

LM Series

Installation Operation Maintenance Manual



Thermo-Dynamics Boiler Company

ROUTE 61 • P.O. BOX 325 • SCHUYLKILL HAVEN, PA 17972
(570) 385-0731 FAX (570) 385-5304

CONTENTS

Service Policy	1
Component Arrangement	2
Installation.....	3
Operation.....	6
Burner Service Information	13
Maintenance	14
Parts List	16
Trouble Shooting	17

IMPORTANT

Read carefully and consult drawings before beginning work

The instructions, drawings, and data included in this manual are only guidelines. The equipment shall be installed in accordance with those installation requirements of the authority having jurisdiction or in the absence of such requirements to the current edition of NFPA-31. (Available from the National Fire Protection Association)

When required by the authority having jurisdiction, the installation must conform to American Society of Mechanical Engineer Safety Code for controls and safety devices for automatically fired boilers, No. CSD-1.

WARNING: IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE CAN CAUSE INJURY OR PROPERTY DAMAGE.

CODE COMPLIANCE IS THE SOLE RESPONSIBILITY OF THE INSTALLER.

Service Policy

Anything mechanical will inevitably need servicing. Oil fired heating equipment is routinely serviced by the installer and/or oil company. Occasionally servicemen cannot correct problems as they arise. When these types of situations arise the dealer or service organization should contact the selling distributor for help.

If the problem still persists the distributor will contact the sales representative for assistance. Depending on the magnitude of the problem, the representative may have to request technical assistance from the factory.

We have a "Quality/Technical Services," department which is prepared to answer questions and deal with requests for field assistance. When necessary, personnel are available for field assistance. There is, however, a procedure which must be followed.

If the problem cannot be resolved by the representative, he should contact Technical Services at the factory and request help. (At this point a serial number should be determined.) If the problem cannot be corrected by phone and a field visit is deemed necessary, the Technical Services person will co-ordinate his services through the sales representative. To best satisfy the service need, it is required that all key persons involved be made available to meet at the job site.

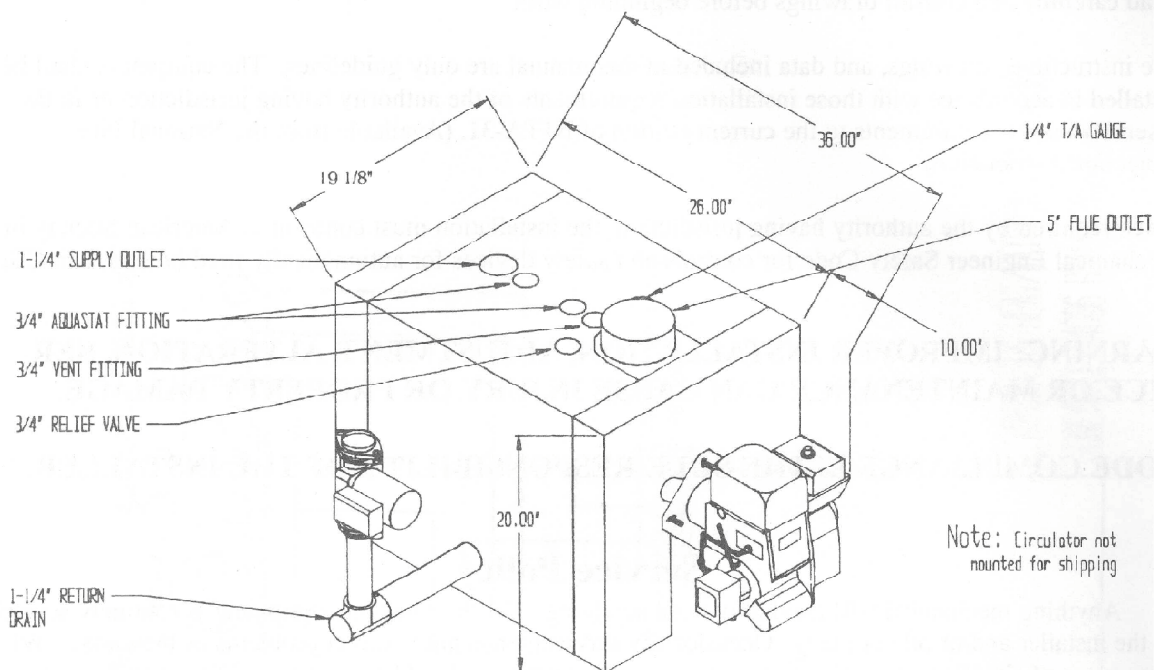
That is:

1. The Installer/Service person
2. Distributor personnel
3. Sales Representatives
4. Technical Service personnel

It is imperative that persons from all four categories are in attendance to assure customer satisfaction, as well as to better train and equip each one for future servicing needs.

We must insist that this guideline is followed to assure good, sound field service.

Component Arrangement



SPECIFICATIONS	Model-75	Model-100	Model-110
HEATING CAPACITY BTU/HR	89,355	118,300	128,600
IBR NET RATING BTU/HR	77,700	102,900	118,000
INPUT BTU/HR	105,000	140,000	154,000
INPUT #2 OIL GPH	0.75	1.00	1.10
CHIMNEY SIZE	8 X 8 X 15	8 X 8 X 15	8 X 8 X 15
BOILER DRAFT LOSS INCHES	+.05	+.08	+.10
WATER CONTENT	5.5 GAL.	5.5 GAL.	5.5 GAL.
BOILER HEIGHT WITH AQUASTAT	25"	25"	25"
JACKET WIDTH	19-1/8"	19-1/8"	19-1/8"
HYDRONIC SUPPLY HEIGHT	20-1/2"	20-1/2"	20-1/2"
BURNER HEIGHT TO CENTERLINE	9-3/8"	9-3/8"	9-3/8"
HYDRONIC RETURN HEIGHT	5"	5"	5"
FLUE OUTLET DIAMETER	5"	5"	5"
JACKET DEPTH	25-1/2"	25-1/2"	25-1/2"
BOILER DEPTH WITH BURNER	34"	34"	34"
RETURN HEIGHT	5"	5"	5"
HYDRONIC SUPPLY SIZE	1-1/4"	1-1/4"	1-1/4"
HYDRONIC RETURN SIZE	1-1/4"	1-1/4"	1-1/4"
DOE AFUE RATING	85.2	84.0	83.0

Installation

I. GENERAL

THIS Series of hot water boilers are high quality oil fired high efficiency horizontal firetube heating units. The installation of the unit shall be in accordance with regulations of the authorities having jurisdiction. refer to the Local Installation Codes for Oil Burning Equipment, for recommended installation practice.

II. FREIGHT CLAIMS

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

III. SIZING

A complete heat loss calculation of the structure is necessary to choose the proper size unit.

Oversizing will result in short cycling and inefficient operation. In order to insure proper sizing of the unit, domestic hot water requirements and the structure heat load must be calculated.

Replacement boilers should not be sized from the firing rate of the old boiler. A recent DOE sponsored study indicates 65% of the heating units in U.S. homes are substantially oversized.

IV. LOCATION

Place the boiler on a level floor, preferably raised and as near to the chimney or venting devise as possible.

Allow clearances as follows in accordance with local codes and NFPA-31.

MINIMUM CLEARANCE TO COMBUSTIBLE MATERIALS

Sides - 2"

Rear - 2"

Front - 12"

Chimney Connector - 6"

For clearances less than the above listed consult NFPA-31, Table 4-2 Appendix B.

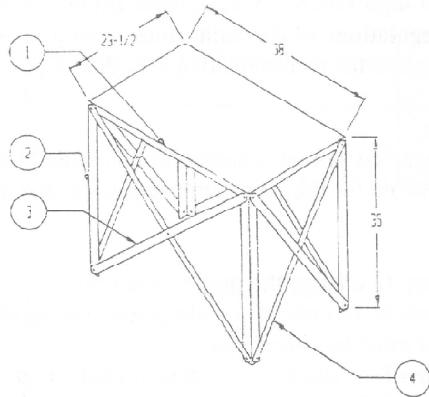
To move the unit, push against the flue box or skids. Pushing or pulling on the jacket or burner will result in damage.

Be sure to level the unit by inserting metal shims under the elevated base.

WARNING: BOILER MUST NOT BE INSTALLED ON CARPETED FLOORS.

V. TANK STAND ASSEMBLY

This series of boilers can be installed on the optional tank stand in order to minimize floor space requirements when using the boiler in conjunction with an indirect fired water heater.



