

Installation, Operation and Maintenance Manual Oil Fired Warm Air Furnaces

O4HD-091A-12-FB (Up-Flow Model)
O4HD-091A-14-FA-DV (Up-Flow Model)
O4HD-091A-V-FA (Up-Flow Model with ECM)

FOR YOUR SAFETY:

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

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

NORDYNE INC.

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



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IMPORTANT:

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE

1. INTRODUCTION

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

MODELS O4HD-091A-12-FB, O4HD-091A-14-FA-DV, AND O4HD-091A-V-FA

Models O4HD-091A-12-FB, O4HD-091A-14-FA-DV and O4HD-091A-V-FA are oil fired forced air up-flow furnaces with an output capacity range of 59,000 BTU/Hr. to 86,000 BTU/Hr.

<p>CAUTION</p> <p>DO NOT USE GASOLINE, CRANK CASE OIL, OR ANY OIL CONTAINING GASOLINE.</p>
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All models are CSA listed, (NRTL/C) for use with No. 1 (Stove) and No. 2 (Furnace) Oil. Please refer to the tables in Appendix A for performance and dimensional data.

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

In the United States of America, the installation of the furnace and related equipment shall be installed in accordance with the regulations of NFPA No. 31, Standard for the Installation of Oil-Burning Equipment, as well as in accordance with local codes.

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

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

2. HEAT LOSS

The maximum hourly heat loss for each heated space shall be calculated in accordance with the procedures described in the manuals of the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), or by other means prescribed, or approved by the local authority having jurisdiction.

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

3. LOCATION OF UNIT

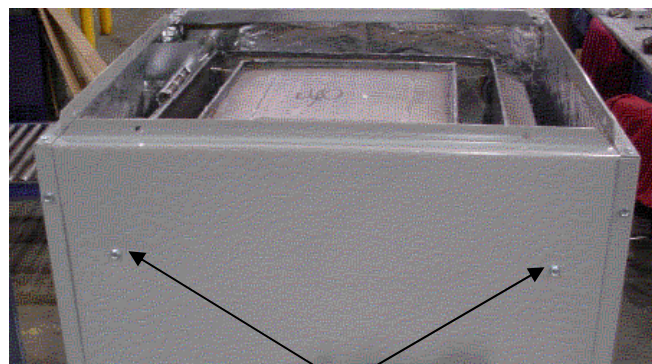
The furnace should be located such that the flue connection to the chimney is short, direct and consists of as few elbows as possible. When possible, the unit should be centralized with respect to the supply and return air ductwork. A central location minimizes the trunk duct sizing. All models may be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

The minimum installation clearances are listed in Table 1.

Table 1: Clearances – (Inches)

Location	Clearance to Combustibles	
	O4HD-091A-12-FB, O4HD-091A-14-FA-DV and O4HD-091A-V-FA	O4HD-091A-V-FA
	Up flow	
Top	1	
Bottom	0	
S/A Plenum	1	
Rear	1	
Sides	1	
Front	1**	
Flue Pipe	9*	
Enclosure	Closet	

*18 in. in USA
** 24 in. required for service clearance



HEAT EXCHANGER SUPPORT SCREWS

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

4. AIR CONDITIONING APPLICATIONS

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

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

5. COMBUSTION AIR

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

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

6. CHIMNEY VENTING

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

regulations, to the requirements of the National Building Code.

NOTE: THE FURNACE IS APPROVED FOR USE WITH TYPE L VENT OR EQUIVALENT.

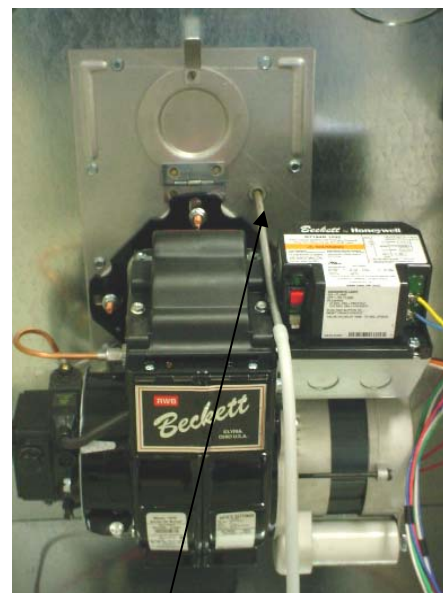
CAUTION
CHIMNEY VENTED VERSIONS OF THE FURNACE MUST BE CONNECTED TO A FLUE HAVING SUFFICIENT DRAFT AT ALL TIMES TO ENSURE SAFE AND PROPER OPERATION OF THE APPLIANCE.

NOTE: THE RECOMMENDED FLUE DRAFT PRESSURE IS -0.02 IN. W.C. (SEE FIG 2.)

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

See appendix A for burner set-up.

Fig. 2: Checking Over-Fire Draft.



Over-fire draft access port.

