

# Metromatic

## INSTALLATION MANUAL FOR WARM AIR FURNACES

All Installations Must Be in Accordance With Local and State Codes Which May Differ From This Manual.

Check With Local Building Official To Be In Conformance With Local Building, Plumbing and Electrical Codes.

### These Instructions Apply To The Following Models:

| LO-BOY   | HI-BOY      | NOZZLE         |
|----------|-------------|----------------|
| LB - 84  | HB/SU - 84  | .75 80° SOLID  |
| LB - 100 | HB/SU - 100 | .85 80° SOLID  |
| LB - 120 | HB/SU - 120 | 1.00 80° SOLID |
| LB - 140 | HB/SU - 140 | 1.25 80° SOLID |
| LB - 200 | HB/SU - 200 | 1.75 80° SOLID |
| LB - 275 | HB/SU - 275 | 2.25 80° SOLID |

**CAUTION:** READ INSTRUCTION MANUAL BEFORE INSTALLING OR OPERATING THIS UNIT.

**CAUTION:** UNIT MUST BE INSTALLED BY A QUALIFIED LICENSED FURNACE INSTALLER. ALL UNITS APPROVED FOR COMBUSTIBLE FLOORS EXCEPT SUSPENDED MODELS. REFER TO CLEARANCE CHART.

**CAUTION:** FOR YOUR SAFETY - DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE LIQUIDS IN THE VICINITY OF THIS OR OTHER APPLIANCES.

**NOTE:** ALL FURNACE MODELS U/L LISTED FOR USE WITH R.W. BECKETT CORP. MODEL AF BURNERS.

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**SAVE THESE INSTRUCTIONS**

# INSTALLATION INSTRUCTIONS

## GENERAL

The information on the following pages has been prepared to save time, obtain the best possible installation, and insure continuous trouble-free operation of your furnace.

### 1. Damage in Transit

- a. Upon receipt of shipment of this material, inspect all cartons for external damage. If external damage is noted, open the carton and inspect for damage to equipment. Mark the number of cartons received in this condition on the delivering carrier's waybill, and request the services of their inspector.
- b. If upon opening a carton, concealed damage is discovered, open the entire shipment and note all equipment so damaged. Contact the delivering carrier and request inspection of the damaged equipment. Do not destroy the carton as the inspector from the freight company will need this to determine reason for damages.
- c. Normally, claims for any and all damages should be filed with the freight company within five working days after receipt of shipment.
- d. Since all oil furnace materials are sold FOB Factory, it is the responsibility of the consignee to file claim with the delivering carrier for materials received in a damaged condition.

## A. GENERAL INFORMATION

All furnaces are shipped assembled. It may sometimes be necessary to disassemble your furnace because of narrow doorways.

## B. LOCATING AND SETTING THE UNIT

The Furnace should be installed following the methods approved by the Warm Air Heating and Air Conditioning Association. Installation shall comply with all applicable local and national codes, NBFU Pamphlet No. 90B (NFPA No. 90B).

## C. APPLIANCE LOCATIONS

1. In installation in confined spaces, two permanent openings shall be provided--one near the top of the enclosure and one near the bottom.
  - a. ALL AIR FROM INSIDE BUILDING

Each opening shall have a minimum free area of one square inch per 1000 BTU/hr of the total input or one square foot per gallon of oil input of all appliances in the enclosure. The openings must freely communicate with interior areas, which have adequate infiltration from the outside.
  - b. ALL AIR FROM OUTDOORS

Each opening shall have a free area of not less than one square inch per 4000 BTU/hr of total input rating of all appliances in the enclosure where vertical ducts are employed and one sq. in. per 1000 BTU/hr input if horizontal ducts are used. ADEQUATE AIR FOR COMBUSTION AND VENTILATION MUST BE MADE AVAILABLE.
2. a. In unconfined spaces in buildings of conventional frame, brick or stone construction, infiltration normally is adequate to provide air for combustion ventilation and draft hood dilution.
  - b. In homes built to the new insulation standards and older buildings of unusually tight construction, air for combustion, draft control and ventilation must be obtained from outdoors. A permanent minimum opening or openings, having a total free area of not less than one sq. in. per 5,000 BTU/hr or 30 sq. in. per gal. per hour a total input of all appliances, shall be provided. Ducts used to convey make-up air from outside shall

be of the same cross sectional area as the free area of the openings, but not less than 3". Such ducts connected to the outside air may be connected to the cold air return of the heating system.

