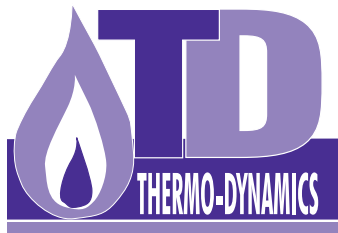


HT Series

**Models HT 90/100/110, HT DV 90/100/110, HT 125/135/150
HT DV 125, HT 165/175/200 and HT 225/250/275**

Installation Operation Maintenance Manual



Thermo-Dynamics Boiler Company

ROUTE 61 • P.O. BOX 325 • SCHUYLKILL HAVEN, PA 17972

TEL (570) 385-0731 • FAX (570) 385-5304

WEB www.thermodynamicsboiler.com • EMAIL sales@thermodynamicsboiler.com

PRODUCT FEATURES

- ASME Coded Boiler Registered with National Board
- Factory Mounted/Wired Burner and Controls
- Fully Insulated Heat Exchanger with Powder-Coated Cabinet
- Packaged with Standard Five Gallon per Minute Tankless Coil (Domestic Hot Water)
- Equipped with Triple Aquastat, Circulator, and Temperature / Altitude Gauge
- Outfitted with Additional Nozzles to Achieve a Variety of Heat Inputs
- Provided with a Lifetime Limited Warranty

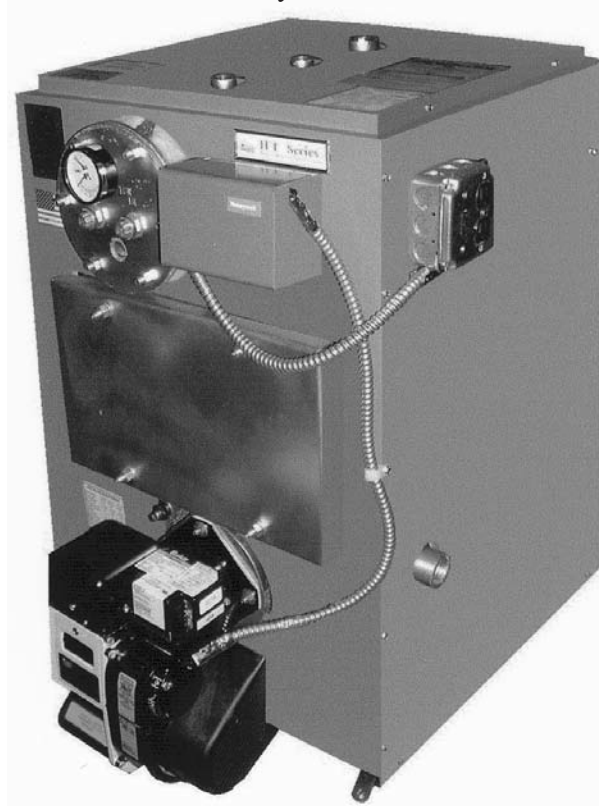


Figure 1 Thermo Dynamics HT 90/100/110 DV Series

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SERVICE POLICY

Congratulations on the purchase of your boiler. At Thermo-Dynamics Boiler Company we pride ourselves on the design and construction of our product. Our intent is to furnish you with a high quality appliance that will provide you and your family with years of trouble free service.

In order to maintain peak performance of your boiler, it is recommended that the burner/boiler be serviced annually, preferably prior to the onset of the winter heating season. Servicing of your appliance must be performed by a qualified heating technician. You should utilize a qualified heating technician familiar with your installation to manage your heater and perform periodic maintenance. Proper care and maintenance of your boiler will allow you to enjoy the benefits of your new purchase as well as extend its long useful life.

In the event that your serviceman encounters difficulty with the boiler, he/she shall contact the distributor from which the product was purchased. The distributor shall, in turn, contact the Thermo-Dynamics sales representative for your area. By adhering to this protocol, Thermo-Dynamics wishes to provide you with responsive and unparalleled service. We realize the importance that our product means to you and your family and our goal is to get your boiler up and running as quickly as possible.

Thank you for purchasing the Thermo-Dynamics boiler. Again, it is our intent to provide you with a high quality trouble free product that will be part of your family for many years to come. Please consider Thermo-Dynamics Boiler Company in the future for all of your home heating needs.

HOMEOWNER INFORMATION

Heating Contractor:

Address:

Phone No.:

A) General

Installation and service is to be done only by a certified and qualified technician.

Never burn garbage or refuse in your boiler or leave combustible material around it. Do not allow the fuel tank to run out of oil. The fuel tank should be kept full during the summer, or periods of non-use, to prevent condensation of moisture on the inside of the tank.

B) Combustion Air Supply

The burner requires an ample amount of clean combustion air to burn efficiently. If ample supply is not available, noisy and erratic combustion will result. Under these conditions fuel odors may occur. The installation and use of venting fans (anywhere in the house) or a vented dryer will greatly increase the need for outside air.

C) Area Around Boiler

The area around the boiler must be kept clean and free of any combustible materials, particularly oily rags or papers. The boiler must be accessible for service.

D) Annual Tune-Up

The boiler should be serviced once a year, ideally just prior to the heating season. The tune-up is to be done by a qualified technician following procedures listed under Maintenance in this manual

E) If Boiler Doesn't Start:

- 1) Check if there is fuel in the tank.
- 2) Is thermostat setting above room temperature.
- 3) Is service switch in the "on" position.

Should there be a problem with operation of the boiler, call a qualified service technician. Do not tamper with the unit or controls. Working with a burner and setting-up the combustion process requires specific technical knowledge, skills and instruments. In addition, your boiler is only part of your overall home heating system. Other controls (etc.) may require adjustment or replacement.

F) Keep this manual in a safe place near your boiler as reference for your service technician.

HEATING CONTRACTOR INFORMATION

Read This First

1. *Installer must be a trained, experienced technician and should read all instructions before installation.*
2. *Inspect the boiler, jacket and all components to be sure damage has not occurred in shipment. If damage is evident, do not install the boiler. Contact your distributor immediately. A claim must be filed with the freight carrier that transported the boiler from the factory to the distributor.*
3. *Disconnect power supply before connecting wiring.*
4. *Refer to local codes for oil burning equipment, for recommended installation practice. You will need to be familiar with NFPA Standard 31, "Standard for the Installation of Oil Burning Equipment".*
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. Over sizing will result in short cycling and inefficient operation.*
6. *When moving the boiler, do not push against the jacket or burner. Damage will result.*
7. *If the boiler is vented to a chimney, be certain the chimney is clean and free of obstructions. The chimney must be masonry with tile lining or metal insulated with a stainless steel surface. The chimney must be properly sized. Draft requirements are essential for safe and proper operation of the boiler.*
8. *If the boiler is connected to a venting device, make sure that it is listed by a recognized testing service. Follow the venting device manufacturer's installation instructions. Verify that the venting device installation complies with the recommendations of the manufacturer and local and state codes.*
9. *Conduct a thorough checkout when installation is complete. Check for indications of leaks and make sure that no material is left adjacent to the boiler.*
10. *The use of low sulfur No. 2 heating oil is highly recommended.*
11. *Modification, substitution or elimination of factory equipped, supplied or specified components may result in property damage, personal injury or the loss of life.*
12. *The following definitions apply to potential hazards noted in this manual.*

DANGER: *Indicates a hazardous situation which if not avoided will result in death or serious injury.*

WARNING: *Indicates a hazardous situation which if not avoided could result in death or serious injury.*

CAUTION: *Indicates a hazardous situation which if not avoided, may result in a minor injury. It may also warn against unsafe practices that may result in minor injury or damage to equipment.*

NOTICE: *Indicates that special attention to information is required. Not related to personal injury or property damage.*

MODEL SPECIFICATIONS

Table 1 - Series I Boilers

	Model 90/100/110*			Model 125/135/150*		
Input	126,000	140,000	154,000	175,000	189,000	210,000
Heat Capacity	109,000	121,000	132,000	150,000	161,000	178,000
Gross Output	N/A	N/A	N/A	N/A	N/A	N/A
Net Out	95,000	105,000	115,000	130,000	140,000	155,000
Firing Rate	0.90	1.00	1.10	1.25	1.35	1.50
Tubes	10	10	10	16	16	16
Baffles	Fully Baffled	Fully Baffled	Fully Baffled	Fully Baffled	Fully Baffled	Fully Baffled
Water Content	30	30	30	28	28	28
Supply	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/4"
Returns (2)	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/4"
Coil Capacity	5 GPM	5 GPM	5 GPM	5 GPM	5 GPM	5 GPM
Steady State	86.5	86.2	85.5	85.6	85.4	84.9
AFUE - DOE Efficiency	85.1	84.8	84.2	85.0	84.7	84.0
Combustion Efficiency	N/A	N/A	N/A	N/A	N/A	N/A
Overall Efficiency	N/A	N/A	N/A	N/A	N/A	N/A
Weight	458	458	458	485	485	485
Burner Model	Beckett AFG, AFII and NX Carlin EZ-1 Riello F5 Riello BF5	Beckett AFG, AFII and NX Carlin EZ-1 Riello F5 Riello BF5	Beckett AFG, AFII and NX Carlin EZ-1 Riello F5 Riello BF5	Beckett AFG Beckett AFII Carlin EZ-1 Riello F5 Riello BF5	Beckett AFG Beckett AFII Carlin EZ-1 Riello F5	Beckett AFG Beckett AFII Carlin EZ-1 Riello F5

*Model 90/100/110 and 125 available in choice of chimney or direct vent. With AFII, NX EZ1 and BF5 burners only.

Table 2 - Series II Boilers

	Model 165/175/200			Model 225/250/275		
Input	231,000	245,000	280,000	315,000	350,000	385,000
Heat Capacity	200,000	212,000	242,000	N/A	N/A	N/A
Gross Output	N/A	N/A	N/A	264,000	291,000	319,000
Net Out	174,000	184,000	210,000	230,000	253,000	277,000
Firing Rate	1.65	1.75	2.00	2.25	2.50	2.75
Tubes	18	18	18	24	24	24
Baffles	Not Baffled	Not Baffled	Not Baffled	Top Pass Baffled	Top Pass Baffled	Top Pass Baffled
Water Content	48	48	48	46	46	46
Supply	2"	2"	2"	2"	2"	2"
Returns (2)	2"	2"	2"	2"	2"	2"
Coil Capacity	5 (7 GPM opt.)	5 (7 GPM opt.)	5 (7 GPM opt.)	5 (7 GPM opt.)	5 (7 GPM opt.)	5 (7 GPM opt.)
Steady State	86.7	86.5	85.4	N/A	N/A	N/A
AFUE - DOE Efficiency	86.0	85.6	84.6	N/A	N/A	N/A
Combustion Efficiency	N/A	N/A	N/A	85.5	85.2	84.9
Overall Efficiency	N/A	N/A	N/A	83.7	83.3	82.9
Weight	680	680	680	710	710	710
Burner Model	Beckett AFG“M”	Beckett AFG“M”	Beckett AFG“M”	Beckett CF375	Beckett CF375	Beckett CF375

