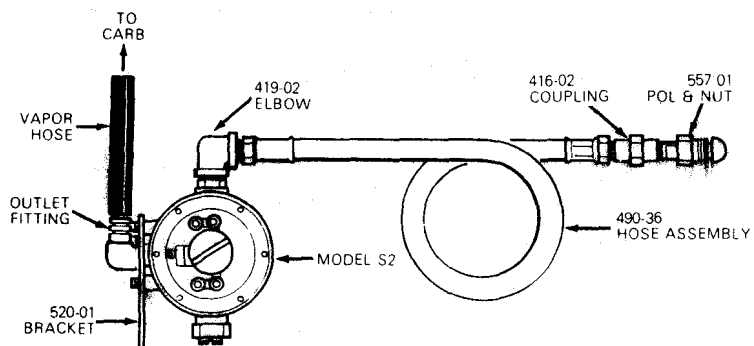
After installation of the fuel hose between the zero governor and the carburetor turn on the gas and test the system for leaks at the piping joints using a soap bubble solution or suitable gas detection device.

## STANDARD PIPING

### MODEL SD AND 68 REGULATOR



### MODEL S2



# PRINCIPLES OF GASEOUS CARBURETION

The Impco-Garretson systems of gaseous fuel carburetion are designed to run internal combustion engines with gaseous fuel in the simplest, most economical manner for top performance and lowest emissions.

The Garretson systems operate using the venturi principle. As air is drawn into the engine by the piston, it must pass through a venturi which creates a vacuum proportional to the amount of air being used. Whereas the vacuum created by the venturi in a liquid fuel system acts on a float and needle valve to draw in fuel, the vacuum in a gaseous system acts upon a diaphragm in a fuel controller (zero governor). As the diaphragm is drawn toward the source of the vacuum, an attached lever opens a valve and allows the gaseous fuel to flow through to the carburetor. The proper fuel-air mixture is then obtained by a mixture adjustment in the fuel line between the fuel controller and the venturi.

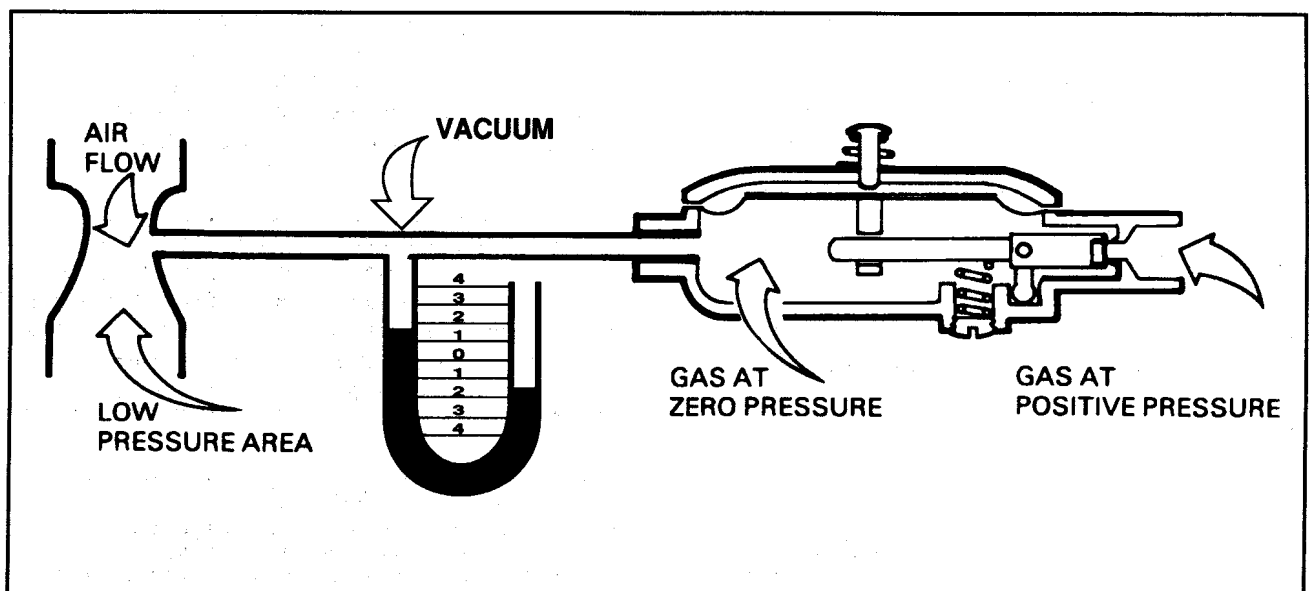
This sounds very simple, and it is. However, the key to satisfactory performance in the venturi system is the sensitivity of the fuel controller throughout its operating range. A properly set fuel controller (zero governor) using a rubber seat and spring tension against an orifice will shut-off the flow of fuel when the engine is not running. Yet the slightest amount of vacuum should cause the seat to move and allow gas to flow. If the spring force is too great and requires greater vacuum to open the device, a flat spot or sluggish progression off idle will develop with a possibility of lean mixtures and power losses at full load. Also, if the fuel controller allows fuel to leak through at shut-down, hard starting and the danger of fire will result. In either case, the fuel

controller should be re-adjusted per the specific instructions for the unit.

Besides a sensitive fuel controller, an accurate and constant fuel pressure leading into the fuel controller is vital for top performance. In remote tank supplied LP-Gas systems a primary regulator feeds the fuel controller a constant pressure regardless of tank pressure or flow. Most natural gas and domestic LP-Gas installations have a constant pressure regulated at the storage equipment, eliminating the need for a primary regulator.

