Installation, Operation and Maintenance Manual

O4MD Oil Fired Downflow / Horizontal Warm Air Furnace

FOR YOUR SAFETY:
Do not store or use gasoline or other flammable liquids or vapors in the vicinity of this, or any other appliance.

ALL INSTALLATIONS MUST MEET ALL LOCAL, PROVINCIAL/STATE, AND FEDERAL CODES WHICH MAY DIFFER FROM THIS MANUAL

Read this complete manual before beginning installation. These instructions must be kept with the furnace for future reference.

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IMPORTANT:

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE

1. INTRODUCTION

Please read these instructions completely and carefully before installing and operating the furnace.

The furnace must be installed and set up by a qualified contractor

MODEL O4MD-091A-12-F

Model O4MD-091A-12-F is an oil fired forced air multi-positional furnace, with a nominal output capacity range of 60,000 BTU/Hr. to 90,000 BTU/Hr. The O4MD-091A-12-F furnace may be installed in the down-flow position, as well as both horizontal positions.

MODEL O4MD-140A-16-F

Model O4MD-140A-16-F is an oil fired forced air multi-positional furnace, with a nominal output capacity range of 91,000 BTU/Hr. to 128,000 BTU/Hr. The O4MD-140A-16-F furnace may be installed in the down-flow position, as well as both horizontal positions.

The O4MD-091A-12-F model is CSA listed, (NRTL/C) for use with No. 1 (Stove) and No. 2 (Furnace) Oil. Please refer to the tables in Appendix A for performance and dimensional data.

The Model O4MD-140A-16-F furnace is listed with the Canadian Standards Association, (CSA), and the Energy Testing Laboratory of Maine, (ETLM), for use with No. 1 (Stove) and No. 2 (Furnace) Oil. Please refer to the tables in the appendix for performance and dimensional data.

⚠WARNING

DO NOT USE GASOLINE, CRANK CASE OIL, OR ANY OIL CONTAINING GASOLINE.

The installation of the furnace and related equipment shall be installed in accordance with the regulations of NFPA No. 31, *Installation of Oil Burning Equipment*, as well as in accordance with local codes.

In Canada, the installation of the furnace and related equipment shall be installed in accordance with the regulations of CAN/CSA-B139, *Installation Code For Oil Burning Equipment*, as well as in accordance with local codes.

When installation or application questions arise, regulations prescribed in the National Codes and Local Regulations take precedence over the general instructions provided with this installation manual. When in doubt, please consult your local authorities.

All models are shipped assembled and pre-wired. The furnace should be carefully inspected for damage when being unpacked.

2. HEAT LOSS

The maximum hourly heat loss for each heated space shall be calculated in accordance with the procedures described in Manual J. titled, "Load Calculation" published by the Air Conditioning Contractors of America, or method suitable for local conditions or prescribed by local codes. The calculation results obtained should be in substantial agreement with, and not less than those obtained using the procedure described in Manual J.

In Canada, the maximum hourly heat loss for each heated space shall be calculated in accordance with the procedures described in the manuals of the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), or by method suitable for local conditions.

3. LOCATION OF UNIT

The furnace should be located such that the flue connection to the chimney is short, direct and consists of as few elbows as possible. When possible, the unit should be centralized with respect to the supply and return air ductwork. A central location minimizes the trunk duct sizing. All models may be installed on combustible floors.

Minimum installation clearances are listed in Table 2.

Sub-bases, for downflow installations are available for the O4MD-091A-12-F and O4MD-140A-16-F series furnaces:

O4MD-091A-12-F: Order Part No. 29018.

O4MD-140A-16-F: Order Part No. 006000073.

TABLE 1.: GENERAL SPECIFICATIONS

FURNACE	INPUT USGPH	OUTPUT BTU/HR.	NOZZLE (Delavan)	BECKETT AF BURNER		AIR FILTER
				BURNER MODEL	BURNER HEAD	
O4MD-091A-12-F	0.50	60,000	0.50 / 60°A	AF76BO	F0	20 X 20 X 1
	0.65	78,000	0.65 / 60°A			
	0.75	90,000	0.75 / 60°A	AF76XN	F3	
O4MD-140A-16-F	0.75	91,000	0.75 / 80°A	AF76XN	F3	20 X 20 X 1
	0.85	101,000	0.85 / 80°A			
	1.00	117,000	1.00 / 60°A			
	1.10	128,000	1.10 / 70°A	AF76YB	F6	

Table 2: Clearances

Model: O4MD-091A-12-F		
Location	Clearance to Combustibles	
	Downflow	Horizontal
Top	0 in.	6 in.
Bottom	0 in. *	1 in.
S/A Plenum	1 in.	1 in.
Rear	1 in.	1 in.
Sides	1 in.	1 in.
Front	6 in. ***	24 in.
Flue Pipe	18 in. **	18 in. **
Enclosure	Closet	- - -
Model: O4MD-140A-16-F		
Location	Clearance to Combustibles	
	Downflow	Horizontal
Top	0”	3 in.
Bottom	1 in. *	1 in.
S/A Plenum	1 in.	3 in.
Rear	1 in.	1 in.
Sides	1 in.	0 in.
Front	16 in. ***	24 in.
Flue Pipe	9 in.	9 in.
Enclosure	Closet	Alcove
Horizontal Duct within 6’ of unit	1 in.	1 in.

* Use sub-base.

** In Canada - 9 inches.

*** The above recommended installation clearances do not take into consideration the clearances necessary to replace the air filter or perform other routine maintenance. 24 inches minimum recommended for servicing.

DOWNFLOW INSTALLATION

The furnace has been assembled for installation in the down-flow position. If the furnace is to be installed in the down-flow position on a combustible floor, use the appropriate sub-base.

Maintain all other clearances to combustibles as outlined in Table 1. Suggestion; as a measure to prevent fuel oil from accumulating in locations other than the fire pot, as could be the case in the event of nozzle drip, install the furnace with an approximate 2 degree slope from the oil burner casing towards the fire pot. Use shims made of noncombustible material.

HORIZONTAL INSTALLATION

Although the furnace is assembled and shipped ready for installation in the down-flow position, the furnace may be installed in either of the horizontal positions; warm air discharging left or warm air discharging right by following these steps:

O4MD-091A-12-F Model:

1. Rotate the furnace 90° to the desired position.
2. Remove the three nut and washer sets fastening the oil burner assembly to the furnace. Rotate the oil burner assembly to be in the upright position. (Ignition transformer and primary control relay control should be on top).
3. Re-align the oil burner assembly to the combustion chamber (fire-pot), then secure into place with the three nut and washer sets.
4. Ensure that the limit control is in the upper position. See Fig. 6, page 16.

O4MD-140A-16-F Model:

1. Rotate the furnace 90° to the desired position.
2. Remove the three nut and washer sets fastening the oil burner assembly to the furnace. Rotate the oil burner assembly to be in the upright position. (Ignition transformer and primary control relay control should be on top).
3. Re-align the oil burner assembly to the combustion chamber (fire-pot), then secure into place with the three nut and washer sets.
4. Remove the cover from the flue collar.
5. Remove the screws securing the flue collar to the furnace, then rotate the flue collar 90°, such that the venting attaches to the top.
6. Secure the flue collar to the furnace, then reinstall the flue collar cover.

NON-SUSPENDED INSTALLATION

Maintain clearances to combustibles as outlined in Table 1. Installation on a combustible floor requires a clearance of 1 inch. This can be done by using noncombustible materials such as one inch thick channel iron or similar material. The furnace must be supported in such a way as to not allow twisting or sagging of the cabinet. Suggestion; as a measure to prevent fuel oil from accumulating in locations other than the fire pot, as could be the case in the event of nozzle drip, install the furnace with an approximate 2 degree slope from the oil burner casing towards the fire pot. Use shims made of noncombustible material.

SUSPENDED INSTALLATION

O4MD-091A-12-F: Maintain clearances to combustibles as outlined in Table 1. The recommended method to suspend the furnace is to fabricate a cradle with angle iron, 2” slotted angle, or steel channel and 3/8” threaded rod. The threaded rod should be located external to the furnace. The furnace must be supported in such a way as to not allow twisting or sagging of the cabinet. Position the cradle so as to not interfere with accessing the burner and blower compartments. Suggestion; as a measure to prevent fuel oil from accumulating in locations other than the fire pot, as could be the case in the event of nozzle drip, install the furnace with an approximate 2 degree slope from the oil burner casing towards the fire pot.

O4MD-140A-16-F: Maintain clearances to combustibles as outlined in Table 1. Remove the four circular knock-outs on the top panel, and similarly, the four circular knock-outs on the bottom panel. The removed knock-outs allow 3/8 inch treaded road to be inserted through the interior of the furnace. Use care when inserting rods, since the foil backed insulation can be easily ripped and torn away from the panel surfaces. Secure the furnace with 2 inch minimum slotted angle or equivalent, as shown in Figure 4, page 15. The furnace must be supported in such a way as to not allow twisting or sagging of the cabinet. Suggestion; as a measure to prevent fuel oil from accumulating in locations other than the fire pot, as could be the case in the event of nozzle drip, install the furnace with an approximate 2 degree slope from the oil burner casing towards the fire pot.

4. AIR CONDITIONING APPLICATIONS

If the furnace is used in conjunction with air conditioning, the furnace shall be installed in parallel with or upstream from the evaporator coil to avoid condensation in the heat exchanger. In a parallel installation, the dampers or air controlling means must prevent chilled air from entering the furnace. If the dampers are manually operated, there must be a means of control to prevent the operation of either system unless the dampers are in the full heat or full cool position. The air heated by the furnace shall not pass through a refrigeration unit unless the unit is specifically approved for such service.

IMPORTANT: DO NOT INSTALL AN AIR CONDITIONING EVAPORATOR COIL IN THE RETURN AIR PLENUM.

The blower speed must be checked and adjusted to compensate for the pressure drop caused by the evaporator coil. Refer to Appendix B for recommended wiring and electrical connections of the air conditioning controls.

5. COMBUSTION AIR

If the furnace is installed in a closet or utility room, two openings must be provided connecting to a well-ventilated space (full basement, living room or other room opening thereto, but not a bedroom or bathroom). One opening shall be located above the level of the upper vent opening and one opening below the combustion air inlet opening in the front of the furnace. Each opening shall have a minimum free area of 1½ square inches per 1,000 Btu/h of total input rating of all appliances installed in the room.

For furnaces located in buildings of unusually tight construction, such as those with high quality weather stripping, caulking, windows and doors, or storm sashed windows, or where basement windows are well sealed, a permanent opening communicating with a well ventilated attic or with the outdoors shall be provided, using a duct if necessary. The duct opening shall have a free area of 1½ square inches per 1,000 Btu/h of total input rating of all appliances to be installed. When a furnace is installed in a full basement, infiltration is normally adequate to provide air for combustion and draft operation. Furnace rooms under 700 ft³ (65m³) should automatically be treated as confined space.

