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DATE: June 26, 2002

TO: [REDACTED]

FAX NO.: [REDACTED]

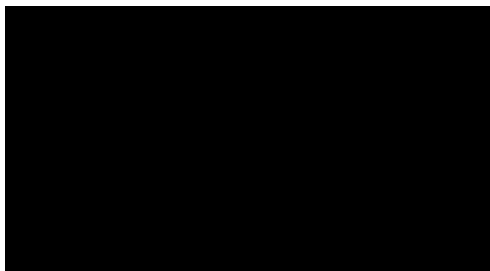
FROM: [REDACTED]

COMPANY: ALPHA MECH.

CC: V & G SALES

THIS MESSAGE CONSISTS OF 27 PAGE (S) INCLUDING THIS COVER SHEET.

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## SHEET A

## REPAIR PARTS LIST

06-26-02

T 142565-1 FG, 40 P 250 AMXL, VTWM, STD, CA, Y LST  
(BASED ON AS-BUILTS)

INVOICE 170063

SER # 106292

CSO # 142565

PAGE 1

SALES REP V &amp; G SALES

CUST ORD # 065-51127641

INSTALLATION: USAF

PART #	PART DESCRIPTION	QTY	U/M
142565-1	PC, B-C, MXL, 399 MBTU, 250 GAL, STD, CA, PH		
64160	PAN, TOP VT 45 OD X 18 ID 250 G	1.00	EA
4122	COVER, TRIM ASME 5 X 8	1.00	EA
76543	INSULATION, TANK 2 X 64 X 50 FT KNAUF KN-200, 2.0 PCF D	1.00	EA
76544	INSULATION, TANK 1 X 64 X 95 FT KNAUF KN-200, 2.0 PCF D	83.08	SF
78589	COLLECTOR, FLUE VT 7 X 39 40/250 MXL	14.77	SF
15833	INSERT, INSULATION 39 OD BOTTOM HEAD VT, FLUE COLL TP 15	1.00	EA
63927	INSERT, INSULATION PG/O 250 38 OD X 16 1/2 X 2 (155)	1.00	EA
78163	INSULATION, PYROBLANKET 1/2 X 2 X 25 FT #8 DENSITY	1.00	EA
9029	COVER, TRIM BURNER NOZZLE 8 400-720, 3.8	9.43	FT
77070	CHAMBER, COMB. PG 250 16 X 45 OD 270-400 BTU BG	1.00	EA
15853	STUD, THREADED 5/16 X 18 NC X 1 5/8 304L SST CPL W/FERRULE	1.00	EA
78199	VALVE, BUTTERFLY 2 ECLIPSE #8HBV-A #500530 + 500527	2.00	EA
79539	INSULATION, PYROBLANKET 1/2 X 12 X 25 FT #8 DENSITY	1.00	EA
5613	FUSEHOLDER, PANEL TYPE #HTB-281	2.00	SF
5742	FUSE, MDA 15 AMP BUSS 250V NO SUBSTITUTE	1.00	EA
5639	CONNECTOR, 3/8 FLEXIBLE CONDUIT STRAIGHT STEEL/ALUM #XC-2	1.00	EA
39426	O-RING, GASKET 2.90 OD X 2.35 ID X .275 CS EPDM 80 DUROMETER	1.00	EA
5	FLANGE, MTC BRONZE BLANK DIMPLE NOT DRILLED SB584 UNS 90300	2.00	EA
7	CONNECTOR, 1/8 MPT X 1/4 COMPRESSION BORED STRAIGHT THRU	2.00	EA
56	THERMOSTAT, JUMO #60/60002277 80-180 DEG W/DIAL 3.3 CAP	2.00	EA
59853	SCALE, JUMO #60/61122216 FOR 65-180 DEG	2.00	EA
73227	CONNECTOR, 1/8 MPT X 1/4 COMPRESSION BORED STRAIGHT THRU	2.00	EA
75057	THERMOSTAT, JUMO #60/60002384 200 DEG AUTO RESET 3.3 CAP	1.00	EA
70565	SWITCH, CARLING #LTLA51-6SBLAM-NBL/125N/INDP BLACK W/AMBER	1.00	EA
76421	COVER, ENCL BL PVT 12 X 18 X 6	1.00	EA
78196	ACTUATOR, MOTORIZED HONEYWELL #ML6175A1001 SPRING RETURN 24	1.00	EA
78197	ARM, CRANK DAMPER ACTUATOR HONEYWELL #205830A	1.00	EA
4154	CONNECTOR, BALL JOINT 1/4 STUD X 5/16 ROD PF #91100	1.00	EA
70289	RELAY, SPDT 15A 120V OMRON #LY1-AC110/120 SQUARE BASE	2.00	EA
73279	TRANSFORMER, STEP DOWN WHITE-RODGERS #3A356 40 VA 120-24V 6	1.00	EA
77908	ASSY, DUCT FGR LOW NOX MXL 1 1/2 X 3 X 48	1.00	EA
73929	TURBULATOR, SMICK 3 X 41 1/2 X 1 45 DEG ANGLE LOW	1.00	EA
7525	TURBULATOR, SMICK 3 X 41 1/2 X 1 1/2 60 DEG ANGLE FLAT END	5.00	EA
7081	VALVE, BALL 1 WATTS #WBV-3 BRASS THREADED 400 WOG	8.00	EA
549	NIPPLE, DIELECTRIC 1 X 3 #11125	1.00	EA
425	VALVE, T&P RELIEF 3/4 WATTS #140-S 150 PSI 180 M	1.00	EA
122	COVER, TRIM ASME 5 X 8	1.00	EA
048	REGULATOR, DRAFT 7 FIELD CONTROLS #MG1-7 GAS	1.00	EA
030	COVER, NBL BLANK ROCKER SWITCH CARLING	1.00	EA

PVI WTR HTR



Post These Instructions With  
Your Water Heating Product

Model No.:

Serial No.:

# GENERAL INSTALLATION AND MAINTENANCE MANUAL

## FOR ALL PVI WATER HEATER AND BOILER MODELS

**WARNING:** If the information on the appliance and in the supplied manual(s) is not followed exactly, a fire, explosion or exposure to hazardous materials may result causing property damage, personal injury or loss of life.

### FOR YOUR SAFETY

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

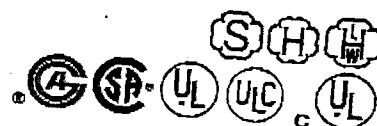
### WHAT TO DO IF YOU SMELL GAS

- 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.

This product contains, or may come to contain, materials that have been identified as carcinogenic, or possibly carcinogenic, to humans. Before installing, servicing, or removing this product, read and follow the supplied instructions.

PVI INDUSTRIES, INC.  
P.O. Box 7124  
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[www.pvi.com](http://www.pvi.com)



## INTRODUCTION

This manual covers installation, operation and maintenance on all PVI commercial water heaters and storage tanks. Read all instructions thoroughly before attempting to start any unit.

**CAUTION:** Factory authorized start-up may be required on this equipment. Labeling on the unit will indicate this requirement. **City, state and national codes governing installation of commercial water heaters and storage tanks must be followed and take precedence over recommendations in this manual.**

### PRODUCT SAFETY INFORMATION REFRACTORY CERAMIC FIBER PRODUCT WITH CRYSTALLINE SILICA

**WARNING:** This product contains crystalline silica, which has been identified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans. This product also contains refractory ceramic fibers, which have been identified by the IARC as possibly carcinogenic to humans.

Avoid breathing fiber particulates and dust.

#### RISKS:

- Airborne fibrous insulation is a possible cancer hazard by inhalation.
- Airborne crystalline silica may cause silicosis (lung disease) by inhalation.
- May cause temporary irritation to eyes, skin, and respiratory tract.

#### PRECAUTIONARY MEASURES:

- Minimize airborne fibers with engineering controls.
- Use NIOSH/MSHA approved respirators as required (see MSDS).
- Wear long sleeved, loose-fitting clothing, eye protection, and gloves.

#### FIRST AID MEASURES:

- Eyes:** Flush with water.  
**Skin:** Wash with soap and warm water.  
**Ingestion:** Do not induce vomiting. Get medical attention if gastrointestinal symptoms develop.  
**Inhalation:** Remove to fresh clean air.

If any of the above irritations persists, seek medical attention.

**WARNING:** If you are unfamiliar with the safe handling of Refractory Ceramic Fiber products, or if you wish additional information prior to beginning any disassembly of the water heater or boiler that might expose refractory ceramic fiber materials, contact: Unifrax Corporation, 2351 Whirlpool Street, Niagara Falls, NY 14305-2413, 1-800-322-2293.

**IDENTIFICATION OF REFRACTORY CERAMIC FIBER MATERIALS** (The RCF materials are located within the product and not generally exposed except during service, disassembly or assembly.)

- Insulation Insert: TURBOPOWER® water heaters and boilers.
- Flue Collector Insulation: TURBOPOWER® water heaters and boilers.
- Combustion Chamber Insulation and/or Tubesheet Insulation: Atmospheric and Power Gas, VENTURA®, MAXIM™, POWER VT™ water heaters & boilers.

### CODES FOR WATER HEATER & BOILER INSTALLATIONS

ANSI Z223.1  
ANSI Z83.1

National Fuel Gas Code  
Installation of Gas Piping and Gas  
Equipment on Industrial and Certain  
Other Premises

CGA B149

Installation Code for Gas  
Burning Appliances &  
Equipment

NFPA No. 31  
NSI Z95.1

American Gas Association  
Installation of Oil Burning Equipment  
National Fire Protection Association  
60 Battery March St., Boston, MA 02210  
Installation of Gas Appliances and Gas  
Piping

CGA B139

National Electrical Code

Installation Code for Oil  
Burning Equipment  
National Fire Protection  
Association  
Part 1

