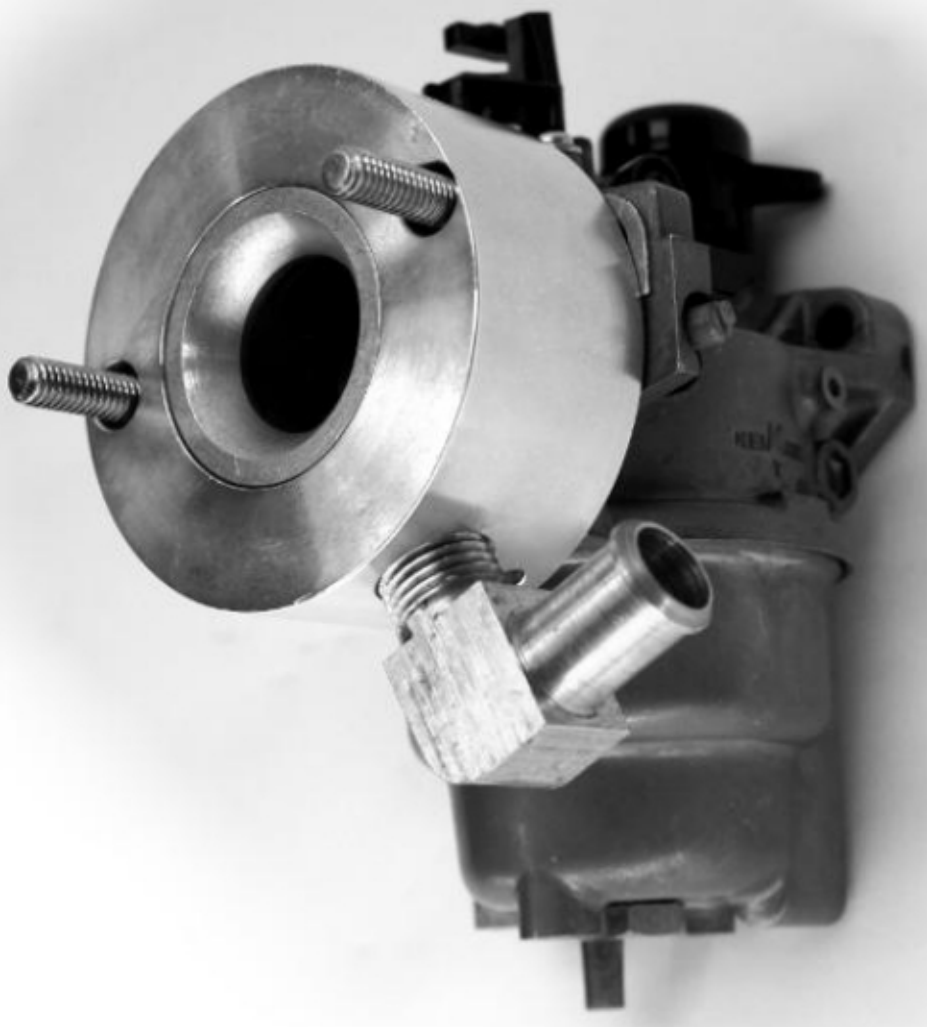
NashFuel™

PROPANE FUEL CONVERSION KITS

www.nashfuel.com

CONVERSION KIT INSTALLATION INSTRUCTIONS

ADAPTER METHOD



GENERAL INFORMATION

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

Our conversion kits have been designed to provide everything you need to convert an internal combustion engine to propane or natural gas. Most conversions can be accomplished in 30-40 minutes using common hand tools.

To aid in installation, these instructions have been divided into multiple parts for installation, startup, troubleshooting etc. This manual contains diagrams and information we have found to be helpful for installations.

Although our kits are designed for particular engine models, there is always a chance that due to specific engine applications or design, the kit can not be installed as instructions show. If there appears to be no alternate way to install the kit, contact us as we may be able to recommend modification or different equipment.

Website: www.nashfuel.com
Phone: 859-881-0509
Tech Support: jerry.nashfuel@gmail.com