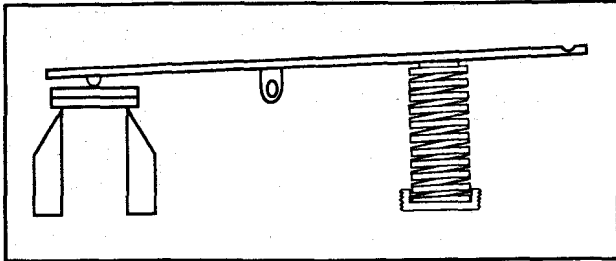
Although there are other methods or designs of gaseous carburetion, we feel that the venturi principle provides a simple, easy to service conversion with no need to sacrifice performance or exhaust emission levels. A properly adjusted venturi system can produce results comparable to other more complicated systems.

There are three ways to convert a venturi system from liquid to gaseous carburetion, either the spud-in method, adaptor method or replacement carburetor method. The spud-in kits use the existing gasoline venturi with a fuel delivery tube installed in the area of greatest vacuum. The adaptor method uses a special venturi and is placed between the carburetor and the air cleaner. The replacement method uses a specially designed carburetor to replace the existing gasoline carburetor.



# ZERO GOVERNORS

The heart of a venturi type gaseous carburetion system is the zero governor. Zero governors may be known by many names including fuel controllers, vacuum regulators, demand regulators, last stage regulators, second stage regulators or negative regulators.



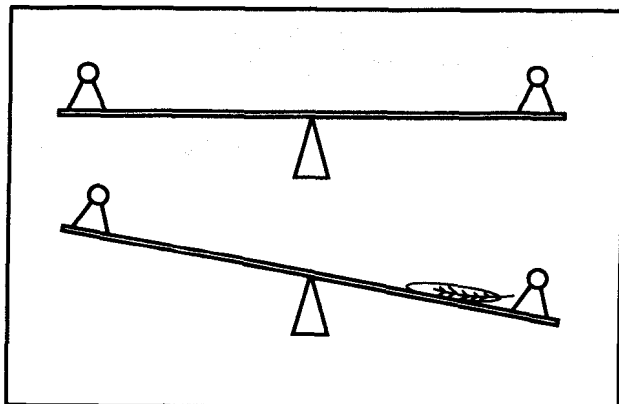
Regardless of the name, all have the same function. The zero governor serves the same purpose in a gaseous fuel system as the float and needle valve in a gasoline carburetor. Both regulate fuel flow from the fuel inlet into the main fuel jet. In a gasoline system, the float and needle valve allows the liquid fuel level (pressure) to vary as needed to meet the fuel demands of the venturi. Using gaseous fuels, this job must be done with a vacuum sensitive diaphragm and a very sensitive relief valve, holding a pressure level of zero or at slightly sub atmospheric pressure.

While a zero governor has the same basic elements of a common pressure regulator; namely, a diaphragm (sensing element), a spring (loading element), and seat-orifice (restricting element), they differ in their relationship to each other.

In the common pressure regulator, when pressure is applied to the inlet, fuel flows through the outlet if it is not plugged or restricted. This is not the case with a zero governor. Fuel will not flow unless vacuum is applied to the diaphragm chamber.

In a zero governor, a round orifice and a flat rubber seat to control fuel flow are attached to one end of a lever. A pivot pin with spring force is attached to the other side of the lever.

A zero governor can be visualized as a teeter totter or seesaw with a fifty pound child on each end of the lever. Equal forces balance the lever. The system is balanced by the fuel pressure trying to force the valve open and the spring tension acting to keep the valve closed. A small amount of force applied to one end of the lever will upset the balance and cause movement.



This force occurs when the venturi suction applied to the diaphragm causes the higher atmospheric pressure on the opposite side to move the diaphragm towards the lever. When the diaphragm applies force on the spring end of the lever, the balance is upset, the relief valve opens and gas is allowed to flow.

If gas pressure greater than the spring force is applied to the inlet, the excess pressure forces past the orifice and causes a leaking condition. However, if too much gas pressure flows into the body case, the diaphragm lifts and assists the spring in closing the valve.

**A zero governor can not be designed as a safety device because several factors can cause it to function improperly.**

The most common cause of trouble is dirt on the seat. Dirt in this area can hold the rubber seat open and allow fuel to flow continuously resulting in unsafe operating conditions as well as causing flooding and hard starting condition. Conversely, if the spring force is excessive, it requires much more vacuum to move the diaphragm causing the engine to be too lean to idle properly or develop a flat spot when progressing from idle.

If the primary pressure applied to the orifice increases or decreases for some reason, and the spring force is not adjusted, this can upset the balance and cause gas to leak through or be locked off too tightly.

Every detail of the zero governor's design; parts, materials and manufacturing methods, must be carefully considered. The diaphragm should have as much area as practical. It must also be strong, yet flexible for sensitivity. It should be resistant to the gas and various contaminants and have good mobility to operate the lever. Garretson produces diaphragms with molded convolutions from silicon rubber material which are flexible down to a temperature of -50 degrees Fahrenheit.

The rubber seat must be flat with a good surface finish and soft enough to seal without excessive force but not so soft that it will indent and make a "footprint".

The orifice must also be flat with a good finish, and sharp, but not so sharp that it will cut the rubber seat. The seat should move against the orifice squarely with a spring that has a fairly constant force or "rate".

We have many different sizes and styles of zero governors in our line which can be used with propane and natural gas at various pressures to suit many sizes of engines and applications.