Item	Quantity	Description
1	1	Top
2	4	Legs
3	4	Large Cross Brace
4	4	Small Cross Brace
	20	3/8-16 Bolts
	20	3/8-16 Nuts
	20	3/8-16 Washers

The following procedure is required for the proper assembly of the tank stand:

- Place the stand top upside down on a level floor.
- Assemble the small cross braces by bolting them together through the center hole. Do not at this time completely tighten the bolts.
- Stand two of the legs up along the short side the top on the outside of the top. Fasten the cross braces through the legs and tighten all bolts. Repeat for the other side.
- Assemble the long side braces to the legs and themselves.

Place the tank stand on a level floor in its proper location before setting the boiler on top. If the floor is not level be sure to level the stand by inserting metal shims under the tank stand legs. Once the boiler is positioned on the stand do not attempt to move the stand.

VI. AIR FOR COMBUSTION AND VENTILATION

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

A. 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 area 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 1,000 Btu (140 square inch per US gph) of the total input for all appliances in the enclosure. One opening located near the top of the enclosure and one near the bottom.

B. Basement

1. Where a boiler is installed in a full basement, infiltration is normally adequate to provide air for combustion.

2. Buildings of tight construction where the basement windows are weather stripped, one opening communicating with a well ventilated attic or with the outdoors should be provided. 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.

C. Special Conditions

Where a boiler is located in an area where the operation of 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.

VII. BOILER PIPING

This series of boilers is equipped with a built in Air Scoop. This feature allows quiet air free operation of your hot water system by assuring the removal of air pockets without the use of Air Scoops to trap noisy air.

The 1-1/4" supply fitting on the top of the boiler extends approximately 1" below the top 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 must be purged through the 3/4" vent tapping by using an Automatic Float Vent, a Manual Vent or piped into a conventional expansion tank.

The recommended locations of circulators, expansion tanks, etc. can be found in the piping diagrams included in this manual.

Relief valve discharge and drain valve piping should be piped to a safe place of discharge.

This series of boiler virtually eliminates all standby losses with its low water content. Because this boiler is also extremely efficient a bypass loop shall be installed between the supply and return of the boiler to maintain boiler water temperature during a call for heat. Consult the piping diagram in this manual for typical bypass piping.

Regulation of the bypass is accomplished by the gate valve installed in the loop. The gate valve should be initially set to the full open position. Final adjustment of the gate valve should be done as your system stabilizes. The valve should be closed down only enough to ensure adequate heat to all system loops.

Failure to install a bypass loop may cause excessive condensation causing premature failure of the boiler due to corrosion.

VIII. STORAGE TANK PIPING

The recommended locations of circulators, expansion tanks, etc. are illustrated in the piping diagrams included in this manual.

It is recommended that the indirect fired water heater be wired to give preference to the domestic water so that when the tank thermostat calls for heat the flow of heat to the rest of the house is turned off. Consult the wiring section of this manual for additional details.

Always consult the tank water heaters installation and operation manual for proper supply piping sizes, location of T & P relief valve and any other information relating to the proper installation of the tank.

A thermal expansion tank may be required on those tanks which are equipped with check valves or back flow preventers on the cold water supply.

X. PLATE TYPE HEAT EXCHANGER

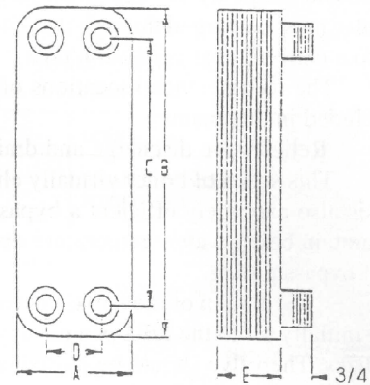
Optional plate type heat exchangers are available from the manufacturer to convert existing electric storage water heaters into an efficient and economical package. The following performance data shows the amounts of water which can be generated using the TTP-1-14 heat exchanger.

Technical Data

Boiler Model	Boiler Circulator Flow GPM	Boiler Circulator Pressure Drop PSI	GPM Domestic Hot Water @ 90° Rise	Bronze Circulator Pressure Drop PSI	Performance GPH With 50 Gal. Storage Tank @ 90° Rise	
					1st Hour	Continuous
Model-75	4	1.5	2	0.5	158	120
Model-100	5	2.5	2.6	0.7	194	156
Model-110	5.5	3.0	2.9	0.8	212	174

Dimensional Data

Model	Dimensions (inches)					Wt. (lb)
	A	B	C	D	E	
TTP-1-1/4	2-7/8	8	6-5/8	1-3/8	1-5/8	.65



Materials

Plates and connections: AISI 316 Stainless Steel

Solder: Copper 99.9%

Operating Conditions

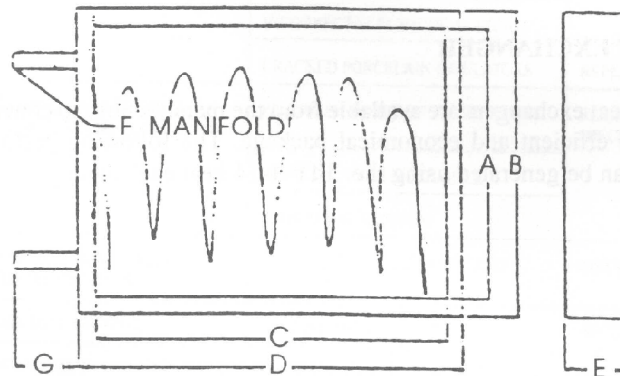
Max. Working Pressure: 450 PSI

Max. Working Temperature: 365°F

Refer to the piping diagrams included in this manual for typical application piping.

XI. OPTIONAL FAN COIL DATA

Fan coils provide an efficient method of converting existing electric forced air systems or heat pump systems to operate with the comfort and economy of oil heat. For your convenience we offer two optional fan or duct coils which will suit almost all residential heating applications.



DIMENSIONAL DATA

Model	Rows	Face Area	A	B	C	D	E	F	G	Tube Size	CKT S	Ship Wt.
TDC-60	2	2.08	15	17	20	22	3-3/4	7/8	4-1/2	1/2	4	15
TDC-105	2	3.47	20	22	25	27	3-3/4	7/8	5	1/2	8	23

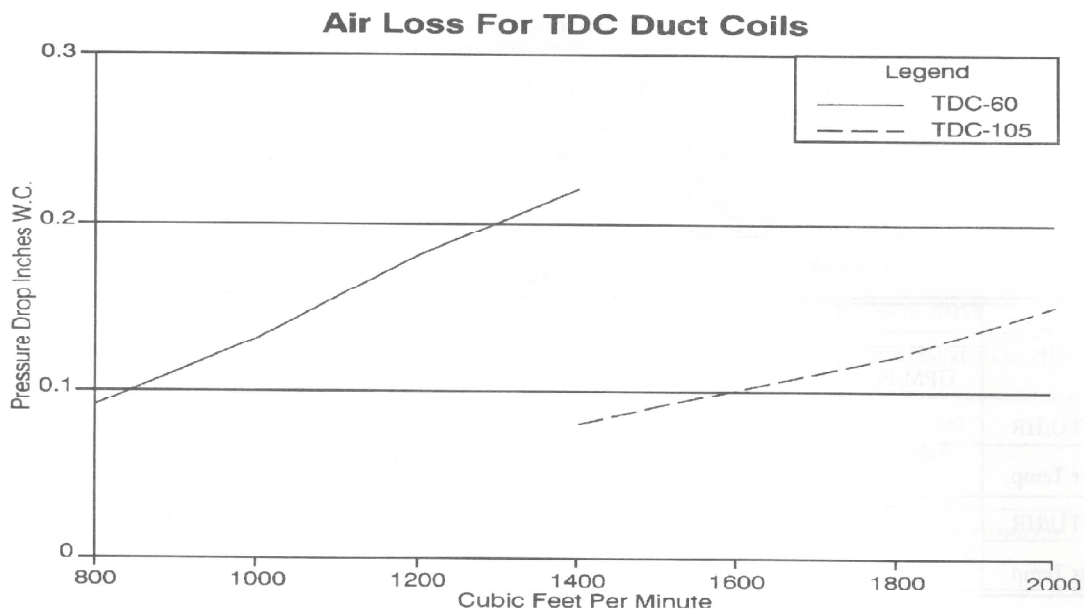
RATINGS MODEL 60

TDC 60		150° Entering Water Temp.			180°F Entering Water Temp.		
	GPM/PD'	800 CFM	1000 CFM	1200 CFM	800 CFM	1000 DVM	1200 CFM
BTU/HR	7.2/2.14'	38230	43686	51163	54521	61640	67432
Air Temp.		103.8	100.1	99.1	122.5	116.6	111.6
BTU/HR	12.0/5.9'	42951	47637	52533	56263	64018	69972
Air Temp.		109.3	103.7	100.2	124.5	118.7	113.5

RATINGS MODEL 105

TDC 105		150° Entering Water Temp.			180°F Entering Water Temp.		
	GPM/PD'	800 CFM	1000 CFM	1200 CFM	800 CFM	1000 DVM	1200 CFM
BTU/HR	9.6/.65'	63944	71961	81152	89924	96669	106428
Air Temp.		101.9	98.8	97.2	118.9	112.2	108.8
BTU/HR	14.4/1.61'	72185	76186	85347	91424	106022	111500
Air Temp.		107.3	101.1	99.2	119.9	117.2	111.1

*Above ratings based on 60°F entering air temperature.