The Model CAS-2B-90E Furnace Boot manufactured by Field Controls, Inc. may be used with the furnace to obtain combustion air directly from outdoors. Use of this device does not alter the need for ventilation air; however, it does provide a good direct source of combustion air and is connected directly to the oil burner.

6. CHIMNEY VENTING

The flue pipe should be as short as possible with horizontal pipes sloping upward toward the chimney at a rate of one-quarter inch to the foot. The flue pipe should not be smaller in cross sectional area than the flue collar on the furnace. The flue pipe should connect to the chimney such that the flue pipe extends into, and terminates flush with the inside surface of the chimney liner. Seal the joint between the pipe and the lining. The chimney outlet should be at least two feet above the highest point of a peaked roof. All unused chimney openings should be closed. Chimneys must conform to local, provincial or state codes, or in the absence of local regulations, to the requirements of the National Building Code.

NOTE: THE FURNACE IS APPROVED FOR USE WITH L-VENT.

⚠CAUTION

THE FURNACE MUST BE CONNECTED TO A FLUE HAVING SUFFICIENT DRAFT AT ALL TIMES TO ENSURE SAFE AND PROPER OPERATION OF THE APPLIANCE.

The flue pipe must not pass through any floor or ceiling, but may pass through a wall where suitable fire protection provisions have been installed. Refer to the latest edition of NFPA 31 for regulations governing the installation of oil burning equipment. In Canada, refer to the latest edition of CAN/CSA B-139 for rules governing the installation of oil burning equipment.

7. BAROMETRIC DAMPER CONTROL

This device is used in conjunction with conventional chimney venting. This control (or draft regulator) automatically maintains a constant negative pressure in the furnace to obtain maximum efficiency. It ensures that proper pressures are not exceeded. If the chimney does not develop sufficient draft, the draft control cannot function properly. The draft regulator, must be installed within the same room or enclosure as the furnace, and should not interfere with the combustion air supply to the burner. The control should normally be located a minimum of 3 pipe diameters from the furnace breeching and installed in accordance to the instructions supplied with the regulator. The flue outlet pressure (measured between the furnace and draft regulator) should be set to - 0.02 in. w.c.

8. FAN AND LIMIT CONTROL

The **L4064W** fan / limit control is a thermally activated control. There are two active components to the control. The “fan on” function is actuated by a heater wrapped bimetallic lever. The internal heater coil is activated whenever the oil burner is operating, resulting in the start up of the blower motor within 30 seconds of the ignition cycle. This is a non-adjustable setting. The second component is a helical bi-metal sensing element enclosed in a metal guard. This controls the “fan off” function and high limit cut off function. This control provides a delay between the burner ignition and blower start-up to eliminate excessive flow of cold air when the blower activates. Blower shutdown is also delayed to remove any residual heat from the heat exchanger and improve the annual efficiency of the furnace. “Fan off” settings of 90º F to 100º F (32º C to 37ºC) will usually be satisfactory. In a normal cycle, the “fan on” adjustment has little if any effect on the L4064W model control. If the blower starts for brief periods after a burner cycle, the condition can usually be eliminated by increasing the differential between the “fan on” and “fan off” settings.

If after 1 minute, the blower has not come on, inspection and / or repair of the fan / limit control wiring, or replacement of the fan / limit control may be necessary.

The limit switch performs a safety function and breaks power to the oil burner primary control, which shuts off the burner if the furnace over-heats. The limit control is thermally operated and automatically resets. The limit control is factory installed, pre-set and is not adjustable. Limit setting for O4MD-091A-12-F: 250°F. Limit Setting for O4MD-140A-16-F: 220°F.

⚠CAUTION

FAN/LIMIT CONTROL LOCATION IS CRITICAL IN THE O4MD-091A-12-F HORIZONTAL POSITIONS. TO OPERATE EFFECTIVELY AS A HIGH LIMIT CONTROL, THE CONTROL MUST BE INSTALLED IN THE UPPER POSITION. See Figure 6, page 16.

The limit control and fan control are incorporated in the same housing and are operated by the same thermal element. Ensure, prior to installation, that the fan / limit probe is not in contact with the heat exchanger.

The O4MD-091A-12-F Series furnace is equipped with a 160°F auxiliary limit control located in the blower compartment.

The O4MD-140A-16-F Series furnace is equipped with two auxiliary limit controls that are both automatic reset types. One is a 200°F disc limit located behind the junction box cover. The other is a 130°F. disc limit located on the blower fan housing.

IMPORTANT: THE O4MD-140A-16-F AUXILLIARY LIMIT (200°F.) POSITIONING IS IMPORTANT. THE DISC SIDE FACES THE HEAT EXCHANGER.

9. ELECTRICAL CONNECTIONS

The O4MD-091A-12-F furnace is listed by the Canadian Standards Association under the NRTL (North American) Standard.

The O4MD-140A-16-F furnace is listed by the Canadian Standards Association (CSA) and by the Energy Testing Laboratory of Maine (ETLM).

Both models are factory wired and require minimal field wiring. In the United States, the wiring must be in accordance with the National Fire Protection Association NFPA-70, National Electrical Code, and with local codes and regulations. In Canada, all field wiring should conform to CAN/CSA C22.1 Canadian Electrical Code, Part 1, and by local codes, where they prevail.

The furnace should be wired to a separate and dedicated circuit in the main electrical panel; however, accessory equipment such as electronic air cleaners and humidifiers may be included on the furnace circuit. Although a suitably located circuit breaker can be used as a service switch, a separate service switch is advisable. The service switch is necessary if reaching the circuit breaker involves becoming close to the furnace, or if the furnace is located between the circuit breaker and the means of entry to the furnace room. The furnace switch (service switch) should be clearly marked, installed in an easily accessible area between the furnace and furnace room entry, and be located in such a manner to reduce the likelihood that it would be mistaken as a light switch or similar device.

The power requirement for all models is: 120 VAC, single phase, 60 Hz., 12A.

Accessories requiring 120 VAC power sources such as electronic air cleaners and humidifier transformers may be powered from the furnace circuit, but should have their own controls. Do not use the direct drive motor connections as a power source, since there is a high risk of damaging the accessories by exposure to high voltage from the auto-generating windings of the direct drive motor.
Thermostat wiring connections and air conditioning contactor low voltage connections are shown in the wiring diagrams. Some micro-electronic thermostats require additional controls and wiring. Refer to the thermostat manufacturer's instructions.

The thermostat should be located approximately 5 feet above the floor, on an inside wall where there is good natural air circulation, and where the thermostat will be exposed to average room temperatures. Avoid locations where the thermostat will be exposed to cold drafts, heat from nearby lamps and appliances, exposure to sunlight, heat from inside wall warm air stacks, etc.

For thermostats with heat anticipators, the heat anticipator should be adjusted to the amperage draw of the heating control circuit as measured between the "R" and "W" terminals of the thermostat. To reduce the risk of damaging the heat anticipator, do not measure this current with the thermostat connected to the circuit. To determine the heating circuit amperage draw:

1. Note and disconnect the wires from the “R” and “W” thermostat terminals.
2. Connect an ammeter between the two disconnected wires from the thermostat.
3. Note the amperage reading.
4. Re-connect the thermostat wires. If the thermostat is serving a combination heating and air conditioning system, pay particular attention to polarity.
5. When the thermostat is reconnected and re-plumbed, adjust the heat anticipator setting to match the observed amperage reading.

10. HUMIDIFIER

A humidifier is an optional accessory available through most heating supplies outlets. Installation should be carried out in accordance with the humidifier manufacturer's installation instructions. Water or water droplets from the humidifier should not be allowed to come into contact with the furnace heat exchanger. Do not use direct drive motor connections as a source of power for 120 VAC humidifiers and humidifier transformers.

11. OIL PIPING INSTALLATION

The entire fuel system should be installed in accordance with the requirement of NFPA No. 31 and local codes and regulations.

In Canada, the entire fuel system should be installed in accordance with the requirements of CAN/CSA B-139, and local regulations. Use only approved fuel oil tanks piping, fittings and oil filters.

Ensure that all fittings used in a copper oil line system are high quality flare fittings. Do not use compression fittings.

Do not use Teflon tape on any oil line fittings.

Pressurized or gravity feed installations must not exceed 10 PSIG on the inlet line or the return line at the pump. A pressure greater than 10 PSIG may cause damage to the shaft seal. A pressure-regulating device approved for use with oil piping systems should be used if the height of the fuel oil exceeds 11½ feet above the oil burner.

The furnace may be installed with a one-pipe system with gravity feed or lift. The maximum allowable lift on a single line system is 8 feet. Lift should be measured from the bottom (outlet) of the tank, to the inlet of the burner. Sizing a single line system is complex because of the difficulty estimating the pressure drop through each fitting, bend and component in the line. In general, keep single line systems short as possible. If the furnace is to be installed in a suspended position, a two-pipe system may be the better alternative. 2-stage oil pumps may be used with both single line and two line systems. 2-stage pumps are available from your HVAC wholesaler. The following chart shows the allowable line lengths (horizontal + vertical) for single and two stage oil pumps. All distances are in feet.

Copper Tubing Oil Line Lengths				
Lift	Single Stage		2-Stage	
	¼" O.D. Tubing	⅜" O.D. Tubing	¼" O.D. Tubing	⅜" O.D. Tubing
0	53	100	68	100
1	49	100	65	100
2	45	100	63	100
3	41	100	60	100
4	37	100	58	100
5	33	100	55	100
6	29	100	53	100
7	25	99	50	100
8	21	83	48	100
9	17	68	45	100
10	13	52	42	100
12	- - -	- - -	37	100
14	- - -	- - -	32	100
16	- - -	- - -	27	100
18	- - -	- - -	22	88

In retrofit applications, where an existing oil line system is in place, a vacuum check will help determine whether a 2-stage oil pump is necessary. The vacuum in a system featuring a single stage oil pump should not exceed 6" Hg. The vacuum in a system featuring a 2-stage oil pump should not exceed 15" Hg. (inches of mercury).

NOTE: Two-pipe oil line systems require the installation of the bypass plug in the oil pump. Consult pump manufacturer's instructions

For additional information, see the installation information sheet affixed to the oil burner.

12. OIL FILTER

All fuel systems should include an oil filter between the fuel oil storage tank and the oil burner. For best results, install the oil filter as close to the burner as possible. When using an oil burner nozzle smaller than 0.65 U.S. gallons per hour, install an additional 7 to 10 micron filter as close as possible to the oil burner. For further details of the oil supply tank and piping requirements, please refer to the instructions and illustrations in the oil burner and oil pump instructions shipped with the furnace.