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## WARNING

**The settings on the zero governor and the primary regulator are made at the factory on each and every product. Please do not attempt to change these settings unless you have the tools, gauges and experience. Never attempt to richen or lean the main fuel air mixture with the spring adjustments of the regulating devices.**

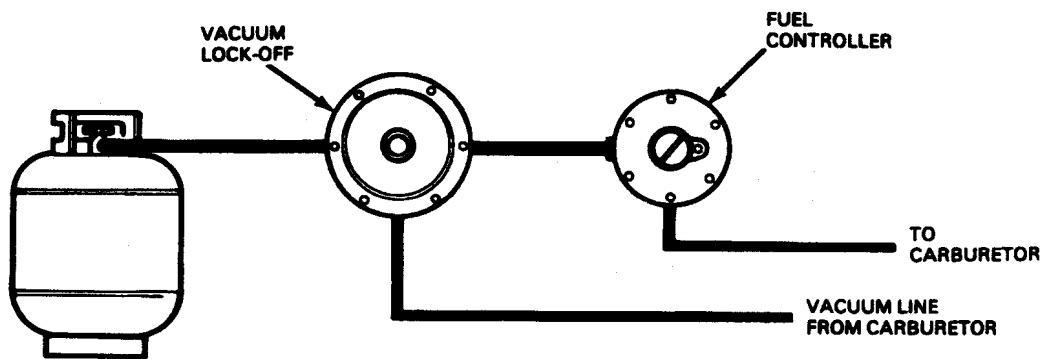
# SAFETY REQUIREMENTS

All Impco-Garretson fuel control equipment should be installed and maintained per all federal, state, local laws and codes, and NFPA Pamphlet 58. All of these include a standard which states for indoor installations, an atmospheric zero governor is not considered a positive shut-off valve and an approved automatic shut-off shall be installed to assure that the flow of fuel will be stopped should the engine fail while unattended. For a copy of Pamphlet 58, write the National Fire Protection Association, One Batterymarch Park, Quincy, MA 02169-7471, or call 1-800-344-3555 Toll Free Phone, 1-617-770-3000 Phone, 1-617-770-0700 Fax.

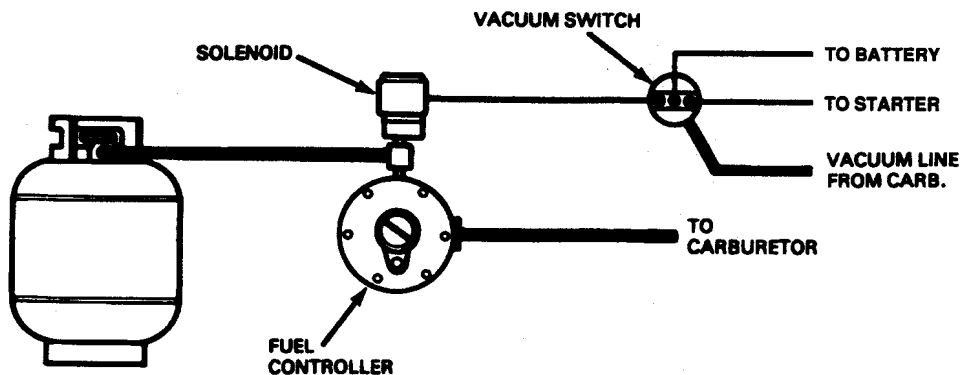
There are two basic ways to sense engine operation, manifold vacuum and engine oil pressure. Because of the difficulty obtaining an oil pressure source on smaller engines, most systems are designed for use with vacuum. Pictured below are two basic vacuum systems, one with electrical components, the other with a non-electrical vacuum operated shut-off.

## TYPICAL INSTALLATION

### VACUUM OPERATED LOCK-OFF



### VACUUM SWITCH & SOLENOID



**Idle Fitting** - Replaces gasoline idle adjusting screw

**Carburetor Adaptor** - Fits between carb and air cleaner

Kit # 650-242

Connects to Tank

Model SD ↑  
Fuel Controller

**Idle Plate** - Fits between carb and Block or manifold

Kit # 730-114

**Carburetor Adaptor** - Fits between carb and air cleaner

Model KN →  
Fuel Controller

Kit # 650-281

Connects to Tank

Model S2 →  
Regulator/Fuel Controller

Typical liquid withdrawal kit using the 083 air heated vaporizer and the low pressure conversion kit.

