



D E S I G N E D T O L E A D

Freeport CT Series

3-Pass Scotch Marine, Oil-Fired, Hot Water Boilers

These instructions must be affixed on or adjacent to the boiler.

Models

- CT-3
- CT-35
- CT-4
- CT-45
- CT-5
- CT-6
- CT-7
- CT-8

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury, or loss of life. For assistance or additional information consult a qualified installer or service agency. This boiler requires a special venting system. Read these instructions carefully before installing.



Manufacturer of Hydronic Heating Products
P.O. Box 14818 3633 I. Street
Philadelphia, PA 19134

Tel: (215) 535-8900 • Fax: (215) 535-9736 • www.crownboiler.com

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SECTION I: BEFORE INSTALLING BOILER

CODE REQUIREMENTS

Installations must comply with all local codes, laws, regulations, and ordinances, and CSA standard B139.

Where required by the authority having jurisdiction, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1.

INSPECT SHIPMENT

ANY CLAIMS for damage or shortage in shipment must be filed immediately against the carrier by the consignee. No claims for variances from, or shortage in orders, will be allowed by the manufacturer unless presented within sixty (60) days after receipt of goods.

1. Packaged Boiler — Consists of a wirebound crate and a separate carton containing the boiler jacket.

Crate contains:

Assembled cast iron sections with burner mounted (3-6 sections)

(with 7-8 sections, burner is shipped in separate carton).

1 — Carton Containing:

- L8148A Aquastat relay w/well, J-box and quick disconnect wiring harness.
- Pressure relief valve with pipe nipple
- Temperature/Pressure Gauge
- Boiler drain
- 1-1/2" x 3" Nipple
- Circulator Flange
- (2) 2" x 1-1/2" Bushings
- 1-1/2" x 5" Nipple

1 — Carton containing circulating pump

1 — Carton containing draft regulator

2. Bare Boiler — Consists of a wirebound crate and a separate carton containing the boiler jacket.

Crate contains:

Assembled Cast Iron Sections

1 — Carton containing:

- Pressure Relief Valve
- Temperature/Pressure Gauge

COMBUSTION AIR SUPPLY

WARNING

Failure to provide an adequate supply of fresh air for combustion will result in hazardous operating conditions.

NOTE

If you use a fireplace or a kitchen or bathroom exhaust fan, you should install an outside air intake. These devices will rob the boiler and water heater of combustion air.

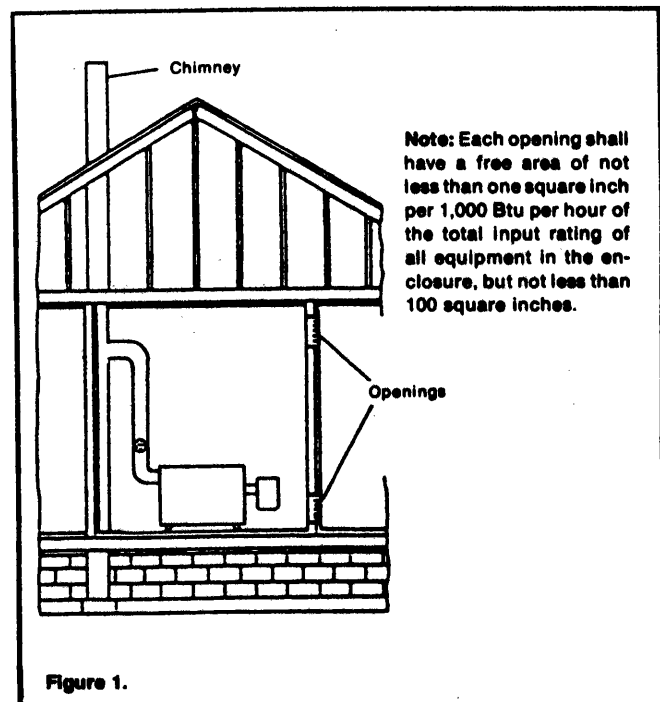
1. In unconfined spaces in buildings infiltration may be adequate to provide air for combustion and ventilation. However, in buildings of unusually tight construction, additional air must be provided as described in Item 2. (b) below.

2. Boiler located in confined space:

[Note: Confined space may be defined as a space whose volume is less than 50 cubic feet per 1000 Btu of total input of all appliances installed in that space.]

- (a) All air from inside of building:

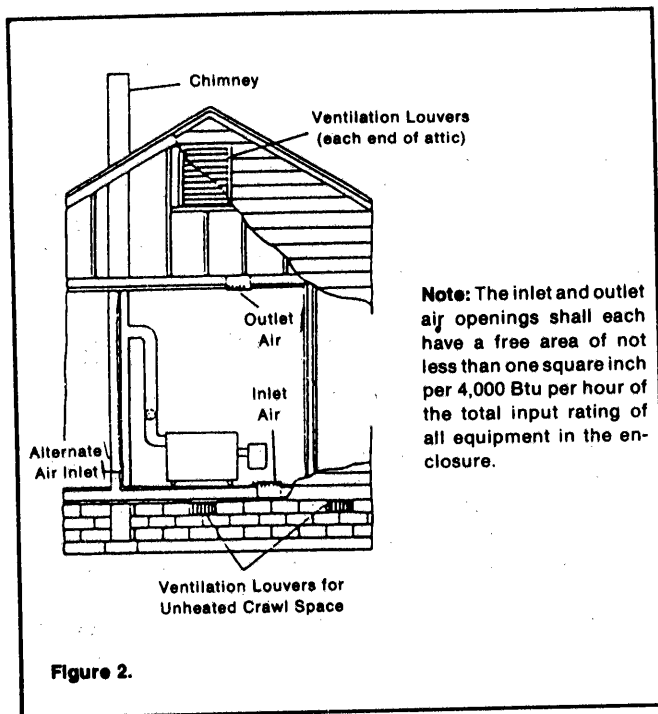
Providing infiltration in the rest of the building is adequate, the confined space may be provided with two permanent openings communicating directly with another room or rooms of sufficient volume that the total volume of all spaces meets the criteria for unconfined space. One opening must be within 12 inches of the top and the other within 12 inches of the bottom of the enclosure. See Figure 1.



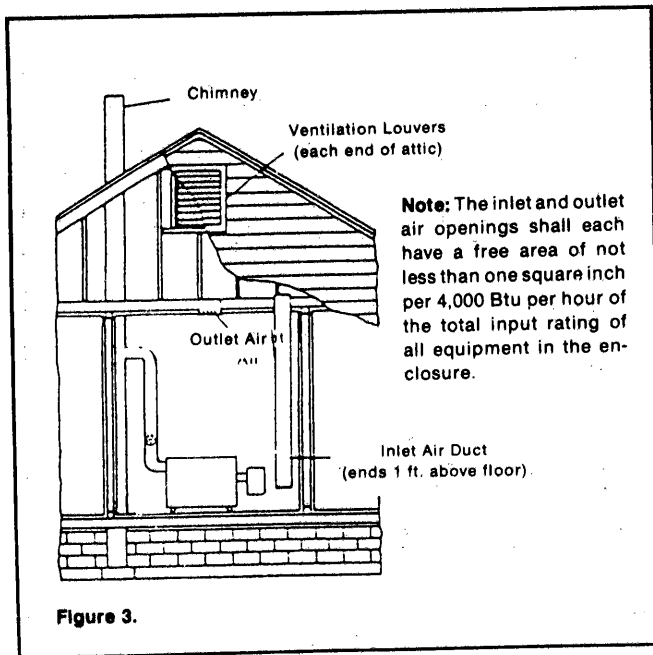
- (b) All Air From Outdoors:

The confined space shall be provided with two permanent openings, one within 12 inches of the top and another within 12 inches of the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or crawl or attic spaces which communicate freely with the outdoors.

Direct to outdoors, see Figure 2.



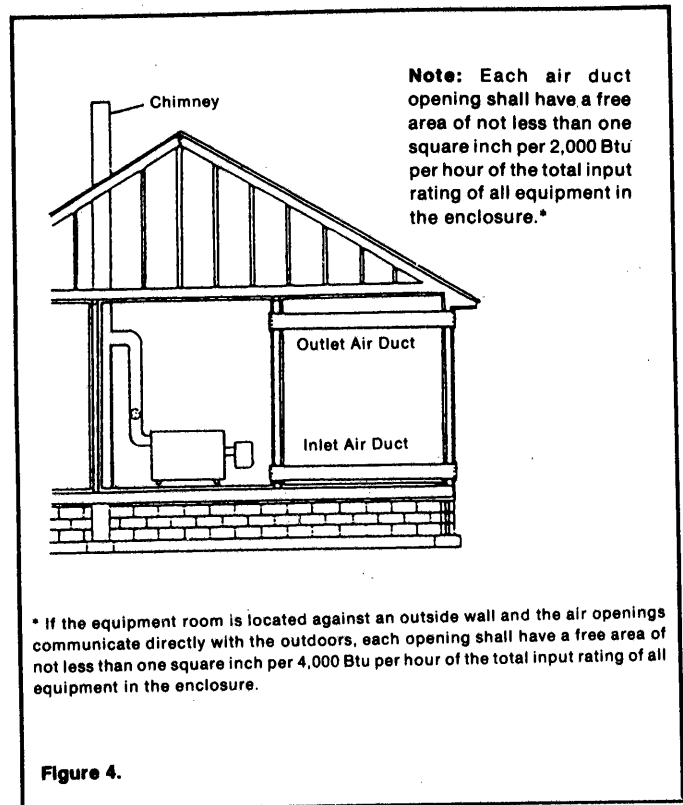
With Vertical Ducts See Figure 3.



NOTE

All wall openings directly to outdoors must be screened to prevent entry by birds or small animals.

With Horizontal Ducts See Figure 4.



CHIMNEY OR VENT REQUIREMENTS

WARNING

Inspect existing chimney to make sure it is clean, the right size, properly constructed and in good condition before installing boiler. Failure to do so may cause a hazardous operating condition.

NOTE

Venting must conform with applicable local codes and/or the National Board of Fire Underwriters.

1. Chimney must be a Class A chimney.
2. This is a high efficiency boiler which operates with a low stack temperature which may be subject to condensation in a cool or improperly designed chimney. Accordingly, the right vent or liner is very important.
 - a) Masonry chimney with three walls exposed to outdoors may require the use of a 316 stainless steel liner.
 - b) Masonry chimney with all inside walls — use a tile liner.

LOCATING THE BOILER

3. Breeching —

- See Table A for minimum recommended breeching and chimney sizes.
 - Keep run boiler to chimney as short as possible
 - Use as few elbows as possible
 - Slope upward towards chimney at not less than ¼" per foot
 - Use a sealed-in thimble for the chimney connection
 - Connect together all sections and/or fittings with sheet metal screws and seal with silicone sealant.
4. When more than one appliance is connected to the same chimney, the chimney's internal cross-sectional area must be at a minimum equal to the area of the largest vent plus 50% of the area of each additional vent.
5. Clearances — vent pipe between boiler and chimney must be a minimum of 6" from any combustible material.

TABLE 1: MINIMUM RECOMMENDED BREACHING AND CHIMNEY SIZE.

Boiler Model	Min. Breeching Dia.	Min. Recommended Chimney I.D.	Size HT.
CT-3	6"	6"	15'
CT-35	6"	6"	15'
CT-4	6"	6"	15'
CT-45	6"	7"	15'
CT-5	6"	7"	15'
CT-6	7"	7"	15'
CT-7	7"	8"	15'
CT-8	7"	8"	20'

6. An oil-fired unit shall be connected to a flue having sufficient draft at all times, to assure safe proper operation of the unit."

WARNING

Boiler must not be installed in an area where gasoline, paint or other combustible materials or flammable vapors or liquids are present.

1. Consider all piping and venting connections before selecting a location. Locate as close to the chimney as possible, observing the following clearance requirements from combustible surfaces:

Front 24"
 Top 6" above controls
 Left side 6"
 Right side 6"
 Back 18"

2. Boiler is not intended for installation on combustible floor. Further, to facilitate servicing it is desirable to raise the boiler at least 8" off the floor. It is recommended that concrete blocks be employed to build up a foundation. Ensure that top surface of foundation is level.

SIDE-WALL VENTING — IMPORTANT NOTE

Two problems arise when side wall venting any oil appliance:

1. There is sometimes an accelerated rate at which soot builds up on the cad-cell, spinner, etc.
2. There is the potential for severe soot damage to the side of the structure in the event that the boiler operates at a high smoke level. This can happen for many reasons, some of which are out of the control of both the installer and appliance manufacturer.

Crown boiler recommends the use of a chimney to vent our residential oil boilers. If a power venter must be used, it is the responsibility of the installer and power vent manufacturer to "engineer" the power vent system. CROWN WILL ASSUME NO RESPONSIBILITY FOR SOOT DAMAGE TO SIDING, ETC. FROM A POWER VENTED OIL BOILER. THIS APPLIES REGARDLESS OF THE CAUSE OF THE SOOTING.

SECTION II: INSTALLING THE BOILER

PLACING THE BOILER (CT-3 - CT-6)

- 1) Move the boiler as close as possible to its final location in the crate.
- 2) Remove the two lag screws holding the rear feet to the skid.
- 3) Remove the front jacket panel. Cut the band holding the front of the boiler to the skid.
- 4) Move the boiler into the final position.

PLACING THE BOILER (CT-7, CT-8)

- 1) Move the boiler as close as possible to its final location in the crate.
- 2) Cut the bands holding the boiler to the skid.
- 3) Move the boiler into its final position.
- 4) Install the jacket. **Note: jacket must be installed before boiler is piped.**

JACKET INSTALLATION INSTRUCTIONS

- 1) Attach the rear jacket mounting brackets (7) to rear tie rod ends on back of boiler using the 12mm nut (9) provided on the end of each tie rod.
- 2) Attach the rear jacket panel (3) to the rear jacket mounting bracket using the 1/4-20 screws (11) and nuts (10) provided.
- 3) Assemble front jacket mounting bracket (23) to the heat exchanger using the two M10 x 16mm cap screws (27).
- 4) Drape the foil faced fiberglass insulation matt (not shown) over the top and sides of the boiler. Make sure that the insulation is behind the Door Hinge and Front Mounting Bracket and that the tappings in the top of the boiler are not covered by the insulation.
- 5) Attach one door bracket (18) to the bottom of both the left and right side jacket panels. Use two 8-32 x 1/2" screws (19) and nuts (20) to assemble each door bracket.
- 6) If the burner supplied with this boiler is equipped with a burner twist plug, discard the Wireway (6) and skip to step 11. If this boiler is supplied with a burner shut-off switch (16), remove knockouts "A" and "B" from the right side jacket panel.
- 7) Attach the loose end of the burner cable to knockout "B" in the right side jacket panel.
- 8) Locate the 6" flexible conduit assembly. Attach the end of this assembly having the straight connector to knockout "A".
- 9) Connect the black lead from the 6" flexible conduit assembly to the black wire from the burner cable. Do the same for the white wires. Route the door switch leads (the wire in the burner cable that looks like lamp cord wire) out through the rectangular opening in the front of the right side jacket panel.
- 10) Attach the wireway to the right side panel using three #10 x 1/2 sheet metal screws (12) through the holes in the top and front of the right side panel. Do not install a screw through the hole in the rear of the panel yet. When installing the wireway, be sure that all wiring is enclosed and not pinched between the wireway and the side panel.
- 11) Attach the left and right side jacket panels to the boiler. The front end of the right side panel is attached to the hinge using 10 24 x 3/4 screws (21). The front end of the left side panel is also attached to the to the front jacket mounting bracket (23) using 10 24 x 3/4 screws. The rear of both the left and right panels are attached to the rear panel using #10 x 1/2 sheet metal screws.
- 12) Install a #10 x 1/2 sheet metal screw into the remaining hole in the rear of the right side jacket panel which secures the rear of the wireway.

