OPERATING, INSTALLATION, AND SERVICE MANUAL FOR THE VOYAGER SANITIZER GAS FIRED BOOSTER HEATER

STAINLESS STEEL HIGH EFFICIENCY

member gama

CLASSIFIED c UL us NSF

ANSI Z 21.10.3

REFERENCING PART NUMBERS

Temperature: 184 degrees F. **Warranty:** 1/3

Sanitizer part numbers:

*(Example **SA130-45LP** - propane; **SA130-45** - natural)*

SA	130	-	45	LP*
series	BTU		U.S. gal.	gas type

(*when ordering propane, you must specify "LP".)

SPECIFICATIONS

MODEL	HEIGHT	WIDTH	SHIP. WEIGHT	DEPTH	INPUT	VENT SIZE	RECOVERY EFFIC. %
SA90-45	42"	23 1/4"	175 Lbs.	32"	90,000	3"	95%
SA130-45	42"	23 1/4"	175 Lbs.	32"	130,000	3"	94%
SA160-45	42"	23 1/4"	175 Lbs.	32"	160,000	3"	94%
SA199-45	42"	23 1/4"	175 Lbs.	32"	199,000	3"	94%

Recovery on rating plate is based at 94% thermal efficiency at 100 degrees Fahrenheit rise, as required by A.N.S.I.

MODEL	GALLON CAPACITY	INPUT BTU/HR. NATURAL & LP GAS		TEMPERATURE RISE IN DEGREES FAHRENHEIT										
				40	50	60	70	80	90	100	110	120	130	140
			GPH	245	196	163	140	122	109	98	89	81	75	70
SA90-45	45	90,000	GPM	4	3.2	2.7	2.3	2	1.8	1.6	1.4	1.3	1.2	1.1
			GPH	354	283	236	202	177	157	141	128	118	109	101
SA130-45	45	130,000	GPM	5.9	4.7	3.9	3.9	2.9	2.6	2.3	2.1	1.9	1.8	1.6
			GPH	436	349	290	249	218	193	174	158	145	134	124
SA160-45	45	160,000	GPM	7	5.8	4.8	4	3.6	3.2	2.9	2.6	2.4	2.2	2
			GPH	545	436	363	311	272	242	218	198	181	167	155
SA199-45	45	199,000	GPM	9	7	6	5	4.5	4	3.5	3.3	3	2.7	2.5

⚠ WARNING

IF THE INFORMATION IN THESE INSTRUCTIONS ARE NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT; CAUSING PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH.

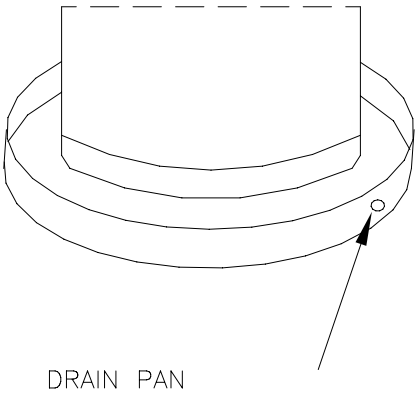
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance;

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance;
- Do not touch any electrical switch; do not use any phone in your building;
- Immediately call your gas supplier from a neighbor's phone;
- Follow the gas supplier's instructions;
- If you cannot reach your gas supplier; call the fire department;
- Installation and service must be performed by a qualified installer; service agency or the gas supplier.

LOCATION

Choose a location for your booster centralized to the piping system, along with consideration to vent pipe length. As the length of vent pipe increases the firing rate of the appliance decreases. You must also locate the Voyager where it will not be exposed to freezing temperatures. Additionally, you will need to place the booster so that the controls, drain, inlet/outlet, and gas valve are easily accessed. This appliance must not be installed outdoors, as it is certified as an indoor appliance, and must be kept vertical and on a level surface. Also, care must be exercised when choosing the location of this appliance; where leakage from the relief valve, leakage from related piping, or leakage from the tank or connections, will not result in damage to the surrounding areas or to the lower floors of the building. **A booster should always be located in a area with a floor drain or installed in a drain pan suitable for boosters.** Proper clearance must be provided around the Voyager as follows: Sides, bottom, top, and back are 0" (zero clearance). Front of the appliance needs 24" service clearance minimum. This front service may be achieved by a non-rated or combustible door or access panel; providing the 24" service clearance is achieved when the door is opened or panel is removed. **Under no circumstances, shall Heat Transfer Products Inc. be held liable for any such water damage whatsoever. This booster must not be located near flammable liquids such as gasoline, adhesives, solvents, paint thinners, butane, liquefied propane, etc.; as the controls of this appliance could ignite those vapors, causing an explosion. Avoid exposing booster to direct spraying of water. All NSF installation requirements must be followed, see page 36.**



DRAIN PAN

WIDTH MUST BE DIAMETER OF WATER HEATER PLUS 2" MIN.
DEPTH OF PAN IS MIN. 1 1/2"

TO OPEN DRAIN, LINE SHOULD BE AT LEAST 3/4" ID AND PITCHED FOR PROPER DRAINAGE.

TEMPERATURE & PRESSURE RELIEF VALVE

⚠ WARNING

NEVER PURGE FROM THE T & P TAPPING! This is not the highest point in the tank; damage to the heat exchanger will result and warranty will VOID! A temperature and pressure relief valve is installed into the marked port (upper right), we recommend a WATTS 100XL-4 valve or equivalent for 90,000 BTU models, and a 40XL5 valve or equivalent for 130,000 BTU models or above input; meeting the requirements for relief valves for hot boosters as per ANSI Z21.22B, by a nationally recognized lab that maintains a periodic inspection of production of such listed safety device. The pressure rating of the valve must not exceed the listed working pressure of this appliance, and must be rated to the proper BTU/hr capacity of the booster. **Do not, under any circumstances, thread a cap or plug into the relief valve! Explosion, serious injury or death may result!** Relief valve piping must be directed to the floor or to an open drain, but not connected directly. There must be a 6" space between the outlet of relief valve piping and drain or floor. **Do not hook up to drain system directly without an air space.** The relief valve must be periodically checked for proper operation.

⚠ WARNING

Water temperature over 125 degrees F. can cuase severe burns instaltly, or death from scalds! Children, disabled people, and elderly are at highest risk of being scalded! The intended use of this product is only for gas fired booster for sanitizing dishes to a dishmachine. It should not be used in any other manner. See instruction manual before setting temperature at water heater. Feel water before use. Temperature limiting valves are available, see manual.

WATER PIPING

⚠ WARNING

The inlet and outlet water connections are 1" NPT. It is very important that you do not deviate from typical pipe shown on **page 4**. All components are supplied in the Voyager Sanitizer Booster Installation Kit (VSBK-1200). **NEVER USE DIELECTRIC UNIONS OR GALVANIZED STEEL FITTINGS ON VOYAGER CONNECTIONS!**

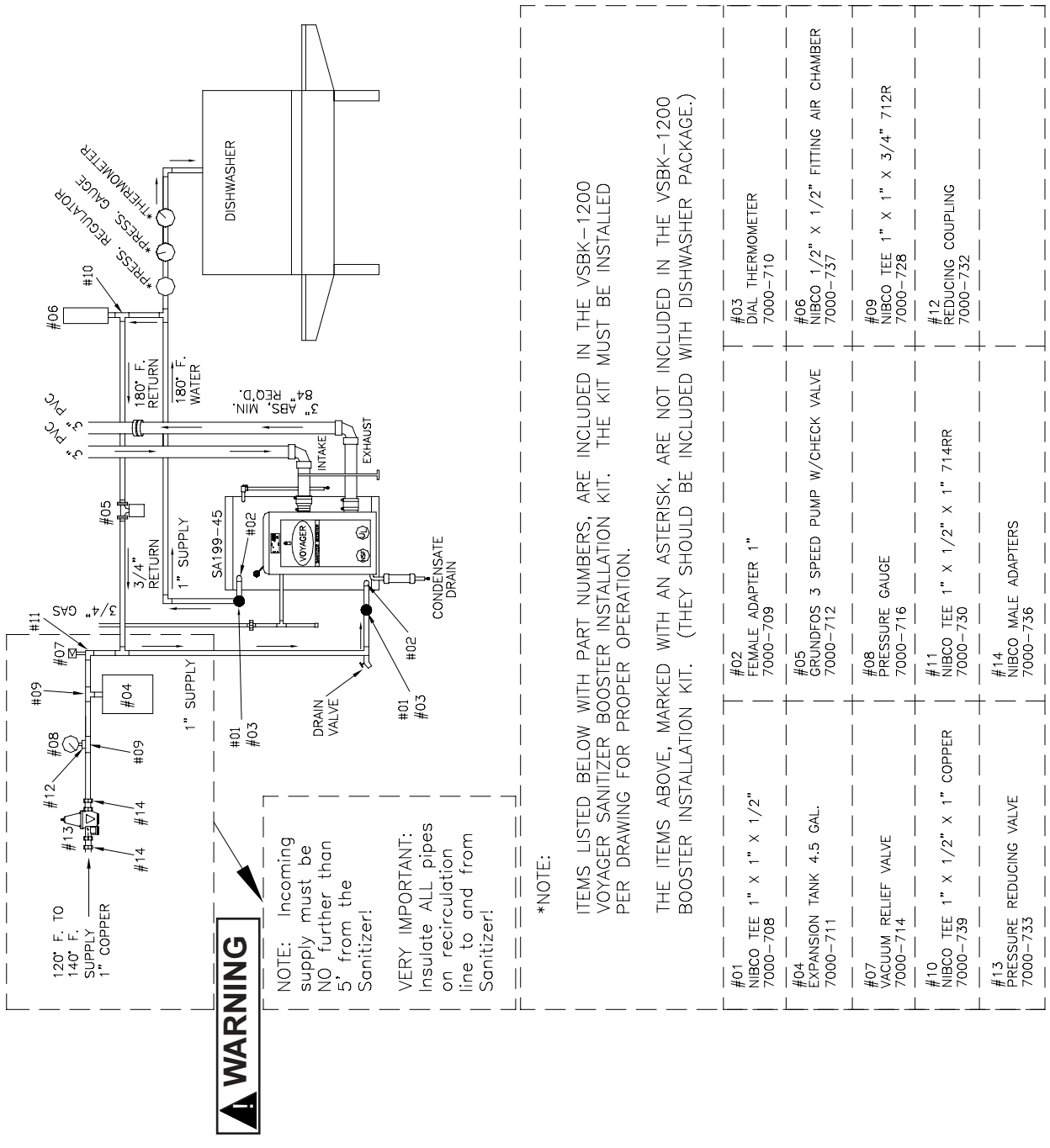
The booster is equipped with a circulator to provide the minimum water flow in the booster, and maintain a uniform water temperature in the tank. Depending on heater distance from the dishwasher, it may be necessary to run empty racks to purge supply of water line lower than the required 180 degree F. water temperature. For this reason, it is best to locate the booster as close as possible to the dishwasher. The circulator is equipped with three speeds, to increase flow and reduce heat loss. Reference chart "A" to the right to set pump at recommended setting. All piping must be installed with suitable pipe insulation to avoid temperature loss on the re-circulation line. A minimum of 1" thick pipe insulation is recommended. **Under no circumstances shall the booster be installed without a pump!**

CHART "A"

SETTING	ONE WAY TO DISHWASHER
1	1 - 19 ft.
2	20 - 59 ft.
3	60 -100 ft.

TYPICAL INSTALLATION

***Each Voyager Sanitizer unit is shipped with a VSBK-1200 Booster Installation Kit .**



General Safety Precautions

ELECTRICAL CONNECTION

The electrical connection for the Voyager is on the left side of the combustion shroud. There is a 1/2" knockout location for electrical connection. All electrical wiring must be performed by a qualified licensed electrician, and in accordance with National Electrical Code, or to the applicable local codes and standards. The electrical requirements are for standard 120 volts, 60 Hz 10 amp service. It is recommended that an electrical disconnect switch be placed on a nearby wall, and that the connection to the Voyager be made using 3/8" extra-flex, or 3/8" greenfield (or equivalent). This unit must be wired with #14 awg, and fused for no more than 15 amps.

DANGER

TANK MUST BE COMPLETELY FILLED WITH WATER BEFORE POWER IS APPLIED OR PERMANENT DAMAGE WILL OCCUR TO THE HEAT EXCHANGER; WARRANTY WILL BE VOIDED!

It is of extreme importance that this unit be properly grounded! Ground the water heater, by connecting the green wire in the electrical access compartment, directly to the main building ground system. It is very important that the building system ground is inspected by a qualified electrician, prior to making this connection. The black wire is the hot lead and the white wire is the neutral lead. Once all connections have been made the electrical access may be closed. It is very important that the electrical power is not turned on at this time! A green LED is provided on the main control board. This LED must be luminated when appliance is turned on for proper operation. Failure to luminate means bad or missing ground or reverse polarity.

GAS CONNECTION

Gas supply shall have a maximum inlet pressure of less than 14" water column (350 mm), 1/2 pound pressure (3.4 kPa), and a minimum of 7" water column. The entire piping system, gas meter, and regulator must be sized properly to prevent pressure drop greater than 0.5" as stated in the National Fuel Gas Code. This information is listed on the rating plate. **It is very important that you are connected to the type of gas as noted on the rating plate.** "LP" or liquefied petroleum, or propane gas; or "Nat" natural gas or city gas. All gas connections must be approved by the local gas supplier, or utility in addition to the governing authority, prior to turning the gas supply on. The nipple provided is 1/2", and it is mandatory that a 3/4" to 1/2" reducing coupling (provided) is used, threaded into the branch of a 3/4" tee, and a drip leg fabricated, as per the National Fuel Gas Code. **You must ensure that the entire gas line to the connection at the Voyager is no smaller than 3/4"**. Once all the inspections have been performed, the piping must be leak tested. If the leak test requirement is a higher test pressure than the maximum inlet pressure, you must isolate the Voyager from the gas line. In order to do this, you must disconnect the union and cap the inlet gas line. In the event the gas valve is exposed to a pressure greater than 1/2 PSI, 14" water column, the gas valve must be replaced.

DANGER **Never use an open flame (lit match, lighter) to check gas connections.**

NOTICE: VERY IMPORTANT! IT IS IMPERATIVE WHEN FLEXIBLE GAS CONNECTORS ARE USED, THAT THEY ARE A MINIMUM SIZE OF 3/4" ID. THIS WILL AVOID RESTRICTION OF GAS FLOW!

Failure to follow all precautions could result in fire, explosion or death! It is recommended that a soapy solution be used to detect leaks. Bubbles will appear on pipe to indicate a leak is present. The gas piping must be sized for the proper flow and length of pipe, to avoid pressure drop. Both the gas meter and the gas regulator must be properly sized for the total gas load. If you experience a pressure drop greater than 1" WC, the meter or regulator or gas line is undersized or in need of service. On the inlet side of the gas valve, there is a 1/8" NPT plug, which can be removed to attach a hose barb, hose, and inches of water column meter. Also, you can attach a meter to the incoming gas drip leg, by removing the cap and installing the meter. The gas pressure must remain between 7" and 14" during stand-by and unit running heat cycle. If an in-line regulator is used, it must be a minimum of 10 feet from the Voyager. **It is very important that the gas line is properly purged by the gas supplier or utility. Failure to properly purge the lines or improper line sizing, will result in the failure of the Voyager lighting off.** This problem is especially noticeable in NEW LP installations, and also in empty tank situations. This can also occur when a utility company shuts off service to an area to provide maintenance to their lines. The gas valve is a special gas valve which has a Pressure Augmented Regulator feature, as well as negative outlet pressure. This valve must not be replaced with a conventional valve under any circumstances. Make sure valve is in the "OFF" position prior to turning gas supply on. As an additional safety feature, this valve has a left hand thread on the outlet end, and a special tamper resistant electrical connector.

CHART "B"

	Pipe Size		
Gas Type	**3/4"**	**1"**	**1 1/4"**
Natural	30'	100'	300'
LP	50'	135'	500'

VENTING

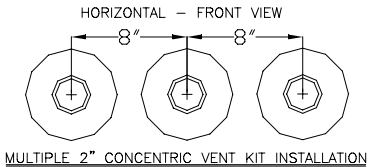
⚠ WARNING

(ALL MODELS MUST HAVE MINIMUM 3" VENT SIZE)

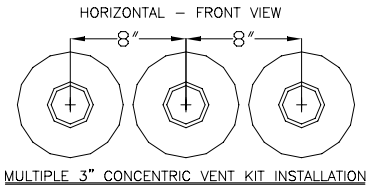
For inlet air supply, top pipe on the right of the shroud, use 3" PVC schedule 40. It is very important that you plan the location properly, to eliminate long pipe runs and excessive fittings. Inlet pipe size must not be reduced. Do not combine the inlet air with any other inlet pipe including an inlet to an additional similar appliance. The joints must be properly cleaned, primed, and cemented. The piping must also be properly supported as per local and national standard plumbing codes. It is important that the piping must be clean and free from burs, debris, ragged ends, and particles of PVC. For exhaust piping, lower pipe on the right of the shroud, for the first 7', use 3" ABS sch 40 (supplied with booster) or 3"CPVC sch 40 or 80. For concrete construction or to meet certain fire codes, exhaust piping - lower pipe on right of shroud, and inlet air piping - top pipe on the right of the shroud, must be 3" CPVC schedule 40 or 80, (only to meet local fire codes). The balance of the inlet and exhaust piping may be PVC schedule 40 or 80, or ABS solid only, **NOT FOAM CORE**. For residential style wooden construction exhaust piping, lower pipe on right of shroud, must be 3" ABS solid (supplied with booster) (NON FOAM CORE) or 3" CPVC schedule 40 or 80 for the first 7' only. The balance of the inlet and exhaust piping may be PVC or ABS solid NON FOAM CORE or CPVC to meet local codes. The only approved exhaust vent materials are ABS solid NON FOAM CORE; first 84" or CPVC. The balance of the exhaust piping must be ABS solid NON FOAM CORE, CPVC or PVC sch 40 **NON FOAM CORE ONLY**. Exhaust piping should be sloped back to the connection on the Voyager, at least 1/4" per foot to remove additional condensate that forms within the pipe. The total combined length of pipe (intake piping plus exhaust piping added together) including elbow allowances intake and exhaust (each elbow = 5' of pipe) should not exceed 70'. The combined vent length should not be less than a combined length of 6' plus two 90 degree elbows. Choose your vent termination locations carefully; see **pages 19 and 20**. You must additionally make certain that exhaust gas does not re-circulate back into the intake pipe. You must place them in a open area, and follow the following guidelines:

1) Never vent into a walkway or patio area, or an alley, or otherwise public area less than 7' from the ground;
2) Never vent less than 6' above a doorway. See next page for diagram on venting over or under a window. For venting below a window, you must be a minimum of 4' below the window, adjacent to the window, for up to 200,000 BTU's; up to 400,000 BTU's you must be 10' below the window; for 600,000 BTU's you must be 21' below the window; for 800,000 BTU's you must be 35' below the window. **NOTE:** A fixed pane of glass that cannot be opened is not considered a window.
3) Never install a heat saver or similar product to capture waste heat from exhaust;
4) Always have vent location at least 1' above maximum snow level;
5) Always have vent 1' above ground level, away from shrubs and bushes;
6) Follow local gas codes in your region or refer to National Fuel Gas Code, or Can B149;
7) Always have vent at least 3' from an inside corner of outside walls;
8) Maintain at least 4' clearance to electric, gas meters, and exhaust fans or kitchen exhausts;
9) **Very Important!** Inlet air must be taken from **outside** of building, next to exhaust outlet, no closer than 8";
10) Always place screens in all openings in intake and exhaust to prevent foreign matter from entering the Booster.
11) The vent intake and exhaust must be properly cleaned and glued, for pressure tight joints. Several methods for venting the Booster can be found on **pages 19 and 20**. Use the following layout as a guideline; certain site conditions such as multiple roof lines/pitches may require venting modifications-consult factory. The air inlet must be a minimum of 1' vertically above the maximum snow level or 24" which ever is greater. The air inlet must also be a minimum of 10' horizontally from the roof, and terminated with a tee. The exhaust must be a minimum of 24" above the air inlet opening, and terminated with a coupling. It is very important that there are no other vents, chimneys, or air inlets in any direction for at least 4'. Please refer to typical venting on **pages 19 and 20**. **All venting must be properly supported, as the Booster is not intended to support any venting whatsoever**. All piping, glue, solvents, cleaners, fittings, and components, must conform to ASTM (American Society for Testing and Materials), and ANSI (American National Standard Institute).
12) It is recommended that you use one of the mentioned vent kits specifically for Booster installations; either KGAVT0601CVT (3 in.) or V1000.

