Installation Instructions
Boiler Burner Unit

Model VT 700 E
Model VT 1000 E
(For Hot Water Heating Systems)

e·f·m· Sales Company

Emmaus, Pennsylvania

Specifications

MODEL	NOZZLE SIZE GPH + TYPE	HEATING CAPACITY BTUH	NET OUTPUT BTUH	NET OUTPUT SQ. FT.	BECKETT BURNER	WATER CAPACITY GAL.	SMOKE OUTLET SIZE	CHIMNEY SIZE	SHIPPING WEIGHT POUNDS
VT 700 E	1.00 - 80 H	116,000	100,000	664	AFG76XN	9	6	8X8X15	315
	0.85 - 80 H	100,000	86,000	570					
	0.75 - 80 H	88,000	77,000	510					
	0.65 - 80 H	77,000	67,000	444					
VT 1000 E	1.65 - 80 H	193,000	166,000	1,107	AFG76YB	19	7	8X8X15	435
	1.50 - 80 H	174,000	151,000	1,006					
	1.35 - 80 H	159,500	137,000	915					
	1.10 - 80 H	131,500	113,000	754					

Installation Instructions

CAUTION:

1. *Installer must be a trained, experienced serviceman.*
2. *Inspect the boiler, jacket and all components to be sure damage has not occurred in shipment. If damage is evident you must file a claim with the freight carrier immediately.*
3. *Disconnect power supply before connecting wiring.*
4. *Refer to local installation codes for oil burning equipment, for recommended installation practice.*
5. *A complete heat loss calculation is necessary to choose the proper size unit to install. The boiler should be sized to within 25% of the actual heat loss of the structure.*
6. *Conduct thorough checkout when installation is complete.*

1) Place the boiler on a level non-combustible floor, preferably raised and as close to the chimney as possible. The following minimum clearances must be adhered to during installation and maintained thereafter to properly clean, inspect and service your boiler: sides and back - 6"; front - 24" and vent connector 18". Reduced clearance installations must follow NFPA-31 guidelines.

2) For location of piping refer to the installation drawing in Figure 5 and 6. The circulator is shipped loose. Wire the circulator as shown on the wiring diagrams in this manual. The

circulator may be located on the return line as shown in the diagram or in the supply piping if desired. The aquastat is wired at the factory. For power and thermostat wiring see Figures 2, 3 and 4 in this manual and the wiring diagrams in the thermostat manufacturer's manual. For piping and wiring of other system components, see the manufacturer's installation manuals. An Expansion Tank (not provided) must be matched to the system and installed in accordance with the manufacturer's recommendations. See the manufacturer's instructions for sizing the expansion tank. Do not under-size the expansion tank. A bypass loop may be installed to improve tankless coil performance. See Figure. 7.

3) The tankless water heater may be piped as shown in Figure 6. A mixing valve, not supplied, must be used to reduce the water temperature at kitchen or bathroom taps. High temperature water for a dishwasher may be obtained by piping as shown in Figure 6. The nuts that secure the tankless coil flange should be tightened before the boiler is filled with water, after initial firing and once a year during the annual maintenance. DETERIORATION DUE TO COIL GASKET LEAKS WILL VOID THE WARRANTY.

4) The VT series boilers are equipped with an air eliminator feature that uses a dip tube construction on the boiler supply fitting. This feature allows quiet air free operation of your hot water system by assuring the removal of air pockets without the installation of Air Scoops to trap noisy air.

   The 1-1/4" supply line or Riser tapping in the top of the boiler extends approximately 1" below the top or waterline of the boiler, thus allowing only air free water to enter the supply to the heating system. The air trapped in the top of the boiler is then purged through a 3/4" vent tapping to be released with an (1) automatic float vent (2) a manual vent or (3) piped into a conventional type expansion tank.

   Relief valve discharges and drain valve piping should be piped to a safe place of discharge. All plugs and water connections should be checked for leaks upon installation and annually.

5) Be certain the chimney is clean and free of obstructions. Connect boiler flue outlet to chimney using galvanized smoke pipe. The flue pipe should be pitched upward at least 1/4" per foot of run. Refer to Page 1 in this manual for proper size flue pipe for your model boiler. Use only elbows and straight sections. Tees may be used in a straight section in conjunction with a barometric draft regulator; however, they must not be used for a 90° turn. Each joint should be securely fastened with sheet metal screws. The flue pipe must not be inserted beyond the inside wall of the chimney. Install barometric draft regulator in the horizontal or vertical section of the flue pipe. The chimney should provide a minimum of .04 draft at the boiler flue outlet. A draft of .04 is ideal. The draft losses for VT Series Boilers are listed below.

