

OIL FURNACE INSTALLATION INSTRUCTIONS

MODELS:

FH085D36B

FLF085D36A

FLR110D48A

FH110D48B

FLR085D36A

FLR140D60A

FH110D60B

FLF110D48A

FC085D36A

WARNING

READ ALL INSTRUCTIONS CAREFULLY BEFORE BEGINNING THE INSTALLATION.

THE 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 2100-164 REV. M
SUPERSEDES REV. L
FILE VOL. I, TAB 3

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/NFPA 54
National Electrical Code	-ANSI/NFPA 70
Standard For The Installation Of Air Conditioning and Ventilating Systems	-ANSI/NFPA 90A
Standard For Warm Air Heating and Air Conditioning Systems	-ANSI/NFPA 90B
Standard For Installation of Oil Burning Equipment	-ANSI/NFPA 31
Standard For Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances	-NFPA 211
Load Calculation For Residential Winter and Summer Air Conditioning	-ACCA Manual J
Duct Design For Residential Winter and Summer Air Conditioning and Equipment Selection	-ACCA Manual D

FOR MORE INFORMATION, CONTACT THESE PUBLISHERS

ACCA:	AIR CONDITIONING CONTRACTORS OF AMERICA 1513 16th Street NW Washington, DC 20036 Telephone: (202) 483-9370	Fax: (202) 234-4721
ANSI:	AMERICAN NATIONAL STANDARDS INSTITUTE 11 West 42nd 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

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BRYAN, OHIO 43506 USA

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INSTALLATION AND OPERATING INSTRUCTIONS FOR OIL FURNACES

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--INCHES**

Model	Minimum Installation Clearances								Minimum Service Clearances		
	Furnace			Plenum		(1) Duct	Flue Pipe	Floor	Front	Back	Sides
	Front	Back	Sides	Top	Sides						
PH085D36B	4	1	2	2	2	2	9	C	24	--	--
PH110D48B	4	1	2	2	2	2	9	C	24	--	--
PH110D60B	4	1	2	2	2	2	9	C	24	--	--
FLP085D36A	6	0	2	2	2	2	9	NC	24	24	18*
FLR085D36A	6	18	2	2	2	2	9	NC	24	24	18*
FLF110D48A	6	0	2	2	2	2	9	NC	24	24	18*
FLR110D48A	6	18	2	2	2	2	9	NC	24	24	18*
FLR140D60A	6	18	2	2	2	2	9	NC	24	24	18*
PC085D36A	6	1	2	2	2	2	9	NC**	24	--	--

(1) For the first three feet from plenum. After 3 feet, no clearance required.

C - combustible flooring NC - non-combustible floor

* Maintained on one side or the other to achieve filter access and/or blower service.

** Floor must be non-combustible. 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	DxR Supply	DxF Return	Location	G Dia	H	J	Size	No. Used
FLF085D36A	23	47-1/4	40-1/4	22x20	22x16	Front	6	--	5-1/4	11-1/2x17	2
FLR085D36A	23	47-1/4	40-1/4	22x20	22x16	Rear	6	34	--	11-1/2x17	2
FLF110D48A	23	47-1/4	44-1/4	22x20	22x16	Front	6	--	5-1/4	10x20/13x20	1
FLR110D48A	23	47-1/4	44-1/4	22x20	22x16	Rear	6	38	--	10x20/13x20	1
FLR140D60A	26	50	50	25x20	25x16	Rear	6	43-5/8	--	13x20	2

(1) Permanent washable type filter 1" nom. thickness.

FIGURE 1

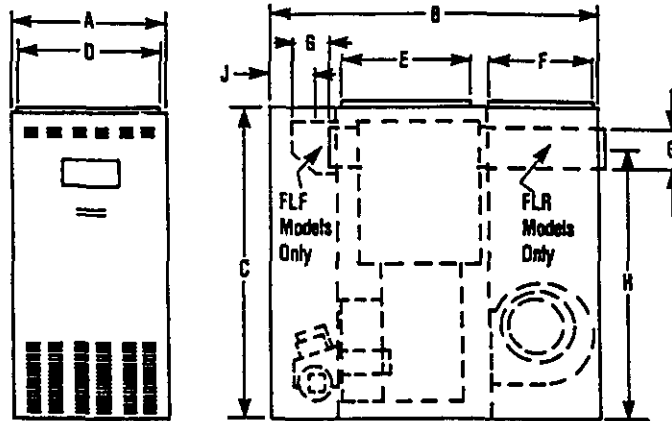


TABLE 3 DIMENSIONS (Inches) HI-BOY MODELS

Model Number	Cabinet			Plenum Opening		G	(1) Filter Size
	A Width	B Depth	C Height	DxR Supply	FxR (2) Return	Flue Diameter	
FHO85D36B	23	31-1/2	56	22x20	23x14	6	16x25
FH110D48B	23	31-1/2	60	22x20	23x14	6	16x25
FH110D60B	23	31-1/2	60	22x20	23x14	6	20x25

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

FIGURE 2

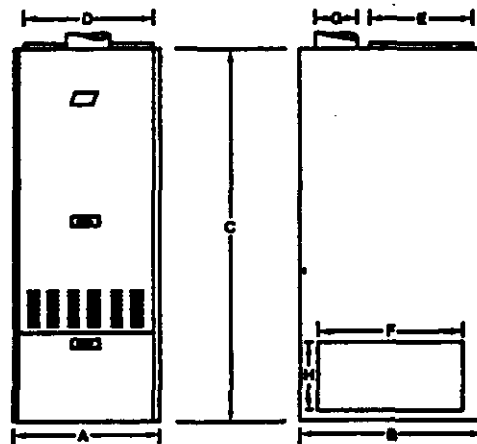
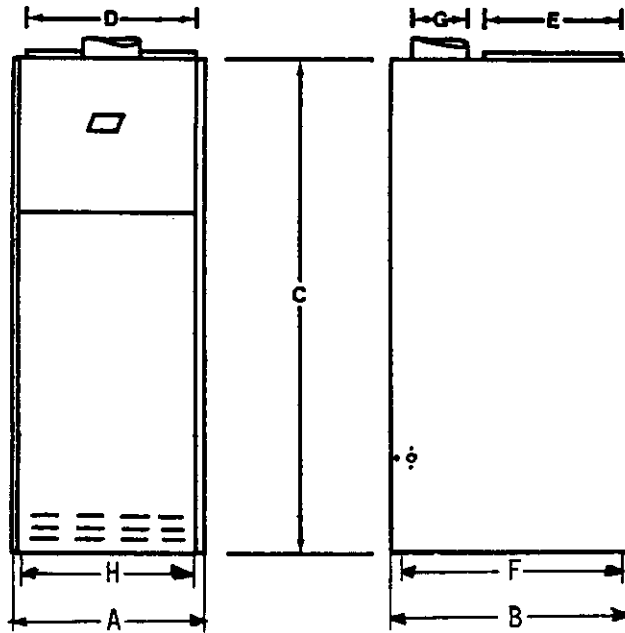


TABLE 4 DIMENSIONS (Inches) COUNTERFLOW MODELS

Model Number	Cabinet			Plenum Opening		G	(1) Filter Size
	A Width	B Depth	C Height	DxB Return	FxH Supply	Flue Diameter	
FC085D36A	23	29-1/2	56	22x20	18x19	6	10x20 (1) 15x20 (1)

(1) Permanent washable type filter.

FIGURE 3



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 curves on pages 17 - 21 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.

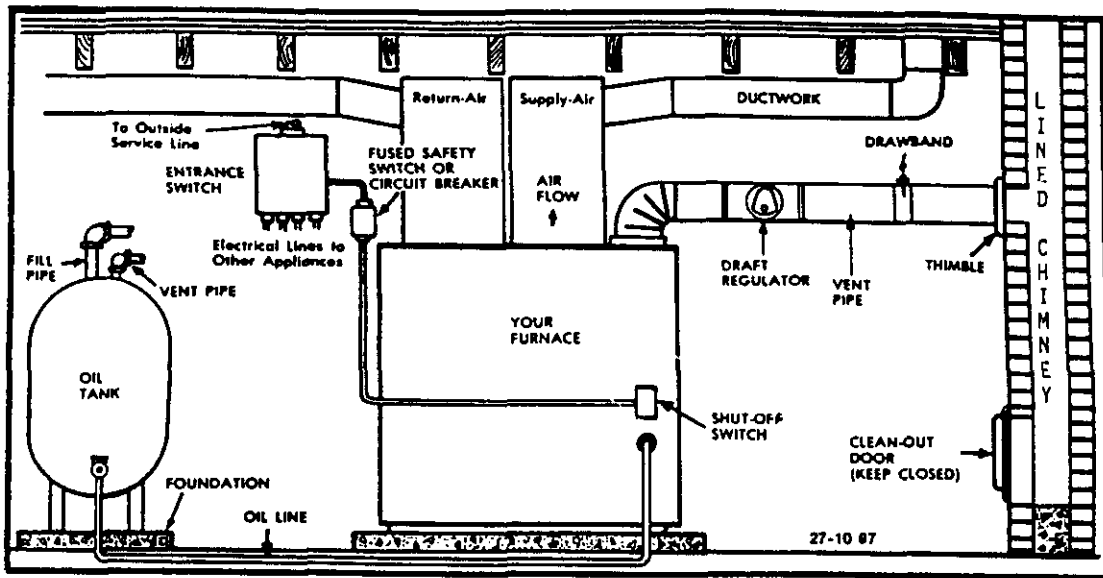
INSTALLING THE FURNACE

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 1.)

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.

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.

WIRING

FACTORY--All units are fully factory wired. Multi-speed 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.

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		
FBO85D36B	115/60/1	10	1/3	7.5	1/7	2.5	15	15
FBI10D48B	115/60/1	13	1/2	10.5	1/7	2.5	16	20
FBI10D60B	115/60/1	15	3/4	12.5	1/7	2.5	19	20
FLFO85D36A	115/60/1	8.1	1/3	5.6	1/7	2.5	15	15
FLRO85D36A	115/60/1	8.1	1/3	5.6	1/7	2.5	15	15
FLFI10D48A	115/60/1	13	1/2	10.5	1/7	2.5	16	20
FLRI10D48A	115/60/1	13	1/2	10.5	1/7	2.5	16	20
FLRI40B60A	115/60/1	15	3/4	12.5	1/7	2.5	19	20
FCO85D36A	115/60/1	8.1	1/3	5.6	1/7	2.5	15	15

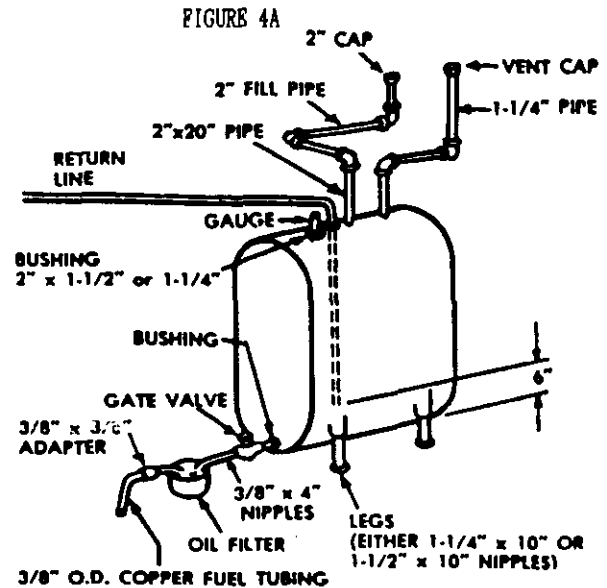
OIL FUEL PUMP

All models are factory standard with single stage fuel pumps mounted on the oil burners. Refer to pump specifications on page 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 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 installation is shown in Figure 4A. For installation details for this and other tank configurations, refer to NFPA31--latest edition. All tank and pipe set-ups 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, preferable location is 1/8 inch from inside surface. Burner head should be centered on the combustion chamber opening.

TABLE 6 FURNACE DATA

Model Number	Furnace Installed Standard			Field Installed Option		
	(1) Nozzle Size	Input BTUH	Heating Capacity BTUH (2)	(1) Nozzle Size	Input BTUH	Heating Capacity BTUH (2)
FLP085D36A	.75	105,000	85,000	.65	91,000	75,000
FLR085D36A	.75	105,000	85,000	.65	91,000	75,000
FLP110D48A	1.00	140,000	115,000	.85	119,000	98,000
FLR110D48A	1.00	140,000	115,000	.85	119,000	98,000
FLR140D60A	1.25	175,000	141,000	1.10	154,000	125,000
PCO85D36A	.75	105,000	84,000	.65	91,000	74,000
FHO85D36B	.75	105,000	84,000	.65	91,000	74,000
FH110D48B	1.00	140,000	113,000	.85	119,000	96,000
FH110D60B	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 tests using D.O.E. isolated combustion rating procedure.

