

Installation, Start-Up, and Operating Instructions

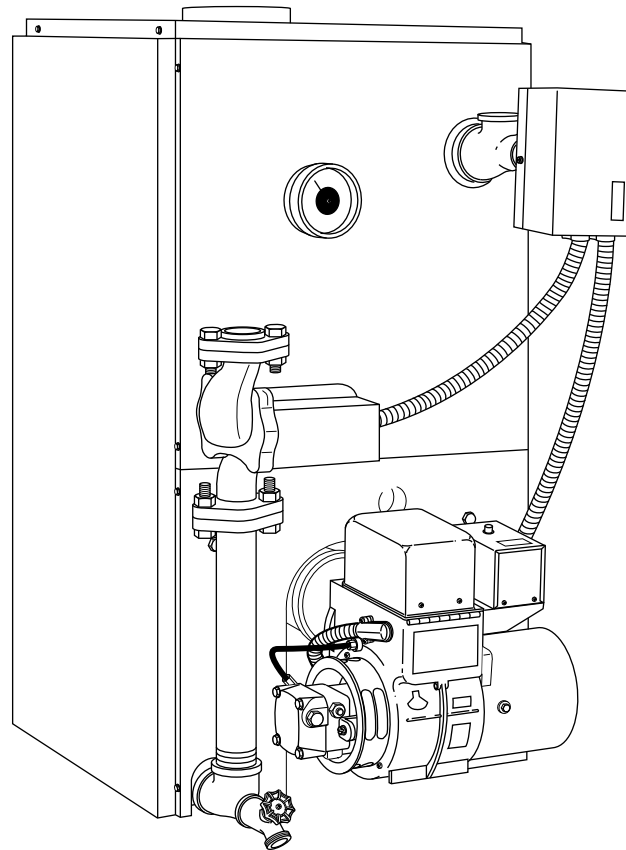
Oil-Fired
Cast Iron Hot Water Boilers
Sizes 74,000 through 239,000
Series A

BW4
BW5



NOTE: Read the entire instruction manual before starting the installation. These instructions must be affixed on or adjacent to the boiler.
This symbol → indicates a change since the last issue.

MODEL BW4/BW5




A88177

INDEX

	Page
SAFETY CONSIDERATIONS	3
INTRODUCTION	3
BOILER RATINGS AND CAPACITIES	4
Explanation of Model Numbers and Rating Plate	4
General Information	4
LOCATING THE BOILER	5
INSTALLATION REQUIREMENTS	6
FRESH AIR FOR COMBUSTION	6-7
Boiler Located in Unconfined Space	6
Boiler Located in Confined Space	6-7
BOILERS WITH TANKLESS HEATER COIL	8
Mounting Aquastat Control	8
Tankless Coil Piping	8
INSTALLATION—SYSTEM PIPING	8-9
CHIMNEY AND CHIMNEY CONNECTION	10-11
Checking Chimney	10
Chimney Connector and Draft Regulator	10
Minimum Vent Pipe Clearance	10
Optional Power Venting	10
ELECTRICAL WIRING	12-14
Installing Thermostat (Not Provided)	12
Grounding	12
Electric Power Supply	12
Connecting 115-v Electric Wiring to Boiler	12
Thermostat Connections	12
Thermostat Heat Anticipator Adjustment	12
Wiring Diagrams	13-14
EQUIPMENT AND OPTIONAL ACCESSORIES	15
Relief Valve (Provided)	15
Expansion Tank (Not Provided)	15
Diaphragm-Type Expansion Tank (Not Provided)	15
Air Eliminating Fitting (Air Purger) (Not Provided)	15
Main Air Vent for Downflow Systems or Diaphragm-Type Expansion Tank (Not Provided)	15
Aquastat Relay Control (Provided)	15
Automatic Fill Valve (Not Provided)	15
Drain Valve (Provided)	15
Circulating Pump (Provided)	15
FILLING BOILER	15-16
How a Hot-Water System Operates	15
Filling System with Water	15-16
OPERATING BOILER	16-18
To Start	16
Fuel Units and Oil Lines	16
Air Supply for Combustion	16
Draft Regulators (Provided)	16
Nozzles (Provided)	16
Final Burner Adjustments	16
Oil Burner Maintenance	16-18
CHECKING AND ADJUSTING CONTROLS	18
Adjusting Operating Controls	18
Checking Thermostat Operation	18
MAINTENANCE	18-19
Relief Valve	18
Expansion Tank	19
Water System	19
Tankless Coil (or Cover Plate) Gasket	19
OIL BOILER/BURNER CLEANING INSTRUCTIONS	19-20
SEQUENCE OF OPERATION—BOILER WITH COIL	20-21
High Limit Controller	20
Low Limit and Circulator Controller	20
SERVICE HINTS	21
REPAIR PARTS	22-24

SAFETY CONSIDERATIONS


Installing and servicing heating equipment can be hazardous due to oil and electrical components. Only trained and qualified personnel should install, repair, or service heating equipment. Untrained personnel can perform basic maintenance functions such as maintaining water level. All other operations must be performed by trained service personnel. When working on heating equipment, observe precautions in literature, on tags, and on labels attached to or shipped with unit and other safety precautions that may apply.


Recognize safety information. This is the safety-alert symbol . When you see this symbol on unit or in instructions and manuals, be alert to potential for personal injury.

Understand the signal words DANGER, WARNING, and CAUTION. These words are used with safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **would** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

Read and obey the following rules to ensure safe installation and operation:

1. Read the Owner's Manual carefully for safe operation. Failure to follow the rules of safe operation and the instructions can cause a malfunction of the boiler and result in death, serious bodily injury, and/or property damage.
2. Check local codes and utility requirements before installation. The installation must be in accordance with their directives, or follow NFPA 31—Installation of Oil Burning Equipment, latest revision.
3. Before servicing, allow boiler to cool. Always shut off any electricity and oil to boiler when working on it. This prevents any electrical shocks or burns.
4. Inspect oil line and connections for leaks.
5. Be certain oil burner nozzle is size required. Overfiring will result in early failure of boiler sections. This causes dangerous operation.
6. Never vent this boiler into an enclosed space. Always vent to the outside. Never vent to another room or inside a building.
7. Be sure there is adequate air supply for complete combustion.
8. Follow a regular service and maintenance schedule for efficient and safe operation.
9. Keep boiler area clean and free from combustible materials, gasoline, and other flammable vapors and liquids.

 **WARNING: Use only number 1 or number 2 fuel oil having commercial standard grade CS 12-48. Do not use gasoline, kerosene, crankcase oil, or any oil containing gasoline. A failure to adhere to this warning can cause a fire, explosion, physical injury, or death.**

 **WARNING: This boiler has been designed for residential installations. If used for commercial applications, all jurisdictional requirements must be met. This may require wiring and/or piping modifications. The manufacturer is not responsible for any changes to original design.**


INTRODUCTION

Check to be sure boiler size is correct before starting installation. See rating and capacity table shown in Fig. 1. Check rating plate on right side of boiler.

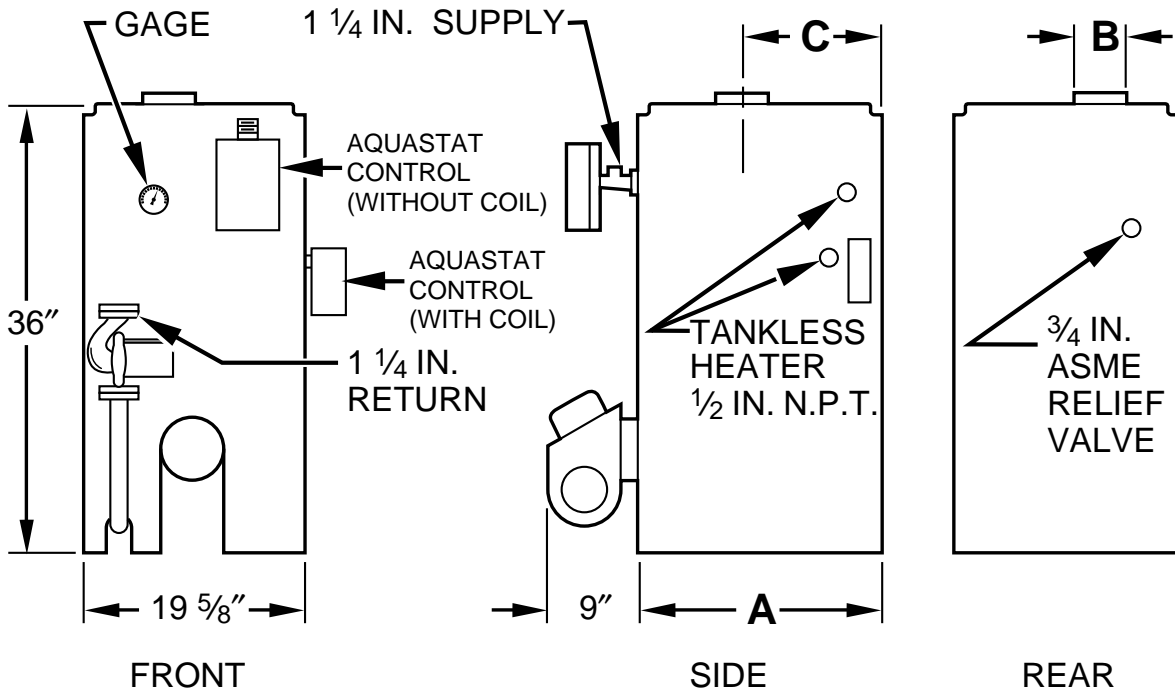
The boiler must be supplied with the proper oil, fresh air for combustion, and a suitable electrical supply. Boiler must also be connected to a suitable venting system and an adequate piping system. Finally, a properly located thermostat is needed for control of heating system. If there are any doubts as to the various requirements, check with local authorities and obtain professional help where needed. The Operating Instructions and Final Checks and Adjustments sections later in this document are vital to the proper and safe operation of the heating system. Take time to be sure they are all done.

The following steps are all necessary for proper installation and safe operation of boiler.

1. LOCATING THE BOILER
2. OIL SUPPLY AND PIPING
3. FRESH AIR FOR COMBUSTION
4. PIPING CONNECTIONS
5. CHIMNEY AND VENT PIPE CONNECTIONS
6. ELECTRICAL WIRING
7. THERMOSTAT LOCATION
8. CHECKING AND ADJUSTING
9. MAINTENANCE

 **WARNING: Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, fuel oil supplier, or your distributor or branch for information or assistance. The qualified installer or agency must use only factory-authorized and listed kits or accessories when modifying this product. Failure to follow this warning could result in electrical shock, fire, personal injury, or death.**

BOILER RATINGS AND CAPACITIES



A96152

Oil-Fired Hot Water Boiler Ratings

BOILER MODEL NUMBER		NO. OF SECTIONS	INPUT MBH	HEATING CAPACITY MBH*	NET I=B=R RATING MBH	MAXIMUM FIRING RATE GPH	TYPICAL CHIMNEY		DIMENSIONS (IN.)		
							Area (In.)	Height (Ft)	A	B	C
BW4AAH000120AAAA	BW5AAH000120AAAA	3	84	74	64	0.60	8 X 8	15	17-3/4	6	9-3/4
		3	105	92	80	0.75	8 X 8	15	17-3/4	6	9-3/4
		3	140	120	104	1.00	8 X 8	15	17-3/4	6	9-3/4
BW4AAH000181AAAA	BW5AAH000181AAAA	4	126	111	97	0.90	8 X 8	15	21	6	11-3/8
		4	175	153	133	1.25	8 X 8	15	21	6	11-3/8
		4	210	181	157	1.50	8 X 8	15	21	6	11-3/8
BW4AAH000239AAAA	BW5AAH000239AAAA	5	168	147	128	1.20	8 X 8	15	24-1/4	6	13
		5	245	210	183	1.75	8 X 8	15	24-1/4	6	13
		5	280	239	209	2.00	8 X 8	20	24-1/4	6	13

* Heating Capacity is based on a 13 percent CO₂ with a -0.02 in. wc draft over fire and a #1 smoke or less. The testing on boilers was done in accordance with the Department of Energy (DOE) test procedure.