MODEL	Firing Rate	Draft Loss
VT700E	0.65GPH	.002
	0.75GPH	.005
	0.85GPH	.015
	1.00GPH	.020
VT1000E	1.10GPH	.005
	1.35GPH	.010
	1.50GPH	.020
	1.65GPH	.025

6) The boiler room must be well ventilated to allow sufficient make-up air to support combustion. Lack of adequate combustion air may result in erratic operation of the burner, noisy combustion or fuel odors. Remember your need for outside air will be greatly increased if you have a vented dryer in the basement or other venting fans in the home. Boilers located in confined spaces shall be provided with two permanent openings, one near the top and one near the bottom of the enclosure. Each opening shall have a free area of not less than one square inch per 1000 BTU per hour input rating of the boiler, freely communicating with interior areas having adequate infiltration from the outside.

7) Fill boiler and system with water. Be sure entire system has been purged of air and the desired pressure is obtained.

8) The boiler is shipped with a nozzle installed. Check the nozzle and change it if a different firing rate is desired. Connect burner to oil supply. Refer to fuel unit manufacturer literature for piping, connections, lift and tank installation.

9) Connect the electric supply to the boiler as indicated on the wiring diagrams. The wiring must be installed in accordance with the National Electrical Code and any other state and local codes.

10) One pipe oil supply line installations must be absolutely air tight or loss of prime may result. Maximum lift on one pipe installations is about 8 feet. See burner literature for two pipe installations. Install a shutoff valve and oil filter in the oil supply line. Locate shutoff valve close to tank with oil filter between valve and burner.

Operational Sequence

1) Boilers with Tankless Coil - This boiler is equipped with a combination aquastat control which has high and low limits to be set at 180° and 160° respectively by the installer. When room temperature falls below thermostat setting, thermostat calls for heat starting the burner and circulating pump. The burner and pump continue to operate until room heating requirements are satisfied (thermostat setting is reached), or until boiler water temperature reaches the high limit control temperature setting. If the high limit control temperature setting is reached, the burner shuts off and the circulating pump continues to operate until the room heating requirements are satisfied. If the thermostat continues to call for heat after the boiler water temperature has dropped below the temperature setting of the high limit control, the oil burner will start again, while the circulating pump will continue to run. The boiler water temperature is normally maintained at 160°F around the tankless coil by the operating control so that an abundance of hot water is available. If the boiler water temperature should fall below the operating control setting (160°F) the oil burner will be started again by that control (and the circulating pump will be prevented from operating) until the operating control setting is satisfied. See control manufacturers literature included in the data package for detailed wiring, operating and safety instructions.

2) Boilers Less Tankless Coil. This boiler is equipped with a combination aquastat control which has high and low limits to be set at 180° and 120° respectively by the installer. The control acts exactly as described for a boiler with a tankless coil except that the low limit is set lower since the boiler does not need to be kept hot to provide heat to the domestic hot water coil. By maintaining the boiler at or above 120° the system will remain warm enough to avoid cycles of hot and cold that can produce condensation which can cause deterioration of the boiler heat exchanger.

3) A cadmium sulfide flame scanner (cad cell) and relay are provided with the oil burner. The cad cell will stop the oil burner within a predetermined number of seconds if the fuel fails to ignite or if the flame goes out during operation. The oil burner will remain off until the red reset button on the relay has been pushed. **RESET MUST NEVER BE PRESSED MORE THAN ONCE DURING A SINGLE FLAME FAILURE.**

Start-Up and Check-Out Procedure

CAUTION

Only a trained, experienced serviceman should attempt the checkout procedure outlined below. Read the burner manufacturers instructions for start-up for special instructions and special features of the burner and control.

1) Combustion test equipment required for proper burner adjustment:

   a) CO_2 Analyzer
   b) Draft Gauge
   c) Oil Pressure Gauge 0-200 PSI
   d) Stack Thermometer
   e) Smoke Test Gun
   f) Vacuum Gauge 0-30 in. of Hg

2) In order to take flue gas samples for combustion testing a 1/4" hole must be drilled in the flue pipe between the boiler and the barometric draft regulator.

