

Installation, Operation and Maintenance Manual

O4LD Oil-Fired Lowboy Warm Air Furnaces

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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1. INTRODUCTION

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

Models O4LD-140A-16-R and O4LD-168A-16-R are rear breeched oil fired forced air low boy furnace, with output capacities ranging from 79,000 Btu/h to 143,000 Btu/h.

Models O4LD-140A-16-F and O4LD-168A-16-F are front breeched oil fired forced air lowboy furnaces, with output capacities ranging from 79,000 Btu/h to 143,000 Btu/h.

▲WARNING

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

All models are CSA listed, for use with No. 1 (Stove) and No. 2 (Furnace) Oil. Please refer to the tables in Appendix A for performance and dimensional data.

In the United States of America, 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.

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

All models are shipped completely 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.

The minimum installation clearances are listed in Table 1.

Table 1: Installation Clearance

Location	Clearance to / for	
	Combustibles	Service
Top	3 in.	3 in.
Bottom	0 in.	0 in.
S/A Plenum	0 in.	0 in.
Rear	1 in.	24 in.
Side 1	6 in.	6 in.
Side 2	6 in.	18 in.
Front	24 in.	24 in.
Flue Pipe	9 in.	9 in.
Enclosure	Standard	Standard

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.

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 65m³ (700 ft³) should automatically be treated as confined space.

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 TYPE L VENT OR EQUIVALENT.

CAUTION

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

NOTE: THE RECOMMENDED FLUE DRAFT PRESSURE IS -0.02 IN. W.C. (AS MEASURED UPSTREAM OF THE BAROMETRIC DRAFT REGULATOR).

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.

See appendix A for burner set-up.

7. BAROMETRIC DAMPER CONTROL

This control, also known as a 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, when installed should be in the same room or enclosure as the furnace and should not interfere with the combustion air supplied to the burner. The control should also be located near the furnace flue outlet and installed according 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 **L6064A** temperature sensitive fan switch is actuated by a helical bi-metal sensing element enclosed in a metal guard, and controls the circulating air blower. This provides a delay between the burner ignition and blower start-up to eliminate excessive flow of cold air when the blower comes on. Blower shutdown is also delayed to remove any residual heat from the heat exchanger and improve the annual efficiency of the furnace. Fan on settings of 110° F to 130° F (43° C to 55° C) and fan off settings of 90° F to 100° F (32° C to 37° C) will usually be satisfactory.

9. ELECTRICAL CONNECTIONS

The furnace is listed by CSA to the North American standard. The furnace is factory wired and requires 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.

Furnace Power Requirements				
Furnace Model	Volts AC	Amps	Ø	Hz
All Models	120	15	1	60

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 diagram in Appendix B. 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 stacks, etc.

The thermostat heat anticipator should be adjusted to the amperage draw of the heating control circuit as measured at 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. Measure the amperage by connecting an ammeter between the two wires that will connect to the thermostat "R" and "W" terminals.

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. PIPING INSTALLATION

The entire fuel system should be installed in accordance with the requirement of NFPA No. 31 and local codes and authorities. In Canada, the entire fuel system should be installed in accordance with the requirement of CAN/CSA B-139, and local regulations. Use only an approved fuel oil tanks piping, fittings and oil filter.

Install the oil filter as close to the burner as possible. For further details of the oil supply tank and piping requirements, please refer to the instructions and illustrations in the oil burner instructions shipped with the furnace.

12. OIL FILTER

All fuel systems should include a high quality oil filter between the fuel oil storage tank and the oil burner.

13. OIL BURNER NOZZLES

Both front breech and rear breech models are certified for multiple firing rates, ranging from output capacities of 79,000 to 143,000 Btu/h. By manipulating the oil burner nozzle, and temperature rise, these furnaces may be fired at an ideal rate for a wide range of structures. Refer to Table A-1, and the furnace rating plate to determine the proper combinations.

14. OIL BURNER ADJUSTMENT

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. Maximum combustion efficiency is achieved with a No. 1 smoke spot on the Bacharach Scale. This is not necessarily 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, it is advisable to adjust the air supply to provide no more than a trace smoke spot on the Bacharach Scale.