WARNING
Never attempt to use gasoline in your furnace. Gasoline is more combustible than fuel oil and could result in a serious explosion.

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 gage 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 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 purpose 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 7. 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 6A.

TABLE 6A
Correlation of Percent of CO₂, O₂ & 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

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 to determine the steady-state efficiency.

TABLE 6B No. 2 Fuel Oil Efficiency Chart (Net Stack Temp. °F)

Z02	200	250	300	350	400	450	500	550	600	650	700	750	800	%CO2
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 7 Recommended Start-Up Settings

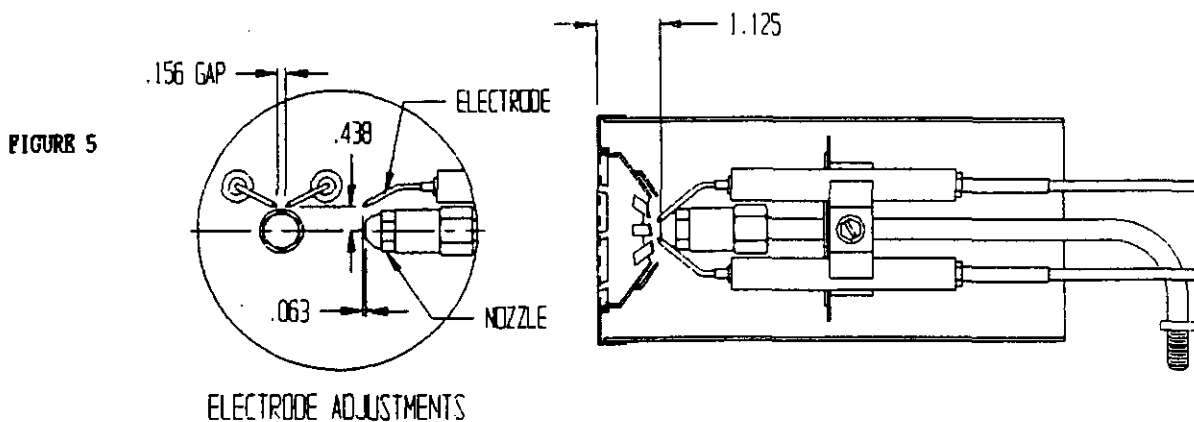
Furnace Model No.	Burner Door/ Part No.	Factory Installed			Field Installed Option		
		Nozzle (1)	Air Band Setting	Air Shutter Setting	Nozzle (1)	Air Band Setting	Air Shutter Setting
FRO85D36B	AF/9020-017	.75	0	5	.65	0	3
FH110D48B	AF/9020-017	1.00	0	7	.85	0	6
FH110D60B	AF/9020-017	1.00	0	7	.85	0	6
FLF085D36A	AF/9020-017	.75	0	5	.65	0	3
FLF110D48A	AF/9020-017	1.00	0	7	.85	0	6
FLR085D36A	AF/9020-018	.75	0	5	.65	0	3
FLR110D48A	AF/9020-018	1.00	0	8	.85	0	6
FLR140D60A	AF/9020-019	1.25	1	5	1.10	1	5
FCO85D36A	AF/9020-017	.75	0	5	.65	0	3

(1) 80° hollow cone spray pattern.

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 settings in Table 7.

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 the drawing below.



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.

VENTILATION AND COMBUSTION AIR

Appliances shall be installed in a location which 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. Appliances shall be located in such a manner as not to interfere with proper circulation of air within the confined space. When buildings 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 openings to which they connect. The minimum dimension of rectangular air ducts shall be not less than 3 inches (76 mm). See Table 8 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 below.

TABLE 8

4,000 BTUH Per Square Inch Round Duct Size	Total BTUH Input
4-3/8	60,000
5-1/8	80,000
5-1/4	85,000
5-7/8	105,000
6-1/8	115,000
6-1/4	120,000
6-3/4	140,000
6-7/8	145,000
7-1/4	160,000
8	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 gases. However, in buildings of unusually tight constructions, additional air shall be provided using the method described under "All Air From Outdoors" below.

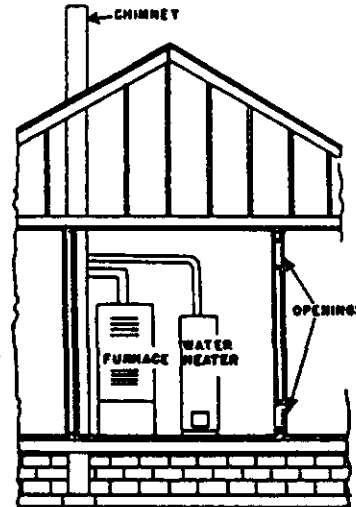
An unconfined space (such as an open basement) must have a minimum volume of 50 cubic feet per 1,000 BTUH of total of all appliances in area. Adjoining rooms may be counted as one area, only if there are no doors between the rooms.

Shown in Table 9 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.

TABLE 9

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

FIGURE 6
APPLIANCES LOCATED IN CONFINED SPACES--
ALL AIR FROM INSIDE THE BUILDING



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.

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.

LOCATED IN CONFINED SPACES

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 6) Also see Table 10 for specific ventilation opening requirements for the furnace only.

TABLE 10

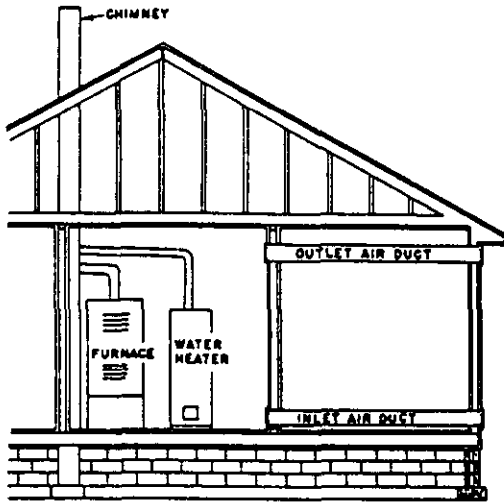
Model	Minimum Ventilation Opening-Square Inch	Recommended Opening 2 Required	
		Size	Sq. In.
FH085D36B	240	8 x 16	128
FH110D48B	280	9 x 18	162
FH110D60B	280	9 x 18	162
FLF085D36A	290	8 x 19	152
FLR085D36A	290	8 x 19	152
FLF110D48A	340	9 x 19	171
FLR110D48A	340	9 x 19	171
FLR140D60A	360	9.5 x 19	180
FC085D36A	240	8 x 16	128

THE FLOW OF COMBUSTION AND VENTILATING AIR MUST NOT BE OBSTRUCTED FROM REACHING THE FURNACE.

ALL AIR FROM OUTDOORS

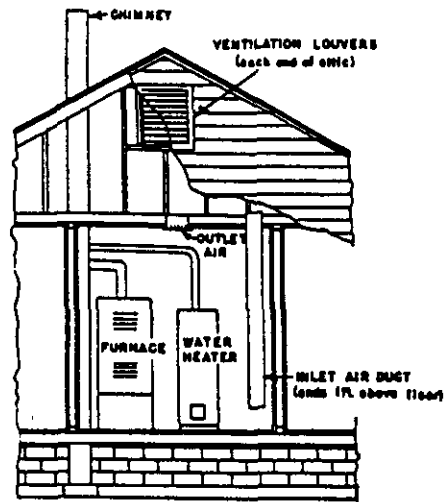
- A. The confined space shall be provided with two permanent openings, one in or near the top of the enclosure and one in or near the bottom. The openings shall communicate directly, or by means of ducts, with outdoors or to such spaces (crawl or attic) that freely communicate with outdoors. (See Figures 7, 8, 9)
- 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.

FIGURE 7
 APPLIANCES LOCATED IN CONFINED SPACES--
 ALL AIR FROM OUTDOORS



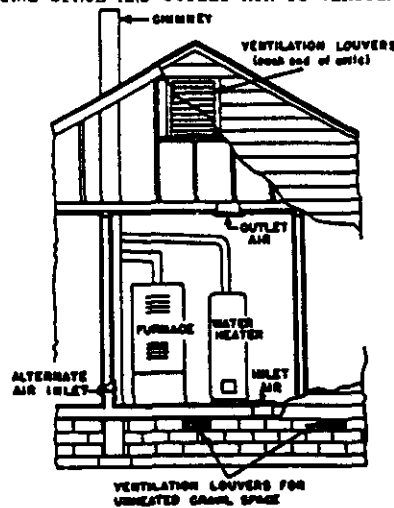
NOTE: Each air duct opening shall have a free area of not less than one square inch per 2,000 BTU per hour (70 square inches per gallon per hour) of the total input rating of all appliances in the enclosure.

FIGURE 8
 APPLIANCES LOCATED IN CONFINED SPACES--
 ALL AIR FROM OUTDOORS THROUGH 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 all appliances in the enclosure.

FIGURE 9
 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.

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 20-25 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 of adequate size must 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

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. See additional information and wiring details on pages 26 - 28.

FAN AND LIMIT CONTROL

The fan and limit control is factory installed on all units. See Table 11 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. The temperature rise across the unit should fall within the "Rise Range" as shown in Table 11. It is normally desirable 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. See wiring details on pages 26 - 28.

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 FC085D36A, the blower "on" setting is timed to assure blower operation. This blower "on" setting cannot be adjusted.

IMPORTANT
Do not set the blower "ON" setpoint lever of the combination fan/limit control above 150.

TABLE 11 TEMPERATURE RISE RANGES, LIMIT CONTROL SETTINGS, AND HEATING BLOWER SPEEDS

MODEL	NOZZLE (1)	RISE RANGES	HEATING BLOWER SPEED	LIMIT SETTING	ON	OFF
FH085D36B	.65	70 - 100	Low	170	110	90
	.75	60 - 90	Med	170	110	90
FH110D48B	.85	70 - 100	Low	170	110	90
	1.00	60 - 90	Med Low	170	110	90
FH110D60B	.85	60 - 90	Low	170	110	90
	1.00	60 - 90	Med Low	170	110	90
FLF085D36A	.65	60 - 90	Low	230	140	110
	.75	60 - 90	Med	230	140	110
FLF110D48A	.85	60 - 90	Med Low	230	140	110
	1.00	60 - 90	Med High	230	140	110
FLR085D36A	.65	60 - 90	Low	250	140	110
	.75	60 - 90	Med	250	140	110
FLR110D48A	.85	60 - 90	Med Low	240	140	110
	1.00	60 - 90	Med High	240	140	110
FLR140D60A	1.10	60 - 90	Med Low2	220	140	110
	1.25	60 - 90	Med High	220	140	110
FC085D36A	.65	70 - 100	Low	180	125	100
	.75	60 - 90	Med	180	125	100

(1) 80 degree hollow cone spray pattern

FILTERS

All models are shipped with filters. See Table 12 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 to furnace, see Figure 12. Refer to Figure 13 for Lo-Boy models which have filters internally mounted in blower compartment at rear of furnace.