13. OIL BURNER NOZZLES

The O4MD-091A-12-F furnace is certified for multiple firing rates, ranging nominally from 60,000 to 90,000 Btu/hr.
The O4MD-140A-16-F furnace is certified for multiple firing rates, ranging nominally from 90,000 to 130,000 BTU/hr. By manipulating the oil burner nozzle, flame retention head, and temperature rise, the furnace may be fired at an ideal rate for a wide range of structures.

Note: A conversion kit, Part No. 36000069 is available to convert the O4MD-091A-12-F, 60 – 80 MBH model to the O4MD-091A-12-F, 90 MBH model. The O4MD-091A-12-F 90 MBH kit includes the 0.75 USGPH nozzle, 2¾-inch static plate and F3 burner head.

Note: A conversion kit, Part No. 00600050 is available to convert the O4MD-140A-16-F 90 –120 MBH to an O4MD-140A-16-F 130 MBH. The O4MD-140A-16-F 130 MBH kit includes the 1.10 USGPH nozzle and F6 burner head.

MODEL	NOZZLE	HEAD
O4MD-091A-12-F (060)	0.50 / 60°A	F0
O4MD-091A-12-F (080)	0.65 / 60°A	F0
O4MD-091A-12-F (090)	0.75 / 60°A	F3
O4MD-140A-16-F (090)	0.75 / 80° A	F3
O4MD-140A-16-F (100)	0.85 / 80° A	F3
O4MD-140A-16-F (120)	1.00 / 60° A	F3
O4MD-140A-16-F (130)	1.10 / 70° A	F6

14. COMBUSTION CHAMBER

This furnace is equipped with an efficient cerafelt combustion chamber. It is held in place by a retaining bracket. Check the alignment of the combustion chamber before firing. It is possible for the combustion chamber to shift if subjected to rough handling during transit.

The cerafelt combustion chamber is quite soft initially. After firing, it becomes very brittle. Be sure to do all

alignment and positioning adjustments before the first firing.

⚠CAUTION

BEFORE OPERATING THE FURNACE CHECK BURNER ALIGNMENT WITH COMBUSTION CHAMBER. THE END CONE OF THE AIR TUBE MUST BE CENTRED TO THE ACCOMODATING RING PROVIDED IN THE DESIGN OF THE COMBUSTION CHAMBER. ADJUST AS NECESSARY.

The combustion chamber should be inspected for damage or carbon build up whenever the oil burner is removed for repairs or routine maintenance.

15. BURNER ELECTRODES

Correct positioning of the electrode tips with respect to each other, to the fuel oil nozzle, and to the rest of the burners is essential for smooth light ups and proper operation.

The electrode tips should be adjusted to a gap of 5/32", 1/16" ahead of the nozzle, 5/16" above the centerline of the nozzle.

NOTE: Older literature specifies 7/16" above centerline; use new specification; 5/16" above centerline.

The "Z" dimension is 1-1/8" (see oil burner instructions insert in documents envelope).

The electrode porcelains should be free of cracks, the electrode tips should be tapered and free of burrs, and the contact rods must be clean and be in firm contact with the ignition transformer or igniter contact springs.

16. OIL BURNER PRIMARY CONTROL

The furnace is equipped with a Honeywell R8184N primary combustion control, sometimes referred to as the burner relay or burner protector relay. It uses a light sensing device (cad cell) located in the burner housing, to monitor and control combustion. Over time, dust or combustion residuals can build up on the lens of the cad cell impairing its response to the flame. The cad cell should be checked for cleanliness and proper alignment if the primary control frequently shuts down combustion.

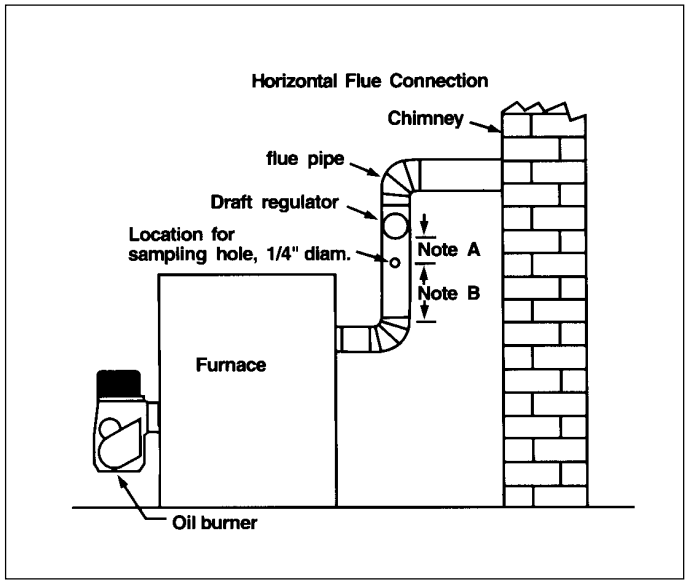
17. OIL BURNER SET-UP

The burner air supply is adjusted to maintain the *fuel to air ratio* to obtain ideal combustion conditions. A lack of air causes "soft" and "sooty" flames, resulting in soot build-up throughout the heat exchanger passages. Excess combustion air causes a bright roaring fire and high stack temperatures resulting in poor fuel efficiency.

PREPARATIONS:

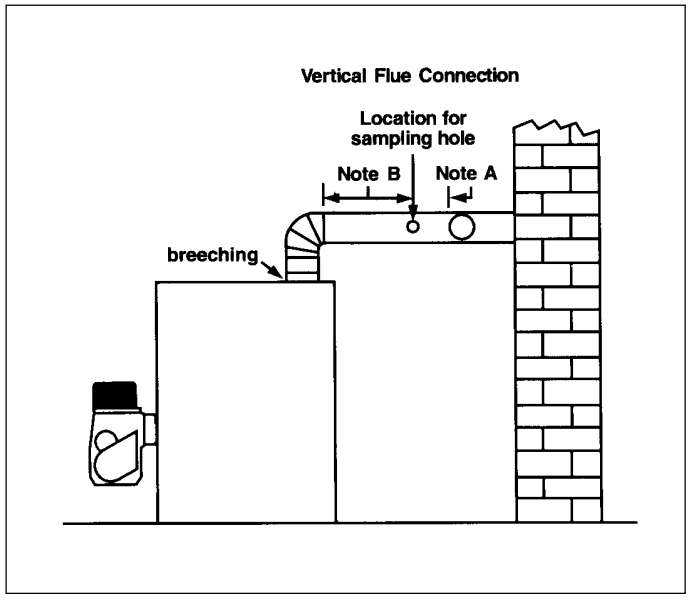
Drill a ¼" test port in the venting, ideally at least 2 flue pipe diameters away from the furnace breeching, if venting horizontally from the furnace, or from the flue pipe elbow if venting vertically before reaching the furnace. (See Figures 1 and 2).

Figure 1: Test port location for smoke test - horizontal.



Courtesy of R. W. Beckett Corporation.

Figure 2: Test port location for smoke test - vertical.



Courtesy of R. W. Beckett Corporation

Note A: Locate hole at least 6 inches on the furnace side of the draft control.

Note B: Ideally, hole should be at least 12 inches from breeching or elbow.

Before starting the burner, check the burner alignment with the combustion chamber (fire pot), check that the correct nozzle is tightened into place, and that the burner electrodes are properly positioned.

PROCEDURE:

Start the burner and allow it to run at least ten minutes. Set the air shutter to give a good flame visually. The combustion air supply to the fire is controlled by manipulating the air shutter on the left side of the burner, and, if necessary, the bulk air band. To adjust, loosen the bolt on the movable shutter. Move the shutter gradually until a good flame (visually) has been achieved. Re-snug the bolt.

Check the initial draft setting as the furnace warms up. The draft may be measured at the test port.

Check the oil pump pressure, normally, 100 PSIG.

After reaching steady state, take a smoke test. If not indicating a trace, set the combustion air controls to provide a trace.

Typically, the CO_2 reading will range between 11.5% to 13.5%.

After the air adjustments have been completed, and the air shutter or air adjustment plate has been secured, take another smoke test to ensure that the values have not changed.

The maximum combustion efficiency based on flue gas high CO_2 content generally lies between a No. 1 and No. 2 smoke spot on the Bacharach Scale. This is not the optimum setting; however, because dust will inevitably build up on the air moving components of the oil burner assembly. This will result in decreased air supply with the potential result of soot building up in the flue gas passageways of the heat exchanger. Soot behaves as an insulator and impairs good heat transfer. Stack temperature will increase, and the overall efficiency will decrease. As a means of avoiding this problem, the smoke should be held at a trace.

SMOKE TEST NOTE:

If oily or yellow smoke spots are found on the smoke test filter paper, it is usually a sign of unburned fuel. This indicates poor combustion. This type of problem may be caused by excess draft, excess air, or contaminated fuel. Do not ignore this indicator.

STACK TEMPERATURE:
Stack temperature will vary depending on fuel input, circulating air blower speed, and burner set up, etc. In general, stack temperature should range between 350°F to 450°F, but could be as high as 550°F, assuming that the combustion air is approximately room temperature (65°F - 70°F). In general, lower stack temperature indicates greater efficiency; however, excessively low stack temperature can lead to condensation forming in the chimney and / or venting. Sulphur and similar contaminants in the fuel oil will mix with condensation to form acids. Acids and resultant chemical salts will cause rapid deterioration of the chimney and venting components, and may attack the furnace.

If the flue gases are below the range, it may be necessary to slow down the blower fan. If the flue gases are above the range, the blower fan may require speeding up. Stack temperature varies directly with the system temperature rise. System temperature rise is the difference between the furnace outlet temperature and furnace inlet temperature as measured in the vicinity of the connection between the plenum take-offs and the trunk ducts. Typical temperature rise values range between 65°F and 90°F.

If the venting from the furnace to the chimney is long, or exposed to cold ambient temperatures, consider using L-Vent to reduce stack loss.

18. CIRCULATING AIR BLOWER

The furnace is equipped with direct drive blower system. Direct drive blower speed adjustments are not normally required in properly sized extended plenum duct systems. The motor RPM and air CFM delivery will vary automatically to accommodate conditions within the usual range of external static pressures typical of residential duct systems. Under-sized duct systems may require a higher blower speed to obtain a reasonable system temperature rise. Some older duct systems were not designed to provide static pressure. They typically feature special reducing fittings at each branch run and lack block ends on the trunk ducts. These systems may require modification to provide some resistance to the airflow to prevent over- amping of the direct drive blower motor. Selecting a lower blower speed may correct this problem.

Direct drive blower speeds are adjusted by changing the "hot" wires to the motor winding connections. Please refer to wiring diagrams in Appendix B or the wiring diagram label affixed to the furnace.

THE NEUTRAL WIRE (normally the white wire) IS NEVER MOVED TO ADJUST THE BLOWER SPEED.