NFPA No. 54

Canadian Electrical Code  
All Provincial Ordinances  
All State & Local Codes

# PVI WATER HEATERS AND STORAGE TANKS TYPICAL PIPING DIAGRAMS

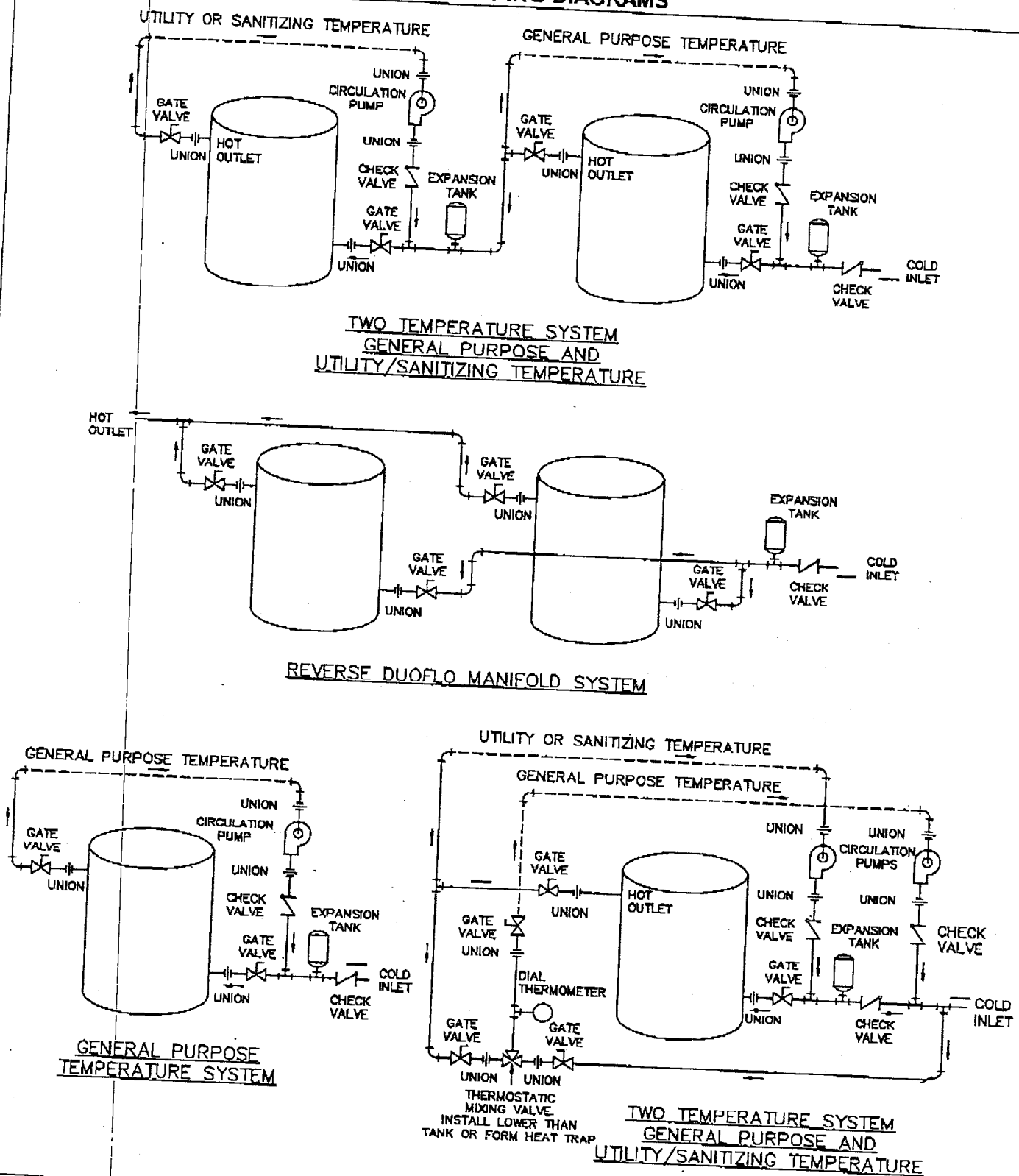
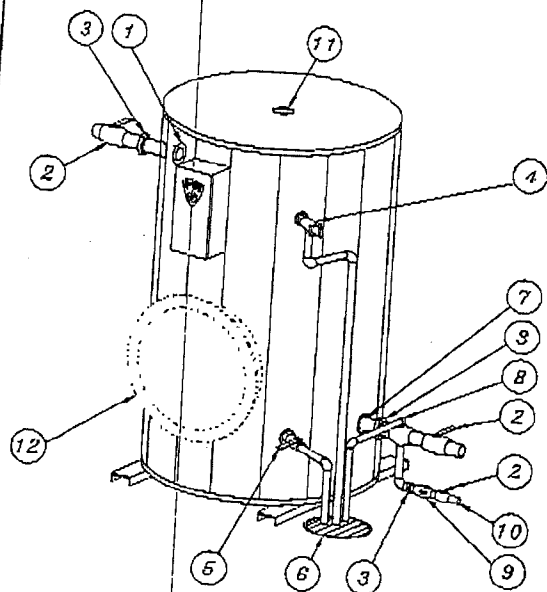
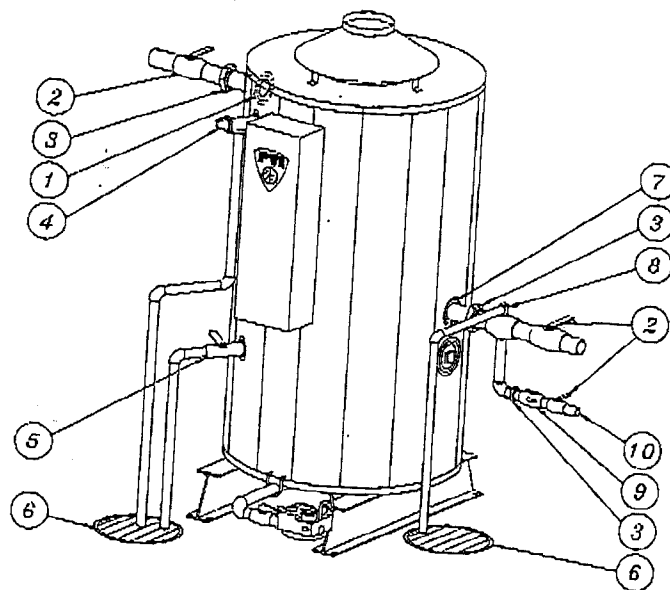


FIGURE 1

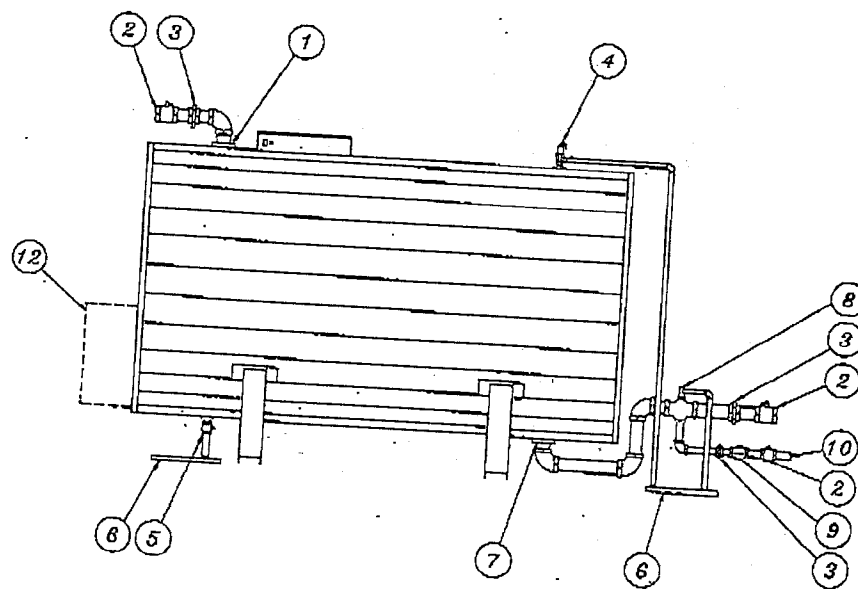
# PVI WATER HEATERS AND STORAGE TANKS TYPICAL PIPING CONNECTIONS



VERTICAL SUPERTANK®



ATMOSPHERIC GAS



HORIZONTAL SUPERTANK®

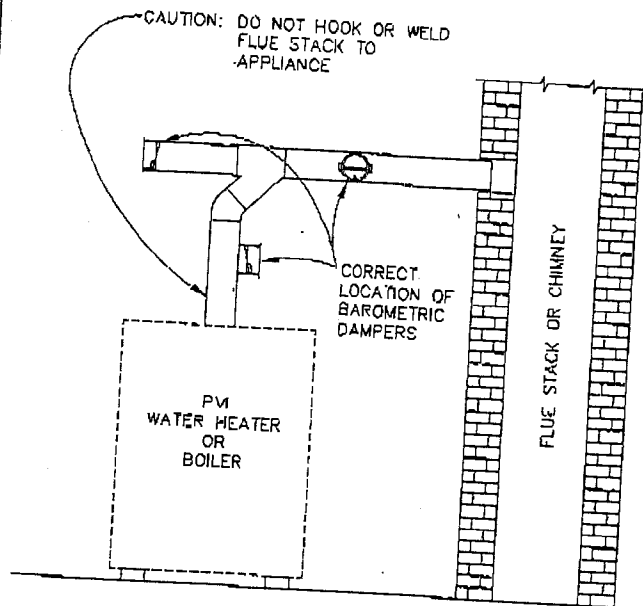
1. HOT WATER OUTLET
2. SHUTOFF VALVE (not furnished by PVI)
3. DIELECTRIC UNION (not furnished by PVI)
4. TEMPERATURE AND PRESSURE RELIEF VALVE
5. DRAIN VALVE
6. FLOOR DRAIN (not furnished by PVI)

7. COLD WATER INLET
8. THERMAL EXPANSION CONTROL VALVE (not furnished by PVI)
9. CHECK VALVE (not furnished by PVI)
10. RETURN CIRCULATOR CONNECTION (not furnished by PVI)
11. HOT WATER OUTLET FOR SOME MODELS
12. ENERGY MODULE(S)