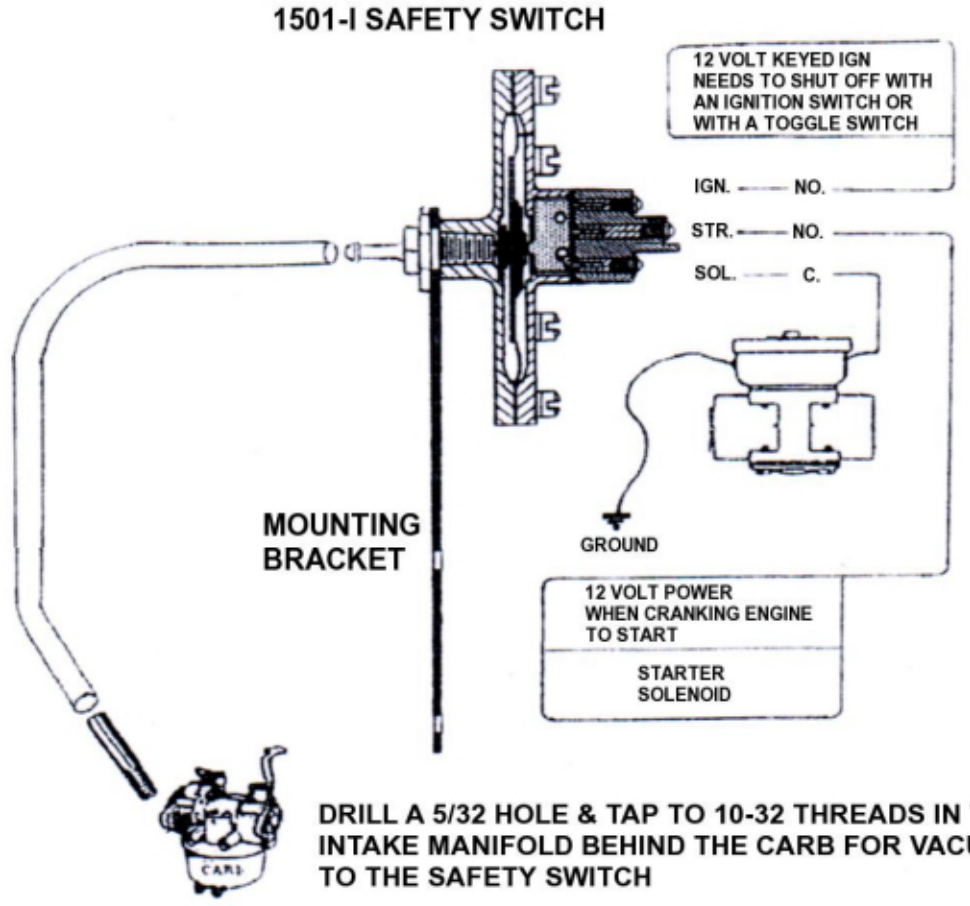
SAFETY REQUIREMENTS

All fuel control equipment should be installed and maintained per all federal, state, local laws and codes, and NFPA Pamphlet 58 (www.nfpa.org). 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 flow of fuel will be stopped should the engine fail while unattended.

If the inlet pressure is correct, the KN regulator will hold the fuel back until engine vacuum is sensed, then it will deliver fuel upon engine demand. Even though the KN regulator operates in this manor, it still does not qualify as a positive shut-off system for indoor operation.

Our automatic shut-off systems are designed for use with vacuum. Pictured here is an example of a basic vacuum system. Starting the engine will create vacuum, this vacuum will draw on the micro vacuum switch allowing power to be sent to the low pressure 12v lock off. If the engine dies, it will lose vacuum and the micro switch will signal for the lock off to close.

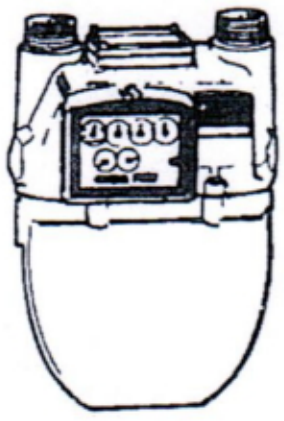
1501-I SAFETY SWITCH



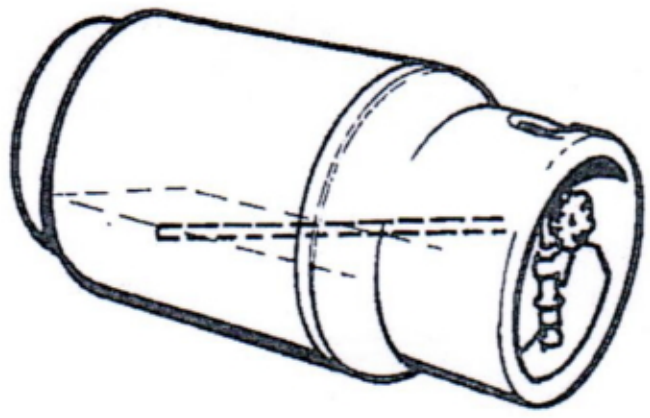
DRILL A 5/32 HOLE & TAP TO 10-32 THREADS IN THE INTAKE MANIFOLD BEHIND THE CARB FOR VACUUM TO THE SAFETY SWITCH