13) Attach the top jacket panel (5) using four #10 x 1/2 sheet metal screws.

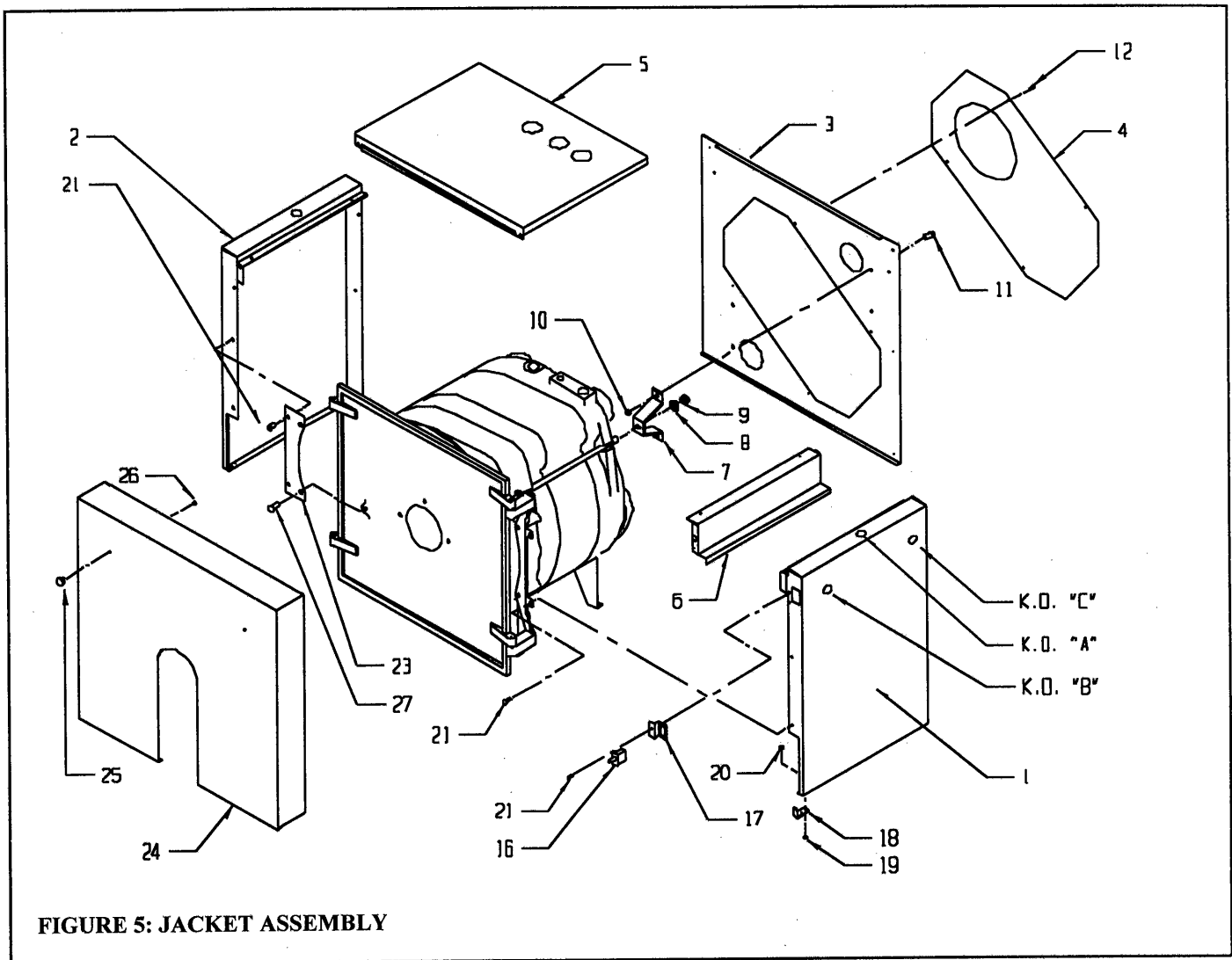
14) Attach the flue collector cover (4) using four #10 x 1/2 sheet metal screws.

15) Press the door switch (16) into the door switch bracket (17). Connect the door switch leads to the switch (it does not matter which wire is connected to which side of the switch). Attach the door switch bracket to the right side jacket panel using a 10-24 x 3/4 machine screw (21).

16) Mount the door knobs (25) to the front panel (24) using two 8-32 x 1/4 screws (26).

17) Mount the front jacket panel on the boiler.

18) (Boilers equipped with door switches only) Connect the loose ends of the 6" conduit assembly to the limit control. Connect the black wire to terminal "B1" and the white wire to terminal "B2".



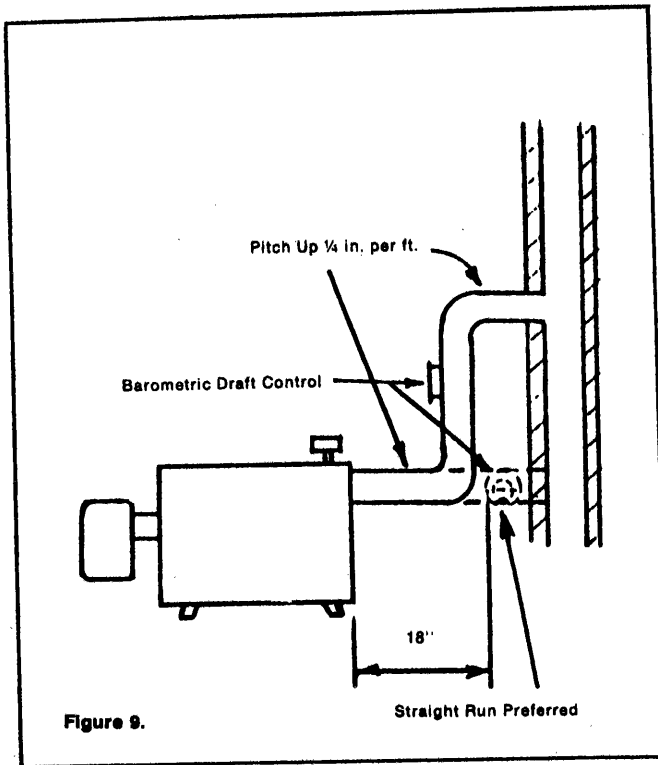
BREECHING INSTALLATION

The breeching connection on all CT series boilers is 7 inches regardless of input. Refer to Table A for minimum breeching sizes. Breeching run should be as short as possible with as few elbows as practical. Unless marginal draft conditions exist, a brametric draft control must be installed in the breeching and should be approximately 18 inches from the boiler breeching connection.

Breeching should not project into the chimney beyond the inside wall of the chimney. Connect the breeching to the chimney with a thimble or slip joint to facilitate cleaning. See Figure 9.

MOUNTING THE BURNER

1. Beckett — Burner should be mounted on the boiler front plate using the flange provided with the burner. The head end of the air tube must be 1/4 inch back from the inside wall of the combustion chamber. Never allow tube to extend into the chamber. The air tube also should have a 2 degree downward pitch. The flange provided with the Beckett Burner automatically provides the right pitch. See Figure 11.



INSTALLING THE BURNER

1. If boiler is 3 through 6 sections and is a package boiler, the boiler will have the burner mounted. If boiler is 7 or 8 sections, the burner is shipped in a separate carton and should be installed at this time.
If boiler was supplied as a bare boiler, no burner will be supplied with boiler. It is assumed that installer will supply his own burner.

USE CERTIFIED NO. 2 FUEL OIL

"Do not use gasoline crankcase drainings or any oil containing gasoline."

NOTE

When the burner is field installed the installer must fill in the space between the burner blast tube and the refractory cement on the front burner plate.

WARNING

If the installer supplies his own burner, it is recommended that one of the burners listed below be selected. The use of any burner other than those listed as having been tested and approved by Crown may result in the inability of Crown to provide engineering backup in the event of combustion or other burner problems.

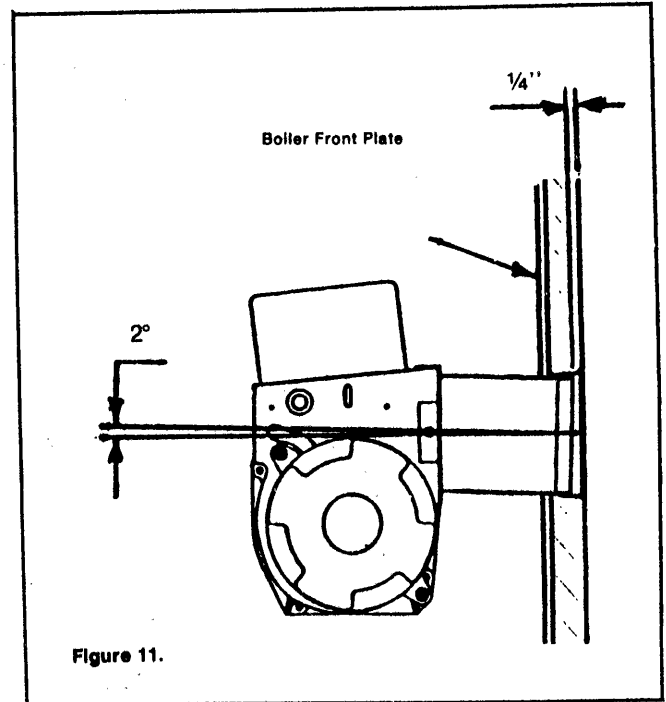


TABLE 2: APPROVED BURNERS/COMBUSTION DATA

WITH BECKETT BURNER

	CT-3	CT-35	CT-4	CT-45	CT-5	CT-6	CT-7	CT-8
BURNER MODEL	AFG	AFG	AFG	AFG	AFG	CF375	CF500	CF500
AIR TUBE COMBO	AFG50MB	AFG50MB	AFG50MB	AFG50MD	AFG50MD	CF56KY	CF60KK	CF60KK
VALVE	-	-	-	-	-	EV8FFNMB	C641D	C641D
LOW FIRING RATE BAFFLE	BECKETT #31760	-	-	-	-	-	-	-
HEAD SETTING	-	-	-	0	2	1	1	4
STANDARD NOZZLE	DELAVAN 0.65/70A	MONARCH 0.85/60AR	MONARCH 0.85/60AR	DELAVAN 1.10/60W	DELAVAN 1.10/60B	HAGO 1.35/60ES	HAGO 1.75/60ES	DELAVAN 2.00/60B
ALTERNATE NOZZLE	-	DELAVAN 0.85/60A	DELAVAN 0.85/60A	-	-	-	-	-
PUMP PRESS (PSI)	140	140	140	140	140	150	140	140
SHUTTER TYPE	STD.	STD.	STD.	STD.	STD.	STD.	5 SLOT	5 SLOT
STARTING: SHUTTER SETTING BAND SETTING	10 0	10 2	6 2	6 2	10 0	3 3	0 5	4 2
DRAFT IN FLUE (In W.C.)	- 0.02	- 0.02	- 0.02	- 0.02	- 0.02	- 0.02	- 0.02	- 0.02
MAX SMOKE (Bacharach Scale)	#1	#1	#1	#1	#1	#1	#1	#1
MIN. CO ₂ (%)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
MAX CO ₂ (%)*	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0

WITH RIELLO BURNER

	CT-3	CT-35	CT-4	CT-45	CT-5	CT-6	CT-7	CT-8
BURNER MODEL	F5	F5	F5	F5	F5	F10		
TURBULATOR SETTING	0	0	1	3	3	0		
STANDARD NOZZLE	MONARCH 0.60/80AR	DELAVAN 0.85/70B	DELAVAN 0.85/70B	DELAVAN 1.10/70A	DELAVAN 1.10/70A	DELAVAN 1.35/60B		
ALTERNATE NOZZLE	-	-	MONARCH 0.85/60AR	-	MONARCH 1.10/70AR	-		
PUMP PRESS (PSI)	150	150	150	150	150	150		
AIR SHUTTER SETTING	2.8	3.3	3.2	4.5	4.5	3.4		
DRAFT IN FLUE (In W.C.)	- 0.02	- 0.02	- 0.02	- 0.02	- 0.02	- 0.02		
MAX SMOKE (Bacharach Scale)	#1	#1	#1	#1	#1	#1		
MIN. CO ₂ (%)	11.0	11.0	11.0	11.0	11.0	11.0		
MAX CO ₂ (%)*	13.0	13.0	13.0	13.0	13.0	13.0		

*Note: Best final CO₂ is dependent on such factors as oil chemistry, ambient temperature, and available draft. If any of these conditions are unstable, the CO₂ level should be reduced below 13.0%. Under no circumstances should the CO₂ level be left over 13.0% or under 11.0%.

2. Riello Burners -The Riello Mectron 5 and Mectron 10 mount on the boiler front plate using both the semi-flange and the universal flange with the gasket between the universal flange and the boiler front plate.

The F5 used on the CT-3, CT-4 and CT-5, is mounted with the head end of the air tube back from the inside of the wall of the combustion chamber 1/4 to 1/2 inch. (See Figure 12.)

The F10, used on the CT-6 through CT-8, is mounted with the head end of the air tube extending 1/4 inch past the inside wall of the chamber. (See Figure 12.)

3. After burner has been mounted, open the burner door and seal the void area between the burner blast tube and the refractory.

NOTE

1. When installing any of the above burners, refer also to the installation instructions supplied with the burner.
2. While the installation instruction manual supplied with the burner may be consulted for general information, the nozzle selections and settings for air shutters, etc. in this Crown manual must be adhered to regardless of information found in the burner manufacturer's manual.

