

installation, start-up, and operating instructions

364AAN

DOWNFLOW/HORIZONTAL OIL-FIRED FURNACE

Cancels: New

II 364A-70-1

8-95

SAFETY CONSIDERATIONS

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.

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All local and national code requirements governing 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 above codes should be used, and are available from either The National Fire Protection Agency, Batterymarch Park, Quincy, MA 02269 or The Canadian Standards Association, 178 Rexdale Blvd., Rexdale, Ontario M9W 1R3

Recognize safety information. This is the safety-alert symbol **△**. When you see this symbol on the furnace and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words **DANGER**, **WARNING**, and **CAUTION**. These words are used with the safety-alert symbol. **DANGER** identifies the most serious hazards which will result in severe personal injury or death. **WARNING** signifies a hazard which could result in personal injury or death. **CAUTION** is used to identify unsafe practices which would result in minor personal injury or product and property damage.

TABLE 1—MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS (IN.)

UNIT APPLICATION		DOWNFLOW	HORIZONTAL
Furnace		1	2
Sides	Supply Plenum and Warm-Air Duct Within 6 ft of Furnace	4*	1
Back		1	1
Top	Furnace Casing or Plenum	2	2
	Horizontal Warm-Air Duct Within 6 ft of Furnace	2	3
Bottom		2	2
Flue Pipe	Horizontally or Below Pipe	4	4
	Vertically Above Pipe	8	8
Front		16	24

* Accessory downflow subbase required when installing on combustible floor. If installed on downflow subbase, 4-in. supply plenum clearance may be reduced to 2 in.

† Floor may be combustible.

NOTES:

1. Adequate service clearance should be provided over and above these dimensions as required.
2. In downflow position, may be installed in closet or alcove.
3. In horizontal position, may be installed in alcove or attic.

INTRODUCTION

The model 364AAN Furnaces are available in sizes 70,000 through 155,000 Btuh input capacities.

This furnace is a 3 position unit, that may be operated in downflow, horizontal left, or horizontal right airflow positions. Since it is shipped without burner and controls mounted, there is no additional effort required to change from 1 airflow configuration to another. The installer merely places burner/controls in proper position for installation. In addition, it is shipped as a front flue unit (flue connection on same side of furnace as burner), but may be changed to rear flue at time of installation. (See Reversing Instructions for Rear Flue Option section.)

The furnace is shipped in 2 packages, 1 with basic furnace and 1 with oil burner and control box. The burner is fully wired, so the only assembly required is mounting of control box (4 screws), mounting of burner (3 nuts), mounting of limit cover (2 screws), and connection of motor and limit wires (all quick-connect terminals). It requires a line voltage (115 vac) connection to control box, thermostat connections as shown on wiring diagram, oil line connection(s), adequate ductwork, and connection to a properly sized vent.

The air handling capacity of this furnace is designed for cooling airflow. Refer to Table 4 for expected airflows at various external duct static pressures.

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 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 in. or more away from any furnace openings. Some types of insulating materials may be combustible.

This furnace is approved for reduced clearances to 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 downflow or horizontal furnace, it may be located in a basement, on the same level as area to be heated, suspended, or in a crawlspace. In any case, unit should always be installed level.

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

When installed in downflow position, this furnace **MUST NOT** be installed on combustible flooring unless approved subbase is used. The required minimum clearances for this furnace in all positions are specified in Table 1.

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

I. 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 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 for 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 furnace) shall be installed in same room or enclosure as furnace in such a manner as to prevent any difference in pressure between regulator and combustion air supply.

Air requirements for 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, infiltration **MAY** be adequate to provide air for combustion, ventilation, and dilution of flue gases. This determination must be made on an individual installation basis and must take into consideration the overall volume of unconfined space, the number of doors to the outside, internal doors which can close off unconfined space, and overall tightness of building construction. Many new buildings and homes (and older ones that have been weatherized) **MUST BE** considered as being tight construction, therefore, infiltration will not be sufficient to supply necessary air for combustion and ventilation.

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

1. Walls and ceilings exposed to outside atmosphere have a continuous water vapor retarder with a rating of 1 perm or less with openings gasketed or sealed and/or
2. Weatherstripping has been added on operable windows and doors, and/or
3. 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, an opening with a FREE AREA of not less than 1 sq in. per 1000 Btuh of total input of all appliances within unconfined space (but not less than 100 sq in.) must be provided. This opening must be located such that it can not be blocked at any time.

When furnace is installed in a closet or enclosure, 2 ventilation openings, with OPEN AREA as dimensioned in example below are required for combustion air. The openings should be located about 6 in. from top and bottom of enclosure at front of furnace.

For Example:

UNIT SIZE	LENGTH (IN.)	HEIGHT (IN.)
036070	18	9
036090	18	9
048125	20	10
048155	20	10

For a confined space, where air is taken from an interior space, 2 permanent openings of equal area are required. One opening must be within 12 in. of ceiling and the other within 12 in. of floor. Each opening must have a free area of at least 1 sq in. per 1000 Btuh of total input rating but no less than 100 sq in.

If outside air is supplied to a confined space, then the 2 openings must be equal and located as above. The free area of each must be:

1. One sq in. per 4000 Btuh of total rating when air is directly communicated from outdoors.
2. One sq in. per 4000 Btuh of total input rating when air is brought in through vertical ducts.
3. One sq in. per 2000 Btuh of total input rating when air is transferred through horizontal ducts.

When ducts are used to supply air, they must be of the same cross sectional area as free area of openings to which they connect.

The minimum dimension of rectangular air ducts must not be less than 3 in.

In calculating free area, consideration shall be given to blocking effect of louvers, grilles, or screens protecting openings. Screens used shall not be smaller than 1/4-in. mesh and shall be readily accessible for cleaning. If free area through a design of louver or grille is known, it shall be used in calculating size design and free area specified. If design and free area is not known, it may be assumed that wood louvers have 20 percent free area and metal louvers and grilles have 60 percent free area. Louvers shall be fixed in open position or interlocked with furnace so they open automatically at furnace start-up and remain open during furnace operation.

WARNING: Do not block 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.

II. DUCTWORK RECOMMENDATIONS

The proper sizing of warm air ducts is necessary to ensure 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 flanged opening provided at discharge end of furnace. See Fig. 14 for dimensions of this opening.