MBH—1000 Btuh (British Thermal Unit Per Hr)

GPH—Gallons per hour oil at 140,000 BTU per gallon

Shaded areas are as shipped.

Fig. 1—Dimensional Drawing and Boiler Ratings and Capacities

PROCEDURE 1—EXPLANATION OF MODEL NUMBERS AND RATING PLATE

Boilers with the same number of sections are identical to each other except for their firing rate. The firing rate is determined by nozzle size in oil burner and oil pressure at nozzle.

Each model number has 3 possible firing rates depending on which nozzle is installed. The model number represents the largest possible output for the unit. For example, a BW4AAH120AAAA has a maximum output of 120,000 Btuh. The rating plate for each model shows the three possible firing rates. Boilers come shipped with the largest nozzle installed. By changing nozzles, the BW4AAH120AAAA firing rate can be changed to 92,000 or 74,000 Btuh output.

PROCEDURE 2—GENERAL INFORMATION

Selection of boiler size should be based upon "Net I=B=R Rating MBH" being equal to or greater than calculated heat loss of building.

The Net I=B=R Ratings shown are based on an allowance of 1.15 in accordance with factors in the I=B=R Standard as published by The Hydronics Institute.

These boilers are low-pressure, sectional cast iron boilers constructed and hydrostatically tested for a maximum working pressure of 50 psi in accordance with the American Society of Mechanical Engineers (A.S.M.E.) Section IV Standards for cast iron heating boilers. They are capacity rated in accordance with the code of the Hydronics Institute.

LOCATING THE BOILER

If boiler is part of a planned heating system, locate it as close as possible to where it is shown on plan. If boiler is to be part of an existing system, it is usually best to put it where the old one was. If location is to be changed, additional materials as well as an adequate base will be required.

The following rules apply:

1. The boiler must be level.
2. Use a raised base if floor can become wet or damp.
3. These boilers must have a non-combustible base if installed on a combustible floor. Two-in. concrete patio blocks or a 2-in. Cladlite™ pad may be used.
4. The vent pipe connection should be as short as possible.
5. Maintain clearances for fire safety as well as servicing. Refer to Fig. 2 for minimum clearances. An 18-in. clearance must be maintained at a side where passage is required to access another side for cleaning, servicing, inspection, or replacement of any parts that normally may require such attention. Boilers must be installed at least 6 in. from combustible materials on all sides and above. Allow at least 24-in. front clearance for servicing. Allow at least 18-in. right-side clearance for servicing boilers equipped with a tankless coil.

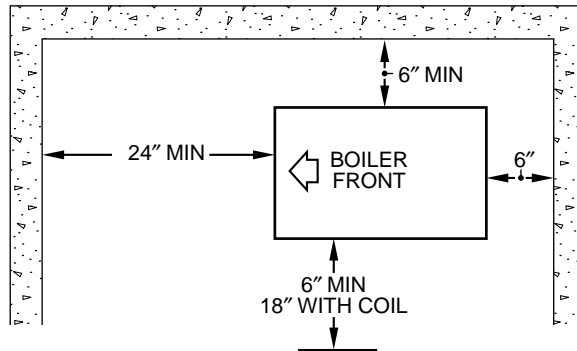


Fig. 2—Minimum Clearance Dimensions

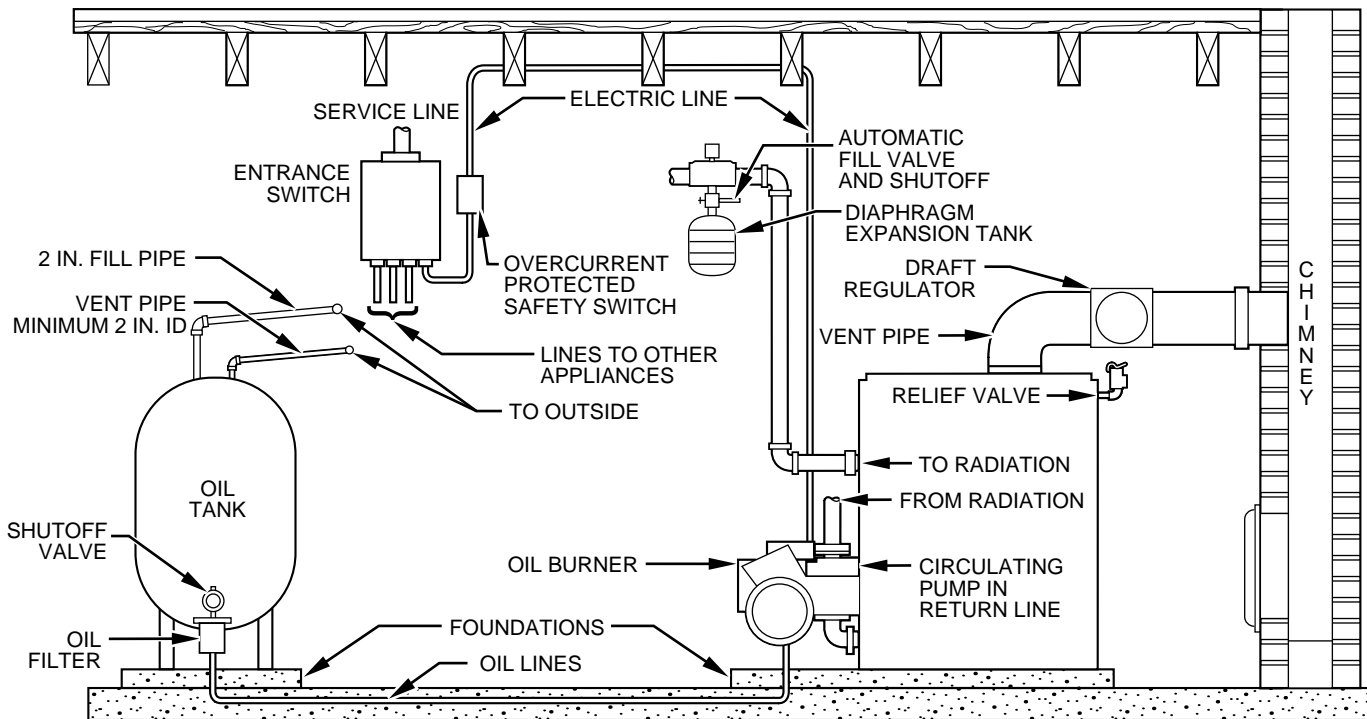
A95592

6. FRESH AIR for combustion must be available at front of boiler. FRESH AIR for ventilation must be available to front AND rear of boiler. Air passages must be free of obstructions at all times. Ventilating and combustion air must enter boiler room without restrictions.
7. Be sure installation is in accordance with the requirements of local authorities having jurisdiction. Compliance with these regulations is required. In the absence of local codes, follow NFPA 31—Installation of Oil Burning Equipment.

INSTALLATION REQUIREMENTS

Refer to Fig. 3 for the basic requirements of a typical installation.

NOTE: Always keep manual fuel supply valve shut off if burner is shut down for an extended period of time.



A98268

→ Fig. 3—General Principal Requirements for a Typical Installation

FRESH AIR FOR COMBUSTION

⚠ WARNING: Be sure to provide enough fresh air for combustion. Enough air ensures proper combustion and ASSURES THAT NO HAZARD WILL DEVELOP DUE TO LACK OF OXYGEN. Failure to follow this warning can cause a fire, personal injury, or death.

⚠ CAUTION: Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodide. These elements are found in aerosol sprays, detergents, bleaches, cleaning solvents, salts, air fresheners, and other household products.

Excessive exposure to contaminated combustion air will result in safety and performance related problems.

⚠ CAUTION: If a fireplace or a kitchen or bathroom exhaust fan is used, an outside air intake should be installed. These devices rob the boiler and water heater of combustion air.

Enough fresh air must be provided to assure proper combustion. The fire in the boiler uses oxygen. It must have a continuous supply. The air in a house contains only enough oxygen to supply the burner for a short time. Outside air must enter the house to replace that used by the burner. The exact fresh air requirements depend on whether the boiler is located in an unconfined or confined space.

PROCEDURE 1—BOILER LOCATED IN UNCONFINED SPACE

An unconfined space is defined as a space with volume not less than 50 cu ft per 1000 Btuh of total input rating of all appliances installed in that space.

If boiler is in an open area (unpartitioned basement) in a conventional house, air that leaks through cracks around doors and windows will usually be adequate to provide air for combustion. The doors should not fit tightly. Cracks around windows should not be caulked.

PROCEDURE 2—BOILER LOCATED IN CONFINED SPACE

A. All Air From Inside Building

The confined space shall be provided with 2 permanent openings communicating directly with an additional room(s) of sufficient volume so that the combined volume of all spaces meets the criteria for an unconfined space. The total input of all combustion equipment installed in the combined space shall be considered in making this determination. Each opening shall have a minimum free area of 1 sq in. per 1000 Btuh of total input rating for all combustion equipment in the confined space, but not less than 100 sq in. One opening shall be within 12 in. of the top and 1 within 12 in. of the bottom of the enclosure. (See Fig. 4.)

Example: The boiler is rated at 100,000 Btuh. The water heater is rated at 30,000 Btuh. The total is 130,000 Btuh. Two grilles are needed, each with 130 sq in. of FREE opening. Metal grilles have about 60 percent FREE area. To find the louvered area needed, multiply the FREE area required by 1.7 (130 X 1.7 = 221.0 sq in. louvered area). In this example, 2 grilles each having an 8-in. X 30-in. (240 sq in.) louvered area would be used. Fig. 4 shows grille locations.

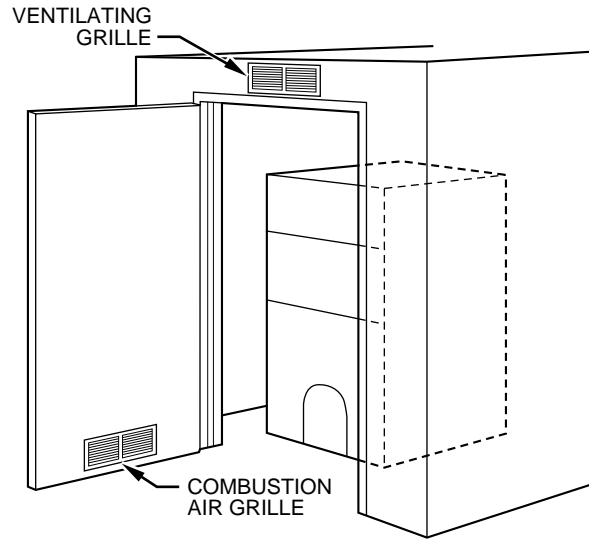


Fig. 4—Air Openings for Closet or Utility Room Installations

A95594

B. All Air From Outdoors

The confined space shall be provided with 2 permanent openings, 1 commencing within 12 in. of the top and 1 commencing within 12 in. of the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.

1. When directly communicating with the outdoors, each opening shall have a minimum free area of 1 sq in. per 4000 Btuh of total input rating of all equipment in the enclosure.
2. When communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 sq in. per 4000 Btuh of total input rating of all equipment in the enclosure.
3. When communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 sq in. per 2000 Btuh of total input rating of all equipment in the enclosure.
4. When ducts are used, they shall be of the same cross-sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular air ducts shall not be less than 3 in.

Table 1—Fresh Air Duct Capacities for Ducts Supplying Fresh Air to Boiler in Tightly Constructed Houses (Btuh)*

FRESH AIR DUCT SIZE (IN.)	1/4-IN. MESH SCREEN	WOOD LOUVERS	METAL LOUVERS
3 X 12	144,000	36,000	108,000
8 X 8	256,000	64,000	192,000
8 X 12	384,000	96,000	288,000
8 X 16	512,000	128,000	384,000

* Based on opening covered by 1/4-in. mesh screen, wood louvers, or metal louvers.