3) Open all shut-off valves in the oil supply line to the burner.

4) Set thermostats substantially above room temperature.

5) Check electrode settings and readjust air setting if required. Electrode settings are

shown in the burner manual provided along with this manual. Burner settings are listed on the Service Man's Label attached to the boiler and on the Burner Unit specifications provided along with this manual.

6) Install pressure gauge in the 1/8" gauge port of the oil pump.

7) Turn on switch to start burner. If burner does not start immediately, you may need to reset the burner control. See the burner manufac turers instructions for control and reset features.

8) On one pipe systems bleed the oil pump as soon as burner motor starts. To bleed, attach a length of 1/4" O.D. clear plastic tubing to the end of the bleed plug and then loosen plug while holding an empty container under the tubing to catch all of the expelled oil. Bleed for at least 15 seconds after the oil stream is free of all air. If air is still evident in the bleed line you must check the oil lines, all fittings, filters and any other connections for tightness. Kinks in the oil lines will create undue high vacuum therefore they must be eliminated. When you are sure all air has been eliminated then close the bleed valve. Ignition should be instantaneous following the closing of this valve. If it is not good, proceed to the trouble shooting guide in the burner manufacturer's manual to determine why the oil did not ignite.

9) FINAL ADJUSTMENTS OF THE BURNER MUST BE MADE USING PROPER COMBUSTION TEST EQUIPMENT. The air supply should be adjusted by loosening the lock screw and moving the bulk air band or shutter so that the CO_2 measured in the stack ahead of the draft control should be a minimum of 10% and a maximum of 12%. At the same time the draft should be adjusted to negative .01"- negative .02" W.C. over the fire. Install a second barometric draft control if necessary to reduce excessive draft. The smoke should also be checked with a smoke gun and found to be zero.

10) Check operation of the cad cell relay by removing one cad cell wire from external terminal during the flame cycle. The relay should cut the burner off in approximately 15 to 45 seconds, depending on the control provided. See the burner manufacturers manual provided in the data pack.

Servicing the Boiler/Burner Unit

1) Burner Components: If replacement of burner parts is necessary, always use parts recommended by the manufacturer. Specify part number and description when ordering.

2) Electrode settings are important for reliable ignition of the oil. Check to be sure the settings are in accordance with the instructions provided in the burner manual.

3) Nozzles: The nozzle specifications listed in the manual are the result of years of exhaustive engineering testing. ANY NOZZLE REPLACEMENT SHOULD BE OF THE EXACT TYPE AS LISTED IN THE SPECIFICATIONS. Use extreme care in handling nozzles to avoid scratches or dirt that could cause leaks or affect the oil spray pattern.

4) Fan and blower housing should be kept clean of dirt and lint. If heating unit is located near an unvented dryer, special care must be taken so that lint does not clog the burner air inlets.

5) Replace the oil filter cartridge annually.

6) Cleaning the Boiler: Cleaning should be done only by a trained, experienced serviceman. Turn power off to the boiler. To clean the boiler, remove the flue pipe, jacket top and flue collector. Remove the baffles then clean the tubes with a soft 2" flue brush. Reinstall parts, readjust and clean the burner if required."

CAUTION

Since this unit utilizes a fiber combustion chamber the careful use of a soft flue brush is highly recommended. In addition, be especially careful when cleaning the chamber with a vacuum cleaner.

Instructing the Homeowner

The operation and care of the heating system should be explained to the homeowner, including the simple checks to make before calling for service if the burner fails to operate automatically.