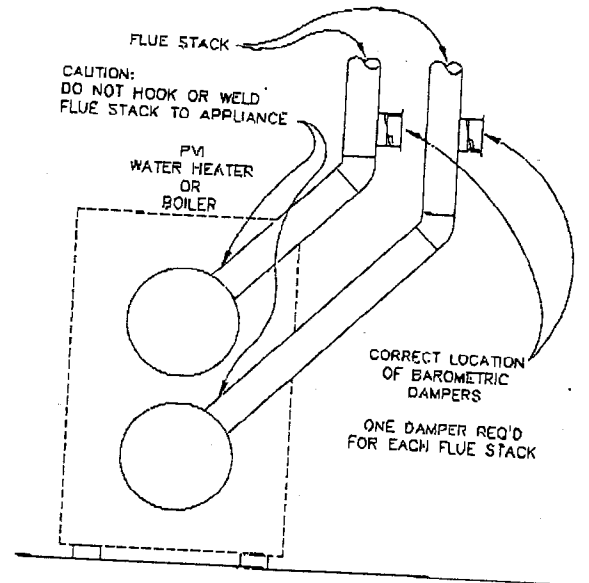
FIGURE 2

# VENTING OF GAS & OIL FIRED MODELS

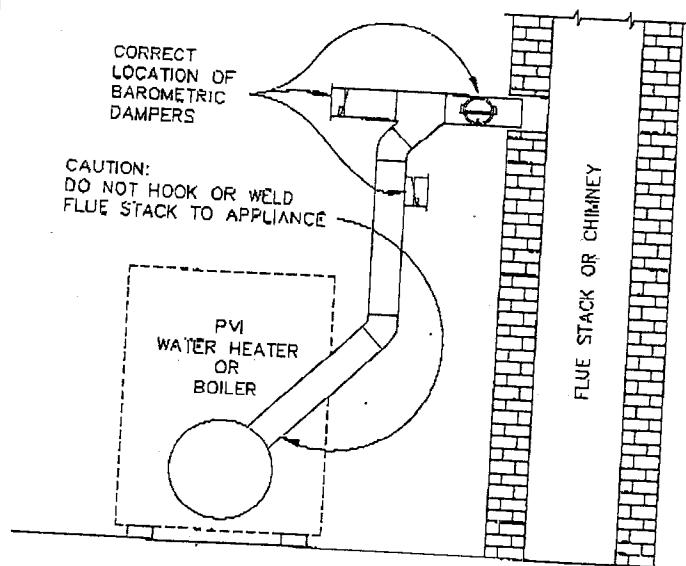
## DRAFT REGULATORS POWER GAS OR OIL



## DRAFT REGULATORS DUAL MODULE TURBOPOWER®



## DRAFT REGULATORS SINGLE MODULE TURBOPOWER®



## TYPICAL THRU-WALL VENTING

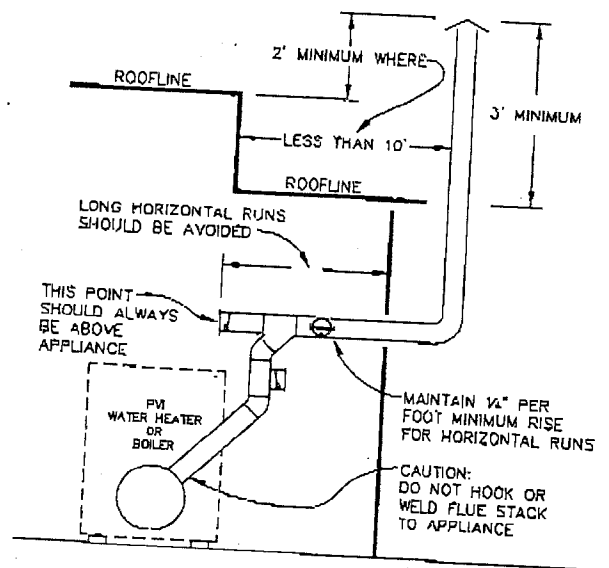


FIGURE 3

## LOCATION

1. Locate the unit in a clean and dry area as close as possible to the greatest hot water usage and as near to gas, oil, steam, boiler water and/or electrical power as practical.
2. The unit should be installed on a firm, level foundation.
3. Locate the foundation on a pitched floor near a suitable drain, or make other provisions to prevent contact to areas of the building subject to water damage should the heater or a water connection leak. The drain must be sufficient to contain water in excess of 210°F.
4. Clearances from combustibles and for servicing and inspection are variable depending on model and must be maintained. See product operating instructions for specifications.

## INSTALLATION

1. Inspect the water heater and packaged components for damage that may have occurred in shipping and handling or during storage.
2. Check the data decal on the water heater. Be sure the electrical, steam, water, oil, or gas supply is adequate for the installation.

### WARNING:

**Some units are top heavy. Use caution when moving and rigging these products.**

3. Carefully remove all shipping supports and bracing. (Float type devices have shipping plugs blocking the float).
4. Connections to the cold water inlet and hot water outlet should be installed with shut-off valves and unions so that the unit may be disconnected for servicing. Use caution when threading pipe nipples into tank connections to prevent cross threading, or over-tightening. Always use a back-up wrench on tank nipples when tightening unions, valves, etc.

### IMPORTANT:

**Do not use galvanized or steel pipe nipples when making connections to the tank. Use non-ferrous nipples only.**

5. Some tank fittings will be attached to the tank wall with studs. Check these type fittings for leaks after filling tank. Do not over-tighten the studded connections as damage to the o-ring under the fittings may occur. A maximum torque of (15) ft. lbs. (unlubricated) should be used on studded connections - tighten only in alternating pattern.

6. Hot water and return circulation lines should be insulated. Cold water supply lines should be insulated if subject to freezing during shutdown periods.
7. A thermal expansion valve (or diaphragm-type expansion tank) should be installed in the cold water line between the water heater and any check valve (see Figure 2).

### IMPORTANT:

**Do not use the plumbing connected to the appliance as a ground for welding or any other purpose.**

8. The water heater is equipped with a temperature and pressure relief valve rated for the input of the energy source and the working pressure of the tank. The relief valve discharge should be piped to a suitable open drain. The drainpipe may not be smaller than the relief valve opening and must be secured to prevent it from lifting out of the drain under discharge pressure. Do not install valves or restrictions in the discharge line. Storage tanks must have over pressure protection. If not factory installed, a properly rated temperature and/or pressure relief valve must be installed in the fitting furnished for that purpose (see Figure 2).
9. The drain valve should be piped to a suitable open drain.

## ELECTRICAL

This product uses 120 volts for control power and must be electrically grounded in accordance with local codes, or in the absence of local codes, with the latest codes, with the latest edition of the National Electrical Code ANSI/NFPA. When unit is installed in Canada, it must conform to the CSA C22.1, Canadian Electrical Code, Part 1 and/or local electrical codes.

### CAUTION:

**Use only copper wire of proper sizing for incoming service. Damage resulting from use of aluminum wiring will be excluded from coverage under the warranty of this unit.**

1. Branch circuit protection and disconnecting means must be furnished by the installer. Refer to the wiring diagram provided with this unit when installing or troubleshooting the electrical components of this heater.
2. All wiring must be in accordance with all local, state, or federal codes.
3. Provide proper overload protection for the system's circulating pump.



## COMBUSTION & VENTILATION AIR OPENING

Provisions for combustion and ventilation air must be in accordance with Section 5.3, Air for Combustion and Ventilation, of the latest edition of the National Fuel Gas Code ANSI Z223.1, or applicable provisions of the local building codes.

The equipment room must be provided with two openings to assure adequate combustion air and proper ventilation.

1. If air is taken directly from outside the building (see Figure 4):
  - a. Inlet air opening, 1 square inch per 2,000 Btu/h input. This opening must be located near the floor.
  - b. Outlet air opening, 1 square inch per 2,000 Btu/h input. This opening must be located near the ceiling.
2. If air is taken from another interior space (see Figure 5), each opening specified above should have a minimum free area of 1 square inch per 1,000 Btu/h input.

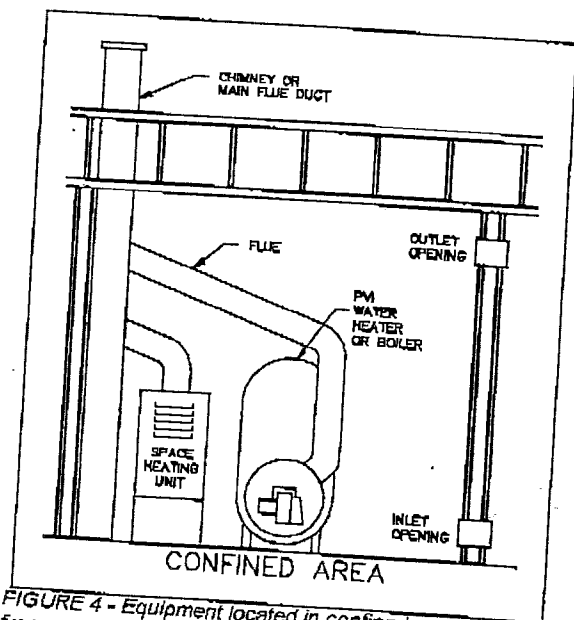


FIGURE 4 - Equipment located in confined spaces; all air from outdoors

### CAUTION:

*Under no circumstances should the equipment room ever be under negative pressure. Particular care should be taken when exhaust fans, compressors, air handling units, etc. may rob air from combustion equipment.*

*The combustion air supply must be completely free of any chemical fumes. Common chemicals that must be avoided are fluorocarbons and other halogenated*

*compounds most commonly present as refrigerants or solvents such as freons, trichlorethylene, perchlorethylene, chlorine, or salts for use in water softeners or any other heavy gas are particularly injurious and corrosive after contact with flames or hot surfaces. The result is improper combustion and premature equipment failure.*

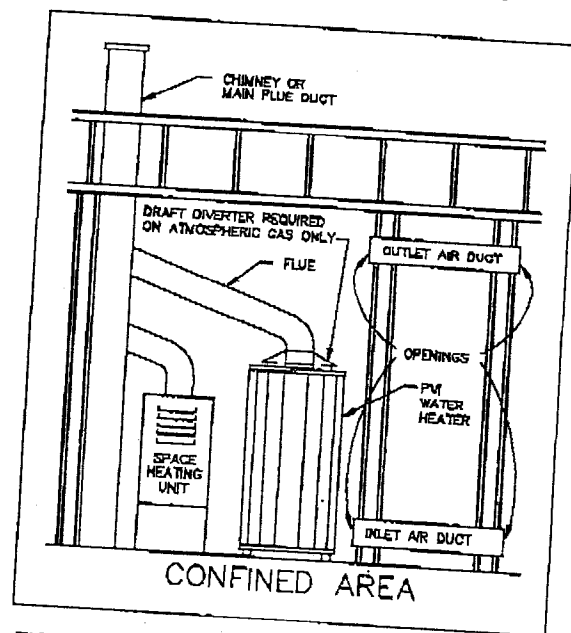


FIGURE 5 - Equipment located in confined spaces; all air from inside the building.

## VENTING

### CAUTION:

*Never size a flue vent based only on the flue outlet size of the product.*

Vent installations for connection to gas vents or chimneys must be in accordance with Part 7, Venting of Equipment, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, or applicable provisions of the building codes.

1. A flue vent passing through the roof must be terminated in accordance with Section 7.6.2, Gas Vent Termination, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, or applicable provisions of the local building codes (see Figure 6).
2. A gas vent passing through a wall must be terminated in accordance with Section 7.8, Through the Wall Vent Termination, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, or applicable provisions of the local building codes.

**WARNING:**

*Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.*

- The vent connector must be the same size as the product flue outlet. The vent size must be determined by the BTU input of the product(s) and the vent design. The horizontal breeching of a vent must have at least 1/4" rise per linear foot not to exceed the length of horizontal vent.

**CAUTION:**

*Do not weld or support breeching to product flue outlet. Adequate support of the venting system must be provided in compliance with local or other applicable codes.*

- Draft regulators (barometric dampers) may be incorporated in the vent for gas, oil, and gas/oil fan assisted products and are recommended. A single swing barometric damper should be used for oil-fired products. The double swing type should be used on gas or gas/oil fired products. Under normal venting conditions, the draft regulator should be the same size as the flue outlet of the product, never smaller. Draft regulators must be installed and adjusted in accordance with the manufacturer's instructions (see Figure 3).