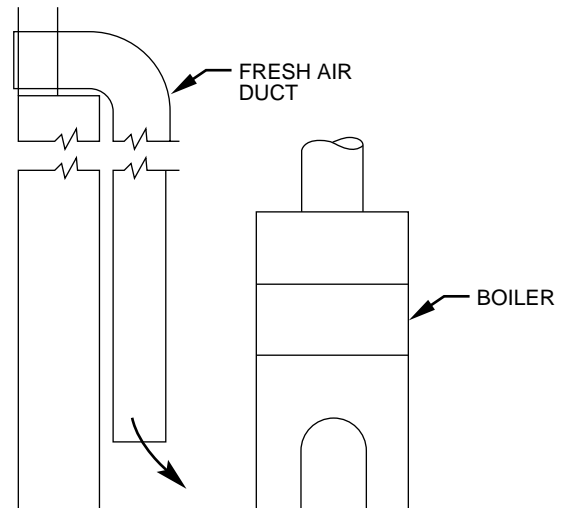


Fig. 5—Fresh Air Duct for Tightly Sealed House

A95595

BOILERS WITH TANKLESS HEATER COIL

Boilers may be factory packaged with a tankless heater coil.

The use of this coil eliminates the need for a hot water storage tank. Instantaneous heating of water in coil provides a flow of hot water for domestic use if proper burner and water supply line controls are used.

IMPORTANT: Do not use a tankless coil if water is excessively hard with lime or other deposits which will accumulate inside coil.

PROCEDURE 1—MOUNTING AQUASTAT CONTROL

The control configuration on this boiler has been set up so that the Honeywell L8124C Combination Hi/Low Limit Aquastat Relay mounts on the tankless coil. This maximizes tankless coil performance by making burner respond more quickly to a call for domestic hot water.

The boiler is completely wired according to schematic wiring diagram. (See Fig. 13.) The installer must mount the L8124C Aquastat on control well in 3/4-in. tapping on tankless coil. (See Fig. 6.)

PROCEDURE 2—TANKLESS COIL PIPING

Piping is as shown in Fig. 7. A tempering valve (mixing valve) is recommended.

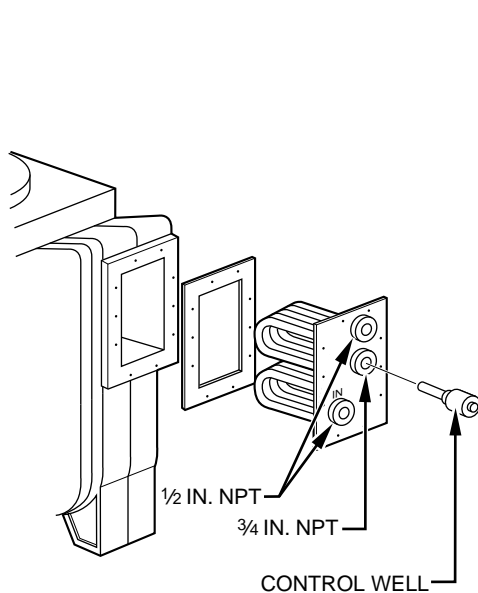
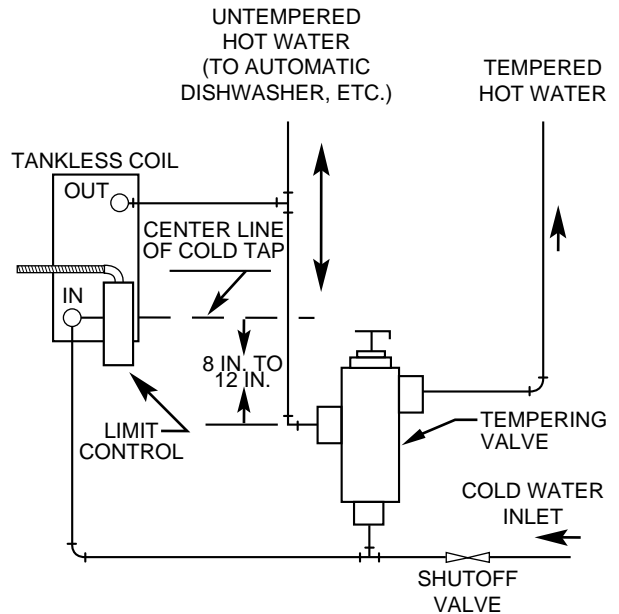


Fig. 6—Tankless Heater Coil

A95596



→ Fig. 7—Recommended Piping with Tankless Heater Coil

A98269

INSTALLATION—SYSTEM PIPING

1. Place boiler in selected location as close to flue as possible. (See Fig. 3.) Boiler is shipped assembled. Only the factory-supplied relief valve need be installed.
2. Install relief valve in rear section on 3/4-in. nipple and street ell. Do not connect directly to a drain, but leave an air gap. No shutoff of any description shall be placed between safety relief valve and boiler, or on discharge pipes between such safety valves and the atmosphere. Installation of safety relief valve shall conform to requirements of the ANSI/ASME Boiler and Pressure Vessel Code, Section IV. The manufacturer is not responsible for any water damage. Connect a drain line of the same pipe size (3/4 in.) to carry any water away to a drain.
3. Connect supply and return lines to boiler. Both supply and return lines should be piped to the front section or both to the rear section. The boiler should NOT be piped return line to the front, supply line to the rear, or vice versa, as this will cause boiler water to short circuit heat exchanger. The connections may require certain additional fittings and parts as shown on diagrams. (See Fig. 8, 9, and 10.)

If installing an entire new heating system, first install all radiation units (panels, radiators, or cabinets) and supply and return mains, then make connections to boiler.

In connecting cold water supply to reducing valve, make sure that a clean water supply is available. When water supply is from a well or pump, a sand stainer should be installed at pump.

When boiler is used in connection with refrigeration systems, it shall be installed so that chilled medium is piped in parallel with the heating boiler with appropriate valves to prevent chilled medium from entering the heating boiler. (See Fig. 10.)

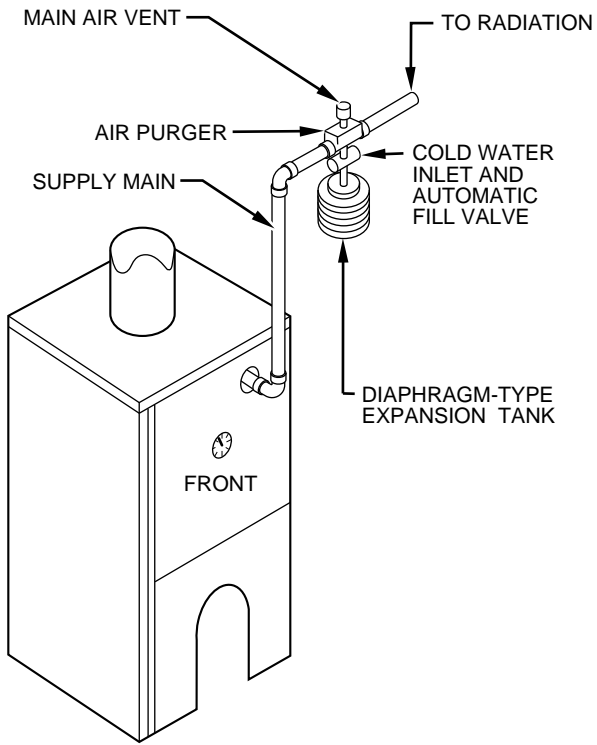


Fig. 8—Forced Hot Water Typical Piping

A95598

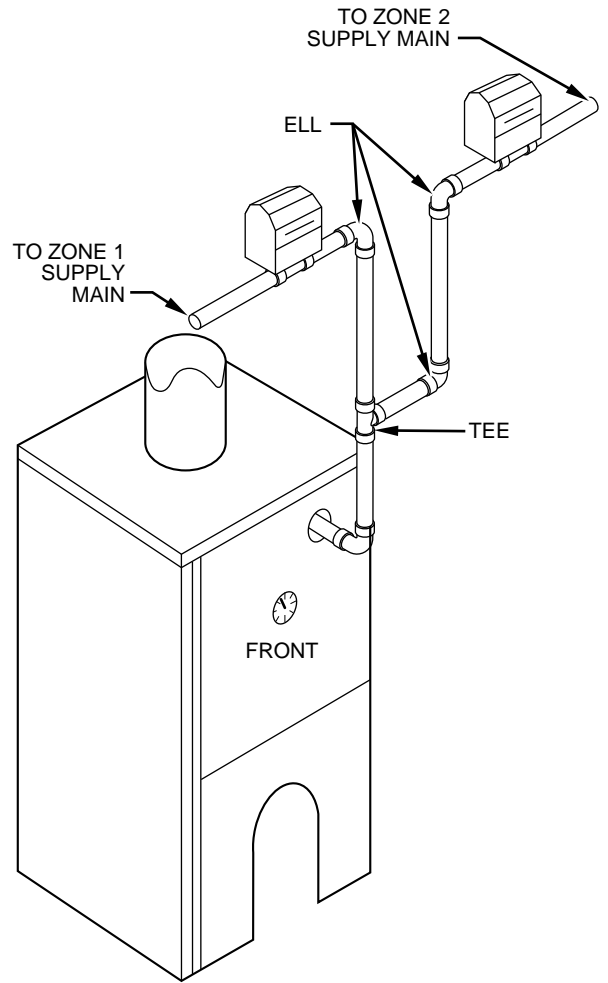


Fig. 9—Forced Hot Water Typical Piping with Zone Control Valves

A95599

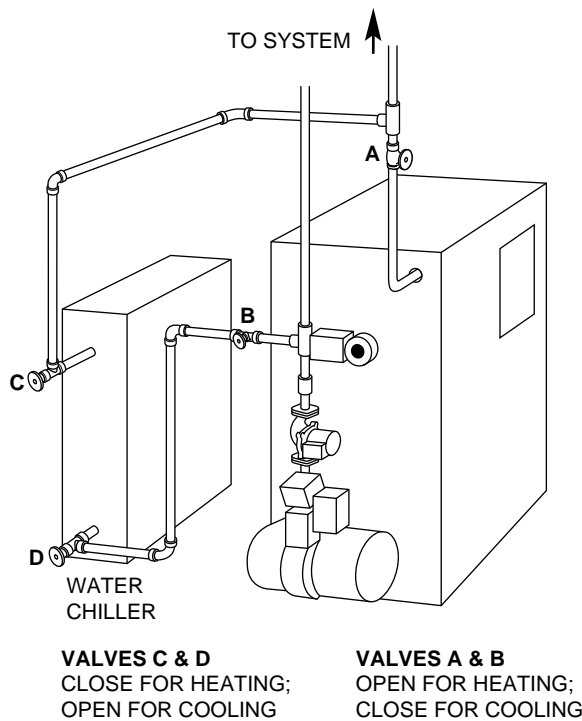


Fig. 10—Piping Arrangements for Boiler When Used in Connection with Refrigeration System

A96153

CHIMNEY AND CHIMNEY CONNECTION

Follow local codes. In the absence of local codes, follow ANSI/NFPA 31 Installation of Oil Burning Equipment, latest revision.

PROCEDURE 1—CHECKING CHIMNEY

The chimney is a very important part of the heating system. No boiler, however efficient its design, can perform satisfactorily if the chimney serving it is inadequate. Check chimney to make certain it is the right size, properly constructed, and in sound condition.

It is cheaper to rebuild a poor chimney than to pay excessive fuel bills. If chimney is an old masonry chimney, a new steel liner or a new prefabricated chimney may be the best solution.

Table 2 shows recommended minimum chimney sizes based on Table 3 and Fig. 6 of the I=B=R Testing and Rating Standard for Heating Boilers, Sixth Edition, June 1989.

Table 2—Recommended Minimum Chimney Sizes

FIRING RATE (GPH)	CHIMNEY HEIGHT (FT)	NOMINAL CHIMNEY AREA (IN.)	ROUND LINER-INSIDE DIAMETER (IN.)	SQUARE LINER-INSIDE DIMENSIONS (IN.)
0.60 to 1.30	15	8 X 8	6	6-3/4 X 6-3/4
1.31 to 1.80	15	8 X 8	7	6-3/4 X 6-3/4
1.81 to 2.00	20	8 X 8	8	6-3/4 X 6-3/4

For elevations above 2000 ft above sea level, add 3 ft to chimney heights. (See Fig. 11.)

→ For additional chimney design and sizing information, consult the ASHRAE 1996 HVAC System and Applications Handbook, Chapter 30, Chimney, Gas Vent and Fireplace Systems; or the National Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances, ANSI/NFPA 211.

