

# INSTALLATION INSTRUCTIONS

## OIL FURNACE

### MODELS:

**FH085D36B**

**FH110D48B**

**FH110D60B**

**FLF085D36A**

**FLR085D36A**

**FLF110D48A**

**FLR110D48A**

**FLR140D60A**

**FC085D36A**

#### FOR YOUR SAFETY

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

#### CAUTION

READ ALL INSTRUCTIONS CAREFULLY BEFORE INSTALLING

MANUAL 2100-164 REV. K  
SUPERSEDES REV. J  
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<br>Air Conditioning and Ventilating Systems              | -ANSI/NFPA 90A       |
| Standard For Warm Air Heating<br>and Air Conditioning Systems                             | -ANSI/NFPA 90B       |
| Standard For Installation Of Oil Burning Equipment  | -ANSI/NFPA 31        |
| Standard For Chimneys, Fireplaces, Vents,<br>and Solid Fuel Burning Appliances            | -NFPA 211            |
| Load Calculation For Residential<br>Winter and Summer Air Conditioning                    | -ACCA Manual J       |
| Duct Design For Residential Winter and Summer<br>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  
1430 Broadway  
New York, NY 10018  
Telephone: (212) 354-3300
- 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: (617) 770-3000

To order publications: (800) 344-3555

COPYRIGHT SEPTEMBER, 1989  
BARD MANUFACTURING COMPANY  
BRYAN, OHIO 43506

## TABLE OF CONTENTS

|   |    |
|---|----|
| INSTALLATION AND OPERATING INSTRUCTIONS . . . . .                             | 1  |
| Equipment Selection . . . . .   | 1  |
| Locating The Furnace. . . . .   | 1  |
| Duct Work . . . . .   | 4  |
| Installing The Furnace. . . . .   | 4  |
| Wiring . . . . .  | 5  |
| Oil Fuel Pump . . . . .   | 5  |
| Oil Line Piping . . . . .   | 6  |
| Oil Burner . . . . .  | 6  |
| Burner Adjustment . . . . .   | 6  |
| Checks and Adjustments . . . . .  | 7  |
| Burner Nozzle and Electrode Adjustments . . . . .                             | 7  |
| Ventilation and Combustion Air . . . . .                                      | 9  |
| A. Appliances Located In Confined Spaces . . . . .                            | 9  |
| B. Located In Confined Spaces . . . . .                                       | 10 |
| C. All Air From Outdoors . . . . .  | 10 |
| D. Louvers and Grilles . . . . .  | 12 |
| Venting . . . . .   | 12 |
| Thermostat . . . . .  | 12 |
| Fan and Limit Control . . . . .   | 12 |
| <br>  |    |
| FILTERS . . . . .   | 14 |
| Filter Locations--Removal and Replacement Procedures--Hi-Boy Models . . . . . | 15 |
| Filter Locations--Counterflow Models . . . . .                                | 16 |
| Filter Locations--Lo-Boy Models . . . . .                                     | 17 |
| <br>  |    |
| MAINTENANCE . . . . .   | 18 |
| Lubrication . . . . .   | 18 |
| Inspect Air Filter . . . . .  | 18 |
| Final Inspection and Test . . . . .   | 18 |
| <br>  |    |
| SERVICE HINTS . . . . .   | 19 |
| Common Causes of Trouble. . . . .   | 19 |
| Care of Finish . . . . .  | 20 |
| Cleaning of Furnace . . . . .   | 20 |
| CFM Versus Static Pressure Curves . . . . .                                   | 21 |
| Wiring Diagrams . . . . .   | 26 |
| A-7000 Single Stage and B-8000 Two Stage Fuel Units . . . . .                 | 29 |
| Oil Primary Control and Solid State Ignitor . . . . .                         | 31 |

## 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 (2)<br>Ventilation<br>Openings For<br>Confined Spaces-<br>Square Inches |      |       |
|------------|---------------------------------|------|-------|--------|-------|------|------|-------|-------------------------------|---|------|-------|
|            | Furnace                         |      |       | Plenum |       | (1)  | Flue | Floor | Minimum Service<br>Clearances |   |      |       |
|            | Front                           | Back | Sides | Top    | Sides | Duct | Pipe |       | Front                         |   | Back | Sides |
| PH08SD36B  | 4                               | 1    | 2     | 2      | 2     | 2    | 9    | C     | 24                            | --  | --   | 240   |
| PH110D48B  | 4                               | 1    | 2     | 2      | 2     | 2    | 9    | C     | 24                            | --  | --   | 280   |
| PH110D60B  | 4                               | 1    | 2     | 2      | 2     | 2    | 9    | C     | 24                            | --  | --   | 280   |
| FLP08SD36A | 6                               | 0    | 2     | 2      | 2     | 2    | 9    | NC    | 24                            | 24  | 18*  | 290   |
| FLR08SD36A | 6                               | 18   | 2     | 2      | 2     | 2    | 9    | NC    | 24                            | 24  | 18*  | 290   |
| FLF110D48A | 6                               | 0    | 2     | 2      | 2     | 2    | 9    | NC    | 24                            | 24  | 18*  | 340   |
| FLR110D48A | 6                               | 18   | 2     | 2      | 2     | 2    | 9    | NC    | 24                            | 24  | 18*  | 340   |
| FLR140D60A | 6                               | 18   | 2     | 2      | 2     | 2    | 9    | NC    | 24                            | 24  | 18*  | 360   |
| PC08SD36A  | 6                               | 1    | 2     | 2      | 2     | 2    | 9    | NC**  | 24                            | --  | --   | 240   |

(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.  
 (2) See Page 10 for additional details on ventilation openings.

TABLE 2

DIMENSIONS (Inches) LO-BOY MODELS

| Model Number | Cabinet    |            |             | Plenum Openings |               | Flue Connection |          |        | Air Filters (1) |             |          |
|--------------|------------|------------|-------------|-----------------|---------------|-----------------|----------|--------|-----------------|-------------|----------|
|              | A<br>Width | B<br>Depth | C<br>Height | DxR<br>Supply   | DxF<br>Return | Location        | G<br>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

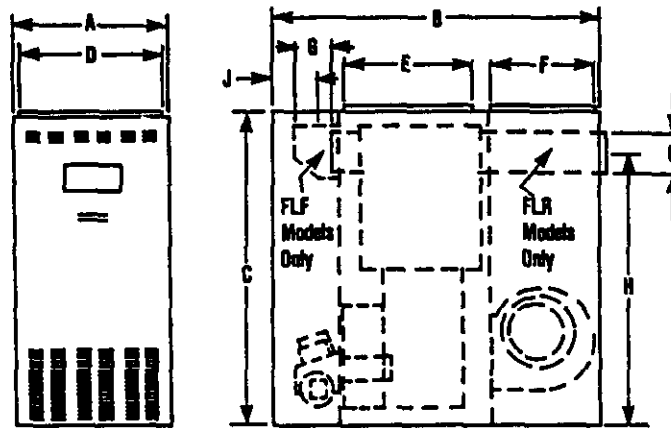


TABLE 3

DIMENSIONS (Inches) HI-BOY MODELS

| Model Number | Cabinet    |            |             | Plenum Opening |                   | G                | (1)             |
|--------------|------------|------------|-------------|----------------|-------------------|------------------|-----------------|
|              | A<br>Width | B<br>Depth | C<br>Height | DxR<br>Supply  | FxH (2)<br>Return | Flue<br>Diameter | Filter Size     |
| FH085D36B    | 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 (3)         | 6                | 16x25 (2 req'd) |

(1) Permanent washable type filter.  
 (2) Left or right side return air option. Must be cut-in by installer.  
 (3) Use both left and right side openings.

FIGURE 2

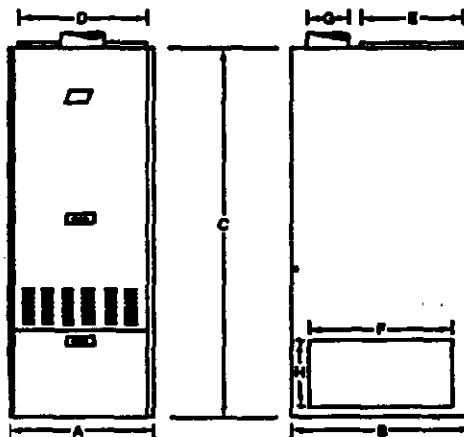
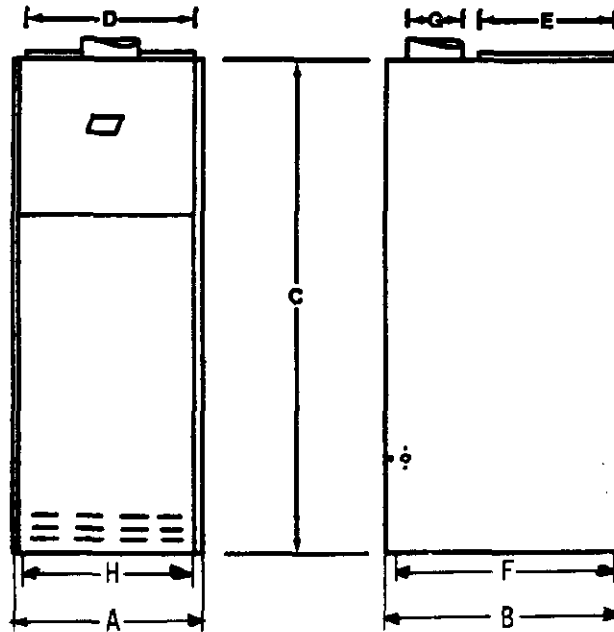


TABLE 4 DIMENSIONS (Inches) COUNTERFLOW MODELS

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

### CAUTION

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.

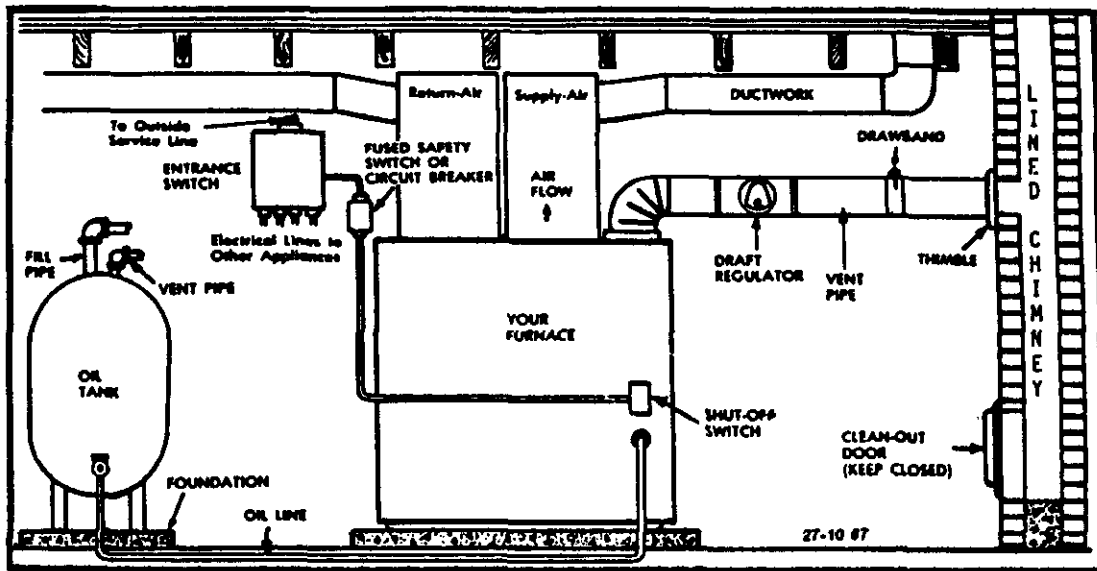
## INSTALLING THE FURNACE

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.

#### 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<br>Amps | Blower<br>Motor |      | Burner<br>Motor |     | Minimum<br>Circuit<br>Ampacity | Max. Time Delay<br>Fuse or HACR<br>Circuit Breaker |
|------------|-------------|---------------|-----------------|------|-----------------|-----|--------------------------------|--|
|            |             |               | HP              | FLA  | HP              | FLA |                                |  |
| FC085D36B  | 115/60/1    | 10            | 1/3             | 7.5  | 1/7             | 2.5 | 15                             | 15   |
| FL110D48B  | 115/60/1    | 13            | 1/2             | 10.5 | 1/7             | 2.5 | 16                             | 20   |
| FL110D60B  | 115/60/1    | 15            | 3/4             | 12.5 | 1/7             | 2.5 | 19                             | 20   |
| FLF085D36A | 115/60/1    | 8.1           | 1/3             | 5.6  | 1/7             | 2.5 | 15                             | 15   |
| FLR085D36A | 115/60/1    | 8.1           | 1/3             | 5.6  | 1/7             | 2.5 | 15                             | 15   |
| FLF110D48A | 115/60/1    | 13            | 1/2             | 10.5 | 1/7             | 2.5 | 16                             | 20   |
| FLR110D48A | 115/60/1    | 13            | 1/2             | 10.5 | 1/7             | 2.5 | 16                             | 20   |
| FLR140B60A | 115/60/1    | 15            | 3/4             | 12.5 | 1/7             | 2.5 | 19                             | 20   |
| FC085D36A  | 115/60/1    | 8.1           | 1/3             | 5.6  | 1/7             | 2.5 | 15                             | 15   |

#### OIL FUEL PUMP

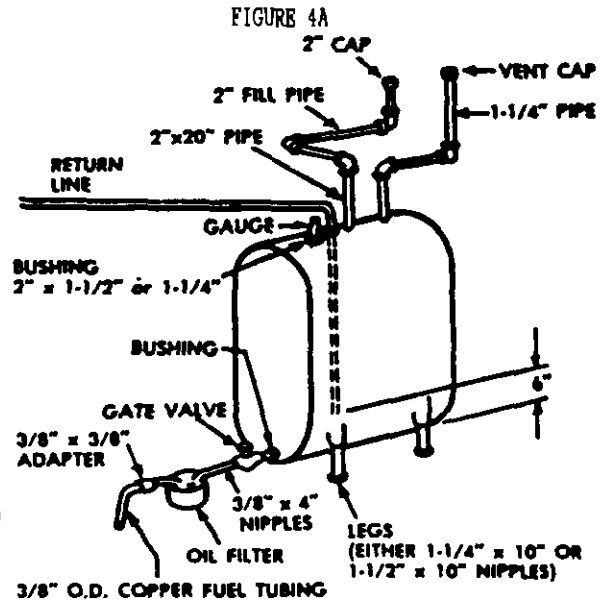
All models are factory standard with single stage fuel pumps mounted on the oil burners. Refer to pump specifications on page 30.



## 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.

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) |
| FLF085D36A   | .75                        | 105,000    | 85,000                    | .65                    | 91,000     | 75,000                    |
| FLR085D36A   | .75                        | 105,000    | 85,000                    | .65                    | 91,000     | 75,000                    |
| FLF110D48A   | 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                   |
| FCO85D36A    | .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.

### CAUTION

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

## BURNER ADJUSTMENT

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.

## CHECKS AND ADJUSTMENTS

1. Check all oil lines for leaks.
2. Check fuel pump pressure and adjust to 100 psig if necessary.
3. Drill 1/4 inch hole in flue pipe between flue outlet of furnace and barometric damper for draft measurement. Adjust barometric damper to obtain approximately .04 inches water column draft in flue pipe. Check draft overfire. For this measurement the burner observation port may be utilized. Draft overfire should be approximately .02 inches water column. It may be necessary to readjust barometric damper to obtain proper draft. Upon completion of draft readings, plug 1/4" hole in flue pipe with a sheet metal screw after making smoke check and taking stack temperature.
4. Air Adjustments. The air intake is located on the left side of the burner housing. The air shutters are factory set to the recommended start-up settings shown in Table 7. These settings are for initial start only and should be readjusted with the use of combustion analyzing equipment.

Adjust air supply by loosening lock screws and moving air shutter and if necessary the bulk air band. Allow just sufficient air to obtain clean combustion determined by visual inspection. Reduce air supply until flame tips appear slightly smoky, then increase air just enough to make the flame tips appear absolutely clean.

5. Final Adjustments. At this point a final adjustment should be made using suitable instruments for smoke spot and CO<sub>2</sub> (or O<sub>2</sub>) measurements. After allowing 10 to 15 minutes for warm up, air should be set so that the smoke number is zero or a trace; less than No. 1 smoke is highly desirable and should never exceed this limit. (Note: Occasionally a new heating appliance will require longer warm up time in order to burn clean because of the evaporation of oil deposits on the heat exchanger and other surfaces. CO<sub>2</sub> measured in the stack (ahead of the draft control) should be a minimum of 11% and a maximum of 13.0%.

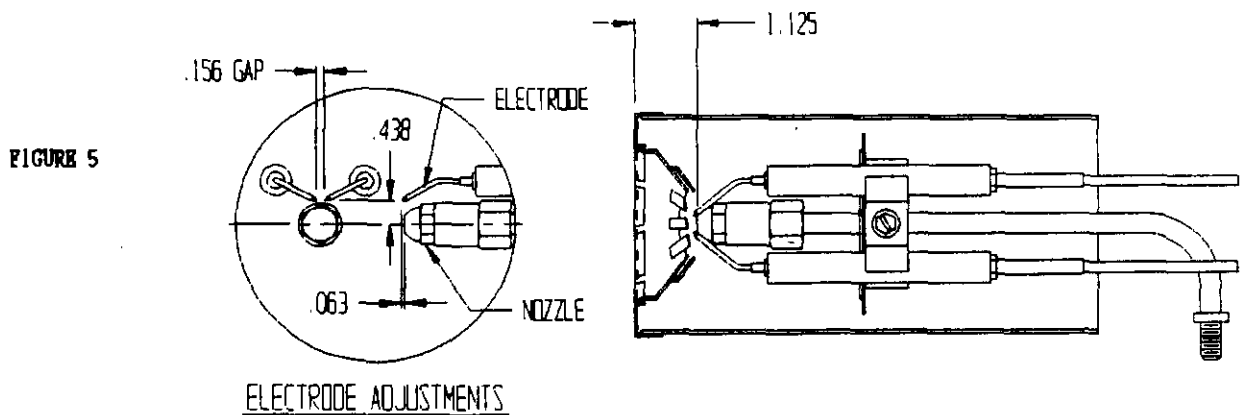
Tighten all locking screws after final adjustments are made.