The return air ductwork should be connected to opening on inlet end of furnace. AN EXTERNALLY MOUNTED AIR FILTER MUST BE USED WITH THIS FURNACE! The filter should be mounted in return air ductwork in a position that is readily accessible to homeowner. Be sure that filter is large enough that air velocity through filter does not exceed rating of filter (typically 300 ft per minute velocity rating). An external filter frame kit is available to mount directly to outside of furnace. Contact your dealer for details.

The following recommendations should be followed when installing ductwork:

1. Install locking type dampers in all branches of individual ducts to balance out system. Dampers should be adjusted to impose proper static at outlet of furnace.
2. A flexible duct connector of noncombustible material should be installed at unit on both supply and return air systems. 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 return air grille is located close to 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, 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 furnace to areas outside spaces containing furnace, return air shall also be handled by a duct sealed to furnace casing and terminating outside space containing furnace. Incorrect ductwork termination and sealing will create a hazardous condition which could lead to bodily harm.

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

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

WARNING: The coil **MUST** be installed on air discharge side of furnace. Under no circumstances should airflow be such that cooled, conditioned air can pass over furnace heat exchanger. This will cause condensation in heat exchanger and possible failure of 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 airflow installation, dampers must be provided to direct air over furnace heat exchanger when heat is desired and over cooling coil when cooling is desired.

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

VENTING INSTRUCTIONS

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

I. PRE-INSTALLATION VENT SYSTEM INSPECTION

Before 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 chimney or vent. If deterioration is discovered, chimney must be repaired or vent must be replaced.
2. Inspection to ascertain that vent system is clear and free of obstructions. Any blockage must be cleared before installing furnace.
3. Cleaning 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 chimney is properly lined and sized per the applicable codes. (Refer to list of codes in Safety Considerations section.)

II. 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 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 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 chimney.

The following requirements are provided for a safe venting system:

1. Be sure that chimney flue is clear of any dirt or debris.
2. Be sure that chimney is not servicing an open fireplace.

3. Never reduce pipe size below size of furnace flue pipe.
4. All pipe should be supported using proper clamps and/or straps. These supports should be at least every 4 ft.
5. All horizontal runs of pipe should have at least 1/4-in per ft 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 chimney but be flush with inside wall.
9. The chimney must extend 3 ft above highest point where it passes through the roof of a building and at least 2 ft higher than any portion of a building within a horizontal distance of 10 ft. It shall also be extended at least 5 ft above highest connected equipment flue collar.
10. Check local codes for any variance.

III. FACTORY-BUILT CHIMNEYS

Listed factory-built chimneys may be used. Refer to chimney manufacturer's instructions for proper installation.

IV. HORIZONTAL VENTING

This furnace may be vented horizontally through an outside wall when installed with 1 of the following auxiliary inducer blowers:

Tjernlund Products, Inc. Model SS1C

available from: 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 face of mounting plate to extreme face of end cone, should be as shown in Table 2.

TABLE 2—OIL BURNER AIR TUBE LENGTH

UNIT SIZE	LENGTH (IN.)
036070	5
036090	5
048125	5
048155	7

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

OIL CONNECTIONS

Complete instructions for installation of fuel oil piping will be found in oil burner Installation Instructions included with furnace. An oil filter should be used with all oil burners and should be installed as close to burner as possible.

BAROMETRIC DRAFT CONTROL

The barometric draft control shipped with furnace **MUST** be used with furnace to ensure proper operation. (Some sizes of units may have barometric control packed in burner carton.) Instructions for installing control are packed with control. Refer to Fig. 15 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 correct polarity of power supply. Connect HOT wire (H) and NEUTRAL wire (N) as shown in Fig. 16.

A separate line voltage supply should be used with a fused disconnect switch or circuit breaker between main power panel and unit. (See Fig. 16.)



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

Use only copper wire for 115-v supply service to unit.

When replacing any original furnace wiring, use only 105°C No. 16 AWG copper wire.

Instructions for wiring thermostat (field-supplied) are packed in thermostat box. Make thermostat connections as shown in Fig. 16 at 24-v terminal board on control box.

When installing optional accessories to this appliance, follow manufacturer's Installation Instructions included with accessory. Other than wiring for 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 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.

I. KEEPING FILTERS CLEAN

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

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 filters at least every 3 to 4 weeks when system is in constant operation. Replace or clean filter at least at 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.

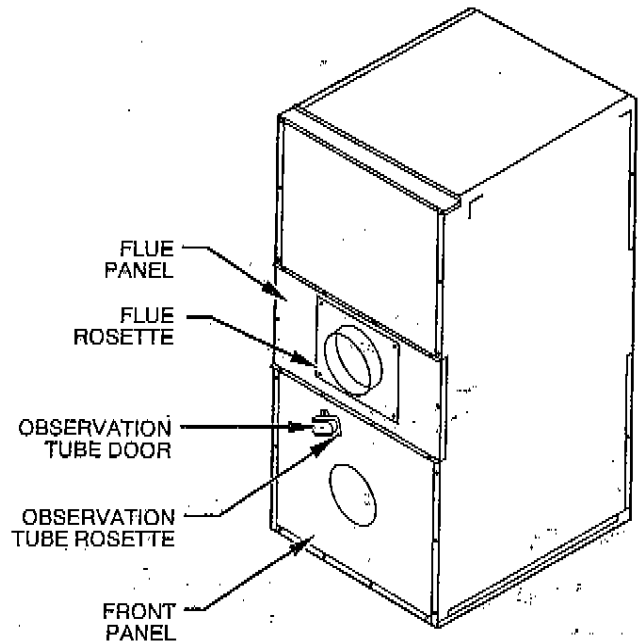
Be sure that filter is thoroughly dry before installing back into furnace.

REVERSING INSTRUCTIONS FOR REAR FLUE OPTION

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

Unit should be reversed prior to installing cabinet in position. See Fig. 1 for component location.

1. Remove observation tube door from front panel, taking care not to let door spring "snap" hinge and pinch your fingers.
2. Remove flat rosette and gasket from around observation tube.



