

City of Portland, Maine - Building or Use Permit Application

389 Congress Street, 04101 Tel: (207) 874-8703, Fax: (207) 874-8716

Permit No: 09-1267	Issue Date:	CBL: <i>2419A-A72</i> 415 B002001
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Location of Construction: 1041 OCEAN AVE	Owner Name: JAMES COMPANY LLC	Owner Address: 7 MILL POND DR	Phone:
Business Name:	Contractor Name: Atlantic Heating Company Inc	Contractor Address: 133 Pride Street Westbrook	Phone 2077977210
Lessee/Buyer's Name	Phone:	Permit Type: HVAC	Zone: <i>I-M</i>

Past Use: Single family home with a garage for auto repair	Proposed Use: Single family home with a garage for auto repair - install a slant fin Boiler	Permit Fee: \$50.00	Cost of Work: \$2,850.00	CEO District: 4
Proposed Project Description: install a slant fin Boiler		FIRE DEPT: <i>w/conditions</i> <input checked="" type="checkbox"/> Approved <input type="checkbox"/> Denied <i>11/16/09</i> Signature: <i>[Signature]</i>		
		INSPECTION: Use Group: <i>U</i> Type: <i>HVAC</i> Signature: <i>[Signature]</i> PEDESTRIAN ACTIVITIES DISTRICT (P.A.D.) Action: <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/Conditions <input type="checkbox"/> Denied Signature: Date:		

Permit Taken By: Ldobson	Date Applied For: 11/9/2009	Zoning Approval		
1. This permit application does not preclude the Applicant(s) from meeting applicable State and Federal Rules. 2. Building permits do not include plumbing, septic or electrical work. 3. Building permits are void if work is not started within six (6) months of the date of issuance. False information may invalidate a building permit and stop all work..		Special Zone or Reviews <input type="checkbox"/> Shoreland <input type="checkbox"/> Wetland <input type="checkbox"/> Flood Zone <input type="checkbox"/> Subdivision <input type="checkbox"/> Site Plan Maj <input type="checkbox"/> Minor <input type="checkbox"/> MM <input type="checkbox"/> Denied <i>NO CAR SALES permitted</i> Date: <i>11/13/09</i>	Zoning Appeal <input type="checkbox"/> Variance <input type="checkbox"/> Miscellaneous <input type="checkbox"/> Conditional Use <input type="checkbox"/> Interpretation <input type="checkbox"/> Approved <input type="checkbox"/> Denied Date:	Historic Preservation <input checked="" type="checkbox"/> Not in District or Landmark <input type="checkbox"/> Does Not Require Review <input type="checkbox"/> Requires Review <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/Conditions <input type="checkbox"/> Denied Date:

CERTIFICATION

I hereby certify that I am the owner of record of the named property, or that the proposed work is authorized by the owner of record and that I have been authorized by the owner to make this application as his authorized agent and I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in the application is issued, I certify that the code official's authorized representative shall have the authority to enter all areas covered by such permit at any reasonable hour to enforce the provision of the code(s) applicable to such permit.

SIGNATURE OF APPLICANT	ADDRESS	DATE	PHONE
RESPONSIBLE PERSON IN CHARGE OF WORK, TITLE	DATE of Portland		PHONE

1-25-10

NOT DONE CORRECT: 1. Boiler not 18" off floor 2. Flier on it too not centered over burner 3. Needs fire door w/ self-closer 4. remove existing lights remaining thru boiler 5. ~~seal~~^{close} all holes in walls 6. dip & correct connection to tank 7. support chimney w/ metal support.

by E H

City of Portland, Maine - Building or Use Permit

389 Congress Street, 04101 Tel: (207) 874-8703, Fax: (207) 874-8716

Permit No: 09-1267		Date Applied For: 11/09/2009	CBL: 415 B002001
Location of Construction: 1041 OCEAN AVE	Owner Name: JAMES COMPANY LLC	Owner Address: 7 MILL POND DR	Phone:
Business Name:	Contractor Name: Atlantic Heating Company Inc	Contractor Address: 133 Pride Street Westbrook	Phone (207) 797-7210
Lessee/Buyer's Name	Phone:	Permit Type: HVAC	

Proposed Use: Single family home with a garage for auto repair - install a slant fin Boiler	Proposed Project Description: install a slant fin Boiler
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Dept: Zoning **Status:** Approved with Conditions **Reviewer:** Marge Schmuckal **Approval Date:** 11/13/2009**Note:** **Ok to Issue:** ☒

- 1) This property is located within a I-M Moderate Industrial Zone where retail and auto sales are not permitted and which are specifically prohibited.
- 2) This is NOT an approval for an additional dwelling unit. You SHALL NOT add any additional kitchen equipment including, but not limited to items such as stoves, microwaves, refrigerators, or kitchen sinks, etc. Without special approvals.
- 3) This property shall remain a single family dwelling with a garage for auto repair. NO AUTO SALES ARE PERMITTED ON THIS SITE. Any change of use shall require a separate permit application for review and approval.
- 4) This permit is being approved on the basis of plans submitted. Any deviations shall require a separate approval before starting that work.

Dept: Building **Status:** Approved with Conditions **Reviewer:** Tammy Munson **Approval Date:** 12/01/2009**Note:** **Ok to Issue:** ☒

- 1) Installation shall comply with 2003 International Mechanical Code and State of Maine Oil and Solid Fuel Board Laws and Rules

Dept: Fire **Status:** Approved with Conditions **Reviewer:** Ben Wallace Jr. **Approval Date:** 11/16/2009**Note:** **Ok to Issue:** ☒

- 1) A signed letter of compliance shall be required.
- 2) A licensed contractor shall be used.
- 3) Heating installation shall comply with NFPA 1-30.2.9.

PERMIT ISSUED

DEC 1

City of Portland

BUILDING PERMIT INSPECTION PROCEDURES

Please call 874-8703 or 874-8693 (ONLY)

to schedule your inspections as agreed upon

Permits expire in 6 months, if the project is not started or ceases for 6 months.

The Owner or their designee is required to notify the inspections office for the following inspections and provide adequate notice. Notice must be called in 48-72 hours in advance in order to schedule an inspection:

By initializing at each inspection time, you are agreeing that you understand the inspection procedure and additional fees from a "Stop Work Order" and "Stop Work Order Release" will be incurred if the procedure is not followed as stated below.

A Pre-construction Meeting will take place upon receipt of your building permit.

 X **Final inspection required at completion of work.**

Certificate of Occupancy is not required for certain projects. Your inspector can advise you if your project requires a Certificate of Occupancy. All projects DO require a final inspection.

If any of the inspections do not occur, the project cannot go on to the next phase, REGARDLESS OF THE NOTICE OR CIRCUMSTANCES.

CERIFICATE OF OCCUPANICES MUST BE ISSUED AND PAID FOR, BEFORE THE SPACE MAY BE OCCUPIED.

Signature of Applicant/Designee

Date

Signature of Inspections Official

Date

PERMIT ISSUED

DEC 1

City of Portland



FILL IN AND SIGN WITH INK

APPLICATION FOR PERMIT HEATING OR POWER EQUIPMENT

PERMIT ISSUED

DEC 1 2009

To the INSPECTOR OF BUILDINGS, PORTLAND, ME.

City of Portland

The undersigned hereby applies for a permit to install the following heating, cooking or power equipment in accordance with the Laws of Maine, the Building Code of the City of Portland, and the following specifications:

Location / CBL 1041 Ocean Ave Use of Building Commercial Date 11/6/09

Name and address of owner of appliance James Irving 1041 Ocean Ave

Installer's name and address Wm Morrell Atlantic HTG Co
133 Poide St Telephone _____

Location of appliance:

- ☐ Basement ☒ Floor
☐ Attic ☐ Roof

Type of Fuel:

- ☐ Gas ☐ Oil ☐ Solid

Appliance Name: Skirt Fin

U.L. Approved ☒ Yes ☐ No

Will appliance be installed in accordance with the manufacture's installation instructions? ☒ Yes ☐ No

IF NO Explain: _____

The Type of License of Installer:

- ☐ Master Plumber # _____
☐ Solid Fuel # _____
☐ Oil # 2768
☐ Gas # _____
☐ Other _____

Type of Chimney:

- ☐ Masonry Lined
Factory built _____

☒ Metal

Factory Built U.L. Listing # _____

- ☐ Direct Vent

Type _____ UL# _____

Type of Fuel Tank

- ☒ Oil
☐ Gas

Size of Tank 27.5 Dept. of Building Inspections
City of Portland Maine

Number of Tanks 1

Distance from Tank to Center of Flame _____ feet.

Cost of Work: \$ 2850.00

Permit Fee: \$ 50

Approved

Approved with Conditions

Fire: _____

Ele.: _____

Bldg.: _____

- ☐ See attached letter or requirement

Inspector's Signature _____

Date Approved _____

Signature of Installer William Morrell

White - Inspection

Yellow - File

Pink - Applicant's

Gold - Assessor's Copy

Mr. Menario,

Here is the information that came with the furnace we would like to get installed before our pipes freeze again. I hope this is sufficient and we will have no more intimidation of licensed contractors applying for the appropriate permits as it is becoming more and more difficult to find them.

We have put well over \$3000 thus far into materials etc. to do this job properly and I hope our efforts at compliance will be given the same respect other businesses in the city receive. Please

contact me for any further
information at 892-7047 or
892-1820 ext 2297

(Earl
C:415-7023) + Dale James for
Oceanside Auto Clinic
1041 Ocean Ave

Atlantic
Heating

1. his *
2. Permit
3. Boiler 18" up off floor
- 4 Needs to be noted thru room
- 5.

return - called: Dale - wed 9:00 AM - Left message

" - called: Earl - wed 9:01 AM - " "

30.1.6.7* A mechanical exhaust system that serves only the fuel dispensing area shall be provided. This system shall meet all of the following requirements:

- (1) The system shall be interlocked with the dispensing system so that airflow is established before any dispensing device can operate. Failure of airflow shall automatically shut down the dispensing system.
- (2) The exhaust system shall be designed to provide air movement across all portions of the floor of the fuel dispensing area and to prevent the flowing of ignitable vapors beyond the dispensing area.
- (3) Exhaust inlet ducts shall not be less than 3 in. (76 mm) or more than 12 in. (305 mm) above the floor. Exhaust ducts shall not be located in floors or penetrate the floor of the dispensing area. Exhaust ducts shall discharge to a safe location outside the building.
- (4) The exhaust system shall provide ventilation at a rate of not less than 1 cfm/ft² (0.3 m³/min/m²) of floor area, based on the fuel dispensing area.
- (5) The exhaust system shall meet all applicable requirements of NFPA 91.

Exception: The provisions of 30.1.6.7 shall not apply to a fuel dispensing area located inside a building if two or more sides of the dispensing area are open to the building exterior. [30A:7.3.6.7]

30.1.6.8 The floor of the dispensing area shall be liquidtight. Where Class I liquids are dispensed, provisions shall be made to prevent spilled liquids from flowing out of the fuel dispensing area and into other areas of the building by means of curbs, scuppers, special drainage systems, or other means acceptable to the AHJ. [30A:7.3.6.8]

30.1.6.9* Oil drainage systems shall be equipped with approved oil/water traps or separators, if they connect to public sewers or they discharge into public waterways. [30A:7.3.6.9]

30.2 Repair Garages.

30.2.1 Application. The construction and protection of, as well as the control of hazards in, garages used for major repair and maintenance of motorized vehicles and any sales and servicing facilities associated therewith shall comply with NFPA 30A, Section 30.2, and Section 30.3.

30.2.1.1 Permits. Permits, where required, shall comply with Section 1.12.

30.2.2 Occupancy Classification. The occupancy classification of a repair garage shall be a special purpose industrial occupancy as defined in NFPA 101. [30A:7.4.1]

30.2.3 General Construction Requirements. In major repair garages, where CNG-fueled vehicles, LNG-fueled vehicles, or LP-Gas-fueled vehicles are repaired, all applicable requirements of NFPA 52 or NFPA 58, whichever is applicable, shall be met. [30A:7.4.2]

30.2.4 Means of Egress. In a repair garage, the required number, location, and construction of means of egress shall meet all applicable requirements for special purpose industrial occupancies, as set forth in NFPA 101. [30A:7.4.3]

30.2.5 Drainage. In areas of repair garages used for repair or servicing of vehicles, floor assemblies shall be constructed of noncombustible materials or, if combustible materials are used in the assembly, they shall be surfaced with approved, nonabsorbent, noncombustible material.

Exception: Slip-resistant, nonabsorbent, interior floor finishes having a critical radiant flux not more than 0.45 W/cm², as determined by NFPA 253, shall be permitted. [30A:7.4.4]

30.2.5.1 Floors shall be liquidtight to prevent the leakage or seepage of liquids and shall be sloped to facilitate the movement of water, fuel, or other liquids to floor drains. [30A:7.4.4.1]

30.2.5.2 In areas of repair garages where vehicles are serviced, any floor drains shall be properly trapped and shall discharge through an oil/water separator to the sewer or to an outside vented sump. [30A:7.4.4.2]

30.2.6 Pits, Belowgrade Work Areas, and Subfloor Work Areas.

30.2.6.1 Pits, belowgrade work areas, and subfloor work areas used for lubrication, inspection, and minor automotive maintenance work shall comply with the provisions of Section 30.2, in addition to other applicable requirements of NFPA 30A. [30A:7.4.5.1]

30.2.6.2 Walls, floors, and structural supports shall be constructed of masonry, concrete, steel, or other approved noncombustible materials. [30A:7.4.5.2]

30.2.6.3 In pits, belowgrade work areas, and subfloor work areas, the required number, location, and construction of means of egress shall meet the requirements for special purpose industrial occupancies in Chapter 40 of NFPA 101. [30A:7.4.5.3]

30.2.6.4 Pits, belowgrade work areas, and subfloor work areas shall be provided with exhaust ventilation at a rate of not less than 1 cfm/ft² (0.3 m³/min/m²) of floor area at all times that the building is occupied or when vehicles are parked in or over these areas. Exhaust air shall be taken from a point within 12 in. (0.3 m) of the floor. [30A:7.4.5.4]

30.2.7 Fixed Fire Protection. Automatic sprinkler protection installed in accordance with the requirements of NFPA 13 shall be provided in major repair garages, as herein defined, when any of the following conditions exist:

- (1) The major repair garage is two or more stories in height, including basements, and any one of the floors exceeds 10,000 ft² (930 m²).
- (2) The major repair garage is one story and exceeds 12,000 ft² (1115 m²).
- (3) The major repair garage is servicing vehicles parked in the basement of the building. [30A:7.4.6]

30.2.8* Heating, Ventilating, and Air-Conditioning.

30.2.8.1* Forced air heating, air-conditioning, and ventilating systems serving a fuel dispensing area inside a building or a repair garage shall not be interconnected with any such systems serving other occupancies in the building. Such systems shall be installed in accordance with NFPA 90A. [30A:7.5.1]

30.2.8.2 Return air openings in areas of repair garages used for the repair or servicing of vehicles or in a fuel dispensing area shall be not less than 18 in. (455 mm) above floor level measured to the bottom of the openings. [30A:7.5.2]

30.2.8.3 Combined ventilation and heating systems shall not recirculate air from areas that are below grade level. [30A:7.5.3]

30.2.8.4 Exhaust duct openings shall be located so that they effectively remove vapor accumulations at floor level from all parts of the floor area. [30A:7.5.4]

30.2.9 Heat-Producing Appliances.

30.2.9.1 Heat-producing appliances shall be installed in accordance with the requirements of 30.2.9. They shall be permitted to be installed in the conventional manner except as provided in 30.2.9. [30A:7.6.1]

30.2.9.2 Heat-producing appliances shall be of an approved type. Solid fuel stoves, improvised furnaces, salamanders, or space heaters shall not be permitted in areas of repair garages used for repairing or servicing of vehicles or in a fuel dispensing area.

Exception No. 1: Unit heaters, when installed in accordance with Chapter 7 of NFPA 30A, need not meet this requirement.

Exception No. 2: Heat-producing equipment for any lubrication room or service room where there is no dispensing or transferring of Class I or Class II liquids or LP-Gas, when installed in accordance with Chapter 7 of NFPA 30A, need not meet this requirement. [30A:7.6.2]

30.2.9.3 Heat-producing appliances shall be permitted to be installed in a special room that is separated from areas that are classified as Division 1 or Division 2, in accordance with Chapter 8 of NFPA 30A, by walls that are constructed to prevent the transmission of vapors, that have a fire resistance rating of at least 1 hour, and that have no openings in the walls that lead to a classified area within 8 ft (2.4 m) of the floor. Specific small openings through the wall, such as for piping and electrical conduit, shall be permitted, provided the gaps and voids are filled with a fire-resistant material to resist transmission of vapors. All air for combustion purposes shall be taken from outside the building. This room shall not be used for storage of combustible materials, except for fuel storage as permitted by the standards referenced in 30.2.9.9. [30A:7.6.3]

30.2.9.4 Heat-producing appliances using gas or oil fuel shall be permitted to be installed in a lubrication or service room where there is no dispensing or transferring of Class I liquids, including the open draining of automotive gasoline tanks, provided the bottom of the combustion chamber is at least 18 in. (455 mm) above the floor and the appliances are protected from physical damage. [30A:7.6.4]

30.2.9.5 Heat-producing appliances using gas or oil fuel listed for use in garages shall be permitted to be installed in lubrication rooms, service rooms, or fuel dispensing areas where Class I liquids are dispensed or transferred, provided the equipment is installed at least 8 ft (2.4 m) above the floor. [30A:7.6.5]

30.2.9.6* Where major repairs are conducted on CNG-fueled vehicles or LNG-fueled vehicles, open flame heaters or heating equipment with exposed surfaces having a temperature in excess of 750°F (399°C) shall not be permitted in areas subject to ignitable concentrations of gas. [30A:7.6.6]

30.2.9.7 Electrical heat-producing appliances shall meet the requirements of Chapter 8 of NFPA 30A. [30A:7.6.7]

30.2.9.8 Fuels used shall be of the type and quality specified by the manufacturer of the heating appliance. Crankcase drainings shall not be used in oil-fired appliances, unless the appliances are specifically approved for such use. [30A:7.6.8]

30.2.9.9 Heat-producing appliances shall be installed to meet the requirements of NFPA 90A; NFPA 31, *Standard for the Installation of Oil-Burning Equipment*; NFPA 54, *National Fuel Gas Code*; NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*; and NFPA 82, *Standard on Incinerators and*

Waste and Linen Handling Systems and Equipment; as applicable, except as hereinafter specifically provided. [30A:7.6.9]

30.3 Operational Requirements.

30.3.1 Dispensing from a Tank that Does Not Exceed 120 Gal (454 L) and from Containers Inside Buildings. Dispensing of flammable and combustible liquids from a tank not exceeding 120 gal (454 L) capacity and from containers in a motor fuel dispensing facility or in a repair garage building shall meet the requirements of 30.3.1.1 and of 30.3.1.2. (*See 4.3.9 of NFPA 30A for storage quantity limitations.*) [30A:9.2.4]

30.3.1.1 Not more than one container of Class I liquid shall be permitted to be provided with a dispensing pump inside a building at any one time. The number of tanks or containers of Class II or Class IIIA liquids fitted for dispensing at any one time shall not be limited, except as provided for in 4.3.9.2 of NFPA 30A. The number of tanks or containers of Class IIIB liquids fitted for dispensing at any one time shall not be limited. [30A:9.2.4.1]

30.3.1.2 Class I, Class II, and Class IIIA liquids shall not be dispensed by applying pressure to tanks or containers. Listed pumps that take suction through the top of the tank or container or listed self-closing faucets shall be used. [30A:9.2.4.2]

30.3.2 Basic Fire Control.

30.3.2.1 Sources of Ignition. Smoking materials, including matches and lighters, shall not be used within 20 ft (6 m) of areas used for fueling, servicing fuel systems of internal combustion engines, or receiving or dispensing of Class I and Class II liquids. The motors of all equipment being fueled shall be shut off during the fueling operation except for emergency generators, pumps, and so forth, where continuing operation is essential. [30A:9.2.5.1]

30.3.2.2 Fire Extinguishers. Each motor fuel dispensing facility or repair garage shall be provided with fire extinguishers installed, inspected, and maintained as required by Section 13.6. Extinguishers for outside motor fuel dispensing areas shall be provided according to the extra (high) hazard requirements for Class B hazards, except that the maximum travel distance to a 80 B:C extinguisher shall be permitted to be 100 feet. [30A:9.2.5.2]

30.3.2.3 Fire Suppression Systems. Where required, automatic fire suppression systems shall be installed in accordance with the appropriate NFPA standard, manufacturers' instructions, and the listing requirements of the systems. [30A:9.2.5.3]

30.3.2.4 Waste Handling.

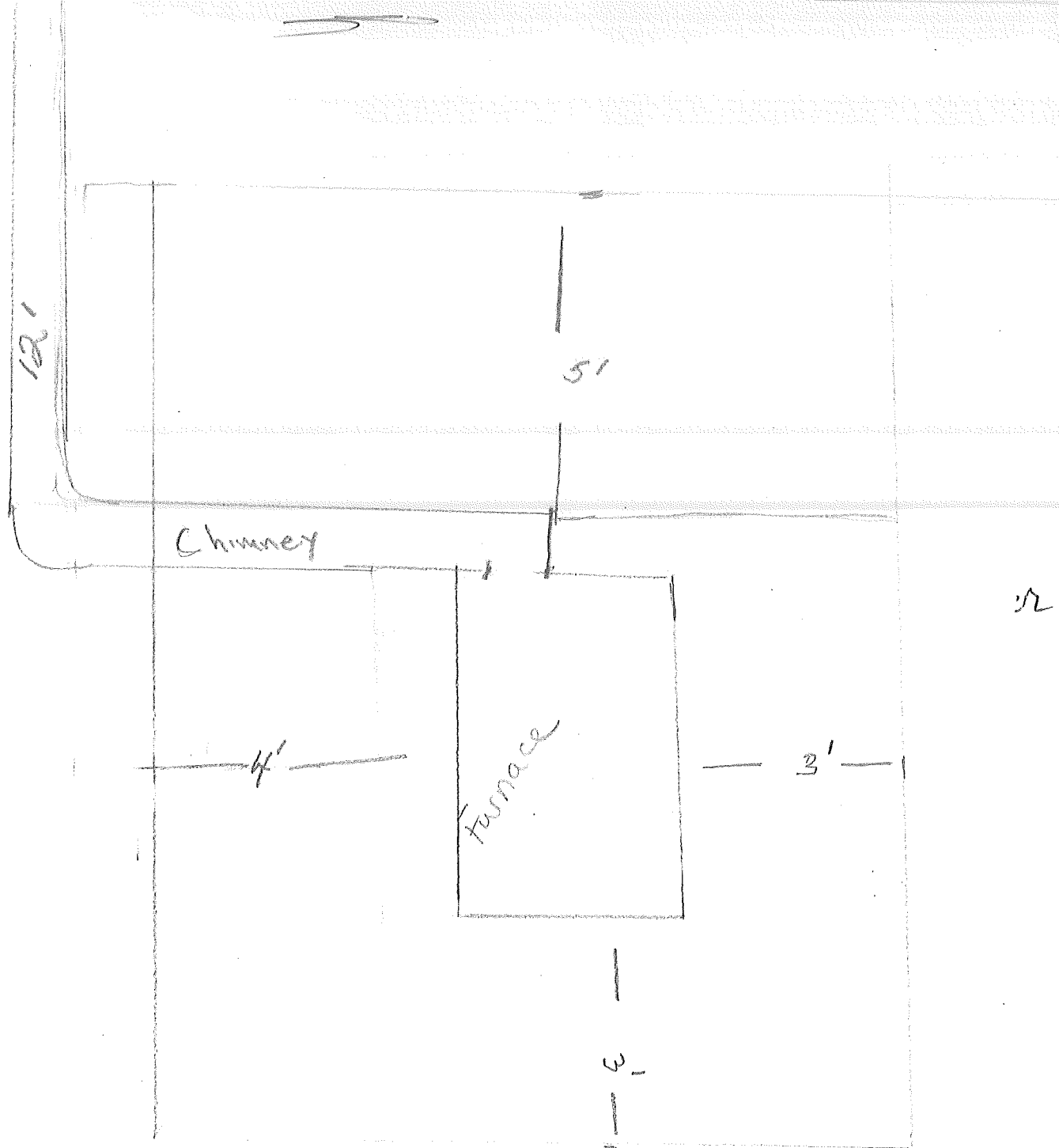
30.3.2.4.1 Crankcase drainings and waste liquids shall not be dumped into sewers, into streams, or on the ground. They shall be stored in approved tanks or containers outside any building, or in tanks installed in accordance with Chapter 4 and Chapter 5 of NFPA 30A, until removed from the premises.

Exception: As provided for in 4.3.9.3 of NFPA 30A. [30A:9.2.6.1]

30.3.2.4.2 The contents of oil separators and traps of floor drainage systems shall be collected at sufficiently frequent intervals to prevent oil from being carried into sewers. [30A:9.2.6.2]

30.3.2.5 Housekeeping. The dispensing area and the area within any dike shall be kept free of vegetation, debris, and any other material that is not necessary to the proper operation of the motor fuel dispensing facility. [30A:9.2.7]

30.3.2.6 Fire Doors. Fire doors shall be kept unobstructed at all times. Appropriate signs and markings shall be used. [30A:9.2.8]



Slant/Fin® ★ LIBERTY® II

OIL-FIRED WATER AND STEAM BOILERS/NO. 2 OIL

SERVICE COMPANY

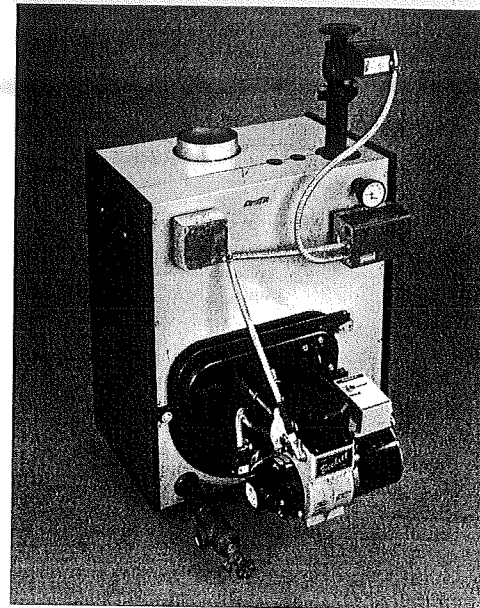
Name _____
Address _____
Telephone _____
Model # _____
Serial # _____

INSTALLATION AND OPERATING INSTRUCTIONS

READ AND SAVE THESE INSTRUCTIONS FOR REFERENCE.