The unit should be started and stopped several times to make sure there are no significant rumbles or pulsations.

## 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.

TABLE 7 RECOMMENDED START-UP SETTINGS

| Furnace Model No.                       | Burner Model and Part Number | Factory Installed Nozzle (1) | Field Installed Nozzle (1) | Air Band Setting | Air Shutter Setting |
|---|------------------------------|------------------------------|----------------------------|------------------|---------------------|
| FH085D36B                               | 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                   |
| PC085D36A                               | AF 9020-017                  | .75                          |                            | 0                | 5                   |
|   |                              |                              | .65                        | 0                | 3                   |
| (1) 80 degree hollow cone spray pattern |                              |                              |                            |                  |                     |

## 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.

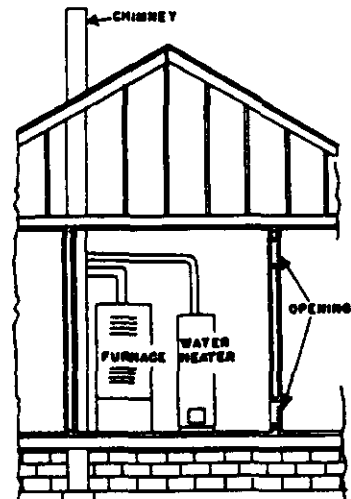
An unconfined space (such as an open basement) must have a minimum volume of 50 cubic feet per 1,000 BTUH of total of all appliances in area. Adjoining rooms may be counted as one area, only if there are no doors between the rooms.

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**

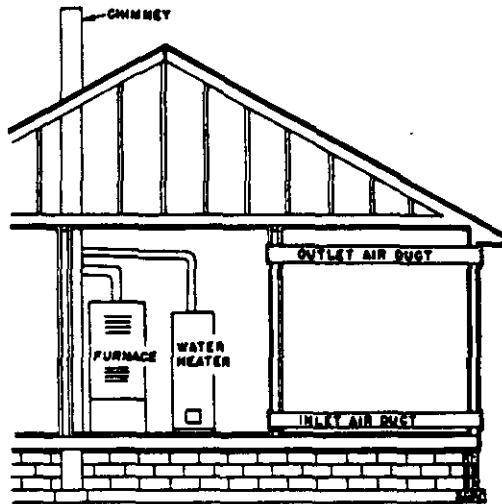
| Model      | Minimum Ventilation<br>Opening-Square Inch | Recommended Opening<br>2 Required |         |
|------------|--|-----------------------------------|---------|
|            |  | Size                              | Sq. In. |
| FRO85D36B  | 240  | 8 x 16                            | 128     |
| FH110D48B  | 280  | 9 x 18                            | 162     |
| FH110D60B  | 280  | 9 x 18                            | 162     |
| FLFO85D36A | 290  | 8 x 19                            | 152     |
| FLRO85D36A | 290  | 8 x 19                            | 152     |
| FLF110D48A | 340  | 9 x 19                            | 171     |
| FLR110D48A | 340  | 9 x 19                            | 171     |
| FLR140D60A | 360  | 9.5 x 19                          | 180     |
| FCO85D36A  | 240  | 8 x 16                            | 128     |

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

**ALL AIR FROM OUTDOORS**

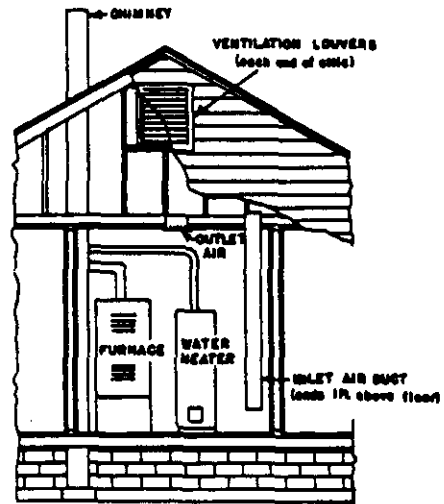
- A. The confined space shall be provided with two permanent openings, one in or near the top of the enclosure and one in or near the bottom. The openings shall communicate directly, or by means of ducts, with outdoors or to such spaces (crawl or attic) that freely communicate with outdoors. (See Figures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



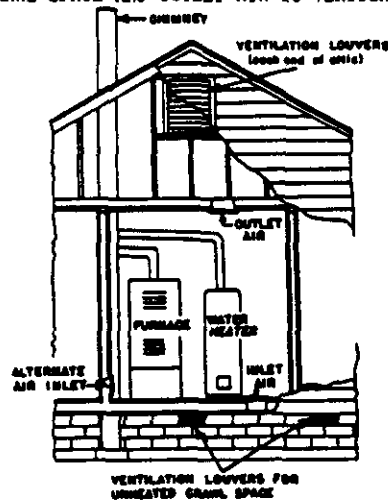
NOTE: Each air duct opening shall have a free area of not less than one square inch per 2,000 BTU per hour (70 square inches per gallon per hour) of the total input rating of all appliances in the enclosure.

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. See Standard for Oil Burning Equipment--NEPA31 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 22 - 24.

## 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 22 - 24.

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 FC085036A, the blower "on" setting is timed to assure blower operation. This blower "on" setting cannot be adjusted.

### NOTE

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 |
|------------|------------|-------------|----------------------|---------------|-----|-----|
| FRO85D36B  | .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<br>Hi-Boy                 | (1) 16x25x1                | P |
| FH110D48B<br>Hi-Boy                 | (1) 16x25x1                | P |
| FH110D60B<br>Hi-Boy                 | (1) 20x25x1                | P |
| FLF085D36A<br>FLR085D36A<br>Lo-Boys | (2) 11.5x17x1              | P |
| FLF110D48A                          | (1) 10x20x1                | P |
| FLR110D48A<br>Lo-Boys               | (1) 13x20x1                | P |
| FLR140D60A<br>Lo-Boy                | (2) 13x20x1                | P |
| FC085D36A<br>Counterflow            | (1) 10x20x1<br>(1) 15x20x1 | P |

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

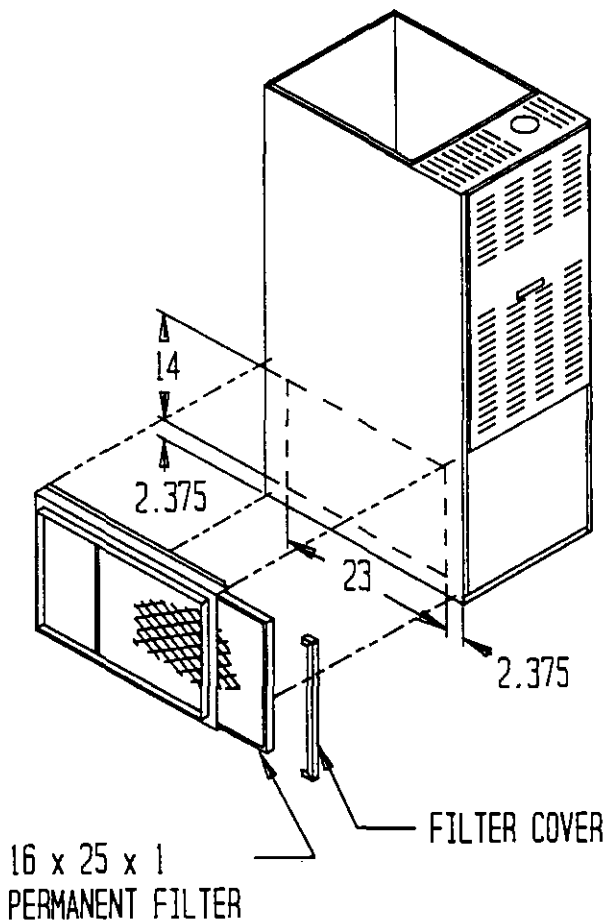
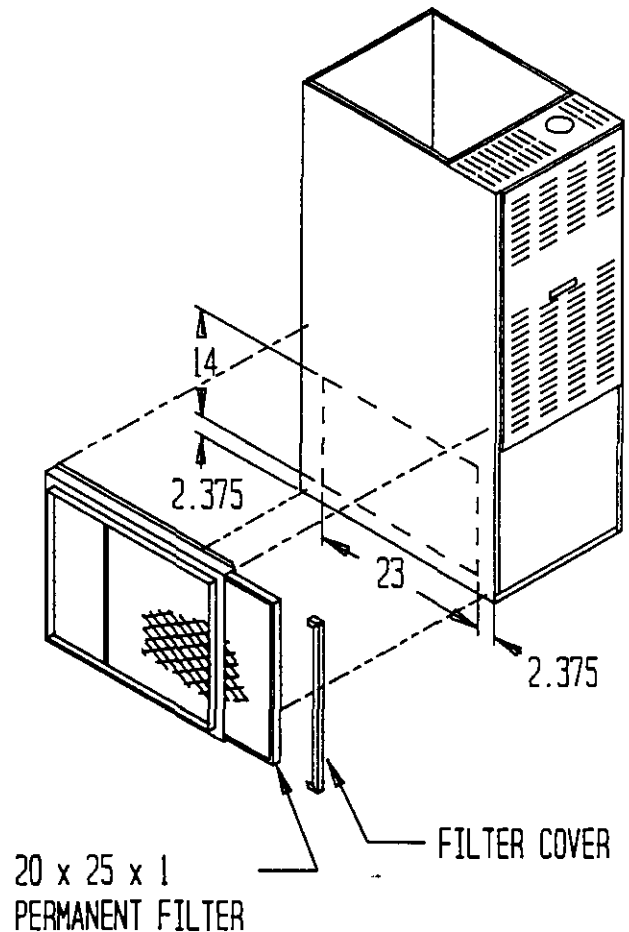


FIGURE 11



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.

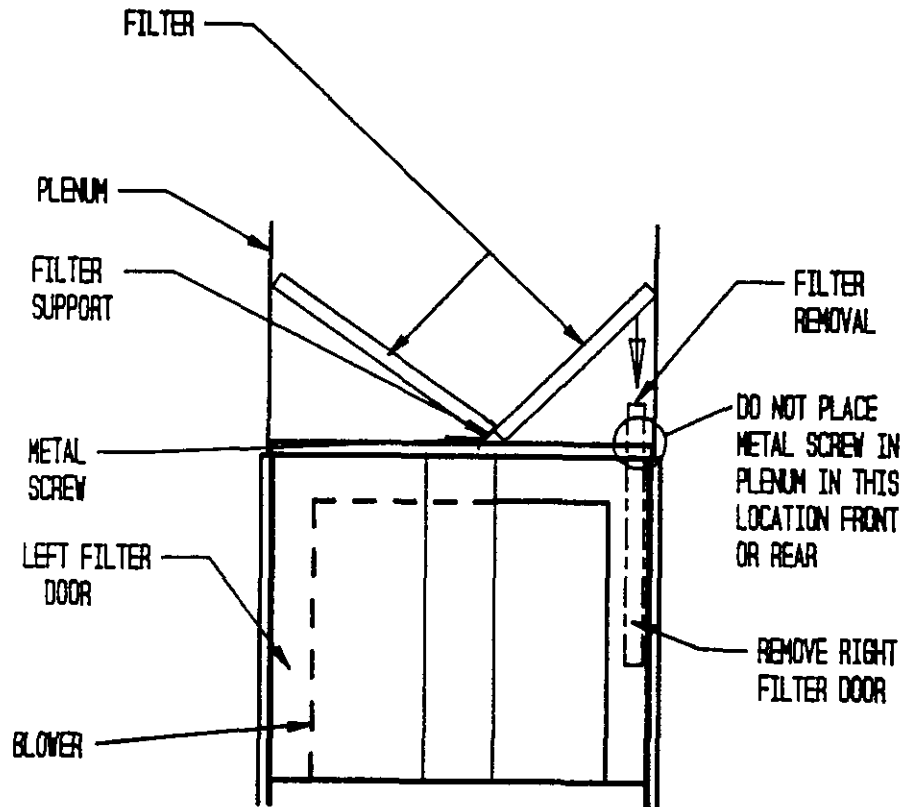
To replace filter, reverse the above procedure.

## 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

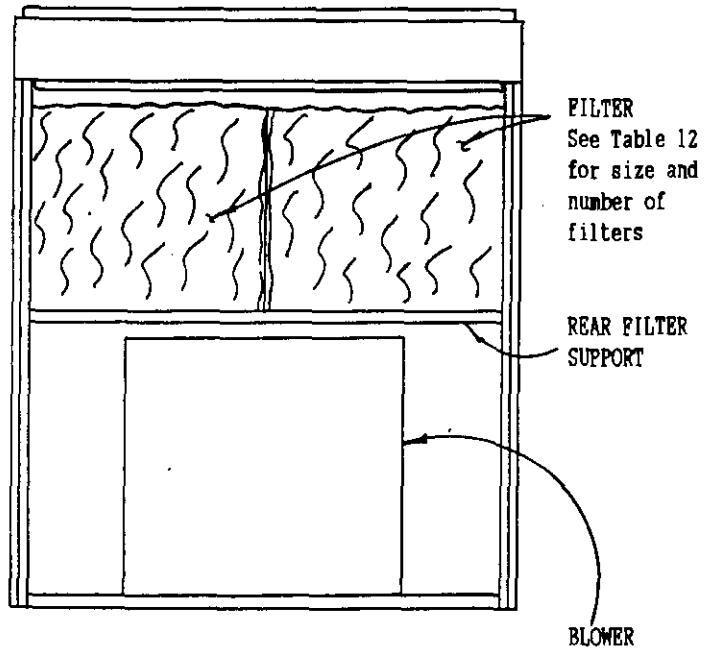


ATTACH FILTER SUPPORT TO FURNACE AS SHOWN WITH TWO SHEET METAL SCREWS. THE FILTERS CAN BE INSTALLED AND REMOVED THROUGH THE RIGHT FILTER DOOR.

## 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.

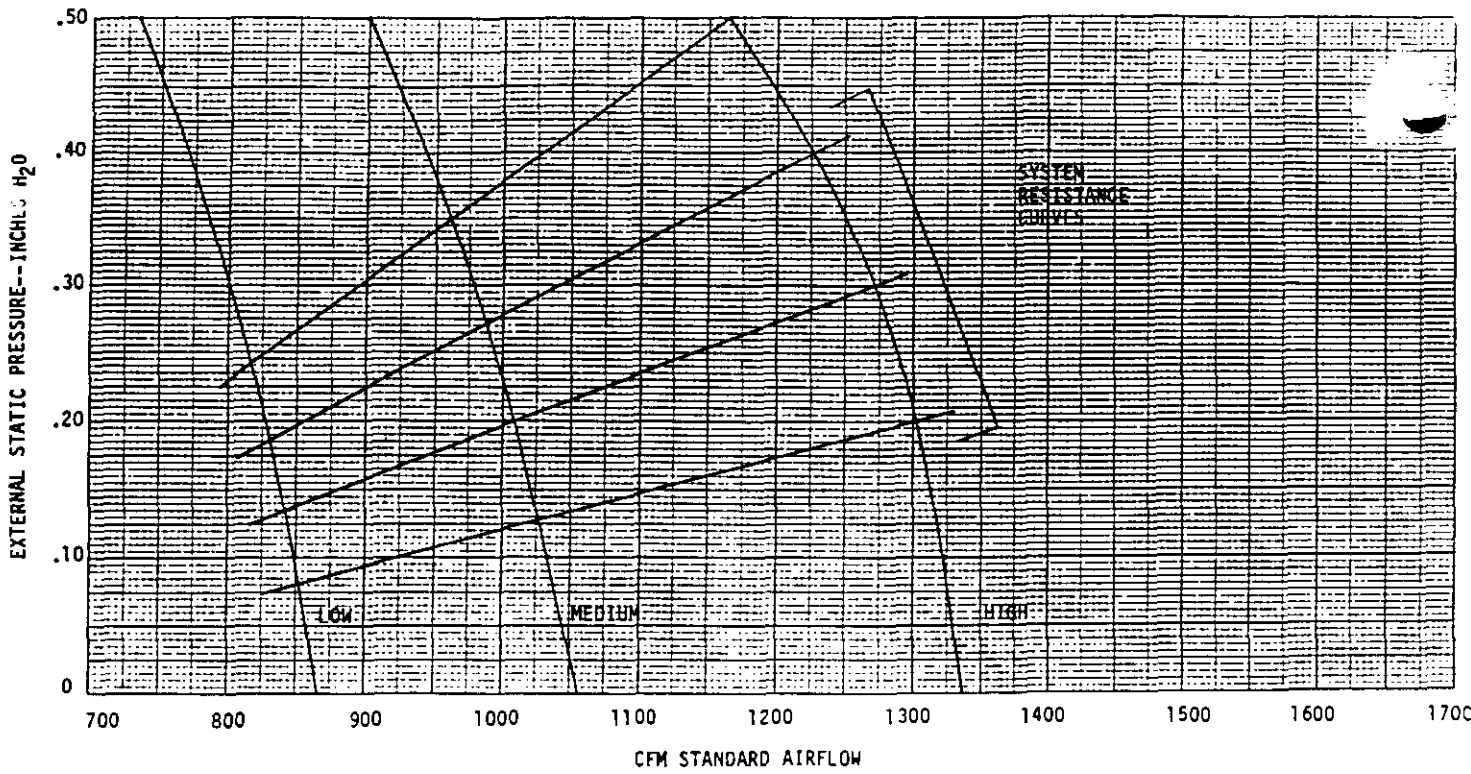
## **CARE OF FINISH**

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.

