

OIL FURNACE INSTALLATION INSTRUCTIONS

MODELS

FH085D36C	FH110D48C	FH110D60C
FLF085D36C	FLR085D36C	FLF110D48C
FLR110D48C	FLR140D60C	FC085D36C

WARNING

READ ALL INSTRUCTIONS CAREFULLY BEFORE BEGINNING THE INSTALLATION.

THIS INSTALLATION MUST COMPLY WITH THESE INSTRUCTIONS AND THE REQUIREMENTS OF ALL GOVERNING CODES AND ORDINANCES FOR THE INSTALLATION LOCATION.

IT IS THE RESPONSIBILITY OF INSTALLER TO KNOW AND UNDERSTAND ALL OF THESE REQUIREMENTS.

FAILURE TO DO SO COULD CREATE A HAZARD RESULTING IN PROPERTY DAMAGE, BODILY INJURY OR DEATH.

FOR YOUR SAFETY

DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS OR LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.

IMPORTANT NOTICE

THIS FURNACE IS NOT INTENDED FOR USE AS A CONSTRUCTION HEATER. USE OF THIS FURNACE DURING CONSTRUCTION AND FINISHING PHASES OF A STRUCTURE IS CONSIDERED AS "OPERATION IN A CORROSIVE ATMOSPHERE" AND "UNUSUAL, NEGLIGENT OR IMPROPER USE" AND AS SUCH ARE CONSIDERED EXCLUSIONS BY THE BARD MANUFACTURING COMPANY LIMITED WARRANTY.

MANUAL:	2100-232A
SUPERSEDES:	2100-232
FILE:	VOL. I, TAB 3
DATE:	07-01-99

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Getting Other Information and Publications

These publications can help you install the furnace. You can usually find these at your local library or purchase them directly from the publisher. Be sure to consult current edition of each standard.

National Fuel Gas Code ANSI Z223.1/NFPA54

National Electrical Code ANSI/NFPA 70

Standard for the Installation ANSI/NFPA 90A
of Air Conditioning and Ventilating Systems

Standard for Warm Air ANSI/NFPA 90B
Heating and Air Conditioning Systems

Standard for Chimneys, Fireplaces, Vents NFPA 211
and Solid Fuel Burning Appliances

Load Calculation for ACCA Manual J
Residential Winter and Summer Air Conditioning

Duct Design for Residential ACCA Manual D
Winter and Summer Air Conditioning
and Equipment Selection

For more information, contact these publishers:

ACCA — Air Conditioning Contractors of America

1712 New Hampshire Ave. N.W.

Washington, DC 20009

Telephone: (202) 483-9370

Fax: (202) 234-4721

ANSI — American National Standards Institute

11 West Street, 13th Floor

New York, NY 10036

Telephone: (212) 642-4900

Fax: (212) 302-1286

ASHRAE — American Society of Heating Refrigerating, and Air Conditioning Engineers, Incorporated

1791 Tullie Circle, N.E.

Atlanta, GA 30329-2305

Telephone: (404) 636-8400

Fax: (404) 321-5478

NFPA — National Fire Protection Association

Batterymarch Park

P.O. Box 9101

Quincy, MA 02269-9901

Telephone: (800) 344-3555

Fax: (617) 984-7057

INSTALLATION AND OPERATING INSTRUCTIONS

EQUIPMENT SELECTION

An accurate heating load calculation must be conducted using American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) or Air Conditioning Contractors of America (ACCA) manuals. **Do not** add a large safety factor above the calculated value. If the calculated heating load requirement exceeds the heating capacity rating of a given model, use only the next larger size available. Never increase by any more than absolutely necessary based upon available equipment heating capacities. Always select based upon heat capacity (output), never use input capacities.

NOTE: It is the personal responsibility and obligation of the purchaser to contract a qualified installer to assure that installation is adequate and is in conformance with governing codes and ordinances.

LOCATING THE FURNACE

When installing the furnace be sure to provide adequate space for easy service and maintenance. Locate the furnace as close to the chimney as practical, giving consideration to the accessibility of the oil burner, controls, and blower for service. Allow a minimum of 24 inches at front of furnace for servicing oil burner. Allow adequate room for filter and blower maintenance. **Clearance from combustible material as stated on the furnace and repeated in Table 1 must be maintained.** For damp basement installations, a raised concrete pad is recommended. This will help keep the bottom of the furnace dry and reduce rusting.

An oil burner must have a generous supply of combustion air to operate properly. The flow of combustion and ventilating air must not be obstructed from reaching the furnace. See "Ventilation and Combustion Air" section.

The furnace area must be kept clear and free of combustible materials, gasoline and other flammable vapors and liquids.

This unit is not designed for mobile home or trailer installations. Always install furnace in a level position.

TABLE 1
MINIMUM CLEARANCES

Model	Minimum Installation Clearances - - Inches								Minimum Service Clearances		
	Furnace			Plenum		(1) Duct	Flue Pipe	Floor	Front	Back	Sides
	Front	Back	Sides	Top	Sides						
FH085D36C	4	1	2	2	2	2	9	C	24	--	--
FH110D48C	4	1	2	2	2	2	9	C	24	--	--
FH110D60C	4	1	2	2	2	2	9	C	24	--	--
FLF085D36C	6	0	2	2	2	2	9	NC	24	24	18 *
FLR085D36C	6	18	2	2	2	2	9	NC	24	24	18 *
FLF110D48C	6	0	2	2	2	2	9	NC	24	24	18 *
FLR110D48C	6	18	2	2	2	2	9	NC	24	24	18 *
FLR140D60C	6	18	2	2	2	2	9	NC	24	24	18 *
FC085D36C	6	1	2	2	2	2	9	NC **	24	--	--

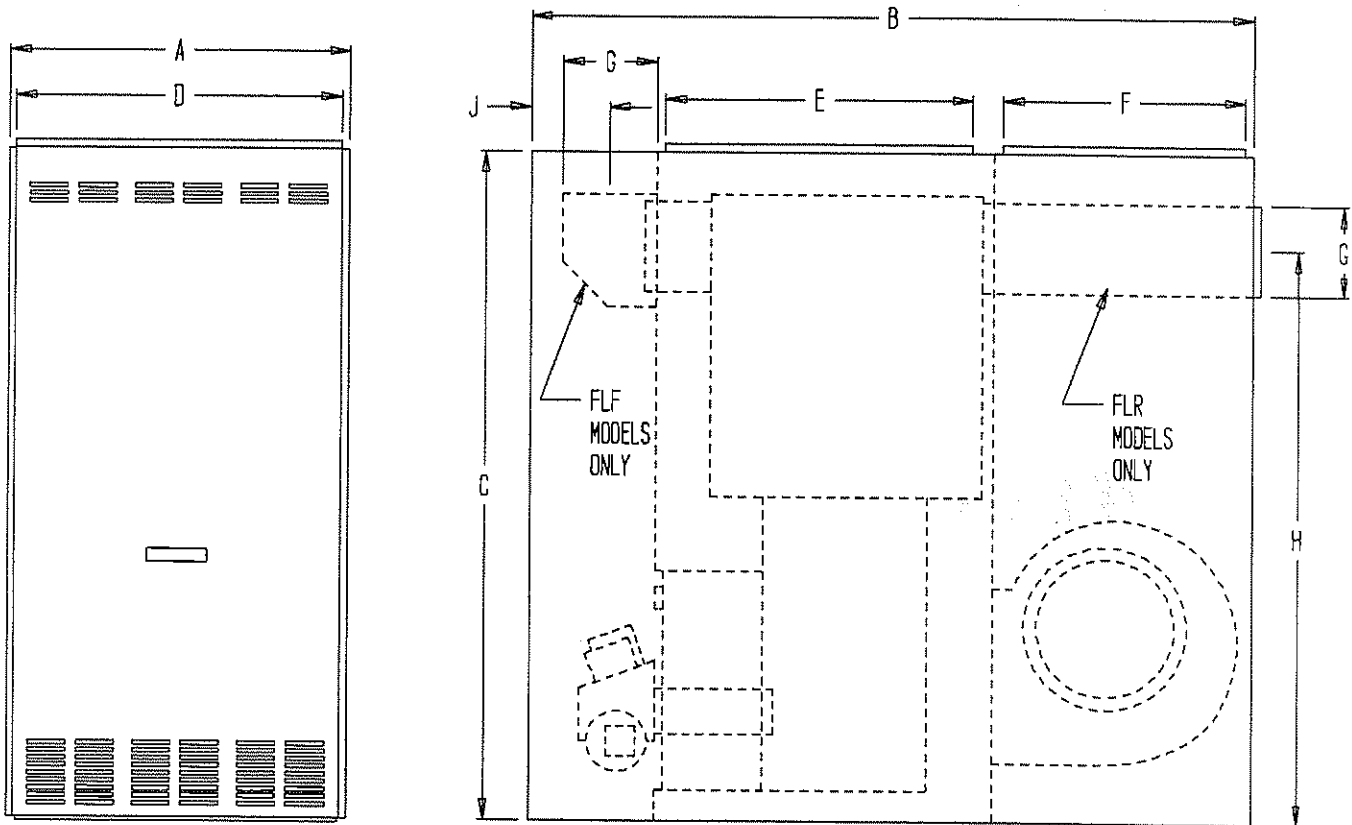
- (1) For the first three (3) feet from plenum. After three (3) feet, no clearance required.
 C Combustible flooring
 NC Noncombustible floor
 * Maintained on one side or the other to achieve filter access and/or blower service.
 ** Floor must be noncombustible. Can be installed on combustible flooring only when installed on special base Part No. CFB7 available from factory.

**TABLE 2
DIMENSIONS (Inches) LO-BOY MODELS**

Model Number	Cabinet			Plenum Openings		Flue Connection			Air Filters (1)		
	A Width	B Depth	C Height	DxE Supply	DxF Return	Location	G Dia	H	J	No. Used	
FLF085D36C	23	47-1/4	40-1/4	22x20	22x16	Front	6	--	5-1/4	11-1/2x17	2
FLR085D36C	23	47-1/4	40-1/4	22x20	22x16	Rear	6	34	--	11-1/2x17	2
FLR110D48C	23	47-1/4	44-1/4	22x20	22x16	Front	6	--	5-1/4	10x20 / 13x20	1
FLR110D48C	23	47-1/4	44-1/4	22x20	22x16	Rear	6	38	--	10x20 / 13x20	1
FLR140D60C	26	50	50	25x20	25x16	Rear	6	43-5/8	--	13x20	2

(1) Washable type filter 1" nom. thickness

FIGURE 1



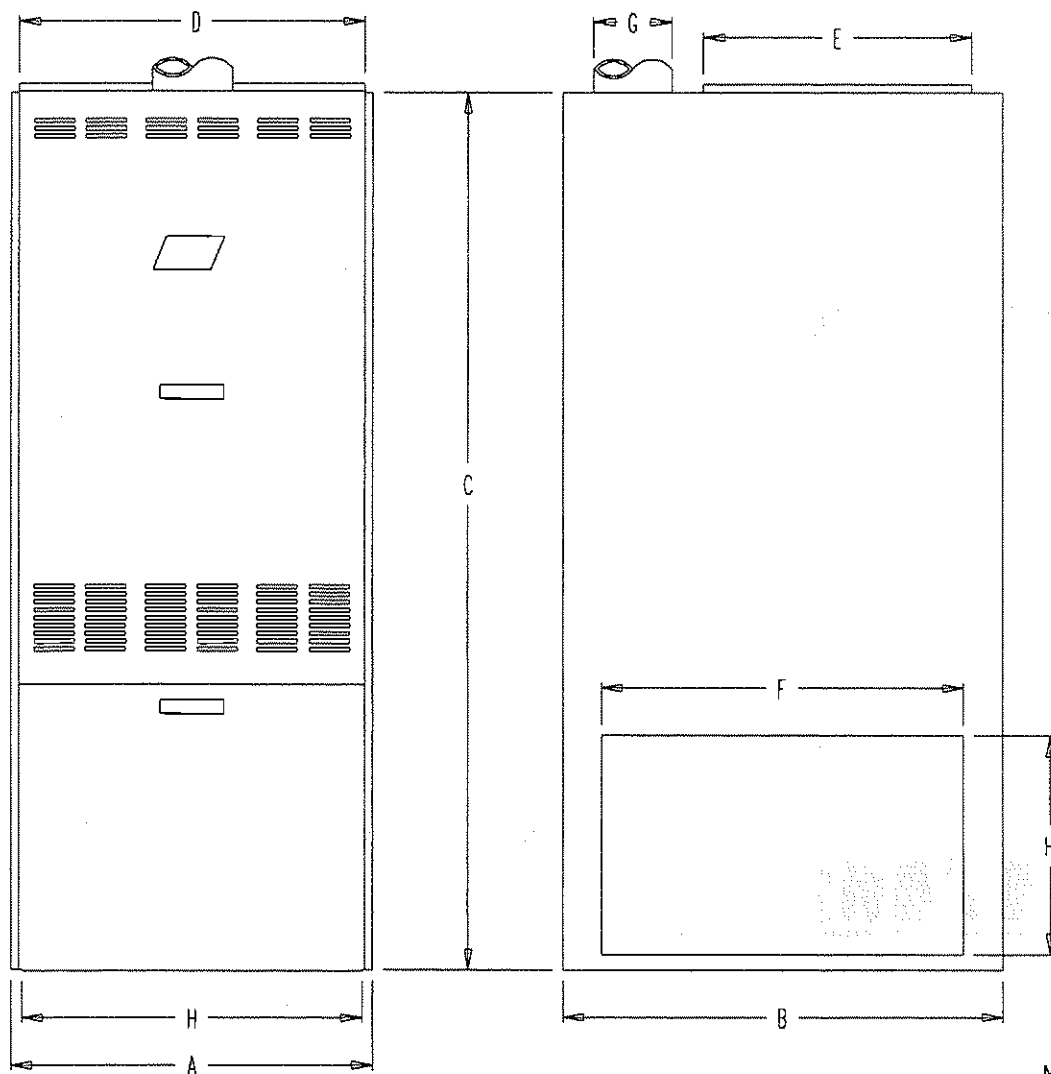
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TABLE 3
DIMENSION (Inches) HI-BOY MODELS

Model Number	Cabinet			Plenum Openings		G Flue Diameter	(1) Filter Size
	A Width	B Depth	C Height	DxE Supply	FxH (1) Return		
FH085D36C	23	31-1/2	56	22x20	23x14	6	16x25
FH110D48C	23	31-1/2	60	22x20	23x14	6	16x25
FH110D60C	23	31-1/2	60	22x20	23x14	6	20x25

- (1) Washable type filter
- (2) Left or right side return air option. Must be cut in by installer.

