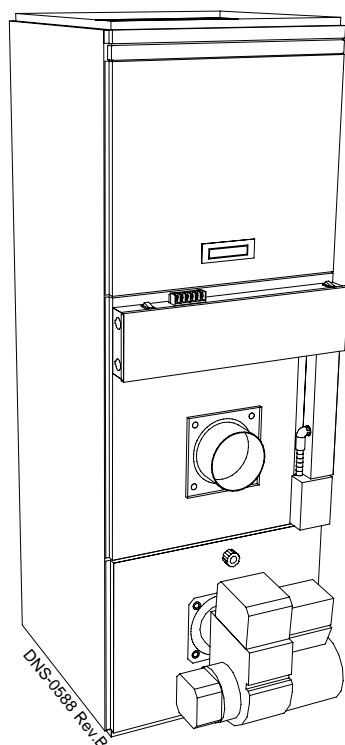


Installation Instructions and Homeowner's Manual

OIL FIRED FURNACE DOWNFLOW or HORIZONTAL



Model:
OCF105A12C



INSTALLER / SERVICE TECHNICIAN:

**USE THE INFORMATION IN THIS MANUAL FOR THE
INSTALLATION / SERVICING OF THE UNIT AND KEEP
THE DOCUMENT NEAR THE FURNACE FOR FUTURE
REFERENCE.**

HOMEOWNER:

**PLEASE KEEP THIS MANUAL NEAR THE FURNACE
FOR FUTURE REFERENCE.**

Caution: Do not tamper with the
unit or its controls.
Call a qualified service technician.

Manufactured by:
UTC Canada Corporation
ICP DIVISION
3400 Industrial Boulevard
Sherbrooke, Quebec - Canada
J1L 1V8

PART 1 INSTALLATION

SAFETY CONSIDERATIONS

INSTALLATION OF OIL FIRED HEATING UNITS SHALL BE IN STRICT ACCORDANCE WITH THE REGULATIONS OF THE AUTHORITIES HAVING JURISDICTION. IN CANADA, CSA B139 AND IN THE UNITED STATES, NFPA NO.31-1992 INSTALLATION CODES FOR OIL BURNING EQUIPMENT APPLY.

DO NOT OPERATE FURNACE IN A CORROSIVE ATMOSPHERE CONTAINING CHLORINE, FLUORINE OR ANY OTHER DAMAGING CHEMICALS.

DO NOT STORE OR USE GASOLINE, OR OTHER FLAMMABLE VAPOURS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.

1.1) SAFETY LABELLING AND WARNING SIGNS

DANGER, WARNING AND CAUTION

The words DANGER, WARNING and CAUTION are used to identify the levels of seriousness of certain hazards. It is important that you understand their meaning. You will notice these words in the manual as follows:



DANGER

Immediate hazards which **WILL** result in death or serious injury.



WARNING

Hazards or unsafe practices which **CAN** result in death or injury.

CAUTION

Hazards or unsafe practices which **CAN** result in personal injury or product or property damage.

1.2) SAFE INSTALLATION REQUIREMENTS



WARNING

Installation or repairs performed by unqualified persons can result in hazards to them and others. Installation **MUST** conform to local codes or, in the absence of same, to codes of the country having jurisdiction.

The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures and equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in personal injury and/or death, property damage, furnace malfunction.



WARNING

Fire hazard.

The furnace must be installed in a level position; never where it will slope toward the front.

If the furnace is installed in that position, oil will drain into the furnace vestibule and create a fire hazard, instead of being directed into the combustion chamber.

NOTE: It is the personal responsibility and obligation of the customer to contact a qualified installer to ensure that the installation conforms to governing local and/or national codes and ordinances.

- This furnace is **NOT** approved for installation in mobile homes, trailers or recreational vehicles;
- Do **NOT** use this furnace as a construction heater or to heat a building under construction;
- There must be a sufficient supply of fresh air for combustion as well as ventilation in the area where the furnace is located;
- Use only the type of fuel oil approved for this furnace (see **Rating Plate** on unit). Overfiring will result in heat exchanger failure and cause dangerous operating conditions;
- Visually check all oil line joints for signs of leakage;
- Connect furnace to a side-wall terminal or chimney;
- The points in Part 2 "Operation" are vital to the proper and safe operation of the heating system. Take the time to ensure that all steps were followed;
- Follow the regulations of the ANSI / NFPA No.31 (USA) and B-139 (Canada) or local codes for placing and installing the oil storage tank;
- Follow a regular service and maintenance schedule for efficient and safe operation;

- j. Before servicing, allow furnace to cool down. Always shut off electricity and fuel to furnace when servicing. This will prevent electrical shock or burns;
- k. Seal supply and return air ducts;
- l. The vent system **MUST** be checked to determine that it is the correct type and size;
- m. Install correct filter type and size;
- n. Unit **MUST** be installed so that electrical components are protected from direct contact with water.

1.2.1) Safety Rules

Your unit is built to provide many years of safe and dependable service, provided it is properly installed and maintained. However, abuse and/or improper use can shorten the life of the unit and create hazards for you, the owner.

- a. The U.S. Consumer Product Safety Commission recommends that users of oil-burning appliances install carbon monoxide detectors. There can be various sources of carbon monoxide in a building or dwelling. The sources could be gas-fired clothes dryers, gas cooking stoves, water heaters, furnaces, gas-fired fireplaces, wood fireplaces, and several other items. Carbon monoxide can cause serious bodily injury and/or death. Therefore, to help alert people to potentially dangerous carbon monoxide levels, you should have carbon monoxide detectors listed by a nationally recognised agency (ex. Underwriters Laboratories or International Approval Services) installed and maintained in the building or dwelling (see Note below).
- b. There can be numerous sources of fire or smoke in a building or dwelling. Fire or smoke can cause serious bodily injury, death, and/or property damage. Therefore, in order to alert people to potentially dangerous fire or smoke conditions, you should have Underwriters Laboratories listed fire and smoke detectors installed and maintained in the building or dwelling (see Note below).

NOTE: The manufacturer of your furnace does not test detectors and makes no representations regarding any brand or type of detector.

CAUTION

Ensure that the area around the combustion air intake terminal is free of snow, ice and debris.

CAUTION

An air pressure switch **MUST** be used when the furnace is side-wall vented.

CAUTION

Do not use any commercially available soot remover. This furnace has a ceramic fibre type of combustion chamber. Normal servicing of this unit does not require the cleaning of same. Use extreme caution if for any reason you have to work in the area of the combustion chamber.

1.2.2) Freezing Temperatures and Your Structure



WARNING

Freezing temperature warning.

Turn off water supply.

If your heater remains shut off during cold weather, the water pipes could freeze and burst, resulting in serious water damage.

Your unit is equipped with safety devices that may keep it from operating if sensors detect abnormal conditions such as clogged exhaust flues.

If the structure is unattended during cold weather you should take the following precautions:

- a. Turn off main water supply into the structure and drain the water lines if possible. Open faucets in appropriate areas;
- b. Have someone check the structure frequently during cold weather to make sure it is warm enough to prevent pipes from freezing. Contact a qualified service agency, if required.

1.2.3) Installation regulations

All local and national code requirements governing the installation of oil burning equipment, wiring and flue connections **MUST** be followed. Some of the codes that may be applicable are:

CSA B139	INSTALLATION CODE FOR OIL BURNING EQUIPMENT
NFPA 31	INSTALLATION OF OIL BURNING EQUIPMENT
ANSI/NFPA 90B	WARM AIR HEATING AND AIR CONDITIONING SYSTEMS
ANSI/NFPA 70	NATIONAL ELECTRICAL CODE
CSA C22.1	CANADIAN ELECTRICAL CODE

Only the latest issues of the above codes should be used.

1.3) POSITIONING THE FURNACE

CAUTION

Carefully check your furnace upon delivery for any evidence of damage that may have occurred during shipping and handling. Any claims for damages or lost parts must be made with the Transport Company.

TABLE 1
Minimum Installation clearances from combustible materials (Chimney installation*)

LOCATION	APPLICATION	OCF105 AND ODH53	RECOMMENDED ACCESS FOR SERVICE
Sides	Furnace	25.4 mm (1")	
	Supply plenum, warm air duct within 6 ft of furnace	25.4 mm (1")	
Back	Furnace	25.4 mm (1")	
Top	Furnace casing or plenum	25.4 mm (1")	0.6 m (24")
Bottom	Furnace – combustible floor **	0" **	
Front	Furnace	0.6 m (24")	

* See Part 1 Section 4.3 for Direct Vent application clearances.

** Combustible floor requires accessory bases CFB-1 or HFB-1.

1.3.1) Location

Position the furnace as closely as possible to the chimney or vent terminal, providing ample clearance to permit easy accessibility for cleaning the inside of the furnace, the removal of filters, blower, motors, controls and flue connections. This unit can be installed in the downflow or horizontal (air left or right) position.

This furnace is approved for reduced clearances to combustibles. Therefore, it may be installed in an alcove, closet, or crawl space. Clearances indicated on the rating plate must be respected.

In the downflow position, this furnace is approved for installation on combustible floors only when the accessory No CFB-1 "Combustible Floor Base" is used.

In the horizontal position (air left or right), this furnace is approved for installation on combustible floors only when the accessory No. HFB-1 "Horizontal Floor Base" is used. It can also be suspending using an angle iron frame with treaded rod hangers.

However, do not install furnace directly on carpet or other combustible material, which can trap air under the floor.

The furnace must be installed level for safe and quiet operation.

CAUTION

Do **NOT** operate the furnace in a corrosive atmosphere containing chlorine, fluorine or any other damaging chemicals. Refer to Part 1, section 5.2.

1.4) VENTING

1.4.1) General

The furnaces can be vented in several ways:

Chimney Vented

Using the Beckett AFG or Riello 40-F burner, the furnaces can be chimney vented with or without a barometric damper. The unit will operate at a **negative** overfire draft and flue draft.



WARNING

Poisonous carbon monoxide gas, fire and explosion hazard.

Read and follow all instructions in this section.

Failure to properly vent this furnace can cause bodily injury or death, property damage.

Side-wall Vented

Using the Beckett AFII or Riello 40-BF burner with the integral pre- and post-purge controls, the system can be side-wall vented with the new DV-2000™ venting system for maximum efficiency and without the use of a side-wall power vent. The unit will operate at a **positive** overfire draft and flue draft.



WARNING

Poisonous carbon monoxide gas hazard.

Never vent this furnace together with another combustion appliance when side-wall venting.

To do so may result in asphyxiation and death to the occupants

1.4.2) Chimney installations

When set up for chimney venting, this furnace is certified for use with an L-vent, A-vent, tile-lined and metal-liner-tile lined chimney, and can be vented both with and without a barometric draft damper. However, this furnace is not approved for use without a barometric damper if it is to be vented together with another oil-fired appliance such as a water heater.

With barometric damper

This furnace may be vented into a chimney of suitable size and adequate chimney base temperature, as specified in the Installation Code. When a barometric damper is used, the basement air entering the damper reduces the possibility of vent condensation. The relevant excerpt from the code is found in this section and can be used as a guide where local or national codes do not exist. One option, to increase the chimney base temperature, is to use vent connection insulation.

Without barometric damper

Due to the lack of dilution air that would ordinarily be drawn into the barometric damper, the dew point of the flue gases is raised. To offset the increased tendency for vent condensation, the chimney must be lined. The liner must be insulated according to the insulating procedure recommended by the manufacturer of the liner. Also, the vent connector should be as short as possible and either be of double wall construction or of single wall construction with 25.4 mm (1") of insulation.



WARNING

Poisonous carbon monoxide gas hazard.

Never install a hand operated damper in the vent pipe. However, any Underwriters Laboratories listed electrically operated automatic type vent damper may be installed if desired. Be sure to follow instructions provided with vent damper. Read and follow all instructions in this section.

Failure to properly vent this furnace or other appliances can result in personal injury and/or death, property damage.

CAUTION

When the furnace (chimney installation) is vented together with other combustion appliances such as a water heater, the allowable venting materials (L-Vent, etc.) for use with those appliances must be investigated.