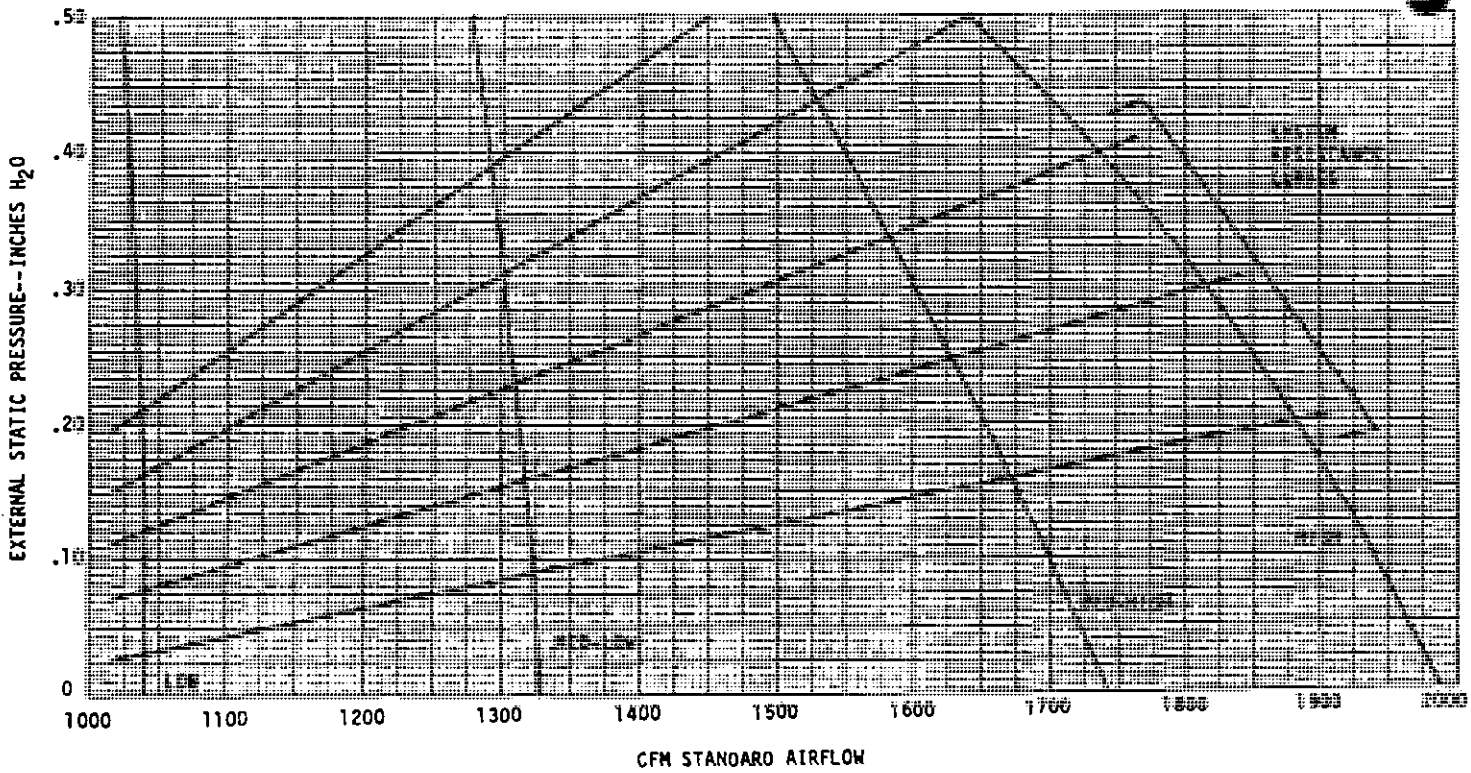
## **CLEANING OF FURNACE**

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

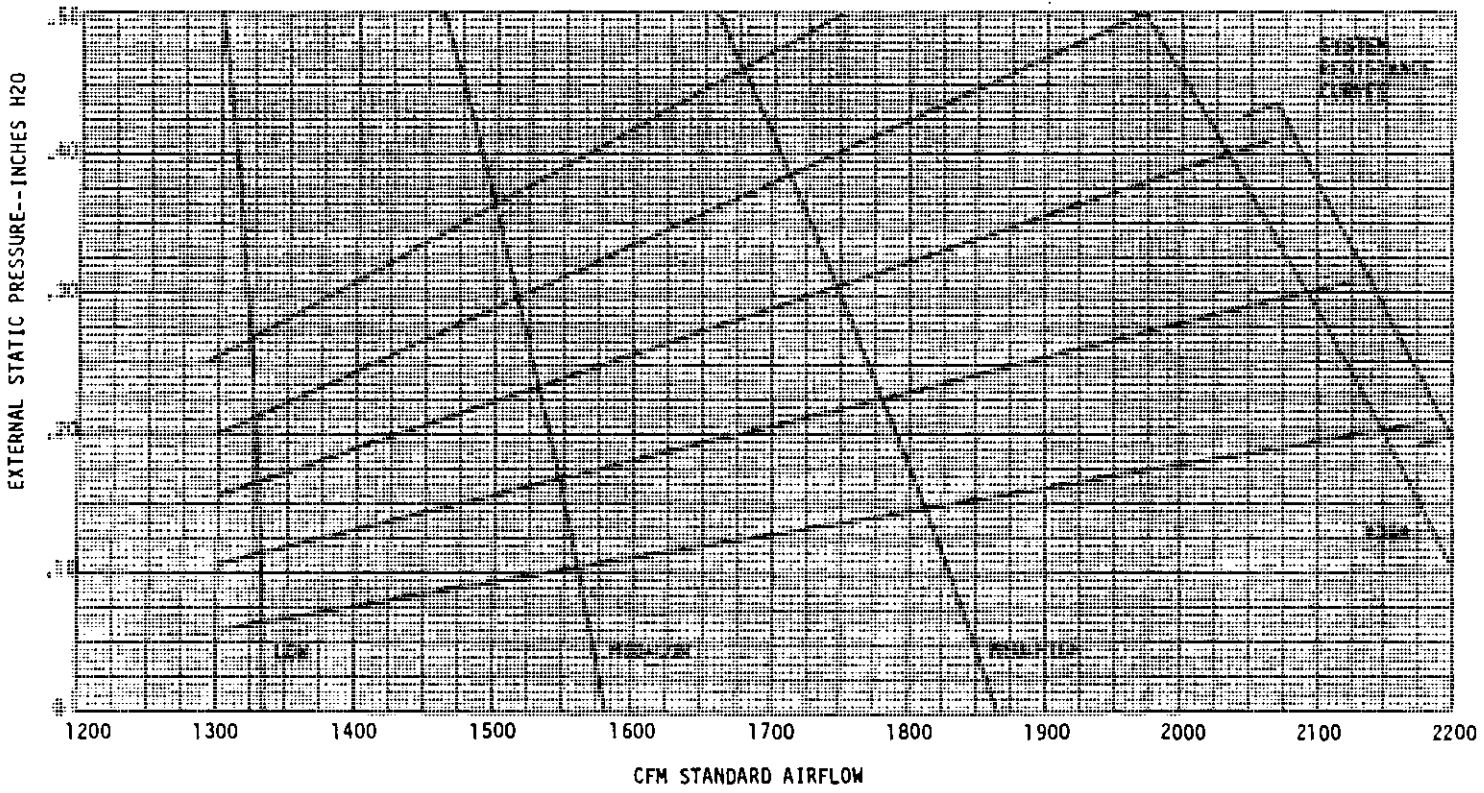


MODEL FH110D48A HI-BOY FURNACE

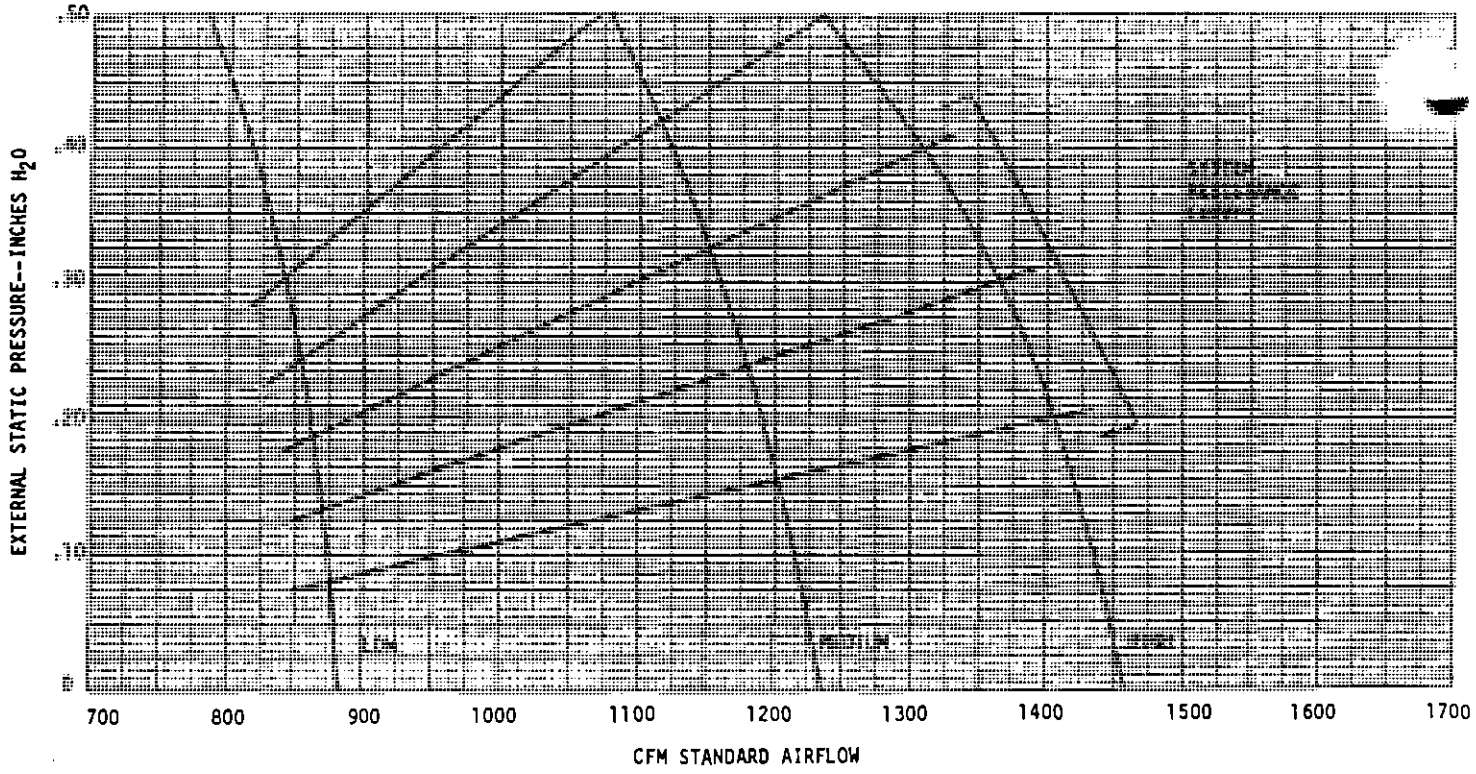




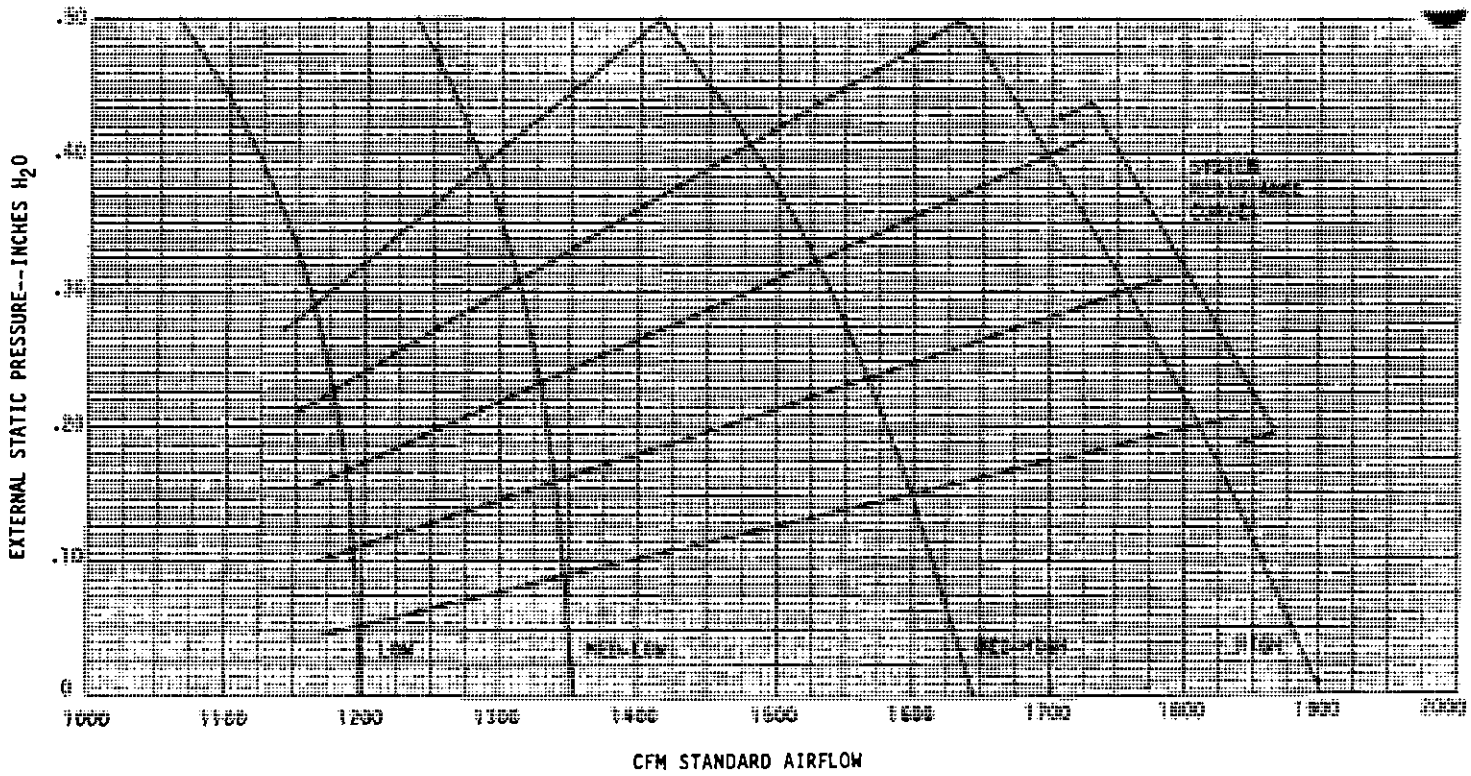
MODEL FH110060B HI-BOY FURNACE



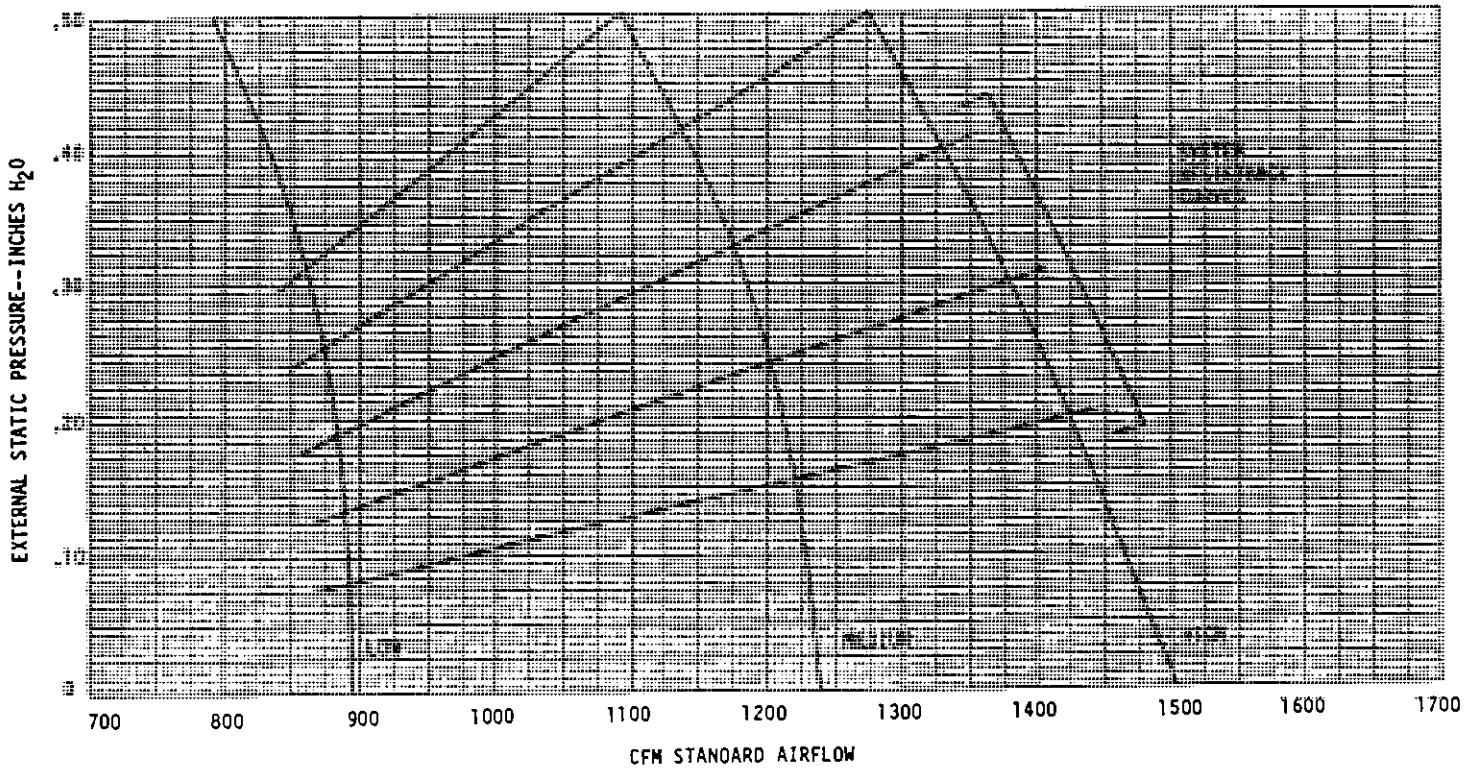
MODEL FLF085D36A LO-BOY FURNACE



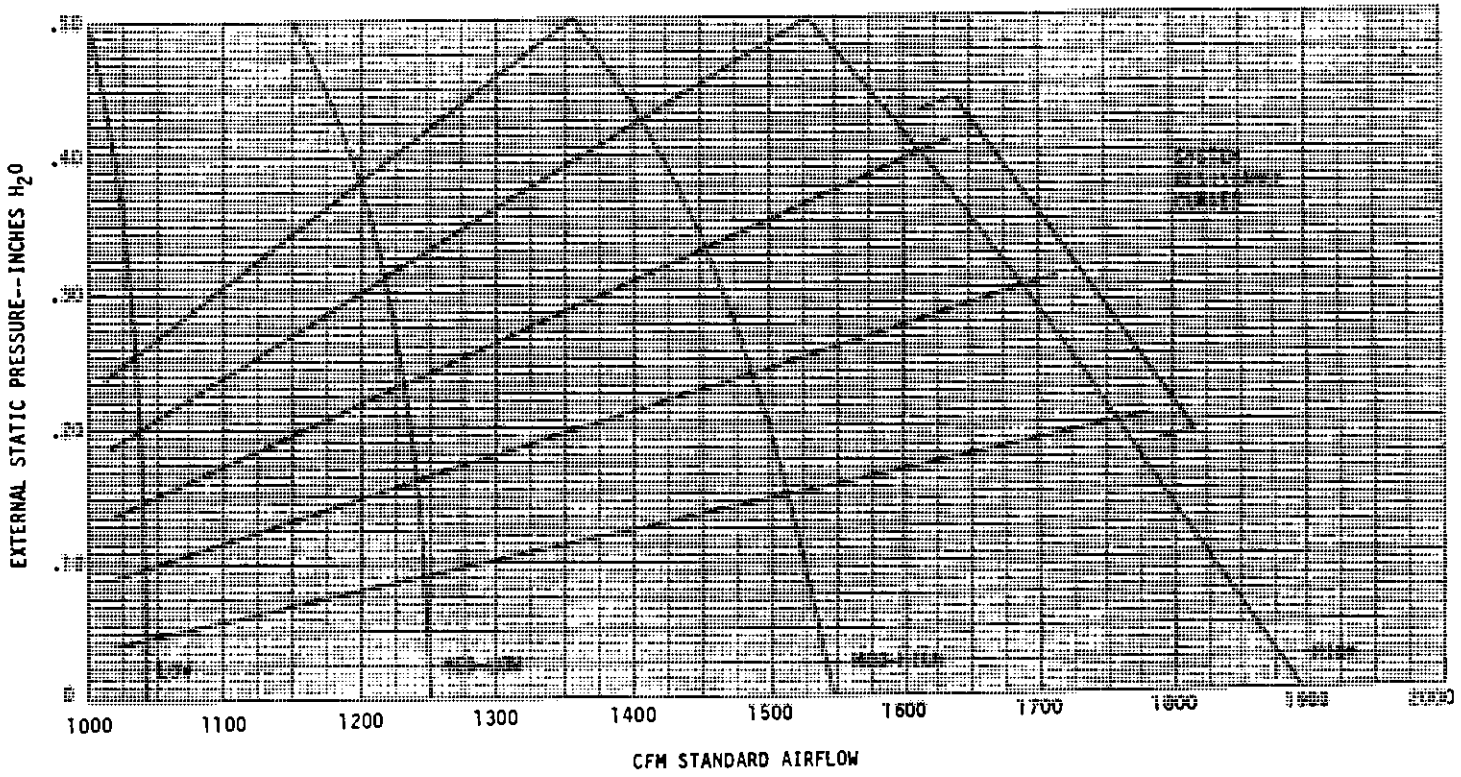
MODEL FLF110D48A LO-BOY FURNACE



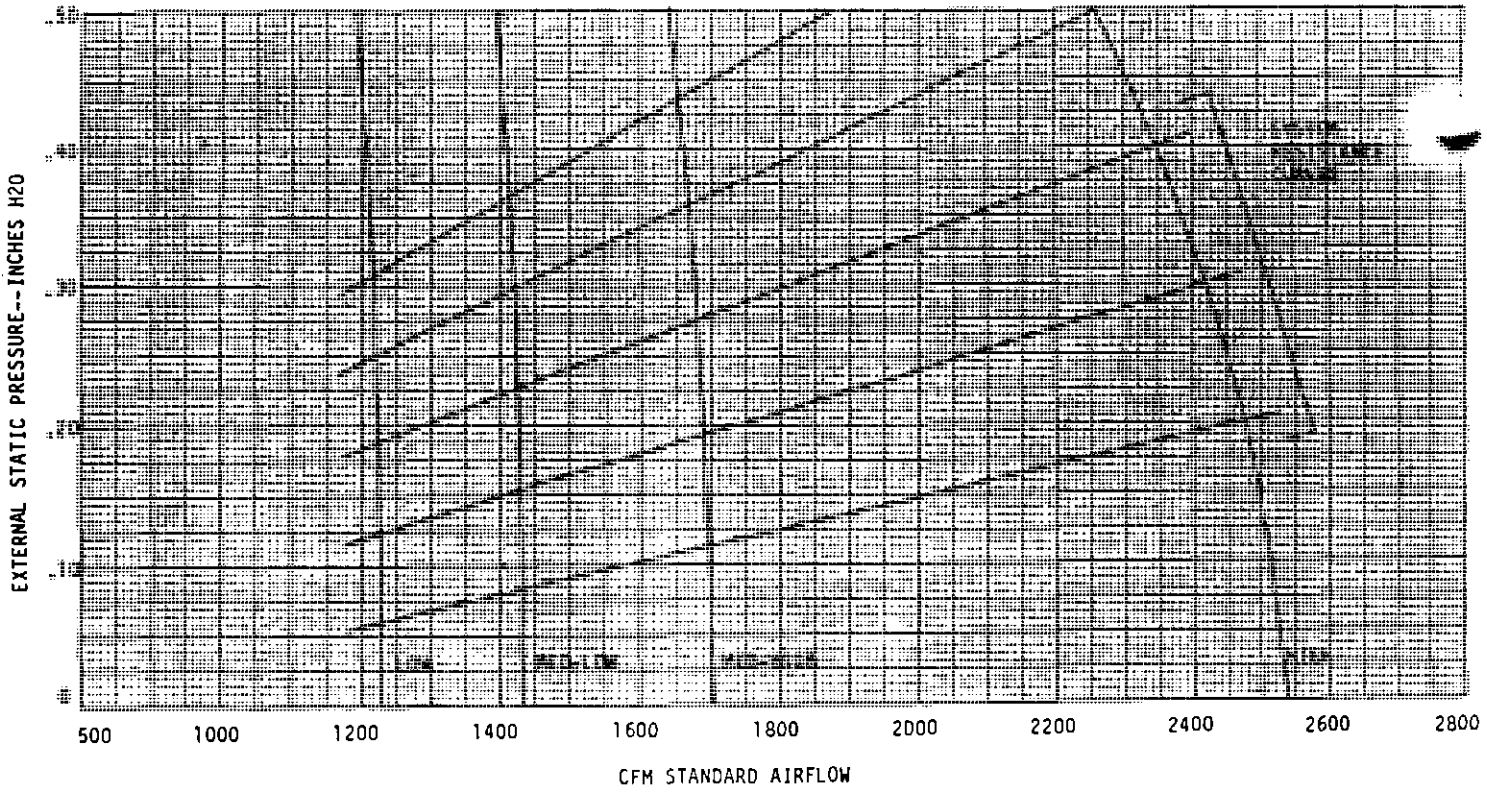
MODEL FLR085D36A LO-BOY FURNACE



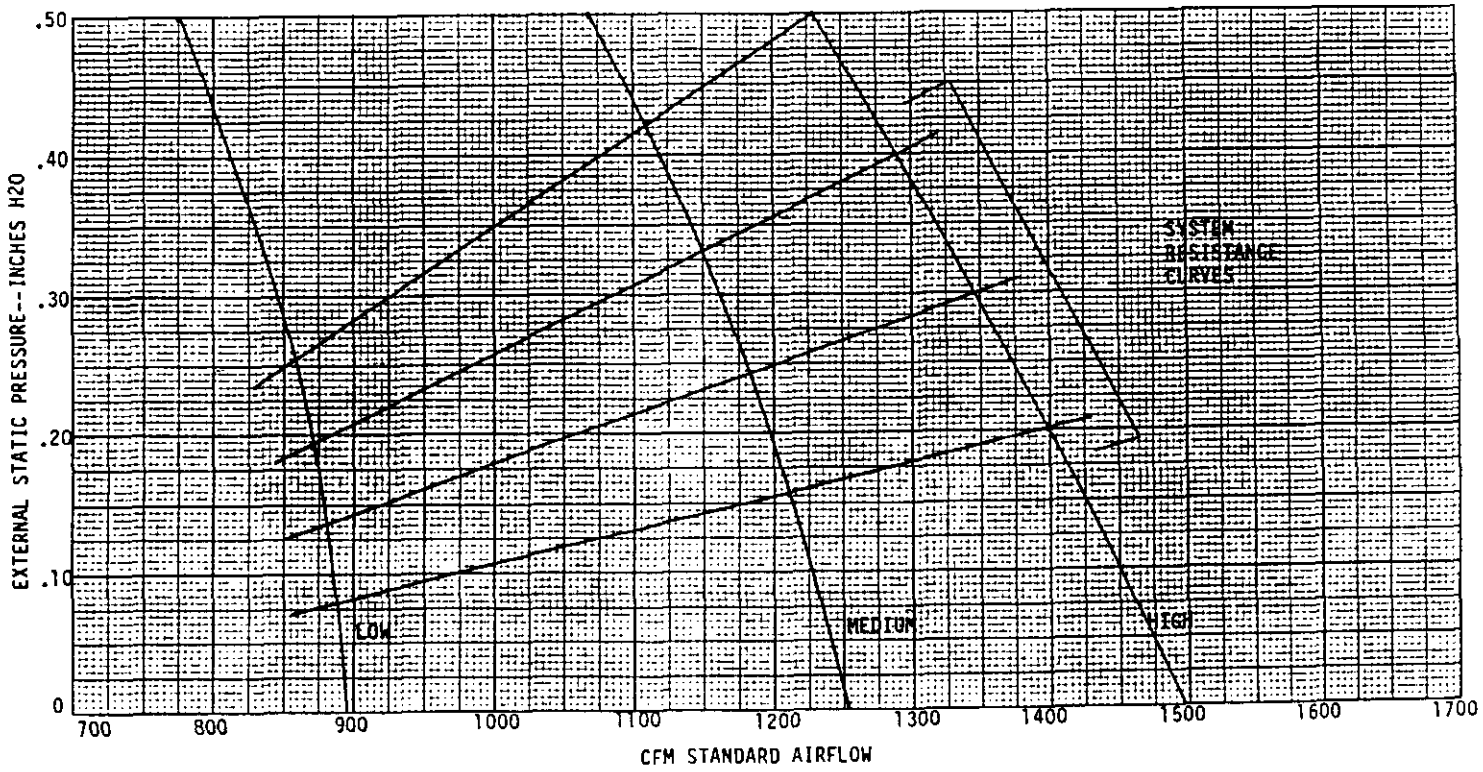
MODEL FLR110D48A LO-BOY FURNACE



MODEL FLR140060A LO-BOY FURNACE



MODEL FC085036A COUNTERFLOW FURNACE

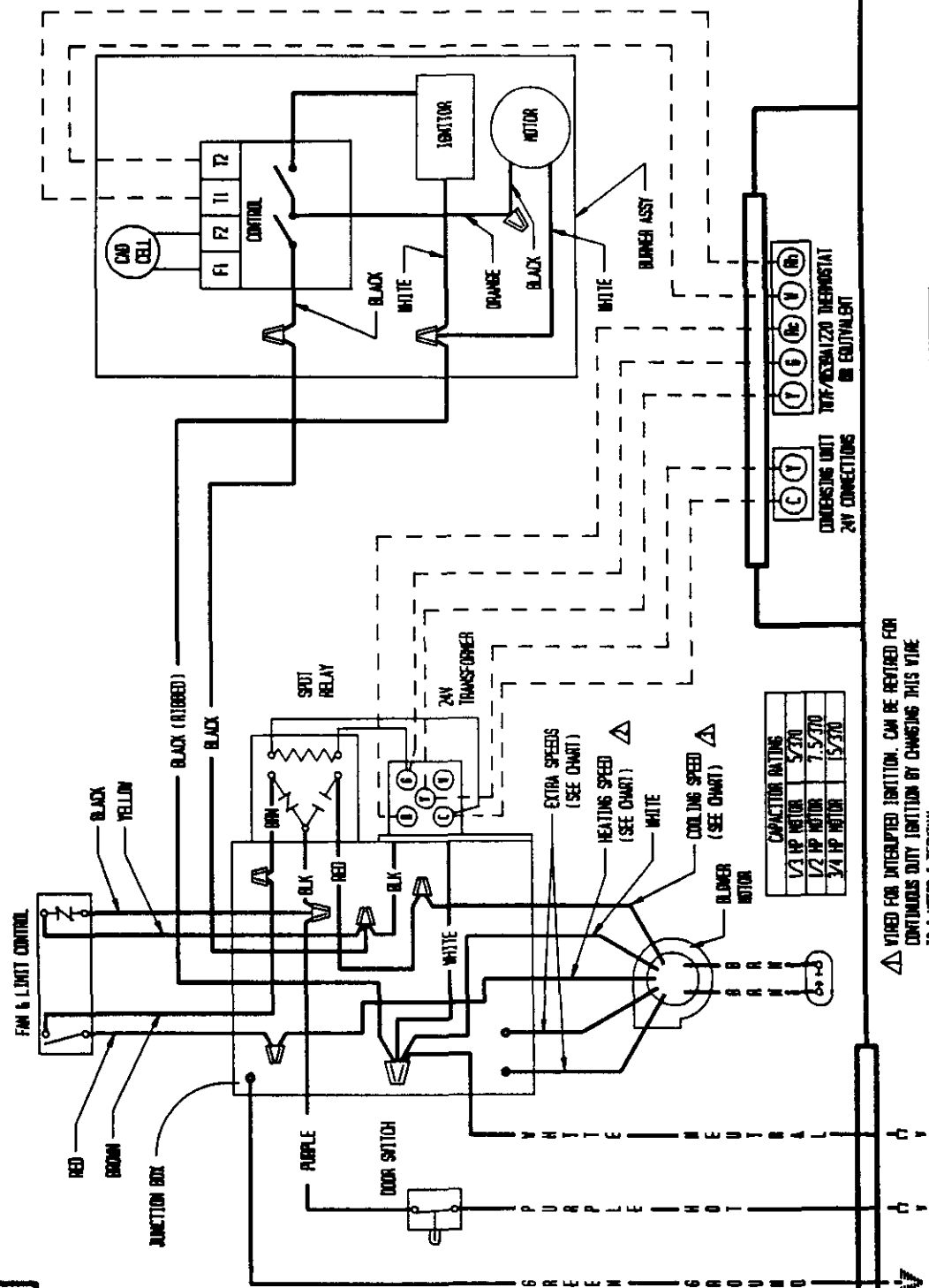




**CONNECTION DIAGRAM** DANGER: ELECTRICAL SHOCK HAZARD  
DISCONNECT POWER BEFORE SERVICING.

| TECHNICAL INFORMATION |            |                |             |
|-----------------------|------------|----------------|-------------|
| MODEL                 | INPUT RATE | HEATING BLOWER | TEMPERATURE |
| FRHS2000              | 0.5        | LOW (RED)      | 70° - 100°  |
|                       | 1.0        | MED (BLUE)     | 60° - 90°   |
| FH10000               | 0.5        | LOW (ORANGE)   | 70° - 100°  |
|                       | 1.0        | MED-LOW (RED)  | 60° - 90°   |
| FH10000               | 0.5        | LOW (ORANGE)   | 60° - 90°   |
|                       | 1.0        | MED-LOW (RED)  | 60° - 90°   |

