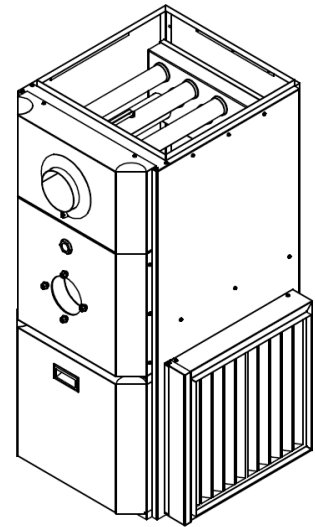


# Installation, Operation and Service Manual

**KHM** SERIES  
85% + EFFICIENCY  
OIL FIRED HI-BOY FURNACE

KHM-100  
KHM-200



KHM-100 Illustration

**INSTALLATIONS MUST MEET ALL LOCAL AND FEDERAL  
CODES THAT MAY DIFFER FROM THIS MANUAL**

*Please read the manual in its entirety before beginning installation.  
This manual must be kept with the furnace for future reference.*

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## **KHM**

### **Oil**

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# 1.0 IMPORTANT SAFETY ADVICE

Please read and understand this manual before installing, operating or servicing the furnace. To ensure you have a clear understanding of the operating procedures of the appliance please take the time to read the **IMPORTANT SAFETY ADVICE** section of this manual.

## WARNINGS

**NEVER** burn garbage or paper in the unit.

**NEVER** store combustible material around it.

**DO NOT** attempt to start burner when excess oil has accumulated, when unit is full of vapour or when heat exchanger is very hot.

**DO NOT** use gasoline, crankcase drainings or any oil containing gasoline.

## CAUTION

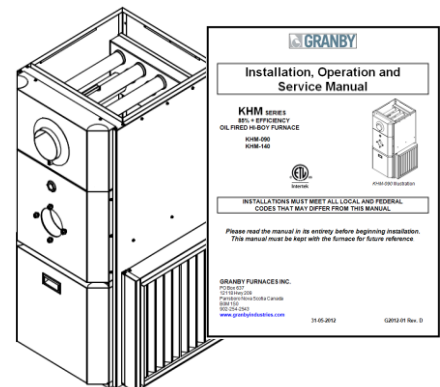
**DO NOT** START THE BURNER UNTIL ALL FITTINGS, COVERS AND DOORS ARE IN PLACE. **DO NOT** TAMPER WITH THE FURNACE OR CONTROLS, CALL A QUALIFIED BURNER TECHNICIAN. **DO NOT** STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPOURS AND LIQUIDS IN THE VICINITY OF THIS UNIT OR ANY OTHER APPLIANCE.

## DANGER

**Do not use this furnace as a construction heater. Use of this furnace as a construction heater exposes it to abnormal conditions, contaminated combustion air and lack of air filtering. Failure to follow this warning can lead to premature furnace failure which could result in a fire hazard and/or bodily harm and/or materials damages.**

## IMPORTANT

This manual contains instructional and operational information for the KHM OIL-FIRED FURNACE. Read the instructions thoroughly before installing furnace or starting the burner. Consult local authorities about your local FIRE SAFETY REGULATIONS. All installations must be in accordance with local state or provincial codes. Improper installation will result in voiding of warranty.



## 2.0 PRODUCT INFORMATION

### CLEARANCE (minimum) TO COMBUSTIBLES

#### UPFLOW POSITION

Top & Sides of Supply Plenum	1"	(25 mm)
Front (Maintenance)	24"	(610 mm)
Rear	0"	(0 mm)
First Side	0"	(0 mm)
Other Side	0"	(0 mm)
Flue Pipe	9"	(229 mm)
Floor		Combustible

#### DOWNFLOW POSITION

Top	2"	(51 mm)
Bottom and Sides - Plenum	1"	(25 mm)
Rear	0"	(0 mm)
First Side	0"	(0 mm)
Other Side	0"	(0 mm)
Front (Maintenance)	24"	(610 mm)
Flue Pipe	9"	(229 mm)
Floor (with Down flow base)		Combustible

#### HORIZONTAL POSITION

Top	2"	(51 mm)
Bottom and Sides - Plenum	1"	(25 mm)
Rear	1"	(25 mm)
First Side	1"	(25 mm)
Other Side	1"	(25 mm)
Front (Maintenance)	24"	(610 mm)
Flue Pipe	9"	(229 mm)
Floor	2"	(51 mm)

#### DRAFT PRESSURE

Breach draft pressure -0.01" wc minimum

#### AIR/BLOWER DATA

External static – Non A/C	0.2" wc
External static – A/C	0.5" wc
Maximum cooling	3.0 tons... KHM-100 5.0 tons... KHM-200
Maximum air temperature rise	See page 16 and 34
High Limit, max design outlet temp	185°F
Thermostat anticipator	0.2 amps

#### MOTOR/BLOWER

KHM-100: 1/2 hp 4 Speed / G10-8 DD or 1/2 hp ECM / G10-8  
KHM-200: 3/4 hp 4 Speed / GT12-10DD or 3/4 hp ECM / GT12-10

## FAN/HIGH LIMIT CONTROL

Honeywell ST9103 Fan Center & Thermo-Disk (7" stem)

### DIMENSIONS (KHM-100)

Depth 26" (660 mm)  
Height 46 1/4" (1175 mm)  
Width 21 7/16" (545 mm)

### DIMENSIONS (KHM-200)

Depth 30" (762 mm)  
Height 49 7/8" (1267 mm)  
Width 21 7/16" (545 mm)

### PLENUM DIMENSIONS (KHM-100)

Cold air return (A) 18" x 18" (457 x 457 mm)  
Hot air supply (B) 20" x 20" (508 x 508 mm)

### PLENUM DIMENSIONS (KHM-200)

Cold air return (A) 23" x 18" (584 x 457 mm)  
Hot air supply (B) 24" x 20" (610 x 508 mm)

### AIR FILTERS

KHM-100 20" x 20" x 2" non-pleated UL approved  
KHM-2 00 25" x 20" x 2" non-pleated UL approved

### A/C COIL LOCATION

Minimum height above the heat exchanger 4" (152 mm)

### See A/C Coil Manufactures Requirements

### SMOKE-PIPE CONNECTION

5" Chimney or direct vent DVS Granby kit

### CLEANOUTS

Front Cover & Burner Opening

### THERMOSTAT

Any thermostat

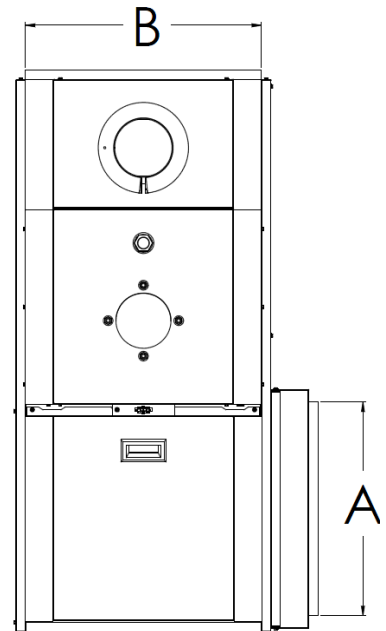
### FUEL

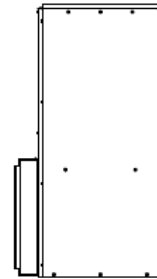
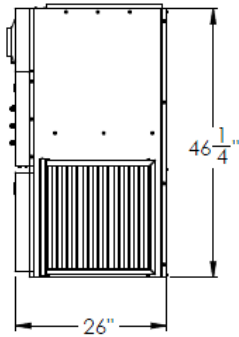
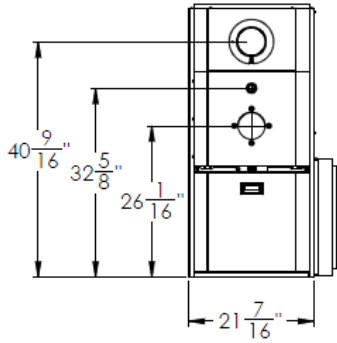
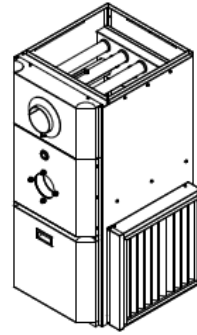
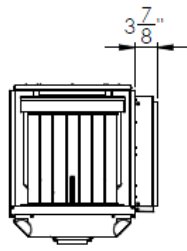
Not heavier than No. 2 furnace oil.

### ELECTRICAL – 120 Volts, 60 Hz

Canada Less than 12 amps, circuit protection 15 amps.

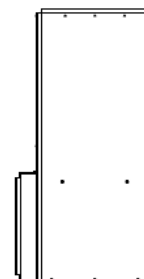
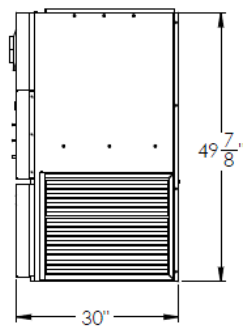
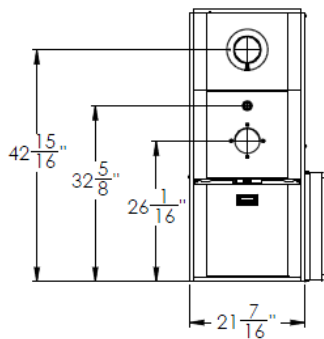
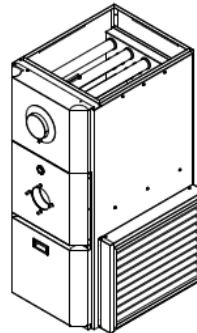
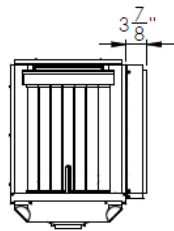
USA 13.3 amps, circuit protection 20 amps.





### KHM-100 - DIMENSIONS

Dimensions are in inches



### KHM-200 - DIMENSIONS

Dimensions are in inches

# 3.0 FURNACE INSTALLATION

## OIL TANK & PIPING

**Tank installation must conform to local requirements.**

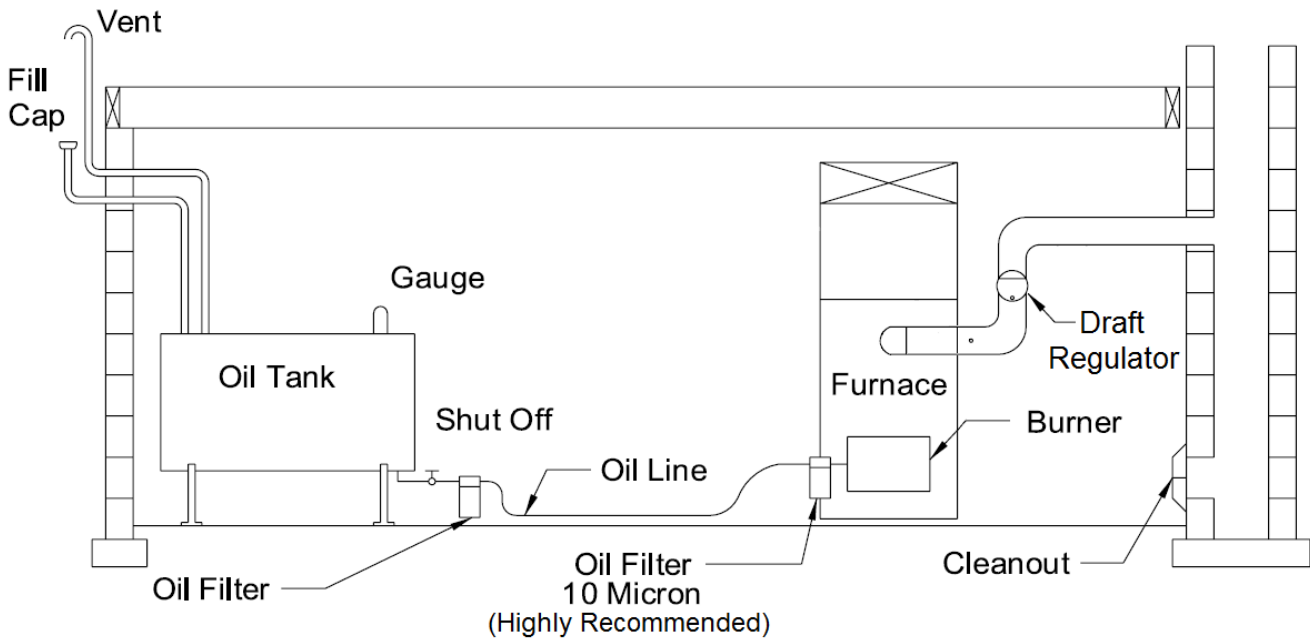
Install according to the applicable code such as CSA B139 and NFPA 31. Minimize the number of connections in suction line and make all connections as tight as possible. Use a pipe joint compound suitable for oil on all pipe threads. To reduce possibility of air leaks, tighten stem packing gland nut on any valves installed in the suction line. Also, be sure the oil filter is tight, as filter gaskets often shrink. Check for kinks in the oil lines as well as for possible air pockets and for loose connections. Two filters as shown below are recommended. Optional tank gauge protectors and outlet protectors are available at your local dealer.