**IMPORTANT:**

A minimum of -.02" to -.06" W.C. draft is required.

**GAS PIPING**

- Before making gas hook-up, verify that the unit is being supplied with same gas type as indicated on the data decal.
- The maximum inlet gas pressure must not exceed the value specified. If delivery pressure is higher, a single suitable intermediate, lock-up type regulator must be installed ahead of the low-pressure regulator on the burner to reduce inlet pressure to acceptable limits. The regulator must have a flow regulating capacity suitable for the firing rate.
- The gas supply line must be of sufficient size for length of run and pressure drop to furnish adequate gas pressure to allow the burner to develop its rated capacity. A drip leg should be installed ahead of burner piping connection, if not supplied (See Table 1).
- Gas valves and gas regulators may contain bleed or vent ports. Local codes may require bleeds and vents to be vented to atmosphere outside the building. Consult local building codes for size and installation.

Equivalent feet from	PIPE SIZE					
	Maximum Capacity for Natural Gas*					
	MBTU/HR Based on 0.5" W.C. Pressure Drop*					
	1-1/4"	1-1/2"	2"	2 1/2"	3"	4"
25	860	1320	2475	3900	7000	-
40	660	990	1900	3000	5300	-
60	-	810	1520	2400	4300	-
80	-	690	1300	2050	3700	-
100	-	620	1150	1850	3250	6700
125	-	-	1020	1650	2950	6000
150	-	-	950	1500	2650	5500
175	-	-	850	1370	2450	5000
200	-	-	800	1280	2280	4600

**TABLE 1**

\*Multiplier for Propane: 1.57

\*\*Multiplier for alternate pressure drops: 0.3" W.C. 0.77; 1.0" W.C. 1.41; 2.0" W.C. 2.00; and 4.0" W.C. 2.82.

**CAUTION:**

*Be sure gas supply and vent lines have been cleaned of all debris, which could enter the regulators or burner system and cause malfunction or unsafe conditions. Pipe joint should be used instead of tape and should be resistant to liquefied petroleum when LP gas is used.*

**OIL TANK AND SUPPLY LINES FOR OIL AND COMBINATION GAS/OIL WATER HEATERS**

- The oil tank construction and installation must meet local codes and should meet the specifications recommended by Underwriter's Laboratories (see Figure 6).

**IMPORTANT:**

*The combination gas/oil burner requires a constant supply of fuel oil for pump lubrication, even when running on gas. Make sure the oil shutoff valve is open and oil is available at the pump when the burner is in service. If no oil supply is available and burner must be run on gas, remove the oil pump coupling on burner.*

*A two-pipe system must be used at the burner inlet. A single pipe system may be used to supply local holding tanks at individual burners (up to 50 gallons, or check your local codes), but provisions must be made for a return line from the burner oil pump to the holding tank. When a gravity feed system is used install anti-siphon valve close to tank in supply line.*

2. Oil supply and return lines must be installed below frost level. Below-floor-level runs are preferred inside the building. Avoid overhead runs, which can cause excess lift for the oil pump. Return lines must be as large as the supply lines with no shutoff valves in the line. If a shutoff valve is installed in existing return line piping, remove or open and disable it to prevent accidental closure.

**IMPORTANT:**

**A supply line filter must be installed and cleaned or replaced regularly.**

3. 90% of all oil pump problems resulting in poor cutoff, noisy operation and erratic firing are caused by air vacuum leaks in the supply (suction) line. To avoid air leaks, both return and supply lines should extend to near bottom of the oil tank. Only flare type fittings should be used, and all fittings and joints must be tight. Check and recheck all fittings and joints for air vacuum leaks.
4. Supply line size is based on the suction developed from the total "gear capacity" of the pump. The pump is a positive displacement type and pumps a constant volume of oil, only a portion of which is used by the nozzle(s), the remainder being bypassed to the return line. During gas operation on the combination gas/oil

burner, the pump is operational, but all oil is bypassed to the return line.

5. No allowance has been made in the recommended supply line sizes (see Table 2) for additional severe restrictions such as multiple elbows, etc. If in doubt of the size required, use the next size larger than recommended. The oil lines (especially the supply line) must be absolutely leak tight to prevent loss of prime. Do not use Teflon tape or oil soluble pipe dope.

**CAUTION:**

If the "lift" from the oil tank to the pump inlet is over 12 feet or if the "lift" plus the supply line pressure drop is such that the total suction at the pump exceeds 15" mercury, install a booster pump. Pressure at the burner inlet must not exceed 3 psi.

RECOMMENDED OIL SUPPLY & RETURN LINES						
LIFT ABOVE TANK	COPPER TUBING SIZE (OD)			IRON PIPE SIZE		
	LENGTH OF RUN			LENGTH OF RUN		
	50'	100'	200'	50'	100'	200'
0 feet	1/2"	1/2"	5/8"	3/8"	3/8"	1/2"
5 feet	1/2"	1/2"	5/8"	3/8"	3/8"	1/2"
8 feet	1/2"	1/2"	5/8"	3/8"	3/8"	1/2"
12 feet	1/2"	5/8"	5/8"	3/8"	1/2"	1/2"

TABLE 2

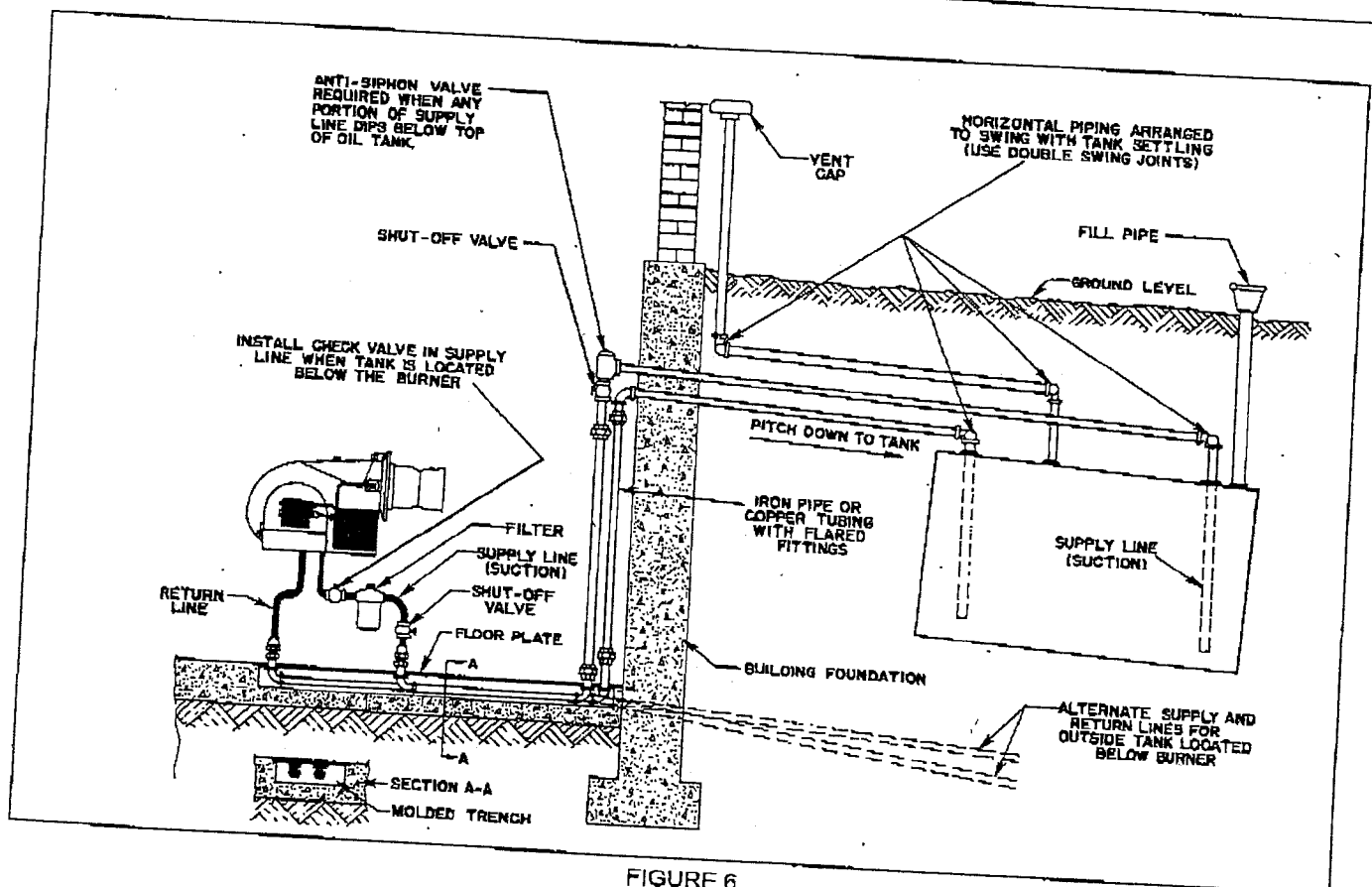


FIGURE 6

## SUPERTANK™ BOLTED HEAD REMOVAL

SUPERTANK™ water heaters and storage tanks may have one or more removable heads or bolted tank sections. The heads may be used for mounting an energy module (i.e. TURBOPOWER® module, electric elements, FLEXCOIL® or HI-VET® modules) or as an access cover on the tank. (See Figure 6.) In addition, some models may be equipped with non-reusable swaged type fasteners. If it is necessary to remove a head or disassemble a tank section, these type fasteners must be replaced with a 9/16" NC, grade 5 bolt, washer and nut. Lubricate the bolt and torque to 100 ft. lbs. Do not reuse the original fasteners.

Torque the bolts using an alternating star pattern to insure proper setting of the o-ring or gasket. A small amount of silicone sealant or other suitable adhesive may be used to hold the o-ring or gasket in place while positioning a head or tank section. Apply adhesive sparingly. A new o-ring or gasket must be used when reinstalling energy modules.

**IMPORTANT:** Mark one hole on the head and on the tank flange for reference when removing the head. Be certain to align these holes during reassembling to insure that the original gasket or o-ring mating surfaces will be correctly positioned.