It is possible and acceptable to use a single blower speed for both heating and cooling modes. The simplest method to connect the wiring from both modes is to use a "piggy-back connector" accommodating both wires on a single motor tap. It is also acceptable to connect the selected motor speed with a pigtail joined to both heating and cooling speed wires with a wire nut. As a safety precaution against accidental disconnection of the wires by vibration, secure the wire nut and wires with a few wraps of electricians tape.

⚠WARNING

DO NOT CONNECT POWER LEADS BETWEEN MOTOR SPEEDS. THE NEUTRAL WIRE MUST ALWAYS BE CONNECTED TO THE MOTOR'S DESIGNATED NEUTRAL TERMINAL.

If the joining of the blower speed wiring is done in the furnace junction box or control box, tape off both ends of the unused wire.

⚠CAUTION

DISCONNECT THE POWER SUPPLY TO THE FURNACE BEFORE OPENING THE BLOWER ACCESS DOOR TO SERVICE THE AIR FILTER, FAN AND MOTOR. FAILURE TO SHUT OFF POWER COULD ALLOW THE BLOWER TO START UNEXPECTEDLY, CREATING A RISK OF DEATH OR PERSONAL INJURY.

Do not use the blower speed wires as a source of power to accessories as electronic air cleaners and humidifier transformers. The unused motor taps auto-generate sufficiently high voltages to damage accessory equipment.

⚠CAUTION

DO NOT START THE BURNER OR BLOWER FAN UNLESS THE BLOWER ACCESS DOOR IS SECURELY IN PLACE.

19. INITIAL START UP

Once the furnace flue pipe, electrical and oil line connections have been made, use the following instructions to set up the furnace:

1. Shut off the electrical power to the furnace.
2. Install an oil pressure gauge to the pressure port on the oil pump. (Refer to the oil pump specification sheet included with the burner instructions).
3. Restore electrical power to the furnace.
4. Start the furnace and bleed all air from the fuel oil lines.
5. Close the purge valve and fire the unit.
6. Follow the procedures outlined in 17. – Oil Burner Set Up, (page 10).
7. Check the system temperature rise with a pair of duct thermometers. *The temperature rise is the difference between the return air temperature measured at a point near the return air inlet, and the supply air temperature measured near the furnace outlet*. The system temperature rise will typically range between 65°F and 95°F. If the temperature rise is too high, the airflow must be increased. If the temperature rise is too low, the fan should be slowed down.
8. Turn off the oil burner. Observing the duct thermometer in the supply air stream, note the temperature at which the blower fan stops. The fan adjustments are made by manipulating the FAN ON and FAN OFF levers. EXAMPLE: If the "FAN OFF" setting is observed to be 100°F, and the actual "fan off" temperature as indicated by the duct thermometer is 110°F, the "FAN OFF" setting on the fan / limit control can be reset to 90° (one notch clockwise), to cause an actual fan shutdown at 100°F. Normally, the 'FAN ON" setting is set to be approximately 30° higher than the "FAN OFF" setting. Some downflow applications require a greater difference; 40° - 50°F.
9. To check the operation of the limit switch, shut off power to the furnace. Temporarily remove the neutral wire from the direct drive blower motor. Restore the electrical power to the furnace and set the thermostat above room temperature. After three or four minutes of burner operation, the limit control should turn the burner off. Progress towards a high limit shut down can be monitored by watching the dial on the fan / limit control. When the limit function test is complete, first, shut off electrical power to the furnace, replace the neutral wire to the blower fan motor, then restore power. The blower fan will start up immediately. Once the temperature has dropped, the oil burner will resume and continue until the thermostat is satisfied. Restore the thermostat setting to a comfortable temperature.
10. Set the thermostat heat anticipator to 0.3 A, or follow the procedure outlined in 9. Electrical Connections, (page 8).

NOTE: THE FURNACE SHOULD BE RUN THROUGH AT LEAST THREE FULL CYCLES BEFORE LEAVING THE INSTALLATION, TO ENSURE THAT ALL CONTROLS ARE OPERATING PROPERLY AND AS EXPECTED.

20. SEQUENCE OF OPERATION

1. Room temperature drops, the thermostat calls for heat.
2. The oil burner starts, ignition begins.
3. The cad cell detects light from combustion, disconnects the primary control safety circuit, allowing combustion to continue.
4. The bi-metallic element in the fan/limit control starts the fan within 30 seconds.
5. The furnace continues to operate and will eventually reach "*steady state*", the point at which the system temperature stabilizes. (The furnace does not become any warmer).
6. Room temperature rises; the thermostat is satisfied, and the thermostat heating contacts open.
7. The oil burner stops.
8. The furnace temperature cools causing the fan control contacts to open; the circulating fan stops.
9. The furnace remains idle until the next call for heat.

21. FINAL CHECK OUT

Ensure that all safety devices and electrical components have been set for normal operation. Ensure that all electrical connections are tight and that the wiring is secure.

The furnace should be operated for a minimum of 15 minutes to reach steady state conditions before fine tuning combustion. The warm up time is ideal for testing the oil pump pressure.

Re-sample the flue gas for draft, [Bacharach] smoke, CO_2 or O_2 content, and temperature. If the results are satisfactory, make note of them and leave them with the furnace. They constitute a baseline that may be helpful for future diagnostics.

22. OPERATING INSTRUCTIONS

Before Lighting

1. Open all supply and return air registers and grilles.
2. Open all valves in oil pipes.
3. Turn on electric power supply

To Light Unit

1. Set the thermostat above room temperature to call for heat. The burner starts.
2. After a short period of time, as the furnace warms, the circulating fan starts.
3. Set the thermostat below room temperature. The oil burner stops.
4. The air circulation blower continues to run until the furnace cools.

To Shut Down Unit

1. Set the thermostat to the lowest possible setting.
2. Set the manual switch (if installed) in the Electrical Power Supply Line to "OFF".

NOTE: IF THE FURNACE IS TO BE SHUT DOWN FOR AN EXTENDED PERIOD OF TIME, CLOSE THE OIL SUPPLY VALVE TO THE BURNER.

⚠WARNING

IF THE FURNACE FAILS TO IGNITE, CHECK THE OIL TANK FUEL GAUGE. IF THE FUEL GAUGE SHOWS THAT OIL IS PRESENT, PRESS THE RESET BUTTON ONCE ONLY. IF THE BURNER FAILS TO IGNITE, CONTACT YOUR SERVICE CONTRACTOR.

⚠CAUTION

ALL FURNACE CONTROLS ARE SENSITIVE AND SHOULD NOT BE SUBJECTED TO TAMPERING. IF PROBLEMS PERSIST, CALL YOUR SERVICE CONTRACTOR.

23. MAINTENANCE AND SERVICE

A: Routine Maintenance By Home Owner

Other than remembering to arrange for the annual professional servicing of the furnace by the service or installation contractor, the most important routine service performed by the homeowner is to maintain the air filter or filters. A dirty filter can cause the furnace to over-heat, fail to maintain indoor temperature during cold weather, increase fuel consumption and cause component failure. The furnace filter(s) should be inspected, cleaned or replaced monthly. The furnace is factory equipped with a semi-permanent type filter. If the filter is damaged, replace with filters of the same size and type.

During the routine service, inspect the general condition of the furnace watching for signs of oil leaks in the vicinity of the oil burner, soot forming on any external part of the furnace, soot forming around the joints in the vent pipe, etc. If any of these conditions are present, please advice your service or installation contractor.

Annual Service By Contractor

⚠CAUTION

THE COMBUSTION CHAMBER (FIREPOT) IS FRAGILE. USE CARE WHEN INSPECTING AND CLEANING THIS AREA.

The heat exchanger should be inspected periodically and cleaned if necessary. if cleaning is necessary, **SHUT OFF POWER TO THE FURNACE** and remove the burner. Using a stiff brush with a wire handle, brush off scale and soot from inside the drum and flue pipe. To clean the radiator, remove the round covers on the inner front panel to gain access to the cleaning ports. When this procedure is done for the first time, carefully cut away the insulation covering the opening with a sharp knife. Loosen the nuts on the radiator clean-outs. DO NOT REMOVE THE NUTS. Remove the covers carefully to avoid tearing the gaskets. A wire brush can be used to loosen dirt and debris on the inside surfaces of the radiator. Clean out all accumulated dirt, soot and debris with a wire handled brush and an industrial vacuum cleaner. Before replacing the clean-out covers, inspect the gaskets. If the gaskets are broken, remove the remnants and replace with new gaskets. Snug the cleanout covers. DO NOT OVER-TORQUE THE CLEAN-OUT NUTS. Replace the inner front panel clean-out covers.

NOTE: A radiator clean-out assembly inadvertently dropped into the interior of the furnace can usually be easily retrieved with a magnet on a wire handle or with a magnet tied to a string.

Both the direct drive blower motor and oil burner motor are factory sealed. They do not require annual lubrication.

Inspect the blower fan. Clean if necessary.

Oil Burner Maintenance: Follow the instructions of the oil burner manufacturer. (See oil burner manufacturer's instructions supplied with furnace). It is advisable to change the oil burner nozzle and oil filter on an annual basis.

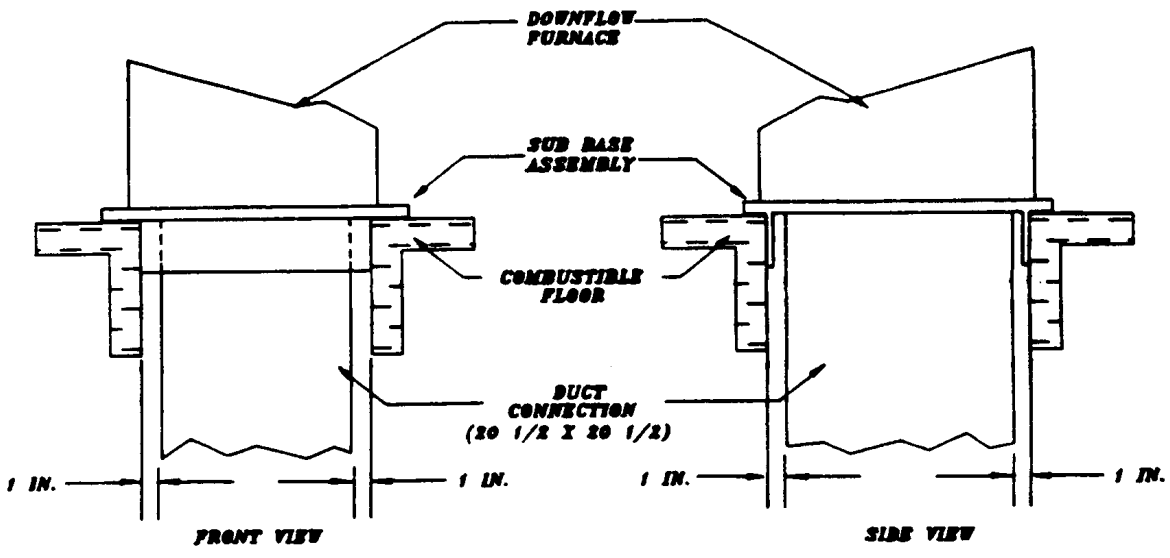
The venting system should be cleaned and inspected for signs of deterioration. Replace pitted or perforated vent pipe and fittings. The barometric damper should open and close freely.