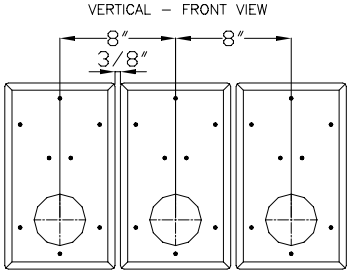
MULTIPLE CONCENTRIC OR V1000 VENT KIT INSTALLATIONS



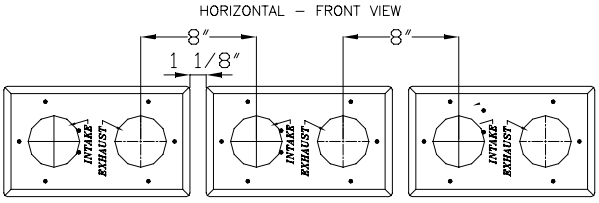
MULTIPLE 2" CONCENTRIC VENT KIT INSTALLATION



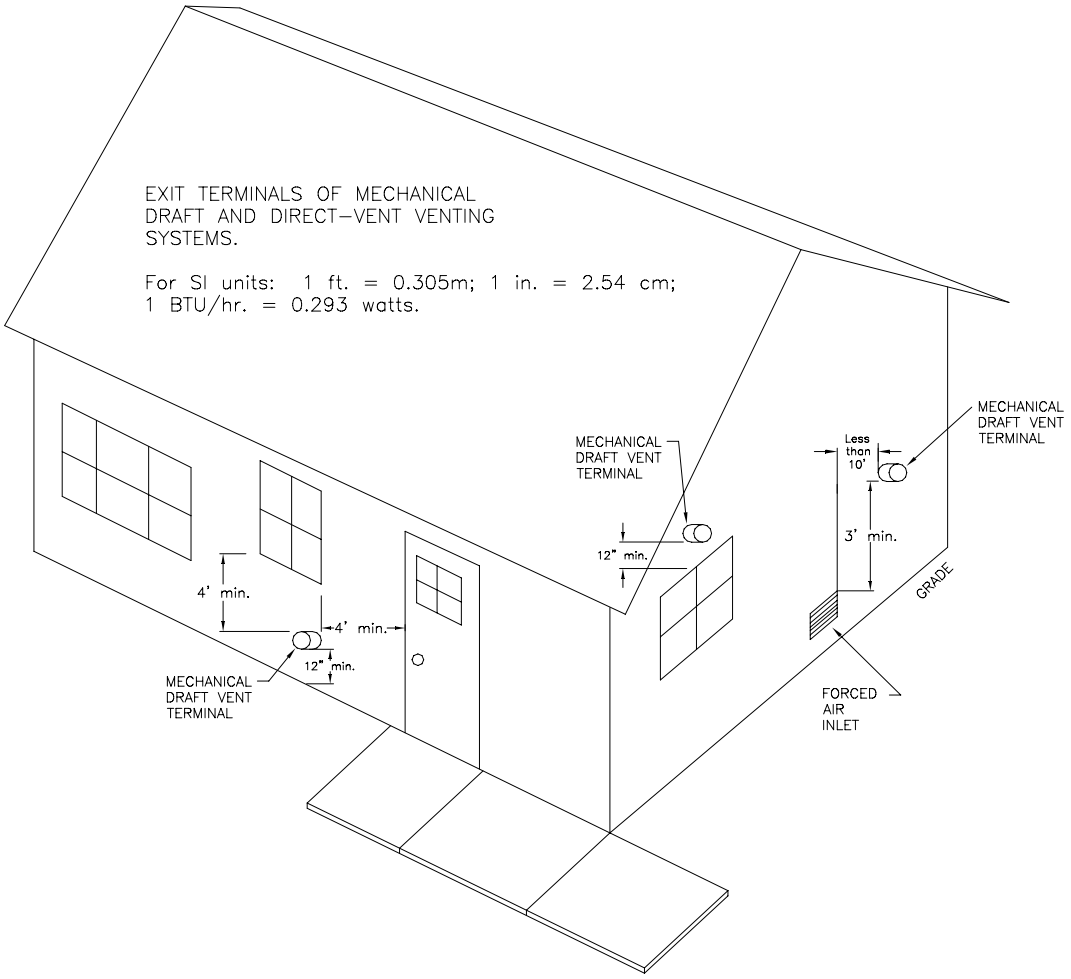
MULTIPLE 3" CONCENTRIC VENT KIT INSTALLATION



MULTIPLE V1000 VENT KIT INSTALLATION



MULTIPLE V1000 VENT KIT INSTALLATION



CLEANER/CEMENT

Cement for all venting must be ALL PURPOSE Cement, and must conform to ASTM D-2235, D-2564 and F-493, and cleaner for the piping and fittings must conform to ASTM F-656. For joining ABS to PVC, you must use transition green cement listed by NSF and IAPMO and exceeds ASTM D-3138 to make solid liquid tight joints and gas tight joints.

PIPE/FITTINGS

The first 84" (7') of exhaust piping, must be of 3" ABS solid only (provided) or CPVC; (**NEVER cellular foam core pipe on exhaust piping**), and conform to ASTM D-3965 for ABS or ASTM F-441 for CPVC, and fittings to ASTM D2661 & D3311 for ABS and ASTM F-439 for CPVC, the balance of exhaust piping, and all of intake piping, use standard 3" PVC sch. 40 or 3" ABS schedule 40, conforming to ASTM D2665, or ABS conforming to ASTM D-3965 & ASTM R-441 for ABS; and fittings conforming to ASTM D-2665 & D331. ABS may also be used for intake venting as long as pipe conforms to ASTM D3965 & D2661 and fittings meet ASTM D2661 & D3311. Foam core pipe may be used for the entire intake system providing it conforms to ASTM F-891, and is cemented together using above materials.

FOR LONGER VENT LENGTHS...

All venting must be 3", both intake and exhaust, **NEVER use any piping less than 3", or different size pipe on the intake and exhaust**. You may use 4" venting on both intake and exhaust, to lower the pressure drop, to provide additional venting length. **It is imperative when using 4", to follow these instructions very carefully. For longer venting lengths, the first 10' of both the intake and exhaust piping are 3". For the intake 10' of 3" PVC plus one 90 degree or two 45 degree elbows and for the exhaust 10' of ABS solid NON FOAM CORE, or CPVC plus one 90 degree or two 45 degree elbows**. Then use a 4" x 3" PVC or 4" x 3" ABS reducing coupling. Then proceed with PVC 4" NON FOAM CORE pipe and fittings for both the intake and exhaust piping. On 4" piping you may go an additional 110 equivalent feet of pipe and fittings, combined total length. The 4" fittings have a friction loss allowance as follows: 4" 90 degree = 3' , and a 4" 45 degree = 1'. **The total maximum venting length can be 110', plus the first 10' of each 3", and a maximum fitting allowance of the 3", total two 90 degree or four 45 degree before increasing to 4". Total equivalent would be 30' of 3" plus 110' of 4". Never use different pipe sizes for intake and exhaust. The vent system must be balanced by friction loss equivalent. IMPORTANT NOTE: THE METHODS DESCRIBED ARE SUGGESTED GENERIC METHODS ONLY. SPECIFIC JOB SITE OBSERVATIONS AND SIZING MAY REQUIRE ALTERNATE INSTALLATION METHODS. CONSULT THE FACTORY WITH SPECIFIC JOB REQUIREMENTS FOR ADDITIONAL RECOMMENDATIONS.**

FRICTION LOSS EQUIVALENCE TABLES

NOTE: SHOWN AS INTAKE & EXHAUST PIPE AND FITTINGS ADDED TOGETHER

* = MINIMUM VENT LENGTH
** = MAXIMUM VENT LENGTH

3" VENTED MODELS EQUIVALENT TABLE

FITTING DESC.	EQUIVALENT FEET OF PIPE
3" 90	5'
3" 45	3'
3" Coupling	0'
3" Tee	0'
3" Pipe	1' = 1'
3" Concentric vent kit	3'
3" V1000 vent kit	0'

(AFTER THE FIRST 10' OF 3" ONLY) 4" VENTED MODELS EQUIVALENT TABLE

FITTING DESC.	EQUIVALENT FEET OF PIPE
4" 90	3'
4" 45	1'
4" Coupling	0'
4" Pipe	1' = 1'
4" Tee	0'

VENTING EXAMPLES

TOTAL COMBINED VENT LENGTH (FEET) INTAKE & EXHAUST	QTY. OF 90° ELBOWS	EQUIVALENT FRICTION LOSS (FEET) FOR EACH ELBOW	TOTAL FRICTION LOSS FOR ELBOWS	GRAND TOTAL VENT LENGTH (FEET) WITH FITTING FRICTION LOSS ADDED
*12	2	5	10	22
20	2	5	10	30
20	3	5	15	35
20	4	5	20	40
20	5	5	25	45
20	6	5	30	50
20	7	5	35	55
20	8	5	40	60
20	9	5	45	65
20	10	5	50	70
30	3	5	15	45
30	4	5	20	50
30	5	5	25	55
30	6	5	30	60
30	7	5	35	65
30	8	5	40	70
40	3	5	15	55
40	4	5	20	60
40	5	5	25	65
40	6	5	30	70
50	3	5	15	65
50	4	5	20	70

CONDENSATE

This is a condensing high efficiency appliance, therefore this unit has a condensate removal system. Condensate is nothing more than water vapor, derived from the combustion products, similar to an automobile when it is initially started. This condensate does have a low PH and should be treated with a condensate filter. This filter contains either lime crystals or marble crystals, which will neutralize the condensate. The outlet of the filter is sized for 5/8" ID (Inside diameter) plastic tubing. It is very important that the condensate line is sloped away from and down to a suitable inside drain, if the condensate outlet on the Booster is lower than the drain, you must use a condensate removal pump. A condensate filter and a condensate pump kit are available from HTP. It is also very important that the condensate line is not exposed to freezing temperatures, or any other type of blockage. Plastic tubing should be the only material used for the condensate line; as steel, brass, copper, or others will be subject to corrosion and deterioration. A second vent may be necessary to prevent condensate line vacuum lock if a long horizontal run is used. Also an increase to 1" tubing may be necessary.

CONTROL DESCRIPTION

The fully integrated booster control is an all electronic, fully automatic controller which will provide many years of trouble free service. The control requires no periodic maintenance and includes a built-in microprocessor which performs a number of diagnostic tests to verify proper appliance and control operation. Should an unsafe condition occur, the burner will shut down and the appropriate status indicators will illuminate indicating the need for service. Consisting of two printed circuit board assemblies, the controller's main board is attached to inside left of the shroud while the display board is mounted to the front top of the shroud. This arrangement simplifies access to the user adjustments while enhancing the visibility of the temperature display and status indicators. A power step-down transformer and blower pressure switch are also mounted on the inside left of the shroud. The controller display functions include a high visibility three digit LED readout which is used to display the actual water temperature within the tank along with the programmed desired water temperature (set point temperature). Nine individual LED indicators are also mounted on the display board which are used to determine the operating status of the appliance and provide assistance when troubleshooting any problems which may occur. All indicators are of the solid state variety and should last for the life of the appliance. The controller has sufficient built-in memory to retain the programmed temperature set point in the event input power is ever interrupted. The final component of the control system includes a temperature sensing probe which is threaded into the side of the tank. This probe is of unique construction in that both the temperature sensing/control and safety limit functions are performed by this single device. All probe components are of solid state construction to provide extended operational life.

START-UP PROCEDURE

DANGER

TANK MUST BE COMPLETELY FILLED WITH WATER BEFORE POWER IS APPLIED OR PERMANENT DAMAGE WILL OCCUR TO THE HEAT EXCHANGER; WARRANTY WILL BE VOIDED!

1. Make sure that the Booster has been installed to these instruction procedures; along with all applicable province and local codes;
2. Make sure all gas piping and connections have been verified and inspected by all applicable inspectors. Turn on gas supply. Insure that the gas line and the LP tank, if applicable, have been properly purged. Failure to properly purge the gas lines will result in failure to operate;
3. Make sure that the water supply has been turned on and that the Booster is completely filled before operating. **NEVER PURGE FROM T & P VALVE, ALWAYS PURGE THROUGH DISHMACHINE;**
4. Turn on electrical supply;
5. The control will first display "1.11", then "88.8", which is the control display test; and finally the actual tank temperature at the probe.

OVERALL APPLIANCE AND CONTROL OPERATION

A normal operating sequence is as follows:

1. The control determines the actual water temperature inside tank , with the factory set 2 degree F. differential, below programmed temperature set point of 184 degree F. Please note that display temperature max. set point will display “183” which is half the differential of 2 degrees F.
2. The control performs selected system diagnostic checks;
3. If all checks are successfully passed, the combustion blower is energized for the 34 second pre-purge cycle;
4. During the pre-purge cycle, power is applied to the ignitor element for the ignitor warm-up period (blower should continue to run);
5. The ignitor warm-up period will last for 30 seconds, then gas valve will be opened, allowing gas to enter the burner chamber;
6. The ignitor will remain on for an additional 4 seconds, then it will be turned off;
7. After an additional 2 seconds, the control will verify the presence of flame. If the flame was not established, the gas valve will be closed, power will be removed from the ignitor element. At this point, the control will return to step 2;U8. If flame is pre sent, the control will enter the heating mode where it will continue heating the tank water until the set point temperature is reached. At this point, the gas valve is closed and the control enters the post-purge cycle. The flame can be viewed through a window on the lower right of combustion blower flange;
9. The post-purge cycle continues to run the combustion blower for an additional 30 seconds to purge the system of all combustion gases. After this time period, the blower is de-energized and will coast to a stop;
10. The control will now enter the idle state while continuing to monitor internal tank water temperature. If the temperature drops to 2 degrees F. below the set point value, the control will automatically return to step 1.

STATUS INDICATORS

Pages 12, 13, 14, 15, and 16 contain seven individual diagrams which illustrate the various operating states of the appliance and their relation to the LED status indicators found on the controller. These diagrams reflect normal booster operation.

MAINTENANCE

General Safety Precautions

The control system requires no periodic maintenance under normal conditions. However, in unusually dirty or dusty conditions, periodic vacuuming of the cover to maintain visibility of the display and indicators is recommended. In dirty environments, construction sites, building constructions, care must be taken to keep the appliance door in place and drywall or saw dust away from appliance. **Failure to do so VOIDS WARRANTY!**

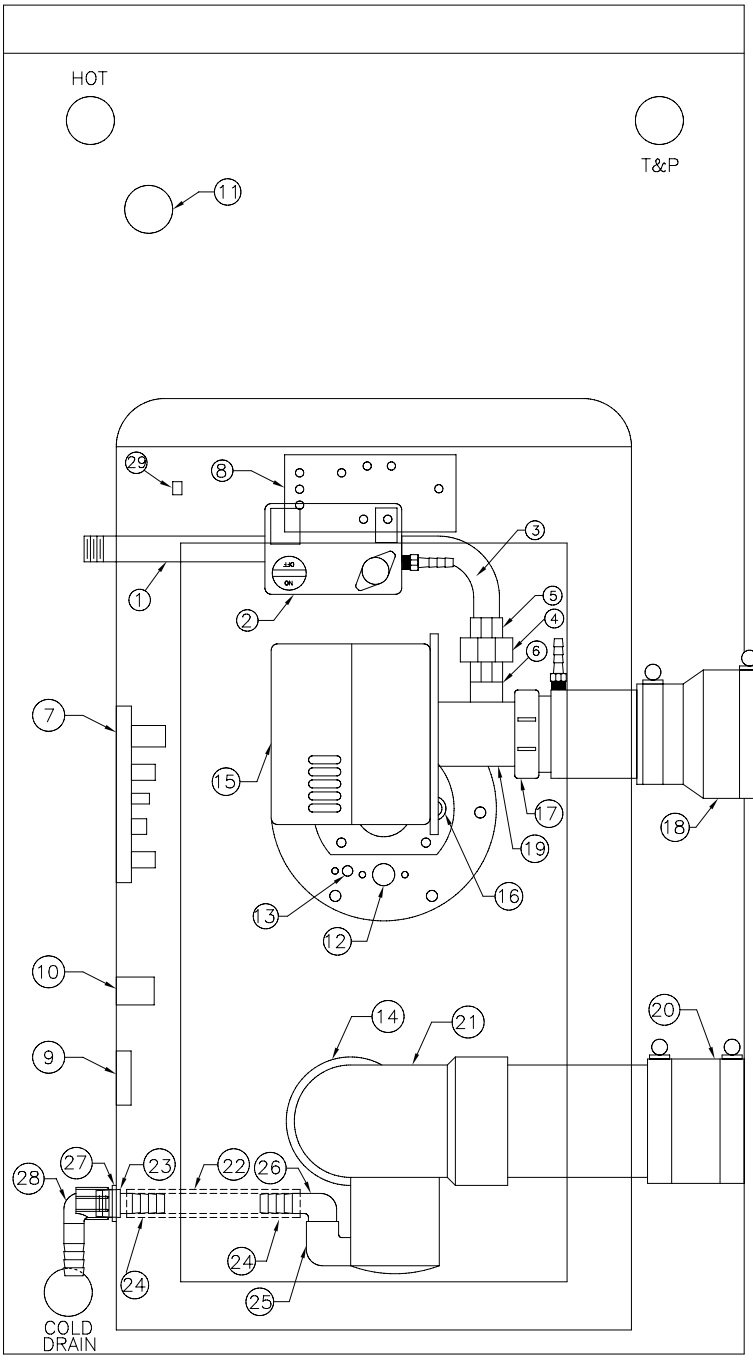
INTERNAL WIRING

For specific wiring information, please refer to the diagrams on **pages 17 and 18**.

