

**INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS
DOWNFLOW/HORIZONTAL
OIL-FIRED
WARM AIR FURNACES**

ISSUE 9440
SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE

AFFIX LABEL HERE

FOR YOUR SAFETY

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

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

WARNING

For use with grade 2 Fuel Oil maximum. Do Not use Gasoline, Crankcase Oil or any Oil containing Gasoline!

CAUTION

Never burn garbage or paper in the heating system and never leave rags or paper around the unit.

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 a three position unit, in that it may be operated in counterflow, horizontal left-to-right, or horizontal right-to-left air flow positions. Since it is shipped without the burner and controls mounted, there is no additional effort required to change from one air flow configuration to another — the installer merely places the burner/controls in the proper position for the installation. In addition, it is shipped as a front flue unit (flue connection on the same side of the furnace as the burner), but may be changed to rear flue at the time of installation. (See page 7 of these instructions.)

The furnace is shipped in two packages, one with the basic furnace and one with the oil burner and control box. The burner is fully wired, so the only assembly required is the mounting of the control box (four screws), the mounting of the burner (three nuts), in the mounting of the limit cover (two screws), and the connection of the motor and limit wires (all quick connect terminals). It requires a line voltage (115 VAC) connection to the control box, a thermostat hook-up as shown on the wiring diagram, oil line connections(s), adequate ductwork, and connection to a properly sized vent.

Issue 9440
20154001 118
2100-251

FILE VOL. I, TAB 3

The air handling capacity of this furnace is designed for cooling air flow. Refer to Figure 15 for the expected airflows at various external duct static pressures.

IMPORTANT: All local and national code requirements governing the installation of oil burning equipment, wiring and flue connections must be followed. Some of the codes (issued by the Canadian Standards Association, the National Fire Protection Agency, and/or the American National Standards Institute) that may be applicable are:

CSA B139	INSTALLATION CODE FOR OIL BURNING EQUIPMENT
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
CSA C22.1	CANADIAN ELECTRICAL CODE

Only the latest issues of the above codes should be used, and are available from either:

The National Fire Protection Agency
Battery March Park
Quincy, MA 02269

or

The Canadian Standards Association
178 Rexdale Blvd.
Rexdale, Ontario M9W 1R3

LOCATION

WARNING

This furnace is not water tight and is not designed for outdoor installation. This furnace shall be installed in such a manner as to protect the electrical components from water. Outdoor installation would lead to a hazardous electrical condition and to premature furnace failure.

CAUTION

For an attic installation it is important to keep insulation 12" or more away from any furnace openings. Some types of insulating materials may be combustible.

This furnace is approved for reduced clearance, combustible construction, therefore, it may be installed in a closet, alcove or similar enclosure. It is also approved for attic installation. As this unit may be installed as a counterflow or horizontal furnace, it may be located in a basement, on the same level as the area to be heated, suspended, or in a crawlspace. In any case, the unit should always be installed level.

When installed in a horizontal position, the furnace may be suspended by using an angle iron frame, as long as the total weight of both the furnace and the frame are allowed for in the support calculations. (Other methods of suspending are acceptable.)

When installed in the counterflow position, this furnace **must not** be installed on combustible flooring, unless the approved sub-base is used.

The required minimum clearances for this furnace in all positions are specified in Figure 14.

The furnace should be located as close as possible to the chimney or vent 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.

Air for Combustion and Ventilation:

This furnace should be installed in a location in which 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.

In addition to air needed for combustion, process air shall be provided as required for: cooling of equipment or material, controlling dew point, heating, drying, oxidation or dilution, safety exhaust and odor control.

In addition to air needed for combustion, air shall be supplied for ventilation, including all air required for comfort and proper working conditions for personnel.

The barometric draft regulator, included with the furnace, shall be installed in the same room or enclosure as the furnace in such a manner as to prevent any difference in pressure between the regulator and the combustion air supply.

Air requirements for the operation of exhaust fans, kitchen ventilation systems, clothes dryers, and fireplaces shall be considered in determining the adequacy of a space to provide combustion air requirements.

In unconfined spaces in buildings of conventional frame, brick or stone construction in filtration **MAY** be adequate to provide air for combustion, ventilation and dilution of the flue gases. This determination must be made on an individual installation basis and must take into consideration the overall volume of the unconfined space, the number of doors to the outside, internal doors which can close off the unconfined space and the overall tightness of the building construction.

Manny new buildings and homes (and older ones that have been weatherized) **MUST BE** considered as being tight construction and, therefore, infiltration will not be sufficient to supply the necessary air for combustion and ventilation.

A building can be considered as being of tight construction when:

- a. Walls and ceilings exposed to the outside atmosphere have a continuous water vapor retarder with a rating of one perm or less with openings gasketed or sealed and/or
- b. weatherstripping has been added on operable windows and doors, and/or
- c. caulking or sealants are applied to areas such as joints around window and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical and fuel lines and at other openings.

If combustion and ventilation air must be supplied to an unconfined space from outside, and opening with a free area of not less than one square inch per 1,000 Btu per hour of total input of all appliances within the unconfined space (but not less than 100 square inches) must be provided. This opening must be located such that it can not be blocked at any time.

When this furnace is installed in a closet or enclosure, two (2) ventilation openings, with **OPEN AREA** as dimensioned in Figure 1, are required for combustion air. The openings should be located about 6" from the top and the bottom of the enclosure at the front of the furnace.

BONNET CAPACITY 1,000 BTU/HR.	LENGTH INCHES	HEIGHT INCHES
55	18	9
75	18	9
100	20	10
125	20	10

Figure 1

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. inch per 1,000 Btu of total input rating but no 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. inch per 4,000 Btu of total rating when the air is directly communicated from the outdoors.
2. 1 sq. inch per 4,000 Btu of total input rating when the air is brought in through vertical ducts.
3. 1 sq. inch per 2,000 Btu of total input rating when the air is transferred through horizontal ducts.

When ducts are used to supply air, 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.

In calculating free area, 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 mesh and shall be readily accessible for cleaning. If the free area through a design of louvered or grille is known, it shall be used in calculating the size design and free area specified. If the design and free area is not known, it may be assumed that wood louvers will have 20 percent free area and metal louvers and grilles will have 60 percent free area. Louvers shall be fixed in the open position or interlocked with the furnace so they are opened automatically at furnace start-up and remain open during furnace operation.

WARNING

Do not block the combustion air openings in the burner. Any blockage will result in improper combustion ventilation which may result in a fire hazard and/or cause bodily harm.

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) or Canadian equivalent.

The supply ductwork should be attached to the flanged opening provided at the discharge end of the furnace. See Figure 16 for the dimensions of this opening.