## TYPICAL VERTICAL SUPERTANK™ BOLTED HEAD ATTACHMENT

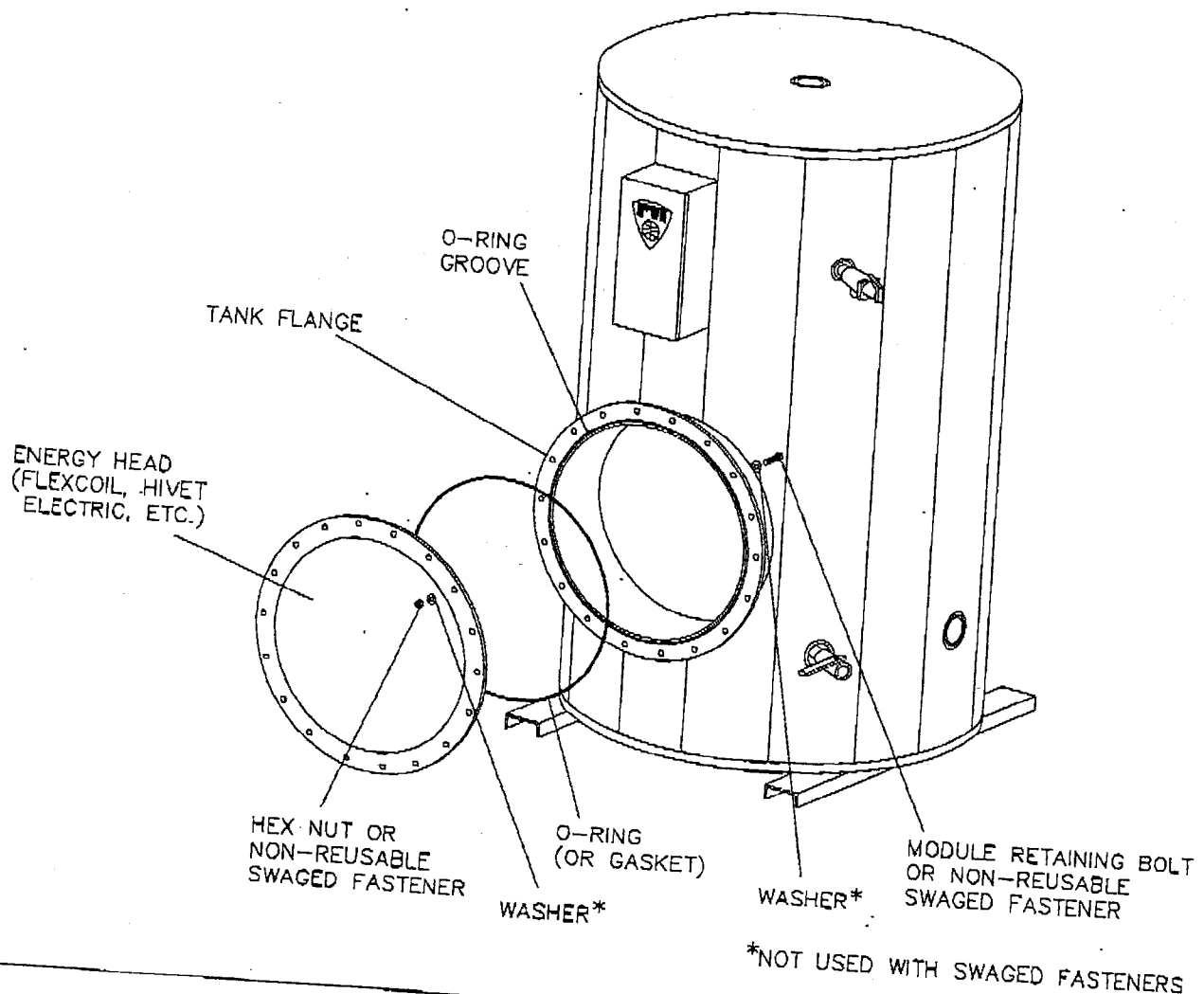
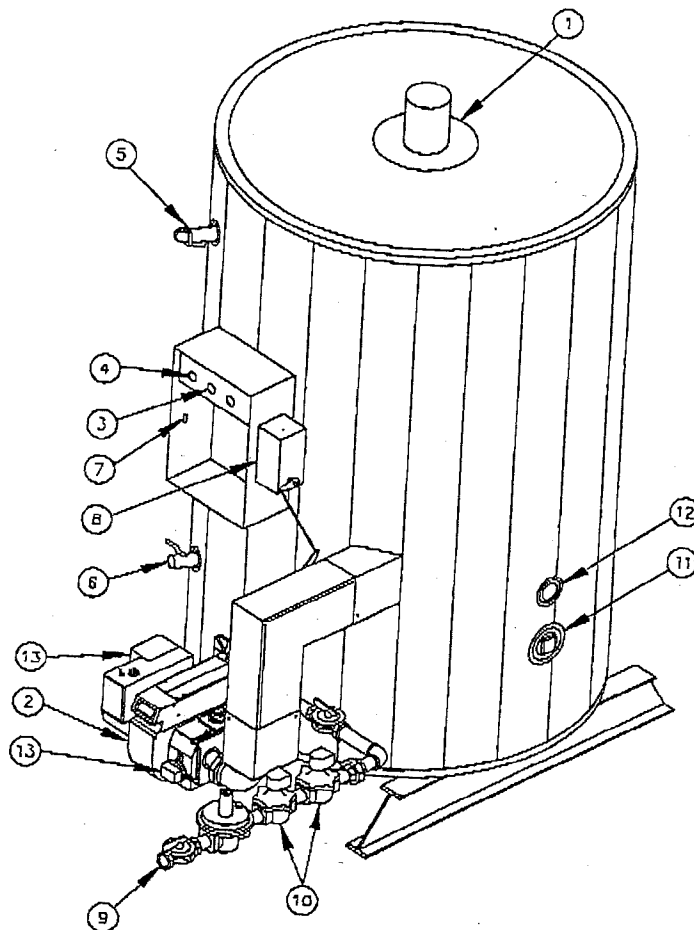


FIGURE 6

# INSTALLATION & MAINTENANCE MANUAL FOR MAXIM LOW NOx WATER HEATER

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**TYPICAL CONSTRUCTION  
FIGURE 27-1**

- |   |  |
|---|--|
| 1. VENT STACK*                                | 8. FGR CONTROL VALVE ACTUATOR              |
| 2. BURNER                                     | 9. GAS INLET                               |
| 3. TEMPERATURE LIMITING DEVICE (set at 200°F) | 10. GAS VALVE                              |
| 4. OPERATING THERMOSTAT (set at 120°F)        | 11. HANDHOLE CLEANOUT                      |
| 5. RELIEF VALVE                               | 12. COLD WATER INLET and RETURN CONNECTION |
| 6. DRAIN                                      | 13. DIFFERENTIAL AIR PROVING SWITCH        |
| 7. CONTROL SWITCH(es) and FUSE(s)             |  |

(\* NOT FURNISHED BY PV)

**CAUTION:** Temperatures higher than 130°F increase the risk of scald injury!  
Important! Clearance to unprotected combustible material must be 8" min. at top, sides and rear, and 24" min. in front.

## MAXIM

### START-UP PROCEDURES

**CAUTION: DO NOT RELIGHT PILOT OR START BURNER WITH COMBUSTION CHAMBER FULL OF GAS VAPOR, OR WITH VERY HOT COMBUSTION CHAMBER.**

1. Study the Installation & Maintenance manual for the burner carefully.
2. Fill the water heater tank with water. Open the relief valve or a nearby hot water faucet to allow air in the tank to escape. Be sure all connections into the tank are tight, as leaks at tank fittings will damage the insulation.
3. The top thermostat is a temperature limiting safety device set at 200°F. The thermostats are set at the factory at 130°F on the upper operating thermostat and 120°F on the lower operating thermostat. Adjustment may need to be made by turning the thermostat dial to the desired temperature.

**CAUTION: TEMPERATURES HIGHER THAN 130°F INCREASES THE RISK OF SCALD INJURY.**

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**CAUTION: CONDUCT THE FOLLOWING GAS TRAIN LEAKAGE TEST BEFORE START-UP, ANNUAL INTERVALS AND PRIOR TO INVESTIGATING THE CAUSE OF ANY REPORTED OCCURRENCES OF DELAYED IGNITION.**

1. Using an appropriate bubble detection solution, thoroughly coat all gas train pipe connections. If any bubbles are detected, the leaking connection must be tightened, recoated and rechecked to assure stoppage of the leak.
2. Attach a manometer, to measure gas pressure, at the manual gas shutoff valve located just upstream of the gas train. Adjust gas train inlet pressure to the specified value (e.g. 14 in. W.C.), and tightly close the gas train manual shutoff valve closest to burner.
3. Reattach the manometer to the gas train manual shutoff valve at the burner and record the measured gas pressure in inches of water column (in W.C.). Measure gas pressure again after 15 minutes. If gas pressure has increased 0.5" W.C. or more, the gas leak must be isolated to one or more of the operating gas valves; for example, a solenoid actuated gas shutoff valve. After any leaking valve is replaced, the reassembled gas train must be leak tested again before start-up is attempted. (NOTE: All gas valves removed because of suspected leakage must be returned to PVI Customer Service for disposition.)

## MAXIM

### MAINTENANCE AND SAFETY INSPECTIONS

1. Establish a preventive maintenance program to assure a longer water heater life.
2. The tank should be flushed at two- or three-month intervals depending on water conditions in your location. To flush, turn off electrical disconnect switch to prevent the burner from operating. Open the drain valve and allow water to flow through the tank until it runs clear. Close the drain valve and turn the electrical switch back on. Draining two or three gallons from the bottom of the tank on a weekly basis will also help prevent the accumulation of sediment. Water impurities consist of fine particles of soil or sand, which will settle out and form a layer of sediment on the bottom of the tank.
3. A scale of lime will normally form during operation and will accumulate on the bottom of the tank. Lime is formed from the natural chemicals in the water, which precipitate out during heating cycles. Some water supplies contain more of these chemicals than others do and scale buildup will occur more rapidly. Other factors affecting scale buildup are the amount of hot water used and the temperature of the water. The more hot water that is used, the more fresh water containing scale-forming chemicals is brought into the tank. As the temperature of water increases, the rate of scale deposition will be increased.
4. The tank will have a handhole for inspection and cleaning. (See Figure 17-1, page 1.) To inspect tank for scale buildup, remove the handhole cover. If scale is present, it can be loosened with a high pressure stream of water. The smaller pieces can be flushed through the drain and the larger pieces removed by hand through the handhole. The frequency of inspections will be determined by the rate of scale buildup. Intervals of 30-60 days are recommended.
5. If a firetube leaks for any reason, consult factory for instructions.

**NOTE: Condensate coming from the tubes on a cold start is normal and does not indicate a leaking tube.**

6. Regularly inspect the bottom tubesheet. Inspect the SCALEGUARD® tubesheet insulator for holes or areas that may have pulled away from tubesheet. Repair or replace as required.

### CARBON MONOXIDE WARNING:

**CAUTION: IMPROPER COMBUSTION MAY CAUSE SERIOUS INJURY.** PVI recommends a seasonal or annual combustion checkout be performed by a qualified service agency to ensure safe and efficient operation.