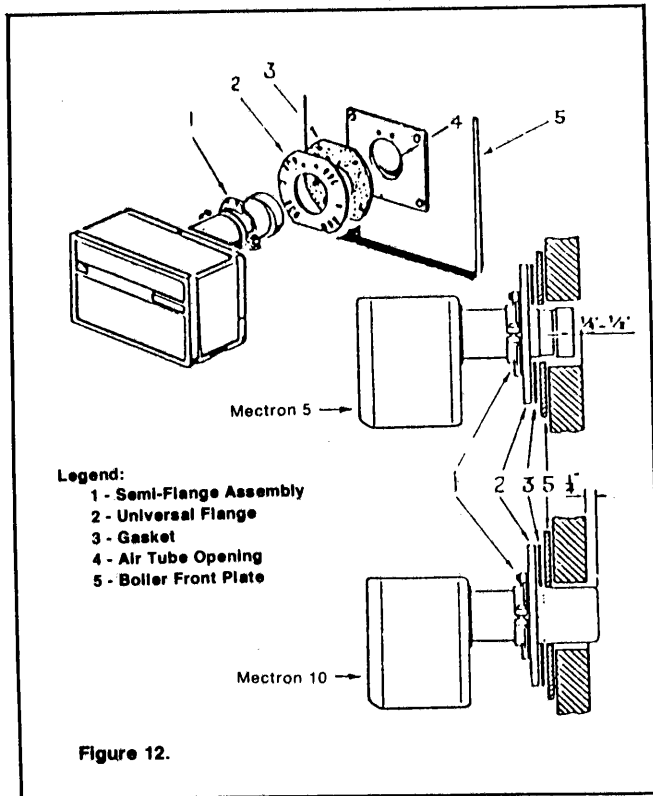


Figure 12.

INSTALLING THE BOILER CONTROLS AND ACCESSORIES

1. Packaged Boiler:

- a) Take the L8148A Aquastat relay, the well, the pressure relief valve with pipe nipple and the temperature/pressure gauge from the large carton which was packed in the wirebound crate.

Install in the tapings provided at the top rear of the boiler as shown in Figure 13.

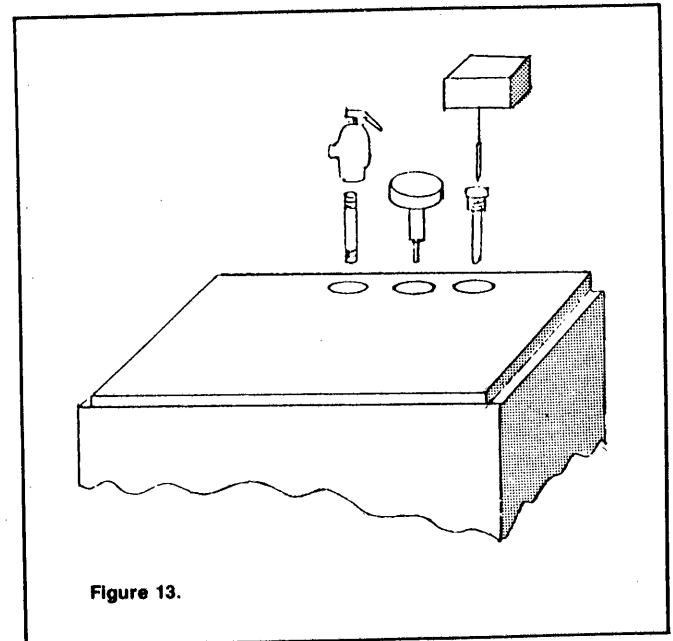


Figure 13.

- b) Take the boiler drain from the same carton and connect it to the 3/4 inch opening of the 1 1/4 x 3/4 x 1 1/4 inch tee in the boiler return manifold at the bottom rear of boiler.
- c) Install 1 1/4 x 3" Nipple and Circulator Flange.
- d) Remove the circulating pump from its carton in the crate and mount it to the pump flange on the end of the return manifold.

2. Bare Boiler:

- a) The pressure relief valve and temperature/pressure gauge are supplied with the boiler and should be mounted as shown in Figure 13.
- b) The bare boiler does not include the return manifold. The installer must make up his own manifold to connect to the 2 x 1 1/4 inch bushing which is supplied in the boiler supply and return ports, and must provide his own boiler drain and circulating pump.

SECTION III: PIPING CONNECTIONS

- The packaged boiler is shipped complete with circulating pump. To make the piping connections to the boiler ready to connect to the system piping, the following will also be required at a minimum:
 - 1 - Air Purger (same size as supply pipe)
 - 1 - Pressure Reducing Fill Valve
 - 1 - Expansion Tank (sized to system design requirements)
 - 1 - Automatic Air Vent
- The following accessories may also be required, depending upon overall system design and code requirements:
 - 1 - Low Water Cutoff may be required if boiler is located above radiation level. Check requirements of state or local code bodies and insurance companies.
If required use a probe-type designed for water system use and install in a tee in supply piping above the boiler.
 - 1 - Manual Reset High Limit — Required by some state or local codes. Also required if system is to comply with ASME code.
 - 1 - Backflow Preventer — Required by many State and local codes.
- Additional circulating pumps or zone valves may also be required if the system is to be multi-zone or if it is to include a domestic hot water storage tank with coil.

WARNING

The expansion tank must be properly sized to system requirements. An under-sized expansion tank will cause system water to be lost through the relief valve and make-up water to be introduced through the fill valve. Continual introduction of fresh water into the system will cause mineral build-up in the boiler sections and eventual section failure.

- There are two types of expansion tanks used, the closed type and the pre-pressurized diaphragm tank. Most new installations use the diaphragm type tank, however some installations still employ the closed type tank.
 - Piping Connections with closed type expansion tank — see Figure 14.
Piping from tee in supply to tank should be $\frac{3}{4}$ inch. If horizontal piping is employed, pipe must be pitched up toward tank $\frac{1}{4}$ inch per foot.

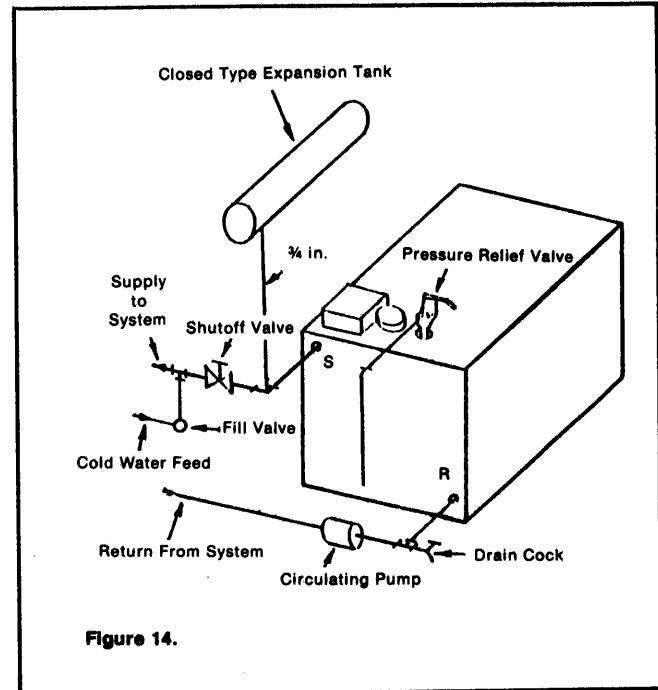


Figure 14.

- Piping connections with diaphragm expansion tank — See Figure 15.

The cold water feed to the pressure reducing fill valve may be piped with $\frac{1}{2}$ inch pipe.

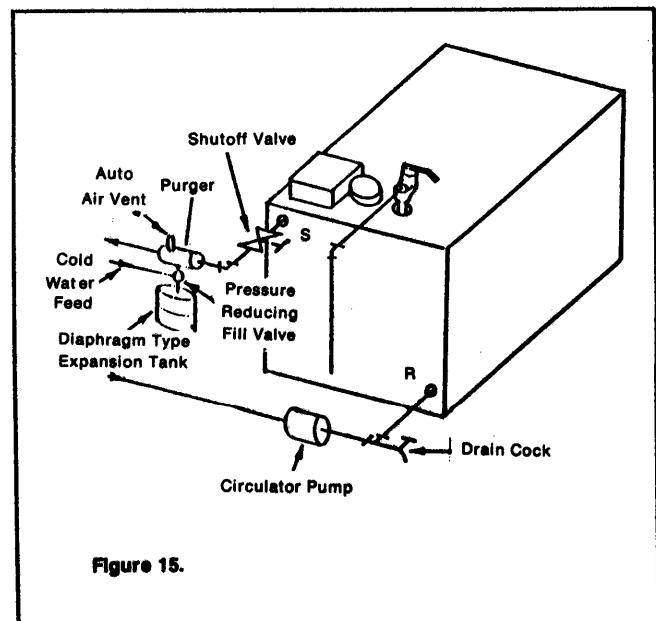
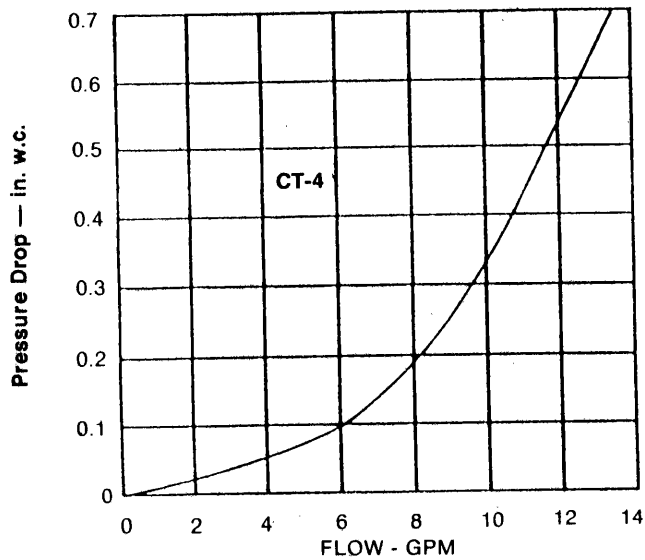
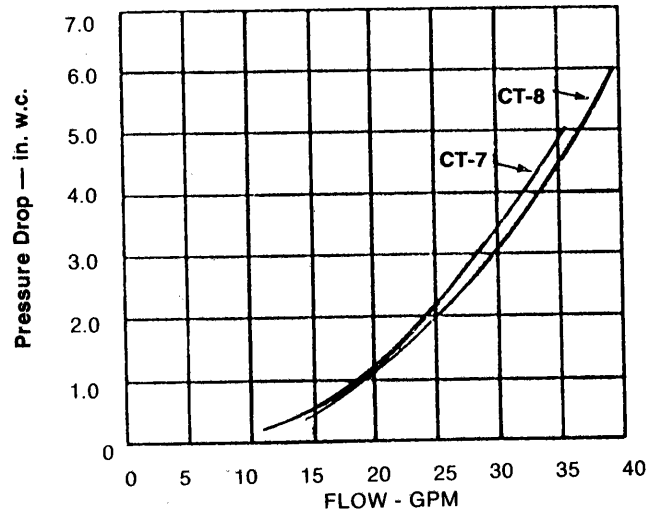
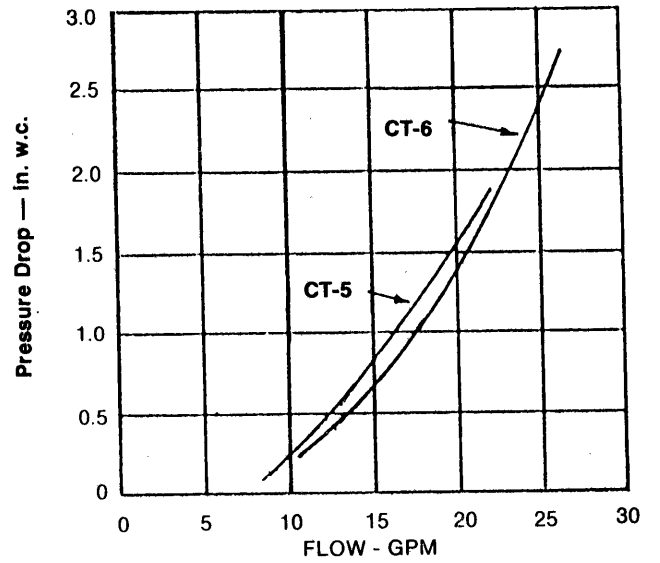
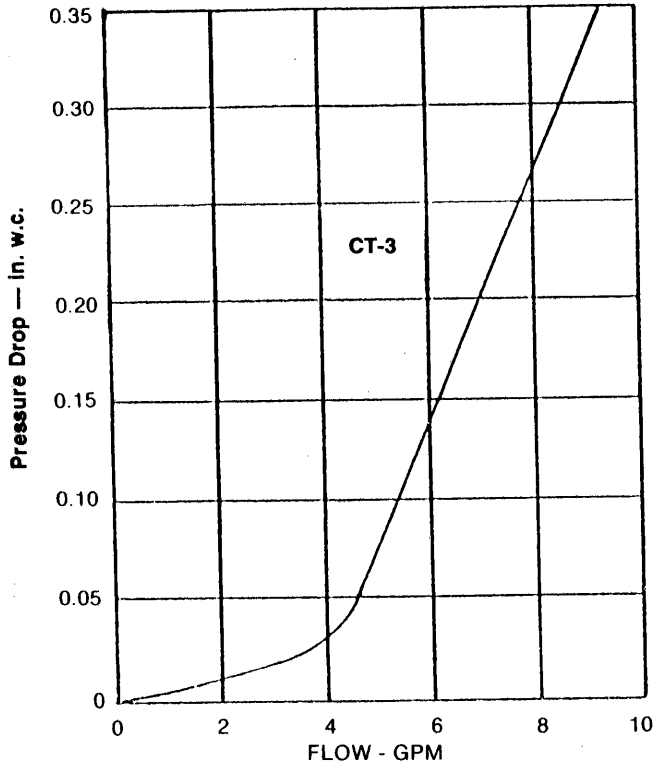


Figure 15.

SYSTEM PIPING

Supply and return and system piping should be sized by determining the pressure drop, required flow rate and pump capacity. See IBR Installation and Piping Guides.