FAILURE TO OPERATE

Should the burner fail to light, the control will perform two more ignition trials prior to entering a lockout state (“LOC”). Note that each subsequent ignition trial will not occur immediately. After a failed ignition trial, the blower must run for approximately 10 seconds to purge the system, then the ignitor element must complete a 30 second warm-up period. Therefore, a time period of approximately 40 seconds will expire between each ignition trial. If the burner lights during any one of these three ignition trails, normal operation will resume. If the burner lights, but goes off in about 4 seconds, check the polarity of the wiring. See electrical on **page 5**. If the burner does not light after the third ignition trial, the control will enter a lockout state. This lockout state indicates that a problem exists with either the appliance, the controls, or the gas supply. Under such circumstances, a qualified service technician should be contacted immediately to properly service the appliance and correct the problem. If a technician is not available, depressing the red button once will remove the lockout state so additional trials for ignition can be performed. **Any time “LOC” is shown, you must look for an LED out, or flashing. The LED that is out or flashing will assist you in diagnosing lock out condition.**

COMPONENTS DIAGRAM



1. 1/2" NPT X 6" GAS INLET NIPPLE
2. GAS VALVE-(GV1000)
3. GAS VALVE ELBOW-(PBE90)
4. GAS ORIFICE UNION-(GGU5)
5. GAS ORIFICE-CONVERSION KITS
   - 90,000 PROPANE TO NATURAL-(N9AG)
   - 90,000 NATURAL TO PROPANE-(P9A6)
   - 130,000 PROPANE TO NATURAL-(N13AG)
   - 130,000 NATURAL TO PROPANE-(P13AG)
   - 160,000 PROPANE TO NATURAL-(N16AG)
   - 160,000 NATURAL TO PROPANE-(P16AG)
   - 199,000 PROPANE TO NATURAL-(N19AG)
   - 199,000 NATURAL TO PROPANE-(P19AG)
6. UNION CONNECTOR NIPPLE
7. *MAIN CONTROL PC BOARD-(7000-702)
   *MUST SPECIFY MODEL & SERIAL NUMBER WHEN ORDERING
8. DISPLAY PC BOARD-(7000-664)
9. PRESSURE SWITCH-(WHC1001-PSW)
10. TRANSFORMER-(7000-666)
11. ECO/TEMPERATURE PROBE-(WHC1001-ECO)
12. 110V IGNITOR (0206FF003)-SURFACE IGNITER
13. FLAME RECTIFICATION PROBE-(PSE-TF1)
14. OVER TEMPERATURE SWITCH-(T1500)
15. COMBUSTION BLOWER-(7000-705)
16. GLASS SIGHT WINDOW-(G2000)
    GASKET SIGHT WINDOW-(G5060)
17. AIR INLET ADAPTER
18. AIR INLET CONNECTOR
19. AIR INLET MANIFOLD
20. EXHAUST OUTLET CONNECTOR
21. EXHAUST ELBOW AND DRAIN-(7000-604)
22. CONDENSATE CONNECTOR HOSE
23. 1/2" BARB X 1/2" M ADAPTER-(1436-005)
24. 15/16" HOSE CLAMP-(22250ZP)
25. 90 DEG. STREET ELBOW-(412-005)
26. COMBINATION 90 DEG. ELBOW-(1413-005)
27. CONDUIT 1/2" LOCKNUT-(401)
28. COMBINATION 90 DEG. ELBOW-(1407-005)
29. PUSH BUTTON

⚠ WARNING

THERE ARE NO USER SERVICEABLE PARTS WITHIN THE CONTROL SYSTEM. TO MAINTAIN SAFETY AND PROPER APPLIANCE PERFORMANCE, REFER ALL TROUBLESHOOTING TO QUALIFIED SERVICE PERSONNEL.

TROUBLESHOOTING

The appliance controller has many inherent diagnostic and fault detection routines built into its operating software and hardware. These routines, along with the three digit LED display and nine LED status indicators present on the display panel, can greatly assist the service person in quickly pinpointing the source of problems that may occur with the appliance. In certain circumstances, multiple LED's may be lit or flashing to better pinpoint the problem. Also, there is a green LED on the main control board to indicate proper polarity and grounding. The following charts, diagrams, and information can be used during troubleshooting procedures:

LED	CONTROLLER FUNCTION	MEANING
LINE	MONITORS INCOMING AC LINE VOLTAGE	"ON" WHEN LINE VOLTAGE IS PRESENT
BLOWER	MONITORS THE BLOWER MOTOR OUTPUT	"ON" WHEN OUTPUT IS ENERGIZED (POWER APPLIED TO BLOWER)
IGNITOR	MONITORS IGNITOR ELEMENT OUTPUT	"ON" WHEN OUTPUT IS ENERGIZED (POWER APPLIED TO IGNITOR)
24V	MONITORS INCOMING VOLTAGE FROM THE TRANSFORMER SECONDARY	"ON" WHEN SECONDARY VOLTAGE IS PRESENT
ECO	MONITORS STATE OF THE ECO SWITCH	"ON" WHEN ECO SWITCH IS IN CLOSED POSITION (NORMAL POSITION)
PRESSURE	MONITORS STATE OF THE AIR SWITCH	"ON" WHEN THE PRESSURE SWITCH IS CLOSED (SUFFICIENT COMBUSTION AIRFLOW EXISTS)
GAS VALVE	MONITORS THE GAS VALVE OUTPUT	"ON" WHEN OUTPUT IS ENERGIZED (POWER APPLIED TO GAS VALVE)
WATER TEMP.	MONITORS WATER TEMP. WITHIN TANK	"ON" WHEN TEMP. DROPS BELOW SET POINT
CONTROL HEALTH	MONITORS INTERNAL STATE OF THE CONTROLLER'S HARDWARE AND SOFTWARE	"ON" WHEN CONTROLLER FUNCTIONALITY IS O.K.
GREEN ON MAIN CONTROL BOARD	MONITORS POLARITY AND GROUND CIRCUIT	"ON" WHEN GROUND AND POLARITY ARE O.K.

VERY IMPORTANT SET-UP INSTRUCTIONS!

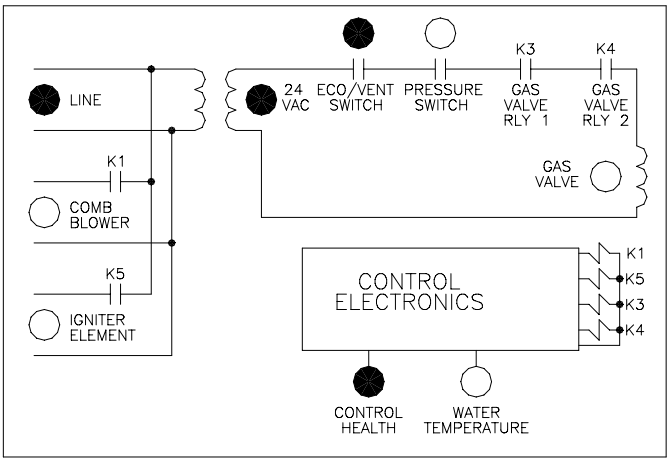
IF YOU HAVE A COMBUSTION ANALYZER, THE FOLLOWING RATINGS WILL BE **VERY HELPFUL** IN SETTING UP YOUR BOOSTER:

FOR NATURAL GAS - CO2 READING SHOULD BE BETWEEN 9 ½% & 10 ½%
O2 READING SHOULD BE BETWEEN 3 ½% & 4 ½%
CO READING SHOULD BE UNDER 10 PPM

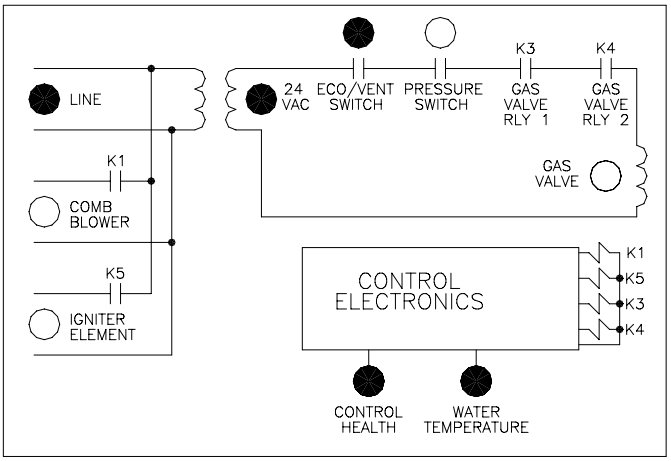
FOR PROPANE GAS - CO2 READING SHOULD BE BETWEEN 10 ½% & 11 ½%
O2 READING SHOULD BE BETWEEN 3 ½% & 4 ½%
CO READING SHOULD BE UNDER 10 PPM

STATUS UNDER NORMAL OPERATING CONDITIONS

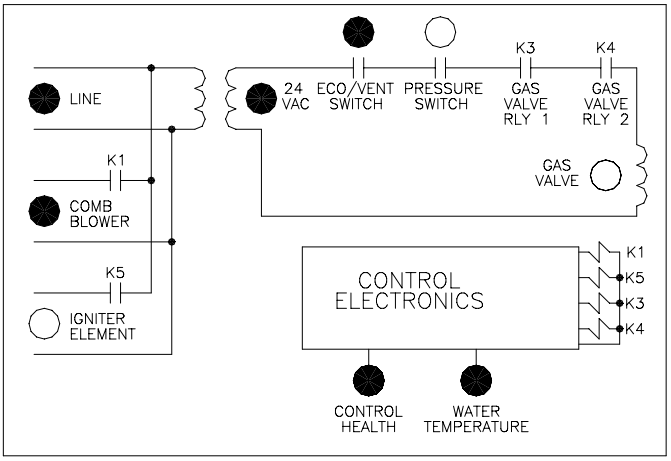
KEY:
LED lights ON ●
LED lights OFF ○



1. Idle State

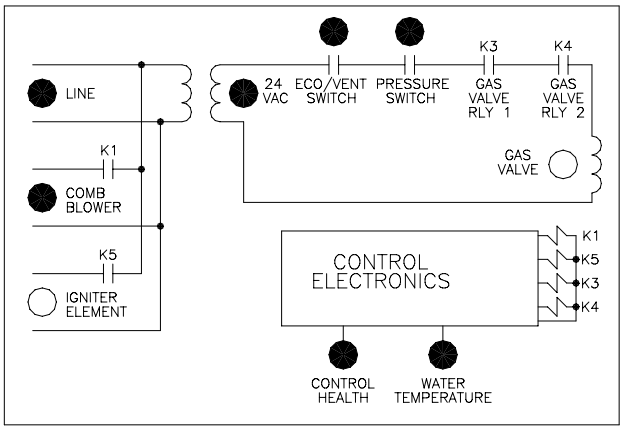


2. Call for Heat

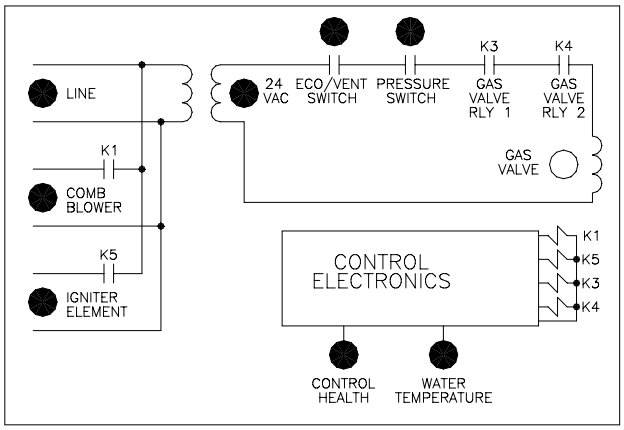


3. Combustion Blower Powered

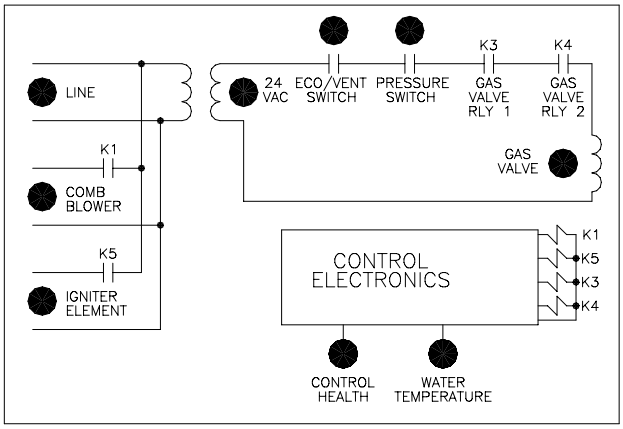
STATUS UNDER NORMAL OPERATING CONDITIONS



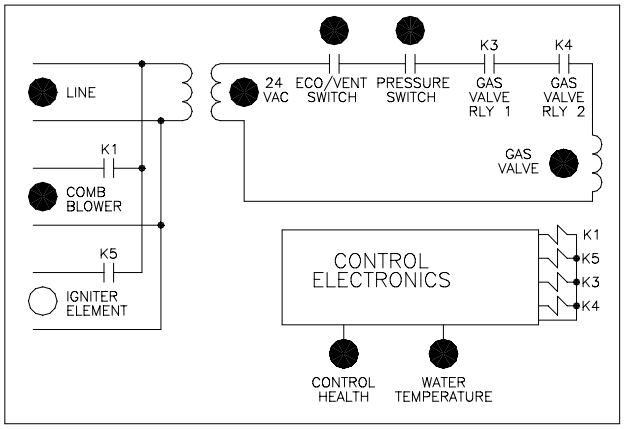
4. Pressure Switch Closes, Pre-purge Cycle Starts



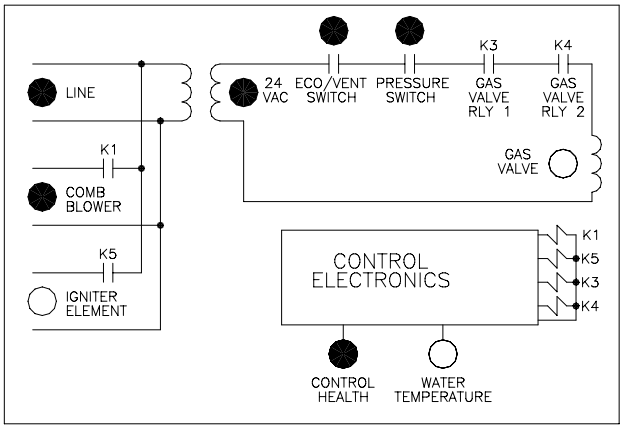
5. Igniter Element Warmup



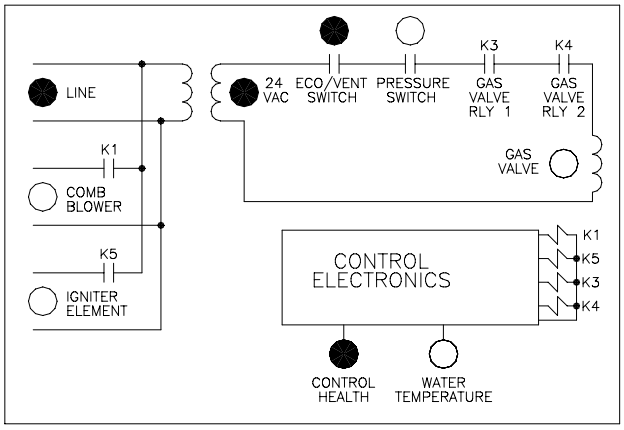
6. Burner Light-off



7. Water Heating

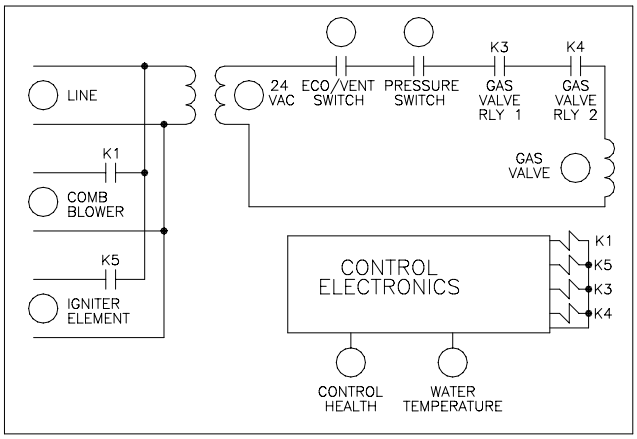


8. End Call for Heat
Start Post-purge Cycle



9. End of Sequence, Idle State

TROUBLESHOOTING

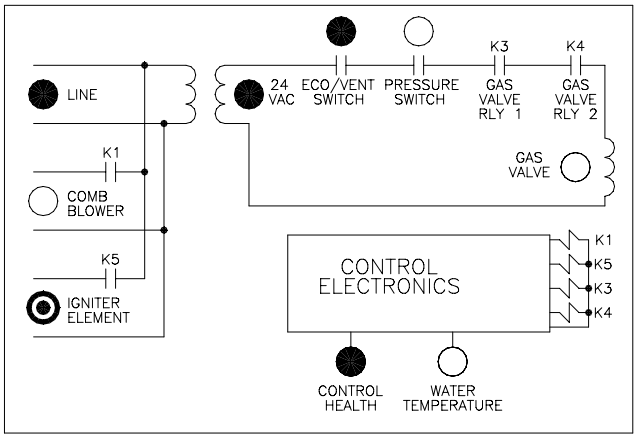


NO INCOMING LINE VOLTAGE OR 24 VOLT

Line LED & 24 VAC LED Off

POSSIBLE CAUSE	REMEDY
1. No input power.	1. Apply power
2. Wiring disconnected	2. check all wiring
3. One or more wiring receptacles disconnected from control.	3. Reconnect plugs on control, confirm all are fully seated
4. LED burned out	4. Ignore or replace Display board
5. Defective transformer	5. Replace transformer
6. transformer wiring problem	6. Repair transformer wiring

Note: The transformer is of Class II variety and has an internal non-replaceable fuse. If blown, a problem may exist with the control which is effecting the transformer. In such cases, it is recommended the control should be replaced as well.