SAFETY WARNING:

KEEP BOILER AREA CLEAR AND FREE FROM COMBUSTIBLE MATERIALS, GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS. FAILURE TO ADHERE TO ABOVE SAFETY WARNING, MAY RESULT IN PERSONAL INJURY OR DEATH AND PROPERTY DAMAGE.



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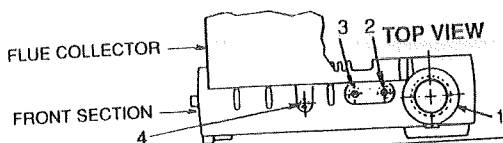
General Maintenance21

IMPORTANT: The installation of this equipment must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the Installation of Oil Burning Equipment, ANSI/NFPA 31, latest edition, and to the National Electrical Code ANSI/NFPA 70, latest edition. The installation must also conform to the additional requirements in this Slant/Fin Instruction Manual. Where there is any difference, the more stringent requirement shall govern.

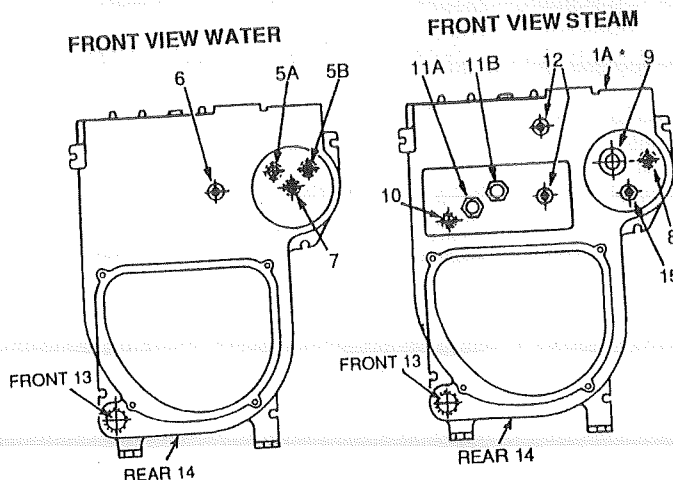
In addition, where required by the authority having jurisdiction, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1, latest edition.

THIS MANUAL MUST BE LEFT WITH OWNER AND SHOULD BE HUNG ON OR ADJACENT TO THE BOILER FOR REFERENCE.

IMPORTANT: This boiler must be installed by a trained, experienced, service technician, licensed for the installation and servicing of oil burning equipment or otherwise qualified by the authorities having jurisdiction over the installation.

TAPPINGS
AND
OPENINGS

Tapping Location	Steam Boiler	Water Boiler
1	3" supply	1 1/2" supply
1A	2" supply on rear section *	3/4" air vent or expansion tank
2	second 1/4" siphon & pressure cutout if required	3/4" water relief valve
3	3/4" steam safety valve	1/2" tankless inlet
4	1/4" siphon, pressure gauge & pressure cut-out	1/2" tankless outlet
5A	—	1/2" pressure temp. gauge
5B	—	1/2" high limit, hi/lo or combination control
6	—	—
7	—	—
8	3/4" alternate electronic low water cut-off	—
9	1 1/2" skimmer tapping	—
10	1/2" low limit for tankless	—
11A	1/2" tankless inlet	—
11B	1/2" tankless outlet	—
12	1/2" steam gauge glass & 67 LWCO	1 1/2" return & 3/4" drain cock
13	1 1/2" pushed to 3/4" for drain cock	1 1/2" alternate return
14	1 1/2" condensate return	—
15	3/4" NPT zone tapping	—



* Rear section LD-50, LD-60, LD-70 steam boilers only.

Figure 1

DIMENSIONS

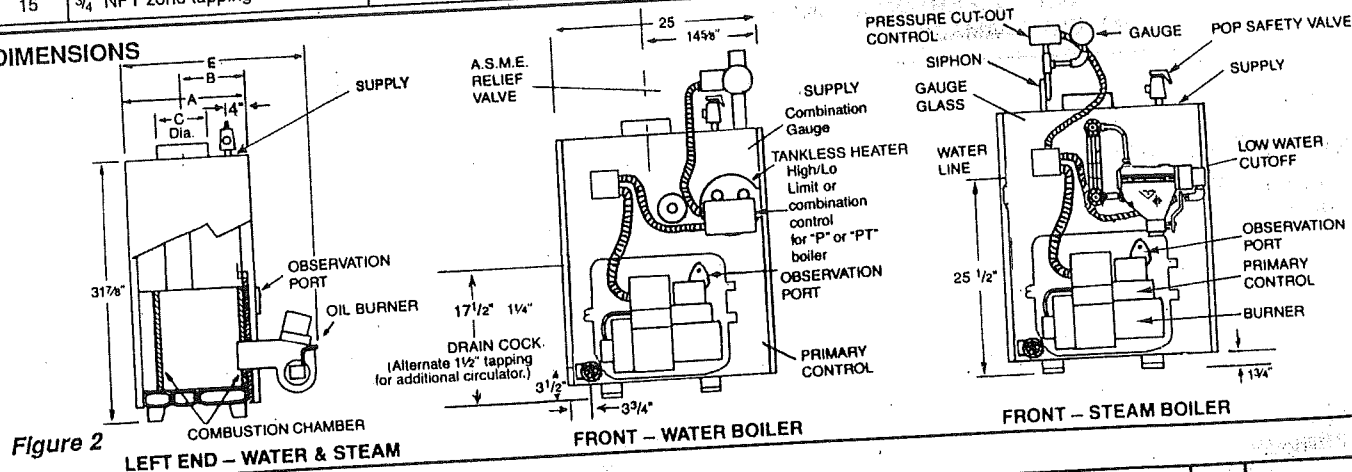


Figure 2

LEFT END - WATER & STEAM

FRONT - WATER BOILER

FRONT - STEAM BOILER

RATINGS

Figure 2

LEFT END - WATER & STEAM

RATINGS

Boiler Model No.*	I=B=R Burner Capacity Oil Input		D.O.E. Heating Capacity MBH		I=B=R Net Ratings			I=B=R Chimney Size		A.F.U.E. %		Dimensions (Inches)					Boiler Sect.	Tankless Heater GPM**	
												Boiler Length "A"	Front to Flue "B"	Flue Dia. "C"	Return Circulator Flange "D"	Overall Length "E"		Water	Steam
	GPH †	BTUH	Water	Steam	Water MBH *	Steam MBH *	Steam Sq.Ft.	Nom. Rect. x Height § (in x in x ft)	I.D. Round x Height (in x ft)	Water	Steam								
LD-20	0.75	105,000	90	—	79	—	—	8 x 8 x 15	5 x 15	83.50	—	11½	8⅝	6	1¼	24¼	2	2.20	—
LD-30H	1.00	140,000	121	—	105	—	—	8 x 8 x 15	6 x 15	86.00	—	14⅞	10⅓	6	1¼	27⅝	3	3.10	—
LD-30H	1.10	154,000	134	134	117	101	421	8 x 8 x 15	6 x 15	84.85	84.15	14⅞	10⅓	6	1¼	27⅝	3	3.20	3.00
	1.25	175,000	151	—	131	—	—	8 x 8 x 15	6 x 15	83.50	—	14⅞	10⅓	6	1¼	27⅝	3	3.40	—
LD-40H	1.50	210,000	182	179	158	134	558	8 x 8 x 15	7 x 15	86.00	84.00	18¼	11⅔	7	1¼	31	4	3.80	3.40
	1.60	224,000	195	195	170	146	608	8 x 8 x 15	7 x 15	84.45	83.80	18¼	11⅔	7	1¼	31	4	3.90	3.50
LD-40H	1.80	252,000	218	—	190	—	—	8 x 8 x 15	7 x 15	83.33	—	18¼	11⅔	7	1¼	31	4	4.15	—
	2.00	280,000	243	239	211	179	746	8 x 8 x 15	8 x 15	86.00	84.00	21⅝	13⅓	8	1½	34⅝	5	4.30	3.90
LD-50H	2.10	294,000	256	255	223	191	796	8 x 8 x 15	8 x 15	84.06	83.45	21⅝	13⅓	8	1½	34⅝	5	4.40	4.00
	2.35	329,000	272†	—	237	—	—	8 x 12 x 15	8 x 15	—	—	21⅝	13⅓	8	1½	34⅝	5	4.70	—
LD-50H	2.60	364,000	298†	298†	259	224	933	8 x 12 x 15	10 x 15	—	—	25	15⅜	8	1½	37¾	6	4.90	4.50
	2.85	399,000	327†	—	284	—	—	8 x 12 x 15	10 x 15	—	—	25	15⅜	8	1½	37¾	6	5.20	—
LD-60H	3.10	434,000	354†	354†	306	266	1108	8 x 12 x 15	10 x 15	—	—	28⅝	16⅔	9	—	41⅝	7	5.45	5.00
	3.35	469,000	381†	—	331	—	—	8 x 12 x 15	10 x 15	—	—	28⅝	16⅔	9	—	41⅝	7	5.70	—

† Minimum clear tile liner dimensions.

Standard working pressure 30 psi water, 15 psi steam.
All boilers hydrostatically tested — A.S.M.E.

* For forced hot water heating systems where the boiler and all piping are located within the area to be heated, the boiler may be selected on the basis of gross D.O.E. capacity output. The net I=B=R output ratings shown are based on an allowance for piping and pickup of 1.15 (water) or 1.33 (steam). D.O.E. capacity gross output is divided by the allowance to obtain net rating. The manufacturer should be consulted before selecting a boiler for unusual piping and pickup requirements such as intermittent system operation, extensive piping, etc.

† Ratings apply to the use of light oil at 140,000 Btu per gallon, and apply only when burner is listed on pages 14-16 of this manual are used, and are properly adjusted to produce the rated output.

§ Nominal clay tile liner dimensions.

** Tankless heater rating based on intermittent draw.

†† Water boiler models LD-30 and larger have two firing rates. The boiler is factory shipped at the lower firing rate. To obtain the higher firing rate, refer to the Liberty II boiler installation instructions for the appropriate field adjustments.

‡ I.B.R. gross output

□ Collar is oblong, will fit 6" diameter nominal connector.

¶ This dimension is from the boiler jacket to the center of the flue outlet.

NOTE: All boilers under 300,000 Btu/h input are tested and rated for capacity under the U.S. Department of Energy (D.O.E.) test procedures for boilers.

INSTALLATION REQUIREMENTS

BOILER LOCATION

Provide a level, solid foundation for the boiler. Location should be near the chimney so that the Flue Pipe Connector or Breeching to the chimney is short and direct.

- A. The foundation must be capable of supporting the weight of the boiler when filled with water:

Boiler Size	Approximate Total Weight of Boiler Assembly, filled with water
LD-20	440
LD-30	550
LD-40	660
LD-50	785
LD-60	895
LD-70	1000

- B. The boiler can be installed on both combustible and non-combustible floors, but must NOT be installed on or above carpeting.
 C. The Intrepid Boiler has full wet base sections which surround fire-box for maximum heat absorption of burning fuel, and low floor temperature.
 D. If boiler is to be located over buried conduit containing electric wires or telephone cables, consult local codes or the National Board of Fire Underwriters for specific requirements.

CAUTION: NEVER BURN GARBAGE OR PAPER IN THE UNIT AND NEVER LEAVE COMBUSTIBLE MATERIAL AROUND IT.

MINIMUM CLEARANCE

Provide accessibility clearance of 24" from surfaces requiring servicing (top and front) and 18" on any side requiring passage. The boiler shall be installed with the following MINIMUM clearances from combustible materials:

- A. CHIMNEY CONNECTOR-18"
 B. BACK AND SIDES- 6" EXCEPT as limited by 18" clearance from chimney connector

NOTE: Except in closets and alcoves, clearances above in (A) and (B) may be reduced by providing forms of protection as specified in NFPA 31, latest edition.

CHIMNEY REQUIREMENTS

- A. The chimney must be constructed in accordance with all local applicable codes and the National Board of Fire Underwriters. See boiler models and rating table shown on page 2 for chimney sizes.
 B. Check chimney condition.
 Existing chimneys and stacks may have deteriorated; without repairs their use would be hazardous. Before connecting to an old chimney or stack:
 1. Clean it.
 2. Inspect it thoroughly.
 3. Remove obstructions.
 4. Replace worn sections of metal stacks.
 5. Seal bad masonry joints.
 6. Repair damaged linings.
 C. Where more than one appliance vents into a common chimney, the area of the common breeching should at least equal the area of the largest appliance flue plus 50% of the additional flue areas.
 D. Breeching area must not be reduced at connection into chimney. Breeching must be inserted into, but not beyond, inside of chimney liner.
 E. Chimney height shall extend at least 3 feet above where it passes through the roof of the building, and at least 2 feet above any ridge within 10 feet of the chimney.
 F. The use of a vent cap, where permitted by code, gives additional protection against adverse wind conditions and precipitation.
 G. Flue Connection: Connect flue pipe between top of boiler and chimney. Horizontal sections of flue pipe must be pitched upward to the chimney at least 1/4" per foot. Flue must be inserted into, but not extend beyond, the inside wall of the chimney flue. Install draft regulator in flue pipe, as shown in figure 3.

AIR SUPPLY AND VENTILATION (see NFPA 31, latest edition)

Sufficient air for combustion and ventilation in the boiler room must be provided. Failure to do this will result in poor combustion, heavy sooting and health hazards.

CAUTION: AN OIL-FIRED UNIT SHALL BE CONNECTED TO A VENT HAVING A SUFFICIENT DRAFT AT ALL TIMES TO ENSURE SAFE AND PROPER OPERATION OF THE UNIT.

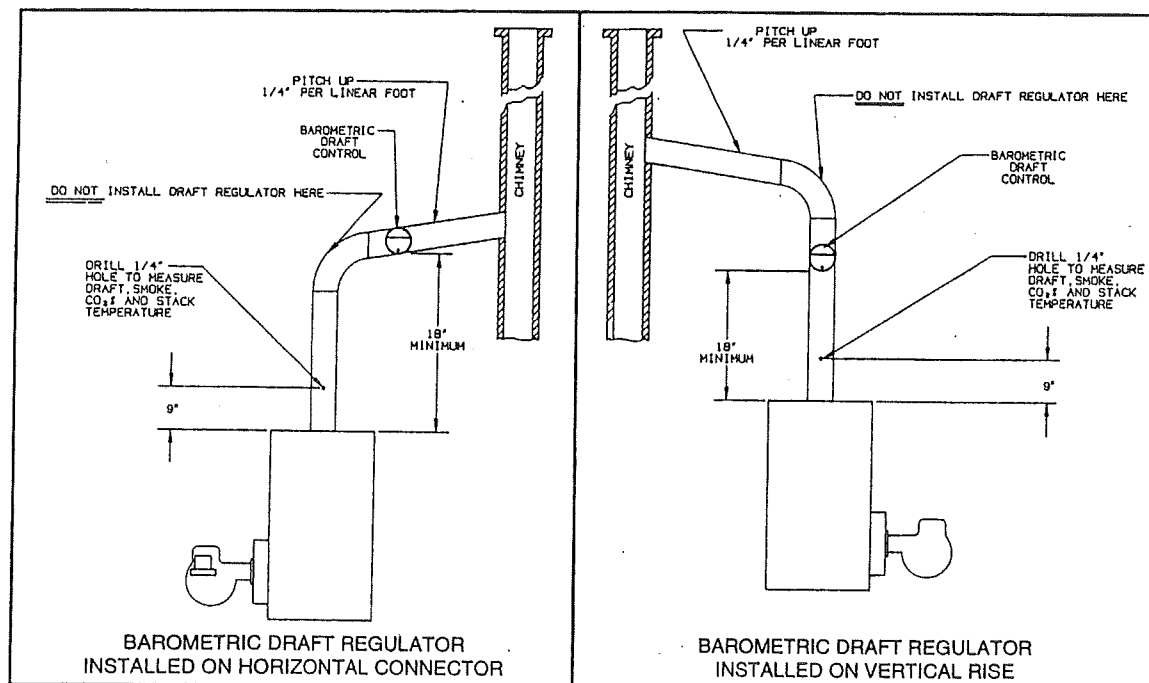
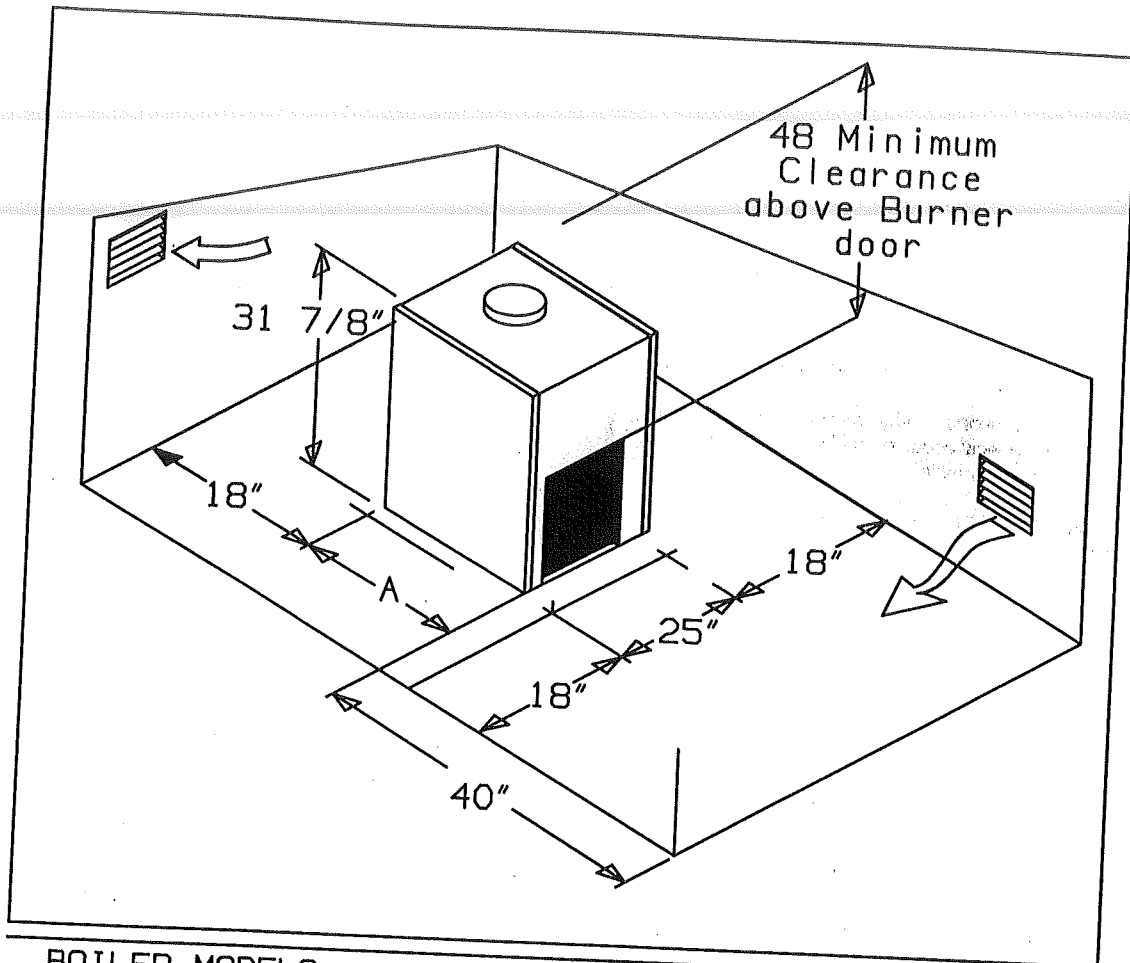


Figure 3.
Barometric
Draft
Regulator

Sufficient space shall be left clear around the boiler.

Do not stack items on or box in the appliance within the required clearances to combustibles.



BOILER MODELS	A (in)
TR-20 / LD-20	11 $\frac{1}{2}$ "
TR-30H / TR(DV)-30 / LD-30	14 $\frac{7}{8}$ "
TR-40H / TR-40 / LD-40	18 $\frac{1}{4}$ "
TR-50H / TR-50 / LD-50	21 $\frac{5}{8}$ "
TR-60 / LD-60	25"
TR-70 / LD-70	28 $\frac{3}{8}$ "

Any oil-fired boiler must have a steady draft* and an ample supply of combustion air at all times during firing. If air supply or chimney draft* is unreliable, CO₂ and overfire draft* will change unpredictably.

DO NOT vent this boiler to the same chimney flue used by a fireplace or coal or wood burning furnace or boiler. The draft* produced by solid fueled devices varies tremendously between high fire and low fire:

In modern, weather stripped, energy-saving buildings or older buildings which have been modified similarly, natural infiltration may not supply enough air for combustion, particularly if other fuel burning appliances, exhaust fans or draft inducers are competing for the same air supply. Fireplaces, other solid fuel burning appliances and exhaust fans consume great quantities of air; if air supply is not ample, such an appliance will create a downdraft in the oil-fired boiler flue. This can create a hazardous condition. Flue gases can be sucked out of the chimney through

the vent regulator into the living space. DO NOT operate this boiler and a solid fuel burning appliance at the same time, unless the solid fuel burner is provided with its own outside air supply.

See Table 2, "Provisions for Combustion and Ventilation Air Supply" for determining need and method of providing air for combustion and ventilation.

If fly screen must be used over air supply openings, areas calculated should be doubled; the screen should be inspected and cleaned frequently to maintain free air flow.

Protect air openings against closure by snow, debris, etc. Openings such as doors or windows, if used, must be locked open.

* Draft is negative or suction pressure

TABLE 2: Provisions for Combustion and Ventilation Air Supply. See NFPA 31, latest edition for more detailed information.

	Boiler Location	Air Supply	Action Required
2.1	Unconfined space	Is there sufficient air for combustion by natural infiltration (see NOTE (1), "Test..." below)?	NONE
2.2	Unconfined space	If there is NOT sufficient air for combustion by natural infiltration due to tight construction or other conditions, then it REQUIRES AIR FROM OUTDOORS. SEE "ACTION REQUIRED" column at right. See Notes (1) and (2) below.	Provide air from outdoors directly through a permanent outside wall opening or openings with a free open area of not less than 1 sq. in. per 4000 Btu/hr. of TOTAL input of ALL fuel burning appliances in the building. See Note (1) and (3).
2.3	Confined space	If there is sufficient air for combustion from within building but it comes from outside of the confined space. SEE "ACTION REQUIRED" column at right. See Note (1) below.	The confined space shall be provided with two permanent air openings, one near the top of the enclosure and one near the bottom. EACH opening shall have a free air opening of not less than 1 sq. in. per 1000 Btu/hr. of TOTAL input of ALL fuel burning appliances within the enclosure. The two openings shall freely communicate with the interior areas of the building which in turn would have to have adequate infiltration of air from outdoors. See Notes (1, 3) and Figure 3a.
2.4	Confined space	If there is NOT sufficient air for combustion due to tight construction or other conditions it REQUIRES AIR FROM OUTDOORS. SEE "ACTION REQUIRED" column at right. See NOTE (2) below.	<p>(a) Air from the outdoors shall be provided to the confined space by two permanent openings, one in or near the top of the enclosure space and one in or near the bottom. The openings shall communicate directly, or by means of ducts, with outdoors or to such spaces (crawl or attic) that freely communicate with outdoors (See figures 3b, 3c and 3d).</p> <p>(b) Where directly communicating with outdoors or by means of vertical ducts, each opening shall have a free area of not less than 1 sq. in. per 4,000 Btu/hr. (35 sq. in. per gal. per hr.) of TOTAL input rating of ALL appliances in the enclosure. If horizontal ducts are used, each opening shall have a free area of not less than 1 sq. in. per 2,000 Btu/hr. (70 sq. in. per gal. per hr.) of TOTAL input of ALL appliances in the confined space. See Figures 3b, 3c and 3d.</p>

- (1) Test for sufficient air for combustion by infiltration by running this boiler for 30 minutes under all of the following conditions and at the same time: a) all doors, windows and other like openings must be closed, b) all fuel burning appliances should be FIRING, c) all exhaust fans and clothes dryers turned ON. At the above conditions the CO₂, smoke and draft readings must be normal. (CO₂ between 11% and 13%, smoke between ZERO and a TRACE, draft between .02" W.C. and .04" W.C. negative pressure.)
- (2) Aside from tight construction, some of the conditions that steal air for combustion from a boiler are other fuel burning appliances, exhaust fans and clothes dryers.
- (3) Generally, louvers made of wood have a free open area of 20% and those made of metal have a 60% to 70% free open area. Screens also reduce the open area of the louvers.

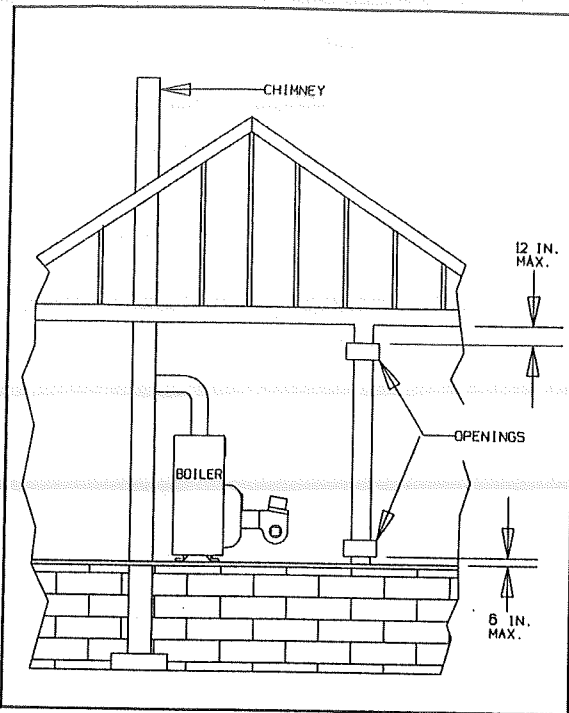


Figure 3a.
Appliances located in confined spaces. Air from inside the building. See Table 2 (2.3).