### 3. VENTILATION AIR FROM INSIDE BUILDING, COMBUSTION AIR FROM OUTDOORS.

- a. The enclosure shall be provided with two permanent openings; one near the top of the enclosure and one near the bottom, each opening having a free area of not less than one sq. in. per 5000 BTU/hr of total input of all appliances in the enclosure. A duct used to convey make-up air shall be of the same cross sectional area as the free area of the opening required and the minimum dimension shall be not less than 3 inches. Such ducts connected directly to outdoor air only may be connected to the cold air return of the heating system.

**NOTE:** In especially cold climates, use of openings of size specified might result in over ventilation and excessive cooling of utility rooms resulting in the hazard of freezing water lines. Consult with local utilities and authorities where there is a question.

## D. SETTING UP THE UNIT

1. Uncrate the unit and set in proper place on a level base. Furnace must be fully supported. Supporting only the corners of the unit will result in permanent damage to the heat exchanger and nullifies the warrantee.
2. Be sure there is adequate clearance around combustion air openings and at front and rear of furnace for servicing burner and blower.
3. Combustion chamber is factory installed in heat exchanger. Check placement before installing oil burner, as rough handling can affect chamber.
4. Install oil burner. (See oil burner instructions)
5. It is necessary to install fan and limit control in plenum. A template is included to assist you. See table 1.

## E. FLUE CONNECTION

Chimney area should be at least 20% greater than the area of the flue outlet. Inspect the chimney to be sure that it is free from obstruction, sufficiently large, and that it provides adequate draft. See Fig. #2. Chimney should be at least two feet higher than any portion of the roof (or walls) within twenty (20) feet.

1. Connect flue outlet of furnace to chimney using approved vent pipe of the same nominal diameter as the flue outlet. Twenty-four (24) gauge galvanized flue pipe or equivalent is recommended.
2. Flue pipe should slope upward at least 1/4 in. per running foot. Furnace flue outlet should be not more than ten flue pipe diameters from chimney connection. If distance is greater, use next size larger flue pipe.
3. Be sure that barometric damper is in vertical position and swings freely. Maximum flue damper setting must not exceed .04" H<sub>2</sub>O. For maximum economy .02" H<sub>2</sub>O is recommended.

## F. AIR DUCT CONNECTIONS

1. Install warm air plenum, warm air duct, and return air duct in accordance with the recommendation of the National Warm Air Heating and Air Conditioning Association. Clearance above the plenum and first six feet of the duct must be at least 3 or 6 inches and then may reduce to two inches. (See Clearance Chart).

Warm air plenums and return air plenums should be the same size as the outlets on the furnaces. Ducts should be connected to the plenums with tight fittings. Circulating air shall not be taken from the enclosure in which the furnace is located.

It is recommended and some codes require that duct with area equal to 5% of the return air opening of the furnace be connected from the return air plenum to outside air.

# Table 1 - CLEARANCES AND FAN LIMIT CONTROL DATA

## LO-BOY and HI-BOY MODELS 84 thru 140

|             |            |              |             |
|-------------|------------|--------------|-------------|
| Top - 6"    | Sides - 1" | Rear - 1"    | Front - 24" |
| Plenum - 5" | Duct - 2"  | Chimney - 7" | Floor - 0"  |

## LO-BOY and HI-BOY MODELS 200 & 275

|             |            |               |             |
|-------------|------------|---------------|-------------|
| Top - 6"    | Sides - 6" | Rear - 6"     | Front - 24" |
| Plenum - 6" | Duct - 2"  | Chimney - 10" | Floor - 0"  |

