

# WarmFlo<sup>®</sup> Electric Furnace

## Installation & Operating Instructions

### HE-A-\*\*-21 Series

All HE-A-\*\*-21 Electric Furnaces must use one of two chip codes based on applications

- An AHS chip code: forced air space heating applications
- WFMU chip code: make-up air applications.

If you have a chip code other than AHS or WFMU, please call factory for assistance.

#### Application

##### Forced Air Space Heating:

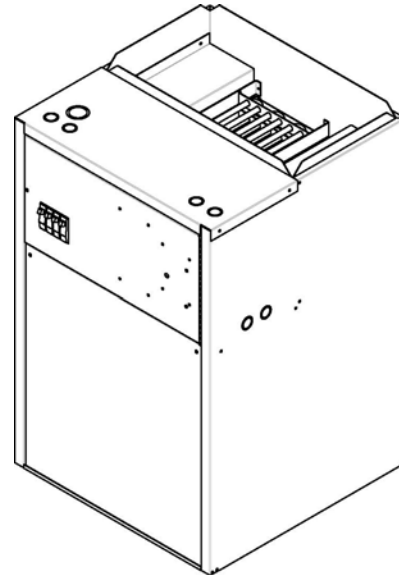
This model series is outlet warm air sensing only for non-heat pump applications. With a preset warm air temperature, the electric elements modulate to maintain this preset temperature based on the sensing of the supply sensor (ST). The CFM requirement will always have to be setup for full electric capacity.

Heat/cool conventional room thermostat applies

##### Make-Up Air Heating:

Fresh air code requirements and/or appliances which could create unhealthy negative pressure within the building.

- Building usage, people loading
- Air environment within building
- Fireplace
- Larger kitchen vent hoods
- Appliances, without sealed combustion
- Single vent gas furnace or water heater
- Forced exhaust systems - restrooms, bathrooms, kitchens, etc.



DO NOT DESTROY THIS MANUAL. PLEASE READ CAREFULLY AND KEEP IN A SAFE PLACE FOR FUTURE REFERENCE BY A SERVICE TECHNICIAN.

Drawings: NH806, NH807, NH819, NS802, EC001, XX017

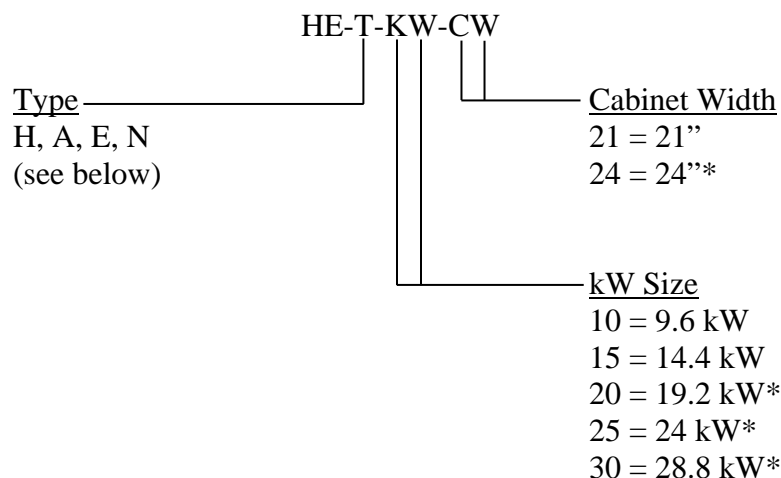


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# Table of Contents

Configurator	1
Inlet Cabinets	2
General Comments	3
Application	4
Installation Requirements	6
Mechanical Installation	7
Electrical Installation	9
Setup or Programming	11
Operation Indicators	12
Handheld Analyzer/Laptop Software	13
Troubleshooting	13
Replacement Parts	15
Drawings Included:	NH806 NH807 NS802 EC001 XX017

## Configurator



## Type

**All models** – ECM™ blower motor, setup selection of four cooling sizes, 50% continuous air (fan – on setting). High efficient air circulation at about 50-watt.

**H** = Full WarmFlo capability with outdoor sensor. This provides warm air outlet temperature dial selection and supply air ramp up with the decrease of outdoor temperature. This WarmFlo feature definitely applies to heat pumps, but it is also the top of the line comfort for straight electric, with air conditioning. The warm air dial suggested setting is 96° or 100° and the front dial selects the rate of ramp up or temperature increase based upon outdoor. The “C” setting will provide 114° warm air at 0° or 125° at -20° F outside. The ECM™ blower also ramps up in speed as there is an increase in supply temperature or decrease in outdoor temperature. Depending upon setup selection, the moderate heating blower speed could be as low as 60% of full capacity and full capacity blower is only used below 30° outdoor.

- Heat/cool conventional thermostat must be used in non-heat pump applications
- Basic heat pump room thermostat must be used in all heat pump applications.

**A** = WarmFlo element modulation based upon a warm air set point and duct sensor. Heating blower speed is installation setup per kW size. A higher CFM selection can be made if there is a desire to “work” WarmFlo harder.

Heat/cool conventional thermostat applies.

**E** = Non-WarmFlo, 10, 15, or 20 kW built-in strip heat, direct function of roomstat W. Setup selection determines nominal ECM™ motor speed. A thermostat “E” type function could be used to jump to full speed.

**N** = Cabinet only, no electric elements or WarmFlo. This could typically be associated with an inlet hydronics water coil. Control board includes a relay for pump, initiated with input W. Setup selection determines heating blower speed. Cooling speeds and air conditioning interface are the same as mentioned above.

**Note:** Two-speed and multi-function room thermostat can also be configured with this system by adding WF-HP2 interface controller.

## Inlet Cabinets

Factory optional cabinets can be configured with this Electric Furnace. Typically these are designed for upflow applications; however, the heat pump coil cabinet could be used in other positions.

### **Side Entry, Filter Cabinet**

Return air can be ducted into either side, 15 $\frac{3}{8}$ " x 19" cutout hole is provided with one filler plate. Easy access door for checking and changing filter.

Adjustable rails are provided for standard 4" x 20" x 20" pleated filter.

Filter examples include Honeywell 203721, BestAir HW2020, or Grainger® 6B936.

Standard 1" filter (20" x 20") – field installer could arrive at filter filler bracket for slip-in within the provided rails.



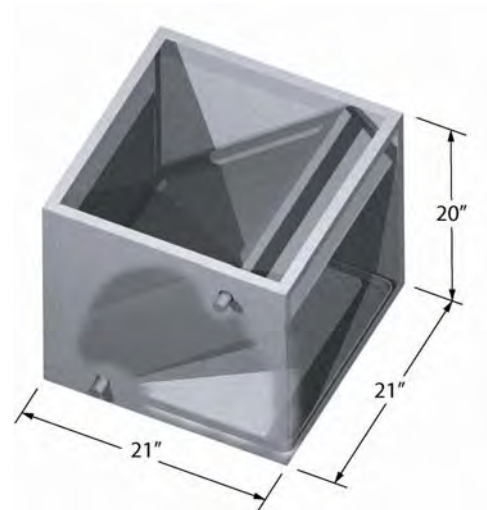
**Comment** – The 3M MERV filter airflow resistance needs to be considered in duct design calculations. Per specification information from 3M the static pressure drop across the 1", Series 1000, MERV 11 filter is 0.2" SP.

### **Hydronics Coil and Cabinet**

The inlet cabinet includes a water coil with parameters shown. The return air connection must be on a side which allows coil draw-through. The cabinet can be reversed for either left or right side entry. The inlet for this cabinet is sized for an externally installed packaged return air filter cabinet – typical 20" x 20" size.

1. Nominal or rated Btu/h, 50,000
2. Recommended CFM setup, 1100 min.
3. Inlet water 120° at 10 GPM minimum.
4. Expected outlet air temperature, 115°

Reduced CFM and/or inlet water temperature will reduce Btu/h rating.



## **General Comments**

### **Upflow/Downflow/Horizontal**

The arrangement of refrigerant coil, hydronics coil, and built-in electric elements need to follow specific air direction or airflow rules, but the orientation of this Electric Furnace is not critical.

For upflow and horizontal standard **air conditioning** applications; the A-coil is mounted at the blower outlet with field provided plenum or AC manufacturer's case coil.

All models contain GE ECM™ Series 2.3 blower motors. The special Electro Industries interface board allows hookup for heat/cool conventional or basic heat pump room thermostat. Blower speed setup and WarmFlo sensor control are separate for cooling and heating (unique).

The ECM™ motor provided in this unit has many features not available in a standard motor.

- Improved efficiency
- Constant CFM
- Soft start and stop
- Better humidity control

The provided ECM™ motor contains permanently sealed bearings and does not require oiling.