INSTALLATION DIMENSIONS

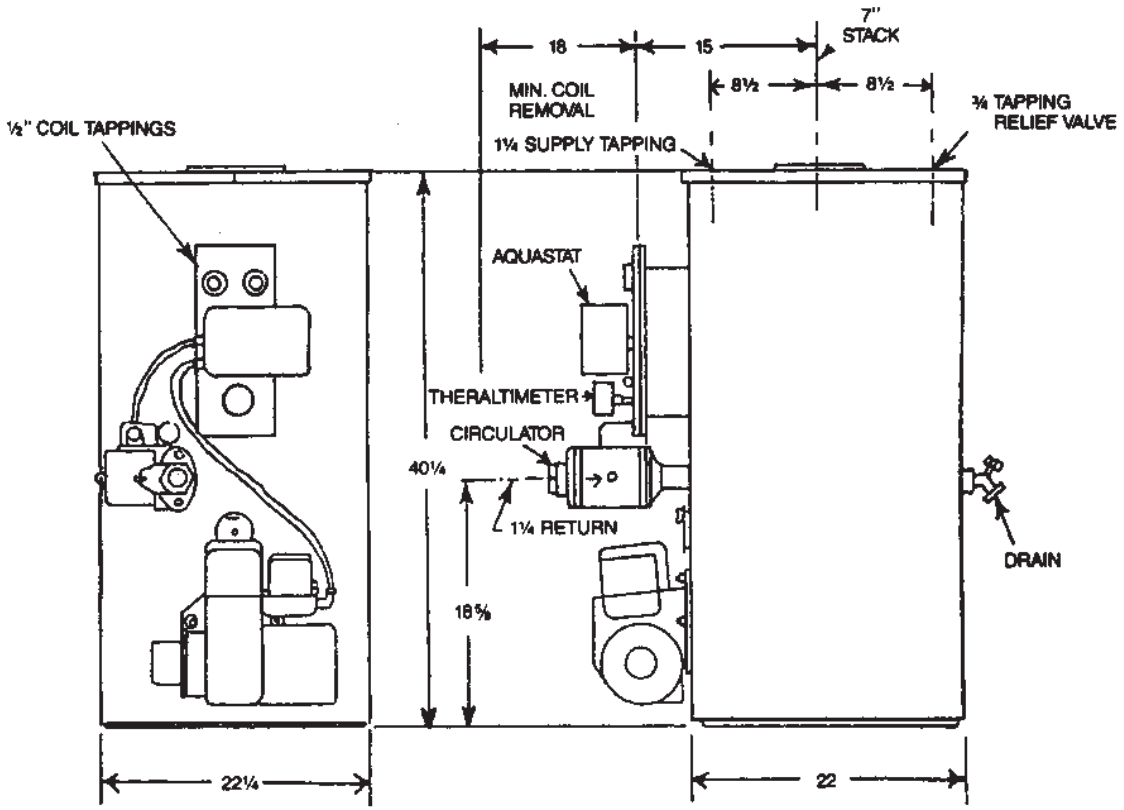


Figure 1

Note: The circulator may be located on the supply side piping if desired.

