

# **Installation, Operation and Maintenance Manual Oil Fired Warm Air Furnaces**

**BCL BCL-S BFL BML**

**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  
DIFER FROM THIS MANUAL**

**Olsen**  
*Heating & Cooling Products*

**Airco**  
*Heating & Cooling Products*

**ECR International Ltd.  
Olsen Division**

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.

### MODEL BCL 170, 190, 200, & 225

Models BCL 170 to 225 are rear breeched oil fired forced air lowboy furnaces, with output capacity of 170,000 Btu/h to 225,000 Btu/h. They are shipped in two pieces; furnace section and blower section, which are assembled together at the installation site.

### MODEL BCL 80S - BCL 145S

Models BCL-120S and BCL-145S 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 designated with a "U" are Sidewall Vent units only, up to 120,000 Btu/hr. Model Numbers designated with a "T" can accommodate up to 5 tons of air conditioning.

### MODEL BFL 120 - BFL 145

Models BFL 120 and BFL 145 are front breeched oil fired forced air lowboy furnaces, with output capacities ranging from 79,000 Btu/h to 143,000 Btu/h. Models designated with a "U" are Sidewall Vent units only, up to 120,000 Btu/hr. Model Numbers designated with a "T" can accommodate up to 5 tons of air conditioning.

### MODEL BML 80

Model BML 80 is a rear breeched oil fired forced air low boy furnace, with an output capacity range of 61,000 Btu/h to 100,000 Btu/h. Models designated with a "U" are Sidewall Vent units only.

#### **⚠ 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 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, 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 except for BCL 170 to 225 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 the manuals of the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), or by any other method which is suitable for local conditions, provided the results obtained are in substantial agreement with and not less than those obtained using the procedure described in the manual.

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 duct work. 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.

## 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.

**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
* BML model requires six 2½" thick bricks placed under bottom panel when installed on combustible floor.		

## 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 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.

## 7. BAROMETRIC DAMPER CONTROL

This device is used on conventional chimney venting only. This control (or draft regulator) automatically maintains a constant negative pressure in the furnace to obtain maximum efficiency. It ensures that proper pressures are not exceeded. If the chimney does not develop sufficient draft, the draft control cannot function properly. The draft regulator, 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. OPTIONAL SIDEWALL VENTING

BFL and BCL Model furnaces designated with a "U" are Sidewall Vent units and shall be installed with sidewall venting components provided. Please refer to the Direct Sidewall Vent Instructions, Part No. 28888, included with the appropriate Vent Kit for details. Through the wall, (Sidewall Venting or Direct Sidewall Venting) requires the use of specific oil burners; the Beckett AFII, or the Riello BF series. Please refer to Appendix A, Tables A2, and A6.

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 may be rectified by the use of ducted outdoor air for combustion (sealed combustion), using the Beckett AFII or Riello BF Series oil burner.

BCL-80S through BCL-145S and BFL-80 through BFL-145 are approved for use with the Field Controls Co. Models SWGII-5 and PVE-5 power venters. This venting option is not recommended as an equal alternative to chimney venting because the outlet terminal becomes a major point of infiltration between furnace cycles, occasionally resulting in oil odour control problems. The SWG and PVE power venter kits are available through major HVAC supply companies. SWG and PVE technical support is offered by their manufacturer; not by ECR International Ltd. - Olsen Division

## 9. 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.

The **L4064W** temperature sensitive fan switch contains a heater-wrapped bi-metal to actuate the fan switch independent of the temperature at the helical sensing element. The time from ignition, to the blower on function is approximately 30 seconds. If after 1 minute, the blower has not come on, replacement of the control may be necessary. The blower shutdown is the same as noted for the L6064A control.

The limit switch performs a safety function and breaks power to the oil burner primary control, which shuts off the burner if the furnace overheats. The limit control is thermally operated and automatically resets. The limit control is factory installed, pre-set and is not adjustable.

The limit control and fan control are incorporated in the same housing and are operated by the same thermal element.

## 10. ELECTRICAL CONNECTIONS

The furnace is listed by CSA to the North American standard. The furnace 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.

Furnace Power Requirements				
Furnace Model	Volts AC	Amps	Phase Ø	Cycles Hz
BML	120	15	1	60
BCL (S)	120	15	1	60
BFL	120	15	1	60
BCL-170/190	120	15	1	60
BCL-200/225	120	20	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 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 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 (BML-60), install an additional 7 to 10 micron filter as close as possible to the oil burner.

## 14. OIL BURNER NOZZLES

The BML furnace is certified for multiple firing rates, ranging from 61,000 to 100,000 Btu/h. The BCL (S) and BFL models are certified for multiple firing rates, ranging from 80,000 to 145,000 Btu/h. By manipulating the oil burner nozzle, flame retention head, static plate and temperature rise. The BCL 190 model series is certified for multiple firing rates ranging from 170,000 to 225,000 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.

## 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 BCL and BFL 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.

**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.**

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

### **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 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.

### **17. 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.**

### **18. 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.**

### **19. CIRCULATING AIR BLOWER**

The BCL and BFL furnaces are equipped with either direct drive or belt 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; however, a belt drive blower system is the better solution, since motor RPM and CFM delivery is not particularly influenced by system external static pressure.

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 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 as electronic air cleaners and humidifier transformers unless it is certain that only one motor speed will be used.** The unused motor taps auto-generate sufficiently high voltages to damage accessory equipment.

Belt drive blower systems can be modified for a variety of speeds and air delivery by adjusting the variable speed motor pulley, and by changing the blower pulley.

The variable speed motor pulley may be adjusted by loosening the 5/32 Allen set screw in the outer sheave, and turning the outer sheave clockwise to increase blower speed; counter clockwise to reduce blower speed. Ensure that the setscrew is tightened at one of the "flat spots", failure to do so will convert the variable speed pulley to a fixed speed pulley by ruining the threads. The blower speed can be modified by the changing of the blower pulley. A smaller blower pulley will cause the blower to turn faster; a larger pulley will reduce blower speed. Large increases in blower speed may increase power requirements. Check the amperage draw of the blower motor after changes have been made. If the amperage draw is greater than the value listed on the motor rating plate, replace with a motor of higher horsepower.

The fan belt tension is very important. There should be a deflection of  $\frac{3}{4}$  of an inch to 1 inch. Less deflection places a strain on the blower bearings, and increases start up amperage draw. More deflection allows excess slippage and causes premature motor pulley wear. Automotive belt dressings are not recommended. A hard soap such as Sunlight® soap will work well as a

belt dressing, for the purpose of reducing belt squeaks, etc. If used, the soap should be applied to the sides of the belt only.

### **⚠ WARNING**

**THE BELT DRIVE COMPONENTS OPERATE AT HIGH SPEEDS AND CAN EASILY SNAG LOOSE CLOTHING, CAUSING SERIOUS PERSONAL INJURY. THIS PROCEDURE SHOULD BE LEFT TO TRAINED SERVICE PERSONNEL.**

If planning to operate the belt drive blower at speeds above 1100 RPM, it is advisable to replace the cintered bronze blower bearings with roller Bearings. The blower assembly used in the BCL 200 / 225 model is equipped with roller Bearings.

### **⚠ WARNING**

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

## **20. 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-11).

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 wire handle or stout string.

The direct drive blower motor is factory oiled. Under normal operating conditions it does not require oiling for the first two years. Oil sparingly (a few drops) with SAE 20 non-detergent oil. Oiling is most easily done with a "tele-spout" oiler. This oiler has a long flexible plastic spout. **DO NOT OVER-LUBRICATE.** Excess oil causes premature electric motor failure. Belt drive blower motors require the same oiling program.

Inspect the blower fan. Clean if necessary.

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

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

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

## 21. 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, L4064B), or preheats the bi-metallic element (L4064W), the blower should start.
3. Set the thermostat below room temperature. The oil burner should stop.
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 adjustments may be altered. If the air at the room registers is uncomfortably high upon blower start up or shutdown, the fan control settings can be lowered.
5. The adjustments to the fan control settings should be based on the temperature of the air in the supply air trunk, three feet from the unit. 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*, will 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 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, 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.

Belt drive blower systems should be tested in a similar manner. Instead of disconnecting the neutral wire to the motor, temporarily remove the fan belt.

### 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

### BCL(S) / BFL / BML

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

<b>Beckett AF Series Oil Burners</b> (for use with chimney vented units)						
<b>Furnace Model</b>	<b>Burner Model</b>	<b>Nozzle</b>	<b>Pump Pressure</b>	<b>Flow Rate</b>	<b>Head <sup>1</sup></b>	<b>Static Plate</b>
BML 60 <sup>2</sup>	AF76BNHS	0.50 / 80°A	100 PSIG	0.50 USGPH	F3	3- <sup>3</sup> / <sub>8</sub> in.
BML 80	AF76BNHS	0.65 / 80°A	100 PSIG	0.65 USGPH	F3	3- <sup>3</sup> / <sub>8</sub> in.
BML 90	AF76BNHS	0.75 / 80°A	100 PSIG	0.75 USGPH	F3	3- <sup>3</sup> / <sub>8</sub> in.
BML 100	AF76BNHS	0.85 / 70°A	100 PSIG	0.85 USGPH	F3	3- <sup>3</sup> / <sub>8</sub> in.
BCL-80(S)	AF65XN	0.65 / 80°A	100 PSIG	0.65 USGPH	F3	2- <sup>3</sup> / <sub>4</sub> in.
BCL-90(S)	AF65XN	0.75 / 80°A	100 PSIG	0.75 USGPH	F3	2- <sup>3</sup> / <sub>4</sub> in.
BCL-100(S)	AF65XN	0.85 / 80°A	100 PSIG	0.85 USGPH	F3	2- <sup>3</sup> / <sub>4</sub> in.
BCL-120(S)	AF65XN	1.00 / 80°A	100 PSIG	1.00 USGPH	F3	2- <sup>3</sup> / <sub>4</sub> in.
BFL-80	AF65XN	0.65 / 80°A	100 PSIG	0.65 USGPH	F3	2- <sup>3</sup> / <sub>4</sub> in.
BFL-90	AF65XN	0.75 / 80°A	100 PSIG	0.75 USGPH	F3	2- <sup>3</sup> / <sub>4</sub> in.
BFL-100	AF65XN	0.85 / 80°A	100 PSIG	0.85 USGPH	F3	2- <sup>3</sup> / <sub>4</sub> in.
BFL-120	AF65XN	1.00 / 80°A	100 PSIG	1.00 USGPH	F3	2- <sup>3</sup> / <sub>4</sub> in.
BCL-130(S)	AF65YB	1.10 / 70°A	100 PSIG	1.10 USGPH	F6	2- <sup>3</sup> / <sub>4</sub> in.
BCL-145(S)	AF65YB	1.20 / 60°A	100 PSIG	1.20 USGPH	F6	2- <sup>3</sup> / <sub>4</sub> in.
BFL-130	AF65YB	1.10 / 70°A	100 PSIG	1.10 USGPH	F6	2- <sup>3</sup> / <sub>4</sub> in.
BFL-145	AF65YB	1.20 / 60°A	100 PSIG	1.20 USGPH	F6	2- <sup>3</sup> / <sub>4</sub> in.
BCL-170	AF81WF	1.50 / 70°B	100 PSIG	1.50 USGPH	F16	2- <sup>3</sup> / <sub>4</sub> in.
BCL-190	AF81WF	1.65 / 70°B	100 PSIG	1.65 USGPH	F16	2- <sup>3</sup> / <sub>4</sub> in.
BCL-200	AF81WF	1.75 / 70°B	100 PSIG	1.75 USGPH	F16	2- <sup>3</sup> / <sub>4</sub> in.
BCL-225	AF81WF	2.00 / 70°B	100 PSIG	2.00 USGPH	F16	2- <sup>3</sup> / <sub>4</sub> in.