FIGURE 2



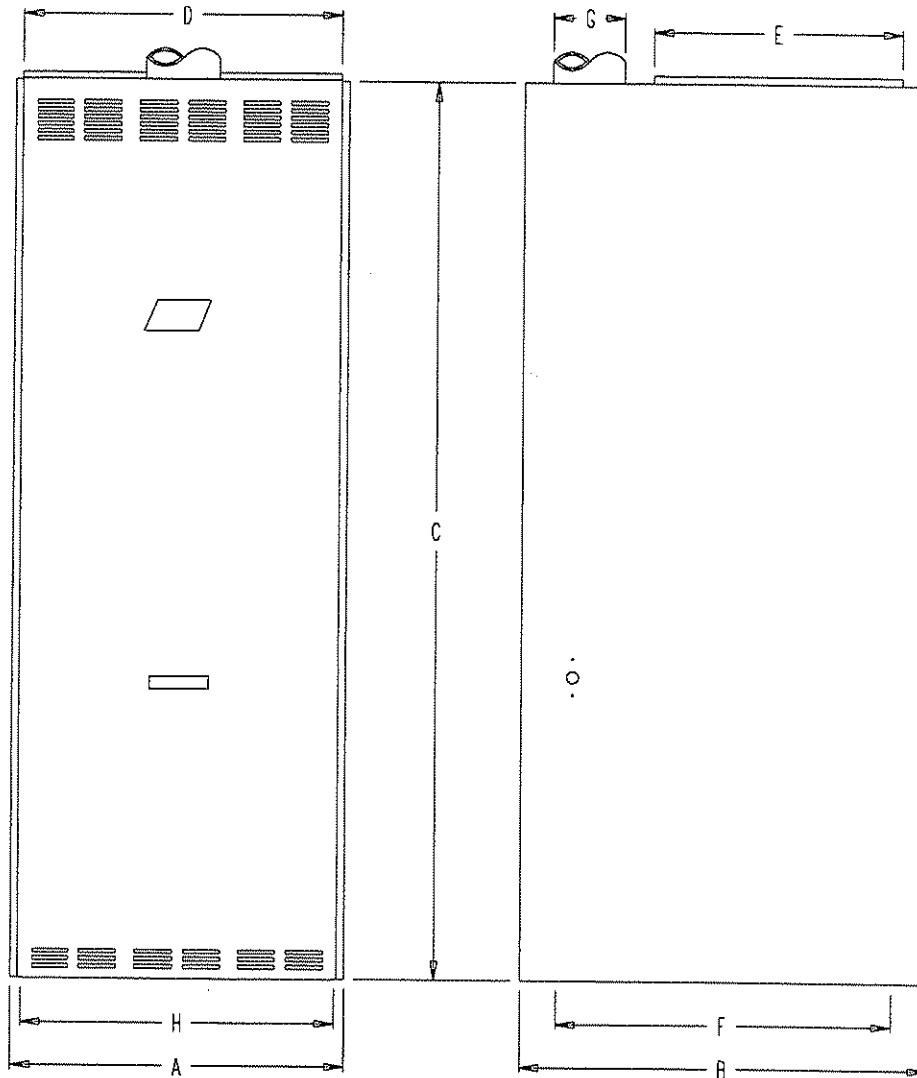
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TABLE 4
DIMENSION (Inches) COUNTERFLOW MODELS

Model Number	Cabinet			Plenum Openings		G Flue Diameter	(1) Filter Size
	A Width	B Depth	C Height	DxE Supply	FxH (1) Return		
FC085D36C	23	29-1/2	56	22x20	18x19	6	10x20 15x20

(1) Washable type filter

FIGURE 3



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DUCT WORK

The air distribution system should be designed and installed in conformance with manuals published by Air Conditioning Contractors of America (ACCA) as set forth in Manual D, or ASHRAE publications.

IMPORTANT

When a furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air must also be handled by a duct(s) sealed to the furnace casing and terminating outside the space containing the furnace. This is to prevent drawing possible hazardous combustion products into the circulated air.

When the furnace is used in connection with a cooling unit*, the furnace shall be installed parallel with or on the upstream side of the cooling unit to avoid condensation in the heating element. With a parallel flow arrangement, the dampers or other means used to control flow of air shall be adequate to prevent chilled air from entering the furnace, and if manually operated, must be equipped with means to prevent operation of either unit, unless the damper is in the full heat or cool position.

* A cooling unit is an air conditioning coil, heat pump coil or chilled water coil.

See CFM versus static pressure tables on pages 23-26 for additional information.

INADEQUATE SUPPLY AIR and/or RETURN AIR DUCT SYSTEMS

Short cycling because of limit control operation can be created by incorrectly designed or installed supply and/or return air duct systems.

The duct systems must be designed using ASHRAE or ACCA design manuals and the equipment cfm and external static pressure ratings to insure proper air delivery capabilities.

On replacement installations, particularly if equipment is oversized, the duct systems can easily be undersized. Modifications may be required to assure that the equipment is *operating within the approved temperature rise range when under full rated input conditions*, and that no short cycling on limit controls is occurring.

INSTALLING THE FURNACE

A typical installation is shown in Figure 4. All parts of the furnace installation (furnace, oil tank and piping systems, combustion and ventilation air, venting, etc.) must comply with NFPA31, Installation of Oil Burning Equipment -- latest edition. This drawing shows the typical connecting parts needed to correctly install this furnace. Make sure that all parts of the heating system comply with the local codes.

Check the furnace and your load calculation to verify that the unit is properly sized. (Refer to Equipment Selection" section on Page 2.)

The correct size of unit needed may be substantially smaller than the unit being replaced due to home improvements and technology advancements since the initial installation.

WIRING

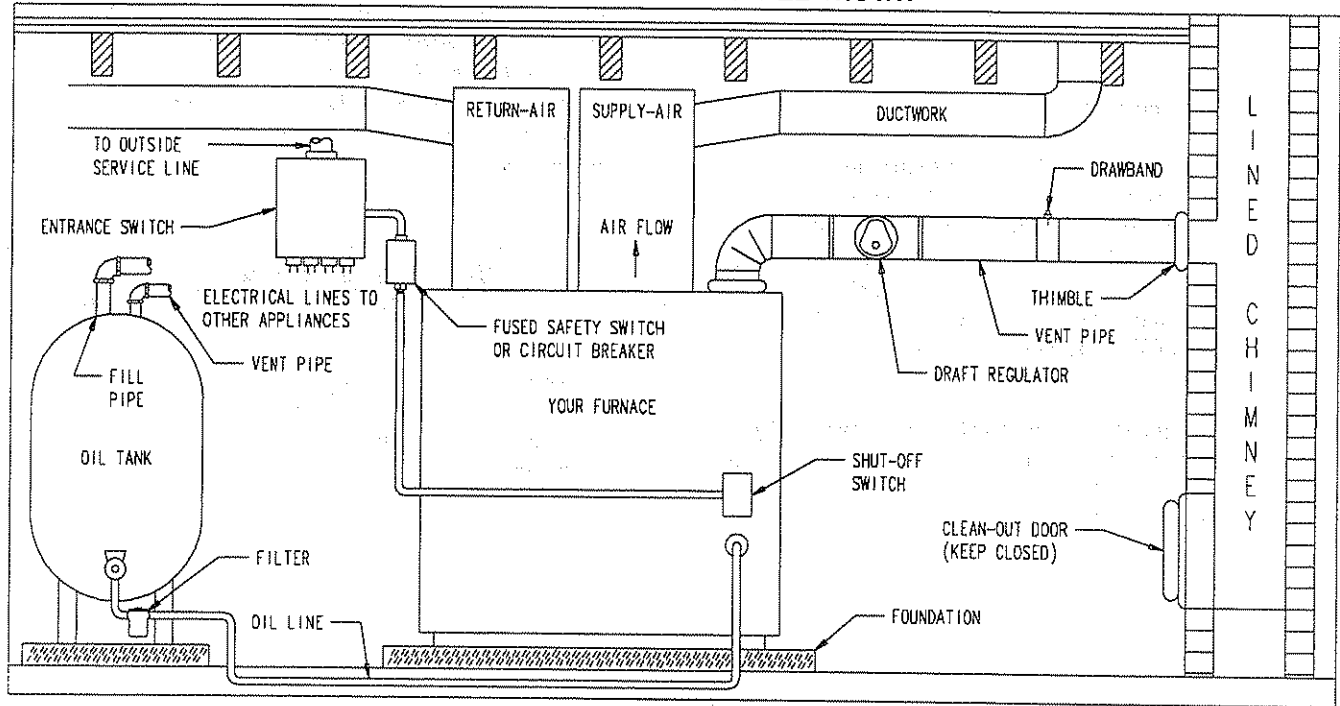
FACTORY

All units are fully factory wired. Multispeed blowers are factory wired on high speed for cooling/manual fan operation. Heating speeds are wired for the largest input and may need lower speed for field installed low input nozzle. If replacement wire is necessary, use 105 degrees C minimum. See electrical data, Table 5.

FIELD

All wiring must conform to the National Electrical Code and all local codes. A separate fuse or breaker should be used for the furnace.

FIGURE 4
TYPICAL INSTALLATION REQUIREMENTS
FRONT FLUE LO-BOY MODEL SHOWN



NOTE: The chimney must be lined with a high temperature noncorrosive material that complies with the local codes, or in their absence with Standard for Chimneys and Vents, NFPA211. Also see section on Venting in these instructions.

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TABLE 5
ELECTRICAL DATA

Model	Volts/HZ/PH	Total Amps	Blower Motor		Burner Motor		Minimum Circuit Ampacity	Max. Time Delay Fuse or HACR Circuit Breaker
			HP	FLA	HP	FLA		
FH085D36C	115/60/1	10	1/3	7.5	1/7	2.5	15	15
FH110D48C	115/60/1	13	1/2	10.5	1/7	2.5	16	20
FH110D60C	115/60/1	15	3/4	12.5	1/7	2.5	19	20
FLF085D36C	115/60/1	8.1	1/3	5.6	1/7	2.5	15	15
FLR085D36C	115/60/1	8.1	1/3	5.6	1/7	2.5	15	15
FLF110D48C	115/60/1	13	1/2	10.5	1/7	2.5	16	20
FLR110D48C	115/60/1	13	1/2	10.5	1/7	2.5	16	20
FLR140B60C	115/60/1	15	3/4	12.5	1/7	2.5	19	20
FC085D36C	115/60/1	8.1	1/3	5.6	1/7	2.5	15	15

OIL FUEL PUMP

All models are factory standard with single stage fuel pumps mounted on the oil burners. Refer to pump specifications on Page 29 and 30.

OIL LINE PIPING

First determine whether the pipe system is to be a single line system or a two line system. After determining the best piping system for the application, refer to the pump specifications on Page 29 and 30. All connections must be absolutely air tight or you will have a malfunction of the burner. When installing the piping, a good oil filter should be installed close to the burner. A single line system is recommended for gravity feed.

A typical single inside tank installations shown in Figure 5. For installation details for this and other tank configurations, refer to NFPA31 -- latest edition. All tank and pipe setups must comply with NFPA31.

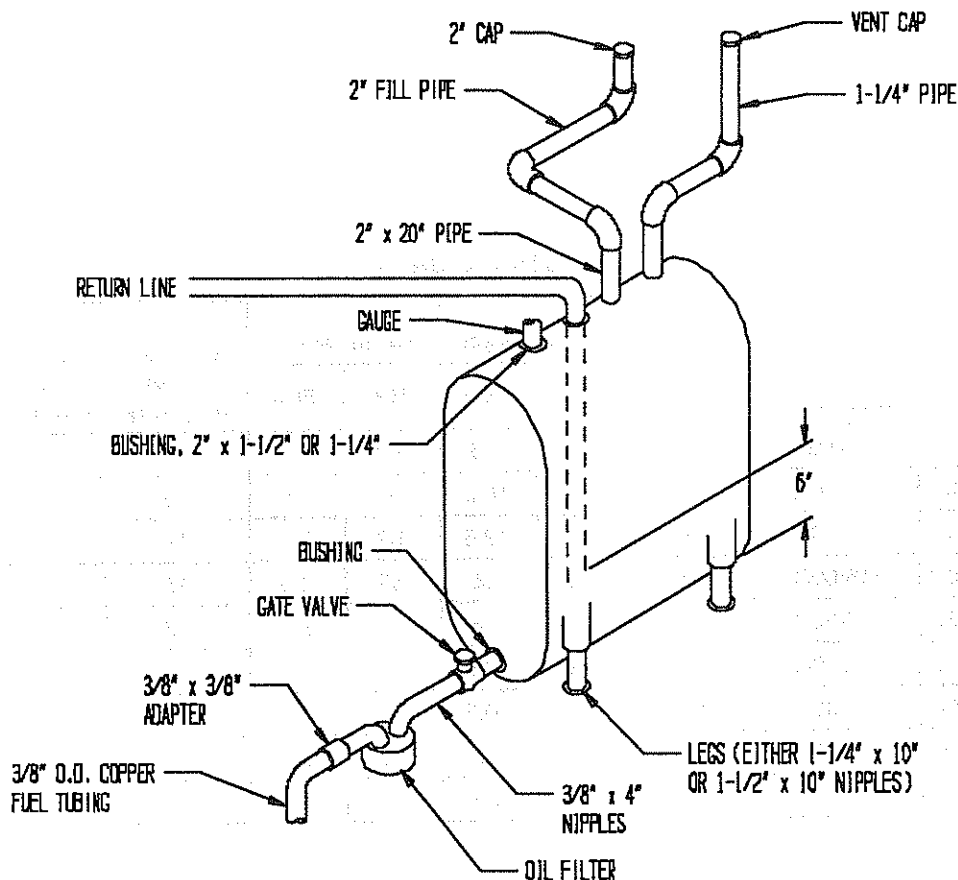
OIL BURNER

All units are shipped with the oil burner installed, and with high rate oil nozzle installed designed for use with No. 1 or No. 2 fuel oil. *Inspect firepot refractory before firing to be sure it has not been jarred out of position in shipment. Burner air tube must not extend beyond inside surface of firepot. Burner head should be centered on the combustion chamber opening.* See Figures 15a and 15b.

WARNING

Never attempt to use gasoline in your furnace. Gasoline is more combustible than fuel oil and could result in a serious explosion causing damage, injury or death.

FIGURE 5
TYPICAL SINGLE INSIDE TANK INSTALLATION



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**TABLE 6
FURNACE DATA**

Model Number	Furnace Installed Standard			Field Installed Option		
	(1) Nozzle Size	Input BTUH	(2) Heating Capacity BTUH	(1) Nozzle Size	Input BTUH	(2) Heating Capacity BTUH
FLF085D36C	.75	105,000	85,000	.65	91,000	75,000
FLR085D36C	.75	105,000	85,000	.65	91,000	75,000
FLF110D48C	1.00	140,000	115,000	.85	119,000	98,000
FLR110D48C	1.00	140,000	115,000	.85	119,000	98,000
FLR140D60C	1.25	175,000	141,000	1.10	154,000	125,000
FC085D36C	.75	105,000	84,000	.65	91,000	74,000
FH085D36C	.75	105,000	84,000	.65	91,000	74,000
FH110D48C	1.00	140,000	113,000	.85	119,000	96,000
FH110D60C	1.00	140,000	113,000	.85	119,000	96,000

(1) 80 degree hollow cone spray pattern

(2) Annual fuel utilization efficiency and heating capacity based upon U.S. Government standard test using D.O.E. isolated combustion rating procedure

BURNER SETUP AND ADJUSTMENTS

All oil burner installations should be performed by a qualified installer in accordance with regulations of the National Fire Protection Standard for Oil-Burning Equipment, NFPA31 -- latest edition, and in complete compliance with all local codes and authorities having jurisdiction. A qualified installer is an individual or agency who is responsible for the installation and adjustments of the heating equipment and who is properly licensed and experienced to install oil-burning equipment in accordance with all codes and ordinances.

The proper installation and adjustment of any oil burner requires technical knowledge and the use of combustion test instruments. The following procedure must be followed to correctly adjust the burner to match the specific characteristics of the installation.

IMPORTANT

Always use combustion test instruments when making burner adjustments and draft gauge when setting the barometric damper. It is virtually impossible to make accurate and reliable adjustments using the "eyeball" method.

CHECK AND ADJUSTMENT PROCEDURE:

1. Check all oil lines and connections for leaks.
2. Connect pressure gauge to pressure gauge port on fuel pump.
3. Operate the burner for 5 - 10 minutes so that the system is near steady state temperature conditions.
4. Check fuel pump pressure, and adjust to 100 psig if necessary.
5. Set the overfire draft to $-.02''$ W.C. by adjusting the barometric damper. The sample tube can be inserted into the heat exchanger over the combustion chamber by loosening the two (2) screws securing the sliding door on the hinged burner observation door.
6. A small diameter hole will be required in the flue pipe *between* the flue connection on the furnace and the barometric damper for purposes of taking the smoke tests and measuring the CO₂ (or O₂) and flue gas temperature.
7. The burner air adjustment shutters are factory set to the recommended start up settings as shown in Table 9. These settings are for initial start up only. Reduce or increase the air supply until a *trace of smoke* is obtained on the smoke tester. *This is a reference point only not the final adjustment.*

8. Measure the CO₂ (or O₂) in the flue gas at the *trace of smoke* level. Open the air control and add reserve air until the CO₂ is lowered by 1.5%.