### **ONE PIPE SYSTEM**

Where the tank is above the burner and when the oil flows by gravity to the oil pump, a single-stage fuel unit with a single oil line to the pump may be used.

### **TWO PIPES SYSTEM**

When a single line is unsuitable, use a double line system or see your dealer for special oil line fittings. Install by-pass plug on burner fuel unit as specified in the burner manual.



**Oil Tank and Piping**

## **PLACEMENT & VENTING**

Furnace installation shall conform to the required installation code for oil-fired equipment (USA: NFPA 31, Canada: CSA B139).

**FLOOR SUPPORT** COMBUSTIBLE – If required, support furnace on five (5) concrete blocks. Make sure the center of the furnace base is supported. Approved for installation on combustible floors in the upflow position and downflow position (with the optional sub-base). Not approved for installation on combustible floor in horizontal applications. For horizontal applications, use railing type support (not supplied) to keep the furnace in position. Make sure that all clearances are respected.

**CHIMNEY/VENT** Connect the furnace to a chimney/vent system of size and condition required by the NFPA 31 (USA) or CSA B139 (Canada) code. Furnace is approved for factory built chimney type “L” vents. Breech is certified for 5” vent pipe. Keep vent/flue pipe as short as possible with a minimum upward slope of ¼” per foot. Vent/flue pipes **MUST NOT** pass through a ceiling. Maximum flue gas temperature is 575°F.

**CONDENSATION** **If you have condensation in your chimney, make sure that the chimney size is according to the tables in CSA B139 / NFPA 31. The temperature at the entrance of the chimney can be increased by insulating the flue-pipe between the furnace and the chimney base. If this is not sufficient, consider cutting or removing some flue baffles in the furnace. BE AWARE THAT REMOVING BAFFLES REDUCES THE UNIT EFFICIENCY AND A MODIFIED UNIT IS NO LONGER ENERGY STAR APPROVED.**

**COMBUSTION & VENTILATION AIR** Install openings and ductwork to the furnace room providing fresh outside combustion and circulation air for cooling the furnace casing, as installation code requires (USA NFPA 31, Canada CSA B139). If installed in a closed room, provide two free air ventilation openings of at least 8” x 12” (96 sq. in.) free flow area near ceiling and floor. Oil burners must have sufficient air to allow vent systems to operate properly.

**DRAFT** Use approved draft control supplied for 5” pipe. Set specified draft minimum pressure of -0.01” wc.

**ELECTRICAL** Wire according to the National Electrical Code (Canadian Electrical Code in Canada) or local codes. Use a separately fused #12 electrical line directly from the service panel to the furnace junction box. Install a manual shut-off switch at the door or stairway to furnace room so furnace can be shut off remotely.

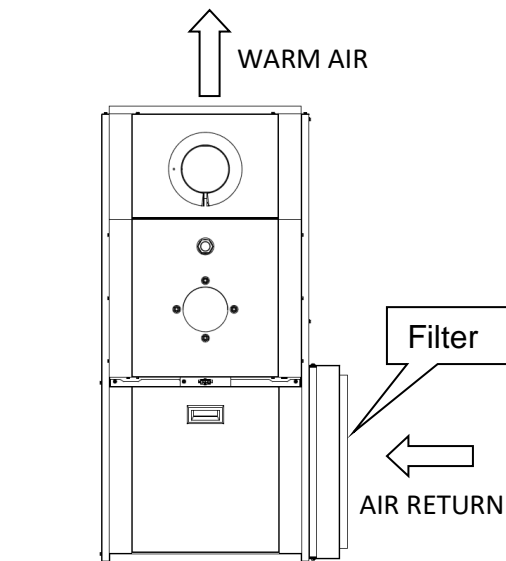
**CLEARANCES** Before placing unit, review installation clearances as shown on furnace operating decal or section **PRODUCT INFORMATION**.

**LOCATION** Install the furnace close to chimney and central to ductwork.



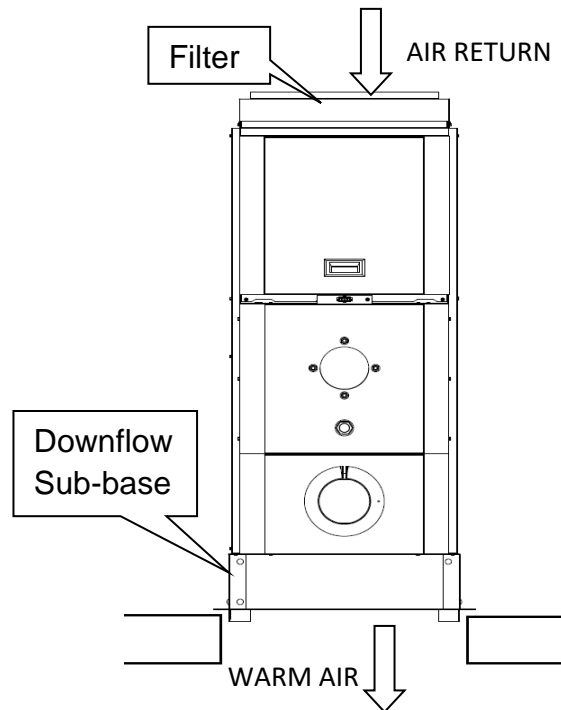
## MULTI-POSITION CONFIGURATIONS

### UPFLOW INSTALLATION



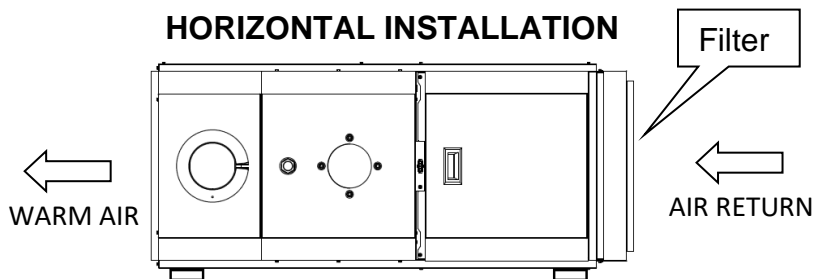
The return air opening can be located on left side or on the right side of the unit. After installing the filter rack supplied with the unit we recommend installing the blower door before handling the unit.

### DOWNFLOW INSTALLATION



When the unit is installed in downflow configuration on a combustable floor, the clearance from combustable material must be respected. The downflow sub-base CAB-A0-0045-00 (for KHM-100) or CAB-A0-0046-00 (for KHM-200) can be used to ensure these clearances.

### HORIZONTAL INSTALLATION



When the unit is installed in the horizontal configuration on a combustable floor with a choice of right or left air outlet, the clearance of (2") from combustable material must be taken into consideration.

**The burner must always be installed facing upwards regardless of the configuration installation.**

**For complete clearance information to combustibles, see PRODUCT INFORMATION, page 3.**

## 4.0 ACCESSORY INSTALLATION

### BLOCKED VENT SWITCH (BVSO) FOR CANADIAN APPLICATION ONLY

Oil-fired appliances installed in Canada require a blocked vent switch system when installed on a chimney. A safety switch is included with the furnace to perform this function. It is the installer's responsibility to install the switch in accordance with the instructions provided. Not applicable for Direct Vent systems. **Field Controls Model: WMO-1 (Manual Reset)**

#### Switch Operation

Blocked vent switches are flue gas safety devices for detecting spillage of flue gases due to a blocked flue or inadequate draft. After detecting a problem, the switch de-energizes the system's burner control.

**NEVER reset the switch unless the cause of the blockage has been corrected.**

#### Installation (Figure 1)

- 1) Drill a 5/8" hole in to the flue vent pipe near the appliance breach connection.
- 2) This hole must be before the draft regulator, vertically or horizontally.
- 3) Remove one of the securing nuts from the threaded tube of the safety switch.
- 4) Tighten the other securing nut onto the pipe as far as possible.
- 5) Insert the threaded tube end into the pierced hole of the flue vent pipe.
- 6) Install the securing nut on the safety switch tube, which protrudes into the flue vent pipe. Tighten the nut securely.

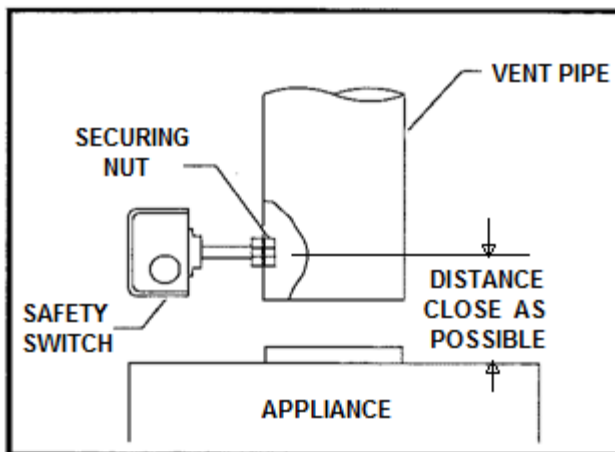


Figure 1- Illustration Granby Industries

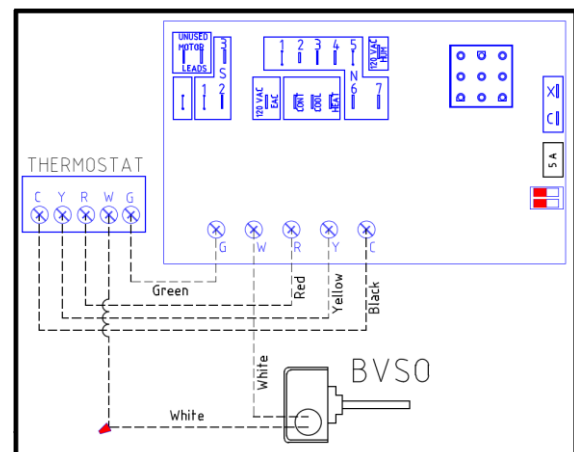


Figure 2- BVSO wiring diagram

#### Wiring Instructions (BVSO)

**Caution:** Disconnect the electrical power when wiring the unit.

Wire the blocked vent switch in accordance with The National Electrical Code and applicable local codes. Wire the safety switch (BVSO) in series with the thermostat and the fan timer relay control (Figure 2).

## System Test Procedure (BVSO)

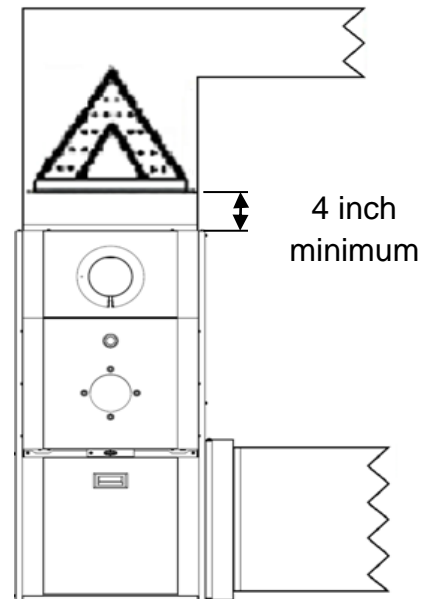
- 1) With the power re-established, block the chimney or vent pipe downstream of the switch.
- 2) Adjust the thermostat to call for heat.
- 3) Once the heating system has started the blocked vent switch should shut down the burner within 10 minutes or sooner.
- 4) Once the system has cooled, the blocked vent switch can manually be reset.
- 5) This procedure should be tested a second time.
- 6) After testing the blocked vent switch the chimney should be cleared of obstruction and the heating system should be tested over a long run cycle.

If the block vent switch shuts down the system, check to ensure there is enough draft in the chimney and venting pipes.

