Olsen
Heating & Cooling Products

Airco
Heating & Cooling Products

WML Series C

(Down-Flow/Horizontal Model)

WMLV Series C

(Down-Flow/Horizontal Model with ECM)

MPL Series B

(Down-Flow/Horizontal Model)

Oil Fired Warm Air Furnaces

INSTALLATION, OPERATION & MAINTENANCE MANUAL

C US

Manufactured by:
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Figure 1 - Dimensions

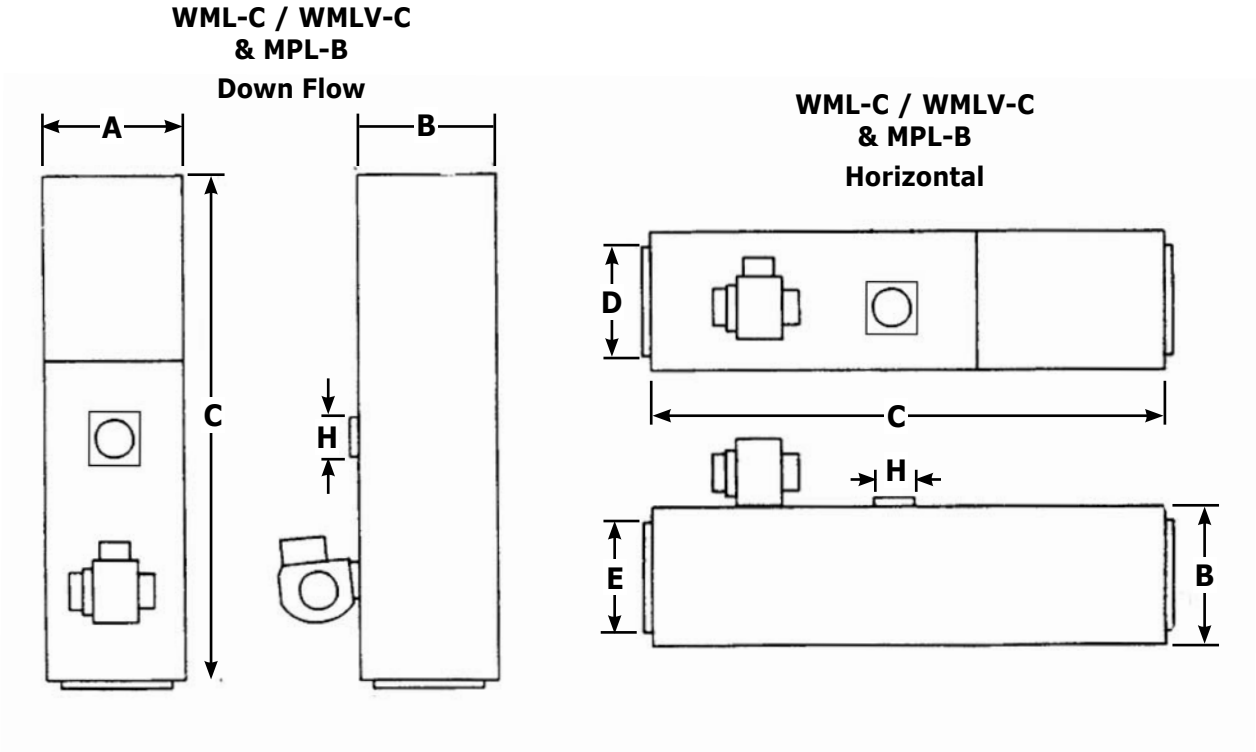

Table 1 - Dimensions

Model	Cabinet			Plenum Openings			Flue	Filter		Shipping Weight (LB)
	Width A	Depth B	Height C	Supply D x E	Return		Diameter H	Type	Size	
					Side	Bottom				
WML-C / WMLV-C	22	22⅛	55¼	19 x 19	18 x 18	18 x 18	5	Permanent	20 x 20 x 1	265
MPL-B	22¼	22¼	62	20½ x 20½	18 x 18	18 x 18	6	Permanent	20 x 20 x 1	292

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Information and specifications outlined in this manual in effect at the time of printing of this manual. Manufacturer reserves the right to discontinue, change specifications or system design at any time without notice and without incurring any obligation, whatsoever.

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1. General

Furnace installation shall be completed by qualified agency. See glossary for additional information.

⚠ WARNING

Fire, explosion, asphyxiation and electrical shock hazard. Improper installation could result in death or serious injury. Read this manual and understand all requirements before beginning installation.

⚠ WARNING

Fire, burn, asphyxiation hazard. Do not use gasoline, crank case oil, or any oil containing gasoline. Failure to follow these instructions could result in death or serious injury.

2. Safety Symbols

Become familiar with symbols identifying potential hazards.

This is the safety alert symbol. Symbol alerts you to potential personal injury hazards. Obey all safety messages following this symbol to avoid possible injury or death.

⚠ DANGER

Indicates a hazardous situation which, if not avoided, WILL result in death or serious injury

⚠ WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Used to address practices not related to personal injury.

3. Introduction

Models WML and WMLV are oil fired forced air downflow/horizontal furnaces with output capacity range of 59,000 btu/hr to 89,000 btu/hr.

- WML models are equipped with 1/2 HP PSC 4 speed blower motor.
- WMLV models are equipped with 1/2 HP ECM variable speed blower motor.

Models MPL are oil fired forced air downflow/horizontal furnaces with output capacity range of 90,000 to 128,000 Btu/hr.

- MPL models are equipped with 3/4 HP PSC 4 speed blower motor.

Furnace models are either factory equipped for chimney venting or factory equipped for direct venting.

Chimney vent models and direct vent models are not field convertible. Direct vent installation instructions are included with the direct vent models.

Installation shall conform to requirements of authority having jurisdiction or in absence of such requirements:

- Canada - CAN/CSA - B139, Installation Code for Oil-Burning Equipment.
- United States - National Electrical Code, NFPA31, Standard for the Installation of Oil-Burning Equipment.

Models are CSA listed, (NRTL/C) for use with No. 1 (Stove) and No. 2 (Furnace) Oil.

Refer to tables in Appendix A for performance data.

4. Heat Loss

Maximum hourly heat loss for each heated space shall be calculated in accordance with the procedures described in the manuals of:

- Canada - The Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), or by other means prescribed, or approved by the local authority having jurisdiction.
- United States - Manual J. titled, "Load Calculation" published by the Air Conditioning Contractors of America, describes a suitable procedure for calculating maximum hourly heat loss.

5. Locating the Unit - [See Table 1]

- Locate furnace so flue connection to chimney is short, direct and consists of as few elbows as possible.
- Centralize furnace location with respect to supply and return air ductwork. Central location minimizes trunk duct sizing.
- All models may be installed on combustible floors.

⚠ WARNING

Fire hazard. Do not install boiler on carpeting or tile floors. Failure to follow these instructions could result in death or serious injury.

- Do not install furnace on carpet or tiled floors.

Table 2 - Clearances

Furnace	WML-C / WMLV-C		MPL-B	
Location	Down Flow	Horizontal	Down Flow	Horizontal
Top	0 in.	3 in.	0 in.	3 in.
Bottom	0 in.[3]	1 in.	0 in.[3]	1 in.
S/A Plenum	1 in.	1 in.	1 in.	1 in.
Rear	1 in.	1 in.	1 in.	1 in.
Sides	1 in.	1 in.	1 in.	1 in.
Front	10 in.[1]	10 in.[1]	10 in[1]	10 in.[1]
Flue Pipe	9 in. [2]	9 in. [2]	9 in. [2]	9 in. [2]
Enclosure	Closet	Closet	Closet	Closet

[1] 24 inches is required for servicing.
[2] 18 inches required in the United States.
[3] When using factory supplied combustible floor sub base.

Note: Installation clearances do not necessarily take into consideration clearances necessary to replace air filter or perform routine maintenance.

6. Down-Flow Installation

- All WML-C / WMLV-C and MPL-B furnace models are factory assembled for installation in the down-flow position.
- Maintain all clearances to combustibles. See Table 2.
- To prevent fuel oil from accumulating in locations other than the fire pot, such as nozzle drip, install furnace with approximate 2 degree slope from oil burner casing towards the fire pot. Use shims made of noncombustible material

7. Horizontal Installation

WML-C / WMLV-C and MPL-B furnace models are 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:

A. Rotate furnace 90° to desired position.
B. Remove three nut and washer sets fastening oil burner assembly to furnace. Rotate oil burner assembly to normal upright position.
C. Realign oil burner assembly to combustion chamber (fire-pot), secure in place with three nut and washer sets.

8. Non-Suspended Installation

- Maintain clearances to combustibles as outlined in Table 2.
- Installation on combustible floor requires clearance of 1 inch. This can be done by using non-combustible material such as one-inch thick channel iron or similar material.
- Support furnace to not allow twisting or sagging of cabinet.
- Prevent fuel oil from accumulating in locations other than fire pot, in the event of nozzle drip, install furnace with approximate 2 degree slope from oil burner casing towards fire pot. Use shims made of noncombustible material.

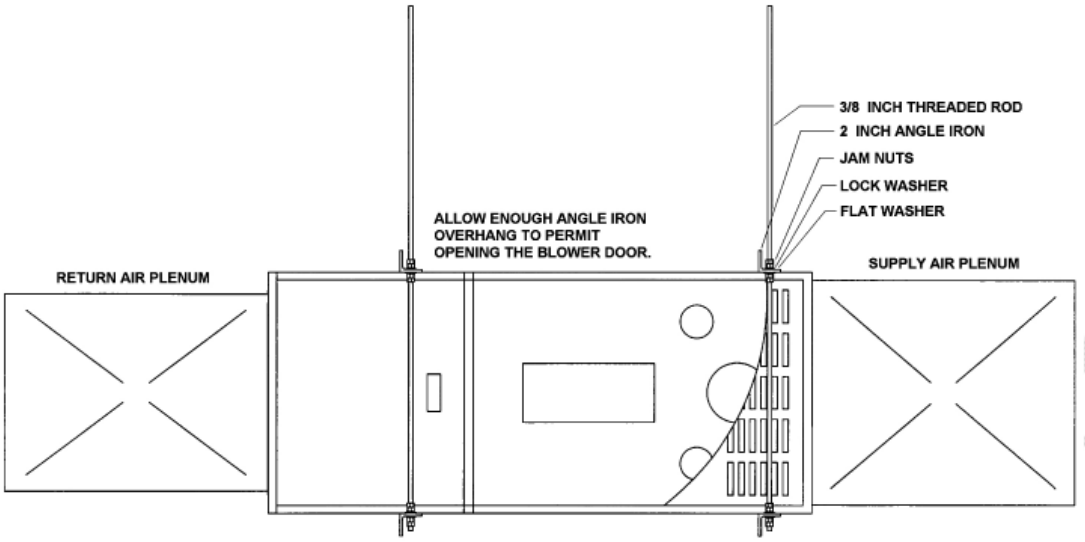
9. Suspended Installation (See Figure 2)

- Maintain clearances to combustibles as outlined in Table 2.
- Suspend furnace by field fabricating a cradle of angle iron and threaded rod. Secure furnace with 2 inch minimum slotted angle or equivalent. Support furnace to not allow twisting or sagging of cabinet. Position supports to not interfere with accessing burner and blower compartments.
- To prevent fuel oil from accumulating in locations other than the fire pot, in the event of nozzle drip, install furnace with approximate 2 degree slope from oil burner casing towards fire pot.