MODEL DIMENSIONS

FIGURE 2 - SERIES I BOILERS

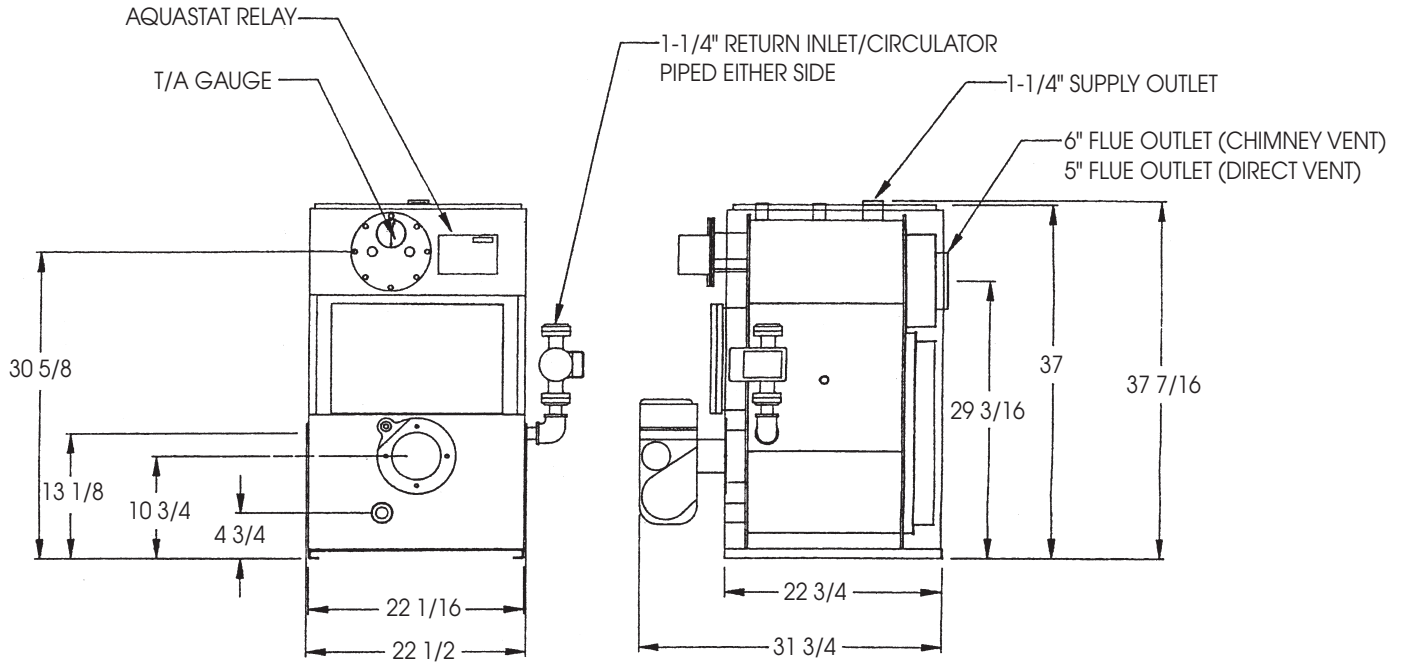
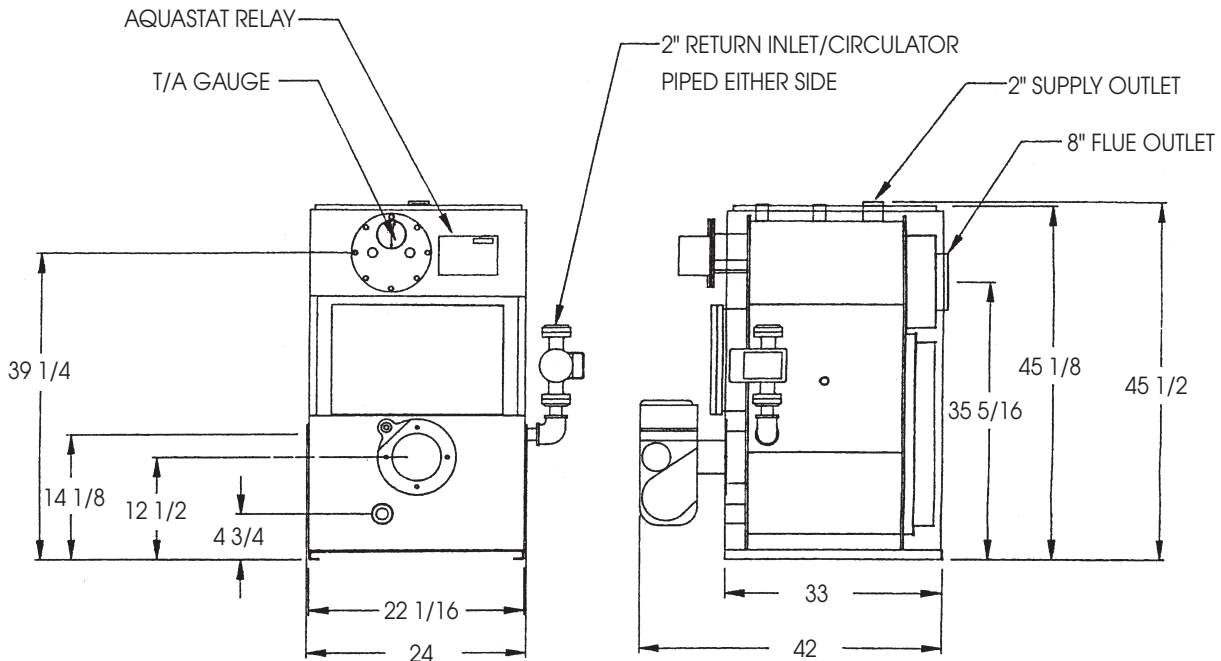


FIGURE 3 - SERIES II BOILERS



Installation/Qualified Heating Contractor Only

A) GENERAL

The installation of the unit shall be in accordance with state and local regulations.

B) FREIGHT CLAIMS

All units should be inspected for damage upon arrival. Concealed damage claims should be filed immediately against the carrier by the consignor. The carrier is responsible for taking prompt action on all claims.

C) SIZING

Replacement boilers should not be sized from the firing rate of the old boiler; a DOE sponsored study indicated 65% of the heating units in U.S. homes are substantially oversized. A complete heat loss calculation of the structure is necessary to choose the proper size unit to install. The boiler should be sized to within 25% of the actual calculated heat loss of the structure. Over sizing will result in short cycling and inefficient operation.

D) BOILER LOCATION

1. Boiler to be installed in a level position with clearances in accordance with NFPA 31 Table 10.6.1.

STANDARD CLEARANCES

Front 24"

Sides 6"

Top 18"

Rear 12"

Chimney Connector 18"

Floor: Sizes 90-150 may be installed on combustible flooring

2. Reduced clearance installations shall comply with NFPA 31 Table 10.6.2.
3. To move the unit, push against the flue box or skids. Pushing or pulling the jacket or burner will result in damage.
4. Be sure to level the unit by inserting shims under the elevated base.

E) AIR FOR COMBUSTION AND VENTILATION - CHIMNEY VENT APPLICATIONS

The unit must be installed where provisions exist for combustion and ventilation air. Ordinarily, provisions may be furnished by the following methods.

1. Utility Room or Closet

In buildings of tight construction, including most modern homes, you should provide an opening, connecting to a well ventilated attic, crawl space or directly with the outdoors. The opening should have a minimum free area of 1 square inch per 1,000 Btu per hour of total input for all appliances in the enclosure and should terminate below the burner level. Boilers installed in confined areas or closets must have two ventilation openings in the closet door. Each opening should have a free area of not less than 1 square inch per 1000 Btu (140 square inch per US gph) of the total input for all appliances in the enclosure. One opening located near the top of enclosure and one near the bottom.

2. Basement

- a. When a boiler is installed in a full basement, infiltration is normally adequate to provide air for combustion.
- b. In buildings of tight construction when the basement windows are weather stripped, one opening to a well ventilated attic or with the outdoors should be provided. (See part A for opening requirements)

3. Special Conditions

When a boiler is located in an area where exhaust fans, kitchen ventilation systems, clothes dryers, or fireplaces may create conditions of unsatisfactory combustion or venting, special provisions should be made for additional air for combustion, as specified by local authority.

F) AIR FOR COMBUSTION AND VENTILATION - DIRECT VENT APPLICATIONS

CAUTION: External vent surfaces are hot..

NOTICE: Use only the ETL listed venting system components supplied with the TV-175 Direct Vent Kit.

Surface discoloration of the building may occur due to improper boiler/burner adjustment. Thermo Dynamics Boiler Company will not accept any liability for such discoloration.

Follow the instructions provided with the TV175 Direct Vent Kit for locating and installing the vent kit.

G) JACKET AND TRIM ASSEMBLY

1. Knock Down Boiler

a. *Jacket Assembly* - Unpack the jacket parts being careful not to damage the finish. Piping and accessories are installed after the jacket is in place.

b. *Trim Assembly*

Install the safety relief valve in the 3/4" tapping in the top of the boiler. The relief valve should be piped to a safe place of discharge.

Install the limit control in the 3/4" fitting provided in the boiler plate.

Install the altitude/temperature gauge in the 1/4" fitting provided in the coil plate.

Install plugs provided in the parts box in all openings that are not used.

2. Packaged Boiler

Controls and burner are installed and prewired at the factory. Install Relief Valve as noted in Figures 6 and 7.

H) BOILER PIPING

This style of boiler is equipped with a built in "Air Scoop System." This feature allows quiet air free operation of your hot water system by assuring the removal of noisy air pockets. The 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. All plugs and water connections should be checked for leaks upon installation and annually.

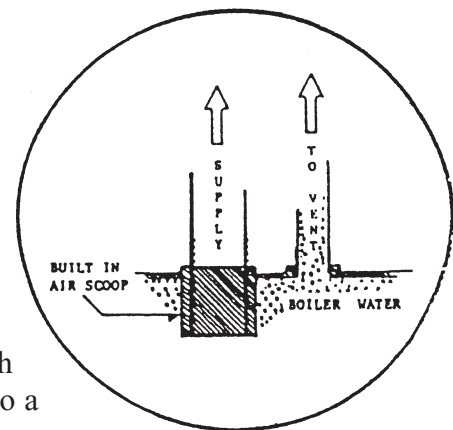


FIGURE 5
BUILT-IN AIR SCOOP

WARNING: *Relief valve discharges and drain valve piping must be piped to a safe place of discharge.*