NOTE: WHEN THE BOILER IS CONNECTED TO THE HEATING COILS LOCATED IN AN AIR HANDLING UNIT WHERE THEY MAY BE EXPOSED TO REFRIGERATED AIR CIRCULATION, THE BOILER PIPING SYSTEM MUST BE EQUIPPED WITH FLOW CONTROL VALVES OR OTHER AUTOMATIC MEANS TO PREVENT GRAVITY CIRCULATION OF BOILER WATER DURING THE COOLING CYCLE.

XI. BURNER AND CONTROLS

Boilers are shipped with the burner installed and prewired.

All wiring must be done in accordance with the local Electric Code.

A. Oil Primary Control

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

The cad cell will stop the oil burner within a predetermined number of seconds if the fuel fails to ignite or if the flame goes out during operation. The oil burner will remain off until the red reset button on the relay has been pushed. **(Reset must never be pressed more than once during a single flame failure.)**

The primary control is mounted on the standard 4" x 4" conduit box on the right side of the burner.

XII. SEQUENCE OF OPERATION

When room temperature or the indirect water heater temperature falls below the thermostat setting, the thermostat calls for heat starting the burner and circulating pump. The burner and pump continue to operate until room heating requirements are satisfied.

If the boiler high limit is reached the burner will shut off with the circulator continuing to operate.

If the thermostat continues to call for heat after the boiler temperature falls below the high limit setting the burner will restart.

It is recommended that the indirect fired water heater be wired so that when its thermostat calls for heat the flow of heat to the rest of the house is turned off. Consult the wiring section of this manual for additional details.

XIII. FUEL SYSTEM

Note: Pump pressure must be set as follows:

Beckett AFII140 PSI

Riello F5150 PSI

Carlin EZ-1140 PSI

Connect burner to oil supply. Refer to fuel unit manufacturers literature for piping connections and tank installation. If such information is unavailable use the following guidelines.

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 joists should be avoided.

All oil feed lines to burners must be air tight. Use only flare fittings when assembling oil lines since the slightest air leak, caused by loose fittings, bad gaskets or any other reasons will cause any of the following conditions.

1. Intermittent firing, causing safety shutdown.
2. Poor starts.
3. Smoky starts.
4. Continual sooting of the boiler and burner parts including the cad cell.
5. Reduce firing rate, inefficient operation and erratic fire pattern.
6. A dangerous combustion condition, allowing the furnace to fill with a lean mixture which could cause a delay in the fuel mixture until the danger point has been reached.

A. Single Stage Fuel Units

1. 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 "bypass" plug in the fuel unit is then required. The return line automatically purges air from fuel units and returns it to the tank.

2. Two Stage Fuel Unit

If the height difference between the burner and the fuel supply level exceeds 10 feet, a two stage unit should be used, and a return line should be installed.

B. 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 of floor joists should be avoided.

C. 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. Install with flare fittings.

D. 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. Install with flare fittings.

E. Suction Vacuum

Suction vacuum must be held to acceptable limits. The vacuum test is worth the time required to make it. This problem becomes proportionally larger with underground tanks.

Suction vacuum must not exceed 10 inches of mercury for single stage pumps and 15 inches of mercury for two stage pumps.

When the suction line is tight and properly installed the pump will hold its vacuum after shutdown.

Installation of a check valve is advisable in the suction line.

XIV. FLUE SYSTEM

General

AN OIL FIRED UNIT SHALL BE CONNECTED TO A FLUE HAVING SUFFICIENT DRAFT AT ALL TIMES TO ASSURE PROPER OPERATION AND EVACUATE COMBUSTION GASES TO THE ATMOSPHERE.

A. Draft

The draft regulator should be installed in accordance with the manufacturer's instructions. Set draft in flue to -.02 (negative).

Set the draft to positive 0 to +.10 inches W.C. over the fire.

B. Venting System

1. Use only an approved venting system.

2. Flue or vent connector must be the same size or larger than the outlet at the unit, and must be inserted into but not beyond the inside wall of the chimney flue.

3. The horizontal length of a chimney connector should not exceed 10 ft. unless a draft booster is used. The connector should be pitched at least 1/4" to the foot toward the unit.

C. Roof Clearances

The chimney flue should extend at least 3 ft. above the highest point at which the chimney comes in contact with the roof, and no less than 2 ft. above the highest roof surface or structure within 10 ft. horizontally of the chimney.

XV. WIRING

The internal wiring on package units is completed at the factory. **This unit must be electrically grounded and wired in accordance with the requirements of the authority having jurisdiction or in the absence of such requirements, with the current edition of the National Electrical Code, ANSI/NFPA No. 70.** Refer to wiring diagram for electrical connections.

The boiler should be connected by a separate, permanently live electrical supply line with a 15 AMP fused rating. Use No. 14 AWG wires rated for at least 90°C. Install a separate fuse disconnect switch near the unit so power can be shut off for servicing.

Caution: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

Install the room thermostat on an inside wall away from fireplaces, appliances or sunlight. Set the heat anticipator to 0.2 amps. Connect the thermostat leads to the “TT” connections on the aquastat control.

The indirect fired water heater, if used, should be wired in such a fashion that the heat to the building is temporarily shut off when there is a demand for domestic hot water. This requires the use of a L6006A-1145 aquastat mounted on the tank which will work with zone valves or circulator relays. Commercially available circulator prioritizing packages are available. Consult factory for their application.

Operation

I. START UP

DO NOT START UNLESS CHIMNEY CLEAN OUT DOORS ARE IN PLACE.

- A. Make sure service switch to boiler is off.
- B. Make sure boiler has been filled with water until entire system has been purged and desired pressure is obtained.
- C. Check to make sure the oil storage tank is filled with No. 2 heating oil.
- D. Make sure all manual shut off valves in the fuel system are open.
- E. Set limit switch at 200°F.
- F. Check settings shown in the manual. Adjust as required.
- G. 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.
- H. On one pipe systems bleed the pump as soon as the burner motor starts. To bleed, attach a piece of 1/4” OD plastic tubing to the end of the bleed port. Loosen same and purge oil of AIR for at least 15 seconds after oil stream appears to be clear. If oil stream does not become clear and free of air bubbles or foam, check all fittings, filter and valve connections. Kinks can cause a high vacuum condition which can cause oil to foam and therefore must be eliminated.

NOTE: See fuel pump information sheet for additional details.

II. START UP ADJUSTMENTS

A. Equipment Required

1. CO2 analyzer
2. Draft Gauge
3. Fuel Pressure Gauge
4. Stack Thermometer
5. Smoke Tester

B. Burner Adjustments

Allow the burner to operate for at least 15 minutes and then make the following adjustments:

- (1) Sampling Hole - Punch a 1/4" hole in the flue box and the draft regulator. Test readings should be taken at this point or inspection port.
- (2) Draft - Take a draft reading from the inspection port above the burner, directly in the combustion chamber. This reading **must** be taken **DURING** combustion. This "Over-the Fire" reading must be **POSITIVE** pressure of 0 to +.1. Adjust the barometric draft regulator accordingly. Tall chimneys may require a second draft regulator in the flue pipe to regulate draft under high draft conditions.
- (3) Pump Pressure - Install a pressure gauge in the 1/8" gauge port or nozzle port of the fuel pump. **Do Not take readings at the Bleed Port.** Adjust the pump pressure to 140 psi.
- (4) Combustion Set-up - Air Band settings shown in the table are approximate. The Burner **MUST** be set-up and adjusted during actual Field installed conditions. After the proper draft and pump pressure have been established:
 - (a) Begin to close the Air Band to create a slight TRACE of Smoke. (As noted on the Bacharach Smoke Tester Scale).
 - (b) Take a Flue Gas Sample and note the CO2 reading, it will be about 13%.
 - (c) Open the Air Band to REDUCE CO2 approximately 2%.
 - (d) Check for a "0" SMOKE. (Head Setting and/or Air Band may be altered to obtain the above results.)