Flue pipe sizing

The following table is an excerpt from the Installation Code and indicates the permitted flue sizes and minimum base temperatures for circular flues in chimneys with thermal resistance of less than R6 (6 ft² •hr •°F / Btu). Where a new appliance, burner, or chimney is installed, chimney vent sizes and maximum flue gas temperatures (measured at the chimney connector with the barometric damper shut, after 5 minutes of operation) shall comply with Table 2.

Note: Thermal resistance values for typical chimneys are as follows:

R2 (2 ft² •hr •°F / Btu): Clay-lined masonry, A-vent
 R3 (3 ft² •hr •°F / Btu): Metal liner in clay-lined Masonry
 R6 (6 ft² •hr •°F / Btu): Metal or clay-lined masonry with R4.5 (4.5 ft² • hr •°F / Btu) insulation between liner and masonry (e.g. 2" of expanded mica or 1 3/8" of high density glass fibreboard.)

Applying Table 2

If a furnace with a 0.60 USGPH nozzle is to be connected to a 20 foot tall clay-lined masonry chimney, the thermal resistance of this type of chimney is R2, (which is less than R6). The actual firing rate at 156 psig is 1.25 x .60 = .75. Therefore this table shall apply as follows:

The minimum size permitted shall be 101.6 mm (4") inside diameter;
 The maximum size permitted shall be 127.0 mm (5") inside diameter;
 The minimum base temperature shall be about 160°C (320°F).

1.4.3) Side-wall venting - DV-2000™ Direct Vent System

The furnace can be side-wall vented without the use of a side-wall power vent, using the new DV-2000™ venting system with the high static pressure Beckett AFII and Riello 40-BF oil burners. **Outdoor combustion air must be directly connected to the burner or the DV-2000™ venting system will not function.**

The notable characteristics of the DV-2000™ system are as follows:

- Certified to use the following materials for ducting the intake air from the terminal to the burner: Schedule 40 PVC DWV, Schedule 40 ABS DWV, and ASTM 2729 sewer Pipe;
- One hole of minimal size (152.4 mm^ø / 6"ø) is required to be cut into the side-wall, and the terminal is designed to fit through a minimum 2 X 8 joist space;
- Incorporates a vent blockage safety shutdown system. If the vent or intake opening ever becomes partially or fully blocked, the burner will shut down before a #1 smoke condition occurs;
- The intake and vent circuits within the terminal can be accessed for cleaning.

There are 3 main components to the DV-2000™ system: the VTK vent terminal kit, the IFV insulated flexible venting material and the field-supplied 3 inch PVC or ABS intake piping.

TABLE 2

Total input rating of all connected appliances			Flue inside diameter		Minimum base temperature for chimney height of:			
kW	Btu/h	USGPH	Min.	Max.	11'	20'	28'	36'
21	70,000	0.50	76.2 mm (3")	0.13 m (5")	149°C / 300°F	204°C / 400°F	279°C / 535°F	385°C / 725°F
27	91,000	0.65	76.2 mm (3")	0.13 m (5")	135°C / 275°F	171°C / 340°F	221°C / 430°F	279°C / 535°F
31	105,000	0.75	0.1 m (4")	0.13 m (5")	127°C / 260°F	160°C / 320°F	193°C / 380°F	246°C / 475°F
36	119,000	0.85	0.1 m (4")	0.13 m (5")	121°C / 250°F	149°C / 300°F	179°C / 355°F	221°C / 430°F
41	140,000	1.00	0.1 m (4")	0.15 m (6")	107°C / 225°F	149°C / 300°F	185°C / 365°F	221°C / 430°F
51	175,000	1.25	0.1 m (4")	0.15 m (6")	116°C / 240°F	135°C / 275°F	160°C / 320°F	185°C / 365°F

DV-2000™ – Vent terminal kits

The certified standard vent terminal kit is Model No. VTK-1 for models ODH5-F and OCF105A12B and is suitable for installation in walls up to 0.3 m (14") thick. Both kits contain the following items to complete the hook-up to the venting and furnace:

Qty	Description
1	Terminal
2	Sealing clamps
1	Side-wall venting breach plate
2	Sealing strips
1	Inner wall plate
1	Pressure control with tubing
2	Insulated quick-connect terminals
3	Stainless steel screws
6	Self tapping stainless steel screws

Insulated flexible venting - DV-2000™

The certified venting materials come in 3 lengths, Model No. IFV3-15, IFV3-23 and IFV3-30 and correspond to 4.6 m, 7.0 m, and 9.1 m (15', 23' and 30') of continuous lengths of vent. The vent construction is coaxial and incorporates a stainless steel corrugated flexible liner surrounded by a thick blanket of insulation and covered with an outer layer of flexible corrugated aluminium sleeve to protect the insulation. **Splicing vent lengths together is prohibited.** The minimum and maximum continuous vent lengths permitted for installation are:

1.5 m (5') minimum 9.1 m (30') maximum



WARNING

Poisonous carbon monoxide gas hazard

Even though the flexible venting is insulated, it must not be run through an unheated space.

To do so can cause residual condensation inside the stainless steel liner, which may eventually perforate the liner and allow vent gasses to enter the dwelling. This can result in death, personal injury and/or property damage.

TABLE 3
Side-wall venting clearances to combustibles

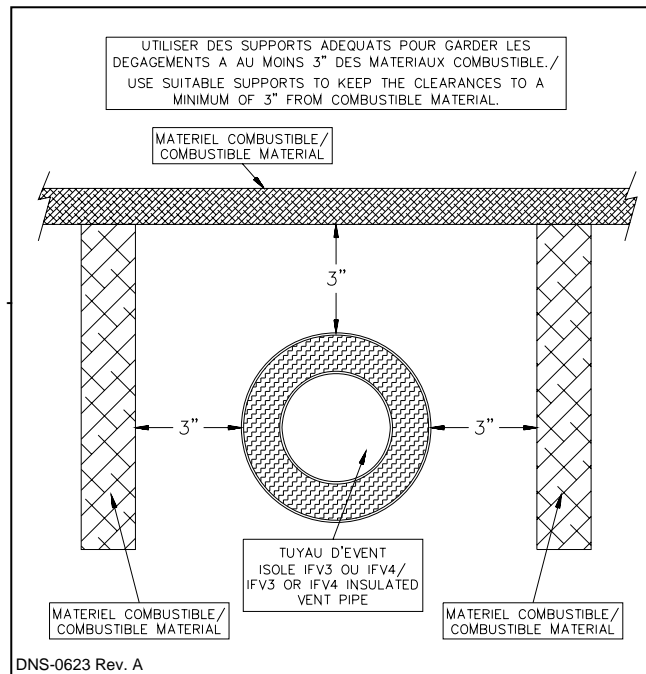
PORTION OF VENT	CLEARANCES
Vent pipe, up to vent terminal*	76.2 mm (3")
Vent terminal	ZERO

*Do not enclose venting

Installation considerations - DV-2000™

Select a location for the vent terminal in accordance with all local and national codes. The following requirements shall be considered to be minimum requirements that can be overridden by stricter local and national codes.

FIGURE 1



The vent shall not terminate

- Directly above a paved sidewalk or paved driveway that is located between two buildings, and that serves both buildings;
- Less than 2.1 m (7') above any paved driveway;
- Within 1.8 m (6') (in Canada) of a window or door, or mechanical air supply inlet to any building, including soffit openings;*
- Within 1.8 m (6') (in Canada) from the soffit of the roof of the structure;*
- Above a gas meter/regulator assembly within 0.9 m (3') of a vertical centreline of the regulator;
- Within 1.8 m (6') of any gas service regulator vent outlet, or within 0.9 m (3') of an oil tank vent, or an oil fill inlet;
- Within less than 0.3 m (1') above grade level;
- Within 1.8 m (6') of any other combustion air inlet;
- Within 1.8 m (6') of a property line;
- Underneath a veranda, porch or deck;
- So that the flue gases are directed at combustible material or any openings of surrounding buildings that are within 1.8 m (6');
- Less than 0.9 m (3') from an inside corner of an L-shaped structure;
- So that the bottom of the vent termination opening is less than 0.3 m (1') above any surface that may support ice, snow, or debris;
- So that the flue gases are directed toward brickwork, siding or other construction, in such a manner that may cause damage from heat or condensation from flue gases.

For installations in the U.S.A. refer to Section 6.7.3.4 of the NFPA 31.

CAUTION

Most codes have a notwithstanding clause that states that products of combustion shall not enter the dwelling under any circumstances, even if all other code requirements as to construction and location have been complied with. The installer is ultimately responsible to do whatever is necessary to ensure that flue gasses do not enter the dwelling.



WARNING

Cuts and abrasion hazard.

Always wear protective gloves and eye protection when handling the vent material.

The process of cutting and fitting the flexible venting material exposes the installer to sharp edges that could cause severe cuts to the skin.

Connection to the furnace breach - DV-2000™

1. Remove the standard breach plate by removing the brass nuts;
2. Determine which direction the venting will be routed from the furnace and then install the special side-wall venting breach plate provided in the VTK Series vent kit so that the breach plate test port will be accessible after vent installation. However, do not install the breach plate with the test port pointing downward. Tighten the brass nuts;
3. The flexible venting has 4 pieces of corrugated spin sleeve that has been temporarily screwed on over top of it. Remove the spin sleeve completely by unscrewing it in a counter-clockwise direction;
4. Using tin snips, cut the aluminium outer sleeve back by 127.0 mm (5") on the IFV Series vent (see Figure 1.1). Ensure the snips are well adjusted and sharp or the cut end of the venting will be too jagged to start the threads of the spin sleeve (see Figure 1.1);
5. Prepare the furnace breach end of the insulated flex vent by first screwing the spin sleeve onto the corrugated aluminium jacket (see Figure 1.2) until the trailing edge of the spin sleeve is about 0.3 m (12") from the end of the vent (see Figure 1.3);
6. Pull the insulation back to expose the corrugated stainless steel core;
7. Cut the corrugated stainless steel core back by 76.2 mm (3") on the IFV Series vent. You should now have about 76.2 mm (3") of insulation hanging out past the stainless steel core (see Figure 1.4);
8. Push the stainless steel core onto the breach pipe as far as it will go (see Figure 1.5) and mechanically attach the vent to the breach using three of the #8 X 1/2" self-drilling screws provided with the VTK Series kit. The screws should be equally spaced around the circumference of the stainless steel core, starting with the first screw at top dead centre. Start the drill point of the screws in the valleys of the corrugations at 9.5 mm –15.8 mm (3/8"-5/8") back from the end of the stainless steel core, so the screw heads can be properly sealed in the forthcoming operations (see Figure 1.6);
9. With the stainless steel core now firmly attached to the breach, tear off one green gum-sealing strip from the backing. Wrap the seal strip around the joint, always keeping the centreline of the seal strip over the line where the corrugated stainless steel core makes the transition to the smooth outer surface of the breach pipe. In other words, the seal strip must be centred over the joint. After wrapping the seal strip around once, allow 12.7 mm (1/2") overlap and tear off the residual length (see Figure 1.7);
10. Break the residual length of seal strip into 3 equal parts and stuff them onto the screw heads of the stainless steel self-drilling screws so that the screw heads are completely covered;

11. Two stainless steel band clamps are provided in the VTK Series kits. Position one stainless steel band clamp over the gum seal joint so that the edge of the clamp closest to the breach lines up with the edge of the gum seal that is closest to the breach. Ensure that the band will close with an action of one strip sliding over the other - not under the gear head of the draw clamp (see Figure 1.8). Tighten the band clamp with considerable torque to cause the gum seal to be squeezed into all crevices and to ooze out of the end of the clamp closest to the breach (see Figure 1.9). The gum will eventually become rubbery;
12. The seal is permanent and should never need to be disconnected as the breach plate can be removed for cleaning and inspection using the 4-bolt joint;
13. Tuck the vent insulation into the breach collar;
14. Screw the spin sleeve tightly into the breach collar for a finished appearance. Wrap the other end of the spin sleeve with aluminium tape to cover any metal burrs that may be present (see Figure 1.10);
15. Bend the venting into the desired radius coming off the breach.