TABLE 12

FILTER SIZES FOR GAS FURNACES	
Model	Size
FH085D36B Hi-Boy	(1) 16x25x1 P
FH110D48B Hi-Boy	(1) 16x25x1 P
FH110D60B Hi-Boy	(1) 20x25x1 P
FLF085D36A FLR085D36A Lo-Boys	(2) 11.5x17x1 P
FLF110D48A	(1) 10x20x1 P
FLR110D48A Lo-Boys	(1) 13x20x1 P
FLR140D60A Lo-Boy	(2) 13x20x1 P
FC085D36A Counterflow	(1) 10x20x1 P (1) 15x20x1

P - Permanent

FILTER LOCATIONS--REMOVAL AND REPLACEMENT PROCEDURES--HI-BOY MODELS

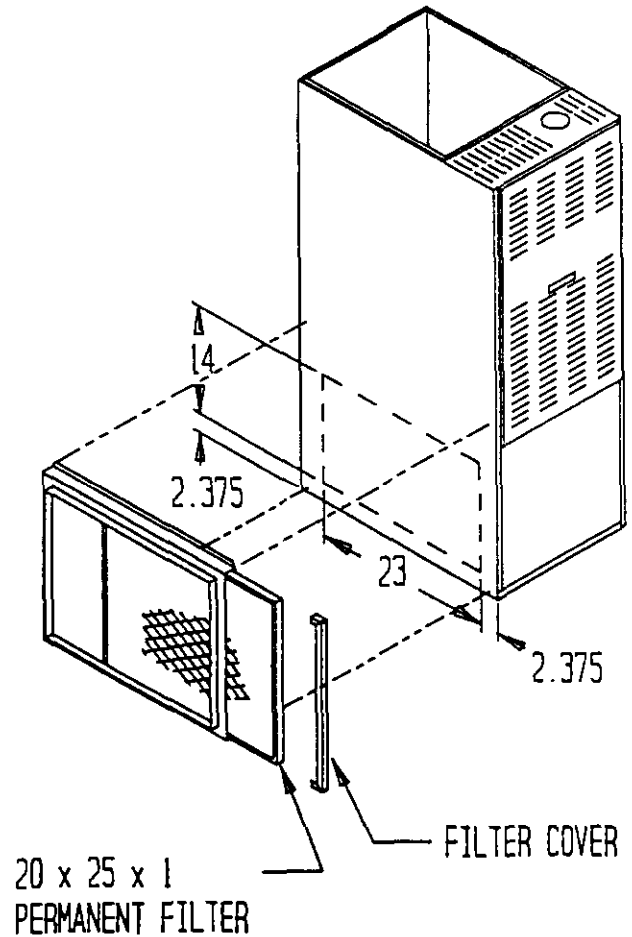
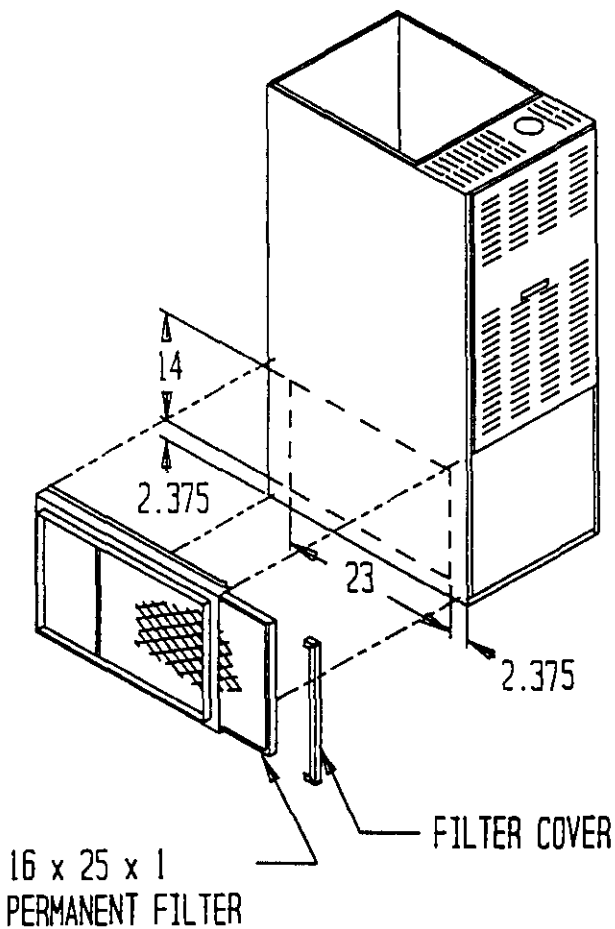
16 x 25 x 1 external filter racks are supplied as standard equipment for all FH models (20 x 25 x 1 is standard for FH110D60B model). A 14 x 23 opening is to be cut into either the left or right side of the furnace depending upon installation requirements.

See Figure 10 for typical installation of a 16 x 25 x 1 filter rack centered over the 14 x 23 cutout.

Figure 11 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.

FIGURE 10

FIGURE 11



To remove filter from the filter rack (see Figures 10 and 11), remove the filter access cover and grasp the end of the filter.

This filter is the permanent 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.

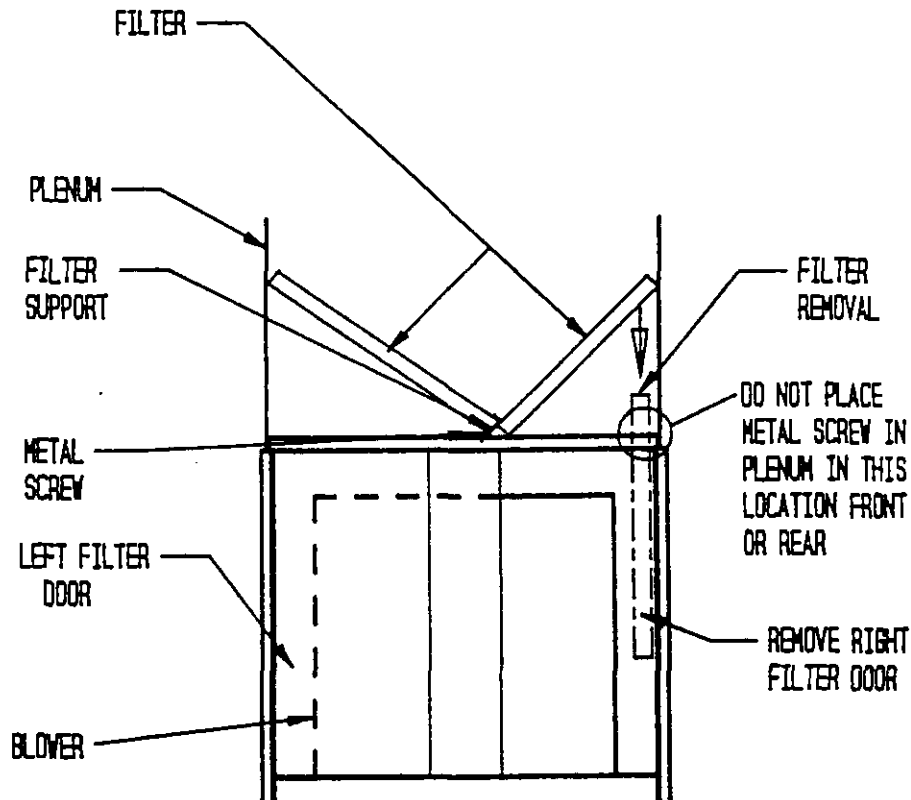
To replace filter, reverse the above procedure.

FILTER LOCATIONS--COUNTERFLOW MODELS

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 12 below for proper filter locations.

FIGURE 12

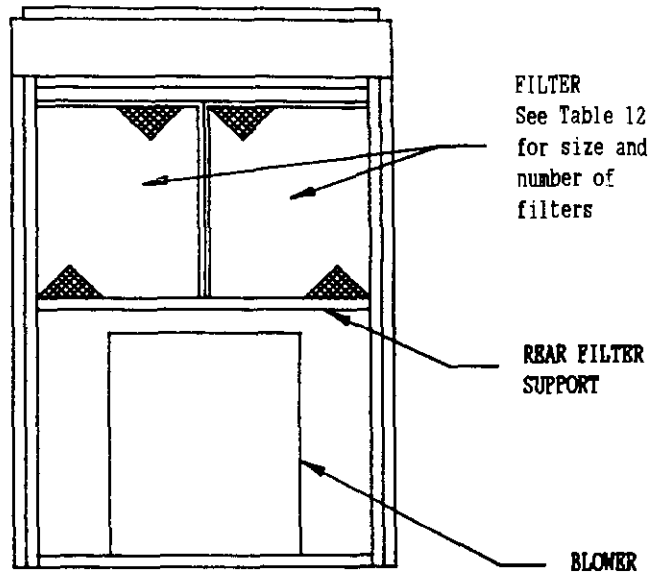


ATTACH FILTER SUPPORT TO FURNACE AS SHOWN WITH TWO SHEET METAL SCREWS. THE FILTERS CAN BE INSTALLED AND REMOVED THROUGH THE RIGHT FILTER DOOR.

FILTER LOCATIONS--LO-BOY MODELS

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 13 below.

FIGURE 13



MAINTENANCE

LUBRICATION

The oil burner motor bearings should be lubricated at least twice each year using a few drops of a good grade of 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

Permanent, washable air filters are supplied with each furnace. Permanent 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 manufacturers' 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.

COMMON CAUSES OF TROUBLE

CAUTION
To avoid accidents, always open main switch (OFF position) when servicing 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 airbound. Follow instructions for bleeding fuel pump.

BURNER STARTS OR STOPS TOO OFTEN. Limit control may be set too low. 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 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 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.

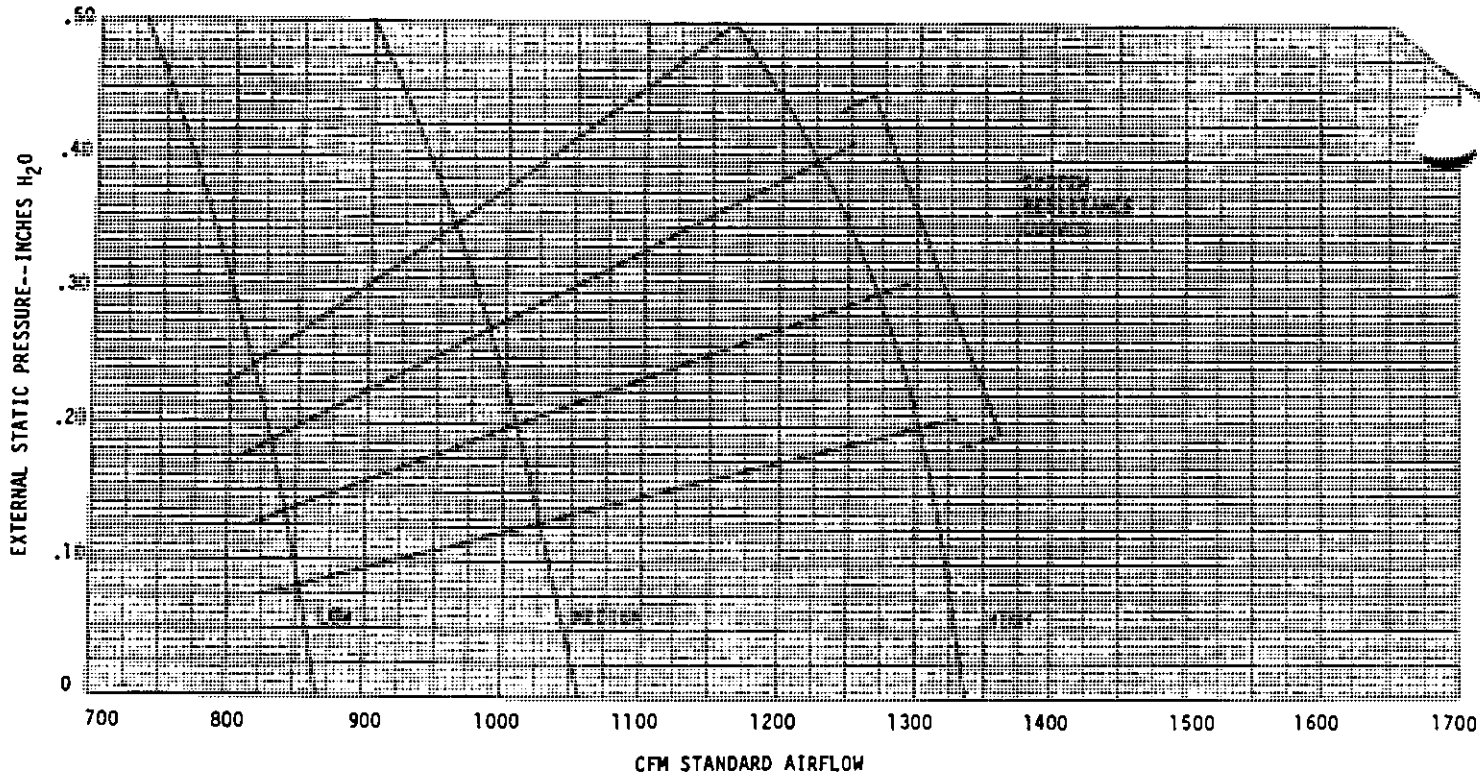
CARE OF FINISH

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.