PROCEDURE 2—CHIMNEY CONNECTOR AND DRAFT REGULATOR

Boiler requires 6-in. diameter chimney connector pipe. The draft regulator shipped with boiler must also be used. When properly installed, the regulator controls the draft automatically. It is best to install it in a horizontal section of the pipe, but it may be in an angled or vertical section. Make certain that the "top" is at top and that the short pipe section which holds vane is horizontal. Install it as close as practicable to boiler. (See Fig. 11.)

Install chimney connector as follows:

1. Start at boiler with a vertical pipe and then an elbow.
2. Install draft regulator making it horizontal.
3. When regulator is in place, start at chimney and work back to regulator.
4. Join the 2 sections with a drawband. The horizontal pipe must slope up toward chimney at least 1/4 in. per ft. It must not leak and must be firmly supported.
5. Join sections with at least 2 sheet metal screws.
6. Support every second section with a stovepipe wire.

PROCEDURE 3—MINIMUM VENT PIPE CLEARANCE

Wood and other combustible materials must not be closer than 18 in. from any surface of vent pipe.

PROCEDURE 4—OPTIONAL POWER VENTING

These boilers are ETL listed for sidewall venting with Field Controls Company Model SWG-6 Power Venter and Model CK-62 Control Kit, eliminating the need for a chimney. Confirm that this option is allowed by local codes before installing. Follow Field's instructions included with power venter and control kit. Electrical wiring diagrams for power venting are shown in Fig. 14 and 15.

→ When sidewall venting, flue gases must be vented to a point in relation to the prevailing wind so that they may freely disperse without being blown back at the building causing discoloration, or into the building through nearby doors or windows causing odors. Also, under certain conditions, flue gases condense, forming moisture. In such cases, steps should be taken to prevent building materials at vent terminal from being damaged by exhausted flue gas.

MUST BE REQUIRED MINIMUM HEIGHT. MUST BE AT LEAST 3 FT HIGHER THAN HIGHEST PART OF PASSAGE THROUGH ROOF. MUST BE AT LEAST 2 FT HIGHER THAN ANY NEIGHBORING OBJECT. MUST HAVE AN UNOBSTRUCTED TOP OPENING.

MUST BE AT LEAST 4 IN. THICK AND BE TIGHT.

TIGHT, SMOOTH, CORRECTLY SIZED.

MUST SLOPE UP AT LEAST 1/4 IN. PER FOOT OF HORIZONTAL RUN.

DRAWBAND LAST PIECE INSTALLED

SEALED IN THIMBLE

TIGHT CLEAN-OUT DOOR

DRAFT REGULATOR VANE

BALANCED WEIGHT

CRIMPED END

ALTERNATE POSITIONS

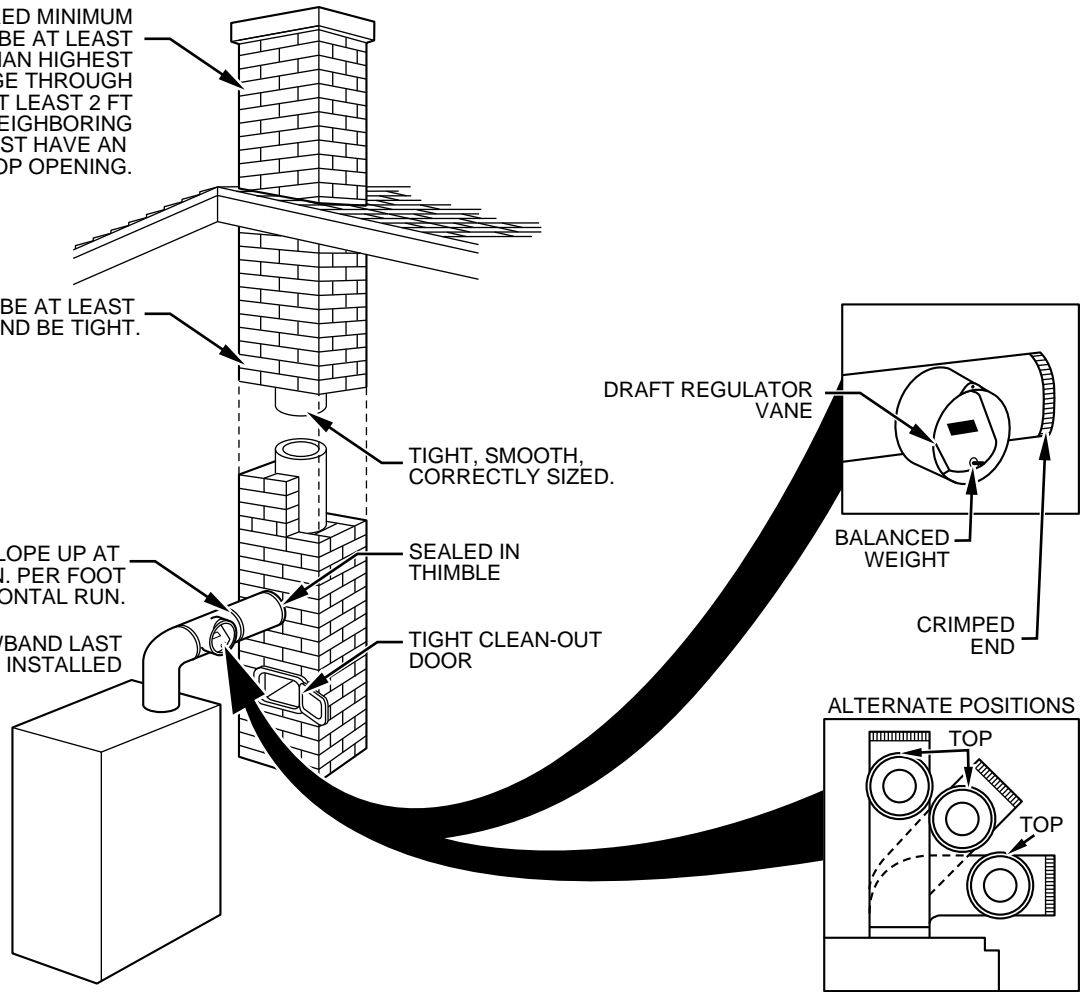
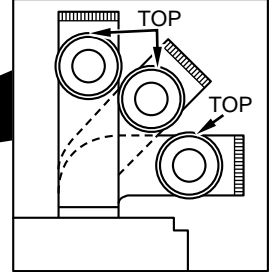


Fig. 11—Typical Chimney Requirements

A95601

ELECTRICAL WIRING

See Fig. 13-15 for wiring diagrams for the various models.

PROCEDURE 1—INSTALLING THERMOSTAT (NOT PROVIDED)

The 24-v thermostat location has an important effect on operation of boiler system. BE SURE TO FOLLOW INSTRUCTIONS INCLUDED WITH THERMOSTAT.

PROCEDURE 2—GROUNDING

Permanently ground boiler according to local codes and the National Electrical Code. Run a 14 gage or heavier copper wire from boiler to a grounded connection in service panel or a properly driven and electrically grounded ground rod.

PROCEDURE 3—ELECTRIC POWER SUPPLY

⚠ WARNING: Turn off electric power at fuse box before making any line voltage connections. Follow local electric codes. Failure to follow this warning could result in electrical shock, personal injury, or death.

All electrical work must conform to local codes as well as the National Electrical Code. If not familiar with wiring and codes in general, have a competent electrician do this job.

Boiler controls are all wired at the factory. All that is required is to connect a 115-v electric supply and thermostat wires to aquastat relay.

Run a separate circuit from a separate overcurrent protective device in electrical service entrance panel. This should be a 15-amp circuit. Locate a shutoff switch at boiler. It must be turned OFF during any maintenance. Solder and tape or securely fasten these connections with wire nuts.

PROCEDURE 4—CONNECTING 115-V ELECTRIC WIRING TO BOILER

Connect 115-v electric supply wires to terminals L1 and L2 on aquastat relay. (See Fig. 12.)

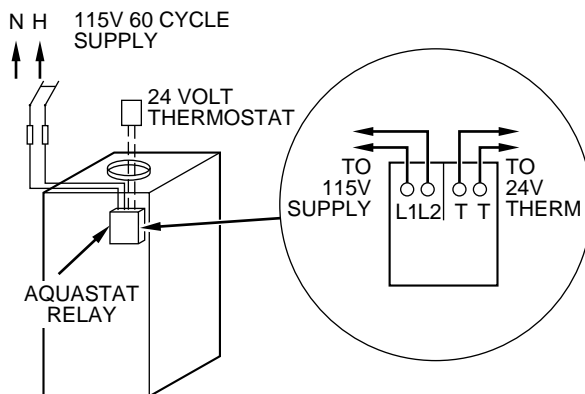


Fig. 12—Wiring Connections to Aquastat Relay

A95602

PROCEDURE 5—THERMOSTAT CONNECTIONS

A. Boilers Without Tankless Coil

The 2 wires from thermostat connect to terminals T and T on L8148A aquastat relay.

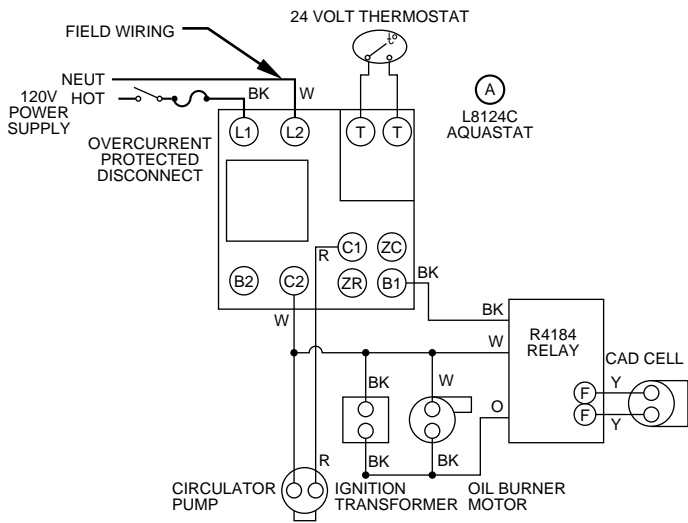
B. Boilers With Tankless Coil

The 2 wires from thermostat connect to terminals T and T on L8124C aquastat relay.

PROCEDURE 6—THERMOSTAT HEAT ANTICIPATOR ADJUSTMENT

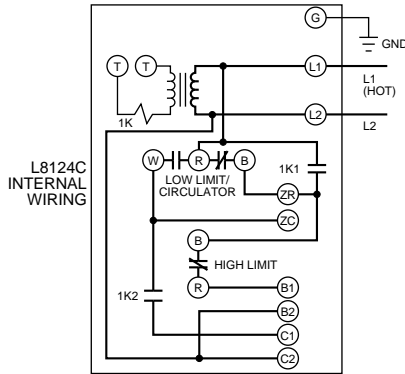
Set heat anticipator at 0.2 amps.

