Installation, Operation and Maintenance Manual

Oil Fired Warm Air Furnaces

HML-C (Up-Flow Model)
HMLV-C (Up-Flow Model with ECM)

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

Olsen Heating & Cooling Products

Airco Heating & Cooling Products

ECR International Limited

C US

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.

MODELS HML-C AND HMLV-C

Models HML-C and HMLV-C are oil fired forced air up-flow furnaces with an output capacity range of 56,000 BTU/Hr. to 95,000 BTU/Hr.

⚠CAUTION

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

All models are 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.

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.

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, *Standard for the Installation of 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 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 the manuals of the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), or by other means prescribed, or approved by the local authority having jurisdiction.

In the United States, Manual J. titled, "Load Calculation" published by the Air Conditioning Contractors of America, describes a suitable procedure for calculating the maximum hourly heat loss.

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.

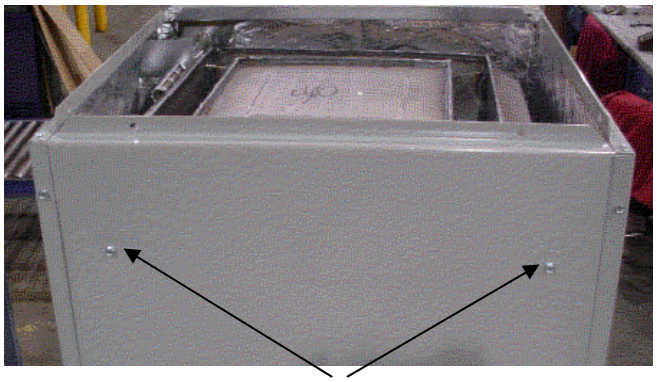
The minimum installation clearances are listed in Table 1.

Table 1: Clearances – (Inches)

Location	Clearance to Combustibles
	HML-C and HMLV-C
	Up flow
Top	1
Bottom	0
S/A Plenum	1
Rear	1
Sides	1
Front	1**
Flue Pipe	9*
Enclosure	Closet

*18 in. in USA

** 24 in. required for service clearance



HEAT EXCHANGER SUPPORT SCREWS

Before final placement of the furnace, the heat exchanger support screws shown in the picture may be removed. This may be preferable if the furnace rear panel will be inaccessible after installation. The screws must be removed if the heat exchanger must be removed from the cabinet.

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

CHIMNEY VENTED VERSIONS OF 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. (SEE FIG 2.)

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 CAN/CSA B-139 for rules governing the installation of oil burning equipment. In the United States, refer to the latest edition of NFPA 31 for regulations governing the installation of oil burning equipment.

See appendix A for burner set-up.

Fig. 2: Checking Over-Fire Draft.

Over-fire draft access port.

7. BAROMETRIC DAMPER CONTROL.

The barometric damper control, also known as a draft regulator, is used on conventional chimney venting only. This control 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, or the oil burner mounting plate over-fired draft access port. fig. 2) should be set to -0.02 in. w.c.

8. OPTIONAL SIDE WALL VENTING

Certain HML-C and HMLV-C furnace models are manufactured to be installed as sidewall vented units. Please refer to Direct Venting Instructions, P/N 240006979 included with the Vent Kit for details. Sidewall Venting (*Direct Venting*) requires the use of specific oil burners; the Beckett AFII, or the Riello 40BF. Please refer to Appendix A, Tables A2, and A4.

Note: Sidewall venting requires special attention to combustion air supply. There is no natural draft in the venting system between furnace cycles; therefore, if the indoor pressure is negative relative to the outdoors, the vent terminal becomes a point of infiltration. This could lead to oil odour control problems. This problem is rectified by the use of ducted outdoor air for combustion (semi-sealed combustion), using the Beckett AFII or Riello 40BF oil burner. See Direct Vent Instructions supplied with the Vent Kits.