All electrical connections should be checked to ensure tight connections. Safety controls such as the high limit controls should be tested for functionality. The fan control should be checked to ensure that the "fan off" function continues to stop the blower fan at temperatures between 90°F to 100°F.

⚠WARNING

DO NOT ATTEMPT TO START THE BURNER WHEN EXCESS OIL HAS ACCUMULATED, WHEN THE FURNACE IS FULL OF VAPOUR, OR WHEN THE COMBUSTION CHAMBER IS VERY HOT. NEVER BURN GARBAGE OR PAPER IN THE FURNACE, AND NEVER LEAVE PAPER OR RAGS AROUND THE UNIT.

Figure 3: O4MD-140A-16-F Sub-Base Assembly



Sub-Base Assembly Part Number 27088

Figure 4: Typical O4MD-140A-16-F Horizontal / Suspended Unit

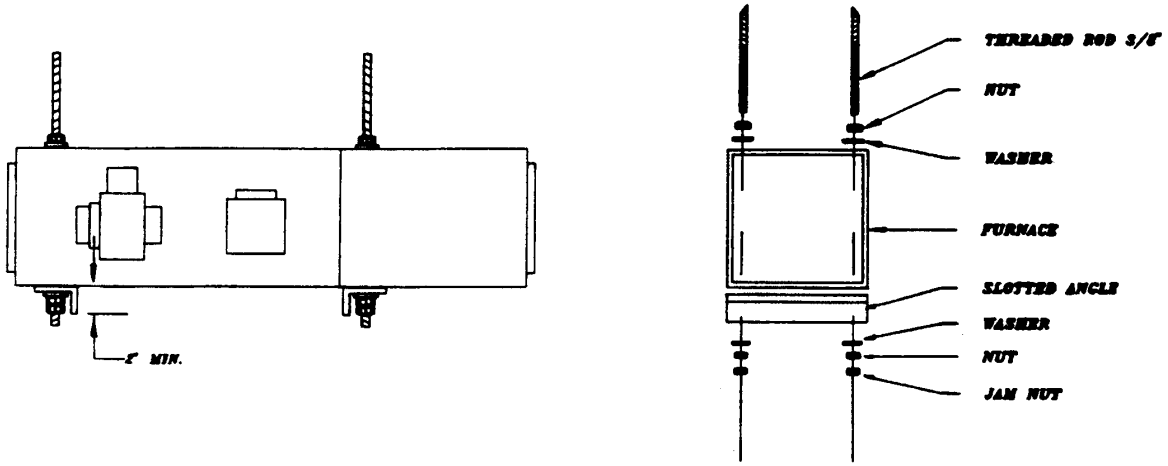
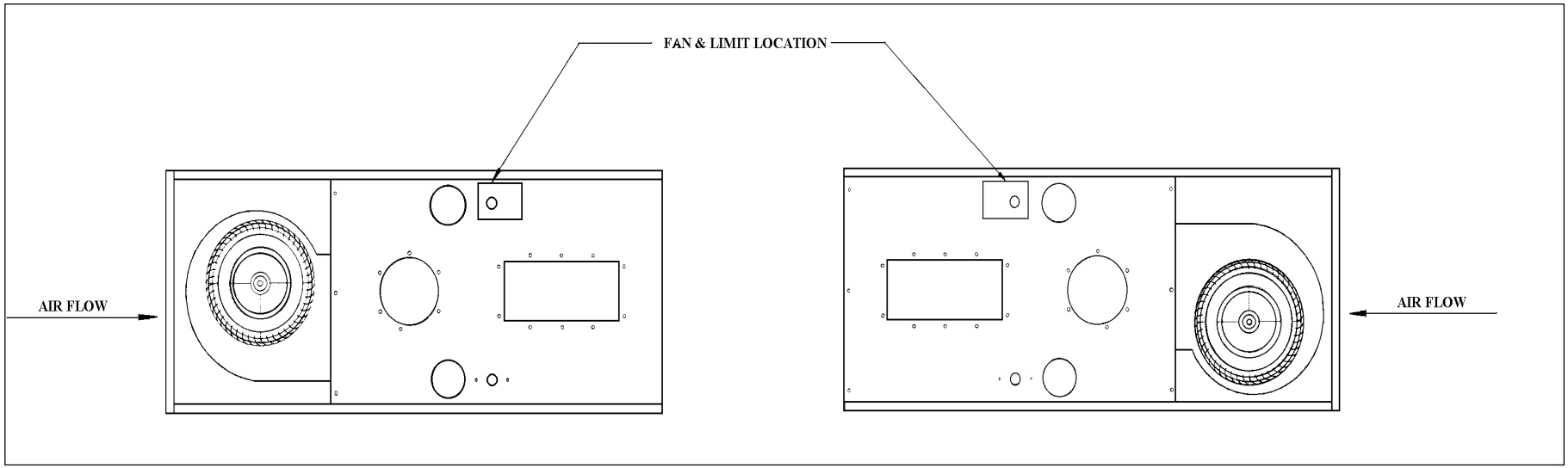


Figure 5: Typical O4MD-091A-12-F Suspended Horizontal Application

Reserved for O4MD-091A-12-F Suspended diagram.

Figure 6: Auxiliary Limit Location – O4MD-091A-12-F Units



Appendix A

Table A-1 Beckett AF Oil Burner Set-Up

BECKETT AF SERIES OIL BURNERS							
FURNACE MODEL	OUTPUT BTUH	BURNER MODEL	NOZZLE	PUMP PRESSURE	FLOW RATE	HEAD	STATIC PLATE
O4MD-091A-12-F	59,000	AF76BO	0.50 / 60°A	100 PSIG	0.50 U.S.GPH	F0	3-3/8”
	77,000	AF76BO	0.65 / 60°A	100 PSIG	0.65 U.S.GPH	F0	3-3/8”
	88,000	AF76XN	0.75 / 60°A	100 PSIG	0.75 U.S.GPH	F3	2-3/4”
O4MD-140A-16-F	91,000	AF76XN	0.75 / 80° A	100 PSIG	0.75 U.S.GPH	F3	2-3/4”
	101,000	AF76XN	0.85 / 80° A	100 PSIG	0.85 U.S.GPH	F3	2-3/4”
	117,000	AF76XN	1.00 / 60° A	100 PSIG	1.00 U.S.GPH	F3	2-3/4”
	128,000	AF76YB	1.10 / 70° A	100 PSIG	1.10 U.S.GPH	F6	2-3/4”

In the United States, the Beckett AF Burner may be equipped with Beckett's "*Inlet Air Shut-Off*" to increase efficiency. (Beckett Part No. AF/A 5861).It reduces the amount of air passing through the oil burner, combustion chamber, breaching, etc. up the chimney between burner cycles.

NOTE: Use of the inlet air shut-off could cause post combustion nozzle drip.

Table A-2 Direct Drive Blower Set-Up

FURNACE MBH	BLOWER	BLOWER SET-UP				COOLING CAPACITY		
		0.20 in. w.c.		0.50 in. w.c.		TONS	MOTOR	CFM RANGE
		SPEED	MOTOR	SPEED	MOTOR			
O4MD-091A-12-F								
60	GT-10	Low	1/2 HP	Medium-Low	1/2 HP	2 - 3	1/2 HP	690 - 1210
80		Medium-Low		Medium-High				
90		Medium-High		High				
O4MD-140A-16-F								
90	11-10T	Medium-Low	1/2 HP	Medium-High	1/2 HP	3 – 4	1/2 HP	1000 - 1500
100		Medium-Low		Medium-High				
120		Medium-High		High				
130		Medium-High		High				

Table A-3 Direct Drive Blower Characteristics

FURNACE MODEL	MOTOR HP	BLOWER	TEMP. RISE	MOTOR FLA	SPEED	CFM				
						EXTERNAL STATIC PRESSURE – in. w.c.				
						0.20	0.30	0.40	0.50	0.60
O4MD-091A-12-F	1/2 HP	GT-10	85°F	7.0	HIGH	1469	1386	1308	1213	1123
					MEDIUM-HIGH	1377	1308	1224	1146	1063
					MEDIUM-LOW	1088	1075	1038	985	916
					LOW	721	721	712	688	649
O4MD-140A-16-F	1/2 HP	11-10T	85°F	7.0	HIGH	1752	1691	1659	1593	1525
					MEDIUM-HIGH	1454	1454	1417	1379	1300
					MEDIUM-LOW	975	944	912	879	844
					LOW	631	593	552	515	486

TIP:

These formulae will assist with the design of the ductwork and the determination of airflow delivery:

$$CFM = \frac{BonnetOutput}{(1.085 x SystemTemperatureRise)} \quad and \quad SystemTemperatureRise = \frac{BonnetOutput}{(1.085 x CFM)}$$

Table A-4 General Dimensions (Inches)

FURNACE MODEL	CABINET			PLENUM OPENINGS		FLUE		AIR FILTER
	Width A	Depth B	Height C	Supply Air D x E	Return Air F x G	Diameter H	Height J	
O4MD-091A-12-F	22-1/4	22-1/4	54-1/2	19 x 19	18 x 18	5	26-1/2	20 x 20 x 1