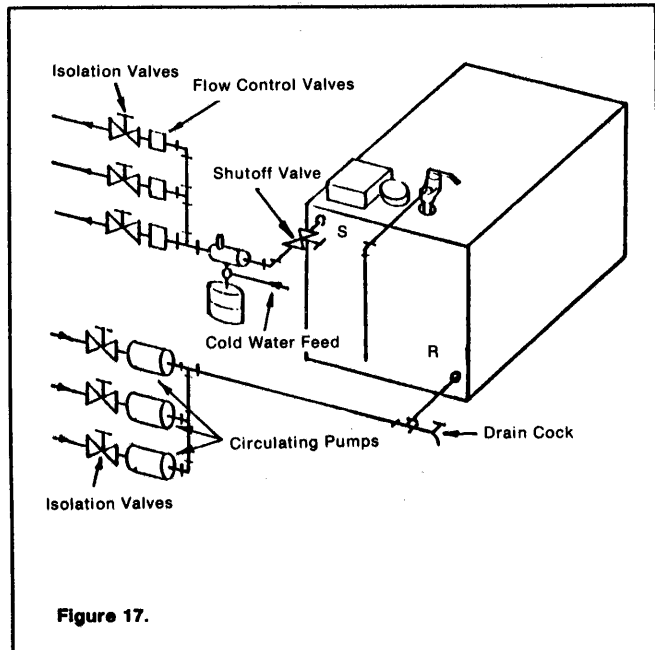
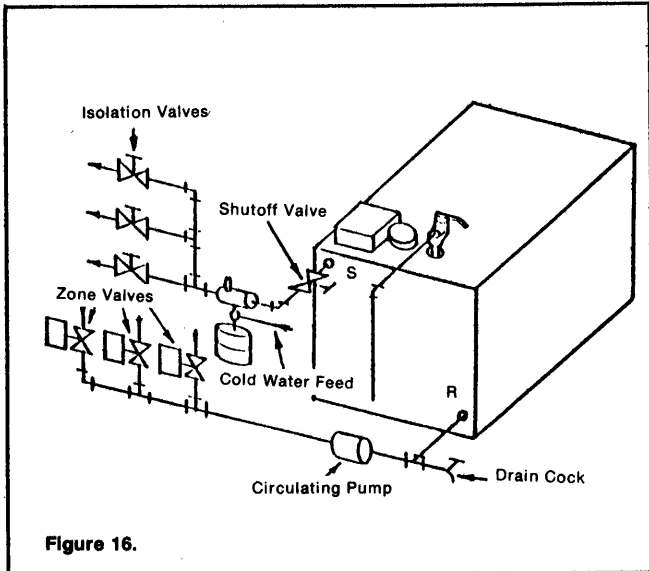
WATER CONTENT:	
CT-3	4.2 Gallons
CT-4	5.5 Gallons
CT-5	6.8 Gallons
CT-6	8.2 Gallons
CT-7	9.5 Gallons
CT-8	10.8 Gallons

Table 2.

WARNING

Discharge Piping from relief valve must be piped to a drain or must terminate 6" above floor to eliminate damage to the structure or personal injury. It must not be piped to a point where freezing might occur.

1. MULTIPLE ZONING WITH ZONE VALVES — see Figure 16. Install a balancing valve in each zone and adjust so that flow is about the same in each zone.

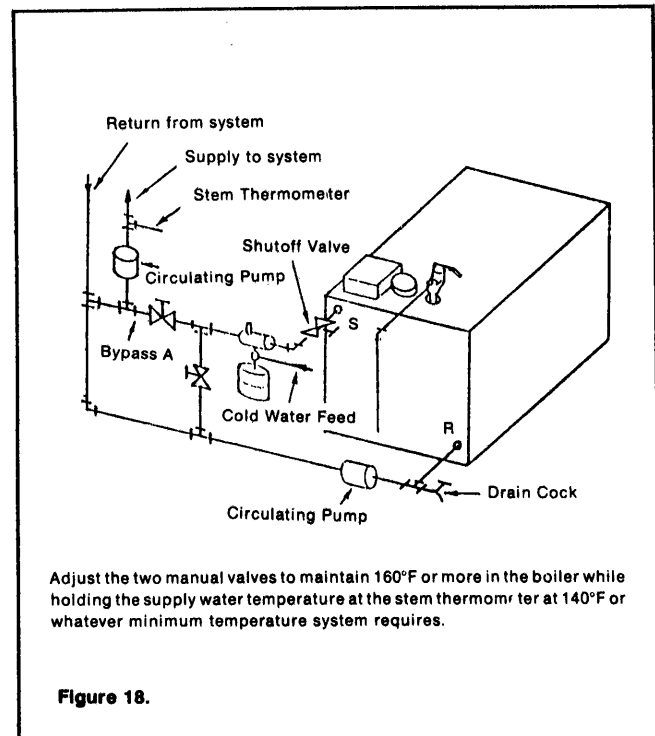


2. MULTIPLE ZONING WITH CIRCULATORS — each pump will require a separate relay (Honeywell R845A or White Rodgers 829A-845, or equivalent).

Install a flow control valve in each zone including the indirect water heater to prevent gravity circulation.

Install a balancing valve in each zone and adjust so that flow in each zone is about the same. See Figure 17.

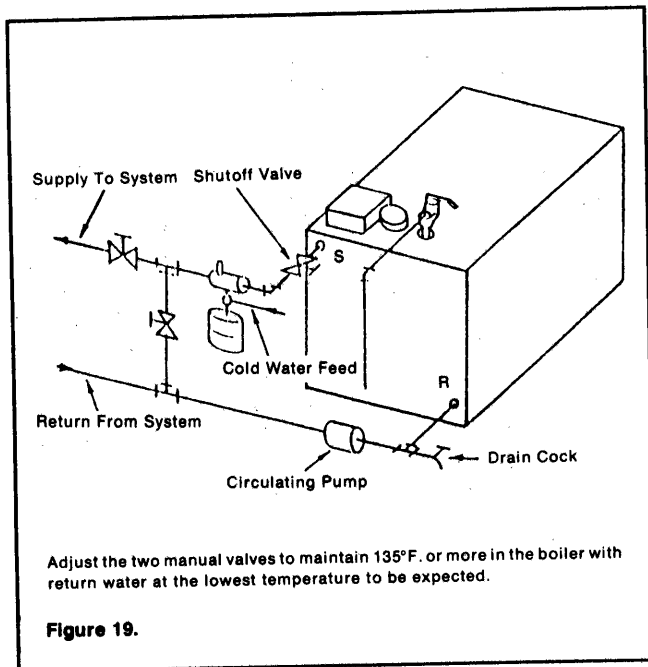
3. RADIANT PANEL OR OTHER LOW TEMPERATURE SYSTEM — The temperature of the system water coming back to the return port of the boiler must not be permitted to drop below about 135°F for an extended period of time. Return water temperatures of 130°F or lower will cause condensation on the exterior surface of the heat exchanger and corrosion and eventual heat exchanger failure will result. Radiant floor and ceiling panel heating systems typically operate with maximum supply water temperatures of 140°F or less. A standard piping arrangement would, under these circumstances, permit return water temperatures of 120°F and lower. Accordingly, such systems must be piped such that the return water temperature will be high enough at all times to prevent condensation. See Figure 18.



NOTE

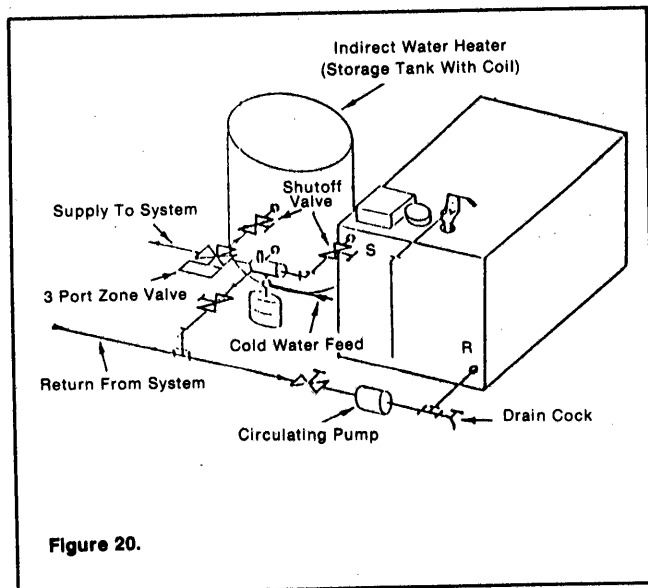
Bypass A shown in Figure 18. above should not exceed 12 inches in length. If it is not practical to maintain a 12 inch length or less then increase the pipe size of the bypass by one size.

4. **LARGE WATER CONTENT SYSTEMS** — Such systems as converted gravity systems, old systems with cast iron radiators, and also newer systems that employ outdoor reset control present a potential problem with low return water temperatures and condensation. The boiler must be protected from condensation in such cases by using a by-pass as shown in Figure 19.



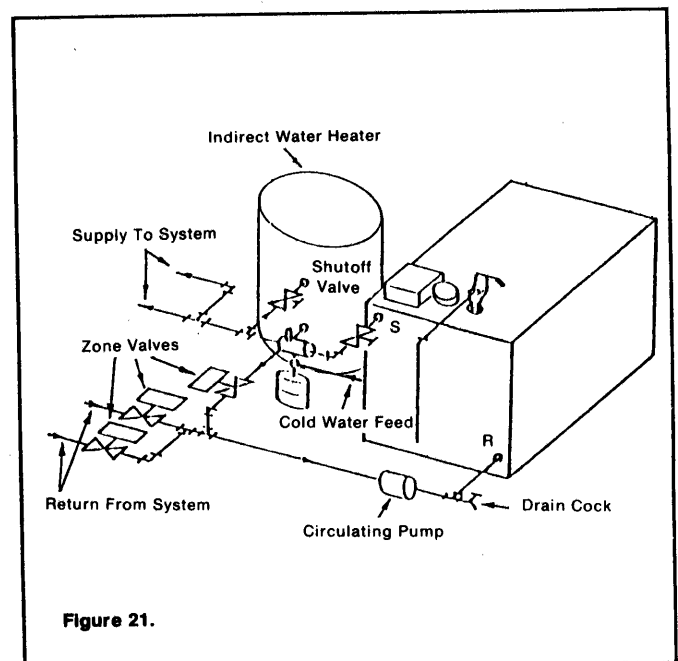
5. **INTEGRATED SYSTEM (HEAT AND DOMESTIC HOT WATER)** — with a single heating zone priority for domestic hot water may be provided through the use of a 3-port zone valve. This system assures that full boiler output is available to recover the storage tank quickly and should be used where supply of domestic hot water on demand is critical.

For this application use a full throated valve with a minimum pressure drop. See Figure 20.



6. **INTEGRATED SYSTEM WITH MULTIPLE HEATING ZONES AND NO PRIORITY FOR DOMESTIC HOT WATER, USING ZONE VALVES** — where the boiler output is large relative to the heating capacity of the coil in the indirect water heater priority for domestic hot water is not necessary. Further, with multiple heating zones there is less likelihood that all zones will call for heat at once and require full boiler output for heating. Because the tank is usually close to the boiler, the pressure drop through the coil circuit will generally be less than through a heating zone circuit, which will provide some measure of priority for domestic hot water. This can be enhanced by increasing the pipe size to the coil e.g. if $\frac{3}{4}$ inch pipe is used on the heating zones run 1 inch pipe to the coil. (See Figure 21.)

Should priority for domestic hot water be mandatory, it can be provided as shown in Section IV — Wiring, Figure 28.

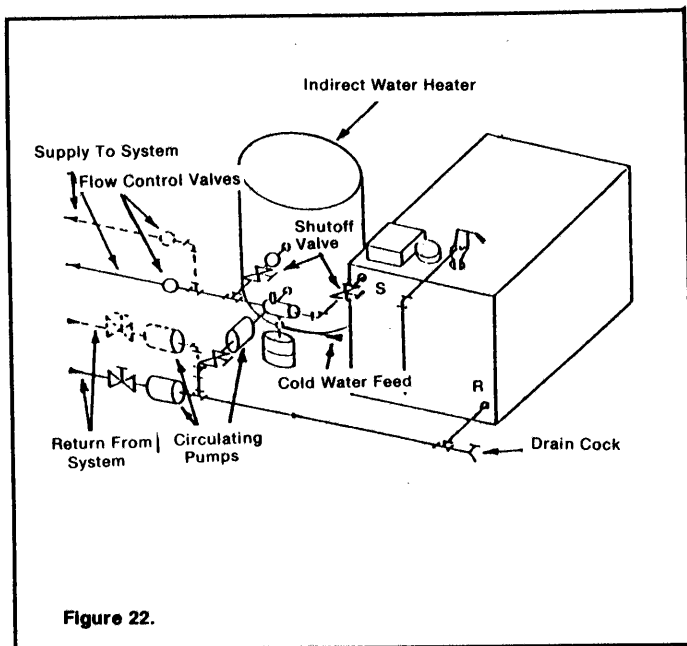


7. **INTEGRATED SYSTEM, SINGLE OR MULTIPLE HEATING ZONES, USING CIRCULATING PUMPS RATHER THAN ZONE VALVES** — each pump will require a separate relay (Honeywell R845A or White-Rodgers 828A-845, or equivalent).

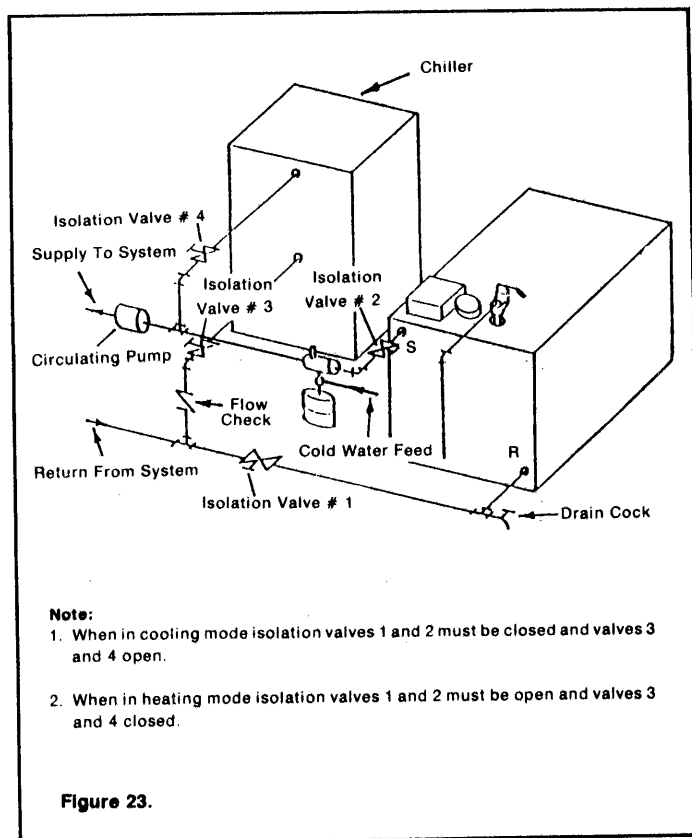
Install a flow control valve in each zone including the indirect water heater to prevent gravity circulation.

Install a balancing valve in each zone and adjust so that flow in each zone is about the same. (See Figure 22.)

While this basic system does not provide priority for domestic hot water, priority can be provided as shown in Section IV — Wiring, Figure 29.