### **Utility Load Control**

Provisions are included for the Utility Receiver to interrupt compressor and WarmFlo or strip heat. No provisions for dual heat, add EE-5046.

### **Zone Controller/Dampers**

When using models HE-A or HE-H Series there are no adverse electrical heat concerns associated with a zone damper system. However, there may be an effect on the heat pump compressor due to potential reduced airflow. The zone dampers themselves must be in the horizontal ducts after the WarmFlo duct sensor and at least 12" downstream of the WarmFlo sensor.

The zone controller "HVAC equipment" terminal block simply connects to this unit's control board as if it was a room thermostat to this unit. If the various zone sizes produce high static pressure and reduced airflow, the WarmFlo temperature sensing technology will reduce the electric elements automatically.

If the zone damper action has an adverse effect on the heat pump compressor, Electro has zone controller staging interface for 2-speed heat pump application (WF-HP2, etc.).

### **Side by Side, with Gas Furnace or Other Dual Heat Arrangements**

Add-on dual heat controller HP-5046 can simplify the wiring for dual heat.

For side by side ducting, a motor operated damper is required to isolate the return air between two blowers. The operation of this motor damper can be controlled from the HP-5046.

### **Installation Setup**

There are specific peg jumpers relating to cooling tons, heating kW, heat pump reversing valve logic, and thermostat type. These must be properly evaluated and selected to match **each** installation.

The "setup or programming" section has all the detailed instructions and selection tables.

The WarmFlo controller also has various dial switch selections relating to duct temperature set point, minimum warm air set point, HP compressor ODT shutoff temperature, and ramp up efficiency dial. These are standard WarmFlo technology and setup requirements, if you're not familiar with WarmFlo controller study the HD320 WarmFlo information document, also in this package.

**NOTICE:** When changing any setup jumpers, power down and up. ECM™ motor needs 240V power and control power removed to **reset** and reread specific control lines. Open CB number 1 for 10 seconds.

### **Operation Instructions**

The “Operation Indicators” section contains information relating to LED monitor lights, thermostat sequences, etc.

### **Installation Checkout**

Attached to this manual is a warranty certification and checkout procedure. This must be completed and returned for warranty coverage. This is the responsibility of the contractor or company which “sold the job” and is assuming responsibility to the end customer.

### **Warranty Statement**

See the last page of this manual for detailed limited warranty coverage explanation.

## **Application**

### **General**

The configurator, previous page, details several product types. Re-verify nameplate on your received unit to make sure it properly represents the product type you need for your installation/application.

The setup control board jumpers provide ECM™ blower motor speed flexibility to match the model and your heat/cool size requirements.

### **This specific model series, HE-A-\*\*-\*\***

This model series is outlet warm air sensing only. With a preset warm air temperature, the electric elements modulate to maintain this preset temperature based on the sensing of the supply sensor (ST). The CFM requirement will always have to be setup for full electric capacity.

### **Make-Up Air Applications**

Located on the WarmFlo board (logic controller) is a 40-pin microcontroller chip. On this chip is a white sticker which indicates chip version (V2.3\*) and chip code. This correct chip code for make-up air applications is **WFMU** which has a specific temperature range options for make-up air applications.

### **Backup or Assist Wood Heating**

This WarmFlo Electric Furnace is ideal for accompanying a wood heating system. The WarmFlo technology and sensors will determine the Btu/h heating requirement of the building. If the wood warm air is below the requirement, a small portion (or as required) of the electric elements will come on automatically supplementing the wood heat.

Using a wood boiler with the water coil inlet option is an ideal arrangement.

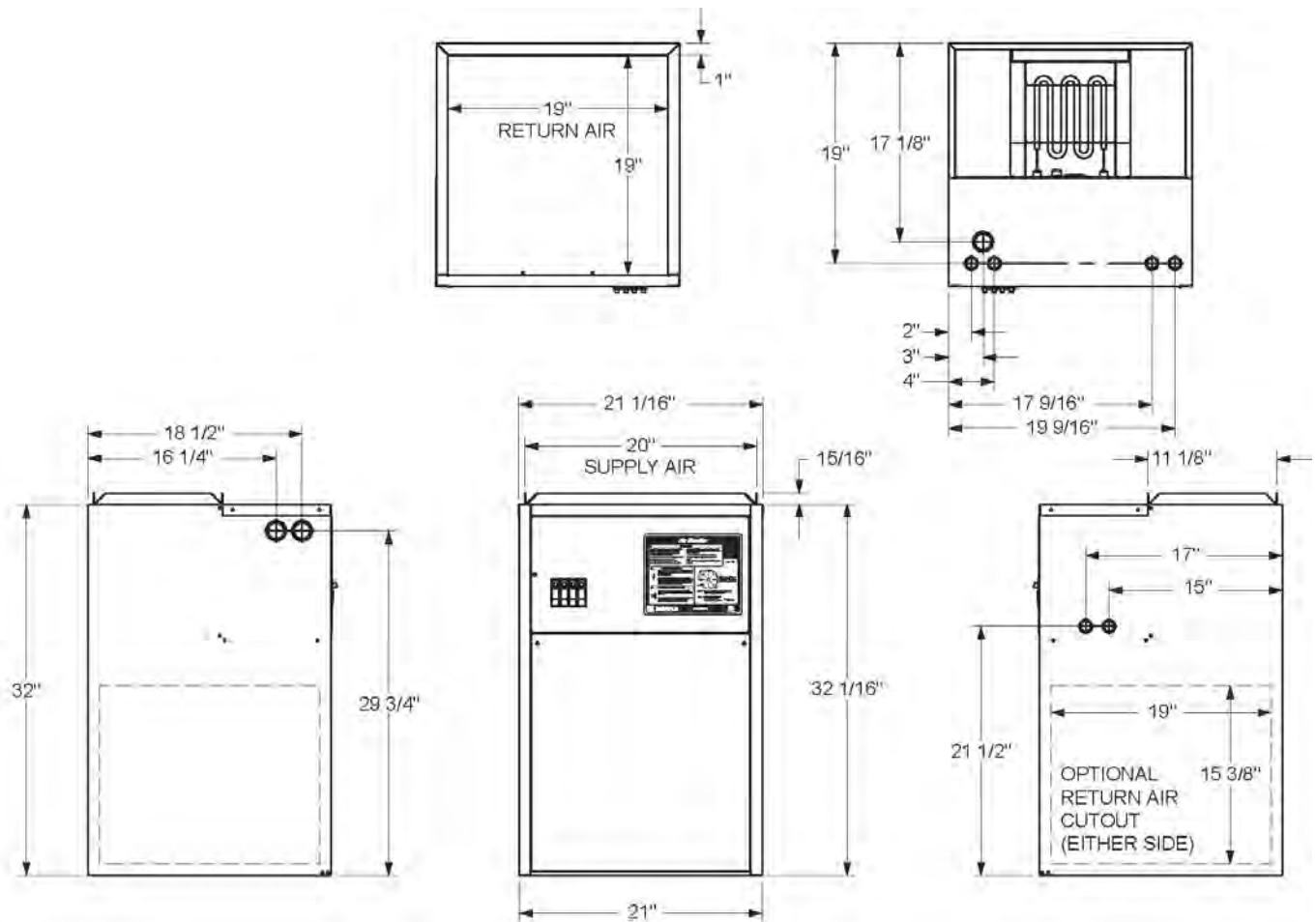
If using a forced wood system, caution must be used when allowing the wood warm air to enter through the ECM™ motor blower. The maximum temperature for the ECM™ motor is approximately 120° F.

## Specification Chart

Model Number	HE-A-10-21	HE-A-15-21	HE-A-20-21
Cabinet Width	21"	21"	21"
kW rating	10	15	20
Btu/h	34000	51000	68000
Voltage/Phase	240/1	240/1	240/1
Circuit Breaker	60	1-60, 1-30	2-60
Amps per CB	42	42, 21	42, 42
Source Feed	1	2	2
Elements	4	6	8
Relays	2	4	6
Heat CFM*	765 (LO)	900 (M)	1035 (HI)
Max. Temp. Rise	45° F	45° F	45° F
Shipping Weight			

\*WarmFlo sensing will override this to 1200 CFM.

## Product Dimensions



## **Installation Requirements**

1. All installation work must be performed by trained, qualified contractors or technicians. Electro Industries, Inc., sponsors installation and service schools to assist the installer. **Visit our web site at [electromn.com](http://electromn.com) for upcoming service schools.**

### **WARNING**

ALL ELECTRICAL WIRING MUST BE IN ACCORDANCE WITH NATIONAL ELECTRIC CODE AND LOCAL ELECTRIC CODES, ORDINANCES, AND REGULATIONS.