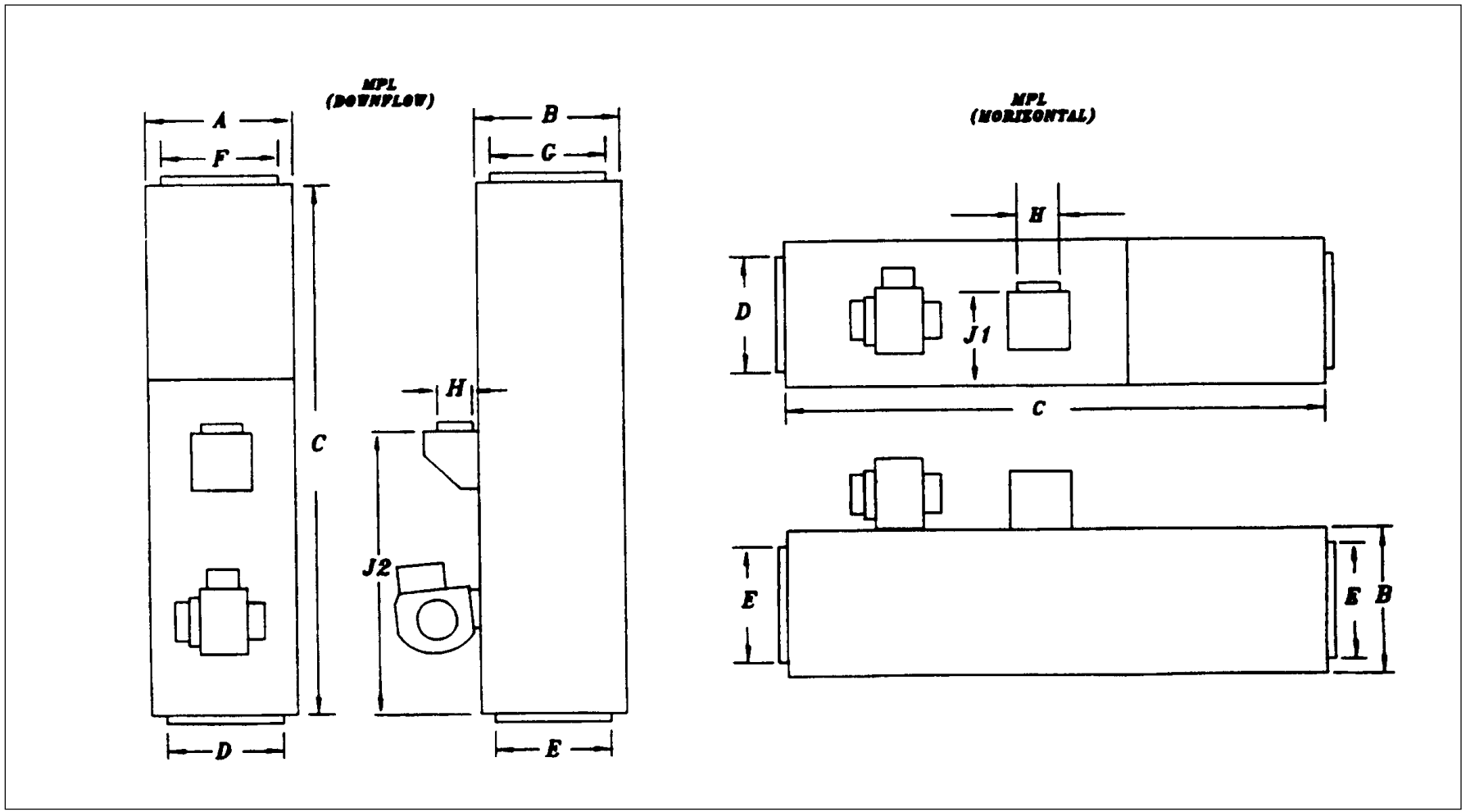
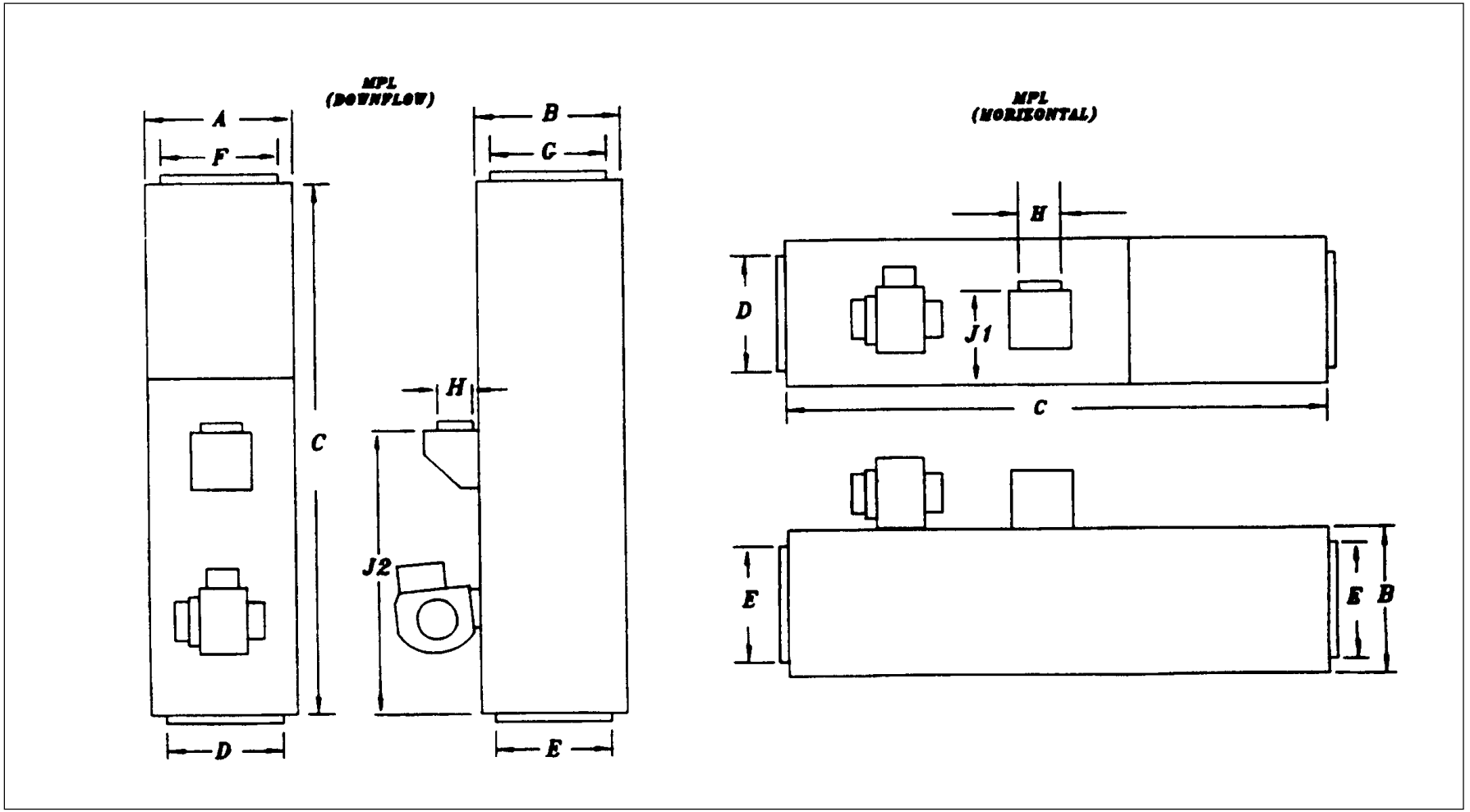
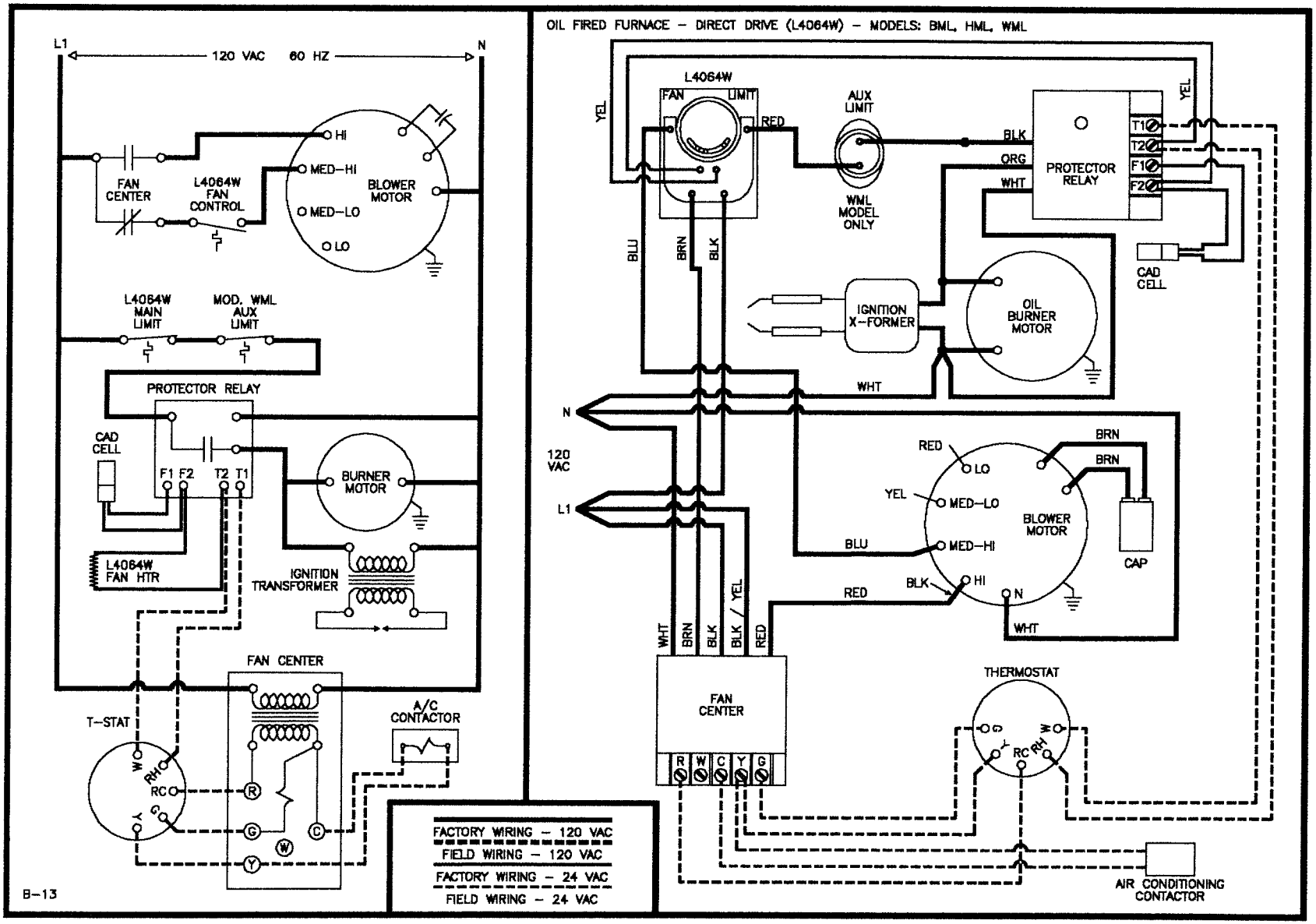


Table A-5 General Dimensions (Inches)