IGNITOR LOCKOUT

Ignitor Element LED Flashing

POSSIBLE CAUSE	REMEDY
1. Broken ignitor element	1. Replace ignitor element
2. Ignitor unplugged	2. Plug in ignitor
3. Insufficient ignitor current draw	3. Monitor ignitor current, see note below

Note: The ignitor current is monitored by pressing the black button to the left of the LED's, during the ignitor warm-up period or when the Ignitor Element LED is illuminated. The 3-segment LED display will display the actual ignitor current draw. The expected ignitor current draw 2.5 to 4.5 amps.

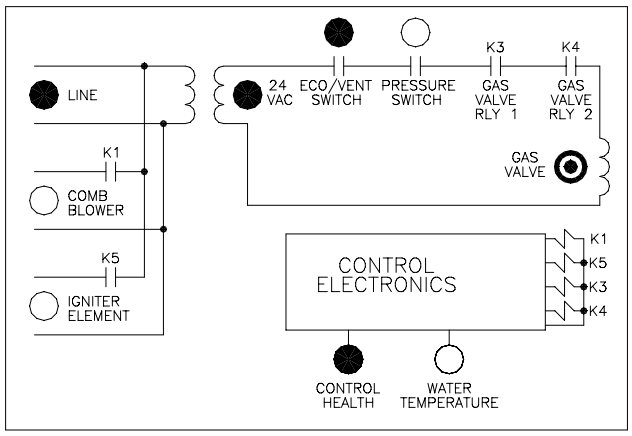
KEY:

LED lights ON

LED lights OFF

LED lights flashing

TROUBLESHOOTING



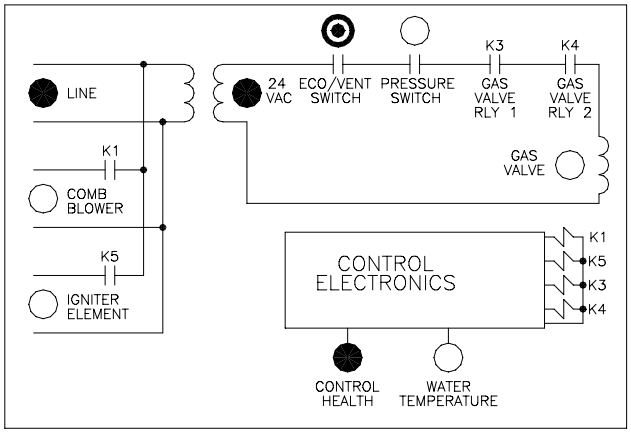
IGNITION LOCKOUT

Gas Valve LED Flashing

This condition results from a failure to establish burner ignition after three successive trials. In such cases:
First, investigate the possible cause and remedy any observations.
Second, momentarily press the button on the display panel to reset the lockout condition.
Third, confirm proper appliance operation.

POSSIBLE CAUSE	REMEDY
1. Burner ground wire broken or corroded	1. Check wire and connection at burner
2. Connectors unplugged	2. Check connectors
3. Flame probe faulty	3. Replace flame probe
4. Gas shut off	4. Turn on gas supply
5. Clogged gas valve	5. Replace gas valve
6. Faulty gas valve	6. Replace gas valve
7. Defective control	7. Replace control
8. Burner improperly adjusted	8. Adjust burner
9. Dirty burner	9. Clean burner
10. Improper line connection	10. Verify green LED on on control board is illuminated when power is applied
11. Insufficient flame current	11. Monitor flame current, see note below

Note: The flame current is monitored by pressing the black button to the left of the LED's, during the heat cycle or when the Gas Valve LED is illuminated. The 3-segment LED display will display the actual flame current. The expected flame current is 4.0 to 5.1 micro-amps.

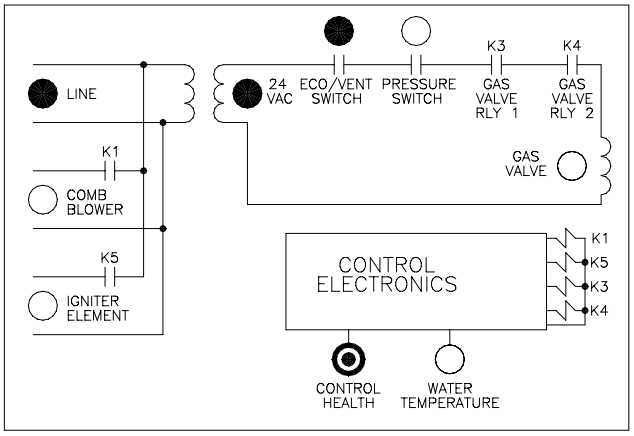


ECO SWITCH OPEN

ECO LED Flashing

POSSIBLE CAUSE	REMEDY
1. Temp probe unplugged	1. Check connectors
2. Temp probe wiring damaged	2. Repair wiring
3. Water in tank too hot	3. Normal condition when water temp exceeds safety limit. Allow water to cool or admit cold water into tank, and manually reset the control. Determine cause for overtemp condition.

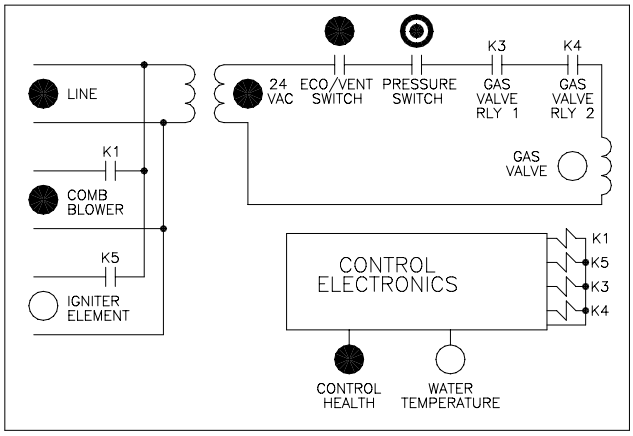
TROUBLESHOOTING



CONTROL HEALTH

LED Flashing

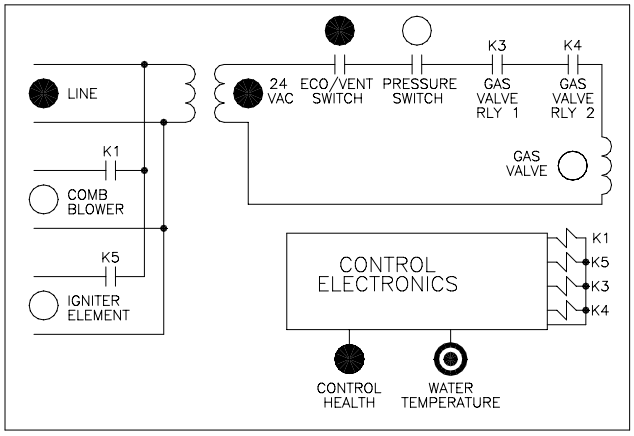
POSSIBLE CAUSE	REMEDY
This indicates that the control has failed one of its internal diagnostic self–tests.	Press button on the display board to reset control. if this error occurs repeatedly, replace the control.



COMBUSTION AIR BLOCKAGE

Pressure Switch LED Flashing

POSSIBLE CAUSE	REMEDY
1. Combustion air blocked	1. Check exhaust piping and flue for obstructions
2. Blower not operating:	
a. check blower wiring	2a. Repair wiring
b. check blower motor	2b. Replace blower motor
3. Defective air switch	3. Replace air switch



TEMPERATURE PROBE FAULT

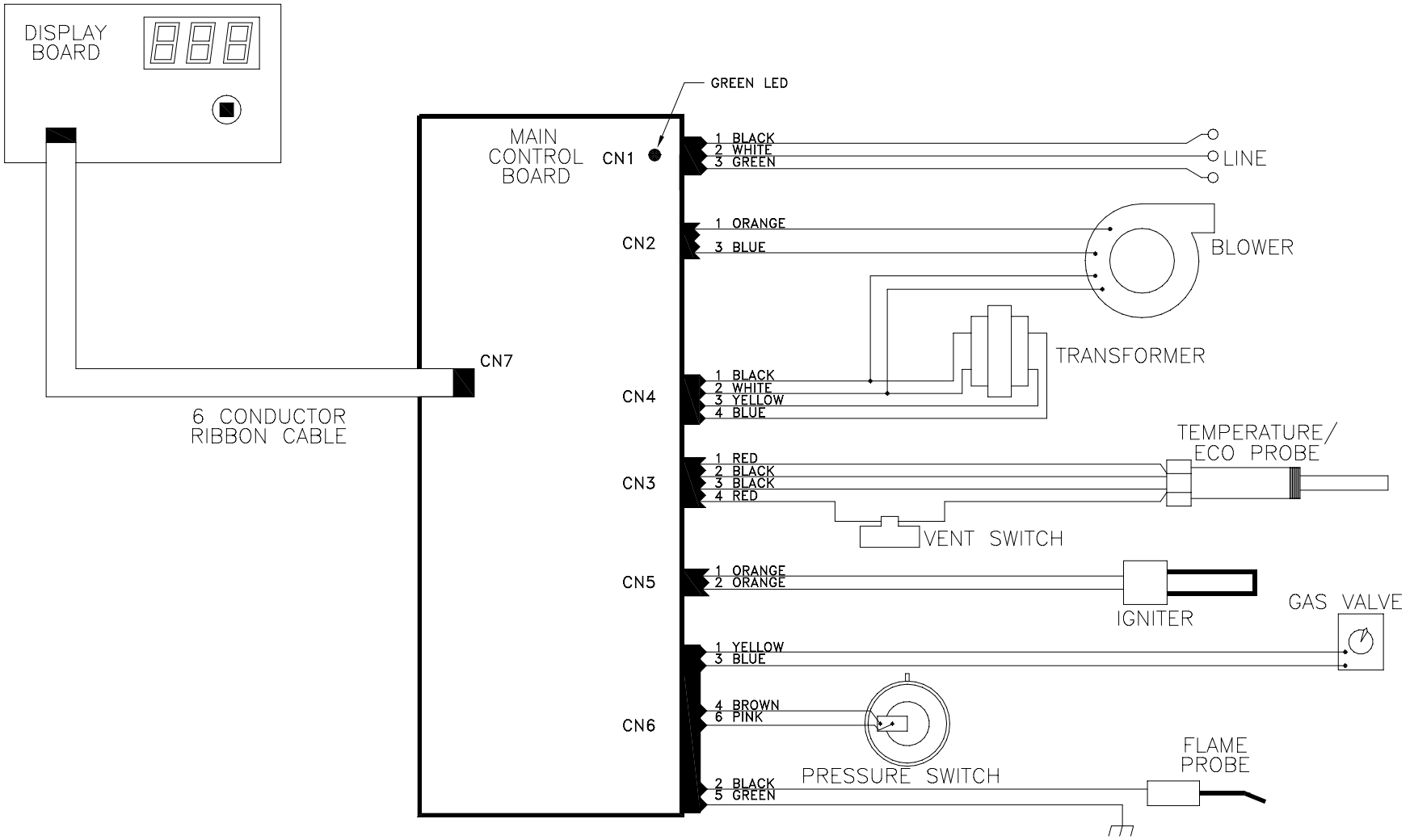
Water Temp LED Flashing

POSSIBLE CAUSE	REMEDY
1. Temp probe wiring open	1. Repair wiring
2. Defective probe	2. Replace probe
3. No water in tank, tank in freezing conditions	3. Control is recording an "out–of–bounds" condition. Turn on water supply, remove tank from freezing conditions.
4. Water level in tank low, probe in steam	4. Control is recording an "out–of–bounds" condition. Fill tank
5. Probe wiring shorted	5. Replace probe

Note: If the temperature probe housing fractures and allows water into the sensor section of the probe, this may effect the temperature displayed on the Display panel. If the display is displaying highly inconsistant temperature readings, this is an indication the temperature probe is defective due to water contamination.

WHC1200 INTEGRATED WATER HEATER CONTROL

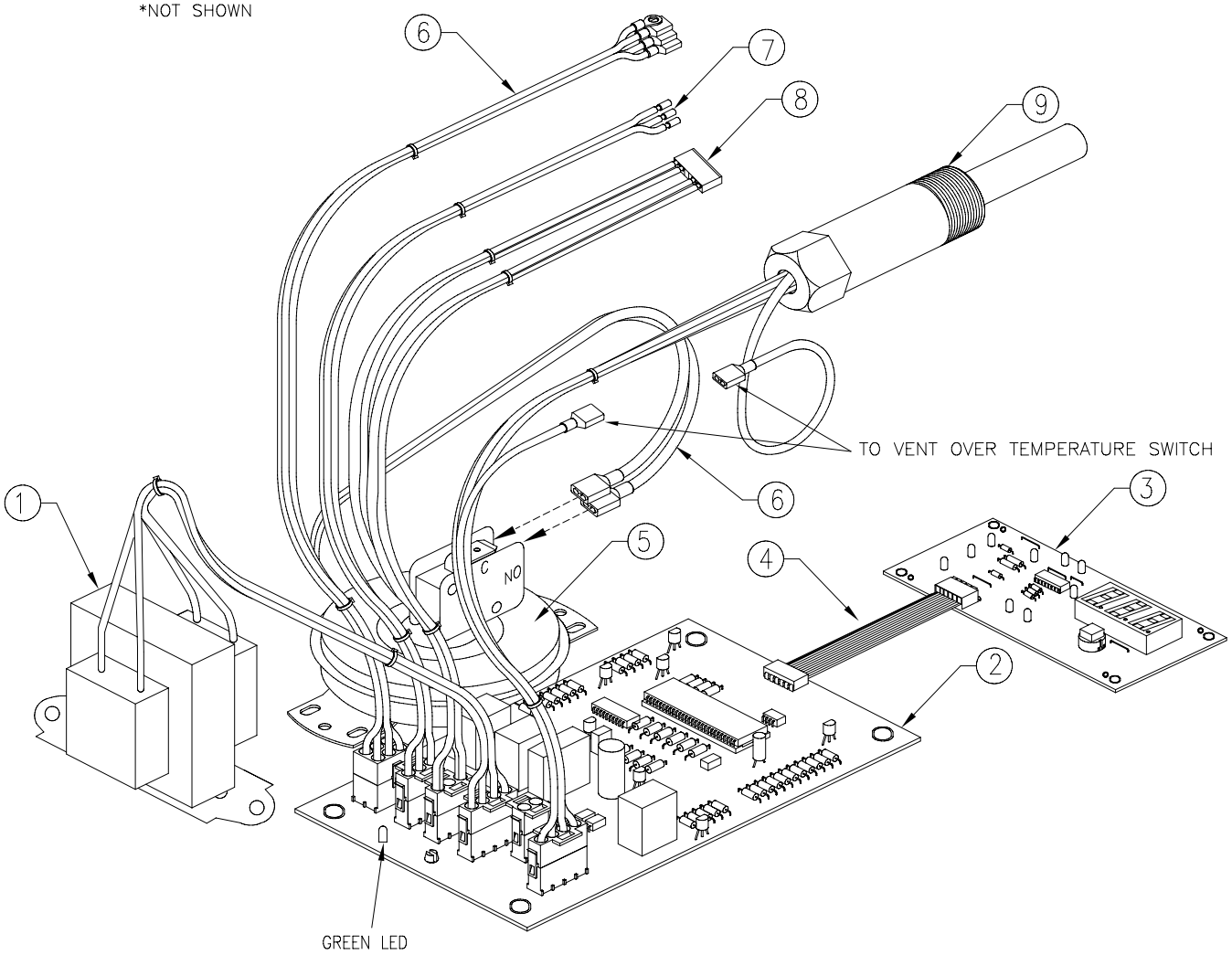
CONNECTION DIAGRAM

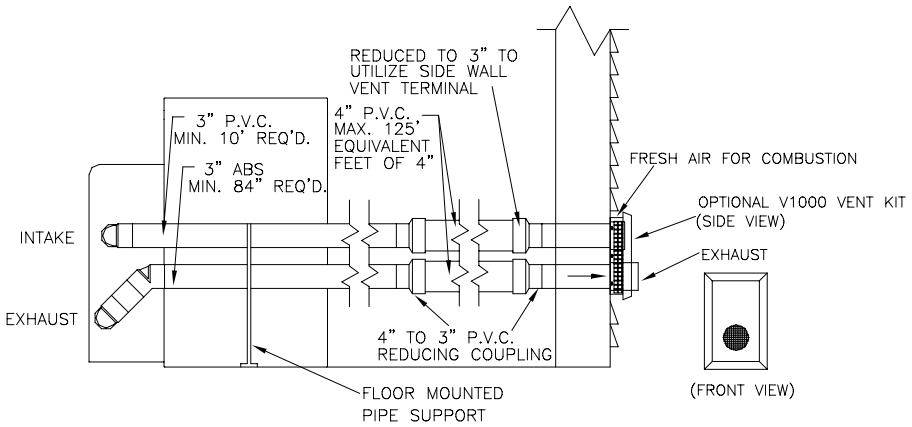


INTEGRATED WATER HEATER CONTROL (1200 BOARD SYSTEM)

PARTS IDENTIFICATION		
ITEM	DESCRIPTION	HTP PART NUMBER
1	TRANSFORMER & BLOWER SUPPLY CABLE	7000-666
2	CONTROL BOARD – MUST SPECIFY MODEL & SERIAL NUMBER WHEN ORDERING	7000-702
3	DISPLAY BOARD	7000-664
4	DISPLAY BOARD TO CONTROL BOARD WIRE	7000-665
5	PRESSURE SWITCH	WHC1001-PSW
6	WIRE HARNESS FROM CN6 TO GAS VALVE, FLAME PROBE AND PRESS. SWITCH	710B0041
7	WIRE HARNESS FROM CN1 TO LINE POWER	710B0048
8	WIRE HARNESS FROM CN2 TO COMBUSTION BLOWER & TRANSFORMER	7000-666
9	ECO/TEMPERATURE PROBE (WIRED TO CN3)	WHC1001-ECO
*10	PUSH BUTTON SWITCH FOR IGNITOR & FLAME CURRENT	7000-667