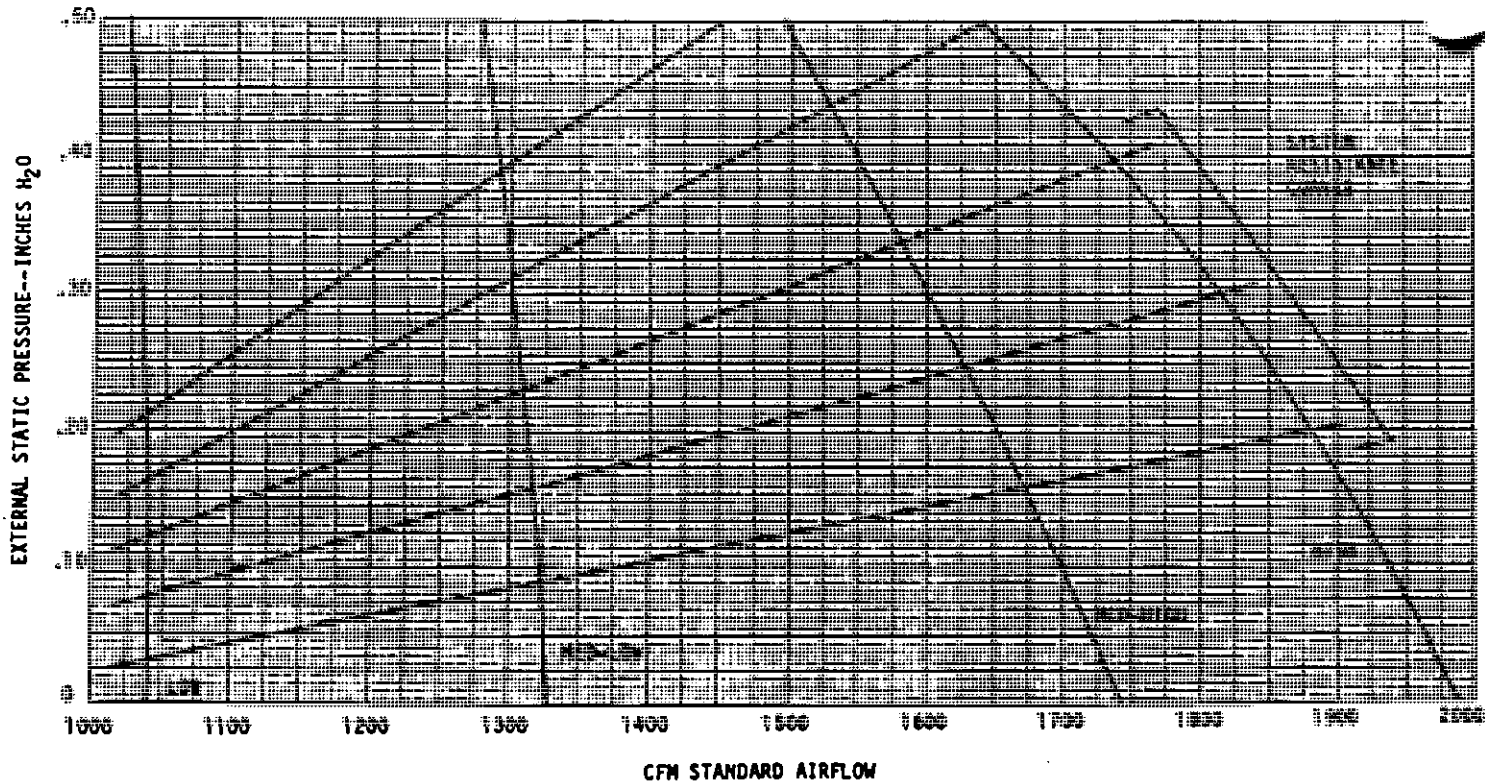
CLEANING OF FURNACE

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 cleanout access cover in the burner compartment. The furnace should be checked annually by a qualified service technician.