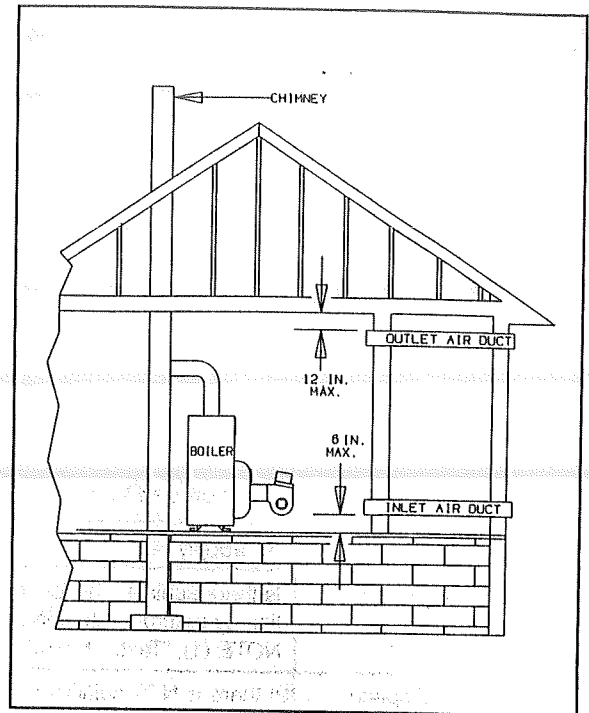


Figure 3b.
Appliances located in confined spaces. Air from outdoors. See Table 2 (2.4).

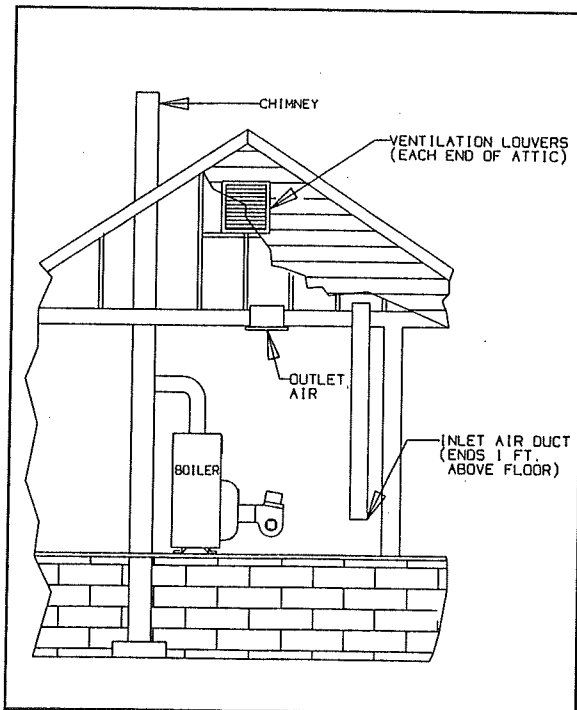


Figure 3c.
Appliances located in confined spaces. Air from outdoors through ventilated attic. See Table 2 (2.4).

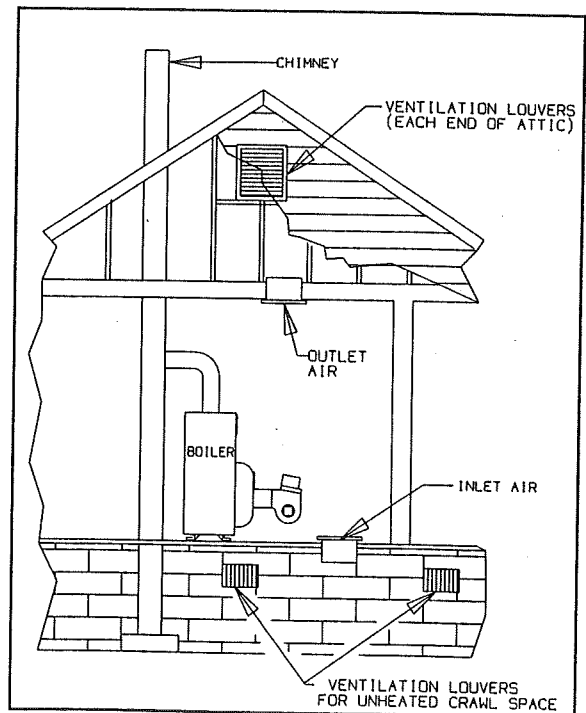


Figure 3d.
Appliances located in confined spaces. All air from outdoors through ventilated crawl space and outlet air to ventilated attic. See Table 2 (2.4).

INSTALLING CONTROLS AND ACCESSORIES ON BOILER UNITS

Note: Jacket must be installed on boiler units prior to installation of trim.

- I. STEAM BOILER TRIM, see page 2 for tapping locations, and figure 4 for illustration of steam boiler.
 - A. Steam pressure gauge and pressure cut-out, install in tapping no. 4, figure 4.
 - B. Gauge glass set — use tapping no. 12.
 - C. Pop safety valve — use tapping no. 3, piped full size to boiler; or pipe full size into a valveless steam header.
 - D. Combustion safety control — mounted on burner.
- II. WATER BOILER TRIM, see page 2 for tapping locations, and figures 1 and 2 for illustration of water boiler.
 - A. Pressure-temperature-altitude gauge — use tapping no. 6.
 - B. High temperature limit — use tapping no. 7.
 - C. Operating control (if used) — use tapping no. 7.
 - D. Water relief valve — use tapping no. 3, piped full size to boiler.
 - E. Automatic air vent or compression tank tapplings — if used, install in tapping no. 2.
 - F. Combustion safety control — mounted on burner.

PIPING

IMPORTANT: Boilers are to be used with closed system. Any application that uses steam or water from system, causes the introduction of a frequent supply of fresh water into the boiler. This will cause damage to the boiler. Use of heat exchangers will prevent this damage.

PIPING FOR STEAM BOILERS

Provide Header and Hartford Loop as suggested. See figures 4 and 5. Local codes apply.

CLEANING PIPING SYSTEM

- A. To clean piping system, open all valves at the heating elements. After getting up a good head of steam, shut the boiler down and allow the condensate to return to the boiler. The condensate will carry the oil film with it. Again blow-off the boiler. On extremely fouled systems, it may require several visits over a few days to clean the system.
- B. When steam only (no water) is released through the hand valve, the boiler will not surge or flood.

PIPING FOR WATER UNITS

NOTE: On knocked-down boiler only, jacket may be installed after supply and return piping connection, but must be installed prior to adding trim.

I. CIRCULATING SYSTEM

- A. **FORCED CIRCULATION** hot water heating system: Use the top tapping as supply tapping, and use the front or rear bottom tapplings for the return.
- B. A **FLOW CONTROL VALVE** (See figure 6) will prevent gravity circulation and usually is required when tankless heater is installed.

II. AIR CONTROL SYSTEMS

- A. **DIAPHRAGM-TYPE COMPRESSION TANKS** are used to control system pressure in an **AIR ELIMINATING SYSTEM**: an automatic air vent is used to **REMOVE** air from the system water. See figure 6. If system pressure needs further control, add an additional tank or install a larger capacity tank. The automatic air vent should be installed in the top of the boiler, as in figure 6.
- B. **CONVENTIONAL COMPRESSION TANKS** (non-diaphragm type) are used to control system pressure in an **AIR COLLECTING SYSTEM**. Within the system, after initial start-up and venting, air is collected in the tank and acts in contact with the water to control pressure. Air is not vented from this system. If system pressure needs further control, add another tank in parallel with the original tank or install a large capacity tank. Locate the tank at the inlet end of the pump near the boiler. (See figure 7)

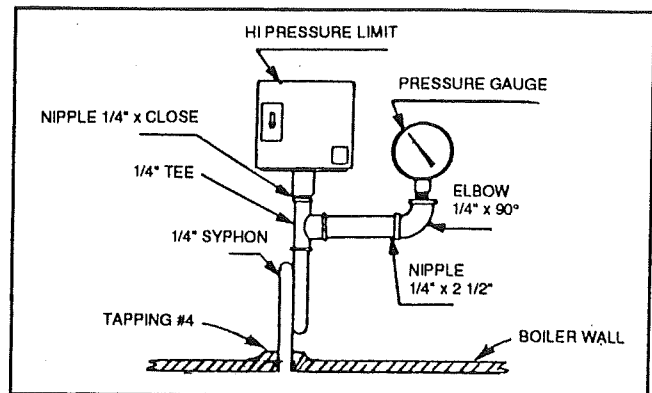


Figure 4.

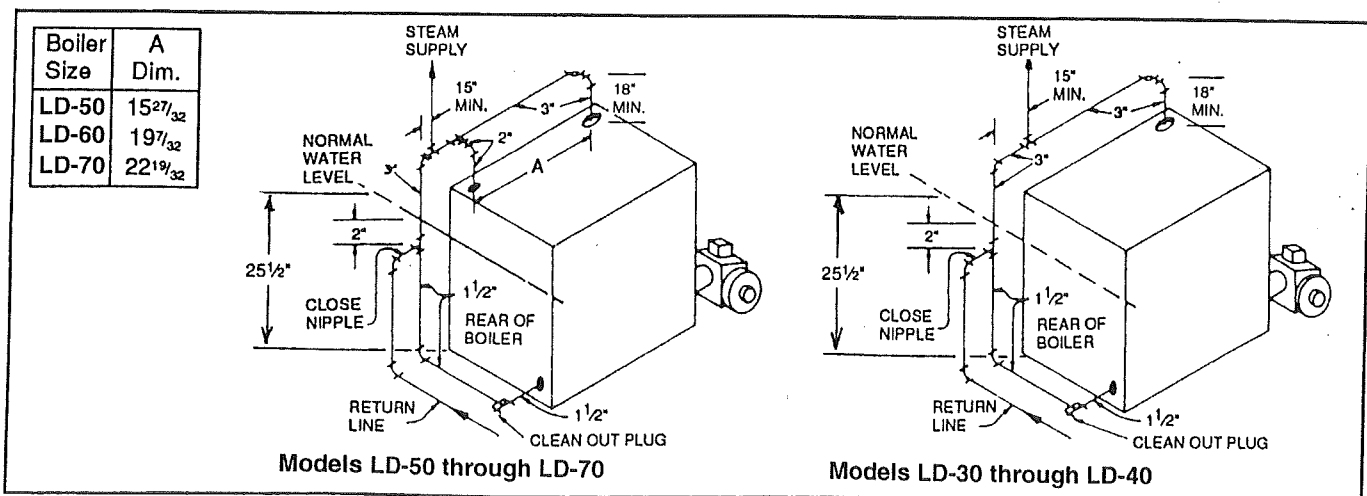


Figure 5. Recommended Steam Piping at Boiler

C. **HOT WATER RADIATION VENTING** - Manual air vents should be installed at the top of all "drops" (where piping goes downward).

Air must be vented or purged from all zone lines to permit proper system heating.

D. **PUMP LOCATION** - Locating low-head pump(s) on return to boiler is only acceptable in residences of one or two stories. (See figure 6) The pump location shown in figure 7 is required in large, multi-story building installations, especially when high-head pumps are used and is also recommended for all applications.

E. A conventional compression tank may be connected to the 3/4" tapping as shown in figure 7.

IMPORTANT: Hot water heating systems containing high water volume, such as would occur with cast-iron radiation, require special care with air elimination. The circulator pump should be located on the boiler supply pipe and the expansion tank and air scoop should be located near the pump suction. (See Figure 6, Alternate Pump Location.)

PIPING TANKLESS HEATER (if used)

I. Heater capacities are listed on Page 2.

II. Pipe the built-in tankless heater using the inlet and outlet tapings indicated on the heater (figure 8).

- Tempering valve (illustrated, but not furnished) is suggested to provide more volume of temperate water to kitchen and bath.
- High temperature water, for dishwasher and laundry, may be piped direct.
- A flow control valve should be used to control the rate of flow of water through the coil, otherwise the heating capacity of the coil will be exceeded. To insure sufficient hot water, the flow rate through the coil should be limited to a maximum shown for intermittent draw in the ratings table on page 2.

IMPORTANT: Escape pipes or drain pipes from relief valves, safety valves, blow-down valves, and low-water cut-off must be piped off to a safe place.

INSTALLING THE BURNER

See Burner Data, pages 14-18, and Burner Manual supplied with burner. If burner is not mounted as received, mount to boiler, placing flange over mounting studs. Use gasket between flange and boiler. Distance between flange and nose of burner must be as shown on pages 14-18. Check to see that nozzle and settings are as given in burner data tables, pages 14-18.

CAUTION: DO NOT USE GASOLINE, CRANKCASE DRAININGS, OR ANY OIL CONTAINING GASOLINE.

OIL SUPPLY PIPING

Install the oil tank or tanks and piping from tank to burner. Follow local codes and practices, NFPA No. 31, INSTALLATION OF OIL BURNING EQUIPMENT and the instruction sheet attached to the oil burner pump. A one-pipe system should be used for gravity-fed fuel systems and for lift systems, where the total lift is less than 8 feet. Where the total lift is greater than 8 feet, a two-pipe system must be used. In some instances, local codes may require a two-pipe system for below grade fuel oil tanks. Be sure to set-up the fuel oil pump for the piping system used; follow the instructions attached to the pump. Be sure to include a good quality, low pressure drop fuel oil filter in the supply line from the tank. This is necessary, especially at low fuel oil flow rates (small nozzle sizes), to prevent nozzle plugging. See Slant/Fin publication on one-pipe and two-pipe fuel oil systems.

WIRING THE BOILER

- The wiring diagrams for the burner and boiler may be found on pages 11-13.
- 24 volt control wiring should be approved Safety Circuit wire, protected as needed.
- Power supply wiring to the burner must be 14 gauge or heavier, as required, and should have a properly fused disconnect switch. 120 volt wiring to pumps and safety controls must also be 14 gauge or heavier. Wire must be enclosed in approved conduit.
- All wiring must be installed in compliance with the National Electric Code, or any local or insurance codes having jurisdiction.

Wiring to the boiler must come through an emergency power isolation switch with a clearly marked red switch plate. This switch should be located so that it is apparent to the homeowner when entering the basement or other boiler area. The homeowner should be made familiar with operating the toggle to provide or stop the power to the boiler.

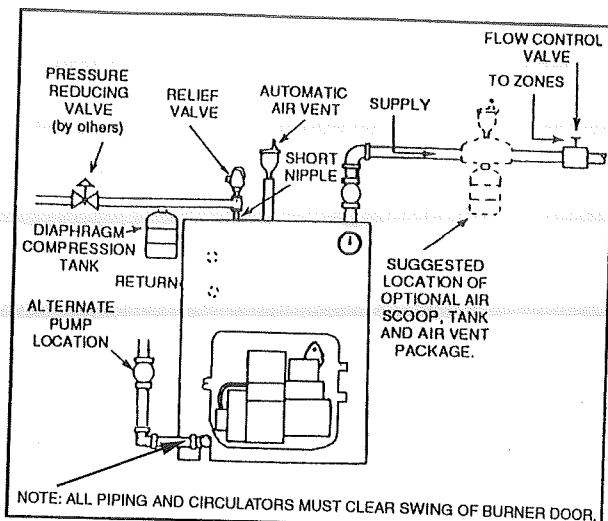


Figure 6. Air Eliminating System

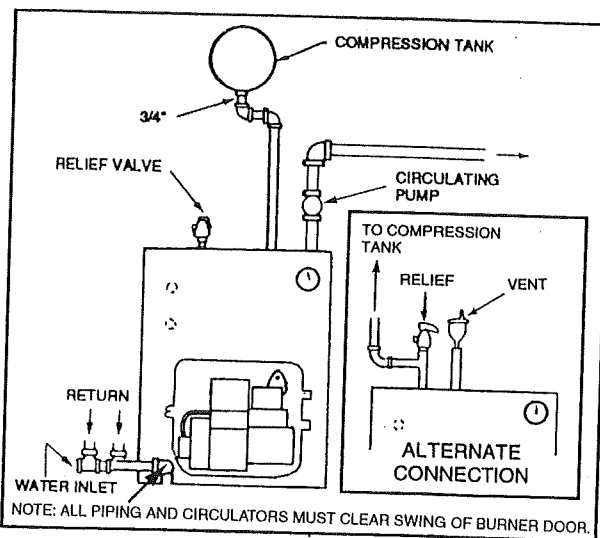


Figure 7. Air Collecting System

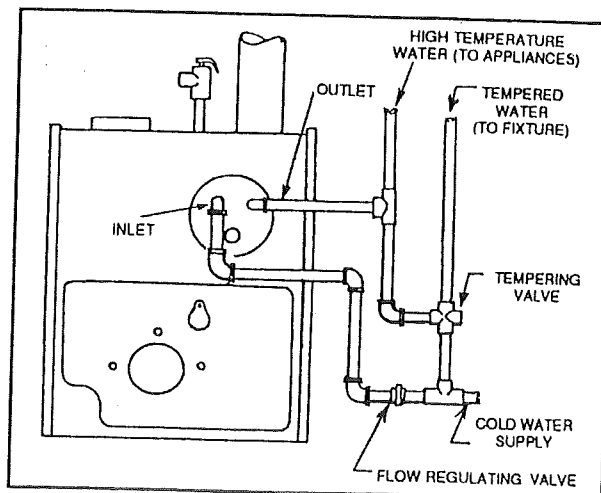


Figure 8. Recommended Piping to Tankless Heater

VENT PIPING AND DRAFT REGULATOR

- A. Vent pipes must be installed having the same diameter as the boiler outlet. (See page 2)
- B. Vent pipes and breeching must be pitched upward a minimum of 1/4" per foot.
- C. Connect vent pipe to the chimney using as few elbows as possible.
- D. Horizontal vent connector into the chimney should not be inserted beyond the inside wall of the chimney.
- E. Install barometric draft regulator on horizontal breeching, near chimney, with hinge horizontal and face vertical. See manufacturer's instructions packed in carton with barometric draft regulator.
- F. If two or more appliances are used on the same chimney, see CHIMNEY, page 3.
- G. Make up all joints with minimum air leaks, secure with sheet metal screws.

OPERATING INSTRUCTIONS**PRECAUTIONS BEFORE STARTING OIL BURNER**

Make a positive check of A through F before starting burner:

- A. Boiler and system are full of water. All air is vented from system. See below.
- B. All wiring is completed. See pages 11-13.
- C. Oil supply is connected to the burner; nozzle is installed correctly; oil valve is open at tank.
- D. Smokepipe is connected to chimney.
- E. All combustible materials are cleared away.
- F. Combustion air supply is provided. See page 3.
- G. Burner settings are adjusted as per pages 14-18 and as shown on boiler jacket.
- H. Main cast-iron door on which burner is mounted is bolted shut and fiberglass rope seal is making good contact.

CAUTION: DO NOT START THE BURNER UNLESS ALL CLEANOUT DOORS ARE SECURED IN PLACE.

WARNING: NEVER OPERATE any natural draft* boiler (Liberty II boiler is a natural draft boiler) with zero draft or overfire pressure: early failure of the burner, nozzle and chamber is inevitable if you do. Use a draft gauge, and make sure that overfire draft* is .02", minimum, during all operating conditions.

* Draft is negative or suction pressure.

START-UP (COMBUSTION TEST INSTRUMENTS MUST BE USED)

- A. Make sure the boiler is installed and wired properly and is full of water.
- B. Open the observation door (on the front, above the burner).
- C. Start the oil burner (see burner instructions for bleeding air from oil, etc.). IMMEDIATELY, set burner air bands to obtain a bright fire without smoke or oil stain. Set the DRAFT REGULATOR to obtain .02" overfire draft*. Take draft reading through slot in observation door.
- D. Close the observation door. Allow the burner to fire for at least one hour total firing time, to bake out the volatile binders in the combustion chamber before taking final combustion readings.
- E. By alternate adjustment of the barometric draft regulator, the burner air regulation and head regulation devices (whichever apply), set for a trace of smoke and as close to 13% CO₂ as you can. Then open the air bands or shutter (whichever apply) an additional 1/8". This should result in zero smoke with NO raw oil on the smoke paper and a smooth light-off. DO NOT ATTEMPT TO SET FIRE BY EYE. Flame retention burners may appear efficient and smoke free from an inefficient 7% up to an overly high 14% CO₂. However, a very low CO₂ can also result in poor ignition and raw (unburned) oil entering the fire box. At very high CO₂, any slight decrease in air flow for any reason will cause incomplete combustion, with high smoke and dry soot formation in the fire box.
- F. If smoke reading is satisfactory, but CO₂ can not be increased to a satisfactory level (12% or better) or overfire draft of 0.02" W.C. can not be obtained, check for proper sealing between sections, between burner mounting plate and front section, around burner blast tube and around flue collector and collar. If seal is not satisfactory, reseal with furnace putty or silicone with a temperature rating of at least 400° F. (All safety precautions indicated on material package must be followed.)

G. Once burner and draft have been set up, then smoke, CO₂ and stack temperature should be checked and recorded. If smoke is greater than trace, review the burner instructions; replace the nozzle if necessary. Normal smoke to be expected at approximately 13% CO₂ is zero to a trace.

CLEANING AND FILLING A NEW WATER BOILER

- I. There are a number of commercial preparations available from your distributor for cleaning and for corrosion protection conditioning the internal (waterside) surfaces of boilers. Follow the preparation manufacturer's instructions.

DANGER: Use CAUTION when handling chemicals and draining hot water from a boiler. Scalding water and/or chemicals can cause permanent injury to the skin, eyes and respiratory system.

- II. Filling and venting the water boiler after cleaning
 - A. Refill the system with fresh water.
 - B. Bring water temperature to at least 180° F promptly.
 - C. Circulate water through entire system.
 - D. Vent the system, including the radiation.
 - E. The boiler is now ready to be put into service or on standby.
 - F. If brand name air-control devices are used, venting instructions furnished with the devices should be followed.
- III. Safety check for control system

High limit control test: Set thermostat high enough for boiler water temperature to reach high limit control setting. When this temperature is reached, the high limit switch should open, and the burner should shut off automatically. If the high limit does not operate to shut off the burner, the high limit or the wiring is faulty. Repair or replace immediately.

WATER CONTENT OF BOILER (GALLONS) *

	LD-20	LD-30	LD-40	LD-50	LD-60	LD-70
Water Boiler	8.3	10.7	13.1	15.5	17.8	20.2
Steam Boiler	—	6.9	8.8	10.7	12.6	14.5

* Without tankless coil

VOLUME OF WATER IN STANDARD PIPE OR TUBE

Nominal Pipe Size Inches	Standard Steel Pipe			Type L Copper Tube	
	Schedule No.	Inside Diameter Inches	Gallons per Lin. Ft.	Inside Dia. Inches	Gallons per Lin. ft..
3/8	—	—	—	0.430	0.0075
1/2	40	0.622	0.0157	0.545	0.0121
5/8	—	—	—	0.666	0.0181
3/4	40	0.824	0.0277	0.785	0.0251
1	40	1.049	0.0449	1.025	0.0429
1 1/4	40	1.380	0.0779	1.265	0.0653
1 1/2	40	1.610	0.106	1.505	0.0924
2	40	2.067	0.174	1.985	0.161
2 1/2	40	2.469	0.249	2.465	0.248
3	40	3.068	0.384	2.945	0.354

CLEANING AND FILLING A NEW STEAM BOILER**I. BEFORE USING STEAM BOILER**

- A. Check burner to be certain it is ready for firing. **DO NOT FIRE** into an empty boiler.
- B. Be prepared to heat raw water to at least 180°F. as soon as it is introduced into the boiler. This procedure will remove dissolved, corrosive gases.
- C. Provide drain line, with valve, from boiler. Use a bottom tapping. Line and drain must be suitable for handling caustic solution.
- D. Check for low water cut-off operation, see section below for check-out.

II. CLEAN STEAM BOILER SYSTEM.

- A. Fill the boiler to water line indicated on the boiler.
- B. Follow start-up procedure for burner and operate the boiler with steam in the entire system for 2 or 3 days to bring oil and dirt from the system to the boiler. While system is in operation, maintain the proper water level in the boiler by slowly adding water to the boiler.
- C. Shut down burner, cool down boiler and drain system.
- D. Procedure to dissolve oil and grease in boiler:
 1. Fill boiler to proper water line.
 2. Prepare a boil-out solution of *sodium hydroxide* (caustic soda) and *tri-sodium phosphate*:
NOTE: Use caution in handling chemicals. Caustic soda is harmful to skin, eyes and clothing.
(a) Proportions: 1 lb. of each chemical per 50 gallons of system water.
(b) Stir chemicals into water until dissolved and pour into the boiler through a top tapping. Replace plug.
 3. Start the burner; boil the water for at least 5 hours; shut off the burner.
- E. With CAUTION, drain the boiler solution to a safe location. **DO NOT LEAVE SOLUTION SITTING IN SYSTEM OVER 2 HOURS.**
- F. Wash the water side of the boiler thoroughly using a high pressure water stream. Fill and drain the boiler several times.

III. TREATING WATER FOR CORROSION CONTROL

(This is not scale control)

- A. Prepare a solution of *sodium chromate*.
Proportions: 1 lb. per 50 gallons of boiler water.
- B. Stir chemical in water until dissolved and pour into boiler through a top tapping. Replace plug.

IV. FILLING AND VENTING THE STEAM BOILER

- A. Refill the boiler to the indicated water line.
- B. Bring water to boiling temperature, promptly.
- C. The boiler is now ready to be put into service or on standby.

BLOWING OFF A LOW PRESSURE STEAM BOILER

- A. A 1-1/2" NPT tapping is provided in the front of the boiler (tapping no. 9, figure 1) for use as a surface blow down to provide rapid skimming of oil and grease which accumulate on the surface of the water. The boiler should be blown down as outlined below.
- B. Turn off electrical power supply to boiler. Allow boiler to cool down and steam pressure to reduce to zero before removing skimmer tapping plug. Check for steam pressure by testing the pop safety valve. Keep your hands and all parts of your body away from the discharge end of the safety valve. Drain boiler down one to two inches below skimmer tapping. The water might be hot. Remove skimmer plug slowly and carefully install a 150 psi malleable iron 1-1/2" NPT street elbow, a 1-1/2" NPT skimmer valve and length of pipe and place a bucket underneath the open end of the pipe. Cover bucket with a piece of cloth. (See figure 9)
- C. Fill boiler slowly until water level is two inches from top of gauge glass. (This is the starting water level for skimming only.) Fire boiler to produce steam. If the system is heavily laden with oil, it may be difficult to obtain much more than a pound or so of pressure. Set the pressure control at about 7 psi. The higher the steam pressure you can use, the better and faster the cleaning.

