

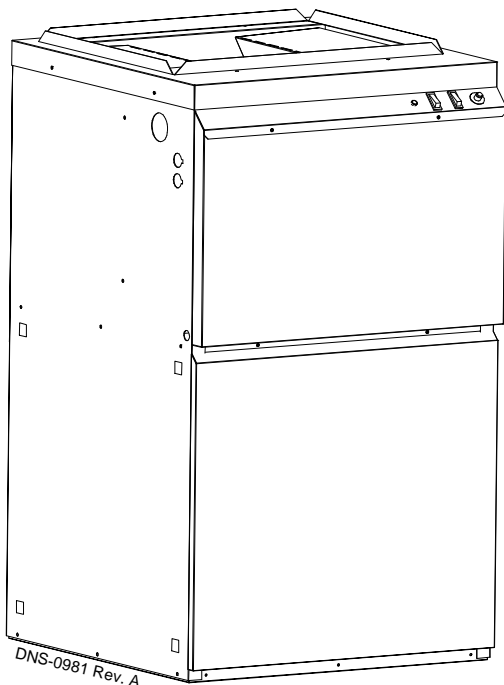
Installation Instructions and Homeowner's Manual

SUPREME

Fournaise électrique Electric Furnace

240 VAC POWER SUPPLY

***MULTI POSITION
VARIABLE SPEED BLOWER
MOTOR (ECM)***



INSTALLER / SERVICE TECHNICIAN:

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

HOMEOWNER:

PLEASE KEEP THIS MANUAL NEAR THE FURNACE FOR FUTURE REFERENCE.

Models:

FEM15-E230V1M-A
FEM18-E230V1M-A
FEM20-E230V1M-A
FEM23-E230V2M-A
FEM27-E230V2M-A



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

Manufactured by:

Industries Dettson inc.
3400 Industrial Boulevard
Sherbrooke, Quebec - Canada
J1L 1V8

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1.0 SAFETY

1.1 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 bodily and/or material damage.



WARNING

Hazards or unsafe practices which **CAN** result in death or serious bodily and /or material damage.



CAUTION

Hazards or unsafe practices which **CAN** result in minor bodily and /or material damage.

1.2 IMPORTANT INFORMATION



WARNING

Non-observance of the safety regulations outlined in this manual will potentially lead to consequences resulting in death, serious bodily injury and/or property damage.



WARNING

Installation and repairs performed by unqualified persons can result in hazards to them and to others. Installations 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 technician, familiar with safety procedures and who is equipped with the proper tools and test instruments.

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

- It is the homeowner's responsibility to engage a qualified technician for the installation and subsequent servicing of this furnace;
- Do not use this furnace if any part of it was under water. Call a qualified service technician immediately to assess the damage and to replace all critical parts that were in contact with water;
- Do not store gasoline or any other flammable substances, such as paper, carton, etc. near the furnace;
- Never block or otherwise obstruct the filter and/or return air openings;

- Ask the technician installing your furnace to show and explain to you the following items:
 - The main disconnect switch or circuit breaker;
 - The air filter and how to change it (check monthly and clean or replace if necessary);
- Before calling for service, be sure to have the information page of your manual close by in order to be able to provide the contractor with the required information, such as the model and serial numbers of the furnace.

IMPORTANT: All local and national code requirements governing the installation of central electric heating equipment, wiring and the flue connection **MUST** be followed. Some of the codes that may apply are:

ANSI/NFPA 70: National Electrical Code

CSA C22.1 or CSA C22.10: Canadian Electrical Code

Only the latest issues of these codes may be used, and are available from either:

The National Fire Protection Agency
1 Batterymarch Park
Quincy, MA 02269

or

The Canadian Standards Association
178 Rexdale Blvd.
Rexdale, Ontario M9W 1R3

1.3 DANGER OF FREEZING



CAUTION

If your furnace is shut down during the cold weather season, water pipes may freeze, burst and cause serious water damage. Turn off the water supply and bleed the pipes.

If the heater is left unattended during the cold weather season, take the following precautions:

- Close the main water valve in the house and purge the pipes if possible. Open all the faucets in the house;
- Ask someone to frequently check the house during the cold weather season to make sure that there is sufficient heat to prevent the pipes from freezing. Tell this person to call an emergency number if required.

2.0 INSTALLATION

This furnace is a true multi-position unit, in that it will function in an upflow, downflow or horizontal configuration to the left or the right. Only a few modifications are required during installation to change from one position to another. The unit is shipped in the upflow configuration and instructions as to how to change to the other positions are included in this manual.

The unit requires a 240VAC power supply to the control panel, thermostat hook-up as shown on the wiring diagram and suitable air ductwork.

2.1 POSITIONING THE FURNACE

If the furnace is installed in a basement or on a dirt floor, in a

crawl space for example, it is recommended to install the unit on a cement base 2.5 cm to 5.0 cm (1" to 2") thick.

WARNING

Fire and explosion hazard.
The furnace must be installed in a level position, never where it will slope toward the front.
Do not store or use gasoline or any other flammable substances near the furnace.
Non-observance of these instructions will potentially result in death, bodily injury and/or property damage.

CAUTION

This furnace is not watertight and is not designed for outdoor installation. It must be installed in such a manner as to protect its electrical components from water. Outdoor installation will lead to a hazardous electrical condition and to premature failure of the equipment.

The unit must be installed in an area where the ambient and return air temperatures are above 15°C (60°F). In addition, the heater should also be located close to the center of the air distribution system.

2.2 CLEARANCES TO COMBUSTIBLE MATERIAL

2.2.1. Heating unit

The furnace is approved for zero clearance to combustible material regardless of the heating capacity.

2.2.2. Supply air ducts

Ducts for furnaces with a heating capacity up to and including 20 kW, can be installed with a zero clearance to combustible material.

Ducts for furnaces of 23 kW or more must have a clearance of 25 mm (1") to combustible material for the first 0.9 m (36") of duct. Thereafter the clearance can be zero.

Units of 23 kW and up, installed in the downflow position must use a DFB-FEM downflow base, which is especially designed for this purpose. It ensures that the required clearances are being adhered to.

2.3 CONFIGURATIONS

2.3.1. Upflow installation

The return air opening may be located on either side of the furnace. Care should be taken not to damage the wires inside, while cutting the opening. Install the filter rack supplied with the unit according to the instructions provided with it. It is also recommended to install the blower door before handling or moving the unit. Refer to Figure 1 for additional details.

2.3.2. Downflow installation

When the furnace is installed in the downflow position on a combustible floor, the clearances from combustibles

materials must be adhered to. The downflow base DFB-FEM can be used to ensure these clearances. Refer to Figure 2 and the installation instructions provided with the base.

Figure 1 : Upflow installation

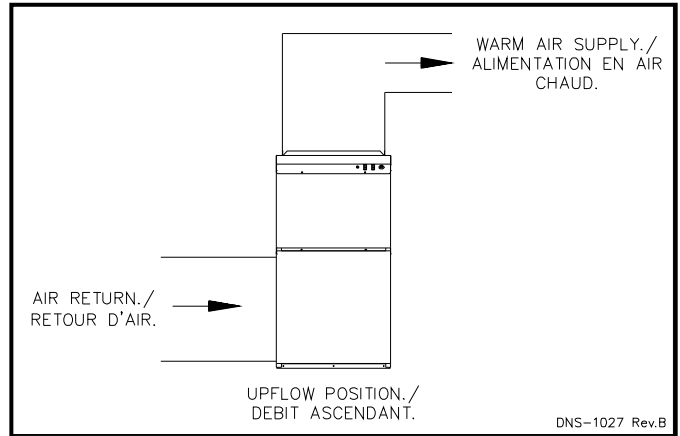
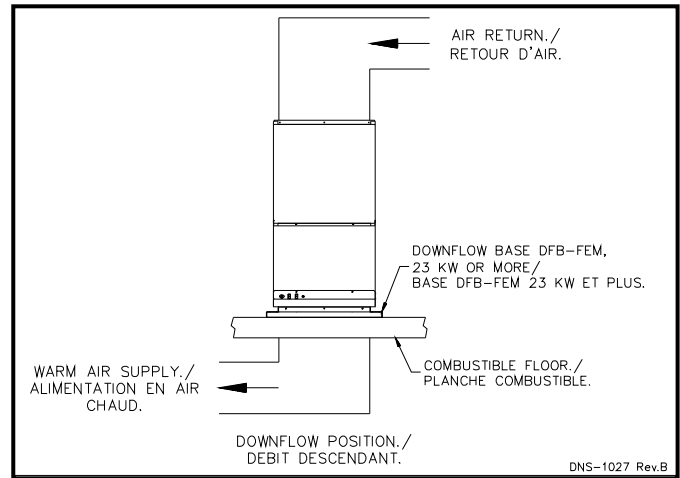