7. BAROMETRIC DAMPER CONTROL.

The barometric damper control, also known as a draft regulator, is used on conventional chimney venting only. This control automatically maintains a constant negative pressure in the furnace to obtain maximum efficiency. It ensures that proper pressures are not exceeded. If the chimney does not develop sufficient draft, the draft control cannot

function properly. The draft regulator, when installed should be in the same room or enclosure as the furnace and should not interfere with the combustion air supplied to the burner. The control should also be located near the furnace flue outlet and installed according to the instructions supplied with the regulator. The flue outlet pressure (measured between the furnace and draft regulator, or the oil burner mounting plate over-fired draft access port. fig. 2) should be set to -0.02 in. w.c.

8. OPTIONAL SIDE WALL VENTING

O4HD-091A-14-FA-DV furnace models are manufactured to be installed as sidewall vented units. Please refer to Direct Venting Instructions, P/N 240006979 included with the Vent Kit for details. Sidewall Venting (*Direct Venting*) requires the use of a specific oil burner; the Beckett AFII. Please refer to Appendix A, Table A2.

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

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

The Electronic Fan Timer integrates control of all burner and circulator fan operations. This control is the central wiring point for most of the electrical components in the furnace. The **United Technologies 1158-120 (O4HD-091A-12-FB and O4HD-091A-14-FA-DV)** has an adjustable fan on time that is set by selecting the dipswitch combination displayed in Chart 1. This fan on delay can be set at 1, 2, 4 or 6 minutes. This provides a delay between the burner ignition and blower start-up to eliminate excessive flow of cold air when the blower comes on. The **United Technologies 1158-120 (O4HD-091A-12-FB and O4HD-091A-14-FA-DV)** has an adjustable fan off time of 30, 60, 90 or 120 seconds displayed in Chart 1. The fan off delay time starts when the burner motor is de-energized at the end of a call for heat. Blower shutdown is delayed to remove any residual heat from the heat exchanger and improve the annual efficiency of the furnace.

The electronic fan timer board works in conjunction with snap disc limit controls, which perform a safety function, and breaks power to the oil burner primary control, which shuts off the burner if the furnace over-heats. The limit control is thermally operated and automatically resets. The limit control is factory installed, pre-set and is not adjustable.

If the limit control opens with the **United Technologies 1158-120 (O4HD-091A-12-FB and O4HD-091A-14-FA-DV)** electronic fan control, the circulating fan will be energized as well. When the limit closes, the fan off timer will begin. At the end of the fan off time cycle the burner will be energized, initiating a normal burner cycle.

CHART 1

United Technologies 1158-120 (O4HD-091A-12-FB and O4HD-091A-14-FA-DV)

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

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

The **United Technologies 1168-1 ECM (O4HD-091A-V-FA)** tap board has an adjustable fan on/off delay that must be adjusted in accordance with the furnace input rating (nozzle size). Refer to Table A-10 (pg 15) for ECM blower set-up.

10. ELECTRICAL CONNECTIONS

The furnace is listed by the Canadian Standards Association under the NRTL (North American) Standard. It is factory wired and requires minimal field wiring. All field wiring should conform to CAN/CSA C22.1 Canadian Electrical Code, Part 1, and by local codes, where they prevail. In the United States, the wiring must be in accordance with the National Fire Protection Association NFPA-70, National Electrical Code, and with local codes and regulations.

The furnace should be wired to a separate and dedicated circuit in the main electrical panel; however, accessory equipment such as electronic air cleaners and humidifiers may be included on the furnace circuit. Although a suitably located circuit breaker can be used as a service switch, a separate service switch is advisable. The service switch is necessary if reaching the circuit breaker involves becoming close to the furnace, or if the furnace is located between the circuit breaker and the means of entry to the furnace room. The furnace switch

4. AIR CONDITIONING APPLICATIONS

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

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

5. COMBUSTION AIR

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

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

6. CHIMNEY VENTING

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

regulations, to the requirements of the National Building Code.

NOTE: THE FURNACE IS APPROVED FOR USE WITH TYPE L VENT OR EQUIVALENT.

⚠ CAUTION

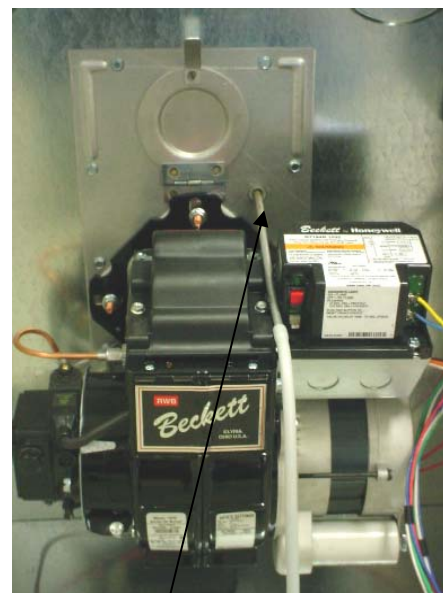
CHIMNEY VENTED VERSIONS OF THE FURNACE MUST BE CONNECTED TO A FLUE HAVING SUFFICIENT DRAFT AT ALL TIMES TO ENSURE SAFE AND PROPER OPERATION OF THE APPLIANCE.