## SUSPENDED MODELS 84 thru 140

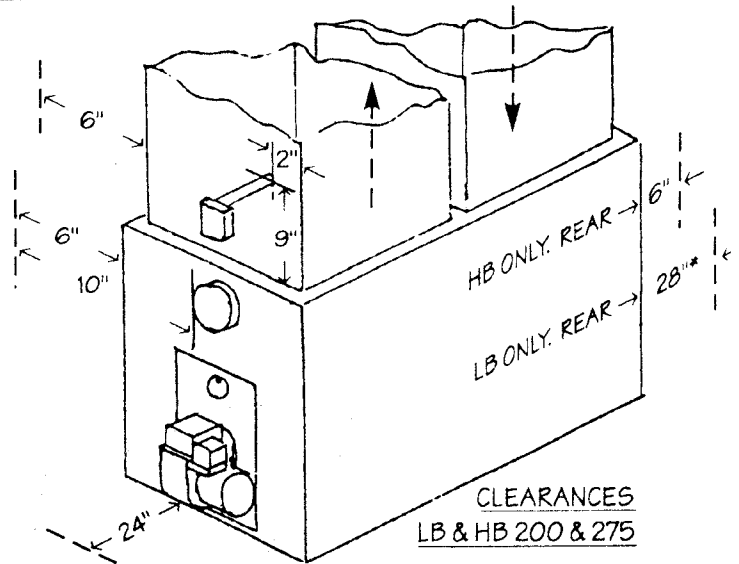
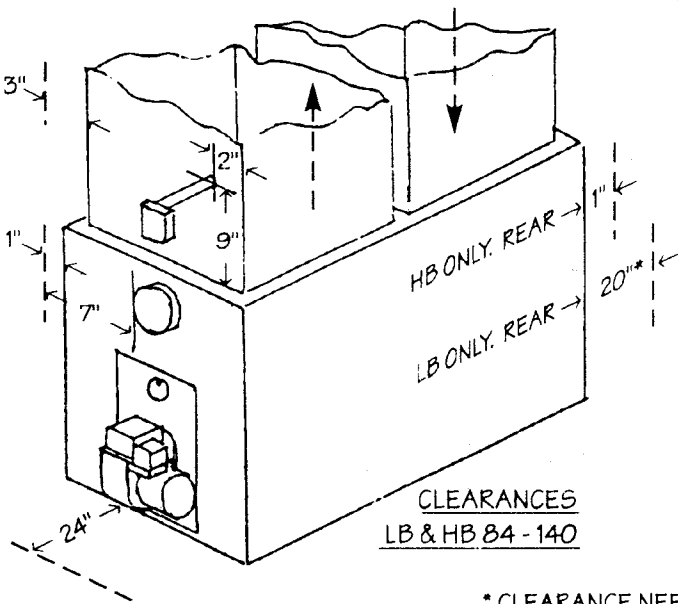
|             |                |              |             |
|-------------|----------------|--------------|-------------|
| Top - 6"    | BTM. Side - 1" | Rear - 1"    | Front - 24" |
| Plenum - 5" | Duct - 2"      | Chimney - 7" |             |

## SUSPENDED MODELS 200 & 275

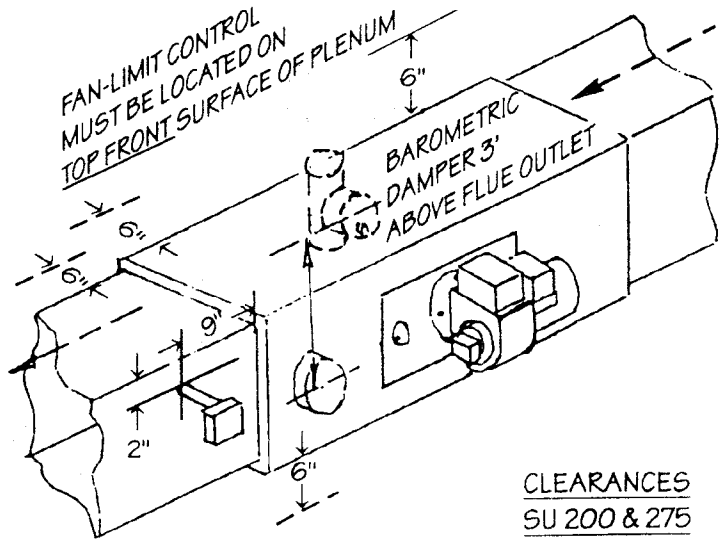
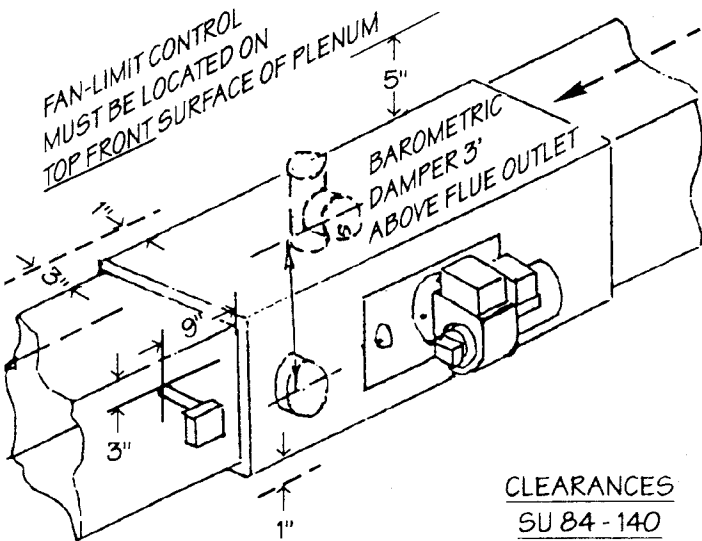
|             |                |               |             |
|-------------|----------------|---------------|-------------|
| Top - 6"    | BTM. Side - 6" | Rear - 6"     | Front - 24" |
| Plenum - 6" | Duct - 2"      | Chimney - 10" |             |

ALL MODELS: Fan-limit Control Element Length - 11"  
Maximum Limit Setting - 200° F.