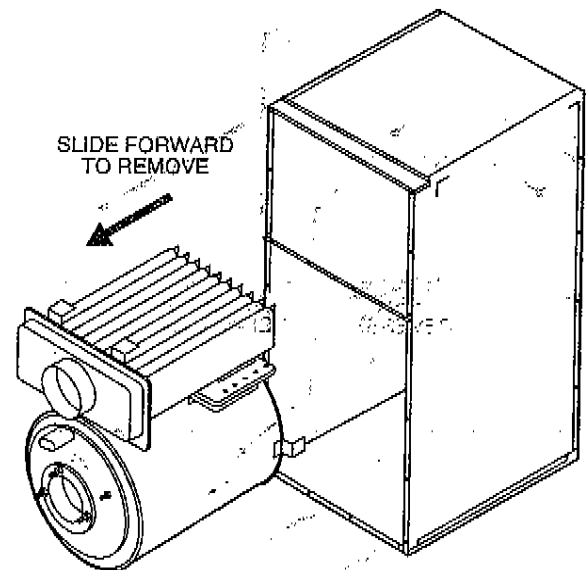
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Fig. 1—Component Location.

3. Remove rosette from around flue connector.
4. Remove front panel and flue panel from unit.

IMPORTANT: The heat exchanger is only secured in place by heat exchanger support legs hooked into brackets on blower partition at this time. Care should be taken to adequately support heat exchanger and prevent it from falling. Be careful not to damage limit control.

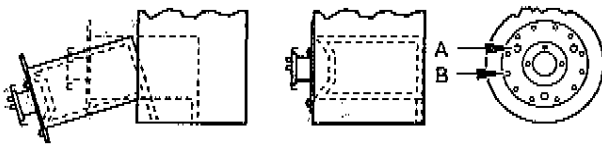
5. Supporting heat exchanger so that it does not fall, remove heat exchanger from cabinet by pulling it straight forward. (See Fig. 2.)



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Fig. 2—Removing Combustion Chamber and Heat Exchanger

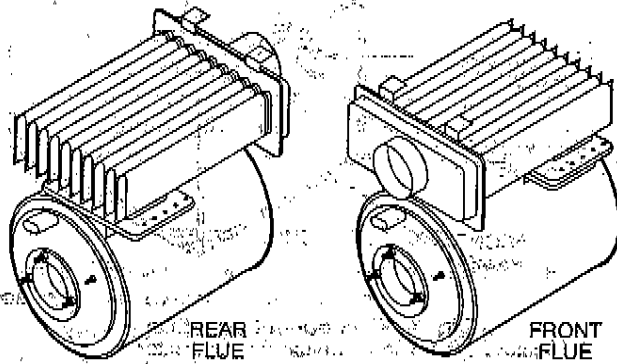
6. Remove cover plate/combustion chamber assembly from heat exchanger drum by removing 12 parkerized screws securing it to drum front. CAREFULLY slide combustion chamber out of drum, taking care not to damage relatively fragile chamber material. (See Fig. 3.)
7. Remove "blank" cover plate on rear of drum by removing 12 parkerized screws on drum rear. Install this "blank" plate on front (flue connector side) of drum. Ensure that gasket is intact and all screws are secure.



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Fig. 3—Removing Combustion Chamber

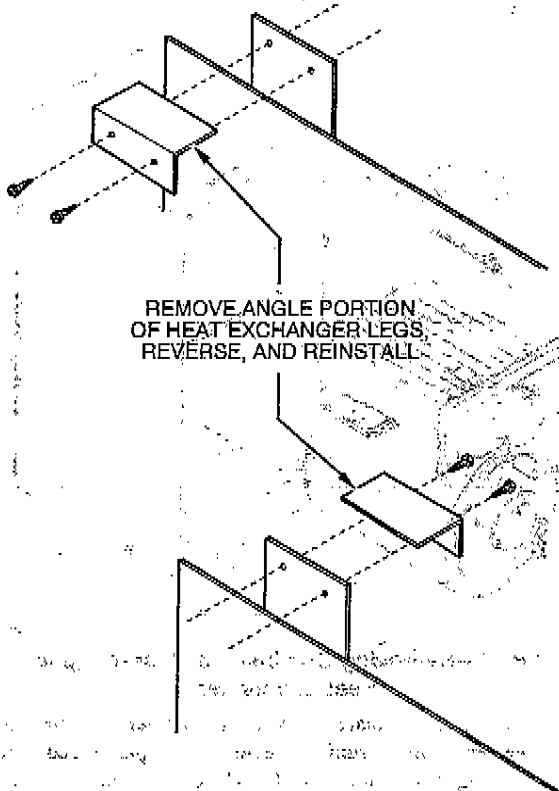
8. Install cover plate/combustion chamber assembly (removed in item 6) into rear opening of drum, taking care not to damage chamber, ensuring gasket is in place, and verifying that screws are all securely tightened. (See Fig. 4.)



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Fig. 4—Front/Rear Flue Orientations

9. Remove 2 screws that attach angle portion of heat exchanger legs to straight portion, rotate angle portion so that they point the opposite direction, and reattach to straight portion, using original screws. (See Fig. 5.)

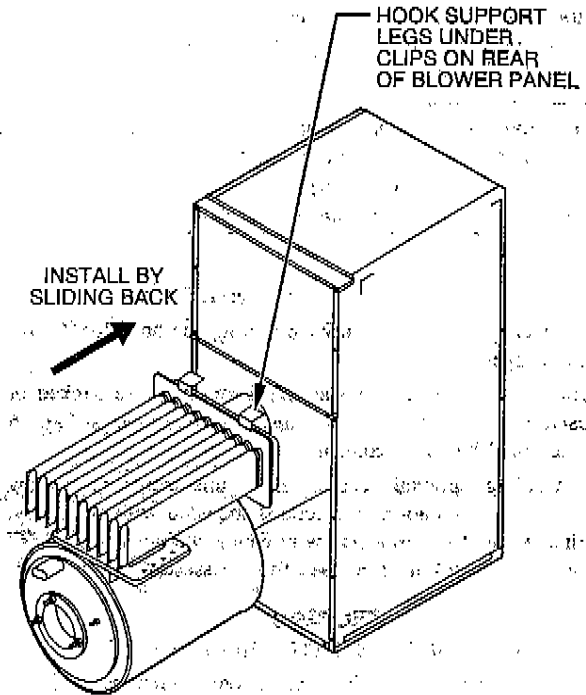


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Fig. 5—Reversing Heat Exchanger Support Legs

10. Remove rear center panel from cabinet and replace it with flue panel removed in item 4.

11. Turn heat exchanger so that flue connector is toward rear of unit and reinstall in cabinet. The heat exchanger support legs will now engage in hangers at rear of blower partition instead of hangers at front. The flue connector should protrude through opening in flue panel on rear of unit with burner mounting flange still at front of unit. (See Fig. 6.)