NOTE: THE RECOMMENDED FLUE DRAFT PRESSURE IS -0.02 IN. W.C. (SEE FIG 2.)

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

See appendix A for burner set-up.

Fig. 2: Checking Over-Fire Draft.



Over-fire draft access port.

7. BAROMETRIC DAMPER CONTROL.

The barometric damper control, also known as a draft regulator, is used on conventional chimney venting only. This control automatically maintains a constant negative pressure in the furnace to obtain maximum efficiency. It ensures that proper pressures are not exceeded. If the chimney does not develop sufficient draft, the draft control cannot

⚠ CAUTION

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

16. BURNER ELECTRODES

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

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

17. BURNER PRIMARY (SAFETY) CONTROL

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

⚠ CAUTION

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

18. COMBUSTION CHAMBER

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

CHECK THE ALIGNMENT OF THE COMBUSTION CHAMBER AND OIL BURNER BEFORE FIRING. IT IS POSSIBLE FOR THE COMBUSTION CHAMBER TO SHIFT IF SUBJECTED TO ROUGH HANDLING DURING TRANSIT. The combustion chamber should be inspected for damage or carbon build up whenever the oil burner is removed for repairs or routine maintenance.

⚠ CAUTION

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

19a. CIRCULATING AIR BLOWER (O4HD-091A-12-FB)

The O4HD-091A-12-FB, O4HD-091A-14-FA-DV and O4HD-091A-V-FA furnace models are equipped with direct drive blower systems. O4HD-091A-12-FB and O4HD-091A-14-FA-DV models are equipped with PSC motors; O4HD-091A-V-FA models are equipped with electronically commutated motors (ECM). Direct drive blower speed adjustments are not normally required in properly sized extended plenum duct systems. The motor RPM and air CFM delivery will vary automatically to accommodate conditions within the usual range of external static pressures typical of residential duct systems. Under-sized duct systems may require a higher blower speed to obtain a reasonable system temperature rise. Some older duct systems were not designed to provide static pressure. They typically feature special reducing fittings at each branch run and lack block ends on the trunk ducts. These systems may require modification to provide some resistance to the airflow to prevent over-amping of the direct drive blower motor. Selecting a lower blower speed may correct this problem. Direct drive blower speeds are adjusted by changing the "hot" wires to the motor winding connections. Please refer to wiring diagrams in Appendix B or the wiring diagram label affixed to the furnace. **THE NEUTRAL WIRE (normally the white wire) IS NEVER MOVED TO ADJUST THE BLOWER SPEED.**

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

⚠ CAUTION

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

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

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

⚠ WARNING

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

19b. CIRCULATING AIR BLOWER (O4HD-091A-V-FA) (See Section 22 Page 9)

20. MAINTENANCE AND SERVICE

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-8).

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 should be inspected periodically and cleaned if necessary. If cleaning is necessary, **SHUT OFF POWER TO THE FURNACE** and remove the burner. Using a stiff brush with a wire handle, brush off scale and soot from inside the drum and flue pipe. To clean the radiator, remove the clean-out caps screws, and remove the caps carefully to avoid tearing the gaskets. A wire brush can be used to loosen dirt and debris on the inside surfaces of the radiator. Clean out all accumulated dirt, soot and debris with a wire handled brush and an industrial vacuum cleaner. Before replacing the clean-out caps, inspect the gaskets. If the gaskets are broken, remove the remnants and replace with new gaskets.

The blower motor is factory oiled and permanently sealed. **DO NOT LUBRICATE.** Excess oil causes premature electric motor failure.

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 or burner). 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 on and off delay function continues to start and stop the blower fan at the optimal settings.

21. OPERATING INSTRUCTIONS (O4HD-091A-12-FB AND O4HD-091A-14-FA-DV)

Before Lighting

Open all supply and return air registers and grilles.

Open all valves in oil pipes.

Turn on electric power supply

To Light Unit

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.

There will be a fan on time delay before the circulating fan is energized. The **United Technologies 1158-120** has an adjustable fan on time that is set by selecting the dipswitch combination displayed in Chart 1. This fan on delay can be set at 1, 2, 4 or 6 minutes.

Set the thermostat below room temperature. The oil burner should stop.

The air circulation blower will continue to run until the time off setting selected on the electronic fan timer control times out. The **United Technologies 1158-120** has an adjustable fan off time of 30, 60, 90 or 120 seconds. The fan timer control adjustments may be altered if the air at the room registers is uncomfortably high upon blower start up or shutdown.

The necessary adjustments to the fan control settings should be determined by measuring the temperature of the air in the supply air take-off, or within the first few inches of the supply air trunk. The side mid point of the transition is usually ideal, providing that the thermometer probe is beyond the "line of sight" wherein false readings from radiant heat could be observed. System temperature rise is *the difference in temperature between the supply air and return air*.

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. When the limit function

test is complete, shut off electrical power to the furnace, replace the neutral wire to the blower fan motor, and then restore power. The blower fan will start up immediately. Once the temperature has dropped and the limit control has reset, the fan will operate until the fan off time is achieved. The oil burner will then resume operation and continue until the thermostat is satisfied. Restore the thermostat setting to a comfortable temperature.