Example: Original CO₂ at *trace of smoke* level was 13.0% (3.30% O₂). Lower to 11.5% CO₂ (5.3%). See Table 7.

9. Perform the smoke test again. It should now be at zero. Lock the air settings securely.

10. Measure the stack temperature. Subtract the room temperature to obtain the net reading and use the Efficiency Chart, Table 8, to determine the steady-state efficiency.

**TABLE 7
CORRELATION OF PERCENT OF CO₂, O₂
AND RESERVE AIR**

Carbon Dioxide	Oxygen	Reserve Air (Approx.)
15.4	0.0	0.0
15.0	0.6	3.0
14.5	1.2	6.0
14.0	2.0	10.0
13.5	2.6	15.0
13.0	3.3	20.0
12.5	4.0	25.0
12.0	4.6	30.0
11.5	5.3	35.0
11.0	6.0	40.0
10.5	6.7	45.0
10.0	7.4	50.0

**TABLE 8
NO. 2 FUEL OIL EFFICIENCY CHART
(NET STACK TEMP. DEGREES F)**

% O ₂	200	250	300	350	400	450	500	550	600	650	700	750	800	% O ₂
1	89.6	88.4	87.3	86.2	85.1	84.0	82.9	81.7	80.6	79.5	78.4	77.3	76.2	14.7
2	89.4	88.2	87.0	85.9	84.7	83.6	82.4	81.2	80.1	78.9	77.7	76.6	75.4	14.0
3	89.2	87.9	86.7	85.5	84.3	83.1	81.9	80.7	79.4	78.2	77.0	75.8	74.6	13.2
4	88.9	87.7	86.4	85.1	83.8	82.6	81.3	80.0	78.7	77.5	76.2	74.9	73.6	12.5
5	88.7	87.3	86.0	84.6	83.3	82.0	80.6	79.3	77.9	76.6	75.3	73.9	72.6	11.7
6	88.4	87.0	85.5	84.1	82.7	81.3	79.9	78.5	77.0	75.6	74.2	72.8	71.4	11.0
7	88.0	86.5	85.0	83.5	82.0	80.5	79.0	77.5	76.0	74.5	73.0	71.5	70.0	10.3

**TABLE 9
RECOMMENDED START-UP SETTINGS**

Furnace Model No.	Burner Style Part No.	Factory Installed			Field Installed Option		
		(1) Nozzle	Air Band Setting	Air Shutter Setting	(1) Nozzle	Air Band Setting	Air Shutter Setting
FH085D36C	AF/9020-020	.75	0	5	.65	0	3
FH110D48C	AF/9020-020	1.00	0	7	.85	0	6
FH110D60C	AF/9020-020	1.00	0	7	.85	0	6
FLF085D36C	AF/9020-020	.75	0	5	.65	0	3
FLF110D48C	AF/9020-020	1.00	0	7	.85	0	6
FLR085D36C	AF/9020-021	.75	0	5	.65	0	3
FLR110D48C	AF/9020-021	1.00	0	8	.85	0	6
FLR140D60C	AF/9020-022	1.25	1	5	1.10	1	5
FC085D36C	AF/9020-020	.75	0	5	.65	0	3

BURNER NOZZLE AND ELECTRODE ADJUSTMENTS

Check nozzle size as to conformance to installation requirements. Install nozzle by screwing into hexagon adapter. Refer to recommended start-up setting in Table 9.

SPACING OF ELECTRODES

The electrodes should be spaced $5/32$ " apart. They should extend $1/16$ " beyond the end and $7/16$ " above the center of the nozzle tip as shown in Figure 6.

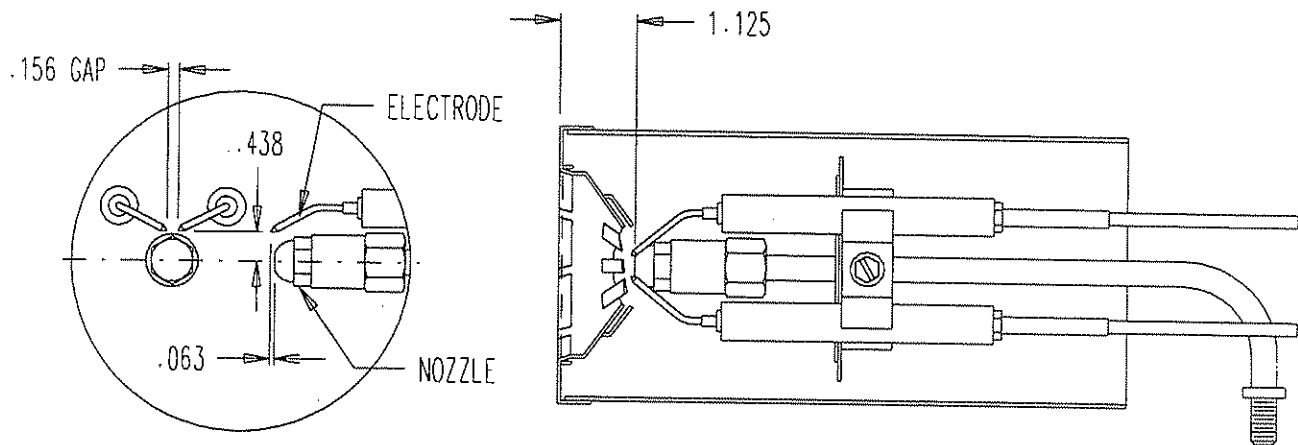
GUN ASSEMBLY ADJUSTMENT

The gun assembly can be adjusted in the slot inside of fan housing by loosening screw holding slot cover in position. Nozzle tip should ordinarily be located $1-1/8$ " behind the front face of the cone.

REMOVING GUN ASSEMBLY

Disconnect the oil line at the fan housing and remove lock nuts on copper tube fitting. Remove transformer hold down screw in upper left hand corner and loosen hold down clip in upper right hand corner, then swing transformer up and backward. Gun assembly can now be removed through this opening.

**FIGURE 6
ELECTRODE ADJUSTMENTS**



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VENTILATION AND COMBUSTION AIR

Appliances shall be installed in a location where the facilities for ventilation permit satisfactory combustion of oil, proper venting and the maintenance of ambient temperature at safe limits under normal conditions of use. Applications shall be located in such a manner as to not interfere with proper circulation of air within the confined space. When building are so tight that normal infiltration does not meet air requirements, outside air shall be introduced. Ducts used to convey air from the outdoors shall be of the same cross-sectional area as the free area of the opening to which they connect. The minimum dimensions of rectangular air ducts shall be not less than 3 inches (76mm). See Table 10 for information on round duct sizing.

For residence-type installations and similar usages, the requirements normally may be obtained by application of one of the methods shown in Figures 7 thru 10 following.

**TABLE 10
ROUND DUCT SIZING**

4,000 BTUH Per Square Inch Round Duct Size	Total BTUH Input
4-3/8 5-1/8	60,000 80,000
5-1/4 5-7/8	85,000 105,000
6-1/8 6-1/4	115,000 120,000
6-3/4 6-7/8	140,000 145,000
7-1/4 8	160,000 200,000

APPLIANCES LOCATED IN CONFINED SPACES

In unconfined spaces in buildings, infiltration may be adequate to provide air for combustion, ventilation, and dilution of flue gasses. However, in buildings of unusually tight construction, additional air shall be provided using the method described under "All Air From Outdoors" in Figure 7.

An unconfined space (such as an open basement) must have a minimum volume of 50 cubic feet per 1,000 BTUH of total of *all* appliances in area. Adjoining rooms may be counted as one area only if there are not doors between the rooms.

Shown in Table 11 are the required minimum areas in square feet to qualify as an unconfined space for various total BTUH input ratings. The table is based on a room(s) with 8 foot ceiling heights.

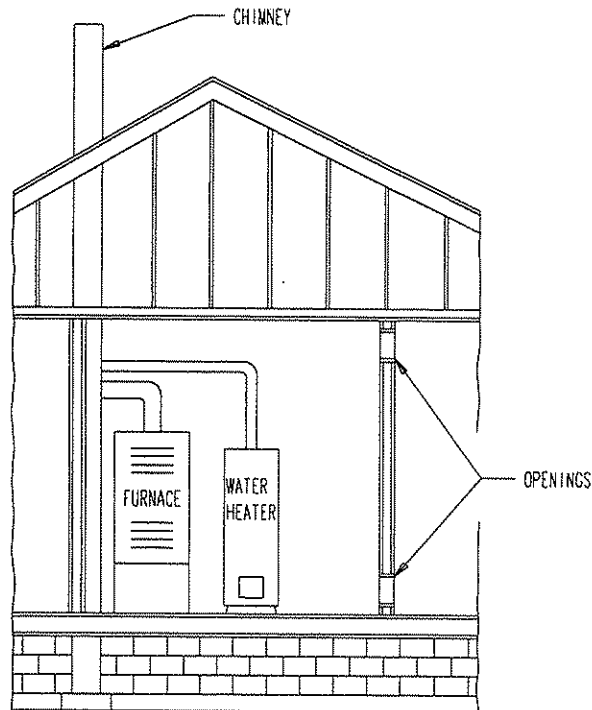
If the unconfined space is within a building having insufficient air because of tight construction, the air for combustion and ventilation shall be obtained from outdoors or from spaces freely communicating with the outdoors.

Under these conditions a permanent opening or openings have a total free area of not less than one square inch per 5,000 BTU per hour (28 square inches per hour) of total input rating of all appliances shall be provided.

**TABLE 11
SQUARE FEET REQUIRED TO
QUALIFY AS UNCONFINED SPACE**

Total BTUH Input	Unconfined Space Minimum Area In Square Feet 8' Ceiling Height
60,000 80,000	375 500
85,000 105,000	531 656
115,000 120,000	719 750
140,000 145,000	875 906
160,000 200,000	1000 1250

**FIGURE 7
APPLIANCES LOCATED IN CONFINED SPACES
ALL AIR FROM INSIDE THE BUILDING**



MIS-1336

NOTE: Each opening shall have a free area of not less than one square inch per 1,000 BTU per hour (140 square inches per gallon per hour) of the total input rating of all appliances in the enclosure.

ALL AIR FROM INSIDE BUILDING

The confined space shall be provided with two permanent openings, one near the top of the enclosure and one near the bottom. Each opening shall have a free area of not less than one square inch per 1,000 BTU per hour (140 square inches per gallon per hour) of the total input rating of all appliances in the enclosure freely communicating with interior areas having in turn adequate infiltration from the outside. (See Figure 7.) Also see Table 12 for specific ventilation opening requirements for the furnace only.

The flow of combustion and ventilating air must not be obstructed from reaching the furnace.

TABLE 12
MINIMUM VENTILATION OPENINGS

Model	Min. Ventilation Opening Square Inch	Recommended Opening (2 Required)	
		Size	Sq. In.
FH085D36C	240	8 x 16	128
FH110D48C	280	9 x 18	162
FH110F60C	280	9 x 18	162
FLF085D36C	290	8 x 19	152
FLR085D36C	290	8 x 19	152
FLF110D48C	340	9 x 19	171
FLR110D48C	340	9 x 19	171
FLR140D60C	360	9.5 x 19	180
FC085D36C	240	8 x 16	128

ALL AIR FROM OUTDOORS

- A. The confined space shall be provided with two permanent openings, one in or near the top of the enclosure 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 8, 9, & 10 on Page 14.)
- B. When directly communicating with outdoors or by means of vertical ducts, each opening shall have a free area of not less than one square inch per 4,000 BTU per hour (35 square inches per gallon per hour) of total input rating of all appliances in the enclosures. If horizontal ducts are used, each opening shall have a free area of not less than one square inch per 2,000 BTU per hour (70 square inches per gallon per hour) of total input of all appliances in the enclosure.

LOUVERS AND GRILLES

In calculating free area for above ventilation and combustion air requirements, consideration shall be given to the blocking effect of louvers, grilles, or screens protecting openings. Screens used shall not be smaller than 1/4 inch (6.3 mm) mesh and shall be readily accessible for cleaning. If the free area through a design of louver or grille is known, it shall be used in calculating the size opening required to provide the free area specified. If the design and free area is not known, it may be assumed that wood louvers will have 30-35 percent free area and metal louvers and grilles will have 60-75 percent free area.

VENTING

The flue pipe to the chimney must be the same size as the flue outlet of the furnace, have no reductions, be of a corrosion-resistant material, and have an upward pitch of 1/4" for every foot of horizontal run. A barometric damper is supplied with the furnace and should be installed in the flue pipe observing the instructions packaged with the damper control. The barometric damper opening must be located in the same atmospheric pressure zone as the combustion air inlet to the furnace. This furnace *must not* be vented into the same chimney with any solid fuel burning appliance. Masonry chimneys must be lined with a listed system or other approved material that will resist corrosion, softening, or cracking from flue gas at temperatures up to 1800° F. See Standard for Installation of Oil Burning Equipment NFPA31 and Standard for Chimneys NFPA211 for additional information.

THERMOSTAT

NOTE: FC models do not wire directly to the primary control. See wiring diagram on Page 28.

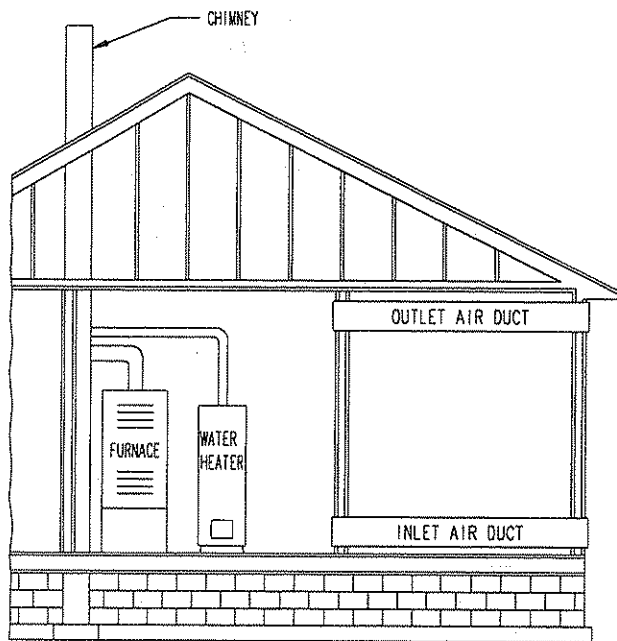
These furnaces are designed to be controlled with any 24V heating or heating/cooling thermostat. The heat/cool thermostats must be designed for independent heat/cool transformer circuits to assure that the 24V transformer built into the oil primary control does not conflict with the main furnace 24V transformer. The heat anticipator should be set at 0.20A. This is a nominal setting. The thermostat circuit should be checked to verify setting.

FAN AND LIMIT CONTROL

The fan and limit control is factory installed in all units. See Table 13 for factory settings. The fan on/off settings may have to be varied due to the static pressure imposed upon the system. The limit control is factory set at *maximum fixed stop allowable* and must not be reset.

When the installation is completed, measure the air temperature in the discharge plenum and return air plenum.