BOILER WITH TANKLESS HEATER COIL

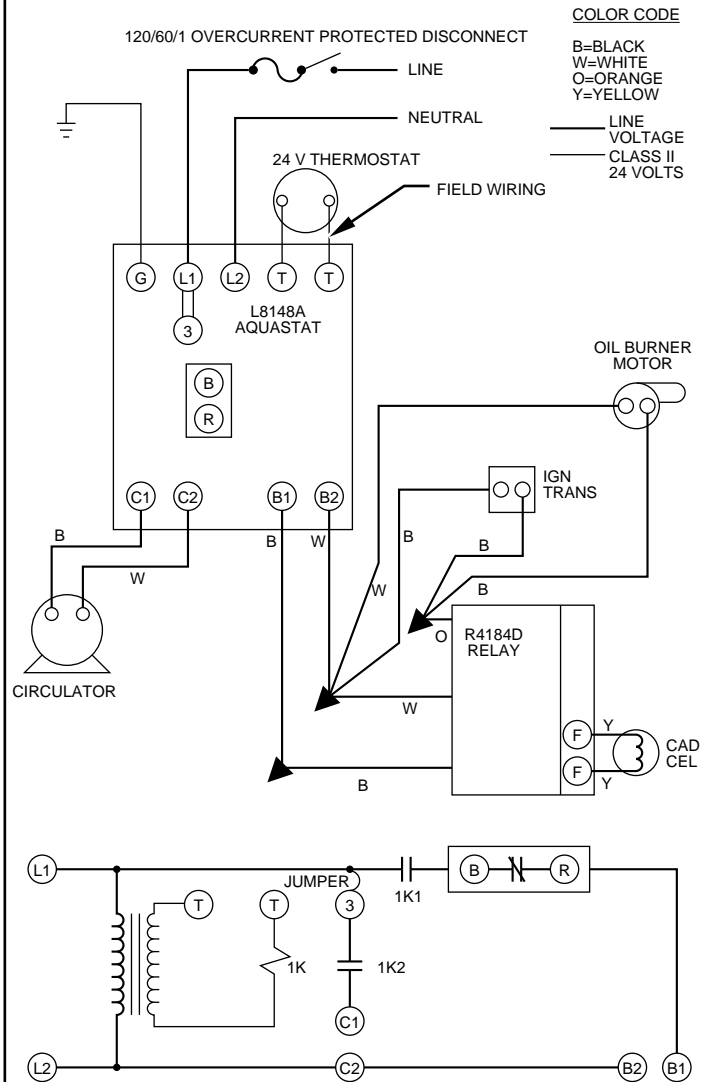


COLOR CODE

BK-BLACK
O-ORANGE
Y-YELLOW
R-RED
W-WHITE



BOILER WITHOUT TANKLESS HEATER COIL

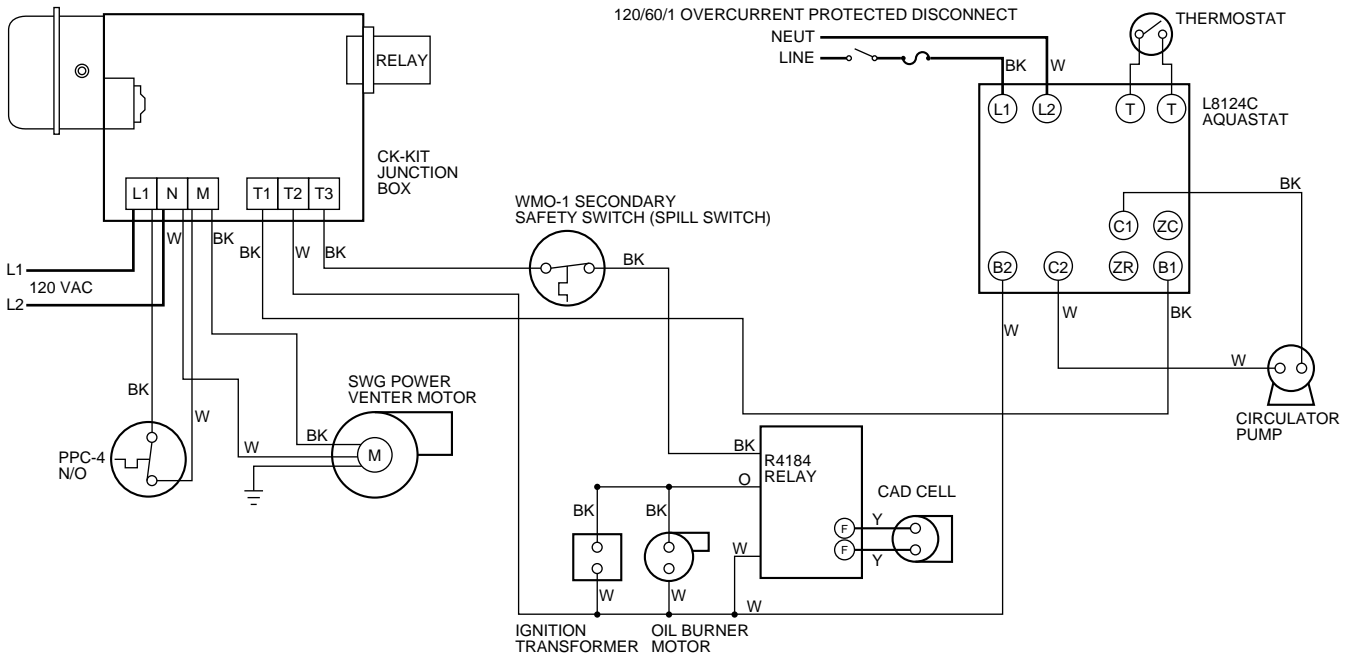


COLOR CODE

B=BLACK
W=WHITE
O=ORANGE
Y=YELLOW
— LINE
— VOLTAGE
— CLASS II
— 24 VOLTS

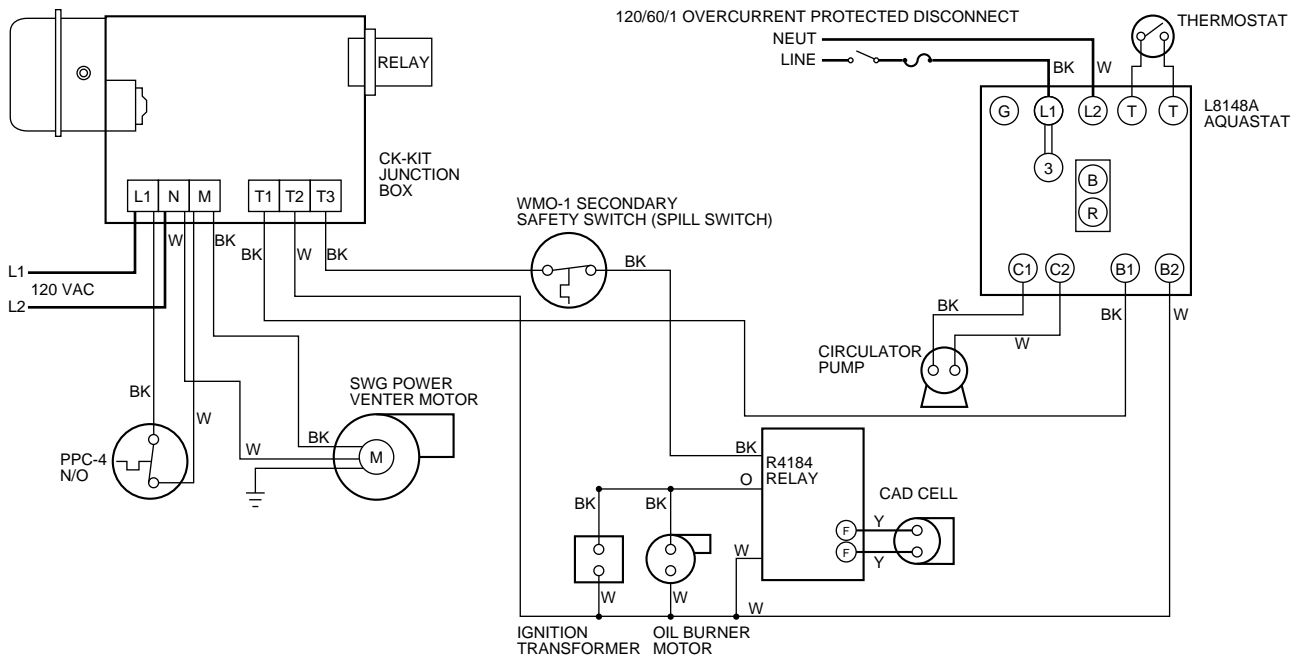
Fig. 13—Wiring Diagrams for Boilers With and Without Tankless Heater Coil

A95610



**Fig. 14—Boiler With Tankless Heater Coil
(With Optional Field SWG Power Venter and CK-62 Control Kit)**

A96154



**Fig. 15—Boiler Without Tankless Heater Coil
(With Optional Field SWG Power Venter and CK-62 Control Kit)**

A96155

EQUIPMENT AND OPTIONAL ACCESSORIES

PROCEDURE 1—RELIEF VALVE (PROVIDED)

Each low-pressure hot water heating boiler is provided with a relief valve for over-pressure protection of boiler and heating system. The relief valve opens when pressure in boiler rises to 30 psig. Each relief valve is provided with a lifting device for testing and should be tested monthly during heating season. Escape piping should be provided from discharge side of relief valve so as to prevent scalding or other hazardous situations. The escape piping must remain full size and end at a safe point of discharge.

PROCEDURE 2—EXPANSION TANK (NOT PROVIDED)

In a properly assembled system, expanding water flows into an expansion tank. This tank should be of the correct size.

The tank is filled with air. As the water expands, it compresses the air in tank to form an air pressure cushion. This "spring-like" cushion serves to maintain correct operating water pressure regardless of water temperature. This assures a "full measure" of water even in the highest radiation unit of system. It also prevents blowing off the relief valve.

The air in tank in the beginning (with system filled with cold water) is sufficient for proper operation. The tank also serves as a trap for excess air in system. This air would cause gurgling in pipes and inefficient circulation in radiators if left in system.

It is possible for a tank to become "water-logged" (filled with water). It can also become overfilled with air. This can happen after filling system with new water. Fittings are provided on tank and in line to tank for bleeding off excess water or air.

When installing this tank, the following are important:

1. Tank should be higher than boiler top.
2. Pipe to tank should continuously rise up to tank (so that air can "bubble" up through it).

PROCEDURE 3—DIAPHRAGM-TYPE EXPANSION TANK (NOT PROVIDED)

The diaphragm-type expansion tank takes the place of a conventional expansion tank. Read instructions packed with tank assembly carefully.

The tank comes with a 10-12 psi air charge. This is the same as the pressure produced in system by automatic fill valve. When system is first filled, tank contains little or no water.

As water is heated, its pressure increases. It expands into tank compressing the air in tank. This compressed air cushion permits water in system to expand as temperature changes.

The diaphragm-type tank can be mounted on air purger fitting or at any other convenient place in supply or return line.

PROCEDURE 4—AIR-ELIMINATING FITTING (AIR PURGER) (NOT PROVIDED)

An air purger is used to remove air from system. It is installed in supply line. It eliminates air from water before it reaches radiators and bleeds off this air.

PROCEDURE 5—MAIN AIR VENT FOR DOWNFLOW SYSTEMS OR DIAPHRAGM-TYPE EXPANSION TANK (NOT PROVIDED)

Before a system is filled with water, there is air in pipes and radiation units. Some of it will be trapped as system fills. It is possible to eliminate most of this air through air vents on radiation units. A main air vent speeds and simplifies this process. It should be installed on highest point in supply main when all radiation is below top of boiler.

PROCEDURE 6—AQUASTAT RELAY CONTROL (PROVIDED)

The water temperature limit control in aquastat relay is adjustable and may be set as necessary. It may be set as low as 140°F or as high as 240°F. This depends on type and amount of radiation involved and weather conditions.

PROCEDURE 7—AUTOMATIC FILL VALVE (NOT PROVIDED)

For safe, efficient operation, a hot water system must be filled with water. Adding new water when needed can be done manually (by use of a hand valve in water supply line). This requires regular attention to system's needs. An automatic fill valve accomplishes this without attention. It is installed in supply line on hot water boilers only. The valve operates through water pressure differentials. It does not require electrical connection.

PROCEDURE 8—DRAIN VALVE (PROVIDED)

This manual valve provides a means of draining all water from boiler and system. It is installed in a tee where return line enters boiler.

PROCEDURE 9—CIRCULATING PUMP (PROVIDED)

Every forced hot water system requires a circulating pump. A separate pump or zone valve is required for each zone if there are 2 or more zones. This pump must have the capacity to provide circulation required by system. The pump is connected into return main just ahead of boiler. It is also wired to electrical system.

FILLING BOILER

PROCEDURE 1—HOW A HOT WATER SYSTEM OPERATES

The entire heating system (boiler, piping, and radiation units) is filled with water. As water in boiler is heated, it is pumped from top of boiler through supply main to radiation units. The cooler water in them flows back through return main to boiler. This provides positive and rapid response to thermostat.

PROCEDURE 2—FILLING SYSTEM WITH WATER

To fill:

1. Close air vents on all radiation units. Open valves to these units.
2. Make sure boiler and expansion tank drain cocks are closed. The air bleed screw on tank drain fitting should be closed.

3. Open valve in line from boiler to expansion tank.
4. Open water inlet to boiler and leave it open.
5. Start with the LOWEST radiation unit. Open the air vent on this radiation unit. When all air has escaped and water starts to flow from vent, close air vent.
6. Proceed to next lowest radiation unit and repeat process outlined in item 5. Repeat until every radiation unit in system has been covered. End with the highest unit in system.