### **WARNING**

OBSERVE ELECTRIC POLARITY AND WIRING COLORS. FAILURE TO OBSERVE COULD CAUSE ELECTRIC SHOCK AND/OR DAMAGE TO THE EQUIPMENT.

### **CAUTION**

This unit can only be used for its intended design as described in this manual. Any internal wiring changes, modifications to the circuit board, modifications or bypass of any controls, or installation practices not according to the details of this manual will void the product warranty, the CSA/us certification label, and manufacturer product liability. Electro Industries, Inc., cannot be held responsible for field modifications, incorrect installations, and conditions which may bypass or compromise the built-in safety features and controls.

2. If this is a Dual Heat system, this product relates only to the addition to the furnace ducting system external to the gas or oil force air furnace. The owner/ installer assumes all responsibility and/or liability associated with any needed installation of the gas/oil furnace, fuel system, flue, chimney, etc. Any instructions or comments made within this manual (or factory phone assistance) relating to the gas/oil furnace are provided as comments of assistance and “helps” only.

### **CAUTION**

This unit shall not be operated (either heating section or blower) until the interior of the structure is completed and cleaned. This also means all duct work must be complete with filter, etc. Both manufacturers’ warranties are void if this unit is operated during structure construction.

### **CAUTION**

Hazards or unsafe practices could result in property damage, product damage, severe personal injury and/or death.

3. Remember, safety is the installer’s responsibility and the installer must know this product well enough to instruct the end user on its safe use.

Safety is a matter of common sense - - a matter of thinking before acting. Professional installers have training and experienced practices for handling electrical, sheet metal, and material handling processes. Use them.



## **Mechanical Installation**

### **Clearances and Accessibility**

Zero clearance is allowed on all sides for combustible materials. However, 36" should be allowed at the front for operation, maintenance, and service.

To reduce the risk of rusting and appearance, do not install the unit directly on the ground or on a floor that is likely to be wet. In such environments the unit must be elevated by use of a sturdy non-porous material.

### **General Ductwork and Airflow Requirement**

Design the airflow ductwork to meet the maximum operating airflow (CFM) for the kW **and** cooling ton requirements (whichever is larger). This document does not provide installation and design information for the ductwork external to this product. It is assumed this is being accomplished by a professional and trained installer understanding ductwork design, airflow/static pressure resistance, and forced air distribution systems. Key requirements information:

- Heating and cooling blower speed or minimum CFM is setup independently. See the "Blower Speed Selection" to match the airflow capacity with the ducting design.
- The airflow distribution system shall be designed for a maximum of 0.5" SP. Ideally the design should be set at 0.3" to 0.4" SP.
- The variable speed, ECM™ motor, is sensitive to inlet static pressure. In order for the motor to arrive at the setup CFM (motor RPM adjust according to static pressure) the inlet must have a minimum resistance of about 0.15 to 0.2. If you do not have return air ducting and you're simply allowing free return air circulation through a filter at this Electric Furnace inlet, you may need to have a slight restriction in order for the blower motor to arrive at its setup speed.
- All transitions must have a slope of 30° to 45°. There shall be no 90° bends or surfaces causing airflow bounce/eddy current.
- The manufacturer strongly recommends the return air entering the bottom (under the blower) of the cabinet. For smaller kW and smaller cooling (10 kW or 2-ton) it is permissible to bring the air in on either side of the 32" cabinet.
- Previous Specification Chart shows the minimum CFM associated with the kW. Again this is setup as detailed in the "Setup or Programming" section.
- The cooling CFM is also selected but is **not** shown on the Specification Chart. In many cases the airflow distribution system is probably designed to meet the **cooling** requirement.
- The room registers and individual 5" or 6" runs must also match the total setup or planned CFM for this installation. Typically a 6" round and a typical room register is rated at 100 CFM.
- All distribution ducts (supply **and** return) must be sized for the setup or planned total CFM requirement. The attached duct sizing chart shows various distribution duct sizes relating to their ability to properly handle the stated CFM.
- Seal connections between this unit and ductwork, all ductwork connections, etc. as required to reduce or eliminate air leakage. Sealing all connections will also reduce air noise.

**Comment:** The ECM™ motor efficiently relates to system static pressure. On one hand a minimum of about 0.2" SP is required for the motor to adjust itself, but above 0.3" it begins to drain high current. For information, consider (at 240):

1.0" SP – 3.4A  
0.8" SP – 2.5A  
0.5" SP – 0.9A  
0.2" SP – 0.4A  
Continuous Air – 0.25A

Whether this unit is sitting on or attached to an inlet cabinet, field designed inlet cabinet, or horizontal supports; verify proper support and mechanical strength is provided within the system installation. Rubber isolation pads should be used where possible to reduce sound and vibration transmission.



## **WARNING**

WHEN HANGING THIS UNIT, THERE MUST BE UNDER SUPPORTS WHICH DISTRIBUTE THE HANGING CHAINS ACROSS THE SURFACE OF THIS UNIT, DO NOT SIMPLY DRILL A HOLE AND USE A COUPLE OF HANGING BOLTS.

For information, factory optional inlet cabinets can reduce cost and simplify installation, see previous pages.

When installing the unit maintain a minimum clearance of 36" in front of the unit for service accessibility.

### **Upflow, Air Conditioning**

As stated above, the return air should enter the bottom of this cabinet. Suggest using Electro bottom filter cabinet (page 2) or field constructed equivalent. The A-coil will be mounted above the blower in either a case coil or field constructed plenum.

### **Downflow, Air Conditioning**

Similar to upflow above, the air conditioning coil is positioned at the blower outlet. Depending upon the coil type and drip pan it is positioned in a field constructed plenum as required.

A typical packaged 20" x 20" filter cabinet could easily be installed at the blower inlet opening.

### **Horizontal, Air Conditioning**

Similar to upflow above, the air conditioning coil is positioned at the blower outlet. Depending upon the coil type and drip pan it is positioned in a field constructed plenum as required.

As horizontal, the return air would enter the blower end of the cabinet with a typical packaged 20" x 20" filter cabinet.

### **Upflow, Make-Up Air**

The non-tempered air should enter the bottom of this cabinet. An appropriate inlet damper, insulated inlet ducting and high quality (washable or moisture tolerant) filter are required.,

### **Downflow, Make-Up Air**

The non-tempered air should enter the top of the cabinet as the unit would be flipped 180°. An appropriate inlet damper, insulated inlet ducting and high quality (washable or moisture tolerant) filter are required.

A typical packaged 20" x 20" filter cabinet could easily be installed at the blower inlet opening.

### **Horizontal, Make-Up Air**

As horizontal, the return air would enter the blower end of the cabinet with a typical packaged 20" x 20" filter cabinet. An appropriate inlet damper, insulated inlet ducting and high quality (washable or moisture tolerant) filter are required.

### **Blower Motor Orientation**

If the installation is not upflow, the blower motor shall be positioned so the power and control connectors are down. This will prevent water from entering the blower motor through the connector housing opening.

Loosen motor mount clamp and rotate motor accordingly.

Before tightening motor mount clamp be sure the blower wheel is properly centered inside the blower housing.

## **Electrical Installation**

### **WARNING**

TO AVOID THE RISK OF ELECTRIC SHOCK OR DEATH, WIRING TO THE UNIT MUST BE PROPERLY GROUNDED. FAILURE TO PROPERLY GROUND THE UNIT CAN RESULT IN A HAZARD LEADING TO PERSONAL INJURY OR DEATH.

#### **Line Voltage**

The nameplate and/or Installation and Operating Manual specification page provides kW rating and operating current requirements for each specific model. Select the proper wire size to comply with your type of wire routing and NEC field wiring requirements.

Field connection is at this product's furnished circuit breaker. This integrated circuit breaker is a proper local disconnect.

### **WARNING**

USE ONLY COPPER WIRE FOR CONNECTION TO THE CIRCUIT BREAKER TERMINALS AND INSIDE THIS PRODUCT'S CABINET.

If the 240 power service is to be wired as single feed, order option circuit breaker single feed bus bar, part number 5701.

### **WARNING**

DISCONNECT ALL ELECTRICAL POWER BEFORE ELECTRICALLY CONNECTING OR SERVICING THE UNIT. FAILURE TO DISCONNECT THE ELECTRICAL POWER BEFORE WORKING ON THIS PRODUCT CAN CREATE A HAZARD LEADING TO PERSONAL INJURY OR DEATH.

## ***WarmFlo Controller – Inside View, Left Board***

#### **Remote Sensor**

**Duct sensor, A-coil not in supply plenum** – the duct sensor (shorter cable, black wire on ST terminal) is installed approximately 24" above (or airflow distance from element) the Electric Furnace or electric elements. Drill a ½" hole, approximately plenum center.

If there is not adequate plenum distance, pick the largest distribution duct and install towards the top of the horizontal duct. Locate, common sense, in the maximum warm air stream.