To Shut Down Unit

Set the thermostat to the lowest possible setting.

Set the manual switch (if installed) in the Electrical Power Supply Line to "OFF".

21. OPERATING INSTRUCTIONS (O4HD-091A-V-FA)

Before Lighting

Open all supply and return air registers and grilles.

Open all valves in oil pipes.

Turn on electric power supply

To Light Unit

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.

There will be a fan on time delay before the circulating fan is energized. The **United Technologies 1168-1** has an adjustable fan on/off time delay that is programmed into the ECM motor, and is set by selecting the SW4 DIP switch combination displayed in Table A-10 page 15. **Fan on/off delay must be adjusted according to input (nozzle size).**

1. Set the thermostat below room temperature. The oil burner should stop.

The air circulation blower will continue to run until the blower off delay setting programmed into the ECM motor times out.

To check the operation of the limit switch, shut off power to the furnace. Temporarily remove the 5 pin power connector plug from the ECM blower motor. **NOTE: Isolate the AC Line pins on the 5 pin power connector with electrical tape to prevent electric shock hazard.** 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. When the limit function test is complete, shut off electrical power to the furnace, replace the 5 pin power plug to the blower fan motor, and then restore power. The blower fan will start up immediately. Once the

temperature has dropped and the limit control has reset, the fan will operate until the fan off time is achieved. The oil burner will then resume operation and continue until the thermostat is satisfied. Restore the thermostat setting to a comfortable temperature.

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

▲ CAUTION

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.

22. ECM BLOWER MOTOR OPERATION (O4HD-091A-V-FA)

Setting Blower “ON” and “OFF” Timings

Blower on/off time delays are handled by ECM motor programming. 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: This ECM variable speed motor will slowly ramp up to the required operating speed. This feature in the heating cycle allows the heat exchanger to reach operating temperature before the set heat speed, which minimizes noise and increases comfort.

Soft Stop: At the end of the heating cycle, the ECM variable speed motor will slowly ramp down. This feature allows for increased energy efficiency and reduced noise levels.

Dehumidification: A dehumidification feature has been programmed into the variable speed motor. At the start of each cooling cycle, the variable speed motor will run at 82% of the rated airflow for 7.5 minutes. After 7.5 minutes has elapsed, the motor will increase to 100% of the rated airflow. This profile is used to provide dehumidification and improve system efficiency.

Continuous Fan Operation: When the thermostat continuous fan (G) switch is on without a call for heating or cooling, the indoor fan is immediately energized up to 50% of the cooling speed. This feature allows continuous circulation of air between calls for heating or cooling.

If a call for heat (W) or cool (Y) occurs during continuous fan, the blower will remain energized

Appendix A- O4HD-091A-12-FB, O4HD-091A-14-FA-DV AND O4HD-091A-V-FA

O4HD-091A-12-FB, O4HD-091A-14-FA-DV and O4HD-091A-V-FA furnaces may be used with the following oil burners.

Please note: The Beckett AF oil burner is for applications using indoor air for combustion only. For sidewall venting applications utilizing outdoor air for combustion, use the Beckett AFII (Balanced Flue) oil burner only.

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
O4HD-070A-12-FB ² O4HD-070A-V-FA ²	59,000	AF76BNHS	0.50 / 80°A	100 psig	0.50 usgph	F3	3- 3/8 in.
O4HD-091A-12-FB O4HD-091A-12-FB	76,000	AF76BNHS	0.65 / 80°A	100 psig	0.65 usgph	F3	3- 3/8 in.
O4HD-105A-12-FB O4HD-105A-12-FB	86,000	AF76BNHS	0.75 / 80°A	100 psig	0.75 usgph	F3	3- 3/8 in.

¹ Head is shielded by ceramic insulator. ² Low Firing Rate Baffle required when using a 0.50-gallon nozzle. Bold models indicate the factory equipped firing rate.

Table A-2 Beckett AFII Oil Burner Set-Up

Beckett AFII Series Oil Burners (For use with sidewall vented units with outdoor combustion air, or chimney vented units with indoor air for combustion)						
Furnace Model	Output BTU/Hr	Burner Model	Nozzle	Pump Pressure	Flow Rate	Head
O4HD-070-14-FA-DV	65,000	AFII-85	0.50 / 60°A	120 psig	0.55 usgph	FB0
O4HD-091-14-FA-DV	75,000	AFII-85	0.60 / 60°A	115 psig	0.65 usgph	FB3
O4HD-105A-14-FA-DV	86,000	AFII-85	0.70 / 60°A	115 psig	0.75 usgph	FB3

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

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 locking screws and moving the air shutter, and if necessary, the bulk 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.

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.

Beckett AF Burner

Electrode gap: 5/32 inch.

Distance above horizontal centerline: 5/16 inch. Older instruction sheets specify 7/16 inch. The current specification is 5/16 inch.

Distance ahead of nozzle: 1/16 inch.