## AIR CONDITIONING

An air conditioning coil may be installed on the supply side **only**. Coils installed on the return side will cause condensation on the heat exchanger; this will shorten the heat exchanger life and may cause products of combustion to enter the house. Wire as per wiring label and diagram. **Height of the coil above the unit supply shall be at least 4" (102 mm).**

**See A/C coil Manufacturers Requirements.**  
**To check the AC coil total air flow resistance,**  
**see procedure at page 34.**



## HUMIDIFIER

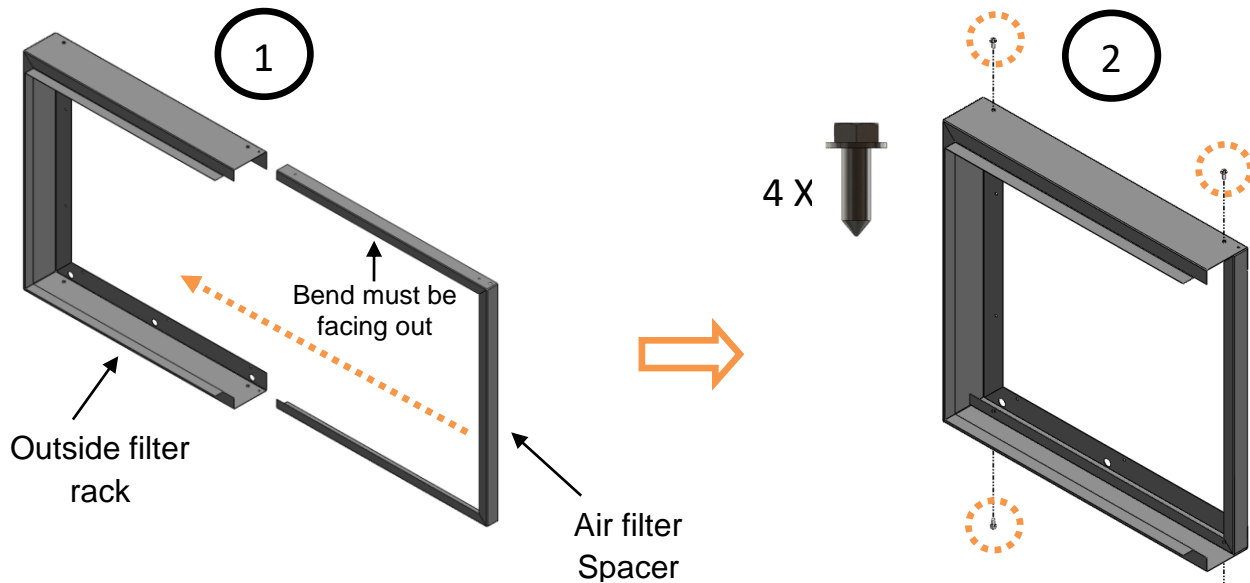
If a humidifier is installed ensure that no water can drip or run from it into the furnace. This would cause deterioration and void the furnace warranty.

## AIR FILTER RACK INSTALLATION

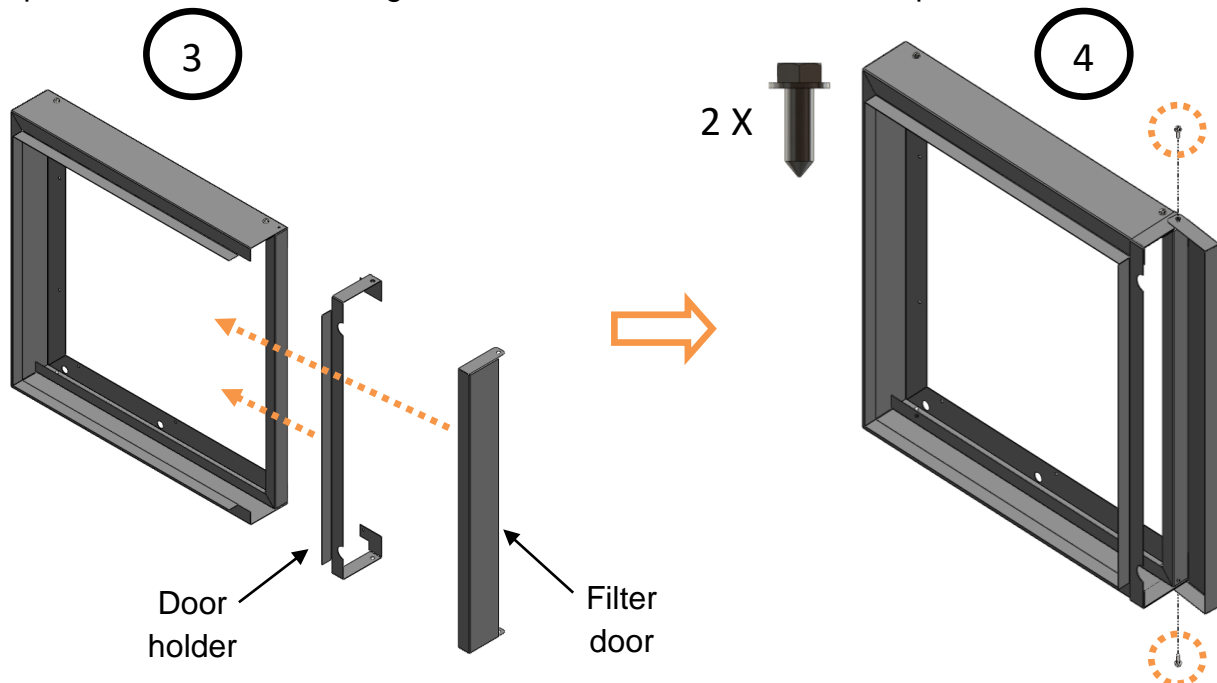
**THE AIR FILTER RACK IS A FIELD INSTALLED COMPONENT. AFTER INSTALLATION THE RACK MUST BE SEALED (WITH DUCT TAPE OR EQUIVALENT) TO MINIMIZE AIR LEAKS. THIS IS THE RESPONSIBILITY OF THE INSTALLER.**

The air filter rack is shipped uninstalled inside the furnace. This way the owner can install it in the position that he wants. There are 3 possible locations to install the air filter rack which are: bottom left side, bottom right side and under the furnace. Follow the instructions below to install the air filter support properly.

- Step 1: Slide air filter spacer inside the outside filter rack.
- Step 2: Screw in the 4 screws to hold these two parts together.

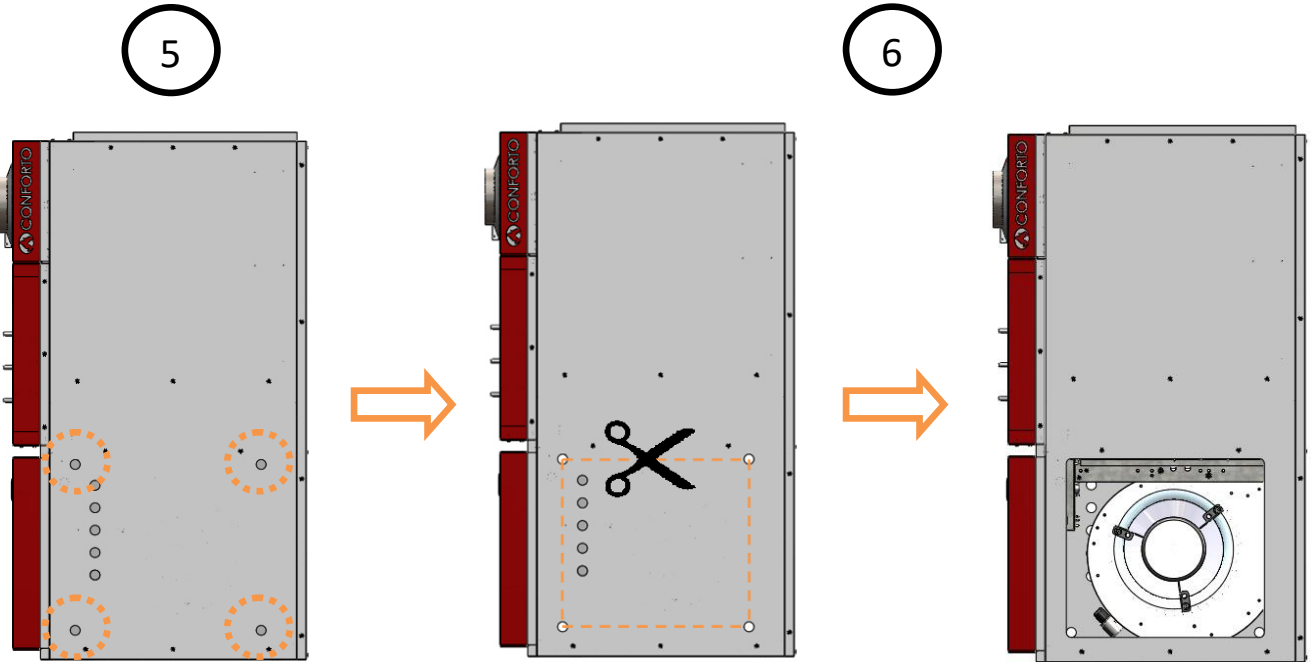


- Step 3: Slide filter holder door and filter door.
- Step 4: Use the 2 remaining screws to maintain the filter door in place.



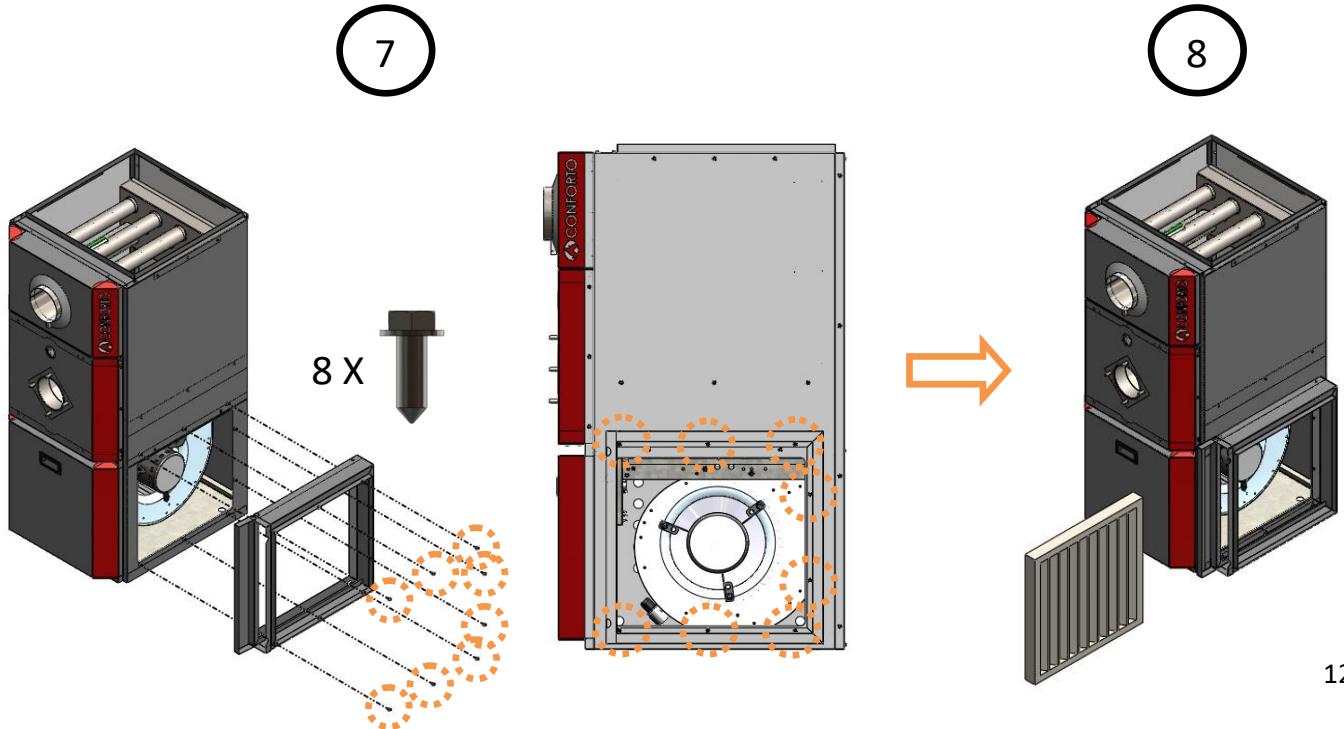
Step 5: Remove the 4 knockouts on the panel (left side, right side or base panel) where you want to install the air filter

Step 6: Cut the panel between the 4 knockouts.



Step 7: Using 8 screws, install the air filter rack on the furnace. Seal Properly.

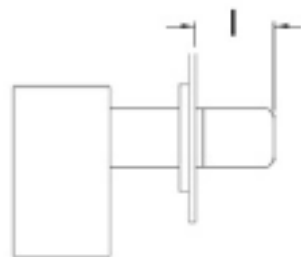
Step 8: Slide the air filter inside the air filter rack



# 5.0 BURNER INSTALLATION AND SPECIFICATIONS

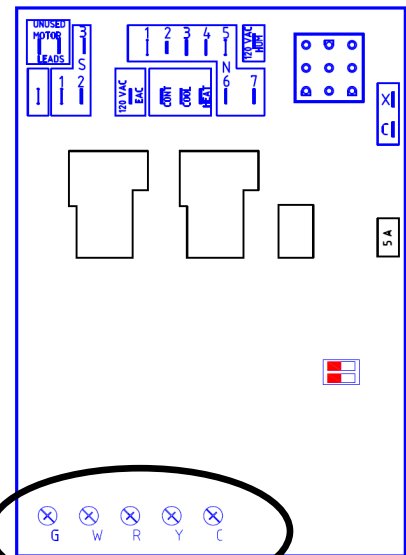
## 5.1 ASSEMBLY & INSTALLATION OF BURNER

- ASSEMBLE** Check burner model is correct for furnace rating required. Assemble as per burner manufacturer’s instructions.
- SELECT NOZZLE** Select oil input, nozzle and burner configuration as shown on furnace operating decal.
- INSTALL NOZZLE** Install selected nozzle, check for clean seating and tighten in nozzle adaptor.
- ELECTRODES** See burner manufacturer’s instructions for correct setting.
- INSERTION LENGTH** See figure below.