- D. As steam develops, open the SKIMMER drain valve with caution to skim the oil and film from the top of the water. **DO NOT** open the boiler drain valve. Close the skimmer drain valve when the water level drops to about 5" from the top of the gauge glass. The water may stop before the level drops to 5" below the top of the glass. Refill boiler until water level is again two inches from the top of the gauge glass.
- E. Repeat (D) above until all film is skimmed off and the water settles to a normal movement. Add make up fresh water to the boiler as described in (D) above, during the blow-off operation, to maintain the proper skimming water level in the vessel. Empty bucket frequently in order to see the difference in water cleanliness.
- F. When surging has stopped and water is clean, and no film can be seen floating in the bucket, shut off boiler, drain down to level of skimmer tapping, remove valve, plug skimmer tapping and refill the boiler to 24-1/2" water level. After 15 minute operation, readjust level to normal operating level of 25-1/2" from bottom of boiler (see figure 9). Check the pop safety valve for proper operation. Check the low water cut-off operation, see below.
- G. The entire process may have to be repeated over a period of a few days on extremely fouled systems.

LOW WATER CUT-OFF CHECK-OUT**I. Electronic probe type low water cut-off**

If this boiler is factory equipped with an electronic probe type low water cut-off, operation of cut-off should be checked at least twice a year as follows:

- A. While boiler is running, drain down boiler water slowly through Boiler Drain Cock shown on page 4, just until light goes on. Boiler should shut down 10 seconds after light goes on.
- B. Be sure that it is the low water cut-off and not the room thermostat, pressure cut-out, or other control that has shut off the burner.
- C. Refill the boiler and repeat test.
- D. Refill the boiler and reset controls for normal operation.

II. Float type low water cut-off

If this boiler is factory equipped with a McDonnell & Miller float type low water cut-off, the low water cut-off must be blown down (flushed), at least once a week.

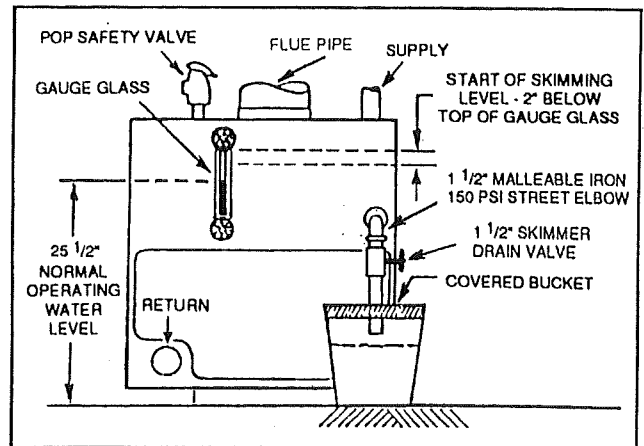


Figure 9.

CAUTION: When flushing float type low water cut-off control, hot water and steam will flow out the blow down valve. Blow down valve is illustrated below.

A. SPECIAL FLUSHING INSTRUCTIONS

For new boiler installed in old system.

Installation of new boiler may break loose a heavy accumulation of sediment and scale from old piping and radiators. It is extremely important to blow down your McDonnell cut-off more frequently the first week.

First week — 3 times

Thereafter — at least once a week.

- B. As boiler water circulates through the float chamber, dirt or other sediment may be deposited. This chamber is extra deep. But the only sure way to keep any accumulation from interfering with float action is to "blow down", or flush out, the control once a week. Do it while boiler is in operation. First note water level in gauge glass. Open blow-off valve at bottom of control; water will pour out, flushing away sediment. Drain until water is clear — about a pail — then close valve. If level in gauge glass has dropped, add water to boiler to restore level.

- C. **NOTE:** Opening blow-off valve checks cut-off operation too. As float drops with falling water level, burner will stop. After burner is off and normal operating conditions restored, burner will resume firing.
- D. Be sure that it is the low water cut-off and not the room thermostat, pressure cut-out, or other control that has shut off the burner.

PRESSURE CONTROL CHECK-OUT

- Check burner to be certain it is ready for firing. **DO NOT FIRE** into an empty boiler.
- Set thermostat high enough for boiler to make steam. Set the pressure control down to its lowest setting. As the boiler starts to produce steam, the steam pressure will start to build. The burner will shut off when the steam pressure exceeds the pressure setting (plus differential if control has this feature).
- Adjust the pressure control to a higher setting. The higher setting should be above the steam pressure in the boiler. This should turn the burner back on.
- Reset the pressure control as needed for the system. The pressure control should be checked at least twice a year.

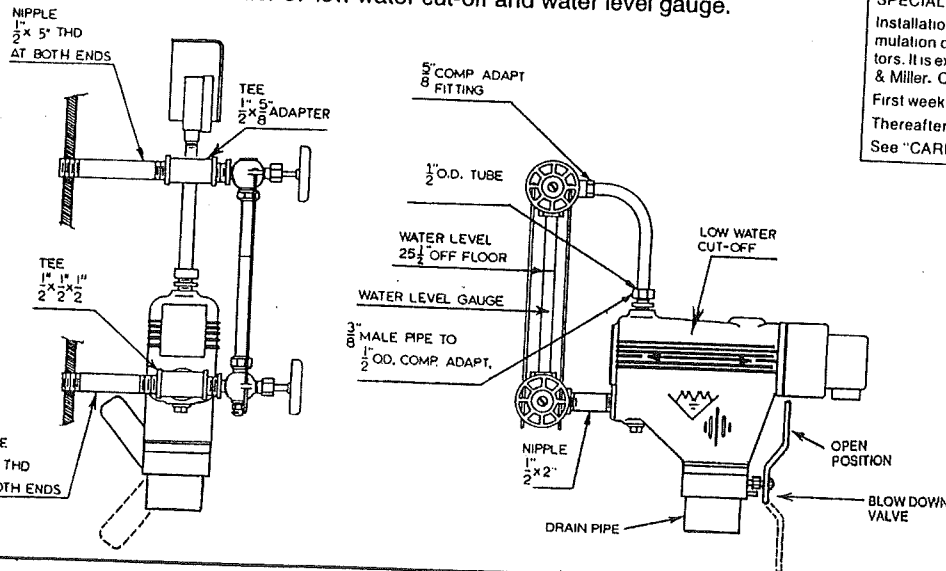
REPLACEMENT OF STEAM BOILERS

Anytime an older steam boiler is removed from the heating system and replaced with a new boiler, there are certain conditions that have to be examined on the heating system.

- Steam systems have a tendency to develop scale inside the wet return lines and the boiler. The older the system the greater the accumulation of scale that can exist inside the piping. Therefore, it is necessary when replacing a steam boiler to check the piping for blockage or restrictions. Clean or replace the piping as required. (See special flushing instructions on this page.)
- Replace all buried wet return lines.
- All equipment (air vents, radiation equipment, etc.) in the steam heating system should be checked for proper operation. All piping should be checked for proper pitch.
- It is good engineering practice to repack or tighten the packing nuts on all valves in the heating system.

STEAM CONTROL ASSEMBLY

Installed McDonnell & Miller 67 low water cut-off and water level gauge.



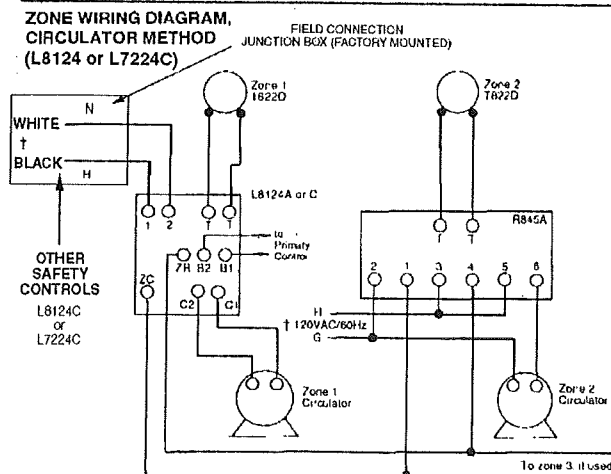
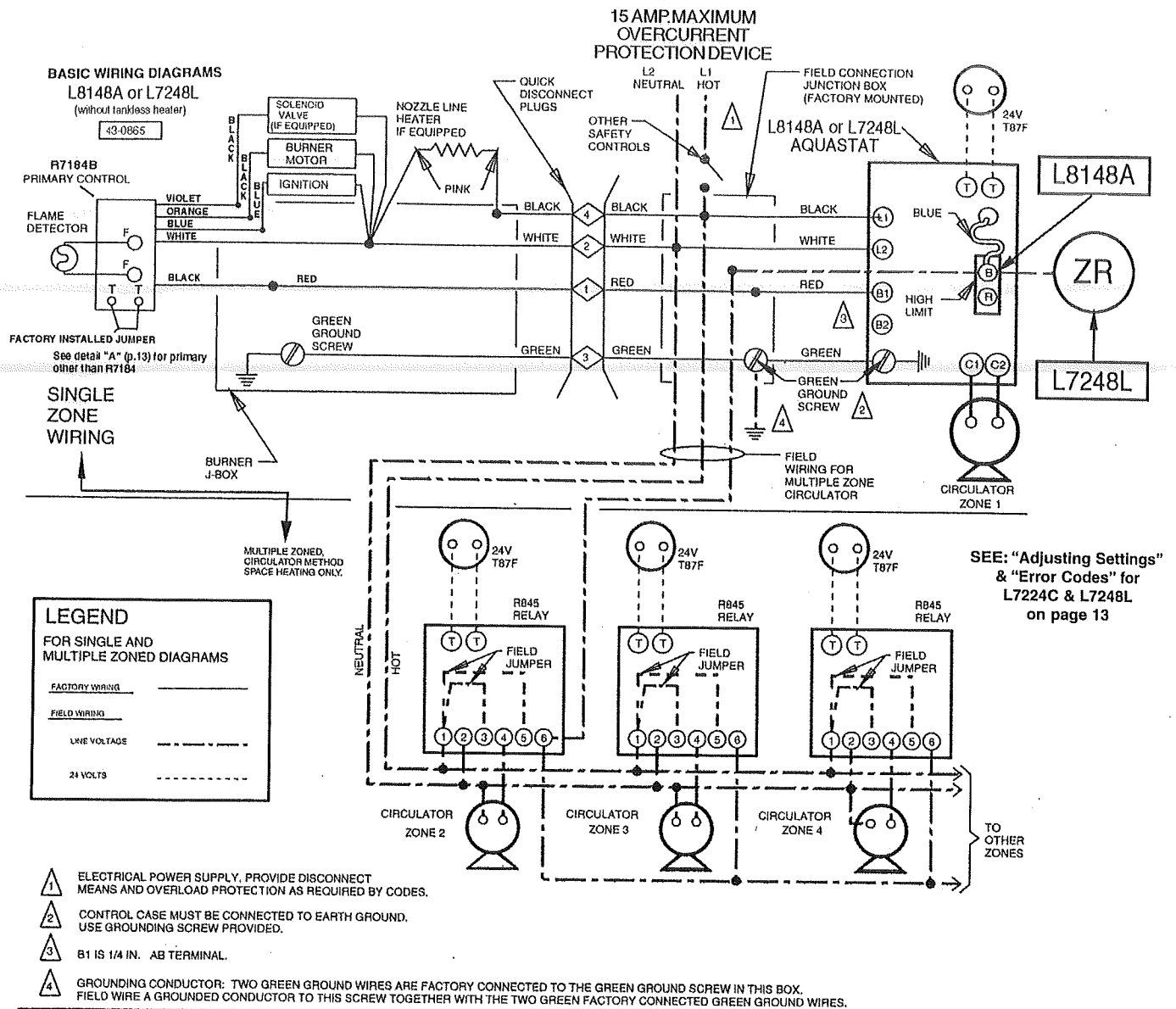
SPECIAL FLUSHING INSTRUCTIONS

Installation of new boiler may break loose a heavy accumulation of sediment and scale from old piping and radiators. It is extremely important to blow down your McDonnell & Miller. Cut-off more frequently the first week.

First week — 3 times

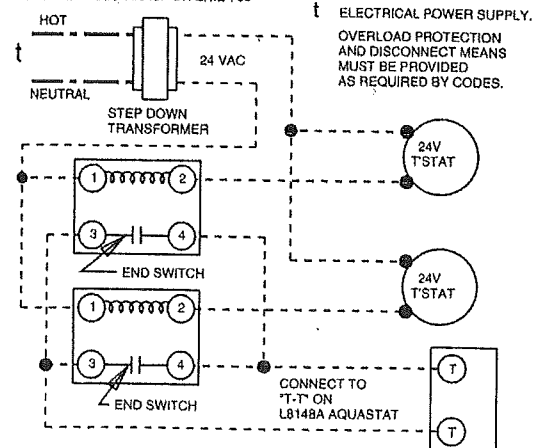
Thereafter — at least once a week.

See "CARE & MAINTENANCE" section for instructions.



MULTIPLE ZONED, ZONE VALVE METHOD

USING HONEYWELL V8043F OR ERIE 785



FOR L7224C OR L7248L

ADJUSTING SETTINGS

To discourage unauthorized changing of Aquastat settings, a procedure to enter the ADJUSTMENT mode is required. To enter the ADJUSTMENT mode, press the UP, DOWN, and I buttons simultaneously for three seconds. Press the I button until the feature requiring adjustment is displayed:

- . HL_ . High Limit.
- . LL_ . Low Limit. (L7224 only)
- . Ldf . Low Limit Differential. (L7224 only)
- . °F . °C.
- . ELL_ External Low Limit (L7248L only)

Then press the UP and/or DOWN buttons to move the set point to the desired value, to change between °F and °C, or to enable (On) or disable (Off) the External Low Limit. After 60 seconds without any button inputs, the control will automatically return to the RUN mode.

DISPLAY

In the RUN mode, the Aquastat will flash .bt. (boiler temp) followed by the temperature (i.e., 220), followed by °F or °C.

To read boiler settings, press the I key to read the parameter of interest. For example, press I High Limit (HL) is displayed, followed by a three-digit number, i.e., 220, followed by

°F or °C. Pressing the I button again (on L7224 models) will display the Low Limit (LL) followed by a three-digit number and the corresponding degree designator.

After approximately 60 seconds without any key presses, the display will enter a dim display mode. To return to the bright display mode, simply press any key.

DESCRIPTION

Boiler Temperature – **bt**
 High Limit – **HL**
 Low Limit – **LL**
 Low Limit Differential – **Ldf**
 Local Thermostat Status – **tt**
 Enviracom Thermostat Status – **ttE**
 Error Code – **Err**
 Degrees Fahrenheit – **°F**
 Degrees Celsius – **°C**

Error Code	Cause/Action
Err1	Sensor fault; check sensor.
Err2	ECOM fault; check EnviraCOM™ wiring
Err3	Hardware fault; replace control.
Err4	B1 fault; check B1 wiring/voltage.
Err5	Low Line; Check L1-L2, 110 Vac.
Err6	Fuse; Check ECOM wires, replace fuse.
Err7	EEPROM, HL, LL, Hdf, Ldf: reset to default values. Restore desired settings.
Err8	Repeated B1 fault (no voltage present at B1 when output is turned on water temperature above 260F when voltage present at B1); check B1 wiring/voltage.

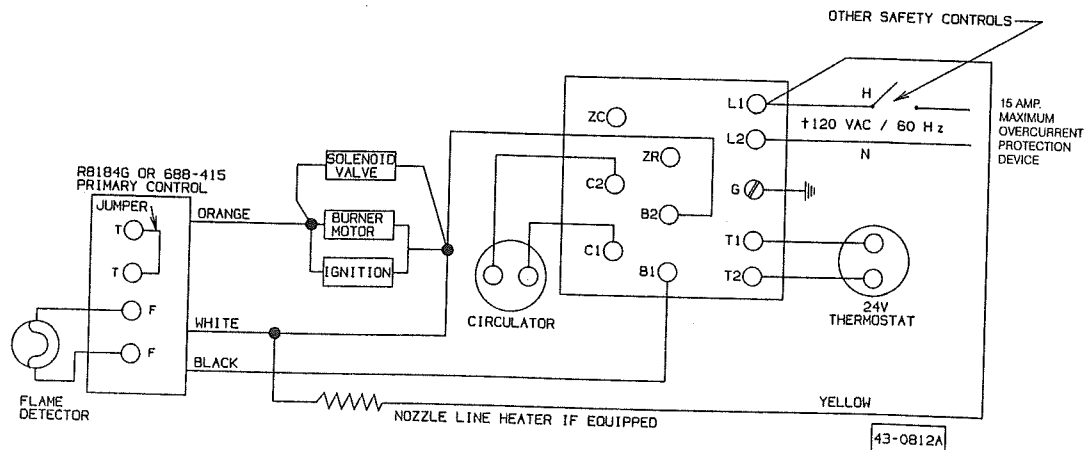
BASIC WIRING DIAGRAMS

L7224C OR L8124C OR A
 (WITH TANKLESS HEATER)

NOTES:

1. RECOMMENDED HIGH LIMIT SETTING IS 200°F. LOW LIMIT MUST BE SET AT LEAST 20°F BELOW HIGH LIMIT SETTING.
2. PUMP ZONING TERMINALS ZR AND ZC FURNISHED ON L8124 AND L7224C CONTROLS. SEE PUMP ZONING DIAGRAM BELOW

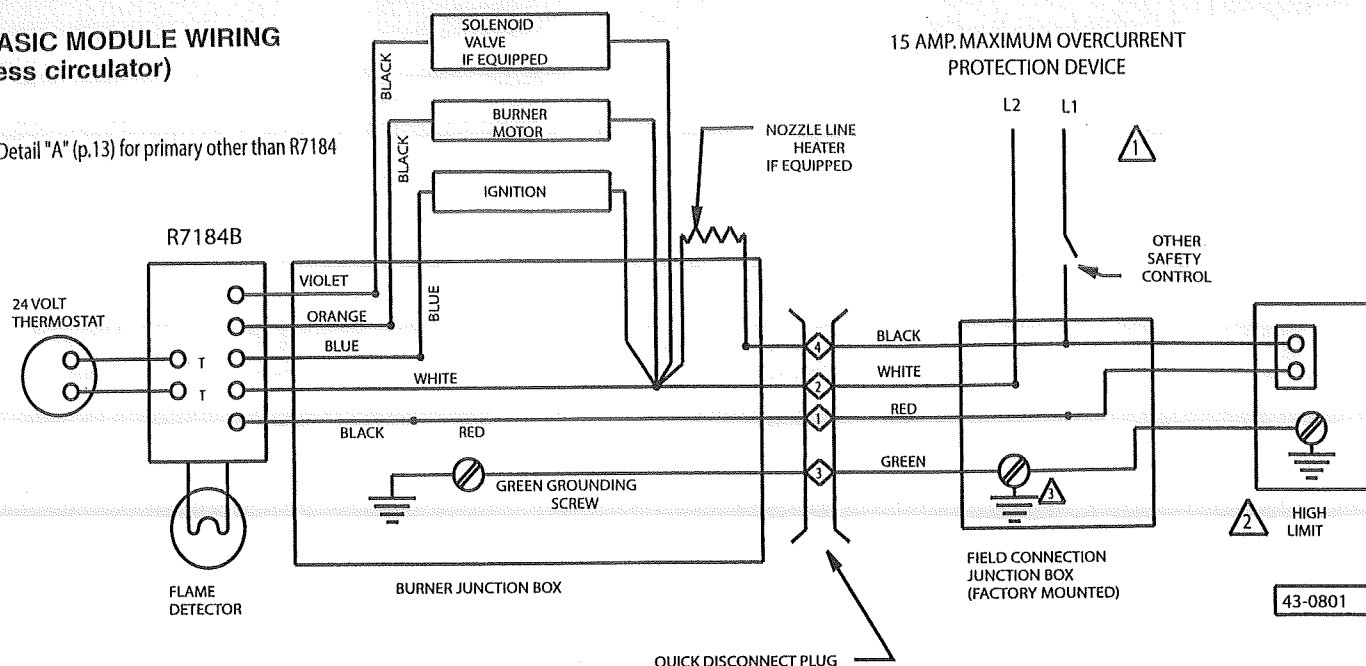
† OVERLOAD PROTECTION AND DISCONNECT SWITCH MUST BE PROVIDED AS REQUIRED BY LOCAL CODES.



43-0812A

BASIC MODULE WIRING (less circulator)

See Detail "A" (p.13) for primary other than R7184

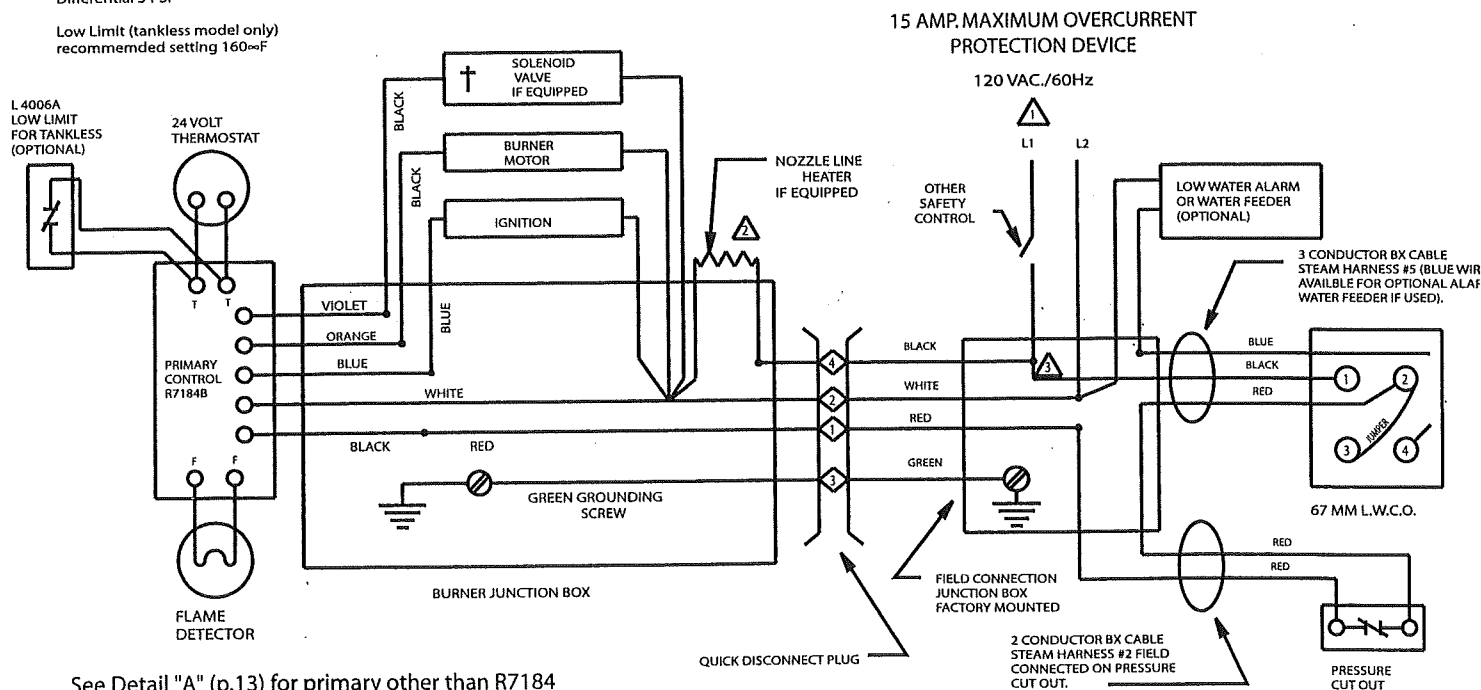


- ⚠ ELECTRICAL POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED BY CODES.
- ⚠ CONTROL CASE MUST BE CONNECTED TO EARTH GROUND USE GROUNDING SCREW PROVIDED.
- ⚠ GROUNDING CONDUCTOR: TWO GREEN GROUND WIRES ARE FACTORY CONNECTED TO THE GREEN GROUND SCREW IN THIS BOX. FIELD WIRE A GROUNDED CONDUCTOR TO THIS SCREW TOGETHER WITH THE TWO GREEN FACTORY CONNECTED GREEN WIRES.

WIRING FOR PACKAGED STEAM BOILER EQUIPPED WITH McDONNELL NO.67 L.W.C.O.

High-Pressure Limit
Recommended setting 0.5 PSI
Differential 5 PSI

Low Limit (tankless model only)
recommended setting 160°F



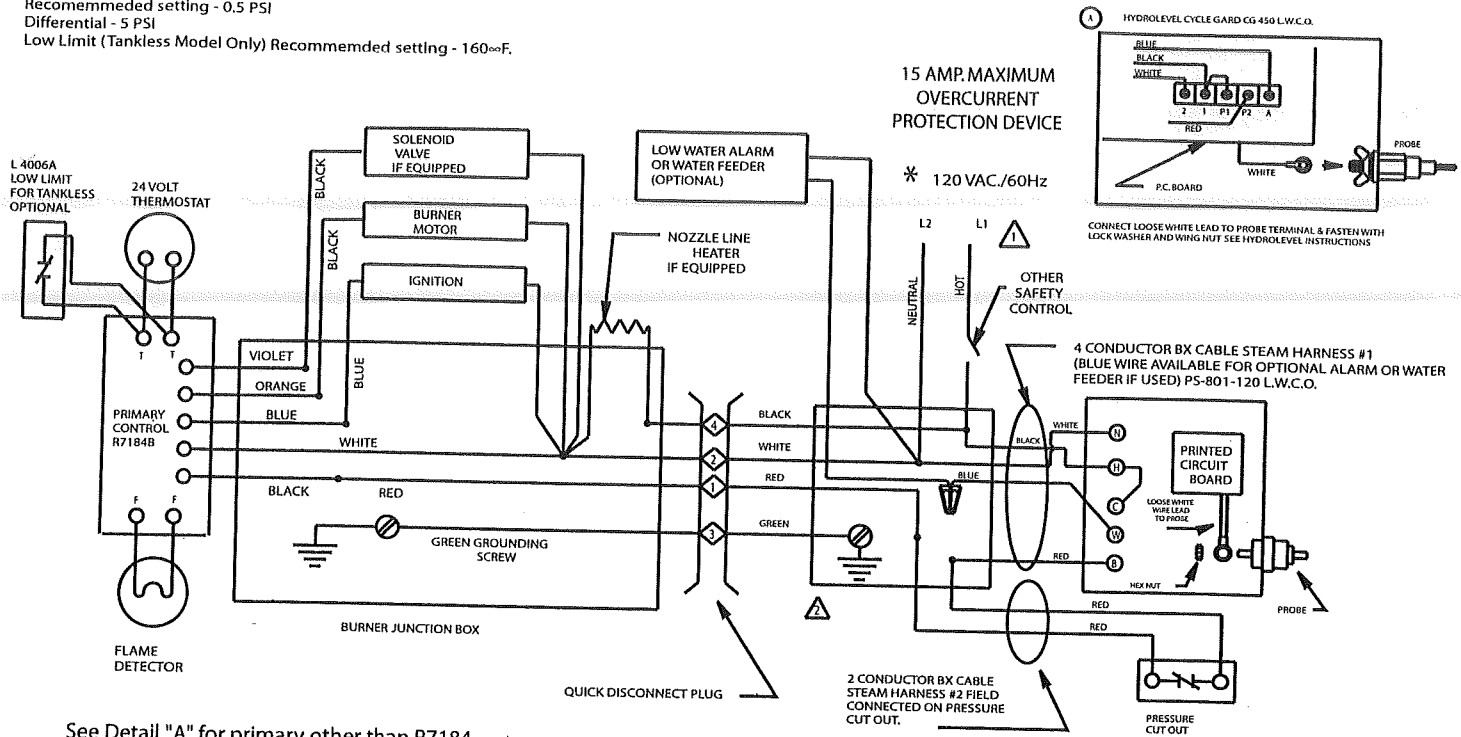
See Detail "A" (p.13) for primary other than R7184

- † Solenoid valve if equipped.
- Splice
- Terminal
- ⚠ Overload protection and disconnect switch must be provided as required by local codes.
- ⚠ Nozzle line heater, if equipped.
- ⚠ On burners without nozzle line heater, field connect hot line to single black wire from 3 conductor box cable in 4 x 4 junction box.