FIGURE 1



\* CLEARANCE NEEDED FOR BLOWER REMOVAL



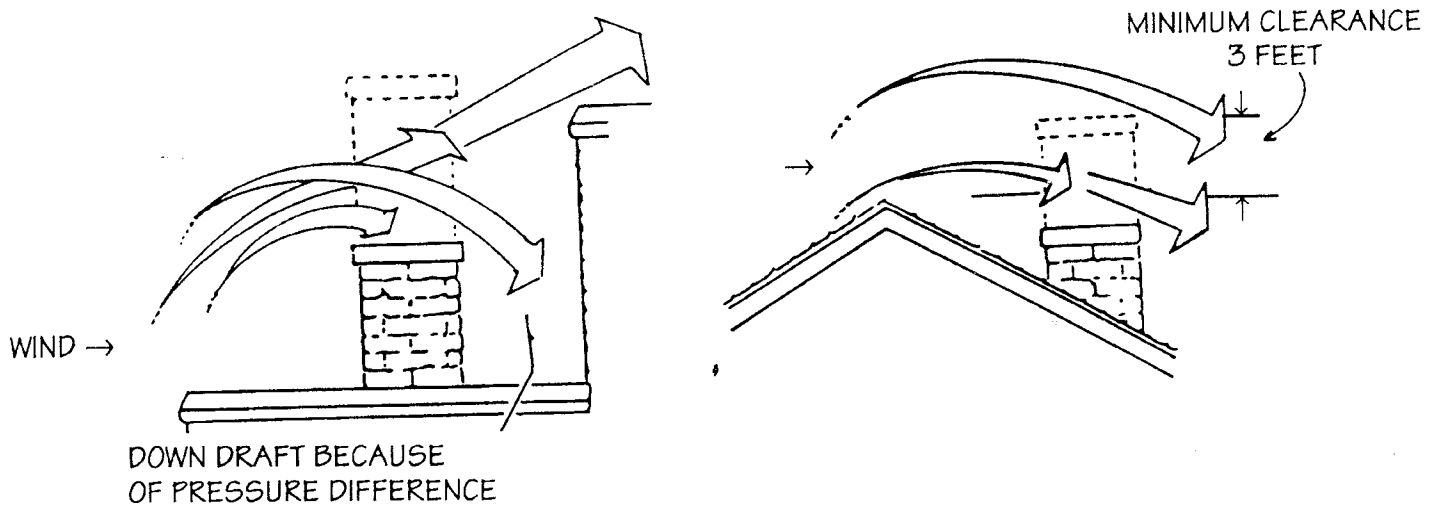


FIGURE 2

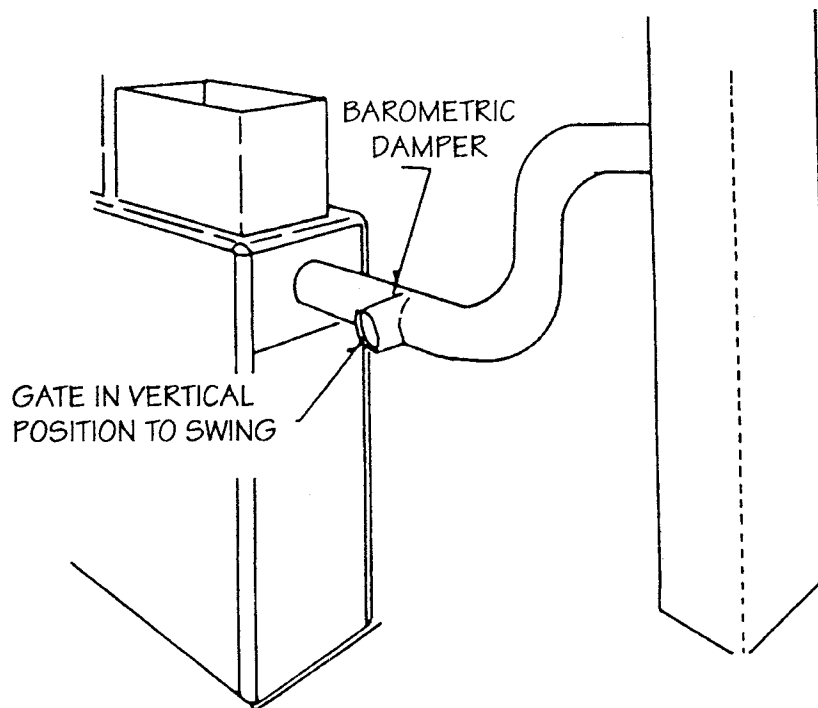


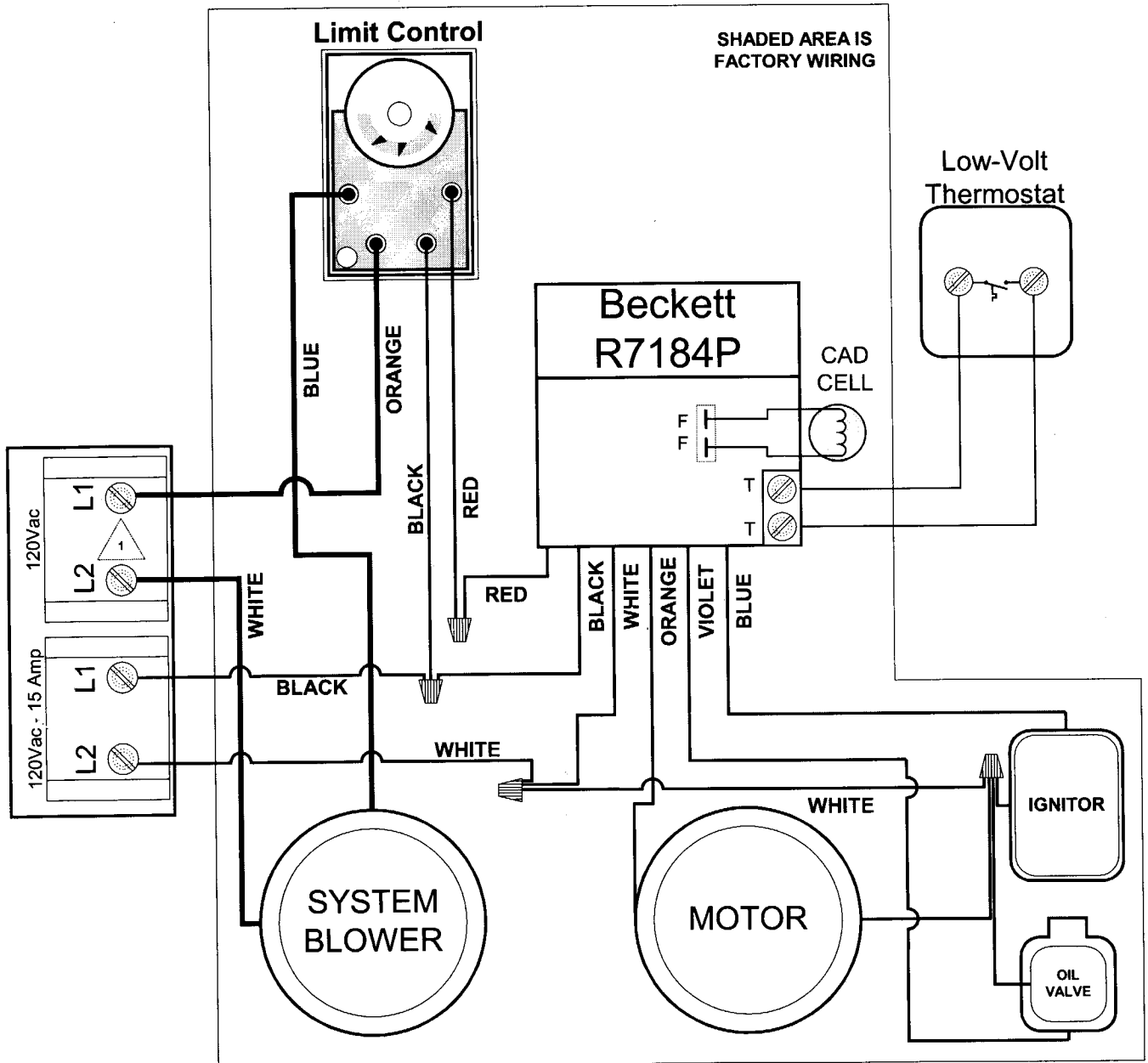
FIGURE 3

INSTALLATION OF BAROMETRIC DAMPER ON DRAFT CONTROL





LB/HB/SU-200 Models require 20 Amp Service  
LB/HB/SU-275 Models require 30 amp Service



**IMPORTANT:** When this furnace is used in connection with a cooling system, the evaporator (cooling) coil must be installed in the warm air plenum. If the cooling system is used in a parallel flow arrangement, the air from the cooling system must always discharge into the warm air plenum. The dampers or other means used to control the air flow, shall be adequate to prevent any chilled air from entering the furnace. If manually operated, it must be equipped with a means to prevent operation of either unit unless the dampers are in the full heat or cool position. Not provided by the furnace manufacturer.