8. COMBINATION HEATING/COOLING SYSTEM WITH CHILLED WATER — The chiller must be piped in parallel with the boiler and isolation valves installed to prevent the chilled water from circulating through the boiler and heated water from circulating through the chiller. See Figure 23.



SECTION IV: WIRING

WARNING

All wiring and grounding must be done in accordance with the authority having jurisdiction or, in the absence of such authority, with the National Electric Code (ANSI/NFPA70).

Single Zone Wiring

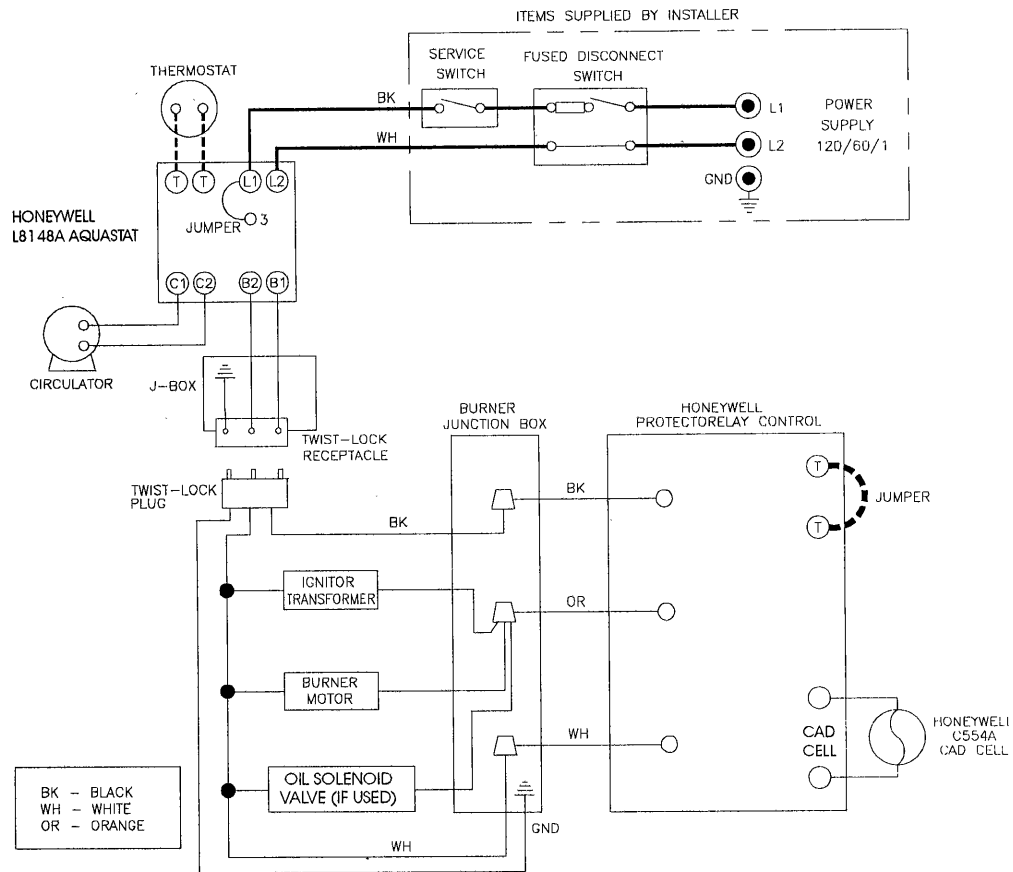
- 1) 120 Volt Wiring - The boiler should be provided with its own 15A branch circuit with fused disconnect. All 120 volt connections are made inside the L8148A aquastat relay as follows (also see Fig. 24 or 25):
 - Hot ("black") - Terminal "L1"
 - Neutral ("white") - Terminal "L2"
 - Ground ("green" or bare) - Ground screw on case of L8148A
- 2) Thermostat Wiring - Follow thermostat manufacturer instructions. To insure proper thermostat operation, avoid installation in areas of poor air circulation, hot spots (near any heat source or in direct sunlight), cold spots (outside walls, walls adjacent to unheated areas, locations subject to drafts). Provide Class II circuit between thermostat and boiler. Connect thermostat wire leads to terminals "T" and "T" inside L8148A aquastat relay.

Wiring Variations

- 1) Multiple Circulator Zones - Figure 26 shows wiring for two or more circulator zones using Honeywell R845As. One R845A is required for each circulator zone. Circulator terminals "C1" and "C2" on the L8148A are not used. A DPST Honeywell RA832A may be substituted in place of the R845A using the "X" and "X" terminals in place of the "5" and "6" terminals on a R845A.

A call for heat from any thermostat will energize the DPST relay in that zone's R845A. When this relay is energized, electrical continuity is created between terminals 3 and 4, energizing the circulator for that zone. At the same time, electrical continuity is created between terminals 5 and 6 on the R845A, creating a current path from terminal "T" to "T" on the L8148A. Assuming that the supply water temperature is below the high limit setting, the normal ignition sequence will be initiated.
- 2) Multiple Zones using Zone Valves - Figure 27 shows wiring for multiple zones using Honeywell V8043F zone valves. This wiring diagram may be used for other 24-volt zone valves as long as they are equipped with end switches. Do not attempt to use the transformer on the L8148A to power the zone valves; use a separate transformer. Up to five V8043Fs may be powered by one 48VA transformer, such as the Honeywell AT87A.

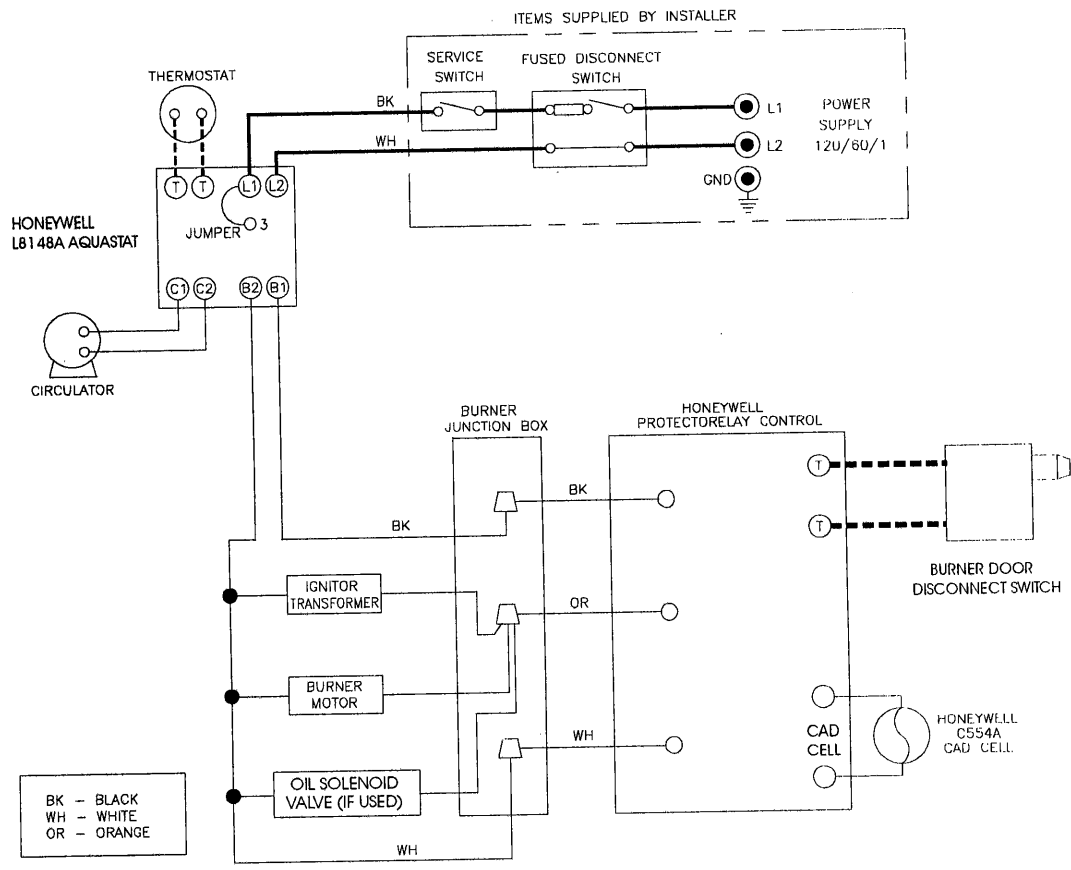
A call for heat from a given thermostat will result in the application of 24 volts across the TH and TR terminals on the corresponding zone valve, energizing the zone valve motor. The zone valve opens and the end switch contacts are then made. The end switches are connected in parallel with each other and to the "T" and "T" thermostat connections so that any zone valve that opens will also start the circulator and fire the boiler (assuming the high limit is not open). Zone valve terminal TH/TR has no internal connection on the zone valve; it is merely a "binding post" used to connect two or more wires.



- LINE VOLTAGE (115V) — FIELD INSTALLED
- LINE VOLTAGE (115V) — FACTORY INSTALLED
- - - - - LOW VOLTAGE (24V) — FIELD INSTALLED

NOTE: BURNER WIRING SHOWN IS FOR BECKETT AFG BURNERS. CONSULT BURNER INSTRUCTION MANUAL FOR OTHER BURNERS

**FIGURE 24: WIRING DIAGRAM, SINGLE HEATING ZONE ONLY
(BOILERS EQUIPPED WITH BURNER TWIST DISCONNECT PLUGS)**



- LINE VOLTAGE (115V) — FIELD INSTALLED
- LINE VOLTAGE (115V) — FACTORY INSTALLED
- - - LOW VOLTAGE (24V) — FIELD INSTALLED

NOTE: BURNER WIRING SHOWN IS FOR BECKETT AFG BURNERS. CONSULT BURNER INSTRUCTION MANUAL FOR OTHER BURNERS

**FIGURE 25: WIRING DIAGRAM, SINGLE HEATING ZONE ONLY
(BOILERS EQUIPPED WITH BURNER DOOR DISCONNECT SWITCH)**

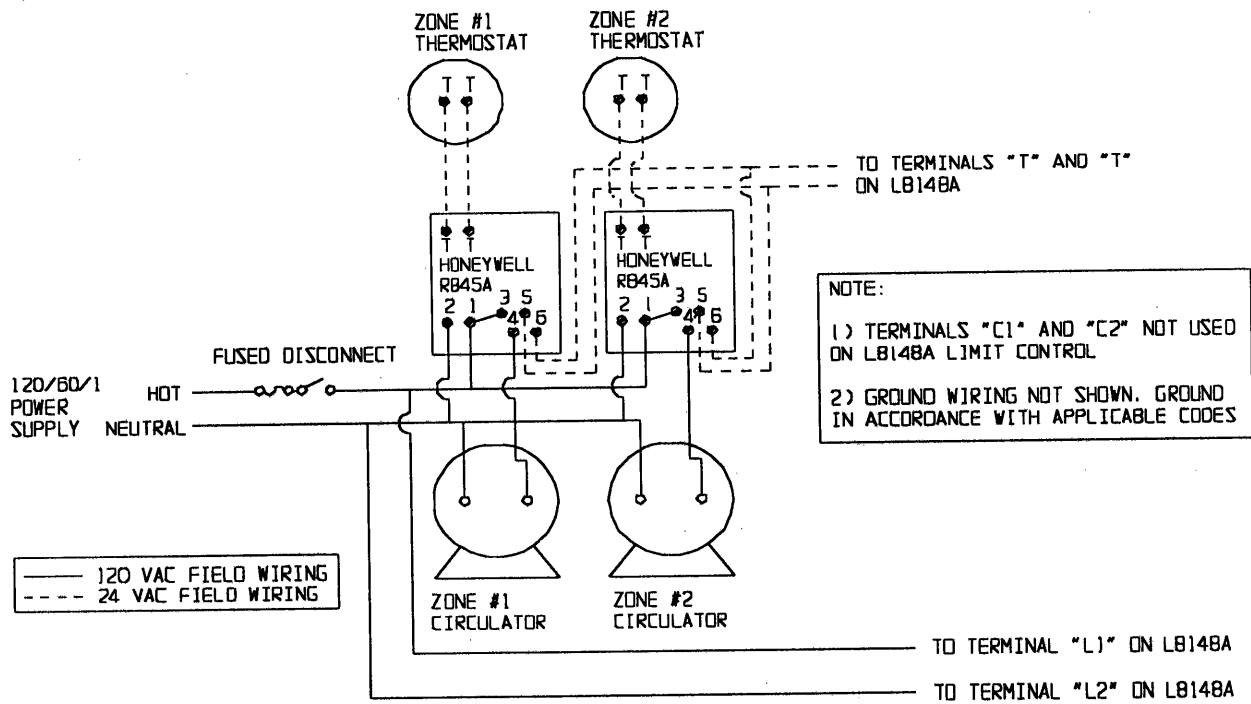


FIGURE 26: WIRING DIAGRAM, ZONE WIRING USING HONEYWELL V8043F ZONE VALVES (FACTORY BOILER WIRING NOT SHOWN - SEE FIGURE 24 OR 25)

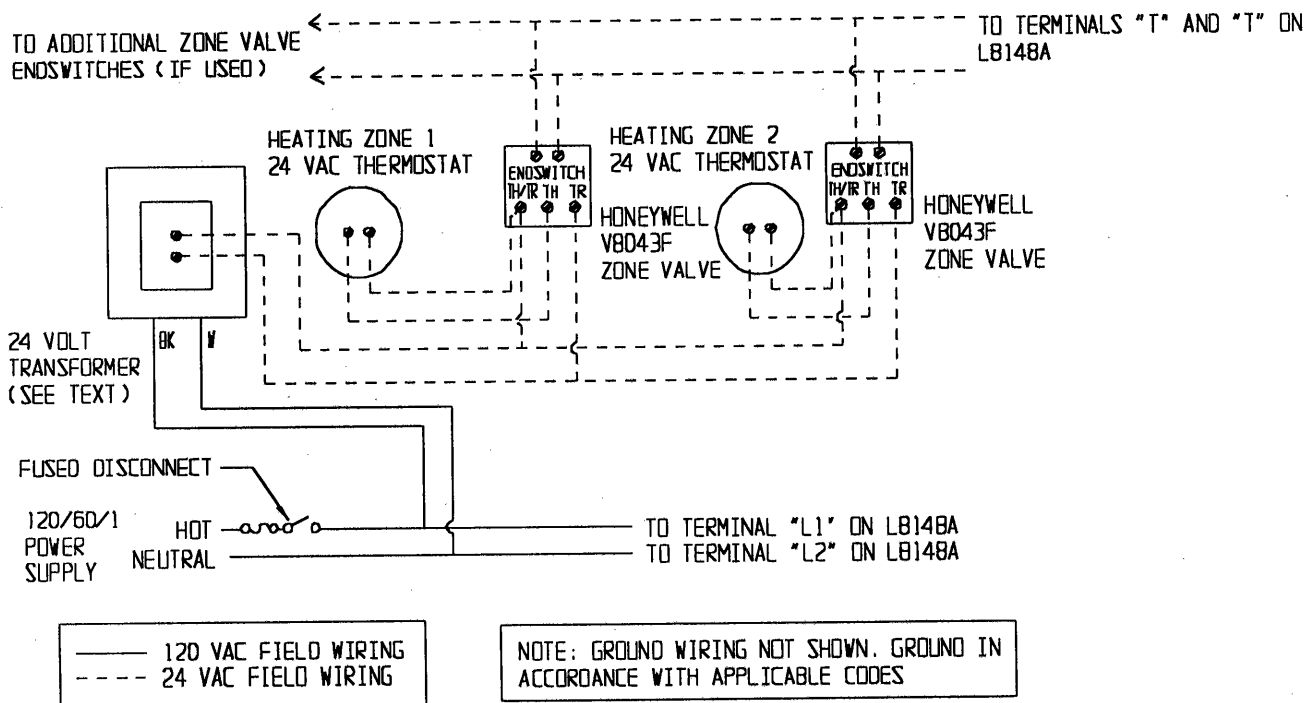


FIGURE 27: WIRING DIAGRAM, CIRCULATOR ZONE WIRING USING HONEYWELL R845A's (FACTORY BOILER WIRING NOT SHOWN - SEE FIGURE 24 OR 25)

SECTION V: FUEL LINE PIPING

NOTE

Refer also to the manual provided with the burner. Fuel line piping must conform with any local, state or national code requirements which may apply.