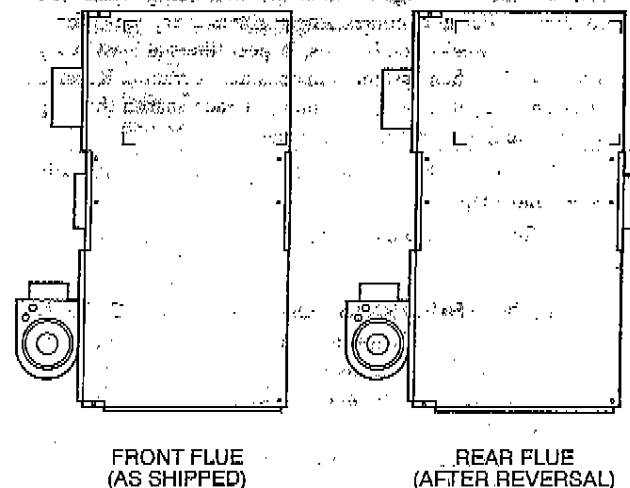
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Fig. 6—Reinstalling Combustion Chamber and Heat Exchanger

12. Reinstall front panel (removed in item 4) and install rear center panel (removed in item 10) where flue panel originally was. BE CAREFUL NOT TO DAMAGE LIMIT CONTROL.

13. Replace rosette on flue connector (now at rear of furnace), observation tube rosette and gasket, and observation door.

14. Proceed with installing furnace cabinet and mounting oil burner and controls.



A95110

Fig. 7—Component Location Before and After Flue Reversal

ASSEMBLY INSTRUCTIONS

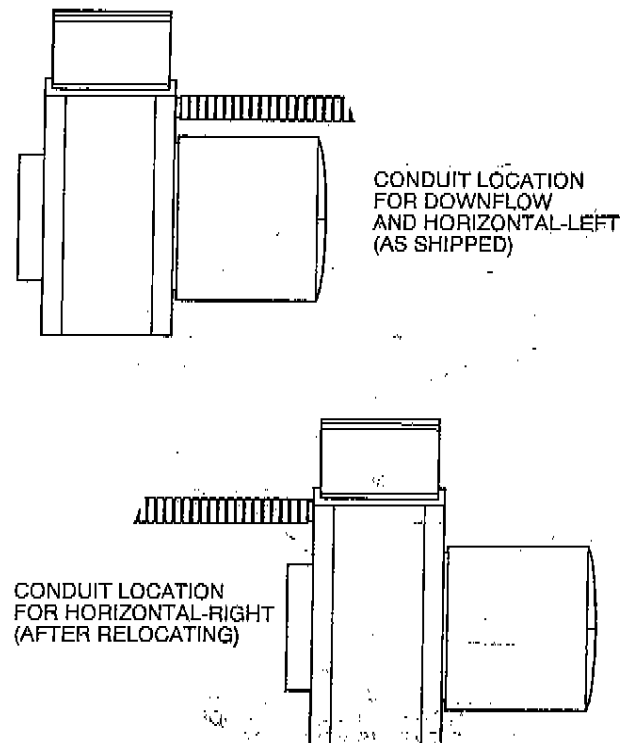
It is easier to install furnace if cabinet assembly (shipped in carton 1 of 2) is placed into position, ductwork connected, and THEN control box/burner assembly (shipped in carton 2 of 2) is mounted to cabinet. Electrical, thermostat, and oil line connections can then be made to completed unit.

To attach control box/burner assembly to cabinet:

1. Carefully unpack carton 2 containing prewired control box/burner assembly and hardware bag.
2. Remove 3 burner mounting nuts securing shipping plate on front of furnace cabinet at burner mounting flange. Remove and discard shipping plate. When furnace is in installed position, burner mounting studs should be in the 12, 3, and 9 o'clock positions, leaving bottom hole empty.
 - a. If furnace is being installed in downflow position, studs are in correct position when shipped from factory.
 - b. If furnace is being installed in horizontal position, it is necessary to remove stud that is now in 6 o'clock position and reposition it so that studs are in 12, 3, and 9 o'clock positions. It may be necessary to use 2 of the burner mounting nuts as "jamm" nuts on stud in order to provide a means of using a wrench to remove a tight stud.
3. If furnace is installed in horizontal left airflow position, it is necessary to relocate burner wiring conduit from right side of burner to left side as follows: (See Fig. 8.)
 - a. Release clip(s) securing ignition control on top of burner and swing control open to gain access to wiring compartment inside burner.
 - b. Disconnect wire nuts on black, white, and orange wires inside burner.
 - c. Remove conduit nut securing conduit to right side of burner and detach conduit and wires from burner housing.
 - d. Remove hole plug from left side of burner housing and install it in hole on right side (where conduit was removed).
 - e. Feed conduit and wires through left side hole and secure with conduit nut removed in item c.
 - f. Reconnect black, white, and orange wires inside burner using wire nuts removed in item b.
 - g. Close and secure ignition control.
4. Carefully install burner onto burner mounting studs, ensuring that mounting flange gasket is positioned between flange on burner and front of furnace. Secure burner in position with 3 burner mounting washers and nuts removed in item 2.

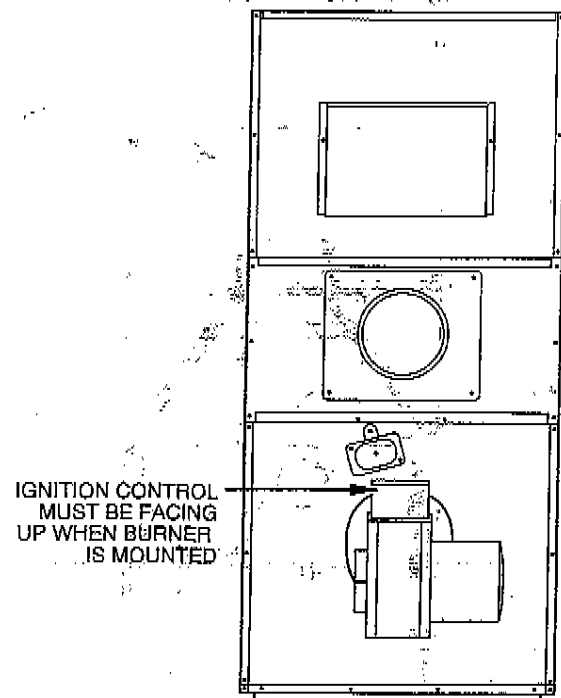
IMPORTANT: The burner must always be installed in upright position with ignition control on top. (See Fig. 9.)