9a. FAN TIMER BOARD AND LIMIT CONTROL (FIG. 4) (page 22)

The Electronic Fan Timer integrates control of all burner and circulator fan operations. This control is the central wiring point for most of the electrical components in the furnace. The **United Technologies 1158-120 (HML-C)** has an adjustable fan on time that is set by selecting the dipswitch combination displayed in Chart 1. This fan on delay can be set at 1, 2, 4 or 6 minutes. This provides a delay between the burner ignition and blower start-up to eliminate excessive flow of cold air when the blower comes on. The **United Technologies 1158-120 (HML-C)** has an adjustable fan off time of 30, 60, 90 or 120 seconds displayed in Chart 1. The fan off delay time starts when the burner motor is de-energized at the end of a call for heat. Blower shutdown is delayed to remove any residual heat from the heat exchanger and improve the annual efficiency of the furnace.

The electronic fan timer board works in conjunction with snap disc limit controls, which perform 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.

If the limit control opens with the **United Technologies 1158-120 (HML-C)** electronic fan control**,** the circulating fan will be energized as well. When the limit closes, the fan off timer will begin. At the end of the fan off time cycle the burner will be energized, initiating a normal burner cycle.

CHART 1

United Technologies 1158-120 (HML-C)

Dip Switch Position				Blower Delay Times	
1	2	3	4	On Seconds	Off Minutes
Off	Off			30	
On	Off			60	
Off	On			90	
On	On			120	
		Off	Off		1
		On	Off		2
		Off	On		4
		On	On		6

9b. FAN TIMER BOARD AND LIMIT CONTROL (FIG. 5) (page 22)

The **United Technologies 1168-1 ECM (HMLV-C)** tap board has an adjustable fan on/off delay that must be adjusted in accordance with the furnace input rating (nozzle size). Refer to Table A-10 (pg 15) for ECM blower set-up.

10. ELECTRICAL CONNECTIONS

The furnace is listed by the Canadian Standards Association under the NRTL (North American) Standard. It is factory wired and requires minimal field wiring. All field wiring should conform to CAN/CSA C22.1 Canadian Electrical Code, Part 1, and by local codes, where they prevail. 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.

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 the HML-C and HMLV-C models is: 120 VAC, 1 Ø, 60 Hz., 12A.

Accessories requiring 120 VAC power sources such as electronic air cleaners and humidifier

transformers may be powered from the electronic fan timer board where provisions have been made for connections, 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 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.

11. 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.

12. PIPING INSTALLATION

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.

In the United States the installation must be in accordance with NFPA No. 31 and local codes and authorities.

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 and oil pump instructions shipped with the furnace.

13. OIL FILTER

All fuel systems should include an oil filter between the fuel oil storage tank and the oil burner. 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.

14. OIL BURNER NOZZLES

The HML-C and HMLV-C are certified for multiple firing rates, ranging from 56,000 to 95,000 Btu/h. By manipulating the oil burner nozzle, flame retention head, static plate and temperature rise; the furnace 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.

15. 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. The HML-C and HMLV-C furnaces operate most efficiently 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.

See the Venting Instructions included in the Vent Kits for set-up details for sidewall vented furnaces.

NOTE: SIDEWALL VENTED MODELS SHOULD BE SET UP TO DELIVER ZERO (0) SMOKE.

⚠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.

16. 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. 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.

17. BURNER PRIMARY (SAFETY) CONTROL

The furnace is equipped with a primary combustion control, sometimes referred 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.

18. COMBUSTION CHAMBER

This furnace is equipped with a high quality cerafelt combustion chamber. It is held in place by a retaining bracket.

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.

19a. CIRCULATING AIR BLOWER (HML-C)

The HML-C and HMLV-C furnace models are equipped with direct drive blower systems. HML-C models are equipped with PSC motors; HMLV-C models are equipped with electronically commutated motors (ECM). 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, it is advisable to secure the wire nut and wires with a few wraps of electricians tape.

⚠CAUTION

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, tape off both ends of the unused wire.

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.

⚠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.

19b. CIRCULATING AIR BLOWER (HMLV-C)

(See Section 22 Page 9)