**Carburetor Half** - Replaces top half of gasoline carburetor

**Idle Fitting** - Takes the place of gasoline idle adjusting screw

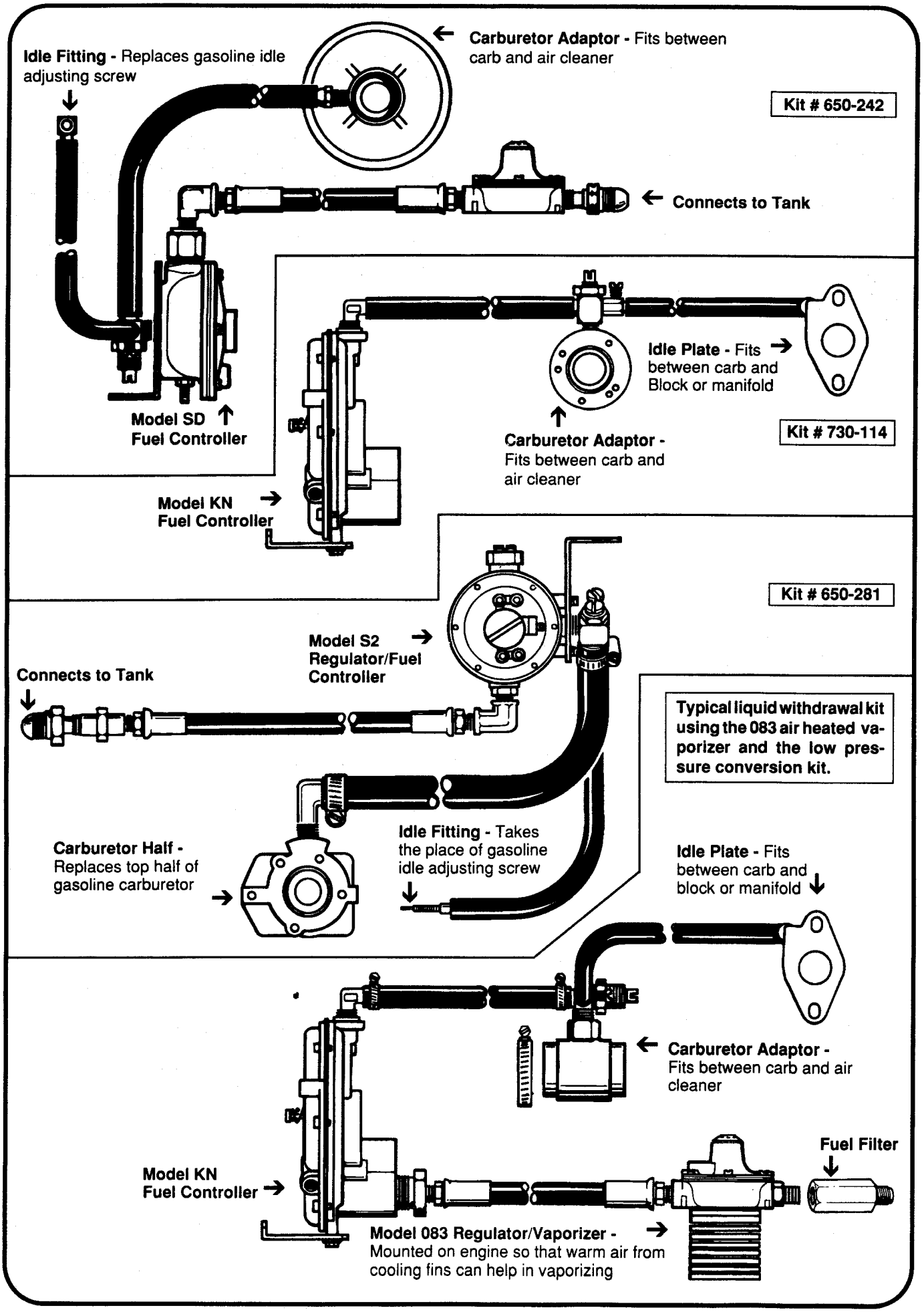
**Idle Plate** - Fits between carb and block or manifold

Model KN →  
Fuel Controller

**Carburetor Adaptor** - Fits between carb and air cleaner

**Model 083 Regulator/Vaporizer** - Mounted on engine so that warm air from cooling fins can help in vaporizing

**Fuel Filter**

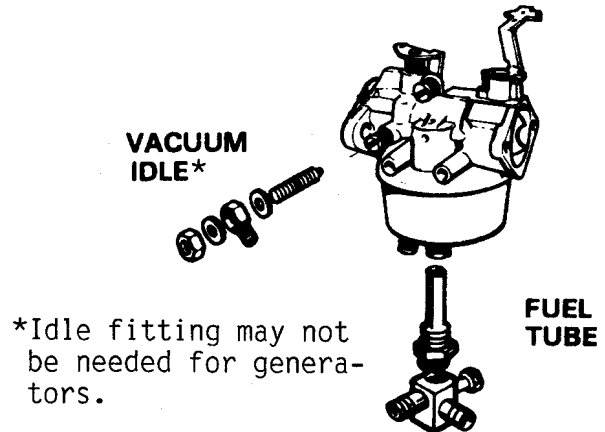


# 3 WAYS TO CONVERT GASOLINE ENGINES TO GASEOUS FUELS

The three methods of conversion all use a venturi to produce the vacuum which opens the fuel controller and allows gas to flow into the air stream. In spud-in conversions the venturi in the gasoline carburetor is utilized. Specially designed venturis are supplied with adaptor and carburetor conversion kits.

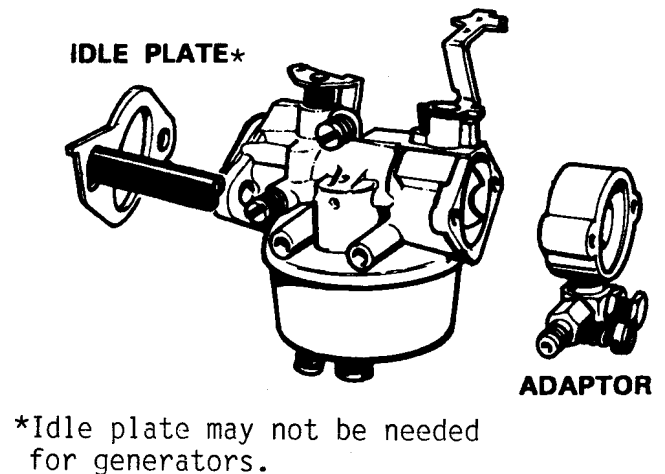
## SPUD-IN CONVERSION

The spud-in system is normally the lowest cost method of conversion, but not necessarily the easiest. We have done everything possible to design our fuel tube so they can be easily installed. You may have to enlarge a hole with a drill bit. Thread tapping is seldom required with any Impco-Garretson spud-in kit.