FUEL TYPE

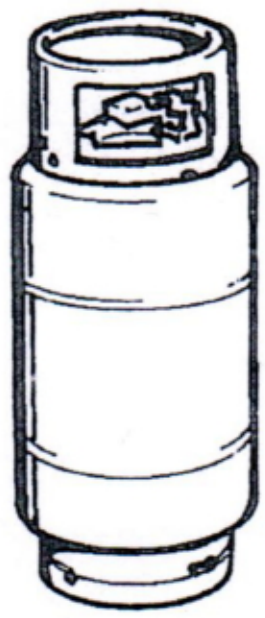
The KN regulator is designed for a maximum inlet pressure of 13.8" water column, and is only compatible with propane or natural gas <u>vapor</u> applications. Tri-fuel conversion kits have an extra regulator to bring high pressure vapor propane down to 12" water column. An air heated regulator is required for liquid applications. Below are a few examples of gaseous fuels.



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

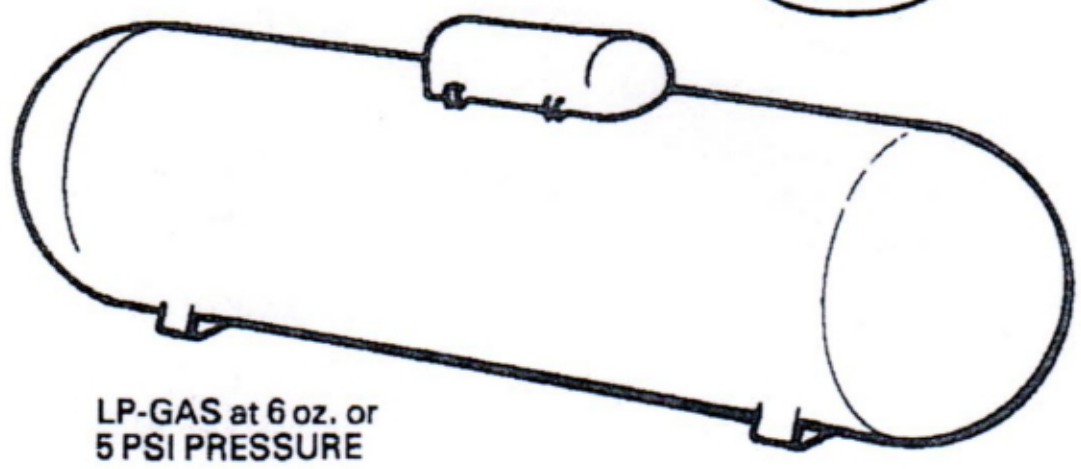


LIQUID WITHDRAWAL
LP-GAS
250 LBS. PRESSURE



VAPOR
WITHDRAWAL
LP-GAS
250 LBS.
PRESSURE

COMPRESSED NATURAL GAS
UP TO 3600 LBS. PRESSURE



LP-GAS at 6 oz. or
5 PSI PRESSURE

ZERO GOVERNOR REGULATOR MOUNTING

The zero governor should be located according to the recommendations included with it. If this sheet is not available, please follow these 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.

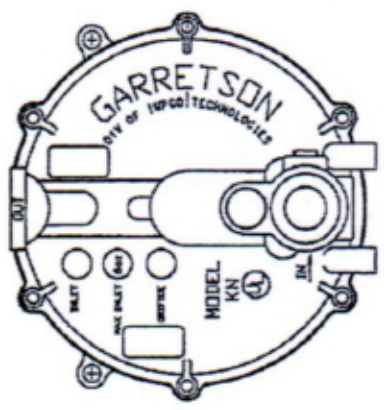
Flexible piping to the inlet should be used to prevent cracking from vibration if the zero governor is mounted on the engine or other vibrating surface. Also, piping to the inlet should be of sufficient size to allow full flow to the zero governor. This is very important in natural gas installations 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.

Important!!!! Mount the regulator in any direction except flat.



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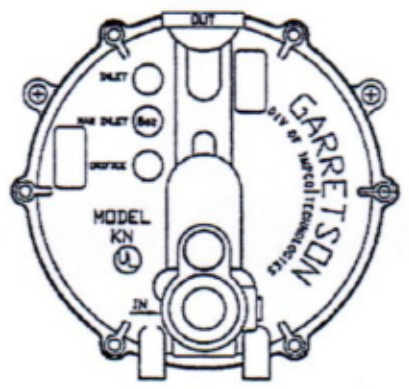