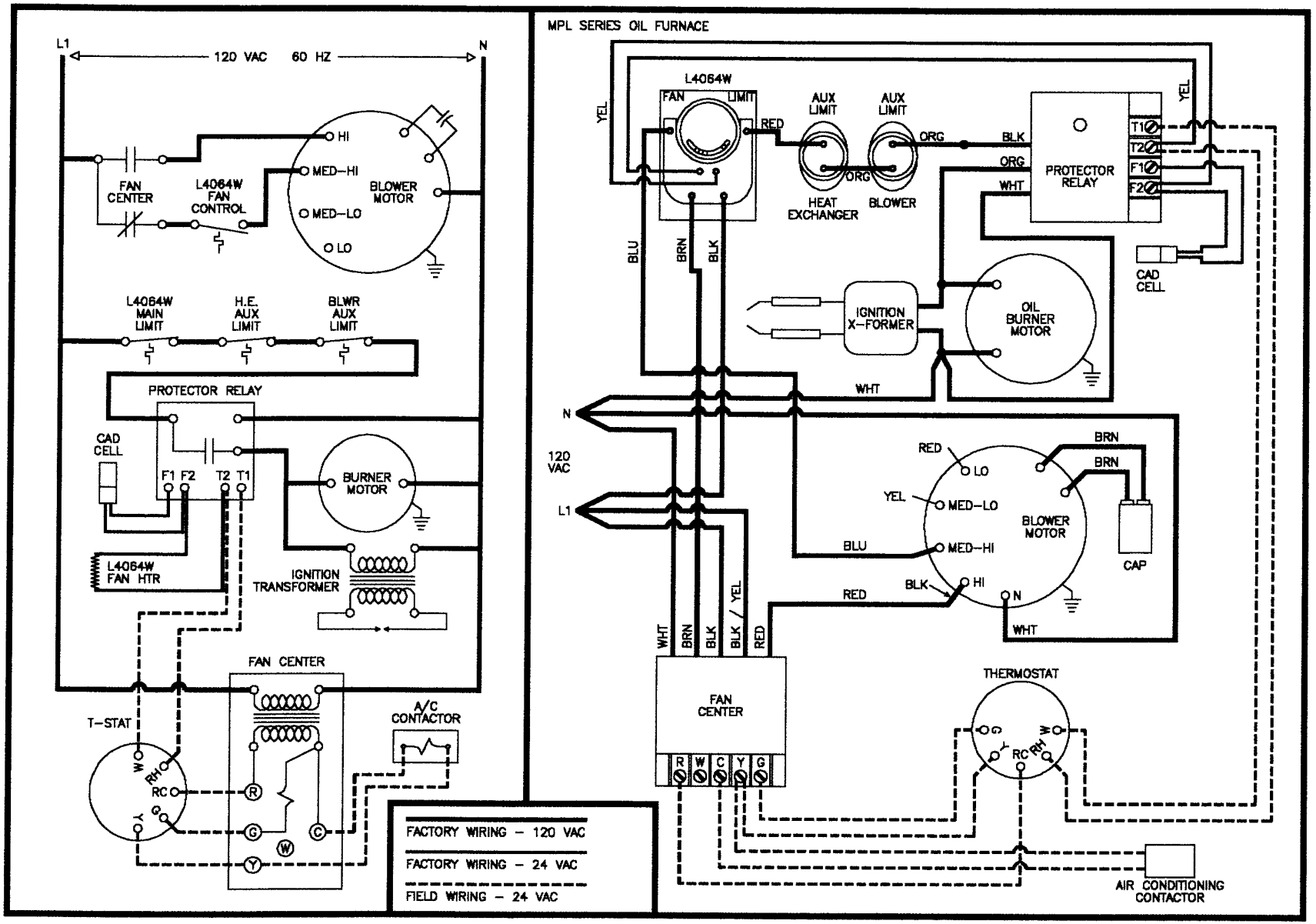
FURNACE MODEL	CABINET			PLENUM OPENINGS		FLUE			AIR FILTER
	Width	Depth	Height	Supply Air	Return Air	Diameter	Height		
	A	B	C	D x E	F x G	H	J1	J2	
O4MD-140A-16-F	22-1/4	22-1/4	62	20-1/2 x 20-1/2	18 x 18	6	15	37-1/2	20 x 20 x 1



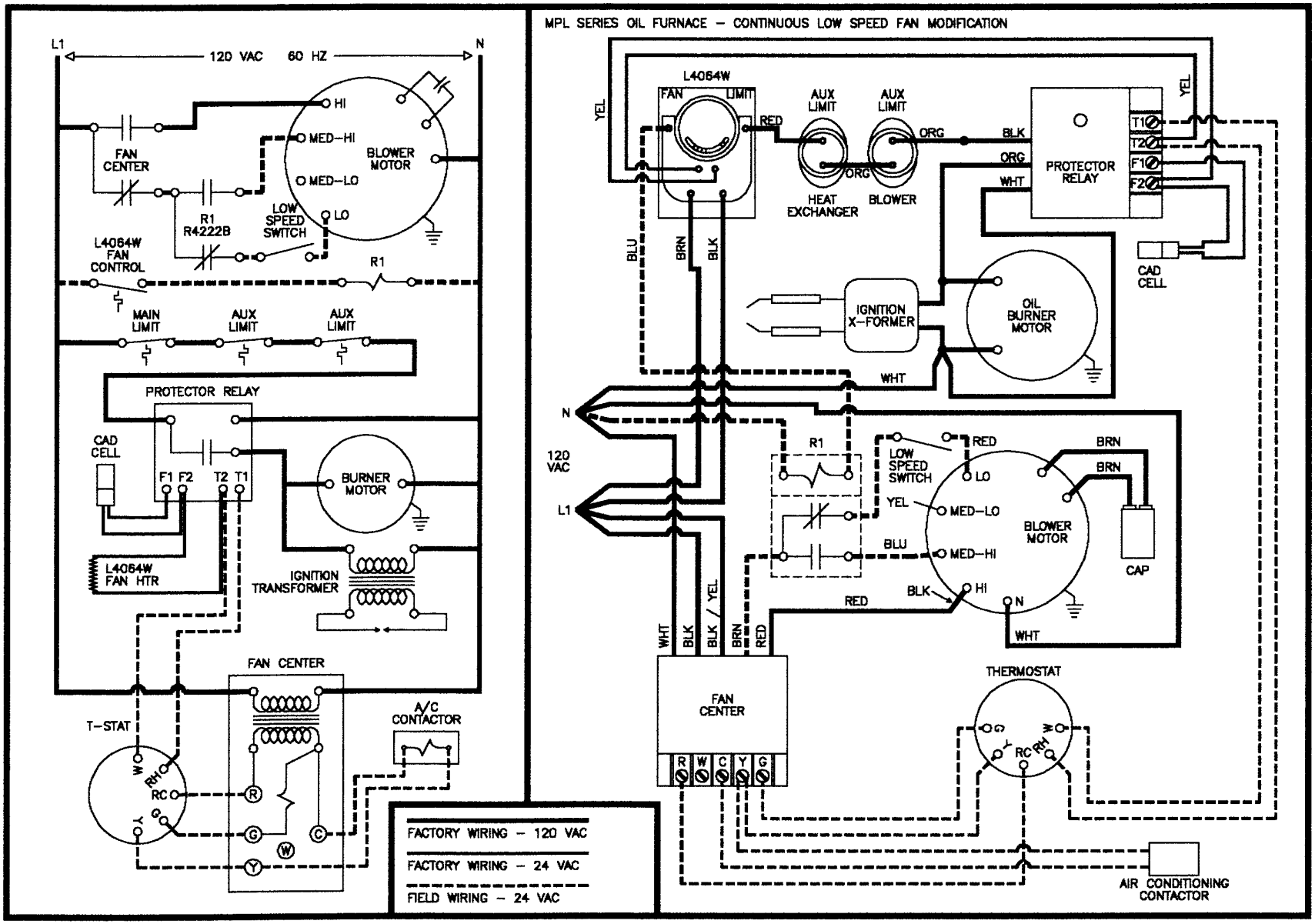
WIRING DIAGRAM: O4MD-091A-12-F SERIES OIL FURNACE



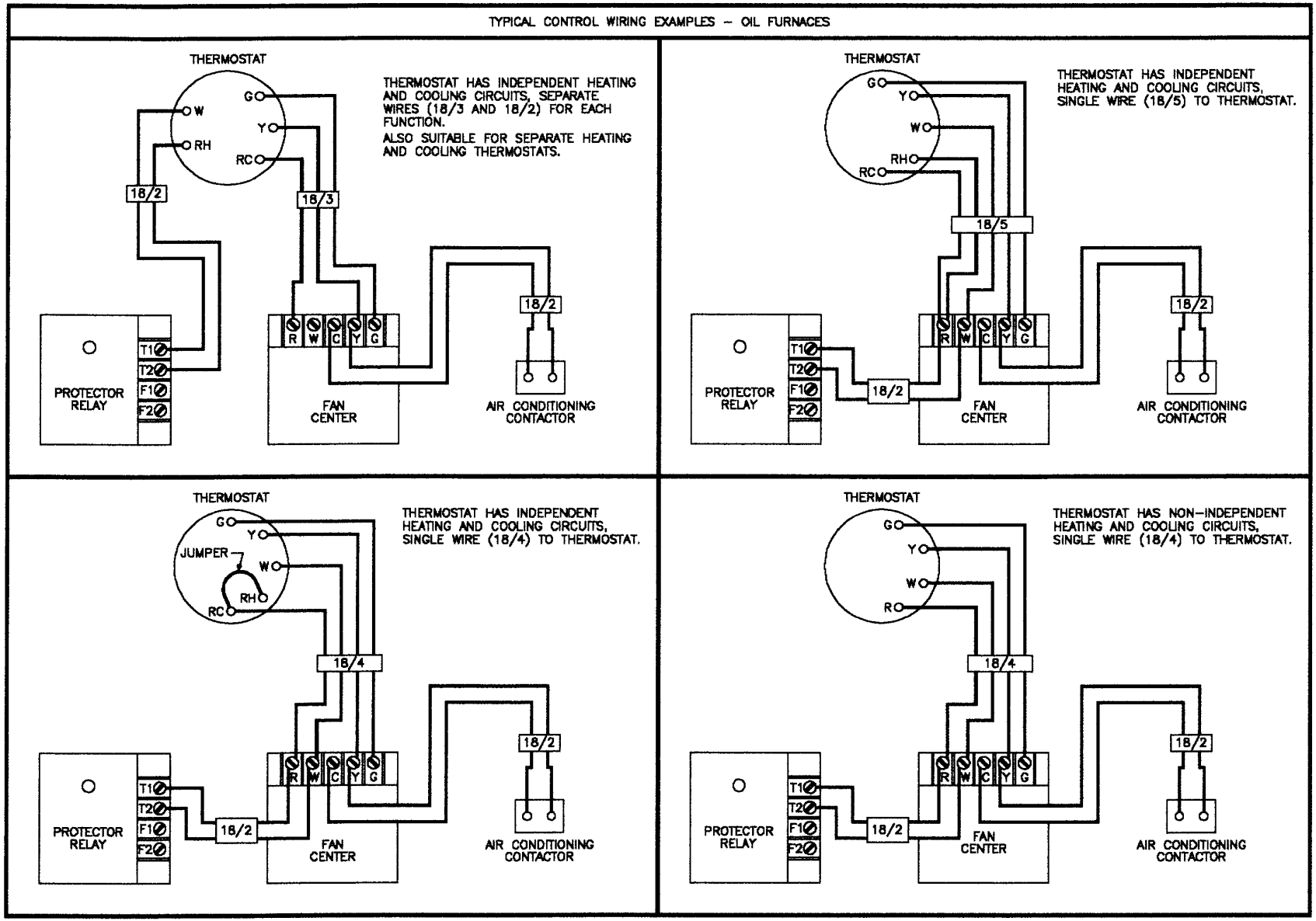
WIRING DIAGRAM: O4MD-140A-16-F SERIES OIL FURNACE



WIRING DIAGRAM: CONTINUOUS LOW SPEED FAN OPERATION MODIFICATION (TYPICAL)