▲ 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.

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 burner is essential for smooth light ups and proper operation. Refer to the oil burner instructions shipped with the furnace for electrode specifications.

NOTE: Beckett AF Series Burner electrode specifications have been revised. They should be adjusted to be 5/16" above the nozzle centerline.

16. BURNER PRIMARY CONTROL

The furnace is equipped with a primary combustion control, sometimes refer to as the burner relay or burner protector relay, which 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.

▲ CAUTION

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

17. COMBUSTION CHAMBER

This furnace is equipped with a high quality cerafelt combustion chamber. It is held in place by a support bracket and stainless steel retaining band and clamp. **CHECK THE ALIGNMENT OF THE COMBUSTION CHAMBER AND OIL BURNER BEFORE FIRING. IT IS POSSIBLE FOR THE COMBUSTION CHAMBER TO SHIFT IF SUBJECTED TO ROUGH HANDLING DURING TRANSIT.** The combustion chamber should be inspected for damage or carbon build up whenever the oil burner is removed for repairs or routine maintenance.

⚠ CAUTION

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

18. CIRCULATING AIR BLOWER

Both front breech and rear breech models are equipped with direct drive blower systems. 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 diagram 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 pig tail joined to both heating and cooling speed wires with a wire nut. As a safety precaution against accidental disconnection of the wires by vibration, it is advisable to 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.

⚠ WARNING

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.

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

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

19. 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. (See Appendix A, Table A-3).

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 advise 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, and flue pipe on rear breach units, 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. The Flue Connector shall be removed to inspect and clean the flue pipe area. 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 industrial a 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 string or wire handle.

The blower motor is factory sealed and requires no routine lubrication.

Inspect the blower fan. Clean if necessary.

Oil Burner Maintenance: Inspect and clean the oil burner. Be sure to remove any dust accumulation in the air band, air shutter, and blower wheel. The oil burner nozzle and oil filter should be replaced on an annual basis. The burner motor is factory sealed and requires no routine lubrication.

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 a suitable temperature, usually between 90°F to 100°F.

20. 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 should start.
NOTE: It may be necessary to press the RESET button on the primary combustion control relay.
2. After a short period of time, as the furnace becomes warm enough to act upon the fan control (L6064A), the blower starts.
3. Set the thermostat below room temperature. The oil burner stops.
4. The air circulation blower will continue to run as long as the temperature remaining in the furnace is higher than the "FAN OFF" setting on the fan control. Typical "fan on" values range from 110°F to 130°F. Typical "fan off" temperatures range between 90°F and 100°F. The fan control settings may be altered if the air at the room registers is uncomfortably high or low upon blower start up or shutdown.
5. Adjustment to the fan control settings should be based on the temperature of the air at the supply air take-off or within the first 24 inches of the supply air trunk duct trunk. The side mid point of the trunk is usually ideal, providing that the thermometer probe is beyond the "line of sight" in relation to the Heat Exchanger, wherein false readings from radiant heat could be observed. The system temperature rise, *the difference in temperature between the supply air and return air*, should typically range between 65°F and 90°F.

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. The progress towards a high limit shut down can be monitored by watching the dial on the L6064A

fan / limit control. When the limit function test is complete, shut off electrical power to the furnace, replace the neutral wire to the blower fan motor, and 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.

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

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.