1. With Riello Burners — Riello burners are shipped with the pump set up for a two pipe system. Unless the oil tank is located below the burner such that a lift system must be used, the pump should be converted to a one pipe, gravity feed system as follows: (Refer to Figure 30 below)

- a) Removal of By-Pass Plug (see Figure 30.)
 - i) Remove the pump cover by undoing the four retaining screws 6.
 - ii) Remove the pump strainer, unscrew and remove the By-Pass Plug 1 from Port A.
 - iii) Replace the strainer and pump cover, ensuring that the O-ring is properly seated under cover. Secure the four retaining screws, 6.
 - iv) Insert Return Port Plug, 7 using washer, 8 into the return port, 9 on the pump.

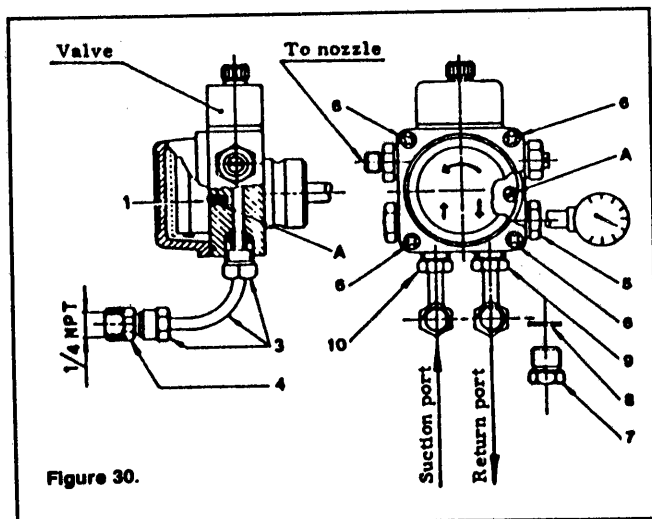


Figure 30.

- b) Piping System — One Pipe Gravity
 - i) Connect one of the pipe connectors supplied with the burner to the suction port. Ensure that the return port plug is tightened securely.
 - ii) Attach the required piping to the pipe connector and to the oil tank. See Figure 31. Use heavy wall copper tubing in a continuous run with the exception of the installation of a filter and two fuel shutoff valves, one near the burner but before the filter and one near the tank. Size tubing from Table 4.

WARNING

Do not use compression fittings! Use only flare fittings.

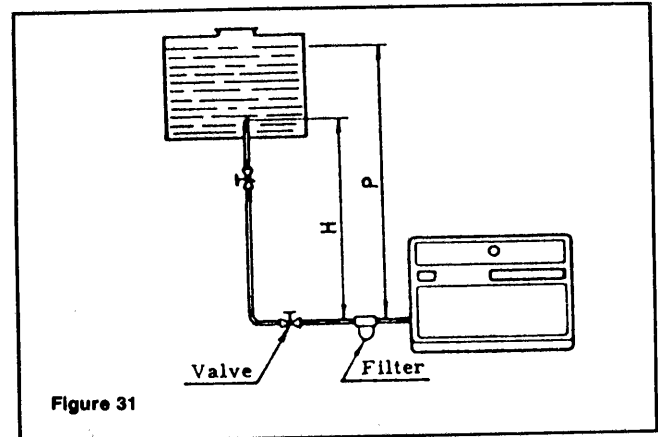


Figure 31

ONE PIPE GRAVITY SYSTEM

Dimension H (ft.)	Pipe Length (ft.)	
	¾ in. O.D.	½ in. O.D.
1½	33	65
3	65	130
5	130	260
6½	195	325

Table 3.

WARNING

Referring to Figure 31, dimension P must not exceed 13 ft.
Also, pump vacuum must not exceed 11.44 in. of Mercury.

NOTE

Fuel pump is factory preset at 146 psi. To read system pressure, install pressure gauge in port 5, Figure 30.

c) Piping System — Two Pipe Lift System — Where the tank is located below the level of the burner the two pipe lift system must be used and the fuel pump may be used as received.

- i) Connect both pipe connectors supplied, one to Suction port 10, and the other to Return port 9, on the pump. (see Figure 30.)
- ii) Attach tubing of the required length and O.D. to the pipe connectors. See Table 5 for sizing.

Both suction and return lines must be the same size and should extend to the same depth within the tank.

Install a filter and two shutoff valves in the suction as shown in Figure 32.

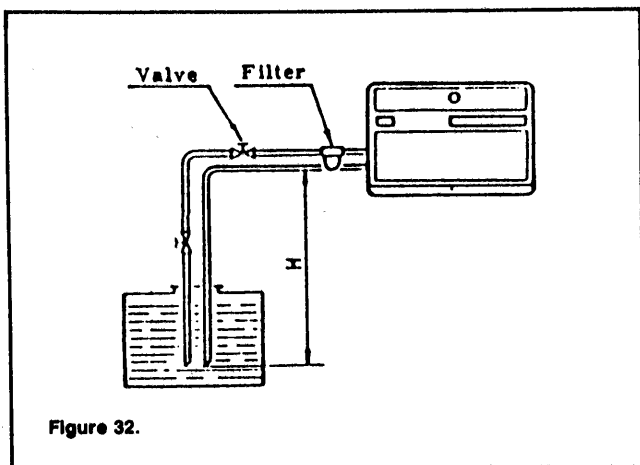


Figure 32.

TWO PIPE LIFT SYSTEM		
Dimension H (ft.)	Pipe Length (ft.)	
	3/8 in. O.D.	1/2 in. O.D.
0	115	330
1 1/2	100	
3	80	
5	65	295
6 1/2	50	230
9 1/2	25	100
11	20	65

Table 4.

NOTE

If either lift (H) and/or pipe length must be greater than the values shown in Table 4 a transfer pump and day tank will be required.

2. With Beckett Burners

- a) Fuel Oil Tank level with or above burner — For this system use a single stage pump with a one pipe gravity system as described in 1.(b). See also Figure 33.
- b) Fuel Oil Tank below level of Burner — if the lift (H) does not exceed 10 feet, use a single stage pump. If the lift (H) is greater than 10 feet, use a two-stage pump.

In both cases a two-pipe system with a return line must be employed as described in 1.c). See also Figure 33. The by-pass plug must be inserted in the fuel pump with the two pipe system.

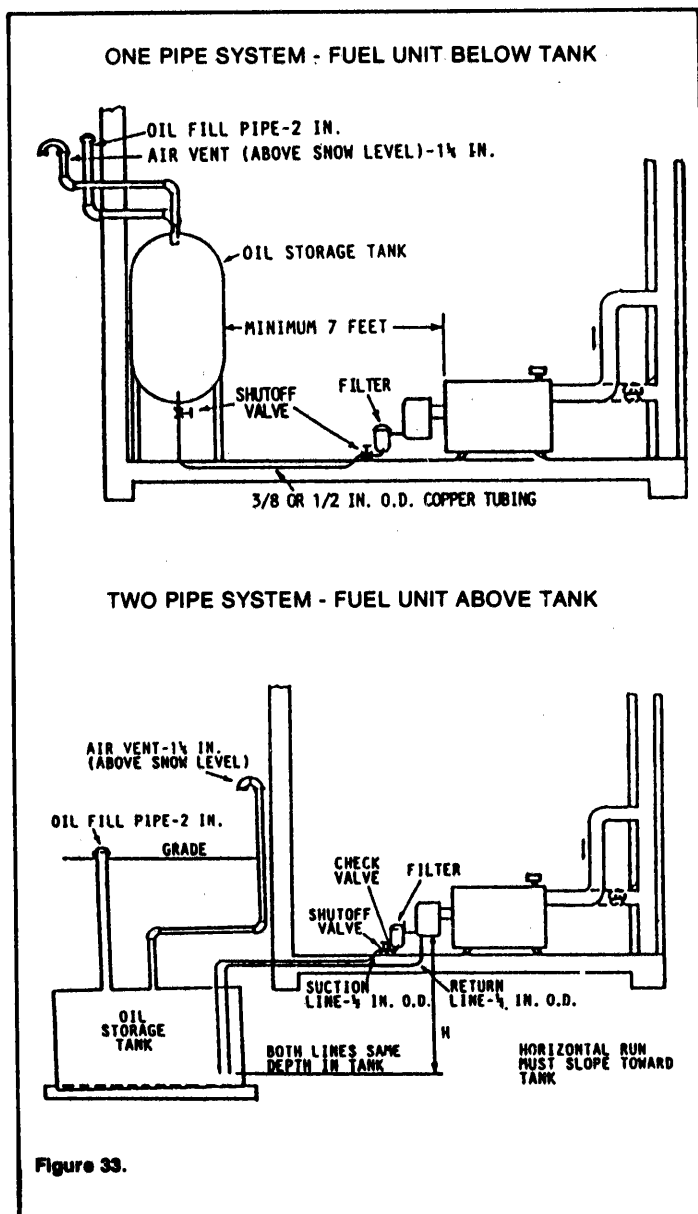


Figure 33.

NOTE

Installation of oil storage tanks, fill pipe, air vent and suction and return lines must be made to conform with Underwriters and local code requirements. The minimum clearances from any building opening are as follows:

Oil fill pipe - 5 feet

Air Vent - 2 feet

Fuel lines should not run against the boiler or the ceiling joists and if possible should be run under the floor.

- c) Determine the maximum allowable length of tubing for the lift from Tables 6 and 7 below.

Suntec Model A — Single Stage		
Lift "H" see Fig. 33	¾" O.D. Tubing	½" O.D. Tubing
0 ft.	53 ft.	100 ft.
1 ft.	49 ft.	100 ft.
2 ft.	45 ft.	100 ft.
3 ft.	41 ft.	100 ft.
4 ft.	37 ft.	100 ft.
5 ft.	33 ft.	100 ft.
6 ft.	29 ft.	100 ft.
7 ft.	25 ft.	99 ft.
8 ft.	21 ft.	83 ft.
9 ft.	17 ft.	68 ft.
10 ft.	13 ft.	52 ft.

Table 5.

- d) Bleeding system:
 - i) One-Pipe system: Connect suction line to pump inlet. Arrange burner primary for continuous operation during purging. Start burner and open Easy Flow Air Bleed Valve one turn counterclockwise (see Figure 34). Continue until all air bubbles disappear. Tighten bleed valve securely.

Suntec Model B — Two Stage

Lift "H" see Fig. 33	¾" O.D. Tubing	½" O.D. Tubing
0 ft.	68 ft.	100 ft.
2 ft.	63 ft.	100 ft.
4 ft.	58 ft.	100 ft.
6 ft.	53 ft.	100 ft.
8 ft.	48 ft.	100 ft.
10 ft.	42 ft.	100 ft.
12 ft.	37 ft.	100 ft.
14 ft.	32 ft.	100 ft.
16 ft.	27 ft.	100 ft.
18 ft.	22 ft.	88 ft.

Table 6.

NOTE

Hurried or inadequate bleeding will impair efficient operation of burner.

SUNTEC

A-7000 Single Stage and B-8000 Two Stage Fuel Units Models A2 & B2 for 3450 RPM, White Label

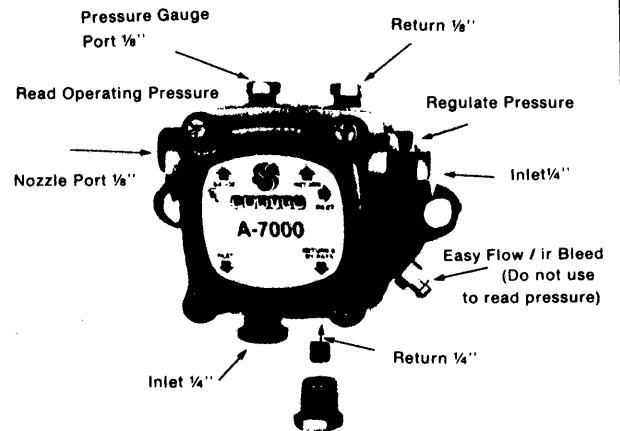


Figure 34.

ii) **Two-Pipe System:**

Remove $\frac{1}{16}$ in. by-pass plug from plastic bag attached to fuel pump. Remove $\frac{1}{4}$ in plug from return port and insert the by-pass plug. Attach the suction and return lines. Now start burner. Air bleeding is automatic. For a faster bleed open the Easy Flow Air Bleed Valve. Tighten valve securely when finished bleeding.

e) **Vacuum Check:**

Install Vacuum gauge in either the $\frac{1}{4}$ " inlet port or in the $\frac{1}{8}$ " return port (on one pipe installations). On a one pipe system the vacuum must not exceed 6 inches of mercury. On a two pipe system vacuum must not exceed 10 inches of mercury. If vacuum is in excess of 10 inches but not in excess of 15 inches of mercury use a Model B two-stage pump.

f) **Pressure Check:**

To measure pressure attach gauge either at the Pressure Gauge Port or the Nozzle Port. Do not use the Easy Flow Air Bleed Valve Port.

g) **Cutoff Pressure Check:**

Install pressure gauge in the Nozzle Port and run burner for a short period of time. Shut burner off and read gauge. Average cutoff pressure for both single stage (A) and two-stage (B) pumps is 80 psig.

NOTE

On pressurized or gravity feed installations pressure at inlet or return line must not exceed 10 psi. Pressures in excess of 10 psi may cause damage to the shaft seal.