10. Furnace Used In Conjunction With Air Conditioning

- Install furnace in parallel with or upstream from evaporator coil to avoid condensation in heat exchanger.
- When installed in parallel, prevent chilled air from entering furnace by use of dampers or air controlling.
- Manually operated dampers must have a control to prevent operation of either system unless dampers are in full heat or full cool position.
- Air heated by the furnace shall not pass through evaporator coil unless coil is specifically approved for such service.
- Check and adjust blower speed to compensate for pressure drop caused by evaporator coil.
- A six inch clearance between air conditioning evaporator coil and heat exchanger will provide adequate airflow through the evaporator coil.

Figure 2 - Suggested Method For Suspending Horizontal Furnace



11. Combustion Air

- Furnace installed in a closet or utility room, provide two openings connecting to well-ventilated space (full basement, living room or other room opening, not a bedroom or bathroom).
- One opening shall be located above level of upper vent opening.
- One opening below combustion air inlet opening in front of 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.
- Furnace 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.

12. Chimney Venting

⚠ WARNING

Asphyxiation hazard. Chimney vented versions of furnace must be connected to flue having sufficient draft at all times. Failure to follow these instructions could result in death or serious injury.

Chimney must be sized correctly and in good repair. There is a risk of flue gases condensing resulting in damage to chimney and other venting parts with oversized chimney. Problem may be corrected by use of appropriately sized chimney liner.

If chimney serves WML-C and WMLV-C furnaces only, size vent at 5-inch minimum. Size MPL-B at 6-inch minimum. Data provided in Table 4 is based on dedicated venting. If furnace is to be co-vented with other appliances, refer to:

NFPA 211, Standard for Chimneys, Fire-places, Vents, and Solid Fuel-Burning Appliances,
NFPA 31, Standard for the Installation of Oil-Burning Equipment or
CAN/CSA B139, Installation Code For Oil-Burning Equipment for correct sizing information.

Test chimney under "winter" conditions; doors and windows closed, all other fossil fuel burning appliances on, clothes dryer on, bathroom fans on, etc. If chimney cannot over-come competition for air, assess the reason, and take corrective action. If chimney is found to be sized correctly and in good repair, re-evaluate the availability of combustion and ventilation air, and take corrective action.

See Figure 4 and Table 3 for common chimney problems and remedies.

- Flue pipe should be as short as possible with horizontal pipes sloping upward toward the chimney at a rate of one-quarter inch per foot.
- Flue pipe should not be smaller in cross sectional area than flue collar on the furnace.
- Flue pipe should connect to chimney so the flue pipe extends into, and terminates flush with the inside surface of chimney liner. Seal the joint between pipe and lining.
- Chimney outlet should be at least two feet above highest point of 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.

NOTICE

This furnace is approved for use with Type L vent or equivalent. Maximum temperature for L vent is 575°F (300C).

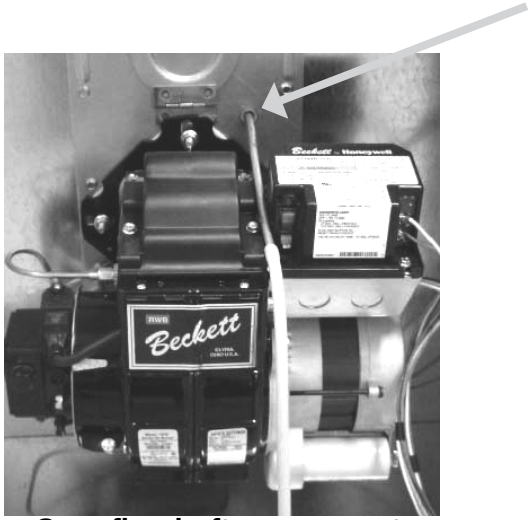
Manufacturer recommends over fire draft of -0.02 in. w.c. See Figure 3.

Flue pipe must not pass through any floor or ceiling, may pass through a wall where suitable fire protection provisions have been installed.

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

See appendix A for burner set-up.

Figure 3 - Check Over-Fire Draft



Over-fire draft access port.

Figure 4 - Common Chimney Problems

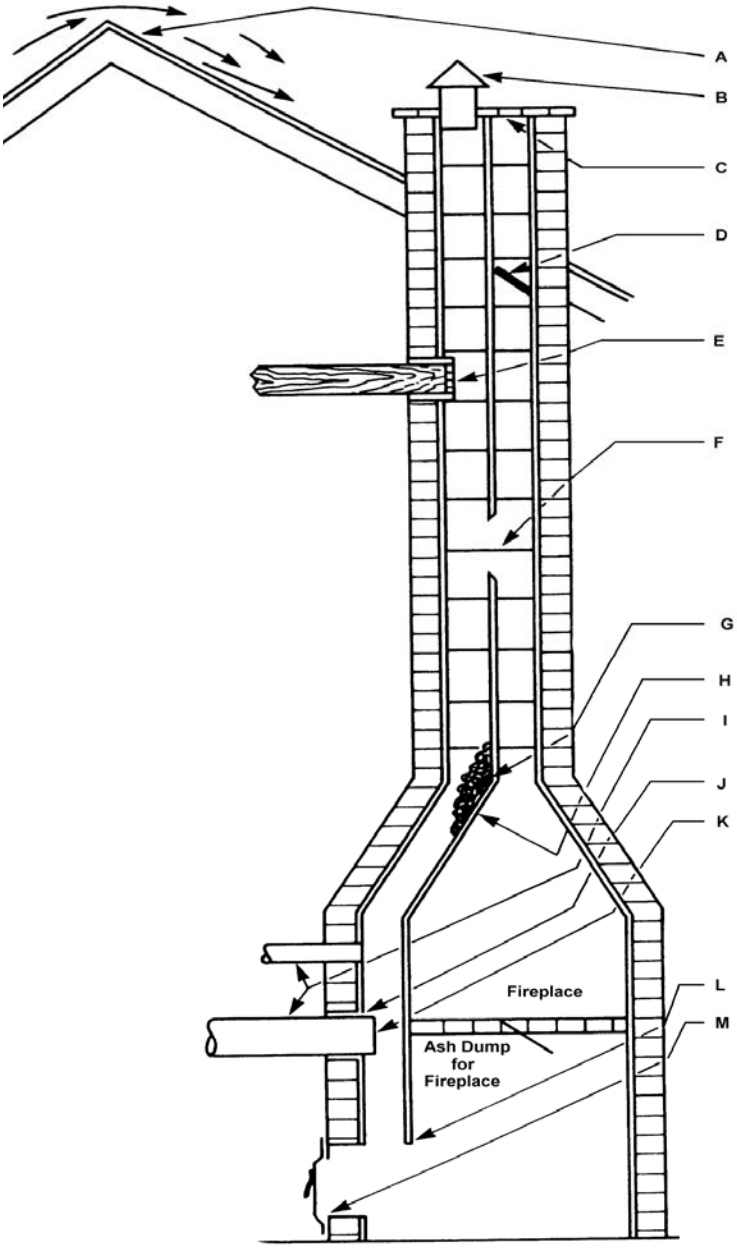


Table 3: Common Chimney Problems

Key	Trouble	Diagnostic	Remedy
A	Top of chimney lower than surrounding objects	Observation	Extend chimney above all surrounding objects within 30 feet
B	Chimney cap or ventilator	Observation	Remove
C	Coping restricts opening	Observation	Make opening as large as inside of chimney
D	Obstruction in chimney	Can be found by light and mirror reflecting conditions in chimney	Use weight to break and dislodge.
E	Joist protruding into chimney	Lowering light on extension cord	Must be handled by competent masonry contractor
F	Break in chimney lining	Smoke test build smudge fire blocking off other opening, watch for smoke to escape	Must be handled by competent masonry contractor
G	Collection of soot at narrow space in flue opening	Lower light on extension cord	Clean out with weighted brush or bag of loose gravel on end of line
H	Offset	Lower light on extension cord	Change to straight or long offset
I	Two or more openings to the same chimney	Found by inspection from basement	Least important opening must be closed, using another chimney
J	Loose-seated pipe in flue opening	Smoke test	Eliminate leaks by cementing all pipe openings
K	Smoke pipe extends into chimney	Measure pipe from within or observation of pipe using a lowered light	Reduce length of pipe to allow end of pipe to be flush with inside of tile
L	Failure to extend the length of flue partition to the floor	Inspection or smoke test	Extend partition to floor level
M	Loose fitted clean out door	Smoke test	Close all leaks with cement

Table 4 - Minimum Chimney Base Temperatures (°F)				
Nozzle	Chimney Height (ft.)			
	11	20	28	36
Chimney Thermal Resistance **<** R6				
0.50	300	400	535	725
0.65	275	340	430	535
0.70	270	330	405	505
0.75	260	320	380	475
0.85	250	300	355	430
1.00	225	300	365	430
Nozzle	Chimney Height (ft.)			
	11	20	28	36
Chimney Thermal Resistance **>** R6				
0.50	185	200	220	250
0.65	175	185	205	220
0.70	175	185	195	215
0.75	175	185	195	210
0.85	165	185	195	205
1.00	165	185	195	205
< - less than, **>** - greater than				

13. Barometric Damper Control

Barometric damper control, also known as draft regulator, is used on conventional chimney venting only. Control automatically maintains constant negative pressure. Ensures proper pressures are not exceeded. If chimney does not develop sufficient draft, draft control does not function properly.

- Install draft regulator in same room or enclosure as furnace. Draft regulator should not interfere with combustion air supplied to the burner.
- Locate control near furnace flue outlet.
- Install per instructions supplied with regulator.
- Set over fire draft, measured at oil burner mounting plate over-fire draft access port, to -0.02 in. w.c. See Figure 3 page 7.

14. Optional Side Wall Venting

Certain WML, WMLV and MPLB furnace models are manufactured as sidewall vented units. Refer to Direct Venting Instructions, P/N 240006979 included with Vent Kit for details.

Sidewall Venting (*Direct Venting*) requires use of specific oil burners; Beckett AFII, or Riello 40BF.

Refer to Appendix A, Tables A2, and A4.

15a. Fan Timer Board And Limit Control (WML and MPL) See Figure 5, page 17.

Electronic Fan Timer integrates control of burner and circulator fan operations. Control is central wiring point for most of furnace electrical components.

- United Technologies 1158-120 (WML and MPL) has an adjustable fan on time set by selecting dipswitch combination displayed in Chart 1. Fan on delay can be set at 30, 60, 90 or 120 seconds. Provides a delay between burner ignition and blower start-up to eliminate excessive flow of cold air when blower comes on.
- United Technologies 1158-120 (WML and MPL) has an adjustable fan off time of 1, 2, 4 or 6 minutes as displayed in Chart 1. Fan off delay time starts when burner motor is de-energized at end of call for heat. Blower shutdown is delayed to remove any residual heat from heat exchanger.
- Electronic fan timer board works in conjunction with snap disc limit controls, performing a safety function, and breaks power to oil burner primary control, shutting off burner if furnace over-heats.
- Limit control is thermally operated and automatically resets. Limit control is factory installed, pre-set and is not adjustable.
- If limit control opens with United Technologies 1158-120 (WML and MPL) electronic fan control**,** circulating fan will energize. When limit closes, fan off timer begins. At the end of fan off time cycle burner is energized, initiating normal burner cycle.