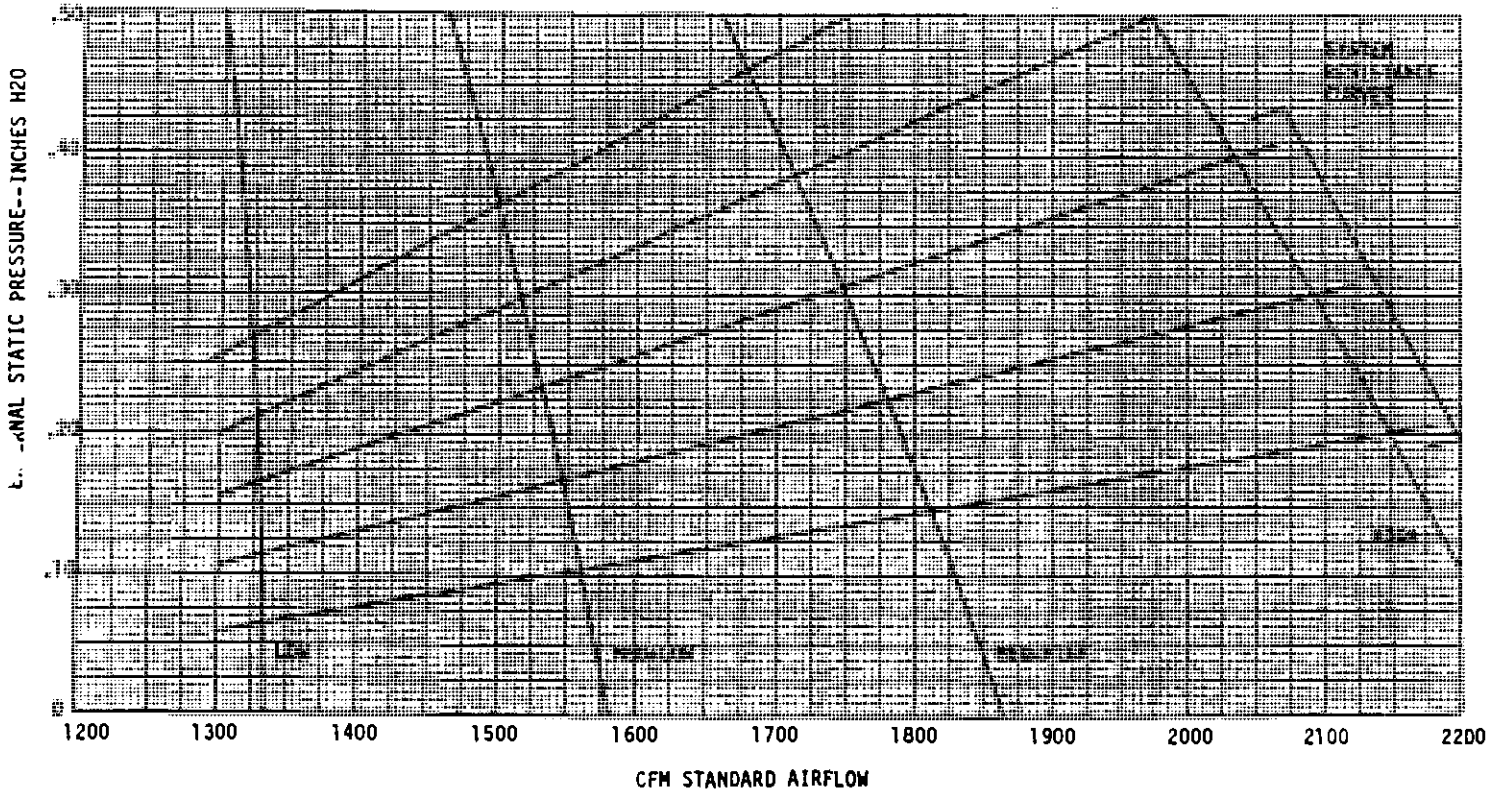
MODEL FH085D36A HI-BOY FURNACE



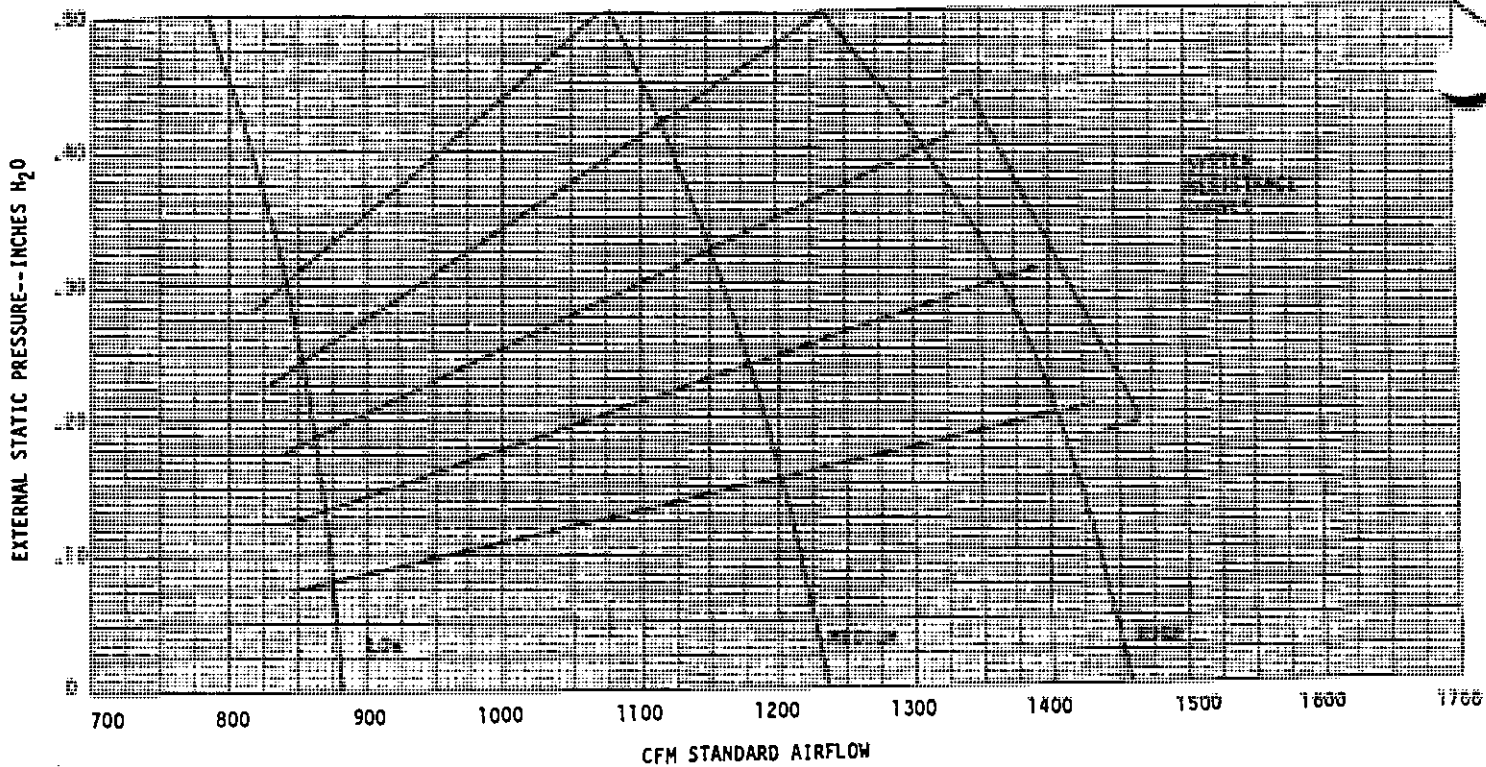
MODEL FH110D48A HI-BOY FURNACE



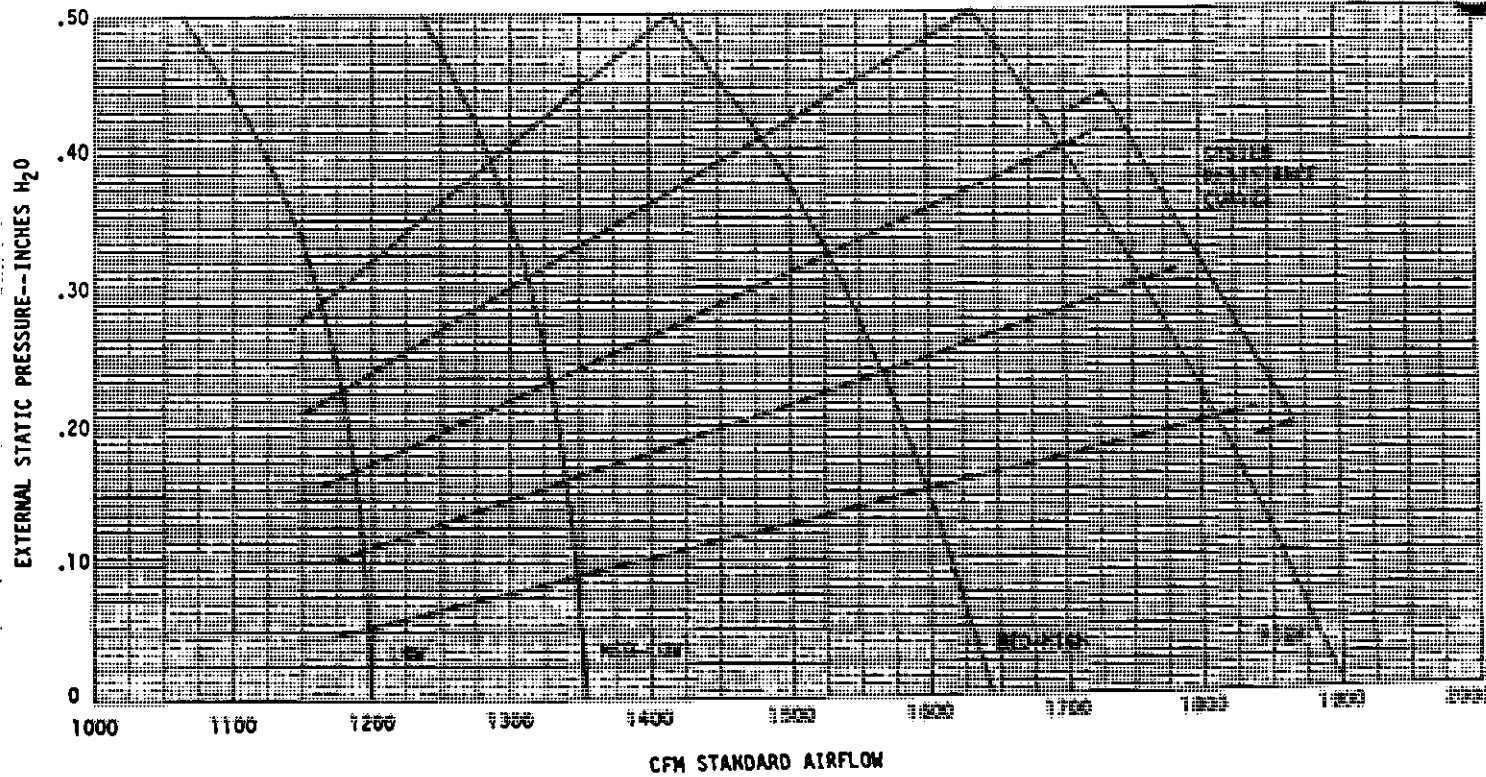
MODEL FH110D60B HI-BOY FURNACE



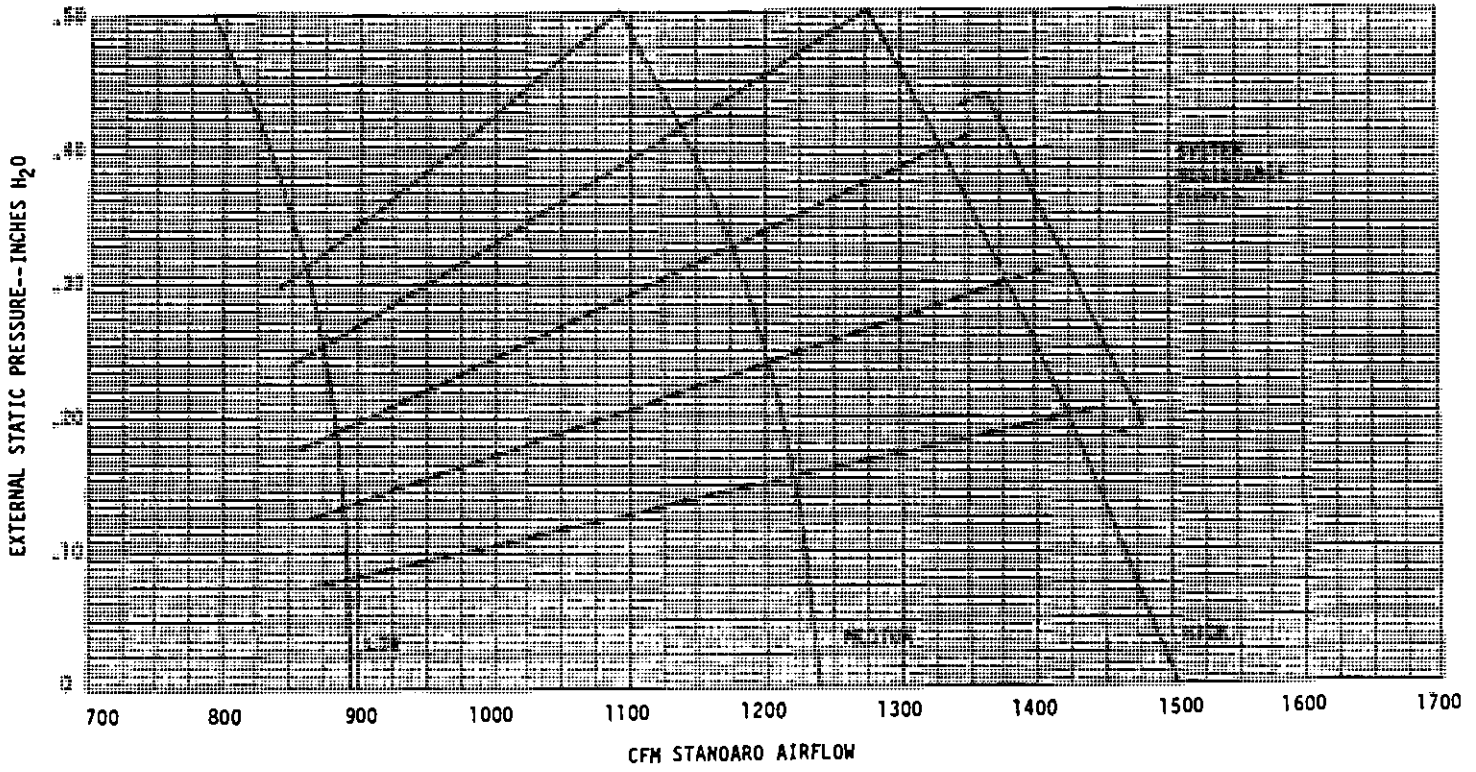
MODEL FLF085D36A LO-BOY FURNACE



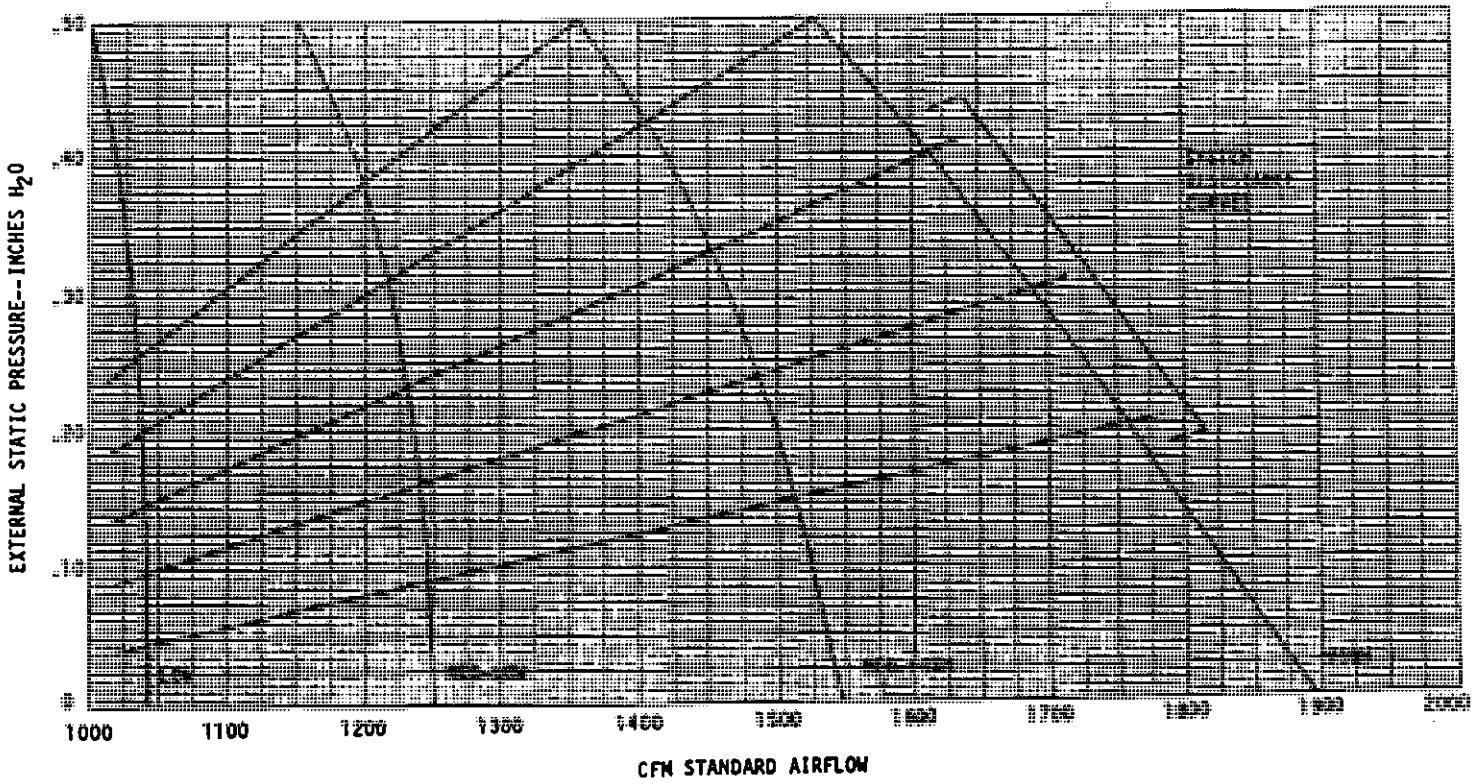
MODEL FLF110D48A LO-BOY FURNACE



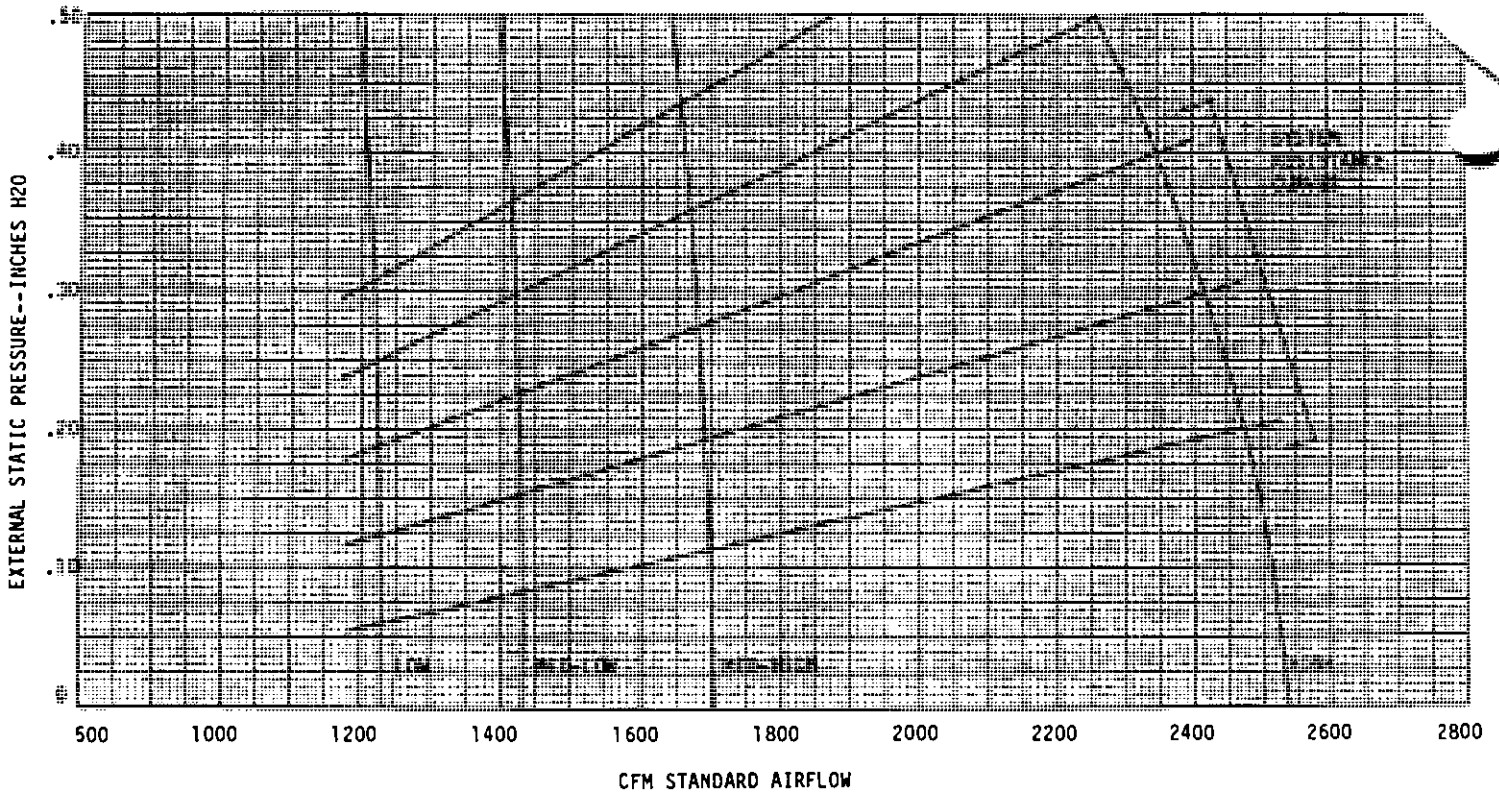
MODEL FLR085D36A LO-BOY FURNACE



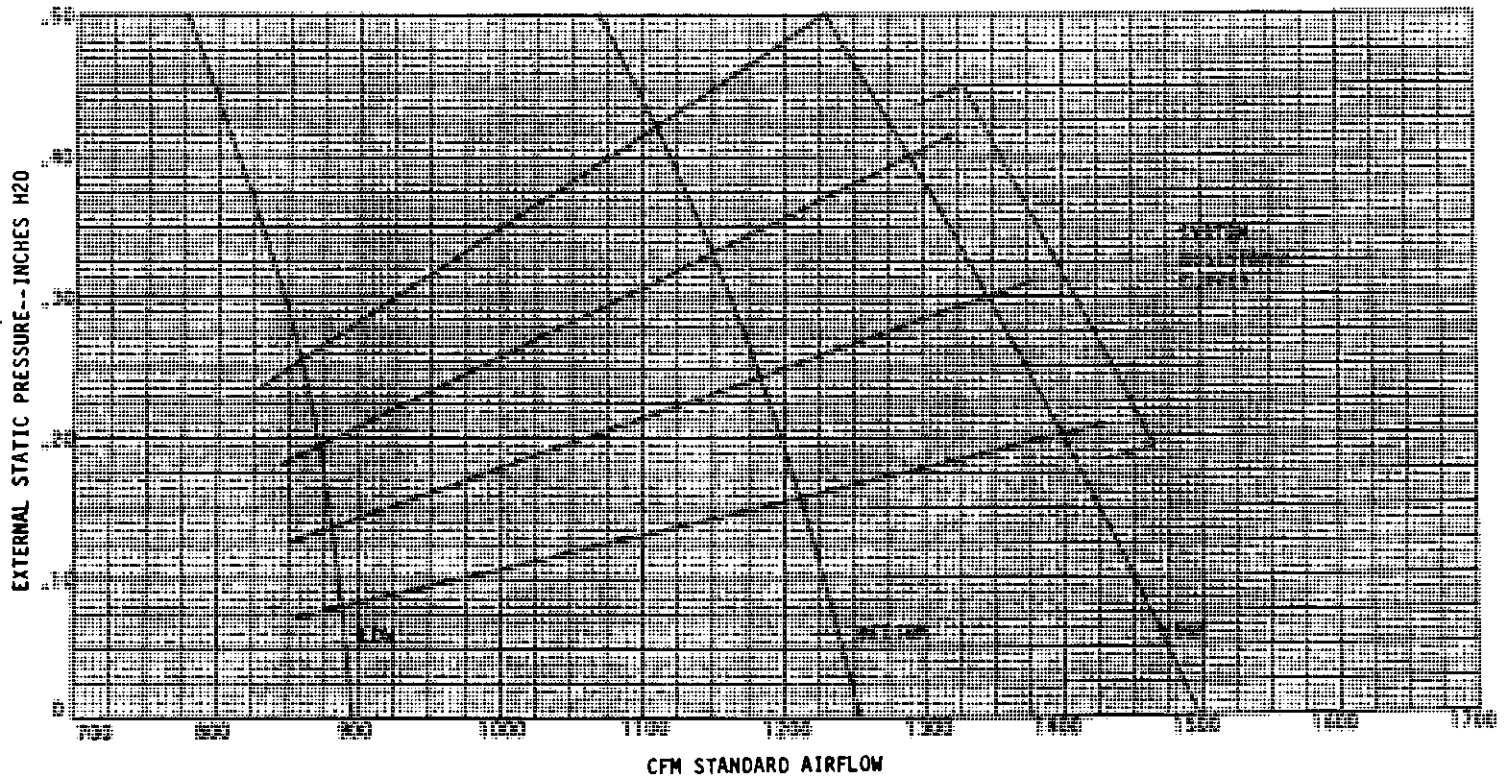
MODEL FLR110D48A LO-BOY FURNACE



MODEL FLR140D60A LO-BOY FURNACE



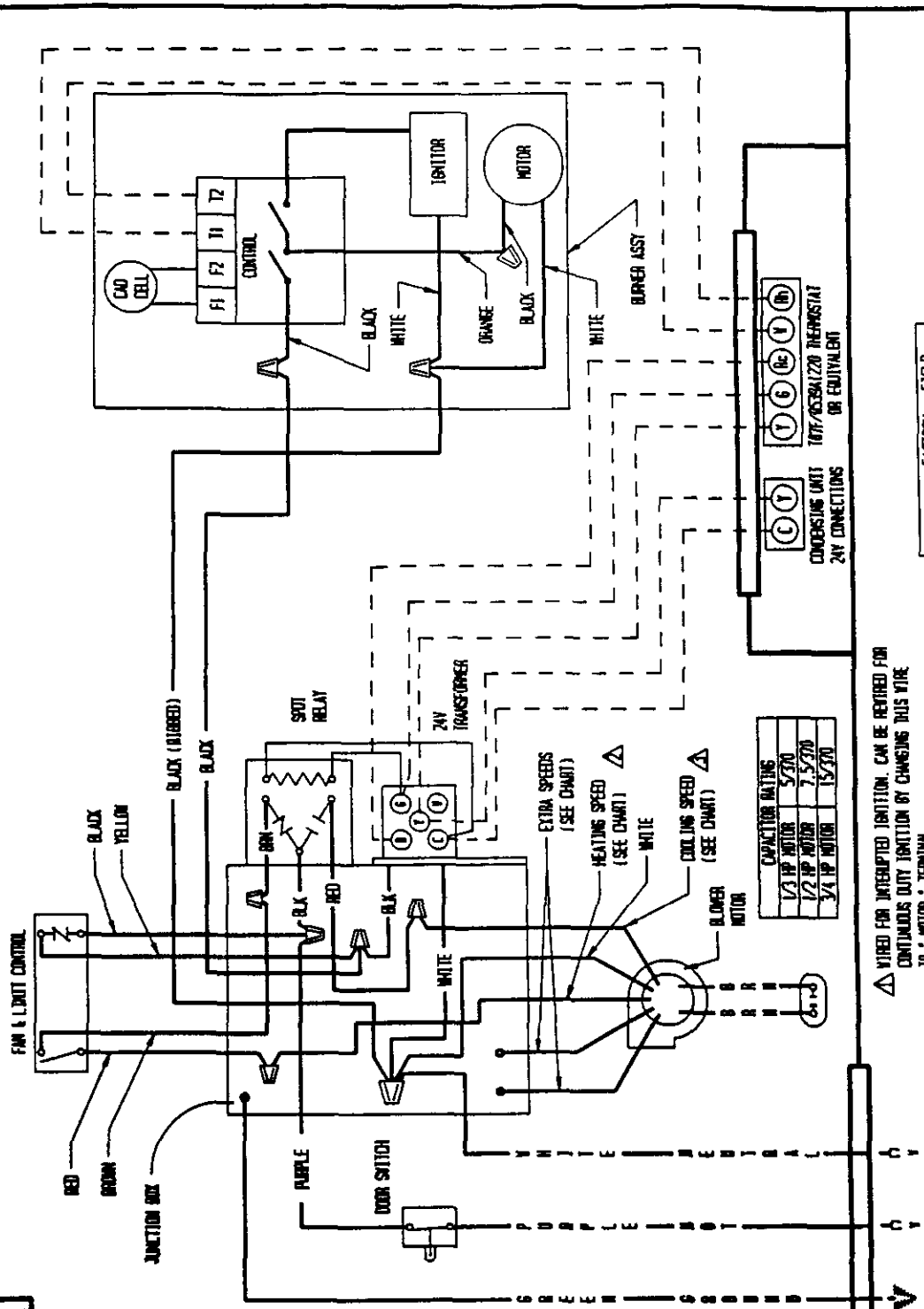
MODEL FC085D36A COUNTERFLOW FURNACE



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

TECHNICAL INFORMATION			
MODEL	INPUT VOLTAGE	HEATING ELEMENTS	TEMPERATURE
	120V	1	150° - 160°
FR050000	120V	2	150° - 160°