Lock Air Band Head Setting screws in place.

THE ABOVE PROCEDURE WILL GIVE A BUILT-IN MARGIN TO ENSURE CLEAN OPERATION THROUGHOUT THE HEATING SEASON.

Should draft condition vary, lint accumulate in the fan, heavier oil be delivered, or other adverse variables be encountered, you have a reasonable margin of built in protection before smoke generation begins.

III. BURNER SERVICING

A. Burner Components

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

B. Nozzles

Use only the correct nozzle specified in the burner parts list in this manual. Be extremely careful not to touch the nozzle orifice to avoid scratches or dirt which may cause leaks or effect the oil spray pattern.

C. Set Up

For specific set up procedures refer to the Installer/Serviceman Decal on the boiler or to the burner manual provided in the home owners envelope.

PRELIMINARY BURNER SETTINGS

Model Number	Burner Type	Nozzle Size	Pump Pressure	Bar Head Type or Pin #	Air Shutter	Air Band
Model-75	Beckett AFG	.65-80°A	140 PSI	F3 *	10 Open	Closed
	Beckett AFII	.65 -70°B	140 PSI	0 Pin	—	4-1/2
	Carlin EZ-1	.65-60°A	140 PSI	.75	—	.75
	Riello F5	.65-60°W	150 PSI	.5	2.5	—
Model-100	Beckett AFG	.85-80°A	140 PSI	F4	10 Open	Closed
	Beckett AFII	.85-70°B	140 PSI	0 Pin	—	5-1/2
	Carlin EZ-1	.75-60°A	140 PSI	.85-100	—	1.25
	Riello BF5	.75-60°W	150 PSI	2.5	3.0	—
Model-110	Beckett AFG	.90-80°A	140 PSI	F-6	10 Open	1
	Beckett AFII	.90-70°B	140 PSI	3 Pin	—	6
	Carlin EZ-1	1.00-60°A	140 PSI	1.10-1.25	—	1.25
	Riello BF5	.85-60°W	150 PSI	3.5	3.5	—

* Equipped with Low Firing Rate Baffle. Please remove when up firing to 1.0 to 1.1.

DRAFT OVERFIRE will vary with firing rate, expect to see 0 to +.10.

DRAFT IN STACK adjust to -.02.

CO₂% all models adjust to 10 - 11-1/2.

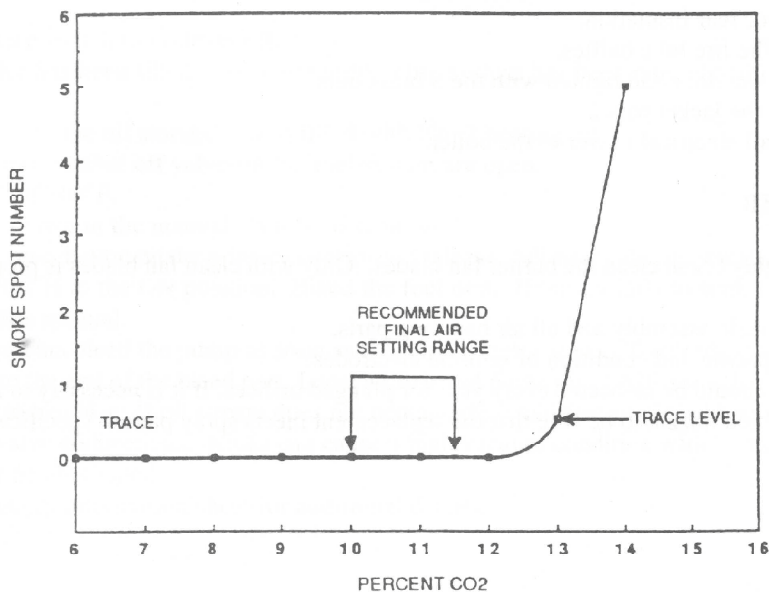
SMOKE READING all models 0.

All AFG Burners STD. with delay oil valve.

All Beckett and Carlin Burners come with fuel pumps preset at 140 PSI.

All Riello Burners come with fuel pumps preset to 150 PSI.

TYPICAL SMOKE V/S CO₂ PERCENT CURVE



Maintenance

I. IMPORTANT

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

DO NOT USE THE BOILER IF ANY PART HAS BEEN UNDER WATER. CALL A QUALIFIED SERVICE TECHNICIAN TO INSPECT THE BOILER AND REPLACE ANY PART OF THE CONTROL SYSTEM THAT HAS BEEN UNDER WATER.

NEVER OPERATE THIS APPLIANCE WITH ANY SWITCHES JUMPERED OR DISABLED. NEVER ATTEMPT TO MODIFY THIS APPLIANCE IN ANY FASHION.

II. OIL FILTER

The oil filter cartridge should be replaced annually.

III. HEAT EXCHANGER

At the beginning of each heating season, boiler flue passages and the oil burner should be checked for cleanliness and if necessary they should be cleaned. The boiler may be cleaned from either the front or rear by removing the jacket panel and the front or rear door. The following procedure is required for inspection and cleaning of the boiler flue passages.

- a) Turn off all electrical power to the boiler before inspecting and cleaning.
- b) Remove either the boiler front or rear jacket panel.
- c) Remove the 8 brass nuts which hold on the door. The front door swings open for access. The rear door must be completely removed.
- d) Remove the fire tube baffles.
- e) If required remove scale and any soot deposits with a flexible 2" flue brush. Be careful not to damage the front or rear insulation.
- f) Replace the fire tube baffles.
- g) Reinstall the door and tighten with the 8 brass nuts.
- h) Reinstall the jacket panel.
- i) Turn on all electrical power to the boiler.

IV. OIL BURNER

A. Thoroughly brush clean the burner fan blades. Only with clean fan blades is proper combustion air delivery possible.

B. Clean nozzle assembly and all air handling parts.

C. Check spacing and condition of ignition electrodes.

D. Nozzles should be inspected every year for plugged orifices. If it is necessary to replace the nozzle, use only the specified nozzle to be sure that the replacement meets spray pattern specifications for the burner.

V. LUBRICATION

Lubricate the burner and circulator motor annually with 2 drops of SAE-10 non-detergent oil.

VI. HOMEOWNER INFORMATION

A. General

NEVER BURN GARBAGE OR REFUSE IN YOUR HEATING UNIT. NEVER TRY TO IGNITE OIL BY TOSSING BURNING MATERIAL INTO YOUR BOILER AND NEVER 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.

Retain this manual for future reference. For routine service or maintenance as described in this manual is required, contact a qualified service agency. **DO NOT ATTEMPT TO MAKE REPAIRS.** An inadvertent service error could result in a dangerous condition.

The boiler should be kept accessible at all times for ease of service.

B. Combustion Air Supply

Your burner requires an ample amount of clean air in order to completely and efficiently burn its fuel. If an ample supply is not available, erratic operation, noisy combustion, and fuel odors in the air may result. Remember that venting fans or a vented dryer will greatly increase the need for outside air.

C. Oiling Motor

The life of the burner motor and circulator motor will be increased by regular oiling. Place a few drops of non-detergent oil in both motor oiling ports once a year.

D. Filter

Replace the cartridge filter in the line every year to avoid fuel unit and nozzle contamination. Clean screen in fuel pump.

E. Area Around Boiler

The area around the boiler should be kept clean and free of any combustible materials, particularly oily rags and papers. The boiler should be accessible for ease of service. If burner is shut down for an extended period of time, shut off manual fuel supply valve. Brush clean flue passages and vacuum clean unit. Inspect for leaks at gaskets and fittings. Follow starting procedures to restart.

VII. SERVICE INFORMATION

To avoid unnecessary expense and inconvenience, the boiler and burner should be cleaned and serviced at least once a year by a qualified serviceman. If difficulty occurs, the following should be observed before calling the serviceman:

A. Check to be sure that there is fuel in the tank.

B. Check to see if the thermostat setting is above room temperature.

C. Check to see if the service switch is in on position.

DO NOT TAMPER WITH THE UNIT OR ITS CONTROLS.