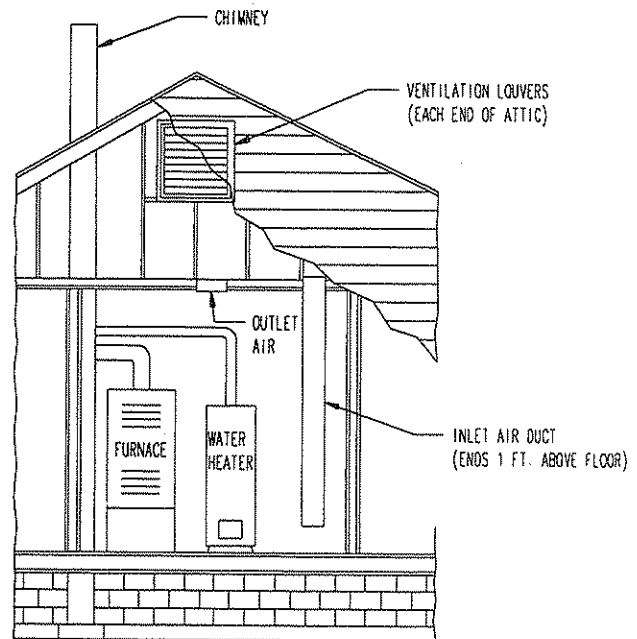
FIGURE 8
APPLIANCES LOCATED IN CONFINED SPACES
ALL AIR FROM OUTDOORS



MIS-1337

NOTE: Each air duct opening shall have a free area of not less than one square inch per 2,000 BTU per hour (70 square inches per gallon per hour) of the total input rating of all appliances in the enclosure.

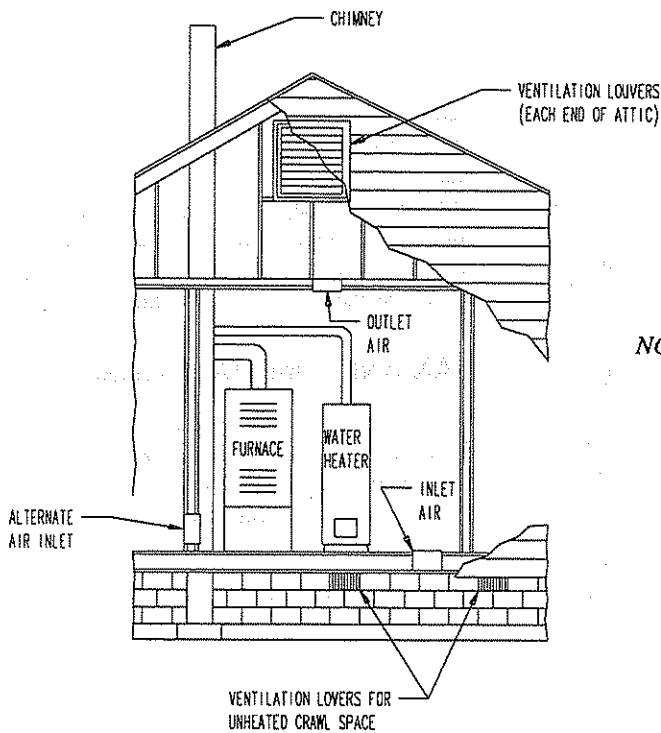
FIGURE 9
APPLIANCES LOCATED IN CONFINED SPACES
ALL AIR FROM OUTDOORS THROUGH
VENTILATED ATTIC



MIS-1338

NOTE: The inlet and outlet air openings shall each have a free area of not less than one square inch per 4,000 BTU per hour (35 square inches per gallon per hour) of the total input rating of all appliances in the enclosure.

FIGURE 10
APPLIANCES LOCATED IN CONFINED SPACES
ALL AIR FROM OUTDOORS
INLET AIR FROM VENTILATED CRAWL SPACE AND OUTLET AIR TO VENTILATED ATTIC



NOTE: The inlet and outlet air openings shall each have a free area of not less than one square inch per 4,000 BTU per hour (35 square inches per gallon per hour) of the total input rating of appliances in the enclosure.

to operate in the middle of the range unless air conditioning or other installation requirements make that unfeasible. The speed of the blower may have to be either increased or decreased to obtain this temperature. The blower is equipped with a 3 or 4 speed motor to make these adjustments.

The fan and limit control in the burner compartment governs the blower operation by means of two temperature selections. One lever is set at 140 degrees for example to start the blower, and the other lever is at a lower temperature, 110 degrees to stop the blower. These settings may be varied to suit the homeowner's comfort. A greater temperature difference between settings may result in less

repetition of the blower operation at the end of the heating cycle. A low "off" temperature is recommended for longer blower operation as this keeps the air of the home in more constant circulation.

NOTE: On model FC085D36C the blower "on" setting is timed to assure blower operation. This blower "on" setting cannot be adjusted.

IMPORTANT

Do not set the blower "on" set point lever of the combination fan/limit control above 150.

**TABLE 13
TEMPERATURE RISE RANGES, LIMIT CONTROL SETTINGS,
and HEATING BLOWER SPEEDS**

Model	(1) Nozzle	Rise Ranges	Heating Blower Speed	Limit Setting	On	Off
FH085D36C	.65	70 - 100	Low	170	110	90
	.75	60 - 90	Med	170	110	90
FH110D48C	.85	70 - 100	Low	170	110	90
	1.00	60 - 90	Med Low	170	110	90
FH110D60C	.85	60 - 90	Low	170	110	90
	1.00	60 - 90	Med Low	170	110	90
FLF085D36C	.65	60 - 90	Low	230	140	110
	.75	60 - 90	Med	230	140	110
FLF110D48C	.85	60 - 90	Med Low	230	140	110
	1.00	60 - 90	Med High	230	140	110
FLR085D36C	.65	60 - 90	Low	250	140	110
	.75	60 - 90	Med	250	140	110
FLR110D48C	.85	60 - 90	Med Low	240	140	110
	1.00	60 - 90	Med High	240	140	110
FLR140D60C	1.10	60 - 90	Med Low	220	140	110
	1.25	60 - 90	Med High	220	140	110
FC085D36C	.65	70 - 100	Low	180	110	90
	.75	60 - 90	Med	180	110	90

(1) 80 degree hollow cone spray pattern

FILTERS

All models are shipped with filters. See Table 14 for sizes. See following information. Hi-Boy models are supplied with an external filter rack which can be installed on either left or right side. The counterflow models require a bracket installation and final filter location projects into return air plenum attachment for furnace. See Figure 13. Refer to Figure 14 for Lo-Boy models which have filters internally mounted in blower compartment at rear of furnace.

**TABLE 14
FILTER SIZES FOR OIL FURNACES**

Model	Size
FH085D36C Hi-Boy	(1) 16x25x1 W
FH110D48C Hi-Boy	(1) 16x25x1 W
FH110D60C Hi-Boy	(1) 20x25x1 W
FLF085D36C FLR085D36C Lo-Boys	(2) 11.5x17x1 W
FLF110D48C FLR110D48C Lo-Boys	(1) 10x20x1 W (1) 13x20x1 W
FLR140D60C Lo-Boy	(2) 13x20x1 W
FC085D36C Counterflow	(1) 10x20x1 W (1) 15x20x1 W

FIGURE 11

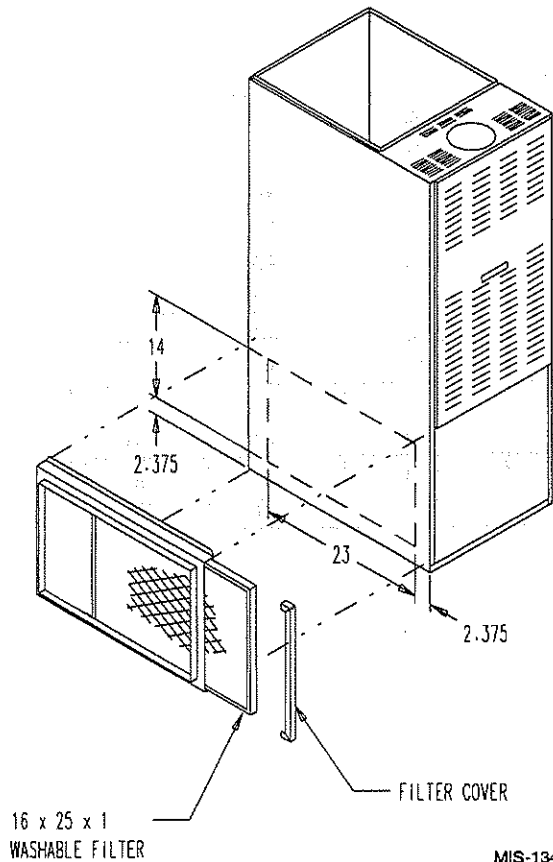
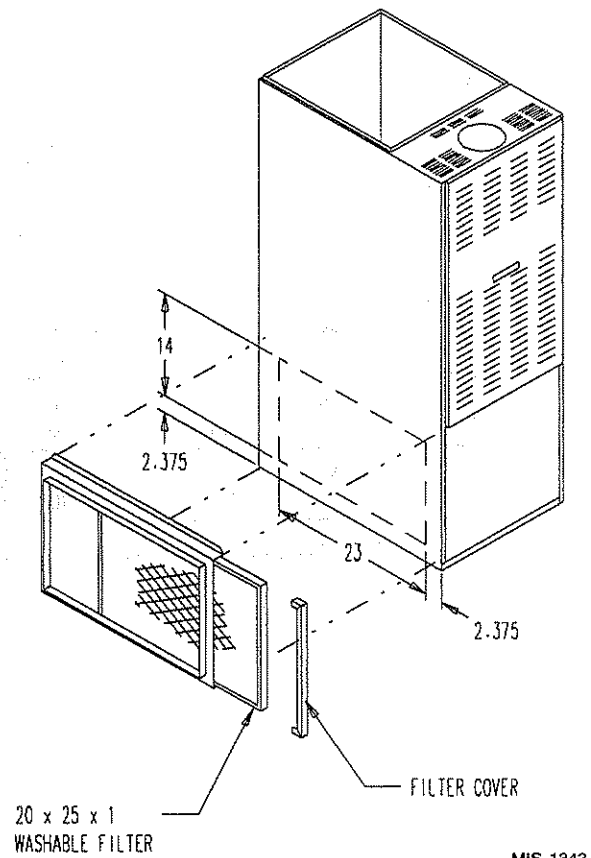


FIGURE 12



HI-BOY MODELS – FILTER LOCATIONS, & REMOVAL AND REPLACEMENT PROCEDURES

16 x 25 x 1 external filter racks are supplied as standard equipment for all FH models (20 x 25 x 1 is standard for FH110D60C model). A 14 x 23 opening is to be cut into either the left or right side of the furnace depending upon installation requirements. See Figure 11 for typical installation of a 16 x 25 x 1 filter rack centered over the 14 x 3 cutout.

Figure 12 shows a typical installation of a 20 x 25 x 1 filter rack. The same 14 x 23 cutout is required in the furnace side, and the bottom of the filter rack is aligned over the bottom of the 14 x 23 cutout. The top of the filter rack rises approximately 6 inches above the top of the cutout. The 3 inch depth of the filter rack provides ample spacing between furnace side and leaving edge of filter for the entire filter surface to be effective.

To remove filter from the filter rack (see Figures 11 & 12), remove the filter access cover and grasp the end of the filter.

This filter is the high velocity type foam filter which may be washed and used over and over. **Do not** replace it with a fiberglass disposable filter of the same size.

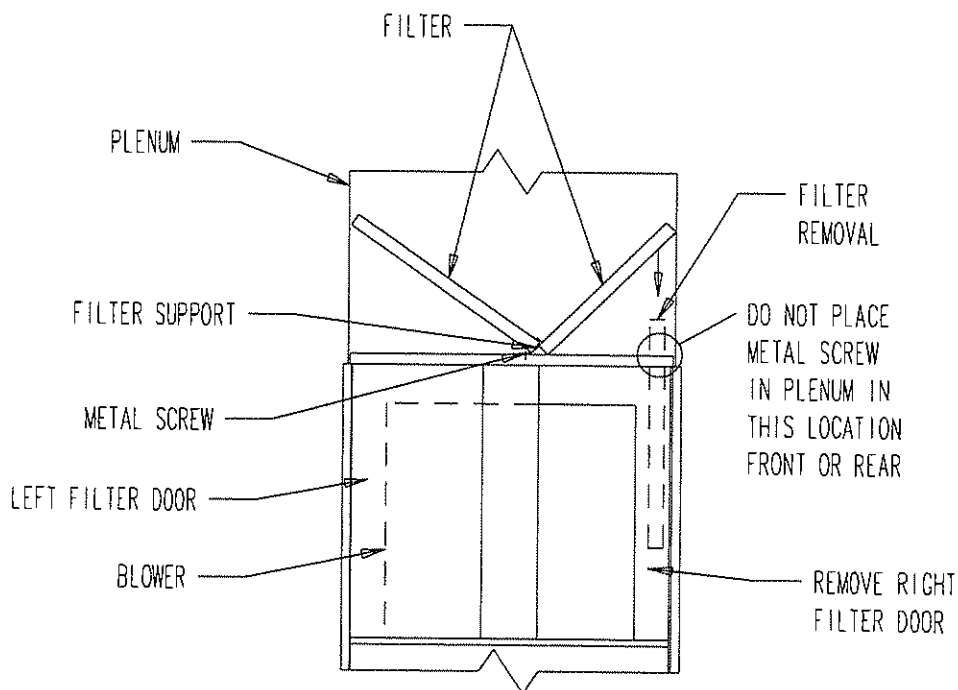
To replace filter, reverse the above procedure.

COUNTERFLOW MODELS – FILTER LOCATIONS

Counterflow models normally have filters installed in the return air plenum above the furnace unless a common return air/filter grille is used.

The electrical switch should be turned "off" before the front door to furnace is removed. After removing the front door, remove the left side filter door in the upper section of the furnace. Refer to Figure 13 for proper filter locations.

FIGURE 13



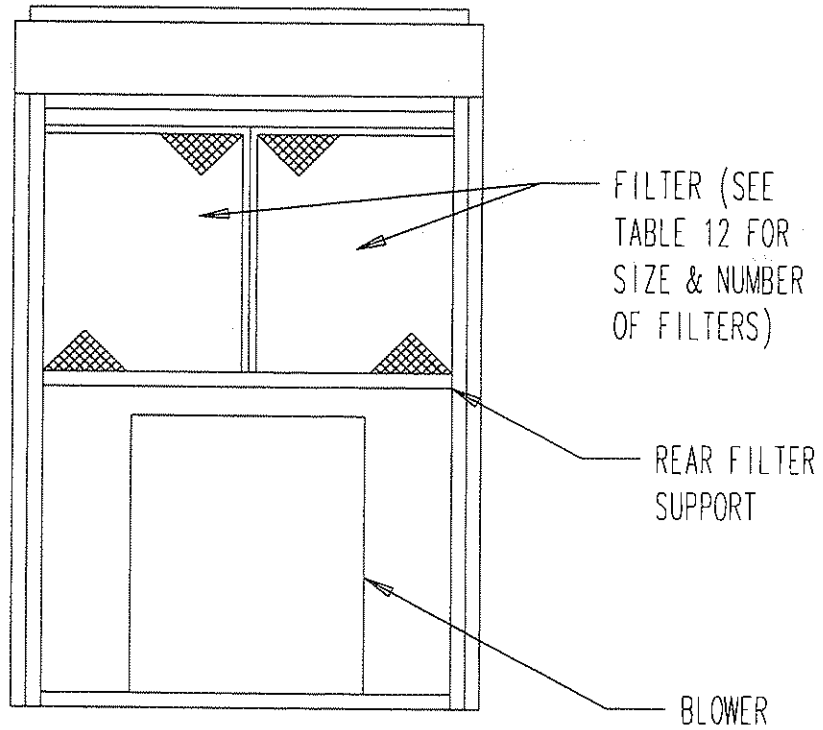
ATTACH FILTER SUPPORT TO FURNACE AS SHOWN WITH TWO SHEET METAL SCREWS. THE FILTERS CAN BE INSTALLED AND REMOVED THROUGH THE RIGHT FILTER DOOR.

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LO-BOY MODELS – FILTER LOCATIONS

Lo-boy models have the filters installed in the return air cabinet section of the furnace. They are accessible from the rear of the furnace by removing the blower/filter access door. The electrical switch should be turned “off” prior to removing the access door. Refer to Figure 14 below.