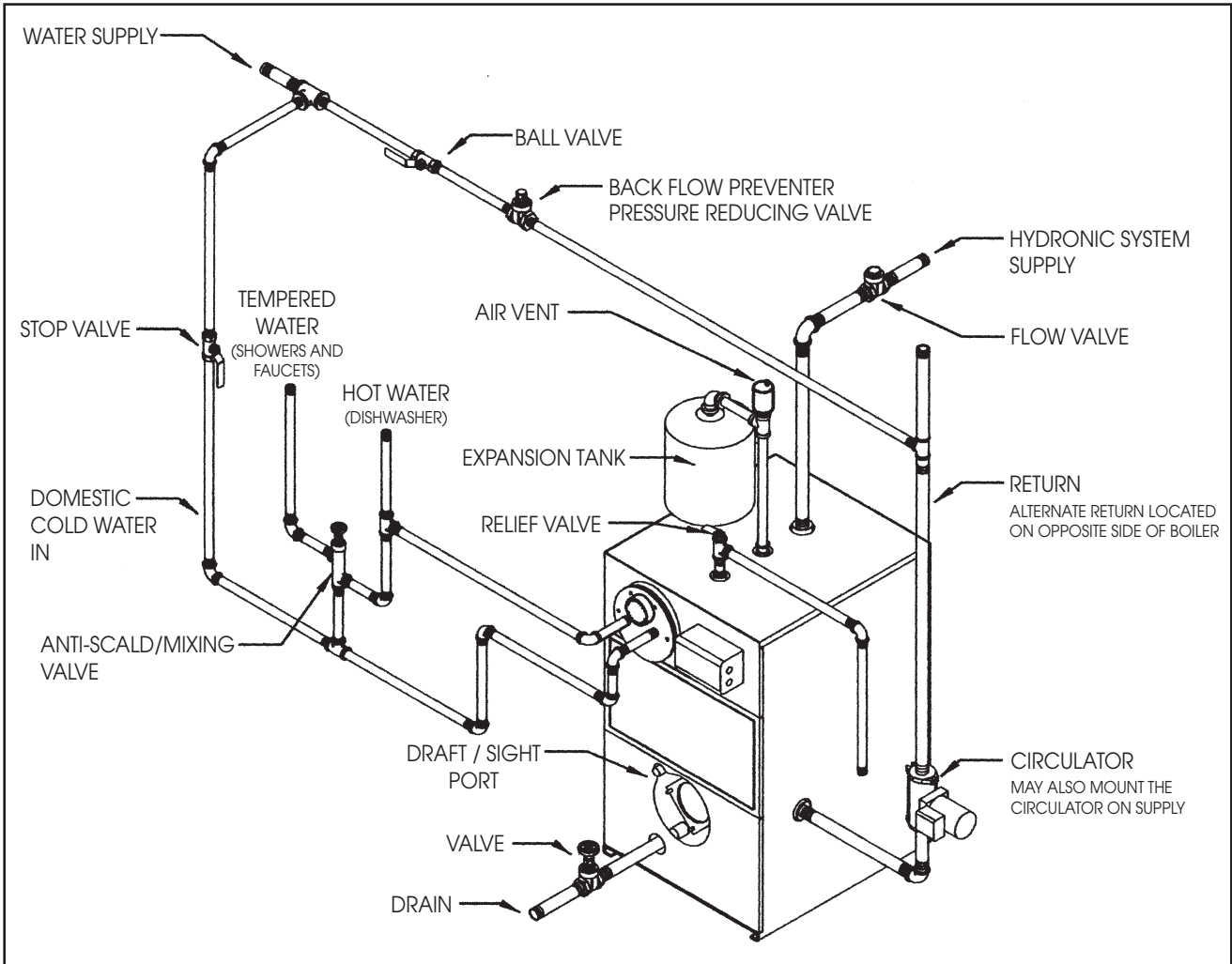
I) TANKLESS WATER HEATING PIPING

The tankless heater may be connected as shown in Figure 6. High temperature water for a dishwasher may be obtained by piping as shown.

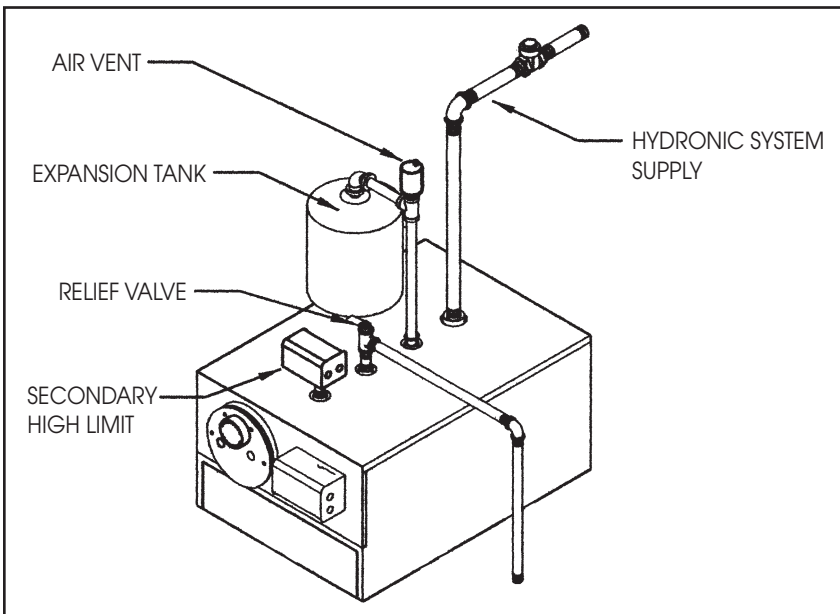
The nuts that secure the tankless coil flange should be tightened before the boiler is filled with water, after initial firing and every year during annual maintenance. Deterioration due to coil gasket leaks shall void warranty.

WARNING: *An anti-scald/mixing valve (not supplied) must be used to reduce the water temperature at kitchen or bathroom taps.*

FIGURE 6 - PIPING DIAGRAM FOR SERIES I BOILERS



**FIGURE 7 - PIPING DIAGRAM FOR SERIES II BOILERS
(PIPING THE SAME EXCEPT THE ADDITION OF A SECONDARY HIGH LIMIT)**



J) BURNER AND CONTROLS

1. Burner Installations

Packaged boilers are shipped with the burner installed and prewired. Boilers that are shipped knocked-down must be field assembled. Follow the procedures listed below to install and connect the burner.

- a. Remove the burner parts and instructions from the carton.
- b. Referring to specifications at the back of the manual, check to see that the burner model and size match the boiler model.
- c. Make sure the correct nozzle is in place and is tightly sealed.
- d. Check the electrode position and set the air intake as indicated in the burner manual.
- e. The burner is installed with a mounting flange. The end of the burner air tube should be 1/4" from the inside surface of the front wall of the combustion chamber.
- f. Make the electrical connections as illustrated in the wiring schematics. All wiring must be done in accordance with the local electrical code. A service box is provided with disconnect switch so power can be shut off to the boiler, but power for a utility lamp is still available.
- g. For units installed in Maine, New Jersey and New York, a low-water cutoff is required on all hot water boilers.

2. Oil Primary Control - Chimney Vent (Non Post Purge Control)

The oil primary control with the solid state flame sensing circuit provides automatic, non-recycling control of oil burners. When used with the cadmium sulfide flame detector, the control will automatically control the oil heating system.

The primary control 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 reset button on the relay has been pushed.

WARNING: *The reset must never be pressed more than once during a single flame failure.*

3. Oil Primary Control - Direct Vent (Post Purge Control)

The oil primary control with the solid state flame sensing circuit provides interrupted ignition. Used in conjunction with a cadmium sulfide flame detector, the control will automatically control the oil burner.

The primary control 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 reset button on the relay has been pushed.

WARNING: *The reset must never be pressed more than once during a single flame failure.*

Post-purge is provided to ensure that the boiler fires at maximum efficiency and dependability throughout the heating season.

Post-purge of the oil burner is controlled through the electronic circuitry supplied. Post-purge timing is variable. The factory set post-purge timing is at approximately one minute. It is recommended that it be left at this setting. In no case should the post purge timing be reduced to less than 1 minute.

Length of Vent Kit	Minimum Post Purge Time
0 - 10 Feet	1 Minute
10.1 - 15 Feet	1 Minute
15.1 - 20 Feet	2 Minutes

Times are approximate and should be considered minimum settings for the length of intake pipe installed.

The length of post-purge may be increased on those units using the Beckett AFII or Riello BF-5 oil burners to any value up to its maximum setting if field conditions require a longer purge cycle.

The length of post-purge on the Carlin burner is not adjustable. The post purge timing on the Carlin burner is 90 seconds.

4. Aquastat Relay

This control is installed in the 3/4" fitting next to the domestic coil. These immersion type controls are used with forced hydronic heating systems which include domestic water service. This model provides high and low limits for maintaining minimum boiler water temperature and circulator controls. This control can also be used for multi-zone control by using a separate circulator and an R845 relay for each zone. The primary control is factory wired to the aquastat relay. These controls, working as a system, will prevent the circulator operation if the water temperature is below a predetermined low level. Likewise, if the water level reaches a predetermined high limit, the burner will automatically shut off.

K) SEQUENCE OF OPERATION

Forced Circulation Hot Water System with Tankless Heater

When room temperature falls below thermostat setting, the thermostat calls for heat starting the 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 high limit control temperature setting. If the high limit control temperature setting is reached, the burner shuts off, 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.

L) FUEL SYSTEM

1. Fuel Units

NOTE: Pump pressure 140 PSI for Beckett and Carlin, 175 PSI for Beckett NX, and 150 PSI for Riello.

- a. Burners are commonly fitted with a single stage fuel unit. A single stage unit may be connected with a supply line only, when the fuel supply is level with or above the burner. When the burner is above the oil level, a return line should be provided between the fuel unit and the tank. A “by-pass” plug in the fuel unit is then required. The return line automatically purges air from fuel units and returns it to the tank.
- b. Two stage fuel unit. If the height difference between the burner and the fuel supply level exceeds 10 ft., a two stage unit should be used, and a return line should be installed.

2. Tubing

Use continuous heavy walled copper tubing with flare fittings only. Locate fittings in accessible locations. If possible, tubing should be installed under the floor. Running tubing against boiler casings or across ceiling or floor joints should be avoided.

3. In-Line Oil Filter

The oil filter should be of a generous capacity. It should be located inside the building between the tank shut off valve and the burner. A shut off valve and the oil filter should be located as close to the burner as possible for ease of servicing.

4. Oil Shut Off Valve

Install manual oil shut off valves at the burner and near the tank on the supply line. Both valves should be easily accessible.

M) FLUE SYSTEM - CHIMNEY VENT APPLICATIONS

1. General

NOTE: *An oil fired unit shall be connected to a flue having sufficient draft at all times to assure proper operation.*

2. Draft

The draft regulator should be installed in accordance with the manufacturers instructions. Set the draft to negative .02 to .04 inches W.C. in the stack.

3. Roof Clearances

The flue gas exit of the venting system should be at least 3 feet above the highest point where it passes through the roof and at least 2 feet higher than any portion of a building with 10 feet of the venting system.

4. Chimney Connectors

The horizontal length of a chimney connector should not exceed 10 feet unless a draft booster is used. The connector should be pitched upward at least 1/4 inch to the foot. Use only high quality lock seam smoke pipe. Each joint should be securely fastened with sheet metal screws. Chimney connectors should be positioned to the shortest possible run of smoke pipe to the chimney.

5. Vent Cap

Install a U.L. listed vent cap where the possibility of down drafts exist.

6. Boiler Venting

This boiler must be vented into a properly sized chimney, or into an Underwriters Laboratories Inc. listed venting device which is capable of maintaining the specified draft requirements.

As indicated in this manual, chimney sizes, draft requirements and other additional service and installation requirements are essential for safe and proper operation of the boiler.

Only a trained experienced serviceman should attempt the installation or service of any boiler and or venting device.

All venting installations must comply with the recommendations of the venting manufacturer and with all state and local codes.

N) WIRING

All internal electrical wiring is completed at the factory on packaged boilers. All external wiring must conform with the National Electric Code and local codes. Refer to wiring diagrams for all field wiring.

1. Field connections should be protected with a 15 amp fuse.
2. Install the room thermostat on an inside wall away from cold drafts, windows, or heat from fireplaces, appliances, or sunlight. Connect the thermostat leads to the "TT" terminals on the circulator control.

3. A separate service box with disconnect switch is provided, wired but not fastened to the jacket. Connect the service box to the jacket using the hole and screw provided.

O) WARRANTY

NOTE: *The limited warranty is not applicable unless these installation instructions are followed.*

OPERATION

A) START UP

CAUTION: *DO NOT START UNLESS CLEAN OUT DOORS ARE IN PLACE.*

1. Make sure service switch to boiler is off.
2. Make sure boiler has been filled with enough water until the entire system has been purged and desired pressure is obtained.
3. Check to make sure the oil storage tank is filled with No. 2 heating oil.
4. Make sure all manual shut off valves in the fuel system are open.
5. Set operating controls at 160°F.
6. Set limit switch at 180°F.
7. Install a pressure gauge in the 1/8" gauge port or nozzle port of the fuel pump. Do not take readings at the bleed valve port.

NOTE: *The pressure should be set per Installer/Service Man Label.*

8. Adjust the burner air band and air shutter in accordance with Installer/service man Label.
9. Push the safety reset button on the primary control and release. Adjust the thermostat to call for heat. Turn the service switch to the on position. Bleed the fuel unit. If burner fails to start, refer to the trouble shooting guide in this manual.
10. With the burner running, bleed the fuel unit again until all air is eliminated from lines. Close and tighten the bleed port.
11. Check all lines and plugs for oil leaks and eliminate.

B) START UP ADJUSTMENTS

1. Equipment Required

- a. CO2 analyzer
- b. Draft gauge.
- c. Fuel pressure gauge.
- d. Stack thermometer.
- e. Smoke tester.