*NOT SHOWN





SIDE VENTING 3" → 4" → 3"
SIDE VIEW

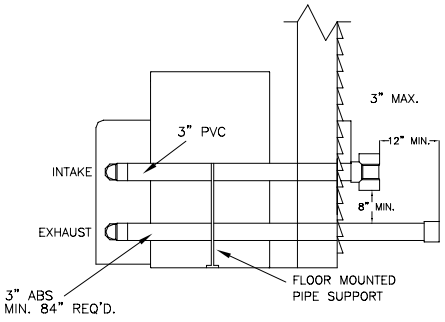


FIGURE 1
SIDE VENTING
SIDE VIEW

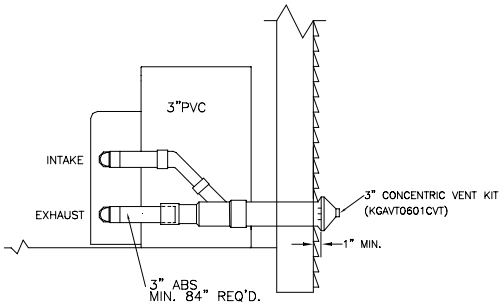


FIGURE 2
SIDE VENTING
SIDE VIEW

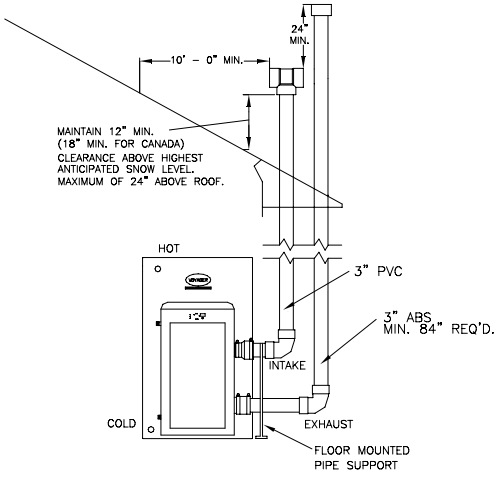


FIGURE 3
VERTICAL ROOF VENTING
FRONT VIEW

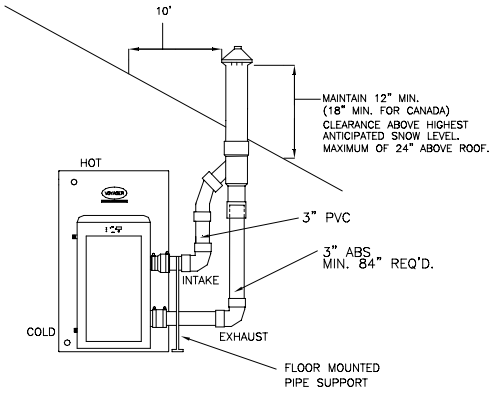
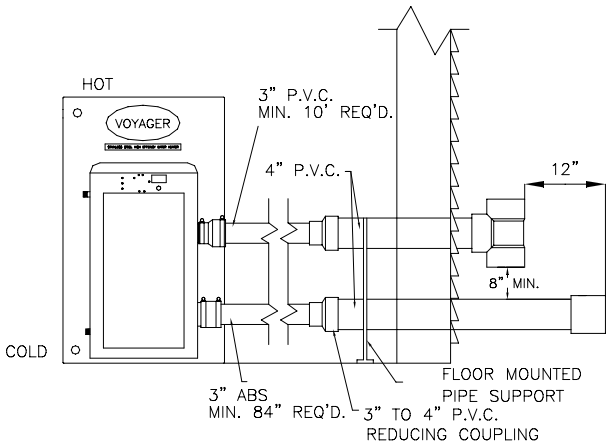
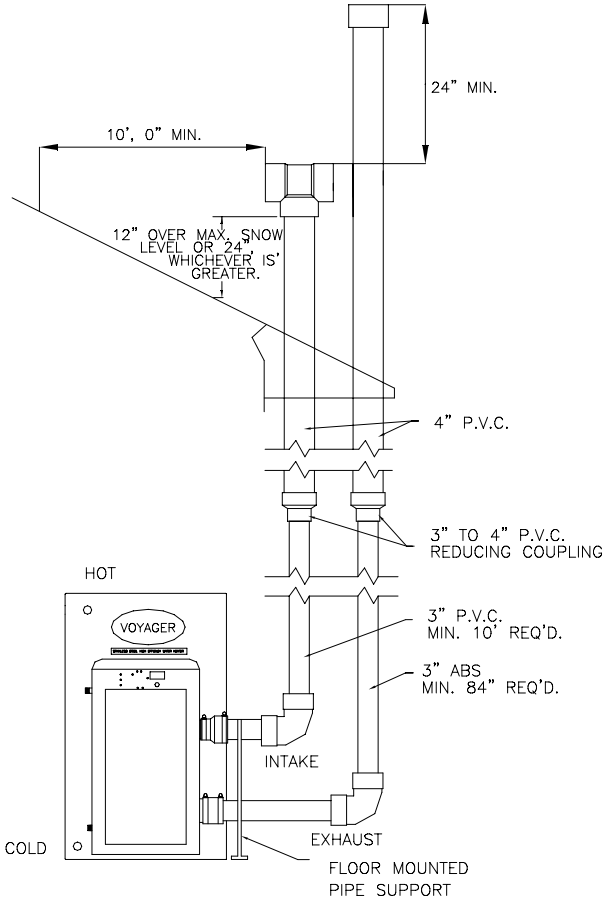


FIGURE 4
VERTICAL ROOF VENTING W/CONCENTRIC VENT KIT
(KGAVT0601CVT, 3 IN. – FRONT VIEW)



3" ⟶ 4" SIDE VENTING
FRONT VIEW



3" ⟶ 4" VERTICAL ROOF VENTING
FRONT VIEW

COMPLETE TEAR-DOWN PROCEDURE

TOOLS REQUIRED:

5/16" NUT DRIVER	¼" FLAT HEAD SCREWDRIVER	3/8" DEEP SOCKET
#2 PHILLIPS HEAD SCREWDRIVER	7/16" DEEP SOCKET	10" PIPE WRENCH
½" DEEP SOCKET	1 ¼" DRIVE INCH POUND TORQUE	3/8" WRENCH
WRENCH (RANGE 0-200)	SNAP RING/NEEDLE NOSE PLIERS	7/16" WRENCH

General Safety Precautions

SEE END OF THIS SECTION FOR PARTS DIAGRAMS.

1. DISCONNECT POWER FROM UNIT.
2. SHUT OFF GAS SUPPLY.
3. REMOVE CABINET DOOR.
4. SHUT OFF GAS VALVE BY TURNING THE BLUE KNOB ON THE GAS VALVE.
5. DISCONNECT THE AIR INLET PIPE AT THE SMALL END OF THE AIR INLET CONNECTOR BY LOOSENING THE HOSE CLAMP WITH A 5/16" NUT DRIVER.
6. REMOVE THE CLEAR VINYL HOSE THAT RUNS FROM THE GAS VALVE TO THE AIR INLET ADAPTER.
7. BREAK THE GAS ORIFICE UNION BY TURNING THE UNION CLOCKWISE WITH A 10" PIPE WRENCH.

WARNING

BE SURE NOT TO LOOSE THE GAS ORIFICE HELD INSIDE THE UNION.

8. REMOVE THE BRASS BARB FROM THE AIR INLET ADAPTER WITH A 7/16" DEEP SOCKET.
9. LOOSEN THE AIR INLET ADAPTER AND PULL THE AIR INLET ADAPTER THROUGH THE SIDE OF THE CABINET.

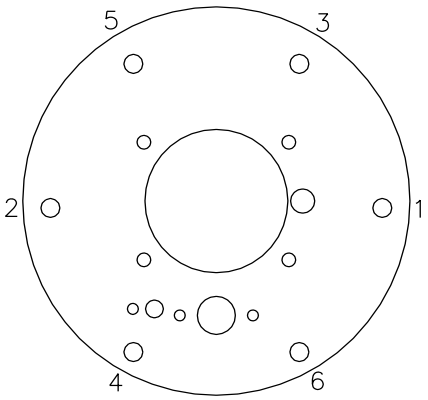
WARNING

BE SURE NOT TO LOOSE THE AIR ORIFICE SNAPPED INTO THE END OF THE ALUMINUM PIPE.

10. REMOVE THE FOUR BRASS NUTS HOLDING THE ALUMINUM AIR INLET MANIFOLD TO THE BLOWER, WITH A 3/8" DEEP SOCKET.
11. REMOVE THE BLOWER OUTLET FLANGE GASKET FROM THE BLOWER.
12. REMOVE THE GAS VALVE WIRING HARNESS FROM THE GAS VALVE BY PRESSING ON THE TABS ON THE TOP AND BOTTOM OF THE PLUG, AND PULLING.
13. REMOVE THE TWO GREEN GROUNDING WIRES FROM THE TOP/REAR OF THE BLOWER BY TAKING OUT THE GREEN GROUNDING SCREW WITH A 5/16" NUT DRIVER.
14. REMOVE THE BLACK WIRE FROM THE FLAME RECTIFICATION PROBE, BY PULLING ON IT.
15. REMOVE THE IGNITOR WIRING HARNESS FROM THE CONTROL BOARD BY PRESSING ON THE TABS ON THE TOP AND BOTTOM OF THE PLUG, AND PULLING.
16. REMOVE THE TWO BRASS NUTS RETAINING THE IGNITOR, WITH A 3/8" DEEP SOCKET.
17. GENTLY PRY THE IGNITOR BACK ABOUT 1/16 OF AN INCH, WITH A ¼" FLAT HEAD SCREWDRIVER. NOW PULL THE IGNITOR STRAIGHT BACK. BE VERY CAREFUL THAT YOU DO NOT WIGGLE THE IGNITOR AT ALL!
18. REMOVE THE FLAME RECTIFICATION PROBE BY REMOVING THE SCREW TO THE LEFT OF THE ELECTRICAL CONNECTOR WITH A #2 PHILLIPS HEAD SCREWDRIVER AND PULLING IT STRAIGHT BACK.
19. REMOVE THE CLEAR VINYL HOSE FROM THE LEFT/BACK OF THE BLOWER.
20. REMOVE THE BLOWER WIRING HARNESS FROM THE LEFT/BOTTOM OF THE BLOWER BY PULLING STRAIGHT OUT ON IT.
21. REMOVE THE FOUR BRASS NUT RETAINING THE BLOWER TO BURNER MOUNTING FLANGE WITH A 7/16" WRENCH.
22. PULL THE BLOWER STRAIGHT BACK BEING CAREFUL NOT TO LOSE THE SIGHT GLASS.
23. REMOVE THE BURNER BY PRYING IT AWAY FROM THE BURNER MOUNTING FLANGE AND THEN PULLING IT STRAIGHT BACK.
24. REMOVE THE OLD BURNER MOUNTING FLANGE GASKET BY REMOVING THE SIX NUTS WITH A ½" DEEP SOCKET.
25. REMOVE ALL OF THE OLD GASKET MATERIAL FROM ALL SURFACES EXCEPT FOR THE SIGHT GLASS WINDOW GASKET.

ASSEMBLY

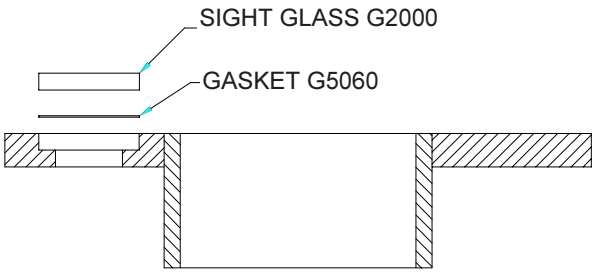
1. REPLACE THE WHITE FIBER BURNER MOUNTING FLANGE GASKET WITH A NEW GASKET.
2. PUT THE BURNER MOUNTING FLANGE BACK IN PLACE WITH THE ½" HOLE NEXT TO THE LARGE HOLE IN THE CENTER OF THE PLATE TO THE RIGHT AND WITH THE STUDS FACING OUT.
3. TIGHTEN THE SIX ½" NUTS TO 50 INCH POUNDS TORQUE AND THEN 200 INCH POUNDS TORQUE IN THE FOLLOWING ORDER:



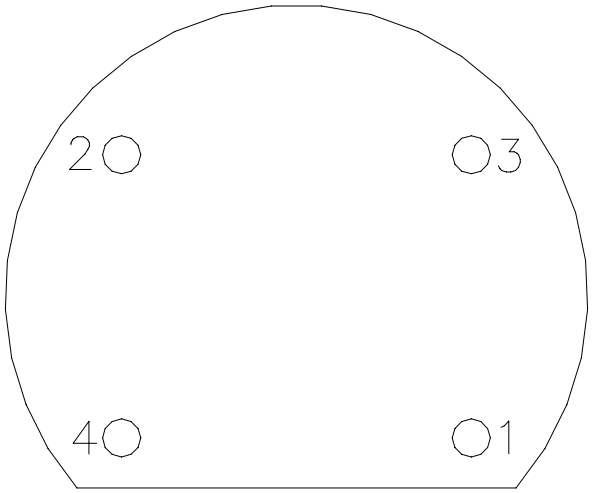
4. REPLACE THE BURNER MOUNTING FLANGE GASKET WITH A NEW GASKET, BE SURE THAT BOTH SIDES OF THE GASKET ARE SPRAYED WITH PERMATEX HIGH TACK SPRAY-A-GASKET ADHESIVE SEALANT (PART #99MA).
5. RE-INSERT THE BURNER WITH THE FLAT SIDE OF THE FLANGE FACING DOWN.
6. REPLACE THE BLOWER OUTLET FLANGE GASKET WITH A NEW GASKET. BE SURE THAT BOTH SIDES OF THE GASKET ARE SPRAYED WITH PERMATEX HIGH TACK SPRAY-A-GASKET ADHESIVE SEALANT (PART #99MA).
7. PLACE BLOWER ON BURNER MOUNTING FLANGE. BE SURE THAT THE SIGHT GLASS IS IN PLACE AND THE GASKET IS INSTALLED CORRECTLY AS SHOWN BELOW:

General Safety Precautions

IF GASKET OR SIGHT WINDOW ARE DAMAGED IN ANY WAY, REPLACE THEM WITH NEW ONES.



8. TIGHTEN THE BLOWER BOLTS FIRST TO 50 INCH POUNDS TORQUE, THEN TO 150 INCH POUNDS TORQUE, IN THE FOLLOWING ORDER:



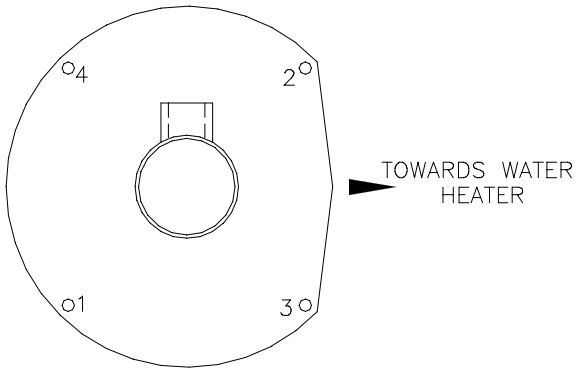
10. TIGHTEN THE TWO 3/8" IGNITOR NUTS TO 50 INCH POUNDS TORQUE.
11. PLACE THE FLAME RECTIFICATION PROBE BACK INTO THE BURNER MOUNTING FLANGE AND TIGHTEN THE SCREW WITH A #2 PHILLIPS HEAD SCREWDRIVER.
12. RE-INSTALL THE AIR INLET GASKET TO THE RIGHT SIDE OF THE BLOWER WITH THE TWO ANGLE CUTS FACING TOWARD THE BOOSTER.
13. RE-INSTALL THE ALUMINUM AIR INLET ASSEMBLY WITH THE TWO ANGLE CUTS FACING THE BOOSTER.
14. TIGHTEN THE FOUR 3/8" NUTS TO 5 INCH POUNDS TORQUE IN THE FOLLOWING ORDER:

⚠ General Safety Precautions

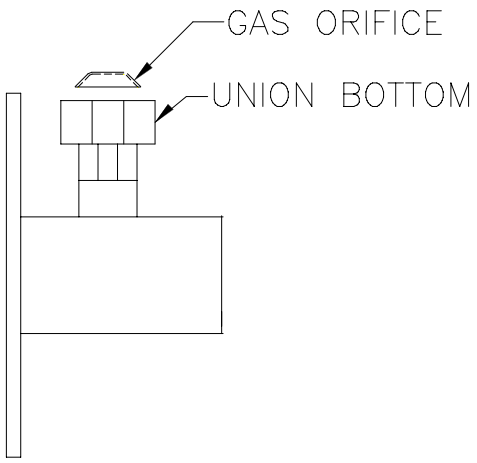
IF THESE BOLTS ARE OVER TIGHTENED,

THE BLOWER WILL BE DAMAGED AND WILL

HAVE TO BE REPLACED.