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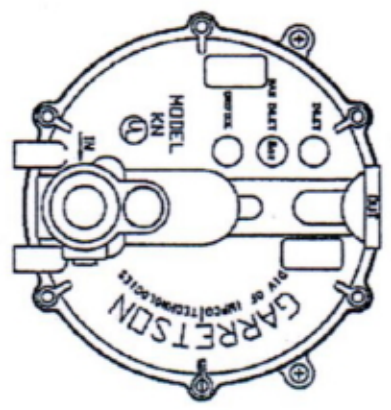

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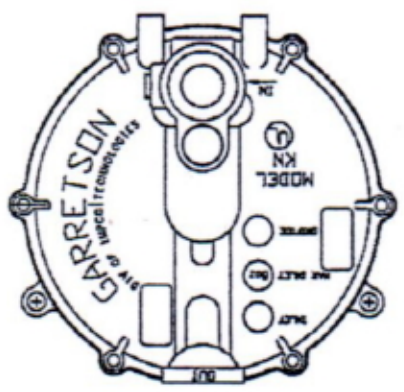

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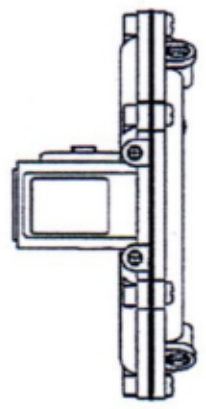

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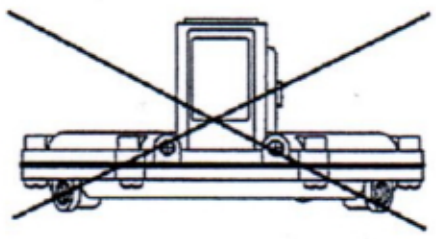


NOT OK

ADAPTER INSTALLATION

All adapter conversion kits use the same basic installation procedure. The venturi adapter will install between the carburetor and the air cleaner. You can find illustrations of a venturi installation on pages 8 and 9.

1. **Remove the air cleaner assembly.**
2. **Install stud extensions or replace existing studs with longer studs**
3. **Install gasket onto studs against the gasoline carburetor**
4. **Install the fuel inlet fitting onto the venturi adapter**
5. **Slide the adapter onto the studs (make note of the flow directlion on the adapter)**
6. **Install vapor hose between the load block on the regulator and the fuel inlet fitting on the venturi (if thread size is identical, these can be interchanged)**
7. **Re-install the air cleaner assembly**

The venturi adapter will push the air cleaner out on average 7/8" to 1-¼" On some engines, the crankcase ventilation hose may be too short. If an extension tube is not included in the kit, you will need to provide your own. This can not be plugged.

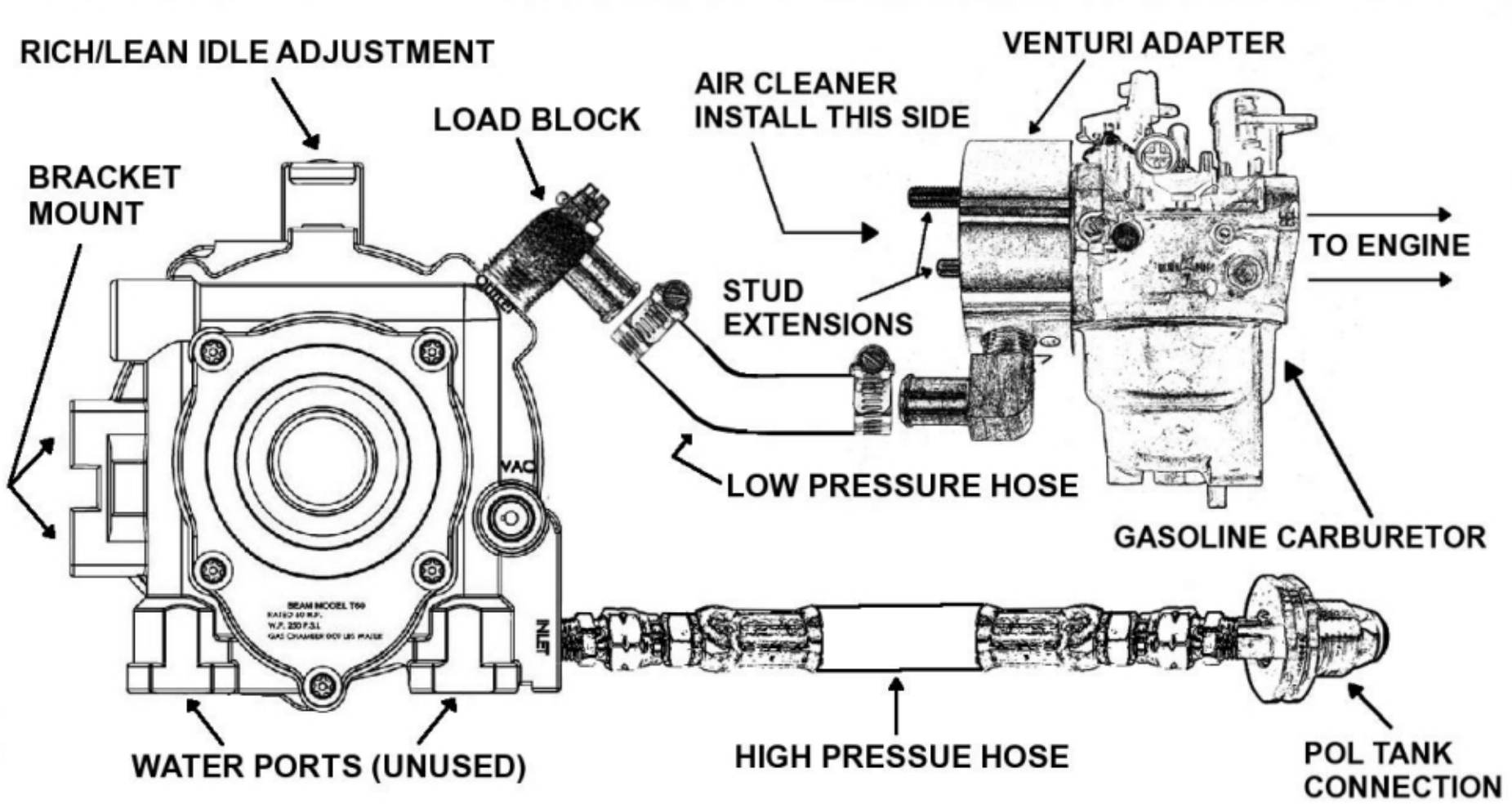
Sometimes the frame design on the generator will not allow the air cleaner assembly to be re-installed, in this case the frame will need to be modified.