	BURNER INSERTION (I)	
	in	mm
RIELLO	2 1/2	63
BECKETT	2 1/2	63
CARLIN	2 1/2	63

- PUMP BY-PASS PLUG** For one pipe system factory setting (no plug).
- WIRING** Refer to wiring diagram for correct burner connections (see page 26,27, or 28).
- THERMOSTAT** Connect the thermostat wires to the fan timer control board (ST9103).



## 5.2 SET BURNER FOR EFFICIENT OPERATION

**BURNER SETTINGS** Use burner settings in the table on page 16 or operating decal as a guide to set burner, particularly for nozzle change. **Those settings are only starting points for the adjustments and are not meant as final settings.**

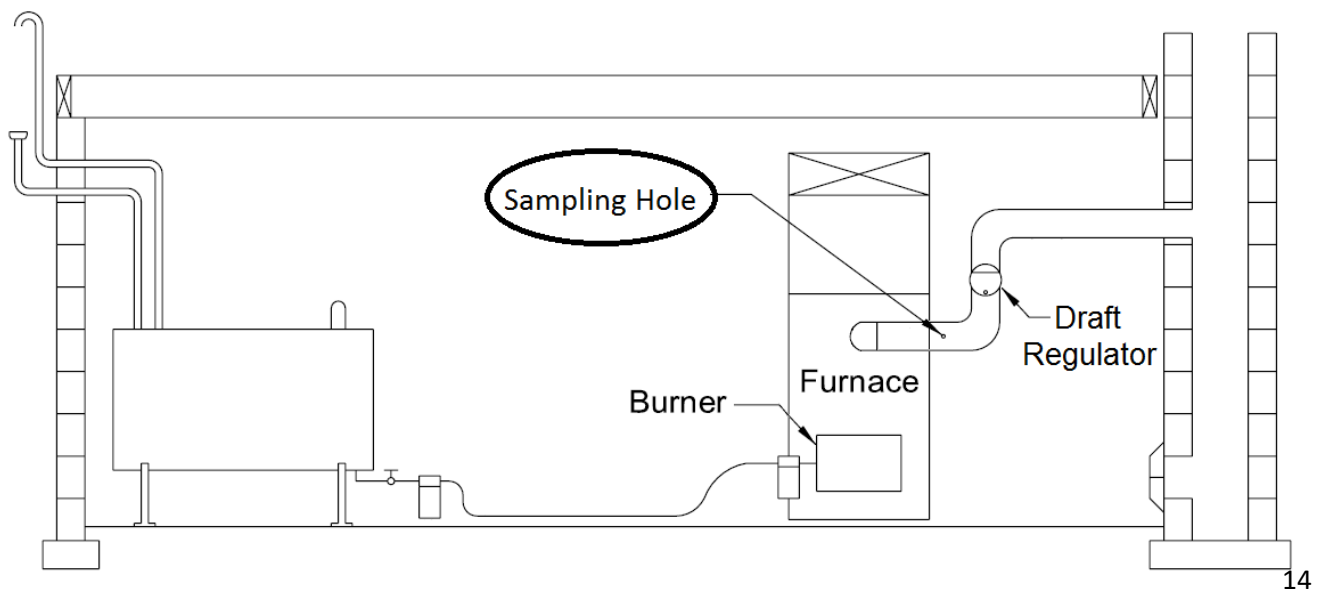
On Beckett AFG burner, make sure the correct retention head and static disk are installed on the burner for the desired firing rate. The head is held in place by two (2) screws at the end of the burner blast tube. In the burner model in the table of page 16, the head is always after the AFG designation and the static disk after the head. For example, the AFG L2 3 3/8 means an AFG chassis burner with a L2 head and a static disk of 3 3/8.

**PUMP PRESSURE** Refer to the table on page 16 or operating decal.

**AIR SETTING** Use air settings on page 16 as a guide to set air adjustment. **Those settings are only starting points for the adjustments and are not meant as final settings.**

**DRAFT REGULATOR** The draft regulator should be installed at least three (3) flue pipe diameters from breeching or elbow of the furnace.

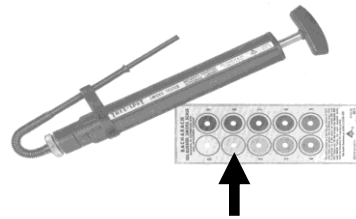
**SAMPLING HOLE** On smoke/vent pipe, drill a 3/8" round opening. The hole should be at least two (2) flue pipe diameter from breeching or elbow of the furnace.



**DRAFT PRESSURE** Using an accurate draft meter; adjust the draft control to obtain - 0.01” wc minimum draft pressure at the breech sampling hole. The draft regulator’s adjustments should be made after furnace has been running under heating mode for at least five (5) minutes minimum.

**COMBUSTION TEST** All your tests must be done with the burner cover on (Riello)

**COMBUSTION SETTING/ EFFICIENCY** After 10 minutes of normal operation, take a **smoke test** and adjust the burner to obtain a reading of “1” on the smoke scale. Take a CO<sub>2</sub> test and note the result.



To reach the maximum smoke test value, a 10 full slow steady pump action is required.

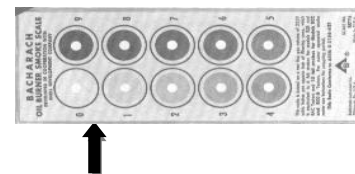
**Open the air band adjustment on the burner to reduce your CO<sub>2</sub> lecture by 1%.**

**CO<sub>2</sub> test can be done mechanically or electronically**

(18 full slow steady pump action)



**You now have a perfect “slight trace” of smoke.**



**Relation between % of CO<sub>2</sub> and O<sub>2</sub>**

CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Excess Air (%)
13.5	2.6	15.0
13.0	3.3	20.0
12.5	4.0	25.0
12.0	4.6	30.0
11.5	5.3	35.0
11.0	6.0	40.0



## 5.3 TECHNICAL INFORMATION

### KHM Series

	KHM-100			KHM-200		
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#### Riello Burner

Unit Model  
Firing Rate (USGPH)  
Input (BTU/h)  
Output (BTU/h)  
Nozzle  
Pump Pr. 2 pipes sys.  
(psi) Pump Pr. 1 pipe sys.  
(psi) Turbulator Setting  
Air Gate Adjustment  
Energy Star Approved  
AFUE (%)

	F3			F5		
KHM-E1-*067-03	KHM-E1-*079-03	KHM-E1-*091-03	KHM-E3-*109-05	KHM-E3-*127-05	KHM-E3-*139-05	
0.55	0.65	0.75	0.90	1.05	1.15	
77,000	91,000	105,000	126,000	147,000	161,000	
67,000	79,000	91,000	109,000	126,000	139,000	
0.40 70A	0.60 70W	0.65 70W	0.75 80W	0.85 70W	1.00 70W	
190	145	145	145	165	145	
190	165	165	165	175	165	
0	0	0	0	1	2	
1.75	2	2.35	2	2.25	2.25	
YES	YES	YES	YES	YES	YES	
86.50	86.80	86.30	87.50	86.60	86.90	

CO2(%)

12.5      13.5      13.7      12.5      13.5      13.5

#### Beckett Burner

Unit Model  
Firing Rate (USGPH)  
Input (BTU/h)  
Output (BTU/h) Nozzle  
Low Firing Rate Baffle  
Pump Pressure (psi) Air  
Band (Gross)  
Air Shutter (Fine)  
Energy Star Approved  
AFUE (%)

	AFG L2 3-3/8			AFG F3 2-3/4		
KHM-G2-*066-03	KHM-G2-*078-03	KHM-G2-*090-03	KLHMG2-*102-05	KHM-G2-*119-05	KHM-G2-*132-05	
0.55	0.65	0.75	0.85	1.00	1.10	
77,000	91,000	105,000	119,000	140,000	154,000	
66,000	78,000	90,000	102,000	119,000	132,000	
0.50 60W	0.60 60W	0.65 60W	0.75 70B	0.85 70B	1.00 70B	
NO	NO	NO	YES	YES	YES	
145	145	145	145	145	145	
N/A	N/A	N/A	1	2	2	
4	5.5	7	7	6	10	
YES	YES	YES	YES	YES	YES	
86.80	86.60	86.00	86.70	86.50	86.40	

CO2(%)

12.5      13.5      13.7      12.5      13.5      13.5

#### Carlin Burner

Unit model  
Firing Rate (USGPH)  
Input (BTU/h)  
Output (BTU/h)  
Nozzle  
Pump Pressure (psi)  
Head Setting  
Air Setting  
Energy Star Approved  
AFUE (%)  
CO2 (%)

KHM-C1-*066-03	KHM-C1-*078-03	KHM-C1-*090-03	KHM-C3-*102-05	KHM-C3-*119-05	KHM-C3-*132-05
0.55	0.65	0.75	0.85	1.00	1.10
77,000	91,000	105,000	119,000	140,000	154,000
66,000	78,000	90,000	102,000	119,000	132,000
0.50 - 70A	0.50 - 60B	0.60 - 60B	0.65 - 70W	0.85 - 70AS	0.90 - 70A
125	170	150	170	140	150
0.50	0.50	0.50	0.60/0.65	0.85/1.00	0.85/1.00
25%	45%	60%	40%	60%	70%
Yes	Yes	Yes	Yes	Yes	Yes
87.0	87.0	86.0	85.5	85.5	85.5
12.2	13.1	13.0	13.3	12.8	13.1

## 5.3 TECHNICAL INFORMATION CONT'D

### CO<sub>2</sub> (%)

#### General Information

#### PSC motor info

Temperature Rise (°F)	40 – 70	40 – 70	50 – 80	40 – 70	40 – 70	50 – 05
Blower Speed (0.2" wc)	M-LOW	M-HIGH	M-HIGH	M-LOW	M-HIGH	M-HIGH
Blower Speed (0.5" wc)	M-HIGH	M-HIGH	HIGH	M-HIGH	HIGH	HIGH

#### Energy Star ECM motor (0.2" wc to 0.5" wc static pressure)

Temperature Rise (°F)	50-80	55-85	60-85	52-85	55-85	55-85
Blower Speed	M-LOW	M-LOW	MEDIUM	M-LOW	MEDIUM	M-HIGH

#### Static Pressure at 0.2" WC / 0.5" WC

Blower Speed	PSC 1/2 hp		PSC 3/4 hp		Blower Speed	ECM 1/2 hp		ECM 3/4 hp	
	0.2" wc	0.5" wc	0.2" wc	0.5" wc		0.2" wc	0.5" wc	0.2" wc	0.5" wc
HI	1375	1275	2120	2030	HI	1300	1230	2000	1910
MHI	1250	1170	1940	1875	MHI	1225	1160	1900	1835
MED	---	---	---	---	MED	1140	1050	1690	1660
MLO	1100	1075	1710	1650	MLO	1025	980	1610	1575
LO	875	850	1150	1050	LO	775	750	1060	1010

(\* In the Unit Model number, is specific information of the product for administration only

## **6.0 FURNACE OPERATION AND SETTINGS**

### **SHUTTING FURNACE DOWN**

**POWER OFF** Turn off main power breaker or disconnect.

**FUEL OFF** Shut off manual fuel supply valve.

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

### **RESTARTING FURNACE**

Follow this procedure before restarting a unit that has been shut down for an extended period of time.

**INSPECTION** Have the furnace/system serviced and inspected by a qualified technician.

**FUEL** Turn on fuel supply and check that there are no leaks.

**POWER** Turn on power and check that the furnace starts and operates as usual.

**OPERATION** If the furnace/system fails to operate or operates in an unusual manner, call your service technician. If the burner fails to operate at any time, call a qualified burner technician.

## **6.1 BLOWER SETTING**

**Ensure power is off when adjusting blower setting.** For heating, use the blower speeds shown on the furnace specifications to give a temperature rise according to tables on page 16. The Lo blower speed can be used for air circulation when neither heating nor cooling are required. Set blower speeds to match the installation requirements.