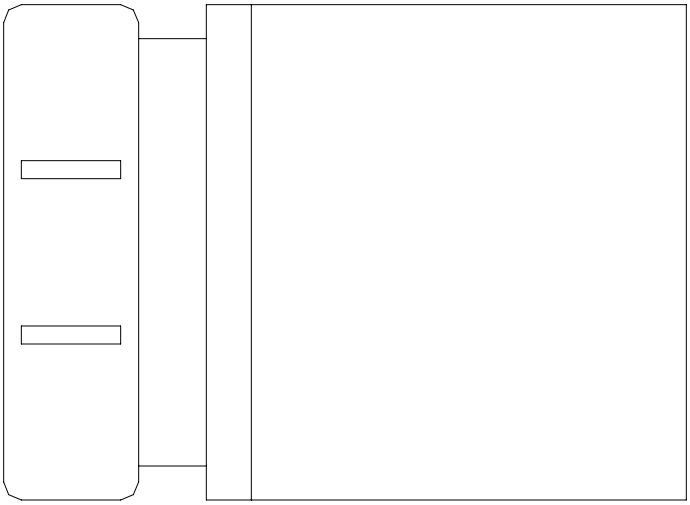


15. SNAP THE AIR ORIFICE INTO THE END OF THE AIR INLET MANIFOLD.
16. SLIDE THE AIR INLET ADAPTER OVER THE END OF THE AIR INLET MANIFOLD UNTIL THE STOP INSIDE THE AIR INLET ADAPTER CONTACTS THE END OF THE AIR INLET MANIFOLD.
17. TIGHTEN THE TRAP ADAPTER BY HAND, WITH 1/8" PIPE THREAD FACING UP.
18. RE-INSTALL THE 1/8" BRASS BARB BACK INTO THE TRAP ADAPTER WITH A 7/16" DEEP SOCKET.
19. PLACE GAS ORIFICE ON TOP OF THE SPLIT UNION WITH HOLE FACING UP, AS SHOWN BELOW:

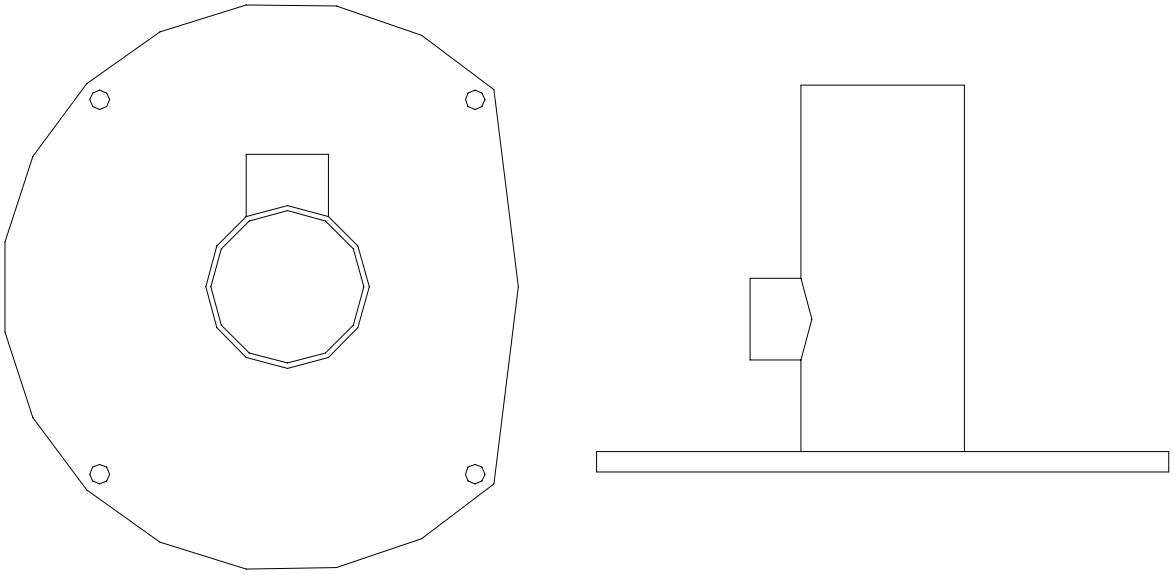


20. RE-CONNECT THE GAS VALVE TO THE AIR INLET MANIFOLD BY TURNING THE UNION COUNTER-CLOCKWISE AND TIGHTENING IT WITH A 10" PIPE WRENCH.
21. RE-CONNECT THE CLEAR VINYL HOSE FROM THE GAS VALVE TO THE AIR INLET ADAPTER.
22. PLUG THE BLOWER POWER WIRE INTO THE LEFT-BOTTOM OF THE BLOWER WITH THE WHITE TOWARDS THE TOP.
23. RE-CONNECT THE CLEAR VINYL HOSE FROM THE PRESSURE SWITCH TO THE BARB ON THE BACK-LEFT OF THE BLOWER.
24. PLUG THE IGNITOR WIRING HARNESS BACK INTO THE CONTROL BOARD.
25. RE-CONNECT THE BLACK WIRE TO THE FLAME RECTIFICATION PROBE, BY PUSHING THE CONNECTOR OVER THE BLADE ON THE FLAME RECTIFICATION PROBE.
26. SCREW THE TWO GREEN GROUNDING WIRES TO THE TOP-BACK OF THE BLOWER WITH THE GREEN GROUNDING SCREW, USING A 5/16" NUT DRIVER.
27. PLUG THE GAS VALVE WIRING HARNESS BACK INTO THE GAS VALVE WITH THE BLUE WIRE TOWARDS THE BOTTOM OF THE CONNECTOR.
28. RE-CONNECT THE AIR INLET PIPING BY LOOSENING THE SMALLER HOSE CLAMP ON THE AIR INLET CONNECTOR ALL THE WAY, AND THEN SLIDING THE BOOT OVER THE END OF THE AIR INLET ADAPTER, THEN TIGHTEN, USING A 5/16" NUT DRIVER.

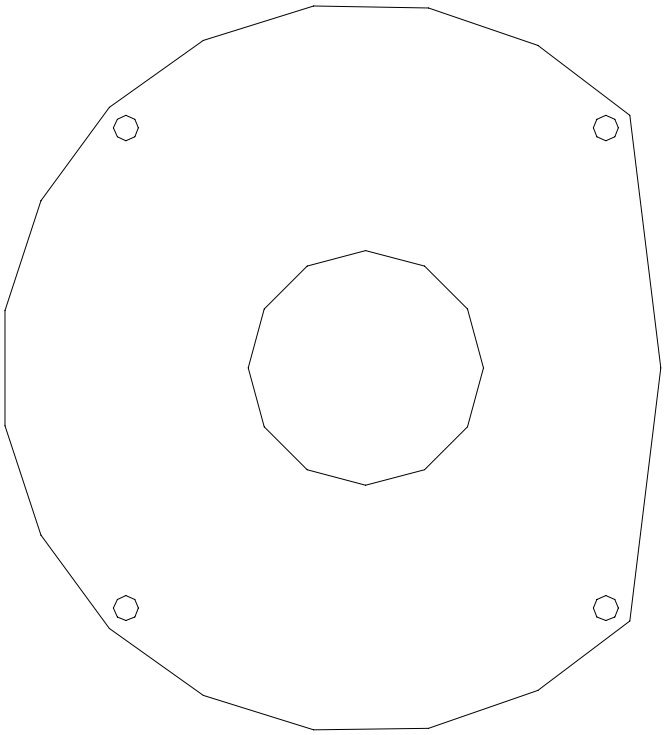
PARTS ILLUSTRATIONS



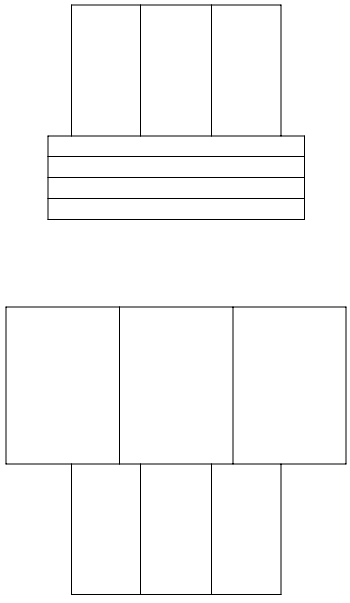
AIR INLET ADAPTER
NI110



AIR INLET MANIFOLD
A5000

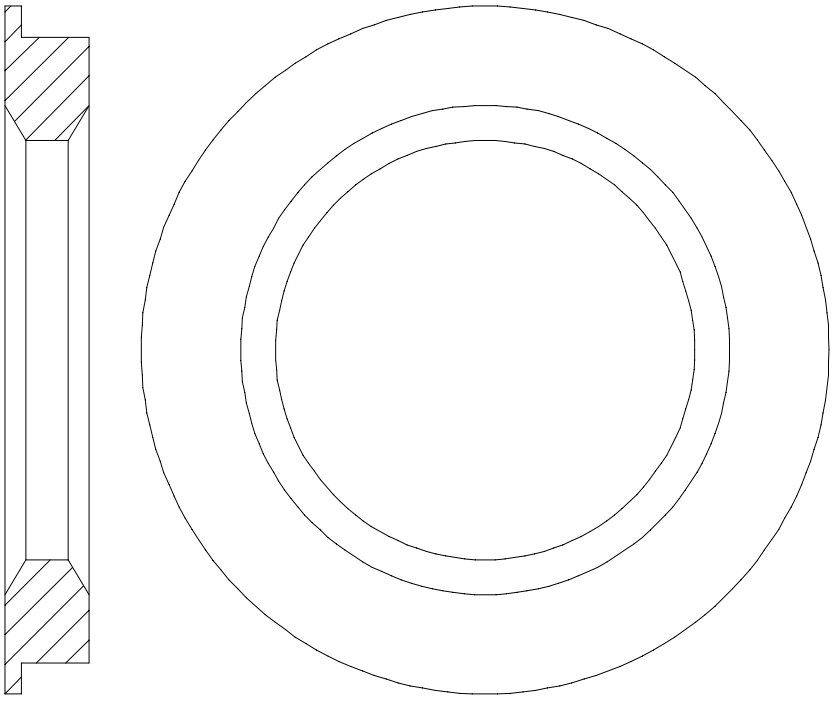


GASKET AIR INLET
G5030

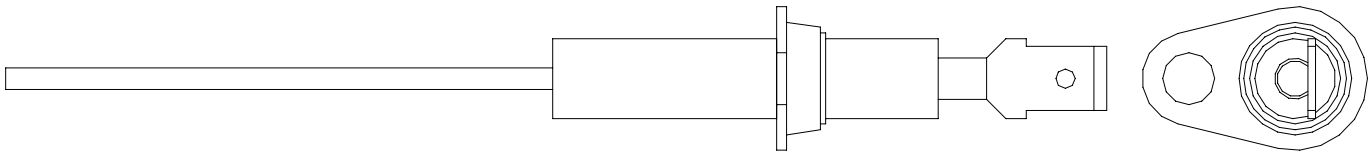


GAS ORIFICE UNION
GGU5

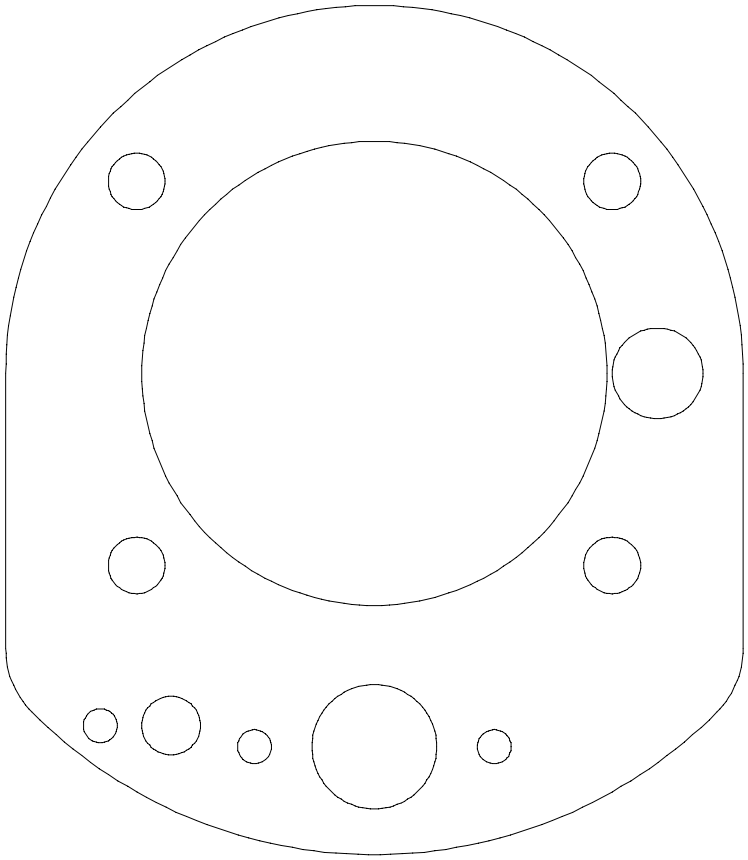
GAS ORIFICE
01000



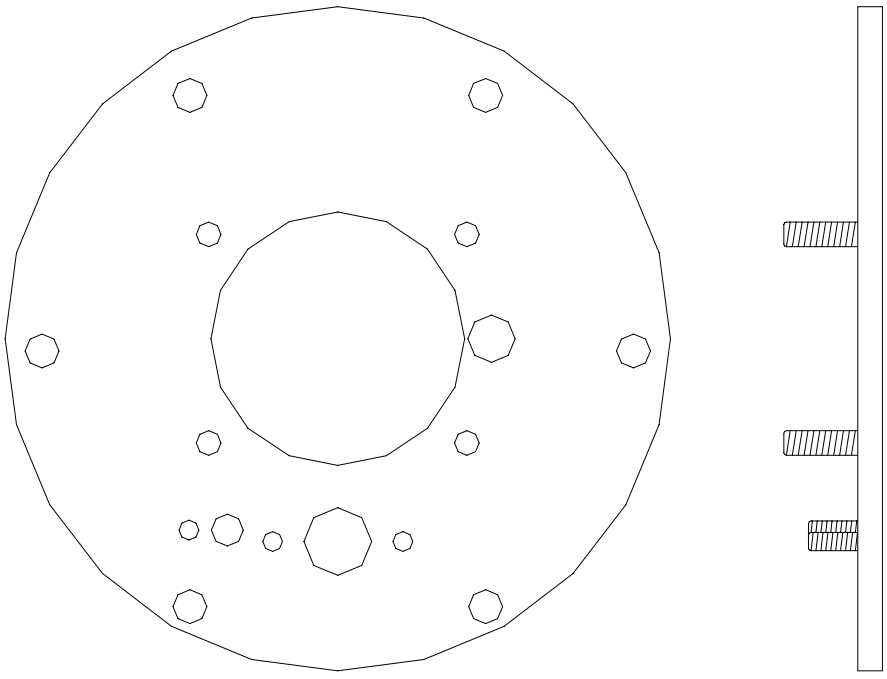
AIR ORIFICE
A3001 = 1.0 SIZE; A3002 = 1.125 SIZE; A3003 = 1.375 SIZE



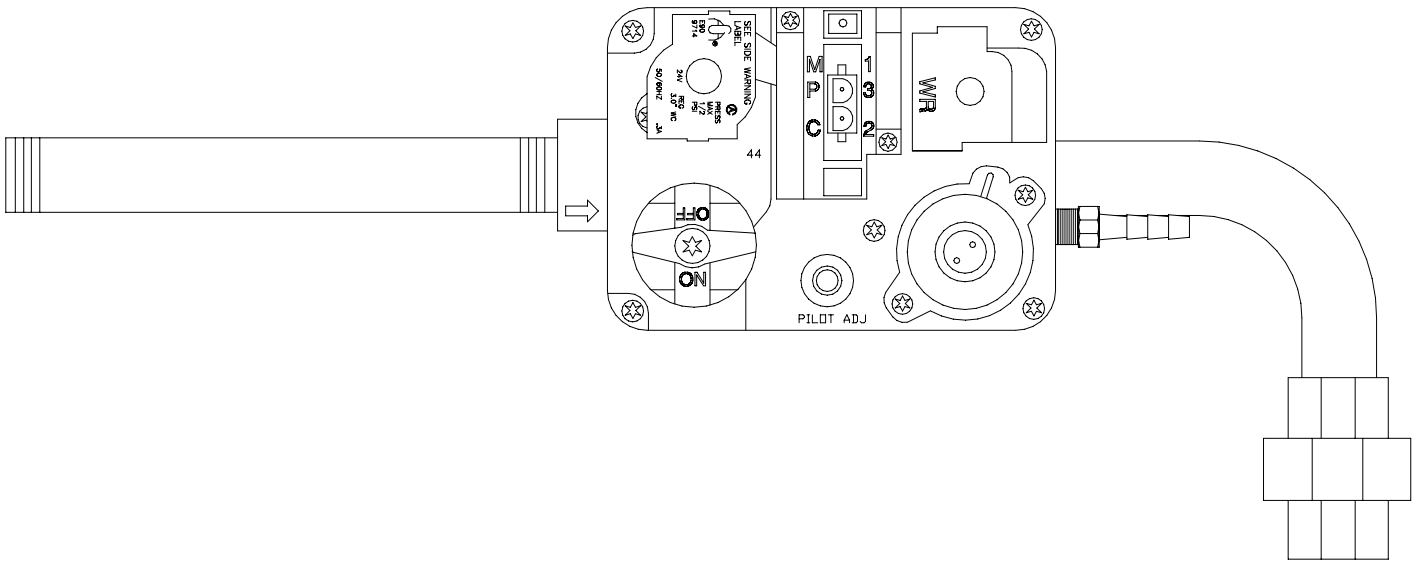
FLAME RECTIFICATION PROBE
PSE-TF1



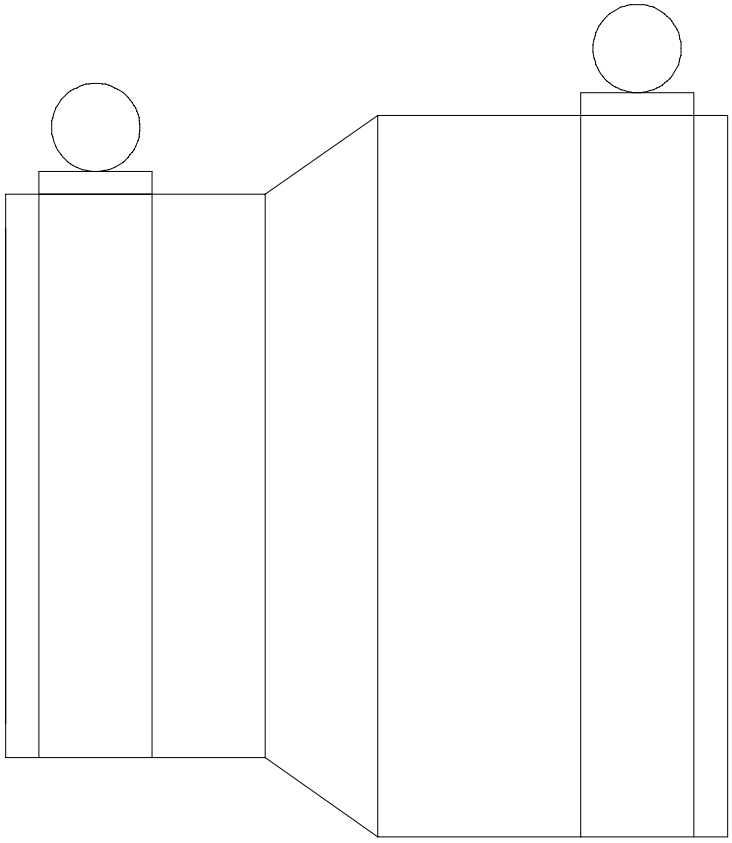
GASKET BURNER MOUNTING FLANGE
G5010



BURNER MOUNTING FLANGE
7000-616



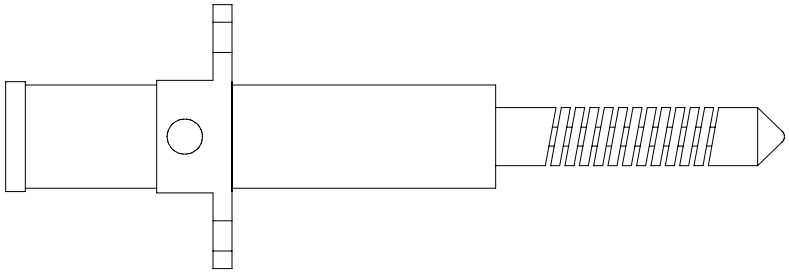
GAS VALVE
HTPPAM203



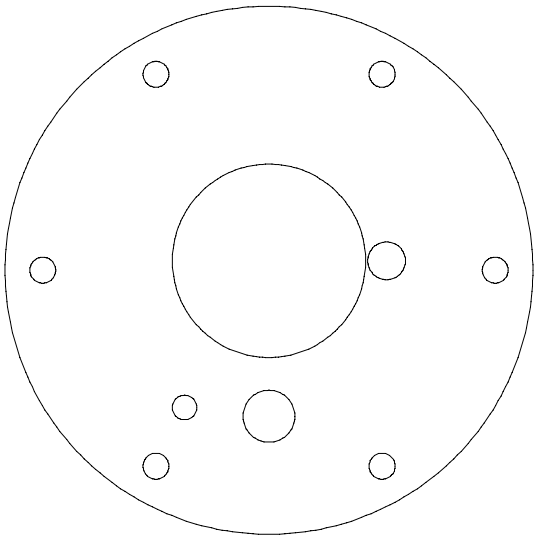
AIR INLET CONNECTOR
F3000

General Safety Precautions

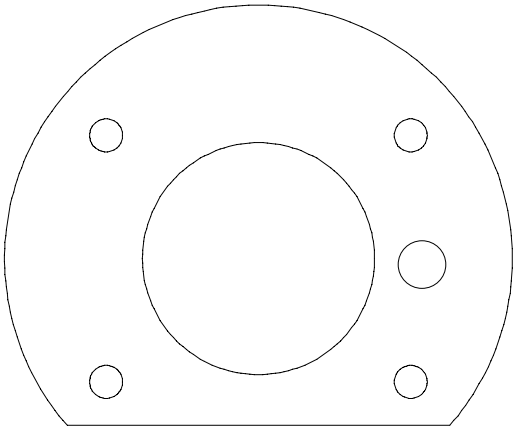
BEFORE INSTALLING IGNITOR, CHECK TO MAKE SURE ALL DEBRIS IS CLEARED FROM CHAMBER!