The return air ductwork should be connected to the opening on the inlet end of the furnace. **An externally mounted air filter must be used with this furnace!** The filter should be mounted in the return air ductwork in a position that is readily accessible to the homeowner. Be sure that the filter is large enough that the air velocity through the filter does not exceed the rating of the filter (typically 300 feet per minute velocity rating). An external filter frame kit is available to mount directly to the outside of the furnace. Contact your dealer for details.

The following recommendations should be followed when installing the ductwork:

1. Install locking type dampers in all branches of 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 the supply and return air system. In applications where extremely quiet operation is necessary, the first 10 feet (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 terminate outside the space containing the furnace. Incorrect ductwork termination and sealing will create a hazardous condition which could lead to bodily harm.

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 possible failure of the heat exchanger which could lead to a fire hazard and/or a hazardous condition which may lead to bodily harm. Heat exchanger failure due to improper installation may not be covered by warranty.

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 the 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.

OIL FIRED APPLIANCES SHALL BE CONNECTED TO FLUES HAVING SUFFICIENT DRAFT AT ALL TIMES TO ENSURE SAFE AND PROPER OPERATION OF APPLIANCE.

For additional venting information refer to ANSI/NFPA 211 Chimney, Fireplaces, Vents and Solid Fuel Burning Appliances and/or CSA B139 Installation Code.

This furnace is certified for use with Type "L" vent (maximum flue gas temperature 575°F).

Pre-Installation Vent System Inspection:

Before this furnace is installed, it is highly recommended that any existing vent system be completely inspected.

For any chimney or vent, this should include the following:

1. Inspection for any deterioration in the chimney or vent. If deterioration is discovered, the chimney must be repaired or the vent must be replaced.
2. Inspection to ascertain that the vent system is clear and free of obstructions. Any blockage must be cleared before installing this furnace.
3. Cleaning the chimney or vent if previously used for venting a solid fuel burning appliance or fireplace.
4. Confirming that all unused chimney or vent connections are properly sealed.
5. Verification that the chimney is properly lined and sized per the applicable codes. (Refer to list of codes on page 2.)

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 size of the

furnace flue pipe.

4. All pipe should be supported using the proper clamps and/or straps. These supports should be at least every four (4) 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 (3) feet above the highest point where it passes through a roof of a building and at least two (2) feet higher than any portion of a building within a horizontal distance of ten (10) feet. It shall also be extended at least five (5) feet above the highest connected equipment flue collar.
10. Check local codes for any variance.

Factory Built Chimneys:

May use listed factory built chimneys. Refer to chimney manufacturers instructions for proper installation.

Horizontal Venting:

This furnace may be horizontally vented through an outside wall when installed with one of the following auxiliary inducer blower:

available from: Tjernlund Products, Inc. Model SS1C

Tjernlund Products, Inc.
1601 Ninth Street
White Bear Lake, MN 55110-6795

or

Fields Controls Model SWGII-5
(with a CK-61 timer)

available from:

The Fields Controls Company
2308 Airport Road
Kinston, NC 28051

CAUTION
USE METALLIC VENT PIPE, ONLY! PLASTIC
VENTING MATERIALS ARE PROHIBITED!

Oil Burner:

This furnace is supplied with a high pressure atomizing retention head type burner (for use with not heavier than grade 2 Fuel Oil). The air tube length, from the face of the mounting plate to the extreme face of the end cone, should be as follows:

<u>Capacity</u>	<u>Length</u>
55,000	5"
75,000	5"
100,000	5"
125,000	7"

Lubricate the burner motor with SAE 10 oil. Once each year, pour two (2) teaspoons of oil slowly into each oil cup.

Oil Connections:

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

An oil filter should be used with all oil burners, installed as close as possible to the burner.

Barometric Draft Control:

The barometric draft control shipped with the furnace must be used with the furnace to insure proper operation. Instructions for installing the control are packed with the control. Refer also to Figure 17 on page 16 for suggested locations.

Electrical:

The appliance must be installed in accordance with current ANSI/NFPA 70 National Electrical Code, CSA C22.1 Canadian Electrical Code Part 1 and/or local codes.

The control system depends on the correct polarity of the power supply. Connect "HOT" wire (H) and "NEUTRAL" wire (N) as shown in Figure 18.

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 Figure 18.

WARNING

The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. A ground screw is provided in the control box for connection.

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

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

Instructions for wiring the thermostat are packed in the thermostat (field supplied) box. Make the thermostat connections as shown in Figure 18 at the 24 volt terminal board on the control box.

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

Filters:

A FILTER MUST BE USED WITH THIS FURNACE

An external filter rack is available as an optional equipment with this furnace.

WARNING

Never operate unit without a filter or with filter access door removed. Failure to adhere to this warning could lead to a hazardous condition which could lead to equipment damage and bodily harm.

Keeping Filters Clean

As a homeowner, this is your most important responsibility. A dirty filter reduces the efficiency of your system, causes erratic performance of controls and could result in damage to the motor or heating element.

1. Inspect filters at regular intervals depending upon dirt conditions. For new homes, check filters every week for 4 consecutive weeks. In all cases, inspect your filters at least every 3 to 4 weeks when the system is in constant operation. Replace or clean filter at least at the beginning of each season (heating and cooling) and thereafter as needed.
2. If a permanent filter is used, it can be cleaned with cold water and soap.

Be sure that the filter is thoroughly dry before installing back into the furnace.

Reversing Instructions for Rear Flue Option:

NOTE: These steps are only for installations where it is necessary to have the flue connection on the opposite side of the furnace from the burner and controls. If rear flue is not required, skip to the "ASSEMBLY INSTRUCTIONS" section.

Unit should be reversed prior to installing the cabinet in position.

1. Remove the observation tube door from the front panel, taking care not to let the door spring "snap" the hinge and pinch your fingers.
2. Remove the flat rosette and gasket from around the observation tube.
3. Remove the rosette from around the flue connector.
4. Remove the front panel and the flue panel from the unit. **IMPORTANT** — the heat exchanger will only be secured in place by the heat exchanger support legs that are hooked into brackets on the blower partition at this time. **Care should be taken to adequately support the heat exchanger and prevent it from falling! Also, be careful not to damage the limit control!**

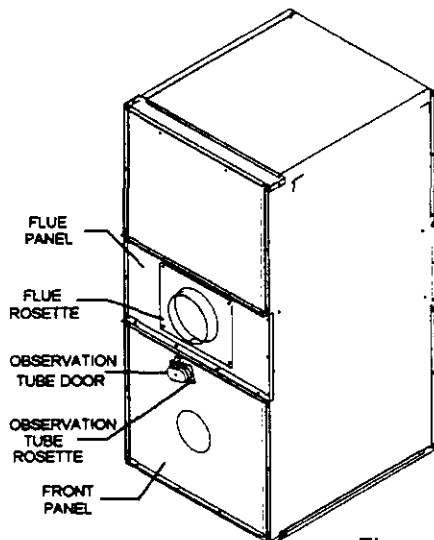


Figure 2

5. Supporting the heat exchanger so that it doesn't fall, remove the heat exchanger from the cabinet by pulling it straight forward.