The air flow direction through the venturi is extremely important, the largest cavity should be mounted toward the carburetor. The adapter should have a flow direction on it, if it does and you are unsure, contact us.

DUAL FUEL OPERATION

The adapter method allows the use of alternative fuels OR gasoline. To run your engine on an alternative fuel, simply turn off the gasoline supply. Most generators will have a valve at the bottom of the gasoline tank. Turn the valve to the off position and run the engine until gasoline in the carburetor is depleted. Now you need to turn on your alternative fuel supply and start.

Some engines do not run well on gasoline after the adapter is installed due to the reduced air flow. Older gasoline carburetors have adjustments to compensate for this, most newer carburetors unfortunately do not. If your carburetor does not have the adjustments and it runs poorly on gasoline, it may be necessary to remove the adapter to run on gasoline.



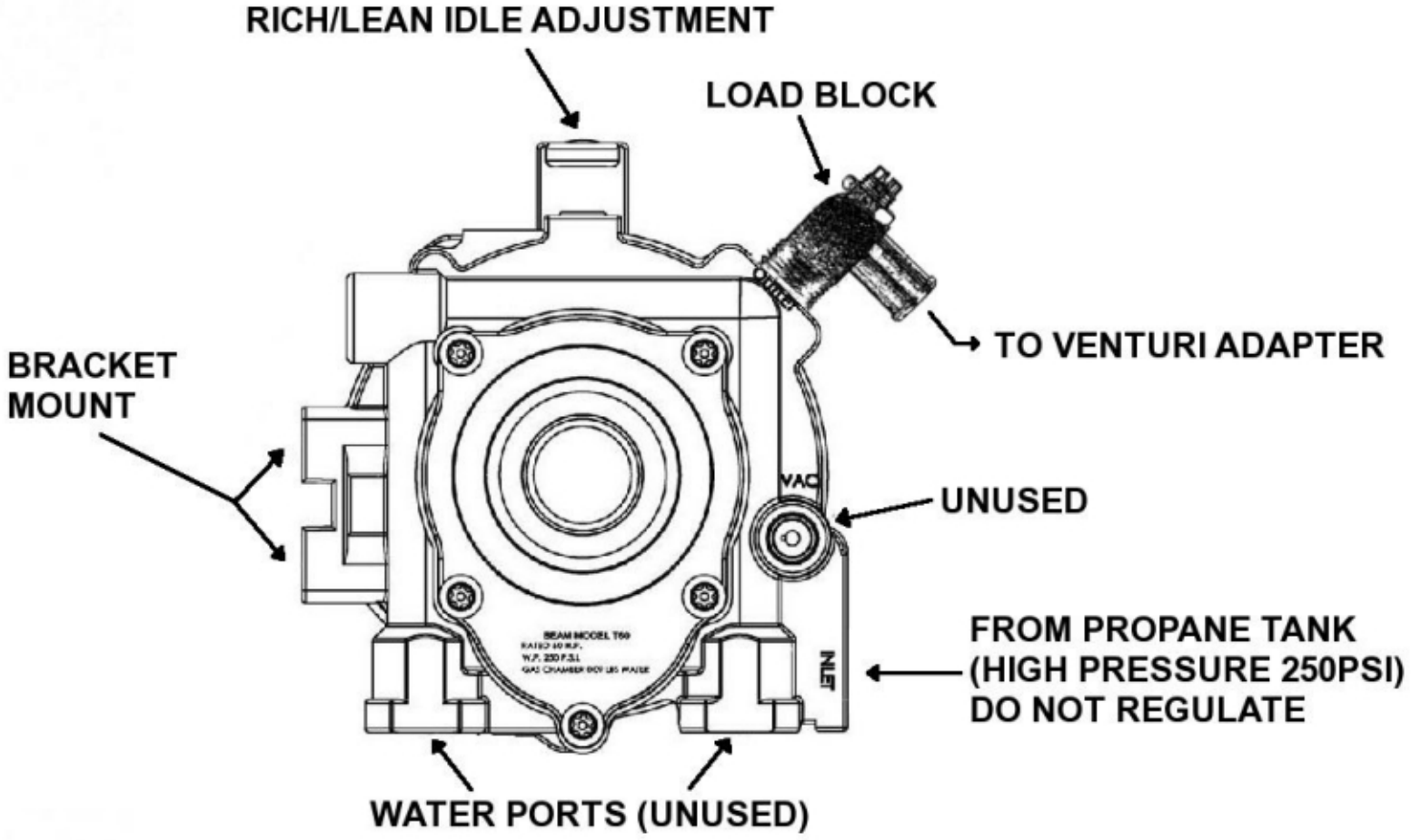
FIRST START INSTRUCTIONS

These are basic first start instructions and are only a basis to work with. Every engine is different and will require specific tuning before the engine runs correctly. If you have any problems, you can contact us for help.

1. **Make sure the gasoline supply is in the OFF position**
2. **The engine choke should be in the RUN position (alternative fuels will run poorly or not at all with the choke on, even in cold temperatures)**
3. **If your engine has an electrical ON/OFF switch, flip it to the ON position**
4. **Turn the load block clockwise until snug, then back out 3-6 turns (larger engines may require the load block backed out more, smaller ones may require less)**
5. **Turn your alternative fuel supply on**
6. **Press the primer button for one second or less**