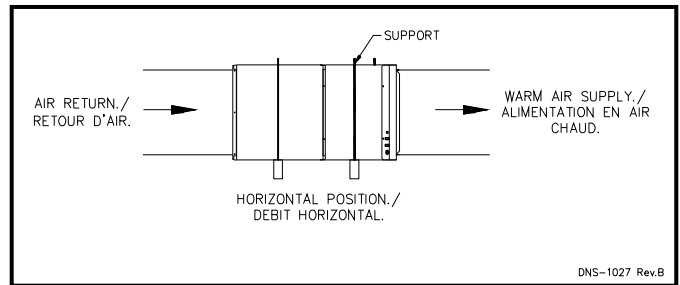
Figure 2 : Downflow installation



2.3.3. Horizontal installation

When the furnace is installed in the horizontal position, either suspended or on a combustible floor with a choice of right or left discharge, the clearances from combustible material must be adhered to. Refer to Figure 3 for additional details.

Figure 3 : Horizontal installation



2.4 ELECTRICAL SYSTEM

The SUPREME furnace is completely pre-wired and all field wiring must be connected to the terminal blocks on the unit. It requires a 240 volt, 2-wire power supply.



WARNING

Risk of fire.

The conductor sizing must conform to the last edition of the local or national codes.

Failure to follow this rule can result in death, bodily injury and/or property damage.

Power supply to the unit can be done using copper or aluminum wires. The wire size must be decided in accordance to unit power consumption, the over current protection type and capacity, the wire type and length, and the environment where the unit is installed. If an aluminum wire is used, other precautions must be taken to insure the conformity of the installation. In all cases, all the factors affecting the wire gauge must be considered and the installation codes followed.

The exterior of the unit must have an uninterrupted ground to minimize the risk of bodily harm. A ground terminal is supplied with the control box for that purpose.

In the event that wires inside the unit require replacement, these must be copper wires only with same temperature rating as originals.

2.5 INSTALLATION OF THE THERMOSTAT

A thermostat must be installed to control the temperature of the area to be heated. Follow the instructions supplied with the thermostat. Some thermostat need to connect the C terminal on the furnace and thermostat. Install the thermostat on an interior wall in a location where it will not be subject to direct sun light, lamps, air diffusers, fireplaces, etc. Seal openings in walls to avoid air currents that may influence the operation of the thermostat. Also refer to the wiring diagrams provided with the heating/air conditioning unit. The connections must be made as indicated on the following diagrams and the electrical diagram (Figure 15).

Figure 4 : 1-stage thermostat, heating only

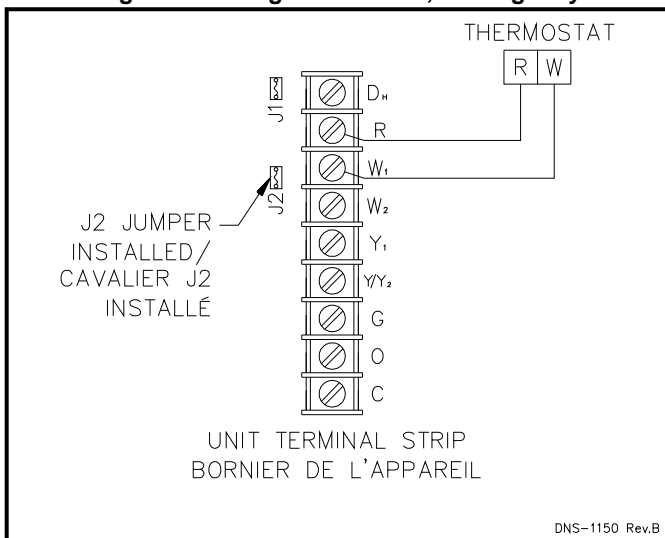


Figure 5 : 2-stage thermostat, heating only

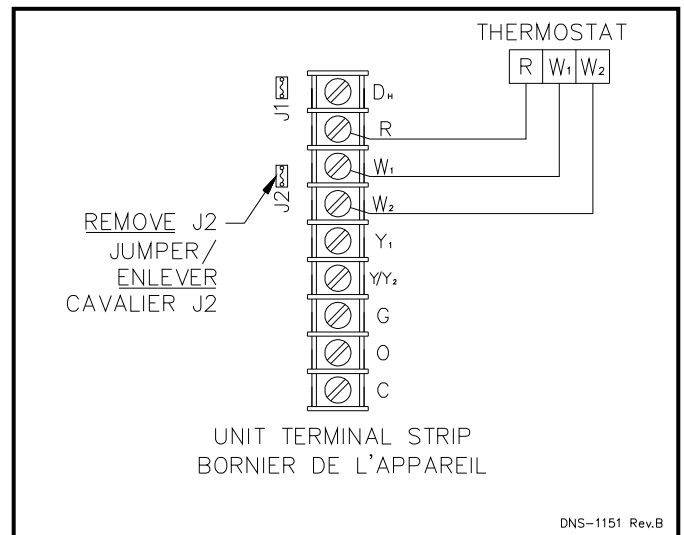


Figure 6 : 1 stage thermostat, electric heat and cooling application

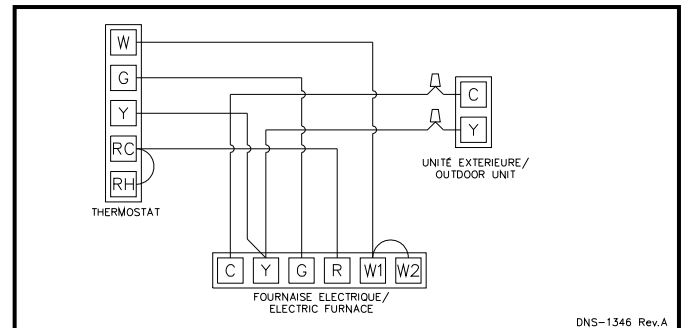
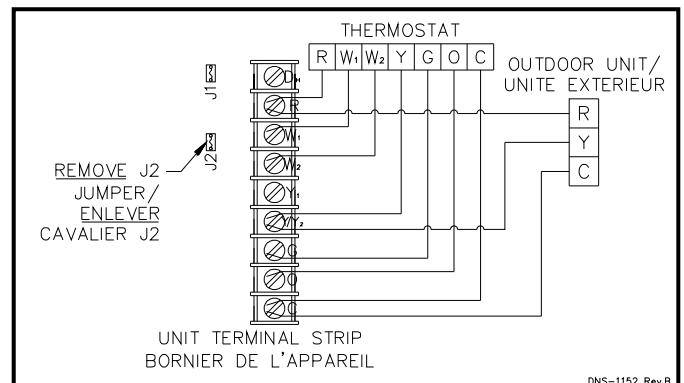


Figure 7 : 2-stage heating & 1-stage air conditioning & heat pump thermostat



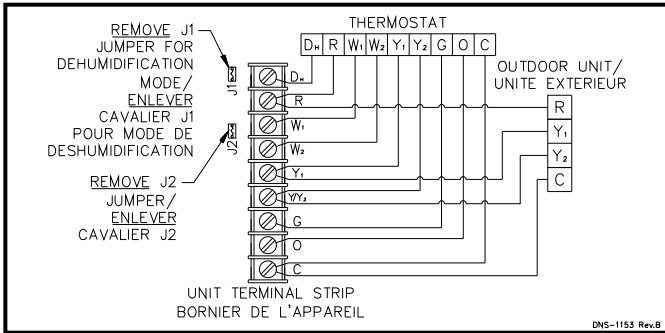
2.5.1. Thermostat heat anticipator adjustment

Certain thermostats are equipped with a heat anticipator that must be adjusted according to the instructions supplied. This is to ensure that the heating mode is comfortable and economical.