FR110000	120V	2	150° - 160°
FR110000	120V	2	150° - 160°

MOTOR COLOR CODE	COLOR	SPEED	3 SPEED
WHITE	COMMON	COMMON	COMMON
BROWN	CAP	HIGH	HIGH
BLACK	LOW	RED	RED
BLUE	RED	LOW	LOW
RED	RED	LOW	LOW
BROWN	LOW	LOW	LOW



CAPACITOR RATING	1/2 HP MOTOR	5/8 HP MOTOR	3/4 HP MOTOR	1 1/2 HP MOTOR
1/2 HP MOTOR	5/20	5/20	5/20	5/20
3/4 HP MOTOR	5/20	5/20	5/20	5/20
1 1/2 HP MOTOR	15/20	15/20	15/20	15/20

- △ WIRED FOR INTERRUPTED IGNITION. CAN BE REWIRED FOR CONTINUOUS DUTY IGNITION BY CHANGING THIS WIRE TO * MOTOR * TERMINAL.
- △ FACTORY WIRED USING RED WIRE FOR PH10 AND BLUE WIRE FOR PH05
- △ FACTORY WIRED USING BLACK WIRE

FACTORY WIRING	FIELD WIRING
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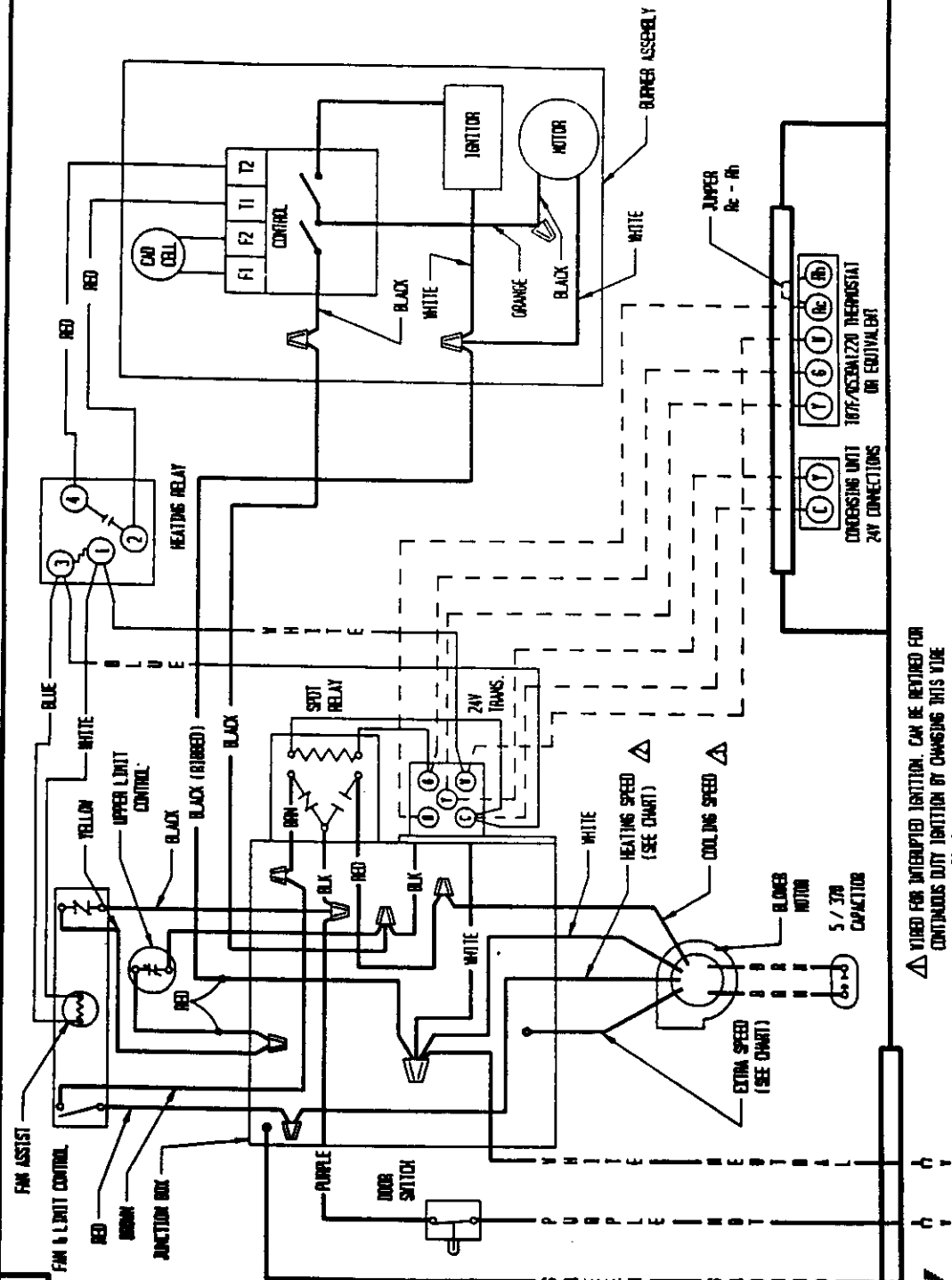
Low Voltage
High Voltage

115-00-1

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 DEGS C.