### **THERMOSTAT ANTICIPATOR SETTING**

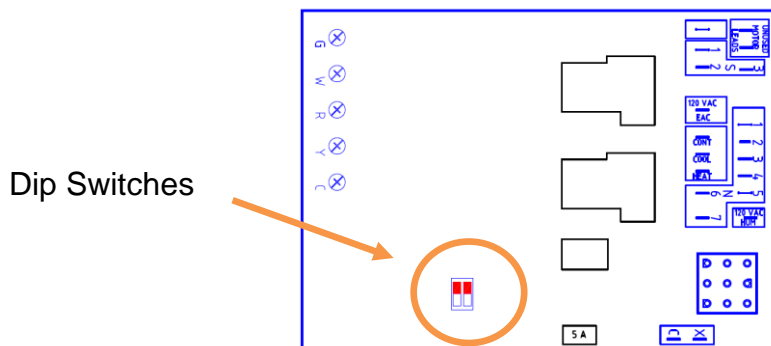
Adjust to thermostat manufacturer's instruction.

### **FAN & LIMIT CONTROL**

Limit	185°F (Factory set)
Fan On	45 seconds after burner stats
Fan Off	Adjustable on fan control board (see page19)

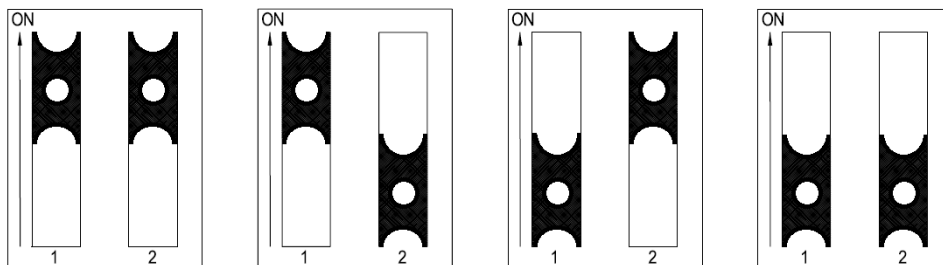
## 6.2 FAN TIMER CONTROL BOARD (ST9103A 1028)

- “FAN OFF” Dip Switches adjustment



### COMFORT ADJUSTMENTS

- Outlet air consistently too warm or too cold - change the blower motor speed to give the specified air temperature rise.
- Outlet air gets too warm and burner shuts down - increase air by changing the blower motor speed to give the specified temperature rise.
- Outlet air is too cold or too warm at the end of the heating cycle after the burner has turned off - adjust the “FAN OFF” dip switch on electronic fan center. Refer to the next figure.



60 SEC

90 SEC

120 SEC

150 SEC

“FAN OFF” Dip Switch

### OFF CYCLE AIR CIRCULATION

**LOW SPEED** All **KHM** models have the **low** speed switch for optional constant air circulation during the furnace off cycle.

**“FAN ON”** When “FAN ON” is selected on the thermostat, the blower will run constantly at the blower speed selected on the cooling terminal. This is the equivalent of jumping terminals R and G on the ST9103 board.

## 6.3 ST9103A 1028 CONTROL BOARD SEQUENCE

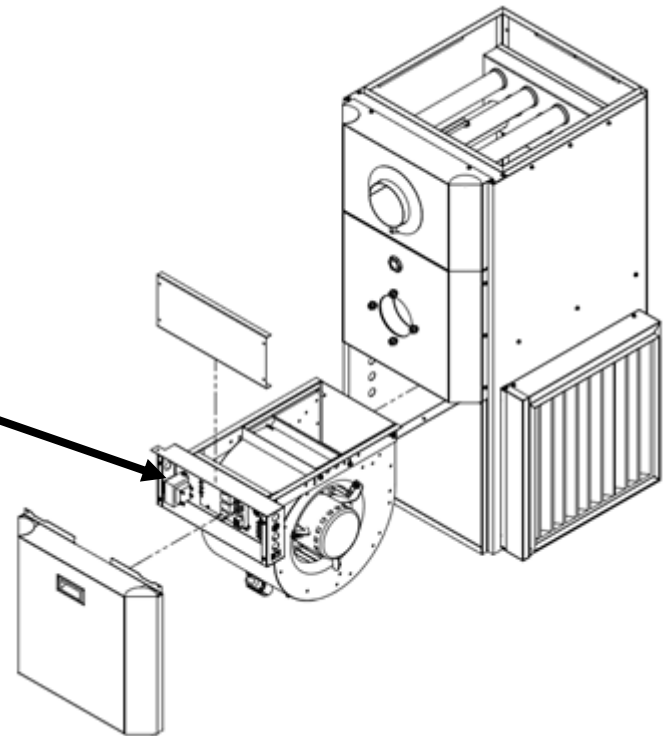
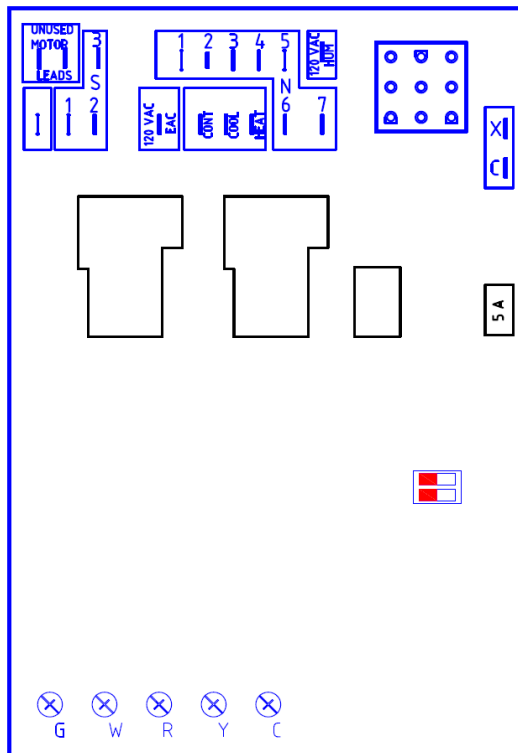
### ST9103 Heating Sequence

- 1) Thermostat calls for Heat.
- 2) Burner starts
- 3) Blower starts after **45** seconds
- 4) Burner shuts down after call for heat is satisfied
- 5) Blower stops according to adjusted (FAN OFF) Dip switch selection

### ST9103 Cooling Sequence

- 1) Thermostat calls for cooling
- 2) Blower starts immediately
- 3) Cooling unit starts
- 4) Blower stops immediately after cooling demand is satisfied
- 5) Cooling unit stops

### Honeywell ST9103A 1028 Electronic Board

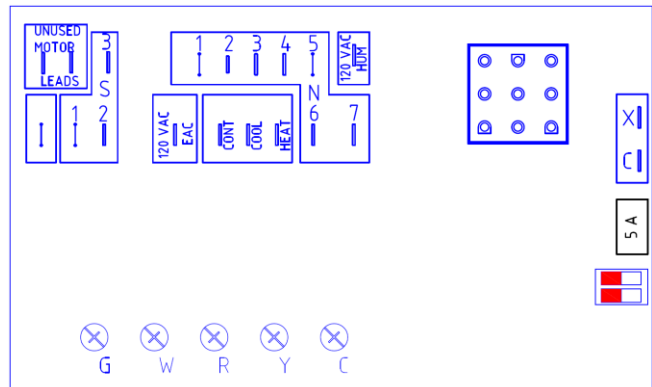


## 6.4 SERVICING - FAN TIMER ST9103A 1028

### Trouble shooting the electronic board ST 9103

**Before trouble shooting the board, check for the 5 amp. fuse**

**For accurate trouble shooting, follow step by step the Trouble Shooting Chart.**



Step	Possible Cause	Check-out procedure	Corrective action
<b>No Heat</b>			
1	Incoming supply	Check for 120 Volts between terminal S2 and 3 on electronic fan control	<b>Yes - Move to next step</b> No - Check breaker main power switch
2	Transformer	Check for 120 Volts between terminal S3 and 4 on electronic fan control. Check for 24 Volts between terminal X and C on electronic fan control	<b>Yes - Move to next step</b> No - Check for bad connection <b>Yes - Move to next step</b> No - Change Transformer
3	Electronic Fan control	Check for 24 Volts between R and C Check for 24 Volts between terminal W and C	<b>Yes - Move to next step</b> No - Change the electronic board <b>Yes - Move to next step</b> No - Check thermostat and wiring
<b>Warning: Make sure the quick connect cable is fully inserted on the board</b>			
4	Limit Control	Check for 120 Volts on each terminal of the two limits  Check for 120 Volts coming from the main plug-in of the electronic fan control to the limit control  Check for 120 Volts coming out of the limit control	<b>Yes - Move to step # 5</b> No - Move to next step  <b>Yes - Move to next step</b> No - Change the electronic fan control  <b>Yes - Move to step # 5</b> No - Failure on the limit control circuit <ul style="list-style-type: none"> <li>. Temperature too high</li> <li>. Bad limit control</li> </ul>

Step	Possible Cause	Check-out procedure	Corrective action
<b>No Heat</b>			
5 A	Riello burner application	<p>Check for 120 Volts on the black wire, contact (COM) on the burner activation relay.</p> <p>Check if oil primary control is on reset</p> <p>Check for continuity between the two wires yellow and violet on the burner activation relay</p> <p>Check for 120 Volts on the contact (No) of the burner activation relay</p> <p>Check for 120 volts on the orange wire coming to the burner (L)</p>	<p><b>Yes - Move to next step</b> No - Back to step # 4 or check for bad connection</p> <p><b>Yes - Press reset button</b> No - Move to the next step</p> <p><b>Yes - Move to next step</b> No - Change the electronic fan control</p> <p><b>Yes - Move to next step</b> No - Change the burner activation relay</p> <p><b>Yes - Failure on the burner</b> No - Change the electronic fan control</p>
5 B	Beckett Burner application	<p>Check for 120 Volts on contact(COM) on the burner activation relay</p> <p>Check if oil primary control is on Reset and if by-pass is on (TT)</p> <p>Check continuity between the yellow and violet wire on the burner activation relay</p> <p>Check for 120 Volts on contact (NO) on the burner activation relay</p> <p>Check for 120 Volts on the orange wire coming from the electronic control to the burner</p>	<p><b>Yes - Move to next step</b> No - Back to step # 4 or check bad connection</p> <p><b>Yes - Press reset button or check for by-pass on(TT)</b> No - Move to the next step</p> <p><b>Yes - Move to next step</b> No - Change the electronic fan control</p> <p><b>Yes - Move to next step</b> No - Change the burner activation relay</p> <p><b>Yes - Failure on the burner</b> No - Change the electronic fan control</p>
6	Blower • Low speed Check if the constant low speed switch is <b>ON</b>	<p>Check for 120 Volts at the "CONT" terminal on the electronic fan control</p> <p>Check for 120 Volts on both side of the constant low speed switch</p>	<p><b>Yes - Move to next step</b> No - Change the electronic fan control</p> <p><b>Yes - Check "LOW" speed on the blower motor</b> No - Change the switch</p>

Step	Possible Cause	Check-out procedure	Corrective action
<b>(No) Cooling / Heating</b>			
7	Blower High speed	Check for 24 Volts between G and C on electronic fan control	<b>Yes - Move to next step</b> No - Check thermostat and wiring; if it's OK, then change the electronic fan control
	Cooling Speed	Check for 120 Volts at the "COOL" terminal of the electronic fan control	<b>Yes - Check "COOL" speed on the blower motor</b> No - Change the electronic fan control
	Heating Speed (45 sec. delay)	Check for 120 Volts at the "HEAT" terminal of the electronic fan control	<b>Yes - Check "HEAT" speed on the blower motor</b> No - Change the electronic fan control
Step	Possible Cause	Check-out procedure	Corrective action
<b>Electronic air filter and Humidifier</b>			
8	Condensing unit	Check for 24 volts between terminal Y and C on the electronic fan control	<b>Yes - Compressor ON</b> No - Check thermostat and wiring
9	Electronic air filter	Check for 120 Volts on terminal "EAC" of the electronic fan control (thermostat must call a Heat, Cool or Fan ON demand)	<b>Yes - Electronic filter failure</b> No - Change the electronic fan control
10	Humidifier	Check for 120 Volts on terminal "HUM" of the electronic fan control (burner must be energized)	<b>Yes - Humidifier failure</b> No - Change the electronic fan control

## 7.0 SERVICE

### REGULAR MAINTENANCE



Check complete operation **at least once a year**. In Canada see B139, (Maintenance), in United States see NFPA 31, for recommended servicing procedure. Clean flue pipes on a regular basis. Replace flue pipes if there is any sign of corrosion or other problems. Gaskets should be checked and may have to be replaced.