Connection to the vent terminal - DV-2000™

1. Prepare the terminal end of the insulated flex vent by first screwing the spin sleeve onto the corrugated aluminium jacket until the trailing edge of the spin sleeve is about 254.0 mm (10") from the end of the vent;
2. Using sharp tin snips, cut the aluminium outer sleeve back by 127.0 mm (5") on the IFV Series vent;
3. Pull the insulation back to expose the corrugated stainless steel core;
4. Cut the corrugated stainless steel core back by 76.2 mm (3") on the IFV Series vent. You should now have about 76.2 mm (3") of insulation hanging out past the stainless steel core;
5. Push the stainless steel core onto the pipe on the back of the terminal as far as it will go and mechanically attach the vent to the terminal using three of the #8 X 1/2" self-drilling screws provided with the VTK Series kit. The screws should be equally spaced around the circumference of the stainless steel core, starting with the first screw at top dead centre. Start the drill point of the screws in the valleys of the corrugations at 9.5 mm-15.8 mm (3/8"-5/8") back from the end of the stainless steel core;
6. With the stainless steel core now firmly attached to the terminal, tear off the other green gum-sealing strip from the backing. Wrap the seal strip around the joint, always keeping the centreline of the seal strip over the line where the corrugated stainless steel core makes the transition to the smooth outer surface of the terminal pipe. After wrapping the seal strip around once, allow 12.7 mm (1/2") overlap and tear off the residual length;
7. Break the residual length of seal strip into 3 equal parts and stuff them onto the screw heads of the stainless steel self-drilling screws so that the screw heads are completely covered;
8. Position the other stainless steel band clamp over the gum seal joint so that the edge of the clamp closest to the terminal lines up with the edge of the gum seal that is closest to the terminal. Tighten the band clamp with considerable torque to cause the gum seal to be squeezed into all crevices and to ooze out of the end of the clamp closest to the terminal (see Figure 1.11);
9. The seal is permanent and should never need to be disconnected as the end of the terminal can be opened for cleaning and inspection by removing the screened end-cone assembly. Tuck the vent insulation into the recess in the terminal body;
10. Screw the spin sleeve tightly into the recess for a finished appearance. Wrap the other end of the spin sleeve with aluminium tape to cover any metal burrs that may be present (see Figure 1.12);
11. Bend the venting into the desired radius coming off the terminal.