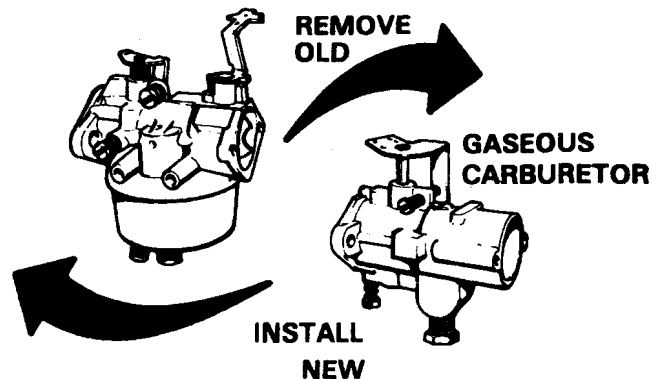
## ADAPTOR CONVERSION

Cost and installation time of the adaptor method usually falls between the other two methods. Installation requires the mounting of an idle plate between the gasoline carburetor and the engine. The carburetor adaptor is installed between the gasoline carburetor and the air cleaner. The adaptor method should be chosen for dual-fuel operation or for the option of converting the engine quickly back to gasoline in the future. At the highest RPM's the adaptor method may cause a slight loss of power because of the greater air restriction due to two venturis in the system.



## CARBURETOR REPLACEMENT

The LP-Gas and Natural Gas carburetor kits give the best consistent power and performance and are the easiest to install. You simply replace the gasoline carburetor with a new carburetor containing the correct venturi for the engine and application. The carburetor kits are considered the best value of the three methods; however there are no carburetors for foreign engines and only limited carburetors for American engines.



## COMMON SERVICE CALLS

**I have a vapor withdrawal kit and the engine runs fine for a while and then frost starts to form on one or both of the regulating units. Is it possible the vapor pressure reduction and flow is causing this?**

No, frost is always caused by drawing liquid from the tank. We have had many calls on this over the years and it is always the same problem. Your tank may be over filled or oriented wrong.

**Engine won't start or is hard to start:**

More starting problems are caused by over priming or dirt on one of the regulating seats causing gas to leak through. If propane or natural gas make up more than 10% of the fuel-air charge, the spark plug will not ignite the mixture — it is too rich. Propane and natural gas require from 50% to 100% higher temperature to ignite a charge as compared to gasoline. The ignition must be in good shape.

**Engine runs but won't come up to full speed or power:**

In most cases poor power is caused by a mixture that is too lean. This lean mixture is often caused by too many pressure regulators in the system or some small or restrictive fitting causing poor flow.

Almost all kits are designed so that the engine will lose power if the load adjusting screw is opened too far.

Our propane kits are made to connect to full propane tank pressure. If you want to install the kit by connecting into a pressure line at a reduced pressure, call us.

**I can get the engine to run at one speed and load okay, but it won't run right if I try to speed it up or slow it down:**

This is probably caused by your getting the idle screw open too far, and the load screw turned in too far. This wrong combination will run the engine at one speed and load. You should close off the idle screw completely, open the main load and get the engine running okay at governed speed. Slowly reduce the speed and as the engine tends to run a little rough, open the idle needle screw just enough to make it run smoothly. Keep working the speed down and keep the idle needle screw adjusted until you reach the desired idle speed.

**My engine was idling too fast so I closed down on the idle mixture screw to reduce the speed but it runs rough:**

Never attempt to control idle speed with idle mixtures. Idle speed should be controlled with the idle stop screw near the governor. This adjustment controls the throttle butterfly valve opening at idle and in turn the idle air flow. At that air flow, always set the gas idle mixture screw for fastest speed.

**How much fuel will my engine use?**

There is a rule of thumb that an engine will consume about 1 gallon of propane per hour for every 10 horse power developed.

Some engine manufacturers recommend that the positive rotators be removed from the exhaust valves when converting to gaseous fuels.

## HELPFUL INFORMATION

### **PRESSURE FACTS**

Simply stated, pressure is the force exerted by a gas or liquid attempting to escape from a container. It is useful to know how strong this "attempt to escape" is. Pressure can be measured with a manometer or with a pressure gauge. At the lower levels, it is expressed in "inches of water column", i.e., 1 1" W.C. Higher pressure is expressed in terms of the force exerted against a square inch of area. For example, "125 pounds per square inch" (125 psi).

### **PRESSURE EQUIVALENTS**

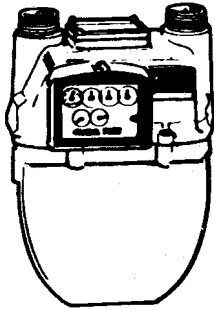
1" Water Column = .58 oz./sq. in.  
 1 1" Water Column = 6.35 oz./sq. in.  
 11" Water Column = .40 lb./sq. in.  
 1 lb./sq. in. = 27.71" water column  
 1 lb./sq. in. = 2.04" Mercury  
 1" Mercury = .49 lb./sq. in.  
 1 Std. Atmosphere = 14.73 lb./sq. in.