Chart 1- United Technologies 1158-120 (WML/ MPL)

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

15b. Fan Timer Board And Limit Control (WMLV) [See Figure 6, page 17]

United Technologies 1168-1 ECM (WMLV) tap board has an adjustable fan on/off delay and airflow settings that must be adjusted in accordance with furnace input rating (nozzle size). Refer to Table A-8, page 19 for ECM blower set-up.

16. Electrical Connections

- Furnace is listed by Canadian Standards Association under NRTL (North American) Standard.
- All field wiring shall conform to CAN/CSA C22.1 Canadian Electrical Code, Part 1, and by local codes, where they prevail.
- United States, wiring shall conform to National Fire Protection Association NFPA-70, National Electrical Code, and with local codes and regulations.
- Wire furnace to separate dedicated circuit in main electrical panel.
- Suitably located circuit breaker can be used as service switch, separate service switch is advisable.
- Service switch is necessary if circuit breaker is close to the furnace, or furnace is located between circuit breaker and entry to furnace room.
- Clearly mark service switch. Install in accessible area between furnace and furnace room entry. Locate so as to reduce possibility it can be mistaken as light switch or similar device.
- Power requirement for all models is: 120 VAC, 1 Ø, 60 Hz., 12A.
- Accessory equipment such as electronic air cleaners and humidifiers may be included on furnace circuit.
- Accessories requiring 120 VAC power sources such as electronic air cleaners and humidifier transformers may be powered from electronic fan timer board where provisions have been made for connections, but should have their own controls.
- Do not use direct drive motor connections as a power source, there is risk of damaging accessories.
- Thermostat wiring connections are shown in wiring diagrams in Appendix B. Some micro-electronic thermostats require additional controls and wiring. Refer to thermostat manufacturer's instructions.
- Locate thermostat approximately 5 feet above floor, on inside wall, and where thermostat is exposed to average room temperatures. Avoid locations where thermostat is exposed to cold drafts, heat from nearby lamps and appliances, exposure to sunlight, heat from inside wall stacks, etc.
- Adjust thermostat heat anticipator to amperage draw of heating control circuit as measured at "R" and "W" terminals of thermostat. Do not measure current with thermostat connected to the circuit. Measure amperage by connecting ammeter between two wires which connect to thermostat "R" and "W" terminals.

17. Humidifier

- Humidifier is optional accessory available through most heating supplies outlets.
- Follow humidifier manufacturer's installation instructions
- Protect furnace heat exchanger from water or water droplets from humidifier.
- Do not use direct drive motor connections as source of power for 115 VAC humidifiers and humidifier transformers.

18. Piping Installation

- Install fuel system in accordance with requirements of CAN/CSA B-139, and local regulations.
- United States installation shall conform to NFPA No. 31 and local codes and authorities.
- Use only approved fuel oil tanks, piping, fittings and oil filter.
- Install oil filter as close to burner as possible.
- Refer to instructions and illustrations in oil burner and oil pump instructions shipped with the furnace.

19. Oil Filter

Install oil filter between fuel oil storage tank and oil burner. When using oil burner nozzle smaller than 0.65 U.S. Gallons Per Hour, install additional 7 to 10 micron filter as close as possible to oil burner.

20. Oil Burner Nozzles

Furnaces are certified for multiple firing rates. Furnace may be fired at ideal rate for wide range of structures by manipulating oil burner nozzle, oil burner configuration, and temperature rise. Refer to Table A-1 thru A-4, and furnace rating plate to determine proper combinations.

21. Oil Burner Adjustment

- Adjust burner air supply to maintain fuel to air ratio to obtain ideal combustion conditions.
- Lack of air causes "soft" and "sooty" flames, resulting in soot build-up throughout heat exchanger passages.
- Excess combustion air causes bright roaring fire and high stack temperatures resulting in poor fuel efficiency.

- Oil furnaces operate most efficiently with No. 1 smoke spot on Bacharach Scale. Dust will eventually build up on air moving components of oil burner assembly resulting in decreased air supply with potential soot build up in flue gas passageways of heat exchanger. Soot behaves as insulator and impairs good heat transfer. Stack temperature increases, and efficiency decreases. To avoid this problem, adjust the air supply to provide no more than trace smoke spot on Bacharach Scale.
- See Venting Instructions included in Vent Kits for set-up details for sidewall vented furnaces.

NOTICE

Set up sidewall vented models to deliver zero (0) smoke.

NOTICE

Before operating furnace check burner alignment with combustion chamber. End cone of air tube must be centred to accommodating ring of combustion chamber. Adjust as necessary.

22. Burner Electrodes

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

Refer to oil burner instructions provided with furnace and Appendix A Section A.2 in this manual for electrode specifications.

NOTICE

Do not tamper with furnace controls they are sensitive. If problems persist, call your service contractor.

23. Burner Primary (Safety) Control

Furnace is equipped with primary combustion control, also referred to as burner relay or burner protector relay, which uses a cad cell located in burner housing, to monitor and control combustion.

Dust or combustion residuals can build up on lens of cad cell impairing its response to flame. Check cad cell for cleanliness and proper alignment if primary control frequently shuts down combustion.

24. Combustion Chamber

Furnace is equipped with cerafelt combustion chamber, 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.

Inspect combustion chamber for damage or carbon build up whenever oil burner is removed for repairs or routine maintenance.

⚠ WARNING

Fire, burn, asphyxiation hazard. Do not start the burner unless blower access door is secured in place. Failure to follow these instructions could result in death or serious injury.

25a. Circulating Air Blower (WML/WMLV/MPL)

- Furnace models are equipped with direct drive blower systems.
- WML and MPL models are equipped with PSC motors.
- WMLV models are equipped with electronically commutated motors (ECM).

Direct Drive Blower Systems

- Direct drive blower speed adjustments are not normally required in properly sized extended plenum duct systems. Motor RPM and air CFM delivery will vary automatically to accommodate conditions within usual range of external static pressures typical of residential duct systems.
- Under-sized duct systems may require higher blower speed to obtain 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 trunk ducts. These systems may require modification to provide some resistance to the airflow to prevent over-amping of direct drive blower motor. Selecting a lower blower speed may correct this problem.
- Direct drive blower speeds are adjusted by changing"hot" wires to motor winding connections. Refer to wiring diagrams in Appendix B or wiring diagram label affixed to furnace.
- ***Do not move neutral wire (normally white wire) to adjust blower speed.***
- Single blower speed for both heating and cooling modes may be used. Use a "piggy-back connector" accommodating both wires on a single motor tap.
- It is also acceptable to connect selected motor speed with a pigtail joined to both heating and cooling speed wires with a wire nut.
- Safety precaution against accidental disconnection of wires by vibration, secure wire nut and wires with few wraps of electricians tape.
- ***Do not connect power leads between motor speeds. Always connect neutral wire to motor's designated neutral terminal.***

- If joining blower speed wiring is done in furnace junction box, tape off both ends of unused wire.
- ***Do not use blower speed wires as source of power to accessories as electronic air cleaners and humidifier transformers. Unused motor taps auto-generate sufficiently high voltages to damage accessory equipment.***

⚠WARNING

Electrical shock hazard. Turn OFF electrical power supply at service panel before opening blower access door. Failure to do so could result in death or serious injury.

25b. Circulating Air Blower (WMLV)

WMLV furnace models are equipped with electronically commutated motors (ECM).

Setting Blower Speed and "ON" and "OFF" Timings

Blower speed and on/off time delays are handled by ECM motor programming and are set via dipswitches per Table A-9 on page 19. Heating airflow rate is SW1 and on/off delay is SW4, both are set according to firing rate. Cooling airflow rate is SW2 and if used is set according to installed cooling capacity. SW3 can be used to adjust airflow rate by (+) or (-) 15%. Features of this ECM variable speed motor are that it will deliver a constant airflow within a wide range of external static pressures, and also includes:

- **Soft Start:** ECM will slowly ramp up to required operating speed. In heating cycle allows heat exchanger to reach operating temperature before set heat speed, minimizes noise and increases comfort.
- **Soft Stop:** At end of heating cycle, ECM will slowly ramp down. Allows increased energy efficiency and reduced noise levels.
- **Dehumidification:** Dehumidification feature is programmed into the variable speed motor. At start of each cooling cycle, variable speed motor will run at 82% of rated airflow for 7.5 minutes. After 7.5 minutes has elapsed, motor will increase to 100% of rated airflow. Used to provide dehumidification and improve system efficiency.
- **Continuous Fan Operation:** When thermostat continuous fan (G) switch is on without call for heating or cooling, indoor fan is immediately energized up to 50% of cooling speed. Allows continuous circulation of air between calls for heating or cooling. If call for heat (W) or cool (Y) occurs during continuous fan, blower remains energized.

26. Maintenance And Service

Routine Maintenance By Home Owner

- Arrange for professional servicing of furnace by the service or installation contractor annually.
- Homeowner is to maintain air filter or filters. A dirty filter can cause furnace to over-heat, fail to maintain indoor temperature during cold weather, increase fuel consumption and cause component failure.
- Inspect, clean or replace filter monthly.
- Furnace is supplied with semi-permanent type filter. If filter is damaged, replace with filters of same size and type.
- During monthly filter inspection, inspect general condition of furnace. Watch for signs of oil leaks in vicinity of oil burner, soot forming on any external part of furnace, soot forming around joints in vent pipe, etc. If any of these conditions are present, please advise your service or installation contractor.

Annual Service By Contractor

NOTICE

Combustion chamber (firepot) is fragile. Use care when inspecting and cleaning this area

- Inspect heat exchanger periodically and clean if necessary.

⚠WARNING

Electrical shock hazard. Turn OFF electrical power supply at service panel before service or maintenance Failure to do so could result in death or serious injury.

- If cleaning is necessary, shut off oil supply, shut off power to the furnace and remove burner.
- Use stiff brush with wire handle, brush off scale and soot from inside drum and flue pipe.
- Clean radiator, remove clean-out cap screws. Remove caps carefully to avoid tearing gaskets.
- Wire brush can be used to loosen dirt and debris on the inside surfaces of radiator. Clean out all accumulated dirt, soot and debris with a wire handled brush and an industrial vacuum cleaner.
- Before replacing clean-out caps, inspect gaskets. If gaskets are broken, remove remnants and replace with new gaskets.
- Blower motor is factory oiled and permanently sealed. ***Do not lubricate.*** Excess oil causes premature electric motor failure.
- Inspect blower fan. Clean if necessary.
- Oil Burner Maintenance: Follow oil burner manufacturer instructions.
- Change oil burner nozzle and oil filter annually.

- Clean and inspect venting system for signs of deterioration. Replace pitted or perforated vent pipe and fittings.
- Barometric damper should open and close freely.
- Check electrical connections to ensure tight connections. Safety controls such as the high limit controls should be tested for functionality.
- Check fan control to ensure fan on and off delay function continues to start and stop blower fan at optimal settings.

⚠ WARNING

Fire, burn, explosion, asphyxiation hazard.

- Do not start burner when excess oil has accumulated, furnace is full of vapor, or combustion chamber is very hot.
- Do not burn garbage or paper in furnace.
- Do not leave paper or rags around furnace.