**Duct sensor, A-coil in supply plenum** – the duct sensor (shorter cable, black wire on ST terminal) is installed on the warm side of the coil and 4" to 6" after the coil. If it is an A-coil, pick the side which appears to have the most airflow distribution (facing A-coil) and drill a ½" hole approximately 2" from the side edge.

Again the key is getting this sensor in the maximum warm air stream, the air coming through the A-coil fins will all be on the edge of the plenum.

**Note:** The black tip inside of the white tube is the sensor itself. It must be positioned slightly sticking out of the white tube. The only purpose of the white tube is physical protection, once it is installed it is okay to push out the sensor ¼" to ½" to make it more sensitive and faster responding to the warm air stream.

The sensor has polarity, is sensitive to wrong voltage, must be protected from static voltage, etc. Do not cross connect or inadvertently short out sensor wires with power on. Permanent destruct damage may result.

### ***Electric Furnace Control – Inside View, Right Board***

There are several room thermostat and outdoor unit possibilities. **Pick** the following paragraph which relates to your installation.

#### **Room Thermostat, Air Conditioning**

Use conventional heat/cool, 1H/1C, thermostat. It can be mechanical, digital, power robbing, battery operated, setback, etc. If mechanical, set the heat anticipator to 0.2.

Connect the standard R, W, G, Y stat terminals to the control board **HEAT/COOL** terminal block with the same letters.

#### **Room Thermostat, 2-Speed Air Conditioning**

Use conventional heat/cool, 2H/2C, thermostat. It can be mechanical, digital, power robbing, battery operated, setback, etc. If mechanical, set the heat anticipator to 0.2.

Connect the R, W, G stat terminals to the control board **HEAT/COOL** terminal block with the same letters.

Connect the Y1 stat terminal to the control board Y1 tab. Connect the Y2 stat terminal to the control board Y/Y2 screw terminal.

The room thermostat W2 is not used or connected.

#### **Outdoor Unit, Air Conditioning**

Connect the outdoor unit 2 wires to the control board Y/Y2 and C. If 2-speed A/C, there will be a third wire connected to the tab Y1.

#### **Cooling, Special Dehumidification**

The BK tab and the BK peg jumper provide the industry standard 12% blower speed reduction to “pull out” additional moisture from the air. Provide an external humidistat between BK and R and pull or permanently disconnect the BK jumper. With the BK terminal at 0 volts the 12% blower speed reduction is activated.

#### **Make-Up Air Hookup**

In its simplest form, this unit turns on and off with a contact closure across R and Y (T3).

- This “on and off” control contact applied across R and Y depends upon installation requirements and can take on several possibilities – end switch within inlet damper, pressure differential switch, current level detection switch, relay across exhaust blower motor, end switch associated with exhaust damper/motor, etc. See Optional Control Devices.

#### **Utility Load Control**

If applicable for your installation and your utility authorized electric rate, at the bottom of the control board is a blue wire jumper. Simply remove this jumper and extend the two tabs to the power company receiver having N.C. logic.

- If opposite control logic is required contact factory for other wiring instructions.

## **Setup or Programming**

It is extremely important the installer properly sets the peg jumpers for all of the following requirements.

### ***WarmFlo Controller – Inside View, Left Board***

#### **Program Control Chip – AHS Chip Code**

This unit is provided with a control chip (version 2.36 or higher) which can relate to non-heat pump, only ST sensors installed. The key information is programmed within this “AHS” chip.

#### **Warm Air Dial Settings**

**Lower right dial switch – min. warm air** – The yellow dial switch sets the operating temperature.

0 = 100	4 = 116	Factory set on #3.
1 = 104	5 = 119	
2 = 108	6 = 122	
3 = 112	7 = 124	

#### **Program Control Chip – WFMU Chip Code**

This unit is provided with a control chip (version 2.36 or higher) which can relate to make-up air, only ST sensors installed. The key information is programmed within this “WFMU” chip.

#### **Warm Air Dial Settings**

**Lower right dial switch – min. warm air** – The yellow dial switch sets the operating temperature.

0 = 30	4 = 62	Factory set on #3.
1 = 38	5 = 80	
2 = 46	6 = 88	
3 = 54	7 = 96	

### ***Electric Furnace Control – Inside View, Right Board***

#### **Room Thermostat Type**

On the control board left side is a peg jumper which, based on application, this jumper must be set accordingly.

- Forced air space heating application (AHS): Set to conventional heat/cool.
- Make-Up Air application (WFMU): Set to “HP”

#### **Heat Minimal Blower Speed Selection**

On the right side is a peg jumper for a LO/MED/HI selection. As an ST sensor only model, this setting must match the kW.

- 10 kW LO 765 CFM
- 15 kW MED 900 CFM
- 20 kW HI 1035 CFM

#### **Cool Minimal Blower Speed Selection**

At the control board right side is A/B/C/D selection. It is very important that this selection be matched to the cooling ton installed within the system. This is independent of the heating as outlined and setup above.

- A – 3-3.5 ton 1200 CFM
- B – 2.5-3 ton 1100 CFM
- C – 2-2.5 ton 1000 CFM
- D – 2 ton 900 CFM

Note: “COOL” section is used in **make-up air** applications with default in A.

## **Operation Indicators**

### ***WarmFlo Controller – Inside View, Left Board***

#### **Monitor LED's on Front**

##### **Green LED**

Illuminated when WarmFlo II is receiving 24V power. Under all normal operating modes, this should be solid green.

- As a secondary function this green LED provides status of the two remote sensors. If a sensor is inoperative, incorrectly wired, or malfunctioning; this monitor light is in a blinking or pulsing mode. By checking the pulsing pattern, the appropriate sensor can be identified.
- ST sensor - two, 1000 ms blinks every second.

##### **Amber LED**

Illuminated when WarmFlo II is in the electric heat operating mode (Utility Load Control).

#### **Inside WarmFlo Board, Red LED's**

The four red LED's next to the output connector indicate Stage 1, 2, 3, and 4 operation (stage 1 is on the top).

### ***Electric Furnace Control – Inside View, Right Board***

#### **Green, next to Fuse**

24-volt power connected and fuse good.

#### **Red, next to W**

Call for electric heat, represents the input signal (yellow wire) to the WarmFlo control board.

#### **Green, Cool**

Conventional H/C stat has an active Y function or heat pump stat reversing valve is in the cool mode (will depend upon proper setup with RV logic jumper). For 2-speed AC this LED is illuminating during high speed.

#### **Amber**

Represents action within ECM™ blower motor. Factory technician troubleshooting only.

## ***Additional Information***

### **WarmFlo Elements Mechanical Hi-Limit**

For this unit there is no LED's representing mechanical, automatic reset, hi-limit.

### **ECM™ Blower Motor**

The “setup or programming” section outlined the peg jumper programming for selecting blower motor speed according to the nominal or low volume heat and cool installed tons.

### **Room Thermostat “Fan On” Mode**

This sets up continuous air at 50% of the pin jumper selected cool. The ECM™ motor is very economical at this speed.

## **Handheld Analyzer/Laptop Software**

This test tool and/or software is available for temperature offset, field altering the program chip parameters and setup, and general assistance for troubleshooting.

**Note:** This unit is designed to operate in a total electric application. Therefore, SOT-S and MU are not permitted and should always remain disabled.

## **Troubleshooting**

**CFM CALCULATION** – By measuring the temperature rise across the Electro-Mate, the actual CFM can be quite accurately determined. The airflow and Electro-Mate unit must be operating in a stable condition for at least 10 minutes. If it is cycling on temperature limit, this calculation will be of no value. The accuracy of this formula will depend upon uniform and average temperature rise plenum thermometer readings and the accuracy of both the clamp-on amp meter and AC voltmeter. NOTE: The volts x amps x 3.4 value is the same as Btuh output.

$$\text{CFM} = \frac{\text{Volts} \times \text{Amps} \times 3.4}{\text{Temperature Rise} \times 1.08}$$

**Sensor Temperature Calibration** - Both remote sensors are digital electronic and factory calibrated. Normally these do not require field calibration or verification. However, if sensor temperature error is determined, there are two field calibration techniques. Proceed with extreme caution.

1. The outdoor sensor can be calibrated with ice (32°F). Notice a small push button next to the sensor terminal block, with the sensor at 32°F, push and hold for approximately ten seconds. When green LED “blinks” at you, release and now the outdoor sensor is set at 32°F.

**Caution:** This is not a temperature checking situation. If you proceed with this function, the sensor automatically goes to 32°F.

2. Use WarmFlo II Analyzer test set or purchase special PC software disc and PC serial port cable. These plug-in devices allow direct readout of both temperatures, allows a visual determination of WarmFlo II internal temperature settings, and can be used to offset either temperature sensor for troubleshooting and demonstration purposes. This is especially valuable during summer installation. Call factory and order test set device.