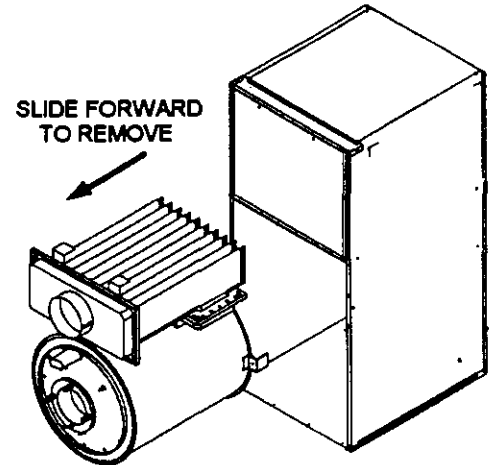


Figure 3

6. Remove the cover plate/combustion chamber assembly from the heat exchanger drum by removing the 12 parkerized screws that secure it to the drum front. **Carefully** slide the combustion chamber out of the drum, taking care not to damage the relatively fragile chamber material.

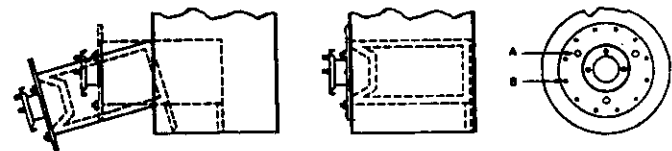


Figure 4

7. Remove the "blank" cover plate on the rear of the drum, again by removing the 12 parkerized screws on the drum rear. Install this "blank" plate on the front (flue connector side) of the drum. Insure that the gasket is intact and that all screws are secure.
8. Install the cover plate/combustion chamber assembly (removed in step 6) into the rear opening of the drum, taking care not to damage the chamber, insuring the gasket is in place, and verifying that the screws are all securely tightened.

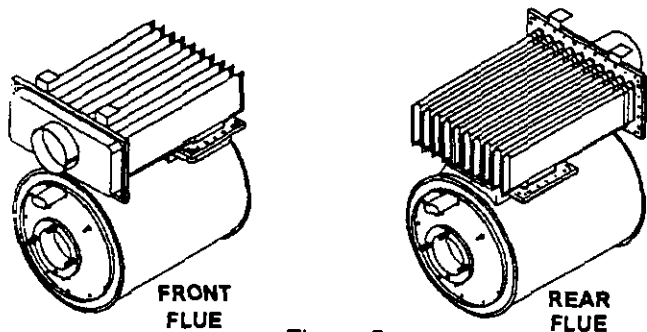


Figure 5

- Remove the two screws that attach the angle portion of the heat exchanger legs to the straight portion, rotate the angle portion so that they point the opposite direction, and reattach to the straight portion, using the original screws.

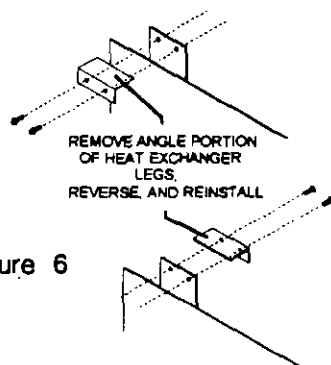


Figure 6

- Remove the rear center panel from the cabinet, and replace it with the flue panel removed in step 4.
- Turn the heat exchanger so that the flue connector is toward the rear of the unit, and reinstall into the cabinet. The heat exchanger support legs will now engage in the hangers at the rear of the blower partition instead of the hangers at the front. The flue connector should protrude through the opening in the flue panel on the rear of the unit, with the burner mounting flange still at the front of the unit.

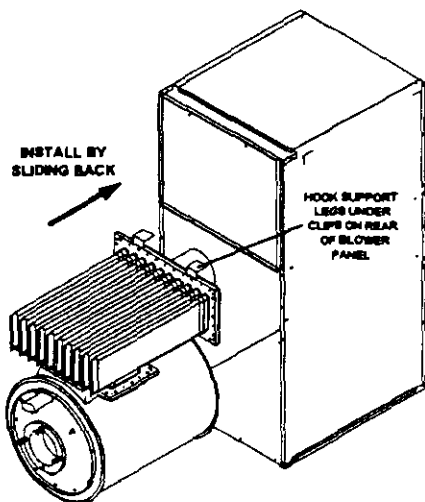


Figure 7

- Reinstall the front panel (from step 4) and install the rear center panel (from step 10) where the flue panel originally was. **Be careful not to damage the limit control!**
- Replace the rosette on the flue connector (located at the rear of the furnace), the observation door rosette and gasket, and the observation door.
- Proceed with installing the furnace cabinet and mounting the oil burner and controls.

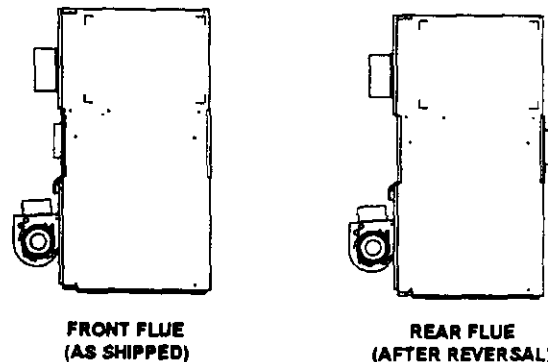


Figure 8

Assembly Instructions:

It is easier to install the furnace if the cabinet assembly (shipped in carton 1 of 2) is placed into position, the ductwork connected, and then the control box/burner assembly (shipped in carton 2 of 2) is mounted to the cabinet. Then the electrical, thermostat, and oil line connections can be made to the completed unit.

To attach the control box/burner assembly to the cabinet:

- Carefully unpack carton 2, containing the prewired control box/burner assembly and hardware bag.
- Remove the three burner mounting nuts that secure the shipping plate on the front of the furnace cabinet at the burner mounting flange, and remove and discard the shipping plate. When the furnace is in its installed position, the burner mounting studs should be in the "twelve", "three", and "nine" o'clock positions, leaving the bottom hole empty. If the furnace is being installed in a counterflow position, the studs are in the correct position when shipped from the factory. If the furnace has been placed in a horizontal position, it will be necessary to remove the stud that is now in the "six" o'clock position and reposition it so that the studs are in "twelve", "three", and "nine" o'clock positions. (It may be necessary to use two of the burner mounting nuts as "jam" nuts on the stud in order to provide a means of using a wrench to remove a tight nut.)