5. Attach control box to blower access panel using 4 No. 8 sheet metal screws from hardware bag in carton 2. The wires extending from blower access panel must be routed through large hole in back of control box, taking care not to scrape or pinch insulation on wires. The wires should be connected to the 2-pin harness connector and appropriate terminals on fan control board. (See Fig. 10 and 16.)
6. Attach the 2 limit switch wires to terminals of limit switch located on lower portion of front panel. After attaching wires, secure limit cover to front panel using 2 No. 8 sheet metal screws from hardware bag in carton 2. (See Fig. 11.)



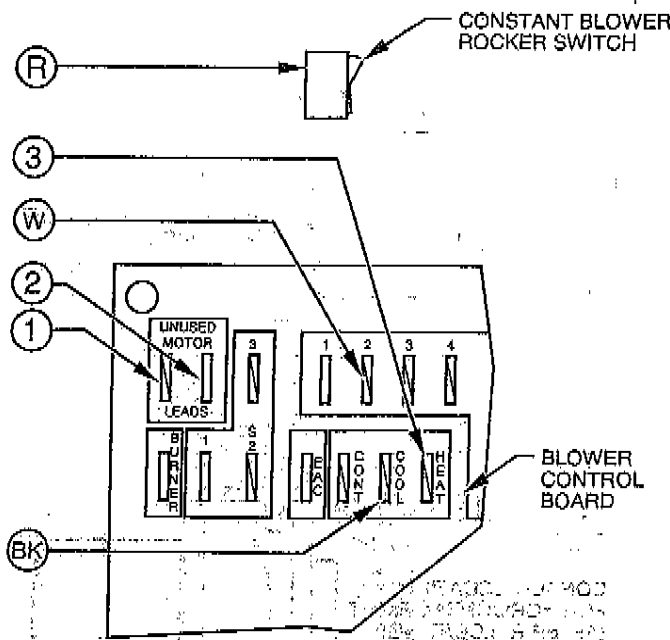
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Fig. 8—Burner Wiring Conduit Location for Horizontal Applications



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Fig. 9—Position of Mounted Burner (Downflow Orientation Shown)



THE BLUE WIRE CONNECTS TO:
 1 - FOR THE 070 AND 090 MODELS
 2 - FOR THE 155 MODEL OR
 3 - FOR THE 125 MODEL

R = RED BK = BLACK W = WHITE

A95113

Fig. 10—Blower Control Board

WARNING: Do not use this furnace as a construction heater. Use of this furnace as a construction heater exposes furnace to abnormal conditions, contaminated combustion air, and 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 similar chemicals. Failure to follow this warning will lead to premature rusting of heat exchanger and possible furnace failure and/or vent failure which could result in fire hazard and/or bodily harm.

OPERATIONAL CHECKOUT

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

Installation of furnace is now complete and operational checkout may be performed.

I. START-UP

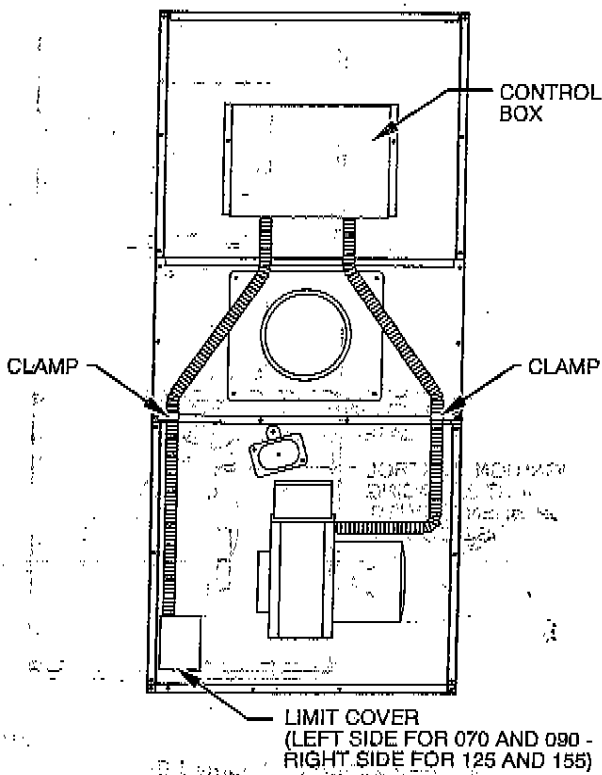
1. Check wiring against wiring diagram shown in Fig. 16.
2. Open valve on oil supply line.
3. Reset primary control.
4. Set thermostat above room temperature.
5. Set main electrical switch to ON position. Burner should start.

DO NOT TAMPER WITH UNIT OR CONTROLS—CALL YOUR SERVICE TECHNICIAN.

II. RECOMMENDED INSTALLATION PRACTICES AND COMBUSTION CHECK

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

1. A test kit (Bacharach No. 5022 kit or equivalent) to measure smoke, stack draft, over-fire draft, CO₂, and stack temperatures MUST be used in order to obtain proper air band setting. Although all of the above measurements are required for optimum setup and efficiency data, the most important readings that must be taken are smoke numbers, over-fire draft, and stack draft.
2. The proper smoke number has been established by engineering tests to be between 0 and 1. This degree of smoke emissions 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 proper draft through furnace, a barometric draft regulator (supplied with furnace) must be installed as close to outlet of furnace as possible. In order for this to function properly, barometric damper must be mounted with hinge pins horizontal and face of damper vertical. (See instructions included with damper.) The draft regulator should be adjusted after furnace has been firing for at least 5 minutes, and stack draft should be measured and set between -0.025 and -0.035 in. wc. The draft should be checked with a Bacharach MZF draft gage or equivalent.
4. The over-fire draft, which is taken through hole provided in observation door, is a measurement necessary to determine if there is a blockage between oil burner and flue outlet.