2. Burner Adjustments

Allow the burner to operate steadily for at least 15 minutes. Check the burner settings according to the installer/serviceman labels for Series I and II boilers at the end of this manual, and make the following adjustments:

- a. *Sampling Hole* - punch 1/4" hole in the flue between the flue box and the draft regulator. All test readings should be taken from this point.
- b. *In The Stack Draft* - Take a draft reading from the flue pipe sampling hole. Adjust the barometric draft regulator to -.02" in the stack. In tall chimneys a second draft regulator may be required in the flue pipe to regulate draft under high draft conditions.
- c. *Overfire Draft* - Take a draft reading from the draft port located to the left of the burner. Compare the readings with those according to the installer/serviceman labels for Series I and II boilers starting on page 30. Reinstall the draft port plug after all readings have been taken.
- d. *Pump Pressure* - Adjust the pump discharge pressure per value on serviceman label.
- e. *Combustion Air* - Reduce the air supply to allow just sufficient air for clean combustion. This is accomplished by loosening the lock screws on the air shutter, and closing the air shutter until a trace of smoke is recorded. Take a CO₂ sample. Open the air shutter lowering CO₂ about 1-1/2% to 2%. A zero smoke reading should result. If this adjustment cannot be obtained, refer to the trouble shooting section in this manual.
- f. *Stack Temperatures* - Check to see that the stack temperature is according to the installer/serviceman labels for Series I and II boilers starting on page 30.

3. Instructing the Homeowner

The care and operation of the boiler should be explained to the homeowner, including care of the burner, how to adjust the thermostat, necessity of air supply to the burner, and the simple checks to make before calling the serviceman if the burner fails to operate automatically.

C) BURNER SERVICING

1. Burner Components

If a replacement part is necessary, use only the part specified on the burner parts list in this manual. Specify the part number and description when ordering. (See included burner literature).

2. Nozzles

Use only the correct nozzle specified on the "Installer/Serviceman" decal located on front boiler jacket. Be extremely careful not to touch the nozzle orifice to avoid scratches or dirt which may cause leaks or effect the oil spray pattern.

3. Electrode Settings

The electrode setting is critical for proper ignition of the fuel. Check to be sure electrode settings comply with the specifications.

4. Fan and Blower Housing

The fan and blower housing should be kept clean from lint and dirt. If the boiler is located near an unvented dryer, special care must be taken so that lint does not block air passages in the burner and proper combustion air is provided.

Maintenance/Qualified Heating Technician Only

A) VENT SYSTEM

DANGER: ESCAPING GASES ARE DANGEROUS. THE ENTIRE FLUE AND VENTING SYSTEM SHOULD BE INSPECTED AT LEAST ONCE A YEAR BY A QUALIFIED SERVICEMAN.

B) OIL FILTER

The oil filter cartridge should be replaced annually.

C) CLEANING

The heat exchanger and combustion chamber should be examined annually for scale and soot accumulation. The heat exchanger examination and cleaning is to be performed through the front clean out panel located above the burner.

1. To clean the unit, Remove the 3/8" brass nuts, clean out cover, and front refractory board.
2. Remove baffles from front. Brush all of the tubes using a 2" soft flue brush.
3. Remove the flue pipe and check for any residue through the flue collector opening. A boiler vacuum can be used to collect any soot and scale. It is not normally necessary to remove the flue box for cleaning.
4. Remove the oil burner to inspect the burner head. Any soot or scale can be removed from the chamber through the burner opening.

NOTICE: DO NOT REMOVE THE REAR COVER AND REAR REFRACTORY FOR NORMAL MAINTENANCE. SOOT OR SCALE MUST BE REMOVED FROM THE FRONT BURNER OPENING ONLY.

D) OIL BURNER

1. Thoroughly brush clean the burner fan blades. Only with clean fan blades is proper combustion air delivery possible.
2. Clean nozzle assembly and all air handling parts.
3. Check spacing and condition of the ignition electrodes.
4. Nozzles should be inspected every year for plugged distributor slots or plugged orifices. If it is necessary to replace the nozzle, use only the specified nozzle to be sure that the replacement meets the spray pattern specifications of the burner.

E) GASKETS

Tighten the nuts on the water coil annually to prevent any gasket leaks. Deterioration due to coil gasket leaks shall void the warranty.

F) WIRING

Check the electrical wiring for damage or frayed insulation.

Troubleshooting Guide/Qualified Heating Technician Only

TROUBLE: BURNER DOES NOT START

SOURCE	PROCEDURE	CAUSES	REMEDY
<i>Thermostat</i>	Check Thermostat	Thermostat set too low.	Turn thermostat up.
		Thermostat on "off" or "cool."	Switch to heat.
		Open thermostat wires.	Repair or replace wires.
		Loose thermostat connectors.	Tighten connection.
		Faulty thermostat.	Replace thermostat.
		Thermostat not level.	Level thermostat.
<i>Circuit Overloads</i>	Check burner motor overload switch. (If equipped)	Burner motor tripped on overload.	Push reset button.
	Check primary control safety switch.	Primary tripped on safety.	Reset safety switch.
<i>Power</i>	Check boiler disconnect switch and main disconnect switch.	Switch open.	Close switch.
		Tripped breaker or blown fuse.	Reset breaker or replace fuse.
<i>Cad Cell</i>	Jump the FF terminals on primary control, if the burner starts, fault is in detector circuit.	Open cad cell wires.	Repair or replace wire.
		Dirty cell face.	Clean or replace face.
		Faulty cad cell.	Replace cad cell.
	Check resistance across cad cell.	If 400-600 ohms cell is bad.	Replace cad cell.
<i>Primary Control</i>	Check for line voltage between the black and white leads. No voltage indicates no power to the control.	Limit control switch open	Check limit setting. Jump terminals - if burner starts replace control.
		Open circuit between limit control and disconnect switch.	Repair circuit.
		Low line voltage or power failure	Call utility company.
	Check for line voltage between orange and white leads. No voltage indicates a faulty control.	Defective control.	Replace control.
<i>Burner</i>	Check for voltage at the black and white leads to the burner motor. Voltage indicates power to motor and a fault in the burner.	Pump seized.	Turn off power to burner. Rotate blower by hand, check for excessive drag. Replace fuel unit or blower wheel.
		Blower wheel binding.	
		Burner motor defective.	Replace burner motor.

When checking burner adjustments always use instruments.

TROUBLE: BURNER STARTS BUT DOES NOT ESTABLISH FLAME

SOURCE	PROCEDURE	CAUSES	REMEDY
<i>Oil Supply</i>	Check tank for oil.	Empty tank.	Fill tank.
	Check for water in oil tank using a dip stick coated with litmus paste.	Water in oil tank.	Strip tank of water exceeding 2" in depth.
	Listen for pump whine.	Fuel supply valve closed.	Open valve.
<i>Oil Line and Filter</i>	Open pump bleed port and start burner. Milky oil or no oil indicates loss of prime.	Air leak in fuel system.	Repair leak, using only flared fittings. Do not use Teflon tape on oil fittings.
	Listen for pump whine.	Oil filter plugged.	Replace filter cartridge.
		Plugged pump strainer.	Clean Strainer.
		Restriction in oil line.	Repair oil line.
<i>Oil Pump</i>	Install pressure gauge in port of fuel pump. Pressure should be according to the installer/serviceman labels for Series I & II boilers.	Pump worn - low pressure. Motor overloads.	Replace pump.
		Coupling worn or broken.	Replace coupling.
		Pump discharge pressure set too low.	Set pressure according to the installer/serviceman labels for Series I & II boilers.
		No spark or weak spark.	
<i>Ignition Transformer</i>	Connect transformer leads to line voltage. Listen for spark. Check that transformer terminals are not arcing with buss bars. Check that transformer is properly grounded.	Line voltage below 102V.	Replace transformer.
			Call utility company.
<i>Ignition Electrodes</i>	Remove and inspect drawer assembly.	Carboned and shorted electrodes.	Clean electrodes.
		Eroded electrode tips.	Replace and reset electrodes.
		Incorrect electrode settings.	
		Cracked porcelain insulators.	Replace and reset electrodes.
<i>Nozzle</i>	Check for faulty nozzle.	Plugged orifice or distributor. Plugged nozzle strainer. Poor spray pattern.	Replace nozzle with nozzle according to the installer/serviceman labels for Series I & II boilers.
	Inspect nozzle for correct size and specifications.	Incorrect nozzle installed.	Install correct nozzle.
<i>Combustion Air Adjustments</i>	See "Burner Adjustment Instructions" in this manual.	Air shutter open too far.	Decrease air shutter setting.
		Air band open too far.	Decrease air band opening.

When checking burner adjustments always use instruments.

TROUBLE: BURNER FIRES, BUT THEN FAILS ON SAFETY

SOURCE	PROCEDURE	CAUSES	REMEDY
<i>Cad Cell</i>	Check cad cell with ohmmeter. If more than 2000 ohms, cad cell is defective or dirty.	Faulty or dirty cad cell	Clean or replace cad cell.
<i>Primary Control</i>	After burner fires, open cad cell circuit if flame looks OK. If burner continues to operate, fault is in primary control.	Faulty primary control	Replace primary control.
<i>Heat Exchanger Restriction</i>	Inspect heat exchanger.	Plugged heat exchanger.	Clean out heat exchanger.
<i>Burner Motor</i>	Burner motor trips on overload. Turn off power and rotate blower by hand to check for excessive drag.	Line voltage below 102V	Call utility company.
		Faulty motor.	Replace motor.
		Pump or blower overloading motor.	Replace blower or pump.

TROUBLE: TOO MUCH HEAT

SOURCE	PROCEDURE	CAUSES	REMEDY
<i>Circulator</i>	Check to see if operating control is working properly.	Circulator does not stop running.	Repair operating control.
<i>Thermostat</i>	Check thermostat settings and calibration.	Thermostat set too high.	Reset thermostat.
		Thermostat defective	Replace thermostat.
		Thermostat out of calibration.	Recalibrate. Check level.
<i>Flow Valve</i>	Check to see if flow valve is operating properly.	Flow valve dirty and stuck.	Clean flow valve.
		Flow valve defective.	Replace flow valve.

When checking burner adjustments always use instruments.

TROUBLE: BURNER FIRES, BUT THEN LOSES FLAME

SOURCE	PROCEDURE	CAUSES	REMEDY
<i>Poor Fire</i>	Inspect flame for stability.	Unbalanced fire.	Replace nozzle with specified nozzle.
		Excessive draft.	Reduce draft setting.
		Insufficient draft.	Increase draft.
		Insufficient combustion air sources.	Increase combustion air sources.
<i>Oil Supply</i>	If burner loses flame prior to the primary control locking out, fault is in fuel system.	Air leak in fuel system.	Repair leak - use only flare fittings.
		Water in oil tank.	Strip tank of water exceeding 2" in depth.
		Fuel supply valve closed.	Open valve.
		Restriction in oil line.	Clear oil line restriction.
		Plugged fuel filter.	Replace filter cartridge.
		Plugged pump strainer.	Clean Strainer.
		Cold oil.	Use #1 heating oil.
<i>Combustion Air</i>	Reduce combustion air supply.	Too much combustion air.	Close air band and air to raise CO ₂ . Check with instruments.
<i>Pump</i>	Install pressure gauge in gauge port of fuel pump. Pressure should be according to installer/serviceman labels for Series I & II boilers .	Pump discharge pressure incorrectly set.	Set pressure according to installer/serviceman labels for Series I & II boiler.
		Coupling worn or broken.	Replace coupling.
		Pump worn - low pressure motor overloads.	Replace pump.
<i>Excessive Draft</i>	Take a draft reading. Draft should be according to installer/serviceman labels for Series I & II boilers starting.	Incorrect draft setting.	Reduce setting. Install second draft regulator if necessary.
<i>Poor Flue Gas Sample</i>	Insert CO ₂ probe into heat exchanger tube. If reading is greater by 1/2% or more, sample was being diluted near flue box.	Leak in flue system.	Sample CO ₂ in heat exchanger.
			Seal flue system leak.
<i>Testing Method</i>	Using a chemical absorption type device, let instrument set after a test before venting. If CO ₂ reading increases 1/2% fluid is weak.	Weak fluid.	Replace fluid in testing device.
<i>Nozzle</i>	Check for faulty nozzle.	Plugged orifice or distributor.	Replace nozzle with specified nozzle.
		Plugged nozzle strainer.	
		Poor spray pattern.	