### Periodic Inspection of Operational Components

Periodic inspection and checkout of the burner ignition, control system, and fuel valve operation (for tight close-off) should be made. Refer to the burner installation instruction for recommendations.

1. Examine the venting system at least once each year for proper connections, alignment and corrosion. The blower inlet will collect dust from the air during operation. Disconnect the power to the heater and clean the blower wheel when necessary.

Inspect all parts and make replacements when necessary. Check wiring for loose connections and burned wires.

## **MAXIM**

### **MAINTENANCE AND SAFETY INSPECTIONS (continued)**

#### Periodic Inspection of Operation Components (continued)

**CAUTION: THE RELIEF VALVE IS A PRIMARY SAFETY DEVICE.**

2. The temperature and pressure relief valve may be checked by slowly lifting the seat lever on top of the valve to determine its condition for safe operation. The openings inside the valve may become restricted by a buildup of scale and become inoperative. If the valve does not open and close properly when tested, it must be replaced. Replace the relief valve with like kind or one meeting the requirements stated on the rating decal located adjacent to the relief valve.
3. A table of periodic safety inspections is an attachment of this manual for ease of reference by the building service technician or licensed equipment operator. Since water heater designs vary, only some of these listed inspections may be appropriate for your particular model.
4. PVI strongly recommends the recording of significant events, such as maintenance or repair actions and safety inspections, and encourage the preparation of an event log for this purpose. All recorded events should be dated, fully described, and signed by the individual performing the service, repair, or inspection. (See Table 17-1, page 5 for sample of Inspection Record.)

**CALL YOUR PVI CUSTOMER SERVICE REPRESENTATIVE IF YOU HAVE ANY QUESTIONS. (1-800-784-8326)**

#### Instructions for Taking Water Heater Out of Service

Extended shutdown of the appliance and restarting are as follows:

- A. Turn off all power and fuel supplies.
- B. Drain and flush tank as previously discussed.
- C. Tag power switch(es) that fuel is off and tank is empty.
- D. Refill tank with water and turn fuel and power switch(es) on to restart. Reset all controls and conduct start-up of the appliance as discussed in the previous pages.

### **ELECTRICAL**

1. Wiring to the unit should conform to the National Electrical Code or the code legally authorized in your locality. A fused disconnect switch should be used for water heater control. Service wiring connections of 120V, 1 phase, 60 Hz. are located in the enclosure on the water heater. (See Figure 17-2, page 6.)

**NOTE: Use only copper wire of proper sizing for incoming service. Damage resulting from use of aluminum wiring will be excluded from coverage under the warranty of this unit.**



[illegible]

TABLE 27-1

NOTE: Burner inspection and Combustion Analysis should be done by a factory authorized service person.

## MAXIM

### PASSIVE FLUE GAS RECIRCULATION (FGR)

The MAXIM Low NOx water heater utilizes a specially designed end shot power burner and passive FGR (flue gas recirculation) to produce NOx levels less than 30 ppm.

The basic adjustment of the burner is detailed in the burner Installation & Maintenance manual accompanying this unit. Additional information concerning the FGR control system is provided below.

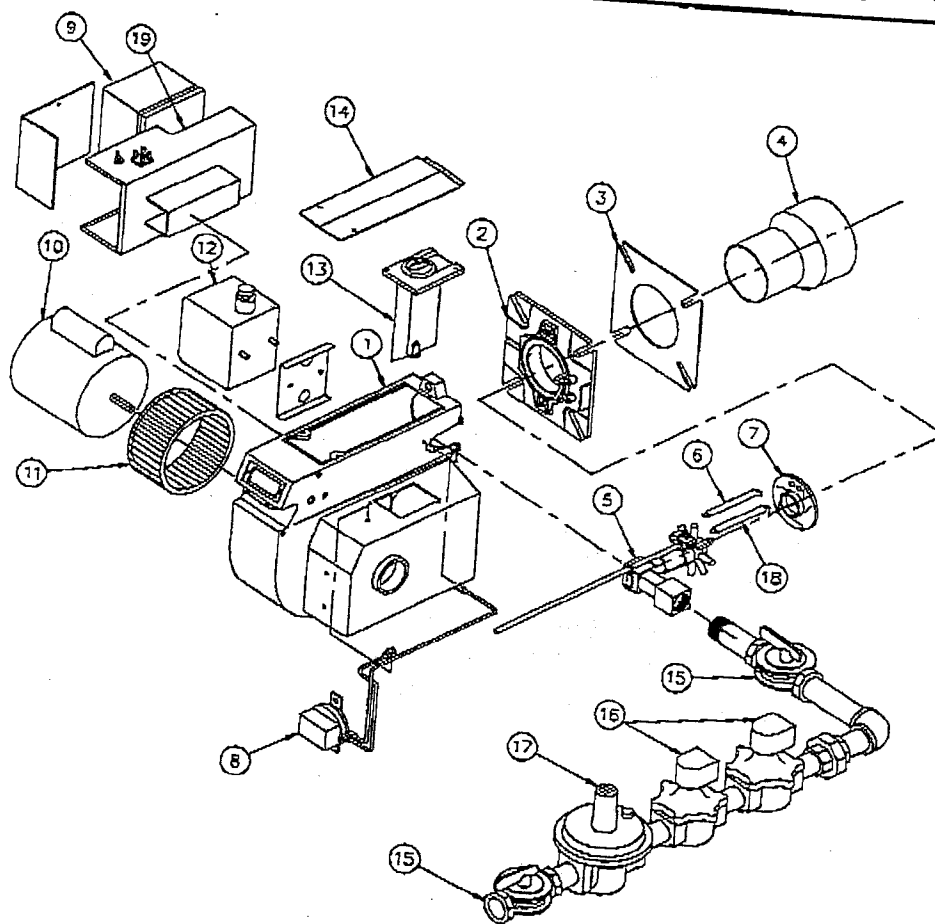
1. On initial start-up, note the position of the FGR control valve and the connecting linkage. The position of the linkage is set at the factory and the ball connectors are marked with paint. If these settings have been tampered with, or come loose during transit, attempt to return the setting to their original state before beginning start-up procedure.
2. The FGR control valve actuator will begin to open only when the pilot has been established and the main valve opens.
3. Once the main flame is established and the FGR control valve is fully open, combustion can be adjusted. The FGR control valve linkage should only be adjusted after combustion is set to factory specifications and the resulting NOx level meets the level mandated in your locality.

**CAUTION:** The FGR duct and plumbing will be hot during and after operation. Use care to avoid contact with skin while making adjustments.

4. If adjustment of the FGR valve linkage is necessary, make small incremental adjustments to lengthen the stroke of the linkage control arm and thereby increase the maximum open position of the valve. Note that an increase in FGR will reduce the available fresh air for combustion and may result in insufficient air for complete or stable combustion. It may be necessary to increase the primary burner air to compensate.
5. Take special care when adjusting the linkage to maintain the fully closed position of the FGR control valve when the actuator is de-energized.
6. If the FGR control valve is allowing excessive FGR, combustion instability may occur. To reduce the flow of FGR, make small incremental adjustments to shorten the stroke of the linkage control arm, and thereby decrease the maximum open position of the valve.
7. All combustion readings should conform to the specifications in the BG400 burner Installation & Maintenance manual. This burner manual is identified as form number PV500-21A.

# INSTALLATION & MAINTENANCE MANUAL FOR PVI FIREPOWER® BG400 GAS BURNER 140,000 thru 1,400,000 Btu/h

**CARBON MONOXIDE WARNING:**  
**CAUTION: IMPROPER COMBUSTION MAY CAUSE SERIOUS INJURY.**  
PVI recommends a seasonal or annual combustion check-out be performed by a qualified service agency to ensure safe and efficient operation.



Typical Construction  
Figure 21A-1

- |                        |                          |
|------------------------|--------------------------|
| 1. Burner housing      | 11. Fan wheel            |
| 2. Mounting flange     | 12. Ignition transformer |
| 3. Flange gasket       | 13. Damper assembly      |
| 4. Blast tube          | 14. Housing cover        |
| 5. Gas nozzle assembly | 15. Manual gas valve     |
| 6. Ignition electrodes | 16. Electric gas valve   |
| 7. Pressure plate      | 17. Gas regulator        |
| 8. Air switch          | 18. Flame rod            |
| 9. Flame safeguard     | 19. Control enclosure    |
| 10. Fan motor          |                          |

# PVI FIREPOWER®

## BG400 GAS BURNER

### FOR YOUR SAFETY WHAT TO DO WHEN 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 phone outside the building. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, CALL THE FIRE DEPARTMENT.

### FOR YOUR SAFETY

DO NOT store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

### FOR YOUR SAFETY

**WARNING:** Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance, or consult a qualified installer

**CAUTION:** CONDUCT THE FOLLOWING GAS TRAIN LEAKAGE TEST BEFORE START-UP, A ANNUAL INTERVALS AND PRIOR TO INVESTIGATING THE CAUSE OF ANY REPORTE OCCURRENCES OF DELAYED IGNITION.

1. Using an appropriate bubble detection solution, thoroughly coat all gas train pipe connections. If any bubbles are detected, the leaking connection must be tightened, recoated and rechecked to assure stoppage of the leak.
2. Attach a manometer, to measure gas pressure, at the manual gas shutoff valve located just upstream of the gas train. Adjust gas train inlet pressure to the specified value (e.g. 14 in. W.C.), and tightly close the gas train manual shutoff valve closest to burner.
3. Reattach the manometer to the gas train manual shutoff valve at the burner and record the measured gas pressure in inches of water column (in W.C.). Measure gas pressure again after 15 minutes. If gas pressure has increased 0.5" W.C. or more, the gas leak must be isolated to one or more of the operating gas valves, for example, a solenoid actuated gas shutoff valve. After any leaking valve is replaced, the reassembled gas train must be leak tested again before start-up is attempted. (NOTE: All gas valves removed because of suspected leakage must be returned to PVI Customer Service for disposition.)

## ELECTRICAL

1. Wiring to the unit should conform to the National Electrical Code or the code legally authorized to your locality. A fused disconnect switch should be used for water heater control. Service wiring connections of 120V, 1 phase, 60 Hz. are located in the enclosure on water heater. (Refer to wiring diagram supplied with appliance.)

**NOTE:** Use only copper wire of proper sizing for incoming service. Damage resulting from use of aluminum wiring will be excluded from coverage under the warranty of this unit.