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

TECHNICAL INFORMATION			
MODEL	INPUT RATE	HEATING BLOWER SPEED (COLOR)	TEMPERATURE RANGE
F036050A	.65	LOW (RED)	50° - 60°
F036050A	.75	HIGH (BLUE)	60° - 90°



CONDENSING UNIT 24V CONNECTIONS	100% ARIANZU THERMOSTAT OR EQUIVALENT	FIELD WIRING
(C) (T)	(1) (6) (R) (H)	Low Voltage
		High Voltage

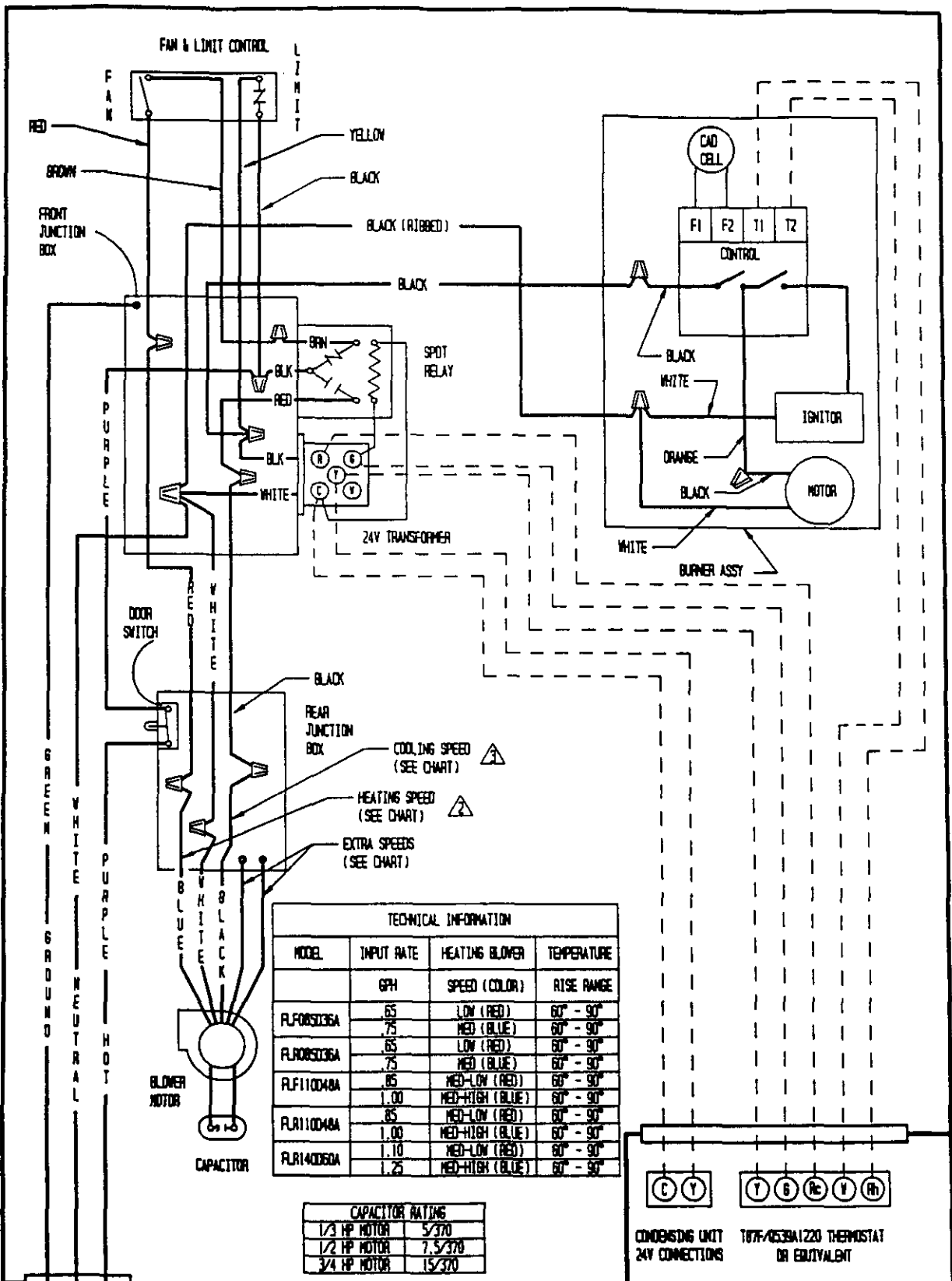
▲ WIRED FOR INTERRUPTED IGNITION. CAN BE REWIRED FOR CONTINUOUS DUTY IGNITION BY CHANGING THIS WIRE TO "MOTOR" TERMINAL.

▲ FACTORY WIRED USING BLUE WIRE

▲ FACTORY WIRED USING BLACK WIRE

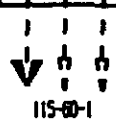
115-90-1

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



TECHNICAL INFORMATION			
MODEL	INPUT RATE	HEATING BLOWER	TEMPERATURE
	GPH	SPEED (COLOR)	RISE RANGE
FLF0R5036A	.65	LOW (RED)	60° - 90°
	.75	MED (BLUE)	60° - 90°
FLR0R5036A	.65	LOW (RED)	60° - 90°
	.75	MED (BLUE)	60° - 90°
FLF110D48A	.85	MED-LOW (RED)	60° - 90°
	1.00	MED-HIGH (BLUE)	60° - 90°
FLR110D48A	.85	MED-LOW (RED)	60° - 90°
	1.00	MED-HIGH (BLUE)	60° - 90°
FLR140D60A	1.10	MED-LOW (RED)	60° - 90°
	1.25	MED-HIGH (BLUE)	60° - 90°

CAPACITOR RATINGS	
1/3 HP MOTOR	5/370
1/2 HP MOTOR	7.5/370
3/4 HP MOTOR	15/370



- ⚠️ WIRED FOR INTERRUPTED IGNITION. CAN BE REWIRED FOR CONTINUOUS DUTY IGNITION BY CHANGING WIRE TO "MOTOR" TERMINAL.
- ⚠️ FACTORY WIRED USING BLUE WIRE
- ⚠️ FACTORY WIRED USING BLACK WIRE

CONNECTION DIAGRAM DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

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.

	FACTORY WIRING	FIELD WIRING
Low Voltage	————	-----
High Voltage	————	-----

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

4047-110 I

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

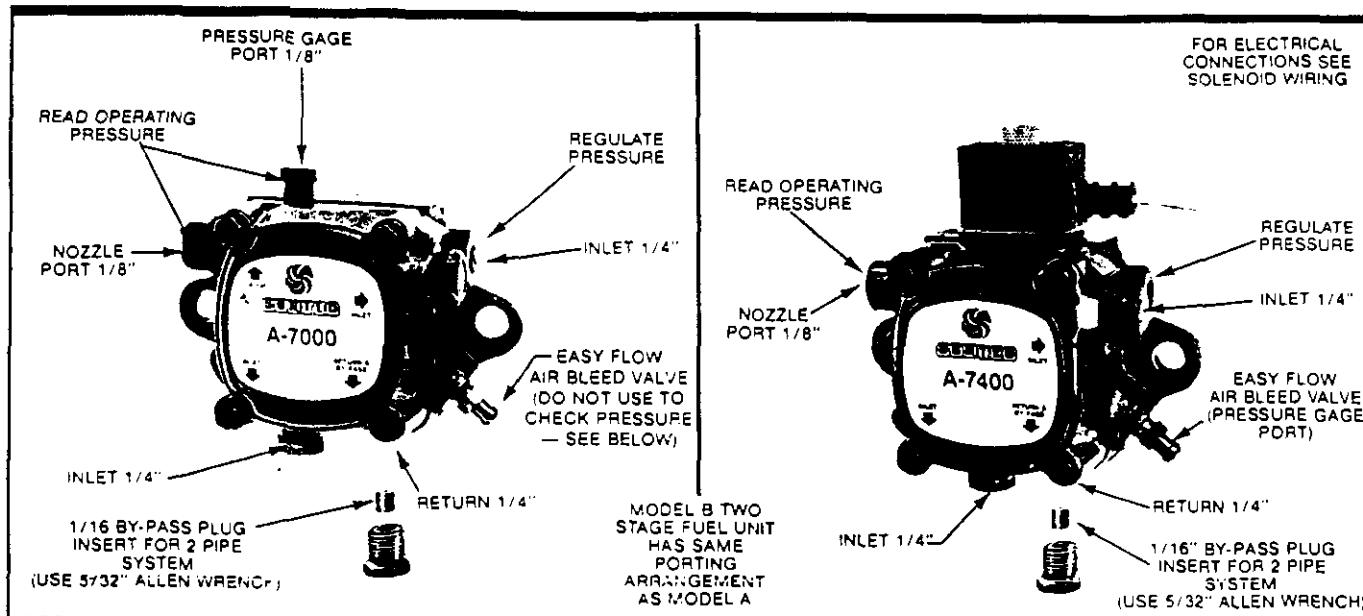


FIGURE 1

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)

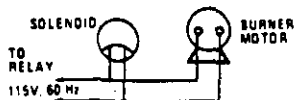


FIGURE 3

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

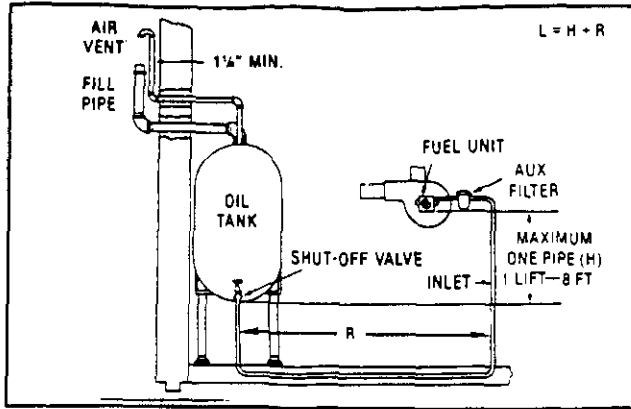


FIGURE 4

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.

TWO-PIPE SYSTEM • MODEL A AND B

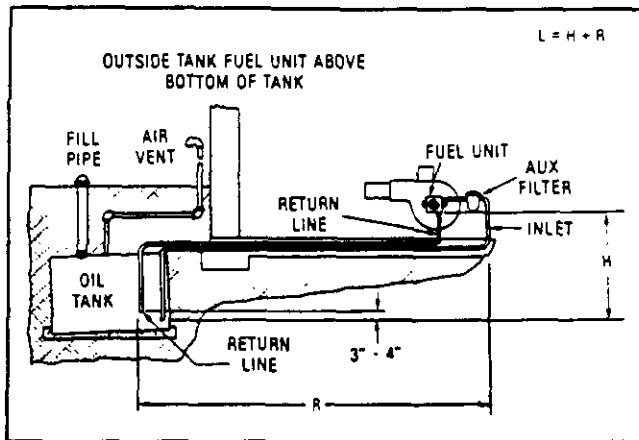


FIGURE 5

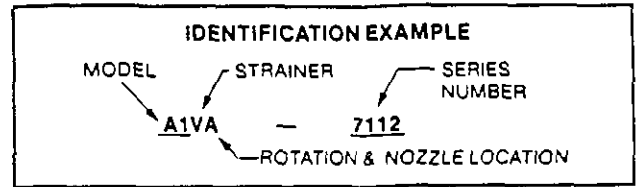
Always terminate return line as shown in Figure 5. Line lengths include both vertical and horizontal lengths.