3. If the furnace is to be installed in the left-to-right air flow horizontal position, it will be necessary to relocate the burner wiring conduit from the right side of the burner to the left side, as follows:
 - a. Release the clip(s) securing the ignition control on top of the burner, and swing the control open in order to gain access to the wiring compartment inside the burner.
 - b. Disconnect the wire nuts on the black, white, and orange wires inside the burner.
 - c. Remove the conduit nut that secures the conduit to the right side of the burner, and detach the conduit and wires from the burner housing.
 - d. Remove the hole plug from the left side of the burner housing, and put it in the hole on the right side (where the conduit was just removed).
 - e. Feed the conduit and wires through the left side hole, and secure with the conduit nut removed in step c.
 - f. Reconnect the black, white, and orange wires inside the burner, using the wire nuts from step b.
 - g. Close and secure the ignition control.

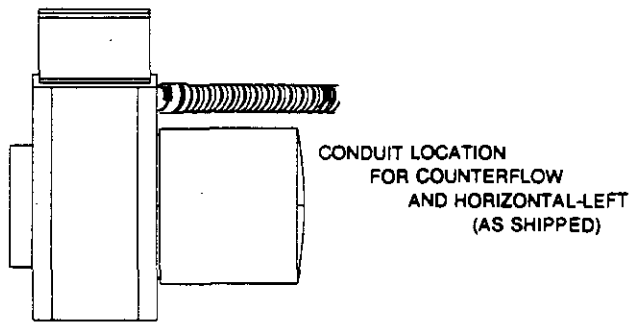
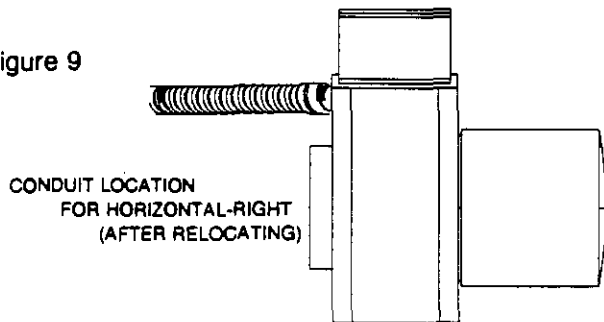


Figure 9



4. Carefully install the burner onto the burner mounting studs, insuring that the mounting flange gasket is positioned between the flange on the burner and the front of the furnace. Secure the burner in position with the three burner mounting washers and nuts removed in step 2. **IMPORTANT:** The burner must always be installed in the upright position with the ignition control on top.

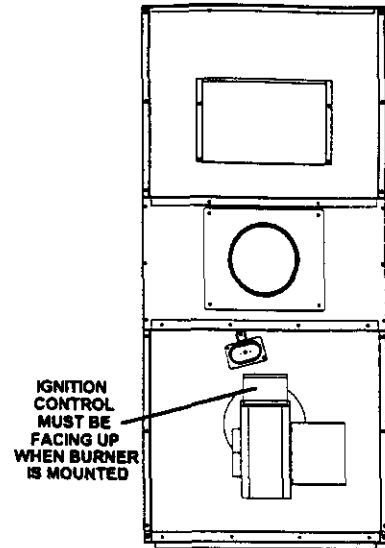
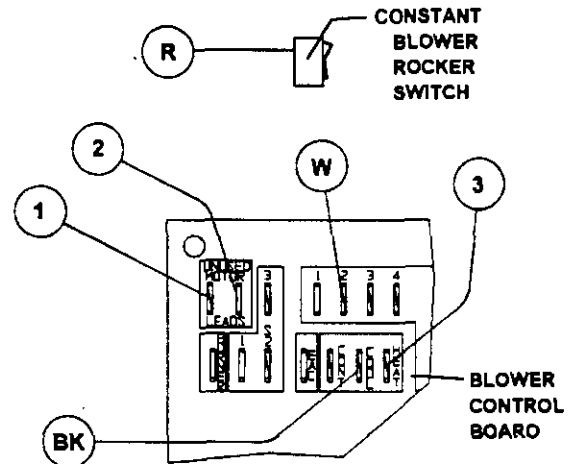


Figure 10

5. Attach the control box to the burner access panel, using four of the No. 10 sheet metal screws from the hardware bag in carton 2. The wires that extend from the burner access panel must be routed through the large hole in the back of the control box, taking care not to scrape or pinch the insulation on the wires. The wires should be connected to the two pin harness connector and the appropriate terminals on the fan control board, as shown in figure 11 (and on the wiring diagram, page 17).



THE BLUE WIRE CONNECTS TO:
 1 - FOR THE 55 AND 75 MODELS
 2 - FOR THE 125 MODEL OR
 3 - FOR THE 100 MODEL

R = RED BK = BLACK W = WHITE

Figure 11

- Attach the two limit switch wires to the terminals of the limit switch, located on the lower portion of the front panel. After attaching the wires, secure the limit cover to the front panel using two of the No. 10 sheet metal screws from the hardware bag in carton 2.

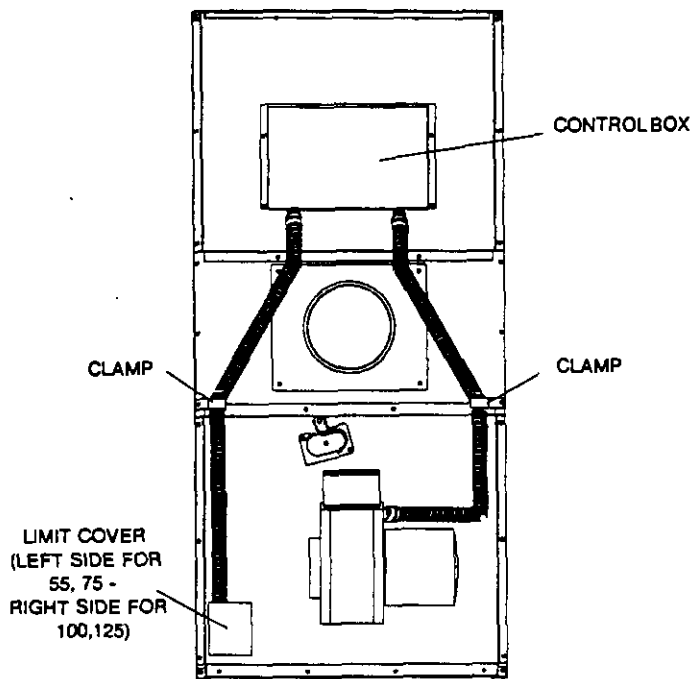


Figure 12

WARNING

Do not use this furnace as a construction heater. Use of this furnace as a construction heater exposes the furnace to abnormal conditions, contaminated combustion air and the lack of air filters. Failure to follow this warning can lead to premature furnace failure and/or vent failure which could result in a fire hazard and/or bodily harm.