If units have automatic vents, this manual venting is unnecessary but will speed up proper filling of system.

If system is a closed expansion tank system, there should be an automatic fill valve. It may be left open to refill system automatically as needed. Check temperature-pressure gage. Note position of hand indicating pressure. This should be between 10 and 15 psi. Any lowering of this movable hand below 10 psi indicates loss of water due to leakage. The automatic fill valve should compensate for this. If it does not, manually open this valve to refill system until hand is again pointing to same pressure reading. Instructions are packaged with valve.

OPERATING BOILER

⚠ CAUTION: Do not tamper with the unit or controls.

IMPORTANT: Follow these instructions carefully.

PROCEDURE 1—TO START

Fill entire system with water. Vent all air from system. Refer to instructions included with oil burner.

PROCEDURE 2—FUEL UNITS AND OIL LINES

The oil burner is provided with a single-stage 3450 RPM fuel unit with by-pass plug removed for a single-pipe installation. This is satisfactory where fuel supply is on same level or above burner, permitting gravity flow of oil. Never exceed 3 psi pressure to suction side of fuel unit. A pressure over 3 psi may cause damage to shaft seat and allow it to leak oil. When it is necessary to lift oil to burner, a return line should run between fuel unit and oil supply. If lift exceeds 10 ft, a 2-stage fuel unit must be used with a return line. When a 2-line installation is made, by-pass plug must be installed. This is supplied with burner attached to fuel unit along with a fuel pump data sheet in a plastic bag. When oil lines are installed, continuous runs of heavy wall copper tubing is recommended. Be sure that all connections are absolutely airtight. Check all connections and joints. Flared fittings are recommended. Do not use compression fittings. See pump data sheet for sizing, lift, and length of tubing recommendations. Use an oil filter of adequate size for all installations. Install inside building between tank shutoff valve and burner. For ease of servicing, locate shutoff valve and filter near burner.

PROCEDURE 3—AIR SUPPLY FOR COMBUSTION

Do not install in rooms with insufficient air to supply combustion. Occasionally, it is necessary to install windows or cut holes in a door to these rooms to obtain sufficient air and to prevent less than atmospheric air pressure in the room. If there is a lack of combustion air, the burner flame will be yellow and formation of soot will occur in heating unit. In buildings of conventional frame, brick, or stone construction without utility rooms, basement windows, or stair doors, infiltration is normally adequate to provide air for combustion and operation of barometric draft control. The room should be isolated from any area served by exhaust fans. Do not install exhaust fans in this room. See Fresh Air for Combustion section earlier in this document.

PROCEDURE 4—DRAFT REGULATORS (PROVIDED)

A draft regulator is required. It should preferably be mounted in smoke pipe. Use a draft gage to adjust to proper opening. When burner air supply and draft are properly adjusted, combustion chamber draft will be approximately -0.01 to -0.02 in. wc and stack draft will be -0.02 to -0.04 in. wc. The larger the installation, the greater the draft required at stack to obtain -0.01 to -0.02 in. wc at combustion chamber.

PROCEDURE 5—NOZZLES (PROVIDED)

Use the proper size, type, and spray pattern nozzle. To install nozzle, loosen clamping screw on retention ring assembly and slide assembly off adapter. Install and tighten nozzle in adapter. Be careful not to damage electrode insulators or bend electrodes. Replace retention ring assembly on adapter. Make sure clamp is tight against shoulder on adapter. Tighten clamping screw. Check electrode setting. (See Fig. 16-20.)

PROCEDURE 6—FINAL BURNER ADJUSTMENTS

A final adjustment must be made with the use of a COMBUSTION TEST KIT. Initial settings for burner are shown on label on top of ignition transformer. Set burner accordingly. After operating 10 minutes to warm unit up, a smoke tester should be used to take a smoke reading in flue pipe between boiler and draft regulator. Smoke should be zero (Shell Bacharach Scale). At times a new boiler requires more time than this to burn clean due to oil film on a new heat exchanger. Check draft over the fire. This should be -0.01 to -0.02 in. wc as previously stated. Adjust draft if necessary. Gradually close air shutter, and if necessary the air band, to obtain a smoke reading showing a trace of smoke. Measure CO₂ at this point. Increase air sufficiently to reduce CO₂ by 0.5 to 1 percent as an insurance margin. Smoke should be zero. If a clean fire cannot be obtained, it will be necessary to verify head and electrode alignment. (See Fig. 16-20.) If fire is still smokey, replace nozzle with a correct replacement. Record nozzle size, oil pressure, combustion readings and air settings then place a tag or label on boiler or burner with this information. Units should be cycled several times to assure good operation with no fluttering or rumbling. Check for oil leaks.

PROCEDURE 7—OIL BURNER MAINTENANCE

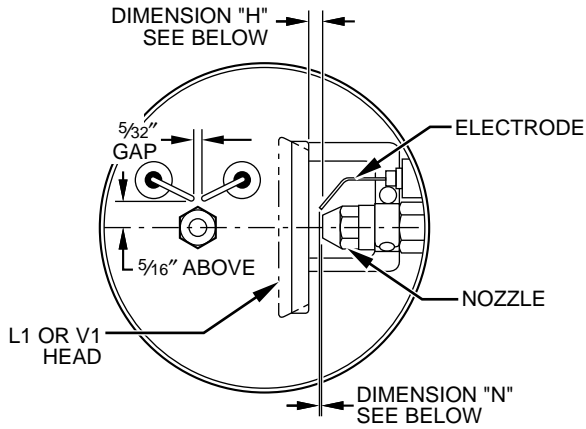
The following preventative maintenance items should be performed annually, preferably prior to the heating season.

A. Oil Burner Motor

Add 2-3 drops of non-detergent electric motor oil to each oil cup located at front and rear of motor. Excessive oiling will shorten the life expectancy of motor.

B. Fuel Filter

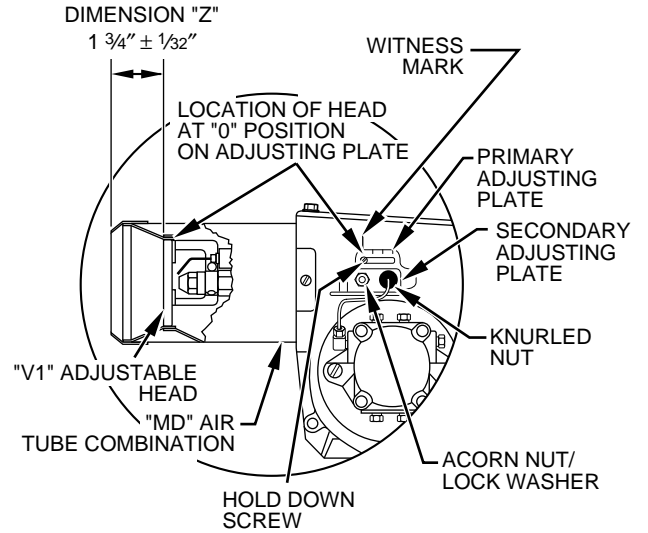
This should be replaced so as to prevent contaminated fuel from reaching the nozzle. A partially blocked fuel filter can cause premature failure of fuel pump unit.



A95603

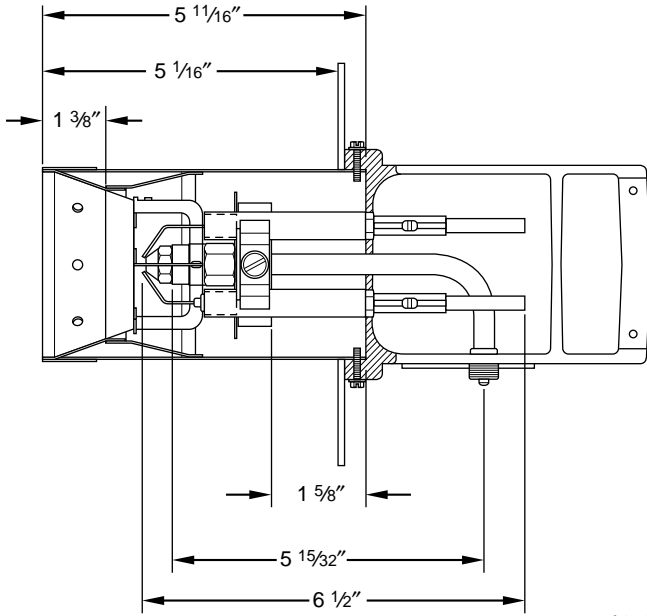
UNIT SIZE	HEAD	DIMENSIONS (IN.)	
		N	H (Head to Nozzle)
120	L1	1/16	7/32 to 9/32
181	V1	1/16	7/32 to 9/32
239			

Fig. 16—Beckett Burner Electrode Adjustments (For L1 or V1 Heads)



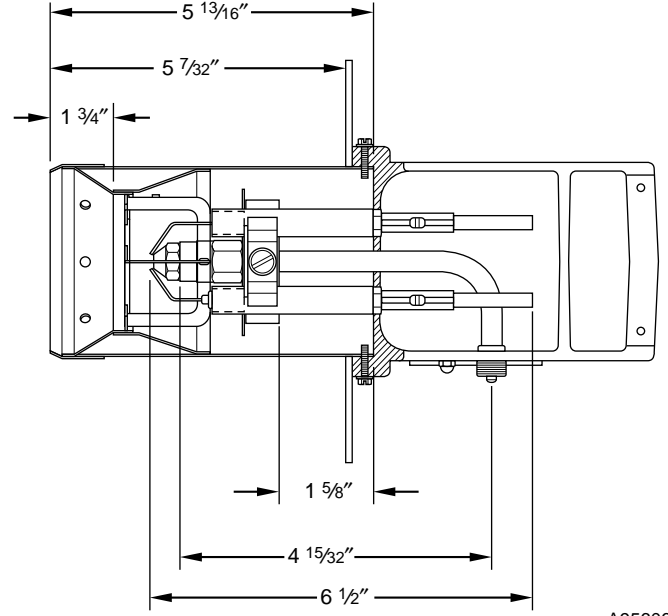
A95604

Fig. 17—Beckett Burner Setting Variable (V1) Head



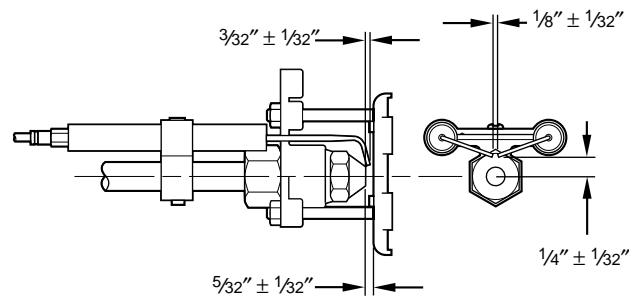
A95605

Fig. 18—Beckett Burner Fixed Head Dimensional Relationships for 120 Size Unit



A95606

Fig. 19—Beckett Burner Variable Head Dimensional Relationships for 181 and 239 Size Units



A95607

Fig. 20—Beckett AFII Burner Electrode Adjustments

Table 3—Oil Burner Nozzles

UNIT SIZE	UNIT CAPACITY	DELANO NOZZLE TYPE FOR BECKETT AFG OIL BURNER OIL PUMP 100 PSI	DELANO NOZZLE TYPE FOR BECKETT AFII OIL BURNER OIL PUMP 140 PSI
120	74,000	0.65-70°-B	—
	92,000	0.75-70°-A	0.65-70°-B
	120,000	1.00-70°-A	0.85-60°-B
181	111,000	0.90-60°-W	0.75-70°-B
	153,000	1.25-70°-B	1.00-70°-B
	181,000	1.50-70°-B	1.25-60°-B
239	147,000	1.20-70°-B	—
	210,000	1.75-70°-B	—
	239,000	2.00-70°-B	—

C. Fuel Pump Unit

Replace pump screen and clean pump unit to maintain reliable fuel delivery to nozzle.

D. Ignition Electrodes

Clean and adjust as per manufacturer’s recommendations so as to maintain reliable ignition of oil.

E. Nozzle

Replace so as to maintain safe and reliable combustion efficiency. Always replace with the exact nozzle as required in Table 3.