Failure to follow these instructions could result in death or serious injury.

27. Operating Instructions (WML And MPL)

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 thermostat above room temperature to call for heat. Burner should start. It may be necessary to press RESET button on primary combustion control relay.
2. There is a fan on time delay before circulating fan is energized. United Technologies 1158-120 has adjustable fan on time set by selecting dipswitch combination displayed in Chart 1. Fan on delay can be set at 30, 60, 90 or 120 seconds.
3. Set the thermostat below room temperature. Oil burner stops.
4. Air circulation blower continues to operate until time off setting selected on electronic fan timer control times out. United Technologies 1158-120 has adjustable fan off time of 1, 2, 4 or 6 minutes. Fan timer control adjustments may be altered if air at room registers is high upon blower start up or shutdown.
5. Restore thermostat setting to comfortable temperature.

To Shut Down Unit

1. Set thermostat to lowest possible setting.
2. Set manual switch (if installed) in electrical power supply line to "OFF".

28. Operating Instructions (WMLV)

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 thermostat above room temperature to call for heat. Burner should start. It may be necessary to press RESET button on primary combustion control relay.
2. There is a fan on time delay before circulating fan is energized. United Technologies 1168-1 has adjustable fan on/off time delay programmed into ECM motor, and is set by selecting SW4 DIP switch combination displayed in Table A-9 page 19. Adjust Fan on/off delay according to input (nozzle size).
3. Set thermostat below room temperature. Oil burner stops.
4. Air circulation blower continues to operate until blower off delay setting programmed into ECM motor times out.
5. Restore thermostat setting to comfortable temperature.

NOTICE

If furnace is to be shut down for extended period of time, close oil supply valve to burner.

Check out and adjustments

WML-C / WMLV-C and MPL-B furnaces may be used with the following oil burners.

Please note: The Beckett AF, and Riello 40F oil burners are for applications using indoor air for combustion only. For sidewall venting applications utilizing outdoor air for combustion, use the Beckett AFII or the Riello 40BF (Balanced Flue) oil burners

Table A-1 Beckett AF Oil Burner Set-Up

Beckett AF Series Oil Burners (For use with chimney vented units only)							
Furnace Model	**Output BTU/Hr**	**Burner Model**	**Nozzle**	**Pump Pressure**	**Flow Rate**	**Head [1]**	**Static Plate**
WML60C2 [2] WMLV60C2 [2]	59,000	AF76BNHS	0.50 / 80°A	100 PSIG	0.50 USGPH	F3	3⁄8 in.
WML80C2 [3] WMLV802 [3]	76,000	AF76BNHS	0.65 / 80°A	100 PSIG	0.65 USGPH	F3	3⁄8 in.
WML90C2 [3] WMLV90C2 [3]	86,000	AF76BNHS	0.75 / 80°A	100 PSIG	0.75 USGPH	F3	3⁄8 in.
MPL90B2	90,000	AF76XNHS	0.75 / 80°A	100 PSIG	0.75 USGPH	F3	2¾ in.
MPL100B2	97,000	AF76XNHS	0.85 / 80°A	100 PSIG	0.85 USGPH	F3	2¾ in.
MPL120B2	118,000	AF76XNHS	1.00 / 60°A	100 PSIG	1.00 USGPH	F3	2¾ in.
MPL130B2 [3]	128,000	AFY6YBHS	1.10 / 70°A	100 PSIG	1.10 USGPH	F6	2¾ in.

[1] Head is shielded by ceramic insulator.

[2] Low Firing Rate Baffle required when using 0.50 gallon nozzle

[3] These models do not meet U.S. government requirements for minimum efficiency. They are intended for Canada only.

Table A-2 Beckett AFII Burner Set-Up

Beckett AFII Series Oil Burners (For use with sidewall vented units using outdoor combustion air)						
Furnace Model	**Output BTU/Hr**	**Burner Model**	**Nozzle**	**Pump Pressure**	**Flow Rate**	**Head [1]**
WML60CB2U2 WMLV60CB2U2	63,000	AFII-85	0.50 /60°A	145 PSIG	0.55 USGPH	FB0
WML80CB2U2 WMLV80CB2U2	75,000	AFII-85	0.60 / 60°A	145 PSIG	0.65 USGPH	FB3
WML90CB2U2 WMLV90CB2U2	85,000	AFII-85	0.70 / 60°W	145 PSIG	0.75 USGPH	FB3
MPL90BB2U2	88,000	AFII-150	0.70 / 60°A	145 PSIG	0.75 USGPH	FB0
MPL100BB2U2	101,000	AFII-150	0.80 / 60°A	145 PSIG	0.85 USGPH	FB3
MPL120BB2U2	118,000	AFII-150	0.85/ 70°A	145 PSIG	1.00 USGPH	FB3

Table A-3 Riello 40F Series Oil Burner Set-Up

Riello 40F Series Oil Burners (For use with chimney vented units)							
Furnace Model	**Output BTU/Hr**	**Burner Model**	**Nozzle**	**Pump Pressure**	**Flow Rate**	**Air Gate**	**Turbulator Setting**
WML60CRF2 WMLV60CRF2	61,000	40F3	0.50 / 60°W	105 PSIG	0.51 USGPH	2.6	1.0
WML80CRF2 WMLV80CRF2	92,000	40F3	0.60 / 60°W	115 PSIG	0.65 USGPH	2.6	1.5
WML90CRF2 WMLV90CRF2	88,600	40F3	0.65 / 60°W	135 PSIG	0.75 USGPH	3.6	2.0
MPL90BRF2	92,000	40F5	0.60 / 60°W	145 PSIG	0.75 USGPH	2.25	0.0
MPL100BRF2	101,000	40F5	0.65 / 60°W	145 PSIG	0.85 USGPH	2.5	0.5
MPL120BRF2	117,000	40F5	0.85/ 60°W	145 PSIG	1.00 USGPH	2.75	1.0
MPL130BRF2	127,000	40F5	1.00 / 60°W	145 PSIG	1.10 USGPH	2.75	2.0

Table A-4 Riello Balanced Flue (BF) Burner Set-Up

Riello Balanced Flue Series Oil Burners (For use with sidewall vented units using outdoor combustion air)						
Furnace Model	**Output BTU/Hr**	**Burner Model**	**Nozzle**	**Pump Pressure**	**Flow Rate**	**Turbulator Setting**
WML60CRBU2	62,000	40BF3	0.50 /60°W	105 PSIG	0.51 USGPH	1.0
WML80CRBU2	78,000	40BF3	0.60 / 60°W	115 PSIG	0.65 USGPH	1.5
WML90CRBU2	89,000	40BF3	0.65 / 60°W	135 PSIG	0.75 USGPH	2.0
Note: Air gate setting may vary for sidewall vented units where air gate must be adjusted to achieve zero smoke.						

A.1 OIL BURNER AIR ADJUSTMENT

Consult oil burner instructions provided in furnace documents envelope for specific information concerning burner adjustments, operation and troubleshooting.

Beckett AF Burner (Chimney Vent)

Adjust air shutter by loosening locking screws. Moving air shutter, and if necessary, bulk air band.

Beckett AFII Burner (Direct Vent)

Adjust burner air supply. Loosen locking screw located on black dial to right of burner. Turn black dial clockwise to increase combustion air and counter-clockwise to decrease combustion air. Re-tighten locking screw after obtaining proper setting.

Riello 40F3 Burner (Chimney Vent)

Combustion air is adjusted by removing burner cover. Loosen screws that secure air adjustment plate. Move adjusting plate to either increase or decrease combustion air. When proper air setting is achieved, retighten fixing screws.

Riello 40BF3 Burner (Direct Vent)

Combustion air can be adjusted with burner cover on. Remove plastic cover on top right hand side of burner cover. With phillips head screw driver, turn adjustment screw clockwise to increase combustion air or counter-clockwise to decrease combustion air. When combustion air is set, re-insert plastic cover.

A.2 Burner Electrodes

Adjustment of electrode tips with respect to each other, nozzle, burner head is very important to ensure smooth start-ups and to permit efficient combustion.

Beckett AF and AFII Burners

- Electrode gap: 5/32 inch.
- Distance above horizontal center-line: 5/16 inch. Older instruction sheets specify 7/16 inch. Current specification is 5/16 inch.
- Distance ahead of nozzle: 1/16 inch.
- "Z" dimension, distance from front of end cone (head) to face of nozzle should be 1-1/8 inches. If ceramic head is used, distance from end cone to nozzle face is increased to 1-3/8 inches.

Riello 40F, & BF Burners

- Electrode gap: 5/32 inch.
- Distance above horizontal center-line: 13/64 inch.
- Distance ahead of nozzle: 5/64 to 7/64 inch.

A.3 Start Up

Use following instructions to set the burner:

1. Shut off electrical power to the furnace.
2. Install oil pressure gauge to pressure port on oil pump. (Refer to oil pump specification sheet included with burner instructions).
3. Restore electrical power to furnace.
4. Start furnace and bleed all air from fuel oil lines.
5. Close purge valve and fire the unit.
6. Allow furnace to warm up to normal operating temperatures. During this time, set pump pressure in accordance with data provided in Appendix A, Table A-1 thru A-4.
7. ***Chimney vented units*** - Drill 1/4" test port in venting between furnace flue outlet and draft regulator (barometric damper) to take smoke readings.
8. ***Sidewall vented units*** - Do not drill. Use test port in the supplied appliance connector to take smoke readings.
9. When furnace has reached "*steady state*" (after approximately 10 minutes). Set combustion air damper to get TRACE of smoke for chimney vented units and ZERO smoke for sidewall vented units.
10. Check system temperature rise. *Temperature rise is the difference between return air temperature measured at a point near return air inlet, and supply air temperature measured near furnace outlet*.
    System temperature rise is listed on furnace rating plate. If temperature rise is too high, airflow must be increased. If temperature rise is too low, slow fan down.
11. After air adjustments have been completed, recheck the over fire draft at test port on burner mounting plate shown in Figure 3. Over fire draft should be adjusted to -0.02 inches w.c. Take another smoke test to ensure smoke has not increased.
12. Gross stack temperature should typically range between 400°F and 575°F depending on firing rate, blower speed, burner setup, etc. If stack temperature is below range it may be necessary to slow down blower fan. If stack temperature is too high, blower fan may require speeding up.
13. Turn burner off. Observe duct thermometer in supply air stream, note temperature blower fan stops. Fan adjustments can be made by moving dipswitch settings on timer control board for fan off delay.
14. Check operation of limit switch.
    A. Shut off power to furnace.
    B. Temporarily remove neutral wire from PSC blower motor or remove 5 pin power connector from ECM blower motor. Isolate AC line voltage pins on 5 pin power connector with electrical tape to prevent electric shock hazard.
    C. Restore electrical power to furnace.
    D. Set thermostat above room temperature.
    E. After three or four minutes of burner operation, limit control should turn burner off.
    F. When limit function test is complete, shut off electrical power to furnace, replace neutral wire to PSC blower motor or 5 pin power connector to ECM blower motor. Restore power.
    G. Blower fan will start up immediately. Once temperature has dropped and limit control has reset, fan will operate until fan off time is reached.
    H. Oil burner will resume operation and continue until thermostat is satisfied.
    I. Restore thermostat setting to comfortable temperature.
15. Set heat anticipator adjustment in thermostat (if so equipped), by removing "R" or "W" wire to thermostat. Read amperage draw between the two wires. Failure to remove one of the wires from thermostat while performing this test could burn out heat anticipator. Set heat anticipator to amperage measured.
16. Run furnace through at least three full cycles before leaving the installation, to ensure all controls are operating properly.
17. Check all joints in any positive pressure venting system for leaks before leaving the installation site

A.4 Special Instructions For Units Equipped With Riello Burners

Riello specifications are listed in Tables A-3 and A-4. Consult Riello Installation Instructions supplied with Burner for specific information concerning burner adjustments, operation, and trouble-shooting.