110V IGNITOR - SURFACE IGNITER
0206FF003



GASKET BURNER MOUNTING FLANGE WHITE
G5040



GASKET BLOWER OUTLET FLANGE
G5020

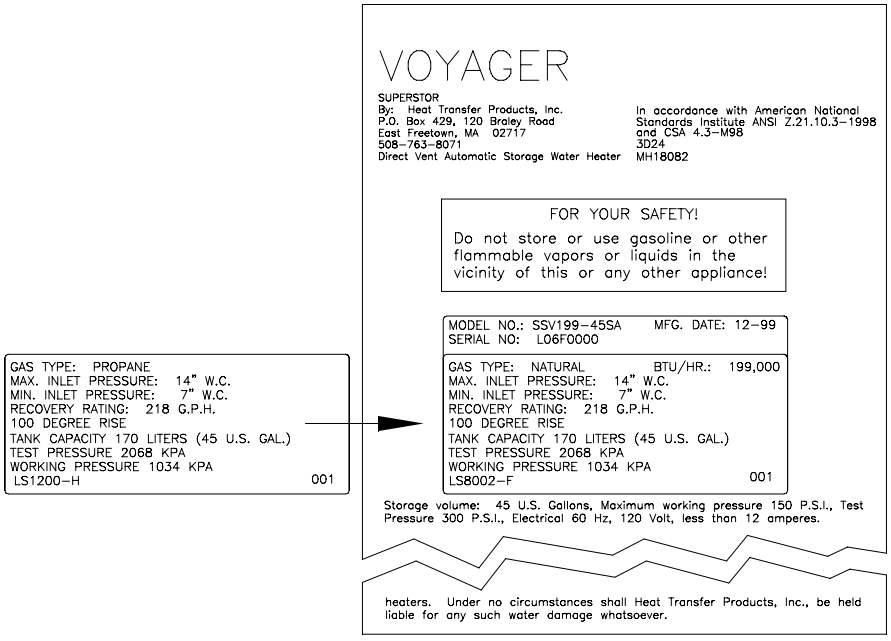
GAS ORIFICE CONVERSION INSTRUCTIONS

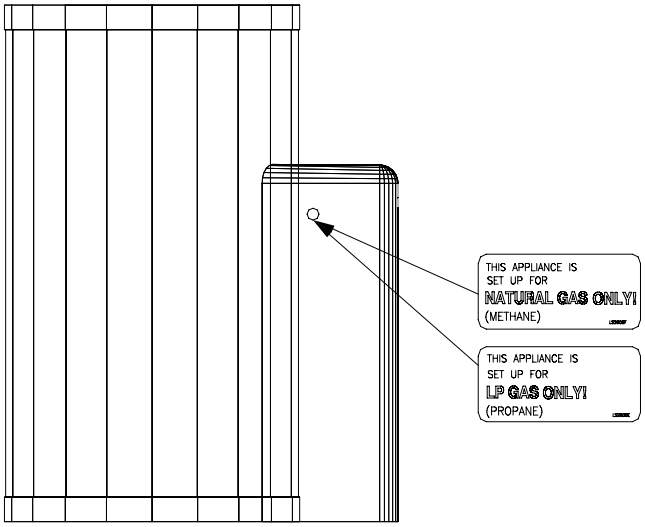
1. IF UNIT IS INSTALLED, TURN OFF POWER AND GAS SUPPLY BEFORE PERFORMING ANY CONVERSIONS.

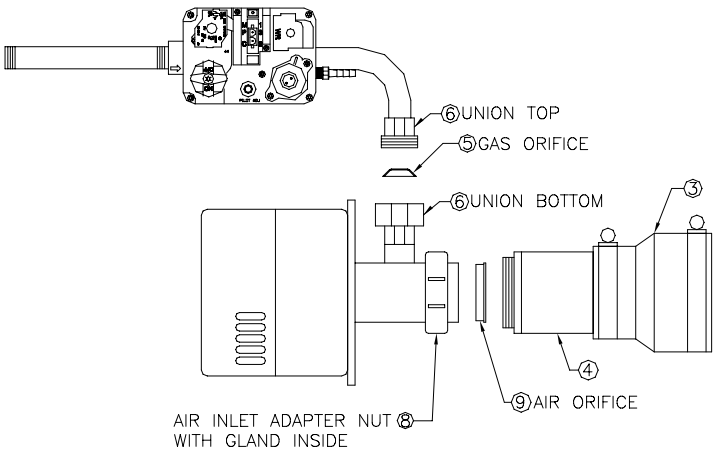
2. TO CHANGE GAS ORIFICE, DISCONNECT UNION (#6) (REFERENCE DRAWING BOTTOM RIGHT) BETWEEN THE GAS VALVE AND AIR INLET; REMOVE OLD GAS ORIFICE (#5), AND INSTALL THE NEW GAS ORIFICE IN THE UNION THAT CORRESPONDS TO THE UNIT MODEL NUMBER AND FUEL BEING USED. SEE KIT CONTENT LIST FOR THE CORRECT ORIFICE TO BE USED. DISCARD ORIFICES NOT USED.

3. FOR LABELING, CHANGE THE RATING PLATE LABEL FROM THE ORIGINAL FUEL TYPE TO THE NEW FUEL TYPE BY PLACING THE NEW LABEL OVER THE EXISTING LABEL (SHOWN DIRECTLY BELOW). NEXT, PLACE GAS TYPE LABEL (LS2000E OR F) OVER PREVIOUS GAS TYPE LABEL, NEXT TO GAS INLET PIPE (AS SHOWN BOTTOM LEFT); THEN PLACE LABEL THAT STATES UNIT HAS BEEN CONVERTED, DIRECTLY BELOW THE GAS TYPE LABEL (LS2000Z OR AA).

4. IF YOU ENCOUNTER COMBUSTION PROBLEMS, REFER TO PROCEDURE 1 - GAS VALVE ADJUSTMENT.

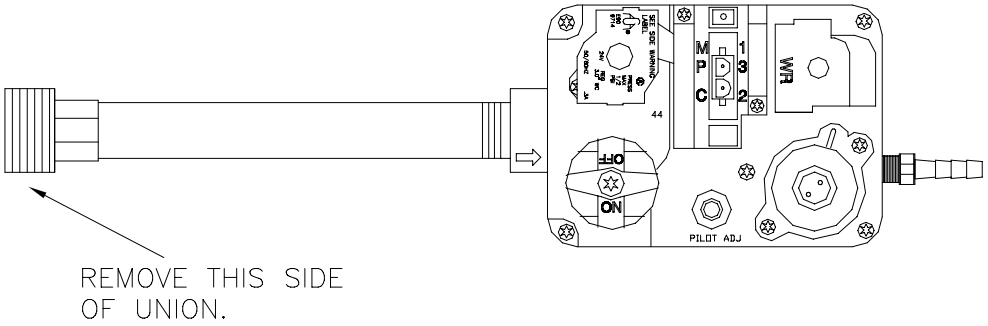




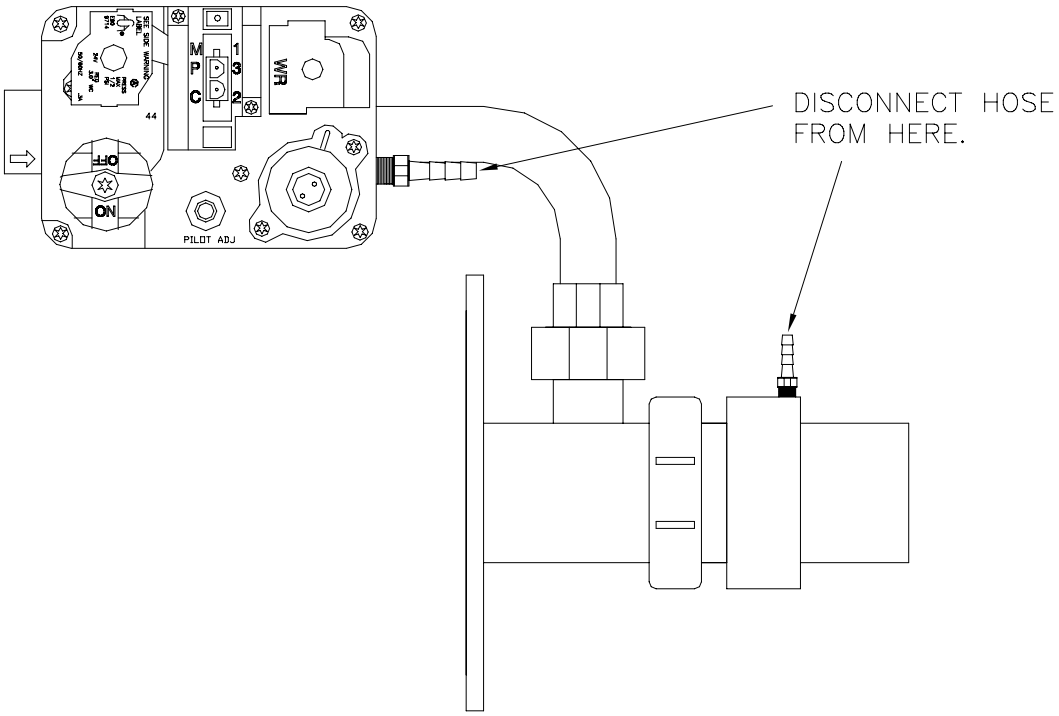


GAS VALVE REPLACEMENT - REMOVAL

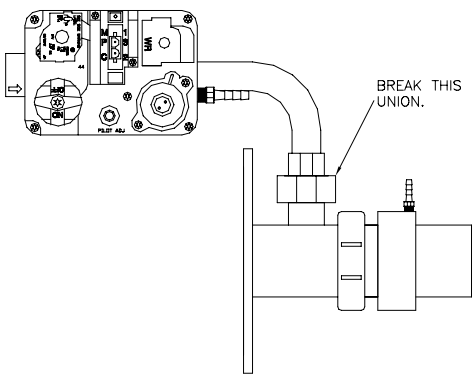
1. SHUT OFF POWER TO THE VOYAGER.
2. REMOVE THE DOOR FROM THE VOYAGER CABINET.
3. SHUT OFF THE GAS VALVE BY TURNING THE BLUE KNOB ON THE VALVE TO THE "OFF" POSITION.
4. SHUT OF THE GAS SUPPLY TO THE VOYAGER.
5. BREAK THE UNION ON THE GAS LINE LOCATED BEFORE THE GAS VALVE, AND REMOVE THE HALF OF THE UNION THAT IS CONNECTED TO THE GAS VALVE INLET PIPE.



6. REMOVE THE CLEAR VINYL HOSE THAT CONNECTS BETWEEN THE GAS VALVE AND THE TRAP ADAPTER.



7. BREAK THE UNION THAT CONNECTS THE GAS VALVE TO THE AIR INLET MANIFOLD.



8. SLIDE THE GAS VALVE OUT THROUGH THE FRONT OF THE VOYAGER CABINET. REMOVE THE GAS VALVE WIRING HARNESS FROM THE GAS VALVE.

GAS VALVE REPLACEMENT - REMOVAL (continued)

⚠ WARNING

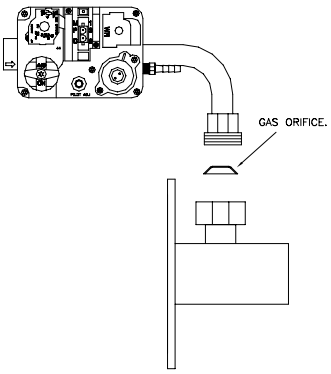
When replacing any components withing this appliance, leak testing with a gas sniffer or other suitable device MUST BE DONE! Failure to check for leaks could result in carbon monoxide leakage, personal injury, fire, or explosion.

GAS VALVE REPLACEMENT - PROCEDURE # 1 (INSTALLATION)

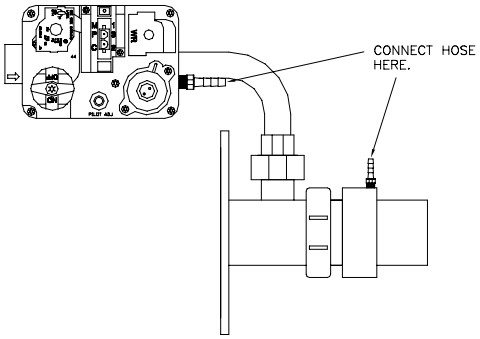
NOTE: IF YOU HAVE TWO MANOMETERS AVAILABLE, THEN FOLLOW INSTALLATION PROCEDURE #2. IF NO MANOMETERS ARE AVAILABLE, USE INSTALLATION PROCEDURE #1.

PROCEDURE #1

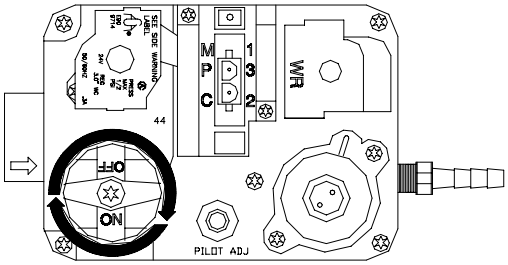
1. RE-CONNECT THE GAS VALVE WIRING HARNESS TO THE GAS VALVE.
2. SLIDE THE GAS VALVE BACK INTO POSITION BY PUTTING THE GAS VALVE INLET THROUGH THE GAS VALVE INLET HOLE IN THE LEFT-TOP OF THE VOYAGER CABINET.
3. PLACE THE GAS ORIFICE BACK ON THE BOTTOM HALF OF THE UNION, AND TIGHTEN THE UNION.



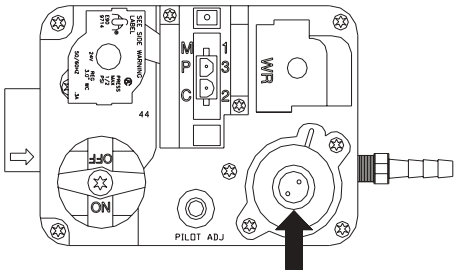
4. RE-CONNECT THE CLEAR VINYL HOSE TO THE GAS VALVE AND TO THE TRAP ADAPTER.



5. RE-CONNECT THE SUPPLY GAS PIPING TO THE VALVE.
6. TURN ON THE GAS TO THE VOYAGER.
7. TURN THE BLUE KNOB ON THE GAS VALVE TO THE "ON" POSITION.



8. REMOVE THE SMALL ROUND BRASS PLUG FROM THE GAS VALVE BY TURNING IT COUNTER-CLOCKWISE WITH A PAIR OF SNAP RING OR NEEDLE NOSE PLIERS.



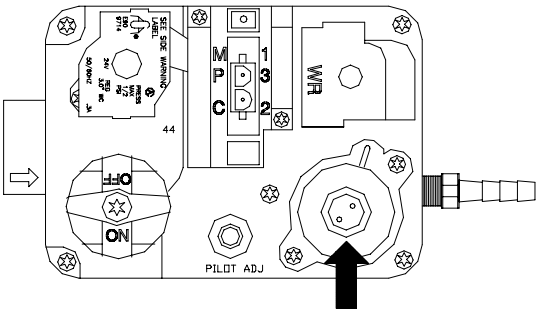
9. TURN THE LINE VOLTAGE BACK ON, TO THE VOYAGER.

GAS VALVE ADJUSTMENT-PROCEDURE # 1

I. LET THE UNIT START TO CYCLE AND LISTED CAREFULLY TO THE IGNITION. IF THE IGNITION WAS QUIET, THE VALVE WILL NEED NO ADJUSTMENT. IF IT WAS A LOUD IGNITION OR THERE WAS NOT IGNITION AT ALL, FOLLOW THESE STEPS:

A. IF THERE WAS NO IGNITION:
1. MAKE SURE THE GAS VALVE IS IN THE "ON" POSITION; GAS IS ON TO THE UNIT; AND THE GAS VALVE WIRING HARNESS IS PLUGGED INTO THE GAS VALVE AND INTO THE CONTROL BOARD
2. TURN THE ADJUSTMENT SCREW UNDER THE BRASS CAP YOU REMOVED IN STEP #8 ABOVE. TURN ONE FULL TURN CLOCKWISE WITH A SMALL FLATHEAD SCREWDRIVER.
   A. IF THE UNIT STILL DOES NOT LIGHT OFF, TURN THE ADJUSTMENT SCREW TWO FULL TURNS COUNTERCLOCKWISE

B. IF IGNITION WAS POOR:
1. LOOK AT THE COLOR OF THE FLAME WHILE THE UNIT IS RUNNING, THROUGH THE SIGHT GLASS. IF IT IS GREEN OR RED IN COLOR, OR THE HEATER WHISTLES ON IGNITION, TURN THE ADJUSTMENT SCREW COUNTERCLOCKWISE AT ½ TURN INTERVALS, UNTIL THE FLAME TURNS BLUE/LIGHT BLUE IN COLOR, OR THE WHISTLING AT IGNITION STOPS. IF THE FLAME IS VERY WEAK OR PULSING, TURN THE ADJUSTMENT SCREW CLOCKWISE UNTIL THE FLAME STEADIES.