FIGURE 14



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LUBRICATION

The oil burner motor bearings should be lubricated at least twice each year using a few drops of a good grade SAE-20 motor oil. Do not over oil, 2 - 4 drops are sufficient. The direct drive comfort air blower motor is considered "permanently lubricated" and needs no oiling.

INSPECT AIR FILTER

Washable air filters are supplied with each furnace. Washable filters should not be replaced with disposable type. Clean filters before each heating season begins. It is recommended that filters also be cleaned at least twice during the heating season.

Be sure the new filters are set securely in the filter rack so there can be no leakage around them. (See instructions on inside of blower compartment door.)

FINAL INSPECTION AND TEST

Final inspection and test of an installation shall be made to determine that the work has been done in full accordance with regulations and according to the highest standards for safety, performance and appearance. Such an inspection and test should indicate the following as a minimum:

1. Determine that all parts of the oil storage and circulating system, including tank, piping and burner, are free from oil leaks. Be sure that no oil discharges from the nozzle when burner is not operating.
2. Be sure that the suction line and pump have been entirely vented of air so that the burner has instantaneous oil shutoff at the nozzle and so that the pump operates without an air noise.
3. Check the flame adjustment to determine that the flame is clear, quiet, free of odor and oil nozzle is of proper size for the furnace.
4. Test operation of burner by operating the thermostat. First, set the thermostat above room temperature. Burner should start. Second, set thermostat below room temperature. Burner will stop.
5. Check operation of burner primary control in accordance with manufacturer's instructions included with the control. Following is the method we recommend in checking the safety switch in this primary control.

- A. Flame Failure – Simulate by shutting off oil supply manual valve while burner is on. After 15 seconds the safety switch locks out, ignition stops, motor stops and the oil valve closes. The safety switch locks out, as in flame failure.
- B. Ignition Failure – Test by closing oil supply while burner is off. Run through starting procedure. The safety switch locks out as in flame failure.
- C. Power Failure – Turn off power supply while burner is on. When burner goes out, restore power and burner will restart.
- D. If operation is not as described, check wiring and installation first. If trouble appears to be in the control circuit, replace the flame detector. If trouble still persists, replace the burner mounted relay.

SERVICE HINTS

Preventive maintenance is the best way to avoid unnecessary expense, inconvenience, and retain operating efficiency of your furnace. It is advisable to have your heating system and burner inspected at periodic intervals by a qualified serviceman. If trouble develops, follow these simple checks before calling the serviceman.

1. Make sure there is oil in tank and valve is open.
2. Make sure thermostat is set above room temperature.
3. Make sure electrical supply to furnace is on and fuses are not blown or circuit breakers tripped.
4. Reset safety switch of burner primary control.

CAUTION

Reset one (1) time only. More than one reset can cause excessive oil to be pumped into combustion chamber which could result in explosion upon ignition.

5. Press thermal protector button of burner motor.
6. Make sure air filters are in place and are clean.
7. Make sure all air openings in furnace, all ventilation and combustion air openings, all return air grilles, and all warm air registers are unobstructed and open.

COMBINATION COMBUSTION CHAMBER/BURNER MOUNTING SYSTEM

The furnace has been designed with a combustion chamber mounting system that enables service personnel to remove the combustion chamber, its mounting system, and burner assembly as one unit for inspection and/or service on the bench. It has also been designed to remove the burner assembly independently from the mounting system to perform basic annual service and inspection. The mounting system is completely adjustable so exact alignment between the burner tube and combustion chamber may be assured prior to installation into the furnace. See Figure 15a and 15b.


 WARNING
The procedures described in Figures 15a and 15b should be conducted only by a qualified service technician.
Improper servicing could cause electric shock hazard, fires or explosion resulting in damage, injury or death.

FIGURE 15A

TO REMOVE BURNER ONLY

Disconnect fuel line, power cord and wires from T, T on primary control. Loosen (3) 1/4 inch nuts securing burner mounting flange. Twist burner counterclockwise and pull straight back away from the furnace. (See below.)

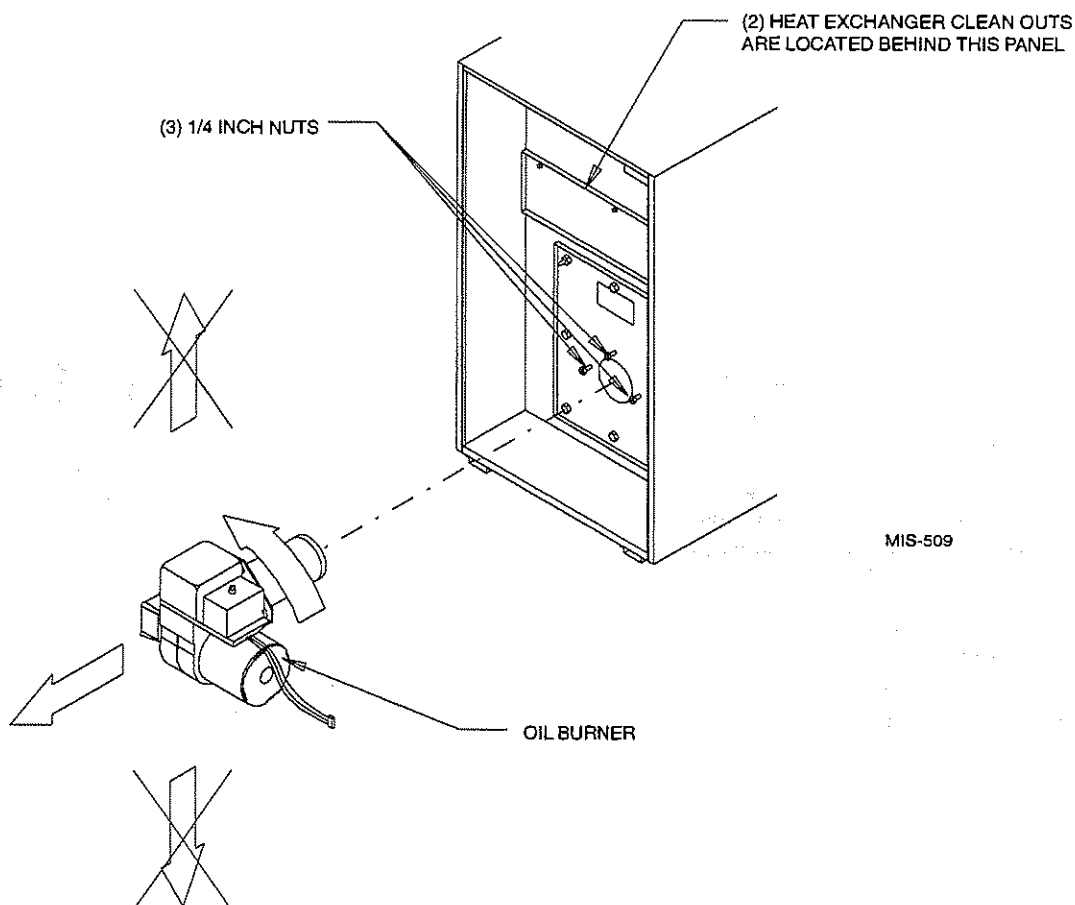
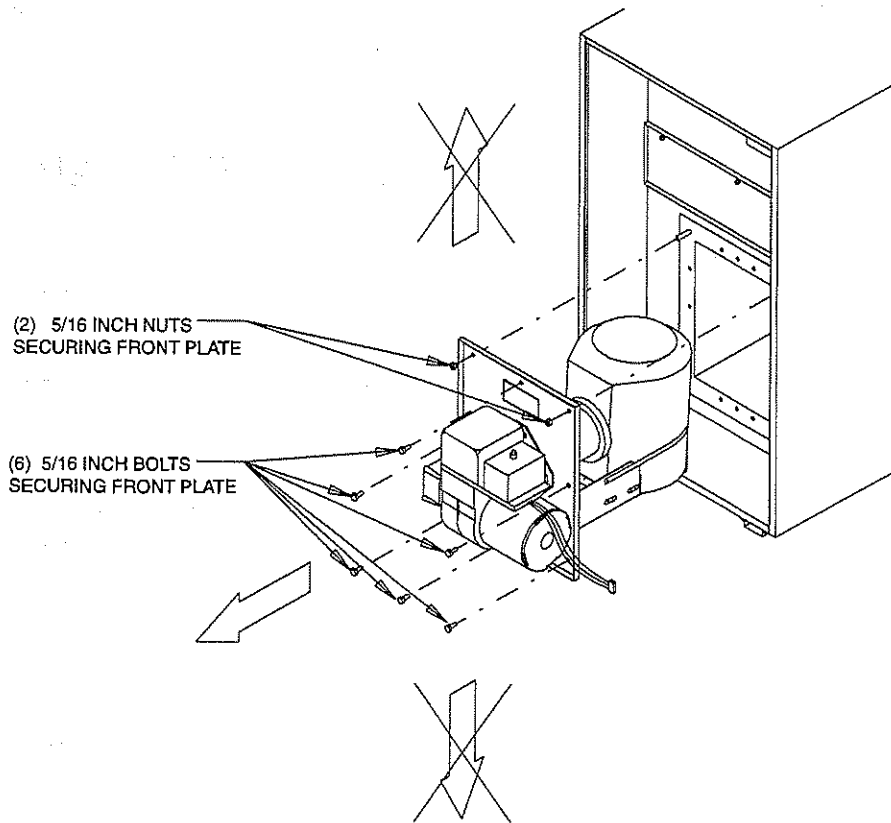


FIGURE 15B

TO REMOVE THE ENTIRE COMBUSTION CHAMBER MOUNTING SYSTEM

Disconnect fuel line, power cord and wires from T, T on primary control. Remove (6) 5/16 inch bolts from around front plate. Next remove (2) 5/16 inch nuts from upper right and left hand corners of the front plate. Pull entire assembly straight back away from furnace. *Be careful* not to tip assembly up or down as it may damage the combustion chamber. (See below.)



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COMMON CAUSES OF TROUBLE

CAUTION

To avoid accidents, always open main switch (OFF position) when servicing the burner.

BURNER WILL NOT PRODUCE FLAME

Check oil level gauge to see that there is sufficient oil in tank or tanks. Check the burner mounted relay control. *Do not adjust this control.*

Check position of electrodes – incorrect position will cause slow or delayed ignition. Clean electrodes and nozzle. Check and clean strainer in pump. If oil line filter is used, check filter condition.

If burner runs but there is no flame the fuel pump may be air bound. Follow instructions for bleeding fuel pump.

BURNER STARTS OR STOPS TOO OFTEN

Limit control may be set too low. Make sure set point indicator is against limit stop on dial. Refer to rating plate for limit setting. Check heat anticipator setting on thermostat.

NOZZLE PRODUCES A STRINGY FLAME

Worn tangential grooves in nozzle. Replace nozzle.

BASEMENT TANK HUM

Occasionally with a two-pipe installation there may be a low return line hum. Eliminate hum by installing a special anti-hum valve in the return line near pump.

HEAVY FIRE OR PULSATING FLAME.

These may occur after burner starts. It may be caused by a slight oil leak in the fuel pump and cannot be corrected except by replacing the pump. This happens only when the burner is started.

CHATTERING SOUND OR HIGH PITCH NOISE

This noise from motor can usually be traced to where a conduit or BX cable is fixed rigidly or attached to some part of the building. Relieving this strain may eliminate noise.

PUMP SQUEALS OR CHATTERS

This may be caused by air in pipes. Check all joints in the oil supply pipe for leaks. Check strainer in pump; if dirty, clean.

INSUFFICIENT HEAT

Check limit control setting. It may be that flame is not allowed to stay on long enough to generate sufficient heat in furnace to heat the house properly. If the proper size furnace has been selected according to house requirements and satisfactory heat is not obtained, recheck the heating plant for size and capacity in relation to house. Check for clogged filters.

CARE OF FINISH

Your unit is painted with baked enamel. Like a good piece of furniture, it has an excellent appearance and an occasional waxing and dusting will keep it attractive for years.

WARNING

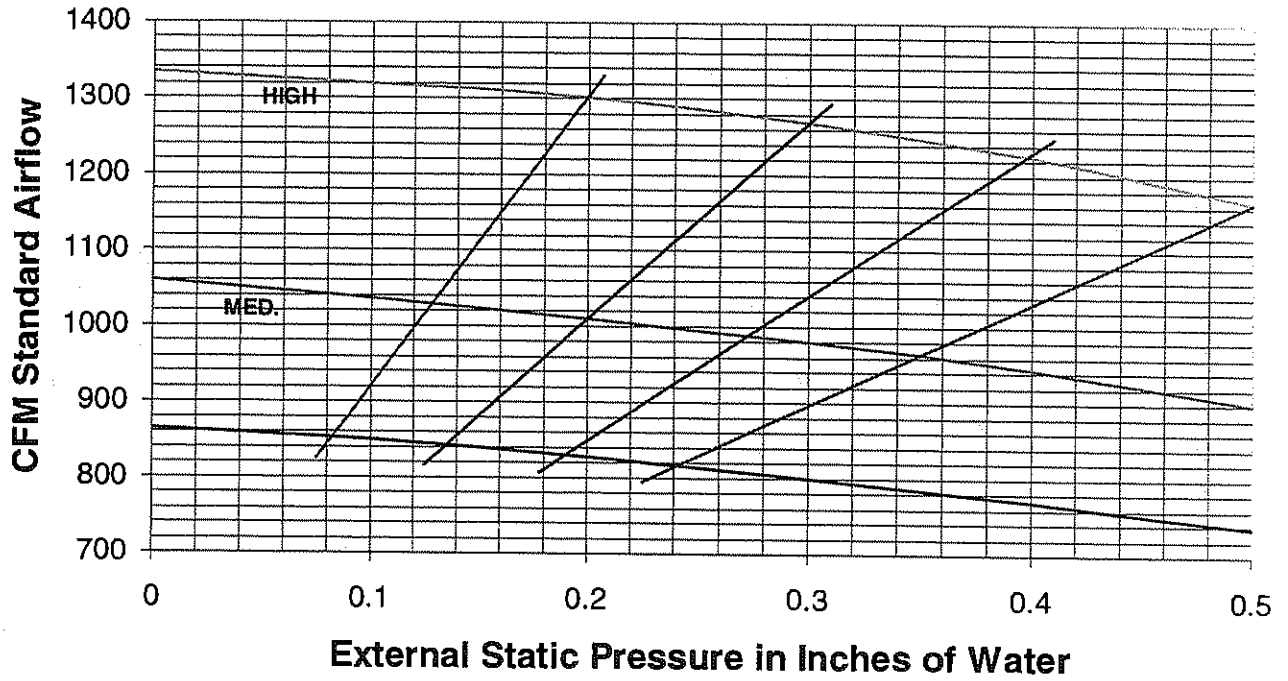
Under **no** circumstance should a soot deterioration device be used in the combustion chamber. These products known as "soot busters" or "soot sticks" are comprised of chemicals that burn at very high temperatures which may exceed the temperature rating of the combustion chamber material.

Use of these products are detrimental to the life expectancy of the combustion chamber and will destroy the chamber. Refer to the "Cleaning of Furnace" section for proper cleaning methods.