Generally speaking, on a single stage thermostat, a reading of the current must be taken with an ammeter as follows:

1. Move the anticipator to its highest setting, rendering it ineffective.
2. Remove the wire from the "W1" terminal and connect an ammeter between the terminal and the wire.

Figure 8 : 2-stage heating & 2-stage air conditioning & heat pump thermostat + dehumidification mode



move the 6 select wires to the pins which match the components used. (Refer to Figure 9 below)

3. Call for heat by raising the set point on the thermostat and allow the furnace to run for 3 to 4 minutes to reach its peak output.
4. Once the current has stabilized, a reading should be taken and the anticipator adjusted to that value. If longer heating cycles are desired, the anticipator can be set to a higher value

2.5.2. Ducts and filters

The ducts must be sized such a way as to accommodate the specified airflow and the available static pressure. Refer to the applicable local and/or national installation codes.

Insulate the ducts that lead through non-heated areas. Use flexible supply and return air connectors to avoid the transmission of vibration. To make the unit run even quieter, the installer should:

1. Use two elbows between each outlet and the supply and return air plenum;
2. Cover the vertical sections of the supply and return air duct with soundproofing material;
3. Use baffles in short radius elbows;
4. Use flexible hangers to suspend the ducts.

The **SUPREME** furnace is equipped with a filter frame for the blower compartment. It must be installed on the outside of one of the three sides or the bottom of the furnace. Once the location of the installation has been determined, use the four square knockouts for ease of cutting the opening.

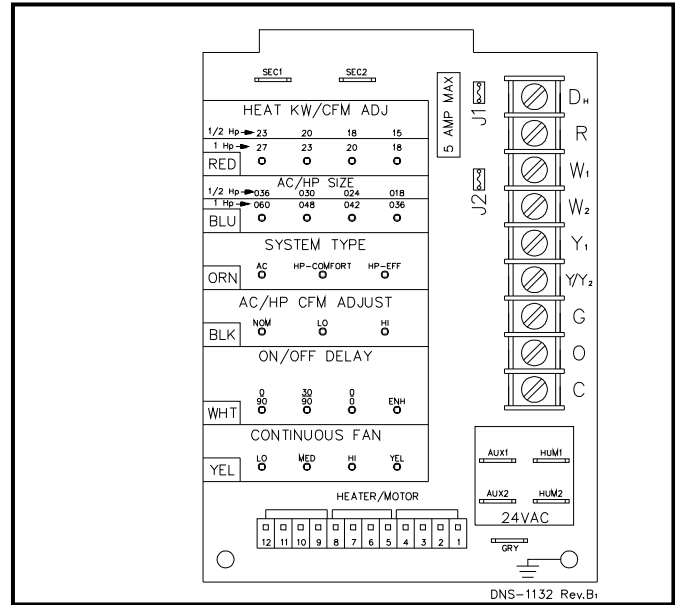
A heat pump or an air conditioner can be added to this furnace, in either the supply or return air duct. Carefully follow the instructions provided with these appliances to ensure proper installation and hook-up to the electric furnace. Refrigerant and drainage pipes must in no way hinder access to the furnace panels.

2.6 SUPPLY AIR ADJUSTMENTS AND OTHER BLOWER SETTINGS

Fan Control Board taps are used by the installer to configure a system. The ECM motor uses the selected taps to modify its operation to a pre-programmed table of airflows (Refer to Table 3 and Table 4). Airflows are based on system size or mode of operation and those airflows are modified in response to thermostat inputs.

FEM electric furnace must be configured to operate properly with system components with which it is installed. To successfully configure a basic system (see information printed on circuit board label located next to select pins),

Figure 9 : Fan Control Board



2.6.1. HEAT KW/CFM adjustment

Installer must verify (factory set) the electric heat airflow adjustment required for kW size heater installed.

The select pins are marked 23, 20, 18, 15 (for ½ HP ECM motor unit) and 27, 23, 20, 18 (for 1.0 HP ECM motor unit). Refer to the unit wiring diagram and select the pin for the heater size being used (Refer to Figures 9 and 15).

The airflow must be large enough for safe and continuous operation. (Refer to Table 3 and 4 for airflow delivery CFM).

2.6.2. AC/HP size

Select System Size Installed

The factory setting for air conditioner or heat pump size is the largest outdoor unit that can be used with the furnace. Installer needs to select air conditioner or heat pump size to ensure that airflow delivered falls within proper range for the size unit installed.

The select pins are marked 036, 030, 024, 018 for furnace equipped with ½ HP ECM motor and 060, 048, 042, 036 for furnace equipped with 1.0 HP ECM motor. Refer to the unit wiring diagram and select the pin for the outdoor unit size being used (Refer to Figures 9 and 15).

2.6.3. System type

Select System Type Installed AC or HP

The type of system must be selected:

1. AC – Air Conditioner provides approximately 400 CFM per ton for greater efficiency and humidity control with the AC/HP CFM ADJUST set to the nominal (NOM) tap. To achieve more or less than 400 CFM per ton, move tap to (HI) or (LO) position respectively. Refer to appropriate airflow tables for exact CFM setting.

- HP-COMFORT – Heat Pump Comfort provides approximately 350 CFM per ton for higher than normal heating air delivery temperature.
- HP-EFF – Heat Pump Efficiency provides same airflow for heating and cooling modes to increase overall HP efficiency; approximately 400 CFM per ton with the AC/HP CFM ADJUST set to the nominal (NOM) tap.

The factory setting is AC (Refer to Figures 9 and 15).

2.6.4. AC/HP CFM adjust

Select Medium, Low, or High Airflow

To provide airflow at rates described above, the AC/HP ADJUST select is factory set to the nominal (NOM) tap. The adjust selections HI/LO will regulate airflow supplied for all operational modes.

HI provides 10% airflow over nominal unit size selected and LO provides 10% airflow below nominal unit size selected.

Adjust selection options are provided to adjust airflow supplied to meet individual installation needs for such things as noise, comfort, and humidity removal. (Refer to Figures 9 and 15)

2.6.5. ON/OFF delay

Select desired time delay profile

NOTE: Delay selections are active in cooling and heat pump heating modes only. Electric heating modes have a one (1) minute OFF delay at 50% airflow and zero (0) ON delay programmed into the ECM motor that cannot be overridden.

Four (4) motor operation delay profiles are provided to customize and enhance system operation. (Refer to Figures 9 and 15).

Selection options are:

- 0/90: No ON delay and 90 second OFF delay at 100% airflow (factory setting).
- 30/90: 30 second ON delay with no airflow and 90 second OFF delay at 100% airflow profile. Used when it is desirable to allow system coils time to heat-up/cool-down in conjunction with the airflow.
- 0/0: No delay option. Used for servicing unit or when a thermostat is utilized to perform delay functions.
- ENH: enhanced selection provides a 30 second ON delay with no airflow followed by 150 seconds at 70% airflow, and no OFF delay for added comfort. This profile will minimize cold blow in heat pump operation and could enhance system efficiency.

2.6.6. Continuous fan

NOTE: If installed with a two-stage outdoor unit, do not select HI speed continuous fan. If HI is selected, low stage compression will also run HI fan speed possibly resulting in insufficient dehumidification.