F. Fan and Blower Housing

These must be kept clean and free of dirt, lint, and oil so as to maintain proper amount of air the fuel requires to burn.

NOTE: If any component parts must be replaced, always use parts recommended by burner manufacturer.

CHECKING AND ADJUSTING CONTROLS

⚠ WARNING: Do not attempt to start the burner when excess oil has accumulated, when unit is full of vapor, or when the combustion chamber is very hot. Failure to follow this warning could result in fire, personal injury, or death.

IMPORTANT: These instructions must be followed carefully.

PROCEDURE 1—ADJUSTING OPERATING CONTROLS

Instructions for each control are included. Refer to Table 4 for recommended settings for the first adjustment:

Table 4—Recommended Operating Control Settings

OPERATING CONTROL	CONTROL SETTING	
High Limit	Standing Radiators	180°F
	Baseboard and Convectors	200°F
Low Limit (When Used)		140°F
Differential (When Used)		10°F

These settings can be changed after gaining familiarity with how system responds. If system does not give quite enough heat in very cold weather, the high limit setting can be raised to 220°F. If more domestic hot water is required, the low limit setting can also be raised.

PROCEDURE 2—CHECKING THERMOSTAT OPERATION

When set above temperature indicated on thermometer, boiler burner should start. Make certain thermostat shuts boiler down when room temperature reaches selected setting and starts boiler operating when room temperature falls a few degrees.

Finally, set thermostat for desired temperature. Special conditions in home and location of thermostat will govern this setting.

NOTE: Do not start burner unless all cleanout doors are secured in place.

MAINTENANCE

To assure trouble-free operation, we recommend that flue passages, burner, combustion chamber area (target wall and fire door insulation), burner adjustment, and operation of controls be checked ONCE EACH YEAR by a competent service technician.

BEFORE THE START OF EACH SEASON (or whenever system has been shut down for some time), recheck the whole system for leaks and recheck boiler and vent pipe for leaks. Replace or patch any boiler seals that are faulty.

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

PROCEDURE 1—RELIEF VALVE

This valve should open automatically when system pressure exceeds the safe limit (30 psi). Should it ever fail to open under this condition, shut system down. Drain it until pressure is reduced below safe limit, then have valve replaced immediately. The relief valve should be tested monthly during heating season. Refer to valve manufacturer’s instructions packaged with relief valve.

PROCEDURE 2—EXPANSION TANK

As previously noted, this tank may become waterlogged or may receive an excess of air. Frequent automatic opening of relief valve indicates waterlogging. A high boiler temperature accompanied by unusually low radiation unit temperature (and "knocking") indicates excess air in tank. To correct either condition, close valve between boiler and tank. Drain tank until it is empty. Check all tank plugs and fittings. Tighten as necessary. Open valve between boiler and tank. Water will rise to normal height in tank if automatic fill valve is installed, otherwise, manually refill system.

PROCEDURE 3—WATER SYSTEM

If system is to remain out of service during freezing weather, always DRAIN IT completely. Water left in to freeze will crack pipes and/or boiler.

PROCEDURE 4—TANKLESS COIL (OR COVER PLATE) GASKET

The tankless coil gasket should be checked at least twice a year for leakage and replaced if necessary.

OIL BOILER/BURNER CLEANING INSTRUCTIONS

1. Shut off all electrical power to boiler/burner and shut off fuel supply.
2. Remove sheet metal smoke pipe from top of boiler. Inspect pipe and chimney for signs of corrosion and deterioration. Clean base of chimney.
3. Remove top jacket panel (6 screws). Remove 2 screws holding left side jacket panel to rear jacket panel and separate the 2 panels enough for side jacket panel to slip off the "Z" bars on collector top.
4. Remove 2 brass wing nuts holding flue collector top. Remove top jacket support bracket and 2 "Z" bars and collector top.
5. Check gasket on underside of flue collector and replace as necessary.
6. Remove lower front jacket panel (4 sheet metal screws and 2 cap nuts).
7. Remove oil burner (3 cap screws).

-OR-

Remove oil burner/fire door assembly (4 hex nuts). This is the recommended method as it allows full access to combustion chamber and less potential for damage to target wall during cleaning process.

8. Remove burner drawer assembly. Clean any soot accumulations.
9. Replace burner nozzle with exact size and type recommended for use on this boiler.

NOTE: Changing to a different firing rate (other than is recommended) or type of nozzle may change performance of boiler and/or cause a hazardous condition.

10. Clean electrode assembly and set electrodes as per manufacturer's recommendations. (See Fig. 16 and 20.)
11. Reinstall drawer assembly and check for proper head location as per manufacturer's recommendations. (See Fig. 17, 18, and 19.)
12. Inspect target wall and fire door insulation for cracking and deterioration. If there is any sign of cracking or deterioration, replace before reassembling boiler.
13. Remove soot from fireside surfaces by brushing diagonally through flue passages. (See Fig. 21.) Care should be taken so as not to damage target wall with flue brush.

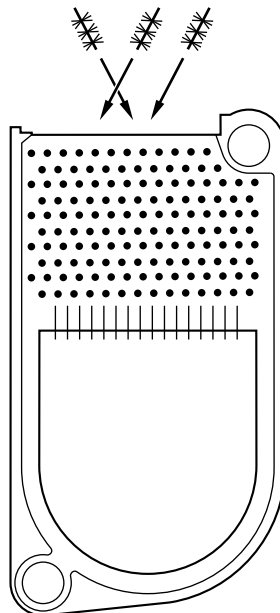


Fig. 21—Removing Soot

A95609

14. Carefully vacuum soot accumulations from combustion chamber area being particularly careful not to damage target wall with vacuum.
15. Reinstall burner/fire door assembly.
16. Reinstall flue collector top, "Z" bars, and top jacket support bracket and secure with 2 brass wing nuts.
17. Hang side jacket panels on "Z" bars and reassemble left side and rear jacket panels. Reinstall top jacket panel. Reconnect flue pipe.
18. Inspect and clean oil burner blower wheel.
19. Oil burner motor. DO NOT OVEROIL.
20. Remove oil pump cover and clean/replace pump screen. Carefully reassemble.
21. Replace fuel filter (if applicable).
22. Reconnect electrical and fuel supplies.
23. Fire burner, checking for proper combustion using combustion test equipment. Make adjustments as necessary. See Final Burner Adjustments section earlier in this document.
24. Ensure that all safety controls and operating controls are functioning properly.

**IMPORTANT OPERATING AND MAINTENANCE REQUIREMENTS KEEP BOILER AND AREA AROUND IT CLEAN
NEVER
BURN REFUSE OR ANY MATERIAL OTHER THAN THE SPECIFIED FUEL IN BOILER HAVE BOILER CHECKED EACH
YEAR BY A
QUALIFIED TECHNICIAN**

SEQUENCE OF OPERATION—BOILER WITH COIL

Refer to Fig. 22 and the wiring diagram shown in Fig. 13 while reviewing sequence of operation.

PROCEDURE 1—HIGH LIMIT CONTROLLER

The high limit contacts open and turn burner off when boiler water temperature reaches high limit set point. The high limit automatically resets after boiler water temperature drops past set point and through fixed 10° differential.

PROCEDURE 2—LOW LIMIT AND CIRCULATOR CONTROLLER

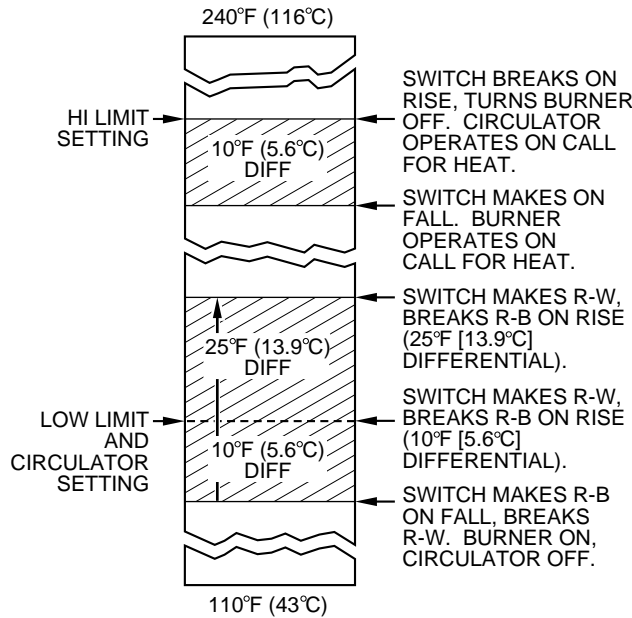
On a boiler water temperature rise, with the adjustable differential set at the minimum setting of 10°, burner circuit contacts RB break and circulator circuit contacts RW make at low limit set point. On a boiler water temperature drop of 10° below set point, the RB circuit makes and RW circuit breaks.

At any differential setting greater than 10°, the RB make and RW break temperature remains the same (control setting minus 10°). The RB break and RW make temperature is the set point temperature plus the difference between differential setting and 10°.

The low limit control fires burner to maintain boiler water temperature at low limit setting (set point plus adjustable differential setting minus 10°). While boiler water temperature is below low limit setting, circulator is prevented from operating, giving preference to domestic hot water requirements. Once boiler water temperature rises to low limit setting, thermostat controls firing of burner and operation of circulator pump as follows:

1. Thermostat calls for heat completing circuit between terminals T and T on L8124C aquastat controller energizing the 1K relay coil.
2. With 1K relay coil energized, contacts 1K1 and 1K2 are closed. Terminal B1 is energized providing power to R4184 oil burner primary control. This in turn powers ignition coil and burner motor.
3. With R4184 primary control energized, burner operation starts and burner remains running as long as cad cell senses flame. In the event of a flame failure or if flame is not fully proven within 45 sec of initial start-up, the R4184 primary control locks out and opens burner circuit. This requires a manual start-up of burner.
4. As long as flame is proven through cad cell relay, burner remains on until circuit is interrupted by boiler water temperature reaching high limit setting (opening high limit contacts BR), or thermostat is satisfied breaking T-T circuit.
5. Circulator pump is powered through terminal C1 and runs when boiler water temperature is above low limit setting.
6. If boiler water temperature reaches high limit setting, high limit contacts BR open de-energizing terminal B1 and shutting off burner. Circulator pump remains running as long as thermostat calls for heat.
7. If boiler water temperature falls 10° below high limit setting, contacts BR close energizing burner.
8. Thermostat is satisfied terminating call for heat. Relay coil 1K is de-energized opening 1K1 and 1K2 contacts. Both burner and circulator pump cease operation.

NOTE: The high limit setting must be set a minimum of 20° higher than low limit setting.



A95611

Fig. 22—Relationship of Set Points and Differential

SERVICE HINTS

Avoid inconvenience and service calls by checking these points before calling for service.

IF SYSTEM IS NOT HEATING OR NOT GIVING ENOUGH HEAT. . .	
Possible Cause	What To Do
Thermostat is not set correctly	Reset thermostat above room temperature.
Boiler and/or burner may be dirty	Clean all flue passages and vent pipe. Have burner cleaned and readjusted.
Burner may not be firing at proper rate	Check nozzle size if there is any doubt. Have burner adjusted.
Burner may be short-cycling	Short-cycling (too frequent off and on) of burner causes sooting. If boiler and/or burner becomes dirty at frequent intervals, correct the "dirt condition," then also correct the control setting (or other cause of short-cycling). Check thermostat heat anticipator and correct setting, if necessary, per instruction sheet packed with thermostat.
No power to boiler	Check overcurrent protection. Check to be sure power supply circuit is on.
Controls out of adjustment	Reset according to instructions packed with controls.
Radiators not heating	Open radiator vents to vent excess air. Check flow control valve (if used). It may be in closed position.
Circulator pump not running	Check relay operation.
Poor electrical contact	Check all control terminals and wire joints.
IF BURNER IS NOISY. . .	
Possible Cause	What To Do
Oil burner fan wheel may be dirty	Clean fan wheel with a stiff brush and cleaning solvent. Readjust oil burner.
Draft regulator may be stuck	Check to see if vane swings freely. Clean if vane is stuck.
IF RADIATORS ARE NOISY. . .	
Possible Cause	What To Do
Air in system	Open radiator vents to vent air. Check expansion tank.
RELIEF VALVE LEAKING. . .	
Possible Cause	What To Do
Dirt on seat	Open valve manually. Allow water to run and clear valve seat.
Waterlogged expansion tank	Drain tank. See instructions.