A95114

Fig. 11—Wire Routing (Downflow Orientation Shown)

There should be a pressure drop of between 0.005 and 0.020 in. wc through furnace. This would set the range of the over-fire draft between -0.01 and -0.03 in. wc. A reading above -0.01 in. wc (for example +0.1 in. wc) would indicate that furnace is in an extremely high-pressure condition in primary section. This condition may be caused by excessive combustion air due to air band being too wide open or a lack of flue draft (chimney effect) or some other blockage, such as soot, in secondary section of heat exchanger.

5. The CO₂ and stack temperature instruments enable you to obtain data required to determine thermal efficiency of furnace.
6. An oil filter should be installed as close to burner as possible with ALL oil burners and is essential on 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 oil capacity be equivalent or greater than fuel pump gear capacity. For a 2-pipe system, this is 25 gph.
7. The oil pressure regulator is factory set to give nozzle oil pressures of 100 psig. The firing rate noted on nameplate may be obtained with "standard" nozzles by adjusting pump pressure as noted in Table 3 or on label on furnace.

TABLE 3—BURNER, NOZZLE, AND PUMP PRESSURE CHART

UNIT SIZE	FIRING RATE GAL/HR (US)	PUMP PRESSURE (PSIG)	BECKETT OIL BURNER	
			Model	Nozzle
036070	0.50	100	AFG	0.50 gph 80° Solid
036090	0.65	100	AFG	0.65 gph 70° Hollow
048125	0.90	100	AFG	0.90 gph 70° Hollow
048155	1.12	104	AFG	1.10 gph 70° Hollow

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

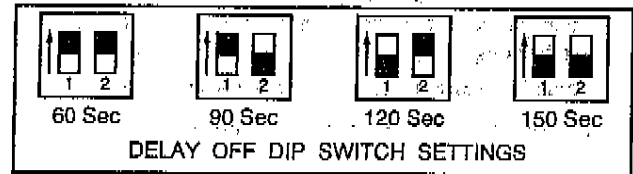
- a. Place a piece of clear plastic 1/4-in. diameter tubing over purge fitting on oil pump.
 - b. Start oil burner, then open purge fitting and allow burner to run until purge tube is completely free of air bubbles.
 - c. Tighten purge fitting which will allow oil to run to nozzle and fire burner.
 - d. If purging takes longer than 30 sec and no flame has been established, burner stops. Push reset button on top of primary control to restart burner.
 - e. For detailed information on operation of primary control, refer to instructions included with furnace.
8. After all setup procedures mentioned above have been completed, burner should be allowed to operate. Use an inspection mirror to observe flame pattern. Any irregularities such as burning to 1 side or pulsating flame patterns should be corrected by changing nozzle.

III. FAN ADJUSTMENT CHECK

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

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

To adjust fan off time, set DIP switches on control board to obtain desired timing. (See Fig. 12.)



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Fig. 12—Fan Off Time DIP Switch Settings

IV. LIMIT CONTROL CHECK

After furnace has been in operation for at least 15 minutes, restrict return-air supply by blocking filters or closing return registers and allow furnace to shut down on high limit. The burner should shut off, and main blower should continue to run.

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

V. FOR YEAR ROUND AIR CONDITIONING

This 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, fan motor speed may need to be changed to obtain necessary cooling airflow.

VI. HEATING

The blower speed is factory set to deliver required airflow at normal duct static pressure.

VII. COOLING

The blower speed may be adjusted in the field to deliver required airflow for cooling application. (See Fig. 16.)

VIII. CONSTANT BLOWER SWITCH

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

MAINTENANCE

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

To avoid personal injury, make sure electrical supply power is off before servicing.

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

WARNING: Before performing any service functions, unless operations specifically require power to be on, make sure all utilities are turned off upstream of appliance. Failure to comply with this warning will cause a fire hazard and/or bodily harm.

I. OIL BURNER

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

To maintain proper performance, oil burner nozzle must be replaced once a year. Contact your dealer service technician if you are unsure of this procedure.

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

After replacement of nozzle, burner should be adjusted in accordance with Combustion Check section of the instruction.

II. HEAT EXCHANGER AND FLUE PIPE

Ordinarily, it is not necessary to clean heat exchanger or flue pipe every year but it is necessary to have your oil burner service technician check 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 furnace.
2. Disconnect flue pipe.
3. Remove collar on flue connection.
4. Remove flue panel.
5. Remove flue collector box from secondary heat exchanger tube flange. This exposes inside surfaces of secondary tubes of heat exchanger.
6. Clean secondary tubes and flue pipe with a stiff brush and vacuum cleaner.
7. If only secondary tubes need to be cleaned, no further disassembly is required. Proceed to item 18 for reassembly. If primary heat exchanger section is also to be cleaned proceed to next item.
8. Disconnect limit control wires.
9. Disconnect oil line and remove oil burner from furnace.
10. Remove observation door.
11. Remove collar on observation tube.
12. Remove front panel. Care must be taken not to bend or damage limit control.
13. Loosen to hand tightness the 3 nuts labeled "A" in Fig. 3. Remove screws labeled "B" in Fig. 3. Slide combustion chamber forward out of heat exchanger. Be careful not to bump combustion chamber as it becomes brittle after having been fired.
14. Use a stiff brush and vacuum cleaner to clean inside of primary drum.