WIRING FOR PACKAGED STEAM BOILER

For alternate option PS-801-120 L.W.C.O.
or Hydrolevel Cycle Gard 450 L.W.C.O.

High-Pressure Limit
Recommended setting - 0.5 PSI
Differential - 5 PSI
Low Limit (Tankless Model Only) Recommended setting - 160°F.



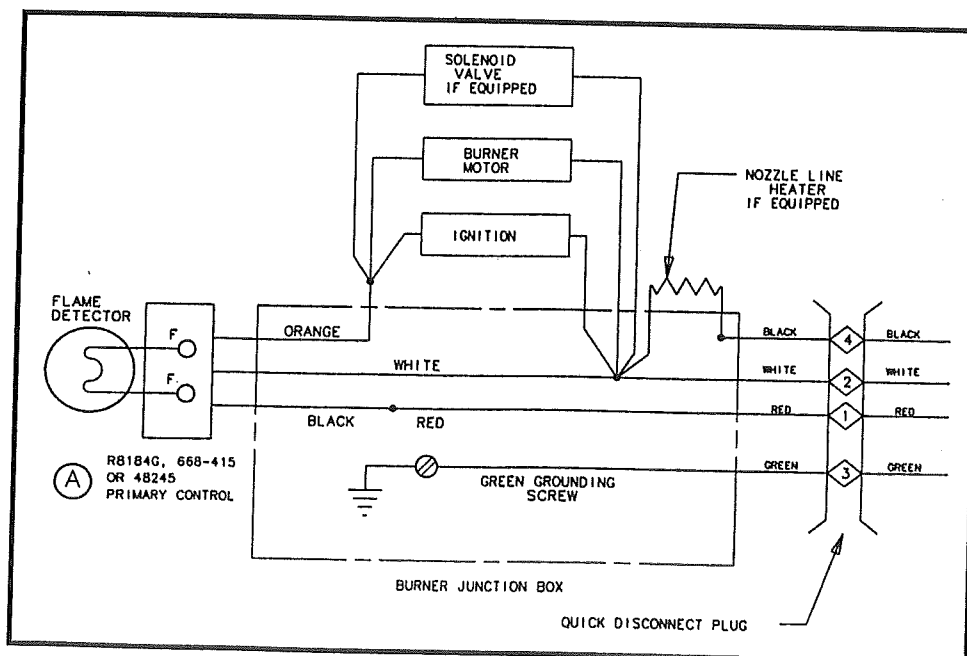
See Detail "A" for primary other than R7184

* OVERLOAD PROTECTION AND DISCONNECT SWITCH MUST BE PROVIDED AS REQUIRED BY LOCAL CODES.

⚠ ELECTRICAL POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED BY CODES.

⚠ GROUNDING CONDUCTOR: GREEN GROUND WIRES ARE FACTORY CONNECTED TO THE GREEN GROUND SCREW IN THIS BOX. FIELD WIRE A GROUND CONDUCTOR TO THIS SCREW TOGETHER WITH THE GREEN FACTORY CONNECTED GREEN WIRES.

Detail "A"



BURNER DATA — BECKETT AFG BURNERS FOR PACKAGED BOILERS ONLY

(For knocked-down & boiler burner units see publication no. L-42KB)

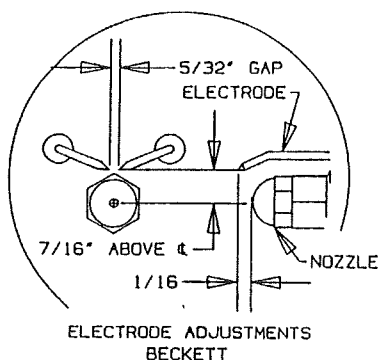
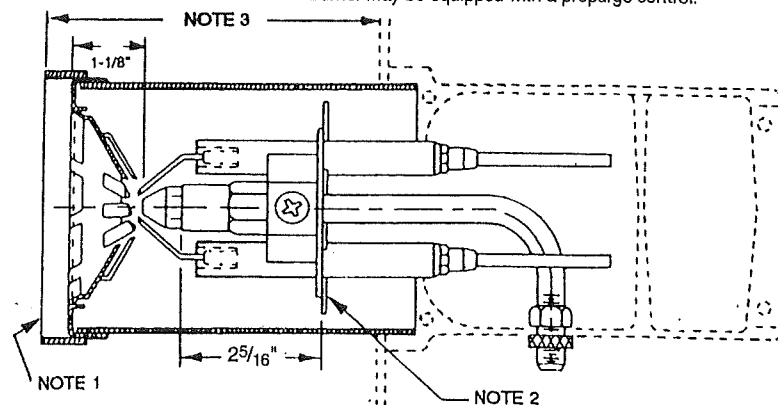
BOILER MODEL	BURNER MODEL *	BURNER HEAD	FIRING RATE (GPH)	NOZZLES			OIL PUMP PRESSURE SETTING (PSIG)	APPROX. AIR SHUT-TER SETTING NO.†	APPROX. AIR BAND SETTING NO. †
				SIZE (GPH)	ANGLE & TYPE	MFR.			
LD-20	AFG-SF-11-03	F0	.75	.75	80° B	DELAVAN	100	8	CLOSED
LD-30	AFG-SF-11-07	F4S	1.00	1.00	80° SS	HAGO	100	8	CLOSED
					80° A	DELAVAN			
					80° W	DELAVAN			
			1.10	1.10	80° ES	HAGO	100	9	CLOSED
					80° W	DELAVAN			
			1.25	1.25	80° ES	HAGO	100	10	1/2
					80° W	DELAVAN			
LD-40	AFG-SF-11-02	F120	1.60	1.50	80° ES	HAGO	113	10	1-1/4
					80° B	DELAVAN	113	10	1-1/2
			1.80	1.75	80° SS	HAGO	105	10	3
					80° B	DELAVAN			
LD-50	AFG-SF-11-05	F164	2.10	2.00	80° P	HAGO	110	10	1-1/2
					80° W	DELAVAN			
			2.35	2.25	80° P	HAGO	109	10	3-1/2
					80° W	DELAVAN			

† Air shutter and air band settings shown are approximate ONLY.

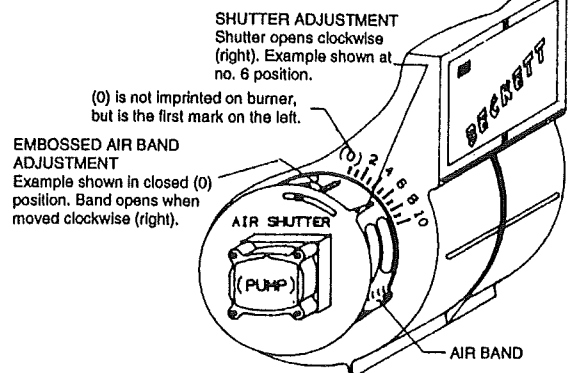
See **START-UP** page 8.

• All burner models shown are single stage.

- NOTE: 1. Extended heads on all units, except model LD-20
 2. No static plate for LD-50 only.
 3. Insertion depth $25/32$ for LD-30 and LD-40; $221/32$ for LD-50. Insertion depth $123/32$ for model LD-20.
 4. Air Band: 2 slot for LD-30, 4 slot for LD-40, 8 slot for LD-50.
 5. Burner may be equipped with a prepurge control.



See table for approximate settings.

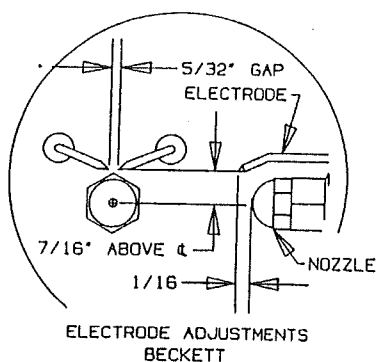
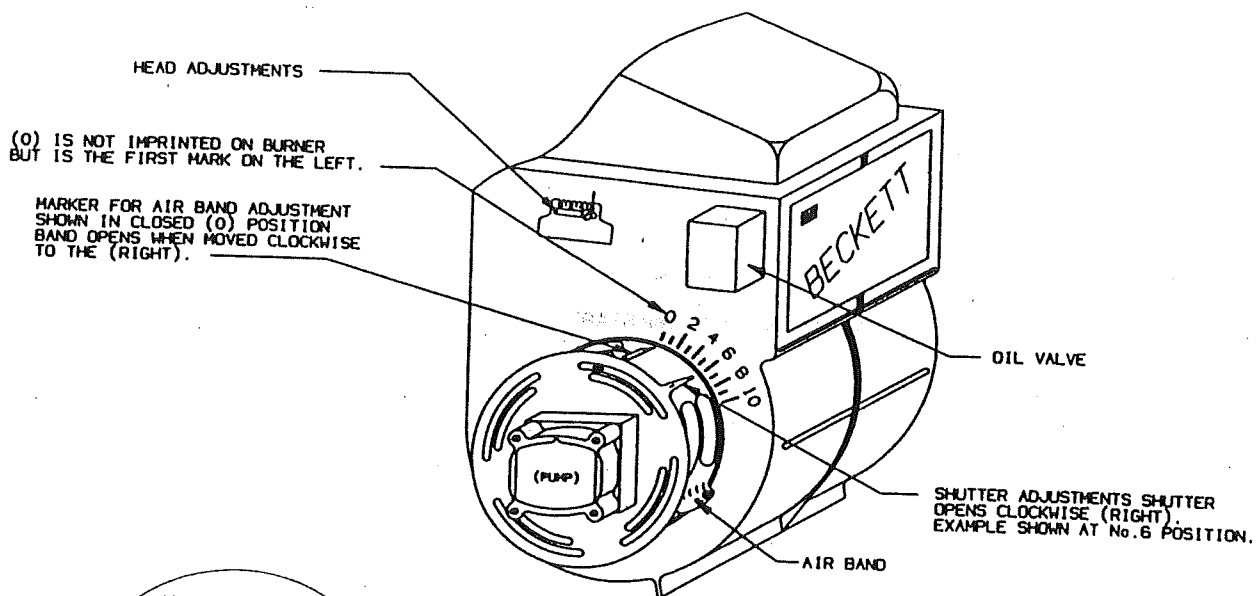


BURNER DATA - BECKETT CF-375 BURNERS FOR PACKAGED BOILERS ONLY
(For knocked-down & boiler burner units see publication no. L-42KB)

Boiler Model	Burner Model *	Nozzles				Oil Pump Pressure Setting (PSIG)	Air Shutter Setting †	Air Band Setting	Head Setting
		Firing Rate (GPH)	Size (GPH)	Angle & Type	MFG				
LD-60	CF-375	2.60	2.25	45° P	HAGO	135	10	3	1
LD-60	CF-375	2.85	2.25	45° P	HAGO	160	10	2	2
LD-70	CF-375	3.00	2.5	45° SS	HAGO	145	10	4	3
LD-70	CF-375	3.10	2.5	45° SS	HAGO	155	10	4	4
LD-70	CF-375	3.35	2.75	45° B	DELEVAN	148	10	4	5

† Air shutter and air band settings shown are approximate ONLY.
See START-UP page 8.

* All burner models shown are single stage.



See table for approximate settings.

BURNER DATA — RIELLO BURNERS FOR PACKAGED BOILERS ONLY
 (For knocked down & boiler burner units see publication no. L-42KB)

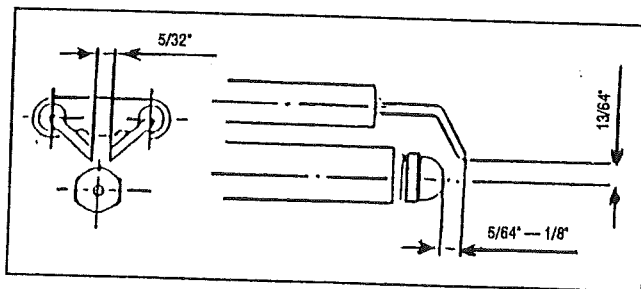
BOILER MODEL	BURNER MODEL *	BURNER DESCRIPTION	FIRING RATE NO.2 OIL (GPH)	NOZZLES			OIL PUMP PRESSURE SETTING (PSIG)	APPROX. AIR SHUTTER SETTING NO.†	APPROX. HEAD SETTING NO.†
				SIZE (GPH)	ANGLE & TYPE	MFR.			
LD-30H	40 Series F-5	with short tube	1.00	.75	60° ES	HAGO	178	2.40	0
LD-30HF	40 Series F-5	with short tube	.95	.75	60° ES	HAGO	160	2.20	0
LD-30	40 Series F-5	with short tube	1.10	.85	70° ES	HAGO	160	4.50	2
					70° B	DELAVAN			
			1.25	1.00	70° ES	HAGO	160	4.00	2
LD-40H	40 Series F-10	with short tube			70° W	DELAVAN			
			1.50	1.25	70° B	DELAVAN	145	2.00	0
LD-40	40 Series F-10	with short tube	1.60	1.25	60° ES	HAGO	160	2.50	1
					70° B	DELAVAN			
			1.80	1.35	70° ES	HAGO	180	3.00	1
LD-50H	40 Series F-10	with short tube			70° B	DELAVAN			
			2.00	1.50	45° B	DELAVAN	178	3.00	1
LD-50HF	40 Series F-10	with short tube	1.90	1.50	45° B	DELAVAN	160	2.60	1
LD-50	40 Series F-10	with short tube	2.10	1.65	60° W	DELAVAN	160	4.00	2
			2.35	1.75	60° W	DELAVAN	170	4.00	4

† Air shutter and head settings shown are approximate ONLY. See START-UP page 8.
 * All burner models shown are single stage.

NOTE: For proper insertion into combustion chamber see figure 12.

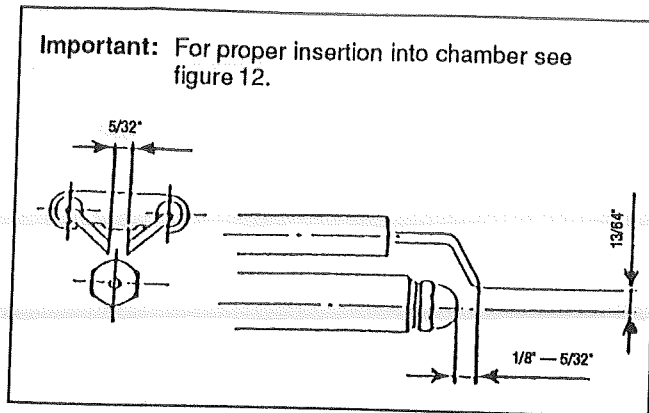
Figure 9A Riello 40 Series

MODEL F-5
ELECTRODE SETTING



BURNER DATA - RIELLO (continued)

Figure 9B

MODEL F-10
ELECTRODE SETTING

NOTE: ELECTRODES ARE PRESET AT THE FACTORY.

REGULATION OF THE TURBULATOR AND AIR SHUTTER FOR PROPER COMBUSTION

Turbulator Setting

1. Loosen nut, 1, then turn the screw, 2, until the index marker, 3, is aligned with the correct index number.
2. Retighten the retaining nut, 1.

TURBULATOR SETTINGS - RIELLO 40 SERIES

The numbers on the casting are there to denote the high and low end of the scale — In all cases the first mark is "Zero". The air/oil ratio depends on accurate setting of the turbulator disc. Be careful when making this adjustment as an incorrect setting will result in an unsatisfactory installation. See figures 10A and 10B.

Figure 10A

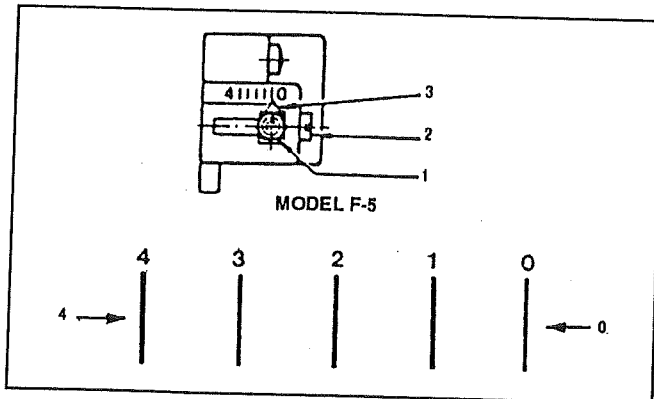
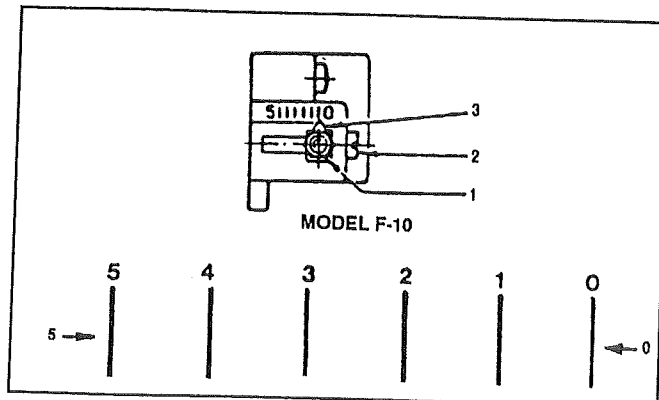


Figure 10B



SETTING THE AIR ADJUSTMENT PLATE (See figure 11)

1. The hydraulic AIR SHUTTER (A) is operated by the HYDRAULIC JACK (F), assuring complete opening of the combustion air intake. Regulation of the combustion air flow is made by adjustment of the manual AIR ADJUSTMENT PLATE (D) after loosening the FIXING SCREWS (C and E). The initial setting of the air adjustment plate should be made according to page 16.
2. The proper number on the manual AIR ADJUSTMENT PLATE (D) should line up with the SETTING INDICATOR (B) on the fan housing cover. Once set, the air adjustment plate should be secured in place by tightening SCREWS C and E. Manually open and release the hydraulic air shutter to ensure it has free movement.
3. The final position of the air adjustment plate will vary on each installation. Use instruments to establish the proper settings for maximum CO₂ and a smoke reading of zero.

NOTE: Variations in flue gas, smoke, CO₂ and temperature readings may be experienced when the burner cover is put in place. Therefore, the burner cover must be in place when making the final combustion instrument readings, to ensure proper test results.

Figure 11

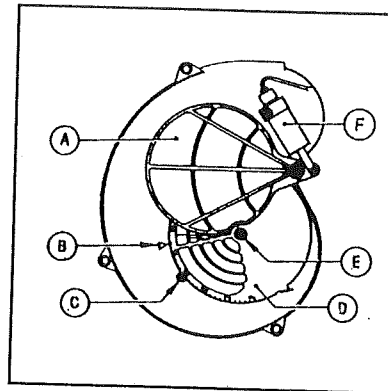
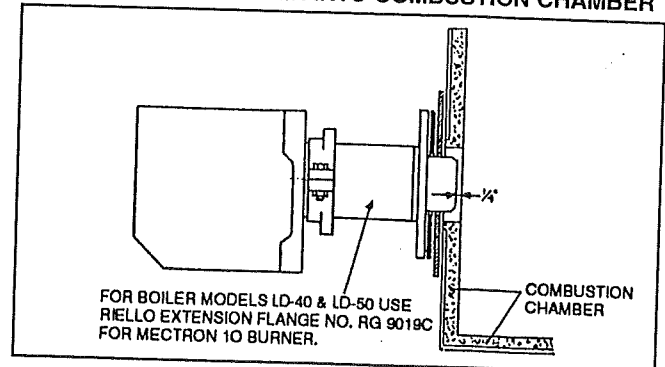


Figure 12

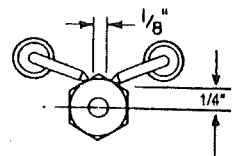
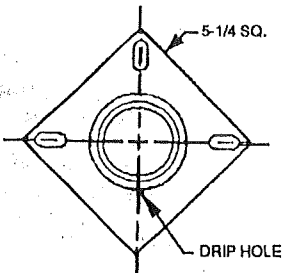
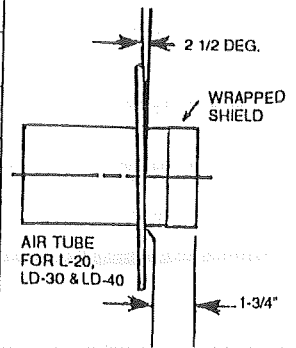
FOR PROPER INSERTION INTO COMBUSTION CHAMBER



BURNER DATA — CARLIN BURNERS FOR PACKAGED BOILERS ONLY

(For knocked-down & boiler burner units see publication no. L-42KB)

BOILER MODEL	BURNER MODEL *	FIRING RATE NO.2 OIL (GPH)	NOZZLES			OIL PUMP PRESSURE SETTING (PSIG)	*A* APPROX. HEAD SETTING NO.†	APPROX. AIR BAND OPENING % †
			SIZE (GPH)	ANGLE & TYPE	MFR.			
LD-20	71357 99-FRD	.75	.75	70° A	DEHAVAN	100	1.0—2.0	45—50
LD-30H	71357 99-FRD	1.00	1.00	60° A	DEHAVAN	100	2.0—3.0	70—80
LD-30	71357 99-FRD	1.10	1.10	60° A	DEHAVAN	100	2.0—3.0	80—90
	71357 99-FRD	1.25	1.25	60° A	DEHAVAN	100	2.0—3.0	90
LD-40H	71373 99-FRD	1.50	1.50	45° ES	HAGO	100	3.0	50
	71373 99-FRD	1.60	1.50	70° SS	HAGO	113	4.0	60
LD-40	71373 99-FRD	1.80	1.75	70° W	DEHAVAN	105	5.0	90
	71373 99-FRD	1.80	1.75	70° SS	HAGO	105	5.0	90
LD-50H	71399 99-FRD	2.00	2.00	45° P.	HAGO	100	3.0	40
	71399 99-FRD	2.10	2.00	60° B	DEHAVAN	110	3.0	50
LD-50	71399 99-FRD	2.35	2.25	70° W	DEHAVAN	109	5.0	60
	71399 99-FRD	2.35	2.25	70° SS	HAGO	109	5.0	60
LD-60	71316 102-CRD-3	2.60	2.50	70° P	HAGO	108	5.0	50
	71316 102-CRD-3	2.85	2.75	70° W	DEHAVAN	107	6.0	80
LD-60 BAR N.Y.C. ONLY	87189 102-CRD-3	2.60	2.50	70° P	HAGO	107	6.0	80
	87189 102-CRD-3	2.60	2.50	60° W	DEHAVAN	107	5.0	50
LD-70	71332 102-CRD	3.10	2.75	45° SS	HAGO	107	5.0	50
	71332 102-CRD	3.10	2.75	60° SS	HAGO	125	8.0	90
LD-70 BAR N.Y.C. ONLY	71332 102-CRD	3.35	3.00	60° W	DEHAVAN	125	10.0	90
	71332 102-CRD	3.35	3.00	60° SS	HAGO	125	10.0	90
LD-70C	71332 102-CRD	3.10	3.00	60° B	DEHAVAN	107	8.0	90
	71332 102-CRD	3.10	3.00	60° SS	HAGO	107	8.0	90
LD-70C	71332 102-CRD	3.00	2.75	60° W	DEHAVAN	119	7.0—8.0	80—90
	71332 102-CRD	3.00	2.75	60° SS	HAGO	119	7.0—8.0	80—90

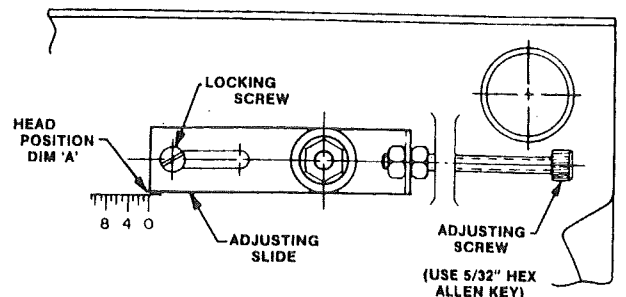
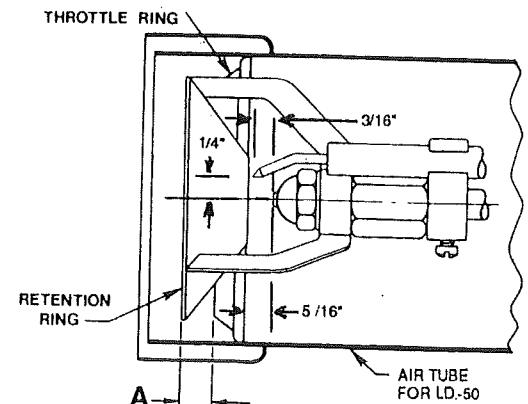
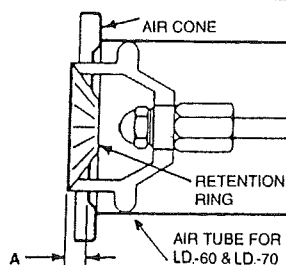
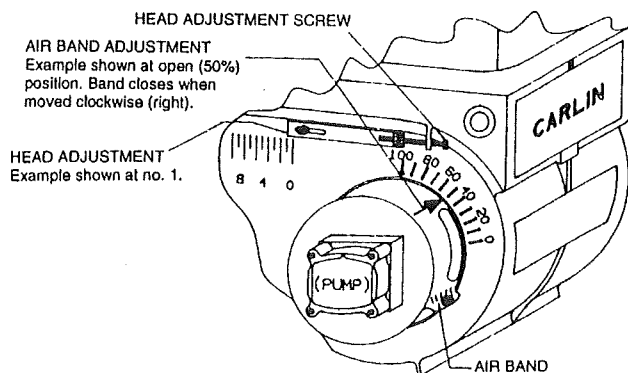


† Head and air band settings are approximate ONLY.
See START-UP on page 8 and burner figure below.
* All burner models shown are single stage.