# PVI FIREPOWER®

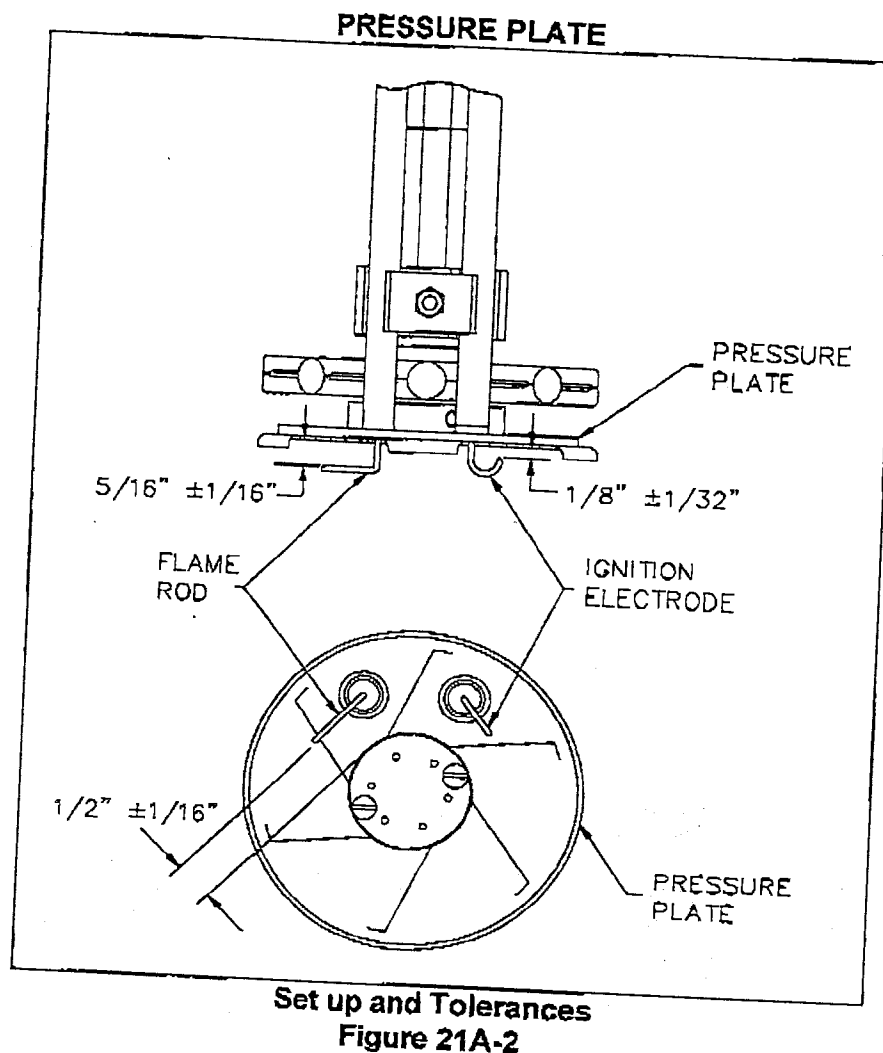
## BG400 GAS BURNER START-UP

(Refer to Figure 21A-1 to identify burner parts)

1. Remove the enclosure panel cover on the water heater or boiler to expose the control circuit. Located on the backside of this cover is a wiring diagram. This diagram will show the controls used in our circuitry.
2. Visually check that all components are intact and no damage has occurred during transit.
3. Check all connections within the control cabinet. A loose connection could cause intermittent shutdowns.
4. Some burners will use direct spark ignition. They may use a single gas pressure regulator and gas valve or multiple valves and regulators. On a call for heat, the motor starts, the gas primary control is energized, and after a short delay (pre-purge) the gas valve(s) opens and ignition should occur. **NOTE: Do not tamper with or readjust program dipswitch settings. This will cause the control to become inoperable. Damage resulting from tampering will be excluded from coverage under the warranty of this unit.**
5. Remove the flame safeguard control from its base. Check the connections in control mounting base; loose connections can cause nuisance shutdowns. When applicable, check the time card or programmer, for good connection. **NOTE: Always secure gas lines and tag "Out of Service" before servicing burner nozzle or electrodes.**
6. Pull the nozzle assembly to check the flame and ignition electrodes. For details, refer to Figure 21A-5, page 7.
7. With the electrodes exposed, check them for the proper settings as called for in Figure 21A-2, page 4. Check for any hairline cracks in the insulators. Should replacement of burner electrodes be required, certain procedures must be followed. In all cases, removal of the electrodes is accomplished by loosening the electrode mounting clamps. Draw the electrodes out of the nozzle assembly through holes in the pressure plate.
8. Inspect the electrodes for cracked ceramic loose retaining studs that hold the wire with the ceramic. Select the proper pressure plate hole to place each electrode and insert 1 electrode through the hole, retaining stud first.
9. Tighten the electrode mounting clamp slightly until electrode ceramics are seated firmly and completely in the mounting bracket without gaps between ceramics and mounting bracket at the bearing faces.
10. Measure and set electrodes according to Figure 21A-2, page 4. After the gaps are set and setting are complete, fully tighten the electrode mounting clamp. **Do not overtighten or the insulation may crack.**
11. Replace nozzle assembly; be sure to connect the flame and spark rod wires before installing nozzle assembly fully into blast tube. Check connections on the ends of the flame and spark rod wires for good contact. Look for properly stripped wire ends. Be sure connectors are firmly attached to the flame and ignition rod ends. Insulating boots can give a false feeling of proper seating. **DO NOT MOVE ELECTRODES.** Be careful not to bump electrodes. Check fan wheel for free rotation.
12. Reinstall orifices in unions (if required). Reinstall gas nozzle assembly.
13. Connect a test meter to the control for reading the flame response signal. **NOTE: Some controls read the flame signal in micro amps and some in volts DC. The MC120 series control has two terminals marked for reading volts DC. The S89 control uses a micro amp signal for measuring flame strength. For this control, a meter must be hooked in series with the flame rod wire. Disconnect the leadwire at the S89 sensor terminal. Connect the positive lead of the meter to the quick-connect sensor terminal on the S89 and the negative lead to the free end of the sensor leadwire.**

# PVI FIREPOWER®

## BG400 GAS BURNER START-UP (con't)



14. Be sure the tank is filled with water. Once the burner is reassembled, two devices to read pressure, preferably U-tube manometers, will be needed to read gas pressures. Connect one to read the inlet pressure of burner. This is the pressure measured before all components in the gas train. The manometer must stay connected throughout the testing, as the inlet pressure must be monitored during the firing of the burner. Record static pressure; it must not exceed 14" W.C. Pressures above this could cause damage to the diaphragm in the gas valve or pressure regulator.

15. Burners with pilot. (See wiring diagram.)

Connect a manometer to the manifold test port at the shutoff valve closest to the burner. Turn off the main gas shutoff valve. Set the air shutter as shown on the tag attached to gas train. This may not be the exact setting you end up with, but it is a good starting point. Turn the unit on using the rocker switch on the side of the control enclosure assembly. If the operating control switches are closed, the burner blower should come on and pre-purge begins.

If nothing happens, check the control to be sure it is not in the tripped position and reset it by pushing the flame safeguard reset button. The burner should pre-purge thirty seconds.

## PVI FIREPOWER®

### BG400 GAS BURNER START-UP (con't)

This section pertains to MC120 control only.

When the blower motor starts, the air proving light on the MC120 should be on. This indicates a positive air flow condition. If the air proving light is not on, turn air proving switch adjustment screw counter-clockwise until the air proving light comes on, then turn screw one turn counter-clockwise. If the gas valves open and close intermittently during normal operation, turn screw one half turn counter-clockwise until this condition ceases. This procedure should be followed with every burner.

After purging is complete, terminal 3 energizes the pilot valve and terminal 4 energizes the ignition transformer on the control. The pilot is then established. The VDC reading on the meter should read a steady 14-17 VDC. Each different control will have the required flame response signal stamped on it. This is the minimum for it to properly operate. If the pilot fails to light during the initial period, it is probably due to air in the line. The control will lock out. Press the flame safeguard reset button to restart burner and begin the purge cycle again.

Once the flame is established, set the pilot pressure (measured downstream of gas valve) at pressure shown on the tag attached to gas train. Next, open the main gas valve slowly. Set manifold pressure at pressure shown on the tag attached to gas train. Do not screw the adjusting nut of the regulator in past the point where no further increase in manifold pressure is noted. Check the incoming pressure with the burner running. This is recorded as inlet flow pressure.

Our standard flow pressure requirement on these burners is 8" W.C. flow. If the required manifold pressure cannot be reached, check the inlet pressure. It should be a minimum of that shown above with the burner running on full input. It is important the incoming pressure does not fall below these minimums or nuisance control lockouts could occur.

**NOTE:** Where low gas pressure is a problem, special arrangements may have been made to fire the burner with reduced pressure. The appliance data decal will reflect this information.

16. Direct Spark Ignition Burners-No pilot.  
(Refer to wiring diagram.)

Connect manometer to the manifold test port. Set manifold pressure as shown on the tag attached to gas train. This may not be the exact setting you end up with, but a good starting point. Some units are equipped with an optional vent restrictor. Adjust air flow as needed.

Turn the unit on, using the rocker switch on the side of the control enclosure assembly. The burner should come on and ignition occur. If the burner fails to ignite, there may have been air in the line. To reset the control, turn the switch off for 60 seconds (S89 controls only) and it should automatically reset, or push the reset button on the control. If after the appropriate prepurge ignition does not occur, turn the air proving switch adjustment screw counter-clockwise until TFI (trial for ignition) occurs. Now in order to more precisely adjust the air failure set point, slowly turn screw clockwise until the burner shuts off. Then turn screw counter-clockwise one turn. If the gas valves open and close intermittently during normal operation, turn screw one half turn counter-clockwise until this condition ceases.

Once the burner fires, set manifold pressure at pressure shown on the tag attached to gas train. There will be a tap on the downstream side of the valve to measure pressure. The manifold pressure must be taken downstream of the gas valve. Check the incoming pressure with the burner running. This recorded flow pressure must be a minimum of 8" W.C.

17. Check flue gases with a flue analyzer to make final settings of the air damper or gas pressure regulator.
  - a. The readings need to be taken from a hole in the vent several inches downstream of the flue outlet connection.
  - b. Insert draft gauge into the test opening in the stack. Draft in stack should read -.02" to -.06" W.C. Adjust draft regulator, if installed.
  - c. Check the manifold gas pressure. If set to the factory specified pressure in (in.W.C.), proceed to paragraph (d). If the manifold gas pressure is too low, increase the gas pressure by adjusting the main gas regulator clockwise; decrease by turning counterclockwise.