When checking burner adjustments always use instruments.

TROUBLE: BURNER FIRES, BUT PULSATES

SOURCE	PROCEDURE	CAUSES	REMEDY
<i>Draft</i>	Take a draft reading. Draft should be according to installer/serviceman labels for Series I & II boiler.	Down drafts.	Install vent cap.
		Insufficient draft.	Increase draft setting.
		Excessive draft.	Reduce draft settings, install second draft regulator if necessary.
<i>Draft Regulator</i>	Inspect draft regulator for correct location on flue system.	Improper installation.	Move draft regulator to correct location.
<i>Combustion Air</i> See Table 1.	Inspect installation for combustion air provisions.	Improper installation.	Provide sufficient sources of air for combustion.
	Open air band wide and take CO ₂ reading.	Improper adjustment.	Adjust CO ₂ level - start with air band wide open. Use instrument.
<i>Oil Supply</i>	Bleed pump; inspect for air leaks or water contamination.	Air leak in fuel system. Compression fittings.	Repair leak - use only flare joints.
		Water in oil tank.	Strip tank of water exceed 2" in depth.
<i>Pump Pressure</i>	Install pressure gauge in gauge port of fuel pump. Pressure should be according to installer/serviceman labels for Series I & II boiler.	Pump discharge pressure incorrectly set.	Set pressure according to installer/serviceman labels for Series I & II boiler.
		Coupling worn or broken.	Replace coupling.
		Pump worn - low pressure motor overloads.	Replace pump.
<i>Nozzle</i>	Check for faulty nozzle.	Plugged orifice or distributor.	Replace nozzle with nozzle specified on burner housing.
		Plugged nozzle strainer.	
		Poor spray pattern.	
<i>Heat Exchanger Restrictions</i>	Inspect heat exchanger.	Plugged heat exchanger.	Clean out heat exchanger.

When checking burner adjustments always use instruments.

TROUBLE: INSUFFICIENT HEAT

SOURCE	PROCEDURE	CAUSES	REMEDY
<i>Circulator</i>	Check if circulator is operational.	Coupling worn or broken.	Replace coupling.
		Pump binding.	Replace pump.
		Circulator motor burned out.	Replace circulator motor.
		Wiring from operating control defective.	Repair wiring.
		Operating control defective.	Repair or replace operating control.
	Check if circulator is correct size.	Circulator too small.	Replace with proper circulator.
	Check if circulator is up to speed; check if voltage to circulator is sufficient.	Circulator defective.	Repair circulator.
Insufficient voltage.		Call utility company.	
<i>Thermostat</i>	Check thermostat settings.	Settings too low.	Increase setting.
	Check thermostat location.	Bad location due to heat build up.	Move thermostat to a better location.
	Check thermostat calibration.	Out of calibration.	Recalibrate. Level thermostat.
<i>Flow Valve</i>	Check flow valve for sticking in partially closed position.	Flow valve not opening fully.	Clean or replace flow valve.
<i>Radiation</i>	Check for air in radiators.	Radiators airbound.	Bleed radiators.
	Check to see if radiators are sized properly.	Radiators inadequate.	Install adequate radiation.
<i>Boiler</i>	Determine structure heat load.	Boiler too small.	Additional heating capacity.
<i>Piping</i>	Check to see if piping is sized properly.	Piping inadequate.	Install adequate piping.
<i>Heat Exchanger</i>	Check heat exchanger for soot or scale accumulation.	Insufficient heat transfer.	Clean heat exchanger.
<i>Burner</i>	Check pump pressure with pressure gauge.	Insufficient pump pressure.	Increase pressure according to installer/serviceman labels for Series I & II boilers.
<i>Nozzle</i>	Check nozzle for size and spray angle.	Wrong nozzle installed.	Install specified nozzle.
	Check for faulty nozzle.	Nozzle underfiring due to defective nozzle.	Replace nozzle.

TROUBLE: HIGH NET STACK TEMPERATURES

SOURCE	PROCEDURE	CAUSES	REMEDY
<i>Nozzle</i>	Check pump pressure with pump gauge.	Nozzle overfiring due to high pump pressure.	Reduce pump pressure according to installer/serviceman labels for Series I & II boilers starting on page 30.
<i>Heat Exchanger</i>	Check heat exchanger surfaces for soot or scale fouling.	Heat exchanger fouled.	Clean heat exchanger.
<i>Baffles</i>	Check baffles installed.	Baffles not installed.	Install baffles.

TROUBLE: INSUFFICIENT DOMESTIC HOT WATER

SOURCE	PROCEDURE	CAUSES	REMEDY
<i>Tankless Coil</i>	Analyze capacity vs. usage.	Insufficient coil capacity.	Install larger coil.
<i>Operating Control</i>	Check operating control.	Setting too low.	Set operating control to 180°F. Raise differential set point.
<i>Heat Exchanger</i>	Inspect coils for fouled surfaces and/or flow restrictions.	Flow restriction.	Remove restriction.
		Fouled surfaces on heat exchanger.	Clean heat exchanger surfaces.

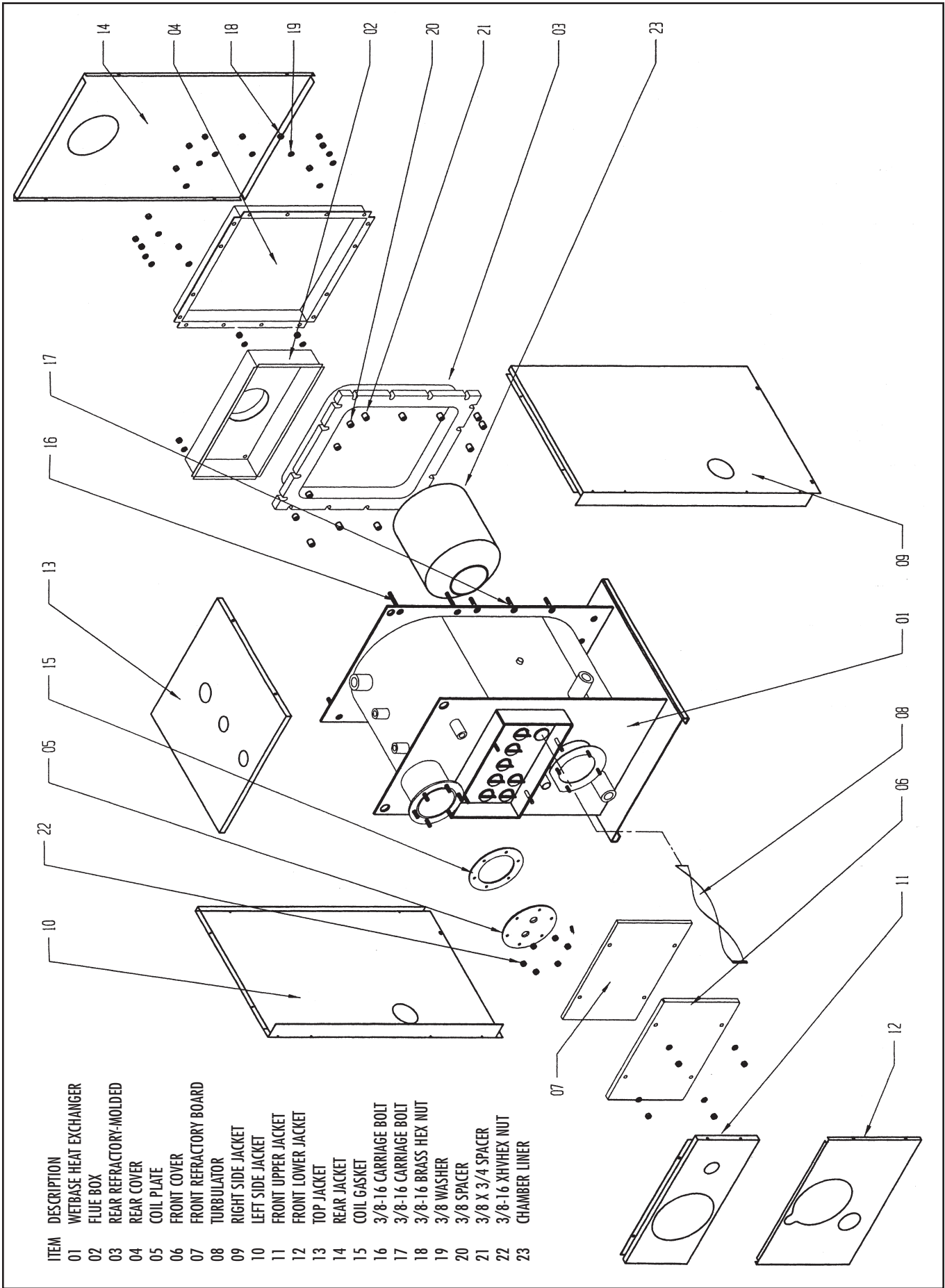


Figure No. 10 - Exploded Parts View

PARTS LIST

For Models 90/100/110 & 125/135/150

(Designate boiler and burner model numbers on all orders).

Item No.	Description	Part No.
1a	90/100/110 Heat Exchanger	241800
1b	125/135/150 Heat Exchanger	241810
2a	HT 6" Flue Box (Chimney Vent)	241128
2b	HT 5" Flue Box (Direct Vent)	241129
3	Rear Refractory - Molded, Target Wall Only	337910
4	Rear Cover with Molded Refractory Assembly	241120
5a	Coil Plate - Blank	229151
5b	Coil - 5 GPM cartoned with Gasket	530245
6	Front Cover	241124
7	Front Refractory Board 1"	337921
8	Turbulator (10 for 90-110, 16 for 125-150)	241150
9	Right Side Jacket	501104
10	Left Side Jacket	501103
11	Front Upper Jacket	501105
12	Front Lower Jacket	501101
13	Top Jacket	501106
14	Rear Jacket	501107
15	Coil Gasket	481005
16	3/8" - 16 x 4" Carriage Bolt (Qty. 4)	311113
17	3/8" - 16 x 2" Carriage bolt (Qty. 12)	311110
18	3/8" - 16 Brass Hex Nut (Qty. 20)	312011
19	3/8" Washer (Qty. 24)	313002
20	3/8" x 3/8" Spacer (Qty. 12)	319917
21	3/8" x 3/4" Spacer (Qty. 4)	319916
22	3/8" - 16 Heavy Brass Hex Nut (Qty. 8)	312002
23	Chamber Liner	337410

PARTS LIST

For Models 165/175/200 & 225/250/275

(Designate boiler and burner model numbers on all orders).

Item No.	Description	Part No.
1a	165/175/200 Heat Exchanger	241820
1b	225/250/275 Heat Exchanger	241825
2	Flue Box	241366
3	Rear Refractory - Molded, Target Wall Only	337416
4	Rear Cover with Molded Refractory Assembly	241360
5a	Coil Plate - Blank	229151
5b	Coil - 5 GPM cartoned with Gasket	530245
5c	Coil - 7 GPM Cartoned with Gasket	530246
6	Front Cover	241350
7	Front Refractory Board 1"	337415
8	Turbulator (0 for 165/200, 12 for 225-275)	241155
9	Right Side Jacket	} 165/275 Jacket Assembly* 501225
10	Left Side Jacket	
11	Front Upper Jacket	
12	Front Lower Jacket	
13	Top Jacket	
14	Rear Jacket	
15	Coil Gasket	481005
16	3/8" - 16 x 7" Carriage Bolt (Qty. 4)	311103
17	3/8" - 16 x 2" Carriage bolt (Qty. 12)	311110

*KD Jacket Assembly purchased as a set, not individual pieces.