<b>Technical Data — LP Gas</b>					
<b>Physical Properties at 60° F.</b>	<b>Butane</b>	<b>Propane</b>	<b>Gasoline</b>	<b>Natural Gas<sup>θ</sup></b>	
Chemical Formula C <sub>n</sub> H <sub>(2n + 2)</sub>	C <sub>4</sub> H <sub>10</sub>	C <sub>3</sub> H <sub>8</sub>	C <sub>5</sub> H <sub>12</sub> / C <sub>12</sub> H <sub>26</sub>	CH <sub>4</sub>	
Normal Atmospheric State	Gas	Gas	Liquid	Gas	
Boiling Point	+32°F.	-44°F.	+97°F. initial +400° end point.	-259°F.	
Octane Number (research)	94	110 plus	82 to 100	110 plus	
Weight per Gallon (lbs)	4.81	4.24	6.16	2.65	
BTU's per Gallon	102,032	91,547	124,600	63,310	
BTU's per Pound	21,212	21,591	20,227	23,890	
Specific Gravity of Gas. Air = 1 (vapor)	2.04	1.55	4.25	0.554	
Specific Gravity of Liquid Water = 1	0.576	0.508	0.739	0.308	
Range of Flammability* % in air, by volume	1.9 to 8.6	2.4 to 9.6	5 to 15	5 to 15	
Self Ignition Temperature	890°F.	950°F.	860°F.	1300°F.	
Chemically					
Correct	<u>By Weight</u>	15.45	15.66	15.05	16.75
Air Fuel Ratio	<u>By Volume</u>	30.94	23.80	59.50	10.58
BTU's per Cubic Foot	3264	2516	6390	1096	
Cubic Feet per Gallon	31.26	36.39	19.50	57.75	
Cubic Feet per Pound	6.49	8.58	3.17	23.56	
* Acetylene C <sub>2</sub> H <sub>2</sub> ( reference only) 2.5 to 80.0 is range of flammability <sup>θ</sup> Principally Methane gas					

# TYPES OF GASEOUS FUELS AVAILABLE

The exact kit you will require will depend upon your available fuel supply. We recommend the use of liquid withdrawal LP-Gas only where the tank must be small in relation to the engine demand or where LP-Gas is used below zero weather from a relatively small tank.

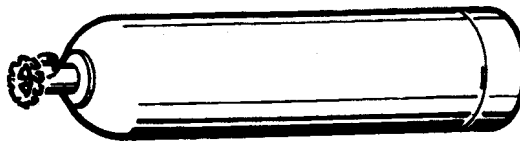
Our kits for Natural Gas and LP-Gas at reduced pressure are set for 6 ounces pressure. If your gas pressure is greater, please specify the pressure you will use.



**NATURAL GAS  
or MANUFACTURED GAS  
6 oz. - 11" WATER COLUMN PRESSURE**



**VAPOR  
WITHDRAWAL  
LP-GAS  
250 LBS.  
PRESSURE**



**COMPRESSED NATURAL GAS  
UP TO 3000 LBS. PRESSURE**

	Vapor Pressure, PSIG														
	Outside Temperature, Degrees Fahrenheit														
	-30	-20	-10	0	10	20	30	40	50	60	70	80	90	100	110
100% Propane	6.8	11.5	17.5	24.5	34	42	53	65	78	93	110	128	150	177	204
70% Propane 30% Butane	--	4.7	9	15	20.5	28	36.5	46	56	68	82	96	114	134	158
50% Propane 50% Butane	--	--	3.5	7.6	12.3	17.8	24.5	32.4	41	50	61	74	88	104	122
70% Butane 30% Propane	--	--	--	2.3	5.9	10.2	15.4	21.5	28.5	36.5	45	54	66	79	93
100% Butane	--	--	--	--	--	--	--	3.1	6.9	11.5	17	23	30	38	47

**Pressure Facts** - We take advantage of the fact that pressure "attempts to escape," and use it to move gas along the pipe or tubing to the engine. Outside temperature greatly affects container pressure. Too low a container pressure means that not enough gas is able to get to the engine. The table above shows vapor pressures for different gas mixtures at various outside temperatures.

# TERMS AND DEFINITIONS

**Absorption Oil:** See *Heavy Ends*

**Air Cleaner Pressure Drop:** The negative pressure effect caused by the restrictive action of the air cleaner element. The effect will increase as the element becomes dirty and can cause rich mixtures and poor operation.

**Air Vaporizer:** See *Vaporizer-Regulator*

**Balance Tube:** To compensate for excessive air cleaner pressure drop or a positive pressure created by an intake blower, a tube is run between the atmospheric vent on the fuel controller and the intake manifold ahead of the carburetor.

**Carburetor Adaptor:** A venturi section placed between the gasoline carburetor and air cleaner that will allow the gasoline carburetor to remain intact so the engine can be run on gasoline or gaseous fuels.

**Carburetor:** Also known as a fuel-air mixer. It is the section of the engine intake system where fuel and air are mixed and passed on to the engine for combustion.

**Choke:** A variable restriction in the air intake to increase the pressure drop (vacuum) in the carburetor.

**Converter:** See *Vaporizer-Regulator*

**Economizer:** A device to create a leaner mixture during part load operation where a richer mixture is desired at full load.

**Excess Flow Valve:** A safety device generally located at a pressurized fuel tank which restricts or shuts off the fuel flow if the discharge rate exceeds a certain figure in the event of a line rupture.

**Exhaust Analyzer:** A device that measures the carbon monoxide level in the exhaust gases and indicates the leanness or richness of the air-fuel mixture entering the engine. It can also be equipped to measure hydro carbons.