<sup>1</sup> Head shielded by ceramic insulator. <sup>2</sup> Low Firing Rate Baffle required when using 0.50-gallon nozzle.

**Table A-2: Aero HFUS Oil Burner Set-up for BCL 170 - 225**

<b>Aero HFUS Series Oil Burners</b> (for use with chimney vented units)						
<b>Furnace Model</b>	<b>Burner Model</b>	<b>Nozzle</b>	<b>Pump Pressure</b>	<b>Flow Rate</b>	<b>Head</b>	<b>Static Plate</b>
BCL-170	HFUS-4	1.50 / 70°B	100 PSIG	1.50 USGPH	AFC-4	3- <sup>3</sup> / <sub>8</sub> in.
BCL-190	HFUS-4	1.65 / 70°B	100 PSIG	1.65 USGPH	AFC-4	3- <sup>3</sup> / <sub>8</sub> in.
BCL-200	HFUS-4	1.75 / 70°B	100 PSIG	1.75 USGPH	AFC-4	3- <sup>3</sup> / <sub>8</sub> in.
BCL-225	HFUS-4	2.00 / 70°B	100 PSIG	2.00 USGPH	AFC-4	3- <sup>3</sup> / <sub>8</sub> in.

**Table A-3: Beckett AFII Burner Set-up for BCL(S), BFL and BML**

<b>Beckett AFII Series Oil Burners</b>					
(for use with side wall vented units with outdoor combustion air)					
<b>Furnace Model</b>	<b>Burner Model</b>	<b>Nozzle</b>	<b>Pump Pressure</b>	<b>Flow Rate</b>	<b>Head</b>
BML-60 B2U	AFII-85	0.50 / 60°A	145 PSIG	0.60 USGPH	FB0
BML-80 B2U	AFII-85	0.60 / 60°A	145 PSIG	0.65 USGPH	FB0
BML-90 B2U	AFII-85	0.70 / 60°A	145 PSIG	0.75 USGPH	FB3
BML-100 B2U	AFII-85	0.75 / 60°A	145 PSIG	0.85 USGPH	FB3
BCL-80(S) B2U	AFII-85	0.60 / 60°A	145 PSIG	0.65 USGPH	FB3
BCL-90(S) B2U	AFII-85	0.70 / 60°A	145 PSIG	0.75 USGPH	FB3
BCL-100(S) B2U	AFII-150	0.80 / 60°A	145 PSIG	0.85 USGPH	FB3
BCL-120(S) B2U	AFII-150	0.90 / 60°A	145 PSIG	1.00 USGPH	FB3
BFL-80 B2U	AFII-85	0.60 / 60°A	145 PSIG	0.65 USGPH	FB3
BFL-90 B2U	AFII-85	0.70 / 60°A	145 PSIG	0.75 USGPH	FB3
BFL-100 B2U	AFII-150	0.80 / 60°A	145 PSIG	0.85 USGPH	FB3
BFL-120 B2U	AFII-150	0.90 / 60°A	145 PSIG	1.00 USGPH	FB3

**Table A-4: Wayne HSR Oil Burner Set-up for BCL(S) and BFL**

<b>Wayne HSR Series Oil Burners</b>						
(for use with chimney vented units)						
<b>Furnace Model</b>	<b>Burner Model</b>	<b>Nozzle</b>	<b>Pump Pressure</b>	<b>Flow Rate</b>	<b>Head</b>	<b>Off-Cycle Damper Setting</b>
BCL-80(S) W	HSR	0.65 / 80°A	100 PSIG	0.65 USGPH	1	1
BCL-90(S) W	HSR	0.75 / 80°A	100 PSIG	0.75 USGPH	1	1
BCL-100(S) W	HSR	0.85 / 80°A	100 PSIG	0.85 USGPH	1	1
BCL-120(S) W	HSR	1.00 / 80°A	100 PSIG	1.00 USGPH	2	1
BCL-130(S) W	HSR	1.10 / 70°A	100 PSIG	1.10 USGPH	2	2
BCL-145(S) W	HSR	1.20 / 60°A	100 PSIG	1.20 USGPH	2	2
BFL-80(S) W	HSR	0.65 / 80°A	100 PSIG	0.65 USGPH	1	1
BFL-90(S) W	HSR	0.75 / 80°A	100 PSIG	0.75 USGPH	1	1
BFL-100(S) W	HSR	0.85 / 80°A	100 PSIG	0.85 USGPH	1	1
BFL-120(S) W	HSR	1.00 / 80°A	100 PSIG	1.00 USGPH	2	1
BFL-130(S) W	HSR	1.10 / 70°A	100 PSIG	1.10 USGPH	2	2
BFL-145(S) W	HSR	1.20 / 60°A	100 PSIG	1.20 USGPH	2	2

**Table A-5: Riello 40F Oil Burner Set-up for BCL(S) and BFL**

<b>Riello 40F Series Oil Burners</b> (for use with chimney vented units)						
<b>Furnace Model</b>	<b>Burner Model</b>	<b>Nozzle</b>	<b>Pump Pressure</b>	<b>Flow Rate</b>	<b>Air Gate</b>	<b>Turbulator Setting</b>
BCL-80(S) RF	40F 3	0.60 / 60°W	120 PSIG	0.65 USGPH	2.9	0.5
BCL-90(S) RF	40F 3	0.65 / 60°W	135 PSIG	0.75 USGPH	3.5	1.0
BCL-100(S) RF	40F 3	0.75 / 60°W	130 PSIG	0.85 USGPH	4.3	0.0
BCL-120(S) RF	40F 5	0.85 / 60°W	140 PSIG	1.00 USGPH	4.1	1.5
BCL-130(S) RF	40F 5	1.00 / 60°W	145 PSIG	1.10 USGPH	4.3	2.0
BCL-145(S) RF	40F 5	1.10 / 60°W	120 PSIG	1.20 USGPH	5.9	2.5
BFL-80 RF	40F 3	0.60 / 60°W	120 PSIG	0.65 USGPH	2.9	0.5
BFL-90 RF	40F 3	0.65 / 60°W	135 PSIG	0.75 USGPH	3.5	1.0
BFL-100 RF	40F 3	0.75 / 60°W	130 PSIG	0.85 USGPH	4.3	0.0
BFL-120 RF	40F 5	0.85 / 60°W	140 PSIG	1.00 USGPH	4.1	1.5
BFL-130 RF	40F 5	1.00 / 60°W	145 PSIG	1.10 USGPH	4.3	2.0
BFL-145 RF	40F 5	1.10 / 60°W	120 PSIG	1.20 USGPH	5.9	2.5

**Table A-6: Riello R35 Oil Burner Set-up for BCL(S) and BFL**

<b>Riello R35 Series Oil Burners</b> (for use with chimney vented units)						
<b>Furnace Model</b>	<b>Burner Model</b>	<b>Nozzle</b>	<b>Pump Pressure</b>	<b>Flow Rate</b>	<b>Air Gate</b>	<b>Turbulator Setting</b>
BCL-80(S) RR	R35-3	0.60 / 60°W	150 PSIG	0.65 USGPH	1.5	0.5
BCL-90(S) RR	R35-3	0.65 / 60°W	145 PSIG	0.75 USGPH	1.5	1.0
BCL-100(S) RR	R35-3	0.75 / 60°W	155 PSIG	0.85 USGPH	2.0	0.0
BCL-120(S) RR	R35-5	0.85 / 60°W	140 PSIG	1.00 USGPH	3.5	1.5
BCL-130(S) RR	R35-5	1.00 / 60°W	135 PSIG	1.10 USGPH	3.5	2.0
BCL-145(S) RR	R35-5	1.10 / 60°W	150 PSIG	1.20 USGPH	3.5	2.5
BFL-80 RR	R35-3	0.60 / 60°W	150 PSIG	0.65 USGPH	1.5	0.5
BFL-90 RR	R35-3	0.65 / 60°W	145 PSIG	0.75 USGPH	1.5	1.0
BFL-100 RR	R35-3	0.75 / 60°W	155 PSIG	0.85 USGPH	2.0	0.0
BFL-120 RR	R35-5	0.85 / 60°W	140 PSIG	1.00 USGPH	3.5	1.5
BFL-130 RR	R35-5	1.00 / 60°W	135 PSIG	1.10 USGPH	3.5	2.0
BFL-145 RR	R35-5	1.10 / 60°W	150 PSIG	1.20 USGPH	3.5	2.5

**Table A-7: Riello 40BF Oil Burner Set-Up for BCL(S), BFL & BML**

<b>Riello Balanced Flue Series Oil Burners</b> (for use with sidewall vented units using outdoor combustion air)					
Furnace Model	Burner Model	Nozzle	Pump Pressure	Flow Rate	Turbulator Setting
BML-60 RBU	40BF-3	0.50 / 60°W	120 PSIG	0.60 USGPH	1.0
BML 80 RBU	40BF-3	0.60 / 60°W	120 PSIG	0.65 USGPH	1.5
BML-90 RBU	40BF-3	0.70 / 60°W	135 PSIG	0.75 USGPH	2.0
BCL-80(S) RBU	40BF-3	0.60 / 60°W	120 PSIG	0.65 USGPH	0.5
BCL-90(S) RBU	40BF-3	0.65 / 60°W	135 PSIG	0.75 USGPH	1.0
BCL-100(S) RBU	40BF-3	0.75 / 60°W	130 PSIG	0.85 USGPH	0.0
BCL-120(S) RBU	40BF-5	0.85 / 60°W	140 PSIG	1.00 USGPH	1.5
BFL-80 RBU	40BF-3	0.60 / 60°W	120 PSIG	0.65 USGPH	0.5
BFL-90 RBU	40BF-3	0.65 / 60°W	135 PSIG	0.75 USGPH	1.0
BFL-100 RBU	40BF-3	0.75 / 60°W	130 PSIG	0.85 USGPH	0.0
BFL-120 RBU	40BF-5	0.85 / 60°W	140 PSIG	1.00 USGPH	1.5

## A.1 OIL BURNER AIR ADJUSTMENT

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

### Beckett AF Burner

Adjust the air shutter by loosening the lock screws and moving the air shutter, and if necessary, the bulk air band.

### Aero HFUS Burner

Adjust the air band by loosening the lock screw and moving the air band.

### Beckett AFII Burner

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

### Riello 40 Series (Chimney Vented)

Riello burners are factory set with respect to pump pressure, air gate and turbulator adjustments, each model and firing rate must be adjusted accordingly, see Appendix A, Tables A-4 to A-6. The combustion air can be adjusted by first removing the burner cover and loosening the fixing screws that secures the air adjustment plate. Move the adjusting plate to either increase or

decrease combustion air. When the proper air setting is achieved, retighten the fixing screws.