**Comment:** Also see the “WarmFlo Information” document (HD320) included with this manual.

## **Troubleshooting/Repair Helps**

1. This WarmFlo II controller contains several interference suppression components, but as an electronic logic product, unpredictable and unusual transients or interferences may sometimes cause strange results. If the WarmFlo II controller is “acting strange”, one immediate step would be power down reset. Simply

turn off the 24-volt source power (probably furnace or Electric Furnace circuit breaker), when the green LED goes out, count to 10, and re-energize power supply.

2. The terminal blocks for control wire hook-up are designed for a wire insertion and screw clamp down. If there is no wire connected and the screw is loose, the screw may not necessarily make a good electrical contact to the inside components. Example – if you are jumpering the thermostat terminals without thermostat wire connection or if you are attempting to measure voltage on the screw head, you may get erroneous or unpredictable results if the screw is not tightened down.
3. Use general heating system logic information and basic understanding of the terminal block wiring functions when measuring voltage to determine proper operation of this module.
4. Acquiring the WarmFlo II Analyzer test set or the PC software and serial port hook-up cable (see previous page) is a positive tool for understanding and troubleshooting the WarmFlo II controller. Either test set device can display all temperatures, real time evaluation of WarmFlo II functions, provide temperature offsets for assimilating winter conditions, and reprogram the control chip (program stays with the actual controller board).

**Bad sensor, safety** – if the internal logic detects open sensor wire, incorrectly wired sensor, or some bad sensor transmitted value conditions; the green LED reverts to a pulsing mode. Basically the appropriate sensor is set internally to a 0° value and the WarmFlo main board only allows stage 1 and stage 2 on.

- ST sensor – two, 1/10 second blips every ½ second

**Analyzer readout, sensor temperature constant 32° or 0°** – these two values represent digital bit patterns that are hard to predict an error function. A blinking green light may or may not be experienced. Typically the cable is too long, wrong type of sensor wire, or some electrical interference on the sensor cable.

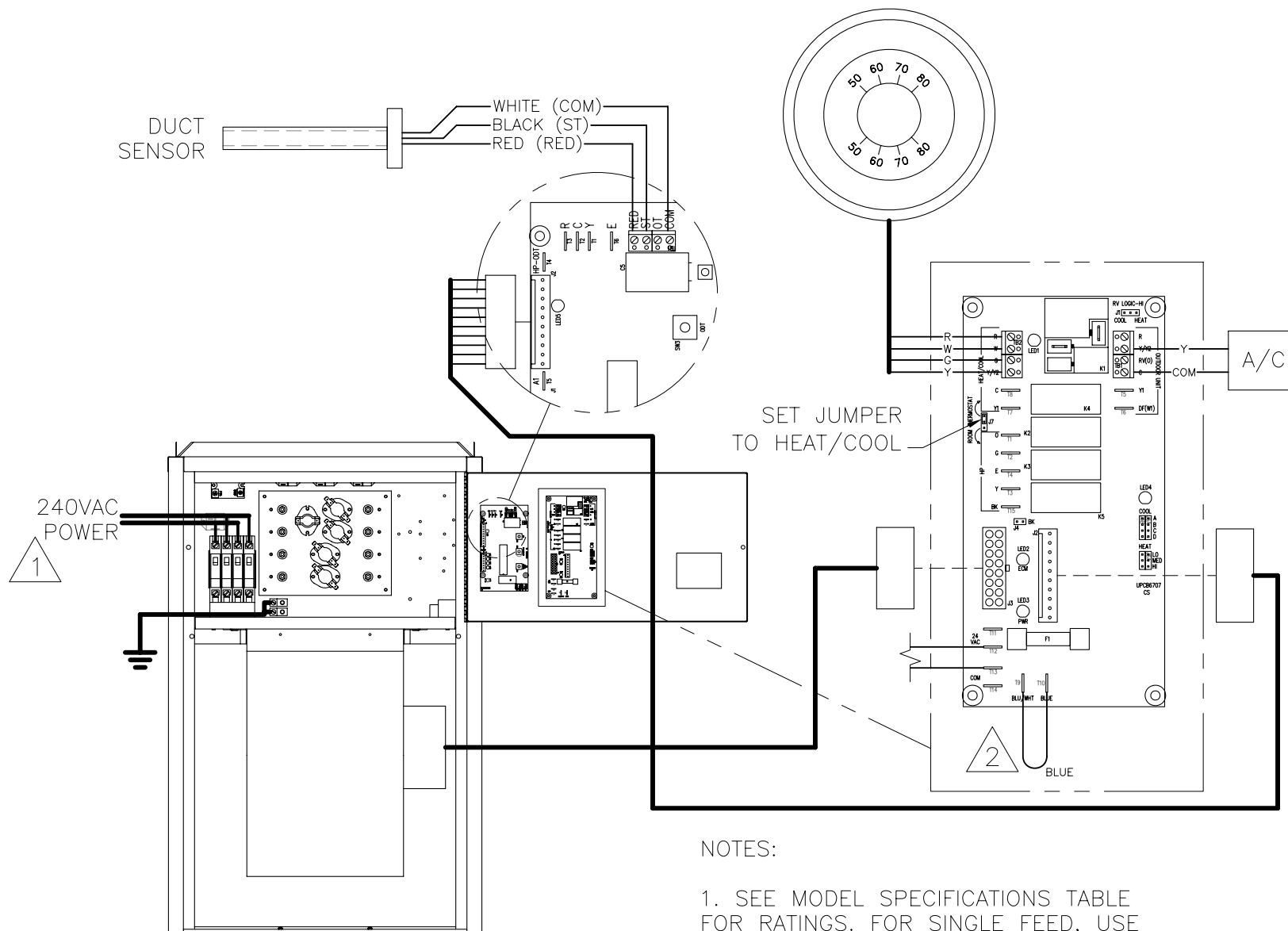
**24-Volt Fuse** – the internal fuse is between the Electric Furnace transformer and all other WarmFlo II functions, including the “R” going to the outdoor unit. Use only two amp, fast blow.



## **Replacement Parts**

@WFS55612	Sensor ST filter 5 ft.
@WFS255612	Sensor 25 ft. filter
@WFCOE5615	PCB WF2 PIC 74 Dual Heat
@HEIBG6707	PCB Electric Furnace ECM™ Motor H/C and HP Stat
@WFPDC5632	PCB Power Sup AC to DC
5850	Motor ½ HP ECM™ GE
5541	Transformer 120/240:24 40VA
4038	Triac SSR 50-amp 24VDC
5127	Relay NO 25A@277 24VDC Coil
6630	Limit O-150/O-180 25A@240V ST-CLSD
5636	Limit O-135/C-120 25A@240V DP-CLSD
6615	Element DI 4800W@240V
5652	Circuit Breaker SD 60A
5650	Circuit Breaker SD 30A
5651	Circuit Breaker SD 45A