Select desired fan speed when thermostat is set on continuous fan. (Refer to Figures 9 and 15)

- LO speed – factory setting, 50% cooling mode airflow.
- MED speed – move connector to MED, 80% cooling mode airflow.

- HI speed – move connector to HI, 100% cooling mode airflow.

2.6.7. Low-voltage circuit

Fusing and Reference

The low-voltage circuit is fused by a board-mounted 5-amp automotive fuse placed in series with the transformer SEC2 and the R circuit. The C circuit of the transformer is referenced to chassis ground through a printed circuit run at SEC1 connected to metal standoff marked with ground symbol.

2.6.8. Basic furnace configuration

The following basic configuration of the furnace will provide ARI rated performance of an air conditioner:

- HEAT KW/CFM – Select the heater range for the size electric heater installed.
- AC/HP SIZE – Select system size installed.
- SYSTEM TYPE – Select system type AC
- AC/HP CFM ADJUST – Select NOM.
- ON/OFF DELAY – Select 0/90 profile.
- CONTINUOUS FAN – Select desired fan speed when thermostat is set to continuous fan.

The following basic configuration of the furnace will provide ARI rated performance of a heat pump:

- HEAT KW/CFM – Select the heater range for the size electric heater installed.
- AC/HP SIZE – Select system size installed.
- SYSTEM TYPE – Select system type HP-EFF
- AC/HP CFM ADJUST – Select NOM.
- ON/OFF DELAY – Select 0/90 profile.
- CONTINUOUS FAN – Select desired fan speed when thermostat is set to continuous fan.

2.7. INSTALLATION OF ACCESSORIES



WARNING

Electrical shock hazard.

Turn OFF electrical power at the 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 can result in death or bodily injury.

2.7.1. Humidifier and humidistat connection

Fan Control Board terminals HUM1 (directly connected internally to C on terminal block) and HUM2 (directly connected internally to G on terminal block) are provided for direct connections to the low-voltage control of a humidifier through a standard humidistat (refer to Figure 10). These terminals are energized with 24 VAC when G thermostat signal is present. Alternately, the 24 VAC signal may be sourced from the W1 and C terminal block connections when electric heaters are used as a primary heating source (refer to Figure 11).

Figure 10 : Standard humidistat connections

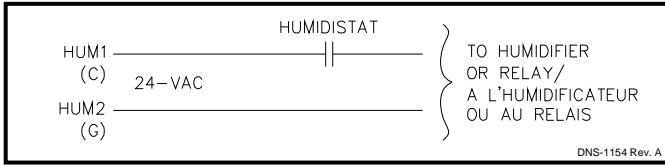
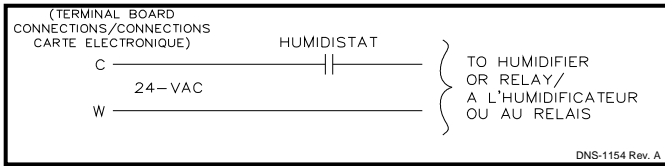


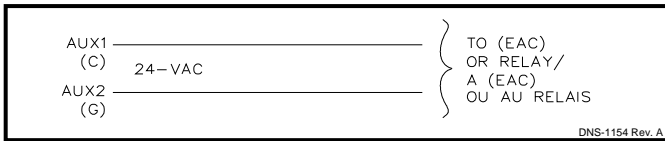
Figure 11 : Thermostat connections



2.7.2. Electronic Air Cleaner (EAC) connections

Fan Control Board terminals AUX1 (directly connected internally to C on terminal block) and AUX2 (directly connected internally to G on terminal block) are provided for direct connections to the low-voltage control of an electronic air cleaner. These terminals are energized with 24 VAC when G thermostat signal is present (refer to Figure 12).

Figure 12 : Electronic air cleaner connections



2.7.3. Dehumidify capability with standard humidistat connection

Latent capacities for systems using this unit are better than average systems. If increased latent capacity is an application requirement, the field wiring terminal block provides a connection terminal (DH) for use of a standard humidistat. The furnace control will detect the humidistat contact opening on increasing humidity and reduce its airflow to approximately 80% of nominal cooling mode airflow. This reduction will increase the system latent capacity until the humidity falls to a level which causes the humidistat contact to close its contacts.

2.7.4. Use of a heat pump

When using a heat pump, a thermostat with dial fuel option or a fossil fuel kit is required that prevents the operation of the electric elements and the heat pump at the same time. Refer to the instructions provided with the thermostat or the "Fossil Fuel" kit for the proper wiring of the furnace and the heat pump.

The simultaneous operation of the electric elements and the heat pump will cause overheating of either unit. The safety controls of the appliances will shut down the elements or heat pump, since they are not designed to function in this fashion.

3.0 OPERATION

3.1 START-UP

Before starting up the unit, be sure to check that the following items are in compliance:

1. The electrical installation and ventilation;
2. The blower access door is in place and the blower rail locking screws are well tightened;
3. The blower speed adjustments for heating and air conditioning are appropriate and according to the specifications in this manual;
4. The thermostat of the room is in the heating mode and is set higher than the ambient temperature.

To start the unit, turn the main electrical switch on.

3.2 USE OF MANUAL FURNACE CONTROLS

When there is a demand for heat, the pilot light ("L-1") comes on. Refer to the wiring diagram.

When the "HI/LO" switch is put into the "LO" position, it will shut down approximately half the elements.

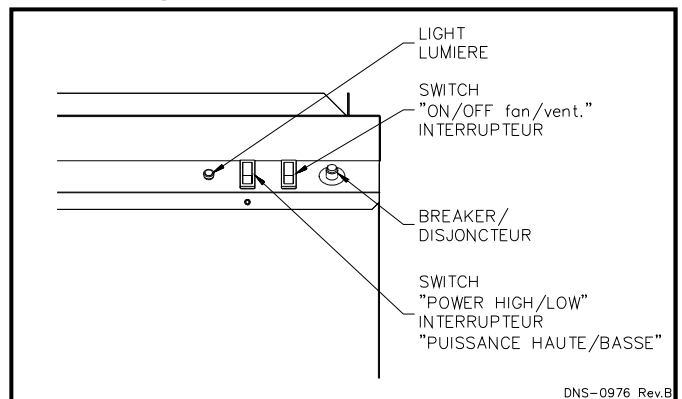
However, it is important to put the switch back to the "HI" position during the winter months to ensure adequate heating.

Also, this switch must remain in the "HI" position when a 2-stage or outdoor thermostat is used to control the electric elements of the second stage. Refer to the diagram in Section 2.5) above (Typical 24 VAC Wiring, Thermostat).

The "ON/OFF VENT/FAN" switch engages the blower in the continuous speed mode. This will filter the air and provide for better air distribution in the building.

The circuit breaker is there to protect the motor and control circuit conductors. If the unit does not function, press the circuit breaker button to see if it may have disengaged due to a power surge. If the breaker has to be pressed again, the unit must be checked by a qualified service technician.

Figure 13 : Manual Furnace Controls



3.3 OPERATING SEQUENCE

This unit is designed to provide the required airflow in order to match with any of four (4) different electronic heat capacity, air conditioner or heat pump outdoor unit sizes (see Tables 3 and 4 for CFM values).

Also, the blower motor is a true variable speed motor designed to deliver constant CFM. Constant CFM is valid for systems with total external static pressure between 0.1 and 0.7 inches water column.

Refer also to Table 1 for sequence of operation summary, depending on thermostat inputs and types.

3.3.1. Continuous fan

- Thermostat closes circuit R to G.
- Blower runs at continuous fan airflow.

3.3.2. Cooling mode – single stage

- If indoor temperature is above temperature set point and humidity is below humidity set point, thermostat closes circuits R to G, R to Y/Y2 and R to O.

NOTE: For single stage systems, do not use the Y1 terminal.

- Furnace delivers single stage cooling airflow.

3.3.3. Cooling mode – two stage

- First stage (low) cooling: Thermostat closes circuits R to G, R to O, and R to Y1.
- Furnace delivers low stage cooling airflow.
- Second stage (high) cooling: Thermostat closes circuits R to G, R to O, R to Y1 and R to Y/Y2.
- Furnace delivers high stage cooling airflow.