PARTS LIST

Model-75/100/110 BOILER

REPAIR PARTS ARE AVAILABLE FROM YOUR INSTALLER OR BY CONTACTING
THE MANUFACTURER

NOTE: INCLUDE BOILER MODEL AND SERIAL NUMBER WHEN ORDERING PARTS

ITEM NO.	PART NO.	DESCRIPTION
1	540559	Beckett AFG W/Oil Valve
2	675400	F-3 Head (AFG Only)
3	675405	F-4 Head (AFG Only)
4	675410	F-6 Head (AFG Only)
5	680104	.65-80° A Nozzle (LM 75 AFG)
6	680126	.65-80° A Nozzle (LM 75 AFG)
7	680136	.65-80° A Nozzle (LM 75 AFG)
8	540558	Beckett AFII
9	680103	.65-70° B Nozzle (LM 75 AFII)
10	680123	.85-70° B Nozzle (LM 75 AFII)
11	680139	.90-70° B Nozzle (LM 75 AFII)
12	541152	Riello 5F Burner
13	680107	.65-60° W Nozzle (LM 75 5F)
14	680112	.75-60° W Nozzle (LM 75 5F)
15	680122	.85-60° W Nozzle (LM 75 5F)
16	542220	Carlin EZ-1 Burner
17	680110	.75-60° A Nozzle (LM 75 EZ-1)
18	680140	1.00-60° A Nozzle (LM 75 EZ-1)
19	680150	1.10-60° A Nozzle (LM 75 EZ-1)
20	280000	Heat Exchanger
21	280275	Fire Tube Baffle
22	337804	Combustion Liner
23	337803	Burner Door Insulation
24	280264	Burner Door
25	337801	Target Wall Insulation
26	280269	Rear Door
27	522113	Aquastat L8148A-1165 (Less Coil)
28	553010	Primary R8184G-1286 (With TT)
29	570180	Relief Valve
30	559560	Temperature/Altitude Gauge
31	535030	Taco 007 Circulator
32	675300	Suntec Single Stage Fuel Pump
33	675310	Suntec Two Stage Fuel Pump
34	817100	Fire Tube Baffles (3-Hole)
35	502620	Rear Jacket Panel
36	502610	Front Jacket Panel
37	602630	Left Side Jacket Panel
38	602640	Right Side Jacket Panel
39	502650	Top Jacket Panel

TROUBLE SHOOTING GUIDE

TROUBLE: TOO MUCH HEAT

SOURCE	PROCEDURE	CAUSES	REMEDY
CIRCULATOR	CHECK TO SEE IF OPERATING CONTROL IS OPERATING PROPERLY	CIRCULATOR DOES NOT STOP RUNNING	REPAIR
THERMOSTAT	CHECK THERMOSTAT SETTINGS AND CALIBRATION	THERMOSTAT SET TOO HIGH	RESET THERMOSTAT
		THERMOSTAT DEFECTIVE	REPLACE THERMOSTAT
		THERMOSTAT OUT OF CALIBRATION	RECALIBRATES
FLOW VALVE	CHECK TO SEE IF FLOW VALVE IS OPERATING PROPERLY	FLOW VALVE DIRTY AND STUCK	CLEAN FLOW VALVE
		FLOW VALVE DEFECTIVE	REPLACE FLOW VALVE

TROUBLE: HIGH NET STACK TEMPERATURES

SOURCE	PROCEDURE	CAUSES	REMEDY
NOZZLE	CHECK PUMP PRESSURE WITH PUMP GAUGE	NOZZLE OVERFIRING DUE TO HIGH PUMP PRESSURE	REDUCE PUMP PRESSURE TO 140 PSI
HEAT EXCHANGER	CHECK HEAT EXCHANGER SURFACES FOR SOOT AND FOULING	HEAT EXCHANGER FOULED	CLEAN HEAT EXCHANGER
HEAT EXCHANGER	CHECK SEAL BETWEEN BURNER DOOR CHAMBER TO FLUE	DAMAGED DOOR REFRACTORY	REPLACE REFRACTORY BOARD

TROUBLE: BOILING NOISE IN TOP OF BOILER

SOURCE	PROCEDURE	CAUSES	REMEDY
VENTING	CHECK IF SYSTEM IS PROPERLY VENTED	DEFECTIVE FLOAT VENT	REPLACE VENT
		WATERLOGGED EXPANSION TANK	DRAIN TANK
		MANUAL VENT REQUIRES VENTING	OPEN VENT
		IMPROPER VENTING	SEE BOILER PIPING SECTION

TROUBLE: EXCESSIVE HEAT EXCHANGER SCALE

SOURCE	PROCEDURE	CAUSES	REMEDY
BYPASS PIPING	CHECK BOILER BYPASS PIPING MANUAL	NO BYPASS INSTALLED	INSTALL BYPASS LOOP
		BYPASS VALVE CLOSED	REGULATE BYPASS VALVE
		BYPASS TOO SMALL	CHANGE BYPASS TO 1-1/4"
	CHECK BOILER BYPASS PIPING AUTOMATIC	BYPASS NOT OPERATING	CHANGE THERMOSTATIC ELEMENT
FIRING RATE	CHECK NOZZLE	NOZZLE PLUGGED	REPLACE NOZZLE
		WRONG NOZZLE INSTALLED	INSTALL CORRECT NOZZLE
	CHECK PUMP PRESSURE	PUMP PRESSURE TO LOW	ADJUST PUMP PRESSURE TO 140 PSI

TROUBLE: BURNER FIRES BUT PULSATES

SOURCE	PROCEDURE	CAUSES	REMEDY
COMBUSTION AIR	INSPECT AIR INTAKE ASSEMBLY	LEAVES OR DEBRIS CLOGGING AIR INTAKE	CLEAR AIR INTAKE SCREEN ADJUST AIR INLET DAMPER PROPERLY
	ADJUST BURNER TO SETTING AS LISTED IN MANUAL	IMPROPER ADJUSTMENT OF COMBUSTION AIR	ADJUST CO ₂ LEVEL TO BETWEEN 11% TO 12%
OIL SUPPLY	BLEED PUMP INSPECT FOR AIR	AIR LEAK IN FUEL SYSTEM	REPAIR AIR LEAKS - USE ONLY FLAIR FITTINGS
	CHECK TANK FOR WATER	WATER IN OIL TANK	STRIP TANK OF WATER
PUMP PRESSURE	INSTALL PRESSURE GAUGE IN GAUGE PORT OF FUEL PUMP PRESSURE SHOULD BE 140 PSI	PUMP DISCHARGE PRESSURE SET INCORRECTLY	SET PUMP PRESSURE TO 140 PSI
		COUPLING WORN OR BROKEN	REPLACE COUPLING
		PUMP WORN LOW PRESSURE MOTOR OVERLOADS	REPLACE PUMP
NOZZLE	INSPECT NOZZLE FOR PLUGGED ORIFICE AND DISTRIBUTOR SLOTS	PLUGGED ORIFICE OR DISTRIBUTOR	REPLACE NOZZLE WITH NOZZLE SPECIFIED IN MANUAL
		PLUGGED NOZZLE STRAINER	
		POOR SPRAY PATTERN	
HEAT EXCHANGER RESTRICTIONS	TAKE DRAFT READING OVER THE FIRE AND AT THE FLUE BOX. THE DIFFERENCE SHOULD NOT EXCEED +.1" W.C.	PLUGGED HEAT EXCHANGER	CLEAN OUT HEAT EXCHANGER

TROUBLE: BURNER FIRES THEN LOSES FLAME

SOURCE	PROCEDURE	CAUSES	REMEDY
POOR FIRE	INSPECT FOR FLAME STABILITY	UNBALANCED FIRE	REPLACE NOZZLE WITH SPECIFIED NOZZLE
		TOO LITTLE COMBUSTION AIR	ADJUST COMBUSTION AIR TO BETWEEN 11% AND 12% CO ₂
OIL SUPPLY	IF BURNER LOSES FLAME PRIOR TO THE PRIMARY CONTROL LOCKING OUT FAULT IS IN THE FUEL SYSTEM	AIR LEAK IN FUEL SYSTEM	REPAIR LEAK - USE ONLY FLARE FITTINGS
		WATER IN OIL TANK	STRIP TANK OF WATER
		FUEL SUPPLY VALVE CLOSED	OPEN VALVE
		RESTRICTION IN OIL LINE	CLEAR OIL LINE RESTRICTIONS
		PLUGGED FUEL FILTER	REPLACE FILTER CARTRIDGE
		PLUGGED PUMP STRAINER	CLEAN STRAINER
COMBUSTION AIR	REDUCE COMBUSTION AIR SUPPLY	TOO MUCH COMBUSTION AIR	CLOSE AIR BAND TO RAISE CO ₂ TO PROPER LEVELS
PUMP	INSTALL PRESSURE GAUGE IN GAUGE PORT OF PUMP PRESSURE SHOULD BE 140 PSI	PUMP PRESSURE INCORRECTLY SET	SET PUMP PRESSURE TO 140 PSI
		COUPLING WORN OR BROKEN	REPLACE COUPLING
		PUMP WORN - LOW PRESSURE MOTOR OVERLOADS	REPLACE PUMP