WIRING DIAGRAM
SINGLE ZONE

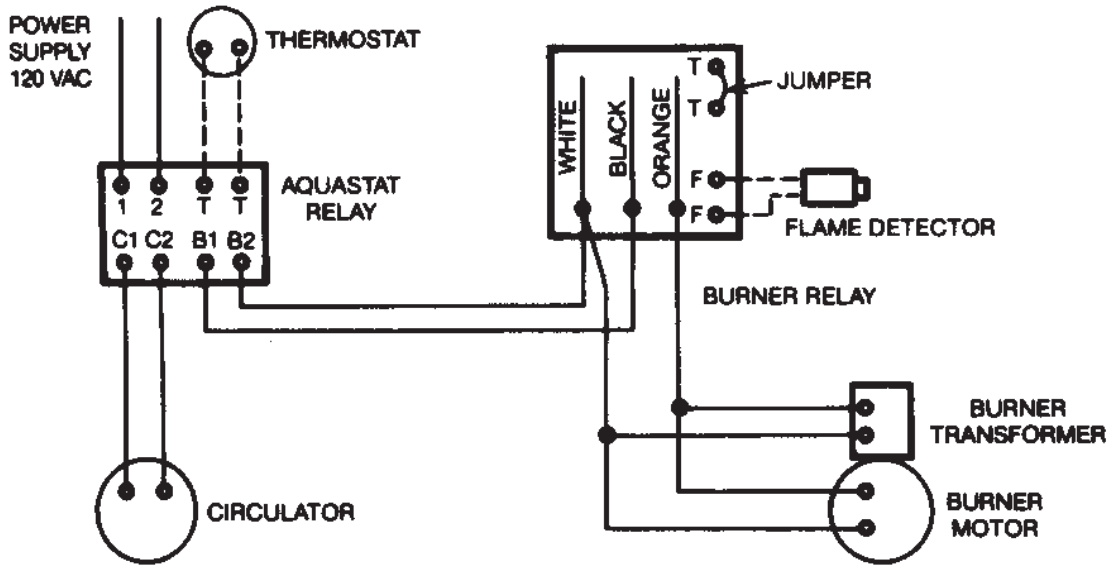


Figure 2

WIRING DIAGRAM
MULTI-ZONE WITH CIRCULATORS

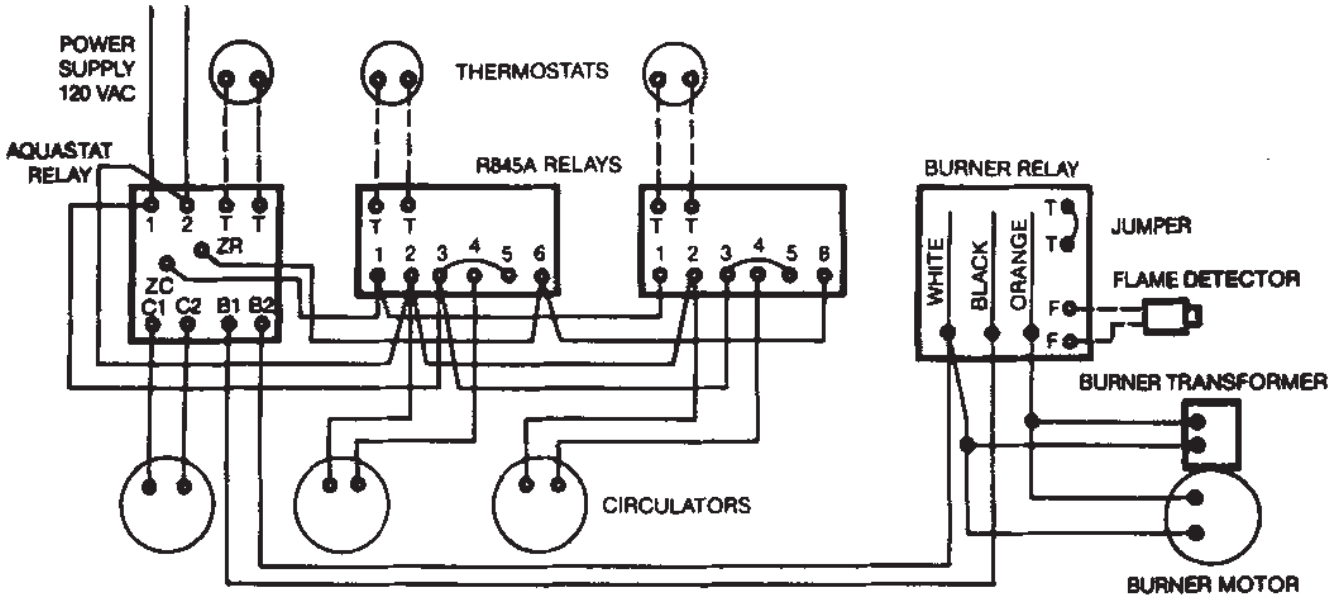


Figure 3

WIRING DIAGRAM
MULTI-ZONE WITH ZONE VALVES

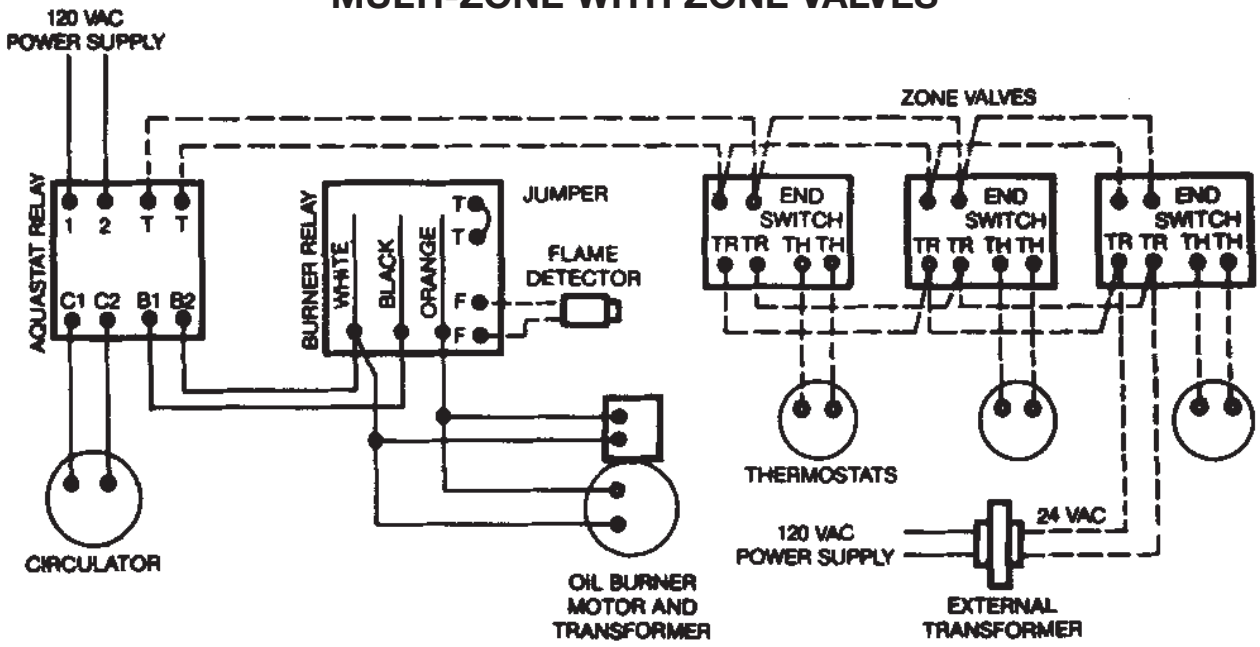