3.3.4. Cooling mode – dehumidification

NOTE: Remove jumper « J1 » on board to activate this function. (Refer to Figures 9 and 15)

- If indoor temperature is above temperature set point and humidity is above humidity set point, thermostat closes circuits R to G, R to Y/Y2 and R to O and humidistat opens circuit R to DH.
- The furnace delivers airflow which is approximately 80% of the nominal cooling airflow to increase the latent capacity of the system.

3.3.5. Electric heat heating mode – 1 stage

- Thermostat closes circuit R to W1 or W2.
- Furnace delivers the selected electric heat airflow and maximum heating capacity is powered within a maximum delay of 8 seconds.

3.3.6. Electric heat heating mode – 2 stage

NOTE: Remove jumper « J2 » on board to activate this function. (Refer to Figures 9 and 15)

- First stage heating: thermostat closes circuit R to W1.
- Furnace delivers low stage heating airflow (50% of nominal electric heating airflow) and approximately half of the heating capacity is powered in a 5 seconds delay.
- Second stage heating: thermostat closes circuit R to W2.
- Furnace delivers high stage heating airflow (100% of nominal electric heating airflow) and maximum heating capacity is powered within a maximum delay of 8 seconds.

3.3.7. Heat pump heating mode – single stage

- Thermostat closes circuits R to G and R to Y/Y2.

NOTE: For single stage systems, do not use the Y1 terminal.

- Furnace delivers single stage heat pump heating airflow.

3.3.8. Heat pump heating mode – two stage

- First stage (low) heating: Thermostat closes circuits R to G and R to Y1.
- Furnace delivers low stage heating airflow.
- Second stage (high) heating: Thermostat closes R to G, R to Y1 and R to Y/Y2.
- Furnace delivers high stage heating airflow.



WARNING

ELECTRICAL SHOCK or UNIT DAMAGE HAZARD

Failure to carefully read and follow this WARNING could result in equipment malfunction, property damage, personal injury and/or death.

Disconnect power to unit before removing or replacing connectors or servicing motor. Wait at least five (5) minutes after disconnecting power before handling.

3.4 AIRFLOW VERIFICATION

Verify the airflow by taking readings of the following points, while the elements are in the heating mode:

- Total amperage of all the heating elements;
- Voltage at the furnace;
- Supply air temperature. The point of the reading must not be affected by radiant heat from the elements;
- Return air temperature.

From these readings, one can arrive at an approximate calculation of the average airflow. To do that, the following formula should be used:

$$\text{Liter/s} = \frac{0.82 \times \text{amps.} \times \text{volts}}{\text{Diff. temperature } ^\circ\text{C}}$$

$$\text{CFM} = \frac{3.1 \times \text{amps.} \times \text{volts}}{\text{Diff. temperature } ^\circ\text{F}}$$

3.4.1. Supply Air Temperature Rise Test

1. Operate the unit at maximum power for at least 10 minutes;
2. Measure the air temperature in the return air plenum;
3. Measuring the air temperature in the largest trunk coming off the supply air plenum, just outside the range of radiant heat from the heat exchanger. 0.3 m (12") from the plenum of the main take-off is usually sufficient;
4. The temperature rise is calculated by subtracting the return air temperature from the supply air temperature.

If the temperature rise exceeds the temperature specified ($\pm 5^\circ\text{F}$) in Table 2, move the "AC/HP CFM ADJUST" black wire to high (HI) position. If the excessive temperature rise cannot be reduced by increasing fan speed, investigate for ductwork obstructions or dirty and improper air filter.



CAUTION

It is important to check the airflow and to ascertain that the unit does not operate above the temperatures specified in the Technical Specifications (Table 2). This is particularly important if a cooling coil or a heat pump has been installed in the ducts.

Hi-Limit thermal protectors should never need to engage during the normal functioning of the appliance. They are strictly designed to engage during the improper functioning of the blower or when the filter was improperly maintained.

3.4.2. High limit verification

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 electric heaters must deactivate themselves one by one before the warm air temperature exceeds 200°F

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

4.0 MAINTENANCE

Preventive maintenance is the best way to avoid unnecessary expense and inconvenience. Have your heating system inspected by a qualified service technician at regular intervals. Do not attempt to repair the furnace or its controls. Call a qualified service technician.

5.0 FURNACE INFORMATION

Model: _____ Serial number: _____

Furnace installation date: _____

Service telephone # - Day: _____ Night: _____

Dealer name and address: _____

START-UP RESULTS

Voltage: _____

Total current consumed by the elements: _____

Supply air temperature: _____

Return air temperature: _____

Supply air duct static pressure: _____

Return air duct static pressure: _____

Total pressure: _____

Calculated air flow: _____

Current consumed by the blower motor: _____

Current consumed by the accessories: _____



WARNING

Electrical shock hazard.

Turn OFF power to the furnace before any disassembly or servicing.

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

Before calling for repair service, check the following points:

1. Check fuses or the circuit breaker;
2. Check if the 15 A circuit breaker on the furnace is disengaged;
3. Check the 5A fuse on the control board;
4. Set the thermostat higher than room temperature. If the unit does not start up, cut the power and call a qualified service technician.

When calling for service or ordering a replacement part, specify the model and serial number of your appliance.

4.1 AIR FILTER

The filter supplied with the unit is the disposable type and should be replaced twice a year. The presence of animal hair, dust, etc. may necessitate more frequent changes. Dirty filters have an adverse effect on the performance of the central heating system.

4.2 MOTOR LUBRICATION

Do not lubricate the blower motor, since it is permanently lubricated.