"Z" dimension, the distance from the front of the end cone (head) to the face of the nozzle should be 1-1/8 inches. If a ceramic head is used, the distance from the end cone to the nozzle face is increased to 1-3/8 inches.

A.3 START UP

The furnace should be operated for a minimum of 10 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 450°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. Temperature rise value is listed on the system rating plate.

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 test port on the burner mounting plate as shown in Figure 2. The draft should be adjusted to -0.02 inches w.c.

In the United States, the Beckett AF Burner may be equipped with Beckett's "*Inlet Air Shut-Off*" to increase efficiency. (Beckett Part No. AF/A 5861).

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

Table A-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			
O4HD-070A-12-FB O4HD-070A-14-FA-DV	100-10T DD	Low	1/2 HP	Med-Low	1/2 HP	3	1/2 HP	690 – 1500
O4HD-091A-12-FB O4HD-091A-14-FA-DV	100-10T DD	Med-Low	1/2 HP	Med-High	1/2 HP	3	1/2 HP	690 – 1500
O4HD-105A-12-FB O4HD-105A-14-FA-DV	100-10T DD	Med-High	1/2 HP	High	1/2 HP	3	1/2 HP	690 – 1500

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.				
						0.2	0.3	0.4	0.5	0.6
O4HD-A-12-FB O4HD-14-FA-DV 070-105	100-10T DD	1/2 HP	7	60°F	High	1741	1651	1556	1476	1369
					Med-High	1557	1497	1434	1369	1278
					Med-Low	1063	1051	1037	1037	1011
					Low	697	697	687	672	646

Table A-8 Direct Drive Blower Characteristics ECM Motor

Furnace Model	Blower	Motor HP	Motor FLA	ΔT	CFM RANGE		
					Continuous Fan	Heating	Cooling
						0.28 - 0.48 inches w.c.	0.5 inches w.c.
O4HD-070A-V-FA O4HD-091A-V-FA O4HD-105A-V-FA	100-10 DD	1/2 HP ECM	7.7	60°F	500 - 700	825 - 1250	600 - 1400

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

$$CFM = \text{Bonnet Output} / (1.085 \times \text{System Temperature Rise } (\Delta T))$$

$$\text{System Temperature Rise } (\Delta T) = \text{Bonnet Output} / (1.085 \times CFM)$$

Table A-9 General Dimensions (Inches)

Furnace Model	Cabinet			Plenum Openings			Flue Diameter	Filter		Shipping Weight (LB.)
	Width	Depth	Height	Supply	Return			Type	Size	
					Side	Bottom				
O4HD-A-12-FB O4HD-A-14-FA-DV 070-105	22	30 -3/4	49-5/8	20½ x 20	14 x 22	14 x 22	5	Permanent	16 x 25 x 1	210

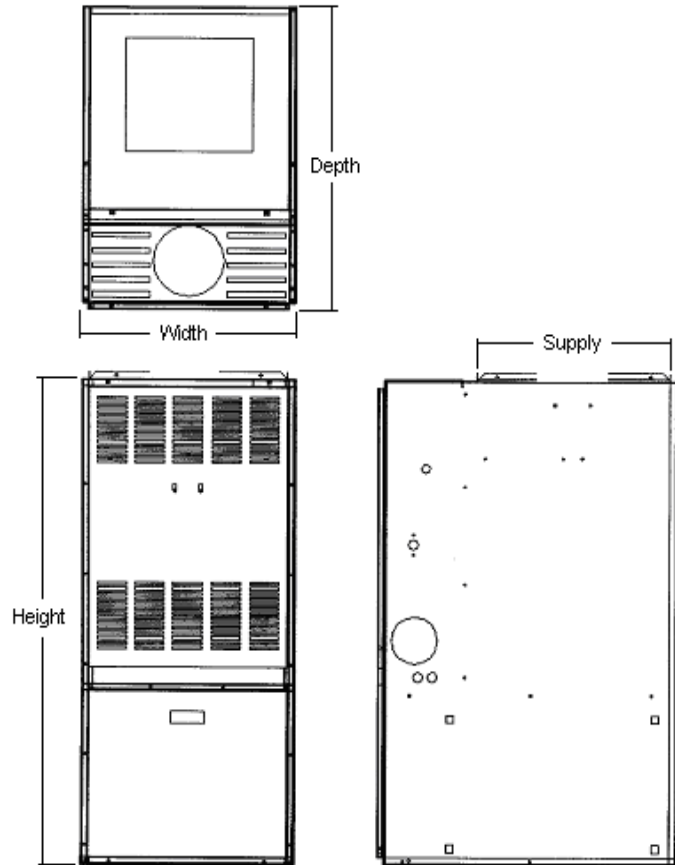


Table A-10 ECM Blower Set-Up (O4HD-091A-V-FA)