Appendix A

OIL-FIRED LOWBOY

Table A-1: Beckett AF Oil Burner Set-up

Beckett AF Series Oil Burners						
Furnace Model	Burner Model	Nozzle	Pump Pressure	Flow Rate	Burner Head	Static Plate
O4LD-140A-16-F	AF65XN	0.65 / 80°A	100 PSIG	0.65 USGPH	F3	2-¾ in.
O4LD-140A-16-F	AF65XN	0.75 / 80°A	100 PSIG	0.75 USGPH	F3	2-¾ in.
O4LD-140A-16-F	AF65XN	0.85 / 80°A	100 PSIG	0.85 USGPH	F3	2-¾ in.
O4LD-140A-16-F	AF65XN	1.00 / 80°A	100 PSIG	1.00 USGPH	F3	2-¾ in.
O4LD-140A-16-R	AF65XN	0.65 / 80°A	100 PSIG	0.65 USGPH	F3	2-¾ in.
O4LD-140A-16-R	AF65XN	0.75 / 80°A	100 PSIG	0.75 USGPH	F3	2-¾ in.
O4LD-140A-16-R	AF65XN	0.85 / 80°A	100 PSIG	0.85 USGPH	F3	2-¾ in.
O4LD-140A-16-R	AF65XN	1.00 / 80°A	100 PSIG	1.00 USGPH	F3	2-¾ in.
O4LD-168A-16-F	AF65YB	1.10 / 70°A	100 PSIG	1.10 USGPH	F6	2-¾ in.
O4LD-168A-16-F	AF65YB	1.20 / 60°A	100 PSIG	1.20 USGPH	F6	2-¾ in.
O4LD-168A-16-R	AF65YB	1.10 / 70°A	100 PSIG	1.10 USGPH	F6	2-¾ in.
O4LD-168A-16-R	AF65YB	1.20 / 60°A	100 PSIG	1.20 USGPH	F6	2-¾ in.

A.1 OIL BURNER AIR ADJUSTMENT

Beckett AF Burner

For additional details, consult the oil burner instruction manual provided in the furnace documents envelope.

The combustion air setting is adjusted by loosening the air shutter lock screws and opening or closing the air shutter. If necessary, the bulk air band may be adjusted.

A.2 BURNER ELECTRODES

Adjustment of the electrode tips with respect to each other, the nozzle, and to the rest of the burner is very important to ensure smooth start-ups and to permit efficient combustion. Refer to the Beckett Oil Burner Instructions for details.

NOTE: The electrode settings are:

- Gap: 5/32 inches
- 1/16 inch ahead of nozzle
- 5/16 inch above nozzle centerline

A.3 START-UP

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.

Drill a 1/4 inch test port in the vent connector between the furnace flue outlet and draft regulator (barometric damper). Insert a stack thermometer and note the flue gas temperature. The flue gases should be within a range of 350°F to 575°F. 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.

Perform a smoke spot test. The smoke spot should not exceed No. 1 on the Bacharach Scale.

After the air adjustments have been completed, re-check the draft pressure at the same point as the smoke spot test. The draft should be adjusted to 0.02 inches w.c.

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).

**NOTE: USE OF THE INLET AIR SHUT-OFF
COULD CAUSE POST
COMBUSTION NOZZLE DRIP.**

Table A-2: Recommended Minimum Installation Clearances (Inches)

Furnace Model	Plenum Top	Front	Rear	Side 1	Side 2 ³	Flue Pipe	Floor	Enclosure
Oil-Fired Lowboy Front Breech	3	24	24	6	18	9	Combustible ¹	Standard
Oil-Fired Lowboy Rear Breech	3	24	24	6	18	9	Combustible ¹	Standard

¹ Wood Floor Only, do not install on carpeted floor, tiled floor, etc.
³ Note – Purpose of the 18" side clearance is to allow a passageway from the front to the back of the furnace.
TIP: Consider greater clearances front and back for easier servicing.

Table A-3: General Dimensions (Inches)