For additional air conditioning installation instructions, refer to those packaged in the air conditioning unit.

**TABLE 2. APPROVED NORMAL RISE AND EXTERNAL STATIC PRESSURES.**

| BLOWER  | MOTOR | THROUGH RISE °F. | EXTERNAL STATIC PRESSURE |
|---------|-------|------------------|--------------------------|
| 10 x 9  | 1/4   | 70 - 90          | .2                       |
| 10 x 9  | 1/3   | 70 - 90          | .4                       |
| 12 x 12 | 1/2   | 70 - 90          | .4                       |
| 12 x 12 | 1/2   | 70 - 90          | .2                       |
| 12 x 12 | 3/4   | 70 - 90          | .5                       |
| 15 x 15 | 1     | 70 - 90          | .2                       |
| 15 x 15 | 1     | 70 - 90          | .5                       |

## J. STARTING AND OPERATION

1. Oil--do not burn oil heavier than No. 2.

Do not use gasoline, crankcase oil or any oil containing gasoline.

### 2. Starting burner:

- a. Check to be sure there is oil and power to burner.
- b. Push reset button on primary control and reset button on burner motor.
- c. Set air shutter on burner one-half (1/2) open.
- d. Open all oil valves.
- e. Set room thermostat above room temperature.
- f. Open inspection door.
- g. Loosen gauge plug and place small pan under port to catch oil (necessary on initial start or if pump has lost prime).
- h. Close line switch to furnace and burner should start.
- j. Run until air is out of oil lines.
- k. Tighten gauge plug.
- l. Check for oil leaks.
- j. Adjust burner air shutter to provide minimum 12% CO<sub>2</sub> and a zero smoke as final test.

**CAUTION: DO NOT START BURNER WITH COMBUSTION CHAMBER FULL OF OIL VAPOR OR WITH VERY HOT COMBUSTION CHAMBER.**

### 3. Stopping burner:

- a. Move thermostat lever to a point lower than room temperature or open line switch.
- b. To shut down for long periods, close valve at oil tank and open line switch.

4. Adjust burner according to burner instructions supplied by manufacturer which are enclosed.

- a. Oil burner motor and blower motor at least once each heating season with SAE 20 oil. Clean oil burner at least once each heating season.

## 5. Normal Rise and Static Pressures

- a. See Table 2 and rating plate for approved normal temperature rise through the unit and the approved external static. All furnaces are approved for a normal rise of 70° to 105° F. (difference between inlet or return air temperature and/or temperature in the warm air plenum), and for operation against external static pressures of 0.2 in. W. C.

All furnaces with the proper motor and blower combination are also approved for operation against 0.5 in. W.C. external static pressure (for air conditioning coils). Some of the furnaces are approved for 50° to 70° F. normal rise. See Table 2 for approved normal rise, motor blower combination, and approved external static pressures.

### b. Blower Adjustment

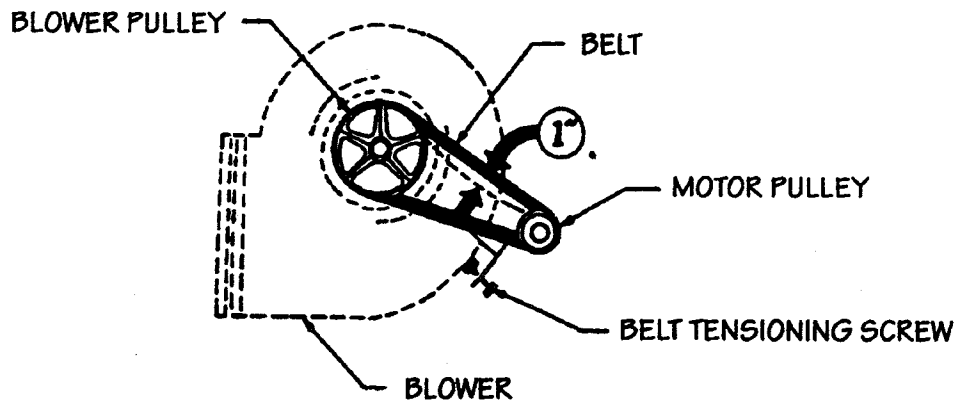
These furnaces are equipped with belt driven blowers with fixed pulleys on the blower and adjustable pulleys on the motor. To reduce blower speed (and air delivery) loosen set screw on the outer half of the motor pulley and turn the outer half counter clock wise looking at shaft end. To increase the blower speed, turn the outer half clockwise. After adjustment, the set screw must be tightened on the flat spot. Be sure that blower and motor pulleys are aligned.