### Riello R35 Series

Riello burners are factory set with respect to pump pressure, air gate and turbulator adjustments, each model and firing rate must be adjusted accordingly, see Appendix A, Tables A-4 to A-6.

### Riello Balanced Flue (BF) Series

Riello burners are factory set with respect to pump pressure, air gate and turbulator adjustments, each model and firing rate must be adjusted accordingly, see Appendix A, Tables A-4 to A-6. The combustion air can be adjusted with the burner cover on by first removing the plastic cover on the top right hand side of the burner cover. With a Philips head screw driver, turn the adjustment screw clockwise to increase combustion air or counter-clockwise to decrease combustion air. When the combustion air is set, re-insert the plastic cover.

### Wayne HSR Burner

Adjust the burner air supply by loosening the screw on the indicator located near the bottom left side of the burner. Turn clockwise to increase or counter clockwise to decrease the amount of air required for combustion. Tighten the screw after finishing with adjustments.

## 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 Burner Manufacturers Instructions for details.

## 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 venting 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.**

## A.4 SPECIAL INSTRUCTIONS FOR UNITS EQUIPPED WITH RIELLO BURNERS

Riello burners are factory set with respect to pump pressure, air gate and turbulator adjustments, each model and firing rate must be adjusted accordingly, see Appendix A, Tables A-4 to A-6. Consult the Riello Installation Instructions supplied with the furnace documents envelope for specific information concerning burner adjustments, operation, and trouble-shooting.



**Table A-8: Direct Drive Blower Set-Up**

Furnace Model	Blower	Blower Set-Up				Cooling Capacity		
		0.20 in. w.c.		0.50 in. w.c.		Tons	Motor	CFM Range
		Speed	Motor	Speed	Motor			
BML-60, (U)	GT10S DD	Low	1/2 HP	Med-Low	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BML-80, (U)	GT10S DD	Med-Low	1/2 HP	Med-Low	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BML-90, (U)	GT10S DD	Med-Low	1/2 HP	Med-High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BML-100, (U)	GT10S DD	Med-High	1/2 HP	Med-High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BCL-80(S), (U)	G10 DD DD10-10A	Med-Low	1/2 HP	Med-Low	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BCL-80(S), (U), (T)	DD12-11T DCT12-11	Low	1 HP	Low	1 HP	3 - 5	1 HP	1300 - 2000
BCL-90(S), (U)	G10 DD DD10-10A	Med-High	1/2 HP	Med-High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BCL-90(S), (U), (T)	DD12-11T DCT12-11	Low	1 HP	Low	1 HP	3 - 5	1 HP	1300 - 2000
BCL-100(S), (U)	G10 DD DD10-10A	Med-High	1/2 HP	Med-High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BCL-100(S), (U), (T)	DD12-11T DCT12-11	Low	1 HP	Low	1 HP	3 - 5	1 HP	1300 - 2000
BCL-120(S), (U)	G10 DD DD10-10A	High	1/2 HP	High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BCL-120(S), (U), (T)	DD12-11T DCT12-11	Medium	1 HP	Medium	1 HP	3 - 5	1 HP	1300 - 2000
BCL-130(S),	G10 DD DD10-10A	High	1/2 HP	High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BCL-130(S), (T)	DD12-11T DCT12-11	Medium	1 HP	Medium	1 HP	3 - 5	1 HP	1300 - 2000
BCL-145(S),	G10 DD DD10-10A	High	1/2 HP	High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BCL-145(S), (T)	DD12-11T DCT12-11	High	1 HP	High	1 HP	3 - 5	1 HP	1300 - 2000

**Table A-8: Direct Drive Blower Set-Up** continued

Furnace Model	Blower	Blower Set-Up				Cooling Capacity		
		0.20 in. w.c.		0.50 in. w.c.		Tons	Motor	CFM Range
		Speed	Motor	Speed	Motor			
BFL-80, (U)	G10 DD DD10-10A	Med-Low	1/2 HP	Med-Low	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BFL-80, (U), (T)	DD12-11T DCT12-11	Low	1 HP	Low	1 HP	3 - 5	1 HP	1300 - 2000
BFL-90, (U)	G10 DD DD10-10A	Med-High	1/2 HP	Med-High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BFL-90, (U), (T)	DD12-11T DCT12-11	Low	1 HP	Low	1 HP	3 - 5	1 HP	1300 - 2000
BFL-100, (U)	G10 DD DD10-10A	Med-High	1/2 HP	Med-High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BFL-100, (U), (T)	DD12-11T DCT12-11	Low	1 HP	Low	1 HP	3 - 5	1 HP	1300 - 2000
BFL-120, (U)	G10 DD DD10-10A	High	1/2 HP	High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BFL-120, (U), (T)	DD12-11T DCT12-11	Medium	1 HP	Medium	1 HP	3 - 5	1 HP	1300 - 2000
BFL-130	G10 DD DD10-10A	High	1/2 HP	High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BFL-130, (T)	DD12-11T DCT12-11	Medium	1 HP	Medium	1 HP	3 - 5	1 HP	1300 - 2000
BFL-145	G10 DD DD10-10A	High	1/2 HP	High	1/2 HP	3 – 4	1/2 HP	1000 – 1600
BFL-145, (T)	DD12-11T DCT12-11	High	1 HP	High	1 HP	3 - 5	1 HP	1300 - 2000

NOTE - Model Suffix Denotations: S: BCL with “S” series Heat Exchanger, T: High Air Flow Model (5 Ton), U: Sidewall Vented Model

**Table A-9: Belt Drive Blower Set-Up**

Furnace Model	Blower	Blower Set-Up								Cooling Capacity		
		0.20 in. w.c.				0.50 in. w.c.				Tons	Motor	CFM Range
		Pulley		Belt	Motor	Pulley		Belt	Motor			
		Motor	Blower			Motor	Blower					
BML-60, (U)	GT10 BCT1020-1020-5	3¼ x ½ 4 T.O.	7 x ¾	4L380	1/2 HP	3¼ x ½	6 x ¾	4L370	1/2 HP	2 - 4	1/2 HP	800 - 1600
BML-80, (U)	GT10 BCT1020-1020-5	3¼ x ½ 2 T.O.	7 x ¾	4L380	1/2 HP	3¼ x ½	6 x ¾	4L370	1/2 HP	2 - 4	1/2 HP	800 – 1600
BML-90, (U)	GT10 BCT1020-1020-5	3¼ x ½ 0 T.O.	7 x ¾	4L380	1/2 HP	3¼ x ½	6 x ¾	4L360	1/2 HP	2 - 4	1/2 HP	800 – 1600
BML-100, (U)	GT10 BCT1020-1020-5	3¼ x ½ 6 T.O.	6 x ¾	4L370	1/2 HP	3¼ x ½	5 x ¾	4L350	1/2 HP	2 - 4	1/2 HP	800 - 1600
BCL-80(S), (U)	10-10A	3¼ x ½	7 x ¾	4L420	1/2 HP	3¼ x ½	6 x ¾	4L410	1/2 HP	3 - 4	1/2 HP	1000 - 1600
	G10	3½ x ½										
BCL-90(S), (U)	10-10A	3¼ x ½	7 x ¾	4L420	1/2 HP	3¼ x ½	6 x ¾	4L410	1/2 HP	3 – 4	1/2 HP	1000 – 1600
	G10	3½ x ½										
BCL-100(S), (U)	10-10A	3¼ x ½	7 x ¾	4L420	1/2 HP	3¼ x ½	6 x ¾	4L410	1/2 HP	3 – 4	1/2 HP	1000 – 1600
	G10	3½ x ½										
BCL-120(S), (U)	10-10A	3¼ x ½	7 x ¾	4L420	1/2 HP	3¼ x ½	6 x ¾	4L410	1/2 HP	3 - 4	1/2 HP	1000 - 1600
	G10	3½ x ½										

continued on next page

**Table A-9: Belt Drive Blower Set-Up** continued

Furnace Model	Blower	Blower Set-Up								Cooling Capacity		
		0.20 in. w.c.				0.50 in. w.c.				Tons	Motor	CFM Range
		Pulley		Belt	Motor	Pulley		Belt	Motor			
		Motor	Blower			Motor	Blower					
BCL-130(S)	10-10A	3¼ x ½	6 x ¾	4L410	1/2 HP	3¼ x ½	5 x ¾	4L390	1/2 HP	3 - 4	1/2 HP	1000 - 1600
	G10	3½ x ½										
BCL-145(S)	10-10A	3¼ x ½	6 x ¾	4L410	1/2 HP	3¼ x ½	5 x ¾	4L390	1/2 HP	3 - 4	1/2 HP	1000 - 1600
	G10	3½ x ½										
BCL-170	G12	3½ x ⅝	7 x ¾	4L430	3/4 HP	3½ x ⅝	7 x ¾	4L430	3/4 HP	3 – 4	3/4 HP	1300 – 1550
BCL-190	G12	3½ x ⅝	7 x ¾	4L430	3/4 HP	3½ x ⅝	7 x ¾	4L430	3/4 HP	3 – 4	3/4 HP	1300 – 1550
BCL-200	G12	3½ x ⅝	6 x ¾	4L410	1 HP	3½ x ⅝	6 x ¾	4L410	1 HP	3 – 5	1 HP	1600 – 2200
BCL-225	G12	3½ x ⅝	6 x ¾	4L410	1 HP	3½ x ⅝	6 x ¾	4L410	1 HP	3 – 5	1 HP	1600 - 2200
BFL-80, (U)	10-10A	3¼ x ½	7 x ¾	4L420	1/2 HP	3¼ x ½	6 x ¾	4L410	1/2 HP	3 - 4	1/2 HP	1000 - 1600
	G10	3½ x ½										
BFL-90, (U)	10-10A	3¼ x ½	7 x ¾	4L420	1/2 HP	3¼ x ½	6 x ¾	4L410	1/2 HP	3 – 4	1/2 HP	1000 – 1600
	G10	3½ x ½										
BFL-100, (U)	10-10A	3¼ x ½	7 x ¾	4L420	1/2 HP	3¼ x ½	6 x ¾	4L410	1/2 HP	3 – 4	1/2 HP	1000 – 1600
	G10	3½ x ½										
BFL-120, (U)	10-10A	3¼ x ½	7 x ¾	4L420	1/2 HP	3¼ x ½	6 x ¾	4L410	1/2 HP	3 - 4	1/2 HP	1000 - 1600
	G10	3½ x ½										
BFL-130	10-10A	3¼ x ½	6 x ¾	4L410	1/2 HP	3¼ x ½	5 x ¾	4L390	1/2 HP	3 - 4	1/2 HP	1000 - 1600
	G10	3½ x ½										
BFL-145	10-10A	3¼ x ½	6 x ¾	4L410	1/2 HP	3¼ x ½	5 x ¾	4L390	1/2 HP	3 - 4	1/2 HP	1000 - 1600
	G-10	3½ x ½										

NOTE - Model Suffix Denotations: S: BCL with “S” series Heat Exchanger, T: High Air Flow Model (5 Ton), U: Sidewall Vented Model