# WARMFLO (ST), HEAT/COOL STAT, A/C (1 SPEED) HE-A-\*\*-\*\* (CHIP CODE "AHS")

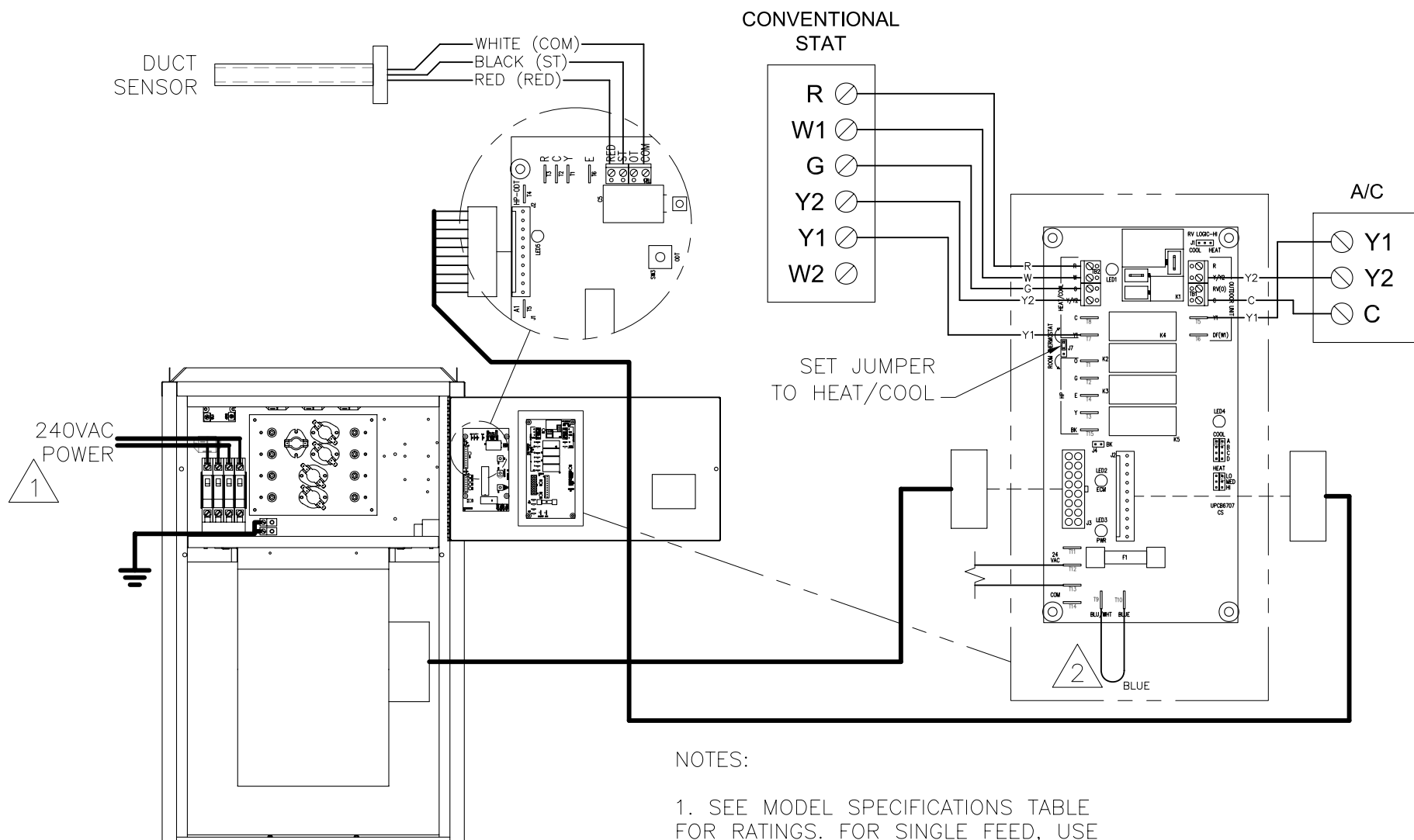


## NOTES:

1. SEE MODEL SPECIFICATIONS TABLE FOR RATINGS. FOR SINGLE FEED, USE LUG SET #5701.
2. FOR LOAD CONTROL INTERRUPT, REMOVE BLUE JUMPER & CONNECT N.C. CONTROL DEVICE.



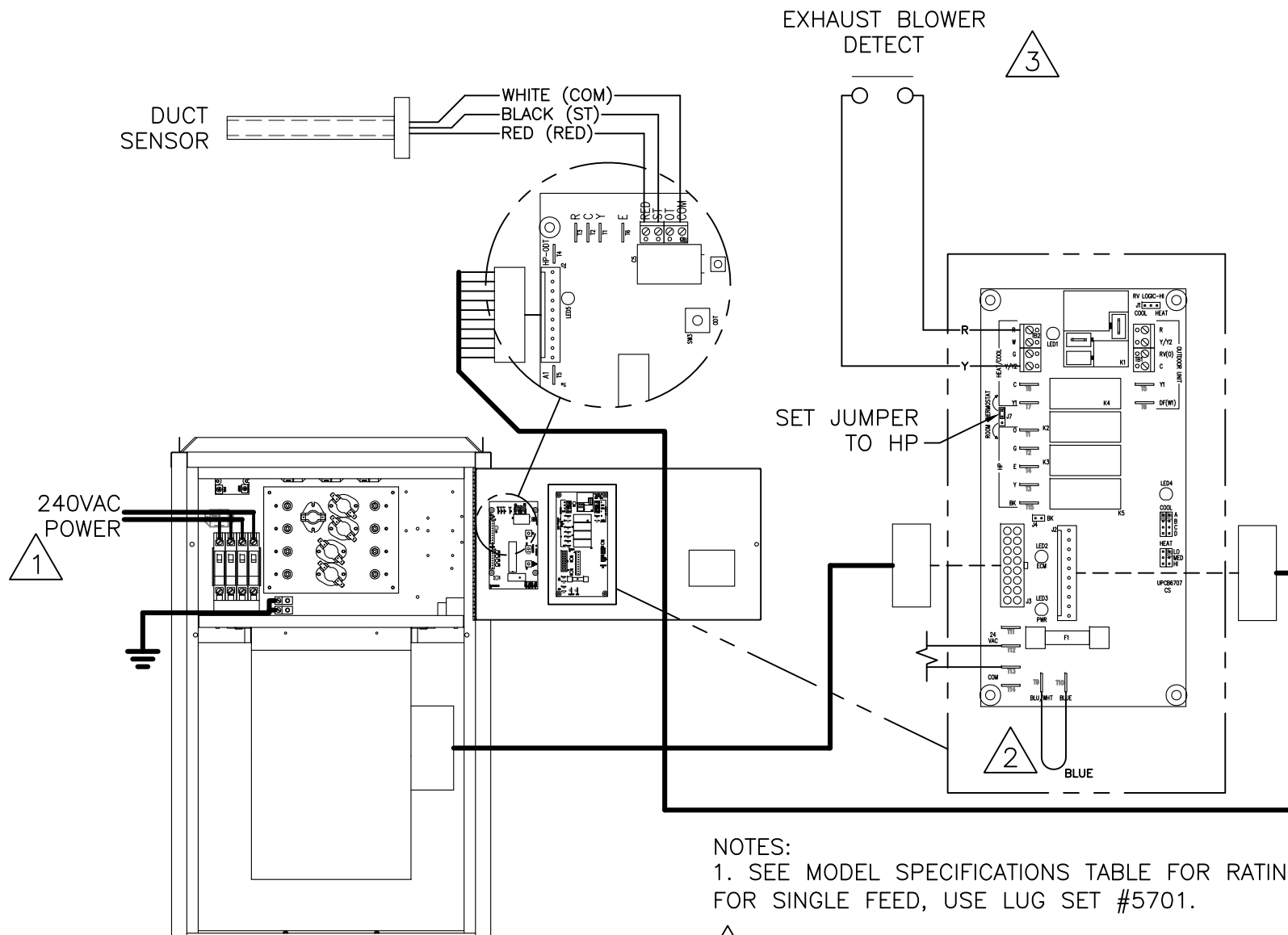
# WARMFLO (ST), HEAT/COOL STAT, A/C (2 SPEED) HE-A-\*\*-\*\* (CHIP CODE "AHS")



## NOTES:

1. SEE MODEL SPECIFICATIONS TABLE FOR RATINGS. FOR SINGLE FEED, USE LUG SET #5701.
2. FOR LOAD CONTROL INTERRUPT, REMOVE BLUE JUMPER & CONNECT N.C. CONTROL DEVICE.