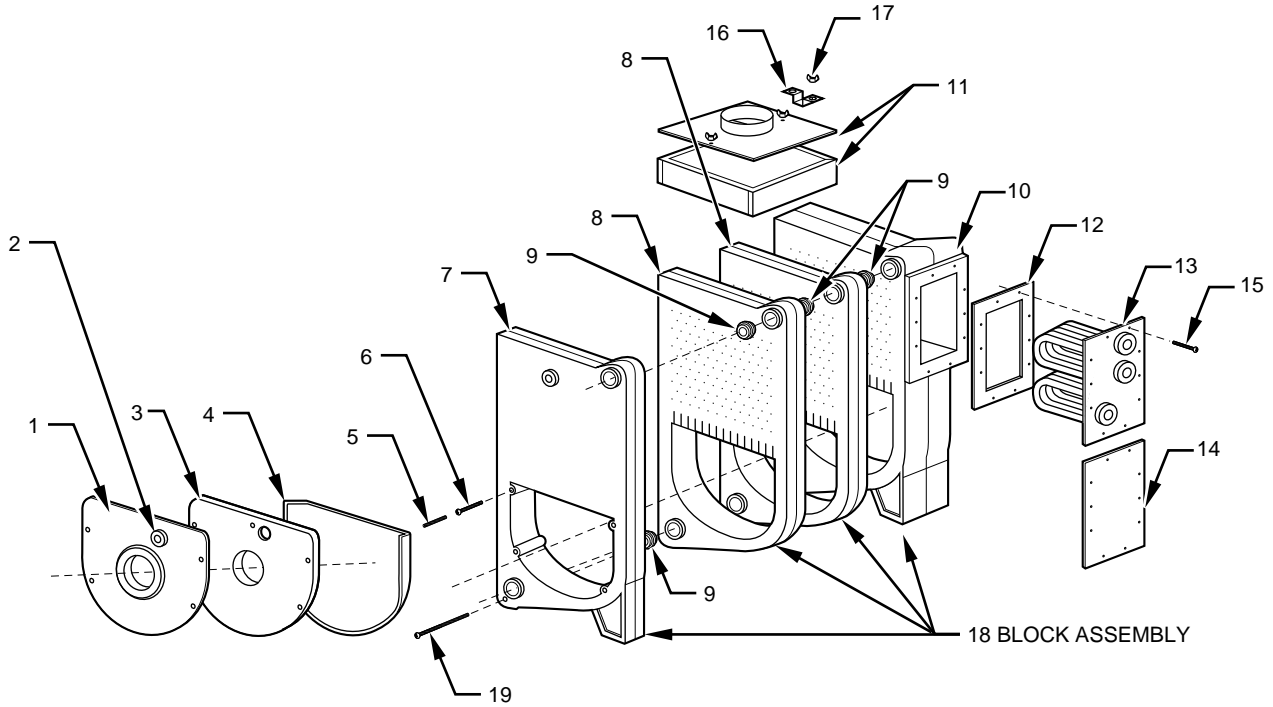
HAVE YOUR SERVICE TECHNICIAN CHECK ANY PROBLEM YOU ARE UNABLE TO CORRECT.

PARTS LIST

All parts are listed in the following Parts Lists. Parts may be ordered through nearest supplier
 When ordering parts, first obtain the Model No. from the name plate on boiler, then determine the Part No. (not the Key No.) and the Description of each part from the following appropriate illustration and list. Parts for which no Part No. is given are standard items which can be procured locally.
 Be sure to give all this information: **The Part No., The Part Description, The Boiler Model No.**

REPAIR PARTS

→ OIL-FIRED HOT WATER BOILERS



A96157

Boiler Parts

This is a Repair Parts List—Not a Packing List

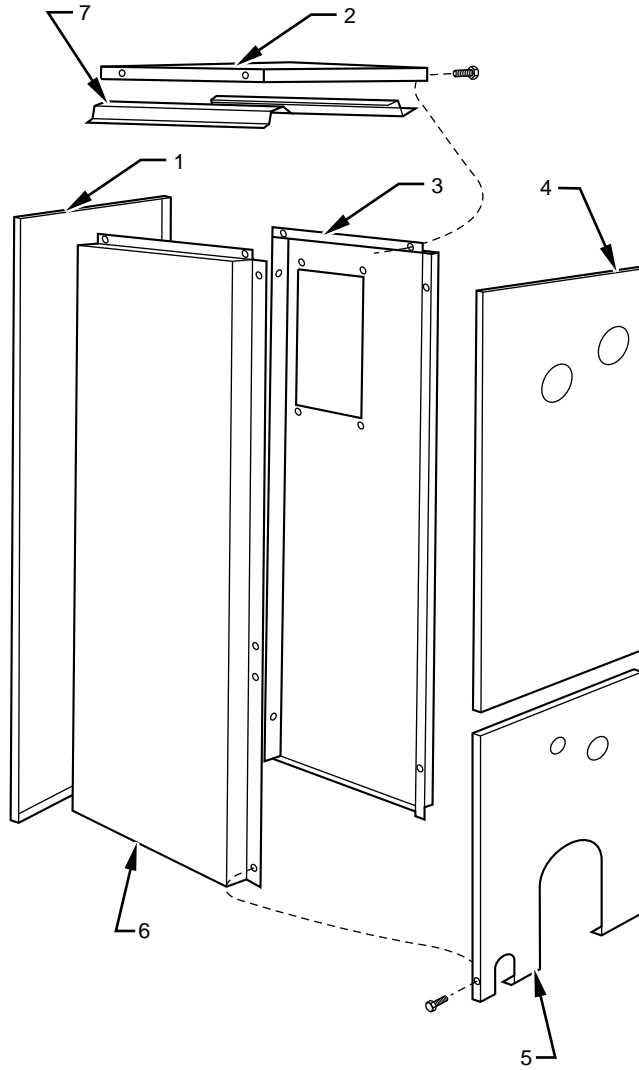
KEY NO.	PART NO.			DESCRIPTION
	3 Section	4 Section	5 Section	
1	403-00-004	403-00-004	403-00-004	Fire Door
2	403-00-005	403-00-005	403-00-005	Observation Door
*	146-95-006	146-95-006	146-95-006	5/16-in. X 3/8-in. Socket Shoulder Bolt 1/4-20 Thread
*	146-95-007	146-95-007	146-95-007	5/16-in. Lock Washer
3	146-14-015	146-14-015	146-14-015	Fire Door Insulation
4	146-19-003	146-19-003	146-19-003	Target Wall
5	146-19-021	146-19-021	146-19-021	Jacket Support Spacers (2 required)
6A	146-95-043	146-95-043	146-95-043	5/16-in.-18 X 2 1/4-in. Stud (4 required)
6B	146-19-014	146-19-014	146-19-014	3/4-in. Spacer (4 required)
6C	146-95-013	146-95-013	146-95-013	5/16-in.-18 Hex Nuts (4 required)
7	403-00-001	403-00-001	403-00-001	Front Section
8	403-00-002	403-00-002	403-00-002	Intermediate Section
9	433-00-976	433-00-976	433-00-976	2-in. Nipples†
10	403-00-003	403-00-003	403-00-003	Rear Section
11	425-00-276	425-00-277	425-00-278	Collector Flue
12	146-93-064	146-93-064	146-93-064	Gasket
13	146-27-020	146-27-020	146-27-020	Tankless Heater Coil
14	146-19-001	146-19-001	146-19-001	Tankless Heater Cover Plate
15	146-95-105	146-95-105	146-95-105	3/8-in.-16 X 3/4-in. Hex Head Cap Screw (10)
15A	146-95-113	146-95-113	146-95-113	3/8-in.-16 X 1 1/2-in. Stainless Steel Studs (10 req'd)
15B	146-95-114	146-95-114	146-95-114	3/8-in. Stainless Steel Flat Washer (10 req'd)
15C	146-95-115	146-95-115	146-95-115	3/8-in.-16 Stainless Steel Top Lock Nut (10 req'd)
*	433-60-408	433-60-408	433-60-408	Replacement Coil Kit (Includes 12, 13, and 15)
16	425-00-226	425-00-226	425-00-226	Jacket Support Bracket
17	137-04-007	137-04-007	137-04-007	No. 8-32 Brass Wing Nuts (2 required)
18	403-00-301	403-00-401	403-00-501	Block Assembly (Includes 1, 2, 3, 4, 6, 7, 8, 9, and 10)
19	146-05-002	146-05-051	146-05-053	1/4-in. Tie Rods (2 required)
*	146-95-042	146-95-042	146-95-042	5/16-in.-18 Acorn Cap Nuts (2 required)

* Not illustrated.

† Four are required for first intermediate replacement section and 2 for each additional section.

REPAIR PARTS

OIL-FIRED HOT WATER BOILERS



A95613

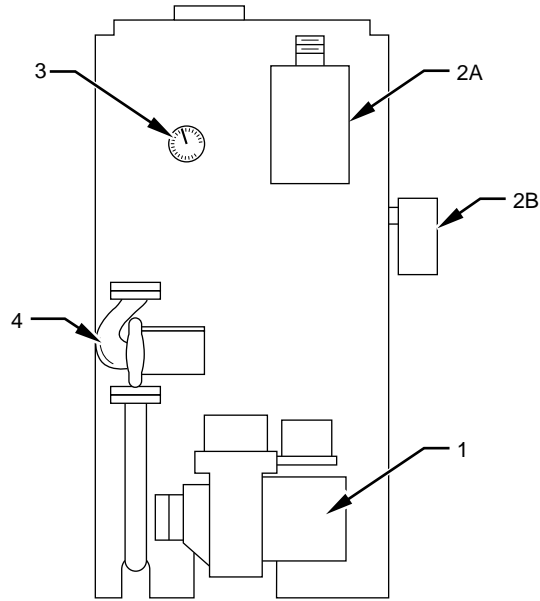
Flush Jacket Parts This is a Repair Parts List—Not a Packing List

KEY NO.	PART NO.			DESCRIPTION
	3 Section	4 Section	5 Section	
1	425-00-271	425-00-271	425-00-271	Back Panel
2	425-00-251	425-00-252	425-00-253	Top Panel
3	425-00-241	425-00-242	425-00-243	Right Side Panel
4	425-00-270	425-00-270	425-00-270	Upper Front Panel
5	425-00-272	425-00-272	425-00-272	Lower Front Panel
6	425-00-261	425-00-262	425-00-263	Left Side Panel
7	425-00-273	425-00-273	425-00-273	Z-Bars
*	146-95-074	146-95-074	146-95-074	No. 10 X 1/2-in. Sheet Metal Screw
*	425-00-286	425-00-287	425-00-288	Complete Jacket

* Not illustrated.

REPAIR PARTS

OIL-FIRED HOT WATER BOILERS



A96156

Controls

KEY NO.	PART NO.			DESCRIPTION
	3 Section	4 Section	5 Section	
1	146-19-012	146-19-013	146-19-013	Beckett AFG Oil Burner, Primary Control and Cad Cell
1	146-19-026	146-19-026	—	Beckett AF-II Oil Burner, Primary Control and Cad Cell
*	146-95-101	146-95-101	146-95-101	5/16-in. X 1-1/4-in. Stud (3 required)
*	146-95-001	146-95-001	146-95-001	5/16-in.-18 Flange Nut (3 required)
2A	433-00-521	433-00-521	433-00-521	Aquastat Control without Tankless Heater
2B	146-62-022	146-62-022	146-62-022	Aquastat Control with Tankless Heater
3	146-23-003	146-23-003	146-23-003	Gage
4	146-26-047	146-26-047	146-26-047	Circulator
*	146-22-011	146-22-011	146-22-011	Relief Valve
*	146-20-007	146-20-007	146-20-007	Barometric Draft Control
*	146-22-000	146-22-000	146-22-000	Drain Valve
*	146-55-003	146-55-003	146-55-003	Flue Brush
*	433-00-814	433-00-814	433-00-814	SWG-6/CK-62 Power Venter Kit

* Not illustrated.