A.5 Final Check Out

Verify all safety devices and electrical components have been set for normal operation.

Verify all electrical connections are tight and wiring is secure.

Verify homeowner is informed and understands:

Where circuit breaker or fuse is located in main electrical panel.

Where furnace switch is located, and switch "on" and "off" positions if not obvious.

Where oil shut-off valve from oil storage tank is located.

Thermostat operation, and other related accessories.

How to operate manual reset button on primary control, and when not to push the reset button.

How and where to visually inspect venting system for leaks or other problems.

How to inspect, clean and replace air filter, and other homeowner maintenance procedures.

Who to call for emergency service and routine annual service.

FIGURE 5: UNITED TECHNOLOGIES 1158-120 FAN TIMER BOARD (WML and MPL)

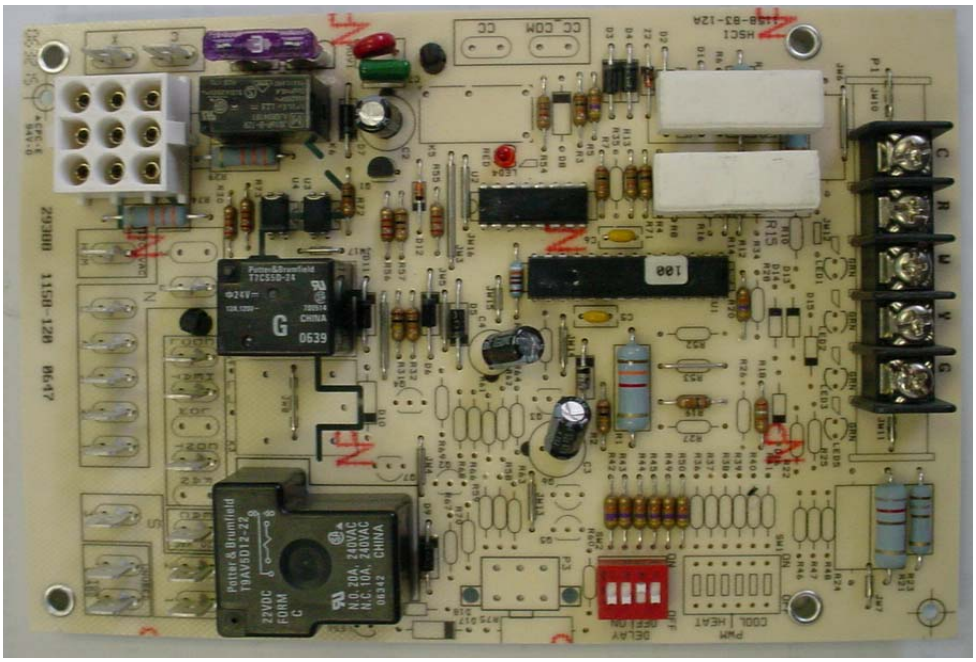


FIGURE 6: UNITED TECHNOLOGIES 1168-1 ECM TAP BOARD (WMLV)

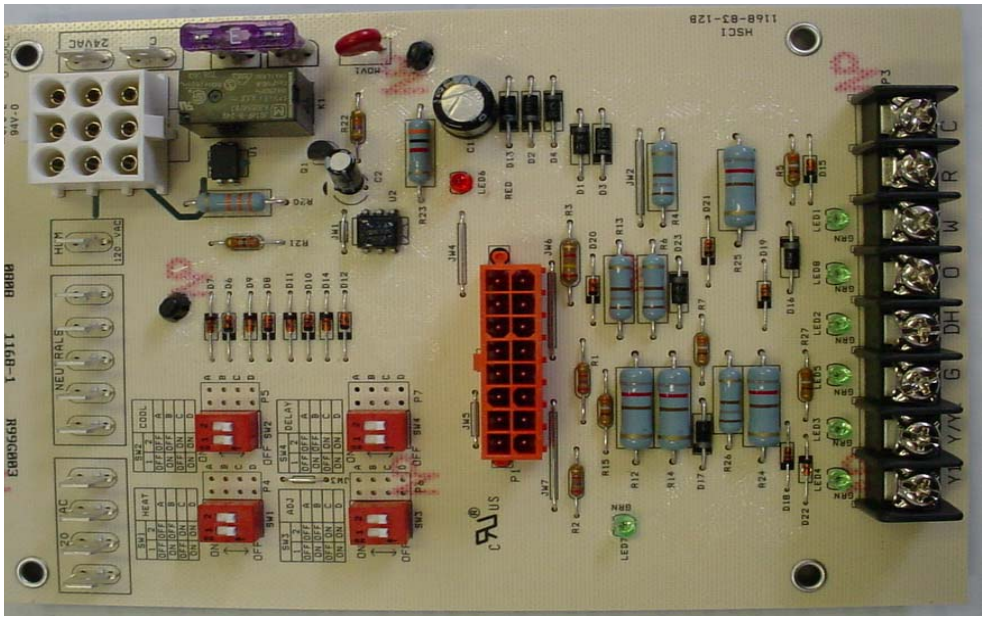


Table A-6 Direct Drive Blower Set-Up PSC Motor

Furnace Model	Blower	Blower Set-Up				Cooling Capacity		
		0.20 in. w.c.		0.50 in. w.c.		Tons	Power	CFM Range
		Speed	Motor	Speed	Motor			
WML60	100-10T DD	Low	1/2 HP	Med-Low	1/2 HP	3	1/2 HP	763-1505
WML80	100-10T DD	Med-Low	1/2 HP	Med-High	1/2 HP	3	1/2 HP	763-1505
WML90	100-10T DD	Med-High	1/2 HP	High	1/2 HP	3	1/2 HP	763-1505
MPL90	120-10 DD	Low	3/4 HP	Med-High	3/4 HP	3	3/4 HP	1185-1553
MPL100	120-10 DD	Med-High	3/4 HP	High	3/4 HP	3	3/4 HP	1185-1553
MPL120	120-10 DD	High	3/4 HP	High	3/4 HP	3	3/4 HP	1185-1553
MPL130	120-10 DD	High	3/4 HP	High	3/4 HP	3	3/4 HP	1185-1553

Table A-7 Direct Drive Blower Characteristics PSC Motor

Furnace Model	Blower	Motor HP	Motor FLA	ΔT	Speed	CFM			
						External Static Pressure – Inches w.c.			
						0.20	0.30	0.40	0.50
WML 60 – 90	100-10T DD	1/2 HP	7.0	60°F	Low	813	813	797	763
					Med-Low	1170	1144	1118	1063
					Med-High	1423	1381	1291	1220
					High	1505	1444	1359	1291
MPL 90 - 130	120-10 DD	3/4 HP	12.5	65°F	Low	1334	1286	1239	1185
					Med-Low	1389	1332	1287	1236
					Med-High	1423	1373	1326	1289
					High	1553	1491	1449	1331

Table A-8 Direct Drive Blower Characteristics ECM Motor

Furnace Model	Blower	Motor HP	Motor FLA	ΔT	CFM RANGE		
					Continuous Fan	Heating	Cooling
						0.38 - 0.48 inches w.c.	0.5 inches w.c.
WMLV 60 – 90	100-10T DD	1/2 HP ECM	7.7	60°F	525-700	825 - 1250	600 - 1200

TIP: These formulae will assist with design of ductwork and determination of air flow delivery:

CFM = Bonnet Output (1.085 x System Temp Rise)

System Temp Rise = Bonnet Output/(1.085 x CFM)

Table A-9 ECM Blower Set-Up (WMLV)

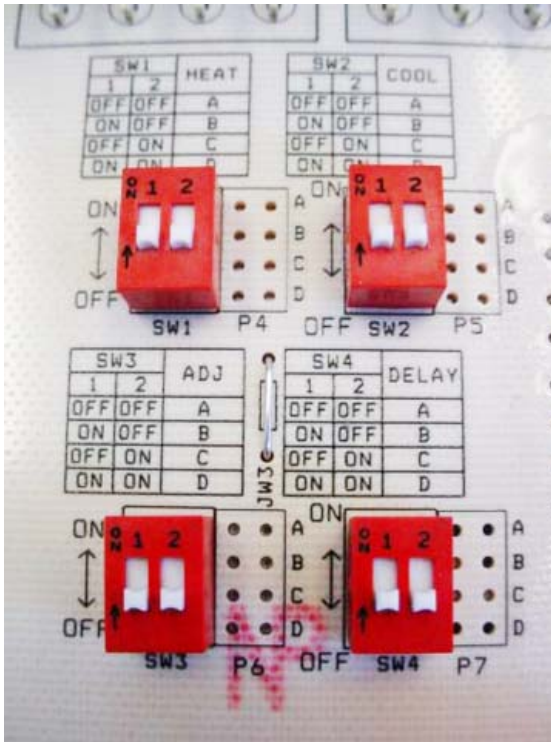
Dip Switch Adjustment Chart
For Input 0.50 USGPH TO 0.75 USGPH

SW1 - HEAT DIP Switch Position 1	2	POS.	INPUT USGPH
OFF	OFF	A	0.65
ON	OFF	B	0.75
OFF	ON	C	0.50
ON	ON	D	N/A

SW2 - COOL DIP Switch Position 1	2	POS.	AC Size (TON)
OFF	OFF	A	3
ON	OFF	B	2.5
OFF	ON	C	2
ON	ON	D	1.5

SW3 - ADJUST DIP Switch Position 1	2	POS.	CFM
OFF	OFF	A	0%
ON	OFF	B	(+)15%
OFF	ON	C	(-)15%
ON	ON	D	N/A