Table 1 : Sequence of operation

Mode	Thermostat to Control Board 24 VAC	Control State	Control Function
Electric Heat only			
Continuous Fan (Fan switch ON)	G	ON	Fan ON at the selected continuous fan CFM
		OFF	Fan OFF
Thermostat calls for 1st stage Heat	W1 ?	ON	Fan ON at selected 1st stage Heat CFM, 1st stage of Heat ON**
		OFF	1st stage of Heat OFF, Fan OFF
Thermostat calls for 2nd stage Heat	W1 & W2 ?	ON	Fan ON at selected 2nd stage Heat CFM, 1st stage & 2nd stage of Heat ON**
		OFF	1st stage & 2nd stage of Heat OFF, Fan OFF
Cooling 1 stage, with Electric Heat			
Continuous Fan (Fan switch ON)	G	ON	Fan ON at the selected continuous fan CFM
		OFF	Fan OFF
Thermostat calls for 1st stage Heat	W1 ?	ON	Fan ON at selected 1st stage Heat CFM, 1st stage of Heat ON**
		OFF	1st stage of Heat OFF, Fan OFF
Thermostat calls for 2nd stage Heat	W1 & W2 ?	ON	Fan ON at selected 2nd stage Heat CFM, 1st stage & 2nd stage of Heat ON**
		OFF	1st stage & 2nd stage of Heat OFF, Fan OFF
Thermostat calls for Cooling	Y/Y2 & G	ON	Compressor ON, Fan ON at selected Cooling CFM and delays
		OFF	Compressor OFF, Fan OFF after selected cooling delays
Thermostat calls for Cooling & Dehumidification	Y/Y2 & G & (DH)*	ON	Compressor ON, Fan ON at selected Cooling CFM -20% and delays
		OFF	Compressor OFF, Fan OFF after selected cooling delays
Cooling 2 stages, with Electric Heat			
Continuous Fan (Fan switch ON)	G	ON	Fan ON at the selected continuous fan CFM
		OFF	Fan OFF
Thermostat calls for 1st stage Heat	W1 ?	ON	Fan ON at selected 1st stage Heat CFM, 1st stage of Heat ON**
		OFF	1st stage of Heat OFF, Fan OFF
Thermostat calls for 2nd stage Heat	W1 & W2 ?	ON	Fan ON at selected 2nd stage Heat CFM, 1st stage & 2nd stage of Heat ON**
		OFF	1st stage & 2nd stage of Heat OFF, Fan OFF
Thermostat calls for 1st stage Cooling	Y1 & G	ON	Compressor ON, Fan ON at selected 1st stage Cooling CFM and delays
		OFF	Compressor OFF, Fan OFF after selected cooling delays
Thermostat calls for 2nd stage Cooling	Y/Y2 & Y1 & G	ON	Compressor ON, Fan ON at selected Cooling CFM and delays
		OFF	Compressor OFF, Fan OFF after selected cooling delays
Thermostat calls for 2nd stage Cooling & Dehumidification	Y/Y2 & Y1 & G & (DH)*	ON	Compressor ON, Fan ON at selected Cooling CFM -20% and delays
		OFF	Compressor OFF, Fan OFF after selected cooling delays
Heat pump 1 stage, with Electric Heat			
Continuous Fan (Fan switch ON)	G	ON	Fan ON at the selected continuous fan CFM
		OFF	Fan OFF
Thermostat calls for Cooling	Y/Y2 & G & O	ON	Compressor ON, Fan ON at selected Cooling CFM and delays
		OFF	Compressor OFF, Fan OFF after selected Cooling delays
Thermostat calls for Cooling & Dehumidification	Y/Y2 & G & O & (DH)*	ON	Compressor ON, Fan ON at selected Cooling CFM -20% and delays
		OFF	Compressor OFF, Fan OFF after selected cooling delays
Thermostat calls for 1st stage Heat (Heat pump heating mode)	Y/Y2 & G	ON	Compressor ON, Fan ON at selected Heat Pump CFM and delays
		OFF	Compressor OFF, Fan OFF after selected Heat Pump delays
Thermostat calls for 2nd stage Heat (Electric heat) ?	W1 & W2 ?	ON	Fan ON at selected 2nd stage Heat CFM, 1st stage & 2nd stage of Heat ON**
		OFF	1st stage & 2nd stage of Heat OFF, Fan OFF
Heat pump 2 stage, with Electric Heat			
Continuous fan (Fan switch ON)	G	ON	Fan ON at the selected continuous fan CFM
		OFF	Fan OFF
Thermostat calls for 1st stage Cooling	Y1 & G & O	ON	Compressor ON, Fan ON at selected 1st stage Cooling CFM and delays
		OFF	Compressor OFF, Fan OFF after selected cooling delays
Thermostat calls for 2nd stage Cooling	Y/Y2 & Y1 & G & O	ON	Compressor ON, Fan ON at selected Cooling CFM and delays
		OFF	Compressor OFF, Fan OFF after selected cooling delays
Thermostat calls for 2nd stage Cooling & Dehumidification	Y/Y2 & Y1 & G & (DH)*	ON	Compressor ON, Fan ON at selected Cooling CFM -20% and delays
		OFF	Compressor OFF, Fan OFF after selected cooling delays
Thermostat calls for 1st stage Heat (Heat pump heating mode)	Y1 & G	ON	Compressor ON, Fan ON at selected Heat Pump CFM and delays
		OFF	Compressor OFF, Fan OFF after selected Heat Pump delays
Thermostat calls for 2nd stage Heat (Heat pump heating mode)	Y1 & Y/Y2 & G	ON	Compressor ON, Fan ON at selected Heat Pump CFM and delays
		OFF	Compressor OFF, Fan OFF after selected Heat Pump delays
Thermostat calls for 3rd stage Heat (Electric Heat) ?	W1 & W2	ON	Fan ON at selected 2nd stage Heat CFM, 1st stage & 2nd stage of Heat ON**
		OFF	1st stage & 2nd stage of Heat OFF, Fan OFF

* The 24 VAC is removed from DH when there is a call for dehumidification.

** Electric heat elements are controlled by relays with a delay sequence from Rectifier timer board on the relays.

△ The thermostat must provide Dual Fuel option or a Fossil Fuel kit must be used (electric heat elements & Heat pump must not run at the same time).

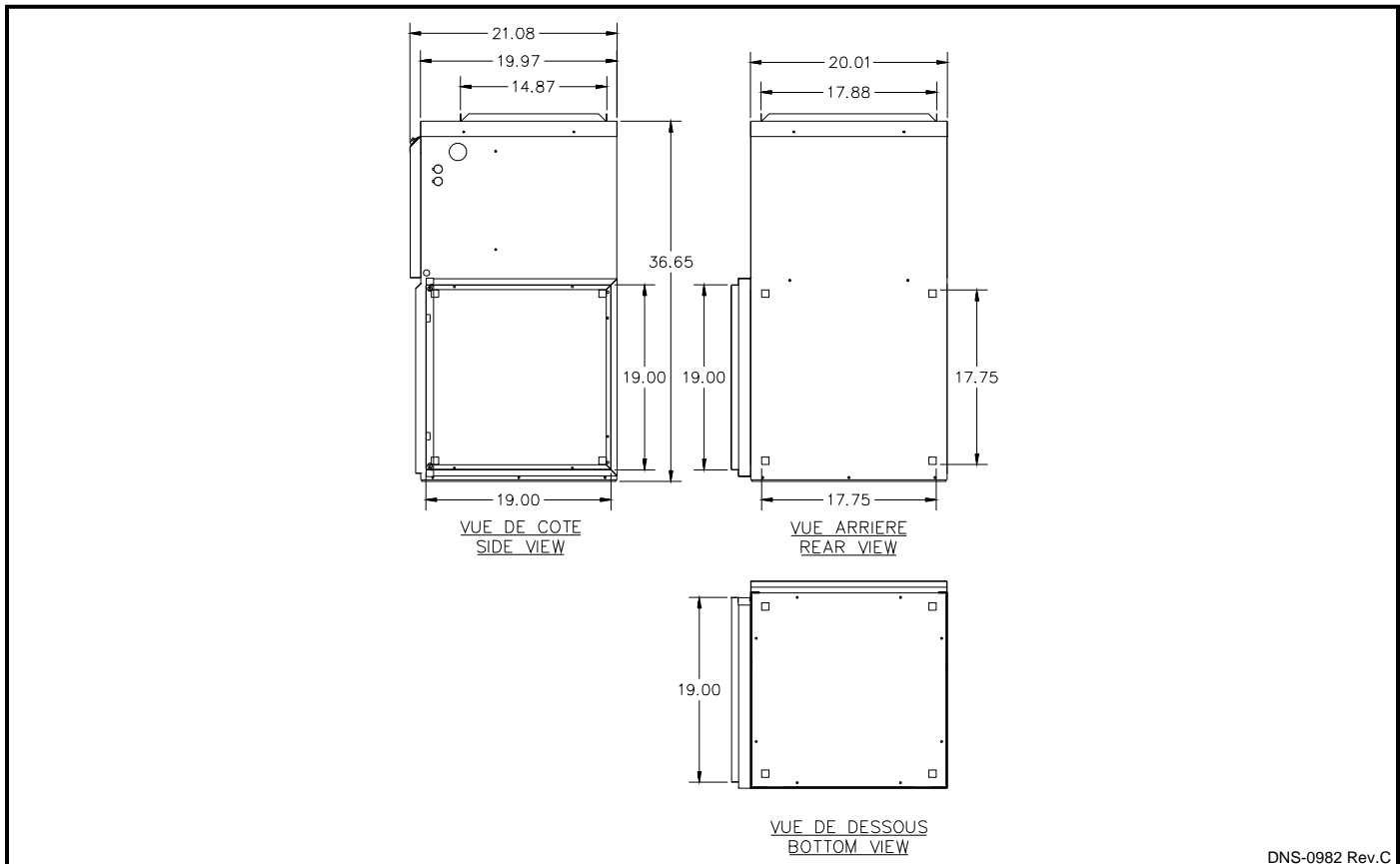
▼ Jumper J2 on the electric board provides connection between W1 & W2. Remove it for 2 stage Electric Heat using a 2 stages thermostat.