# WARMFLO (ST), MAKE-UP AIR HE-A-\*\*-\*\* (CHIP CODE WFMU)



## NOTES:

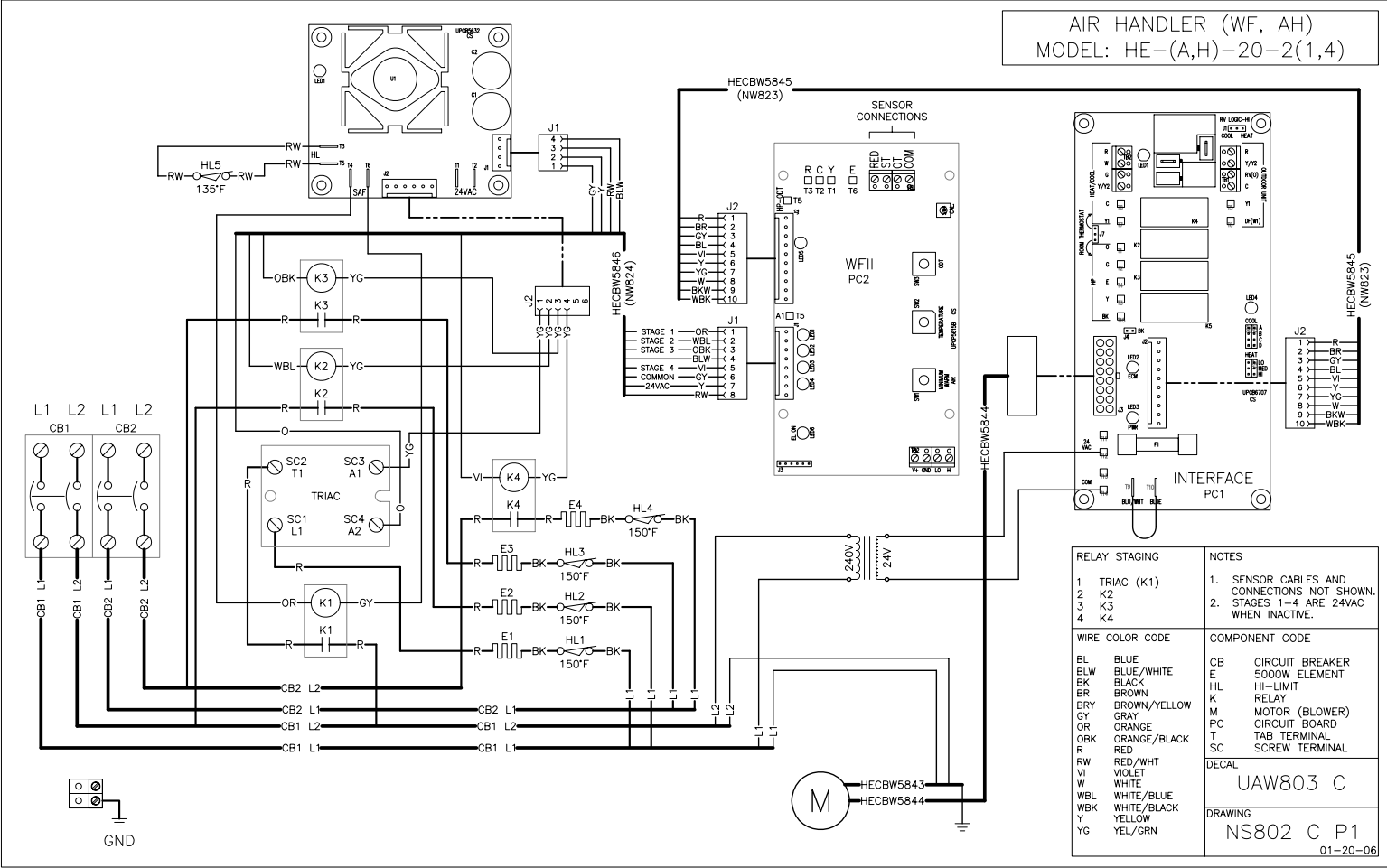
1. SEE MODEL SPECIFICATIONS TABLE FOR RATINGS. FOR SINGLE FEED, USE LUG SET #5701.

2. FOR LOAD CONTROL INTERRUPT, REMOVE BLUE JUMPER & CONNECT N.C. CONTROL DEVICE.

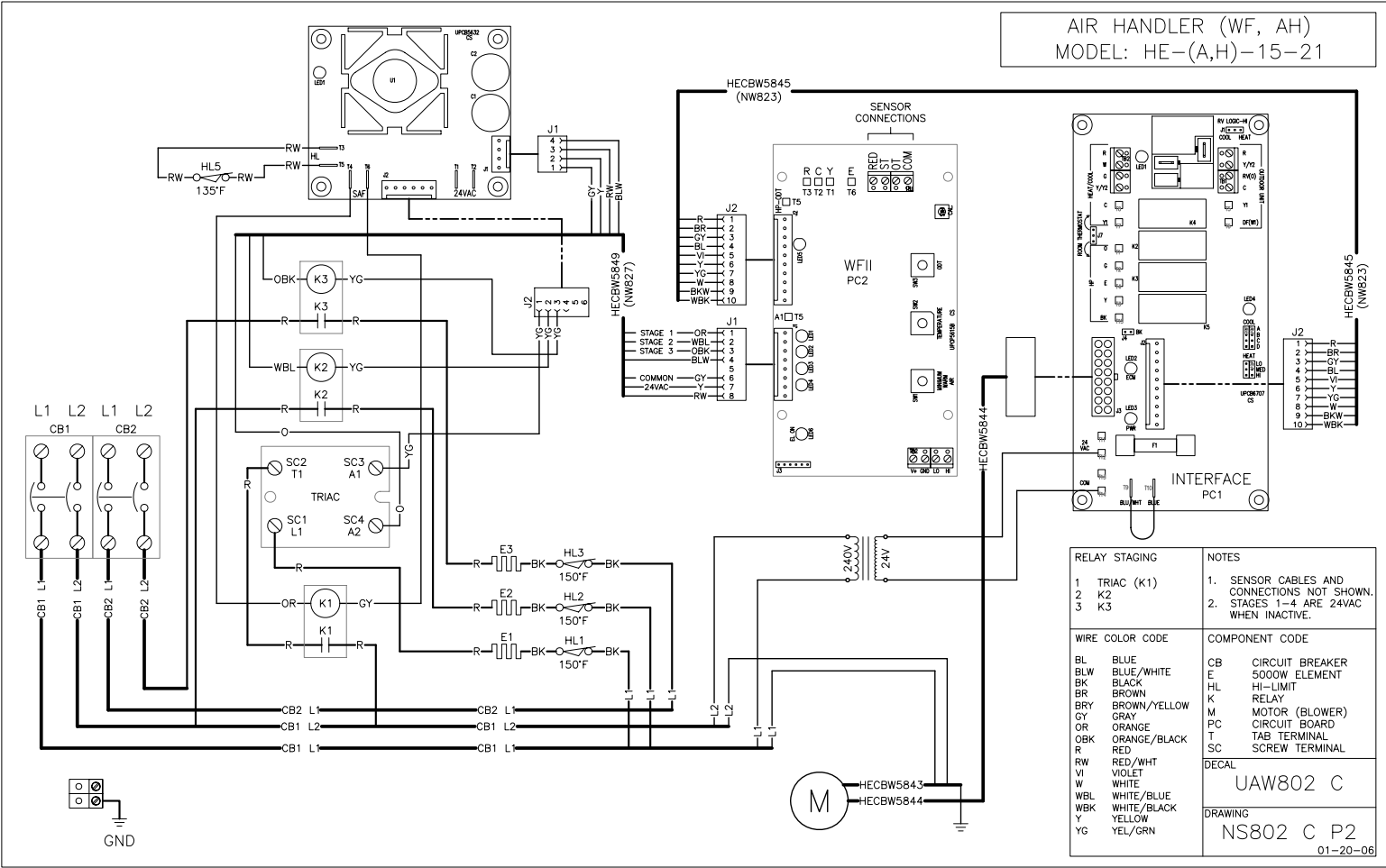
3. SEE SETUP PAGE FOR CFM SELECTION. (DEFAULT, A-1200CFM)



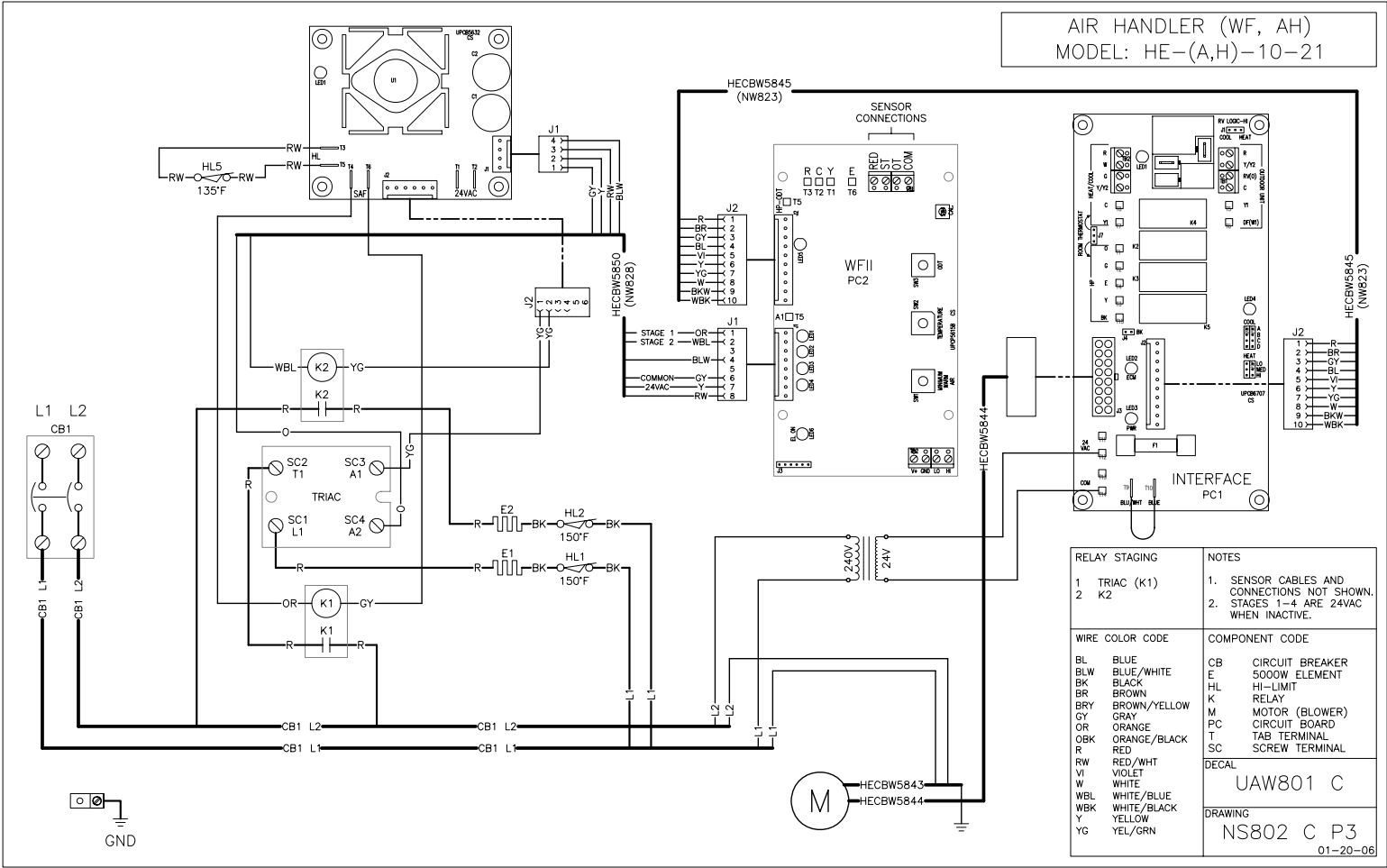
WarmFlo Air Handler (HE-(A,H)-20-2(1,4)), Individual relays  
WIRING SCHEMATIC