Figure 4

PIPING DIAGRAMS

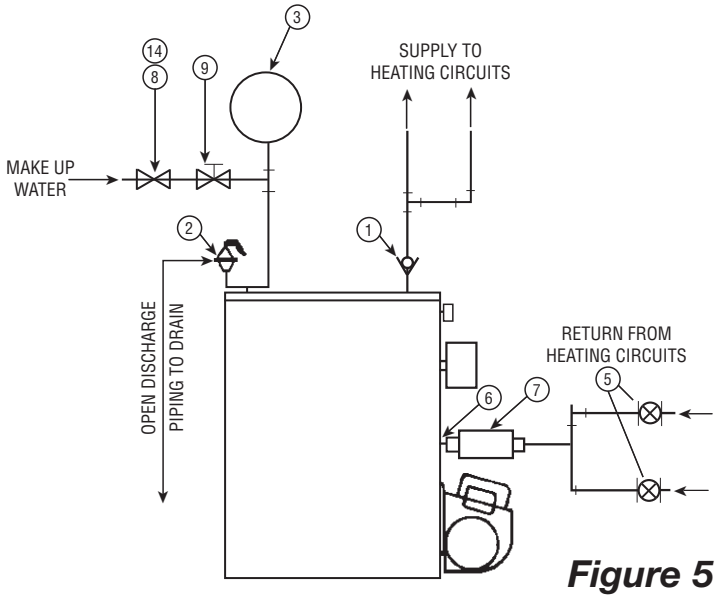
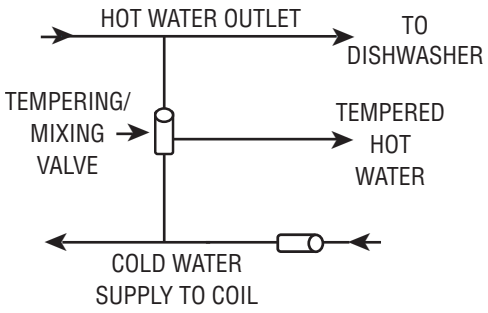


Figure 5



TANKLESS WATER HEATER PIPING

Note: the circulator may be located on the supply side piping if desired.