FIGURE 1.1



FIGURE 1.2

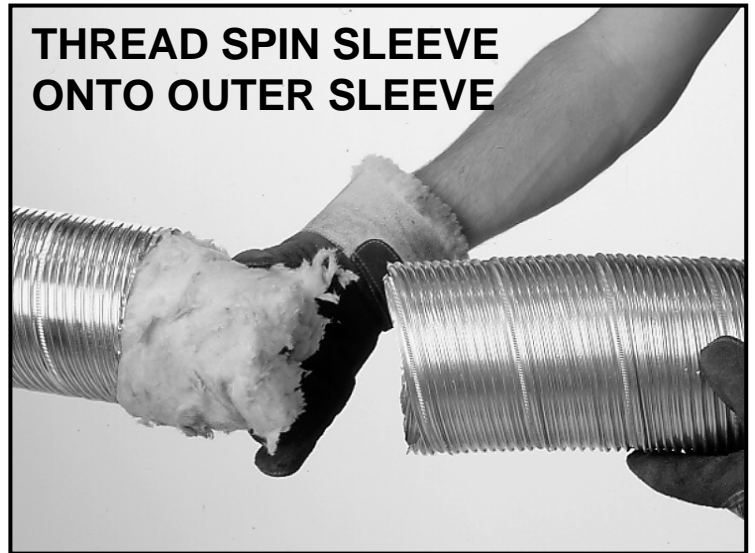


FIGURE 1.3



FIGURE 1.4



FIGURE 1.5



FIGURE 1.6



FIGURE 1.7

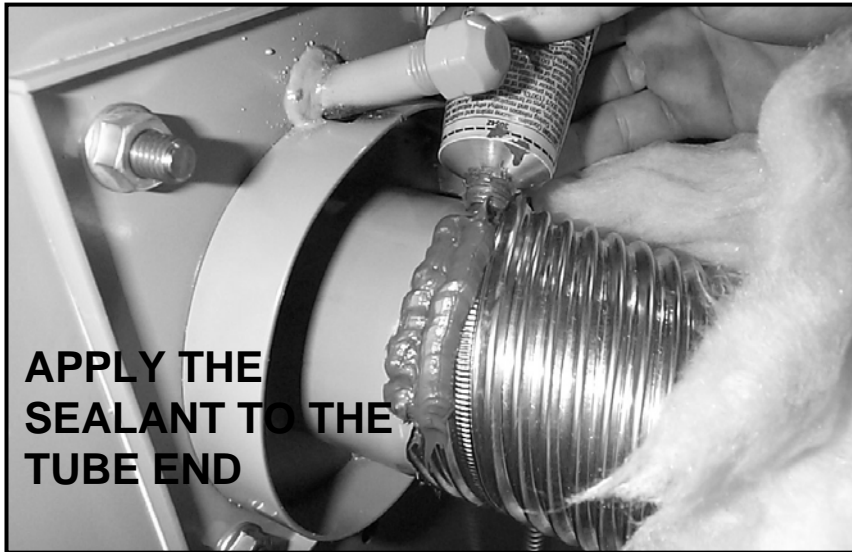


FIGURE 1.8

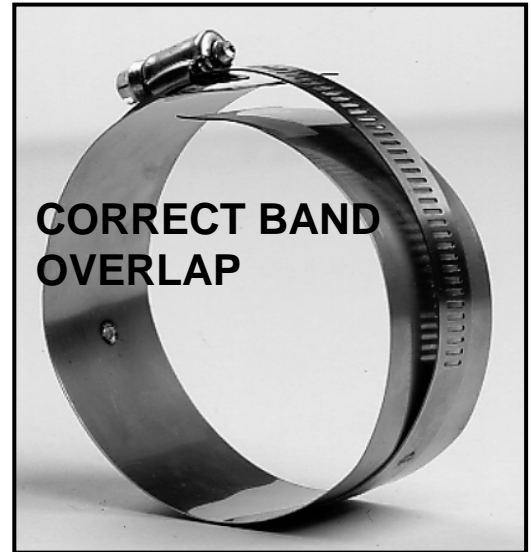


FIGURE 1.9



FIGURE 1.10



FIGURE 1.11

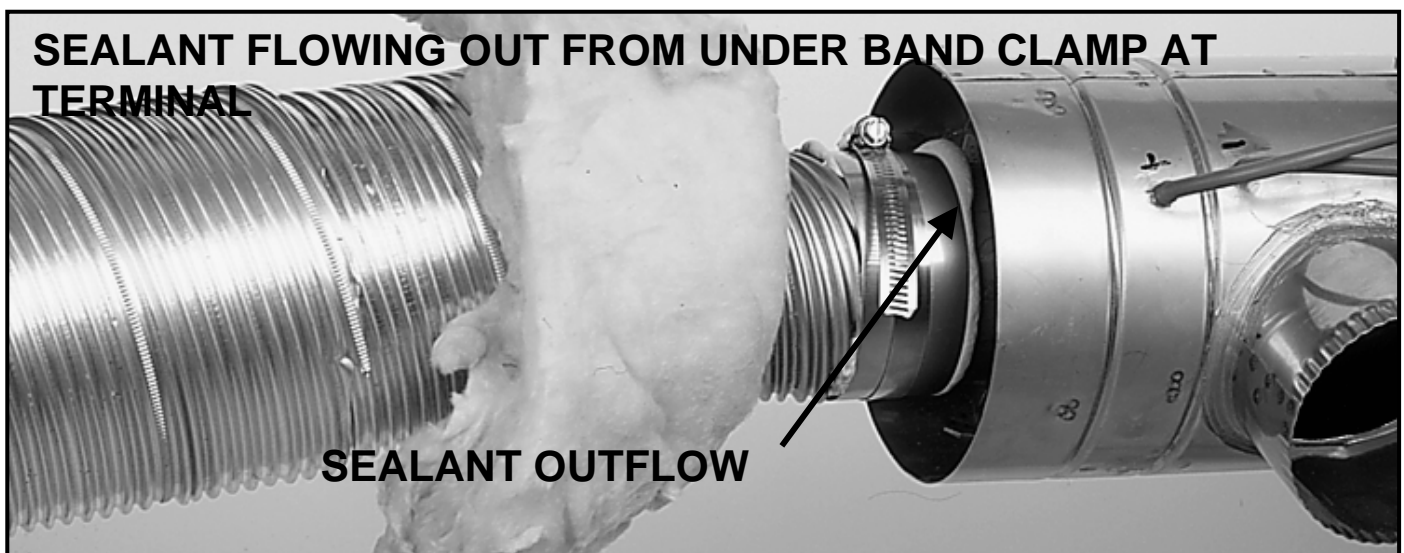


FIGURE 1.12

TWIST SPIN SLEEVE TIGHTLY INTO RECESS

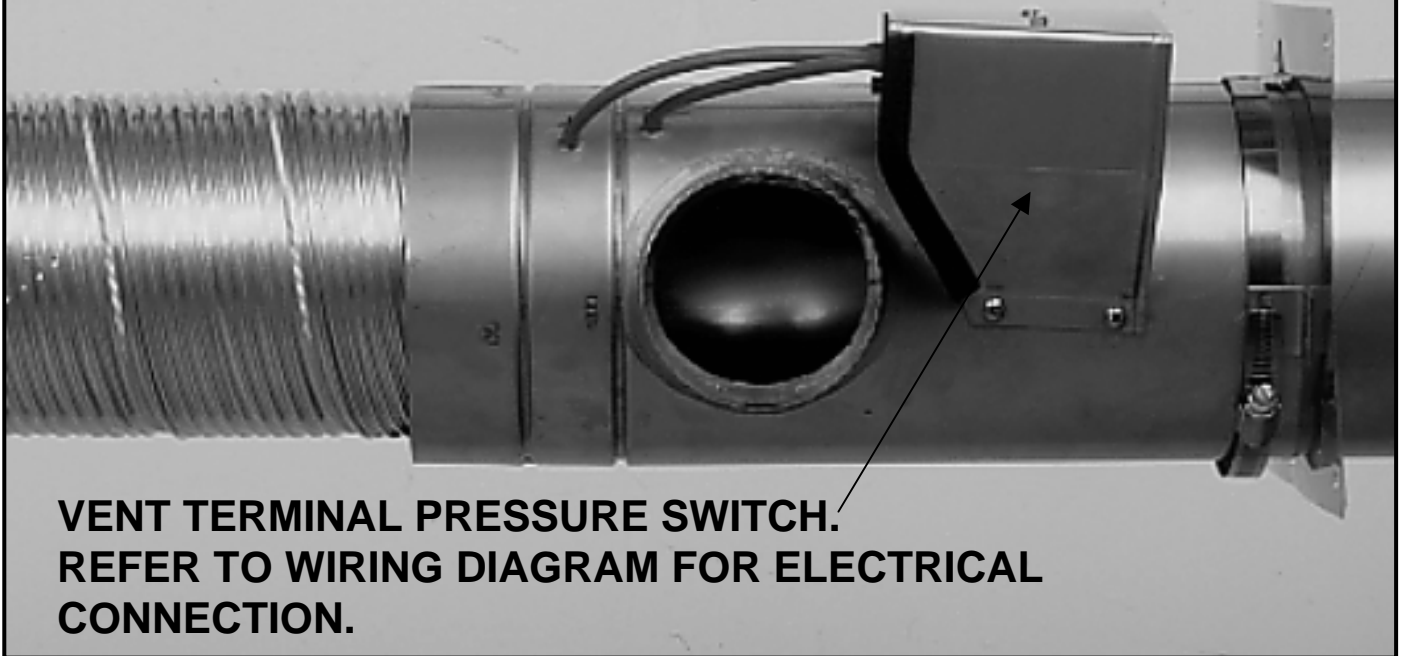


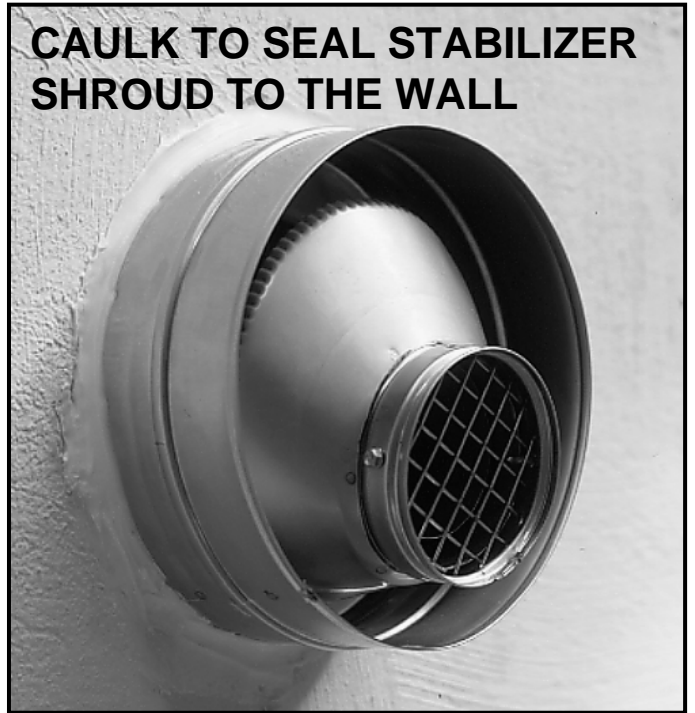
FIGURE 1.13

**INSTALL
STABILIZER
SHROUD**



FIGURE 1.14

**CAULK TO SEAL STABILIZER
SHROUD TO THE WALL**



Installing terminal in the wall - DV-2000™

1. Cut a 152.4 mm (6") hole in the side-wall in accordance with the location considerations outlined in the previous section;
2. Fasten the wall plate to the inside-wall using 4 field-provided fasteners appropriate for the material behind the wall plate. Depending on the angle of access, the pressure control bracket may need to be removed to access the top right wall plate screw hole. For concrete and block, Tapcon™ screws or equivalent are recommended. Install the wall plate so that the top of the hole in the wall plate is positioned 3.2 mm (1/8") lower than the top of the 152.4 mm (6") hole in the wall. This will accommodate the proper downward slope of the terminal, in the direction from the inside to the outside;
3. Remove the 2 screws fastening the end cone in place and remove the cone;
4. Remove the 2 screws fastening the stabiliser shroud in place and remove the stabiliser shroud;
5. Insert the main body of the terminal through the wall plate so that the end of the terminal extends about 50.8 mm (2") past the outside wall;
6. Install the stabiliser shroud and replace the two mounting screws. (see Figure 1.13);
7. On concrete and block wall installations in particular, if it appears that the flange at the back of the stabiliser shroud is not large enough to cover the irregularities in the hole, a field fabricated wall plate can be constructed of 304, 316, or 316L stainless steel;
8. Silicone seal the circumference of the joint where the stabiliser shroud connects to the main body of the terminal;
9. Apply caulking to the back plate of the stabiliser shroud and push the terminal back firmly against the wall;
10. While pushing down gently on the top of the stabiliser shroud, install the three 2" stainless steel screws provided with the kit to secure the back of the shroud to the wall. Do not overtighten the screws or it will distort the stabiliser shroud. The screws will not be necessary in a concrete or block wall as the mortar can provide positive positioning;
11. Tighten the clamp on the wall plate to secure the terminal in place;
12. Apply more caulking all around the seam where the stabiliser shroud meets the wall. It is important to have a good seal to prevent water from entering the dwelling (see Figure 1.14). A considerable amount of caulking may be necessary for irregular wall surfaces such as lapped siding;
13. Install the end cone and replace the two mounting screws;
14. Support the vent and intake air piping so that a 6.4 mm to 12.7 mm (1/4" to 1/2") downward slope (toward the outside) results for proper drainage out the terminal body.

Connection of combustion air piping to the terminal - DV-2000™

Refer to Part 1, section 5.3 (1.5.3), Outdoor Combustion Air – Side-wall Venting, DV-2000™ for a complete description.

1.5) AIR FOR COMBUSTION



WARNING

Poisonous carbon monoxide gas hazard.

Comply with NFPA standards for the installation of Oil Burning Equipment and applicable provisions of local building codes to provide combustion and ventilation air.

Failure to provide adequate combustion and ventilation air can result in personal injury and/or death.

1.5.1) General

Oil furnaces must have an adequate supply of combustion air. It is common practice to assume that older homes have sufficient infiltration to accommodate the combustion air requirement for the furnace. However, home improvements such as new windows, doors, and weather stripping have drastically reduced the volume of air infiltration into the home.

Home air exhausters are common. Bathroom and kitchen fans, power vented clothes dryers, and water heaters all tend to create a negative pressure in the home. Should this occur, the chimney becomes less and less effective and can easily downdraft.

Heat Recovery Ventilation Systems (HRVs) are gaining in popularity. HRVs are not designed to supply combustion air. If not properly balanced, a serious negative pressure condition could develop in the dwelling.

1.5.2) Contaminated Combustion Air

Installations in certain areas or types of structures will increase the exposure to chemicals or Halogens which may harm the furnace. These instances will require that only outside air be used for combustion.

The following areas or types of structures may contain or be exposed to certain substances, potentially requiring outside air for combustion:

- a. Commercial buildings;
- b. Buildings with indoor pools;
- c. Furnaces installed near chemical storage areas.

Exposure to the following substances:

- a. Permanent wave chemicals for hair;
- b. Chlorinated waxes and cleaners;
- c. Chlorine based swimming pool chemicals;
- d. Water softening chemicals;
- e. De-icing salts or chemicals;
- f. Carbon tetrachloride;
- g. Halogen type refrigerants;
- h. Cleaning solvents (such as perchloroethylene);
- i. Printing inks, paint removers, varnishes, etc.;
- j. Hydrochloric acid;
- k. Solvent based glue;
- l. Antistatic fabric softeners for clothes dryers;
- m. Acid based masonry cleaning materials.

1.5.3) Ducted outdoor combustion air

Three burners are set up to duct outside combustion air directly to the burner: the Beckett AFII and Riello 40-BF for side-wall venting using the new DV-2000™ venting system, and the Beckett AFG for use with conventional chimney venting. The Riello 40-F is not suitable for direct-connected outdoor air.

CAUTION

The use of ducted outside combustion air is mandatory for the DV-2000™ venting system. This system operates on a balanced flue principle and will not function properly if the combustion air piping is not attached and sealed at all connections between the vent terminal and burner inlet.

Outdoor combustion air kits – chimney venting

The following kit has been certified for use on this appliance. The kit contains an important safety feature, namely a vacuum relief valve, or VRV. During normal operation the burner aspirates outdoor air. If the intake terminal ever becomes partially blocked or fully blocked from ice or snow etc., the VRV will open to allow a proportion of air from the dwelling to enter the burner thus maintaining proper combustion. Once the blockage is removed, the VRV will close and the burner will draw all air from the outdoors again.

CAS-2B Components (except air duct) for the Beckett AFG burner: The kit includes the intake terminal, vacuum relief valve (VRV) and special air boot connection with integral air adjustment means for the AFG burner. The CAS-2B can be used with a 101.6 mm (4") galvanized steel air duct or with a 101.6 mm (4") flexible aluminium air duct. It is recommended that the metallic air ducting material be insulated from the air intake up to 1.5 m (5') from the burner, to avoid condensation on the outside of the intake pipe.

CAUTION

The CAS-2B does not turn the furnace installation into a direct vent system. Therefore, the building structure must provide for adequate combustion air to be delivered to the Vacuum Relief Valve. The burner will need to draw combustion air from the VRV's surroundings if the intake ever becomes blocked. Therefore, non-direct vent installation codes must be followed.

CAD-1 This air duct kit consists of 7.6 m (25') of insulated UL/ULC Listed Class 1 air duct and two 101.6 mm (4") steel band clamps. The duct incorporates a corrugated flexible aluminium core, surrounded by fibreglass insulation and a vinyl vapour barrier.

Comprehensive installation instructions are provided with the kit.

Outdoor combustion air – side-wall venting, DV-2000™

The new DV-2000™ venting system is a sealed system and completely isolates the furnace from the interior of the building. The burner is totally unaffected by any pressure fluctuations within the building which makes it ideal for tight home construction.

The DV-2000™ venting system requires additional parts, which are not included with the kit. These additional parts must be constructed of 3" Schedule 40 PVC, PVC-SWV, SDR-26, SDR-21, Septic Sewer Pipe, or ABS plastic pipe, fittings and sealant. Also, installation procedures, piping and fittings must conform to the following ANSI /ASTM standards:

PVC	ASTM D-1785
SDR26, SDR21	ASTM D-2241
Septic Sewer Pipe	ASTM D-2729
PVC-DWV	ASTM D-2665
PVC Primer and Solvent Cement	ASTM D-2564
ABS Pipe and Fittings	ASTM D-2235
Procedure for Cementing Joints	ASTM D-2855

Additional parts required (not included in VTK kit)

- 3" elbow fitting as required;
- 3" plastic pipe;
- 3" 90° elbow, female-female (for terminal);
- 3" female to 2 inch female reducer (Riello 40-BF burner only);
- 2" 90° elbow, street type, female-male (Riello 40-BF burner only);
- 3" female-female PVC or ABS coupling (not sewer pipe) (Beckett AFII burner only);
- Transition bushings to go from PVC or ABS to ASTM D2729 Septic Sewer Pipe (if applicable).

If PVC fittings are mixed with ABS fittings, use solvent cement that is approved for bonding the two plastics.

Intake pipe length - DV-2000™

The DV-2000™ venting system has been certified for 37 equivalent m (120 equivalent feet) of 3" intake pipe. Count a 90° elbow as 10 equivalent feet and a 45° elbow as 5 equivalent feet in the calculation.

For example:

1	1.5 m (5') length	= 1.5 equivalent m (5 equiv. feet)
2	3.0 m (10') lengths	= 6.0 equivalent m (20 equiv. feet)
3	90° elbows	= 9.0 equivalent m (30 equiv. feet)
2	45° elbows	= 3.0 equivalent m (10 equiv. feet)
1	90° elbow (terminal)	= 3.0 equivalent m (10 equiv. feet)
1	90° elbow (Burner)	= 3.0 equivalent m (10 equiv. feet)

Total = 25.5 equivalent m (85 equivalent feet);
this is below the 37 equivalent meters (120 equiv. feet).

Intake pipe installation - DV-2000™

Obtain the necessary additional parts, to complete the installation, and start by piping at the burner. If the optional vestibule has been installed, remove the appropriate knockouts in the side panels of the vestibule. The lower 127.0 mm (5") knockout in the right-hand panel is used for the Beckett AFII burner. The higher 127.0 mm (5") knockouts on the right and left-hand panels are for right or left connection to the Riello 40-BF burner.

Beckett AFII burner

Remove the burner intake cover by removing the 3 screws securing it in place. Discard the cover and screws. Apply silicone liberally around the end of a 3" coupling and fully insert the siliconed end into the burner opening. Fasten securely with 3 self-tapping sheet metal screws.

Riello 40-BF burner

Fully insert the female end of the 2" 90° street elbow into the combustion air fitting on top of the burner. Fasten securely with 3 self-tapping sheet metal screws. Cement the 2" end of the 3" female to the 2" female reducer onto the male end of the 2" 90° street elbow. If these parts are not easily obtained, use a 3" 90° street elbow with the male end fitted over the combustion air fitting. The fitting will have to be silicone sealed as the fit is a bit loose. Fasten securely with 3 self-tapping sheet metal screws.

Terminal connection

Insert the 3" 90° female-female elbow onto the stainless steel air intake fitting located on the right side of the vent terminal (viewed from the rear). Fasten securely with 3 self-tapping sheet metal screws.

Intermediate piping

Pipe as required between the terminal and the burner. Ensure that the 3" piping is routed and supported in accordance with local and national codes. Obey minimum furnace clearances to combustibles when routing any section of 3" piping in the vicinity of the furnace. If Septic Sewer Pipe is to be used, install transition bushings on the 3" female ends of the fittings at the burner and at the terminal. Transition bushings are readily available and are required because 3" PVC and ABS pipes have a typical outside diameter of 3.5", whereas Septic Sewer Pipe has a typical outside diameter of 3.25".