Table 2 : Technical Specifications

SPECIFICATIONS, FEM ELECTRIC FURNACE WITH ECM MOTOR							
RATINGS AND PERFORMANCE	FEMxx-E230V1M-A				FEMxx-E230V2M-A		
Power second stage (Kw)	15	18	20	23	20	23	27
Power first stage (Kw)	10	9	10	13	10	13	17
Net capacity second stage (BTU/h)	51180	61420	68240	78480	68240	78480	92130
Heating temperature rise, second stage heating (F) ¹	58	62	62	62	65	62	60
Heating temperature rise, first stage heating (F) ¹	78	62	62	70	65	70	75
ELECTRICAL SYSTEM							
Volts - Hertz - Phase	2 wires 240 - 60 - 1						
Electrical element #1 (Kw)	5	4	5	4	5	4	4
Electrical element #2 (Kw)	5	5	5	5	5	5	5
Electrical element #3 (Kw)	5	4	5	4	5	4	4
Electrical element #4 (Kw)		5	5	5	5	5	4
Electrical element #5 (Kw)				5		5	5
Electrical element #6 (Kw)							5
Blower motor Consumption (Amp)	4,3	4,3	4,3	4,3	9,1	9,1	9,1
Heating Elements Consumption (Amp)	61	74	82	94	82	94	111
Total Consumption (Amp)	65,3	78,3	86,3	98,3	91,1	103,1	120,1
Circuit amperage (wire sizing) ²	82	98	108	124	114	130	150
Maximum size circuit breaker (Amp) ²	90	100	110	125	125	150	150
BLOWER DATA							
Motor (HP) / Type	1/2 HP / ECM 2.3				1 HP / ECM 2.3		
Blower size	G10-8 or 100-8R				GT12-10 or 120-10T		
GENERAL INFORMATION							
Overall dimensions (width x depth x height)	20" x 20" x 36.5"						
Supply	15" x 18"						
Return	19" x 19"						
Filter quantity and size	(1) 20" x 20"						
Shipping weight	48 Kg / 105 lbs						
Maximum cooling capacity	3 tons				5 tons		

- 1) Can be increased or decreased by +10% or -10% using "CFM adjust" option on the control board.
- 2) Calculated on the basis of Norm C22.2 No.236.

Figure 14 : Furnace dimensions



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Table 3 : Electric furnace FEM, ECM ½ HP motor, air flow tables

COOLING OR HEAT PUMP HEATING MODE (WITH HP-EFF SELECTED ?)				
AC / HP SIZE Adjustment BLUE wire position	A/C size (TONS)	CFM ? AC/HP CFM ADJUST (NOM) position	CFM ? AC/HP CFM ADJUST (LO) position	CFM ? AC/HP CFM ADJUST (HI) position
36	3,0	1200	1080	1320
30	2,5	1000	900	1100
24	2,0	800	720	880
18	1,5	600	540	660

? In Cooling - Dehumidification mode (with Jumper **J1** remove), with no 24 VAC input to DH, the CFMs are reduced by 15%.
 ? The CFMs shown are reduced by 20% if there is 24 VAC input to Y1 only (Y/Y2 not powered)
 ? SYSTEM TYPE select to HP-EFF corresponds to 400 CFM/TONS - HP-COMFORT corresponds to 350 CFM/TONS

CONTINUOUS FAN				
CONTINUOUS FAN YELLOW wire position	A/C size (TONS)	CFM ? CONTINUOUS FAN (LO) position	CFM ? CONTINUOUS FAN (MED) position	CFM ? CONTINUOUS FAN (HI) position
36	3,0	600	960	1200
30	2,5	500	800	1000
24	2,0	400	640	800
18	1,5	300	480	600

? CFMs when AC/HP CFM ADJUST at NOM position. CFMs 10% lower or higher if AC/HP CFM ADJUST at LO or HI position.

ELECTRIC HEATING MODE			
24 VAC (R) input on W 1 and/or W 2 only			
HEAT KW /CFM adjustment RED wire position	POWER (Kw)	CFM First stage 24 VAC on W 1 *	CFM Second stage 24 VAC on W 1 and/or W 2 *
20	20	500	1000
18	18	450	900
15	15	400	800

* Remove the Jumper **J2** when a 2 stages thermostat is used

ON & OFF DELAY FOR COOLING AND HEAT PUMP HEATING MODE		
ON / OFF DELAY Adjustment WHITE wire position	ON-Delay Time	OFF-Delay % CFM - Time
0 / 90	0 sec.	100% - 90 sec.
30 / 90	30 sec.	100% - 90 sec.
0 / 0	0 sec.	0 sec.
ENH	30 sec.	70 % - 150 sec.

DELAY PROFILE FOR ELECTRIC HEATING MODE		
No adjustment required	ON-Delay CFM Level - Time	OFF-Delay % CFM - Time
-	0 sec.	50% - 60 sec.

Table 4 : Electric furnace FEM, ECM 1.0 HP motor, air flow tables

COOLING OR HEAT PUMP HEATING MODE (WITH HP-EFF SELECTED ?)				
AC / HP SIZE Adjustment BLUE wire position	A/C size (TONS)	CFM ? AC/HP CFM ADJUST (NOM) position	CFM ? AC/HP CFM ADJUST (LO) position	CFM ? AC/HP CFM ADJUST (HI) position
60	5,0	2000	1800	2200
48	4,0	1600	1440	1760
42	3,5	1400	1260	1540
36	3,0	1200	1080	1320

? In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.
 ? The CFMs shown are reduced by 20% if there is 24 VAC input to Y1 only
 ? SYSTEM TYPE select to HP-EFF corresponds to 400 CFM/TONS - HP-COMFORT corresponds to 350 CFM/TONS

CONTINUOUS FAN				
CONTINUOUS FAN YELLOW wire position	A/C size (TONS)	CFM ? CONTINUOUS FAN (LO) position	CFM ? CONTINUOUS FAN (MED) position	CFM ? CONTINUOUS FAN (HI) position
60	5,0	1000	1600	2000
48	4,0	800	1280	1600
42	3,5	700	1120	1400
36	3,0	600	960	1200

? CFMs when AC/HP CFM ADJUST at NOM position. CFMs 10% lower or higher if AC/HP CFM ADJUST at LO or HI position.