NOTE:

1. The air shutters on the burners for models LD-20, LD-30 and LD-40 are blank (closed).
2. The air shutters on the burners for models LD-50, LD-60 and LD-70 are full open.
3. Single slotted air band for LD-20 and LD-30.
4. Double slotted air band LD-40, LD-50, LD-60 and LD-70.

See table for approximate settings.

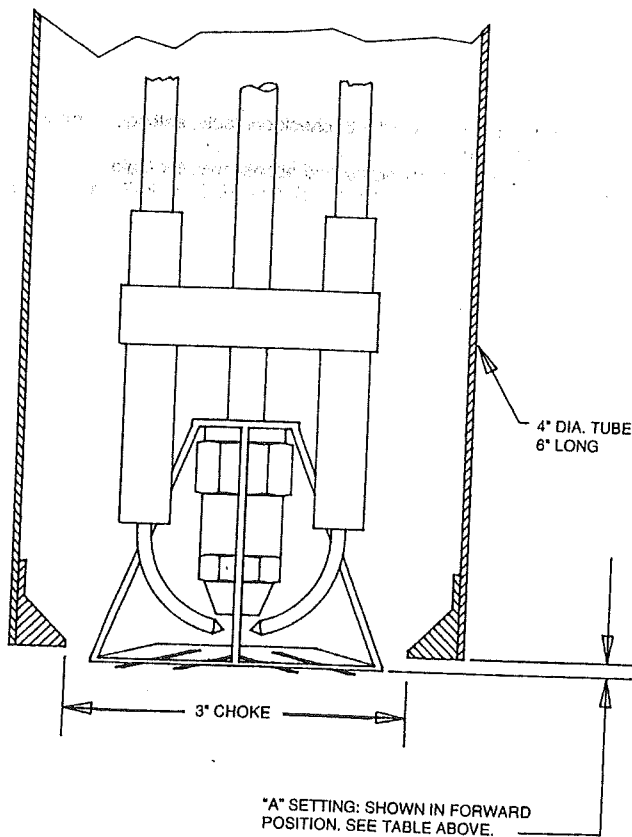


BURNER DATA — WAYNE BURNERS FOR PACKAGED BOILERS ONLY
(For knocked-down & boiler burner units see publication no. L-42KB)

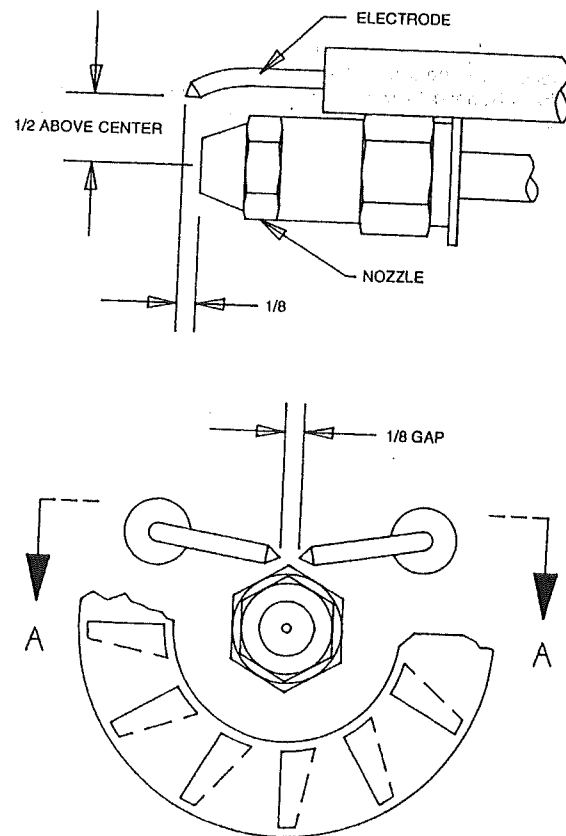
BOILER MODEL	BURNER MODEL *	FIRING RATE NO.2 OIL (GPH)	NOZZLES			OIL PUMP PRESSURE SETTING (PSIG)	"A" APPROX. HEA SETTING†	APPROX. AIR BAND SETTING †
			SIZE (GPH)	ANGLE & TYPE	MFR.			
LD-50	EH	2.15	2.00	80° B	DELAVAN	115 (BAR)†	3/8" Back	1/2"
		2.35	2.25	80° B 80° P	DELAVAN HAGO	109	1/8" Back	3/4"
LD-60	EH	2.60	2.50	80° W 80° SS	DELAVAN HAGO	108 (BAR)†	1/8" Forward	3/4"
		2.85	2.75	80° P 80° W	HAGO DELAVAN	107	1/8" Forward	1-1/8"
LD-70	EH	3.00	3.00	70° W	DELAVAN	100 (BAR)†	1/4" Forward	1-1/2"
		3.10	3.00	70° SS	HAGO	107	1/4" Forward	1-1/2"
				70° W	DELAVAN	107		
		3.35	3.00	70°W 70°SS	DELAVAN HAGO	125 113	1/4" Forward	1-7/8"

* Choke 3" (Wayne part no. 12329); Static Disc 2-1/2", 6" air tube; 1-3/4" insertion for the welded flange.

† Burner specifications marked "BAR" are for Liberty II boilers approved for use in N.Y.C. by Bureau of Air Resources.



VIEW A-A



CARE AND MAINTENANCE

CAUTION: DO NOT ATTEMPT TO START THE BURNER WHEN EXCESS OIL HAS ACCUMULATED, WHEN THE UNIT IS FULL OF VAPOR, OR WHEN THE COMBUSTION CHAMBER IS VERY HOT.

CAUTION: DO NOT TAMPER WITH THE UNIT OR CONTROLS—CALL YOUR SERVICE PERSONNEL.

I. EXTENDED SHUTDOWN, CLEANING OR REMOVAL OF BOILER FROM SERVICE.

DANGER: Use CAUTION when handling chemicals and draining hot water from a boiler. Scalding water and/or chemicals can cause permanent injury to the skin, eyes and respiratory system.

- A. Shut down burner by disconnecting all electrical power to the burner by turning OFF the BURNER EMERGENCY SWITCH of this boiler. After shutting down burner, while the boiler is still hot (180°F to 200°F), drain water from the bottom of the boiler until it runs clear.
- B. To clean the fireside boiler surfaces, first shut down burner by disconnecting all electrical power to the burner by turning OFF the OIL BURNER EMERGENCY SWITCH of this boiler in order to perform the following work in (1) through (10) below.
 1. Remove the flue pipe from the boiler flue collar and clean thoroughly.
 2. Inspect the entire vent connector back to the chimney and clean if necessary.
 3. Inspect the chimney for soot, debris and other unsafe conditions of the chimney and take the necessary action.
 4. Remove the flue collector by first removing the top jacket panel. The flue collector is held in place by two hex 1/4-20 screws. Remove the screws and carefully remove the flue collector. Try not to disturb the flat fiberglass rope under the flue collector.
 5. When necessary to clean the combustion chamber you must first CLOSE the suction valve (and return valve if two pipe). Then disconnect the oil lines from the burner. The flexible electric conduit connected from the junction box on the boiler to the burner via a plastic connector must be disconnected from the burner by grasping the plastic half of the connector closest to the flexible conduit and gently pulling it in the direction of the conduit until it is disconnected. Remove the single 3/8-16 hex head screw on the LEFT side of the swinging door. You will need a 9/16" drive socket. Open the door to completely expose the combustion chamber for thorough cleaning and for inspection of target wall, blanket (provided in certain models; see rating plate), main cast iron burner door insulation and burner door fiberglass sealing rope. If combustion chamber parts above are badly deteriorated then replace with original factory parts available at your distributor.
 6. Use the flue brush to clean the pinned flueways between the sections.† A wire brush may be used to remove any carbon accumulation that may have developed in the combustion chamber. Vacuum the loose soot and debris from the boiler.
 7. Inspect the burner combustion head. Clean if necessary and make sure all the adjustments are correct. (See burner data pages for the burner installed.) Replace oil nozzle with new one and readjust electrodes. To insure proper burner operation ONLY THE NOZZLES SPECIFIED IN THIS MANUAL OR ON THE BURNER LABEL SHOULD BE USED FOR REPLACEMENT.
 8. Close main cast iron burner door (door on which burner is mounted). Make sure that the entire seal (fiberglass rope) is making good contact with the boiler casting when replacing 3/8-16 x 1" long hex head bolt and tightening.
 9. Check the flue collector seal. This is the flat rope seal on top of the heat exchanger. The rope must be in place adjacent to the long bosses on front and rear sections and adjacent to the short bosses on the intermediate sections. The rope should be directly under the flue collector flanges when the flue collector is replaced. Use the two 1/4-20 x 3/4" washer hex head screws to fasten the flue collector. In order to assure a proper seal be sure that the flue collector is compressing the flat rope and not hanging up on the section bosses. Tighten the two screws.

C. If boiler room is damp, provide ventilation.

CAUTION: ALWAYS KEEP THE OIL SUPPLY VALVE SHUT OFF IF THE BURNER IS SHUT DOWN FOR AN EXTENDED PERIOD OF TIME.

II. PROVIDING PROTECTION FOR FREEZING

Anti-freeze is sometimes used in hydronic heating systems to protect against freeze-up in the event of power failure, or safety control shutdown when the building is unoccupied. It should be recognized that unless the building is kept above freezing temperature by some means, the plumbing system is not protected.

PROPYLENE GLYCOL is used in the quick-freeze food industry; it is practically non-toxic. Its use may be permitted when tankless heaters are used. When anti-freeze must be used, inhibited propylene glycol is recommended. Useful information on the characteristics, mixing proportions, etc. of glycol in heating systems is given in Technical Topics No. 2A, available from the Hydronics Institute, 35 Russo Place, Berkeley Heights, N.J. 07922. Consult glycol manufacturers for sources of propylene glycol. DO NOT use ethylene glycol because it is toxic.

III. OIL BURNER

All service to the oil burner, oil filter, oil strainers, etc., should be performed by a professionally trained service person. Inspect and clean annually and following any period of improper operation. Recheck and adjust settings as specified for burner model and nozzle size. Set burner air and draft regulator, using test instruments to obtain recommended CO₂ and draft without smoke. Refer to page 8.

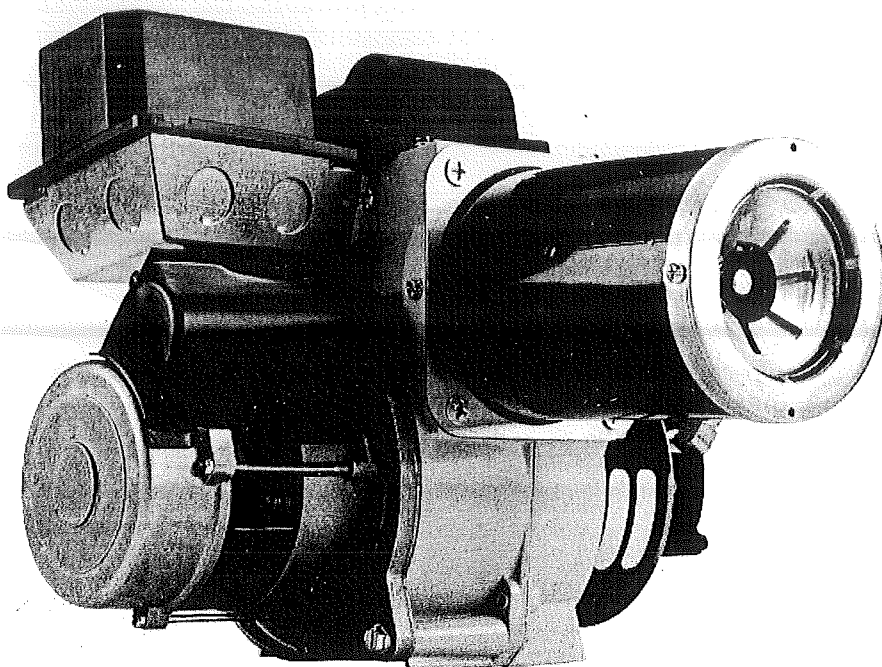
IV. GENERAL MAINTENANCE

These operations are recommended to be performed at regular intervals:

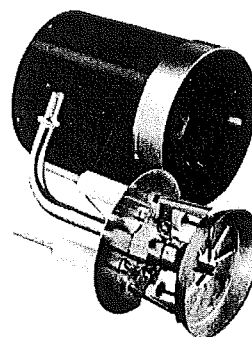
- A. BOILER HEATING SURFACES: clean off all coatings found. Reseal covers.
- B. BOILER CONTROLS: check contacts, settings, correct functioning.
- C. PIPING: check piping and accessories for leaks.
- D. CHIMNEY or STUB VENT and BREECHING: check for obstructions and leaks.
- E. COMBUSTION AIR TO BURNER: check for continued POSITIVE supply of air as required. Air needs are greatest in coldest weather. Refer to AIR SUPPLY, page 3.
- F. WATER SYSTEM: check
 1. System to be full of water and pressure to remain stable (between 12 psi and 25 psi).
 2. Air-control system: noise and air binding in radiation should not occur.
 3. Water lines: slightest leaks should be corrected.
 4. Low water cut-off, for operation (see instructions furnished with unit). See page 9.
- G. STEAM SYSTEM: check
 1. Low water cut-off, for operation (see instructions furnished with unit). See page 9.
 2. Check pressure cut-off for operation. See page 10.
 3. Any unusual water conditions. Obtain water analysis and treat water.
- H. BOILER ROOM AIR SUPPLY: air vents should be open and free of obstruction. See page 3.

† A flue brush (2-1/4" dia.) is supplied with boiler. Replacements are available from dealer or hardware stores.

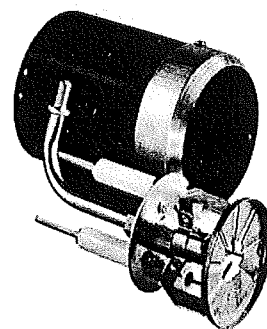
Beckett AF/AFG Oil Burner Manual



Type 'M' Air Tube Combination
(AFG Models only)



Type 'L1' Head



Type 'V1' Head

WARNING Potential for Fire, Smoke and Asphyxiation Hazards



Incorrect installation, adjustment, or misuse of this burner could result in death, severe personal injury, or substantial property damage.

To the Homeowner or Equipment Owner:

- Please read and carefully follow all instructions provided in this manual regarding your responsibilities in caring for your heating equipment.
- Contact a professional, qualified service agency for installation, start-up or service work.
- Read these instructions and save for reference.

To the Professional, Qualified Installer or Service Agency:

- Please read and carefully follow all instructions provided in this manual before installing, starting, or servicing this burner or heating system.
- The Installation must be made in accordance with all state and local codes having jurisdiction.

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NOTICE

This manual contains information that applies to both AF and AFG burners. These burners may appear to be basically identical, but there are differences in design and performance. Please review the comparison chart below:

Feature	AF	AFG
Static Pressure Capability	Conventional - Low range	Enhanced - Medium range
Blower Wheel Design	Standard strip	Special tablock
Inlet Airflow Design	Standard inlet bell	Special airguide
UL Air Tube Combinations	"F" Series ONLY	"F" or "M" Series
Igniter Gaskets Baseplate/Barrier	Optional, as specified	Required, always specified
Low Firing Rate Baffle	Not required	Required, per specification

General Information

Hazard Definitions



DANGER Indicates an imminently hazardous situation, which, if not avoided, will result in death, serious injury, or property damage.



WARNING Indicates a potentially hazardous situation, which, if not avoided, could result in death, severe personal injury, and/or substantial property damage.



CAUTION Indicates a potentially hazardous situation, which, if not avoided, may result in personal injury or property damage.

Within the boundaries of the hazard warning, there will be information presented describing consequences if the warning is not heeded and instructions on how to avoid the hazard.

NOTICE

Intended to bring special attention to information, but not related to personal injury or property damage.



Owner's Responsibility



Incorrect installation, adjustment, and use of this burner could result in severe personal injury, death, or substantial property damage from fire, carbon monoxide poisoning, soot or explosion.

Contact a professional, qualified service agency for the installation, adjustment and service of your oil heating system. This work requires technical training, trade experience, licensing or certification in some states and the proper use of special combustion test instruments.

Please carefully read and comply with the following instructions:

- Never store or use gasoline or other flammable liquids or vapors near this burner or appliance.
- Never attempt to burn garbage or refuse in this appliance.
- Never attempt to light the burner/appliance by throwing burning material into the appliance.
- Never attempt to burn any fuel not specified and approved for use in this burner.
- Never restrict the air inlet openings to the burner or the combustion air ventilation openings in the room.

To the Owner:

Thank you for purchasing a Beckett burner for use with your heating appliance. Please pay attention to the Safety Warnings contained within this instruction manual. Keep this manual for your records and provide it to your qualified service agency for use in professionally setting up and maintaining your oil burner.

Your Beckett burner will provide years of efficient operation if it is professionally installed and maintained by a qualified service technician. If at any time the burner does not appear to be operating properly, **immediately contact your qualified service agency** for consultation.

We recommend annual inspection/service of your oil heating system by a qualified service agency.

Daily – Check the room in which your burner/appliance is installed. Make sure:

- Air ventilation openings are clean and unobstructed
- Nothing is blocking burner inlet air openings
- No combustible materials are stored near the heating appliance
- There are no signs of oil or water leaking around the burner or appliance

Weekly

- Check your oil tank level. Always keep your oil tank full, especially during the summer, in order to prevent condensation of moisture on the inside surface of the tank.



Do NOT Alter the Original Burner Design

Tampering with or altering the burner design could seriously impair performance, resulting in loss of static pressure, damage to the system components, reduced air volume, heavy smoke, flame impingement, appliance sooting, hot gas puff-back, and asphyxiation or fire hazards.

Maintain the design to its original configuration.

Only use parts specified for AF or AFG Burners

Do NOT remove the air guide from the AFG chassis.

Do NOT use 'M' Series air tube combinations on AF Burners.

Never try to convert an AF to an AFG or vice versa
Any design alteration will:

- Void UL Listing
- Void manufacturer's warranties
- Seriously impact burner performance
- Greatly increase your liability risk

General Specifications

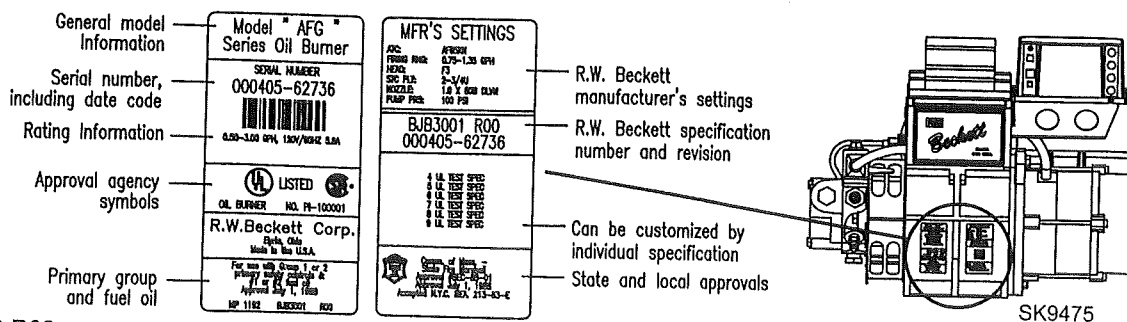
Table 1 – Burner Specifications

Capacity (Note 1)	'F' Head (AF & AFG) Firing rate range: 0.40 – 3.00 GPH Input: 56,000 – 420,000 Btu
	'L1' Head (AFG Only) Firing rate range: 0.40 – 1.10 GPH Input: 56,000 – 154,000 Btu/h
	'L2' Head (AFG Only) Firing rate range: 0.50 – 1.00 GPH Input: 70,000 – 140,000 Btu/h
	'V1' Head (AFG Only) Firing rate range: 0.75 – 2.75 GPH Input: 105,000 – 385,000 Btu/h
Certifications/ Approvals	UL listed to comply with ANSI/UL296 and CSA-B140.0
Fuels	U. S. No. 1 or No. 2 heating oil only (ASTM D396) Canada No. 1 stove oil or No. 2 furnace oil only
Electrical	Power supply: 120 volts AC, 60 Hz, single phase Operating load: 5.8 Amps max Motor: 1/7 hp, 3450 rpm, NEMA 48M frame PSC rotation CCW when facing shaft end Ignition: ... Continuous duty solid-state igniter
Fuel pump	Outlet pressure: Note 2
Air tube	ATC code: See Table 2
Dimensions (with cover)	Height (maximum) 12.5 inches Width (maximum) 15 inches Depth 9.25 inches Air tube diameter 4.00 inches

Note 1: Approval agency listed rating for these burners is 0.40 to 3.00 gph. However, the firing rate range is limited by the specific air tube combination being used. Refer to Table 2.

Note 2: See appliance manufacturer's burner specifications for recommended pump discharge pressure.

Figure 1. Burner label location



Notice Special Requirements

- THE INSTALLATION OF A BURNER SHALL BE IN ACCORDANCE WITH THE REGULATIONS OF AUTHORITIES HAVING JURISDICTION.
- For recommended installation practices in the U.S. refer to the latest edition of NFPA 31. (CSA-B139 and CSA-B140 in Canada.
- Concealed damage — If you discover damage to the burner or controls during unpacking, notify the carrier at once and file the appropriate claim.
- When contacting Beckett for service information — Please record the burner serial number (and have available when calling or writing). You will find the serial number on the silver label located on the left rear of the burner. Refer to Figure 1.

WARNING Professional Service Required

Incorrect installation, adjustment, and use of this burner could result in severe personal injury, death, or substantial property damage from fire, carbon monoxide poisoning, soot or explosion.

Please read and understand the manual supplied with this equipment. This equipment must be installed, adjusted and put into operation only by a qualified individual or service agency that is:

- Licensed or certified to install and provide technical service to oil heating systems.
- Experienced with all applicable codes, standards and ordinances.
- Responsible for the correct installation and commission of this equipment.
- Skilled in the adjustment of oil burners using combustion test instruments.

The installation must strictly comply with all applicable codes, authorities having jurisdiction and the latest revision of the National Fire Protection Association Standard for the installation of Oil-burning Equipment, NFPA 31 (or CSA-B139 and CSA-B140 in Canada). Regulation by these authorities take precedence over the general instructions provided in this installation manual.

Inspect/Prepare Installation Site

Table 2 – Air Tube Combination (ATC) codes

Firing Rate (gph)	Head	Static plate size	Venturi	ATC Codes for usable air tube lengths ('A' in inches; See Figure 3.)									
				4-1/2	5	5-3/8	6-5/8	7	7-1/4	9	10-1/2	13	16
(min-max)		(inches)											
0.50-0.75	F0	3-3/8U	None	AF44XR	-	AF53XR	AF65XR	-	AF72XR	AF90XR	AF104XR	AF130XR	A160XR
0.75-1.25	F3	2-3/4U	None	AF44XN	-	AF53XN	AF65XN	-	AF72XN	AF90XN	AF104XN	AF130XN	AF160XN
0.85-1.35	F4	2-3/4U	None	AF44WH	-	AF53WH	AF65WH	-	AF72WH	AF90WH	AF104WH	AF130WH	AF160WH
0.85-1.65	F6	2-3/4U	None	AF44YB	-	AF53YB	AF65YB	-	AF72YB	AF90YB	AF104YB	AF130YB	AF160YB
1.10-2.00	F12	2-3/4U	None	AF44XO	-	AF53XO	AF65XO	-	AF72XO	AF90XO	AF104XO	AF130XO	AF160XO
1.65-2.50	F22	2-3/4U	None	AF44XP	-	AF53XP	AF56XP	-	AF72XP	AF90XP	AF104XP	AF130XP	AF160XP
2.50-3.00	F31	None	None	AF44XS	-	AF53XS	AF65XS	-	AF72XS	AF90XS	AF104XS	AF130XS	AF160XS
0.50-1.10	L1	3-3/8U	8hole	-	AFG50MB	-	-	AFG70MB	-	AFG90MB	-	-	-
0.50-1.00	L2	2-3/4U	8hole	-	AFG50MP	-	-	AFG70MP	-	AFG90MP	-	-	-
0.75-2.75	V1	2-3/4U	8hole	-	AFG50MD	-	-	AFG70MD	-	AFG90MD	-	-	-
0.40-0.75	F0	3-1/2U	None	AF44WG	-	AF53WG	AF65WG	-	AF72WG	AF90WG	AF104WG	AF130WG	A160WG

Inspect/Prepare Installation Site

Inspect Chimney or Direct Vent System



WARNING Fire, Smoke & Asphyxiation Hazard

- Carefully inspect the chimney or exhaust vent system.
- Make sure it is properly sized and in good working condition.
- Follow the instructions supplied by the appliance manufacturer.
- The installation must strictly comply with all applicable codes, authorities having jurisdiction and the latest revision of the National Fire Protection Association Standard NFPA 31 for the installation of chimneys and vent sizing, (or CSA-B139 and CSA-B140 in Canada).
- Regulation by these authorities take precedence over the general instructions provided in this installation manual.

1. Starting with minimum gph firing rate, the minimum size recommended is 6" flue pipe with 8" X 8" inside chimney, unless specified otherwise by the appliance manufacturer.
2. A chimney flue shall extend at least 3 feet above the highest point at which the chimney comes in contact with the roof, and not less than 2 feet above the highest roof surface or structure within 10 feet horizontally of the chimney. Refer to Figure 2.
3. Any accumulation of soot or debris in chimney offsets should be removed

4. Any obstructions such as a protruding joint or a piece of broken tile wedged in the chimney should be removed.
5. No other appliance connection should be made to the same flue pipe.
6. The flue pipe should have an upward pitch toward the chimney of at least 1/4" per foot of length. It should fit tightly and should not project into the chimney.
7. Any leakage between tiles, around clean-out doors, or around the vent pipe should be sealed.