1.6) OIL TANKS AND LINES

Check your local codes for the installation of the tank and accessories.

A manual shut-off valve and an oil filter shall be installed in sequence from tank to burner. Be sure that the oil line is clean before connecting to the burner. The oil line should be protected to eliminate any possible damage. Installations having the fuel oil tank below burner level must employ a two pipe fuel supply system with an appropriate fuel pump. For more than a 2.4 m (8') rise use a 2 stage pump; for more than a 4.9 m (16') rise, an auxiliary pump.

Follow the pump instructions to determine the size of pipe you need in relation to the rise, or the horizontal distance.

At the beginning of each heating season or once a year, check the complete oil distribution system for leaks.

1.7) BURNER INSTALLATION

Mounting the burner

1. The warm air furnace burner mounting plate has a 4-bolt configuration;
2. Position the mounting gasket between the mounting flange and the appliance burner mounting plate. Line up the holes in the mounting flange with the studs on the appliance mounting plate and securely bolt in place.

After the burner is mounted

1. Remove drawer assembly or air tube combination;
2. Install nozzle (see specifications);
3. Confirm electrode settings;
4. Make the electrical connections;
5. Complete oil line connections.

CAUTION

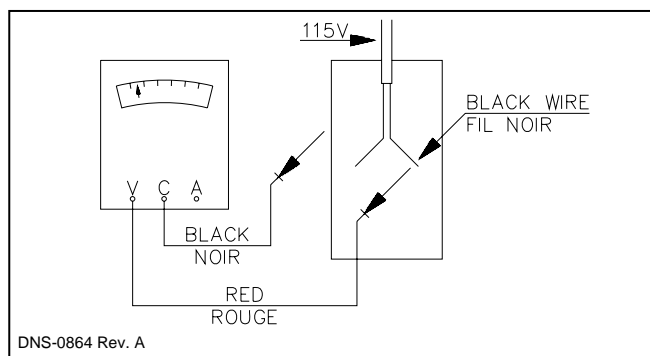
Do not turn on the burner until you have checked:

Checking the polarity

Oil burners used on furnaces have solid state control systems which make them sensitive to the proper connections of the hot and neutral power lines. The controls will be damaged if the 2 lines are reversed.

1. Set your voltmeter to line voltage;
2. Place one prong on your grounded electric entry box and one prong on the black wire;
3. Read the voltage;
4. If the voltage is zero, check the white wire. If line voltage shows, reverse the 115-volt leads entering the furnace junction box;
5. If you do not have a voltmeter, use a pilot light.

FIGURE 2



Checking the nozzle

The burner is equipped with an appropriate nozzle. However, if another size or a replacement nozzle is required, use the manufacturer's nozzle data concerning spray angle, as shown in Table 4. Note that all nozzle sizes are based on a pump pressure of 100 PSI.

Always select nozzle sizes by working back from the actual desired flow rate at operating pressure, and not by the nozzle marking.

Checking the air and turbulator settings

Before starting the burner for the first time, adjust the air and turbulator settings to those listed in Table 4. Once the burner becomes operational, final adjustments will be necessary.

Checking the fuel supply system

Fuel Specifications

NOTE: Use No.1 or No.2 Heating Oil (ASTM D396) or in Canada, use No.1 or No.2 Furnace Oil.

Before starting the burner, be sure the fuel tank is filled with clean oil.

NOTE: You may notice a slight odor the first time your furnace is operated. This will soon disappear. It is only the oil used on certain parts during manufacturing.



WARNING

Fire and explosion hazard.

Use only approved heating type oil in this furnace. DO NOT USE waste oil, used motor oil, gasoline or kerosene.

Use of these will result in death, personal injury and/or property damage.

IMPORTANT

When using nozzle sizes of less than .75 USGPH, the Installation Code for oil burning equipment requires the installation of a 10 (or less) micron filter in the fuel oil line. ICP requires that this practice be followed in order to keep the lifetime heat exchanger warranty intact.

1.8) BLOCKED VENT SHUT-OFF (BVSO) For chimney venting



WARNING

It is imperative that this device be installed by a qualified agency.

This device is designed to detect the insufficient evacuation of combustion gases in the event of a vent blockage. In such a case the thermal switch will shut down the oil burner. The device will then need to be re-armed MANUALLY.

Refer to the wiring diagrams and the detailed instructions supplied with the BVSO for the installation and wiring procedures. The length of wires supplied with the unit is such that the safety device must be installed between the flue outlet of the appliance and the draft regulator, as indicated in the instructions.

It is further imperative that the BVSO be maintained annually. For more details refer to the instructions supplied with the device itself, as well as Section 3. of this Manual.

CAUTION

A positive pressure venting system (Sealed Combustion System or Direct Vent) **MUST NOT** use the BVSO. Follow the instructions supplied with the venting system.

1.9) INSTALLING ACCESSORIES



WARNING

Electrical shock hazard.

Turn OFF electric power at fuse box or service panel before making any electrical connections and ensure a proper ground connection is made before connecting line voltage.

Failure to do so could result in bodily injury or death, property damage.

1.9.1) Electronic air cleaner

Wire terminals are provided to direct 115 volts @ 0.5 Amp maximum to an Electronic Air Cleaner (EAC). Power will be available to the EAC at all times, so it must incorporate a flow proving switch if it is to be wired into the furnace control box. Most modern EACs have the required integral airflow proving switch. Wire the Electronic Air Cleaner between terminals #5 and #2. Refer to wiring diagram, Figure 6.

1.9.2) Humidifier

The red wire from burner can be used to direct 115 volts @ 1.0 Amp maximum to the transformer powering the humidifier. The humidifier will be energized anytime the burner is operating in the "Heating Mode". Refer to wiring diagram, Figure 6.

1.9.3) Air conditioning

An air conditioning coil may be installed on the supply air side only. Also, notwithstanding the evaporator coil manufacturer's instructions, a minimum of 6 inches clearance must be allowed between the bottom of the coil drain pan and the top of the heat exchanger. Wire the thermostat and condensing unit contactor as indicated in the wiring diagram (Figure 6).

1.9.4) Ductwork and Filter

Installation

Design and install the air distribution system to comply with Air Conditioning Contractors of America manuals or other approved methods that conform to local and/or national codes and good trade practices.

CAUTION

When ducting supplies air to a space other than where the furnace is located, the return-air ducts must be sealed and also be directed to the space other than where the furnace is located. Incorrect ductwork termination and sealing will create a hazardous condition which can lead to bodily harm.

Install air conditioning cooling coil (evaporator) on downstream side from the supply air plenum of the furnace. If a separate evaporator and blower unit is used, install appropriate sealing dampers for air flow control. Cold air from the evaporator coil going through the furnace could cause condensation and shorten furnace life.

CAUTION

Dampers (purchased locally) **MUST** be automatic.



WARNING

Poisonous carbon monoxide gas hazard.

Do NOT draw return air from inside a closet or utility room. Return air duct MUST be sealed to furnace casing.

Failure to properly seal duct can result in death, personal injury and/or property damage.



WARNING

Poisonous carbon monoxide gas hazard.

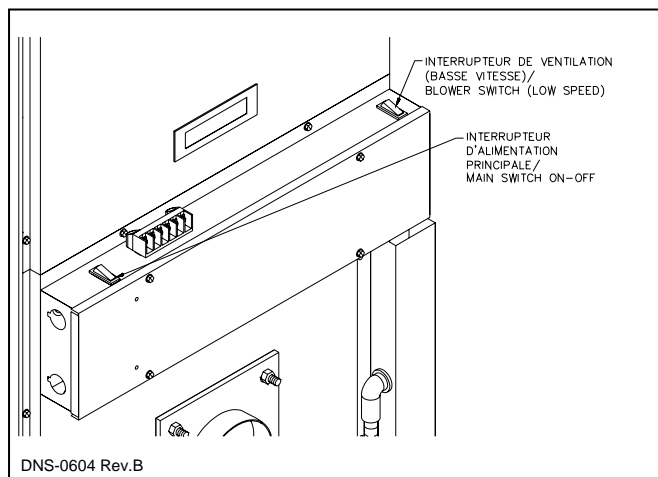
Install evaporator coil on the supply side of the furnace ducting.

Evaporator coil installed in return side ducting can cause condensation to form inside heat exchanger resulting in heat exchanger failure. This could result in death, personal injury and/or property damage.

PART 2 OPERATION

2.1) MANUAL OPERATION SWITCHES

FIGURE 3



2.2) SEQUENCE OF OPERATION

2.2.1) Sequence of operation - Beckett AFII Side-wall venting

1. On the Beckett AFII burner, the T-T terminals have to be jumpered on the primary control of the burner;
2. Normally open contact (W-R) on SPDT relay closed when thermostat calls for heat;
3. Burner motor starts and spark is established. The burner motor fan pre-purges the combustion chamber and vent for 15 to 20 seconds, establishing the combustion air pattern;
4. After pre-purge period, solenoid valve opens, allowing oil to flow through nozzle;
5. The ignition transformer spark ignites oil spray;
6. Cad cell senses flame and burner continues to fire;
7. After Fan-Limit Control heats up to the factory set point, the circulating air blower starts;
8. The circulating air blower, burner motor and ignition transformer remain on until the thermostat is satisfied. Also, the solenoid valve remains open;

Thermostat is satisfied:

9. PDT relay contacts open, solenoid valve closes, burner fan motor post-purges the combustion chamber and vent for a pre-set time of 15 seconds. The ignition transformer also continues to spark for this time period;
10. During the post-purge cycle, the Fan-Limit Control cools down to the factory set point of 32°C (90°F) and the circulating air blower turns off.

2.2.2) Sequence of operation - Riello 40-BF Side-wall venting

1. Normally open contact (W-R) on SPDT relay closed when thermostat calls for heat;
2. Burner motor starts. The burner motor fan pre-purges the combustion chamber and vent for 10 seconds, establishing the combustion air pattern. During this time the solenoid valve holding coil pressure will be approximately 100 psig;

3. After the pre-purge period, the solenoid valve opens, allowing oil to flow through the nozzle. At the same time, the burner motor ignition coil produces spark;
4. The ignition transformer spark ignites the oil spray;
5. Cad cell senses flame and burner continues to fire. Ignition transformer ceases sparking;
6. After Fan-Limit Control heats up to the factory set point, the circulating air blower starts;
7. The circulating air blower and burner motor remain on until the thermostat is satisfied. Also, the solenoid valve remains open;

Thermostat is satisfied:

8. Relay contacts open, solenoid valve closes and the burner fan motor post-purges the combustion chamber and vent for a pre-set time of up to 15 seconds (5 inch breach model only);
9. During the post-purge cycle, the Fan-Limit Control BI-metal cools down to the factory set point of 32°C (90°F), and the circulating air blower shuts down.

NOTE: With burner relay contact open, the Riello 40-BF will post-purge when 115 volt power is applied to the burner.

2.2.3) Sequence of operation - Beckett AFG and Riello 40-F - Chimney venting

1. On the AFG burner, the T-T terminals have to be jumpered on the primary control of the burner;
2. Normally open contact (W-R) relay closes when thermostat calls for heat;
3. Burner motor starts. The burner motor fan pre-purges the combustion chamber and vent for 10 to 15 seconds, establishing the combustion air pattern. After the pre-purge period, the solenoid valve opens, allowing oil to flow through nozzle. At the same time, the burner motor ignition coil produces a spark;
4. Spark ignites oil droplets;
5. Cad cell senses flame and burner continues to fire. Ignition transformer ceases sparking;
6. After Fan-Limit Control heats up to the factory set point, the circulating air blower starts;
7. The circulating air blower and burner motor remain on until the thermostat is satisfied;

Thermostat is satisfied:

8. Relay contacts open, solenoid valve closes, burner fan motor shuts down and the ignition transformer ceases sparking.

2.2.4) Sequence of operation - DV-2000™ Venting system

Normal operation

1. Before a call for heat, the contacts of the pressure switch are closed;
2. When the room thermostat calls for heat, the normally open contact W-R closes, the burner blower starts and creates suction in the intake piping circuit and pressure in the vent piping circuit;
3. The differential pressure set point of the pressure switch is not exceeded and the thermostat circuit remains closed until the call for heat has ended.