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



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

▲ FACTORY WIRED USING RED WIRE FOR RH10 AND BLUE WIRE FOR PH05

▲ FACTORY WIRED USING BLACK WIRE

FACTORY FIELD WIRING WIRING

Low Voltage High Voltage

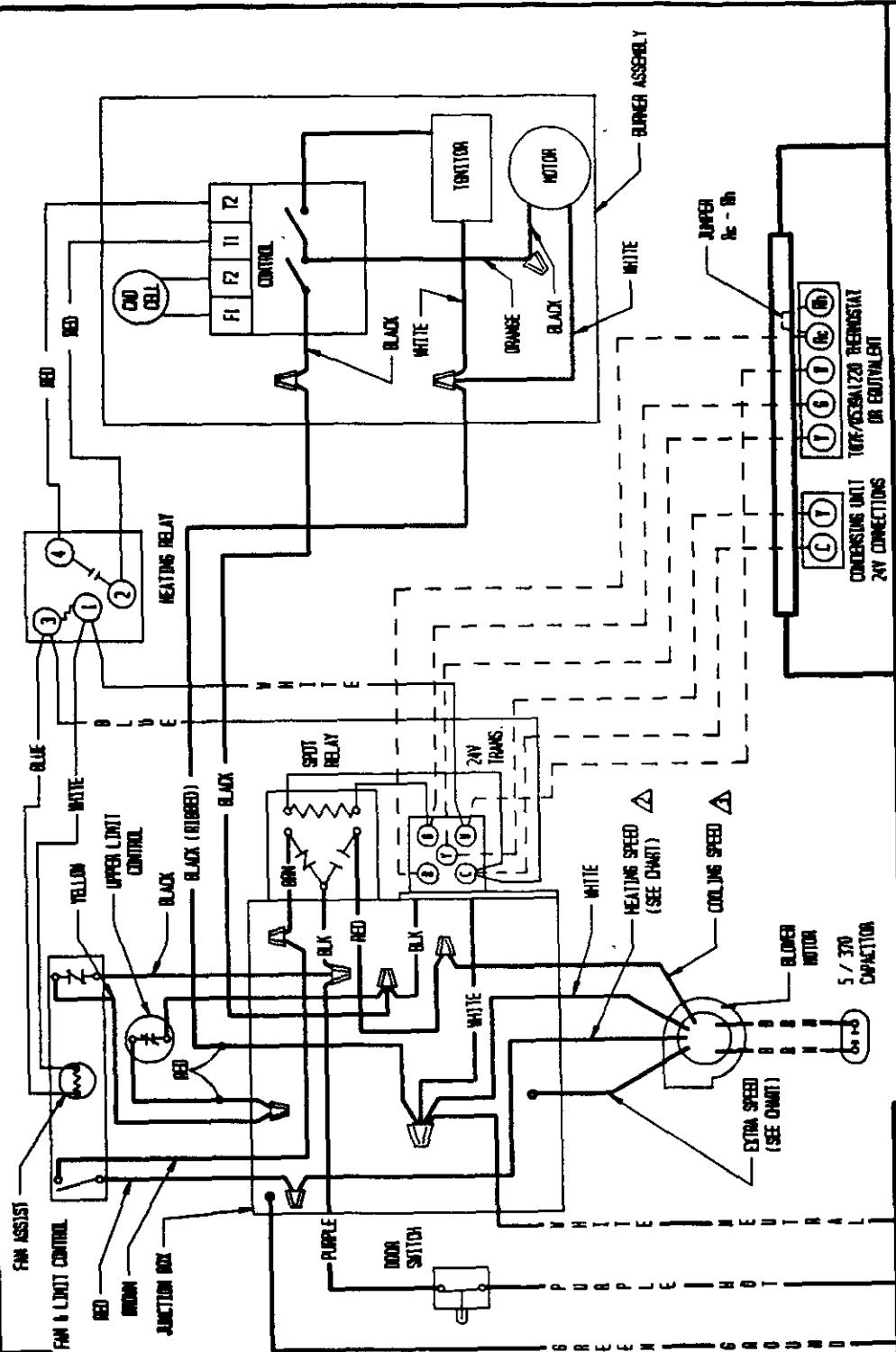
| CAPACITOR RATING |         |
|------------------|---------|
| 1/2 HP MOTOR     | 5/370   |
| 1/2 HP MOTOR     | 7.5/370 |
| 3/4 HP MOTOR     | 15/370  |

115-50-1

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 DEG C.

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

| TECHNICAL INFORMATION |            |                              |                        |
|-----------------------|------------|------------------------------|------------------------|
| MODEL                 | INPUT RATE | HEATING BLOWER SPEED (COLOR) | TEMPERATURE RISE RANGE |
| F005030A              | .65        | LOW (RED)                    | 50° - 60°              |
| F005030A              | .75        | HIGH (BLUE)                  | 60° - 90°              |



▲ WIRED FAN INTERRUPTED IGNITION. CAN BE RESTORED FOR CONTINUOUS DUTY IGNITION BY CHANGING THIS WIRE TO \* MOTOR \* TERMINAL

▲ FACTORY WIRED USING BLUE WIRE

▲ FACTORY WIRED USING BLACK WIRE

CONDENSING UNIT 24V CONNECTIONS

TERMINALS: (C), (T), (1), (6), (R), (B)

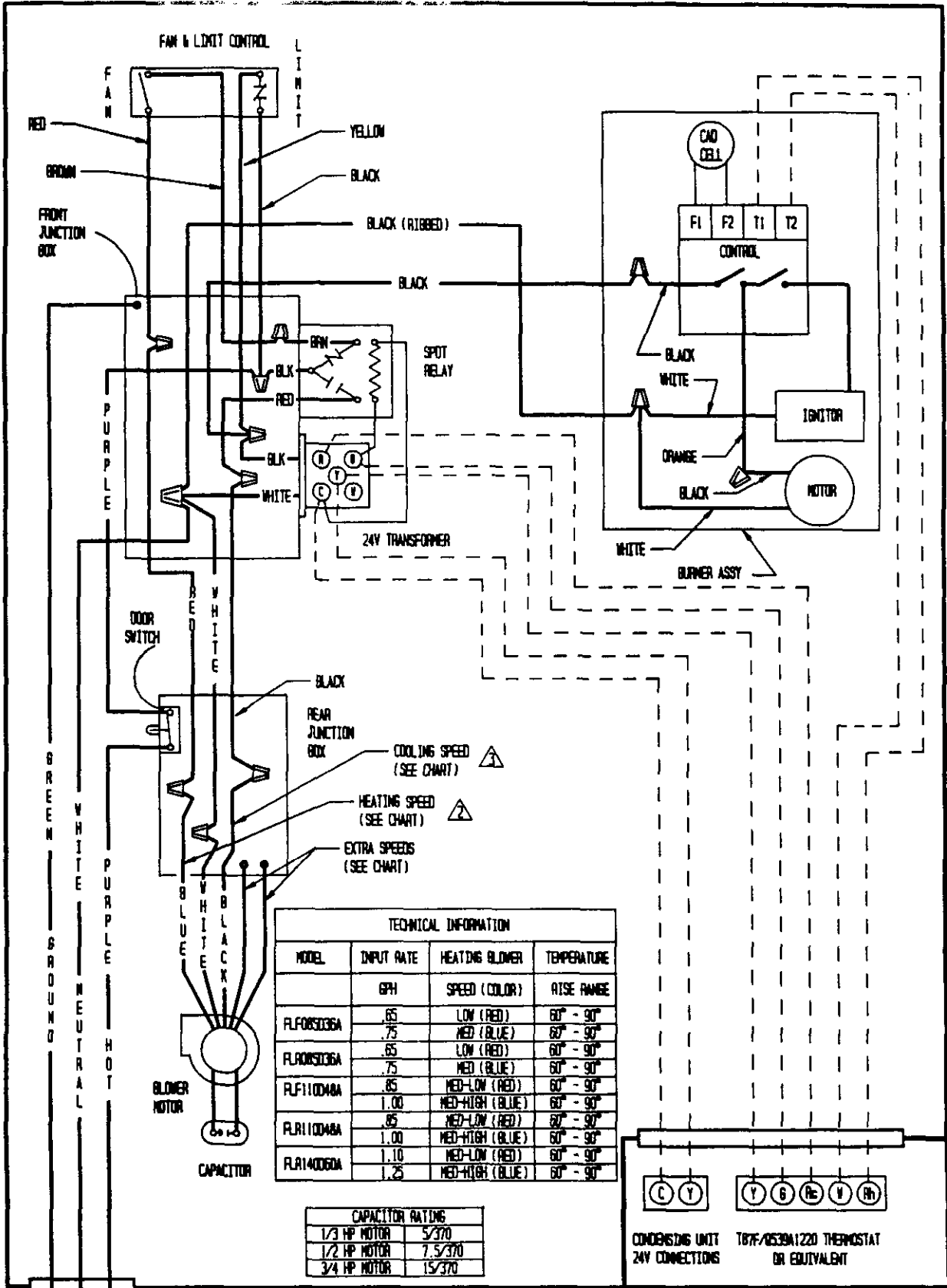
TEMPERATIZED THERMOSTAT OR EQUIVALENT

JUMPER R2 - R1

LEGEND:  
 --- FACTORY WIRING  
 - - - FIELD WIRING

115-60-1

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 DEG C.



| TECHNICAL INFORMATION |            |                 |             |
|-----------------------|------------|-----------------|-------------|
| MODEL                 | INPUT RATE | HEATING BLOWER  | TEMPERATURE |
|                       | GPH        | SPEED (COLOR)   | RISE RANGE  |
| FLF08503GA            | .65        | LOW (RED)       | 60° - 90°   |
|                       | .75        | MED (BLUE)      | 60° - 90°   |
| FLR08503GA            | .65        | LOW (RED)       | 60° - 90°   |
|                       | .75        | MED (BLUE)      | 60° - 90°   |
| FLF11004BA            | .85        | MED-LOW (RED)   | 60° - 90°   |
|                       | 1.00       | MED-HIGH (BLUE) | 60° - 90°   |
| FLR11004BA            | .85        | MED-LOW (RED)   | 60° - 90°   |
|                       | 1.00       | MED-HIGH (BLUE) | 60° - 90°   |
| FLR14006DA            | 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

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

**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 DEB 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

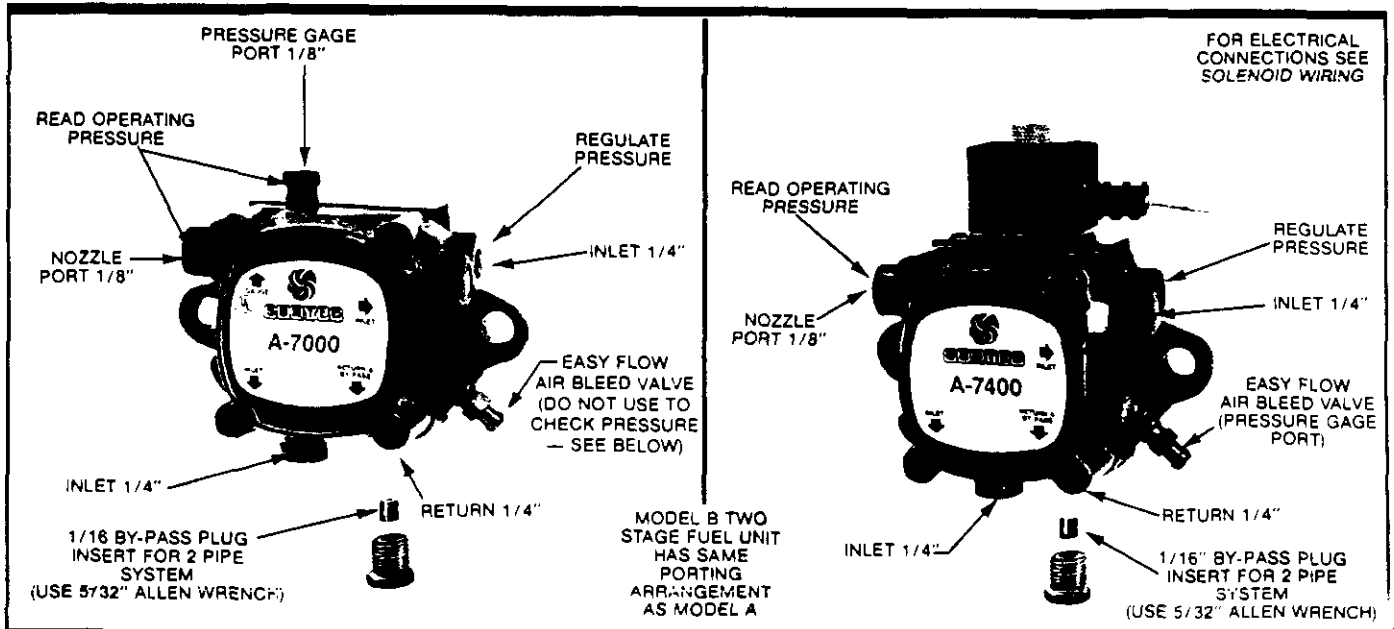


FIGURE 1

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)

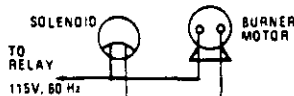
### TWO-PIPE SYSTEM • FIGURE 5

**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 gears. 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 ( $\Delta P$ ) 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

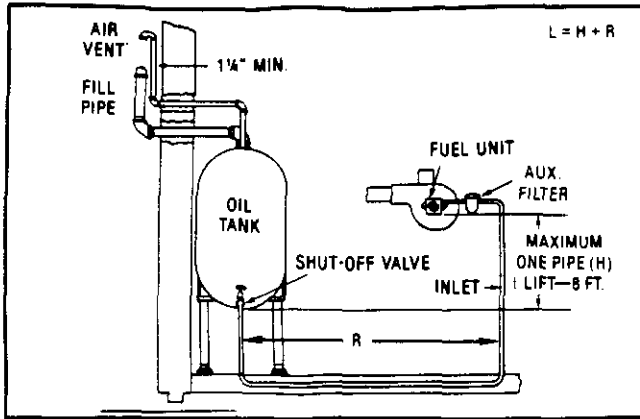


FIGURE 4

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

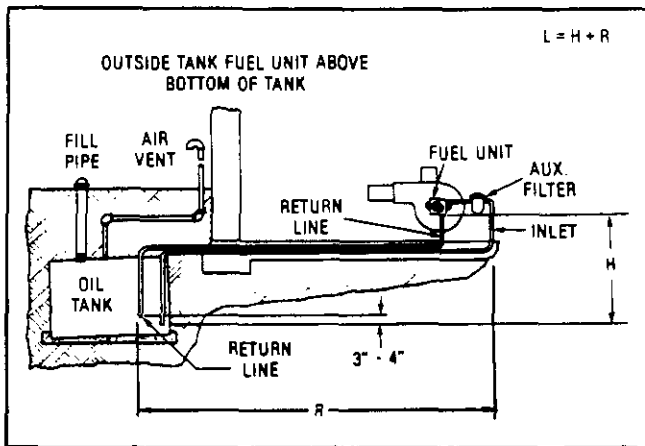


FIGURE 5

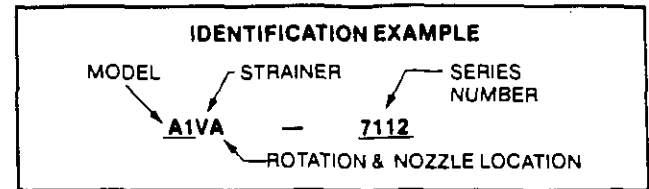
Always terminate return line as shown in Figure 5. Line lengths include both vertical and horizontal lengths.



2210 Harrison Avenue Rockford, Illinois 61125-7010  
 P.O. Box 7010 (815) 226-3700

... working harder to serve you even better.

## 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

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

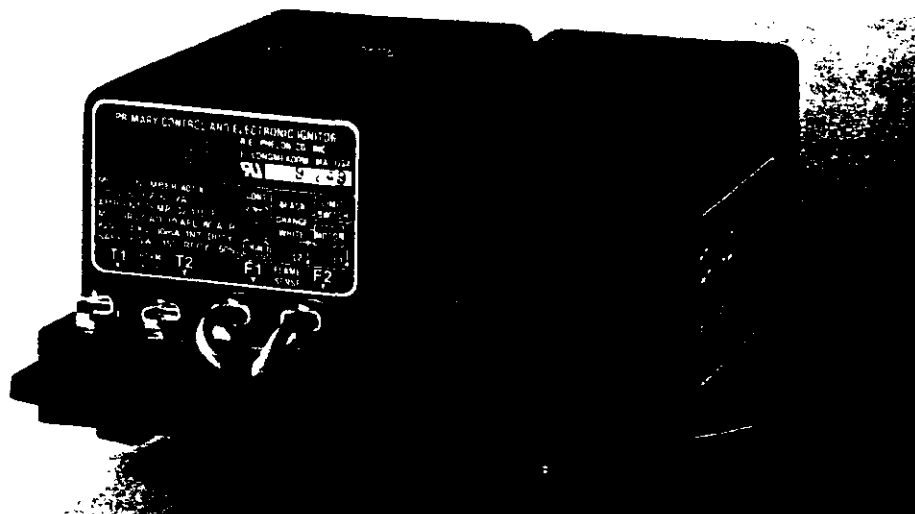
| Lift "H"<br>Figure 5 | 1725 RPM       |       | 3450 RPM       |       |                |       |
|----------------------|----------------|-------|----------------|-------|----------------|-------|
|                      | 3/8" OD Tubing |       | 3/8" OD Tubing |       | 1/2" OD Tubing |       |
|                      | 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"<br>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 PHELON 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.

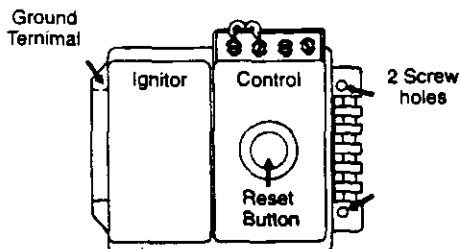


FIG. 1 40100-02 MOUNTING

# 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

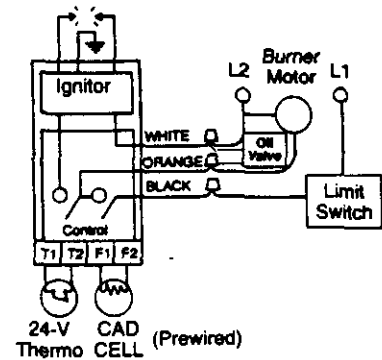


FIG. 2A 40100-02 WIRING DIAGRAM

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).