7. **Attempt to start the engine. If the engine does not start, you may need to adjust the load block in or out and re-prime if necessary (this step may need to be repeated several times to get the engine to run well enough to proceed to the next step**
8. **Once the engine is running, put a full, or near full load on the engine. Turn the load block in (lean) until the engine begins to lose power, then turn the load block back out (rich) to where the engine runs best.**
9. **If the engine is required to run at an idle, let the engine slow down to an idle. Adjust the idle gas needle screw to where the engine runs smooth. To set the proper idle speed, adjust the idle air adjustment on the throttle shaft. Do not attempt to set the idle speed with the gas mixture adjustment**

If step 8 was completed correctly, the engine should run well under full load or no load. If you have problems starting or running, the load block may need adjustment.

RICH/LEAN IDLE ADJUSTMENT



Adjusting Via Digital Voltage Meter

*Must have digital voltage meter with HZ (Hertz) function.

Start Engine
Put voltage meter in a 120V outlet on generator
Turn voltage meter to HZ position
Free rev the engine; you should have 62HZ
Add load to generator to bring down HZ to between 58.0 and 58.5HZ
Once you are at that load, adjust 90° adjustable fitting in or out to get the highest HZ at that load setting.
Lean down the fuel mixture to drop 1 or 2HZ, then richen it up to gain the 1 or 2HZ back just to make sure you are on the lean side of the adjustment.

Example: Free rev 62 HZ. Ad load down to between 58.0 and 58.5 HZ. If you are at the 58.4 HZ, start leaning down. If HZ goes to 58.4, 58.3 or 58.2, you are going the wrong way. You must richen the load. The numbers will be at 58.3, 58.4, 58.5 and 58.6, but if the number starts heading back down, you're too rich. Now you have to lean down to the highest HZ, which is 58.6 in this example. Lock down the load block. The fuel mixture will track properly to lighter loads.