Check belt for adjustment. When belt tension is correct, the belt can be depressed about one inch in center. Belt tension can be adjusted by raising and lowering motor using adjusting screw. (Fig. #6.) A tight belt will cause noise and overload the motor. Check blower rotation.

The motor pulley should be adjusted to give a temperature rise through the furnace of between 70° and 105° F.

The best setting for comfort heating and quiet operation is between 90° and 100° F. When these furnaces are installed to operate against a total external static pressure of 0.2 in. W. C. (excluding air conditioning coil) the total drop through the return duct should be less than 0.05 in. W. C. and the total drop through the warm air duct work should be less than 0.15 in. water column.

Blower motor should be oiled at least once each heating season with SAE 20 lubricating oil or equivalent. Do not use light oil such as sewing machine oil and do not over-oil motors.



**FIG. 6 - ADJUSTING BELT TENSION**

### c. Fan and Limit Control

1. The limit control should be set below and not to exceed the temperature established by the fixed stop. The maximum settings allowed are given in Table 1.
2. The fan control should be adjusted to turn on between 100° F. and 120° F. for economical and satisfactory heating performance. Continuous blower operation will provide the most economical operation and also the most uniform temperature.

d. Safety check

1. Check to see that the furnace has the proper draft.
  - a) Allow unit to run for a short length of time.
  - b) Over fire draft should be 0.01 in. to 0.03 in. and should be set using a draft gauge. Correct the draft if required before operating the furnace.
2. Check all of the safety devices to assure proper operation.
  - a) Disconnect a wire on the limit control - the primary relay will not be energized.
  - b) Check primary relay following instructions packed with the control.

e. Balancing System

1. System can be balanced tentatively by placing a thermometer in the center of each room.
  - a) Operate the furnace with all dampers wide open. until the hottest room can be selected.
  - b) Adjust the damper in the duct to the hottest room to reduce air flow slightly.
  - c) Allow time for distribution to stabilize and recheck for hottest room.
  - d) Adjust the damper in the duct to the hottest to reduce air flow.
  - e) Continue this procedure until uniform temperatures or the distribution desired is attained. Do not change dampers after final balancing, unless the room (or rooms) is found to be continually uncomfortable. Wind directions will shift and cause some change in heat losses with resulting changes in temperature.

## K. MAINTENANCE AND SERVICE

### 1. Cleaning

Cleaning furnace room vestibule of furnace and burner at regular intervals. Dust and lint can cause poor combustion and smoky flames. If a vacuum cleaner is used, turn off furnace before cleaning around burner.

### 2. Filters

Inspect and clean filters every month.

Replace with new filters of same size at least once each heating season and more often if necessary. Dirty filters cause reduced air circulation, lower efficiency of the heating system and result in excess fuel consumption.

|       |             |       |         |       |         |
|-------|-------------|-------|---------|-------|---------|
| LB84  | Two 15 x 20 | HB84  | 16 x 20 | SU 84 | 16 x 20 |
| LB100 | Two 15 x 20 | HB100 | 16 x 20 | SU100 | 16 x 20 |
| LB120 | Two 15 x 20 | HB120 | 16 x 20 | SU120 | 16 x 20 |
| LB140 | Two 20 x 25 | HB140 | 18 x 24 | SU140 | 18 x 24 |
| LB200 | Two 20 x 25 | HB200 | 20 x 25 | SU200 | 20 x 25 |
| LB275 | Two 20 x 30 | HB275 | 20 x 30 | SU275 | 20 x 30 |

### 3. Blowers and Motors

Oil at least once each heating season with SAE 20 oil. Do not overoil and do not use sewing machine oils or gummy oils. Blower bearings are self-lubricating and normally require no oiling.

### 4. Annual Performance Checks

Check shutoff valves and line filter. Replace or clean cartridge in line filter. Be sure to open shutoff valve after service is completed.

Check nozzle assembly. Clean or preferably replace nozzle.

Clean or replace strainer (nozzle).

Check connections for leaks and tighten.

Check efficiency.

Check cut off. Insert pressure gauge in nozzle port. Upon shutdown, pressure should drop approximately 15 PSI. If pressure drops to 0 PSI cut off seat may be damaged.