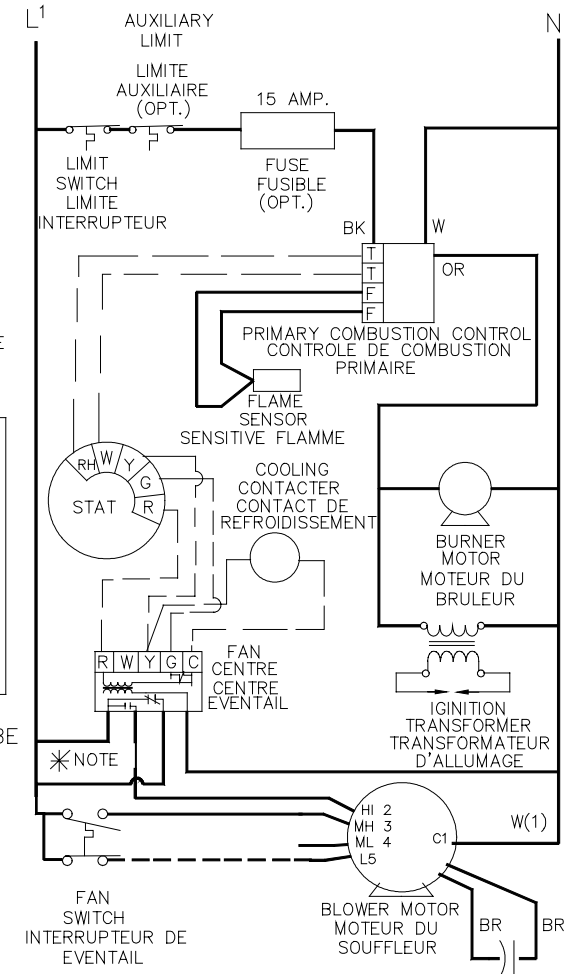
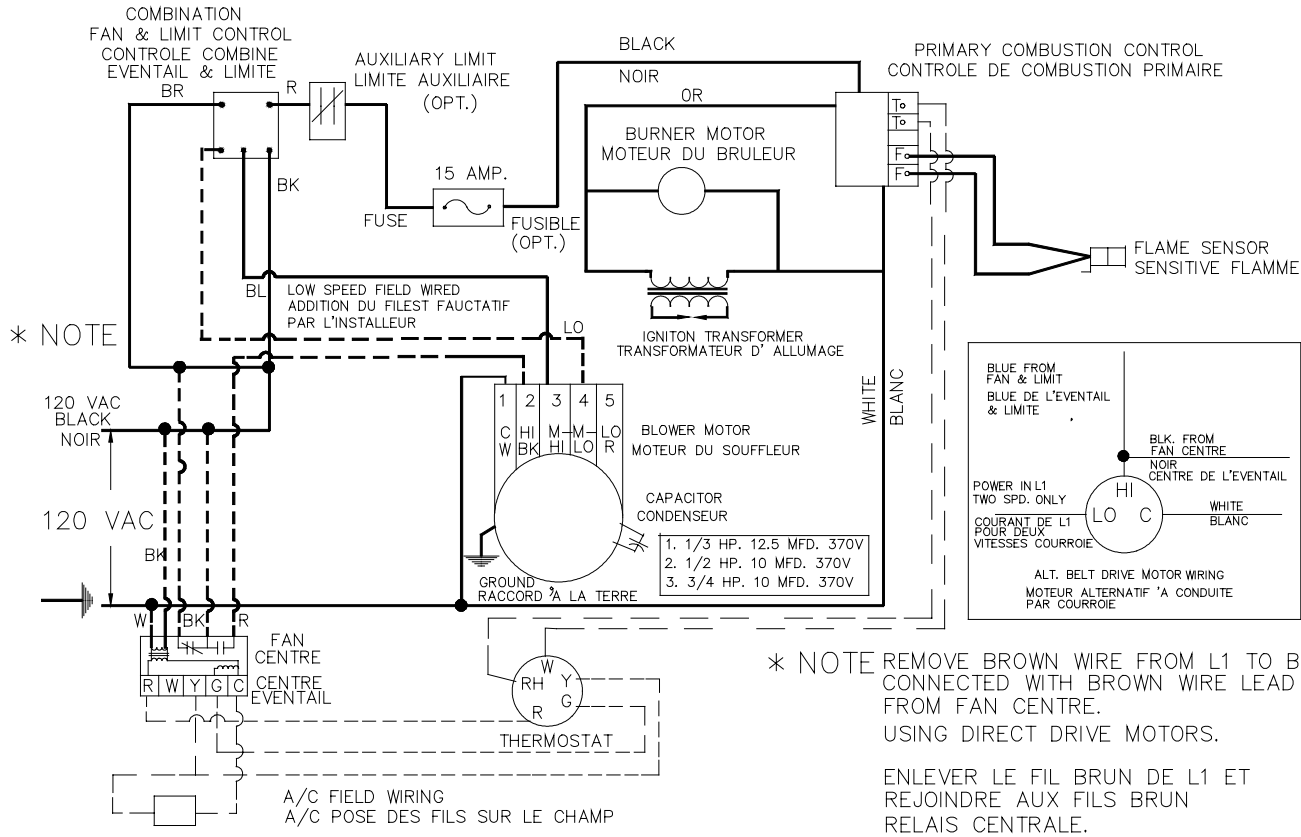
Furnace Model	Cabinet			Plenum Openings			Flue		Filter		Shipping Weight
	Width	Depth	Height	Supply	Gap	Return	Diameter	Height	Type	Size	
Rear Breech	22	51½	41	20½ x 18	2½	20½ x 18	6	37¼	Permanent	20 x 25 x 1	280
Front Breech	22	51½	41	20½ x 18	2½	20½ x 18	6	38¼	Permanent	20 x 25 x 1	250