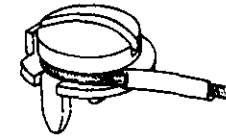


FIG. 2B RECOMMENDED TERMINATION

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

8. 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.
9. 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.

1. **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.
2. **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.
3. 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.

1. **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:
  - A. Turn off power and fuel supply.
  - B. Check all connections.
  - C. Check that the spring terminals are making contact with burner electrodes.
  - D. 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

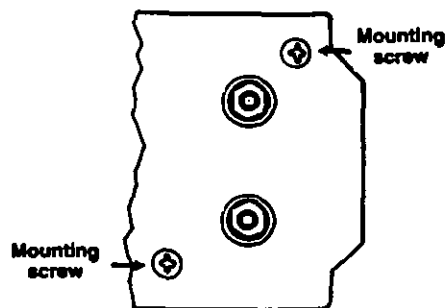


FIG. 3 IGNITOR MOUNTING

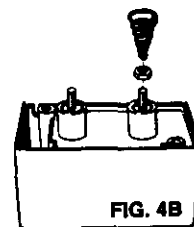
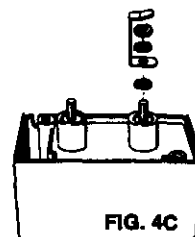
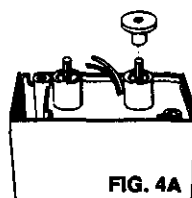
- E. Disconnect ignitor from control by cutting blue and white control leads at the butt connector.

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.

- F. 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.)
- G. Tuck excess wire in ignitor wiring compartment and re-screw new ignitor to baseplate.
- H. Connect proper electrode terminals to ignitor as shown. Refer to figures 4A thru 4C.

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

- A. 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)



- B. 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 its resistance across its 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."
- 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 cover from baseplate with a small screwdriver (Fig. 6).



FIG. 5

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

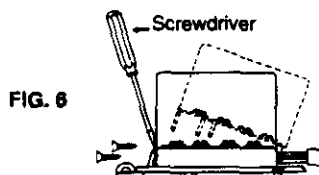
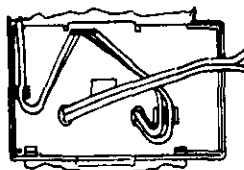


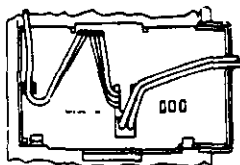
FIG. 6

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

# phelon

R.E. PHELON CO., INC.  
EAST LONGMEADOW, MA 01028  
TEL: (413) 525-6471

## INSTALLATION INSTRUCTIONS

SUSPENDED (HORIZONTAL)  
OIL-FIRED  
WARM AIR FURNACES

ISSUE  
8805

### FOR YOUR SAFETY

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

#### CAUTION

These instructions are intended to be used by qualified personnel who have been trained in installing this type of furnace. Installation of this furnace by an unqualified person may lead to equipment damage and/or a hazardous condition which may lead to bodily harm.

#### GENERAL

This furnace is shipped as a packaged unit with the burner and primary control shipped in a separate carton.

The design of this furnace is unique in that the complete heat exchanger assembly may be reversed in the field to facilitate servicing for installations where only limited access to the unit is available.

The air handling capacity of this furnace is designed for cooling air flows (See Fig. 4).

#### IMPORTANT:

All local and national code requirements governing the installation of oil burning equipment, wiring and flue connections must be followed.

A partial list of these national codes would be the following, issued by the National Fire Protection

Agency and the American National Standards Institute:

ANSI/NFPA 31  
INSTALLATION OF OIL BURNING EQUIPMENT

ANSI/NFPA 90B  
WARM AIR HEATING AND AIR CONDITIONING SYSTEMS

ANSI/NFPA 211  
CHIMNEYS, FIREPLACES, VENTS AND SOLID FUEL BURNING APPLIANCES

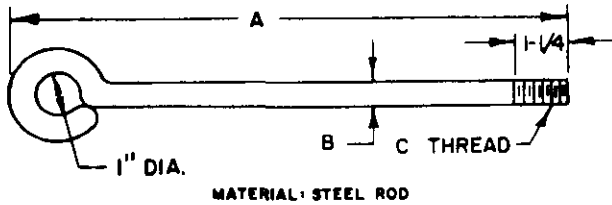
ANSI/NFPA 70  
NATIONAL ELECTRICAL CODE

All of the above codes should be the latest issue and are available from the National Fire Protection Agency, Batterymarch Park, Quincy, MA 02269

#### LOCATION

This furnace is desirable for applications where economy of floor space is required or where there are limitations for the height of a furnace. To meet these considerations, this furnace may be suspended or located in a crawl space.

Four hanger rods as shown in Fig. 1 may be used to suspend this furnace. Other methods of suspending this furnace, such as an angle iron frame, are acceptable as long as the total weight for furnace and support are allowed for in support calculations.



| BONNET CAPACITY | A  | B   | C      | MAX FURNACE WT |
|-----------------|----|-----|--------|----------------|
| 85,000-150,000  | 25 | 3/8 | 3/8-16 | 300#           |
| 200,000-335,000 | 34 | 1/2 | 1/2-13 | 600#           |

HANGER ROD  
FIG. 1

Should this furnace be installed on the floor, as in a crawl space, it should be installed level and a concrete pad 1" to 2" thick is recommended.

The required minimum clearances for this furnace are outlined in Fig. 2.

| BONNET CAPACITY IN 1000's | FRONT | TOP | REAR | BOTTOM | FLUE |
|---------------------------|-------|-----|------|--------|------|
| 85 - 125 ONLY<br>ALCOVE   | 48    | 2   | 2    | 2      | 9    |
| 85 - 335<br>STANDARD      | 24    | 6   | 6    | 6      | 18   |

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL  
FIG. 2

The furnace should be located as close to the chimney as possible in order to keep vent connections short and direct. The furnace should also be located as near as possible to the center of the air distribution system.

### INSTALLATION

#### Air for Combustion and Ventilation:

This furnace should be installed in a location in 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. The location should not interfere with proper circulation of air within the confined space.

For an unconfined space (more than 50 cu. ft. of volume per 1,000 BTU of aggregate input rating of all appliances installed in that space) such as a crawl space, infiltration air is normally adequate to provide air for combustion and ventilation.

For a confined space, where air is taken from an interior space, two permanent openings of equal area are required. One opening must be within 12" of the ceiling and the other within 12" of the floor. Each opening must have a free area of at least 1 sq. in. per 1000 BTU of total input rating but not less than 100 sq. inches.

If outside air is supplied to a confined space, then the two openings must be equal and located as above and the free area of each must be:

1. 1 sq. in. per 4,000 BTU of total input rating when the air is directly communicated from the outdoors.
2. 1 sq. in. per 4,000 BTU of total input rating when the air is brought in through vertical ducts.
3. 1 sq. in. per 2,000 BTU of total input rating when the air is transferred through horizontal ducts.

When ducts are used, they must 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 must not be less than 3 inches.

The free area through a design of louver or grille should be used in calculating the size opening required to provide the free area specified. If the design and free area are not known, it

may be assumed that wood louvers will have 20-25% free area and metal louvers and grilles will have 60-75% free area. Screens used must not be smaller than 1/4" mesh and louvers shall be fixed in the open position or interlocked with the equipment so that they are opened automatically during equipment operation.

For additional information refer to Installation of Oil Burning Equipment (ANSI/NFPA 31).

**WARNING**

**Do not block the combustion air openings in the furnace. Any blockage will result in improper combustion and may result in a fire hazard or unsafe condition.**

**Ductwork Recommendations:**

The proper sizing of warm air ducts is necessary to insure satisfactory furnace operation. Ductwork should be in accordance with the latest editions of NFPA-90A (Installation of Air Conditioning and Ventilating Systems) and NFPA-90B (Warm Air Heating and Air Conditioning Systems).

The supply and return ductwork should be attached to the flanged openings provided on both ends of the furnace. See Fig. 10 for the dimensions of these openings.

The following recommendations should be followed when installing the ductwork:

1. Install locking type dampers in all branches or the individual ducts to balance out the system. Dampers should be adjusted to impose the proper static at the outlet of the furnace.
2. A flexible duct connector of noncombustible material should be installed at the unit on both supply and return air system.

In applications where extremely quiet operation is necessary, the first 10 ft. (if possible) of supply and return ducts should be internally lined with acoustical material.

3. In cases where the return air grille is located close to the fan inlet, there should be at least one 90° air turn between fan inlet and grille. Further reduction in sound level can be accomplished by installing acoustical air turning vanes or lining duct as described in item 2 above.

4. When a single air grille is used, the duct between grille and furnace must be the same size as return opening in furnace.

**CAUTION**

**Return air grilles and warm air registers must not be obstructed.**

**WARNING**

**When supply ducts carry air circulated by the furnace to areas outside the spaces containing the furnace, the return air shall also be handled by a duct sealed to the furnace casing and terminating outside the space containing the furnace.**

When installing the furnace with cooling equipment for year round operation, the following recommendations must be followed for series or parallel air flow:

1. In series air flow applications, the coil is mounted after the furnace in an enclosure in the supply air stream. The furnace blower is used for both heating and cooling air flow.

**WARNING**

**The coil MUST be installed on the air discharge side of the furnace. Under no circumstances should the air flow be such that cooled, conditioned air can pass over the furnace heat exchanger. This will cause condensation in the heat exchanger and early failure from rust.**

2. In parallel flow installation, dampers must be provided to direct air over the furnace heat exchanger when heat is desired and over the cooling coil when cooling is desired.



**IMPORTANT:** The dampers should be adequate to prevent cooled air from entering the furnace, and if manually operated, must be equipped with means to prevent operation of either the cooling unit or furnace unless the damper is in the full cool or heat position.

**Venting Instructions:**

Venting of the furnace should be to the outside and in accordance with local codes or requirements of the local utility.

For additional venting information refer to ANSI/NFPA 211 Chimney, Fireplaces, Vents and Solid Fuel Burning Appliances.

**Masonry Chimney:**

This furnace can be vented into an existing masonry chimney. This furnace must not be vented into a chimney servicing a solid fuel burning appliance. Before venting this furnace into a chimney, the chimney must be checked for deterioration and repaired if necessary. The chimney must be properly lined and sized per local or national codes.

If the furnace is vented into a common chimney, the chimney must be of sufficient area to accommodate the total flue products of all appliances vented into the chimney.

The following requirements are provided for a safe venting system:

1. Be sure that the chimney flue is clear of any dirt or debris.
2. Be sure that the chimney is not servicing an open fireplace.
3. Never reduce the pipe size below the outlet size of the furnace.
4. All pipe should be supported using the proper clamps and/or straps. These supports should be at least every four feet.
5. All horizontal runs of pipe should have at least a 1/4" per foot of upward slope.

6. All runs of pipe should be as short as possible with as few turns as possible.

7. Seams should be tightly joined and checked for leaks.

8. The flue pipe must not extend into the chimney but be flush with the inside wall.

9. The chimney must extend three feet above the highest point where it passes through a roof of a building and at least two feet higher than any portion of a building within a horizontal distance of ten feet. It shall also be extended at least five feet above the highest connected equipment flue collar.

10. Check local codes for any variance.

**Oil Burner:**

The furnace is supplied with a high pressure atomizing retention head type burner.

The air tube length, from the face of the mounting plate to the face of the end cone, must be as shown in Fig. 3.

| BONNET CAPACITY, 1000 BTU |    |     |     |     |     |     |     |
|---------------------------|----|-----|-----|-----|-----|-----|-----|
|                           | 85 | 100 | 125 | 150 | 200 | 250 | 335 |
| AIR TUBE LENGTH, IN.      | 5  | 5   | 7   | 7   | 7   | 7   | 9   |

FIG. 3

Complete instructions for installation of the fuel oil piping will be found in the oil burner installation instructions.

If the motor is equipped with oilers, lubricate the burner motor with SAE 10 oil. Once each year slowly pour two teaspoons of oil into each oil cup.

The oil burner and controls must be mounted on the furnace in the proper configuration as shown in Fig. 6.

### **Fan and Limit Control:**

This control must be installed (with No. 10 sheet metal screws) in the hole provided at the top of the front panel, see Fig. 10. When an 1/8" thick fiberglass gasket is provided with this control and it must be located between the furnace casing and the fan limit control.

#### **WARNING**

The fan and limit control must remain mounted in its designated position at all times to insure safe operation of the furnace.

### **Barometric Draft Control:**

Instructions for installing the barometric draft control into the flue pipe are packed in the box with the control. The barometric draft control must be used to ensure proper furnace operation.

### **Electrical:**

The control system depends on the correct polarity of the power supply. Connect "hot" wire (H) and "ground" wire (G) as shown in Fig. 8 and Fig. 9.

A separate line voltage supply should be used with a fused disconnect switch or circuit breaker between the main power panel and the unit. See Figs. 8, 8A and 9.

#### **WARNING**

The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur.

Use copper wire only for 115V supply service to unit.

When replacing any original furnace wiring, use only 105 degree C, 16ga. AWG. copper wire.

Instructions for wiring the thermostat are packed in the thermostat (field supplied) box. Make the thermostat connections as shown in Figs. 8 or 9 at the 24 volt terminal board on the primary relay.

When installing optional accessories to this appliance, follow the manufacturer's installation instructions included with the accessory. Other than wiring for the thermostat, a minimum of type T (63°F rise) must be used for accessories.

**IMPORTANT:** All wiring must comply with local codes and/or the National Electrical Code (ANSI/NFPA 70).

### **Filters:**

Filter racks are provided with this furnace. The filters are sized in accordance with Fig. 10 and are shipped with the furnace. The 335,000 capacity model has an external filter rack as optional equipment. The standard furnace is not supplied with filters.

### **Optional Checkout:**

The installation of the furnace is now complete and the operational checkout may be performed.

### **Start up:**

1. Check the wiring against the diagrams in Figs. 8 and 9.
2. Open the valve on the oil supply line.
3. Reset the primary control.
4. Set the thermostat above room temperature.
5. Set the main electrical switch to "ON" position and the burner should start.

### **Recommended Installation Practices and Combustion Check:**

In order to obtain the optimum performance from the oil burner, the following set up procedures must be followed:

1. A test kit (Bacharach No. 5022 kit or equivalent) to measure the smoke, stack draft, over fire draft, CO<sub>2</sub>, and stack temperatures must be used in order to obtain the proper air band setting. Although all of the above measurements are required for optimum set up and efficiency data, the most important

readings that must be taken are the smoke number, over the fire draft and stack draft.

2. The proper smoke number has been established by engineering tests to be between 0 & 1. This degree of smoke emission is commonly referred to as a "Trace" of smoke. It is recommended to use a Bacharach true spot smoke test set or equivalent.

3. In order to ensure the proper draft through the furnace, a barometric draft regulator, which is supplied with the furnace, must be installed as close to the breech of the furnace as possible. In order for this device to function properly, the barometric damper must be mounted with the hinge pins horizontal and the face of the damper vertical (see instructions included with damper). The draft regulator should be adjusted after the furnace has been firing for at least five minutes and the stack draft should be measured and set between  $-.025''$  wc and  $-.035''$  wc. The draft should be checked with a Bacharach MZF draft gauge or equivalent.

4. The over the fire draft, which is taken through the hole that is provided in the observation door, is a measurement that is necessary to determine if there is a blockage between the oil burner and the flue outlet.

There should be between a  $+.005''$  wc to  $+.015''$  wc pressure drop through the furnace. This would set the range of the over the fire draft between  $-.01''$  wc to  $-.03''$  wc. A reading above  $-.01''$  wc, for example  $+0.1''$  wc, would indicate that the furnace is in an extremely high pressure condition in the primary section. This condition may be caused by excessive combustion air due to the air band being too wide open or a lack of flue draft (chimney effect) or some other blockage, such as soot, in the secondary section of the heat exchanger.

5. The CO<sub>2</sub> and stack temperature instruments will enable you to obtain the data that is required in order to determine the thermal efficiency of the furnace. Although this information is nice to have, it is not essential in the basic set up of the furnace.

6. An oil filter should be installed as close to the burner as possible with all oil burners. The oil filter is more important on the lower firing rate burners and is absolutely essential on the .5 GPH model. We recommend the use of a low pressure drop oil filter such as the General Filter Inc. Model #1A-25A or equivalent.

7. The oil pressure regulator is factory set to give nozzle oil pressures of 100 psig. The firing rate noted on the nameplate may be obtained with "standard" nozzles by adjusting the pump pressure as follows:

| BONNET CAPACITY BTU/HR. | FIRING RATE GAL./HR. | STANDARD NOZZLE SIZE | PUMP PRESSURE PSIG |
|-------------------------|----------------------|----------------------|--------------------|
| 85,000                  | .76                  | .75                  | 103                |
| 100,000                 | .90                  | .90                  | 100                |
| 125,000                 | 1.12                 | 1.10                 | 104                |
| 150,000                 | 1.35                 | 1.35                 | 100                |
| 200,000                 | 1.80                 | 1.75                 | 112                |
| 250,000                 | 2.25                 | 2.25                 | 100                |
| 335,000                 | 3.00                 | two/1.50             | 100                |

NOTE: Refer to the U.L. plate for specific nozzle information.

On a new installation the air entrapped in the oil line leading from the tank to the nozzle must be thoroughly purged in order to prevent excessive after drip. The oil pump is provided with a special fitting that will enable you to purge any air between the tank and oil pump. The proper procedure for performing this operation is as follows:

Place a clear plastic 1/4" dia. tubing over the purge fitting provided on the oil pump. Start the oil burner and then place a jumper across the two "F" terminals on the primary relay (terminals for cad cell connection). Note: Jumper must be in place within 30 sec. after start up or a lockout condition will occur. Open purge fitting (if burner has already ignited flame will cease) and allow the burner to run until the purge tube is completely free of air bubbles.