# PVI FIREPOWER®

## BG400 GAS BURNER START-UP (con't)

- d. Gradually close air damper to decrease O<sub>2</sub> reading or open air damper to increase O<sub>2</sub> reading until optimum O<sub>2</sub> % (4-5%) is reached. Refer to Figure 21A-3, page 7 for adjustment details.
- e. The CO should not exceed 300 ppm. A reading greater than 300 ppm indicates a lack of air or misadjusted gas nozzle assembly. Open air damper slightly and note any change in CO. If no improvement is seen or burner pulsates, it may be necessary to adjust the gas nozzle assembly. Refer to Figure 21A-4, page 7 for details.
- f. Once combustion is set, take note of the gross stack temperature; maximum gross stack temperature should not exceed 330°F plus room temperature (gross temp ≤ room temp + 330). Minimum gross stack temperature should not be below 300°F plus room temperature. If excessively high gross stack temperature is recorded, consult the factory.
- g. Make sure the air shutter is locked securely in place.
18. On burners with pilots, if adjustments are made in the air shutter, recheck the pilot to make sure its operation has not deteriorated. To do this, shut off the main valve, check the flame response signal by cycling the burner through several lightoffs.
19. Check each operating and limit control to sure they function properly by lowering raising the temperature setting on each of controls, causing the burner to cycle on and
20. Record the following information for future use
  - a) Air shutter position \_\_\_\_\_
  - b) Manifold gas pressure \_\_\_\_\_ "W.C.
  - c) Stack draft \_\_\_\_\_ "W.C.
  - d) O<sub>2</sub> reading \_\_\_\_\_ % (4-6%)
  - e) CO<sub>2</sub> reading \_\_\_\_\_ % (8-9%)
  - f) CO reading \_\_\_\_\_ % (less than .03%)
  - g) Stack temperature:
 

Gross \_\_\_\_\_ °F.

Less ambient \_\_\_\_\_ °F.

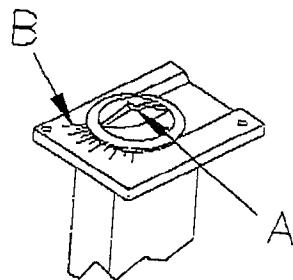
Net \_\_\_\_\_ °F.
  - h) Combustion efficiency \_\_\_\_\_ %



# PVI FIREPOWER®

## BG400 GAS BURNER START-UP (con't)

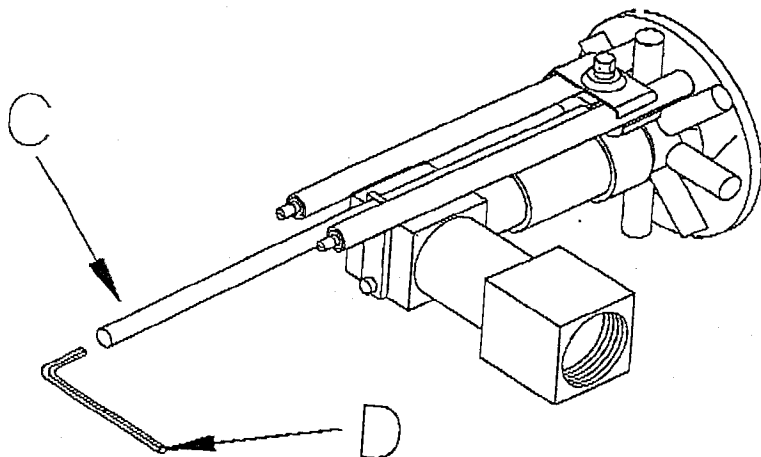
### AIR ADJUSTMENT



Loosen the locking screw and move the knob (A) along the scale (B) to position wanted and tighten the screw. Check the air adjustment by making flue gas analysis.

Figure 21A-3

### GAS NOZZLE ADJUSTMENT



High carbon monoxide can be caused by misaligned gas nozzle assembly. Turning the adjustment rod (C) clockwise will retract the gas nozzle assembly which can improve alignment.

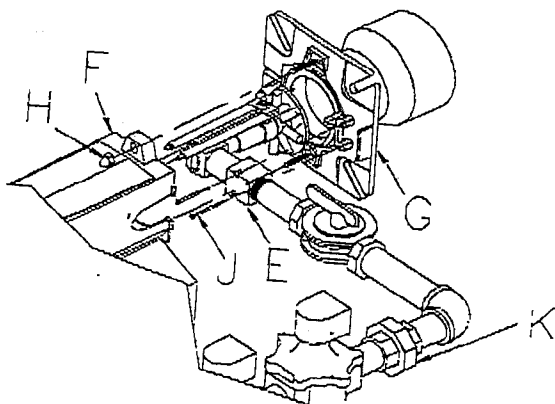
Flame pulsation can be caused by poor flame retention. Turning the adjustment rod (C) clockwise will retract the gas nozzle assembly which will increase flame retention.

Retracting the gas nozzle assembly will restrict air flow thereby reducing the input of the burner. Any adjustments should be gradual.

Adjustment of the gas nozzle assembly is done using a 4mm Allen wrench (D) inserted through the hole in the sight glass.

Figure 21A-4

### GAS NOZZLE ASSEMBLY REMOVAL DETAIL



To remove the gas nozzle assembly (E), disconnect the gas train by breaking the union (K). Then remove the burner housing (F) by unscrewing the dome nut (H) located at the top and bottom of the housing. Disconnect the electrode wires without stressing the electrodes and support the burner housing while removing the nozzle. Now unbolt the nozzle by removing the two mounting bolts (J). Be careful not to break the electrodes while extracting the nozzle. It is not necessary to unbolt the flange (G) to maintain the burner.

Figure 21A-5

# PVI FIREPOWER®

## TROUBLESHOOTING SUGGESTIONS

### BG400 GAS BURNER

#### 1. BURNER FAILS TO START:

- A. Defective on/off switch. Replace switch.
- B. Control circuit has open control contact. Check limits, low water cutoff, and others as applicable.
- C. Bad fuse or switch opens on incoming power source. Correct as required.
- D. Flame safeguard control safety switch tripped out. Reset and determine cause of apparent flame failure.
- E. Loose connections or faulty wiring. Tighten all terminal screws and consult wiring diagram furnished with the heater.
- F. Flame safeguard control starting circuit blocked due to flame relay being energized. Possible defective scanner or flame rod - replace. Possible defective amplifier - replace. Scanner actually sighting flame due to leaking fuel valve - correct unwanted flame cause. Defective flame safeguard control - replace.
- G. Defective blower motor. Check for free rotation of fan wheel. Repair or replace.
- H. Air proving switch is not properly adjusted. Adjust per instructions on pg. 5, paragraph 1.

#### 2. OCCASIONAL LOCKOUTS FOR NO APPARENT REASON:

- A. Gas pilot ignition failure. Check to see that ignition is instant and flame signal readings are stable and above minimum values. Use a manometer to make certain pressure is as recommended.
- B. Loose or broken wires. Check all wire nut connections and tighten all terminal screw connections in panel and elsewhere as appropriate.

C. With flame safeguard controls that incorporate the air flow switch in the no recycling circuit, ensure that when main flange lights, the air flow switch is not so critically sensitive as to allow occasional momentary opening of the air switch contacts.

D. Occasional low supply voltage. Contact local utility to correct. Make certain the burner control circuit transformer (if supplied) is correct for the voltage and power (VAC) being supplied.

E. Occasional low gas supply pressure. Contact local utility to correct.

#### 3. BURNER MOTOR RUNS, BUT PILOT DOES NOT LIGHT:

- A. Gas supply to burner shut off. Make sure all manual gas supply valves are open. Automatic high pressure valve at meter such as "Sentry" type tripped shut due to high gas pressure. Reset valve and correct cause for trip out.
- B. Pilot solenoid valve not opening. Listen and feel for valve actuation. Solenoid valve not being powered. Check electrical circuitry. Replace coil or entire valve if coil is burned out.
- C. Defective gas pilot regulator. Replace.
- D. Gas pressure too high or too low at pilot orifice (if supplied). Check orifice size in gas pilot assembly. Replace if incorrect. Readjust pressure as required.
- E. Defective ignition transformer. Replace. Incorrect ignition electrode settings. Readjust as required.
- F. Defective flame safeguard control or plug in purge timing card. Replace as required.
- G. Air flow switch not making circuit. Check out electrically. Defective air flow switch. Replace. Air switch negative pressure sensing tube out of position. Reposition as necessary.

# PVI FIREPOWER®

## TROUBLESHOOTING SUGGESTIONS

### BG400 GAS BURNER (con't)

#### 4. BURNER MOTOR RUNS & PILOT LIGHTS, BUT MAIN GAS FLAME IS NOT ESTABLISHED:

- A. Main shutoff or test cock closed. Check to make certain fully open.
- B. Pilot flame signal reading too low to pull in flame safeguard relay. Readjust as required.
- C. Defective automatic main or auxiliary gas shutoff valves. Check electrical circuitry to valves. Replace valves or correct circuitry as required.
- D. Main diaphragm shutoff valve opening too slowly. Adjust bleed on valve.
- E. Defective flame safeguard control or plug on amplifier. Check and replace as required.
- F. Main gas pressure regulator atmospheric vent line obstructed. Correct.
- G. Defective main gas pressure regulator. Replace. Misadjusted main gas pressure regulator. Readjust to meet required operational values.
- H. Polarity reversed on incoming power. (S89 control only.)

#### 5. CARBON MONOXIDE READINGS ON GAS FIRING:

- A. Flame impingement on "cold" heat transfer surfaces caused by excessive firing rate. Reduce firing rate to correct input volume.
- B. Incorrect gas/air ratios. Readjust burner to correct CO<sub>2</sub> / O<sub>2</sub> levels, eliminate all CO formation.
- C. Gas nozzle misadjusted. Adjust nozzle per instruction in Figure 21A-4, page 7.

#### 6. GAS HIGH FIRE INPUT CANNOT BE ACHIEVED:

- A. Gas company pressure regulator or meter operating incorrectly, not allowing required gas pressure at burner train inlet. Contact gas company to correct.
- B. Gas cock upstream of train inlet not fully open. Check and correct.
- C. Gas line obstructed. Check and correct.
- D. Gas train main and/or lead test cocks not fully open. Check and correct.
- E. Gas supply line between gas company regulator and burner inlet too small. Check supply pressure at meter, determine pressure drop and increase line size as required, or raise supply pressure to compensate for small line. Do not raise pressure so high that under static (no flow) conditions the pressure exceeds the maximum allowable pressure to the gas train components on the burner.
- F. Gas nozzle misadjusted. Adjust nozzle per instruction in Figure 21A-4, page 7.
- G. Automatic gas valve not opening fully due to defective operation. Replace gas valve.
- H. Orifice (if supplied) too small. Replace with correct size.
- I. Defective main gas pressure regulator. Replace.
- J. Incorrect spring in main gas pressure regulator. Replace as required.
- K. Main gas pressure regulator vent line obstructed. Check and correct.
- L. Normally open vent valve (if supplied) not closing when automatic gas valves open. Replace vent valve, if not closing fully.

Additional troubleshooting information can be found in the Flame Safeguard bulletin supplied with the burner.