WARNING

Installation of this furnace in an area where it will receive contaminated combustion air must be avoided. Such contamination would include the following: ammonia, chlorine, hydrogen sulfide, halogenated hydrocarbons, carbon tetrachloride, cleaning solvents, hydrochloric acid, water softening chemicals and other similar chemicals. Failure to follow this warning will lead to premature rusting of the heat exchanger and possible premature furnace failure and/or vent failure which could result in fire hazard and/or bodily harm.

Operational Checkout:

DO NOT START THE BURNER UNLESS THE BLOWER ACCESS PANEL IS SECURED IN PLACE.

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

Start-Up:

- Check the wiring against the diagram in Figure 18.
- Open the valve on the oil supply line.
- Reset the primary control.
- Set the thermostat above room temperature.
- Set the main electrical switch to "ON" position and the burner should start.

DO NOT TAMPER WITH THE UNIT OR CONTROLS - CALL YOUR SERVICEMAN.

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:

- A test kit (Bacharach No. 5022 kit or equivalent) to measure the smoke, stack draft, over-fire, CO_2 , 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 numbers, over the fire draft and stack draft.
- The proper smoke number has been established by engineering tests to be between 0 & 1. This degree of smoke emissions commonly referred to as a "Trace" of smoke. It is recommended to use a Bacharach true spot smoke test set or equivalent.
- 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 outlet 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 .020"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 CO₂ and stack temperature instruments will enable you to obtain the data that is required to determine the thermal efficiency of the furnace.
6. An oil filter should be installed as close to the burner as possible with all oil burners and is essential on the lower firing rate burners. We recommend the use of a low pressure drop oil filter such as the General Filter, Inc. model #1A-25A or equivalent. It is critical that the oil capacity be equivalent or greater than the fuel pump gear capacity. For a two pipe system this is 25gph.
7. The oil pressure regulator is factory set to give nozzle oil pressures of 100PSIG. The firing rate noted on the nameplate may be obtained with "standard" nozzles by adjusting the pump pressure as noted on the chart below or noted on the label on the furnace.

NOTE: This appliance is equipped with one of the oil burners as listed on the chart below and rating label on the furnace. Use the nozzle listed for that specific oil burner.

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 piece of clear plastic 1/4" dia. tubing over the purge fitting on the oil pump. Start the oil burner, then open the purge fitting 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 the oil to run to the nozzle and fire the burner. (If the purging takes longer than 15 seconds and no flame has been established the burner will stop. Push the reset button on top of Primary Control to restart burner.) For detailed information on operation of primary control refer to instructions included with furnace.

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. Any irregularities such as burning to one side or pulsating flame patterns should be corrected by changing the nozzle.

BURNER, NOZZLE AND PUMP PRESSURE CHART

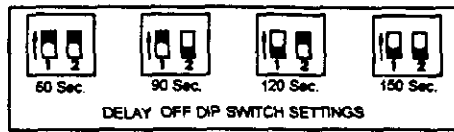
HEATING CAPACITY BTU/HR.	FIRING RATE GAL/HR/(US)	PUMP PRESSURE PSIG	DUCANE OIL BURNER		R.W. BECKETT OIL BURNER	
			MODEL	NOZZLE	MODEL	NOZZLE
55,000	.50	100	DRC-10A	.50GPH 80' SOLID	AFG	.50 GPH 80' SOLID
75,000	.65	100	DRC-10A	.65 GPH 80' SOLID	AFG	.65 GPH 70' HOLLOW
100,000	.90	100	DRC-10A	.90 GPH 80' SOLID	AFG	.90 GPH 70' HOLLOW
125,000	1.12	104	DRC-15A	1.10 GPH 80' SOLID	AFG	1.10 GPH 70' HOLLOW

Fan Adjustment Check:

This furnace is equipped with a 3 speed direct drive motor to deliver a temperature rise within the range specified on the rating plate, between the return and supply plenums, at the external duct static pressure noted on the rating label.

Adjust the fan speed so that the temperature rise is within the rise specified on the rating plate. Consult the wiring diagram for speed changes on the direct drive motor.

To adjust fan OFF time, set the DIP switches on the control board as shown to obtain the desired timing (See settings below).



Limit Control 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 burner will shut OFF and the main blower should continue to run.

Remove the restriction and the burner should come back on in a few minutes.

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 need to 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 Figure 18.

Constant Blower Switch:

This furnace is equipped with a constant low speed blower option. Whenever the room thermostat is not calling for heating or cooling, the blower will run on low speed in order to provide air circulation. If this constant blower option is not desired, the rocker switch on the side of the control box may be used to "turn off" the constant speed.

MAINTENANCE

This furnace should never be operated without an air filter. Filters should be cleaned at least twice a year.

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

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

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. Failure to comply with this warning will cause a fire hazard and/or bodily harm.

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

To maintain proper 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 the burner manual, should be performed at this time.

After replacement of the nozzle, the burner should be adjusted in accordance with the "COMBUSTION CHECK" section of the instruction.

Ordinarily, it is not necessary to clean the heat exchanger or flue pipe every year, but it is necessary to have your oil burner serviceman check the unit before each heating season to determine whether cleaning or replacement of parts is required.

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

1. Turn "OFF" all utilities upstream of the furnace.
2. Disconnect the flue pipe.
3. Remove the collar on the flue connection.
4. Remove the flue panel.

5. Remove the flue collector box from the secondary heat exchanger tube flange. This exposes the inside surfaces of the secondary tubes of the heat exchanger. If only the secondary needs to be cleaned, no further disassembly is required.
6. Clean the secondary tubes and flue pipe with a stiff brush and vacuum cleaner.

If the primary heat exchanger section is also to be cleaned:

7. Disconnect the limit control wires.
8. Disconnect the oil line and remove the oil burner from the furnace.
9. Remove the observation door.
10. Remove the collar on the observation tube.
11. Remove the front panel. (Care must be taken not to bend or damage the limit control.)
12. Loosen to hand tightness the three (3) nuts labeled "A" in Figure 4. Remove the screws labeled "B" in Figure 4. Slide the combustion chamber forward, out of the heat exchanger. Be careful not to bump the combustion chamber as it becomes brittle after having been fired.
13. Again, use a stiff brush and vacuum cleaner to clean the inside of the primary drum.

CAUTION

Never use incendiary type cleaners (smoke sticks) for cleaning!!

14. Before reassembly, the heat exchanger and combustion chamber should be inspected to determine if replacement is required. After cleaning, place combustion chamber back into primary drum and secure with the "B" screws — insure that the cover plate gasket is in place before tightening the screws. (Care must be taken not to damage the combustion chamber.)
15. Tighten the "A" nuts to 30 pound-inches of torque (firm, but not overly tight).
16. Replace the front panel, observation tube collar, observation door, limit wiring, and oil burner.
17. Replace the collector box on the secondary tube flange, insuring proper placement of the gasket.