Engine Shutdown

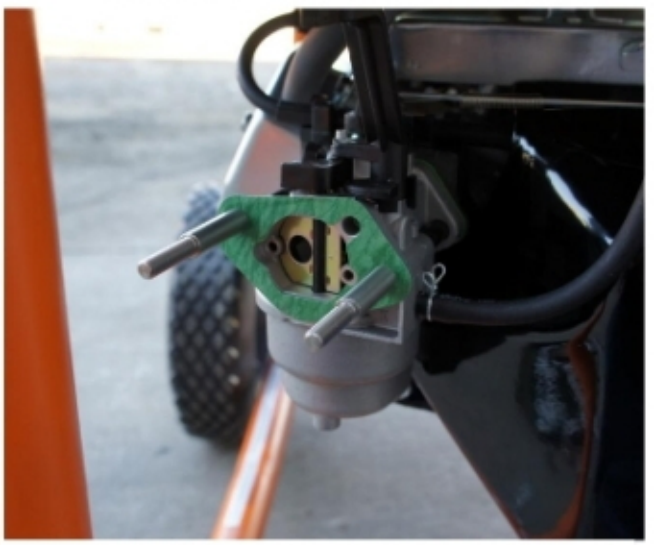
When stopping the engine, if it is manual start and not equipped with a solenoid valve, turn off the fuel supply valve. Do not ground the ignition or choke the engine. For those engines that are equipped with solenoid shut-off valves, this is not a requirement but the supply valve should be closed if 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 sump and the possibility of damaging the engine. To avaid this hazard, check the crankcase 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.

Basic Installation Instructions

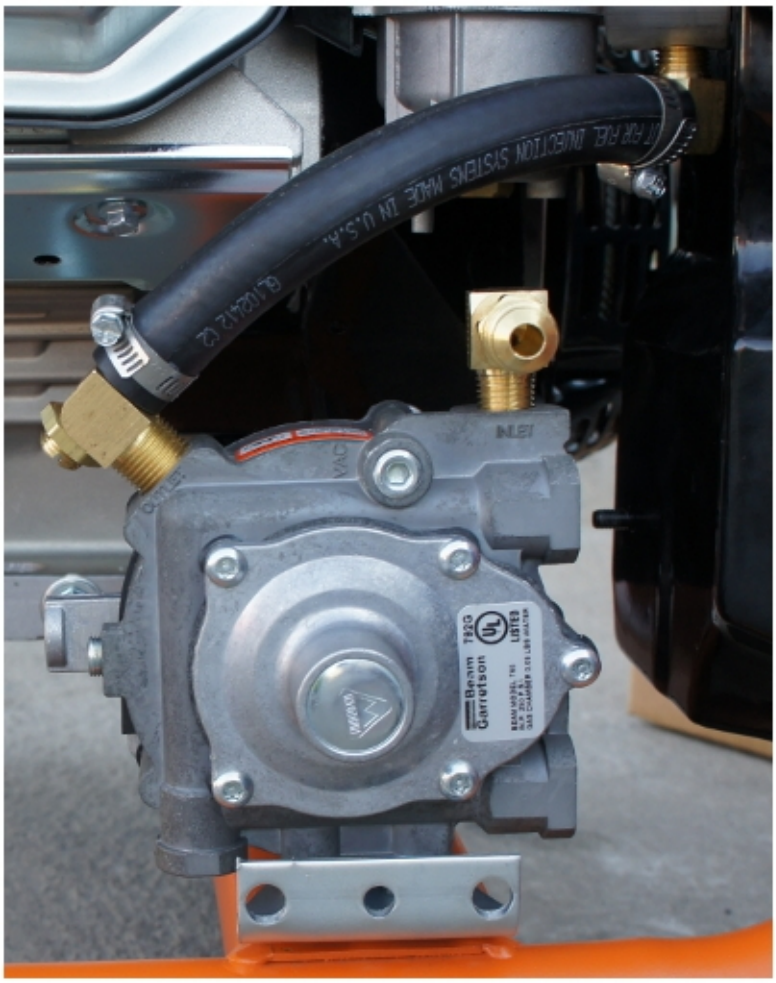
Step 1:
Remove Air Filter

Step 2:
Install Stud Extensions



Step 3:
Assemble Venturi
Install Venturi & Gasket

Step 4:
Re-Install Air Filter



Step 5:
Assemble and Mount
T60 Regulator

Step 6:
Install High
Pressure Hose

Read First
Start Instructions

FREQUENTLY ASKED QUESTIONS

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 has always been the same problem. Your tank may be over filled or oriented wrong.

The 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 a 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 openend too far.

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 having 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 the 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 run?