SECTION VI: START-UP AND ADJUSTMENTS

FILL SYSTEM

1. Close manual air vents (if used) and automatic air vents. Attach hose to boiler drain on return connection and run to a drain or to outdoors. Open drain cock and close shutoff valve on boiler supply pipe.

2. **HEATING ONLY - SINGLE ZONE SYSTEM —**

Open manual valve in cold water feed line and set the fill valve to fast fill. Allow water to flow through the system and out the hose to drain until there is a steady flow of water through the hose with no air bubbles.

Next, open the shutoff valve in the boiler supply pipe and allow water to flow through the drain until air bubbles cease.

Then take the fill valve off fast fill, close the drain cock, remove the hose and open all automatic air vents. Also open all manual air vents one at a time and close when water squirts out.

Observe the temperature/pressure gauge. System pressure with a cold fill should be in the 12 to 14 psi range.

3. **MULTI-ZONE SYSTEMS - HEATING ONLY OR HEAT & DOMESTIC HOT WATER WITH ZONE VALVES —**

To ensure good circulation through all zones with no air pockets, each zone should be purged of air individually. With all zone valves in the manual open position let water flow through the system by opening the manual valve on the cold water feed and opening the drain cock so water can exit the system through a hose as in 1. above.

When system seems to be full and free of air, close the drain cock, and the shutoff valve on the boiler supply pipe, leaving the manual valve on the cold water feed open. Now release the manual openers to close all but one zone valve. Open the drain cock and put the fill valve on fast fill. When the flow through hose becomes steady with no air bubbles, take the fill valve off fast fill and then close the drain cock.

Repeat this procedure with each zone until all zones have been purged. Open the shutoff valve on the boiler supply pipe. Then open all manual air vents one at a time. When water sprays out of the air vent close it and leave it closed. Any automatic air vents should have the cap loosened so it can vent air.

4. **MULTI-ZONE SYSTEMS ZONED WITH CIRCULATORS —**

Following the same procedure as in 3. above using the manual shutoff valves to isolate a zone instead of zone valves.

5. Check system pressure on the temperature/pressure gauge on the boiler. Pressure should be in the 12-14 psi range. If pressure is over 14 psi drain a little water out with the drain cock. Watch gauge for a few minutes to ensure pressure does not build back up. If pressure is too high with system cold there is a good possibility the relief valve will blow off when the sys-

tem is brought up to temperature. Too high a pressure with the system cold indicates a faulty fill valve.

START-UP AND ADJUST BURNER

1. With room thermostat(s) calling for heat, turn the line switch to the "ON" position.

NOTE

Do not fire boiler without water or sections will overheat and eventually crack.

2. Final burner adjustments must be made using combustion test equipment. Allow burner to fire until system is up to design operating temperature.
3. Adjust barometric damper such that there is a negative draft in the range of $-.01$ to $-.02$ at the test point in the breeching (see Figure 35.)
4. Using the appropriate table for the burner employed, make all necessary adjustments to the settings of air shutters, dampers, etc. as noted on Page 9 of this manual.
5. Perform a flue gas combustion test with instruments at the test point shown in Figure 35. Final test results should be as shown in the burner Tables on Page 9.

NOTE

Ensure that all venting connections and joints are sealed with High Temperature Silicone Sealant.

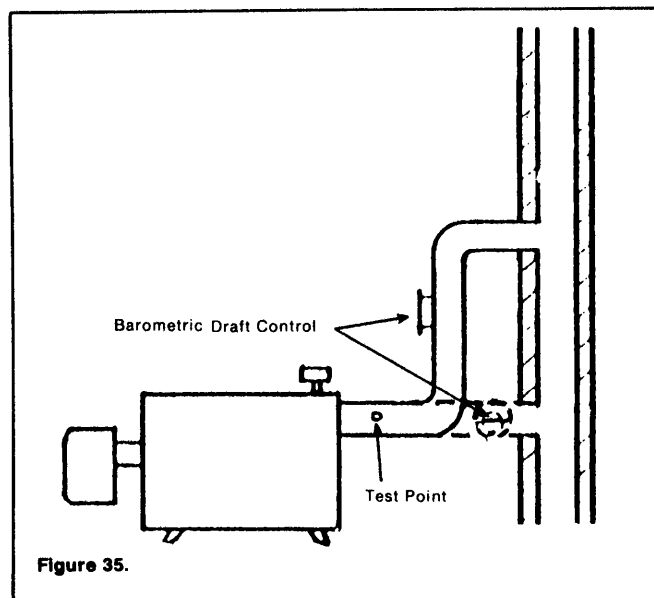


Figure 35.

WATER TREATMENT

Generally no water treatment will be required. Care should be taken to ensure that the system does not lose water from leaks, or continual relief valve operation since continual make-up water will reduce boiler life.

FREEZE PROTECTION

Where freeze protection is required use antifreeze made especially for hydronic systems such as inhibited Propylene Glycol. DO NOT use automotive type antifreeze. Follow antifreeze manufacturer's directions for quantity. A 50% solution provides protection to -30° F. For boiler water content see Page 12.

SECTION VII: SYSTEM CHECKOUT AND CERTIFICATION

CHECK-OUT PROCEDURE

Before leaving job, the installer should perform each of the steps shown below and check off the boxes to the left as each is performed.

- Is system filled with water?
- Is air purged from the system?
- Is the automatic air vent cap open?
- Is air purged from the fuel line piping?
- Has fuel line piping been checked for leaks?
- Has the barometric damper been adjusted to provide proper draft?
- Has final burner adjustment been made using combustion test instruments?
- Test safety controls. If a low water cutoff and/or a manual reset high limit is employed, test for operation as shown in the instructions provided with the safety controls. Burner should go off, then be reignited when controls are restored.
- Check system for water leaks. Repair any that are found immediately.
- Test High Limit Control. With burner operating, reduce limit control setting below actual water temperature as shown on the temperature/pressure gauge. Burner should go off but circulator pump should continue to operate. Raise setting above water temperature and burner should go back on. Leave high limit set to design system temperature (usually 180°F to 200°F)
- On multiple zone system, has system been balanced to provide about the same flow through each zone?
- Is the heat anticipator in the room thermostat(s) set to match the device it is controlling? See wiring diagrams, Section IV.
- Does boiler cycle with thermostat(s)? Raise thermostat to highest setting. Burner should come on. (If system is multi-zone with zone valves, wait for zone valve to open and end switch to close to start burner.) Then lower to lowest setting. Burner should go off. Repeat for each zone on a multi-zone system.
- Leave thermostat(s) at desired setting.
- Leave all instructions provided with boiler with owner or in boiler room, displayed near boiler.

CERTIFICATION

Boiler Model No. _____ Serial No. _____ Burner Make _____

Burner Serial No. _____ Btuh Input _____ Date Installed _____

Check-Out Procedure followed Yes No Installation Instructions Followed Yes No

Installation Instructions left with owner Yes No

Installing Contractor _____

Address _____ Phone : _____

Installer's Signature: _____

SECTION VIII: PERIODIC MAINTENANCE & TROUBLE SHOOTING

You are the owner of one of the safest and most efficient heating systems available. To ensure that this heating system continues to operate safely and efficiently the following maintenance procedure should be followed by a trained professional service person annually or after any extended period of shutdown.

MAINTENANCE

1. Clean Boiler using procedure below.
2. Replace nozzle with identical make and model.
3. Check all water system piping for leaks. Repair any found.
4. Check pressure relief valve operation by opening with manual lever. If it fails to relieve, replace immediately.
5. Check operation of safety controls, low water cutoff and manual reset high limit (if provided).
6. Check breeching connections to ensure there are no flue gas leaks. Seal any leaks found with High Temperature Silicone Sealant.
5. Check flue gas temperature at the test point in the breeching. If gross flue gas temperature is 550° or above, suspect that cleaning of the boiler flueways is required.

BOILER CLEANING

Turn off the power with the line switch. Disconnect the electrical plug at the J-Box by the Aquastat Relay. Close the shutoff valve(s) in the fuel oil line(s) and disconnect the line(s) at the fuel pump.

Remove the four hex head bolts from the outer corners of the burner mounting plate and swing open the burner door with burner mounted to provide access to the boiler flueways.

First remove the retarders or flue baffles when provided, from the flueways, then brush the horizontal flueways thoroughly and remove the deposits from the front of the boiler.

IMPORTANT

It is essential that the boiler be cleaned on an annual basis, even if no soot is present. Sulfur, and other deposits which may be present, can cause severe corrosion damage if they are not removed periodically.

When flueways are clean, replace the flue retarders (baffles), close burner door, re-connect fuel lines, open shutoff valves and plug in the electrical lead, restore the power and turn burner on.

If a boiler is to be shut down and taken out of service for a period of time, the boiler should be cleaned immediately upon shut-down while the flueways are still warm. When the boiler gets cold, the deposits harden making cleaning difficult. Further, hardened deposits will absorb moisture and cause corrosion of the sections.

6. Run a complete combustion test and make any adjustments necessary.
7. Lubricate motor on oil burner and motor and bearings on circulator (if applicable).

TROUBLE-SHOOTING GUIDE

A. No Heat Complaint —

1. Check line switch and make sure power is available to the control system.
2. If included in system, check low-water cutoff and/or manual reset high limit.
3. Check room thermostat(s) and zone valves or pump relays (if used).
4. Make sure there is oil in the tank.
5. Inquire if reset button on burner primary has been pushed. If it has been pushed repeatedly, then DO NOT attempt to start burner.

Open burner door by disconnecting the plug-in lead and fuel line(s) and removing the four hex head bolts. Examine the combustion chamber for unburned oil and oil vapor. If present, clean up oil.

With burner door open check cad cell for soot or dirt deposits, check nozzle and if clogged, replace with nozzle of identical make and style. Check ignition electrodes for gap and for soot or oil deposits. Also check porcelains for cracks.

Close burner door & re-connect electric and fuel lines. Press reset button while watching through the observation port. If burner fires immediately and flame looks good, cycle several times.

If burner does not fire immediately, or if it fires but flame looks ragged and/or smoky, shut burner down and check the fuel delivery system. The problem may be air in the intake line so tighten all fittings and tighten the unused intake port plug. Also check the filter cover and gasket.

Also check the pump strainer and clean it with a brush and fuel oil or kerosene if it looks dirty. Check filter cartridge and replace if necessary.

B. Inadequate Heat Complaint —

1. Check thermostat and heat anticipator setting. A wrong setting can cause short cycling and inadequate heating.
2. Check to see if the distribution system is air-bound. If pump and boiler are running and the pipe connection to the boiler supply port is hot, check the pipe temperature at the inlet to the first radiator. If it is cool or only lukewarm, then the problem is a lack of circulation. Look for air in the system, a valve partially closed, a zone valve failed in the closed position, a pump failure. The most common fault is air in the system.

C. Relief Valve Leaks Constantly —

1. Check system pressure. With system hot, pressure should be in the 20 to 25 psi range, not to exceed 25 psi. With system cold, pressure should be in the 12-14 psi range. If pressure is over these ranges, then suspect the pressure reducing fill valve or the expansion tank. A diaphragm tank may be too small, may have a ruptured diaphragm (this would cause a very sharp rise in pressure as system water heats up and a sudden opening of the relief valve) or may be over-pressurized.

A closed type expansion tank may be undersized, may be improperly piped to the boiler, may be water logged.

2. Relief valve may be defective, or it may have foreign material lodged on the seat.

D. Poor Combustion Performance —

1. Check burner configuration and settings against those shown in Table 2 on page 9. Also check burner manufacturers' manual for dimensional settings not shown in this manual (e.g. electrode settings, nozzle to disc dimension, etc.) Note: Where a conflict exists between burner manufacturers' settings and settings shown in Table 2, the settings shown in Table 2 take precedence.
2. Check oil lines for air infiltration.
3. Check for adequate combustion air.
4. Check vacuum at inlet of pump to be sure that it is not in excess of oil pump manufacturers' specifications.
5. Check oil chemistry for conformance to ASTM D 396.

CAUTION

"Do not tamper with the unit or controls."

CAUTION

"Never burn garbage or paper in the unit, and never leave combustible material around it."

SECTION IX: RATINGS AND DIMENSIONS

RATINGS

Number	Number of Sections	IBR Gross Output BTU/HR	IBR Net Rating Water BTU/HR 1	Net Rating Water Sq. Ft. 2	Burner Cap. GPH 3	Flue Dia. Inches	Ship. Wgt. Lbs.	Dimensions in Inches		Approx. Water Cont. Gallons	AFUE Ratings w/Burner	
								A	B*		Beckett	Riello
CT-3	3	92,000	80,000	533	.75	7	443	19-1/4	34	4.2	86.1	87.6
CT-35	3	120,000	104,000	693	1.00	7	443	19-1/4	34	4.2	84.7	-
CT-4	4	121,000	105,000	700	1.00	7	527	24-1/4	39	5.5	86.1	86.1
CT-45	4	160,000	139,000	927	1.35	7	527	24-1/4	39	5.5	84.0	-
CT-5	5	162,000	141,000	940	1.35	7	618	29-1/4	44	6.8	86.1	86.1
CT-6	6	202,000	176,000	1173	1.65	7	716	34-1/4	49	8.2	86.1	86.1
CT-7	7	243,000	211,000	1407	2.00	7	794	39-1/4	54	9.5	86.1	-
CT-8	8	286,000	249,000	1660	2.50	7	902	44-1/4	59	10.8	▲85.3	-

▲ IBR COMBUSTION EFFICIENCY

* Dimension B is approximate due to varying burner lengths.