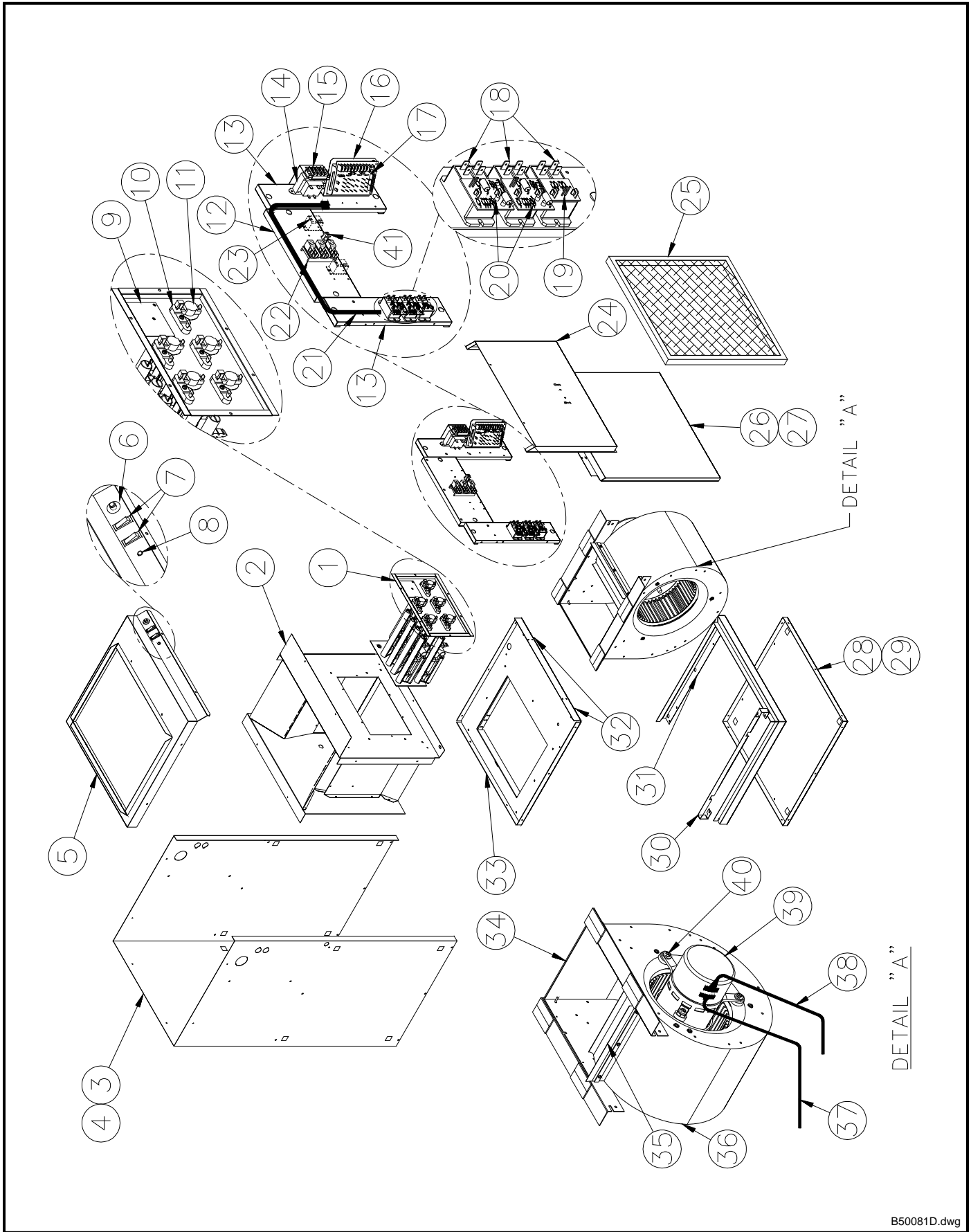
ELECTRIC HEATING MODE			
HEAT KW /CFM adjustment RED wire position	POWER (Kw)	CFM First stage 24 VAC on W 1*	CFM Second stage 24 VAC on W 1 and/or W 2*
27	27	700	1400
23	23	575	1150
20	20	475	950
18	18	400	800

* Remove the Jumper J2 when a 2 stages thermostat is used

ON & OFF DELAY FOR COOLING AND HEAT PUMP HEATING MODE		
ON / OFF DELAY Adjustment WHITE wire position	ON-Delay Time	OFF-Delay % CFM - Time
0 / 90	0 sec.	100% - 90 sec.
30 / 90	30 sec.	100% - 90 sec.
0 / 0	0 sec.	0 sec.
ENH	30 sec.	70 % - 150 sec.

DELAY PROFILE FOR ELECTRIC HEATING MODE		
No adjustment required	ON-Delay CFM Level - Time	OFF-Delay % CFM - Time
-	0 sec.	50% - 60 sec.

Figure 16 : PARTS LIST, Supreme with ECM : FEMxx-E230V1M-A or FEMxx-E230V2M-A



DETAIL "A"

Table 5 : PARTS LIST, Supreme with ECM : FEMxx-E230V1M-A or FEMxx-E230V2M-A

ITEM	PART #	DESCRIPTION	COMMENTS
1A	B03275-01	HEATING ELEMENT ASSEMBLY FEM-15KW (1/2 HP ECM)	Items 10 and 11 included
1B	B03276-01	HEATING ELEMENT ASSEMBLY FEM-18KW (1/2 HP ECM)	Items 10 and 11 included
1C	B03276-02	HEATING ELEMENT ASSEMBLY FEM-20KW (1/2 - 1 HP ECM)	Items 10 and 11 included
1D	B03277-01	HEATING ELEMENT ASSEMBLY FEM-23KW (1/2 HP ECM)	Items 10 and 11 included
1E	B03314-01	HEATING ELEMENT ASSEMBLY FEM-23kW (1 HP ECM)	Items 10 and 11 included
1F	B03530-01	HEATING ELEMENT ASSEMBLY FEM-27kW (1 HP ECM)	Items 10 and 11 included
2	B03313	FRONT DIVIDER ASSEMBLY (1/2 - 1 HP ECM)	
3	B03260	CASING ASSEMBLY	Panel and insulation included
4	B03302	CASING INSULATION	
5	B03263	TOP PANEL ASSEMBLY	Items 6, 7, 8 and label included
6	L01J001	CIRCUIT BREAKER 15A	
7	L07F015	ROCKER SWITCH SPDT	
8	L01L006	PILOT LIGHT 24 VAC	
9	B03286	HEATING ELEMENT COVER	
10A	L99H008	HEATING ELEMENT 5KW	
10B	L99H009	HEATING ELEMENT 4KW	
11A	R02N015	THERMODISK L150-55F	
11B	R02N019	THERMODISK L140-55F	
12	B03288	MOUNTING PLATE FOR ELECTRICAL, TOP	
13	B03528	MOUNTING PLATE FOR ELECTRICAL, SIDE	2 per unit
14	L01F010	TRANSFORMER 240-24Volts	
15	L05F004	TERMINAL STRIP, 4-POSITIONS, 120 VAC	
16	B03529	MOUNTING PLATE FOR CONTROL BOARD	
17A	B03531-01	ELECTRONIC BOARD ASSEMBLY (1/2 HP MOTOR)	15, 18, 20 et 23 KW
17B	B03531-02	ELECTRONIC BOARD ASSEMBLY (1 HP MOTOR)	18, 20, 23 et 27 KW
18	L01H030	RELAY DPST 22VDC	
19	R99G006	RECTIFIER CONTROL 22VDC	
20	R99G007	RECTIFIER/TIMER CONTROL (5 AND 8 SECONDS)	
21	B03533	ELECTRICAL KIT FOR RELAYS	
22	L99F001	TERMINAL BLOCK, 3 POLES	
23A	L01H009	RELAY SPDT 24 VAC	Option for HUM or EAC
23B	L01H011	RELAY SPDT 120 VAC	Option for HUM or EAC
24	B03280	DOOR, ELECTRICAL COMPARTMENT	
25	Z04F004	PAPER FILTER 20 x 20 x 1	
26	B03257-01	DOOR, BLOWER COMPARTMENT	Insulation and label included
27	B02293-22	INSULATION	
28	B03258	FLOOR ASSEMBLY	Insulation included
29	B02293-21	INSULATION	
30	B03299	FILTER RACK ACCESS	
31	B03298	FILTER RACK U-FRAME	
32	B30513	BLOWER RAIL	2 per unit
33	B03264	DIVIDER	Item 32 and label included
34A	B03301-02	REPLACEMENT BLOWER ASSEMBLY (1/2 HP ECM)	Motor included
34B	B03318-02	REPLACEMENT BLOWER ASSEMBLY (1 HP ECM)	Motor included
35A	B01291-04	SEAL STRIP 1 1/2" x 10 1/8"	
35B	B01291-01	SEAL STRIP 1 1/2" x 13 1/8"	
36A	B03720-02	BLOWER 100-8R (1/2 HP ECM)	Housing and wheel included
36B	B03720-05	BLOWER 120-10T (1,0 HP ECM)	Housing and wheel included
37	B03519	BLOWER ELECTRICAL KIT	
38	B03520	BLOWER ELECTRONIC KIT	
39A	L06H011	MOTOR 1/2HP ECM	
39B	L06K006	MOTOR 1HP ECM	
40A	B01888	BELLY BAND KIT (1/2 HP ECM)	
40B	B01889	BELLY BAND KIT (1.0 HP ECM)	
41	L99G005	GROUND TERMINAL LUG (CU-AL)	