TROUBLE: INSUFFICIENT HEAT

SOURCE	PROCEDURE	CAUSES	REMEDY
CIRCULATOR	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	CIRCULATOR DEFECTIVE	REPAIR CIRCULATOR
	CHECK VOLTAGE TO CIRCULATOR	INSUFFICIENT VOLTAGE	CALL UTILITY COMPANY
THERMOSTAT	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 LOCATION	OUT OF CALIBRATION	RECALIBRATES
FLOW VALVE	CHECK FLOW VALVE FOR STICKING IN PARTIALLY CLOSED POSITION	FLOW VALVE NOT OPENING FULLY	CLEAN OR REPLACE FLOW VALVE
RADIATION	CHECK RADIATORS FOR AIR	RADIATORS AIR BOUND	BLEED RADIATORS
	CHECK TO SEE IF RADIATORS ARE PROPERLY SIZED	RADIATORS INADEQUATE	INSTALL ADEQUATE RADIATION
BOILER	DETERMINE STRUCTURE HEAT LOAD	BOILER TOO SMALL	ADDITIONAL HEATING CAPACITY REQUIRED
PIPING	CHECK TO SEE IF PIPING IS PROPERLY SIZED	PIPING INADEQUATE	INSTALL ADEQUATE PIPING
HEAT EXCHANGER	CHECK HEAT EXCHANGER FOR SOOT OR SCALE ACCUMULATION	INSUFFICIENT HEAT TRANSFER	CLEAN HEAT EXCHANGER
BURNER	CHECK PUMP PRESSURE WITH PRESSURE GAUGE	INSUFFICIENT PUMP PRESSURE	INCREASE PUMP PRESSURE TO 140 PSI
NOZZLE	CHECK NOZZLE FOR SIZE AND SPRAY ANGLE	WRONG NOZZLE INSTALLED	INSTALL SPECIFIED NOZZLE
	CHECK NOZZLE FOR PLUGGED ORIFICE, SCORED SURFACE	NOZZLE INTERFERING DUE TO DEFECTIVE NOZZLE	REPLACE NOZZLE

TROUBLE: BURNER FIRES, BUT THEN FAILS ON SAFETY

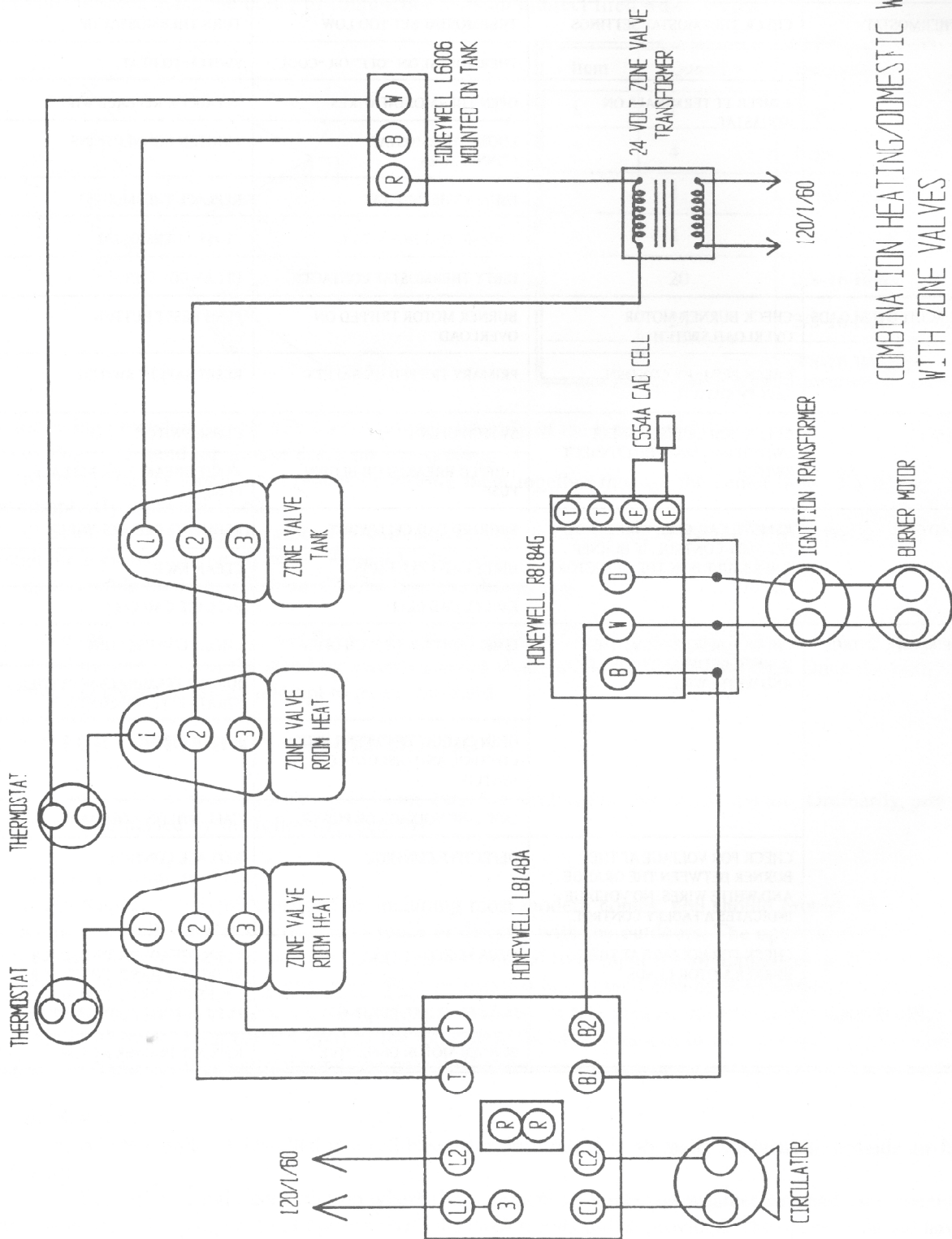
SOURCE	PROCEDURE	CAUSES	REMEDY
CAD CELL	CHECK CAD CELL WITH OHMMETER. IF MORE THAN 2000 OHMS, CAD CELL IS DEFECTIVE OR DIRTY	FAULTY OR DIRTY CAD CELL	CLEAN OR REPLACE CAD CELL
PRIMARY CONTROL	AFTER BURNER FIRES OPEN CAD CELL CIRCUIT IF FLAME LOOKS GOOD, IF BURNER CONTINUES TO OPERATE FAULT IS IN PRIMARY CONTROL	FAULTY PRIMARY CONTROL	REPLACE PRIMARY CONTROL