PRELIMINARY SETTINGS

INSTALLER/SERVICEMAN

Model Number	HT-90	HT-100	HT-110
Burner Type	Beckett	Beckett	Beckett
Burner Model	AFG	AFG	AFG
Nozzle Type	.75 80°B	.85 80°B	.90 80°B
Pump Pressure PSI	140	140	140
Head/Pin Position	F-3	F-3	F-3
Air Band	CLOSED	2	3
Air Shutter	10	10	10
Draft Over Fire	+.085"	+.085"	+.085"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-90	HT-100	HT-110
Burner Type	Beckett	Beckett	Beckett
Burner Model	AFII	AFII	AFII
Nozzle Type	.75 60B	.85 60B	.90 60B
Pump Pressure PSI	140	140	140
Head/Pin Position	3	3	3
Air Band	3	4	4.5
Air Shutter	N/A	N/A	N/A
Draft Over Fire	+.085"	+.085"	+.085"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-90	HT-100	HT-110
Burner Type	Carlin	Carlin	Carlin
Burner Model	EZ-1	EZ-1	EZ-1
Nozzle Type	.75 60A	.85 60A	.90 60A
Pump Pressure PSI	140	140	140
Head/Pin Position	.85-1.00	.85-1.00	1.10-1.25
Air Band	100	100	125
Air Shutter	N/A	N/A	N/A
Draft Over Fire	+.085"	+.085"	+.085"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-90	HT-100	HT-110
Burner Type	Riello	Riello	Riello
Burner Model	F5	F5	F5
Nozzle Type	.75 60B	.85 60B	.90 60B
Pump Pressure PSI	150	150	150
Head/Pin Position	1.5	2.0	2.5
Air Band	N/A	N/A	N/A
Air Shutter	2.0	2.5	2.75
Draft Over Fire	+.04"	+.06"	+.08"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-90DV	HT-100DV	HT-110DV
Burner Type	Beckett	Beckett	Beckett
Burner Model	AFII	AFII	AFII
Nozzle Type	.75 60B	.85 60B	.90 60B
Pump Pressure PSI	140	140	140
Head/Pin Position	3	3	3
Air Band	3	4	4.5
Air Shutter	N/A	N/A	N/A
Draft Over Fire	+.085"	+.085"	+.085"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-90DV	HT-100DV	HT-110DV
Burner Type	Carlin*	Carlin*	Carlin*
Burner Model	EZ-1	EZ-1	EZ-1
Nozzle Type	.75 60A	.85 60A	.90 60A
Pump Pressure PSI	140	140	140
Head/Pin Position	.85-1.00	.85-1.00	1.10-1.25
Air Band	100	100	125
Air Shutter	N/A	N/A	N/A
Draft Over Fire	+.085"	+.085"	+.085"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

*Requires Carlin Air Intake Adapter

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-90DV	HT-100DV	HT-110DV
Burner Type	Riello	Riello	Riello
Burner Model	BF5	BF5	BF5
Nozzle Type	.75 60B	.85 60B	.90 60B
Pump Pressure PSI	150	150	150
Head/Pin Position	1.5	2.0	2.5
Air Band	N/A	N/A	N/A
Air Shutter	3.5	4.0	4.5
Draft Over Fire	0 TO .10"	0 TO .10"	0 TO .10"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-90DV	HT-100DV	HT-110DV
Burner Type	Beckett	Beckett	Beckett
Burner Model	NX	NX	NX
Nozzle Type	0.70 60°B	0.75 60°B	0.85 60°B
Pump Pressure PSI	175	175	175
Head/Pin Position	2.0	2.5	3.75
Air Band	N/A	N/A	N/A
Air Shutter	N/A	N/A	N/A
Draft Over Fire	+0.040"	+0.090"	+0.160"
Draft In Stack	+0.000"	+0.050"	+0.060"
CO ₂ Reading	10-11.5%	10-11.5%	10-11.5%
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-90	HT-100	HT-110
Burner Type	Beckett	Beckett	Beckett
Burner Model	NX	NX	NX
Nozzle Type	0.70 60°B	0.75 60°B	0.85 60°B
Pump Pressure PSI	175	175	175
Head/Pin Position	2.0	2.25	3.75
Air Band	N/A	N/A	N/A
Air Shutter	N/A	N/A	N/A
Draft Over Fire	+0.040"	+0.050"	+0.110"
Draft In Stack	-0.020"	-0.020"	-0.020"
CO ₂ Reading	10-11.5%	10-11.5%	10-11.5%
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-125	HT-135	HT-150
Burner Type	Beckett	Beckett	Beckett
Burner Model	AFG	AFG	AFG
Nozzle Type	1.00 80°B	1.10 80°B	1.25 80°B
Pump Pressure PSI	140	140	140
Head/Pin Position	F-6	F-6	F-6
Air Band	2	4.5	6
Air Shutter	10	10	10
Draft Over Fire	+0.085"	+0.085"	+0.085"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-125	HT-135	HT-150
Burner Type	Beckett	Beckett	Beckett
Burner Model	AFII	AFII	AFII
Nozzle Type	1.00 60B	1.10 60B	1.25 60B
Pump Pressure PSI	140	140	140
Head/Pin Position	7	7	8
Air Band	3	4	8
Air Shutter	N/A	N/A	N/A
Draft Over Fire	+0.085"	+0.085"	+0.085"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-125	HT-135	HT-150
Burner Type	Carlin	Carlin	Carlin
Burner Model	EZ-1	EZ-1	EZ-1
Nozzle Type	1.00 60A	1.10 60A	1.25 60A
Pump Pressure PSI	140	140	140
Head/Pin Position	1.1-1.25	1.35-1.5	1.35-1.5
Air Band	125	150	150
Air Shutter	N/A	N/A	N/A
Draft Over Fire	+0.085"	+0.085"	+0.085"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-125	HT-135	HT-150
Burner Type	Riello	Riello	Riello
Burner Model	F5	F5	F5
Nozzle Type	1.00 60B	1.10 60B	1.25 60B
Pump Pressure PSI	150	150	150
Head/Pin Position	2.5	3.5	4.0
Air Band	N/A	N/A	N/A
Air Shutter	3.0	3.5	4.5
Draft Over Fire	+0.03"	+0.05"	+0.07"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT DV-125	HT DV-125	HT DV-125
Burner Type	Beckett	Carlin*	Riello
Burner Model	AFII	EZ-1	BF5
Nozzle Type	1.00 60°B	1.00 60°B	1.00 60°B
Pump Pressure PSI	140	140	150
Head/Pin Position	7.0	0.85-1.00	2.0
Air Band	N/A	N/A	N/A
Air Shutter	6.0	6.0	6.0
Draft Over Fire	+0.16	+0.14	+0.13
Draft In Stack	-0.08	-0.07	-0.07
CO ₂ Reading	10-11.5%	10-11.5%	10-11.5%
Smoke Reading	ZERO	ZERO	ZERO

*Requires Carlin Air Intake Adapter

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-165	HT-175	HT-200
Burner Type	Beckett	Beckett	Beckett
Burner Model	AFG	AFG	AFG
Nozzle Type	1.50 60B	1.65 60B	1.75 60B
Pump Pressure PSI	140	140	140
Head/Pin Position	M-2	M-3	M-3
Air Band	5	5	7
Air Shutter	OPEN	OPEN	OPEN
Draft Over Fire	+0.06"	+0.08"	+0.10"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTE: Pressure over fire will vary according to CO₂ setting.

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-225	HT-250	HT-275
Burner Type	Beckett	Beckett	Beckett
Burner Model	CF-375	CF-375	CF-375
Nozzle Type	2.00 60B	2.25 60B	2.50 60B
Pump Pressure PSI	140	140	140
Head/Pin Position	3	3	4
Air Band	3	6	6
Air Shutter	OPEN	OPEN	OPEN
Draft Over Fire	+0.06"	+0.09"	+0.11"
Draft In Stack	-0.02"	-0.02"	-0.02"
CO ₂ Reading	10-11.5	10-11.5	10-11.5
Smoke Reading	ZERO	ZERO	ZERO

NOTE: Pressure over fire will vary according to CO₂ setting.

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-90	HT-100	HT-110
Burner Type	Beckett	Beckett	Beckett
Burner Model	NX	NX	NX
Nozzle Type	0.70 60°B	0.75 60°B	0.85 60°B
Pump Pressure PSI	175	175	175
Head/Pin Position	2.0	2.025	3.75
Air Band	N/A	N/A	N/A
Air Shutter	N/A	N/A	N/A
Draft Over Fire	+0.040"	+0.050"	+0.110"
Draft In Stack	-0.020"	-0.020"	-0.020"
CO ₂ Reading	10-11.5%	10-11.5%	10-11.5%
Smoke Reading	ZERO	ZERO	ZERO

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

INSTALLER/SERVICEMAN

Model Number	HT-90DV	HT-100DV	HT-110DV
Burner Type	Beckett	Beckett	Beckett
Burner Model	NX	NX	NX
Nozzle Type	0.70 60°B	0.75 60°B	0.85 60°B
Pump Pressure PSI	175	175	175
Head/Pin Position	2.0	2.5	3.75
Air Band	N/A	N/A	N/A
Air Shutter	N/A	N/A	N/A
Draft Over Fire	+0.040	+0.090	+0.160
Draft In Stack	+0.000	+0.050	+0.060
CO ₂ Reading	10-11.5%	10-11.5%	10-11.5%
Smoke Reading	ZERO	ZERO	ZERO