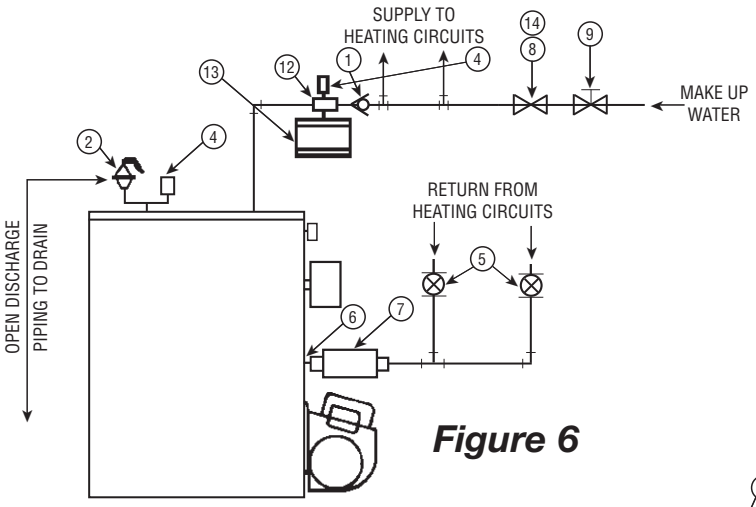
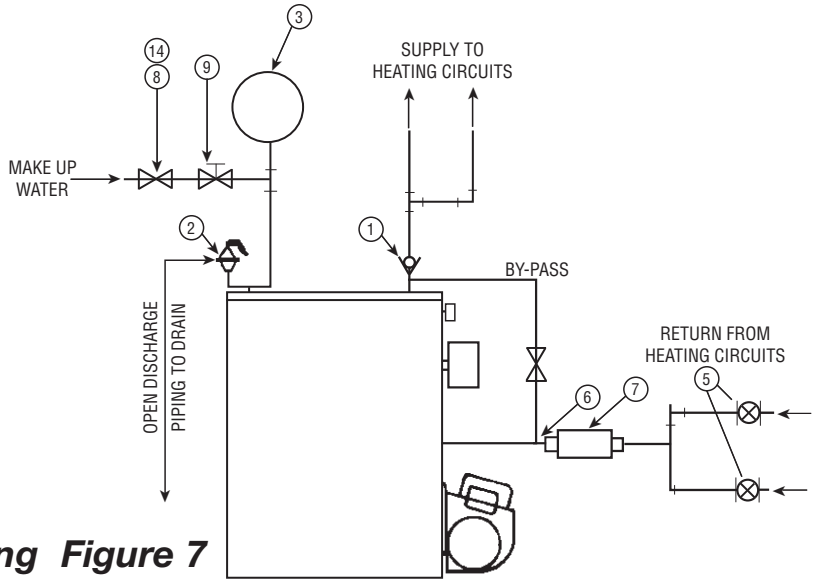


Figure 6

LEGEND

1. FLOW CHECK VALVE
2. PRESSURE RELIEF VALVE
3. CONVENTIONAL EXPANSION TANK
4. AUTOMATIC AIR VENT
5. BALANCING COCKS
6. DRAIN VALVE
7. CIRCULATOR
8. PRESSURE REDUCING VALVE
9. SHUT OFF VALVE
10. TEMPERING VALVE
11. FLOW REGULATOR
12. AIR PURGER
13. EXPANSION TANK (PRESSURIZED)
14. AUTOMATIC REFILL



By-Pass Piping Figure 7

SERVICEMAN LABELS

e•f•m•
VT SERIES

S/N:

MODEL:	VT 1000E		
Firing Rate G.P.H.:	1.10	1.35	1.65
Input BTU/HR:	154,000	189,000	231,000
DOE Cap. BTU/HR:	131,500	159,500	193,000
Net Rate BTU/HR:	113,000	137,000	166,000
Val. Cap. Lbs/HR:	270	270	270
Max W.P. Water PSI:	30	30	30

Boiler to be installed in a level position in accordance with NFPA 31 and local codes.

STANDARD CLEARANCES

Front	24"
Sides	6"
Rear	6"
Top	N/A
Chimney Connector	18"

EMMAUS, PA

e•f•m•
VT SERIES

S/N:

MODEL:	VT 700E		
Firing Rate G.P.H.:	0.65	0.85	1.00
Input BTU/HR:	91,000	119,000	140,000
DOE Cap. BTU/HR:	77,000	100,000	116,000
Net Rate BTU/HR:	67,000	86,000	100,000
Val. Cap. Lbs/HR:	140	140	140
Max W.P. Water PSI:	30	30	30

Boiler to be installed in a level position in accordance with NFPA 31 and local codes.

STANDARD CLEARANCES

Front	24"
Sides	6"
Rear	6"
Top	N/A
Chimney Connector	18"

EMMAUS, PA