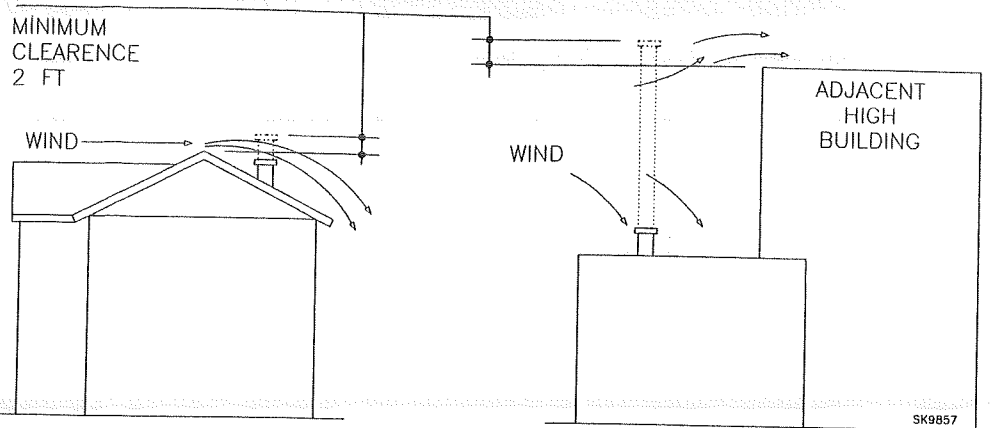
INSULATED STAINLESS STEEL CHIMNEY LINERS

The new designs of high efficiency oil furnaces and boilers in conjunction with flame retention oil burners are more efficient. One result of increased efficiency is lower flue gas temperatures. As flue gases rise in the chimney, they will cool and condense when they reach the dew point. The condensation will mix with the sulphur in the flue gases creating sulphuric acid. The acid will attack the chimney mortar, brick and clay liners causing corrosion, deterioration and blockage of the chimney. Eventually the blockage could prevent exhausting the flue gases. Instead, the flue gases could vent out the barometric damper into the living space.

Therefore, it is strongly recommended that an approved insulated stainless steel liner be installed.

- For those installations not requiring a chimney, such as through-the-wall vented appliances, follow the instructions given by the appliance and power venter (if used) manufacturers.

Figure 2 – Chimney Design - Above the Roof



NOTE: Correct chimney design is shown by dotted lines. Incorrect chimney design, as shown by the solid lines, may result in down-drafts.

Combustion air supply



WARNING

Adequate Combustion and Ventilation Air Supply Required

Failure to provide adequate air supply could seriously affect the burner performance and result in damage to the equipment, asphyxiation, explosion or fire hazards.

- The burner cannot properly burn the fuel if it is not supplied with a reliable combustion air source.
- Follow the guidelines in the latest editions of the NFPA 31 and CSA-B139 regarding providing adequate air for combustion and ventilation.

Appliance located in confined space

The confined space should have two (2) permanent openings: one near the top of the enclosure and one near the bottom of the enclosure. Each opening shall have a free area of not less than (1) one square inch per 1,000 BTU's per hour of the total input rating of all appliances within the enclosure. The openings shall have free access to the building interior, which should have adequate infiltration from the outside.

Exhaust fans and other air-using devices

Size air openings large enough to allow for all air-using devices in addition to the minimum area required for combustion air. If there is any possibility of the equipment room developing negative pressure (because of exhaust fans or clothes dryers, for example), either pipe combustion air directly to the burner or provide a sealed enclosure for the burner and supply it with its own combustion air supply.

Direct air supply and sidewall venting

- Some AFG burners are equipped with combustion air boots to allow use of outside air for combustion.

- When sidewall venting appliances, carefully follow appliance and power venter instructions for installation and wiring.



WARNING

Follow the Outside Air Kit Instructions Exactly

Failure to comply could result in impaired combustion, appliance soot-up, puffback of smoke, and fire or asphyxiation hazards.

- Do not attempt to install outside air piping to the burner without using the outside air kit and instructions.

Outside air kit applications

Refer to separate instruction sheet supplied with AF/AFG outside air kit for installation. This optional kit allows combustion air to be piped directly to the burner (Beckett part number 51747).

Clearances to burner and appliance

- Provide space around burner and appliance for easy service and maintenance.
- Check minimum clearances against those shown by the appliance manufacturer and by applicable building codes.



WARNING

Protect Steel Combustion Chamber From Burnout

Failure to comply could result in damage to the heating equipment and result in fire or asphyxiation hazards.

- When retrofitting appliances that have unlined stainless steel combustion chambers, protect the chamber by lining the inside surfaces with a ceramic fiber blanket, such as a wet-pac or other suitable refractory material.
- Some steel chambers may not require liners because the appliance was designed and tested for use with flame retention burners. Refer to the manufacturer's instructions.

Prepare the Burner

Combustion chamber — Burner retrofiting

Verify that the appliance combustion chamber provides at least the minimum dimensions given in Table 3.

Table 3. Chamber Dimensions

Chamber Dimensions (inches)					
Firing Rate (GPH)	Round I.D.	Rectangular		Height	Floor to nozzle
		Width	Length		
0.50	8	7	8	12	5-6
0.75	9	8	9	12	5-6
1.00	10	9	10	12.5	5-6
1.25	11	10	11	12.5	5-6
1.50	12	11	12	13	6-7
2.00	14	12	15	13.5	6-7
2.50	16	13	17	14	7-8
3.00	18	14	18	15	7-8

Prepare the Burner

Low Firing Rate Baffle

The AFG Low Firing Rate Baffle (LFRB) reduces the air flow and pressure. The LFRB is sometimes used for firing rates under 1.00 gph as listed in Table 4. Refer to the appliance manufacturer's instructions. Do not omit the LFRB when specified. Omitting the baffle when specified or installing the baffle when not specified could result in impaired burner performance.

Table 4. AFG Reduced Firing Rates (with LFRB)

Burner head type	Low Firing Rate Baffle installed
F0	up to 0.65 gph
F3 or L1	up to 0.85 gph
F4 or F6	up to 0.90 gph
V1	up to 1.00 gph

Burner fuel unit

- Verify that the burner fuel unit is compatible with the oil supply system. For more details, refer to the pump manufacturer's instructions provided with the burner.

Attach air tube (if not already installed)

If using a flange and gasket, slide them onto the air tube. Then attach the air tube to the burner chassis using the four sheet metal screws provided. Refer to Figure 4 for details.

Nozzle and Pump Pressure

WARNING Correct Nozzle and Flow Rate Required



Incorrect nozzles and flow rates could result in impaired combustion, under-firing, over-firing, sooting, puff-back of hot gases, smoke and potential fire or asphyxiation hazards.

Use only nozzles having the brand, flow rate (gph), spray angle and pattern specified by the appliance manufacturer.

Follow the appliance manufacturer's specifications for the required pump outlet pressure for the nozzle, since this affects the flow rate.

- Nozzle manufacturers calibrate nozzle flow rates at 100 psig.
- When pump pressures are higher than 100 psig, the actual nozzle flow rate will be greater than the gph stamped on the nozzle body. (Example: A 1.00 gph nozzle at 140 psig = 1.18 gph)

Securely tighten the nozzle (90 torque inch pounds). For typical nozzle flow rates at various pressures refer to Table 5.

Table 5. Nozzle Flow Rate by Size

Nozzle flow rate U. S. gallons per hour of No. 2 fuel oil when pump pressure (psig) is:					
Nozzle size (rated at 100 psig)	125 psi	140 psi	150 psi	175 psi	200 psi
0.40	0.45	0.47	0.49	0.53	0.56
0.50	0.56	0.59	0.61	0.66	0.71
0.60	0.67	0.71	0.74	0.79	0.85
0.65	0.73	0.77	0.80	0.86	0.92
0.75	0.84	0.89	0.92	0.99	1.06
0.85	0.95	1.01	1.04	1.13	1.20
0.90	1.01	1.07	1.10	1.19	1.27
1.00	1.12	1.18	1.23	1.32	1.41
1.10	1.23	1.30	1.35	1.46	1.56
1.20	1.34	1.42	1.47	1.59	1.70
1.25	1.39	1.48	1.53	1.65	1.77
1.35	1.51	1.60	1.65	1.79	1.91
1.50	1.68	1.77	1.84	1.98	2.12
1.65	1.84	1.95	2.02	2.18	2.33
1.75	1.96	2.07	2.14	2.32	2.48
2.00	2.24	2.37	2.45	2.65	2.83
2.25	2.52	2.66	2.76	2.98	-
2.50	2.80	2.96	-	-	-

Install burner nozzle (if not already installed)

1. Remove the plastic plug protecting the nozzle adapter threads
2. Place a 3/4" open-end wrench on the nozzle adapter. Insert the nozzle into the adapter and finger tighten. Finish tightening with a 5/8" open-end wrench. Use care to avoid bending the burner head support legs or electrodes. If you remove the head to replace the nozzle (type "L1"/"L2" or "V1" heads), carefully reconnect the head to the nozzle adapter, making sure that the head support makes contact with the nozzle adapter shoulder. Refer to Figure 5 or 6.
3. If the nozzle is already installed, remove the nozzle line assembly to verify that the nozzle size and spray pattern are correct for the application (per appliance manufacturer's information). Verify that the electrode tip settings comply with Figure 3.
4. If the nozzle is not installed, obtain a nozzle from the manufacturer, having the capacity and spray angle specified in the appliance manufacturer's information. For conversions or upgrades, when information is not available for the application:
 - Refer to Table 6 to select the mid-range nozzle spray angle for the head type being used.
 - Fire the burner and make sure the combustion is acceptable and the flame is not impinging on chamber surfaces.
 - If a shorter flame is needed, select a wider spray angle. If a longer flame is needed, select a narrower spray angle.
 - Either hollow or solid spray patterns may be used. If combustion results are not satisfactory with the selected spray pattern, try the other pattern.

Table 6. Nozzle Spray Angles

Recommended nozzle spray angles	
"F" head	70° or 80° nozzle
"L1" & "L2" head	45°, 60°, or 70° nozzle
"V1" head	45°, 60°, or 70° nozzle

Check/adjust electrodes

Check the electrode tip settings. Adjust if necessary to comply with the dimensions shown in Figure 3. To adjust, loosen the electrode clamp screw and slide/rotate electrodes as necessary. Securely tighten the clamp screw when finished.

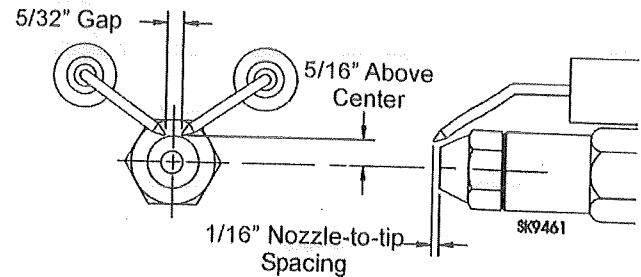
Servicing nozzle line assembly

1. Turn off power to burner before proceeding.
2. Disconnect oil connector tube from nozzle line.
3. Loosen the two screws securing igniter retaining clips and rotate both clips to release igniter baseplate. Then tilt igniter back on its hinge.
4. Remove splined nut.

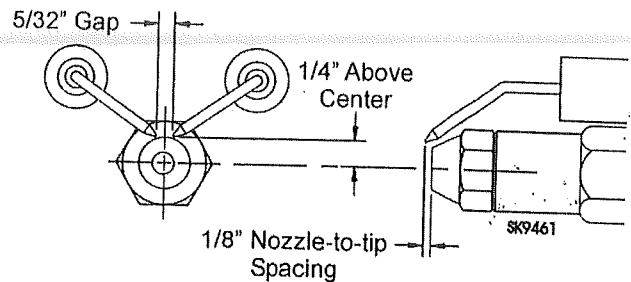
Prepare the Burner

Figure 3. – Electrode Tip Adjustment

Standard Dimensions for F, L1, and V1 Heads.



The Dimensions shown below are for use with L2 heads and M series air tube combinations ending with an 'N' suffix (example: AFG70MDAQN)



5. "F" head air tube. - Remove nozzle line assembly from burner, being careful not to damage the electrodes or insulators while handling. To ease removal of long assemblies (over 9 inches), rotate assembly 180° from installed position after pulling partially out of tube.
6. "L1", "L2", and "V1" head air tubes. - Slide nozzle line assembly forward (further into air tube) so the head clears the venturi opening. Then rotate the nozzle line assembly 90° so the nozzle line end points up. Pull the nozzle line assembly toward you and remove assembly from burner.
7. To replace the nozzle assembly, reverse the above steps.

Mount burner on appliance

Mounting options

1. Bolt the burner to the appliance using the factory-mounted flange or an adjustable flange.

Mounting dimensions

1. When using the Beckett universal adjustable flange, mount the air tube at a 2° downward pitch unless otherwise specified by the appliance manufacturer.
2. Verify that the air tube installed on the burner provides the correct insertion depth. See Figure 7.

Prepare the Burner

Check/Adjust 'Z' Dimension for 'F' Heads

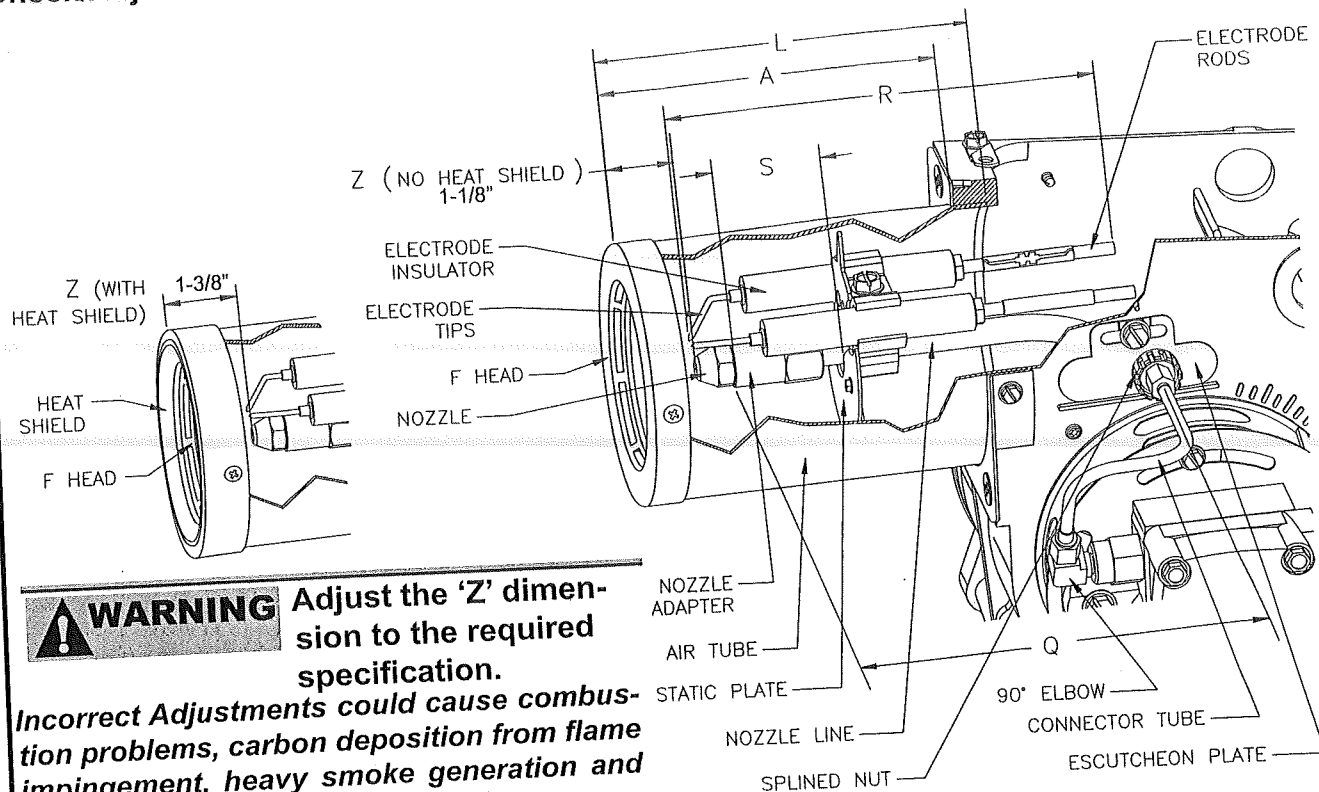


Figure 4. 'F' Head

- Make all adjustments exactly as outlined in the following information.

Check/Adjust 'Z' Dimension - 'F' heads

1. The important 'Z' dimension is the distance from the face of the nozzle to the flat face of the head (or heat shield, if applicable). This distance for F heads is 1-1/8" (1-3/8" if the air tube has a heat shield). The "Z" dimension is factory set for burners shipped with the air tube installed. Even if factory set, verify that the "Z" dimension has not been changed.
2. Use the following procedure to adjust the "Z" dimension, if it is not correct:
 - Turn off power to the burner.
 - Disconnect the oil connector tube from the nozzle line
 - See above figure. Loosen the splined nut from the nozzle line. Loosen the hex head screw securing the escutcheon plate to the burner housing.
 - Place the end of a ruler at the face of the nozzle and, using a straight edge across the head, measure the distance to the face of the head. A Beckett T501 gauge may also be used.
 - Slide the nozzle line forward or back until this dimension for F heads is 1-1/8" (1-3/8" if applicable).
 - Tighten the hex head screw to secure the escutcheon plate to the burner chassis. Then tighten the splined nut and attach the oil connector tube.
3. Recheck the "Z" dimension periodically when servicing to ensure the escutcheon plate has not been moved. You will need to reset the "Z" dimension if you replace the air tube or nozzle line assembly. The Beckett Z gauge (part number Z-2000) is available to permit checking the F head "Z" dimension without removing the burner from the appliance.

Burner Dimensions

Dimension (inches)	For usable length A (inches)			
	F Head	L1 Head	L2 Head	V1 Head
H (nozzle to head), $\pm 1/32$	N/A	1/4	7/32	1/4
L (Total tube length)	A+1/2	A+1/2	A+1/2	A+1/2
R (electrode length), $\pm 1/4$	A+2-1/4	A+1-1/8	A+1-1/8	A+1-1/8
S (adapter to static plate), $\pm 1/16$	(Note 1)	1-3/8	1-3/8	1-3/8
Q (nozzle line length),	A+ 15/16	A+ 3/16	A+ 3/16	A+ 3/16
Z (F head-no heat shield)	1-1/8	N/A	N/A	N/A
Z (F head-with heat shield)	1-3/8	N/A	N/A	N/A
Z (L1 head w/straight shroud) (L1/L2/V1 head w/conic shroud)	N/A	1-3/8	N/A	N/A
	N/A	1-3/4	1-3/4	1-3/4

Note 1: 1-3/8 for dimension A less than 4"; 1-5/8 for dimension A from 4" through 4-1/2", 2-13/32 for dimension A greater than 4-1/2".

Check/Adjust 'Z' Dimension - L1 & L2 Heads

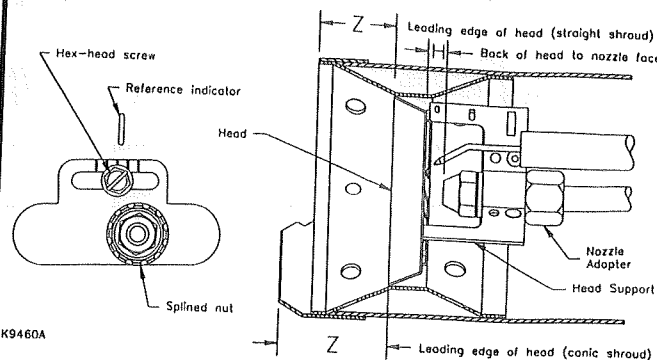


Figure 5. 'L1 & L2' Heads

L1/L2 heads (see Table 7 and Figure 3 for dimensions)

1. See figure above. The important "Z" dimension is the distance from the leading edge of the head to the end of the air tube. This distance for L1 & L2 heads is 1-3/4" if the tube has a straight shroud or 1-3/4" if the air tube has a conic shroud. The "Z" dimension is factory set for

2. Use the following procedure to adjust the "Z" dimension, if it is not correct:
 - Turn off power to the burner.
 - Disconnect the oil connector tube from the nozzle line.
 - Refer to figure. Loosen the splined nut from the nozzle line. Loosen the hex head screw securing the escutcheon plate to the burner housing.
 - Place the end of a ruler at the leading edge of the head and, using a straight edge across the end of the air tube, measure the distance to the end of the tube. A Beckett T501 gauge may also be used.
 - Slide the nozzle line forward or back until this dimension is 1-3/4" for L1 & L2 heads if the tube has a straight shroud, or 1-3/4" if the air tube has a conic shroud.
 - Tighten the hex head screw to secure the escutcheon plate to the burner chassis. Then tighten the splined nut and attach the oil connector tube.
3. Recheck the "Z" dimension periodically when servicing to ensure the escutcheon plate has not been moved. You will need to reset the "Z" dimension if you replace the air tube or nozzle line assembly.

Check/Adjust 'Z' Dimension - V1 Heads

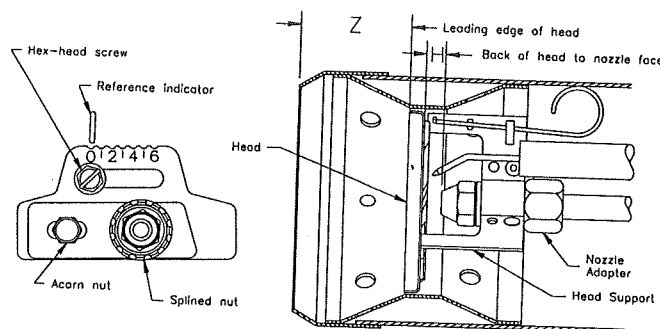


Figure 6. 'V1' Head

V1 heads (see Table below and Figure above for dimensions)

1. See figure above. The important "Z" dimension is the distance from the leading edge of the head to the end of the air tube. This distance for V1 heads is 1-3/4". The "Z" dimension is factory set for burners shipped with the air tube installed. Even if factory set, verify that the "Z" dimension has not been changed.

2. Use the following procedure to adjust the "Z" dimension, if it is not correct:
 - Turn off power to the burner.
 - Disconnect the oil connector tube from the nozzle line.
 - See figure above. Loosen the splined nut from the nozzle line. Loosen the hex head screw securing the head adjusting plate to the burner housing.
 - Loosen the acorn nut. Move the head adjusting plate until the "0" lines up with the reference indicator on the housing, and retighten the hex head screw. Place the end of a ruler at the leading edge of the head and, using a straight edge across the end of the air tube, measure the distance to the end of the tube. A Beckett T501 gauge may also be used.
 - Slide the nozzle line forward or back until this dimension is 1-3/4" for V1 heads. Tighten the acorn nut.
 - Tighten the hex head screw to secure the head adjusting plate to the burner chassis. Then tighten the splined nut and attach the oil connector tube.
3. Recheck the "Z" dimension periodically when servicing to ensure the escutcheon plate has not been moved. You will need to reset the "Z" dimension if you replace the air tube or nozzle line assembly.

Set head position adjusting plate (V1 head only)

1. After setting "Z" dimension, loosen head adjusting plate hex head screw and nozzle line splined nut. Move the nozzle line assembly until the burner reference indicator lines up with the head adjusting plate setting number given in Table shown below.
2. Tighten the hex head screw and splined nut. (DO NOT loosen the acorn nut when setting head position.) Refer to the manufacturer's instructions for OEM settings.
3. The position of the head affects air flow volume and pattern. For most applications, the burner will perform satisfactorily with the air adjustment plate setting of Table shown below.
4. If combustion results indicate the need for change, adjust the head position adjusting plate forward or back one position at a time to optimize combustion.

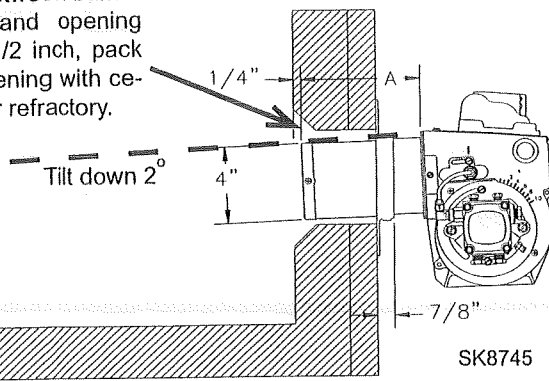
Table for initial adjusting plate settings for V1 Head

V1 Adjusting Plate Setting	AFG with V1 Head Burner Firing Rates
0	0.75-1.00
1	1.00-1.50
2	1.50-1.75
3	1.75-2.00
4	2.00-2.25
5	2.25-2.50
6	2.50-2.75

Mount burner on appliance

Figure 7. – Mounting Burner in Appliance

If space between burner air tube and opening exceeds 1/2 inch, pack burner opening with ceramic fiber refractory.



3. The end of the air tube should normally be 1/4" back from the inside wall of the combustion chamber. Never allow the leading edge of the head assembly to extend into the chamber, unless otherwise specified by the heating appliance manufacturer. Carefully measure the insertion depth when using an adjustable flange. Verify the insertion depth when using a welded flange.

Installing the Oil Tank and Supply System

WARNING Oil Leak and Fire Hazard

Install the oil tank following applicable standards in the U.S. by referring to the latest edition of NFPA 31 or CSA-B139 & CSA-B140 in Canada, and all authorities having jurisdiction.

CAUTION Do Not Use Teflon Tape

Damage to the pump could cause impaired burner operation, oil leakage and appliance soot-up.

- Never use Teflon tape on fuel oil fittings.
- Tape fragments can lodge in fuel line components and fuel unit, damaging the equipment and preventing proper operation.
- Use oil-resistant pipe sealant compounds.

Note: to determine the proper fuel line size, refer to the fuel pump manufacturer's instructions provided with the burner. Refer to Figure 8 or Figure 9 for typical installation layouts.

Fuel Line Valves and Filter

Install two high quality, oil duty rated, fusible handle design shutoff valves in accessible locations on the oil supply line. Locate one close to the tank and the other close to the burner, upstream of the filter for service access.

Install a generous capacity filter inside the building between the fuel tank shutoff valve and the burner, locating both the filter and the valve close to the burner for ease of servicing. Filter should be rated for 50 microns or less.