SW4 - DELAY DIP Switch Position 1	2	POS.	INPUT USGPH
OFF	OFF	A	0.65
ON	OFF	B	0.75
OFF	ON	C	0.50
ON	ON	D	N/A



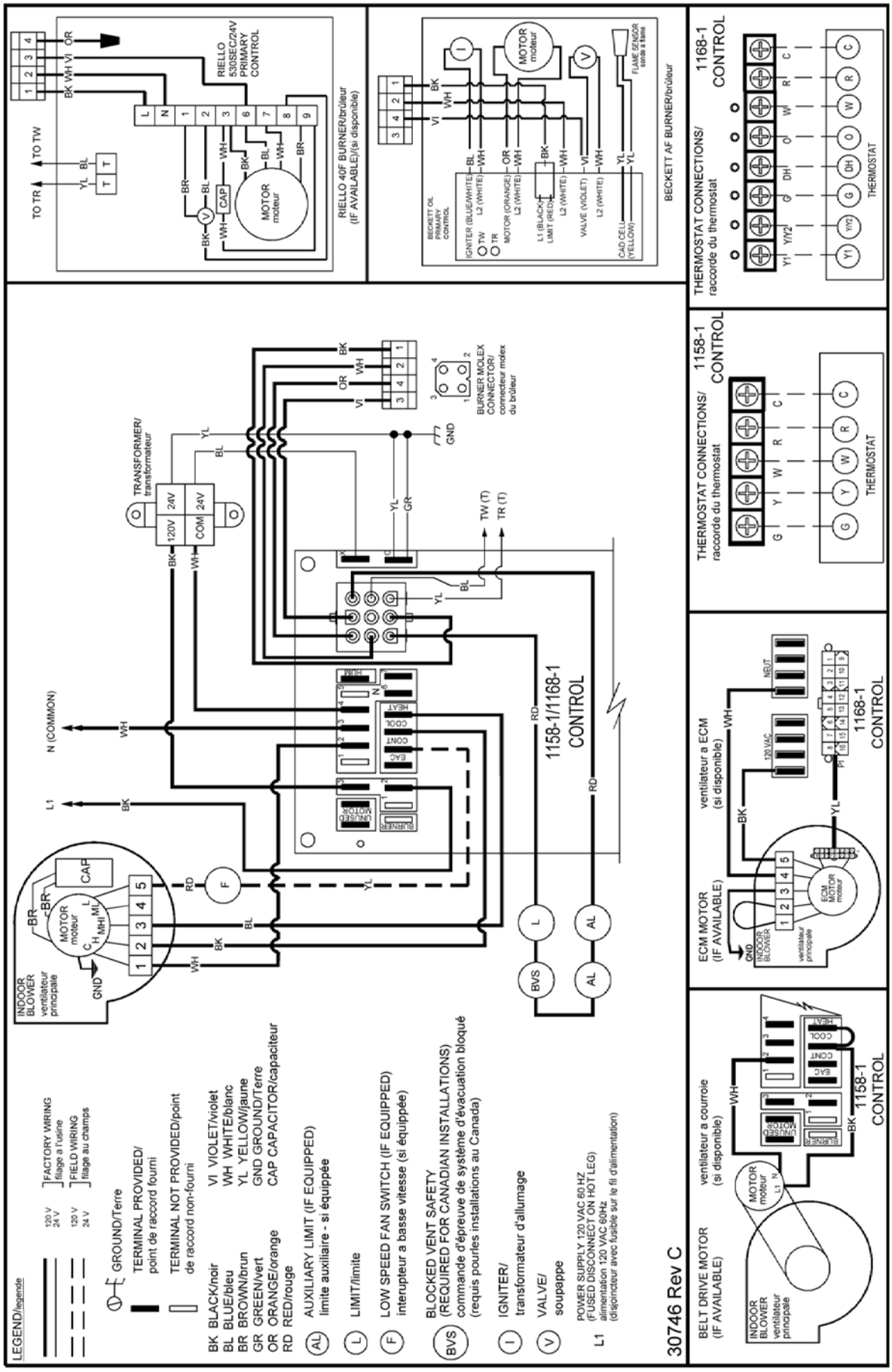
NOTE:

SW1 (HEAT) AND SW4 (DELAY) DIP SWITCHES MUST BOTH BE ADJUSTED ACCORDING TO INPUT (NOZZLE SIZE).

SW2 (COOL): 1 TON is approximately equal to 400 CFM

SW3 (ADJUST): (Heating Mode) Increase OR decrease temperature rise respectively
(Cooling Mode) Increase OR decrease CFM respectively

Chimney Vent Furnace Wiring Diagram WML/WMLV/MPL



Direct Vent Furnace Wiring Diagram WML/WMLV/MPL

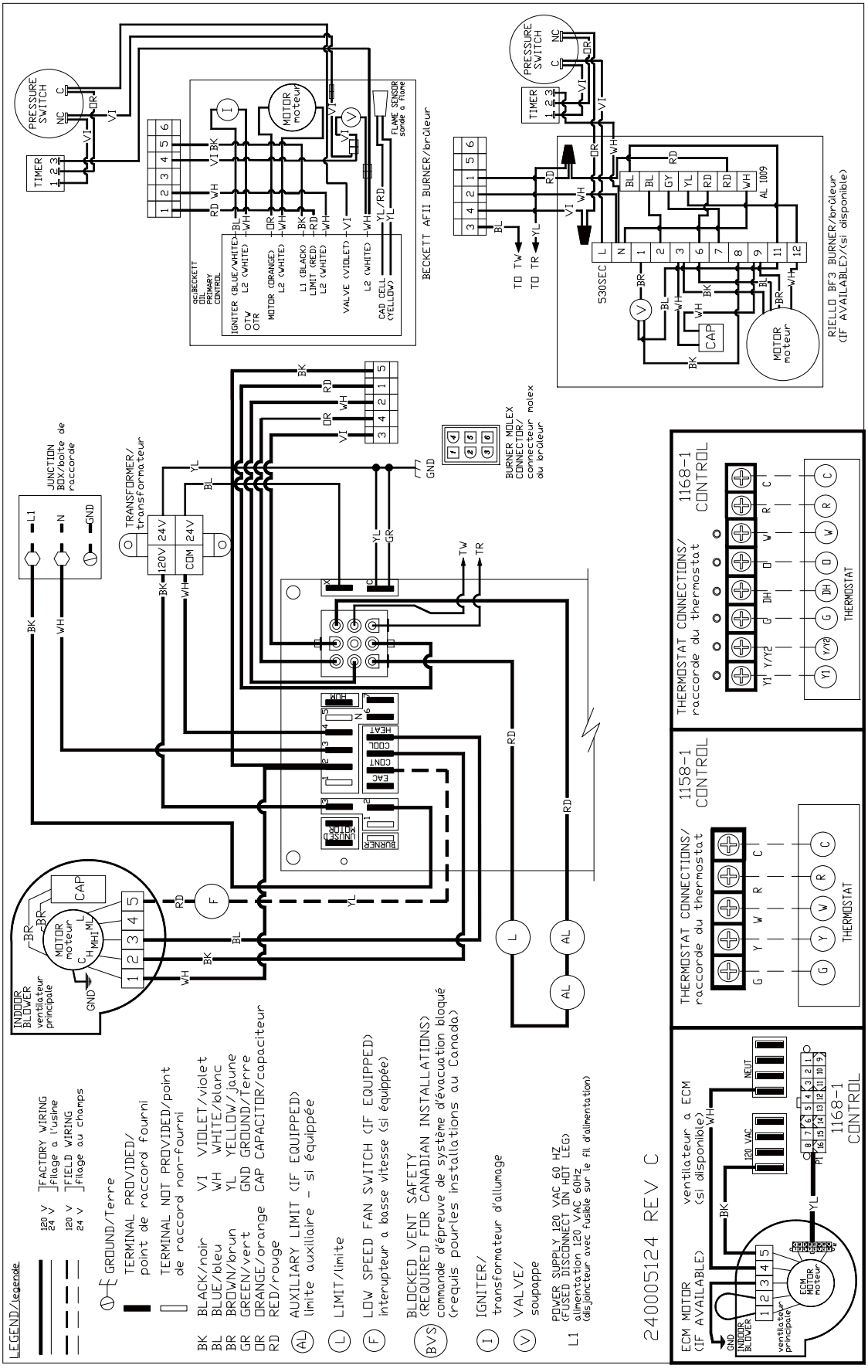


Table C-1: 1158-120 Electronic Fan Timer Board (EFT) Detailed Sequence Of Operation (WML)

Mode	Action	System Response
HEAT	Thermostat calls for heat. ("W" terminal is energized).	EFT closes the oil primary control T - T connections. Ignition system and the oil primary control start the furnace. Oil flows as long as the oil primary control senses flame. Burner motor is energized and heat "fan on" delay timing begins. When timing is complete, the circulator fan is energized at heat speed.
	Thermostat ends call for heat. ("W" terminal is de-energized).	The oil primary control is de-energized, terminating the burner cycle. Heat "fan off" delay timing begins. Length of delay depends on EFT dipswitch settings. When timing is complete, the circulator fan is de-energized. EFT returns to standby mode, (Oil primary control and circulator fan are off, unless continuous fan operation is selected at the thermostat).
	Burner fails to light.	Oil primary control locks out within lockout timing, (15 seconds). Burner motor is de-energized. (Even though thermostat is still calling for heat). If circulator fan has started, it continues through the selected heat "fan off" delay period.
	Established flame fails.	Burner motor is de-energized and oil primary control goes into recycle mode. If the selected heat "fan off" delay timing is longer than the recycle delay timing, the circulator fan continues to run through the next trial for ignition.
COOL	Thermostat begins call for cool. (G and Y terminals are energized).	Cooling contactor is energized immediately. Circulator fan is energized at cool speed.
	Thermostat ends call for cool. (G and Y terminals are de-energized).	Cooling contactor is de-energized immediately. Circulator fan turns off immediately.
FAN	Thermostat begins call for fan. (G terminal is energized).	Circulator fan is energized immediately at cooling speed.
	Thermostat ends call for fan. (G terminal is de-energized).	Circulator fan is de-energized immediately.
LIMIT	Limit switch string opens.	Oil primary control shuts off burner. Circulator fan is energized immediately at heat speed. EFT opens the oil primary control T - T connections. Circulating fan runs as long as limit string stays open. If there is a call for cooling or fan, the circulating fan switches from heating to cooling speed.
	Limit switch string closes (with existing call for heat).	EFT begins heat "fan off" delay sequence. Circulating fan turns off after the selected heat "fan off" timing. EFT re-closes the oil primary control T - T connections. Oil primary control is energized, initiating burner light off.
	Limit switch string closes (without existing call for heat).	Circulator fan turns off when heat "fan off" delay time is complete. Normal operation resumes; EFT control is in standby mode awaiting next thermostat command.
FAN	Continuous circulating fan is connected.	Circulating fan is energized when there is no call for heat, cool, or fan. If fan operation is required by a call for heat, cool, or fan, the EFT switches off the continuous fan speed tap before energizing the other fan speed.

EAC	Electronic Air Cleaner is connected.	Electronic air cleaner (EAC) connections are energized when the heat or cool speed of the circulator fan is energized. EAC connections are not energized when the optional continuous fan terminal is energized.
HUM	Humidity control is connected.	Humidifier connections are energized when the oil burner motor is energized.

1168-1 Electronic Fan Timer Board (EFT) Detailed Sequence Of Operation (wMLV)

Thermostat Input LEDs (LED1-5, LED8)

Six green LEDs are placed behind their respective thermostat connections (Y1, Y/Y2, G, DH, O, and W) and operate whenever a call is present.

Thermostat calls for heat "W". The 24VAC input signal is passed to pin 2 of P1 and will drive the K1 relay that provides dedicated contacts to the T-T input of the Oil Primary Control. **Thermostat calls for cool "Y1"**. The 24VAC input signal is passed to pin 6 of P1. **Thermostat calls for fan "G"**. The 24VAC input signal is passed to pin 15 of P1. **Thermostat calls for dehumidification "DH"**. The 24VAC input signal is passed to pin 10 of P1. **Thermostat calls for reversing valve "O"**. The 24VAC input signal is passed to pin 9 of P1.

C.1 Troubleshooting

⚠WARNING

Electrical shock hazard. Only a trained, experienced service technician should perform troubleshooting procedure. Failure to do so could result in death or serious injury.