TROUBLE: BURNER STARTS BUT DOES NOT ESTABLISH FLAME

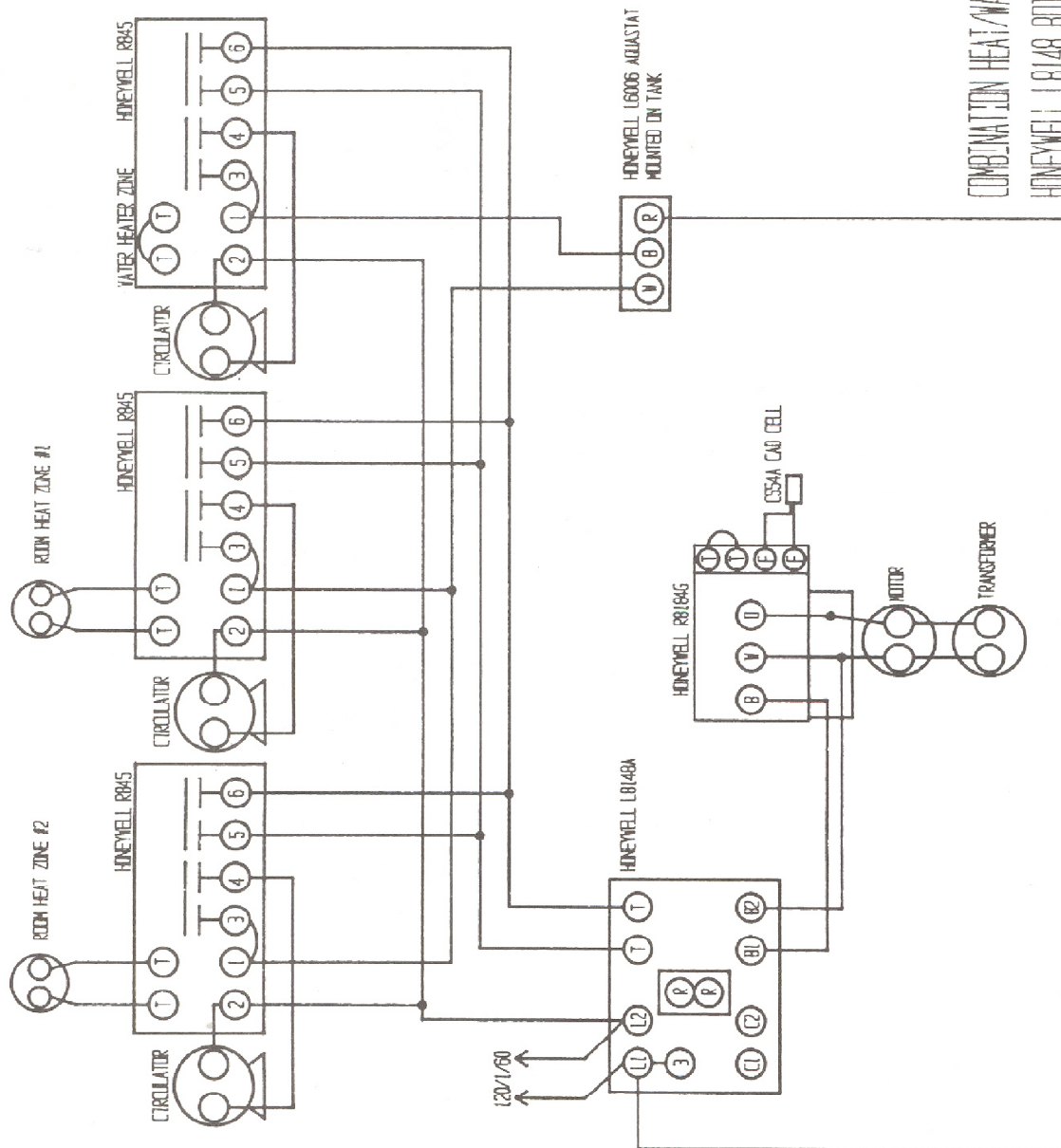
SOURCE	PROCEDURE	CAUSES	REMEDY
OIL SUPPLY	CHECK TANK FOR OIL	EMPTY TANK	FILL TANK
	CHECK FOR WATER IN OIL TANK	WATER IN OIL TANK	STRIP TANK OF WATER
	LISTEN FOR PUMP WHINE	FUEL SUPPLY VALVE CLOSED	OPEN VALVE
OIL LINE FILTER	BLEED PUMP-MILKY OR NO OIL INDICATES LOSS OF PRIME	AIR LEAK IN FUEL SYSTEM	REPAIR LEAK USE FLARE FITTINGS ONLY
	LISTEN FOR PUMP WHINE	OIL FILTER PLUGGED	REPLACE FILTER CARTRIDGE
		PLUGGED PUMP STRAINER	CLEAN STRAINER
		RESTRICTION IN OIL LINE	REPAIR OIL LINE
	INSTALL PRESSURE GAUGE IN PUMP PORT	PUMP WORN-LOW PRESSURE MOTOR OVERLOADS	REPLACE PUMP
		COUPLING WORN OR BROKEN	REPLACE COUPLING
		PUMP DISCHARGE PRESSURE SET TO LOW	SET PRESSURE TO 140 PSI
IGNITION TRANSFORMER	CONNECT IGNITION TRANSFORMER LEADS TO LIVE VOLTAGE. LISTEN FOR SPARK. CHECK THAT TRANSFORMER IS PROPERLY GROUNDED. CHECK THAT TRANSFORMER TERMINALS ARE NOT ARCING WITH BUSS BARS.	NO SPARK OR WEAK SPARK	REPLACE TRANSFORMER
		LINE VOLTAGE BELOW 102 V.	CALL UTILITY COMPANY
	REMOVE AND INSPECT DRAWER ASSEMBLY	CARBONATE AND SHORTED ELECTRODES	CLEAN ELECTRODES
		ERODED ELECTRODE TIPS	DRESS UP TIPS AND REPAIR
		INCORRECT ELECTRODE SETTINGS	
		CRACKED PORCELAIN INSULATORS	REPLACE ELECTRODES
NOZZLE	INSPECT NOZZLE FOR PLUGGED ORIFICE AND DISTRIBUTOR SLOTS	PLUGGED ORIFICE OR DISTRIBUTOR	REPLACE NOZZLE WITH NOZZLE SPECIFIED IN MANUAL
		PLUGGED NOZZLE STRAINER	
		POOR SPRAY PATTERN	
	INSPECT NOZZLE FOR CORRECT SIZE AND SPECIFICATIONS	INCORRECT NOZZLE INSTALLED	INSTALL CORRECT NOZZLE
COMBUSTION AIR	CHECK AIR DIAL SETTINGS	AIR DIAL SET TO FAR OPEN	DECREASE AIR SETTING
OIL VALVE	NO OIL TO NOZZLE	DEFECTIVE VALVE	REPLACE OIL VALVE