**Table A-10: Recommended Minimum Installation Clearances (Inches)**

Furnace Model	Plenum Top	Front	Rear	Side 1	Side 2 <sup>3</sup>	Flue Pipe	Floor	Enclosure
BML-60, 80, 90, 100 (U)	3	24	24	6	18	9	Combustible <sup>1, 2</sup>	Standard
BCL(S)-80, 90, 100, 120, 130, 145	3	24	24	6	18	9	Combustible <sup>1</sup>	Standard
BCL-170, 190, 200, 225	3	24	24	6	18	9	Combustible <sup>1</sup>	Standard
BFL-80, 90, 100, 120, 130, 145	3	24	24	6	18	9	Combustible <sup>1</sup>	Standard

<sup>1</sup> Wood Floor Only, do not install on carpeted floor, tiled floor, etc.  
<sup>2</sup> Use six 2-½ inch bricks under bottom panel if installing on wood floor.  
<sup>3</sup> 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-11: General Dimensions (Inches)**

Furnace Model	Cabinet			Plenum Openings			Flue		Filter		Shipping Weight
	Width	Depth	Height	Supply	Gap	Return	Diameter	Height	Type	Size	
BML 60 – 100	22	43	31	20½ x 18⅝	2½	20½ x 18⅝	5	29	Permanent	20 x 20 x 1	210
BCL 80 – 145	22	51½	41	20½ x 18⅝	2½	20½ x 18⅝	6	37¼	Permanent	20 x 25 x 1	280
BCL 170 – 225	26	49	56	24 x 22	2½	24 x 22	7	47	Permanent	20 x 25 x 1 (2)	390
BFL 80 - 145	22	51½	41	20½ x 18⅝	2½	20½ x 18⅝	6	38¼	Permanent	20 x 25 x 1	250

**Table A-12: Airflow Characteristics – Direct Drive**

Furnace Model	Motor HP	Blower	$\Delta T$	Motor FLA	Speed	CFM					
						External Static Pressure – Inches w.c.					
						0.20	0.25	0.30	0.40	0.50	0.60
BML 60 - 100	1/2 HP	G10S DD	85°F	7.0	High	1826	1792	1758	1669	1536	1413
					Med-High	1595	1576	1556	1497	1391	1278
					Med-Low	1072	1058	1043	1042	1037	997
					Low	714	713	711	687	662	625
BCL(S) BFL 80 – 145	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
BCL(S) BFL 80 – 145 (T)	1 HP	DCT1220-1104-5	85°F	12.3 14.0 MAX	High	2188	2161	2133	2069	2016	1933
					Medium	1742	1730	1718	1702	1670	1604
					Low	1410	1410	1410	1390	1374	1326

**Table A-13: Airflow Characteristics – Belt Drive**

Furnace Model	Motor HP	Motor FLA	$\Delta T$	Blower	Blower Pulley	Motor Pulley Turns Out	CFM					
							External Static Pressure – Inches w.c.					
							0.20	0.25	0.30	0.40	0.50	0.60
BML 60 - 100	1/2 HP	7.8	85°F	GT10S	7 x ¾	0	1528	1411	1293	976	534	---
						1	1411	1270	1128	763	281	---
						2	1262	1099	935	229	---	---
						3	1262	1099	935	229	---	---

Continued on next page.

**Table A-13: Airflow Characteristics – Belt Drive** continued

Furnace Model	Motor HP	Motor FLA	$\Delta T$	Blower	Blower Pulley	Motor Pulley Turns Out	CFM					
							External Static Pressure – Inches w.c.					
							0.20	0.25	0.30	0.40	0.50	0.60
BML 60 - 100	1/2 HP	7.8	85°F	GT10S	6 x $\frac{3}{4}$	0	1775	1704	1633	1455	1278	1042
						1	1651	1574	1497	1278	1099	851
						2	1505	1414	1323	1113	883	714
						3	1364	1268	1172	928	634	365
BML 60 - 100	1/2 HP	7.8	85°F	GT10S	5 x $\frac{3}{4}$	0	2030	2008	1985	1876	1778	1637
						1	2073	2006	1939	1795	1656	1464
						2	1939	1867	1795	1638	1464	1244
						3	1828	1733	1638	1444	1220	912
BCL(S) 80 – 120 BFL 80 – 120	1/3 HP	5.4	85°F	G10	7 x $\frac{3}{4}$	0	1425	1355	1280	1125	905	516
						2	1280	1200	1125	915	555	256
						4	1115	1020	905	530	225	11
						6	920	800	645	190	---	---
BCL(S) 80 – 145 BFL 80 – 145	1/2 HP	7.8	85°F	G10	6 x $\frac{3}{4}$	0	1535	1475	1410	1250	1065	845
						2	1440	1370	1295	1090	880	472
						4	1320	1250	1170	970	625	319
						6	1225	1140	1040	835	435	132
BCL(S) 80 – 145 BFL 80 – 145	3/4 HP	10.4	85°F	G10	5 x $\frac{3}{4}$	0	1770	1725	1670	1560	1435	1288
						2	1580	1525	1450	1305	1155	959
						4	1380	1315	1245	1055	825	460
						6	1205	1125	1020	775	365	71

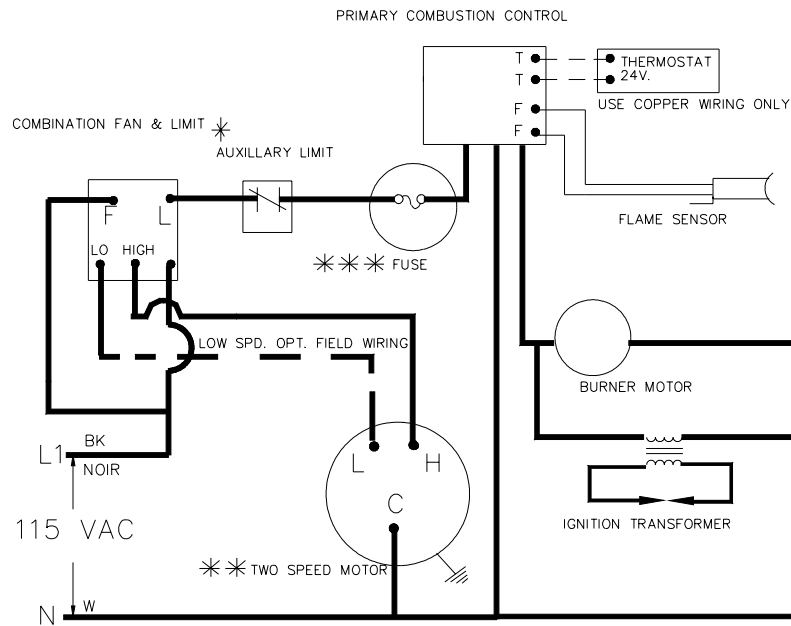
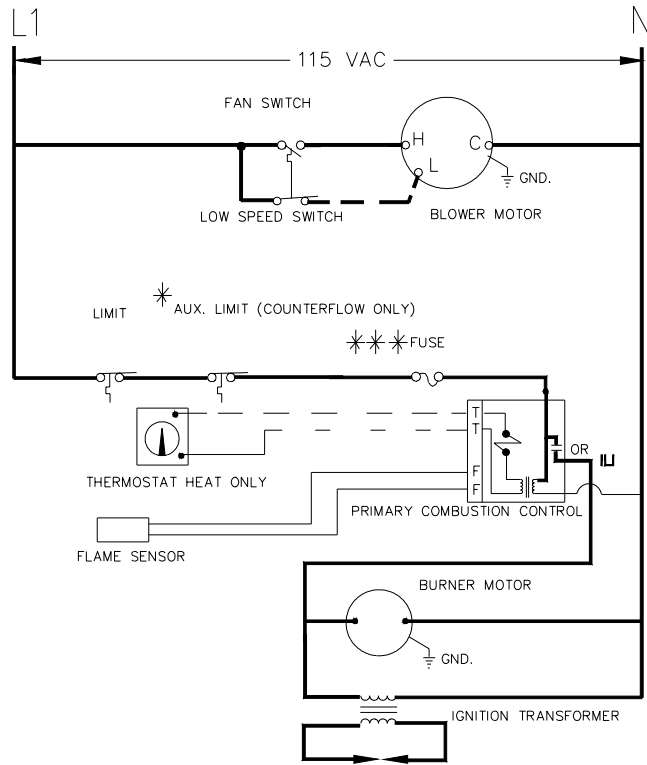
Continued on next page.

**Table A-13: Airflow Characteristics – Belt Drive** continued

Furnace Model	Motor HP	Motor FLA	$\Delta T$	Blower	Blower Pulley	Motor Pulley Turns Out	CFM					
							External Static Pressure – Inches w.c.					
							0.20	0.25	0.30	0.40	0.50	0.60
BCL 170 – 190	3/4 HP	13.0	85°F	G12	7 x ¾	0	2274	2177	2080	1847	1532	1099
						2	2107	2017	1927	1712	1420	1019
						4	1939	1857	1775	1576	1308	939
						6	1772	1697	1622	1441	1196	859
BCL 200 - 225	1 HP	14.0	85°F	G12	6 x ¾	2	2601	2525	2449	2334	2164	2007
						3	2549	2474	2399	2288	2120	1967
						4	2497	2424	2350	2241	2077	1927
						5	2444	2373	2301	2194	2034	1887



## WIRING DIAGRAM – OIL FIRED WARM AIR FURNACE



— — — — — FIELD WIRING LOW VOLTAGE  
 - - - - - FIELD WIRING HIGH VOLTAGE  
 — — — — — FACTORY WIRING LOW VOLTAGE  
 — — — — — FACTORY WIRING HIGH VOLTAGE

IF WIRING IS REPLACED, THE SAME SIZE AND TYPE AS ORIGINALLY SUPPLIED ON FURNACE SHOULD BE USED.

\* THE AUXILLARY LIMIT IS SUPPLIED ON THE DOWNFLOW WTL UNITS ONLY.