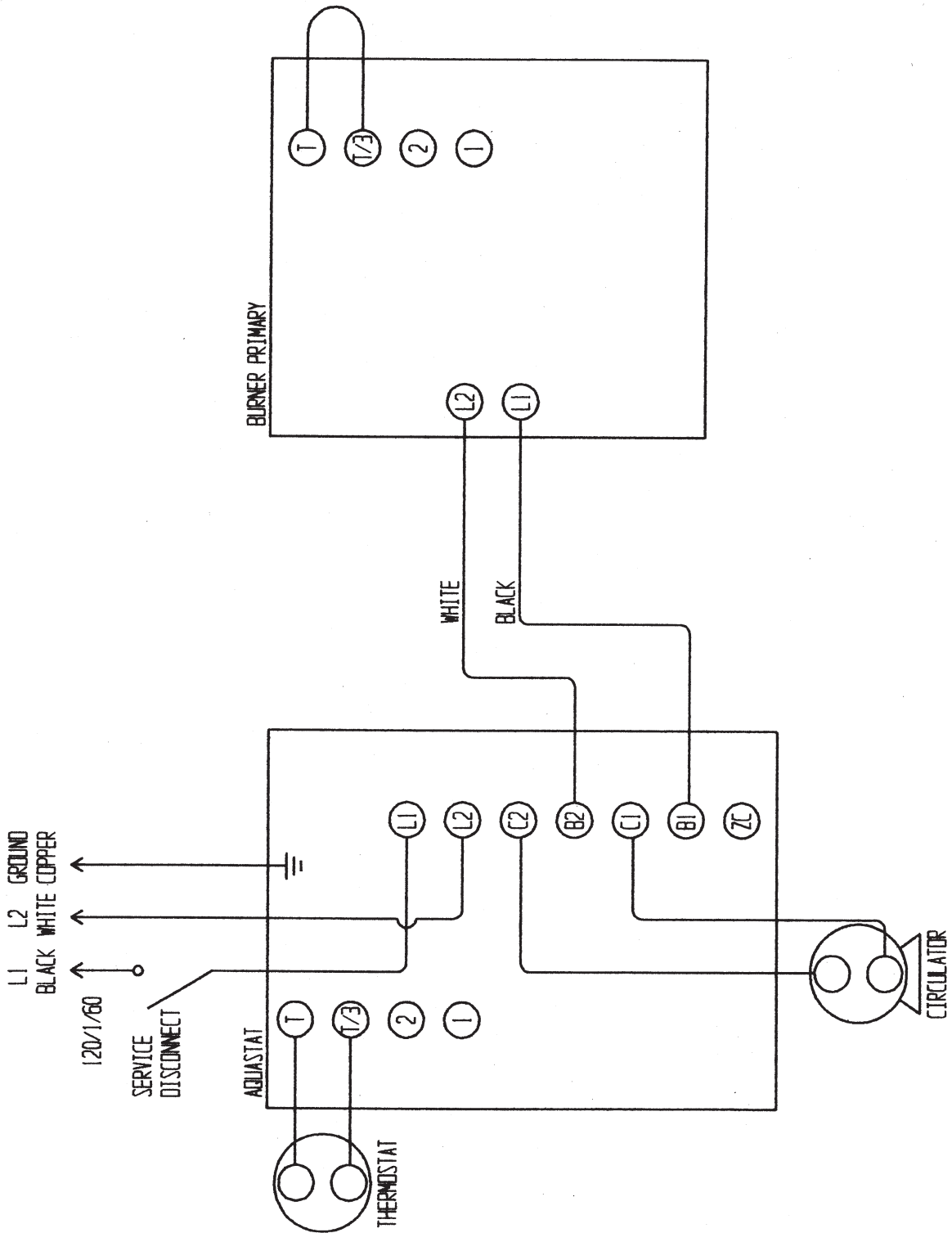
**Requires Carlin Air Intake Adapter*

NOTICE

Above settings are approximate. Final adjustments to be made with proper test equipment. Be sure all oil lines are air free and the use of flare fittings is recommended. See installation/service manual for detailed information.

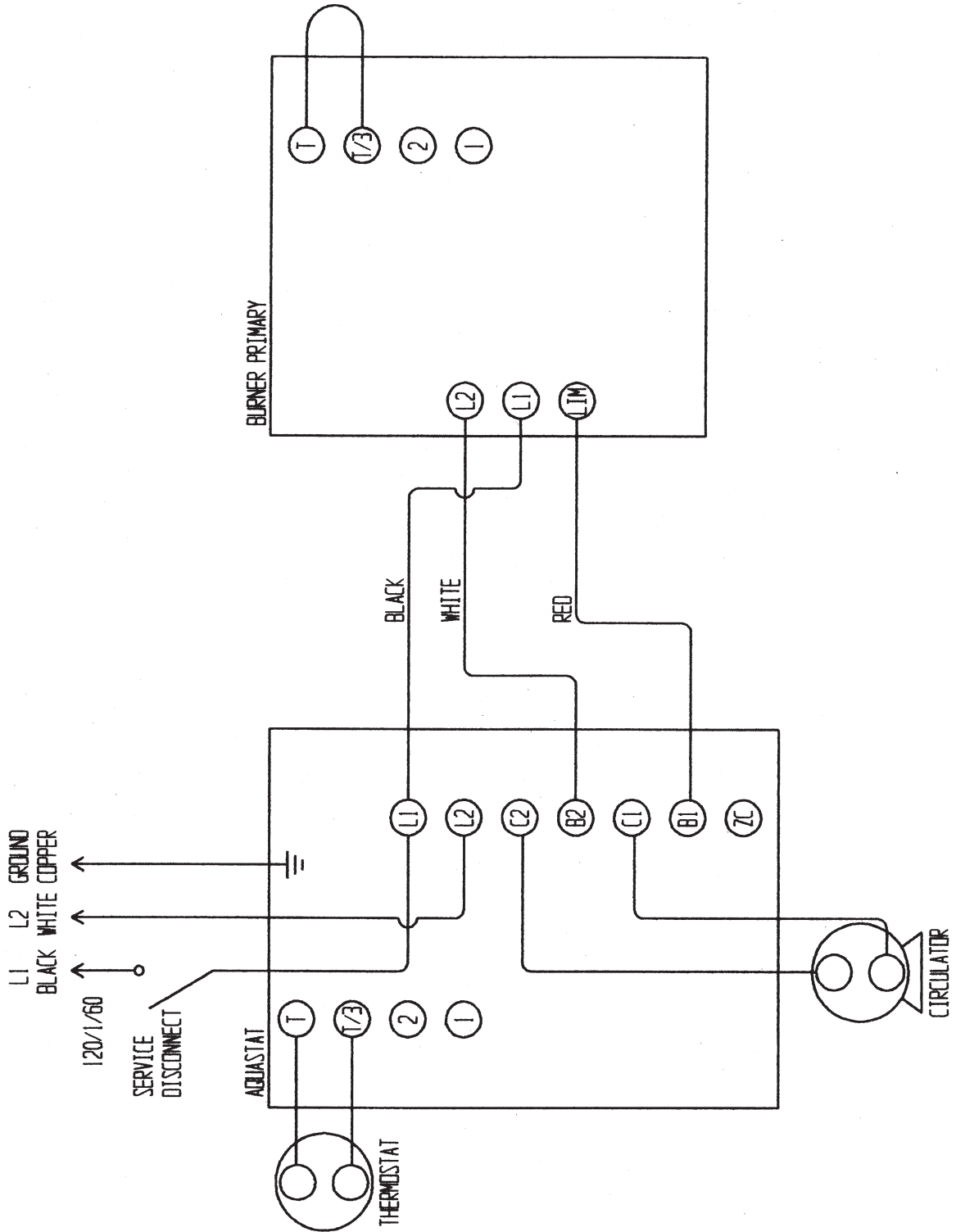
ELECTRICAL DIAGRAM FOR HT SERIES BOILERS TO CONNECT BURNER TO AQUASTAT

(APPLIES TO BECKETT CHIMNEY VENT BURNERS)



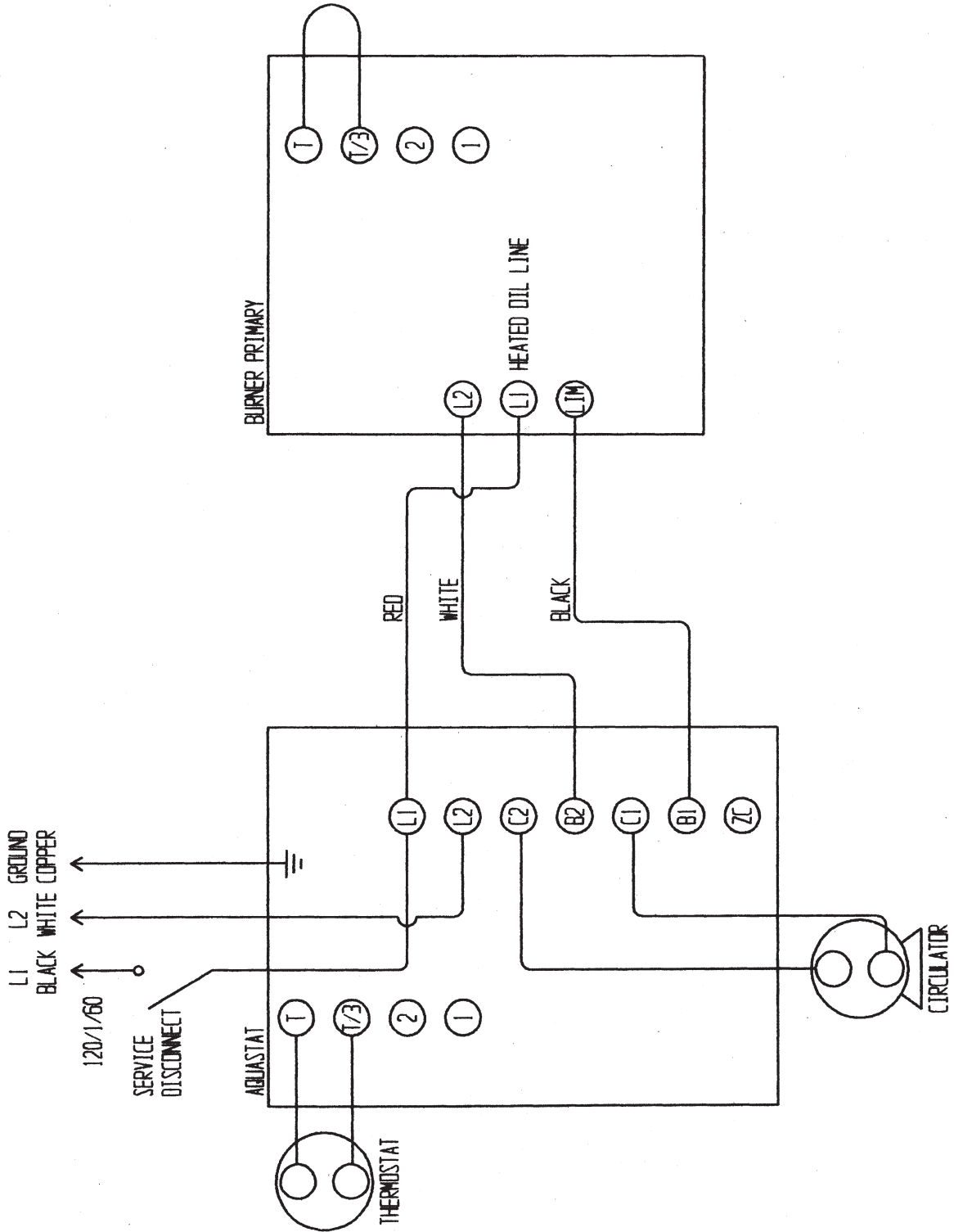
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(APPLIES TO BECKETT DIRECT VENT BURNERS)