TROUBLE: BURNER DOES NOT START

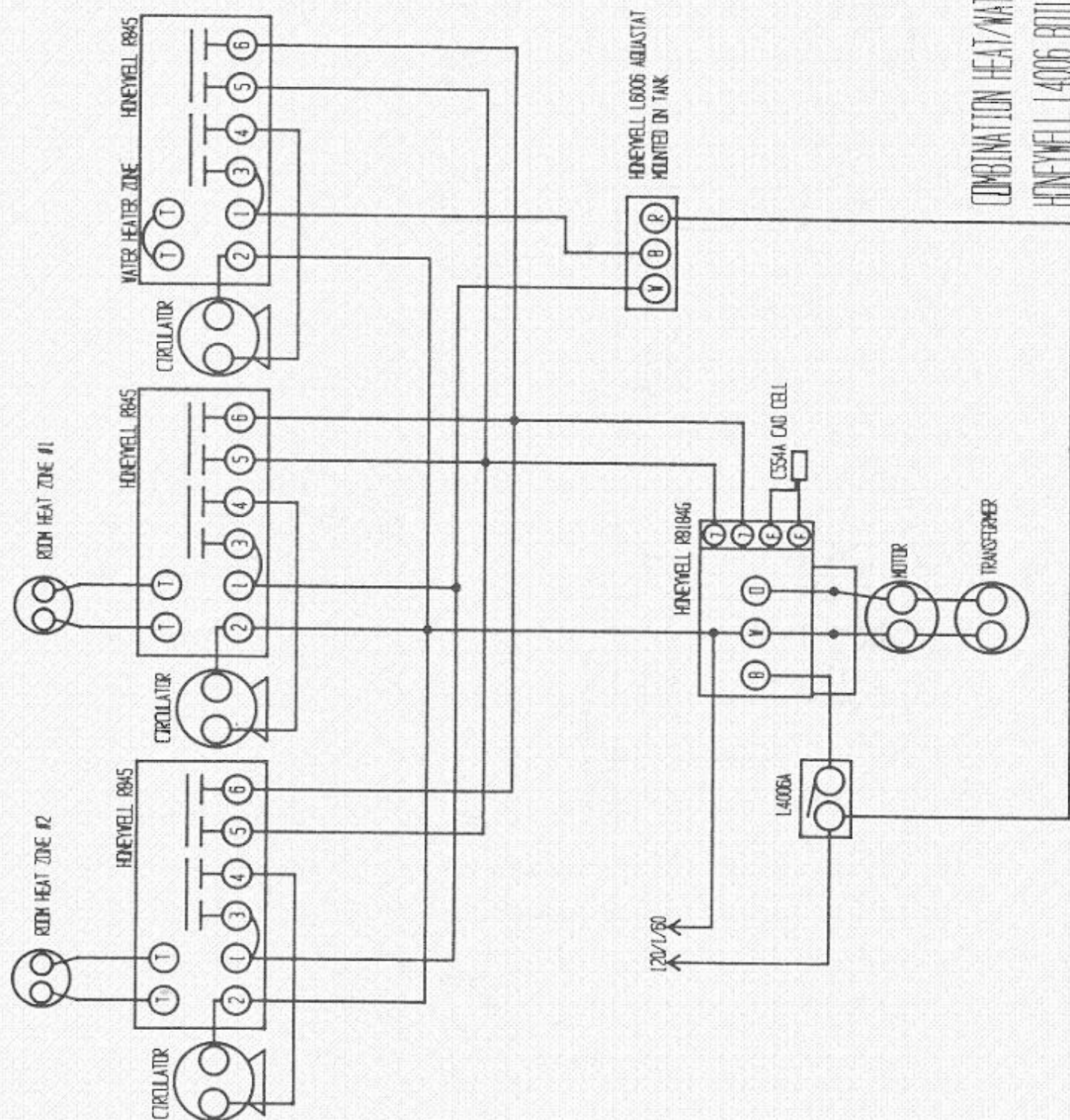
SOURCE	PROCEDURE	CAUSES	REMEDY
THERMOSTAT	CHECK THERMOSTAT SETTINGS	THERMOSTAT SET TOO LOW	TURN THERMOSTAT UP
		THERMOSTAT ON "OFF" OR "COOL"	SWITCH TO HEAT
	JUMPER TT TERMINALS ON AQUASTAT	OPEN THERMOSTAT WIRES	REPAIR OR REPLACE WIRES
		LOOSE THERMOSTAT CONNECTORS	TIGHTEN CONNECTIONS
		FAULTY THERMOSTAT	REPLACE THERMOSTAT
		THERMOSTAT NOT LEVEL	LEVEL THERMOSTAT
		DIRTY THERMOSTAT CONTACTS	CLEAN CONTACTS
CIRCUIT OVERLOADS	CHECK BURNER MOTOR OVERLOAD SWITCH	BURNER MOTOR TRIPPED ON OVERLOAD	PUSH RESET BUTTON
	CHECK PRIMARY CONTROL SAFETY SWITCH	PRIMARY TRIPPED ON SAFETY	RESET SAFETY SWITCH
POWER	CHECK BOILER DISCONNECT SWITCH AND MAIN DISCONNECT SWITCH	SWITCH OPEN	CLOSE SWITCH
		TRIPPED BREAKER OR BLOWN FUSE	RESET BREAKER OR REPLACE FUSE
CAD CELL	REMOVE CAD CELL WIRES FROM PRIMARY CONTROL. IF BURNER FIRES FAULT IS IN THE DETECTOR CIRCUIT	SHORTED CAD CELL WIRES	REPAIR OR REPLACE WIRE
		DIRTY CAD CELL FACE	CLEAN FACE
		FAULTY CAD CELL	REPLACE CAD CELL
PRIMARY CONTROL	CHECK FOR VOLTAGE AT THE BURNER BETWEEN THE BLACK AND WHITE WIRES	LIMIT CONTROL SWITCH OPEN	CHECK LIMIT SETTING
			JUMPER TERMINALS-IF BURNER STARTS REPLACE CONTROL
		OPEN CIRCUIT BETWEEN LIMIT CONTROL AND DISCONNECT SWITCH	REPAIR CIRCUIT
		LOW LINE VOLTAGE OR POWER	CALL UTILITY COMPANY
	CHECK FOR VOLTAGE AT THE BURNER BETWEEN THE ORANGE AND WHITE WIRES. NO VOLTAGE INDICATES A FAULTY CONTROL	DEFECTIVE CONTROL	REPLACE CONTROL
BURNER MOTOR	CHECK FOR VOLTAGE AT THE BURNER MOTOR LEADS	PUMP SEIZED	TURN OFF POWER TO BURNER. ROTATE BY HAND. CHECK FOR EXCESSIVE DRAG. REPLACE FUEL UNIT OR BLOWER WHEEL
		BLOWER WHEEL BINDING	
		BURNER MOTOR DEFECTIVE	REPLACE BURNER MOTOR



COMBINATION HEATING/DOMESTIC WATER
WITH ZONE VALVES

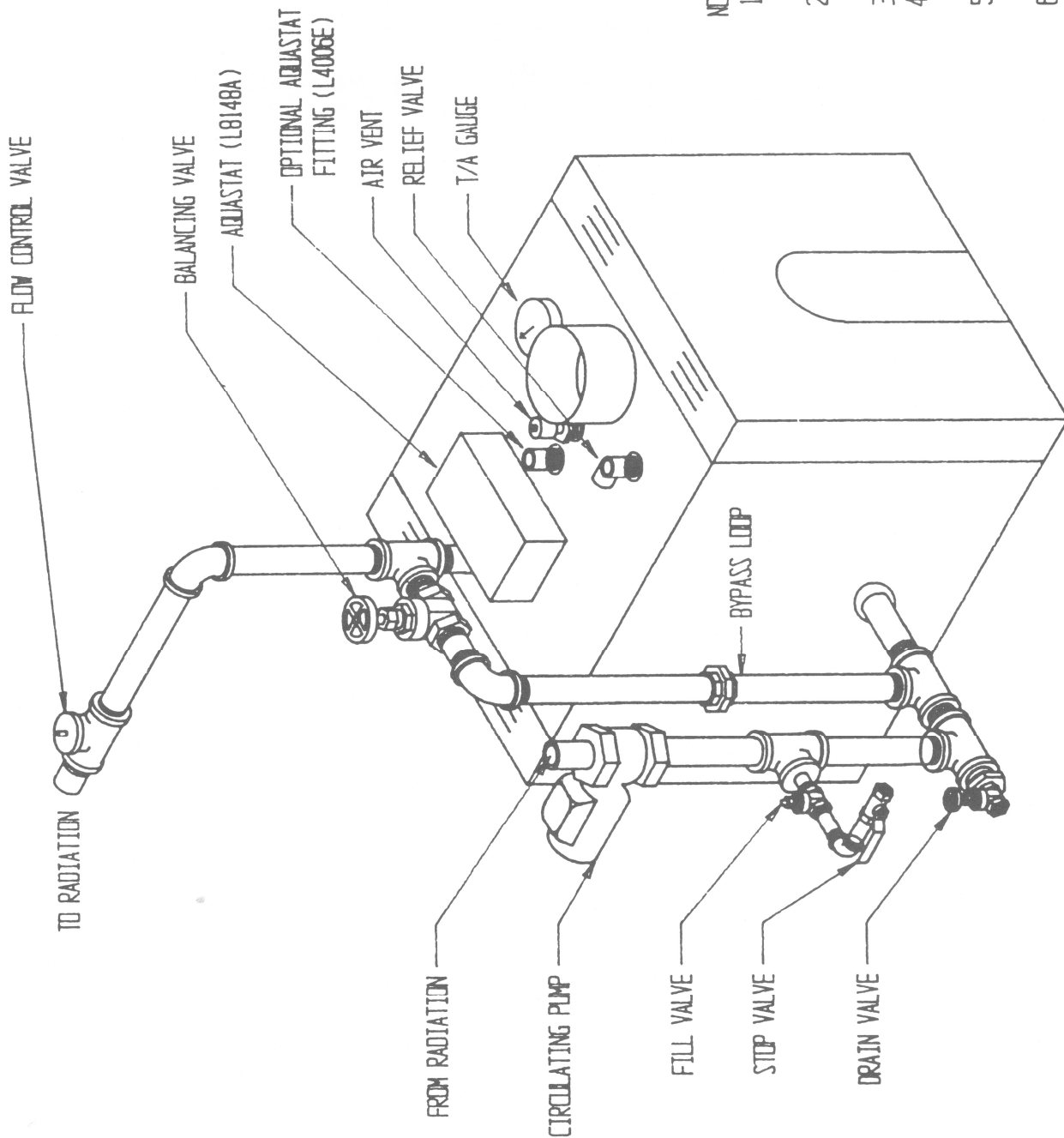


COMBINATION HEAT/WATER V/CIRCULATORS
HONEYWELL LB48R BOILER AQUASTAT



COMBINATION HEAT/WATER CIRCULATORS
HONEYWELL L4006 BOILER AQUASTAT

PIPING LAYOUT



NOTES:

1. RELIEF VALVE MUST BE PIPED TO A SAFE PLACE OF DISCHARGE
2. AIR VENT MAY BE PIPED TO NON BLADDER TYPE EXPANSION TANK
3. BALANCING VALVE SHOULD BE GATE VALVE
4. FLOW CONTROL VALVE MAY BE REPLACED BY ZONE VALVES
5. ALL PIPING MUST COMPLY WITH ALL STATE AND LOCAL CODES
6. CONSULT HOT WATER TANK MANUFACTURERS LITERATURE FOR TANK PIPING

BURNER SERVICE SET-UP RECORDS

[illegible]