Abnormal operation

Start-up

1. When the room thermostat calls for heat, the normally open contact W-R closes, the burner blower starts and creates suction in the intake piping circuit and pressure in the vent piping circuit;
2. If there is a blockage in the intake or vent openings to cause a pressure differential beyond the set point of the pressure switch, then the thermostat circuit is opened and the burner will go into a 15 seconds post-purge and then shut down;
3. Once the burner blower shuts down, after the post-purge, the pressure switch contacts will re-close. If the call for heat remains, the burner will re-start. If the blockage still exists, the thermostat is again opened, and the burner post-purges again. The post-purge function thus becomes an inherent anti-short cycling device;
4. The unit will essentially go into a continuous re-cycling/post-purge mode with no heat being supplied to the dwelling, which will prompt a service call;
5. If, during the re-cycling/post-purges, the blockage of the terminal is removed, the burner will immediately fire up at the end of the current post-purge cycle.

During operation

If the terminal vent or intake openings become blocked to the point where the set point of the pressure switch is exceeded, during a firing cycle, the burner flame will shut down and the burner will go into the indefinite recycling/post-purge mode as described above, until the blockage is removed.

2.3) CHECKS AND ADJUSTMENTS

2.3.1) General

During initial start-up and subsequent yearly maintenance calls, the furnace must be thoroughly tested.

Open the oil bleed port screw and start the burner. Allow the oil to drain into a container for at least 10 seconds. Slowly close and tighten the bleed screw. The oil should flow absolutely free of white streaks or air bubbles to indicate that no air is being drawn into the suction side of the oil piping and pump. Fire the burner. Adjust the oil pressure as indicated in Table 4.

IMPORTANT

The burner must be put in operation for at least 10 minutes before any test readings are taken. For new installations, set up the burner to the settings in Table 4 before firing. These are rough adjustments but they will ensure that the burner will start and run smoke-free in advance of the fine adjustments being made.

2.3.2) Restart after burner failure

1. Set thermostat lower than the room temperature;
2. Press the reset button on the burner primary control (relay);
3. Set thermostat higher than the room temperature for 10 seconds, then set lower than room temperature. This will start the pre-purge cycle. Repeat twice;

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. Always keep the supply valve closed if the burner is shut down for an extended period of time.

4. Set thermostat higher than the room temperature;
5. If the burner motor does not start or ignition fails, turn off the disconnect switch and CALL A QUALIFIED SERVICE TECHNICIAN.

2.3.3) Combustion chamber curing

Some moisture and binders remain in the ceramic combustion chamber after fabrication. It is important to clear the chamber of this residue before testing. If you smoke test before curing, the instrument may become damaged. To cure the chamber, run the unit for 3 consecutive cycles, with 3 minutes of elapsed time in between each cycle. Each burn cycle should be 3 minutes long. The exhaust will have a pungent odour and produce a white cloud of steam.

2.3.4) Smoke / CO₂ test

1. On chimney installations, pierce a test hole in the smoke pipe 18 inches above the furnace breach. On side-wall vented installations, remove the threaded cap from the extended test pipe that is welded into the 4-bolt breach plate. Insert the smoke test instrument probe into the open hole;
2. From a cold start, let the unit operate during 5 to 10 minutes;
3. Set the burner air setting until just a trace of smoke results (#1 on the Bacharach scale);
4. Take a CO₂ sample at the same test location where the #1 smoke reading was taken and make note of it. Example: 13.8% of CO₂ or 2.5% of O₂;
5. Adjust the burner air setting to obtain a CO₂ reading 1.5% lower (or a O₂ reading 2.0% higher) than the reading associated with the #1 smoke. Example: 12.3% of CO₂ or 4.5% of O₂;
6. This method of adjusting the burner will result in clean combustion and ensure the proper functioning of the system.

2.3.5) Perform the supply air temperature rise test

1. Operate the burner for at least 10 minutes;
2. Measure the temperature of the air in the return air plenum;
3. Measure the temperature of the air in the largest trunk coming off the supply air plenum, just outside the range of radiant heat coming off the heat exchanger; 0.3 m (12") away from the plenum on the main take-off is usually sufficient;
4. The temperature rise is calculated by subtracting the return air temperature from the supply air temperature;
5. If the temperature rise exceeds the temperature specified in Table 4, change to the next higher blower speed tap until the temperature rise falls to this temperature or below. If the excessive temperature rise cannot be reduced by increasing fan speed, investigate for ductwork restriction(s), dirty or improper air filter, overfiring caused by excessive pump pressure, or improper nozzle sizing.

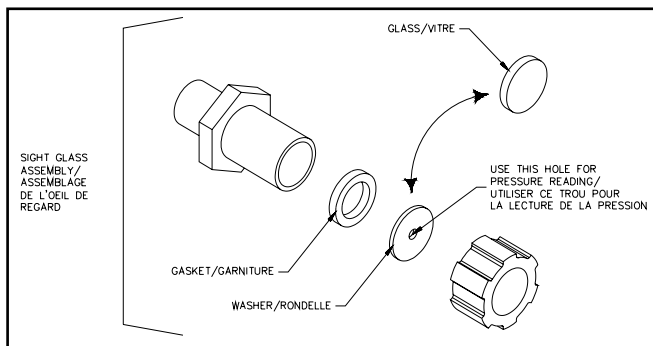
2.3.6) Vent temperature test

1. After 5 to 10 minutes of operation, place a thermometer in the test hole located in the breach pipe;
2. The vent temperature should be between 204 and 302°C (400 and 575°F). If not, check for improper air temperature rise, pump pressure, nozzle size, or for a badly sooted heat exchanger;
3. Check the minimum permitted temperature at the base of the chimney. Refer to the installation code in order to avoid the risk of condensation in the chimney.

2.3.7) Overfire pressure test procedure

1. To read the pressure, replace the glass with the washer supplied with the appliance;
2. After the test, put the glass back in place in the sight glass assembly;
3. Verify that the pressure reading corresponds to the one specified in Table 4. Also see Figure 3.1.

FIGURE 3.1



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2.3.8) Fan-Limit adjustment

Modification of the "FAN ON" and "HI" limit settings on the Fan-Limit can cause malfunctioning of the furnace and result in premature wear of the heat exchanger.

CAUTION

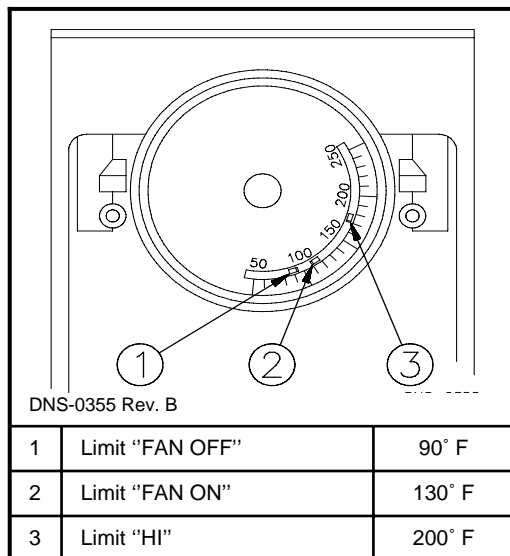
Modification of the factory set limits will void the warranty.

2.3.9) Limit control check

After operating the furnace for at least 15 minutes, restrict the return air supply by blocking the filters or the return air register and allow the furnace to shut off on High Limit. The burner will shut off but the blower will continue to run.

Remove the obstruction and the burner should restart after a few minutes.

FIGURE 4



2.3.10) DV-2000™ Blocked intake / blocked vent test

On side-wall vented furnaces, the DV-2000™ venting system incorporates a safety shutdown system that will shut the burner down before #1 smoke occurs due to the presence of a blocked intake or blocked vent outlet. Test the system as follows:

1. Ensure that the furnace has been running for at least 10 minutes;
2. Gradually block the intake. The burner flame should shut down before a #1 smoke reading occurs;
3. Gradually block the vent outlet. The burner flame should shut down before a #1 smoke reading occurs;
4. If the burner does not shut down before #1 smoke occurs, ensure that the burner is set up according to Part 2, section 3.4 (2.3.4). Perform the CO₂/ Smoke Test, and allow for the 1.5% CO₂ operating headroom required by the instructions;
5. If the burner still does not shut down before #1 smoke occurs, check for a blockage in the pressure hose, or at the hose connection points.

IMPORTANT

The DV-2000™ safety shutdown system will shut down the burner flame during a blocked intake or blocked vent condition if and only if the burner has been set up and calibrated in accordance with Part 2, section 3.4 (2.3.4). Perform the CO₂ / Smoke Test. For instance, if the burner is adjusted and final-set to a #1 smoke condition during normal operation, the burner flame cannot possibly shut down before #1 smoke occurs during a blockage condition.

2.3.11) BVSO performance test

The purpose of the following test is to check that the electrical outlet on the furnace, designated to the BVSO, is functional.

1. Start up the burner;
2. Remove the three-pole plug from the BVSO outlet on the furnace;
3. The burner must shut-off immediately, while the blower continues to run to the end of the cool-down cycle.

If the test is not in line with the above, call a QUALIFIED SERVICE TECHNICIAN.

PART 3 MAINTENANCE

3.1) GENERAL

Preventive Maintenance

“Preventive maintenance” is the best way to avoid unnecessary expense and inconvenience. Have your heating system and burner inspected at regular intervals by a qualified service technician.

After inspection, a complete combustion test must be performed after each annual service of the unit to maintain optimum performance and reliability.

Do not tamper with the unit or controls. Call a qualified service technician.

Before calling for service, check the following:

1. Check oil tank gauge and check if the oil tank valve is open;
2. Check fuse or circuit breaker;
3. Check if shut-off switch is “ON”;
4. Reset thermostat above room temperature;
5. If ignition does not occur, turn off the disconnect switch and call a qualified service technician.

When ordering replacement parts, specify the complete furnace model number and serial number.



WARNING

Electrical shock hazard.

Turn OFF power to furnace before any disassembly or servicing.

Failure to do so can result in bodily injury and/or death, property damage.

3.1.1) Heat exchanger

The entire heat exchanger should be inspected annually for soot accumulation. If the burner is operating normally there should be very little soot accumulation. If the heat exchanger requires scale removal, use a wire brush first, to loosen the scale and then vacuum the soot and scale that has fallen into the secondary heat exchanger (radiator) section. You will find that a 0.9m (36”) long flexible hose attachment will be helpful to reach into the back of the radiator; a piece of 12.7 mm (1/2”) flexible gas connector, or a piece of 12.7 mm (1/2”) liquid-tight vinyl jacket metallic electrical conduit works well as a makeshift device.

Cleaning the heat exchanger

Remove the 4-bolt flange from the front of the furnace to expose the clean-out port and check for soot deposits. If there is very little soot in the radiator section visible from the clean-out port, you will not need to clean it. However, if you notice scaling in the radiator, you should remove the scale.

The wrap-around radiator can now be cleaned entirely from the front inspection port. Also, the furnace has external clean-out ports so the soot does not fall into the fan compartment during the cleaning operation.

IMPORTANT

Do not vacuum the ceramic chambers—they are easily damaged.

Soot will have collected in the first sections of the heat exchangers only if the burner was started after the combustion chamber was flooded with fuel oil, or if the burner has been operating in a severely contaminated condition.

3.1.2) Refractory firepot

Remove the burner and check the firepot.

IMPORTANT

Use extreme care if cleaning of the pot is required. After firing, the pot becomes very fragile. Do not use any commercially available soot remover. This furnace has a fibre type refractory combustion chamber. Normal servicing of this unit does not require cleaning of the combustion chamber.

If the pot is damaged, it must be replaced. A damaged pot could lead to premature heat exchanger failure. Cracking of the firepot is normal, however, replace the pot only if the cracks have propagated more than 2/3 the way through the wall thickness. The average wall thickness of the firepot is 19.1 mm (3/4”).

Flooding of the firepot

Flooding can occur when the oil primary control has been reset a number of times in a no-heat situation. Each time oil is fired into the pot and does not ignite, it is absorbed into the pot. Even if the burner is removed and the pot is felt for wetness, it is difficult to assess the degree of oil absorption by the pot.

There is only one way to properly service a flooded firepot, and that is to change it.