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

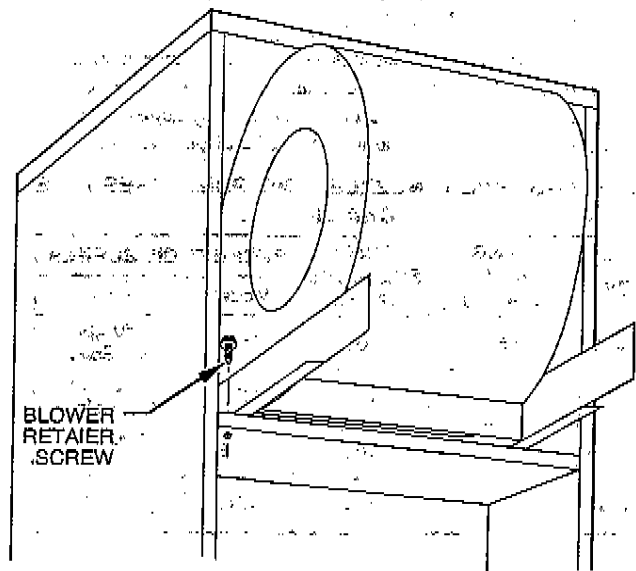
15. Before reassembly, heat exchanger and combustion chamber should be inspected to determine if replacement is required. After cleaning, place combustion chamber back into primary drum and secure with "B" screws. Ensure that cover plate gasket is in place before tightening screws. Care must be taken not to damage combustion chamber.
16. Tighten "A" nuts to 30 lb-in. of torque (firm, but not overly tight).
17. Replace front panel, observation tube collar, observation door, limit wiring, and oil burner.
18. Replace collector box on secondary tube flange, ensuring proper placement of gasket. **IF GASKET IS DAMAGED IN ANY WAY, IT SHOULD BE REPLACED!** Tighten screws to 30 lb-in. of torque.
19. Replace flue panel and flue collar.
20. Reconnect flue pipe and oil pipe(s) if removed.
21. Readjust burner for proper operation. Check limit operation as outlined in this manual.

III. BLOWER REMOVAL

To remove blower from furnace:

NOTE: All directions are given as though furnace were installed in downflow position. For either horizontal position, "left" and "right" become "up" and "down" depending on position in which furnace is installed.

1. Turn off all utilities upstream of furnace.
2. Remove control box cover and disconnect black, red, blue, and white blower wires from blower control board and constant blower rocker switch. (See Fig. 10.) Disconnect 2-pin harness connector for auxiliary limit wires.
3. Remove screws securing blower access panel and rotate panel (with control box attached) down and out of way of blower compartment. Be careful not to scrape or pinch blower and auxiliary limit wires as they pull through wiring hole in panel.
4. Remove blower retaining screw located at front of left blower leg. (See Fig. 13.)



A95116

Fig. 13—Blower Retaining Screw

5. Slide blower forward on rails and out of unit. Care must be taken not to scrape or pinch motor or limit wires.

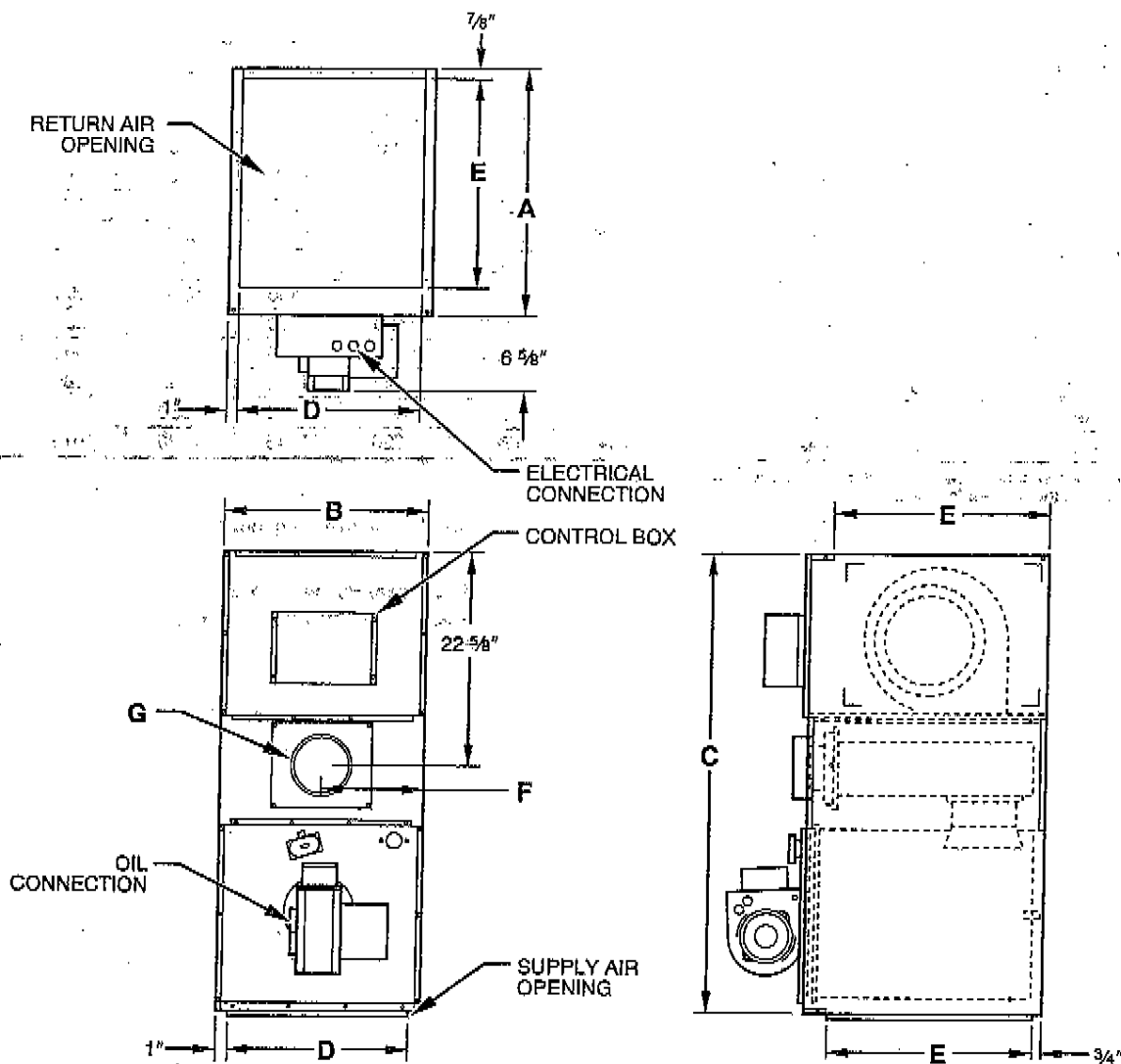
CAUTION: Be sure blower is adequately supported when sliding out of mounting rails, especially in horizontal position, in order to prevent dropping blower and injuring yourself or damaging blower!

6. Reverse items 1 through 5 to reinstall blower. Refer to Fig. 10 and wiring diagram (Fig. 16) of this instruction, or diagram located on inside of blower access panel to properly rewire unit.