DIP SWITCH ADJUSTMENT CHART

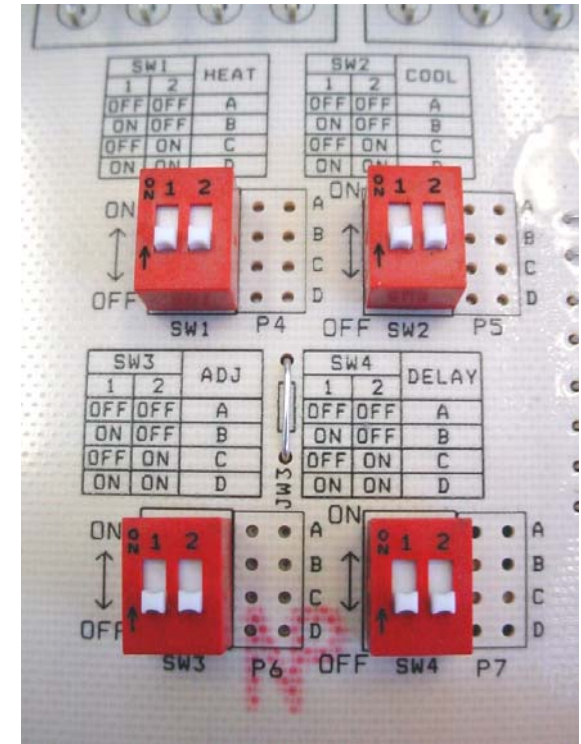
FOR INPUT 0.50 USGPH TO 0.75 USGPH

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

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

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

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



NOTE:

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

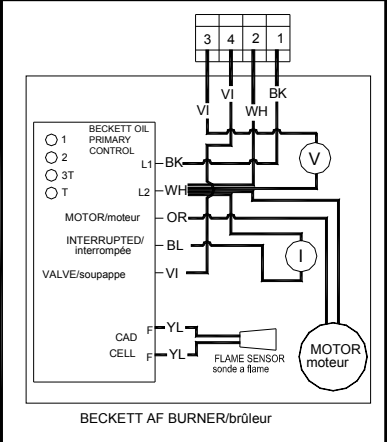
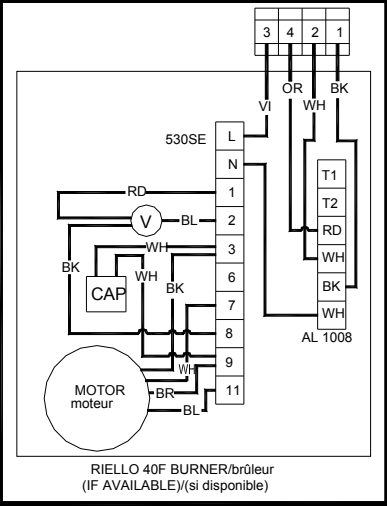
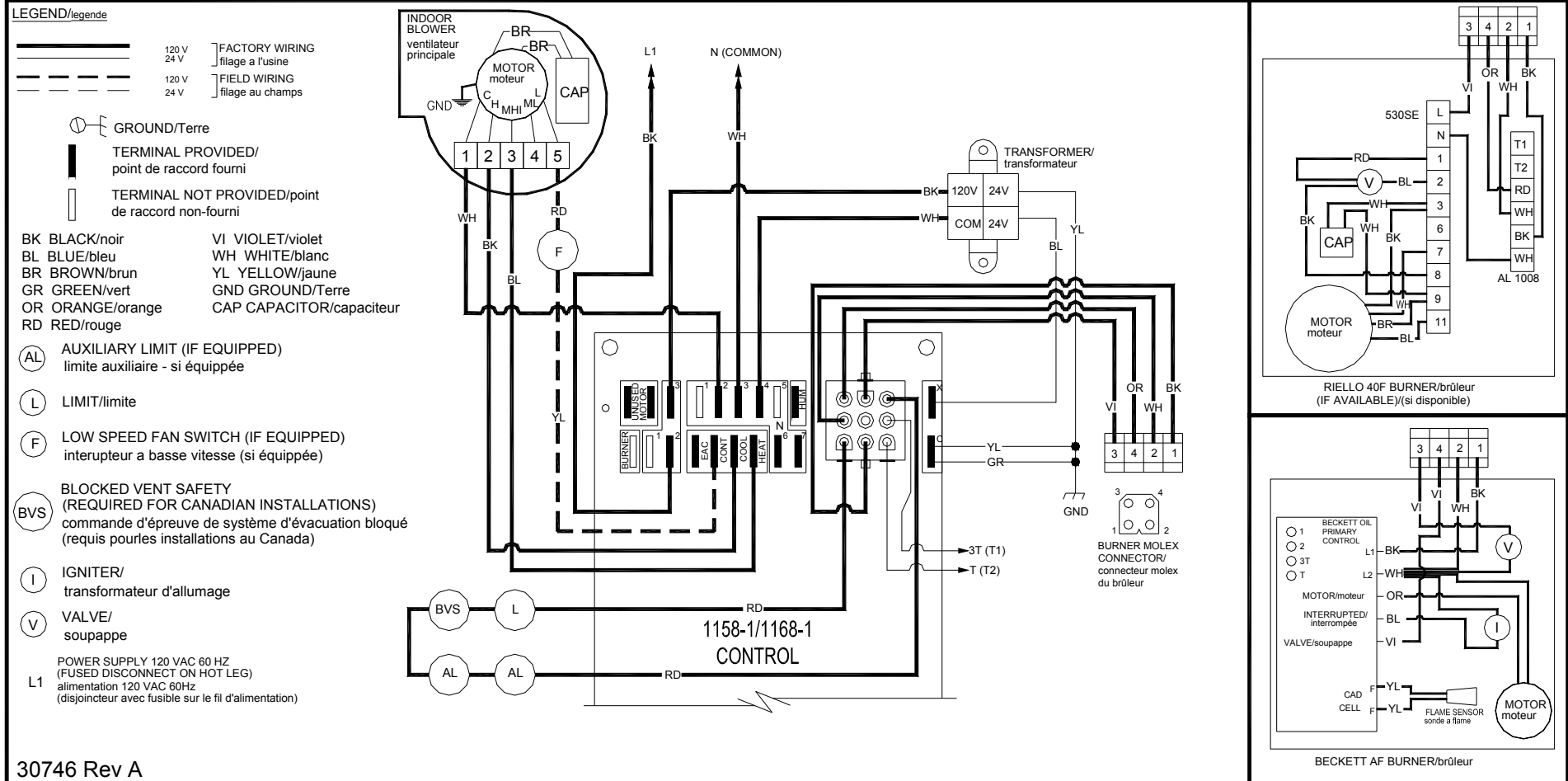
SW2 (COOL): 1 TON is approximately equal to 400 CFM