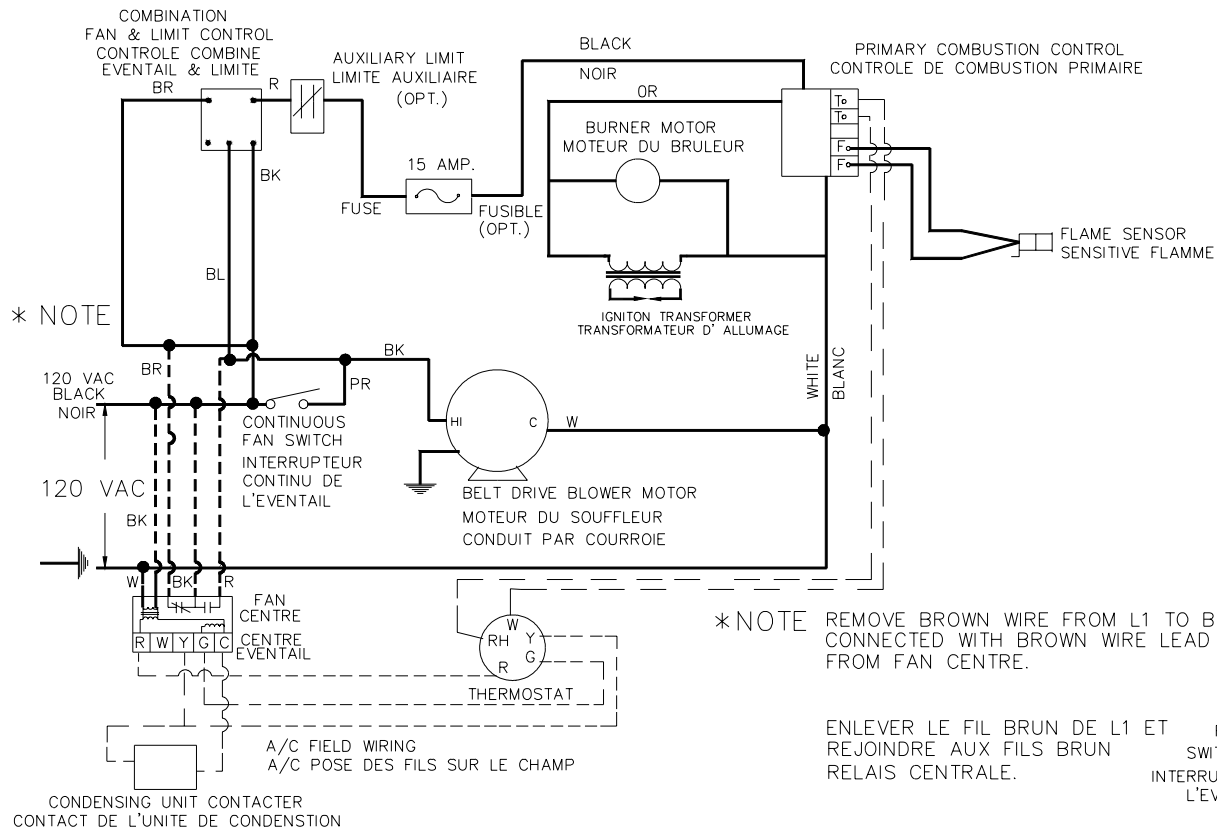
\* \* TWO SPEED IS OPTIONAL.

\* \* \* A FUSE LINK IS PROVIDED FOR THE BURNER CIRCUIT ON ALL UNITS WHERE THE AMP DRAW EXCEEDS 12A.

**Appendix B**  
Wiring Diagrams

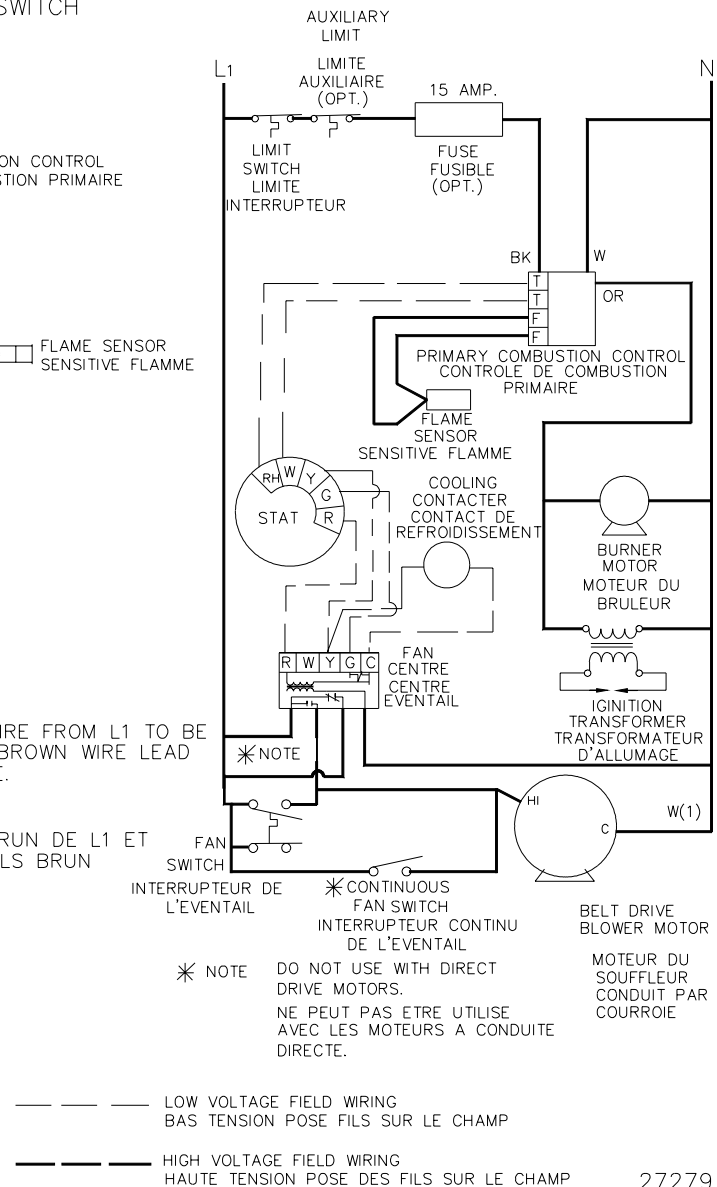
17514 R1

WIRING DIAGRAM – OIL FIRED WARM AIR FURNACE WITH CONTINUOUS FAN SWITCH  
 DIAGRAMME DE LA POSE DES FILS FOURNAISE A L'HUILE A AIR CHAUD  
 AVEC INTERRUPTEUR CONTINU DE L'EVENTAIL



IF WIRING IS REPLACED, THE SAME SIZE AND TYPE AS ORIGINALLY SUPPLIED ON FURNACE SHOULD BE USED.  
 SI LES FILS DOIVENT ETRE REMPLACES, DES FILS DE MEME TYPE ET GROS SEUR QUE CEUX SUR LA FOURNAISE DEVRONT ETRE UTILISES.

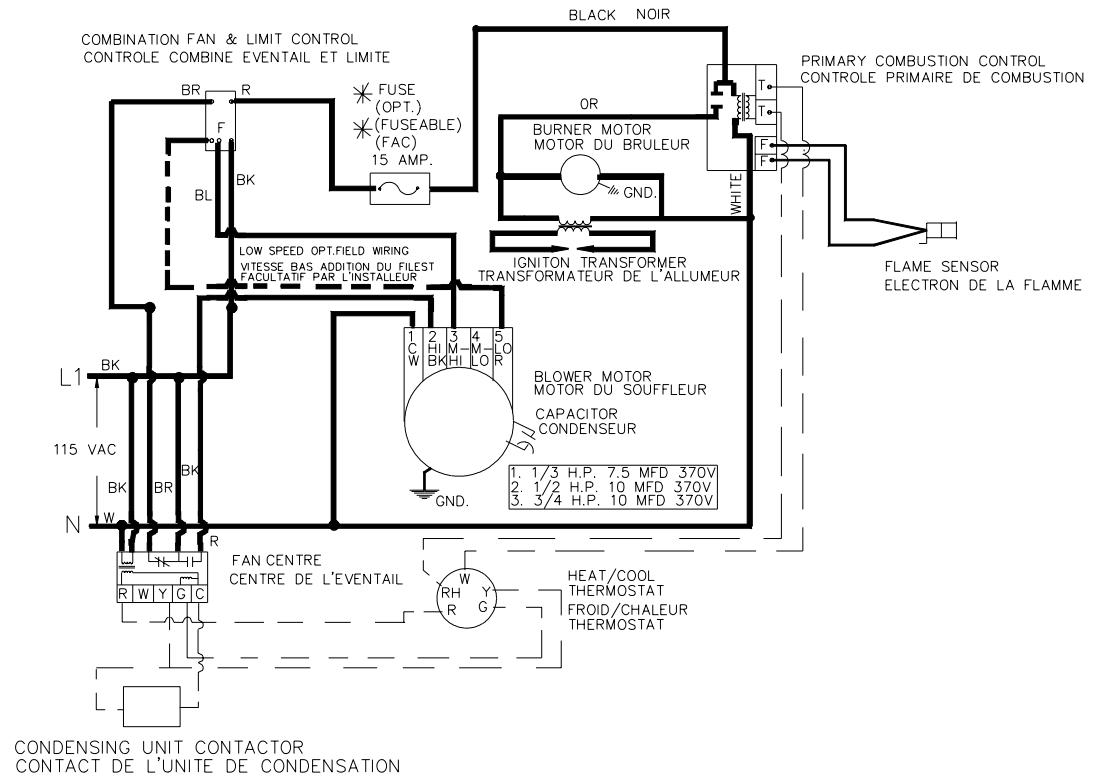
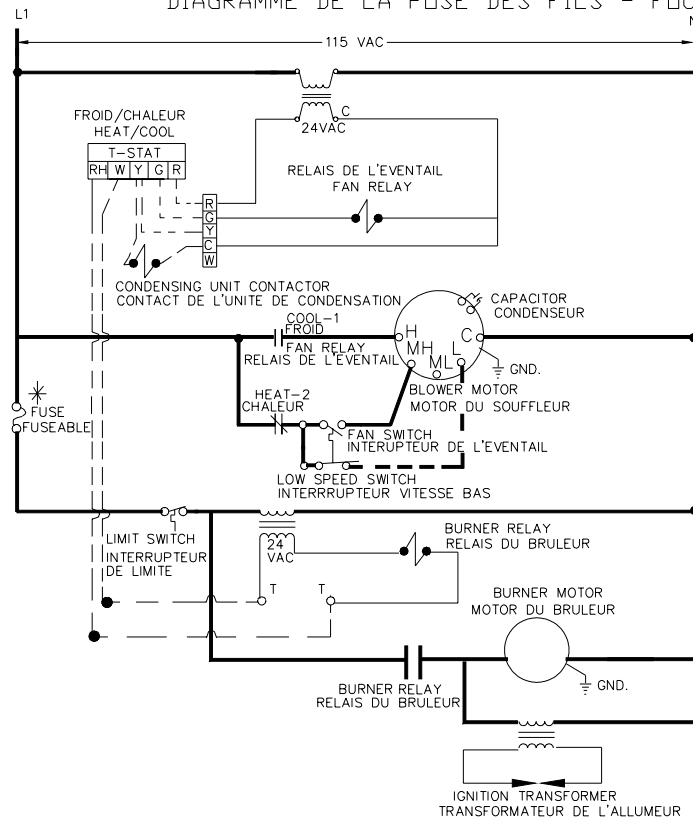
Electrical rating is 120V. 60Hz, 12A. for BCL & BFL 80S, 90S, 100S, 120S  
 Le taux el electric est de 120V. 60Hz, 12A. pour BCL & BFL 80S, 90S 100S, 120S  
 Electrical rating is 120V, 60Hz, 16A. for BCL & BFL 130, 145S  
 Le taux electrique est de 120V. 60Hz, 12A. pour BCL & BFL 130S, 145S



27279

# WIRING DIAGRAM - OIL FIRED WARM AIR FURNACE DIRECT DRIVE A/C READY

## DIAGRAMME DE LA POSE DES FILS - FOURNAISE A AIR CHAUD A L'HUILE A CONDUITE DIRECTE ET POUR L'AIR CLIMATISE



IF WIRING IS REPLACED, THE SAME SIZE AND TYPE AS ORIGINALLY SUPPLIED ON FURNACE SHOULD BE USED.