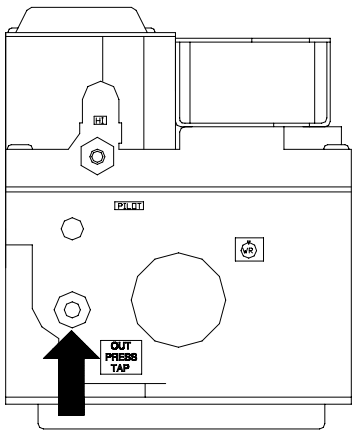
GAS VALVE ADJUSTMENT SCREW

2. PUT THE GAS VALVE ADJUSTMENT SCREW COVER BACK IN PLACE AND TIGHTEN.
3. PUT THE VOYAGER CABINET DOOR BACK INTO PLACE.

GAS VALVE REPLACEMENT - PROCEDURE # 2 (INSTALLATION)

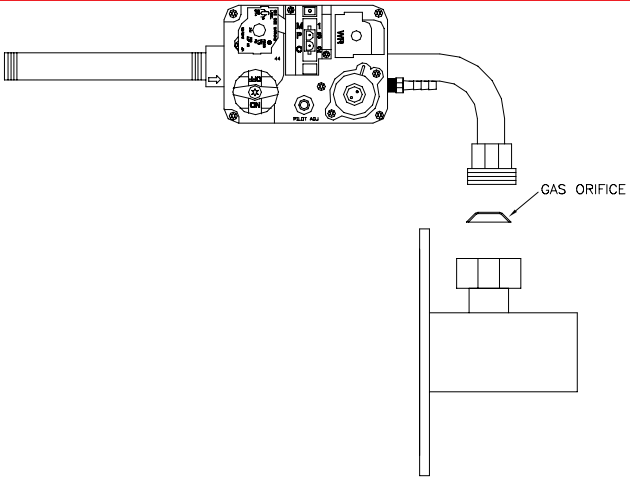
PROCEDURE #2

1. REMOVE THE OUTLET PRESSURE TAP PLUG FROM THE RIGHT SIDE OF THE GAS VALVE WITH A 3/16" ALLEN WRENCH.

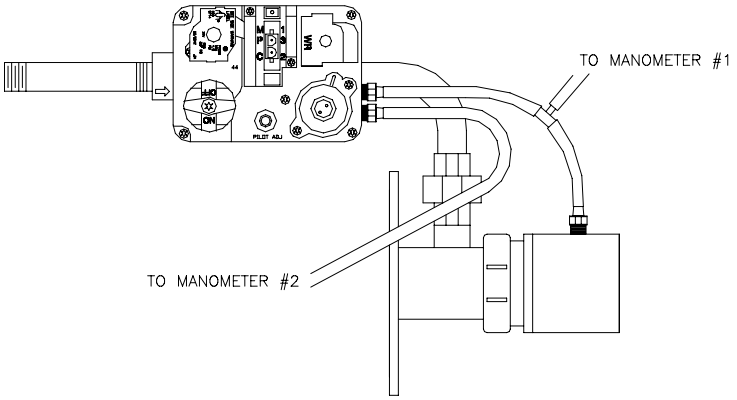


2. PUT A 1/8" NPT HOSE BARB IN PLACE OF THE OUTLET PRESSURE TAP PLUG. NO SEALANT IS REQUIRED ON THIS FITTING.
3. RE-CONNECT THE GAS VALVE WIRING TO THE GAS VALVE.
4. SLIDE THE GAS VALVE BACK INTO POSITION BY PUTTING THE GAS VALVE INLET PIPE THROUGH THE GAS VALVE INLET HOLE IN THE LEFT-TOP OF THE VOYAGER CABINET.
5. PLACE THE GAS ORIFICE BACK ON THE BOTTOM HALF OF THE UNION AND TIGHTEN THE UNION.

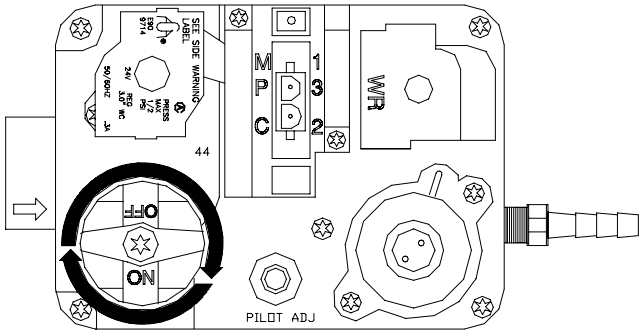
GAS VALVE REPLACEMENT - PROCEDURE # 2 (INSTALLATION) (continued)



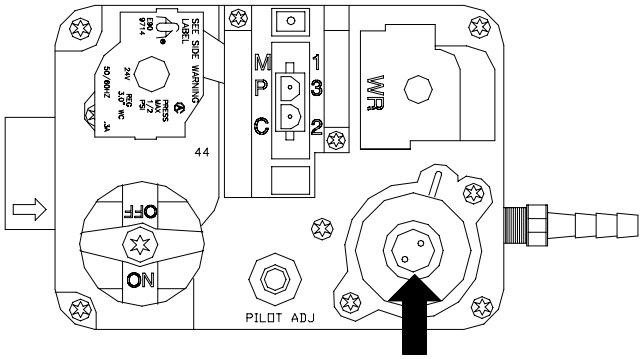
6. CONNECT THE VACUUM HOSING ACCORDING TO THE FOLLOWING DIAGRAM:



7. RE-CONNECT THE SUPPLY GAS PIPING TO THE VALVE.
8. TURN ON THE GAS TO THE VOYAGER.
9. TURN THE BLUE KNOW ON THE GAS VALVE TO "ON".



10. REMOVE THE SMALL ROUND BRASS PLUG FROM THE GAS VALVE BY TURNING IT COUNTERCLOCKWISE WITH A SMALL PUNCH AND HAMMER.

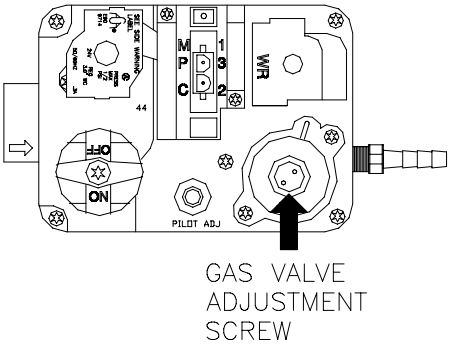


11. TURN THE LINE VOLTAGE BACK ON TO THE VOYAGER.

GAS VALVE ADJUSTMENT - PROCEDURE # 2

12. LET THE VOYAGER CYCLE. AFTER THE VOYAGER STARTS, LET IT RUN FOR 30 SECONDS, THEN ADJUST THE GAS VALVE BY USING THE GAS VALVE ADJUSTMENT SCREW, SO THAT MANOMETER #2 READS EXACTLY THE SAME AS MANOMETER #1.

EXAMPLE: IF MANOMETER #1 READS -.35" AND MANOMETER #2 READS .1"; YOU WOULD ADJUST THE GAS VALVE BY USING THE GAS VALVE ADJUSTMENT SCREW, SO THAT THE MANOMETER #2 ALSO READS -.35".

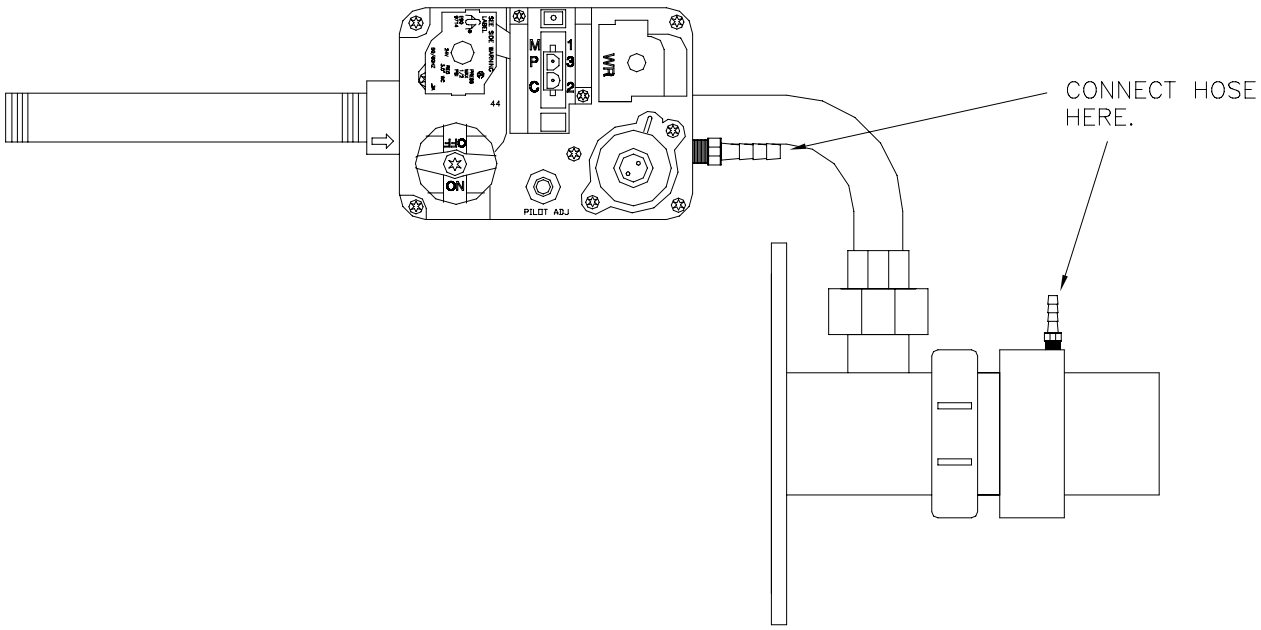


13. IF THERE WAS NO IGNITION:
    1. MAKE SURE THE GAS VALVE IS IN THE "ON" POSITION; GAS IS ON TO THE UNIT; AND THE GAS VALVE WIRING HARNESS IS PLUGGED INTO THE GAS VALVE AND INTO THE CONTROL BOARD
    2. TURN THE ADJUSTMENT SCREW UNDER THE BRASS CAP YOU REMOVED IN STEP #8 ABOVE. TURN ONE FULL TURN CLOCKWISE WITH A SMALL FLATHEAD SCREWDRIVER. IF THE UNIT STILL DOES NOT LIGHT OFF, TURN THE ADJUSTMENT SCREW TWO FULL TURNS COUNTERCLOCKWISE

14. SHUT THE VOYAGER DOWN, THEN START IT UP AGAIN; LET IT RE-LIGHT. IF THE IGNITION WAS GOOD, THE VALVE NEEDS NO FURTHER ADJUSTMENT. IF THE IGNITION WAS POOR, SHUT DOWN THE UNIT AND LET IT CYCLE AGAIN. TURN THE GAS VALVE ADJUSTMENT SCREW SO THAT MANOMETER #2 READS .10" MORE THAT MANOMETER # 1. EXAMPLE: MANOMETER #1 READS -.35"; ADJUST MANOMETER #2 SO THAT IT READS -.25". IF THIS DOES NOT STOP THE POOR IGNITION, ADJUST THE GAS VALVE ADJUSTMENT SCREW ANOTHER .10".

EXAMPLE: IF MANOMETER #1 READS -.35", MANOMETER #2 SHOULD BE ADJUSTED TO NOW READ -.15".

15. PUT THE GAS VALVE ADJUSTMENT SCREW COVER BACK IN PLACE AND TIGHTEN.
16. REMOVE ALL THE CLEAR VINYL HOSES FROM THE GAS VALVE.
17. REMOVE THE BARB IN THE OUTLET PRESSURE TAP, REPLACE IT WITH THE ORIGINAL PLUG, AND TIGHTEN.
18. RE-CONNECT THE CLEAR VINYL HOSE TO THE GAS VALVE, AND TO THE TRAP ADAPTER.



2O. PUT THE VOYAGER CABINET DOOR BACK IN PLACE.

MOST COMMON VOYAGER INSTALLATION CONCERNS

General Safety Precautions

VENTING:

- VENT LENGTH TOO LONG - OVER 85'
- VENTING NOT PITCHED PROPERLY - CONDENSATE BUILD UP IN VENT
- EXHAUST GAS RE-CIRCULATION - VENT TERMINALS NOT USED, WRONG FITTINGS USED, SIGHT PROBLEMS
- BUSHING FRONT OF VENT TERMINAL
- INSIDE CORNER OF BUILDING FOR VENT LOCATION
- OVERHANG WITH VENT UNDERNEATH
- COMPOUND ROOF PITCH, OR ABOVE ROOF FIRE WALL
- ADDITIONAL FITTINGS INSTALLED INTO TERMINALS
- VENT SIZED FROM 3" TO 4" BY USING BUSHINGS - INSTEAD OF REDUCING COUPLING OR REDUCING ELBOW
- VENT CHANGED FROM 3" TO 4" - WITHOUT GOING REQUIRED 10' ON BOTH INTAKE AND EXHAUST
- VENTING NOT CLEANED AND GLUED TOGETHER FOR PRESSURE TIGHT JOINTS
- INTAKE AIR CONTAINING EXHAUST FROM ANOTHER VENT OR APPLIANCE

GAS SUPPLY:

- GAS PRESSURE TOO LOW - NEED 7" GAS PRESSURE UP TO 14" GAS PRESSURE
- GAS METER TOO LOW IN CAPACITY
- GAS REGULATOR NOT SIZED PROPERLY - TOO LOW IN CAPACITY
- GAS PIPE TOO SMALL - ¾" MINIMUM GAS SUPPLY SIZE
- GAS REGULATOR TOO CLOSE TO APPLIANCE - NEED 10' OF PIPE FOR EVERY 200,000 BTU'S PER HOUR
- GAS REGULATOR WITH LONG VENT OR BLEED VENT ORIFICE - REGULATOR SLOW TO RESPOND
- GAS METER RESTRICTION, OR IN NEED OF REPAIR/REPLACEMENT
- GAS SUPPLY PRESSURE DROPS BELOW 3½" WHEN APPLIANCE FIRES

ELECTRICAL:

- APPLIANCE NOT GROUNDED
- ELECTRICAL POLARITY REVERSED - FLAME WILL LIGHT BUT GO BACK OUT IN 4-6 SECONDS VOLTAGE TOO LOW OR TOO HIGH
- APPLIANCE CYCLES, BUT NO IGNITION - LOOK FOR GLOW FROM IGNITOR, IF NOT, REPLACE IGNITOR

PLUMBING:

- DIELECTRIC UNIONS INSTALLED - RUSTY WATER

CONDENSATE:

- CONDENSATE LINE NOT PITCHED TO DRAIN
- CONDENSATE LINE NOT DRAINING DUE TO LONG RUN WITHOUT VENT
- CONDENSATE PUMP NOT WORKING
- CONDENSATE TRAP PLUGGED WITH PVC SHAVINGS

BURNER:

- EXTREMELY LOUD BANG ON IGNITION - BURNER FAILED OR END CAP OFF
- RED BURNER DECK AS SEEN THROUGH VIEW PORT - GAS VALVE NEEDS ADJUSTMENT, REFERENCE THE "GAS VALVE ADJUSTMENT" SECTION.

GAS VALVE:

- PUFFING ON IGNITION; LOUD POP ON IGNITION, THEN RUNNING SMOOTH; HUFFING OR PUFFING - REFERENCE THE "GAS VALVE ADJUSTMENT" SECTION.
- RUNNING GREAT BUT INTERMITTENTLY HUFFING OR POPPING - CHECK FOR RE-CIRCULATION UNDER VENTING

SEALING BOOSTER AS PER N.S.F. STANDARD NUMBER 5

TO SEAL THE BASE OF BOOSTER TO THE FLOOR TO PREVENT SEEPAGE UNDERNEATH, PER N.S.F. STANDARD #5 - APPLY A 3/8" BEAD OF RTV SILICONE (AS SHOWN HERE), COMPLETELY AROUND TANK.

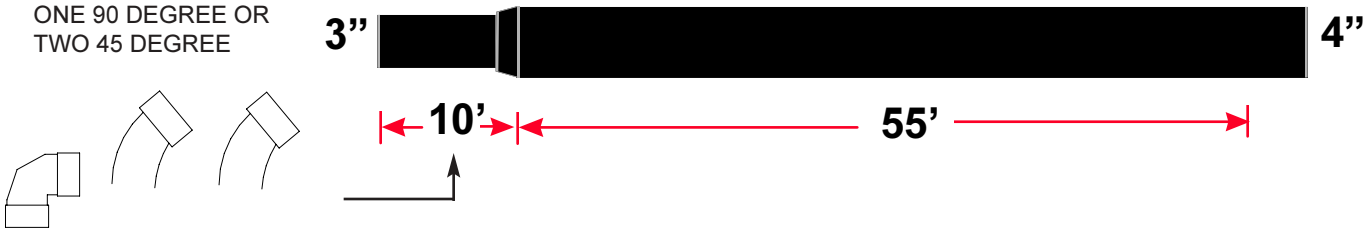
⚠ WARNING

All maximum venting lengths include intake pipe, exhaust pipe, and fittings added together. Minimum combined operating vent length requirement for any Voyager is the equivalent of 11' of piping on inlet and exhaust each way.

MAXIMUM VENTING LENGTHS ONE WAY, ON EITHER INTAKE OR EXHAUST

FOR ALL MODELS:

ONE 90 DEGREE OR
TWO 45 DEGREE



When increasing vent run from 3" to 4”, avoid the transition on a horizontal run to avoid condensation build up. Maximum allowable fittings in first 10 feet of pipe run on both intake and exhaust, of each 3" section, one 90 degree or two 45 degree fittings before increasing pipe size. Never use different sizes for intake and exhaust. The vent system must be balanced to operate properly.

NOTE: NEVER USE FOAM CORE PIPE ON EXHAUST!!

FITTINGS SHOWING EQUIVALENT FRICTION LOSS IN EQUIVALENT STRAIGHT PIPING:

One 3” 90 degree elbow is equal to:

5 FEET

One 3” 45 degree elbow is equal to:

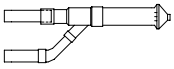
3 FEET

One 4” 90 degree elbow is equal to:

3 FEET

One 4” 45 degree elbow is equal to:

1 FOOT



One concentric vent kit is equal to:

MANUFACTURED BY:

HEAT TRANSFER PRODUCTS, INC.
P.O. BOX 429, 120 BRALEY ROAD
EAST FREETOWN, MA 02717
TEL.: 1-508-763-8071 and (outside of MA) 1-800-323-9651
.....or visit our website at: WWW.HTPRODUCTS.COM

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VOYAGER