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

(Cooling Mode) Increase OR decrease CFM respectively

APPENDIX B: WIRING DIAGRAMS

Chimney Vent Burner Wiring Diagram O4HD-091A-12-FB O4HD-091A-V-



30746 Rev A

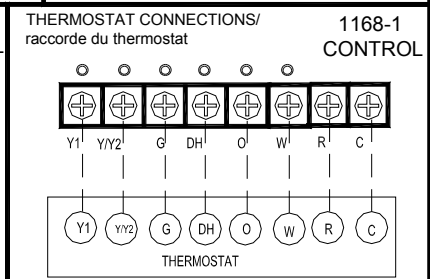
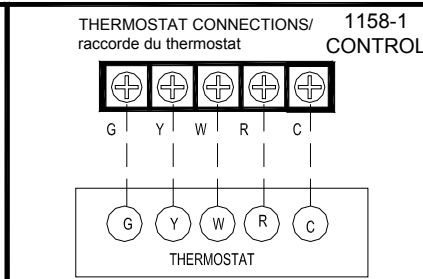
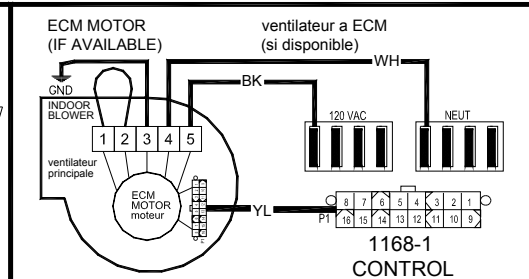
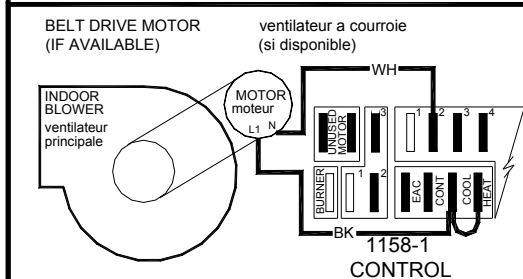


Table C-4: System and General Troubleshooting *continued*

Problem	Possible Cause	Remedy
Excessive fuel oil consumption.	System temperature rise too high.	System temperature rise ideally 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.
	Poor “fan off” delay timing selection, (fan stops too soon).	Check “fan off” delay timing setting. Use a duct thermometer in the supply air plenum take-off or first few inches of the supply air trunk duct. Ideally, the fan will shut off at a temperature of 90° - 100°F. Manipulate the 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 350° to 450°F. Check draft regulator. Draft should be set to -0.02 in. w.c.
	Thermostat improperly adjusted or in poor location.	Check thermostat heat anticipator setting against measured amperage draw. Increase heat anticipator setting if necessary. If the thermostat is being influenced by drafts, sunlight, duct work, etc., relocate to more suitable location.
Too much smoke.	Insufficient combustion air adjustment at oil burner, or improper draft pressure.	Adjust the oil burner combustion air band and draft regulator to gain the highest practical CO ₂ or lowest practical O ₂ content in the flue gases. See Burner Set Up.
	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.	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 the thermostat is being influenced by drafts, sunlight, duct work, etc., relocate to more 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 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.

Table C-4: System and General Troubleshooting *continued*

Problem	Possible Cause	Remedy
Supply air temperature too hot.	Airflow blocked or dirty air filter.	Clean or replace air filter.
	Insufficient airflow.	Check all dampers. Open closed dampers including registers in unused rooms. Check system temperature rise. If temperature rise is too high, speed up blower fan.
Supply air temperature too cool.	Excess airflow.	Check system temperature rise. Slow down blower fan if necessary.
	Excessive duct losses.	Check supply air ductwork. Seal leaky joints and seams. Insulate ductwork if necessary.
Supply air temperature too cool during first moments of furnace cycle.	Fan control "fan on" setting too low.	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.