SI DES FILS DOIVENT ETRE REMPLACES, LA MEME GROSSEUR ET LE MEME TYPE QUE CEUX ORIGINALEMENT POSES SUR LA FOURNAISE DEVRONT ETRE UTILISES.

\* A FUSE LINK IS PROVIDED FOR THE BURNER CIRCUIT ON ALL UNITS. WHERE THE TOTAL AMP DRAW EXCEEDS 12A.

\* UN FUSIBLE ANNEAU EST SUR LE CIRCUIT DU BRULEUR DE TOUTES LES UNITES DONT LE TIRAGE TOTAL D'AMPERE DEPASSE 12A.

NOTE: Electrical rating is 120V. 60Hz, 12A. FOR BCL 80S, 90S, 100S, 120S, HTL-80C, 90C, 100C

NOTE: le taux électrique est de 120V. 60Hz. 12A. pour BCL 80S, 90S, 100S, 120S HTL-80C, 90C, 100C

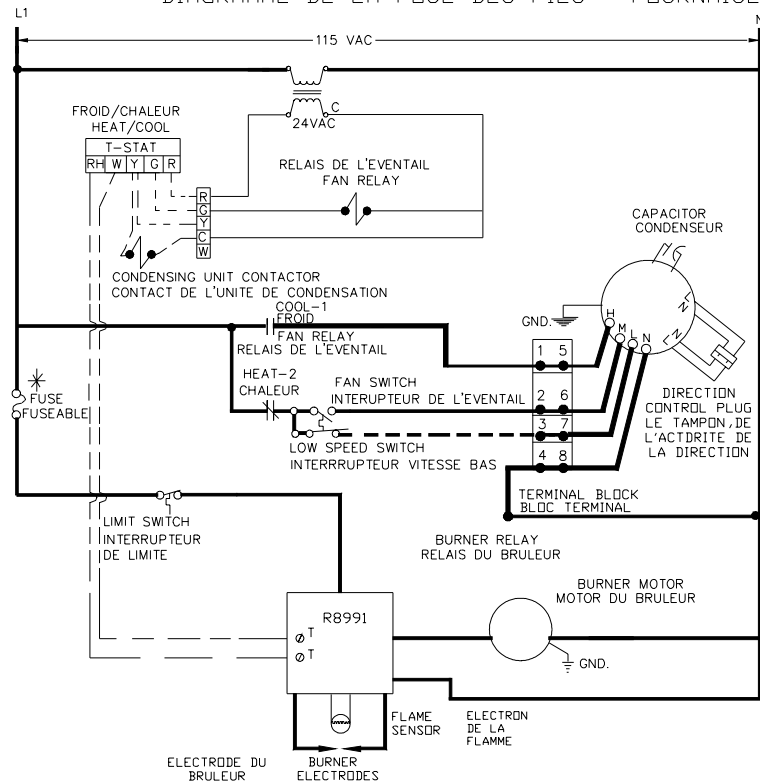
Electrical rating is 120V. 60Hz, 16A. FOR BCL 130S, 145S

le taux électrique est de 120V. 60Hz. 16A. pour BCL 130S, 145S

--- FIELD WIRING LOW VOLTAGE  
FABRIQUE BAS TENSION  
--- FIELD WIRING HIGH VOLTAGE  
FABRIQUE HAUTE TENSION  
--- FACTORY WIRING LOW VOLTAGE  
SUR LE CHAMP BAS TENSION  
--- FACTORY WIRING HIGH VOLTAGE  
SUR LE CHAMP HAUTE TENSION

21120

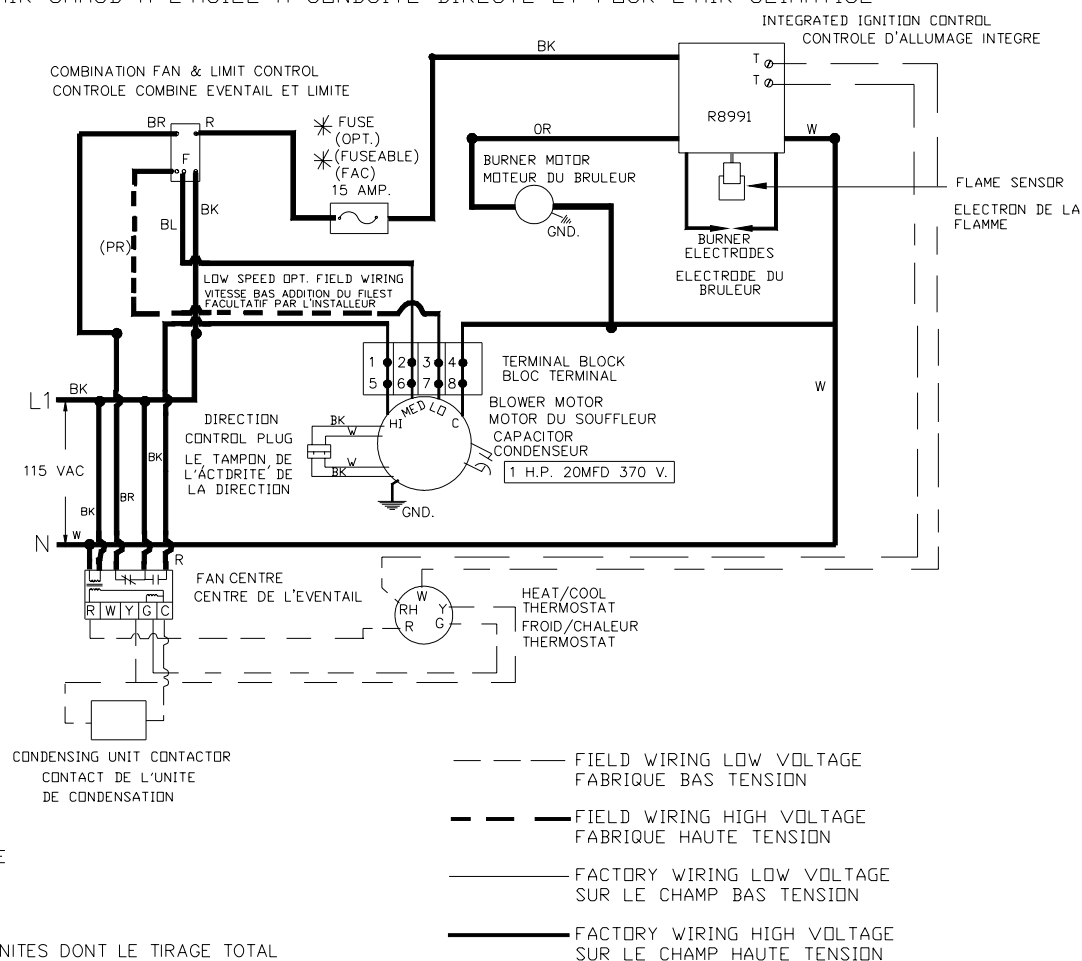
WIRING DIAGRAM - OIL FIRED WARM AIR FURNACE DIRECT DRIVE 5 TON A/C READY  
 DIAGRAMME DE LA POSE DES FILS - FOURNAISE A AIR CHAUD A L'HUILE A CONDUITE DIRECTE ET POUR L'AIR CLIMATISE



IF WIRING IS REPLACED, THE SAME SIZE AND TYPE AS ORIGINALLY SUPPLIED ON FURNACE SHOULD BE USED.  
 SI DES FILS DOIVENT ETRE REMPLACES, LA MEME GROSSEUR ET LE MEME TYPE QUE CEUX ORIGINALEMENT POSES SUR LA FOURNAISE DEVRONT ETRE UTILISES.  
 \* A FUSE LINK IS PROVIDED FOR THE BURNER CIRCUIT ON ALL UNITS.

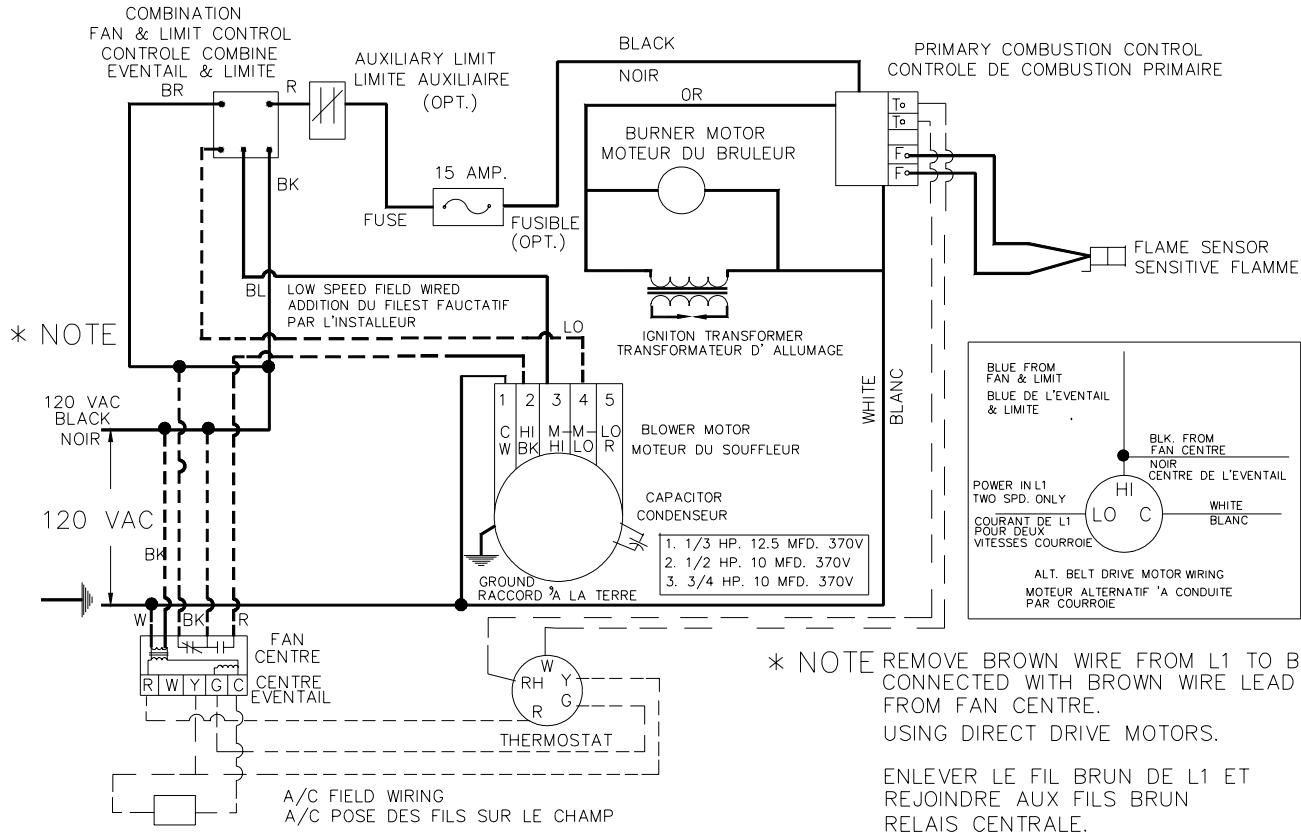
WHERE THE TOTAL AMP DRAW EXCEEDS 12A.  
 \* UN FUSIBLE ANNEAU EST SUR LE CIRCUIT DU BRULEUR DE TOUTES LES UNITES DONT LE TIRAGE TOTAL D'AMPERE DEPASSE 12A.