If gasket is damaged in any way, it should be replaced! Tighten the screws to 30 pound-inches of torque.

18. Replace the flue panel and flue collar.
19. Reconnect the flue pipe and oil pipe(s).
20. Readjust burner for proper operation. Check limit operation as outlined in this manual.

Blower Removal:

To remove the blower from the furnace:

(NOTE: All directions are given as though the furnace were installed in the counterflow position. For either of the horizontal positions, "left" and "right" become "up" or "down", depending on which position the furnace is installed.)

1. Turn "OFF" all utilities upstream of the furnace.
2. Remove the screws securing the blower access panel, while holding the panel/control box assembly to prevent it from falling and causing injury or damage. Move the panel to the right just far enough to reach in and disconnect the motor wires at the terminal block on the motor and then disconnect the wires from the auxiliary limit controls mounted on either side of the blower housing. Rotate the access panel/control box assembly down and out of the way of the blower compartment.
3. Remove the blower retaining screw, located at the front of the left blower leg (See Figure 13).
4. Slide the blower forward on the rails and out of the unit.

CAUTION

Be sure the blower is adequately supported when sliding out of the mounting rails, especially in the horizontal position, in order to prevent dropping the blower and injuring yourself or damaging the blower!

5. Reverse the above steps to reinstall the blower. (Refer to the wiring diagram Figure 18 of this instruction, or the diagram located on the inside of the blower access panel to properly rewire the unit.)

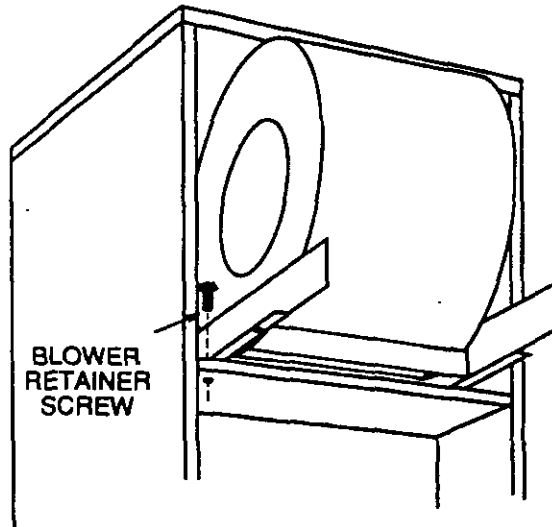


Figure 13

MINIMUM CLEARANCE TO COMBUSTIBLES

(Adequate service clearance should be provided over and above these dimensions, as required.)

CLEARANCE FROM :	COUNTERFLOW	HORIZONTAL
Top of furnace casing or plenum	2"	2"
Top of horizontal warm-air duct within 6 ft of furnace	2"	3"
Flue pipe, measured horizontally or below pipe	4"	4"
Flue pipe, measured vertically above pipe	8"	8"
Any side of supply plenum and warm-air duct within 6 ft of furnace	4"***	1"
Front of furnace	16"	24"
Sides of furnace	1"	2"
Rear of furnace	1"	1"
Bottom of furnace	0"***	0"*

* Floor may be combustible

** Floor shall be non-combustible, except when installed on MP2199 Base No.(20073901 for 55,000 or 75,000 output models; 20073902 for 100,000 or 125,000 output models), floor may be combustible and 4" decreased to 2".

In the downflow position, may be installed in a closet or alcove.

In the horizontal position, may be installed in an alcove or attic.

Figure 14

CHZ AIR-FLOW DATA

UNIT OUTPUT (KBTUH)	BLOWER SPEED	EXTERNAL STATIC									
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
55 (12 X 9 WHEEL) (1/3 HP MOTOR)	LOW	905	870	845	795	765	730	690	650	600	565
	MED	1250	1220	1185	1130	1080	1050	1000	925	855	785
	HIGH	1585	1530	1470	1405	1350	1280	1215	1140	1075	985
75 (12 X 9 WHEEL) (1/3 HP MOTOR)	LOW	905	870	845	795	765	730	690	650	600	565
	MED	1250	1220	1185	1130	1080	1050	1000	925	855	785
	HIGH	1585	1530	1470	1405	1350	1280	1215	1140	1075	985
100 (12 X 9 WHEEL) (1/2 HP MOTOR)	LOW	1505	1475	1430	1375	1325	1270	1200	1145	1065	970
	MED	1725	1675	1610	1545	1480	1420	1350	1270	1200	1110
	HIGH	1865	1795	1720	1650	1610	1520	1455	1380	1295	1215
125 (12 X 12 WHEEL) (3/4 HP MOTOR)	LOW	1480	1430	1380	1340	1280	1220	1145	1080	1015	925
	MED	1790	1740	1685	1605	1545	1475	1415	1330	1250	1160
	HIGH	1960	1900	1840	1775	1700	1625	1550	1465	1380	1285

NOTES:

- 1). AIR FLOW VALUES IN CUBIC FEET PER MINUTE (CFM), ROUNDED TO NEAREST FIVE (5) CFM
- 2). DATA TAKEN WITHOUT FILTERS IN PLACE