FINAL CHECK OUT

ENSURE THAT ALL SAFETY DEVICES AND ELECTRICAL COMPONENTS HAVE BEEN SET FOR NORMAL OPERATION. ENSURE THAT ALL ELECTRICAL CONNECTIONS ARE TIGHT AND THAT THE WIRING IS SECURE.



IMPORTANT:

Please ensure that the homeowner is informed and understands:

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

HOMEOWNER'S REFERENCE TABLE

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.	

IF DIFFERENT FROM INSTALLATION CONTRACTOR:

Service Tech.	
Telephone No.	
After Hours No.	

PARTS LISTING: HIGHBOY MODEL: O4HD-091A-12-FB & O4HD-091A-V-FA

Ref. No.	Description	Part No.
1	Left Side Panel Assembly	29187L
2	Right Side Panel Assembly	29186L
3	Rear Panel	29205L
4	Blower Division Assembly	29189
5	Base Panel	26216
6	Inner Front Panel	30066
7	Blower Access Panel	27721L
8	Top Panel	21437L
9	Heat Exchanger Assembly	28675
10	Combustion Chamber Retainer Bracket	27068
11	Replacement Combustion Chamber	27000WP
12	Oil Burner Mounting Plate	29869
13	Flue Connector	29005
14	Pouch Gasket	2080175
15	Flue Collar Gasket	21994
16	Insulation Retainer	20602
17	Radiator Clean-out Cover (2 per unit)	29162
17	Radiator Clean-out Cover Gasket (2 per unit)	240006333
18	Clean-out Gasket Retainer	29161
18	Clean-out Tube Gasket	29163
19	Filter Frame 16" X 25"	18020
20	Filter Frame End Support	5592B2
21	Filter 16" X 25" X 1" Permanent	2180023
24	Control Box	29362
25	Upper Door Panel	30164L
	Logo Bezel	28479
	Logo Label	28563
26	Limit Disc 60T11 BOF 155°F	30071
27	Fan Timer Control 1158-120 UTEC	29388
	Fan Timer Control 1168-1 ECM UTEC	240007048
28	Wire Harness, Controls Fan Timer	29364
29	Wire Harness, Blower	29365
30	Wire Harness, Fan Timer Board, Transformer	29751
31	Wire Harness, ECM Control	240006438
31	Wire Harness, ECM Supply	240005742
32	Transformer	27738
33	Draft Regulator	27494 (5")
34	Oil Burner Assembly, Beckett AF76BNHS	30067
	Burner Motor 1/7 HP 3450 RPM PSC	29689
	Beckett Clean-cut Oil Pump A2EA6520	29688
	Solid State Ignitor 10SAY-01	29522
	Oil Primary Combustion Control	29664
	Flame Retention Head	11961 (F3)
	Nozzle, 0.65/80°A	210086
	Low Fire Kit	29880
	Low Firing Rate Baffle	25521101
	Nozzle, 0.50/80° A	29389

**PARTS LISTING: HIGHBOY MODEL: O4HD-091A-12-FB
O4HD-091A-V-FA**

Ref. No.	Description	Part No.
35	Blower Assembly Direct Drive	30146
	Blower Assembly Direct Drive ECM	109007271
	Blower Housing and Wheel, 100-10T DD (O4HD-091A-12-FB and O4HD-091A-V-FA)	30626
	Blower Motor, 1/2 hp, 4-Speed	102000131
	Blower Motor, 1/2 hp, ECM Programmed	109007272
	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
	Blower Slide Rail 2 Per	27733
36	Right Side Panel, Air Baffle O4HD-091A-12-FB O4HD-091A-V-FA	27731

PARTS LISTING: HIGHBOY DIRECT VENT MODEL: O4HD-091A-14-FA-DV

Ref. No.	Description	Part No.
All parts are the same as listed on the previous pages for Models O4HD-091A-12-FB and O4HD-091A-V-FA except where noted below.		
12	Oil Burner Mounting Plate Assembly	29872
	Oil Burner Mounting Plate	29867
	Sight Glass Cover Plate	29850
	Sight Glass Gasket (2 per unit)	29870
	Sight Glass	29876
13	Flue Connector Assembly 6" to 4" 90° Elbow	28952
14	Pouch Gasket (Second gasket required for Direct Vent)	2080175
15	Flue Collar Gasket (Second gasket required for Direct Vent)	21994
25	Upper Door Panel	27722L
34	Beckett Oil Burner AFII 85	30069
	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	29649
	Air Tube Combination FBX80HGXS	28561
	Flame Retention Head (FB3)	28533
	Nozzle, 0.60/60°A (O4HD-091A-14-FA-DV only)	28017

Model O4HD-091A-12-FB, O4HD-091A-V-FA, and O4HD-091A-14-FA-DV