NOTE: Electrical rating is 120V. 60Hz, 16A, FOR BCL,BFL, AND HTL (T) SERIES  
 NOTE: le taux electrique est de 120V. 60Hz. 16A pour SERIE BCL,BFL,HTL (T)



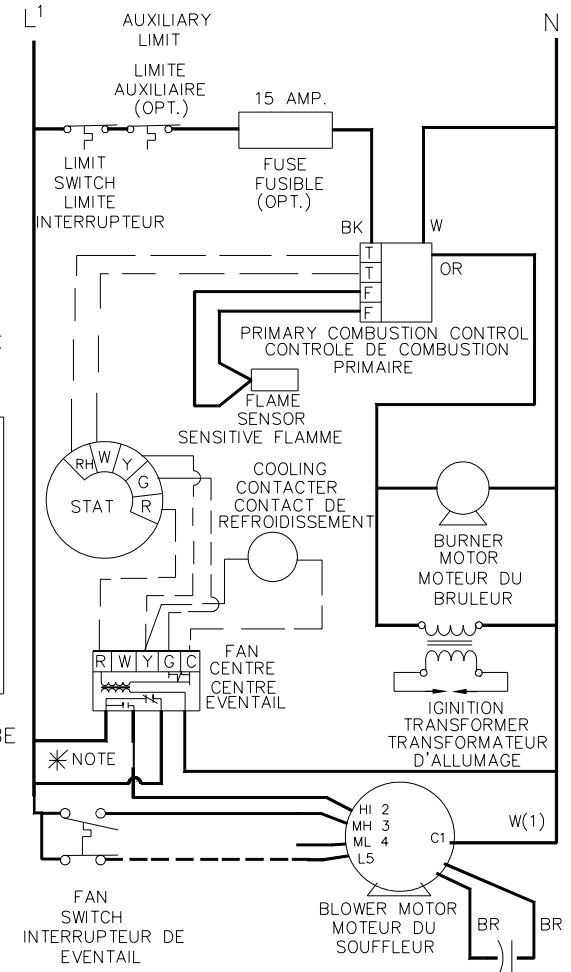
26836 R3

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



CONDENSING UNIT CONTACTER  
 CONTACT DE L'UNITE DE CONDENSION  
 IF WIRING IS REPLACED, THE SAME SIZE AND TYPE AS ORIGINALLY SUPPLIED  
 ON FURNACE SHOULD BE USED.  
 SI LES FILS DOIVENT ETRE REMPLACES, DES FILS DE MEME TYPE ET GROS  
 SEUR QUE CEUX SUR LA FOURNAISE DEVRONT ETRE UTILISES.

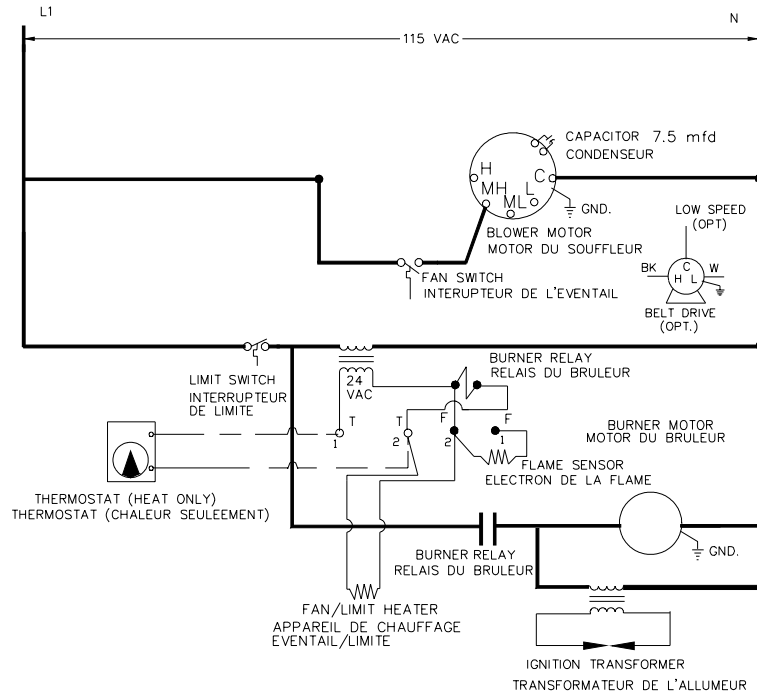
Electrical rating is 120V. 60Hz, 12A. for BCL & BFL 80S, 90S, 100S, 120S  
 Le taux el electrique est de 120V. 60Hz, 12A. pour BCL & BFL 80S, 90S  
 100S, 120S  
 Electrical rating is 120V, 60Hz, 16A. for BCL & BFL 130, 145S  
 Le taux electrique est de 120V. 60Hz, 12A. pour BCL & BFL 130S, 145S



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

20620

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



IF WIRING IS REPLACED, THE SAME SIZE AND TYPE AS ORIGINALLY SUPPLIED ON FURNACE SHOULD BE USED.

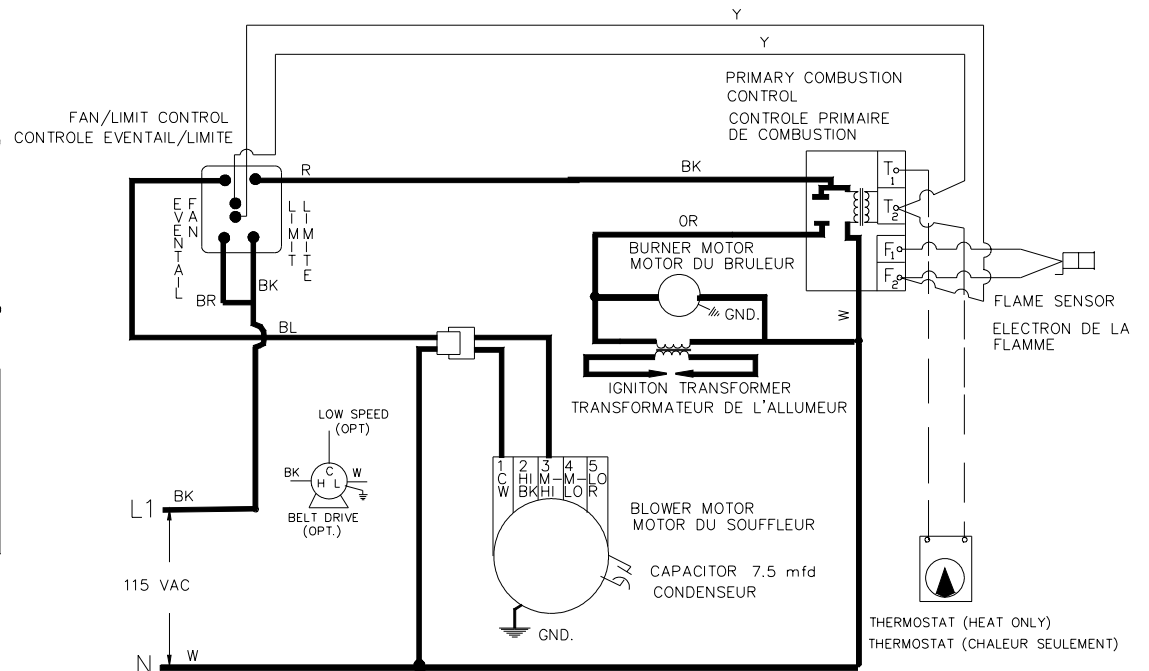
USE COPPER WIRING

NOTE: Electrical rating is 120v. 60Hz, 12A

SI DES FILS DOIVENT ETRE REMPLACES, LA MEME GROSSEUR ET LE MEME TYPE QUE CEUX ORIGINALEMENT POSES SUR LA FOURNAISE DEVRONT ETRE UTILISES.

UTILIZER SEULEMENT UN FIL DE CUIVRE

NOTE: le taux electrique est de 120V. 60Hz, 12A



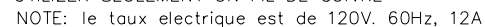
NOTE CHECK MOTOR SPEED WITH STATIC PRESSURE LABEL.

LA NOTE VERIFIER LA VITESSE DU MOTEUR AVEC LA PLAQUE DE PRESSION STATIQUE POUR PROPRE VITESSE.

— — — FIELD WIRING LOW VOLTAGE  
 FABRIQUE BAS TENSION  
 - - - FIELD WIRING HIGH VOLTAGE  
 FABRIQUE HAUTE TENSION  
 — — — FACTORY WIRING LOW VOLTAGE  
 SUR LE CHAMP BAS TENSION  
 — — — FACTORY WIRING HIGH VOLTAGE  
 SUR LE CHAMP HAUTE TENSION

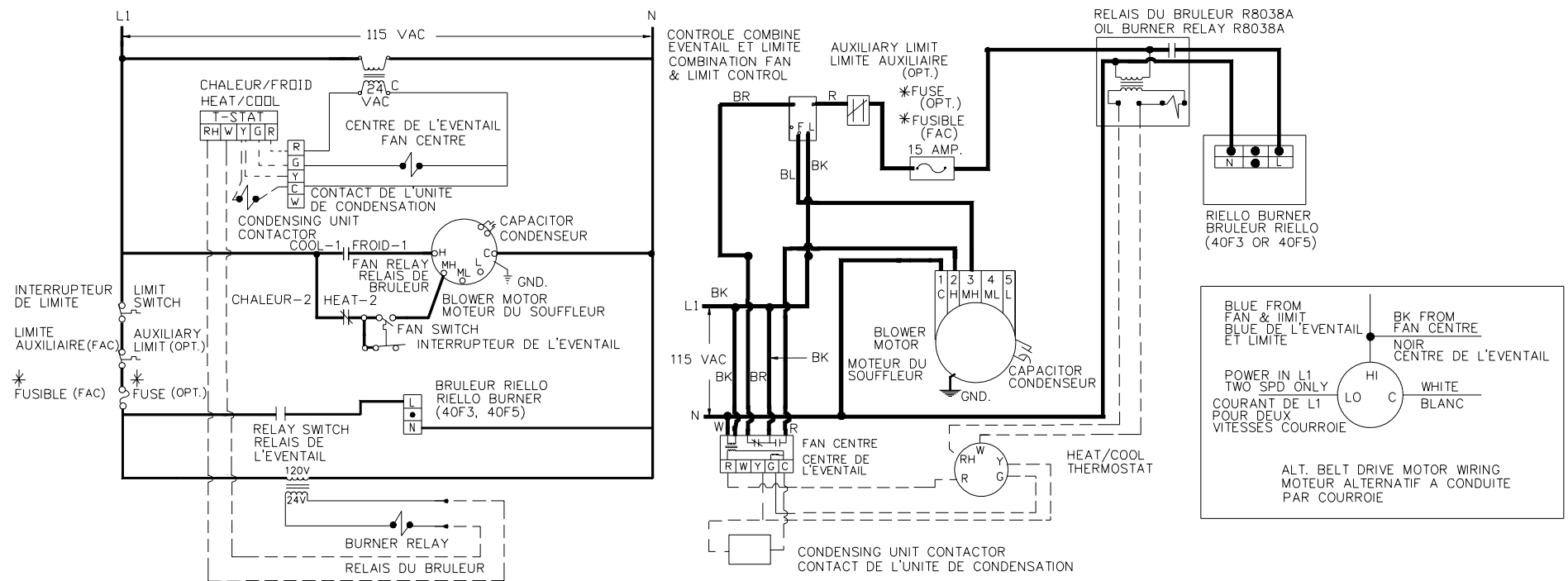
27502

DIAGRAMME DE LA POSE DES FILS - FOURNAISE A AIR CHAUD A L'HUILE A CONDUITE DIRECTE ET POUR L'AIR CLIMATISE



- |       |   |
|-------|---|
| — — — | FIELD WIRING LOW VOLTAGE<br>FABRIQUE BAS TENSION          |
| — — — | FIELD WIRING HIGH VOLTAGE<br>FABRIQUE HAUTE TENSION       |
| — — — | FACTORY WIRING LOW VOLTAGE<br>SUR LE CHAMP BAS TENSION    |
| — — — | FACTORY WIRING HIGH VOLTAGE<br>SUR LE CHAMP HAUTE TENSION |