Figure 15

GENERAL LAYOUT MULTI-POISE OIL FURNACE

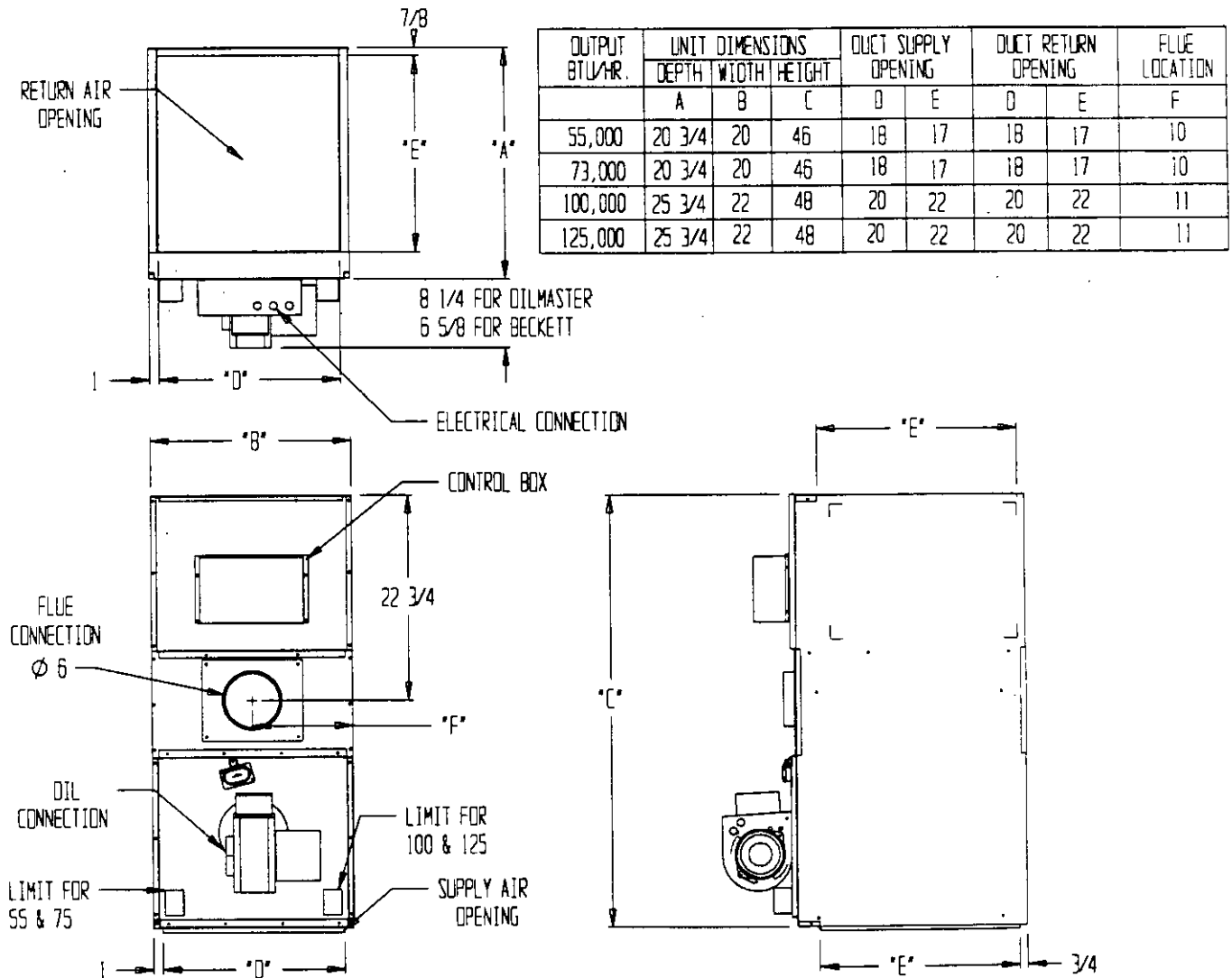
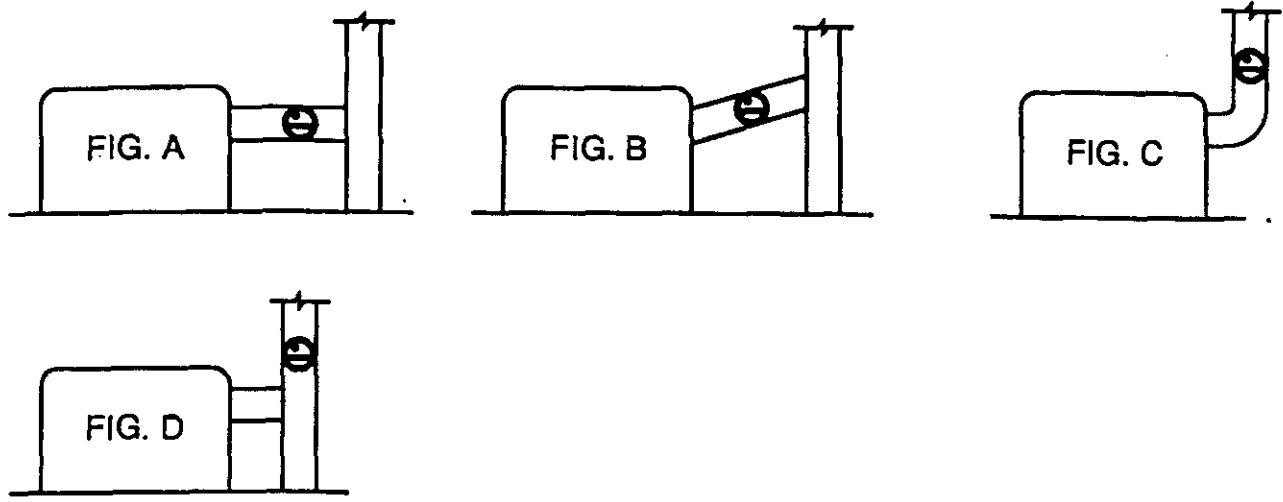
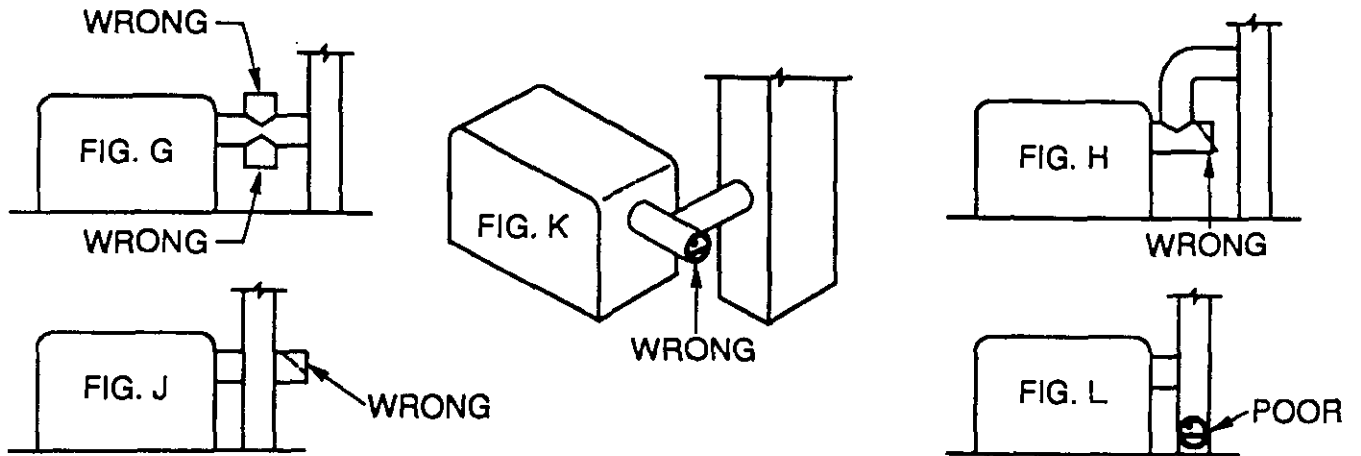