TABLE 4—AIRFLOW DATA (CFM)

UNIT SIZE	BLOWER SPEED	EXTERNAL STATIC PRESSURE IN. WC									
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
036070	High	1585	1530	1470	1405	1350	1280	1215	1140	1075	985
	Medium	1250	1220	1185	1130	1080	1050	1000	925	855	785
	Low	905	870	845	795	765	730	690	650	600	565
036090	High	1585	1530	1470	1405	1350	1280	1215	1140	1075	985
	Medium	1250	1220	1185	1130	1080	1050	1000	925	855	785
	Low	905	870	845	795	765	730	690	650	600	565
048125	High	1865	1795	1720	1650	1610	1520	1455	1380	1295	1215
	Medium	1725	1675	1610	1545	1480	1420	1350	1270	1200	1110
	Low	1505	1475	1430	1375	1325	1270	1200	1145	1065	970
048155	High	1960	1900	1840	1775	1700	1625	1550	1465	1380	1285
	Medium	1790	1740	1685	1605	1545	1475	1415	1330	1250	1160
	Low	1480	1430	1380	1340	1280	1220	1145	1080	1015	925

NOTES: 1. Airflow values in cubic ft per minute (CFM) rounded to nearest 5 CFM.
 2. Data taken without filters in place.



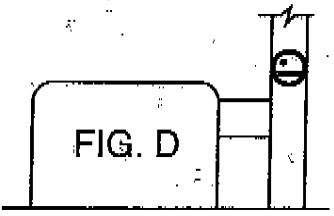
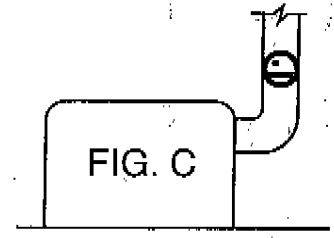
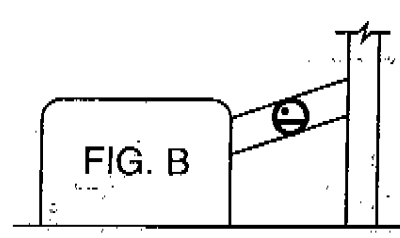
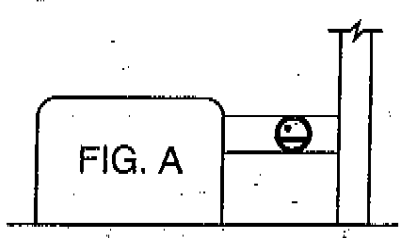
DIMENSIONS (IN.)

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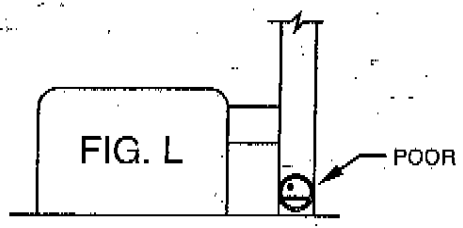
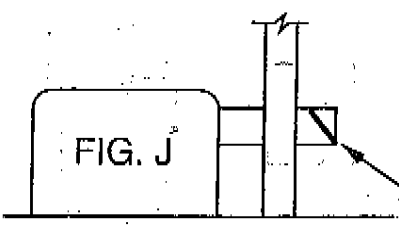
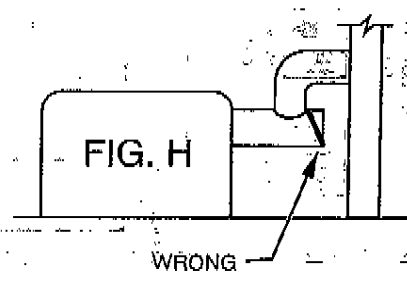
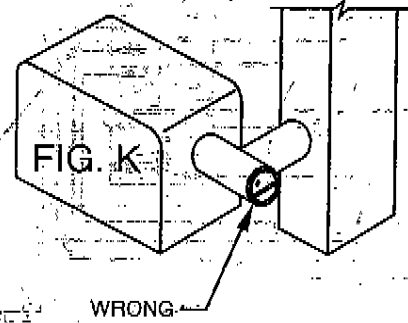
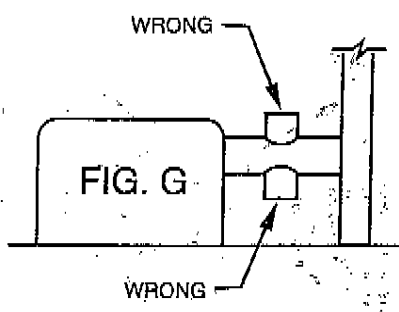
UNIT SIZE	UNIT DIMENSIONS			DUCT SUPPLY OPENING		DUCT RETURN OPENING		FLUE LOCATION	FLUE DIAMETER
	Depth	Width	Height	D	E	D	E	F	G
036070	20-3/4	20	46	18	17	18	17	10	6
036090	20-3/4	20	46	18	17	18	17	10	6
048125	25-3/4	22	48	20	22	20	22	11	6
048155	25-3/4	22	48	20	22	20	22	11	6

Fig. 14—Dimensional Drawing

BAROMETRIC DAMPER LOCATIONS



GOOD LOCATIONS



BAD LOCATIONS

Fig. 15—Barometric Damper Locations

A95117

USER'S INFORMATION**I. HERE'S HOW YOUR HEATING SYSTEM WORKS**

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

When thermostat call for heat, power from transformer energizes fan control board. The fan control energizes ignition control. The ignition control lights burner automatically.

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

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

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

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

II. PREPARING YOUR 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 all return-air grilles are unobstructed.

2. If a humidifier is installed with your system, open water supply valve.
3. Set thermostat to lowest setting.
4. Turn on electric power to furnace.
5. Open oil supply valve.
6. Check all connections to ensure there are no leaks.

III. LIGHTING YOUR FURNACE

△	CAUTION: This furnace is equipped with an interrupted type electronic ignition system. DO NOT ATTEMPT TO LIGHT WITH A MATCH. HIGH VOLTAGE AT IGNITOR.
---	---

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

IV. TURNING OFF YOUR FURNACE

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

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

FOR SERVICE CALL

NAME: _____

ADDRESS: _____

TELEPHONE: _____

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