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., 11" 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.
11" 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

Technical Data — LP Gas

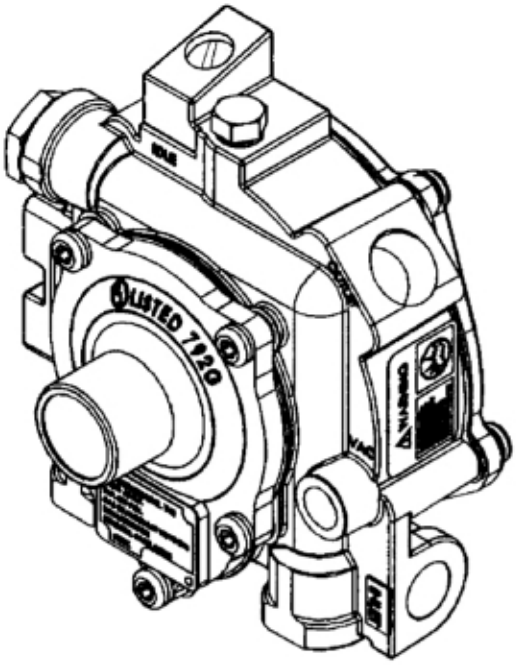
Physical Properties at 60° F.	Butane	Propane	Gasoline	Natural Gas[a]
Chemical Formula Cn H ($_2$n + $_2$)	C_4H_{10}	C_3H_8	C_5H_{12} / $C_{12}H_{26}$	CH_4
Normal Atmospheric State	Gas	Gas	Liquid	Gas
Boiling Point	+32°F.	–44°F.	+97°F. initial +400° end point.	–259°F.
Octane Number (research)	94	110 plus	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 Air Fuel Ratio By Weight	15.45	15.66	15.05	16.75
Chemically Correct Air Fuel Ratio By Volume	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

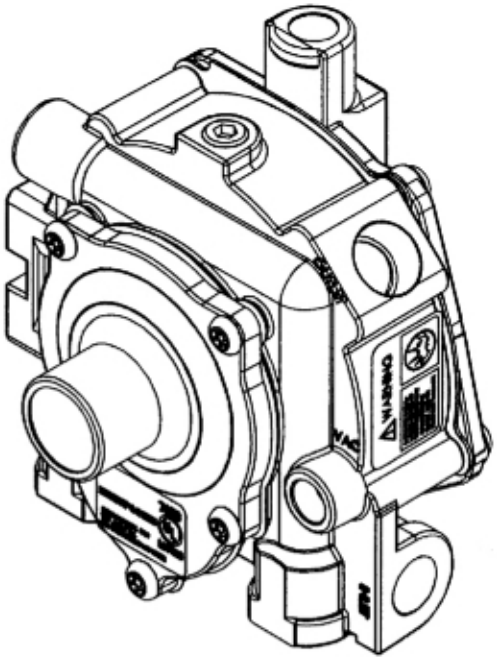
	Vapor Pressure, PSIG														
	Outside Temperature, Degrees Fahrenheit														
	-30	-20	-10	0	10	20	30	40	50	60	70	80	90	100	110
100% Propane	6.8	11.5	17.5	24.5	34	42	53	65	78	93	110	128	150	177	204
70% Propane 30% Butane	--	4.7	9	15	20.5	28	36.5	46	56	68	82	96	114	134	158
50% Propane 50% 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.

MODEL T60 REGULATOR

Current Model





New Model

DESCRIPTION

The T60 is a two stage regulator/vaporizer for LPG applications up to 60hp (45Kw). Various models feature built-in vacuum lockoffs, idle adjustment, primers, various heating methods, and several mounting options. Newly designed models (scheduled for spring 2010 production) include an improved primary and secondary lever and seat design, and a standard freeze plug and idle screw. The idle screw has improved sensitivity and stability and is relocated to the cover. An idle screw cap and tamper resistant screws satisfy regulatory tamper resistance requirements. Optional dual mounting tabs are available and all mounting features and ports will remain the same.

SPECIFICATIONS

Fuel Type	LPG Liquid/Vapor or Natural Gas
Inlet Pressure	
Maximum	250 psi (17.23 Bar)
Minimum Inlet Pressure	30 psi (207 kPa)
Outlet Pressure	-0.5" w.c. (-0.13 kPa)
HP/kW	60hp (45kW) with LPG liquid, 40hp (30kW) LPG Vapor 30hp (22kW) for Natural Gas
Operating Temperature Range	-40°F to +250°F (-40°C to +121°C)
Fuel Filtration	40 micron
Heating Chamber Source	Required for liquid LPG
Mounting Position	Vertical (outlet down) recommended. Horizontal position can be used when fuel contamination can be controlled with HD-5 or HD-10 specified LPG fuel.
Diaphragm	Hydrin
Applications	Stationary, mobile, industrial and automotive
Certification	UL (AU1502), Inquire for specific ECE approval