**Filter Lock:** Combination fuel filter and safety shut-off.

**Fuel Controller:** Common term used to describe a unit which contains an atmospheric zero governor.

**Fuel Filter:** A unit placed in a fuel line to remove dirt and rust picked up from the tank or service fittings.

**Heavy Ends:** This is a residue picked up by propane from lubricated valves and compressors. It will sometimes collect inside the fuel controller where the pressure is sub-atmospheric.

**Idle Plate:** A thin Plate inserted between the carburetor and the engine to obtain a vacuum source or provide an idle gas inlet.

**Liquid Withdrawal:** Used to describe fuel systems where the fuel is drawn from the liquid section of the storage tank.

**Lockoff Valve:** A device either electrically or vacuum operated to positively shut-off the flow of fuel if the engine should fail while unattended.

**Primary:** See *Regulator*.

**Primer:** A feature included on most zero governors, to allow fuel flow prior to cranking the engine as a starting aid.

**Regulator:** This term applies to the pressure reducing device or section in a fuel system that reduces the tank pressure down to the rated inlet pressure required by the atmospheric zero governor or pressure carburetor.

**Secondary:** See *Zero Governor*.

**Shut-Off Valve:** See *Lockoff Valve*.

**Solenoid Valve:** An electrically operated shut-off device used in connection with a manifold sensing vacuum switch or oil pressure switch to positively shut off the flow of fuel should the engine fail.

**Spud-In:** A method used to convert a gasoline carburetor to gaseous fuel by placing a tube at the small section of the venturi.

**Vapor Withdrawal:** Describes a fuel system where the fuel is drawn from the vaporized gas section of the storage tank.

**Vaporizer-Regulator:** A device which includes a regulator and a heat exchanger to convert liquid propane to gaseous state and reduce the pressure. These devices will sometimes include zero governors and are called converters.

**Venturi:** A symmetrical restriction in the intake manifold or carburetor which produces a pressure drop (vacuum) and draws fuel into the airstreams. The amount of fuel drawn in is in proportion to the volume and speed of the air passing through the venturi.

**Zero Governor:** This unit is sometimes called a fuel controller or secondary. It is a vacuum demand device which is normally shut when the engine is not running. Venturi vacuum or intake manifold pressure drop causes it to open and flow fuel at a zero or negative pressure. This device is not considered a satisfactory shut off for indoor installations.

# ADAPTOR CONVERSION METHOD

All adaptor conversions use the same basic installation procedure. You will install the adaptor between the carburetor and the air cleaner.

- 1-Remove the air cleaner assembly
- 2-Add stud extenders onto carburetor studs or replace existing studs with longer studs.
- 3-Install gasket onto studs against carburetor.
- 4-Install adjustable load fitting into adaptor pointing hose end in direction of regulator. In some cases if the load adjustment is too hard to adjust because of the air cleaner, you may have to put the adjustable load fitting on the outlet of your regulator.
- 5-Slide adaptor onto studs.
- 6-Hook up vapor hose from adaptor to outlet of regulator.
- 7-Install gasket next to adaptor.
- 8-Replace air cleaner assembly.

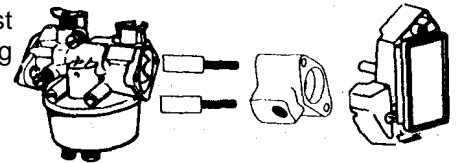
Note-The adaptor spaces the air cleaner out about one inch. On some engines the fresh air hose that goes from the air cleaner to engine may be too short. Some kits have a metal tube so that you can cut the hose and use the tube to extend the hose to a new length and reconnect to air cleaner.

If your kit doesn't have an extension tube or if it is the wrong size you will have to provide your own size tube to extend the fresh air hose.

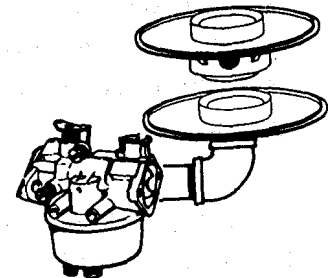
Note-The frame of some generator sets is too close to the air cleaner so you will have to cut out the frame to allow for air cleaner clearance.

Note-The direction of air flow through the adaptor venturi is important. The smallest tapered opening is toward the air cleaner. The largest cavity is towards the carburetor.

## Typical two bolt adaptor



## Briggs and Stratton with round air cleaner.



Note-If your kit comes with an idle plate, it goes in between the carburetor and the intake manifold.

If your kit comes with an idle fitting, it usually replaces the idle mixture screw on the gasoline carburetor.

If your kit has an idle fitting and you want to retain the function of the gasoline carburetor, then you can drill and tap your idle fitting into the intake manifold.

Run idle hose between the idle plate (or idle fitting) and idle adjustment built into the load block.

Note-Most generator sets are constant speed and do not need an idle circuit so one may not be provided in your kit.

If your generator has an idle-down feature it is not recommended to use it on a residence because of low voltage output at idle.

Many generators will still idle-down without idle circuits.

## DUAL FUEL OPERATION

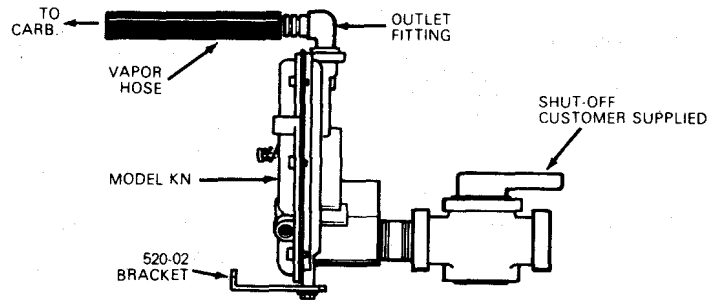
With the adaptor method dual fuel options are available because you do not modify the gasoline carburetor.