CAUTION

If you observe the red warning light on the burner, push ONLY once to try and restart. If the burner will not start, call a qualified service technician. Do NOT press the button again.

Self-aligning firepot

The primary heat exchanger of the furnace is comprised of an upper and lower half. The lower half is essentially a “can” that contains a self-aligning firepot. The firepot fits into the bottom half in one direction only.

Removing the firepot

The firepot is seldom replaced, but when it has to be replaced one must simply:

1. Remove the burner;
2. Remove the burner Limit Control;
3. Remove the breach plate;
4. Remove the front panel;
5. Remove the brass nuts on the stainless steel heat exchanger studs;

6. Pry the bottom half of the heat exchanger apart by using the designated prying tabs;
7. Remove the bottom half of the heat exchanger through the front of the furnace;
8. Pull the firepot up and out of the bottom half of the heat exchanger;
9. Remove the old sealing gasket from the flange of the upper half of the heat exchanger;
10. Scrape any residual gasket material off the matching flanges of the heat exchanger.

Replacing the firepot

1. Align the slot at the front part of the firepot with the burner tube sleeve and gently lower the firepot into the bottom half of the heat exchanger;
2. Holding the firepot near the perimeter, gently push the firepot all the way into the bottom half of the heat exchanger until it is properly seated;
3. Thoroughly wet the gasket with water using a spray pump bottle, position the tabs over the studs, and push the gasket upward against the sealing flange of the upper half of the heat exchanger;
4. Install the brass nuts on the studs by engaging only 2 or 3 threads;
5. Position the bottom half of the heat exchanger underneath the upper half and align the bottom half so that the slots in the bolting tabs engage the stainless steel studs. There is no further need to hold onto the bottom half as it will now be suspended on the stud nuts;
6. Push upward on the housing and thread the nuts finger-tight as far as possible;
7. Intermittently tighten the brass nuts with a wrench in a sequence that will pull the heat exchanger halves together evenly. Tighten all nuts to 90 inch-lbs torque once and then alternately re-tighten all nuts again to 100 inch-lb. **THE RE-TIGHTENING SEQUENCE IS ABSOLUTELY NECESSARY TO ENSURE A TIGHT JOINT;**
8. Re-assemble the front panel, breach plate, Limit Control and burner in reverse sequence to their removal;
9. Follow the instructions for starting the burner for the first time to cure the firepot and perform combustion checks. See Section 2.3.

3.1.3) Drawer assembly

Remove the drawer assembly. Clean all foreign matter from the retention head and electrodes. If a Beckett AFG burner has been installed, the burner will have to be removed to check the retention head.

3.1.4) Nozzle

Replace the nozzle with the one specified in Table 4.

3.1.5) Oil filters

Tank filter

The tank filter should be replaced as required.

Secondary filter

The 10 (or less) micron filter cartridges should be replaced annually.

3.1.6) Air filters

Air filters are the disposable type. They should be replaced at least once a year. Dusty conditions, presence of animal hair etc. may require much more frequent filter changes. Dirty filters will impact furnace efficiency and increase oil consumption.

3.1.7) Motor lubrication

Do NOT lubricate the oil burner motor or the direct drive blower motor as they are permanently lubricated.

3.1.8) CAS-2B combustion air kit (chimney venting)

If used, check the CAS-2B combustion air kit for proper operation. Check to see that the inlet screen is not plugged. Block the air inlet completely and ensure that a zero smoke reading results. If a zero smoke reading is not obtained, set up the burner as indicated in Part 2, section 3.

Gradually block off the intake. The CO₂ should increase to a maximum of 0.5 percentage points at the fully blocked condition. If not, check that the VRV gate is pivoting freely and that the pivot rod is in a horizontal position. Also, check that the counterweight has been properly adjusted in accordance with CAS-2B installation instructions.

3.1.9) Blocked Vent Shut-Off (BVSO) Cleaning

For continued safe operation, the Blocked Vent Shut-Off System (BVSO) is required to be inspected and maintained annually by a qualified agency.

1. Disconnect the power to the appliance.
2. Remove the two screws holding on the BVSO assembly cover.
3. Remove the cover.
4. Remove the two screws holding the thermal switch to the assembly base.
6. Without removing the electrical wires, remove the thermal switch and remove any build-up from the thermal switch surface.

CAUTION

Do not dent or scratch the surface of the thermal switch. If the thermal switch is damaged, replacement is required.

6. Clear and remove any build-up or obstruction inside the heat transfer tube.
7. Re-mount the thermal switch to the assembly base.
8. Re-attach the assembly cover with the screws removed in step 2.
9. Re-establish power to the appliance.

PART 4
INFORMATION

Model: _____ Serial number: _____

Installation date of the furnace: _____

Service telephone # - Day: _____ Night: _____

Dealer name and address: _____

START-UP TEST RESULTS

Nozzle: _____ Pressure: _____ lbpsi

Burner adjustments: Primary air _____

 Fine air _____

 Drawer Assembly _____

CO₂: _____ % Smoke scale: _____ (Bacharach)

Gross stack temperature: _____ °F

Ambient temperature: _____ °F

Chimney draft: _____ " W.C.

Overfire draft: _____ " W.C.

Test performed by: _____

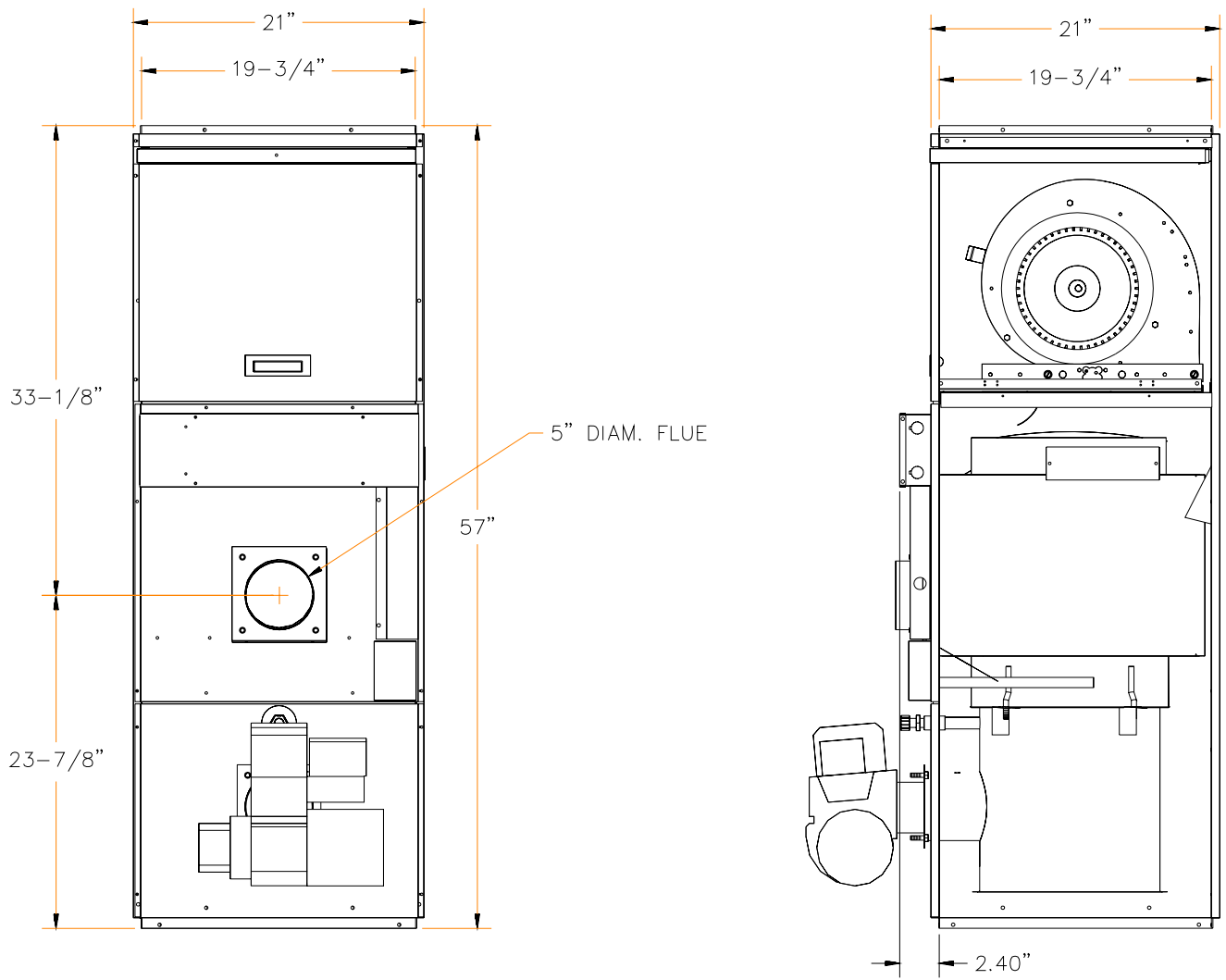
TABLE 4
Technical specifications

Model :		OCF105A12C			
RATING AND PERFORMANCE					
Firing rate (USGPH)	0.50	0.63	0.75	0.72	
Input (BTU/h)	70 000	88 200	105 000	100 800	
Heating capacity, chimney installation (BTU/h)	58 000	72 500	85 200		
Heating capacity, side-wall installation (BTU/h)	58 200	72 600	85 700	83 000	
Minimum - maximum temperature rise	11 - 24°C (52 - 75°F)				
Flue draft, (Chimney), (Side-wall)	(-0.035" to -0.06") (+0.04" to +0.16")				
Overfire pressure (chimney), (Side-wall)	(0.00" to +0.035") (+0.10" to +0.25")				
BECKETT BURNER, CHIMNEY INSTALLATION		AFG with F0 head			
Burner tube insertion length (inches)	5 1/8"				
Low firing rate baffle	Yes	Yes	No		
Static disc, model	2 3/4 #3383	2 3/4 #3383	2 3/4 #3383		
Nozzle (Delavan)	0.50 - 70A	0.50 - 70A	0.60 - 70B		
Pump pressure (PSIG)	100	156	156		
Combustion air adjustment (band/shutter)	0 / 4.5	0 / 8	0 / 7.5		
AFUE % (From CSA B212 standard and Canadian regulation)	81.5	81.0	80.3		
AFUE % (From ASHRAE 103 standard and US regulation)	81.5	81.0	80.3		
RIELLO BURNER, CHIMNEY INSTALLATION		40-F3			
Burner tube insertion length (inches)	5 3/16"				
Nozzle (Delavan)	0.40 - 60A	0.50 - 60A	0.60 - 60A		
Pump pressure (PSIG)	156	156	156		
Combustion air adjustment (turbulator / damper)	0 / 2	0 / 3	0 / 4		
AFUE % (From CSA B212 standard and Canadian regulation)	83.6	83.1	81.6		
AFUE % (From ASHRAE 103 standard and US regulation)	81.5	81.0	80.3		
BECKETT BURNER, SIDE-WALL INSTALLATION		AFII-85			
Burner tube insertion length (inches)	4 15/16"				
Nozzle (Delavan)	0.50 - 60W	0.50 - 60W	0.60 - 60W		
Pump pressure (PSIG)	130	140	160		
Combustion air adjustment (screw / dial) or (dial only)	3 / 1.5	3 / 3	3 / 4.5		
AFUE % (From CSA B212 standard and Canadian regulation)	81.5	81.0	80.3		
AFUE % (From ASHRAE 103 standard and US regulation)	81.5	81.0	80.3		
RIELLO BURNER, SIDE-WALL INSTALLATION		40-BF3 with AL1009 post purge control			
Burner tube insertion length (inches)	5 3/16"				
Nozzle (Delavan)	0.50 - 60W	0.50 - 60W		0.60 - 60W	
Pump pressure (PSIG)	135	140		155	
Combustion air adjustment (turbulator / damper)	0 / 3	0 / 6		0 / 7.5	
AFUE % (From CSA B212 standard and Canadian regulation)	83.6	83.1		81.6	
AFUE % (From ASHRAE 103 standard and US regulation)	81.5	81.0		80.3	
ELECTRICAL SYSTEM					
Volts - Hertz - Phase	115 - 60 - 1				
Operating voltage range (Volts)	104 - 132				
Electrical load (Amps)	12.2				
Minimum ampacity for wiring sizing	13.7				
Max. fuse size (Amps)	15				
Control transformer	40 VA				
Ext. control power available, cooling and accessories	30 VA				
BLOWER DATA					
Blower speed at 0.50" W.C. static pressure	MED-LO	MED-HI	HIGH	HIGH	
Blower speed at 0.25" W.C. static pressure	MED-LO	MED-HI	HIGH	HIGH	
Maximum cooling, speed	LOW	MED-LO	MED-HI	HIGH	
Maximum cooling, tons @ 0.50" W.C.	1.5	2	2.5	3	
Motor (HP) / number of speeds	1/3 HP / 4 speeds				
Blower wheel size (in.)	10 X 10				
Filter quantity and size (in.)	(1) 20 X 20				