C.2 Preliminary Steps:

Consult Beckett or Riello instruction manuals provided with oil burner for specific information regarding oil burner primary control sequence of operation, diagnostics and troubleshooting.

Check diagnostic light for indications of burner condition.

NOTICE

When simulating call for heat at oil primary control, disconnect at least one thermostat lead wire from T - T terminals to prevent damage to thermostat. Neglecting this procedure may burn out heat anticipator of standard 24 vac thermostat, or cause harm to components within micro-electronic thermostat.

Before checking oil primary control, perform these preliminary checks, repair or replace controls as necessary:

- Check power supply, fuse box or breaker, any service switches, all wiring connections, and burner motor reset button (if equipped).
- Check limit switches to ensure switch contacts are closed.
- Check electrode gap and position.
- Check contacts between oil primary control and electrodes.
- Check oil supply (tank gauge).
- Check oil nozzle, oil filter, and oil valves.
- Check piping or tubing to oil tank.
- Check oil pump pressure.

C.3 Check Oil Primary Control

If the trouble does not appear to be in the burner or ignition hardware, check the oil primary control per manufacturer's instructions included with oil burner.

⚠WARNING

Electrical shock hazard. Only a trained, experienced service technician should perform troubleshooting procedure. Failure to do so could result in death or serious injury.

Table C2: System and General Troubleshooting

Problem	Possible Cause	Remedy
Furnace will not start.	Thermostat not calling for heat	Check thermostat and adjust. Check thermostat for accuracy; if mercury switch type, it might be off level.
	No power to furnace	Check furnace switch, main electrical panel furnace fuse or circuit breaker. Look for any other hand operated switch, such as old poorly located furnace switch, which was not removed during furnace replacement.
	Thermostat faulty	Remove thermostat wires from oil primary control terminals T-T. Place a jumper across T-T. If furnace starts, replace thermostat, thermostat sub-base (if equipped), or both.
	Oil primary control faulty	Check reset button on oil primary control. Remove thermostat wires from oil primary control terminals T - T. Check for 24V across T -T. If no voltage is present, check for 115V to oil primary control. If 115V is present, refer to oil primary control documentation provided with oil burner.
	Photo Cell wiring shorted or room light leaking into photo cell compartment	Check photo cell (cad cell) wiring for short circuits. Check for room light leaking into cad cell compartment. Repair light leak if necessary.
	Open safety switch	Check for open limit or auxiliary limit. Check internal wiring connections; loose connectors, etc.
Furnace will not start without first pushing oil primary control reset button. (Happens on frequent basis)	No fuel oil	Check fuel oil supply. Check all hand operated fuel oil valves are in 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. Verify 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 signs of oil leaks. Any oil leak is 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.

Table C-2: System and General Troubleshooting continued

Problem	Possible Cause	Remedy
Furnace starts, but cuts out requiring manually resetting 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: Photocell should have resistance of 100 KΩ in absence of light; maximum of 1500 Ω in presence of light. Verify room light is not leaking into the cad cell compartment. (See diagnostic light section).
Furnace starts, but cuts out requiring manually resetting oil protector reset button.	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. Verify 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 igniter connections or defective igniter.	Check contacts between the igniter and electrodes. If OK, replace the igniter
	Fuel oil filter clogged.	Replace fuel oil storage tank filter and / or fuel oil in-line filter.
	Defective oil pump.	Check burner motor and / or 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 75°F. Check for clogged air filters. Check blower fan for excess dirt build-up or debris. Speed up blower fan if necessary.
	Poor "fan off" delay timing selection, (fan stops too soon).	Check "fan off" delay timing setting. Use duct thermometer in supply air plenum take-off or first few inches of supply air trunk duct. Fan should shut off at 90° - 100°F. Manipulate dip switch settings to come as close as possible to this "fan off" temperature.
	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 400° to 500°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 thermostat is being influenced by drafts, sunlight, duct work, etc., relocate to suitable location.

Table C-2: System and General Troubleshooting continued

Problem	Possible Cause	Remedy
Too much smoke.	Insufficient combustion air adjustment at oil burner, or improper draft pressure.	Adjust oil burner combustion air band and draft regulator to gain highest practical CO2 or lowest practical O2 content in flue gases. See Burner Set Up.
	Heat exchanger partially clogged.	Check for soot build-up in heat exchanger flue passages, especially in 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 inside surface of 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 fire pot.
	Defective fire-pot	Check fire-pot. Repair or replace.
Furnace will not warm home to desired temperature.	Airflow 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 thermostat is being influenced by drafts, sunlight, duct work, etc., relocate to suitable location.
	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.
	Defective high limit control.	Test high limit function of all limit switches. Use duct thermometer to verify accuracy of limit control. Check for obstructions to airflow around limit switch bimetal 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.	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.	Increase "fan on" dipswitch settings on EFT if control has this option. Register air deflectors may help.
	Excessive duct losses.	Check supply air ductwork. Seal leaky joints and seams. Insulate ductwork if necessary.

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

Fuel Supplier

Fuel Oil Supplier	
Contact	
Telephone No.	
After Hours No.	

PARTS LISTING - CHIMNEY VENT MODELS WML - (C2, CRF2) AND WMLV- (C2, CRF2)

Ref. No.	Description	Part No.
1	Right and Left Side Panel	30072AD
2	Rear Panel Baffle	27918
3	Rear Panel	30272AD
4	Blower Division Panel Assembly	30311
5	Base Panel Assembly	109007698
6	Front Panel	30073AD
7	Blower Access Door	30074AD
	Door Handle - P2-41	28673
	Logo Bezel	28479
	Logo Label	28563
8	End Panel	29013
9	Heat Exchanger Assembly	550001636
10	Firepot Retainer Bracket	27068
11	Replacement Combustion Chamber	2700WP
12	Oil Burner Mounting Plate Assembly	29872
	Sight Glass Cover Plate	29850
	Sight Glass Gasket (2 per unit)	29870
	Sight Glass	29876
13	Flue Pipe Connecting Flange	29005
15	Pouch Gasket	2080175
16	Flue Pipe Gasket	21994
17	Clean-out Tube Gasket Retainer (2 per unit)	29161
	Clean-out Tube Gasket (2 per unit)	29163
18	Radiator Clean-out Cap (2 per unit)	240007841
	Radiator Clean-out Cap Gasket (2 per unit)	240006333
19	Filter Frame	21260
20	Filter Frame End Support	21306
21	Air Filter - 20 x 20 x 1 (Permanent)	2180032
23	Channel Wire Retainer	30239
24	Limit Control 60T11BOF L180°F	28654
25	Wire Harness Control	30268
26	Wire Harness PSC Blower	30391
35	Wire Harness ECM Blower Control	240006438
35	Wire Harness ECM Blower Supply	240005742
27	Fan Timer Control: 1158-120 UTEC	29388
27	Fan Timer Control : 1168-1 ECM UTEC	240007048
28	Draft Regulator 5"	27494
29	Beckett Oil Burner AF76BNHS	30288
	Beckett Motor 1/7 HP 3450 RPM PSC	29689
	Beckett Clean-cut Oil Pump	29688
	Solid State Igniter	29522
	Oil Primary Combustion Control 7505B1500	240008816
	Flame Retention Head	1050002
	Low Firing Rate Baffle	25521101
29	Riello Oil Burner 40F3	30426

PARTS LISTING - CHIMNEY VENT MODELS WML - (C2, CRF2) AND WMLV - (C2, CRF2)

Ref. No.	Description	Part No.
30	Blower Assembly, Complete, Direct Drive , 1/2 HP, 4-Speed	30313
30	Blower Assembly, Complete, Direct Drive, 1/2 HP, ECM	109007378
	Blower Housing and Wheel, 100-10T DD	30626
	Blower Motor, 1/2 HP, 4-Speed	102000131
	Blower Motor, 1/2 HP ECM Programmed	109007381
	Motor Mounting Band - TR6884B	17811
	Motor Mount Arms - 10-10 DD Blower (3 per unit)	26251
	Motor Run Capacitor, 10 mfd @ 370 Vac	27743
	Capacitor Strap	27760
31	Auxiliary Limit 60TBOF L140°F (2 per unit)	29198
32	Transformer	240005330
33	Control Panel	30190
34	Wire Harness, Fan timer Board to Transformer	29751
36	Limit Cover, Left	30240
37	Limit Cover, Right	30195
*	Insulation/Limit Disk Retainer (2 per unit)	20602
*	Blocked Vent Safety Switch Kit Complete	30692
*	Blocked Vent Safety Switch - Replacement Switch Only	30660
*	Flue Pipe Elbow for Blocked Vent Safety Switch	30682
*	Flue Pipe Elbow with Vestibule without Safety Switch	30A046501

PARTS LISTING - DIRECT VENT MODELS WML - (CB2U2, CRBU2) AND WMLV - (CB2U2, CRBU2)

Ref. No.	Description	Part No.
All parts as the same as listed on previous pages for Model WML-C and WMLV-C except where noted below.		
13	Flue Connector Assembly 6" to 4" 90° Elbow	240008224
15	Pouch Gasket (Second gasket required for Direct Vent)	2080175
16	Flue Collar Gasket (Second gasket required for Direct Vent)	21994
25	Wire Harness Control Direct Vent	30377
29	Beckett Oil Burner AFII85	30741
	Burner Motor 1/7 HP 3450 RPM PSC	28907
	Beckett Clean-cut Oil Pump A2EA6520	29688
	Solid State Ignitor 10SAY-01	28558
	Oil Primary Combustion Control 7505P1530	
	Air Tube Combination FBX80HGXS	28561
	Flame Retention Head (FB3)	28533
29	Riello Oil Burner 40BF3	30428
*	Appliance Adapter 4" x 3"	240006902
*	Pressure Switch -0.28 WC	30700
*	10 Second Bypass Timer GPS00C9X10 (Use with Beckett AFII)	30699
*	25 Second Bypass Timer GPS00C9X25 (Use with Riello 40BF3)	240005182