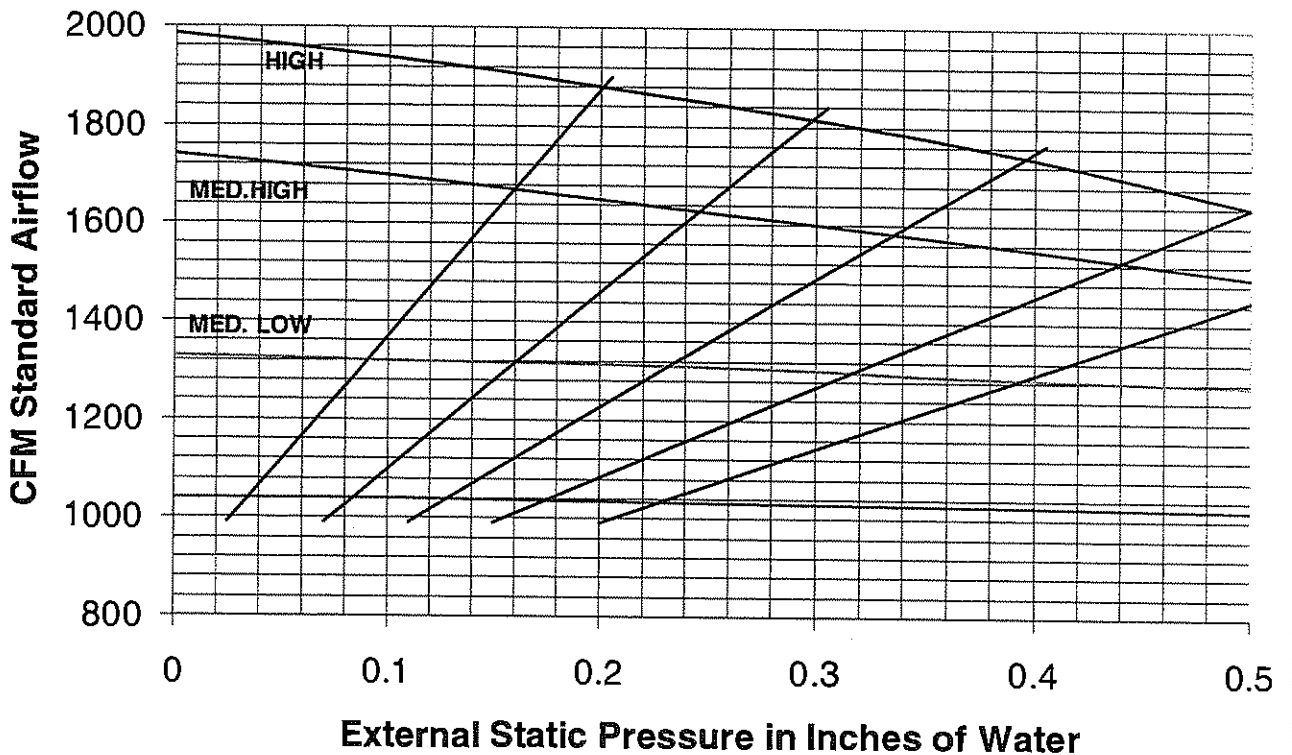
CLEANING OF FURNACE

All of these units have two clean out plugs for easy cleaning of the heat exchanger. They are accessible from the front of these units by removing the clean out access cover in the burner compartment. The furnace should be check annually by a qualified service technician.