Figure 8. – Inside Tank Gravity Feed System

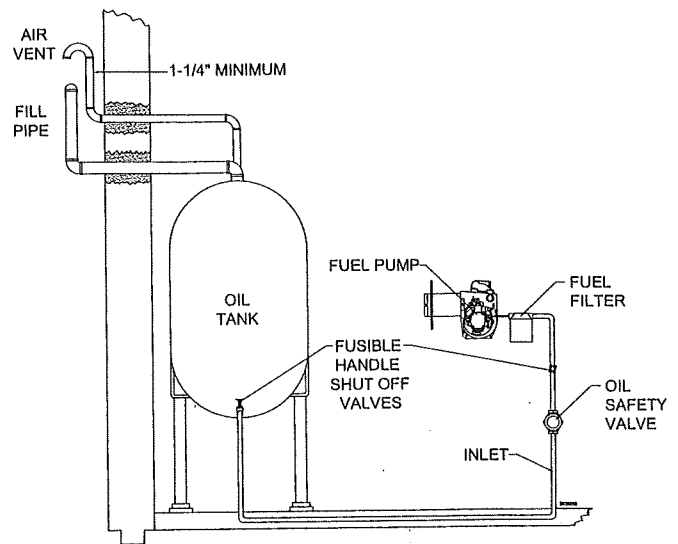
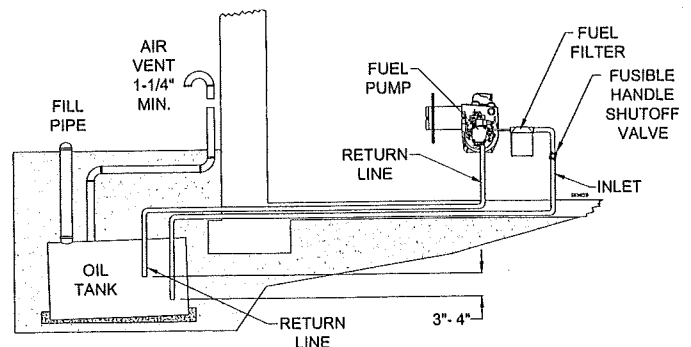


Figure 9. – Outside Buried Tank-Lift System



NOTICE

To further protect the fuel supply system and reduce nozzle orifice plugging with firing rates below 0.75 gph, a dual filtration system can be installed. This typically consists of a 50 micron primary filter, located near the fuel tank and a secondary filter rated for at least 10 microns located near the burner.

Fuel supply level with or above burner –

WARNING Do Not Install By-pass Plug with 1-Pipe System

Failure to comply could cause Immediate pump seal failure, pressurized oil leakage and the potential for a fire and injury hazard.

- The burner is shipped without the by-pass plug installed.
- Install the by-pass plug in two-pipe oil supply systems ONLY.

CAUTION Oil Supply Pressure Control Required

Damage to the filter or pump seals could cause oil leakage and a fire hazard.

- The oil supply inlet pressure to the burner **cannot exceed 3 psig**.
- Insure that a pressure limiting device is installed in accordance with the latest edition of NFPA 31.
- Do NOT install valves in the return line. (NFPA 31, Chapter 8.)
- **Gravity Feed Systems:** Always install an anti-siphon valve in the oil supply line or a solenoid valve (RWB Part # 2182602U) in the pump/nozzle discharge tubing to provide backup oil flow cut-off protection.

The burner may be equipped with a single-stage fuel unit for these installations. Connect the fuel supply to the burner with a single supply line if you want a one-pipe system (making sure the bypass plug is NOT installed in the fuel unit.) Manual bleeding of the fuel unit is required on initial start-up. If connecting a two-pipe fuel supply, install the fuel unit bypass plug.

Fuel supply below the level of the burner –

When the fuel supply is more than eight feet below the level of the burner, a two-pipe fuel supply system is required. Depending on the fuel line diameter and horizontal and vertical length, the installation may also require a two-stage pump. Consult the fuel unit manufacturer's literature, included with the burner, for lift and vacuum capability.

Fuel line installation –

- Continuous lengths of heavy wall copper tubing are recommended. **Always use flare fittings. Never use compression fittings.**
- Always install fittings in accessible locations. Proper routing of fuel lines is required to prevent air cavitation and vibration.

Wire burner

Burner packaged with appliance

WARNING Electrical Shock Hazard



Electrical shock can cause severe personal injury or death.

- Disconnect electrical power before installing or servicing the burner.
- Provide ground wiring to the burner, metal control enclosures and accessories. (This may also be required to aid proper control system operation.)
- Perform all wiring in compliance with the National Electrical Code ANSI/NFPA 70 (Canada CSA C22.1)

- Refer to appliance manufacturer's wiring diagram for electrical connections.

Burner installed at jobsite

- Refer to Figure 10, for typical burner wiring, showing cad cell primary controls. Burner wiring may vary, depending on primary control actually used.
- Refer to the appliance manufacturer's wiring diagram prior to connecting the burner wiring. All wiring must be in accordance with the latest revision of National Electric Code NFPA 70 and all local codes and regulations. In Canada, all wiring to be in accordance with the Canadian Electrical Code, Part 1.

The R7184 primary control with valve-on delay (prepurge) and burner motor-off delay (postpurge), requires a constant 120 volts AC power source supplied to the BLACK wire on the control. The RED wire goes to the appliance limit circuit. Please note that other control manufacturers may use different wire colors for power and limit connections.

Special wiring required with covered burners

The mounting plate is not a conduit connection point. Pass conduit and attached connector through the opening in the mounting plate and attach it directly to the burner-mounted 4x4 electrical box.

If attaching a burner cover to a previously installed burner, attach the mounting plate and then slide the conduit into the "J" shaped conduit slot.

Wire burner

Typical Burner Wiring & Burner Sequence of Operation for R7184P Control.

Refer to the appliance manufacturer's wiring diagram for actual specifications.

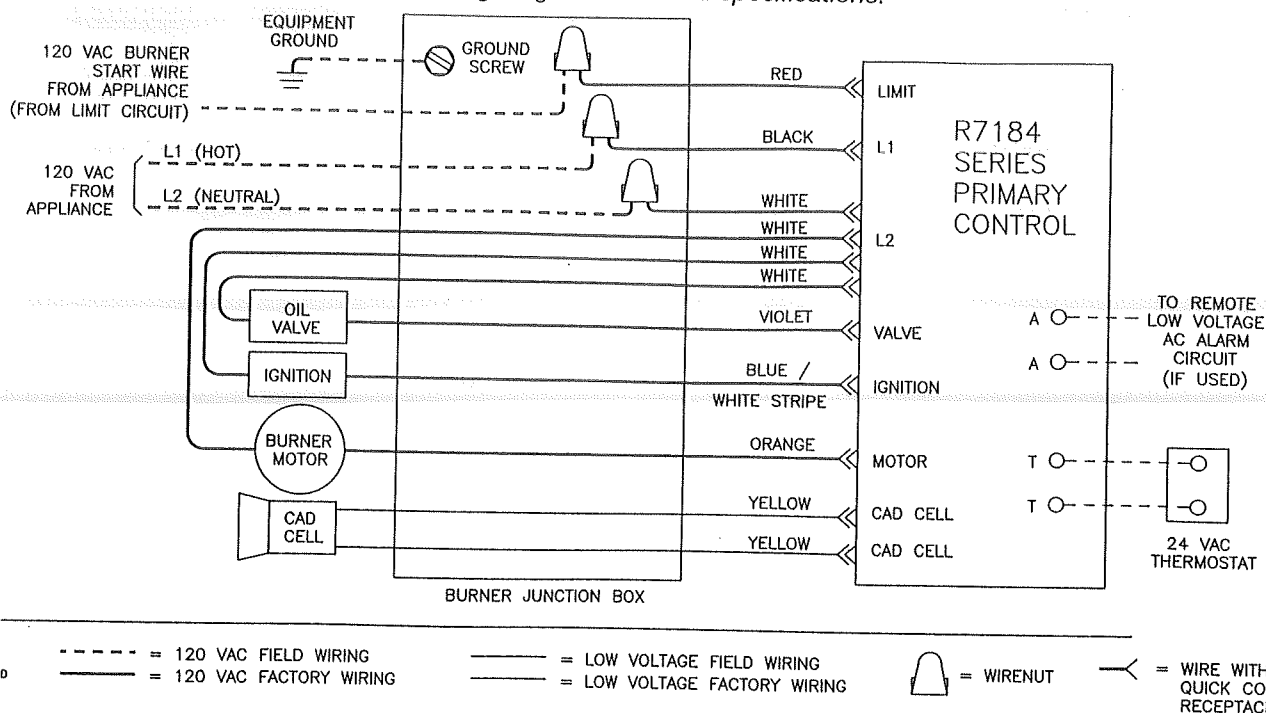
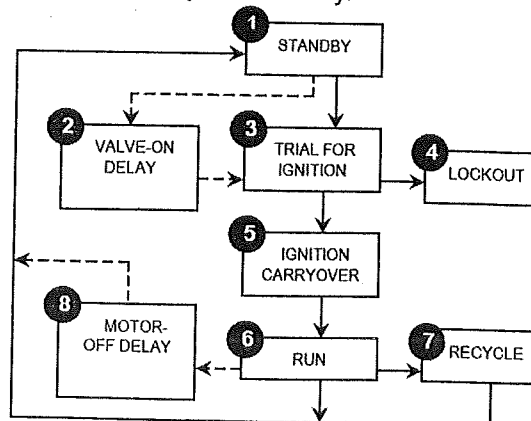


Figure 10. – Typical Burner Wiring

- STANDBY.** The burner is idle, waiting for a call for heat. When a call for heat is initiated, there is a 3-10 second delay while the control performs a safe start check.
- VALVE-ON DELAY.** The ignition and motor are turned on for a 15 second valve-on delay.
- TRIAL FOR IGNITION (TFI).** The fuel valve is opened. A flame should be established within the 15 second lockout time.
- LOCKOUT.** If flame is not sensed by the end of the TFI, the control shuts down on safety lockout and must be manually reset. If the control locks out three times in a row, the control enters restricted lockout.
- IGNITION CARRYOVER.** Once flame is established, the ignition remains on for 10 seconds to ensure flame stability before turning off. If the control is wired for intermittent duty ignition, the ignition unit stays on the entire time the motor is running.
- RUN.** The burner runs until the call for heat is satisfied. The burner is then sent to burner motor off delay, if applicable, or it is shut down and sent to standby.

- RECYCLE.** If the flame is lost while the burner is firing, the control shuts down the burner, enters a 60 second recycle delay, and then repeats the above ignition sequence. If flame is lost three times in a row, the control locks out to prevent cycling with repetitious flame loss due to poor combustion.
- BURNER MOTOR-OFF DELAY.** The fuel valve is closed and the burner motor is kept on for the selected motor-off delay time before the control returns the burner to standby.



Control System Features

Feature	Interrupted ignition	Limited reset, Limited recycle	Diagnostic LED, cad cell indicator	Valve-on delay	Burner motor off delay	Alarm Con-tacts
R7184A	YES	YES	YES	—	—	—
R7184B	YES	YES	YES	YES	—	—
R7184P	YES	YES	YES	YES	YES	Optional

Start up burner/set combustion

1. Open the shutoff valves in the oil supply line to the burner.
2. Close air band and partially open air shutter. This is an initial air setting for the pump bleeding procedure only. Additional adjustments must be made with instruments.
3. Set the thermostat substantially above room temperature.
4. Close the line voltage switch to start the burner. If the burner does not start immediately you may have to reset the safety switch of the burner primary control.

WARNING Explosion and Fire Hazard



Failure to follow these instructions could lead to equipment malfunction and result in heavy smoke emission, soot-up, hot gas puff-back, fire and asphyxiation hazards.


- Do not attempt to start the burner when excess oil has accumulated in the appliance, the appliance is full of vapor, or when the combustion chamber is very hot.
- Do not attempt to re-establish flame with the burner running if the flame becomes extinguished during start-up, venting, or adjustment.
- **Vapor-Filled Appliance:** Allow the unit to cool off and all vapors to dissipate before attempting another start.
- **Oil-Flooded Appliance:** Shut off the electrical power and the oil supply to the burner and then clear all accumulated oil before continuing.
- If the condition still appears unsafe, contact the Fire Department. Carefully follow their directions.
- Keep a fire extinguisher nearby and ready for use.

5. Bleed air from fuel unit as soon as burner motor starts rotating.
 - To bleed the fuel unit, attach a clear plastic hose over the vent fitting. Loosen the fitting and catch the oil in an empty container. Tighten the fitting when all air has been purged from the oil supply system.
 - If the burner locks out on safety during bleeding, reset the safety switch and complete the bleeding procedure. Note — Electronic safety switches can be reset immediately; others may require a three- to five-minute wait.
 - If burner stops after flame is established, additional bleeding is probably required. Repeat the bleeding procedure until the pump is primed and a flame is established when the vent fitting is closed.

Start up burner/set combustion

- For R7184 primary controls, see Technician's Quick Reference Guide, part number 61351 for special pump priming sequence.
 - Prepare for combustion tests by drilling a 1/4" sampling hole in the flue pipe between the appliance and the barometric draft regulator.
6. Initial air adjustment — Using a smoke tester, adjust the air shutter (and air band, if necessary) to obtain a clean flame. Now the additional combustion tests with instruments can be made

Set combustion with instruments

 **CAUTION** OIL-BURNING EQUIPMENT SHALL BE CONNECTED TO FLUES HAVING SUFFICIENT DRAFT AT ALL TIMES TO ASSURE SAFE AND PROPER OPERATION OF THE BURNER.

1. Allow the burner to run for approximately 5 to 10 minutes.
2. Set the stack or over-fire draft to the level specified by the appliance manufacturer.
 - **Natural Draft Applications;** typically over-fire draft is -0.01" or -0.02" w.c.
 - **Direct Venting;** typically may not require draft adjustment.
 - **High Efficiency/Positive Pressure Appliances;** also vary from traditional appliances (see manufacturer's recommendations).
3. Follow these four steps to properly adjust the burner:
 - Step 1:** Adjust the air shutter/band until a trace of smoke is achieved.
 - Step 2:** At the trace of smoke level, measure the CO₂ (or O₂). This is the vital reference point for further adjustments. Example: 13.5% CO₂ (2.6% O₂)
 - Step 3:** Increase the air to reduce the CO₂ by 1.5 to 2 percentage points. (O₂ will be increased by approximately 2.0 to 2.7 percentage points.) Example: Reduce CO₂ from 13.5% to 11.5% (2.6% to 5.3% O₂).
 - Step 4:** Recheck smoke level. It should be Zero.
 - This procedure provides a margin of reserve air to accommodate variable conditions.
 - If the draft level has changed, recheck the smoke and CO₂ levels and readjust the burner if necessary
4. Once combustion is set, tighten all fasteners on air band, air shutter and head adjusting plate or escutcheon plate.
5. Burner equipped with cover - Reinstall the cover and repeat Steps 2 and 4. If CO₂ increases (O₂ decreases), remove the cover and adjust the air setting so the CO₂ (O₂) with cover on meets requirements of Step 3.

Perform regular maintenance

6. Start and stop the burner several times to ensure satisfactory operation. Test the primary control and all other appliance safety controls to verify that they function according to the manufacturer's specifications.

Perform regular maintenance



WARNING Annual Professional Service Required



Tampering with or making incorrect adjustments could lead to equipment malfunction and result in asphyxiation, explosion or fire.

- DO NOT TAMPER WITH THE UNIT OR CONTROLS - CALL YOUR QUALIFIED SERVICE TECHNICIAN OR SERVICEMAN.
- To ensure continued reliable operation, a qualified service technician must service this burner annually.
- More frequent service intervals may be required in dusty or adverse environments.
- Operation and adjustment of the burner requires technical training and skillful use of combustion test instruments and other test equipment.

- ☐ Replace the oil supply line filter. The line filter cartridge must be replaced to avoid contamination of the fuel unit and nozzle.
- ☐ Inspect the oil supply system. All fittings should be leak-tight. The supply lines should be free of water, sludge and other restrictions.
- ☐ Remove and clean the pump strainer if applicable.
- ☐ Replace the nozzle with an equivalent nozzle.
- ☐ Clean and inspect the electrodes for damage, replacing any that are cracked or chipped.
- ☐ Check electrode tip settings. Replace electrodes if tips are rounded.
- ☐ Inspect the igniter spring contacts.
- ☐ Clean the cad cell grid surface, if necessary.

- ☐ Make sure Low Firing Rate Baffle is in place if required for the burner application. Omitting the baffle can result in unacceptable burner combustion.
- ☐ Inspect all gaskets. Replace any that are damaged or would fail to seal adequately.
- ☐ Inspect the combustion head and air tube. Remove any carbon or foreign matter. Replace all damaged units with exact parts.
- ☐ Clean the blower wheel, air inlet, air guide, burner housing and static plate of any lint or foreign material.
- ☐ If motor is not permanently lubricated, oil motor with a few drops of SAE 20 nondetergent oil at each oil hole. DO NOT over oil motor. Excessive oiling can cause motor failure.
- ☐ Check motor current. The amp draw should not exceed the nameplate rating by more than 10%.
- ☐ Check all wiring for secure connections or insulation breaks.
- ☐ Check the pump pressure and cutoff function.
- ☐ Check primary control safety lockout timing.
- ☐ Check ignition system for proper operation.
- ☐ Inspect the vent system and chimney for soot accumulation or other restriction.
- ☐ Clean all flue passages and flue pipe. Replace corroded or damaged pipes.
- ☐ Clean the appliance thoroughly according to the manufacturer's recommendations.
- ☐ Check the burner performance. Refer to the section "Set combustion with test instruments".
- ☐ It is good practice to make a record of the service performed and the combustion test results.

Shutting the Burner Off

Turn off all electric power to the burner.

Note: There could be more than one disconnect switch.



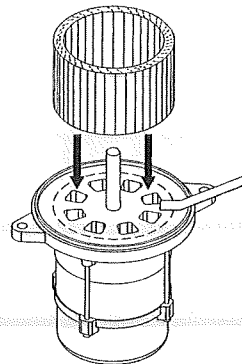
CAUTION IF THE BURNER IS SHUT DOWN FOR AN EXTENDED PERIOD OF TIME, ALWAYS KEEP THE VALVE SHUT OFF.

Perform regular maintenance

Replace the blower wheel:

1. Turn off all power to the burner before servicing.
2. Disconnect the burner motor wires.
3. Remove the bolts securing the motor to the burner housing.
4. Remove the motor and blower wheel.
5. Remove the existing blower wheel.
6. Referring to the figure below, slide the new blower wheel onto the shaft.
 - Use a feeler gauge to set the wheel-to-motor gap, as shown below. (AF = $0.125 \pm 1/64$ inch, AFG = $0.030 \pm 1/64$ inch)
 - Slide blower wheel toward motor until it contacts feeler gauge.
 - Rotate the blower wheel until the setscrew is centered on the flat of the motor shaft. Tighten the setscrew to secure the wheel.
7. DO NOT use a motor that has endshield openings outside the blower wheel circumference (represented by the dashed line).
8. Install the motor on the burner housing. Tighten screws. Reconnect wires.
9. Restore power, start the burner and perform combustion tests. Refer to the section "Set combustion with test instruments".

Figure 11. Blower wheel assembly

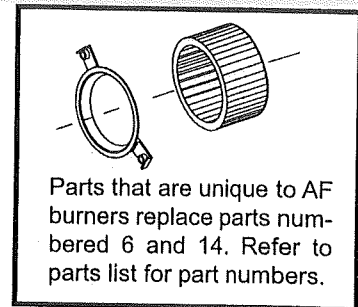
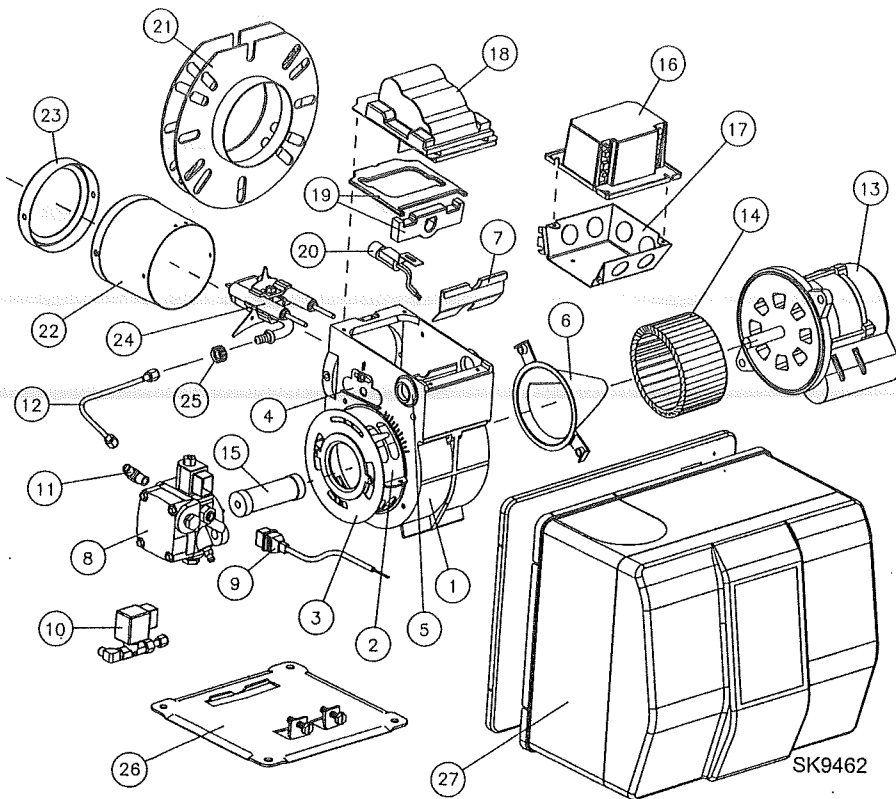


SK9190

Use a Feeler Gauge to set the gap to;
AF = $0.125 \pm 1/64$ inch
AFG = $0.030 \pm 1/64$ inch

Parts

For best performance specify genuine *Beckett* replacement parts



Parts List

#	Part No.	Description
1		Burner Housing Assembly
2	Specify	Air Band - Specify # of slots
	4198	Screw, 10-24 x 1/2"
	4150	Nut, 10-24 Square
3	Specify	Air Shutter - Specify # of slots
	4292	Screws, 10-24 x 5/16"
4	3493	Escutcheon (F & L1/L2 heads)
	5941	Head Adjusting Plate (V1 head)
	4292	Screw, 10-24 x 5/16"
5	2139	Hole Plug
6	31231U (AFG) 31841U (AF)	Air Guide (AFG) Air Inlet Bell (AF)
7	5880	Low Firing Rate Baffle
8	2184404U	CleanCut Pump
	4189U	Mounting Screws
9	21807U	Valve Cordset
	21887U	PD Timer Delay Cordset
10	2182602U	Solenoid Valve Kit (delay)
11	2256	Pump Elbow
12	5394	Copper Oil Line - 8"
13	21805U 4189	PSC Motor Mounting Screws

#	Part No.	Description
14	2999U (AFG) 2459U (AF)	Blower Wheel (AFG) Blower Wheel (AF)
15	2454	Coupling
16	7455U	R7184A - Interrupted Ignition
	7456U	R7184B - Pre-purge
	7457U	R7184P - Pre and Post-purge
	7458U	R7184P w/ Alarm Contacts
17	5770	Electrical Box
18	51771U	Igniter & Base Plate
19	51304	Igniter Gasket Kit
20	7006U	Cad Cell Detector
21	5432 3616	Universal Flange w/ Gasket Gasket Only
22	Specify **	Air Tube Combination
23	Specify **	Heat Shield, Ceramic or Fiber
24	5780	Electrode Kit - F Head up to 9"
	5782	Electrode Kit - F Head over 9"
	5940	Electrode Kit - M Head up to 9"
25	3666	Splined Nut
26	5685	Pedestal Kit
27	51814U	Cover

** Contact your Beckett Representative for part number and pricing.

Limited WARRANTY

For Residential, Commercial and Specialty Burners

The R. W. BECKETT CORPORATION ("Beckett") warrants to persons who purchase its Beckett burners from Beckett for resale or for incorporation into a product for resale ("Customers") that its equipment is free from defects in material and workmanship under normal use and service for 60 months from the date of manufacture for Residential Burners and 18 months from the date of manufacture for Commercial and Specialty Burners. *Residential burner models include:* AF, AFG, AFII, NX, SF, SR and SMG. *Commercial burner models include:* CF375, CF500, CF800, CF1400, CF2300A, CF2500, CF3500A, CG10, CG15, CG25 and CG50. *Specialty burner models include:* ADC, ADCP, ARV, SDC and SM. The provisions of this warranty are extended to individual major burner components as follows:

- a) 60 months from date of manufacture for all Beckett-branded major components, except for 12 Vdc components.
- b) 18 months from date of manufacture for all non-Beckett-branded major components and Beckett branded 12 Vdc components.

Note: Normal service items found to be defective upon receipt by the customer are covered by this warranty.

THIS WARRANTY DOES NOT EXTEND TO EQUIPMENT SUBJECTED TO MISUSE, NEGLECT, OR ACCIDENT; NOR DOES THIS WARRANTY APPLY UNLESS THE PRODUCT COVERED BY IT IS PROPERLY INSTALLED BY A QUALIFIED, COMPETENT TECHNICIAN, WHO IS LICENSED WHERE STATE AND LOCAL CODES REQUIRE, AND WHO IS EXPERIENCED IN MAKING SUCH INSTALLATIONS, IN ACCORDANCE WITH THE LATEST EDITION OF NFPA NO. 31 OF THE NATIONAL FIRE PROTECTION ASSOCIATION, THE LATEST EDITION OF THE NATIONAL FUEL GAS CODE (NFPA NO. 54) AND IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND NATIONAL CODES HAVING JURISDICTIONAL AUTHORITY.

Equipment, which is defective in material or workmanship and within the warranty period, may be returned for credit as follows:

Beckett Burners, Beckett-branded major components and non-Beckett-branded major components that came as original equipment on a Beckett burner or were sold as a replacement part by Beckett should be returned, freight prepaid, to Beckett's home office. Credit will be issued to the customer unless the returned equipment is determined by Beckett to be out of warranty or damaged by user, in which case the equipment will be scrapped.

Note: Beckett is not responsible for any labor cost for removal and replacement of equipment.

THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES, AND IN PARTICULAR THERE SHALL BE EXCLUDED THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL BECKETT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE OF ANY NATURE. Beckett neither assumes nor authorizes any person to assume for Beckett any other liability or obligation in connection with the sale of this equipment, Beckett's liability and Customer's exclusive remedy being limited to credit as set forth above.

R.W. BECKETT CORPORATION

P.O. Box 1289 Elyria, Ohio 44036

Form No. 61545 R72905

The Oilheat Manufacturers' Association supports the use of low sulfur fuels as defined by ASTM D396, Grades No. 1 Low Sulfur and No. 2 Low Sulfur, as the preferred heating fuel for the following reasons:

- Low sulfur fuels reduce deposits on heat exchanger surfaces, extending the service interval between cleanings.
- The reduced deposits increase the efficiency of the appliance.
- Low sulfur fuels reduce particulate emissions.
- Low sulfur fuels reduce oxides of nitrogen emissions.

R.W. BECKETT CORPORATION

U.S.A.: P.O. Box 1289 · Elyria, Ohio 44036

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