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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
A1V-7900	7	1725
A2V-7900	7	3450

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

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

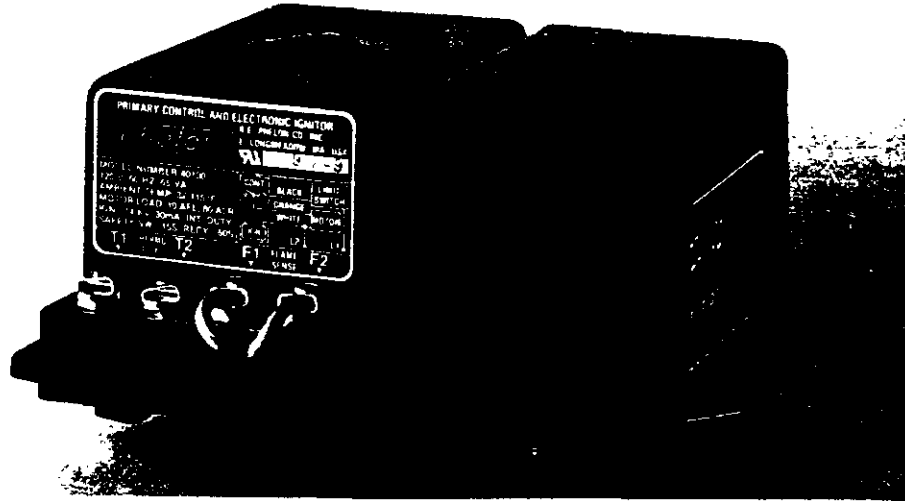
Lift "H" Figure 5	1725 RPM		3450 RPM					
	3/8" OD Tubing		1/2" OD Tubing		3/8" OD Tubing		1/2" OD Tubing	
	3 GPH	7 GPH	3 GPH	7 GPH	3 GPH	7 GPH	3 GPH	7 GPH
0'	86'	100'	84'	71'	100'	100'	100'	100'
1'	80'	100'	73'	66'	100'	100'	100'	100'
2'	75'	100'	73'	62'	100'	100'	100'	100'
3'	70'	100'	68'	57'	100'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



INSTRUCTION MANUAL
ELECTRONIC OIL BURNER PRIMARY
CONTROL AND IGNITOR



The PHELOM Model 40100-02 Oil Burner Ignitor/Control provides an interrupted duty electronic ignition and recycle type primary control mounted on a single baseplate. The 40100-02 model is designed to mount directly on top of standard flame retention oil burners, and offers the following features:

- Patented interrupted duty electronic ignitor provides longer trouble-free operation and lower operating costs.
- Provides 5 to 10 second ignition overrun time after the "trial for ignition" period to prevent nuisance lockouts.
- Provides 24 VAC thermostatic control.
- Provides 15 second safety switch timing with externally mounted manual reset button.
- Control, ignitor, and cadmium sulfide flame detector are each field replaceable and interchangeable on most standard flame retention burners.
- Can be used with standard cadmium sulfide flame detector.
- Control, ignitor, and cadmium sulfide cell enclosures and mounting plate are made of light weight, high impact plastic for ease of handling and installation.
- Control, ignitor, and cadmium sulfide cell are prewired at the factory, reducing normal installation time.
- Provides external low voltage terminal strip with screw terminals for ease of installation.
- Safety monitor circuit will shut down burner in the event the motor relay contacts stick.

MODEL 40100-02

SPECIFICATIONS

MODEL NO. 40100-02 SERIES

CONTROL SERIES 14290

Power Consumption:

120 VAC, 60 Hz, 10 VA

Motor Load Relay Contacts:

Full Load 10A

Locked Rotor 60A

Ignition Sequence: Interrupted duty

Safety Switch Timing: 15 Seconds

Recycle Time: 60-120 Seconds

Ambient Operating Temperature: 32-144 degrees F.

Anticipator: current = .2A

Recommended CAD resistance (burner running) = less than 1500 ohms.

IGNITOR SERIES 14280

Power Consumption:

120 VAC, 60 Hz, 60 VA

Output Power: 14KV, 30mA RMS

Secondary Grounding: Midpoint

Ambient Operating Temperature: 32-144 degrees F.

INSTALLATION PROCEDURES

1. Read all instructions carefully prior to beginning installation.
2. The 40100-02 Series is designed to mount directly on top of the burner housing (Fig. 1). The baseplate is secured with two (2) screws through the hinge and two (2) hold-down clamps on the ignitor side.

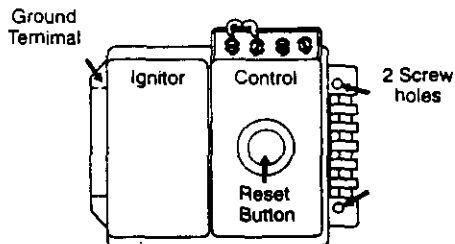


FIG. 1 40100-02 MOUNTING

WIRING

CAUTION

Disconnect power supply before wiring to avoid electrical shock and damage to the Controller/Ignitor

NOTE: All wiring must comply with applicable codes and local ordinances.

1. Unclamp and swing open unit, exposing wires.
2. **Line wiring:** Hook up orange, black and white wires, referring to Fig. 2A.

WIRING CONTINUED

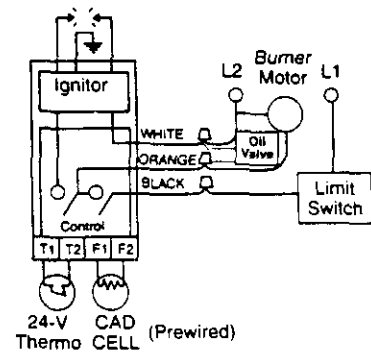


FIG. 2A 40100-02 WIRING DIAGRAM

3. **CAD cell** is factory installed and connected to "F1, F2" terminals on low voltage strip. To replace full assembly, refer to "Photocell" section under Service.
4. **Thermostat** wires should be directly connected to low voltage terminals marked T1, T2. For most electronic Set Back Thermostats, connect red low voltage wire to T1 (for White Rogers model 1F 90-51 connect white lead to T-1, red lead to T-2).

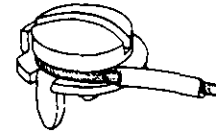


FIG. 2B RECOMMENDED TERMINATION

5. **Ground** connection is made by contact of the baseplate ground terminal and the baseplate hold-down clamps on the burner housing. Refer to Fig. 1.
6. **Ignitor springs** should be checked for proper contact to burner electrodes.

START-UP PROCEDURE

CAUTION

Insure that combustion chamber is free of oil or vapors before starting system.

1. Push in, and hold reset button 3 seconds, then release to reset the control.
2. Set thermostat to call for heat.
3. Open all oil line valves.
4. Close line switch; ignitor and motor should immediately start.
5. **Safety switch lockout will occur if flame is not established during the start-up 15 second "trial for ignition" period; to restart, the safety switch must be manually reset.**
6. Control will provide a 5 to 10 second ignition overrun time after the "trial for ignition" period to prevent nuisance lockouts.
7. Burner will turn off when call for heat is satisfied.

START-UP CONTINUED

- If flame failure occurs during a run, the motor will immediately shut off. A 60-120 second "recycle" delay will begin followed by a new "trial for ignition" period.
NOTE: During set-up, recycle period can be eliminated by pushing reset button.
- Power loss during a run will cause the burner to safely shut down and begin a normal "trial for ignition" upon power restoration.

FIELD CHECKOUT PROCEDURE

NOTE: Only a trained service technician should complete the following safety checkout.

- Flame Failure Check:** To simulate flame failure, shut off the oil supply hand valve at the end of "trial for ignition". Immediately after the flame goes out, the motor will stop for 60 to 120 seconds, then both ignitor and motor will restart. After 15 seconds, the control will go into lock-out, shutting down the ignitor and control. Turn on the oil supply then depress and hold the red reset button for 3 seconds to restore flame. Burner will restart in 3-5 seconds.
- Power Failure Check:** After establishing flame, turn off the power; burner will immediately stop. Restore power, and burner should begin normal start-up within 90 - 120 seconds of loss of power.
- If control does not operate as described, check wiring and installation. If problems persist, perform a system component checkout outlined in the Service Section.

SERVICE

The 40100-02 Series Ignitor/Controller is preset at the factory and requires no field adjustment. The control, ignitor, and CAD cell assembly are field replaceable and in the event of failure or damage to any part, replace only with OEM service parts.

- Ignitor:** The 14280 Series is an interrupted duty ignitor designed to operate in conjunction with the 14290 Controller. Use of this ignitor with other controllers can cause prolonged ignition periods and result in damage to the ignitor and invalidation of warranty.

If the ignitor fails to spark:

- Turn off power and fuel supply.
- Check all connections.
- Check that the spring terminals are making contact with burner electrodes.
- If no fault is found in A through C, remove the ignitor from the baseplate by removing two screws on underside of baseplate (Fig. 3).

SERVICE CONTINUED

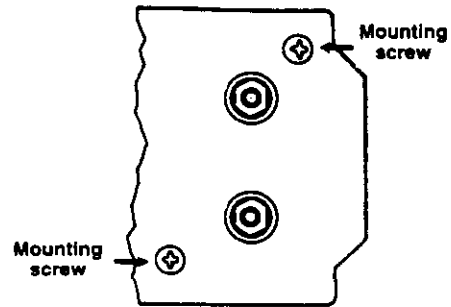


FIG. 3 IGNITOR MOUNTING

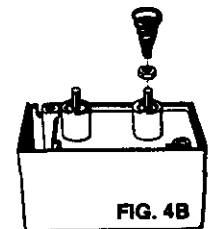
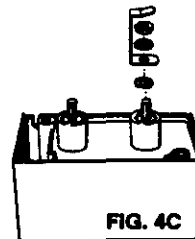
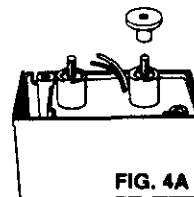
- Disconnect ignitor from control by cutting blue and white control leads at the butt connector.

NOTE: Transformer testers cannot be reliably used to test the output of the ignitor because of the high frequency content in the ignitor's output.

- Connect new ignitor (PN14280SOS) by splicing the white lead of the control to the white lead of the ignitor. Splice the remaining lead of the control with the remaining lead of the ignitor. (Use insulated butt connector provided.)
- Tuck excess wire in ignitor wiring compartment and re-screw new ignitor to baseplate.
- Connect proper electrode terminals to ignitor as shown. Refer to figures 4A thru 4C.

- Control:** With ignitor disconnected, the control can be checked for proper operation.

- With line voltage meter leads connected to the controls, blue and white wires (for ignitor), turn power supply on, leaving fuel supply OFF and thermostat set for heat. (cover CAD cell)



- If blue and white leads are providing 115 VAC for 12 seconds then the ignitor should be replaced.

SERVICE CONTINUED

- C. If blue and white leads are providing 115 VAC for over 45 seconds, then both ignitor and control should be replaced.
- D. If blue and white leads provide no power at all then;
1. No power is getting to controller (check power supply.)
 2. CAD cell is seeing light and preventing startup.
 3. Control is not functioning properly and should be replaced with correct 14290 series control.
 4. Ignitor and CAD cell from defective control can be used with 14290 replacement control.

NOTE: Disconnect line voltage before attempting control replacement.

Replacement Controls	Part Number
Aero Burner	14290-02ARS
Beckett Burner	14290-02AOS
Carlin Burner	14290-02BOS

3. Photocell

- A. Check cell by unplugging and measuring it's resistance across it's pins; covered, it should be over 50Kohms; when exposed to light, it should be under 10K.
- B. Further check system operation by replacing cell into unit (Fig. 5), reset control, and attempt normal "trial for ignition."

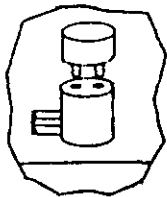


FIG. 5

cover from baseplate with a small screwdriver (Fig. 6).

- C. If cell fails "B", replace and try again.
- D. Should the entire cell assembly require replacement, disconnect leads from P.C. board terminal strip, and remove ignitor (Step 1). Refer to Fig. 3. Remove 2 screws from control cover, and release

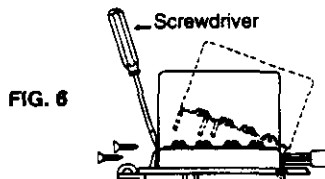
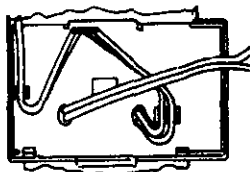


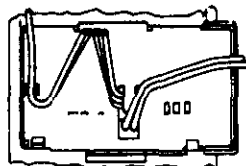
FIG. 6

With control cover tipped up, remove old CAD cell leads and replace with new CAD cell leads. Route leads as shown in FIG. 7.



Baseplate #14278

FIG. 7



Baseplate #14281

SERVICE CONTINUED

- E. Snap control cover back on baseplate, and reinsert the two screws. Connect CAD cell leads to control low voltage terminals marked F1, F2.
- F. Assemble ignitor as in service section.

TROUBLESHOOTING TIPS

1. Burner (control) will not come on.
 - A. No power to control.
 - B. Control is in lock out, (press reset for a minimum of 4 seconds).
 - C. CAD cell seeing light.
 - D. CAD assembly defective.
 - E. Control motor relay is stuck closed (see note below).
2. Burner (control) will light then shut down after a short time only to restart after approx. two minutes.
 - A. CAD cell is defective.
 - B. Air leaking into oil line causing flameout.
 - C. Defective nozzle causing flame to be erratic.
 - D. Excessive air flow or draft causing flame to leave burner head.
 - E. Excessive back pressure causing flame to be erratic.
3. Control locks out after 15 seconds.
 - A. No oil to burner.
 - B. Shorted electrodes.
 - C. Nozzle clogged.
 - D. Airflow too high.
 - E. Ignitor module defective.
 - F. CAD cell defective.

NOTE: Phelon's Safety Monitor Circuit (S.M.C.) is designed to totally disable the control in the event the motor relay contacts are stuck closed.

For further assistance please call 1-800-637-0425

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