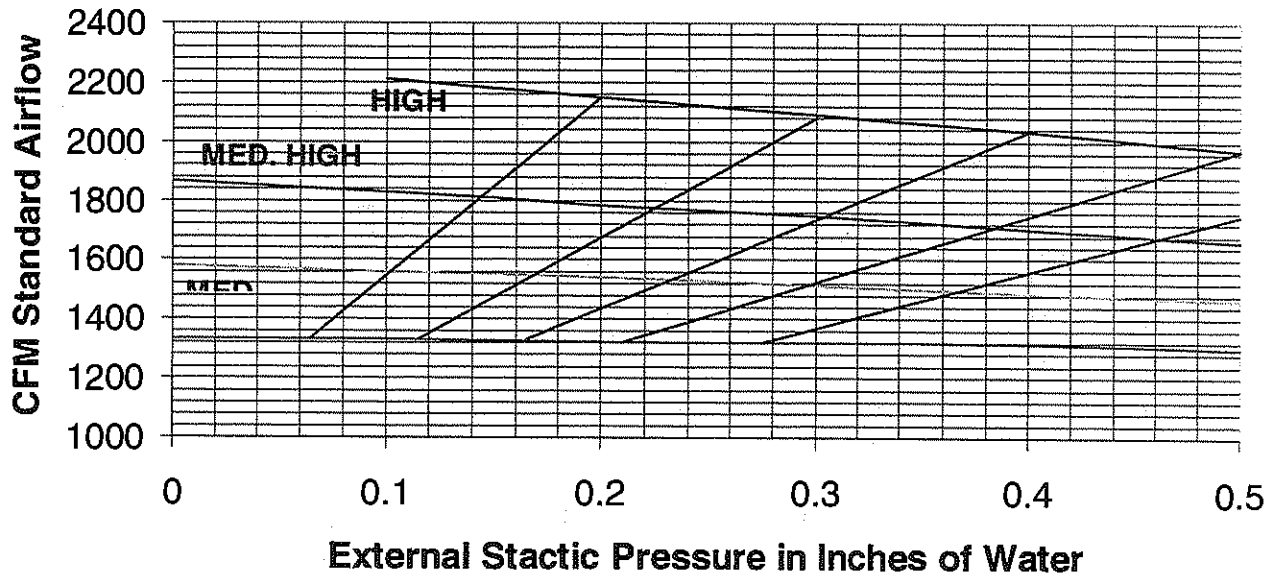
FH085D36C System Resistance Curves



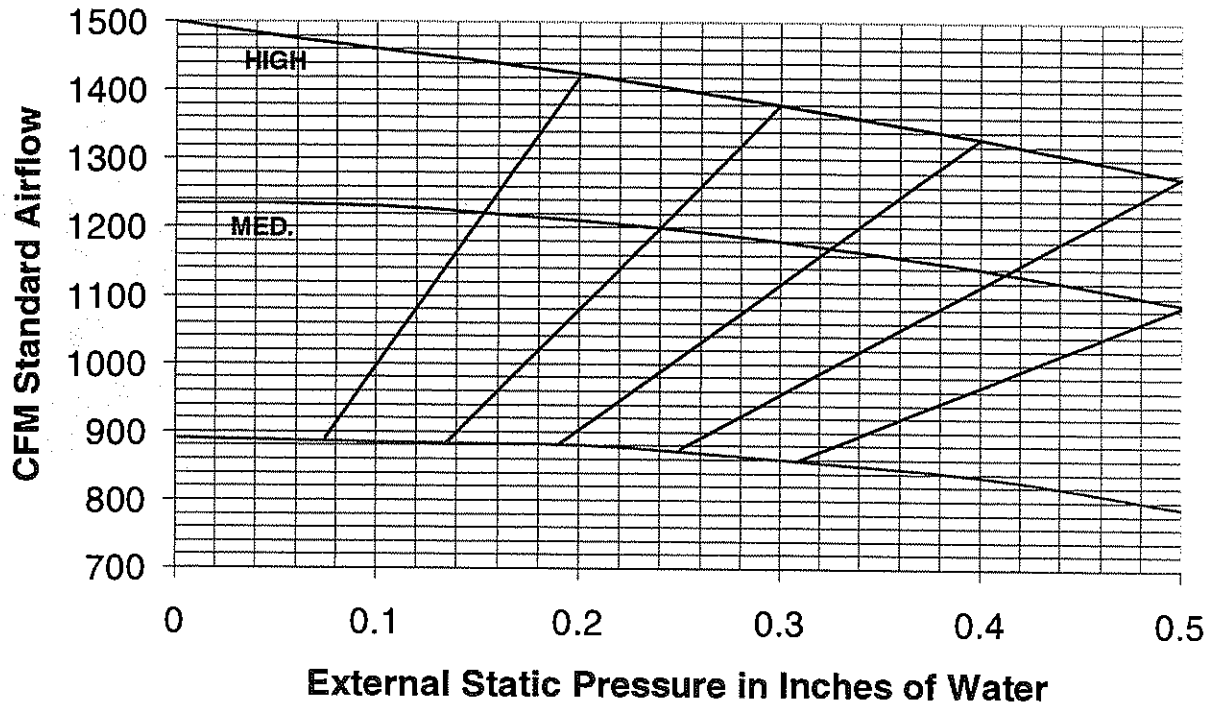
FH110D48C System Resistance Curves



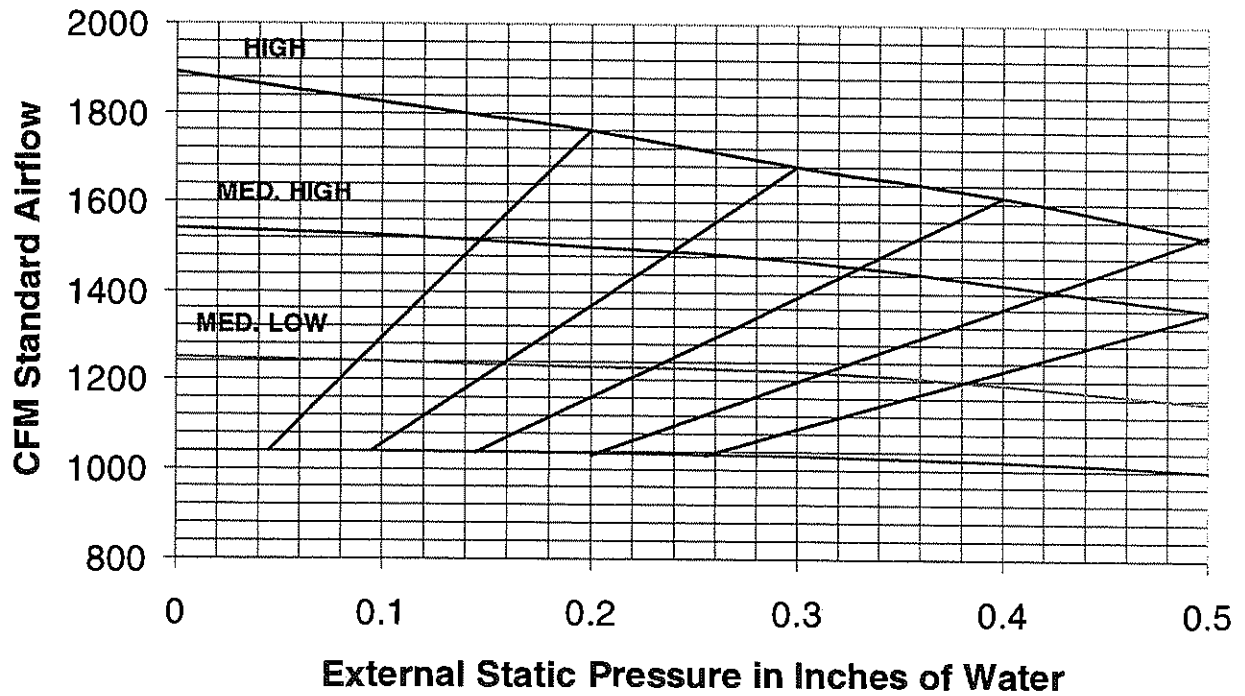
FH110D60C System Resistance Curves



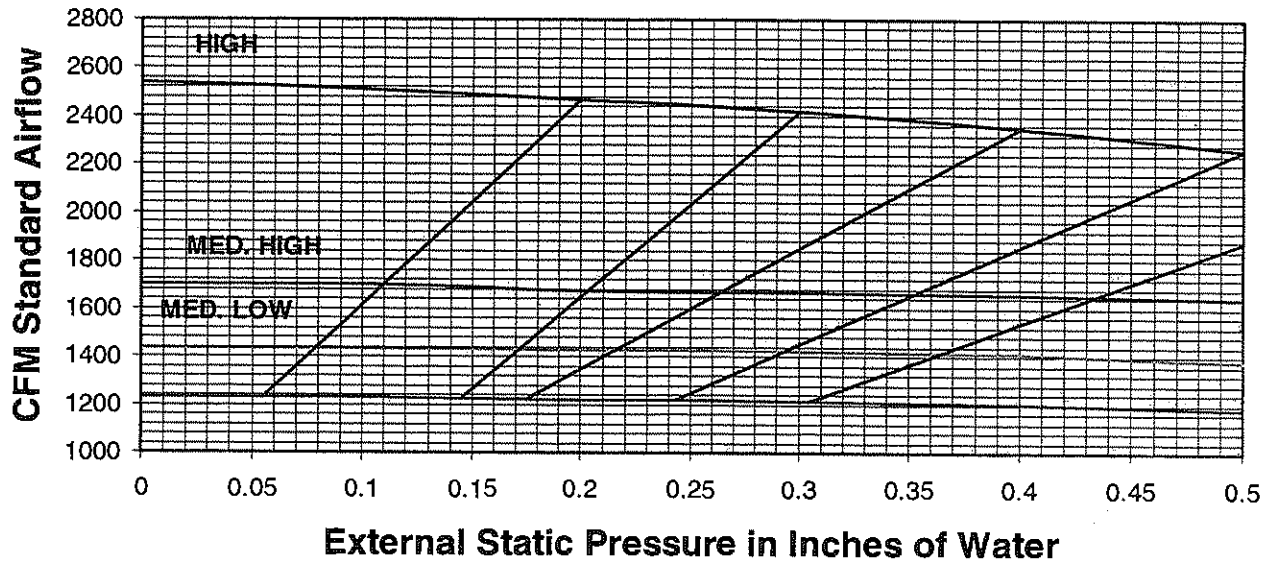
FLF/R085D36C System Resistance Curves



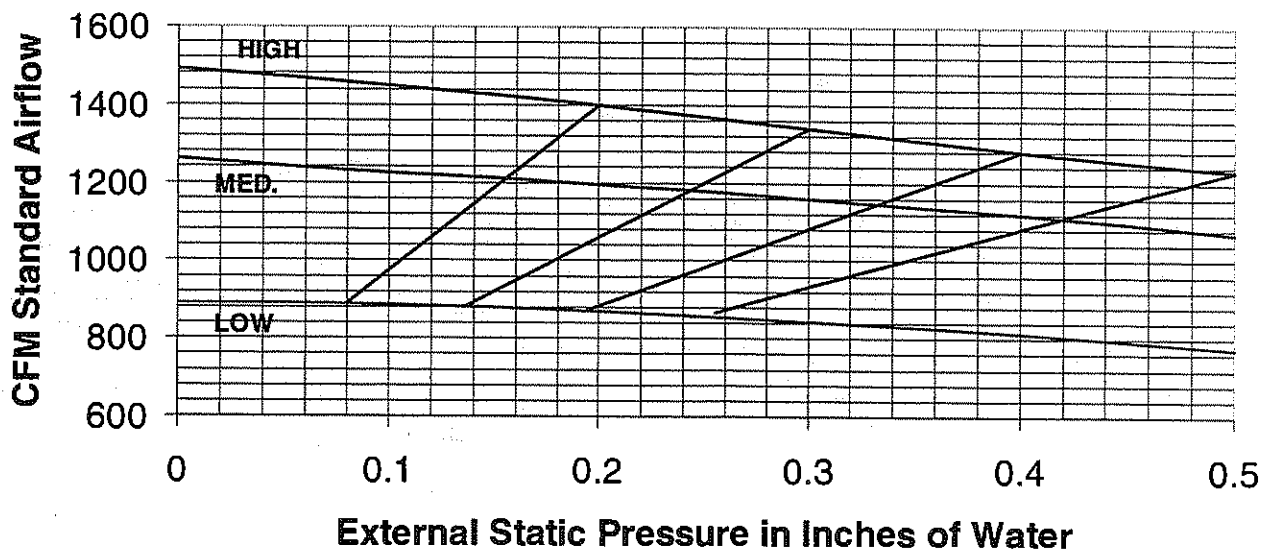
FLF/R110D48C System Resistance Curves



FLR140D60C System Resistance Curves



FC085D36C System Resistance Curves

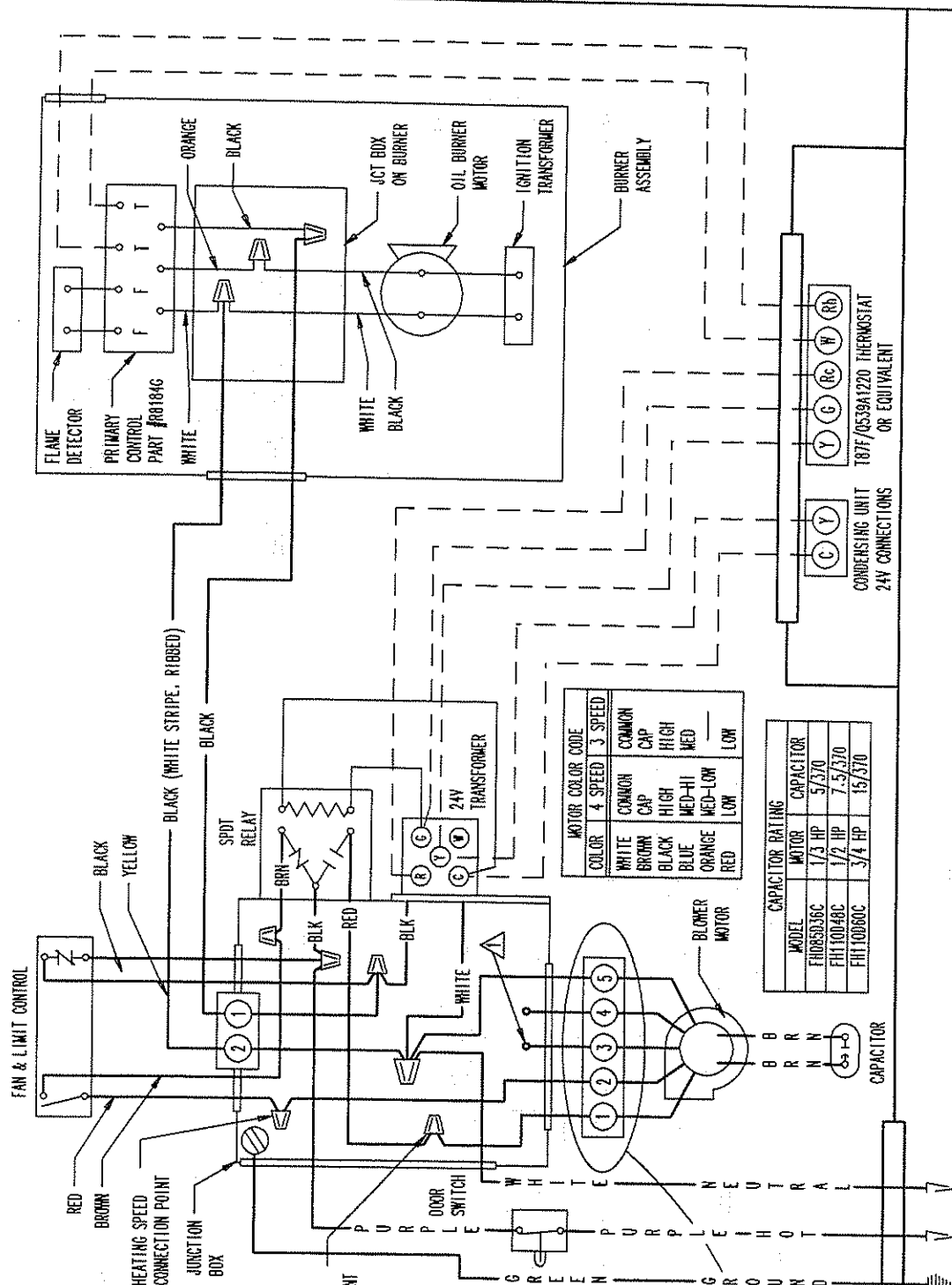


CONNECTION DIAGRAM DANGER: ELECTRICAL SHOCK HAZARD
DISCONNECT POWER BEFORE SERVICING.

FACTORY SETTINGS (CHART A)				
MODEL	INPUT RATE GPH	HEATING BLOWER SPEED (COLOR)	COOLING BLOWER SPEED (COLOR)	TEMPERATURE RISE RANGE
FH085D36C	.65	LOW (RED)	HIGH (BLACK)	70° - 100°
	.75	MED (BLUE)	HIGH (BLACK)	80° - 90°
FH110D48C	.85	LOW (RED)	HIGH (BLACK)	70° - 100°
	1.00	MED-LOW (ORANGE)	HIGH (BLACK)	80° - 90°
FH110D60C	.85	LOW (RED)	HIGH (BLACK)	60° - 90°
	1.00	MED-LOW (ORANGE)	HIGH (BLACK)	60° - 90°

COOLING BLOWER SPEEDS (CHART B)			
MODEL	NOMINAL A/C TONS	SPEED (COLOR)	CFM @ .50" W.C.
FH085D36C	2	LOW (RED)	730
	2 - 1/2	MED (BLUE)	900
	3	HIGH (BLACK)	1160
FH110D48C	2 - 1/2	LOW (RED)	1020
	3	MED-LOW (ORANGE)	1280
	3 - 1/2	MED-HIGH (BLUE)	1485
FH110D60C	4	HIGH (BLACK)	1640
	3	LOW (RED)	1300
	4	MED-LOW (ORANGE)	1480
	5	MED-HIGH (BLUE)	1660
		HIGH (BLACK)	1970

SPEED TAPS AVAILABLE FOR HEATING AND COOLING INPUT RATINGS. SEE CHARTS A AND B.
NOTE: ONLY ONE HEATING AND ONE COOLING SPEED CAN BE CONNECTED. THE OTHER SPEED TAPS MUST BE TAPED OFF INDEPENDENTLY FROM ALL OTHER WIRES.



MOTOR COLOR CODE			
COLOR	4 SPEED	3 SPEED	COMMON
WHITE	COMMON	CAP	HIGH
BROWN	CAP	HIGH	MED
BLACK	HIGH	MED-HI	LOW
BLUE	MED-HI	MED-LOW	
ORANGE	MED-LOW		
RED	LOW		

CAPACITOR BATING		
MODEL	MOTOR	CAPACITOR
FH085D36C	1/3 HP	5/370
FH110D48C	1/2 HP	7.5/370
FH110D60C	3/4 HP	15/370

ON FH110 MODELS THE ORANGE (MED-LOW) SPEED IS THE FACTORY CONNECTED HEATING SPEED

FACTORY FIELD WIRING WIRING
Low Voltage High Voltage

CONNECTION DIAGRAM DANGER: ELECTRICAL SHOCK HAZARD
DISCONNECT POWER BEFORE SERVICING.

CHART A (FACTORY SETTINGS)

MODEL	INPUT RATE GPH	HEATING BLOWER SPEED (COLOR)	COOLING BLOWER SPEED (COLOR)	TEMP. RISE RANGE
FC085D36C	.65	LOW (RED)	HIGH (BLACK)	50° - 80°
	.75	MED (BLUE)	HIGH (BLACK)	60° - 90°

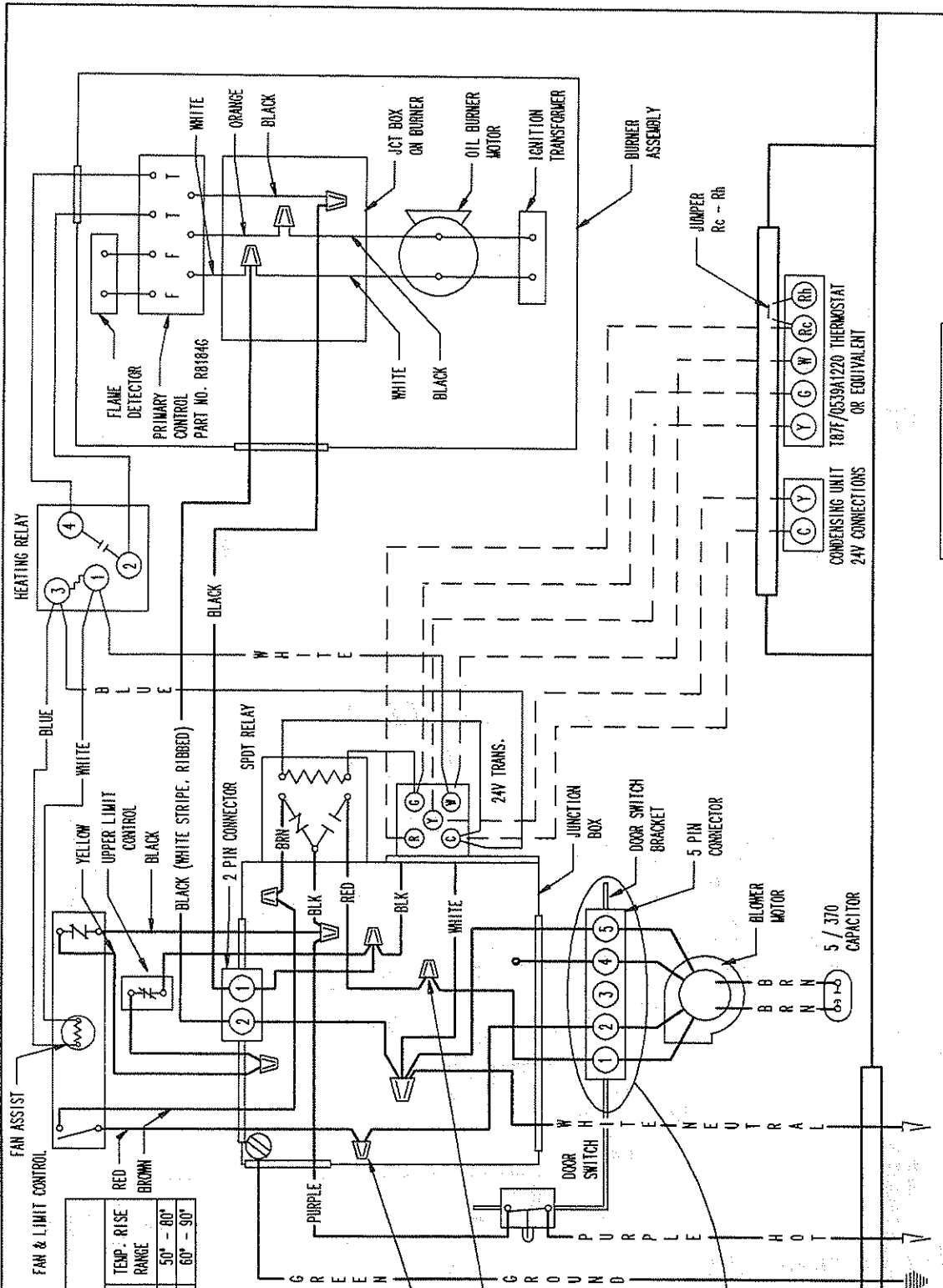
CHART B (COOLING BLOWER SPEEDS)

MODEL	NOMINAL AC (TONS)	SPEED (COLOR)	CFM @ .50" WC
FC085D36C	2	LOW (RED)	775
	2.5	MED (BLUE)	1070
	3	HIGH (BLACK)	1230

MOTOR COLOR CODE

COLOR	3 SPEED
WHITE	COMMON
BROWN	CAP
BLACK	HIGH
BLUE	MED
ORANGE	LOW
RED	LOW

SPEED TAPS AVAILABLE FOR HEATING AND COOLING INPUT RATINGS.
SEE CHARTS A AND B.
NOTE: ONLY ONE HEATING AND ONE COOLING SPEED CAN BE CONNECTED.
THE OTHER SPEED TAPS MUST BE TAPED OFF INDEPENDENTLY
FROM ALL OTHER WIRES.



115-60-1

Low Voltage	FACTORY WIRING	FIELD WIRING
High Voltage		

IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105 DEG C.

CONNECTION DIAGRAM
DANGER: ELECTRICAL SHOCK HAZARD
DISCONNECT POWER BEFORE SERVICING.

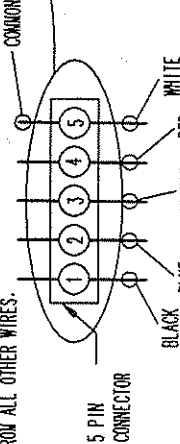
CHART A (FACTORY SETTINGS)

MODEL	INPUT RATE (GPH)	HEATING BLOWER SPEED (COLOR)	COOLING BLOWER SPEED (COLOR)	TEMP. RISE RANGE
FLF085D36C	.65	LOW (RED)	HIGH (BLACK)	60°-90°
FLR085D36C	.75	MED (BLUE)	HIGH (BLACK)	60°-90°
FLF110D48C	.85	MED-LOW (ORANGE)	HIGH (BLACK)	60°-90°
FLR110D48C	1.00	MED-HIGH (BLUE)	HIGH (BLACK)	60°-90°
FLR140D60C	1.10	MED-LOW (ORANGE)	HIGH (BLACK)	60°-90°
FLR140D60C	1.25	MED-HIGH (BLUE)	HIGH (BLACK)	60°-90°

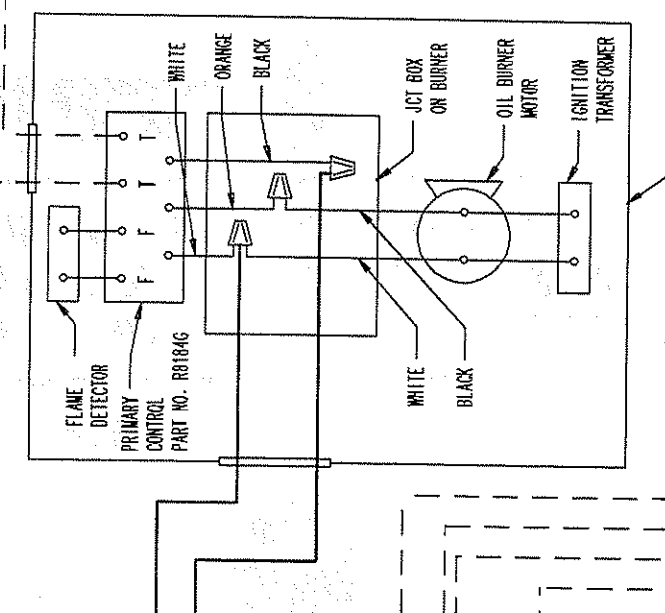
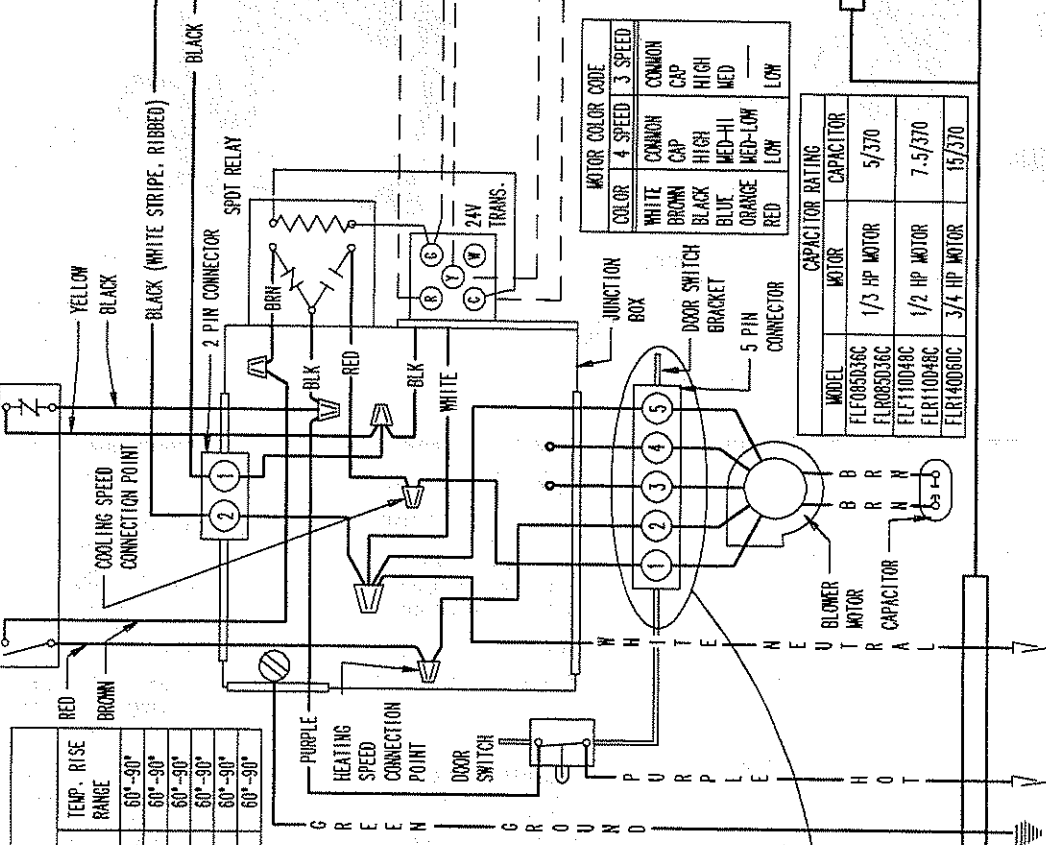
CHART B (COOLING BLOWER SPEEDS)

MODEL	NOMINAL AC (TONS)	SPEED (COLOR)	CFM @ .50" WC
FLF085D36C	2	LOW (RED)	775
FLR085D36C	2.5	MED (BLUE)	1070
FLF110D48C	3	HIGH (BLACK)	1230
FLR110D48C	2.5	LOW (RED)	1065
FLR110D48C	3.5	MED-LOW (ORANGE)	1235
FLR110D48C	4	MED-HIGH (BLUE)	1415
FLR140D60C	3	HIGH (BLACK)	1635
FLR140D60C	3.5	LOW (RED)	1190
FLR140D60C	4	MED-LOW (ORANGE)	1400
FLR140D60C	5	MED-HIGH (BLUE)	1640
FLR140D60C	5	HIGH (BLACK)	2250

SPEED TAPS AVAILABLE FOR HEATING AND COOLING INPUT RATINGS. SEE CHARTS A AND B.
 NOTE: ONLY ONE HEATING AND ONE COOLING SPEED CAN BE CONNECTED. THE OTHER SPEED TAPS MUST BE TAPED OFF INDEPENDENTLY FROM ALL OTHER WIRES.