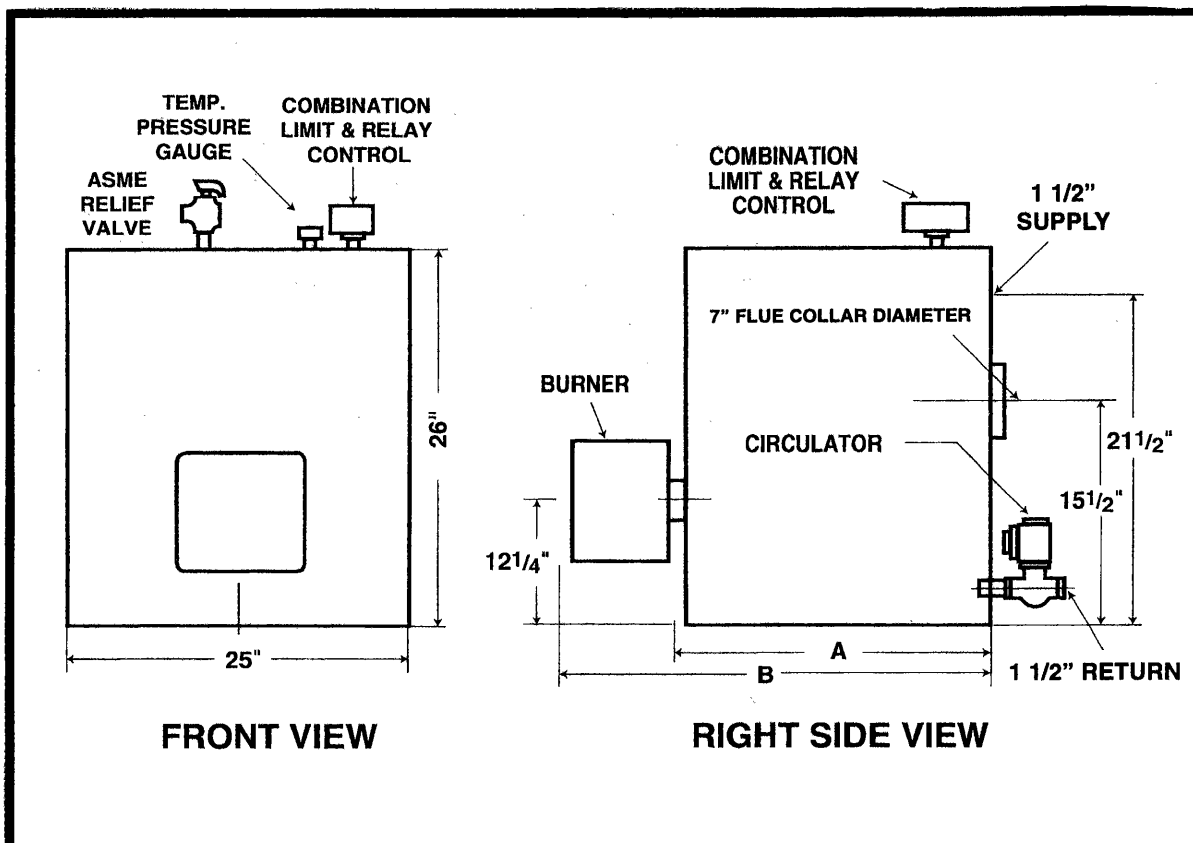
NOTES:

1. Net ratings shown are based on a piping and pick-up allowance of 1.15.
2. Net ratings in sq. ft. based on 170°F average water temperature in radiators. For higher water temperatures, select boiler on basis of net ratings in BTU/HR.

Consult the manufacturer for installations having unusual piping and pick-up requirements, such as intermittent system operation, extensive piping systems, etc.

3. Firing rate in GPH based on oil having a heat value of 140,000 BTU/GAL.
4. A.S.M.E. Max Allowable Water Working Pressure 60 PSI.

DIMENSIONS



SECTION X: REPLACEMENT PARTS

PARTS LIST — BOILER (see Figure 41)

Ref. No.	DESCRIPTION	Part Number	Ref. No.	DESCRIPTION	Part Number
1	Setscrew 10MT x 16 mm	90-022	15	CT-3 Tie Rod	11-015
2	Hinge Pin for burner plate	11-002	15	CT-4 Tie Rod	11-001
3	Fiberglass Rope 8 mm dia.....	11-003	15	CT-5 Tie Rod	11-004
4	Pipe Plug — 1-1/4" BSP thread	95-024	15	CT-6 Tie Rod	11-034
5	Fiberglass Rope 8 mm dia	11-005	15	CT-7 Tie Rod	11-007
6	Stud 10 MT x 40 mm	90-023	15	CT-8 Tie Rod	11-008
7	Washer 10 MT	90-024	16	Front Section	11-016
8	Nut 10 MT	90-025	17	Front Burner Plate	11-017
9	Flue collector	11-006	18	Setscrew 10 MT x 50 mm	90-027
10	Nut 12 mm	90-026	19	Refractory cement on inside of burner plate	11-027
11	Fiberglass Rope 8 mm	11-011	20	Sight glass 3/4 in. B.S.P.	11-020
12	Rear Section	11-012	23	Hinge bracket for front burner plate	11-023
13	Push Nipple	11-013	24	Third Pass Flue baffles (2 used) CT-3 through 7	11-024
14	Intermediate Section	11-014	25	Second Pass Flue baffles (4 used) CT-3 only	11-025
				* Door Refractory Kit	11-500

* Not Shown

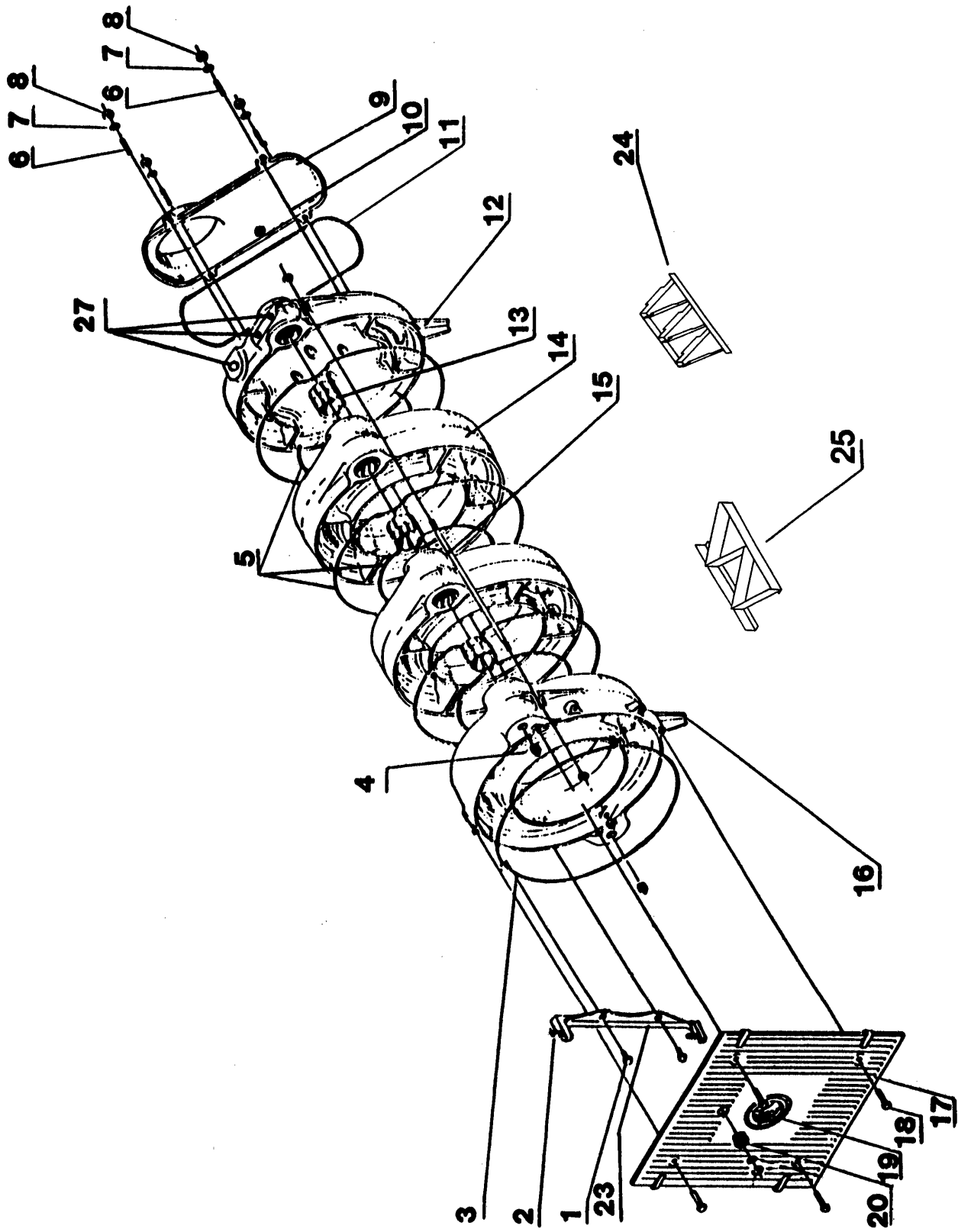
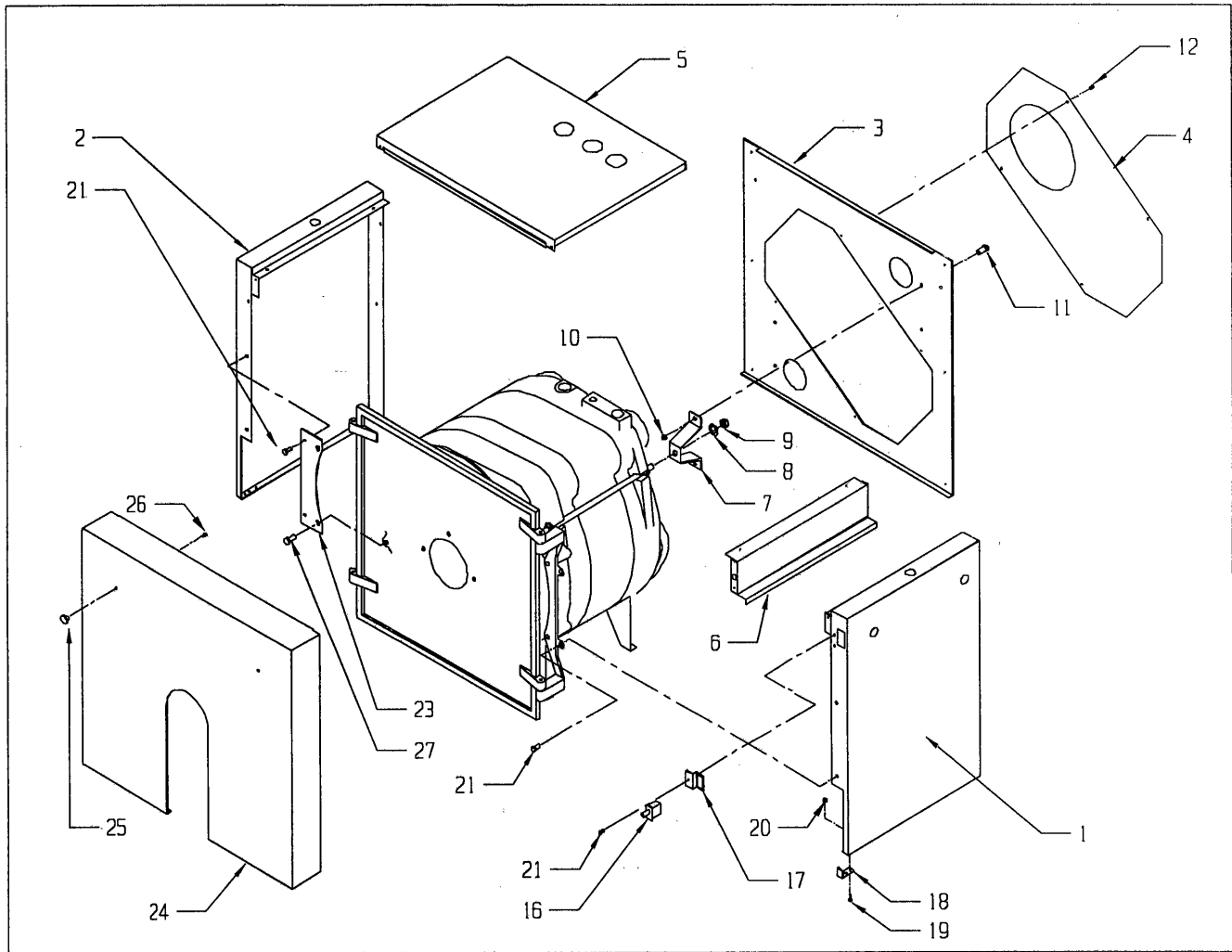


Figure 41.

JACKET COMPONENTS



KEY #	DESCRIPTION	QTY. OR CROWN P.N.	QUANTITY PER BOILER OR CROWN P.N.							
			CT-3	CT-35	CT-4	CT-45	CT-5	CT-6	CT-7	CT-8
1	RIGHT SIDE JACKET PANEL	1 ea.	110300	110300	110400	110400	110500	110600	110700	110800
2	LEFT SIDE JACKET PANEL	1 ea.	110310	110310	110410	110410	110510	110610	110710	110810
3	REAR JACKET PANEL	110210	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.
4	FLUE COLLECTOR COVER	110215	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.
5	TOP PANEL	1 ea.	110320	110320	110420	110420	110520	110620	110720	110820
6	WIREWAY	1 ea.	110305	110305	110405	110405	110505	110605	110705	110805
7	REAR JACKET MOUNTING BRACKET	700110	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.
8	M12 WASHER	90-033	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.
9	M12 NUT	90-026	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.
10	1/4-20 NUT	90-202	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.
11	1/4-20 x 3/4 SCREW	90-213	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.
12	#10 x 1/2 SHEET METAL SCREW	90-212	18 ea.	18 ea.	18 ea.	18 ea.	18 ea.	18 ea.	18 ea.	18 ea.
*	INSULATION MATT	1 ea.	110153	110153	110154	110154	110155	110156	110157	110158
16	DOOR SWITCH	960500	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.
17	DOOR SWITCH BRACKET	110115	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.
18	DOOR BRACKET	60-303	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.
19	8-32 X 1/2 SCREW	90-052	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.
20	8-32 HEX NUT	90-053	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.	4 ea.
21	10-24 X 3/4 SCREW	90-218	5 ea.	5 ea.	5 ea.	5 ea.	5 ea.	5 ea.	5 ea.	5 ea.
23	FRONT JACKET MOUNTING BRACKET	110110	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.
24	FRONT JACKET PANEL	110200	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.	1 ea.
25	DOOR KNOB	90-210	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.
26	8-32 x 1/4 SCREW	90-211	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.
27	M10 x 16mm SCREW	90-022	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.	2 ea.

* NOT PICTURED

SECTION XI: HOMEOWNERS GUIDE

WARNING

To avoid personal injury, death or property damage, keep boiler area clear and free from combustible materials, gasoline and other flammable liquids and vapors.

1. For fuel economy maintain a thermostat setting not over 70°F during day and evening operation. For maximum fuel economy, there are programmable thermostats available which will permit automatic temperature set-back and morning pick up. Ask your installer about other economy measures which are available.
2. Annual maintenance and boiler cleaning should be performed by a qualified oil burner service technician. The oil burner should be checked and an efficiency check performed at the same time.
3. In the event of oil fumes, excessive noise or unusual occurrences of any kind, shut the boiler off with the red emergency switch and call your oil burner service technician.
4. In the event the oil burner primary control "locks out", push the reset button ONCE. If the burner fails to fire and continue running, **do not reset again. Call serviceman.**



Manufacturer of Hydronic Heating Products
P.O. Box 14818 3633 I. Street
Philadelphia, PA 19134

Tel: (215) 535-8900 • Fax: (215) 535-9736 • www.crownboiler.com

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