## **CHANGING NOZZLE**

It is recommended that the nozzle be replaced once a year. If a new nozzle of a different size is installed, change the blower speed according to section **BURNER INSTALLATION AND SPECIFICATIONS** (see table at page 16) or operating decal as required

## **CLEANING HEAT EXCHANGER**

Heat exchanger must be inspected every heating season. Refer to instructions and pictures below.

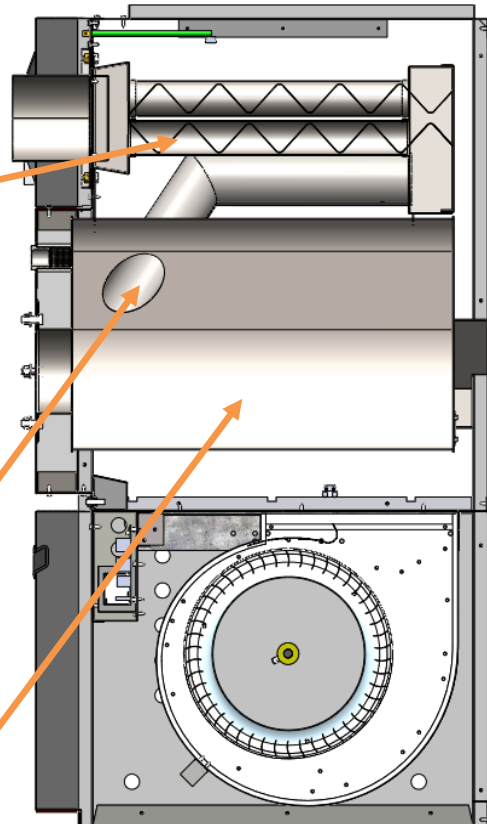
**Step 1:**  
Remove the breech plate

**Step 2:**  
Remove the baffles and clean the round tubes if needed (use a 2" diameter brush)

**Step 3:**  
Remove the burner

**Step 4:**  
Clean the transitions tubes if needed

**Step 5:**  
Clean the combustion chamber if needed



## **AIR FILTERS**

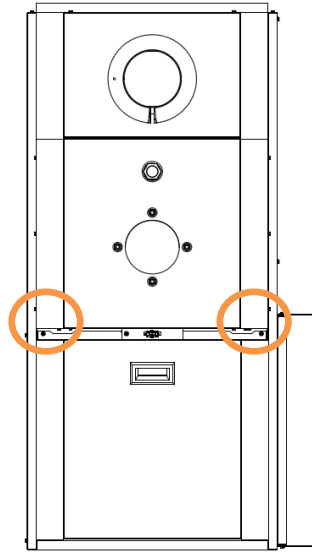
To maintain furnace performance and safety, replace dirty filters as required or at least once every heating season or as required. Use new approved disposable filters of the same size

and type. Dirty, clogged or wrong sized filters will impair the furnace performance and may cause the furnace to shut down or overheat

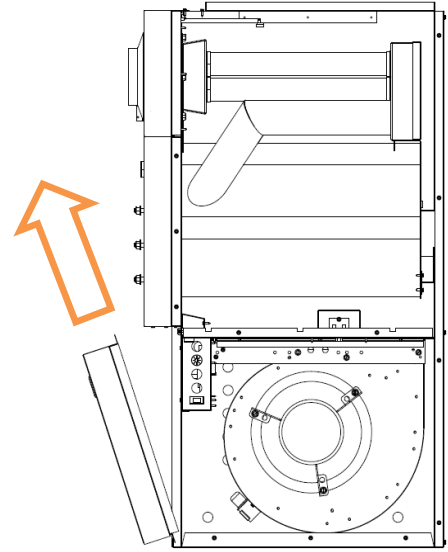
## **BLOWER REMOVAL**

This furnace has a blower sealing system, which is designed to be tight and rattle free. Refer to the instructions and pictures below.

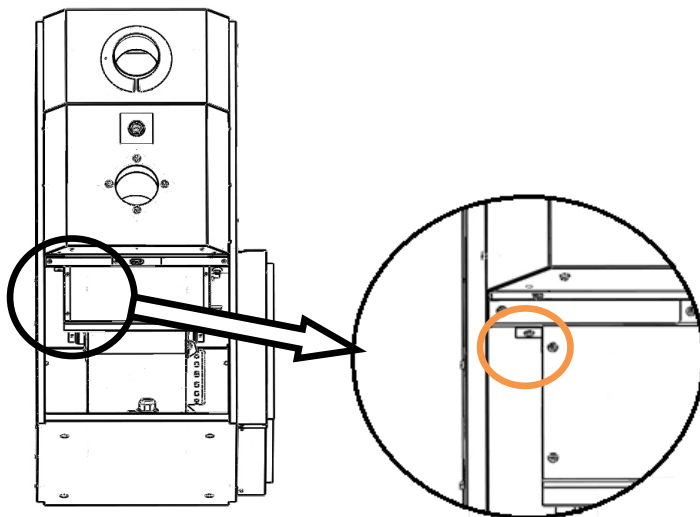
- 1) Shut off oil and power to furnace.
- 2) Remove the two (2) screws securing the blower door (Figure 1).
- 3) Open blower compartment (Figure 2).
- 4) Disconnect the wiring to the blower motor.
- 5) Remove the screw securing the blower side to the separating panel (Figure 3).
- 6) Slide the blower toward you and get the blower out of the furnace (Figure 4).



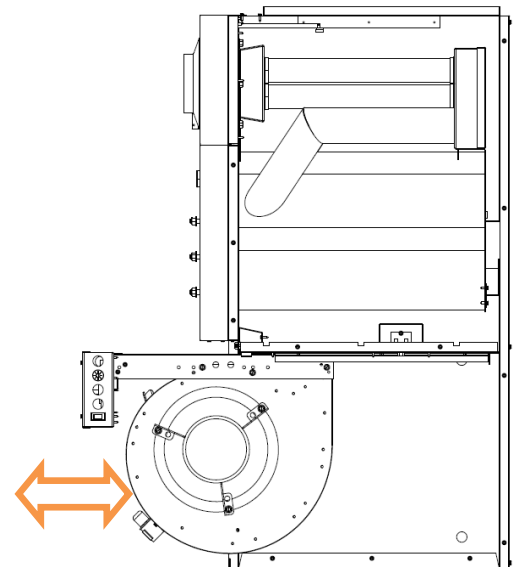
**Figure 1**



**Figure 2**



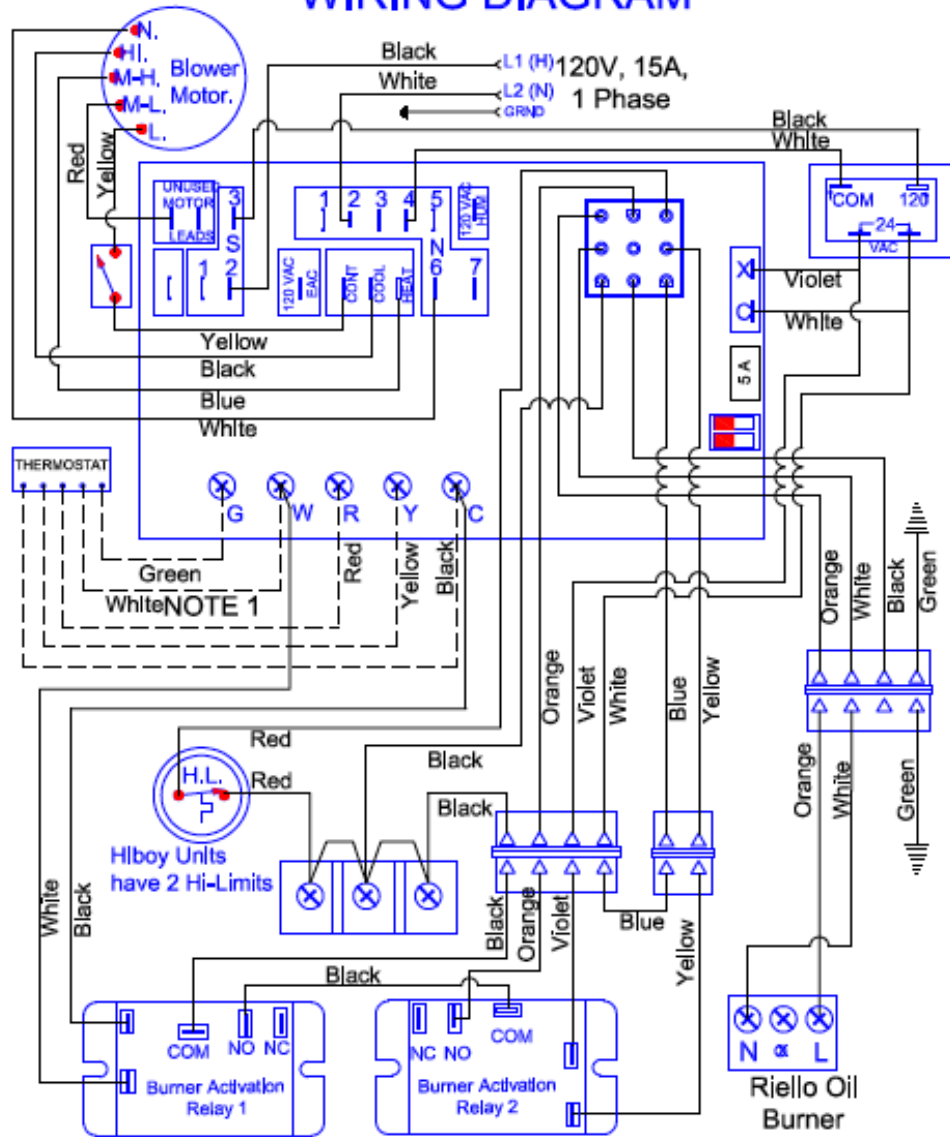
**Figure 3**



**Figure 4**

# 8.0 ELECTRICAL / WIRING DIAGRAMS HEATING & COOLING

## RIELLO WIRING DIAGRAM

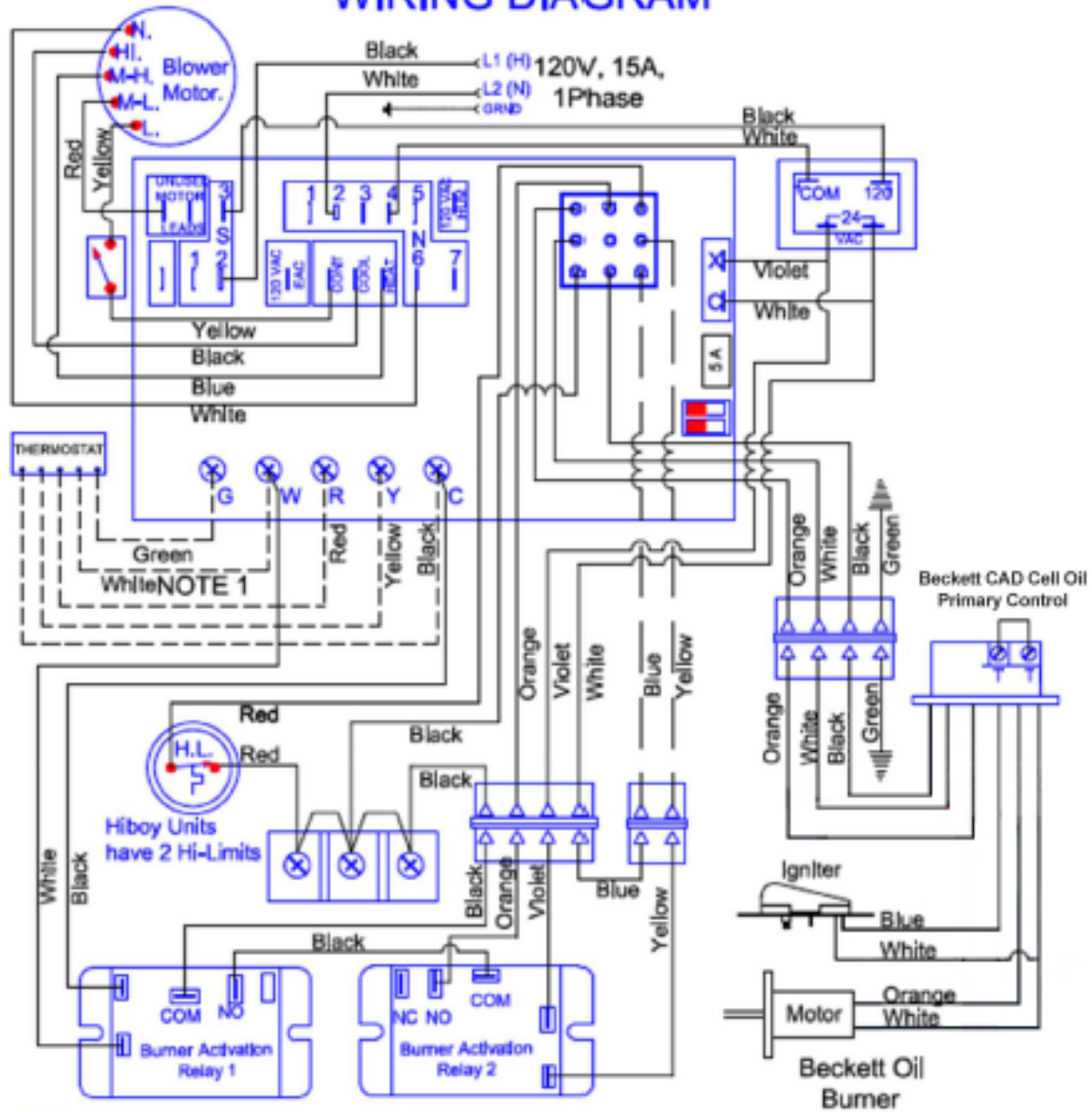


**NOTE 1**  
For Canadian application only, see wiring diagram of the Blocked Vent Shut Off Switch (BVSO) in the Installation manual