WIRING DIAGRAM – OIL FIRED WARM AIR FURNACE WITH RIELLO BURNER 40F3 OR 40F5 A/C READY  
 DIAGRAMME DE LA POSE DES FILS – FOURNAISE A AIR CHAUD A L'HUILE A BRULEUR RIELLO 40F3 OU 40F5 ET POUR L'AIR CLIMATISE



IF WIRING IS REPLACED, THE SAME SIZE AND TYPE AS ORIGINALLY SUPPLIED ON FURNACE SHOULD BE USED.  
 SI DES FILS DOIVENT ETRE REMPLACES, LA MEME GROSSEUR ET LE MEME TYPE QUE CEUX ORIGINALEMENT  
 POSES SUR LA FOURNAISE DEVRONT ETRE UTILISES.

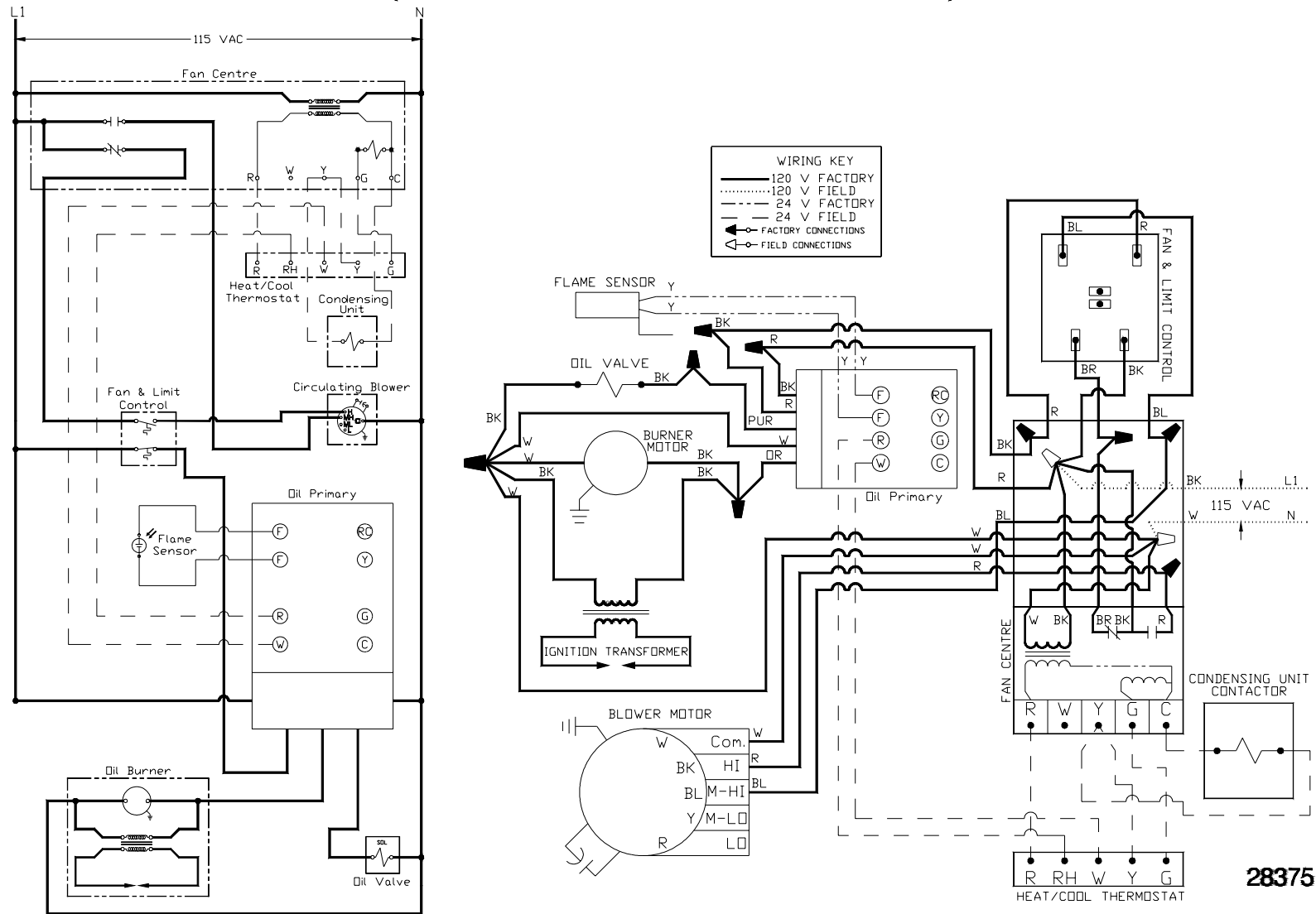
\*A FUSE LINK IS PROVIDED FOR THE BURNER CIRCUIT ON ALL UNITS WHERE THE AMP DRAW EXCEEDS 12A.  
 \*UN FUSIBLE ANNEAU EST SUR LE CIRCUIT DU BRULEUR DE TOUTES LES UNITES DONT LE TIRAGE TOTAL D'AMPERE DEPASSE 12A.

NOTE: Electrical rating is 120V, 60Hz, 12A. for BCLS/BFL 80, 90, 100, 120, HTL-80C, 90C, 100C  
 Electrical rating is 120V, 60Hz, 16A. for BCLS/BFL 130, 145

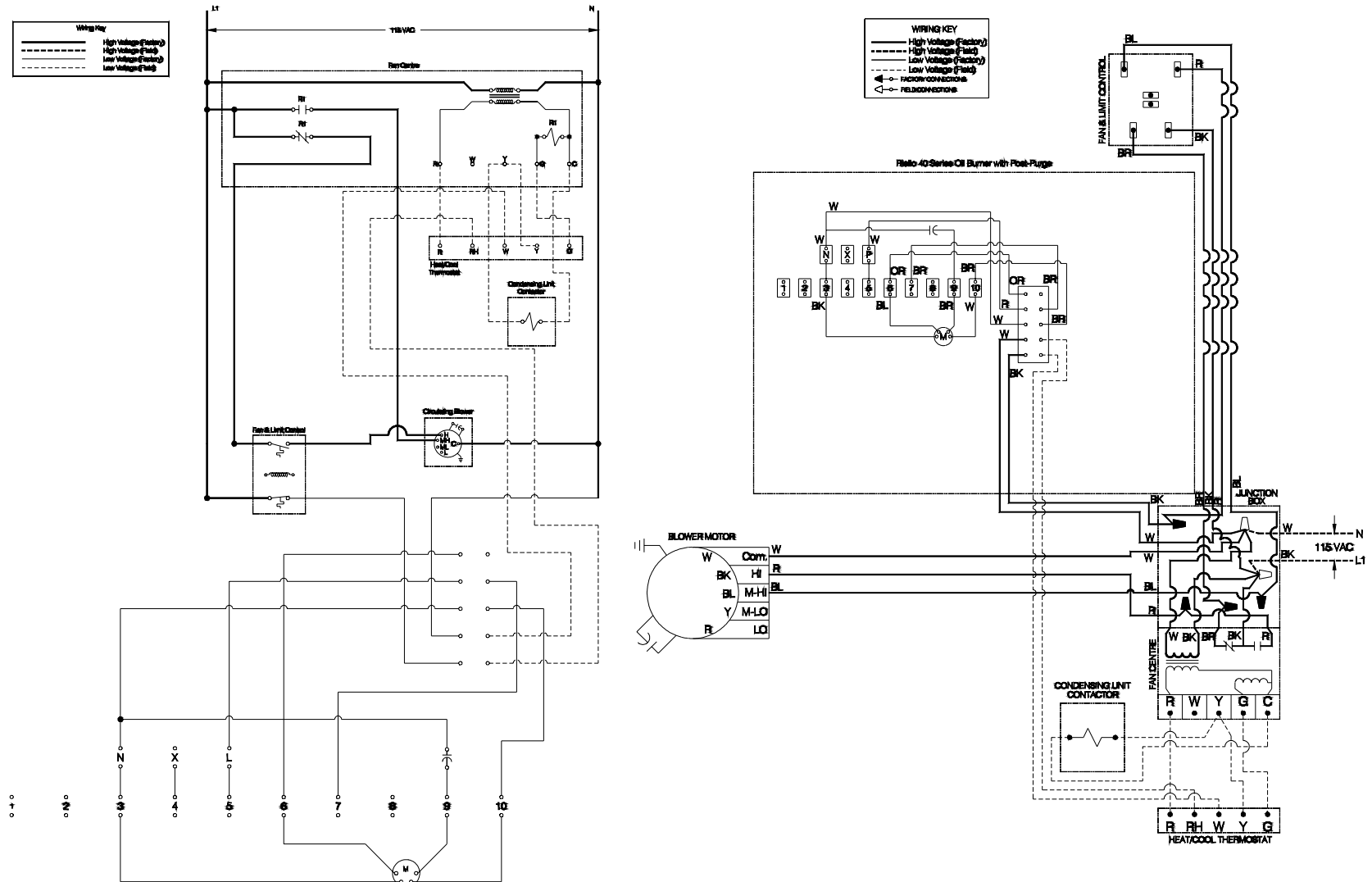
NOTE: Le taux electrique est de 120V, 60Hz, 12A. pour BCLS/BFL 80, 90, 100, 120, HTL-80C, 90C, 100C  
 Le taux electrique est de 120V, 60Hz, 16A. pour BCLS/BFL 130, 145



# Wiring Diagram - Through The Wall Vented, Oil Fired, Warm Air Furnace (Beckett AFII-85 & AFII-150 Oil Burners)



# Wiring Diagram - Direct Vent (Riello BF-3 & BF-5, 40F3 & 40F5) Oil Fired Warm Air Furnace



## 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 $\Omega$ in absence of light; a maximum of 1500 $\Omega$ 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 <sub>2</sub> 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.



## 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.	



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