## TROUBLE SHOOTING

| <u>CONDITION</u>          | <u>CAUSE</u>  | <u>REMEDY</u>  |
|---------------------------|---|--|
| 1. Change in size of fire | Dirty Nozzle  | Replace  |
|                           | Low pressure  | Adjust at pump   |
|                           | Plugged strainer                                    | Clean  |
|                           | Cold oil  | Reduce nozzle one size and increase pump pressure to 140 PSI |
| 2. No oil flow            | Oil level below intake line in supply tank          | Fill tank  |
|                           | Clogged strainer                                    | Remove and clean strainer                                    |
|                           | Clogged nozzle                                      | Clean & replace  |
|                           | Air leak in intake line                             | Tighten fittings & plugs<br>Check valves                     |
|                           | Restricted intake line<br>(High vacuum reading)     | Replace kinked tubing<br>Check valves, filters, etc.         |
|                           | Two pipe system air bound                           | Check bypass plug  |
|                           | Single pipe system air bound                        | Loosen vent plug and drain oil until foam is gone            |
|                           | Slipping or broken coupling                         | Tighten or replace   |
|                           | Frozen pump shaft                                   | Replace  |
|                           | 3. Oil spray but no ignition                        | Dirty electrodes   |
| Improper spacing          |   | Reset  |
| Short                     |   |  |
| Cracked porcelain         |   | Replace  |
| Dead transformer          |   | Replace  |
| Loose connection          |   | Tighten  |
| Faulty relay              |   | Replace  |
| 4. Burner fails to start  | Defective thermostat                                | Replace  |
|                           | Fuse burned out                                     | Replace  |
|                           | Limit control open                                  | Check setting - correct                                      |
|                           | Contact dirty or open on primary relay              | Clean or replace relay                                       |
|                           | Relay transformer burned out                        | Replace relay  |
|                           | Motor stuck or burned out or overload protector out | Push reset button Replace if burned out                      |
|                           | Primary relay off on safety                         | Push reset button  |
| 5. Noisy operation        | Bad coupling alignment                              | Loosen fuel unit or mtr.                                     |
|                           | Loose coupling                                      | Tighten set screws or replace coupling                       |
|                           | Air in oil line                                     | Bleed oil line look for leaks                                |
|                           | Pump noise  | Continued running sometimes works in gears; if not replace   |
|                           | Hum vibration                                       | Isolate pipes from structural members                        |
|                           | Combustion noise                                    | Adjust air   |

| <u>CONDITION</u>                    | <u>CAUSE</u>  | <u>REMEDY</u>  |
|-------------------------------------|---|--|
| 6. Burner will not run continuously | Lockout timing too short<br>Poor flame - too much air - too little oil<br>Water or air in oil<br>Control wired wrong      | Replace primary control<br>Check nozzle, air adjustment oil pressure size of nozzle<br>Look for leak in supply<br>Check and rewire   |
| 7. Pulsation                        | Air adjustment<br>Pressure over fire<br>Dirty or improperly set electrodes<br><br>Too much oil impingement                | Readjust air<br>Correct draft to 0.02 W.C.<br>Clean & reset. Wire primary cont. for cont. ignition<br>Check nozzle & pump press. Check nozzle size & angle & position of drawer assembly                                       |
| 8. Short cycling of Blower          | Blower control setting<br><br>Input too low<br>Temp. rise too low<br><br>High ambient temp.                               | Fan limit, adjust blower off lever to 115° F<br>Check burner input<br>Blower running too fast. Slow down blower<br>Check ventilation   |
| 9. Short cycling on limit control   | Limit setting low<br>Input too high<br>Temp. rise too high<br><br>Fan control setting too high<br>Control out of position | Reset to maximum<br>Check burner input<br>Blower too slow speed up blower. Restricted returns or outlets - open dampers or add additional outlets or returns<br>Reset lower (150° F)<br>Bent sensing element or loose mounting |
| 10. High fuel consumption           | Input too high<br>Fuel loss too great   | Check burner input<br>Measure CO <sub>2</sub> and flue gas temp. If loss is more 25%, reset air, check input, speed up blower. Check static pressure in return and outlet plenum. Correct to recommended values.               |
| 11. Not heating                     | Low input<br>Insufficient air circulating<br><br>Furnace too small  | Check nozzles and input<br>Speed up blower, check size and location of ducts and outlets. Set fan control and blower for continuous air circulation.<br>Check heat loss to be sure furnace properly sized.                     |
| 12. Noisy operation                 | Burner noisy<br><br>Blower motor  | Check mounting & position. Adjust air - see previous comment.<br>Oil bearings. Tighten shaft collars. Adjust belt tension. Align and tighten pulleys. Position rubber isolators.   |

# COMMON CHIMNEY PROBLEMS AND THEIR CORRECTIONS