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# HEATING & COOLING

## BECKETT WIRING DIAGRAM

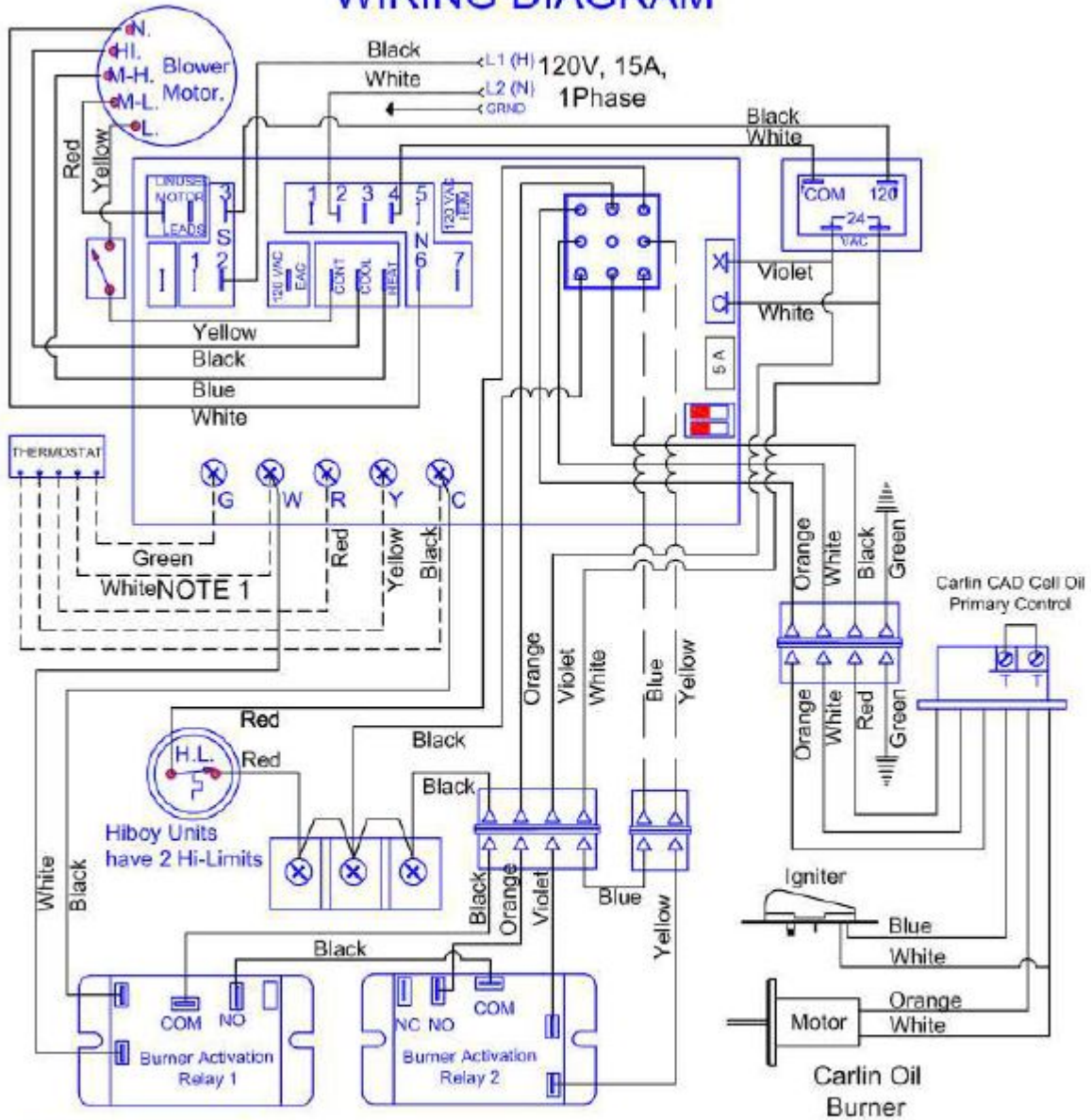


**NOTE 1**  
For Canadian application only, see wiring diagram of the Blocked Vent Shut Off Switch (BVSO) in the Installation manual

————— FACTORY WIRED / CABLE EN USINE  
- - - - - FIELD SUPPLIED WIRING / CABLE SUR LES LIEUX

# HEATING & COOLING

## CARLIN WIRING DIAGRAM



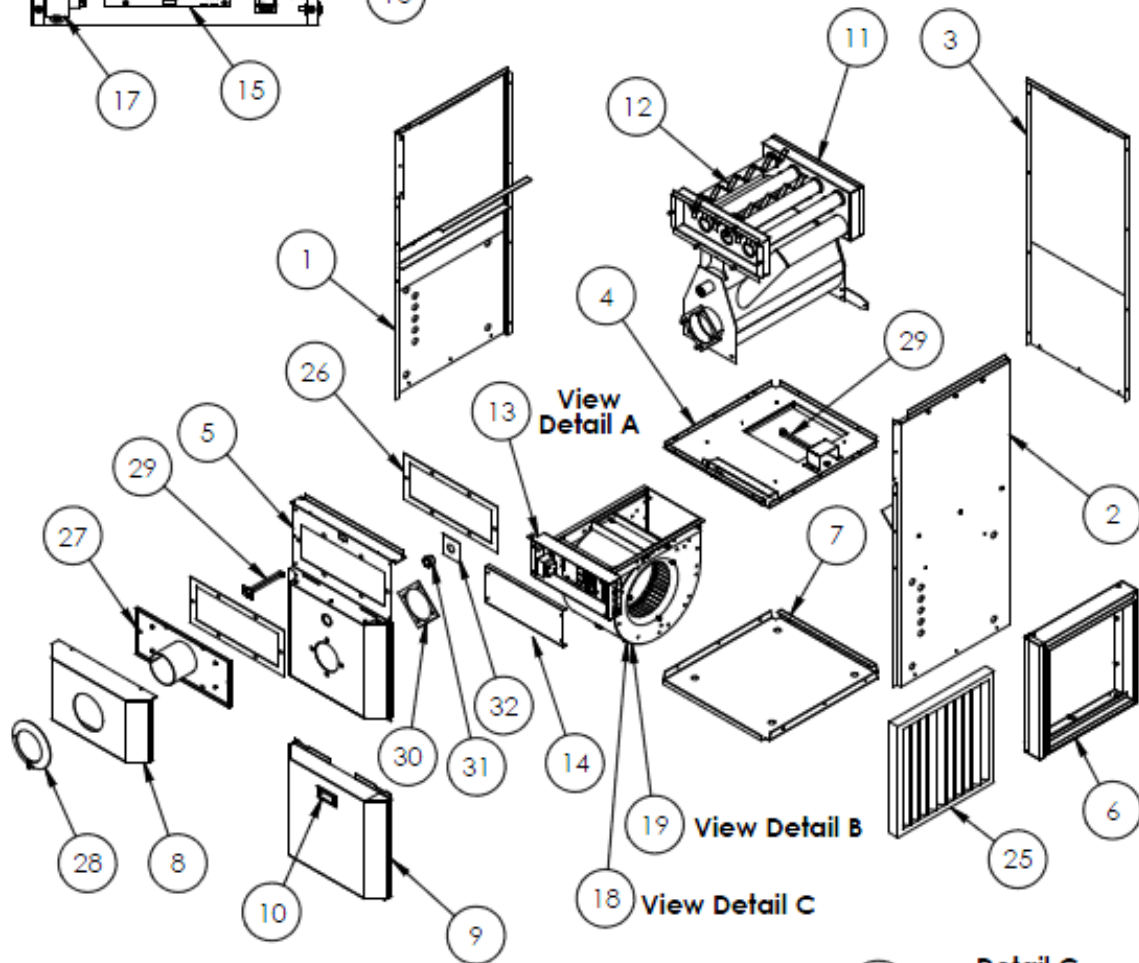
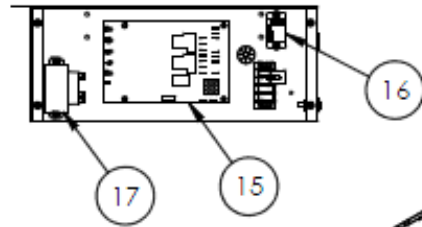
**NOTE 1**  
For Canadian application only, see wiring diagram of the Blocked Vent Shut Off Switch (BVSO) in the Installation manual

————— FACTORY WIRED / CABLE EN USINE  
- - - - - FIELD SUPPLIED WIRING / CABLE SUR LES LIÈGES

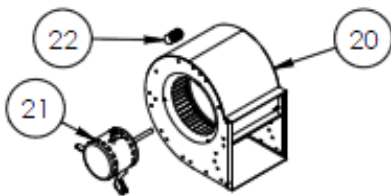
# 9.0 EXPLODED PARTS VIEW

## KHM-100 – Exploded Parts View

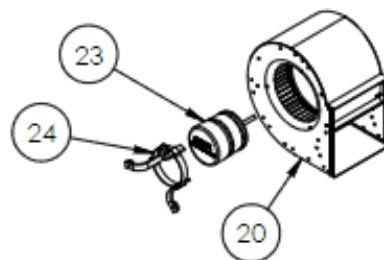
**Detail A**  
13 ELB-PO-0006-00  
Electrical Box



**Detail B**  
18 FAN-A0-0002-00  
PSC Motor



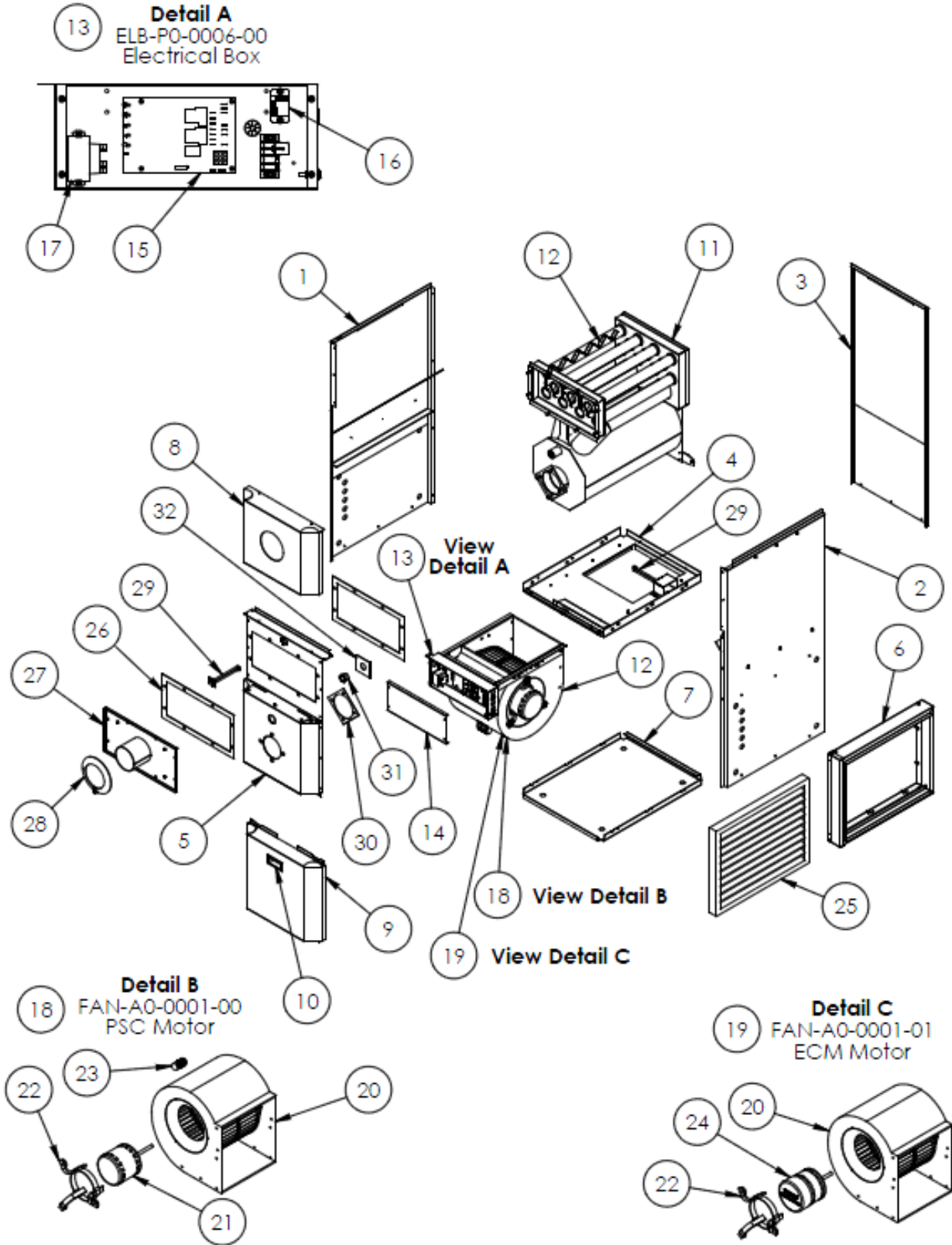
**Detail C**  
19 FAN-A0-0002-01  
ECM Motor