FAN & LIGHT CONTROL



MOTOR COLOR	4 SPEED	3 SPEED
WHITE	COMMON	COMMON
BROWN	CAP	CAP
BLACK	HIGH	HIGH
BLUE	MED-HI	MED
ORANGE	MED-LOW	MED-LOW
RED	LOW	LOW

MODEL	MOTOR	CAPACITOR
FLF085D36C	1/3 HP MOTOR	5/370
FLR085D36C	1/2 HP MOTOR	7.5/370
FLR110D48C	3/4 HP MOTOR	15/370

CONDENSING UNIT
 24V CONNECTIONS
 T87F/AS39A1220 THERMOSTAT
 OR EQUIVALENT

FACTORY FIELD WIRING
 WIRING WIRING

Low Voltage
 High Voltage

IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105 DEG C.

INSTALLATION INFORMATION



FOR A-7000 SINGLE STAGE AND B-8000 TWO-STAGE FUEL UNITS MODELS A1 & B1 FOR 1725 RPM, BLACK LABEL MODELS A2 & B2 FOR 3450 RPM, WHITE LABEL

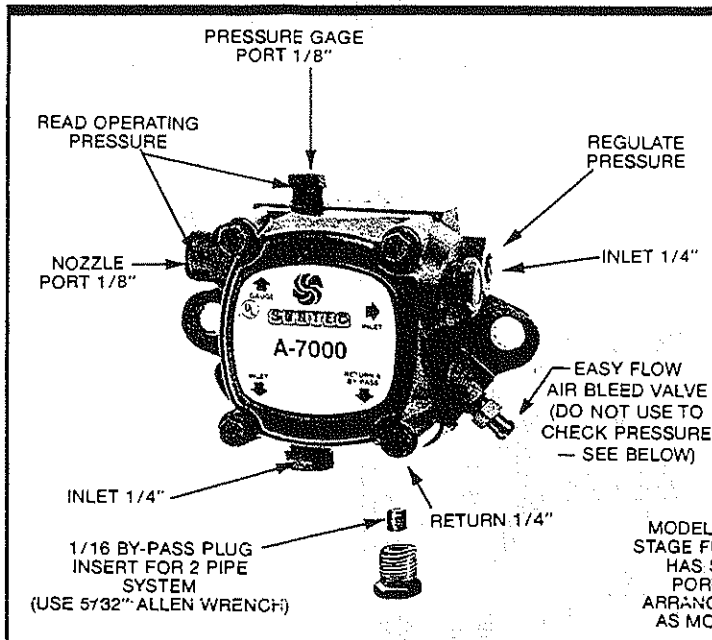


FIGURE 1

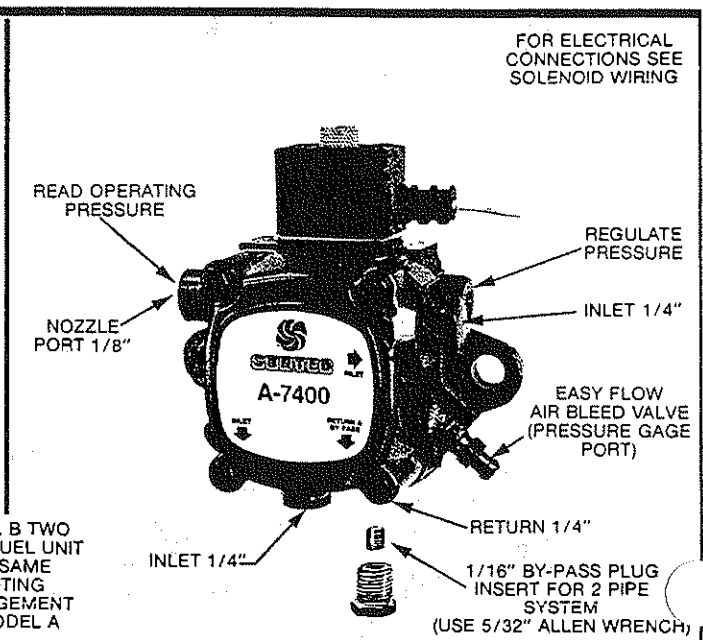


FIGURE 2

ONE-PIPE SYSTEM • FIGURE 4

DO NOT INSTALL BY-PASS PLUG! Connect inlet line to pump inlet. Start burner. Arrange primary burner control for continuous operation during purging. Open easy flow bleed valve 1 turn CCW. Bleed unit until all air bubbles disappear — **HURRIED BLEEDING WILL IMPAIR EFFICIENT OPERATION OF UNIT.** Tighten easy flow bleed valve securely. (Figure 4)

TWO-PIPE SYSTEM • FIGURE 5

REMOVE 1/16" BY-PASS PLUG FROM PLASTIC BAG ATTACHED TO UNIT. Remove 1/4" plug from return port. Insert by-pass plug (See Figure 1 or 2). Attach return and inlet lines. Start burner — Air bleeding is automatic. Opening Easy Flow Air Bleed Valve will allow a faster bleed if desired. Return line must terminate 3-4" above supply line inlet (See Figure 5). Failure to do this may introduce air into the system and could result in loss of prime.

SOLENOID WIRING

DISCONNECT POWER SUPPLY BEFORE WIRING TO PREVENT ELECTRICAL SHOCK OR EQUIPMENT DAMAGE. Lead wires on these devices are long enough to reach the junction box on most burner installations. Wire solenoid in parallel with burner motor (See Figure 3). All electrical work should be done according to local and national codes. (Solenoid 115V, 0.1A, 60 Hz)

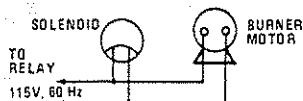


FIGURE 3

GENERAL INFORMATION • ALL SYSTEMS

IMPORTANT INFORMATION Long or oversized inlet lines may require the pump to operate dry during initial bleeding period. In such cases, the priming may be assisted by injecting fuel oil into the pump gearset. Under lift conditions, oil lines and fittings must be air tight. To assure this, "Pipe Dope" may be applied to both the used and unused inlet and both return fittings. **DO NOT USE TEFLON TAPE!! DO NOT USE COMPRESSION FITTINGS!!**

MOUNTING POSITION Model "A" Single Stage Fuel Unit may be mounted in any position. Model "B" Two Stage Fuel Unit may be mounted in any position except upside down (1/8" ports pointed down).

VACUUM CHECK A Vacuum Gage may be installed in either of the 1/4" inlet ports or in the 1/8" return port (on single pipe installations), whichever is most convenient. The Model "A" pump should be used where the vacuum does not exceed 6" hg, single pipe and 12" hg, two pipe. The Model "B" should be used where vacuum does not exceed 17" hg. Remember, running vacuum is the total of all pressure drops (ΔP) in the system from tank to inlet of pump.

PRESSURE CHECK If a pressure check is made use GAGE PORT OR NOZZLE PORT. **DO NOT USE EASY FLOW BLEED VALVE PORT FOR THE 7000 SERIES.** The Easy Flow Bleed Valve Port contains pressure higher than operating pressure. Setting pump pressure with gage in the Easy Flow Bleed Valve Port results in **WRONG** operating pressure. The 7400 is an exception (See Figure 2).

CUTOFF PRESSURE Average cutoff pressure for A and B fuel units is 80 psig. To check cutoff pressure, install pressure gage in nozzle port. Run burner for short period of time. Shut burner off. Gage shows cutoff pressure.

CAUTION

Pressurized or gravity feed installations must not exceed 10 P.S.I. on inlet line or return line at the pump. A pressure greater than 10 P.S.I. may cause damage to the shaft seal.

ONE-PIPE SYSTEM • MODEL A

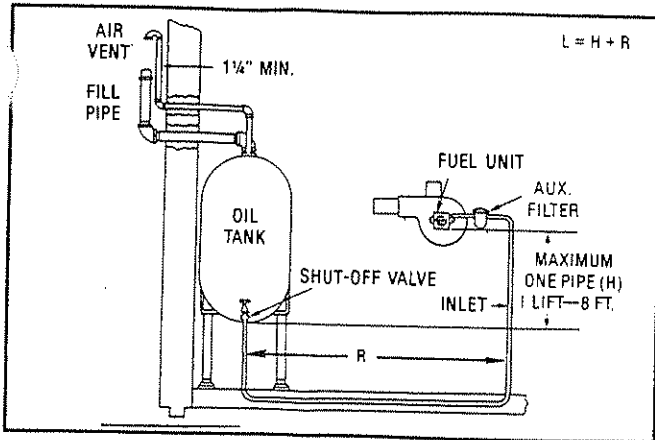


FIGURE 4

The SUNTEC MODEL "A"-70 FUEL UNIT may be installed ONE-PIPE with Gravity Feed or Lift.

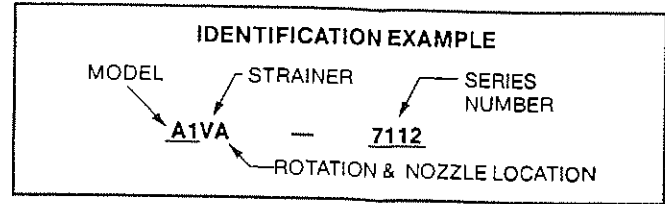
The maximum allowable lift is 8 ft. — See Figure 4.

IMPORTANT: One-pipe installations must be absolutely air tight or leaks or loss of prime may result. Bleed line and fuel unit completely. Bleed for 15 seconds after last air is seen from easy flow to be certain lines are air free.

L = Line Length in Feet H = Head in Feet Q = Firing Rate in GPH
 $3/8"$ line $L = \frac{6 - .75H}{.0086 Q}$ $1/2"$ line $L = \frac{6 - .75H}{.00218 Q}$

If tank is above pump change - to +. Fittings, valves, and filters will reduce total length allowed.

PUMP USAGE IDENTIFICATION



A		
MODEL	MAX NOZZLE CAPACITY (GPH) AT 100 PSI	RPM
A1V-7100	3	1725
A2V-7100	3	3450
A2V-7400	3	3450
A1Y-7900	7	1725
A2Y-7900	7	3450

B		
MODEL	MAX NOZZLE CAPACITY (GPH) AT 100 PSI	RPM
B1V-8200	3	1725
B2V-8200	3	3450
B1Y-8900	7	1725
B1Y-8900	7	3450

STRAINER TYPE	UL Strainer Rating (GPH)*
	#2 Fuel Oil
V	3
Y	7
T	16

DESIGNATOR	Rotation/Nozzle Location
A	RH/RH
B	RH/LH
C	LH/LH
D	LH/RH

*Max. firing rate not to exceed max. nozzle capacity or strainer rating whichever is Less. A greater firing rate requires a suitable external strainer.

ALL INSTALLATIONS SHOULD BE MADE IN ACCORDANCE WITH LOCAL AND NATIONAL CODES

TWO-PIPE SYSTEM • MODEL A AND B

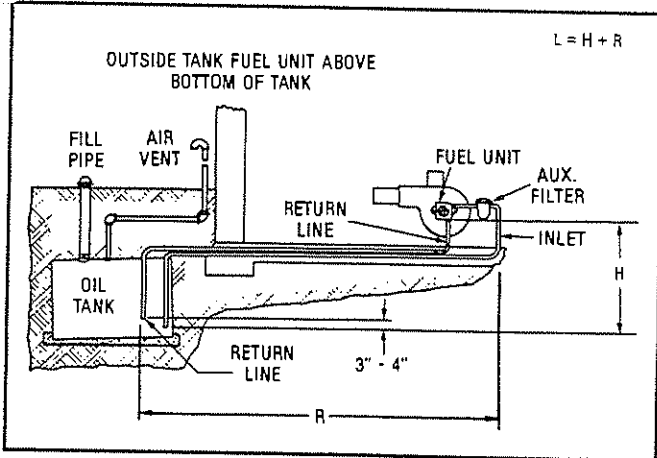


FIGURE 5

Always terminate return line as shown in Figure 5. Line lengths include both vertical and horizontal lengths.

A: SINGLE-STAGE • TWO-PIPE MAXIMUM LINE LENGTH (H + R)

Lift "H" Figure 5	1725 RPM		3450 RPM			
	3/8" OD Tubing		3/8" OD Tubing		1/2" OD Tubing	
	3 GPH	7 GPH	3 GPH	7 GPH	3 GPH	7 GPH
0'	86'	100'	84'	71'	100'	100'
1'	80'	100'	78'	66'	100'	100'
2'	75'	100'	73'	62'	100'	100'
3'	70'	100'	68'	57'	100'	100'
4'	64'	100'	63'	53'	100'	100'
5'	59'	100'	57'	48'	100'	100'
6'	54'	100'	52'	44'	100'	100'
7'	49'	100'	47'	39'	100'	100'
8'	43'	100'	42'	35'	100'	100'
9'	37'	100'	36'	31'	100'	100'
10'	32'	100'	31'	27'	100'	100'
11'	26'	100'	26'	22'	100'	87'
12'	21'	85'	21'	18'	83'	70'
13'	—	63'	—	—	62'	52'
14'	—	42'	—	—	41'	35'

B: TWO-STAGE • TWO-PIPE MAXIMUM LINE LENGTH (H + R)

Lift "H" Figure 5	1725 RPM				3450 RPM			
	3/8" OD Tubing		1/2" OD Tubing		3/8" OD Tubing		1/2" OD Tubing	
	3 GPH	7 GPH	3 GPH	7 GPH	3 GPH	7 GPH	3 GPH	7 GPH
0'	100'	91'	100'	100'	93'	80'	100'	100'
2'	100'	83'	100'	100'	85'	73'	100'	100'
4'	89'	75'	100'	100'	77'	66'	100'	100'
6'	80'	67'	100'	100'	69'	59'	100'	100'
8'	70'	59'	100'	100'	60'	52'	100'	100'
10'	61'	51'	100'	100'	52'	45'	100'	100'
12'	51'	43'	100'	100'	44'	38'	100'	100'
14'	41'	35'	100'	100'	36'	31'	100'	100'
16'	32'	27'	100'	100'	27'	24'	100'	93'
18'	22'	—	88'	74'	—	—	76'	65'



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