WIRING DIAGRAM: ALTERNATE THERMOSTAT WIRING METHODS



Appendix C
TROUBLESHOOTING

Problem	Possible Cause	Remedy
Furnace will not start.	Thermostat not calling for heat.	Check thermostat and adjust. Also, check thermostat for accuracy; if it is a mercury switch type, it might be off level.
	No power to furnace.	Check furnace switch, main electrical panel furnace fuse or circuit breaker. Also look for any other hand operated switch, such as an old poorly located furnace switch that was not removed during furnace replacement.
	Thermostat faulty.	Check reset button on protector relay. Remove thermostat wires from protector relay terminals T1-T2. Place a jumper across T1-T2. If furnace starts, replace thermostat, thermostat sub-base (if equipped), or both.
	Protector relay faulty.	Check reset button on protector relay. Remove thermostat wires from protector relay terminals T1-T2. Check for 24v across T1-T2. If no voltage is present, check for 115v to protector relay. If 115v is present, replace protector relay.
	Photo Cell wiring shorted or room light leaking into photo cell compartment	Check cad cell wiring for short circuits. Also, check for room light leaking into cad cell compartment. Repair light leak if necessary.
	Open safety switch.	Check for open limit or auxiliary limit, open door switch (if equipped). Also, check internal wiring connections; loose connectors, etc.
Furnace will not start without first pushing protector relay reset button. (Happens on frequent basis)	No fuel oil.	Check fuel oil supply. Check that all hand operated fuel oil valves are in the open position. Fill oil storage tank if necessary.
	Clogged nozzle.	Replace nozzle with high quality replacement. Use rating plate or Tables in Appendix A as a guide.
	Clogged oil filter.	Replace oil tank filter or in-line filter if used.
	Low oil pump pressure.	Connect pressure gauge to oil pump. Adjust pump pressure, or replace oil pump if necessary. Ensure that erratic pressure readings are not caused by defective fuel oil line.
	Air getting into fuel oil lines, or fuel oil line dirty, clogged, or in some manner defective.	Check fuel oil lines. Replace any compression fittings found with high quality flared fittings. Check for any signs of oil leaks. Any oil leak is a potential source of air or contaminants.
	Defective burner motor.	Check burner motor. If burner motor is cutting out on over-load, determine why. Replace if necessary.
Furnace starts, but cuts out requiring manually resetting the oil protector reset button.	Photo Cell (Cad Cell) defective.	If cad cell is dirty, clean it. (Determine why cad cell is getting dirty). If cad cell is poorly aimed, realign it. NOTE: The cad cell should have a resistance of 100K Ω in absence of light; a maximum of 1500 Ω in the presence of light. Ensure that room light is not leaking into the cad cell compartment.

Problem	Possible Cause	Remedy
Furnace starts, but cuts out requiring manually resetting the oil protector reset button. …continued	Faulty L4064W heater wiring.	Ensure that the wires from the L4064W fan/limit control are connected to T2 and F2 on the R8184N primary control.
	No fuel oil.	Check fuel oil supply. Check that all hand operated fuel oil valves are in the open position. Fill oil storage tank if necessary.
	Clogged nozzle.	Replace nozzle with high quality replacement. Use rating plate or Tables in Appendix A as a guide.
	Clogged oil filter.	Replace oil tank filter or in-line filter if used.
	Low oil pump pressure.	Connect pressure gauge to oil pump. Adjust pump pressure, or replace oil pump if necessary. Ensure that erratic pressure readings are not caused by defective fuel oil line.
	Air getting into fuel oil lines, or fuel oil line dirty, clogged, or in some manner defective.	Check fuel oil lines. Replace any compression fittings found with high quality flared fittings. Check for any signs of oil leaks. Any oil leak is a potential source of air or contaminants.
	Defective burner motor.	Check burner motor. If burner motor is cutting out on over-load, determine why. Replace if necessary.
	Water or contaminants in oil.	Drain fuel oil storage tank, replace fuel oil. (Consult with fuel oil supplier).
	Frozen oil line.	Gently warm oil line. Insulate oil line. (Outdoor piping size may require increased diameter).
	Wrong primary control.	Ensure that the primary control (Protector Relay) is an R8184N. Substitutes such as the R8184G do not have sufficient capacity to operate both the safety circuit and fan circuit.
Oil burner sputtering at nozzle	Electrodes out of adjustment or defective.	Check electrode settings. Check electrodes for dirt build-up or cracks in porcelain.
	Poor transformer high voltage connections or defective transformer.	Check contacts between transformer and electrodes. If OK, replace transformer.
	Fuel oil filter clogged.	Replace fuel oil storage tank filter and / or fuel oil in-line filter.
	Defective oil pump.	Check burner motor / fuel oil pump coupling. Check oil pump pressure. Replace fuel oil pump if necessary.
	Fuel oil line partially clogged or contains air.	Bleed air from oil line. If problem persists, replace oil line.
Excessive fuel oil consumption.	System temperature rise too high.	System temperature rise should not exceed 85°F. Check for clogged air filters. Check blower fan for excess dirt build-up or debris. Speed up blower fan if necessary.
	Blower fan control out of adjustment, (fan stops too soon).	Check fan control settings. The fan control is adjusted with a duct thermometer in the supply air plenum take-off or first few inches of the supply air trunk duct. The " fan off" setting should be 90° - 100°F. Once set, the "fan on" setting is normally adjusted 25° - 30°F higher than the "fan off" setting.

Problem	Possible Cause	Remedy
Excessive fuel oil consumption. …continued	Fuel oil leak.	Check fuel oil line for leaks. Repair or replace if necessary.
	Stack temperature too high.	Check stack temperature. Stack temperatures will normally range from 350° to 450°F. Check draft regulator. Draft should be set to 0.02 in. w.c.
	Thermostat improperly adjusted or in poor location.	Check thermostat heat anticipator setting against measured amperage draw. Increase heat anticipator setting if necessary. If the thermostat is being influenced by drafts, sunlight, duct work, etc., relocate to more suitable location.
Too much smoke.	Insufficient combustion air adjustment at oil burner, or improper draft pressure.	Adjust the oil burner combustion air shutter and draft regulator to gain the highest CO_2 possible with a Bacharach trace smoke.
	Heat exchanger partially clogged.	Check for soot build-up in heat exchanger flue passages, especially in the outer radiator.
Soot building up on air tube (end coning).	Poor alignment between oil burner blast tube and fire pot.	Check alignment. blast tube should be centered with fire pot burner opening. Oil burner head should be ¼ inch back from the inside surface of the fire pot.
	Flame impingement caused by Incorrect nozzle angle.	Check nozzle size and angle. (See Appendix A). Check distance from head to inside surface of the fire pot.
	Incorrect electrode settings.	Check the electrode settings and “Z” dimension.
	Defective fire-pot	Check fire-pot. Repair or replace.
Furnace will not warm home to desired temperature	Air flow blocked or dirty air filter.	Clean or replace air filter.
	Thermostat adjustments or location.	Check thermostat heat anticipator setting against measured amperage draw. Increase heat anticipator setting if necessary. If the thermostat is being influenced by drafts, sunlight, duct work, etc., relocate to more suitable location.
	Insufficient air flow.	Check all dampers. Open closed dampers including registers in unused rooms. Check system temperature rise. If temperature rise is too high, speed up blower fan.
	Defective high limit control.	Test high limit function of all limit switches. Use a duct thermometer to assess accuracy of limit control. Check for obstructions to airflow around limit switch bi-metal elements. Replace control if necessary.
	Under-sized nozzle.	Check nozzle. If problem is not caused by air flow problems, use larger nozzle, if permitted by rating plate.
	Blower fan motor stopping intermittently on overload.	Check blower fan motor amperage draw. Check motor ventilation ports, clean if necessary. Replace motor if necessary.
	Burner motor stopping intermittently on overload.	Check burner motor. Replace if necessary.
Home does not heat evenly	Improper distribution of heat.	This is not likely to be a furnace problem. Balance duct system.

Problem	Possible Cause	Remedy
Supply air temperature too hot.	Airflow blocked or dirty air filter.	Clean or replace air filter.
	Insufficient airflow.	Check all dampers. Open closed dampers including registers in unused rooms. Check system temperature rise. If temperature rise is too high, speed up blower fan.
Supply air temperature too cool.	Excess airflow.	Check system temperature rise. Slow down blower fan if necessary.
	Excessive duct losses.	Check supply air ductwork. Seal leaky joints and seams. Insulate ductwork if necessary.
Supply air temperature too cool during first moments of furnace cycle.	Fan control "fan on" setting too low.	No adjustments available for L4064W fan / limit control). Register air deflectors may help.
	Excessive duct losses.	Check supply air ductwork. Seal leaky joints and seams. Insulate ductwork if necessary.

NOTES

HOMEOWNER'S REFERENCE GUIDE

Model No.	
Serial No.	
Date Installed	
Installer	
Contact	
Address	
Postal Code	
Telephone No.	
After Hours No.	

If different from Installation Contractor:

Service Tech	
Telephone No.	
After Hours No.	
Fuel Supplier	
Contact	
Telephone No.	
After Hours No.	

MEMO TO INSTALLER

Please ensure that the homeowner is informed and understands:

1. where the circuit breaker or fuse is located in the main electrical panel.
2. where the furnace switch is located, and the switch "on" and "off" positions if not obvious.
3. where the oil shut-off valve from the oil storage tank is located.
4. how to operate the thermostat, and other related accessories.
5. how to operate the manual reset button on the primary control, and especially when not to push the reset button.
6. how and where to visually inspect the venting system for leaks or other problems.
7. how to inspect, clean and replace the air filter, and other homeowner maintenance procedures.
8. who to call for emergency service and routine annual service.
9. the terms and conditions of the manufacturer's warranty and the contractor's warranty.