## KHM-100 – Part List

ITEM	PART NUMBER	DESCRIPTION	QTY
1	CAB-A0-0019-00	Left Panel Assembly	1
2	CAB-A0-0020-00	Right Panel Assembly	1
3	CAB-A0-0018-00	Rear Panel Assembly	1
4	CAB-A0-0016-00	Blower Panel Assembly	1
5	CAB-A0-0021-00	Front Panel Assembly	1
6	CAB-A0-0022-00	20" x 20" Filter Holder Assembly	1
7	CAB-P0-0045-00	Base Panel	1
8	CAB-P0-0052-00	Front Door Panel	1
9	CAB-P0-0051-00	Blower Door Panel	1
10	3HN-00-PULL-00	Handle Flush Pocket Pull	1
11	HEX-A0-0009-00	Heat Exchanger Assembly	1
12	HEX-P0-0064-00	Pipe Baffle Hi-Boy	7
13	ELB-A0-0006-00	Electrical Box Assembly - Hi-Boy Model	1
14	ELB-P0-0014-00	Cover Electric Box - Hi-Boy Model	1
15	4CB-00-FAN0-00	ST9103A1028 Electronic Board	1
16	4RY-00-24V0-00	Relay AE04001 24VAC Form C SPDT 24V	1
17	4TF-00-40VA-00	Transformer HTC-01A0BB01 40 VA	1
18	FAN-A0-0002-00	Fan Motor Assembly KLR-090 PSC Motor	1
19	FAN-A0-0002-01	Fan Motor Assembly KLR-090 ECM Motor	1
20	3BU-10-08DD-00	Blower 10" x 8" Direct Drive (G10-8DD)	1
21	3BM-50-4SDD-01	Motor Blower 1/2 HP Direct Drive 4SP EMERSON	1
22	4CA-00-705M-00	Capacitor 7.5 $\mu$ F 370VAC 70C 60 Hz	1
23	3BM-50-ECM0-02	Motor Blower 1/2 HP ECM Ecotech EMERSON	1
24	1SB-00-BUMR-00	Bracket Motor Mounting Direct Drive Blower	1
25	3AF-02-2020-01	Filter Air 20" x 20" x 2" Non-Pleated (Strata Type)	1
26	INS-P0-0015-00	Low-Boy Rear Insulation	2
27	HEX-A0-0013-00	Front Collector Assembly	1
28	CAB-P0-0121-00	Front Flue Collar	1
29	4SD-00-0185-00	Control Limit Snap Disc (185°) Auto Reset (L185-40F)	2
30	INS-P0-0017-00	Burner's Flange Insulation	1
31	3SG-0P-1030-5A	Glass Sight Clear 1" NPT Hex With THD Seal	1
32	INS-P0-0018-00	Sight Glass Insulation	1

# KHM-200 – Exploded Parts View





## KHM-200 – Part List

ITEM	PART NUMBER	DESCRIPTION	QTY
1	CAB-A0-0027-00	Left Panel Assembly	1
2	CAB-A0-0028-00	Right Panel Assembly	1
3	CAB-A0-0026-00	Rear Panel Assembly	1
4	CAB-A0-0024-00	Blower Panel Assembly	1
5	CAB-A0-0029-00	Front Panel Assembly	1
6	CAB-A0-0030-00	20" x 25" Filter Holder Assembly	1
7	CAB-P0-0061-00	Base Panel	1
8	CAB-P0-0065-00	Front Door Panel	1
9	CAB-P0-0051-00	Blower Door Panel	1
10	3HN-00-PULL-00	Handle Flush Pocket Pull	1
11	HEX-A0-0011-00	Heat Exchanger Assembly	1
12	HEX-P0-0064-00	Pipe Baffle Hi-Boy	11
13	ELB-A0-0006-00	Electrical Box Assembly - Hi-Boy Model	1
14	ELB-P0-0014-00	Cover Electric Box - Hi-Boy Model	1
15	4CB-00-FAN0-00	ST9103A1028 Electronic Board	1
16	4RY-00-24V0-00	Relay AE04001 24VAC Form C SPDT 24V	1
17	4TF-00-40VA-00	Transformer HTC-01A0BB01 40 VA	1
18	FAN-A0-0001-00	Fan Motor Assembly KHM-140 PSC Motor	1
19	FAN-A0-0001-01	Fan Motor Assembly KHM-140 ECM Motor	1
20	3BU-12-00DD-00	Blower 12" Direct Drive (GT12-10DD)	1
21	3BM-75-4SDD-01	Motor Blower 3/4 HP Direct Drive 4SP EMERSON	1
22	1SB-00-BUMR-00	Bracket Motor Mounting Direct Drive Blower	1
23	4CA-00-156M-2B	Capacitor 15 $\mu$ F 370VAC 70C 60 Hz	1
24	3BM-75-4SDD-02	Motor Blower 3/4 HP ECM Ecotech EMERSON	1
25	3AF-02-2025-01	Filter Air 20" x 25" x 2" Non-Pleated (Strata Type)	1
26	INS-P0-0020-00	Hi-Boy Front Insulation	2
27	HEX-A0-0010-00	Front Collector Assembly	1
28	CAB-P0-0121-00	Front Flue Collar	1
29	4SD-00-0185-00	Control Limit Snap Disc (185°) Auto Reset (L185-40F)	2
30	INS-P0-0017-00	Burner's Flange Insulation	1
31	3SG-0P-1030-5A	Glass Sight Clear 1" NPT Hex With THD Seal	1
32	INS-P0-0018-00	Sight Glass Insulation	1

# 10. START-UP TEST RESULTS

Model: \_\_\_\_\_ Serial Number: \_\_\_\_\_

Unit configuration: Upflow\_\_\_\_ Downflow\_\_\_\_ Horizontal left\_\_\_\_ Horizontal right\_\_\_\_

Date of installation: \_\_\_\_\_

Installer (name & address): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

## START-UP TEST RESULTS

Size of unit (Btu/h): \_\_\_\_\_

Nozzle: \_\_\_\_\_ Oil Pressure (psi): \_\_\_\_\_

Chimney \_\_\_\_\_ Direct vent system (DVS) \_\_\_\_\_

Burner adjustments:

RIELLO **F3/BF3**\_\_\_\_ *RIELLO F5/BF5*\_\_\_\_ BECKETT **AFG-LII** \_\_\_\_ Beckett **F3** \_\_\_\_

CARLIN **EZ-LF** \_\_\_\_\_

Turbulator: \_\_\_\_\_ Air Gate: \_\_\_\_\_ \*Head Setting: \_\_\_\_\_

Air band: \_\_\_\_\_ Air shutter: \_\_\_\_\_ \*Air Setting: \_\_\_\_\_

\*Carlin Only

Smoke result: #0 \_\_\_\_\_ TRACE \_\_\_\_\_ #1 \_\_\_\_\_

Combustion Results: \_\_\_\_\_ CO<sub>2</sub> %

Chimney draft: \_\_\_\_\_ " W.C.

Ambient temperature: \_\_\_\_\_ °F

Gross flue temperature: \_\_\_\_\_ °F

Temperature rise: \_\_\_\_\_ °F (see page 34)

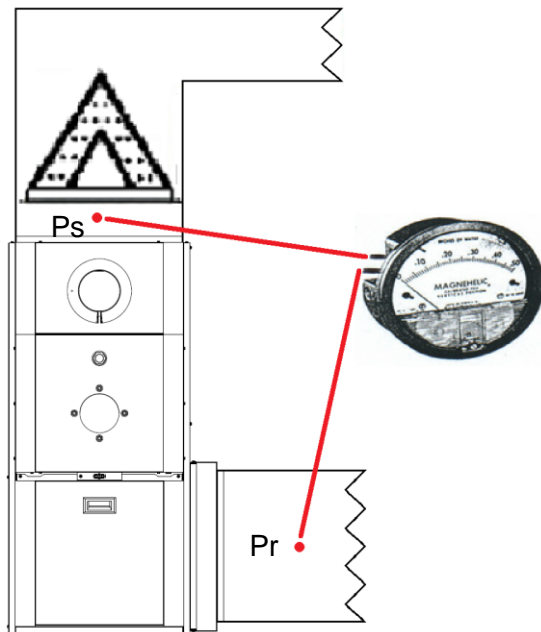
External total static pressure: \_\_\_\_\_ " W.C. (see page 34)

A/C Coil total resistance: \_\_\_\_\_ " W.C. (see page 34)

## TEST PROCEDURES

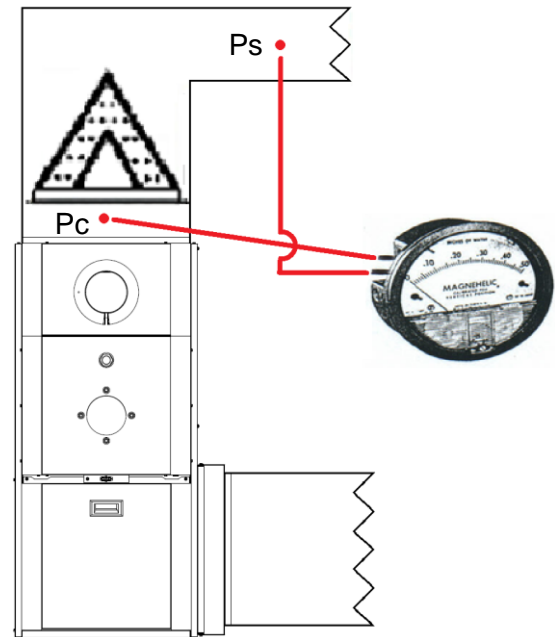
### External Total Static Pressure Reading

Supply Pressure (Ps) + Return Pressure (Pr)



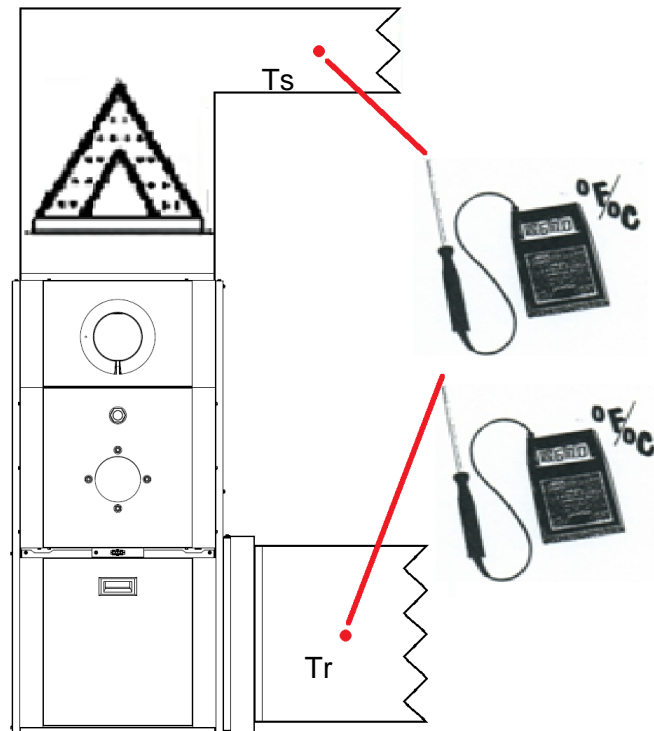
### A/C Coil Total Resistance Reading

Coil Pressure (Pc) - Supply Pressure (Ps)



### Temperature Rise Reading \*\*\*

Supply Temp. (Ts) - Return Temp. (Tr)



\*\*\* Probe must not be in direct sight of heat exchanger.

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