Figure 16

BAROMETRIC DAMPER LOCATIONS



GOOD LOCATIONS



BAD LOCATIONS

Figure 17

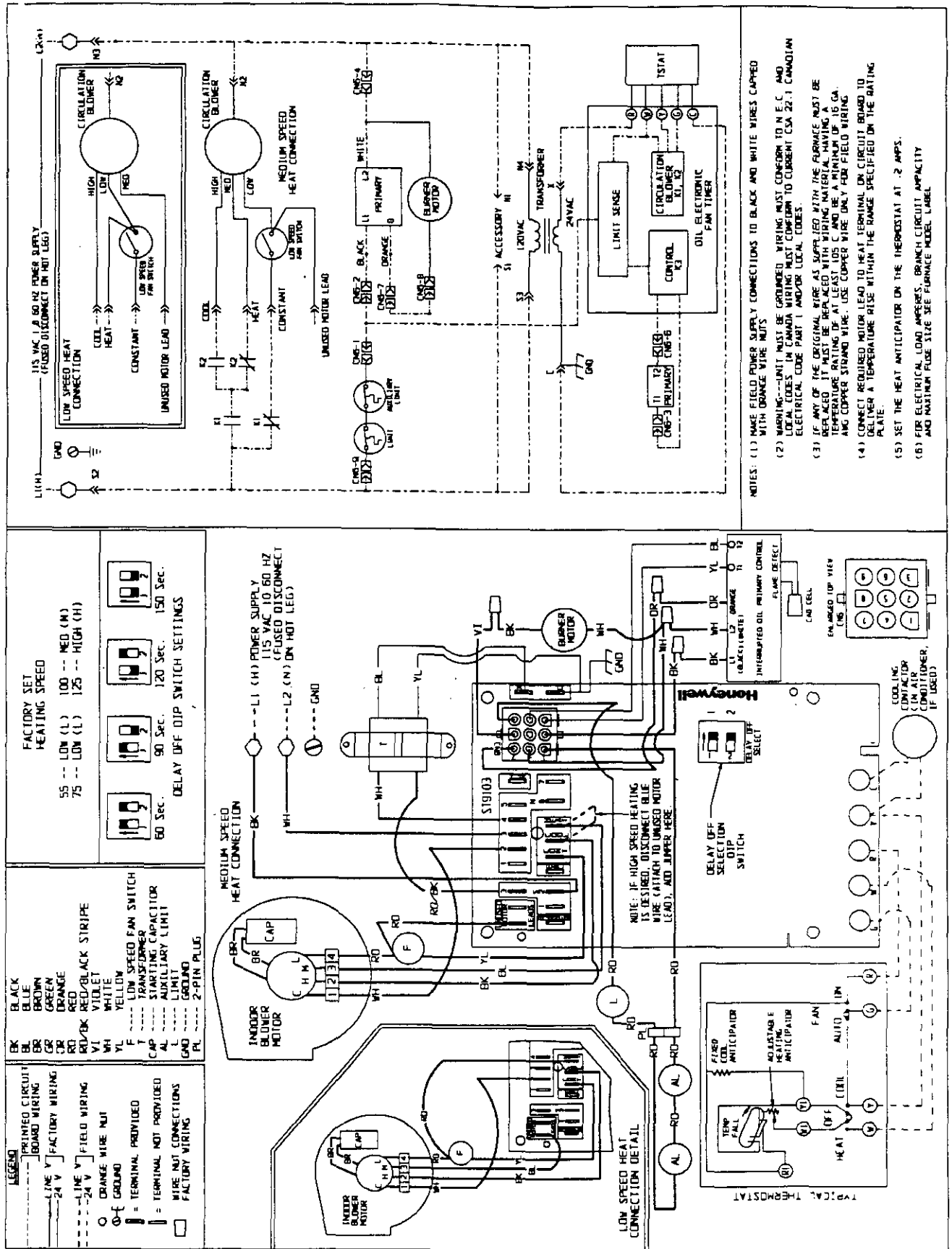


Figure 18

HEAT/COOL WIRING DIAGRAM WITH S18103 ELECTRONIC FAN TIMER
DOWNFLOW/HORIZONTAL OIL FURNACE

USER'S INFORMATION

Here's How Your Heating System Works

The furnace operates automatically. It is controlled by a thermostat which you set at the temperature most comfortable to you. When the inside temperature drops below this setting, your thermostat will turn on the heating system.

When the thermostat calls for heat, power from the transformer energizes the fan control board. The fan control energizes the ignition control. The ignition control will light the burner automatically.

The electronic fan control will automatically turn on the blower after 30 seconds. Fan "ON" control is not adjustable. The air moved over the heat exchanger by the blower is warmed and passes through the ducts to the room registers.

When the thermostat is satisfied, the circuit is de-energized and the primary control shuts off the burner. The blower continues to run until the selectable fan off time period has expired.

The heat sensing switch performs as the furnace high temperature limit switch. If the furnace overheats for any reason, the limit switch opens, breaking the circuit to the burner. The blower motor will be energized and as the unit cools the limit switch will close. This will relight the burner and unless the overheating condition is corrected, the furnace will cycle on limit.

This unit is equipped with an interrupted ignition electronic control. If the main burner does not ignite within 15 seconds from the call for heat, the control will go into lockout. The red button on top of the control must be depressed for 3 seconds in order to reset the control. The control can not be reset from the room thermostat.

HEATING

Preparing Furnace For Operation

Before attempting to put your furnace into operation for the heating season you should perform the following procedures.

WARNING

If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

1. Open all warm air registers and make sure that return air grills are unobstructed.
2. If a humidifier is installed with your system, open the water supply valve.
3. Set the thermostat to its lowest setting.
4. Turn "ON" the electric power to the furnace.
5. Open the oil supply valve.
6. Check all connections to insure there are no leaks.

Lighting Your Furnace

CAUTION

This furnace is equipped with an interrupted type electronic ignition system. **DO NOT ATTEMPT TO LIGHT WITH A MATCH. DANGER! HIGH VOLTAGE AT IGNITOR.**

1. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
2. After preparing the furnace for heating operation (See previous section) and checking for oil, proceed as follows.
3. For heating/cooling system, set the thermostat system switch to "HEAT" and the fan switch to "AUTO" the thermostat to the desired room temperature. Turn on the electrical power to the furnace.
4. The burner should light and the system should be controlled by the thermostat.

Turn Off Furnace

Follow these simple procedures to put your furnace into "retirement" for the summer.

1. Set the thermostat to the lowest setting
2. Turn "OFF" all electric power to the appliance.
3. Turn the oil supply "OFF".
4. If applicable, turn "OFF" water supply to humidifier.
5. If furnace blower will be necessary for cooling system, remember to turn electric power back on when needed for air conditioning.

FOR SERVICE CALL

NAME: _____

ADDRESS: _____

TELEPHONE: _____