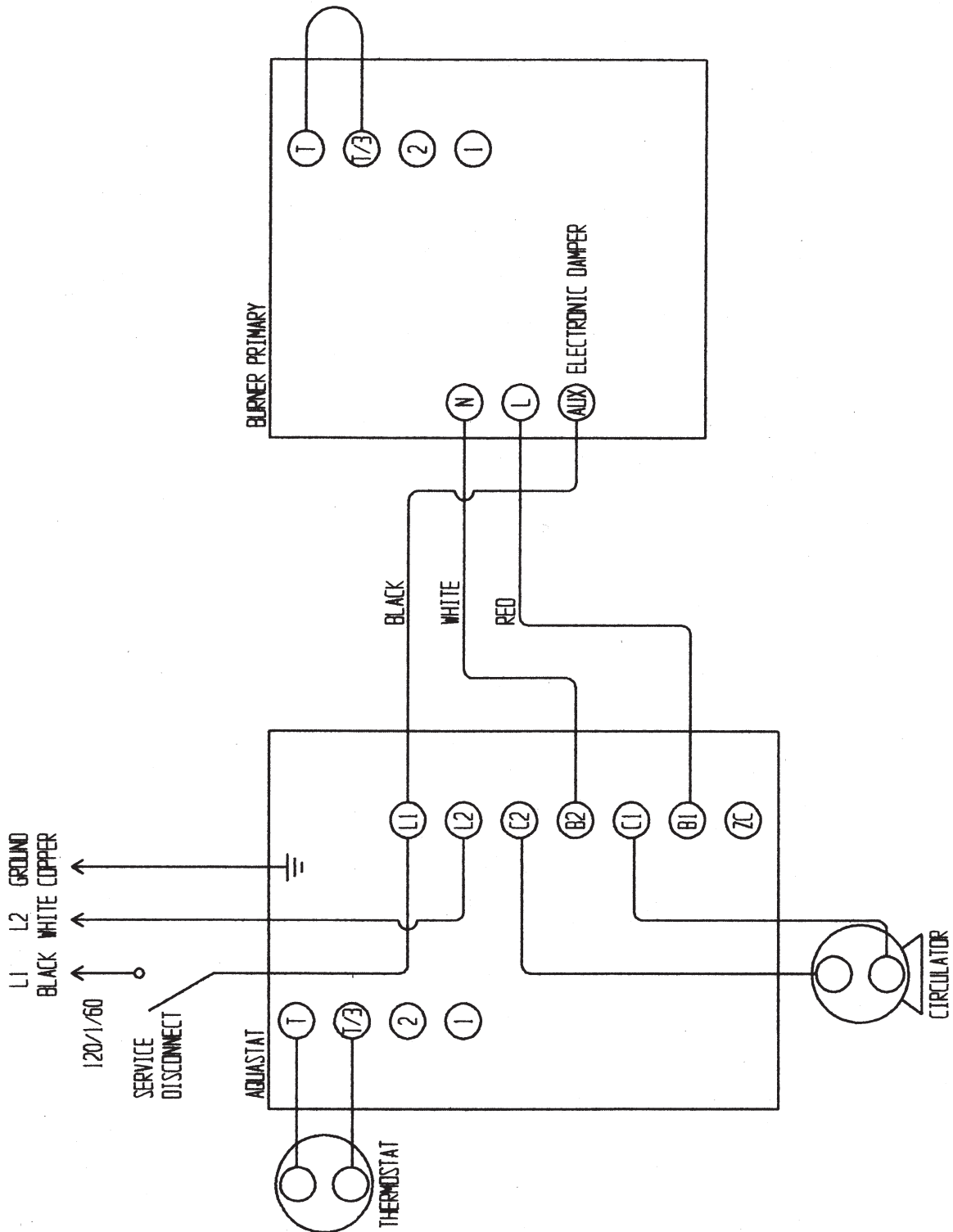
ELECTRICAL DIAGRAM FOR HT SERIES BOILERS TO CONNECT BURNER TO AQUASTAT

(APPLIES TO CARLIN CHIMNEY VENT AND CARLIN DIRECT VENT BURNERS)



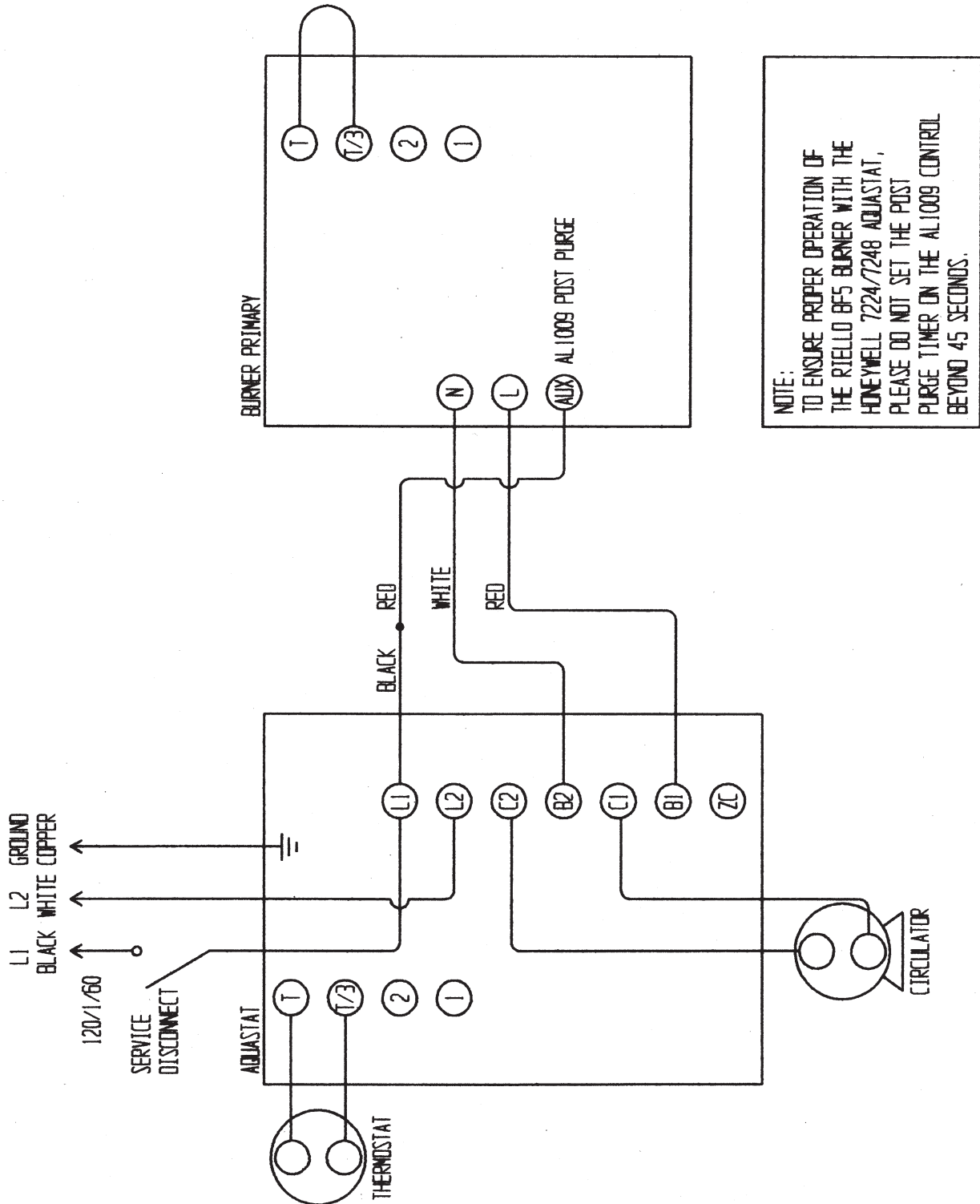
ELECTRICAL DIAGRAM FOR HT SERIES BOILERS TO CONNECT BURNER TO AQUASTAT

(APPLIES TO RIELLO CHIMNEY VENT BURNERS)



ELECTRICAL DIAGRAM FOR HT SERIES BOILERS TO CONNECT BURNER TO AQUASTAT

(APPLIES TO RIELLO DIRECT VENT BURNERS)



NOTE:
TO ENSURE PROPER OPERATION OF THE RIELLO BF5 BURNER WITH THE HONEYWELL 7224/7248 AQUASTAT, PLEASE DO NOT SET THE POST PURGE TIMER ON THE AL1009 CONTROL BEYOND 45 SECONDS.



Thermo-Dynamics Boiler Company

Route 61 - P.O. Box 325, Schuylkill Haven, PA 17972
 (570) 385-0731 • Fax (570) 385-5304 • sales@thermodynamicsboiler.com

Limited Lifetime Warranty for Residential Steel Water Boilers

Effective July 1, 2000

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

FIRST YEAR, LIMITED WARRANTY, RESIDENTIAL WATER BOILERS

Thermo-Dynamics Boiler Company ("Thermo") warrants to the original consumer purchaser ("purchaser") that its residential water boiler is free from defects in material and workmanship under normal usage for one year from the date of original installation. If any parts are found to be defective in manufacture during this one year period, Thermo will, at its option, repair or replace the defective part.

SECOND THROUGH FIFTEENTH YEARS, LIMITED WARRANTY, RESIDENTIAL BOILERS

Thermo warrants to purchaser that the pressure vessel of its residential steel boilers are free from defects in material and workmanship. If such pressure vessel proves to be defective under normal usage within fifteen (15) years of the date of installation, Thermo shall, at its option, furnish a replacement or repair such pressure vessel. Purchaser's remedy shall be limited to such repair or replacement.

SIXTEENTH THROUGH TWENTY-FIFTH YEARS AND BEYOND

In the event that a pressure vessel is found to be defective sixteen (16) years or more following installation, Thermo will repair or replace the pressure vessel and the purchaser will pay a proportionate charge for the time the pressure vessel has been in service based upon a percentage of the list price of such vessel at the time Thermo is notified of the defect, as listed in the table below.

EXCEPTIONS AND EXCLUSIONS

1. Component parts, coil, fire chamber, burner, jackets, controls, and other equipment furnished by Thermo but manufactured by others shall be limited to the manufacturer's warranty, if any.
2. This warranty is applicable only to models of residential steel water boilers installed in one or two family residential dwellings in accordance with the basic BOCA Building Code and local statutes or ordinances, whichever shall be more restrictive.
3. This warranty does not cover expenses for removal or reinstallation. The purchaser will be responsible for the cost of removing and reinstalling the defective part or its replacement and all labor and material connected therewith. The purchaser will be responsible for returning the defective pressure vessel prepaid. Replacement pressure vessels or components will be invoiced by Thermo in the usual manner and will be subject to adjustment upon proof of defect.
4. This limited warranty is applicable only to defects in material and workmanship and shall not cover failure of the pressure vessel or other components due to any other reason including, but not limited to (a) lack of water, (b) freezing, (c) floods, (d) fire, (e) acts of God, (f) negligent or improper operation or installation, (g) corrosion of tubes or plates (such as

oxygen attack), (h) leaky gaskets, (i) improper water conditioning, (k) improper maintenance of external and fireside surfaces.

5. This limited warranty will not be applicable if the boiler is used or operated over its rated capacity, or installed for uses other than home heating, or is not maintained in accordance with Thermo's recommendation or accepted good practice as determined by industry standards.

6. This limited warranty in no way can be considered as a guarantee of workmanship of an installer connected with the installation of the Thermo water boiler or as imposing on Thermo's liability of any nature for unsatisfactory performance as a result of faulty workmanship in the installation, which liability is expressly disclaimed.

7. This warranty applies only to boilers installed within the United States of America.

8. This warranty is in lieu of all others, and any and all expressed or implied warranties (including, without limitation, any implied warranties of merchantability or fitness for a particular purpose) are expressly limited in duration to the period of the warranty as previously stated herein. Some states do not allow the exclusion or limitations of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY SHALL BE LIMITED TO THE DURATION OF THE EXPRESSED WARRANTY. THERMO SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES RESULTING FROM BREACH OF THIS OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED.

This warranty does not apply to swimming pool and outdoor boilers. See the specific warranty for those products.

WARRANTY SERVICE

1. Proof of purchase is required to validate warranty. This limited warranty does not extend to anyone except the first purchaser at retail and only when the boiler is in the original installation site.
2. For prompt warranty service, notify the installer who will notify the Thermo distributor from where the boiler was purchased. If this action does not result in warranty service, write to Thermo at the address listed above or contact us on our website. Alleged defective parts must be handled through trade channels and using Thermo's returned goods procedure. Thermo will furnish replacement or repaired parts to the Thermo Distributor who will furnish them to the contractor who installed the boiler.

If you have any questions concerning the coverage of the warranty, contact Thermo at the address listed above or at our website.

Years In Service	1-15	16	17	18	19	20	21	22	23	24	25 and above
Service Charge as % of Retail Price	No Charge	30	35	40	45	50	55	60	65	70	75

Note: Lifetime Limited Warranty applies only to Boiler Pressure Vessel.

BURNER SERVICE SET-UP RECORDS

	Initial Set Up 1	2	3	4	5
1. Date					
2. Model Number					
3. Firing Rate					
4. Pump Pressure*					
5. CO2					
6. "0" Smoke					
7. Gross Stack°F					
8. Draft Over Fire					
9. Replaced Filter Yes/No					
10. Replaced Nozzle Yes/No					
11. Clean Pump Filter Yes/No					
12. Inspect Coil Gasket					
13. Check for Leaks @ plugs/fittings					
14. Brush Clean Flue Tube Passages					
15. Vacuum Chamber/Flue Tubes					
16. Clean Blower Wheel					
17. Check/Set Electrodes					

*See pump pressure according to the installer/serviceman labels for Series I and II boilers.