At this point tighten the purge fitting which will allow oil to run to the nozzle and fire the burner. Remove the jumper from the cad cell terminals and allow the burner to operate normally.

Note: Use 80° solid nozzles for all models except the 250,000 and 335,000 capacity models which use 70° solid.

8. After all the set up procedures mentioned above have been completed, the burner should be allowed to operate and an inspection mirror should be used to observe the flame pattern at the tip of the nozzle. Any irregularities such as burning to one side or pulsating flame patterns should be corrected by changing the nozzle.

#### **Fan Adjustment Check:**

This furnace is equipped with either a 3 speed direct drive motor or a belt drive motor with a variable pitch motor pulley. The blower speed should be adjusted to deliver a differential air temperature of 85°F between the return and supply plenums at the duct static pressure noted on the rating plate.

Consult the wiring diagram for speed changes on the direct drive motor.

To adjust the belt drive motor pulley, loosen the set screw on the adjustable hub, then to increase speed turn clockwise to close or to decrease speed turn counterclockwise to open. Retighten the set screw on flat section of hub. The pulley belt tension should be adjusted to provide a 1" deflection midway between the two pulleys.

#### **Fan & Limit Check:**

After the furnace has been in operation for at least 15 minutes, restrict the return air supply by blocking the filters or closing the return registers and allow the furnace to shut down on high limit. THE FAN MUST CONTINUE TO RUN. Remove the restriction and the burner should come on in a few minutes.

The operational checkout is now complete. Be sure to adjust the thermostat to the desired setting before leaving the installation.

#### **For Year Round Air Conditioning:**

The furnace is designed for use in conjunction with cooling equipment to provide year round air conditioning. The blower has been sized for both heating and cooling. However, the fan motor speed may be changed to obtain the necessary cooling air flow.

#### **Heating:**

The blower speed is factory set to deliver the required air flow at normal duct static pressure.

#### **Cooling:**

The blower speed may be adjusted in the field to deliver the required air flow, for cooling application, as outlined in Fig. 4.

#### **Field Reversing:**

This furnace has been designed to facilitate servicing and installation in locations where access to the furnace is limited. The complete heat exchanger may be reversed to provide either a right or left hand unit (See Note 1 on page 8), by following the steps outlined below:

1. Remove the observation door cover.
2. Remove the collars around the sight tube and flue breech.
3. Remove the front and back panels. On larger models removal of the top panel will facilitate the heat exchanger removal.
4. Remove the four (4) bolts which secure the heat exchanger to the main support channels.
5. Remove the heat exchanger from the casing.

IMPORTANT: For 250,000 and 335,000 BTU models combustion chamber must have "Z" leg reversed as shown in Figure 7.

6. Rotate the heat exchanger so that the front and back are reversed and the flue breeching remains adjacent to the blower compartment.
7. Now reverse the procedure outlined in steps 1 thru 5.

8. FOR FURNACES WITH DIRECT DRIVE MOTORS, it will be necessary to loosen the access motor leads and re-route them to the opposite side of the furnace. Refasten the nylon strain relief strap and insert the bushing in the opposite panel.

**CAUTION**

**Make certain the fan and limit control is mounted in the knock-out provided at the TOP of the front panel.**

**NOTE 1:** Whether the furnace is right or left handed is determined by the location of the burner when the furnace is viewed from the discharge end (i.e. if the burner is on the right side when the furnace is viewed from the discharge end, the unit is termed "right handed"). A right handed unit is shown in Fig. 10.

**Reversible Flue Models:**

The 85,000 and 100,000 BTU models have been designed so the flue can be changed

from the burner side of the furnace to the side opposite the burner. Follow the steps outlined below.

1. Remove the collar from around the flue breech.
2. Remove front and back exterior center panels.
3. Remove and interchange the front and back heat exchanger cover plates (See Fig. 5).

**CAUTION**

**Make sure fiberglass rope gasket seal is in place and tight when replacing cover plates.**

4. Interchange exterior center panels. Be sure to keep knock-outs toward blower end of furnace. Secure with sheet metal screws and replace flue collar.

| FURNACE BONNET CAPACITY | FAN MOTOR H.P. | BLOWER SIZE D X W | FAN PULLEY O.D. IN.                    | MOTOR PULLEY O.D. IN. | BELT LENGTH | MOTOR PULLEY TURNS-OPEN | BLOWER SPEED R.P.M. | AIR FLOW-EXTERNAL DUCT STATIC-IN. W.C. |         |      |      |
|-------------------------|----------------|-------------------|--|-----------------------|-------------|-------------------------|---------------------|--|---------|------|------|
|                         |                |                   |  |                       |             |                         |                     | HEATING                                | COOLING |      |      |
|                         |                |                   |  |                       |             |                         |                     | .20                                    | .40     | .45  | .50  |
| 85,000                  | 1/3PSC         | 10 X 10           | DIRECT DRIVE - LOW SPEED - RED LEAD    |                       |             | 640                     | 1050                |  |         |      |      |
|                         |                |                   | DIRECT DRIVE - HIGH SPEED - BLACK LEAD |                       |             | 1000                    | *                   | 1800                                   | 1750    | 1690 |      |
| 100,000                 | 1/3PSC         | 10 X 10           | DIRECT DRIVE - LOW SPEED - RED LEAD    |                       |             | 620                     | 1070                |  |         |      |      |
|                         |                |                   | DIRECT DRIVE - HIGH SPEED - BLACK LEAD |                       |             | 1050                    | *                   | 1820                                   | 1770    | 1730 |      |
| 125,000                 | 1/2            | 12 X 9            | 7                                      | 3-1/4                 | 43          | 3 1/2                   | 620                 | 1580                                   |         |      |      |
|                         |                |                   |  |                       |             | 1/2                     | 750                 | *                                      | 1780    | 1730 | 1620 |
|                         |                |                   |  |                       |             | 0                       | 770                 | *                                      | *       | 1780 | 1700 |
| 150,000                 | 1/3            | 12 X 12           | 6                                      | 3-1/4                 | 42          | 4                       | 670                 | 1650                                   |         |      |      |
|                         |                |                   |  |                       |             | 2                       | 780                 | *                                      | 1610    | 1520 | 1420 |
|                         |                |                   |  |                       |             | 1 1/2                   | 790                 | *                                      | *       | *    | 1530 |
| 200,000                 | 1/2            | 12 X 12           | 7                                      | 3-1/4                 | 44          | 1                       | 730                 | 2190                                   |         |      |      |
|                         |                |                   |  |                       |             | 0                       | 795                 | *                                      | 1860    | 1740 | 1530 |
| 250,000                 | 3/4            | 15 X 15           | 8                                      | 3-1/4                 | 50          | 3                       | 570                 | 2740                                   |         |      |      |
|                         |                |                   |  |                       |             | 1 1/2                   | 645                 | *                                      | 2570    | 2430 | 2190 |
|                         |                |                   |  |                       |             | 1                       | 650                 | *                                      | *       | *    | 2480 |
| 335,000                 | 1-1/2          | 15 X 15           | 14                                     | 3-1/4                 | 62          | 3 1/2                   | 605                 | 3480                                   |         |      |      |
|                         |                |                   |  |                       |             | 1/2                     | 705                 | 4200                                   | 3720    | 3520 | 3310 |
|                         |                |                   |  |                       |             | 0                       | 780                 | 4620                                   | 4220    | 4060 | 3870 |

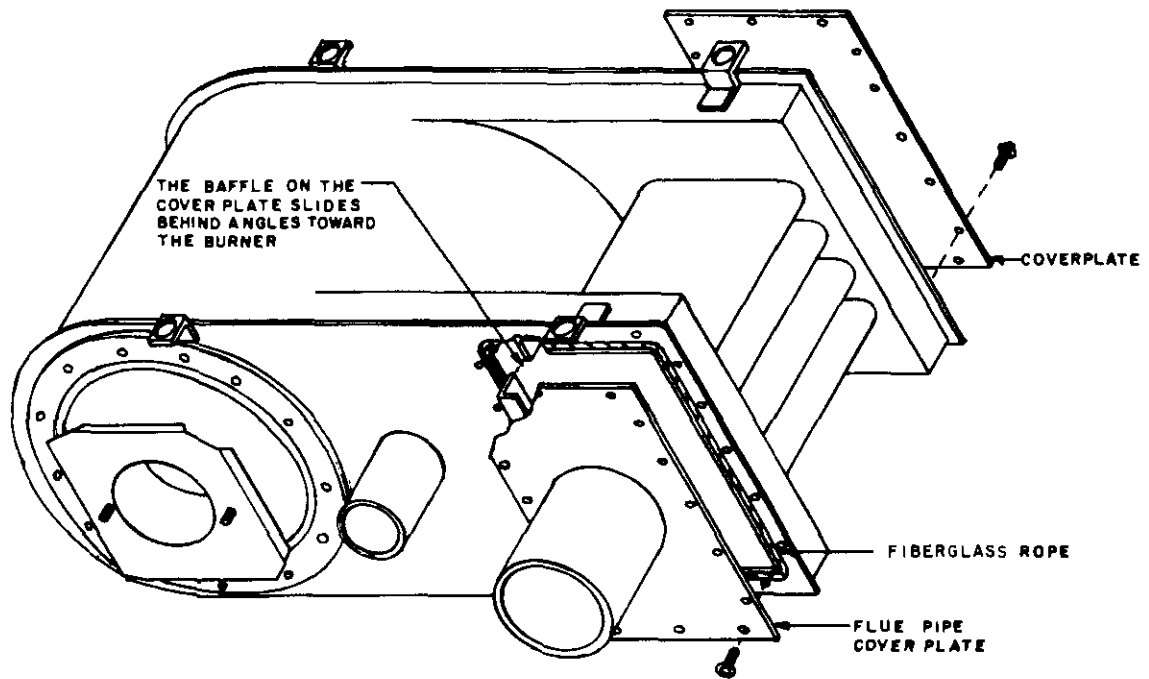
FURNACE BLOWER SPECIFICATIONS AND AIR-FLOW DATA  
FIG. 4

**CAUTION**

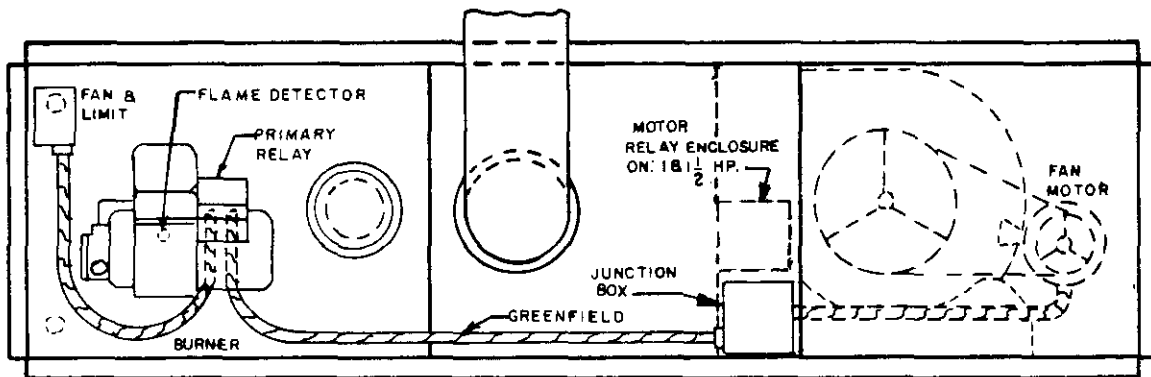
**Operation of the blower motor under conditions established in these spaces on the chart will result in motor overloading and eventual motor failure.**

**WARNING**

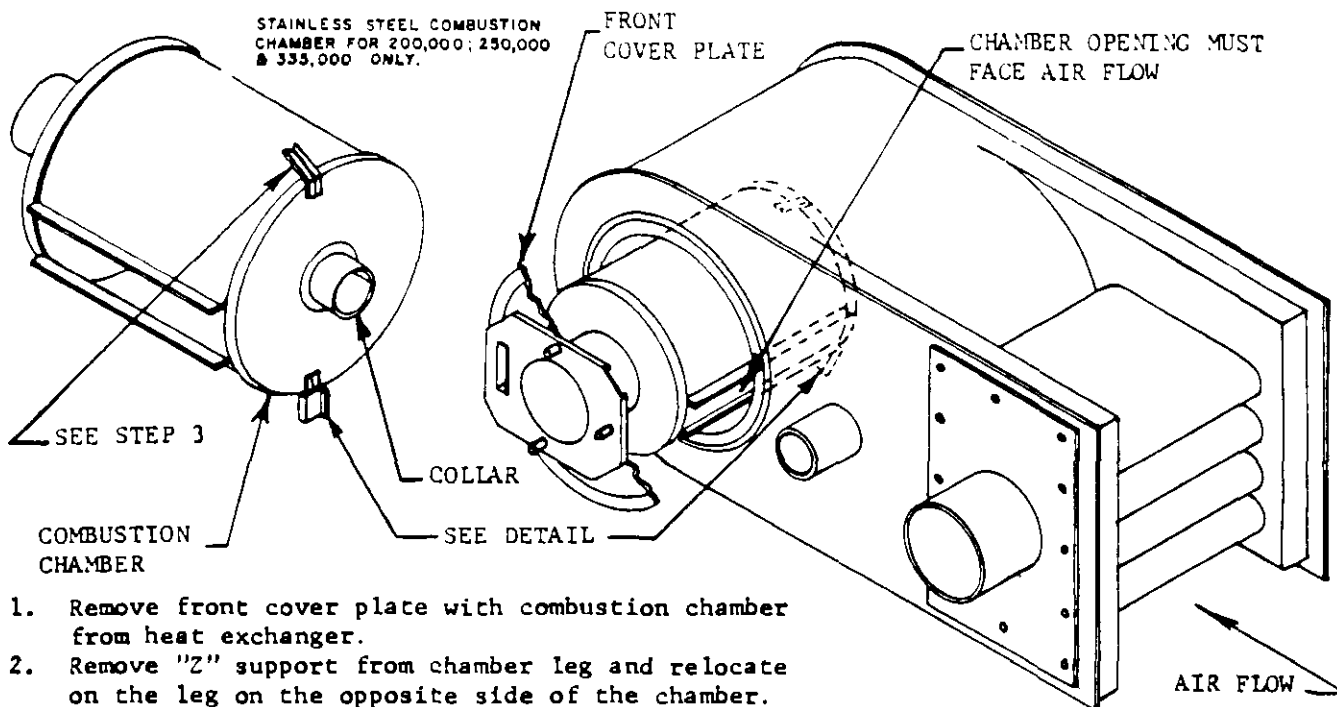
**When operating the furnace in the heating mode, the static pressure and the temperature rise (outlet air temperature minus room temperature) must be within those limits specified on the UL rating plate.**



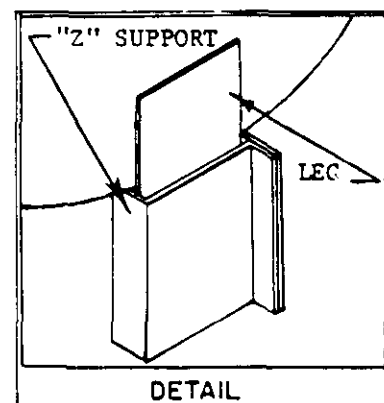
HEAT EXCHANGER - REVERSIBLE FLUE MODELS  
FIG. 5



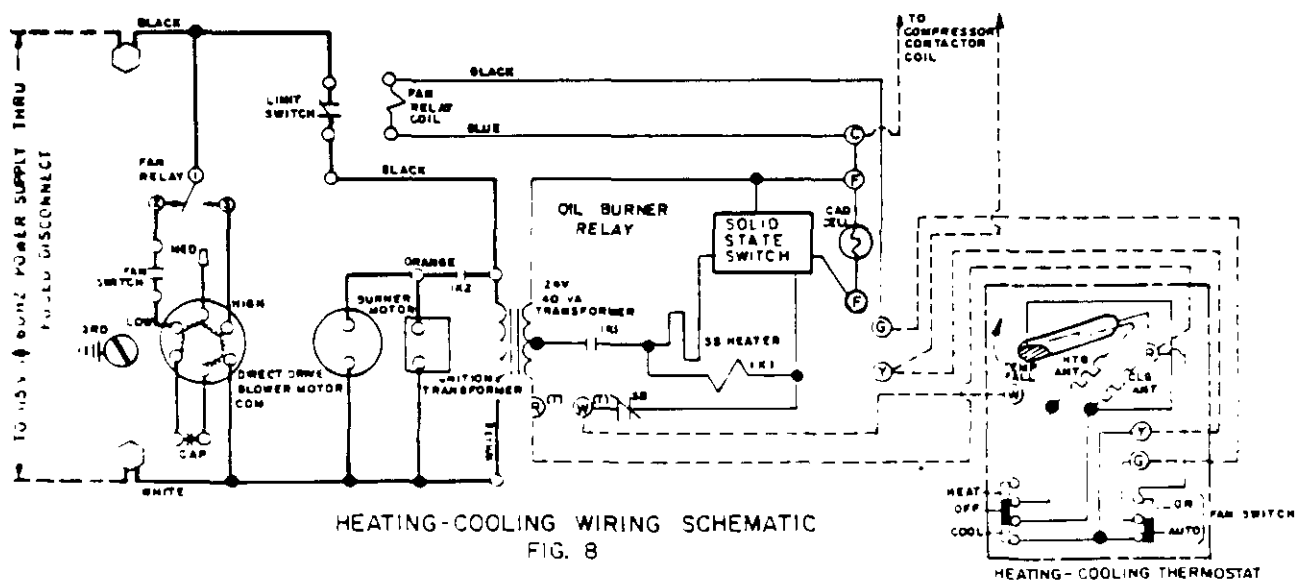
WIRING ARRANGEMENT - BURNER MOUNTED RELAY  
FIG. 6



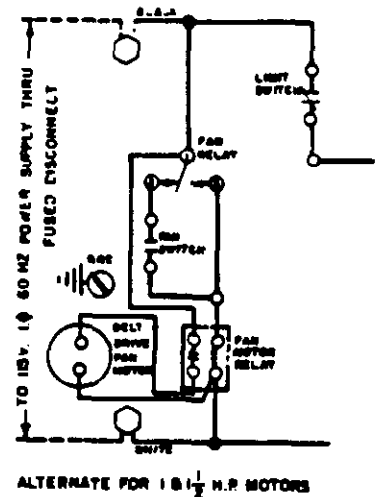
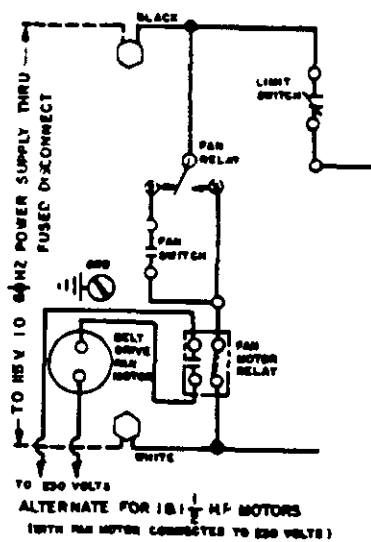
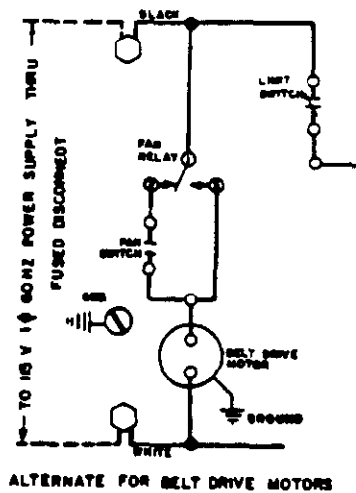
1. Remove front cover plate with combustion chamber from heat exchanger.
2. Remove "Z" support from chamber leg and relocate on the leg on the opposite side of the chamber.  
Note: Bend leg straight so "Z" support is perpendicular to chamber as shown in detail.
3. The leg that now is without the "Z" support should be bent over the chamber for easy installation.
4. Slide combustion chamber back into heat exchanger until collar on rear of chamber slides inside of support in heat exchanger and bolt in place.  
IMPORTANT: "Z" support must be on the bottom of the chamber when the heat exchanger is in its final position.
5. Return to step 6 of field reversing on page 2 of this instructions.