TABLE 5
Air delivery - CFM with air filter

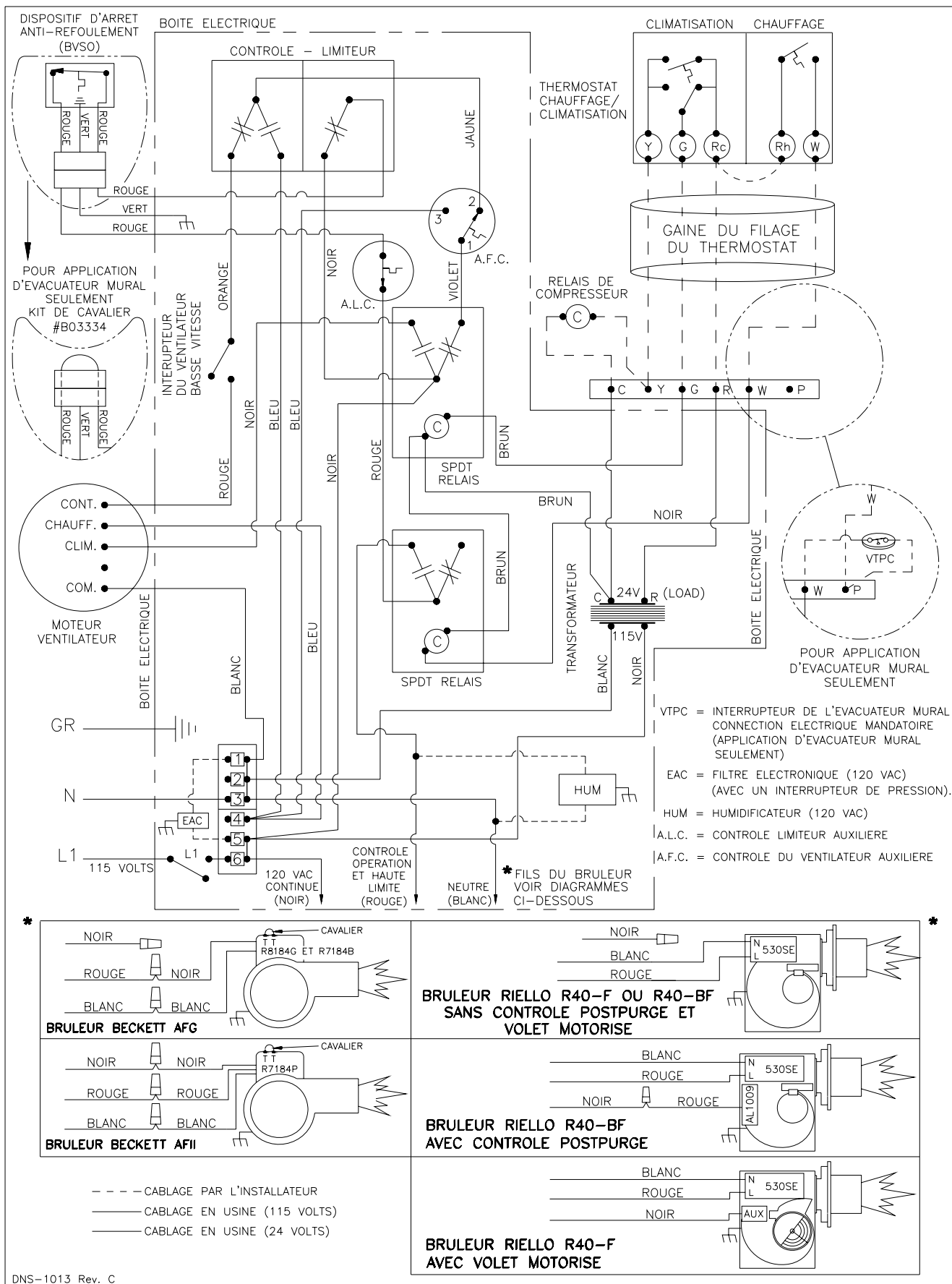
SPEED	ODH53F100LB-3MC, OCF105A12C						
	EXTERNAL STATIC PRESSURE WITH AIR FILTER						
	0.1"	0.2"	0.3"	0.4"	0.5"	0.6"	0.7"
LOW	720	700	680	660	640	620	600
MED-LO	818	806	794	782	770	758	746
MED-HI	1114	1078	1042	1006	970	934	898
HIGH	1434	1378	1322	1266	1210	1154	1098

FIGURE 5
Models: ODH53F100LB-3MC, OCF105A12C



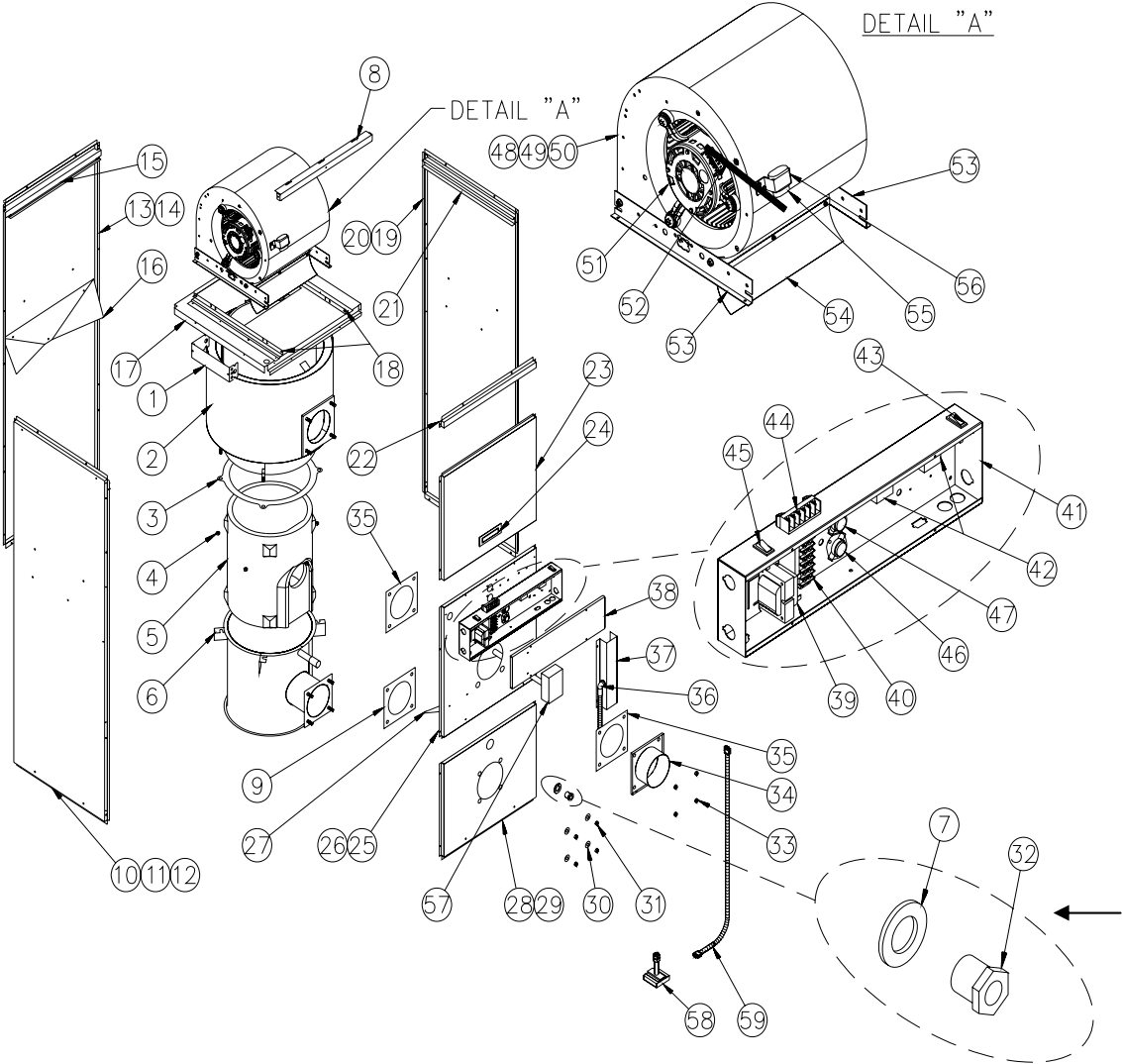
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FIGURE 6
Wiring diagram, ODH53F100LB-3MC, OCF105A12C



***COMPONENTS
AND
REPLACEMENT PARTS***

PARTS LIST
Model : ODH53F100LB-3MC, OCF105A12C



PARTS LIST
Model : ODH53F100LB-3MC, OCF105A12C

ITEM	DESCRIPTION	PART #
1	Complete heat exchanger	B30776-01
2	Top heat exchanger	B30542-01
3	Gasket, heat exchanger	B30517
4	Hexagonal flange nut 3/8-16NC brass	F07O001
5	Combustion chamber	B30518
6	Bottom heat exchanger	B30757
7	Washer 1 7/16 zinc	F06F015
8	Front filter drawer	B30507
9	Gasket, burner	B30534
10	Left side panel assembly	B30550-02
11	Left side panel insulation	B30571
12	Left filter support	B30566
13	Rear panel assembly	B30549
14	Rear panel insulation	B30572
15	Rear filter support	B30555
16	Rear Baffle	B30564
17	Division panel	B30567
18	Blower slide support	B30513
19	Right side panel assembly	B30550-01
20	Right side panel insulation	B30571
21	Right filter support	B30566
22	Upper front reinforcer	B30556
23	Blower door assembly	B30709-02
24	Door handle	Z99F050
25	Center front panel assembly	B30703
26	Center front panel insulation	B30570
27A	Front right baffle	B30569-01
27B	Front left baffle	B30569-02
28	Bottom front panel assembly	B30774
29	Bottom front panel insulation	B30773
30	Washer 3/8" AA zinc	F06F005
31	Hexagonal nut 3/8-16NC brass	F07F024
32	Sight glass	Z99F061
33	Hexagonal flange nut 3/8-16NC brass	F07O001
34A	5" breech plate	B30459
34B	3" breech plate	B30515
35	Gasket, breech plate	B30415-02
36	Burner electrical kit	B30575
37	Corner conduit	B30557
38	Electrical box cover (without logo)	B40098-02
39	Transformer 120/24 VAC / 40 VA	L01F009
40	Terminal strip, 6 positions	A00336
41	Electrical box	B30830
42	Relay SPDT 24VAC	L01H009
43	Rocker switch SPST (constant blower operation)	L07F003
44	Terminal strip, 6 positions	L05F011
45	Rocker switch SPST (main power)	L07F016
46	Thermoswitch 160-40F	R02N012
47	Thermoswitch 110-10F	R02N011
48	Blower wheel 10X10	Z01L004
49	Blower 100-10T (housing and wheel)	B03720-04
50A	Blower assembly (55, 56, 48, 49, 51 and 54 included)	B01405-01
50B	Belly band assembly (belly band & legs included)	B01888
51	Motor assembly 1/3 HP (motor, bell band & legs included)	B01890-01
52	Blower electrical kit	B30096
53	Blower side rails	B30433
54	Seal strip	B01291-01
55	Capacitor 5 MF	L01I001
56	Capacitor holder	B01024
57	Fan limit control 11 1/2"	R02I002
58	Blocked vent shut off BVSO	Z06G001
59	External electrical kit BVSO	B03118-01