To run propane simply turn off gasoline supply, usually a valve at the bottom of the gasoline tank. Run engine until gasoline in carburetor is depleted. Then turn on propane supply and start.

Note-Some engines may not run well on gasoline after the adaptor is installed because of the reduced air flow through the adaptor. With new gasoline carburetors there are no adjustments to compensate for this.

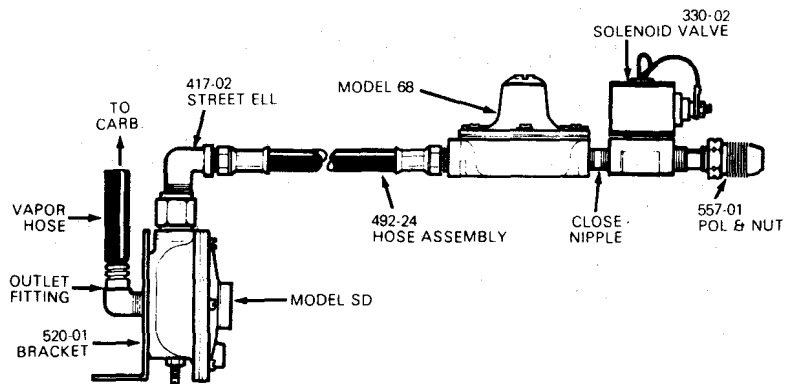
If your engine runs poorly on gasoline it may be necessary to remove the adaptor when running on gasoline.

**MODEL KN**

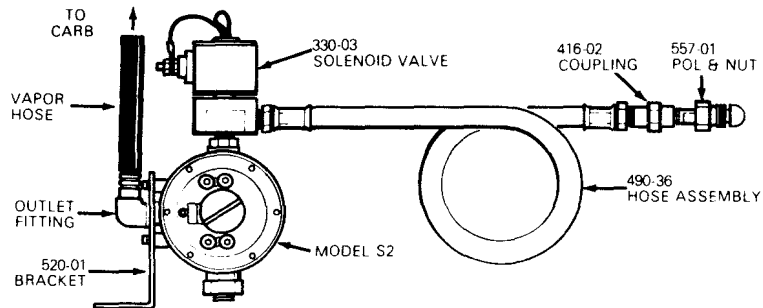


## STANDARD PIPING WITH SOLENOID VALVE

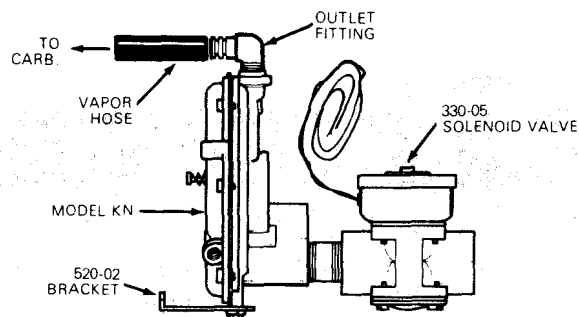
**MODEL SD  
AND  
68 REGULATOR**



**MODEL S2**



**MODEL KN**



## FIRST START UP

The first time starting procedure is not an exactly defined process for each and every kit. However, there are certain steps which can help to get the engine running well enough to make fine tuning adjustments. The objective is to make some approximate mixture settings and attempt to start the engine. Then depending on the results, either make further rough adjustments or proceed to the fine tuning.

**Step 1.** Turn both the main load and idle gas needle screws in finger tight. Then open the larger or main load screw three to four turns. Next open the idle gas screw 2 to 2 1/2 turns. (Some kits do not have idle systems.)

**Step 2.** Turn on the fuel supply and depress the primer button on the zero governor for an instant (approx. 1 sec.) and start the engine. If the engine fires but does not continue to run, turn the main load screw out 1/2 turn, re-prime if necessary,

and re-start. This step may have to be repeated several times to allow the engine to run well enough to proceed to the next step.

**Step 3.** Adjust the main load screw for maximum RPM and smoothest engine performance at governed speed. In most cases, turning the screw in leans the mixture and out enriches it.

**Step 4.** If the engine is required to run at idle speed, slowly let the engine return to idle speed. Adjust the idle gas needle screw to obtain a smooth idle operation. To set the proper idle speed, adjust the idle air adjustment on the throttle shaft. Do not attempt to set speed with the gas mixture adjustment.

**Step 5.** To check the adjustments, put the engine under its normal load and re-check the main load adjustment then return to idle and re-check this setting.

## NORMAL OPERATION

To start the engine, depress the primer button on the zero governor (if provided) and start the engine. **DO NOT USE A CHOKE**, as it will most likely cause flooding.

When stopping the engine, if it is manual start and not equipped with a solenoid valve, turn off the fuel supply valve. Do not ground the ignition or choke the engine. For those engines that are equipped with solenoid shut-off valves, this is not a requirement but the supply valve should be closed if the engine will be left out of operation for an extended period of time.

**REMINDER.** When an engine is operated on gaseous fuels, it is possible for the engine to run unattended for a long period of time. This could lead to a dry oil pump and the possibility of damaging the engine. To avoid this hazard, check the crank-case oil level at least every 5 hours of operation or have a reserve supply system installed. Also keep the air filter clean and avoid getting dirt in the system at any point as this is the cause of most carburetion problems.

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