Table A-4: Airflow Characteristics – Direct Drive

Furnace Model	Motor HP	Blower	ΔT	Motor FLA	Speed	CFM					
						External Static Pressure – Inches w.c.					
						0.20	0.25	0.30	0.40	0.50	0.60
All Lowboy Models	1/2 HP	G10	85°F	7.0	High	1810	1775	1740	1675	1585	1510
					Med-High	1570	1555	1540	1495	1445	1375
					Med-Low	1090	1085	1080	1070	1065	1050
					Low	710	700	700	690	665	650

APPENDIX B WIRING

WIRING DIAGRAM – OIL FIRED WARM AIR FURNACE
DIAGRAMME DE LA POSE DES FILS FOURNAISE A L'HUILE A AIR CHAUD



— — — — — LOW VOLTAGE FIELD WIRING
BAS TENSION POSE FILS SUR LE CHAMP

— — — — — HIGH VOLTAGE FIELD WIRING
HAUTE TENSION POSE DES FILS SUR LE CHAMP

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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, which was not removed during furnace replacement.
	Thermostat faulty.	Check reset button on protector relay. Remove thermostat wires from protector relay terminals T T. Place a jumper across T T. 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 T T. Check for 24v across T T. 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 photo cell (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 all 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 photo 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	No fuel oil.	Check fuel oil supply. Check that all hand operated all 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).
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 10° - 30°F higher than the "fan off" setting.
	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 575°F. Check draft regulator. Draft should be set to 0.02 in. w.c.

Problem	Possible Cause	Remedy
Excessive fuel oil consumption. (continued)	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 band and draft regulator to gain the highest CO ₂ possible with a Bacharach No. 1 smoke.
	Heat exchanger partially clogged.	Check for soot build-up in heat exchanger flue passages, especially in the outer radiator.
Soot building up on blast 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.
	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.
Supply air temperature too hot.	Air flow blocked or dirty air filter.	Clean or replace air filter.
	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.

Problem	Possible Cause	Remedy
Supply air temperature too cool. (continued)	Excess air flow.	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.	Increase differential between fan control "fan off" and "fan on" settings. Register air deflectors may help.
	Excessive duct losses.	Check supply air ductwork. Seal leaky joints and seams. Insulate ductwork if necessary.

21. FINAL CHECK-OUT

Before the final test cycle, carefully examine the complete heating system for leaks. Be sure that the vent connector joints are screwed together and properly supported. The hot vent can be checked with a lit taper for signs of air movement around joints or seams.

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.

IMPORTANT:

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.

NOTES:

HOMEOWNER'S REFERENCE TABLE

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

If different from Installation Contractor:

Service Tech.	
Telephone No.	
After Hours No.	

Fuel Supplier

Fuel Oil Supplier	
Contact	
Telephone No.	
After Hours No.	