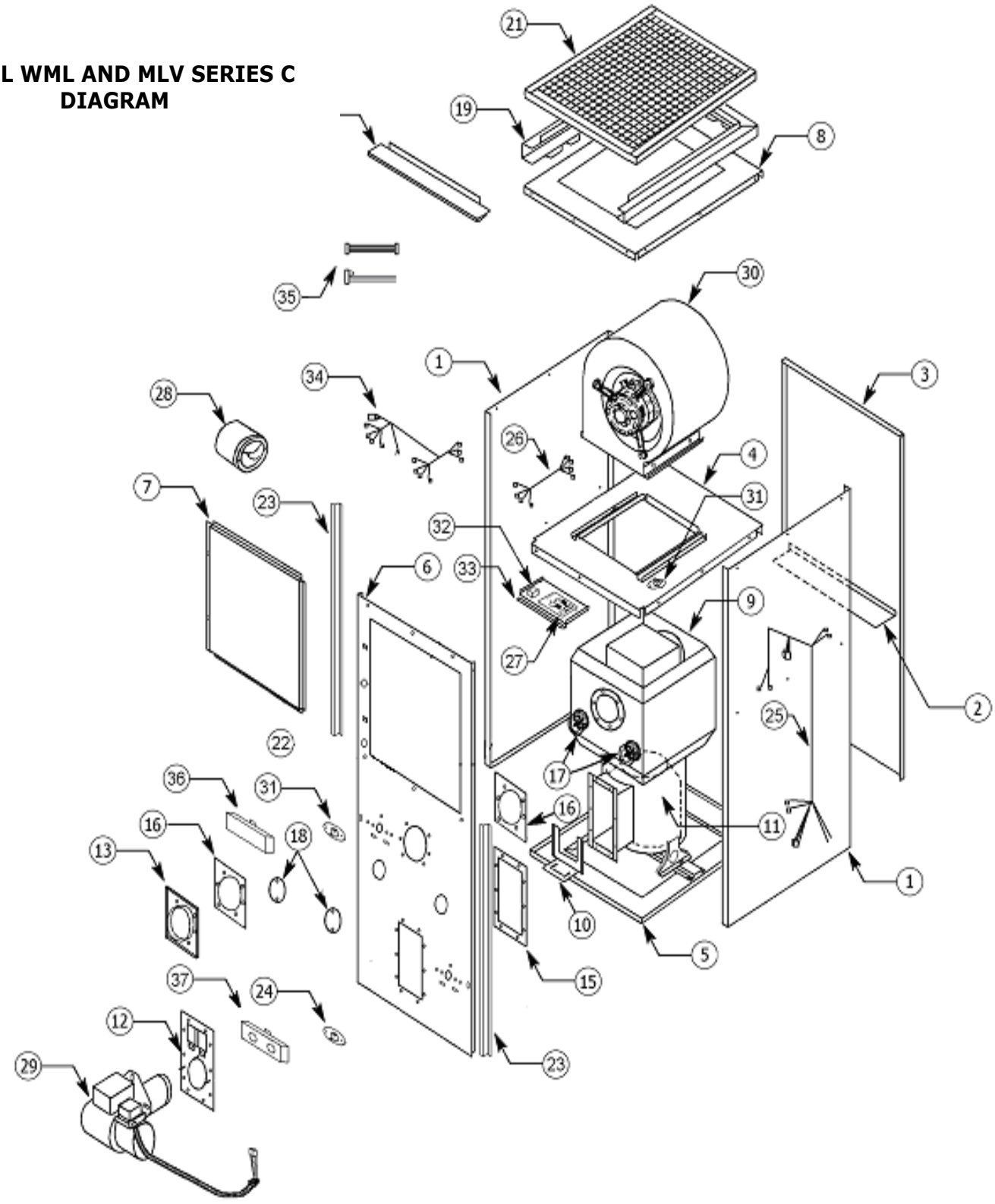
PARTS LISTING - VESTIBULE KIT : WML-C AND WMLV-C

Ref. No.	Description	Part No.
*	Vestibule Kit	30554
*	Door Handle	28673
*	Base Panel	29019
*	Top Panel	30643AD
*	Door Panel	30644AD
*	Left Side Panel	30527AD
*	Right Side Panel	30528AD
* Not Shown		

PARTS LISTING - SUB BASE FOR COMBUSTIBLE FLOOR INSTALLATION: WML-C and WMLV-C

Ref. No.	Description	Part No.
*	Sub Base	06000075
* Not Shown		

MODEL WML AND MLV SERIES C
DIAGRAM



PARTS LISTING - CHIMNEY VENT MODELS MPL - (B2, BRF2)

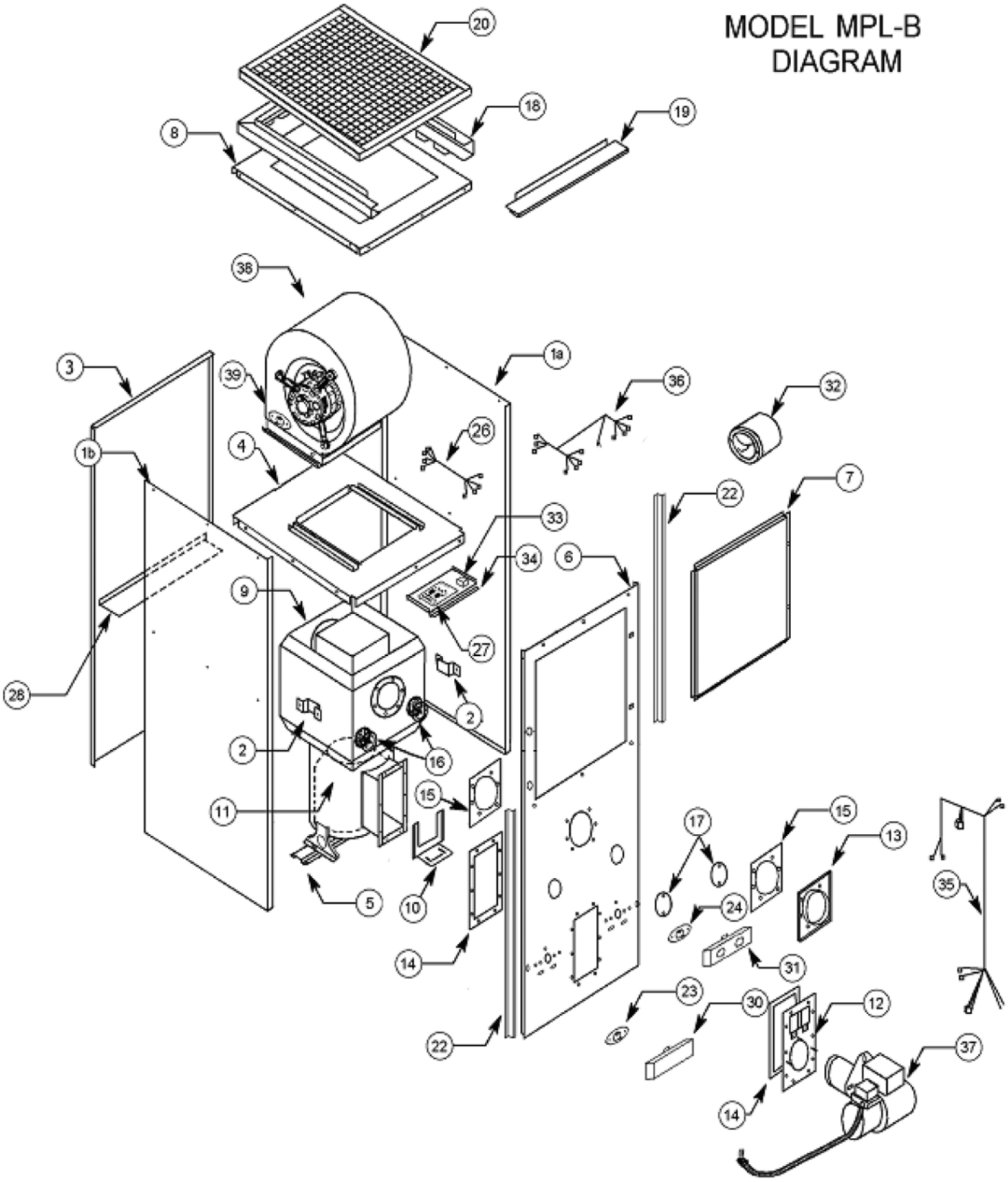
Ref. No.	Description	Part No.
1a	Right Side Panel	30360AD
1b	Left side Panel	30351AD
2	Side Panel Heat Exchanger Support (2 per unit)	27038
3	Rear Panel	30353AD
4	Blower Division Panel Assembly	30397
5	Base Heat Exchanger Support	26975
6	Front Panel	30350AD
7	Blower Access Door	30363AD
	Door Handle - P2-41	28673
	Logo Bezel	28479
	Logo Label	28563
8	End Panel	30352
9	Heat Exchanger Assembly	550001639
10	Firepot Retainer Bracket	27068
11	Replacement Combustion Chamber	27000WP
12	Oil Burner Mounting Plate Assembly	29872
	Sight Glass Cover Plate	29850
	Sight Glass Gasket (2 per unit)	29870
	Sight Glass	29876
13	Flue Connector	28306
14	Pouch Gasket	2080175
15	Flue Pipe Gasket	21994
16	Clean-out Tube Gasket Retainer (2 per unit)	29161
	Clean-out Tube Gasket (2 per unit)	29163
17	Radiator Clean-out Cap (2 per unit)	240007841
	Radiator Clean-out Cap Gasket (2 per unit)	240006333
18	Filter Frame	21260
19	Filter Frame End Support	21306
20	Air Filter - 20 x 20 x 1 (Permanent)	2180032
22	Channel Wire Retainer (2 per unit)	30239
23	Limit Control 60T11BOF L150°F	29197
24	Limit Control 60T11BOF L160°F	29662
26	Wire Harness Blower Direct Drive	30391
27	Fan Timer Control: 1158-120 UTEC	29388
28	Air Baffle	30364
30	Limit Cover, Left	30240
31	Limit Cover, Right	30195
32	Draft Regulator 6"	12240
33	Transformer	240005330
34	Control Panel	30355
35	Wire Harness Burner to Timer Board	30390
36	Wire Harness Transformer to Timer Board	29751
*	Insulation/Limit Disc Retainer (2 per unit)	20602
*	Wire Harness Auxiliary Limit to Timer Board	30502
*	Blocked Vent Safety Switch Kit Complete	30691
*	Blocked Vent Safety Switch - Replacement Only	30660

PARTS LISTING - CHIMNEY VENT MODELS MPL - (B2, BRF2)

Ref. No.	Description	Part No.
	Beckett Oil Burner AF76XNHS	30389
	Burner Motor 1/7HP 3450 RPM PSC	29689
	Beckett Clean-cut Oil Pump A2EA6520	29688
37	Solid State Ingnitor FRANCE 10SAY-04	29522
	Oil Primary Combustion Control 7505B1500	240008816
	Air Tube Combination AF76XN	27610
	Flame Retention Head	1050002
37	Riello Oil Burner 40F5	29569
	Blower Assembly, Complete, Direct Drive, ¾ hp, 4-Speed	30387
	Blower Housing and Wheel, 120-10 DD	30095
	Blower Motor, 3/4 HP, 4-Speed	102000132
38	Motor Mounting Band - TR6884B	17811
	Motor Mount Arms (3 per unit)	240006535
	Motor Run Capacitor, 20 mfd @ 370 Vac	27745
	Blower Side Rail (2 per unit)	29026
39	Auxillary Limit L130°F 60T11 BOF	30388

PARTS LISTING - DIRECT VENT MODELS MPL - BB2U2

Ref. No.	Description	Part No.
All parts as the same as listed on previous pages for Model MPL- B except where noted below.		
13	Flue Connector Assembly 6" to 4" 90° Elbow	240008224
14	Pouch Gasket (Second gasket required for Direct Vent)	2080175
15	Flue Collar Gasket (Second gasket required for Direct Vent)	21994
35	Wire Harness Burner to Timer Board Direct Vent	30402
37	Beckett Oil Burner AFII 150	30742
	Burner Motor 1/7 HP 3450 RPM PSC	28907
	Beckett Clean-cut Oil Pump A2EA6520	29688
	Solid State Ignitor 10SAY-01	28558
	Oil Primary Combustion Control 7505P1530	
	Air Tube Combination FBX80HGXS	28561
	Flame Retention Head (FB3)	28533
*	Appliance Adapter 4" x 4"	240006903
*	Pressure Switch -0.33" WC	30734
*	10 Second Bypass Timer GPS00C9x10 (Use with Beckett AFII)	30699


MODEL MPL-B
DIAGRAM
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NOTES

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