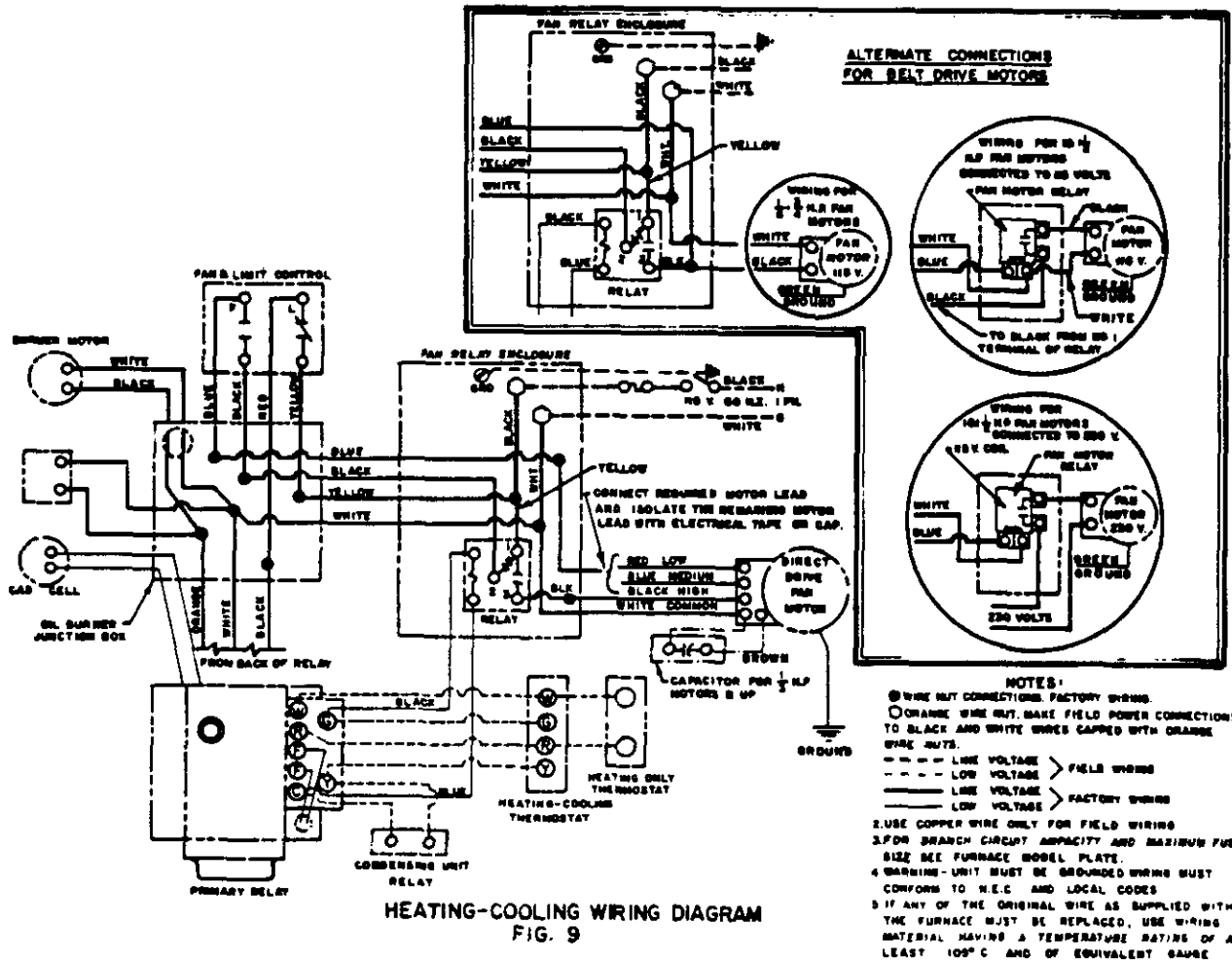
250,000 AND 335,000 B.T.U. MODELS  
COMBUSTION CHAMBER "Z" LEG FIELD REVERSING  
FIG. 7



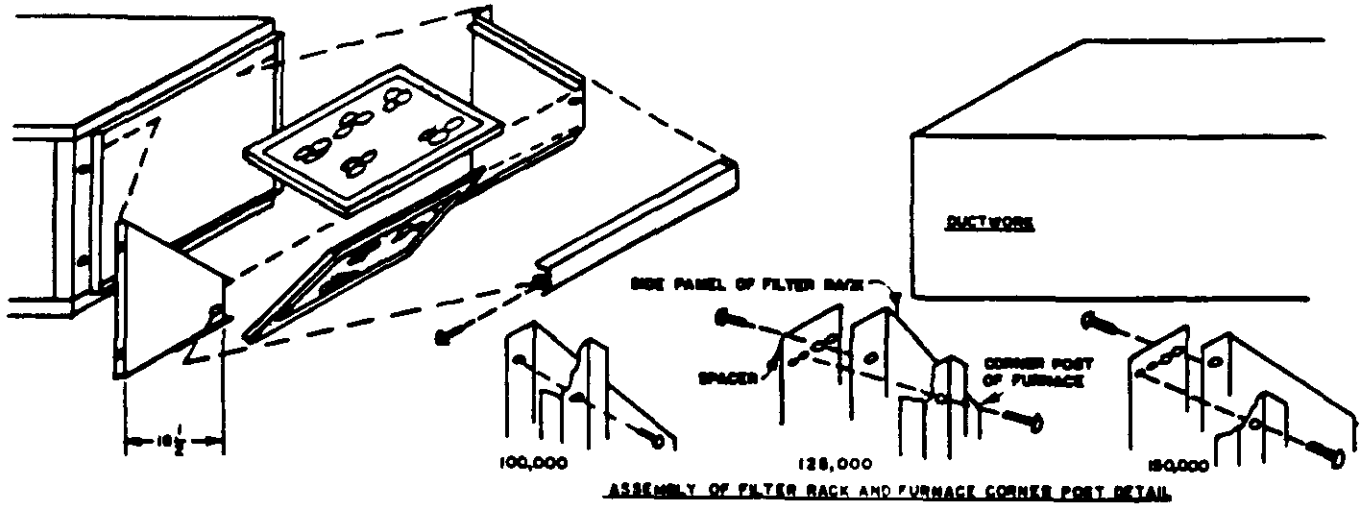
HEATING-COOLING WIRING SCHEMATIC  
FIG. 8



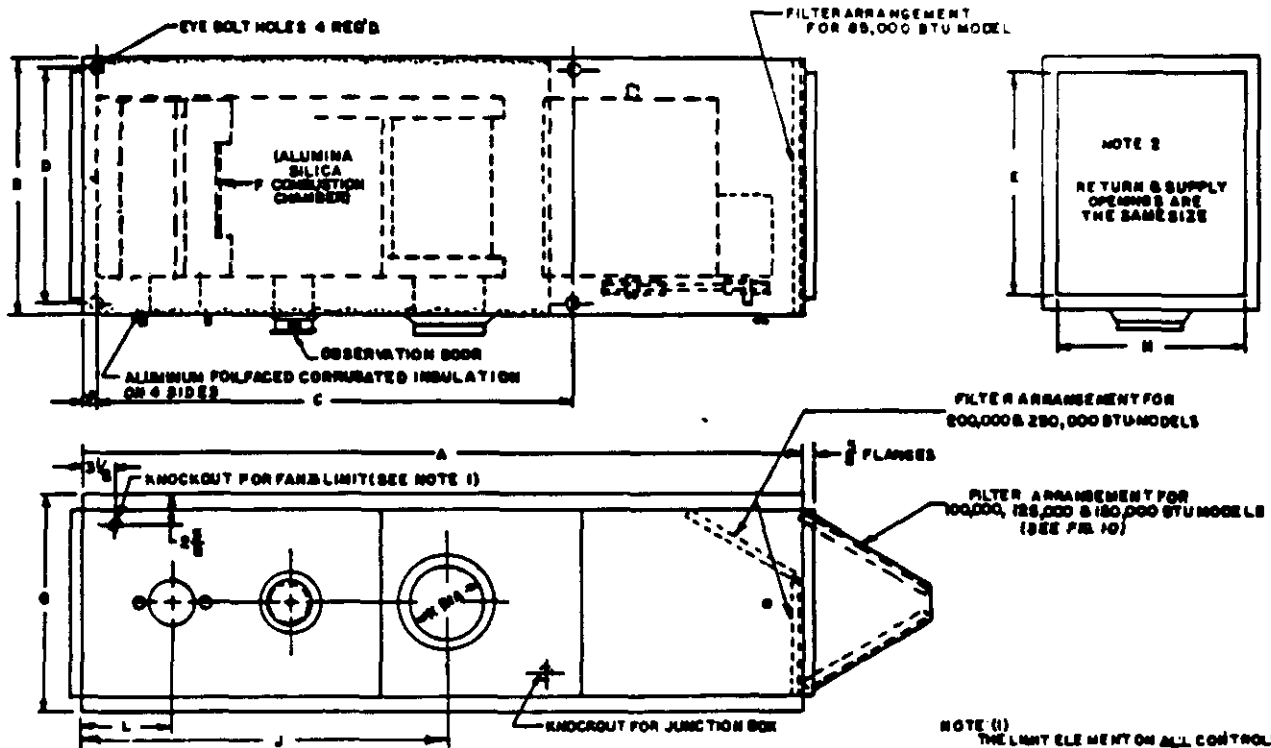
ALTERNATE WIRING SCHEMATICS  
FIG. 8-A



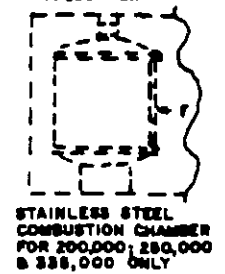




FILTER RACK ASSEMBLY 100, 125 & 150,000 BTU MODELS



| BONNET CAPACITY BTU/HR. | A  | B  | C      | D      | E  | L x D IA P      | G  | H      | J      | K | L      | FILTER SIZES |
|-------------------------|----|----|--------|--------|----|-----------------|----|--------|--------|---|--------|--------------|
| 85,000                  | 68 | 21 | 42 1/4 | 17 1/2 | 18 | 15 3/4 x 9 3/4  | 22 | 18 1/2 | 35     | 7 | 10     | 1-20x20x1    |
| 100,000                 | 72 | 23 | 46 1/2 | 18 1/2 | 20 | 17 3/4 x 11 1/4 | 22 | 19 1/2 | 38     | 7 | 10     | 2-20x20x1    |
| 125,000                 | 78 | 25 | 45 3/4 | 21 1/2 | 22 | 19 3/4 x 11 1/4 | 22 | 19 1/2 | 37     | 7 | 11     | 2-20x20x1    |
| 150,000                 | 78 | 27 | 45 3/4 | 23 1/2 | 24 | 21 3/4 x 12 1/4 | 22 | 19 1/2 | 37     | 7 | 11     | 2-20x20x1    |
| 200,000                 | 80 | 29 | 55 1/2 | 24 1/2 | 26 | 14x14           | 30 | 27 1/2 | 42     | 8 | 15     | 2-20x25x1    |
| 250,000                 | 86 | 32 | 55 1/2 | 27 1/2 | 29 | 16x16           | 30 | 27 1/2 | 42     | 8 | 12     | 4-15x20x1    |
| 335,000                 | 86 | 39 | 71 1/2 | 31 1/2 | 36 | 18x18           | 32 | 28 1/2 | 51 1/2 | 8 | 18 1/2 | 4-20x20x1    |



GENERAL ASSEMBLY LAYOUT

FIG. 10

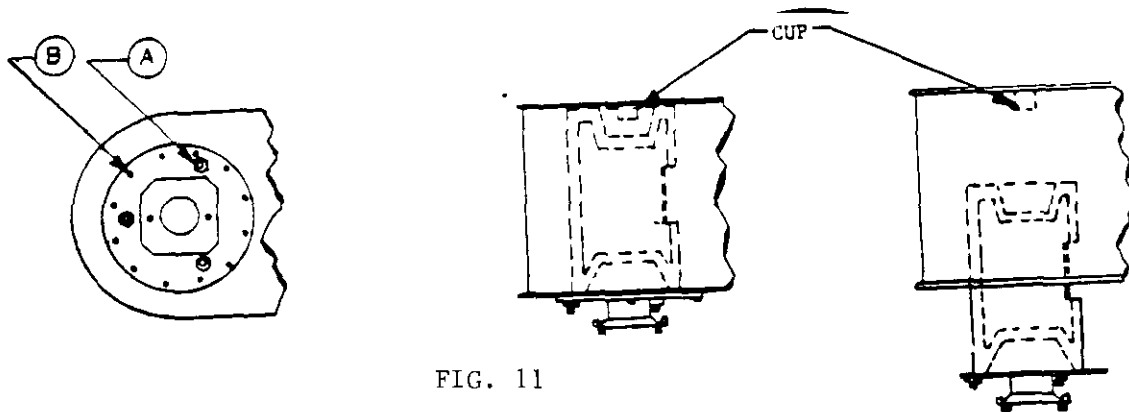


FIG. 11

### MAINTENANCE

This furnace should never be operated without an air filter. Disposable filters should be replaced at least once a year. If equipped to provide cooling, filters should be replaced a minimum of twice a year.

To avoid personal injury, make sure the electrical supply power is "OFF" before servicing.

#### WARNING

**Before performing any service functions, unless operations specifically require the power to be on, make sure all utilities are turned "OFF" upstream of the appliance.**

Periodic oiling of the blower motor may be necessary. Check for instructions on the inside of your blower compartment door.

For optimum performance, the oil burner nozzle must be replaced once a year. Contact your dealer serviceman if you are unsure of this procedure.

The procedure for nozzle installation and/or replacement is outlined in the oil burner instruction manual which came with the furnace. For ease of maintenance, the oiling procedure for the burner motor, as outlined in this manual, should be performed at this time.

After replacement of the nozzle, the burner should be adjusted in accordance with the COMBUSTION CHECK and OIL PUMP CHECK sections of the instruction.

Ordinarily, it is not necessary to clean the heat exchanger every year, but it is advisable to have your oil burner serviceman check the unit before each

heating season to determine whether cleaning is necessary.

If cleaning is necessary, the following steps should be performed:

1. Turn "OFF" all utilities upstream of the furnace.
2. Disconnect the oil line and remove the oil burner from the furnace.
3. Disconnect and remove the fan & limit control and all other controls mounted on the intermediate panel.
4. Disconnect the observation flipper door and collar. Remove the intermediate panel.
5. Loosen to hand tightness bolts "A" in Figure 11 for model 85 thru 150.
6. Remove bolts "B". Slide combustion chamber outwards and slant downward for removal of chamber support leg.
7. Clean flue passageways with stiff brush and vacuum cleaner. Removal of flue pipe and cleanout cover is recommended for ease of cleaning.

#### CAUTION

**Never use incendiary type cleaners (smoke sticks) for cleaning.**

8. After cleaning, place combustion chamber back into furnace by slanting chamber and placing support leg inside of furnace. Slide chamber into place.

**IMPORTANT:** Make sure fiberglass rope gasket is in place. Replace bolts "B" and tighten.

9. Tighten bolts "A" to 30 inch pounds of torque (firm not tight).
10. Reverse disassembly procedure to reassembly furnace.
11. Re-adjust burner for proper operation. Recheck fan & limit function as outlined in this manual.

# SERVICE NOTES

ISSUE 8805  
B8183 1414