WarmFlo Air Handler (HE-(A,H)-15-21), Individual relays  
WIRING SCHEMATIC



WarmFlo Air Handler (HE-(A,H)-10-21), Individual relays  
WIRING SCHEMATIC



# DUCT SIZING TABLE

DUCT CAP. CFM	DUCT DIAM IN.	Equivalent Friction Rectangular Ducts (In.)								
1	2	3	4	5	6	7	8	9	10	11
80	5.3	5x5	6x4	9x3						
100	5.8	6x5	7x4	10x3						
125	6.3	6x6	7x5	9x4	12x3					
150	6.8	7x6	8x5	10x4	15x3					
175	7.2	7x6	9x5	11x4	17x3					
200	7.5	7x7	8x6	10x5	13x4	19x3				
225	7.9	8x7	9x6	11x5	14x4	21x3				
250	8.2	8x7	10x6	12x5	16x4	23x3				
275	8.5	8x8	9x7	10x6	13x6	17x4	25x3			
300	8.8	8x8	9x7	11x6	14x5	18x4	27x3			
350	9.3	9x8	11x7	13x6	16x5	21x4	32x3			
400	9.8	9x9	10x8	12x7	14x6	18x5	24x4	36x3		
450	10.2	10x9	11x8	13x7	15x6	19x5	26x4	40x3		
500	10.7	10x10	11x9	12x8	14x7	17x6	21x5	28x4	44x3	
550	11.0	10x10	11x9	13x8	15x7	18x6	23x5	32x4	48x3	
600	11.4	11x10	12x9	14x8	16x7	20x6	25x5	35x4	52x3	
650	11.8	11x11	12x10	13x9	15x8	17x7	21x6	27x5	37x4	
700	12.1	11x11	12x10	14x9	16x8	18x7	22x6	29x5	40x4	
750	12.3	12x11	13x10	15x9	17x8	20x7	24x6	30x5	42x4	
800	12.7	12x11	14x10	15x9	18x8	21x7	25x6	32x5	45x4	
850	13.0	12x12	13x11	14x10	16x9	18x8	21x7	26x6	35x5	
900	13.2	12x12	14x11	15x10	17x9	19x8	23x7	28x6	36x5	
950	13.6	13x12	14x11	16x10	18x9	20x8	24x7	30x6	38x5	
1000	13.9	13x12	15x11	16x10	18x9	21x8	25x7	31x6	40x5	
1100	14.3	13x13	14x12	16x11	18x10	20x9	23x8	27x7	33x6	43x5
1200	14.8	14x13	15x12	17x11	19x10	21x9	25x8	29x7	36x6	47x5
1300	15.2	14x14	15x13	16x12	18x11	20x10	23x9	26x8	31x7	39x6
1400	15.7	15x14	16x13	17x12	19x11	21x10	24x9	28x8	34x7	41x6

## NOTE:

If sizing is in question, always go to the larger duct for CFM in question.

Grilles and registers shall be sized according to manufacturers performance data capable of handling the CFM of the duct at a throw based on room dimensions. Return air registers should be selected to provide for 450 FPM face velocity.

The above capacities assume individual duct static pressures of less than about 0.1. If the static pressure is higher, assume considerably reduced CFM.



## EVALUATING AND SIZING DUCT WORK SYSTEMS

### Quickie Method

- The trunkline duct work off of the plenum should have 70 square inches per ton for the supply side
- The return air plenum should have 80 square inches per ton

### Standards Used

- Heat pumps require 400 CFM to 450 CFM per ton to operate
- Use a friction per 100 ft. of duct of .08 when sizing or evaluating supply duct work
- Use a friction per 100 ft. of duct of .06 when sizing or evaluating return air duct work
- Duct work is manufactured in 8 ft. lengths
- Rectangular duct work is normally 8 inches tall
- Return air grills are normally 8 inches high and the width of one or two joist spaces
- 7 inch round pipe will handle approximately 150 CFM
- 6 inch round pipe will handle approximately 100 CFM

### Tips

- Never go larger than a 3 to 1 ratio on rectangular duct work width to height when figuring a duct work system
- Common branch duct round pipe is either 6 inch or 7 inch
- Never use branch duct piping smaller than 6 inch round pipe when using a heat pump system
- Normal practice when sizing new duct work is to use a friction per 100 ft. of duct of .08 for the supply line duct work and .06 for the return line duct work
- When doing a retrofit job you will more likely have problems with the distribution of air to the rooms than the size of the duct work

### Evaluating Existing Duct Work

1. Perform a heat loss/gain calculation on the structure and obtain the size system needed and the CFM needed per room.
2. Figure the total CFM needed for the system room by room or: 400 CFM minimum to 450 CFM maximum x heat pump system tonnage.
3. Figure the CFM that can be supplied with each trunkline leaving the plenum using the duct calculator with a friction per 100 ft. of duct of .08.
4. The total CFM that the trunkline(s) can handle must equal or exceed the CFM required by the heat pump system. If it is not, the duct work will have to be replaced or changed.
5. If the trunkline is large enough, subtract the heat loss/gain CFM (whichever is larger) needed per room, fed by the first section of trunkline from the total provided. Then figure the size of the next piece of trunkline for the remaining CFM.
6. The return air duct work must handle the CFM put out by the supply side of the system. Using the duct calculator, figure the amount of air that can be handled by the existing system. Use a friction per 100 ft. of duct of .06. Figure the trunklines first, then branch ducts.

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MONTICELLO, MN 55362  
(763) 295-4138

# **Electro Industries, Inc. Residential Limited Product Warranty**

**Effective November 1, 2009**

Electro Industries, Inc. warrants to the original owner, at the original installation site, for a period of two (2) years from date of original purchase, that the product and product parts manufactured by Electro Industries, Inc. are free from manufacturing defects in materials and workmanship, when used under normal conditions and when such product has not been modified or changed in any manner after leaving the plant of Electro Industries, Inc. If any product or product parts manufactured by Electro Industries, Inc. are found to have manufacturing defects in materials or workmanship, such will be repaired or replaced by Electro Industries, Inc. Electro Industries, Inc., shall have the opportunity to directly, or through its authorized representative, examine and inspect the alleged defective product or product parts. Electro Industries, Inc. may request that the materials be returned to Electro Industries, Inc. at owner's expense for factory inspection. The determination as to whether product or product parts shall be repaired, or in the alternative, replaced, shall be made by Electro Industries, Inc. or its authorized representative.

Electro Industries, Inc. will cover labor costs according to the Repair / Replacement Labor Allowance Schedule for a period of ninety (90) days from the date of original purchase, to the original owner, at the original installation site. The Repair / Replacement Labor Allowance is designed to reduce the cost of repairs. This Repair / Replacement Labor Allowance may not cover the entire labor fee charged by your dealer / contractor.

## **TWENTY YEAR (20) LIMITED WARRANTY ON BOILER ELEMENTS AND VESSELS**

Electro Industries, Inc. warrants that the boiler elements and vessels of its products are free from defects in materials and workmanship through the twentieth year following date of original purchase. If any boiler elements or vessels are found to have a manufacturing defect in materials or workmanship, Electro Industries, Inc. will replace them.

## **TWENTY YEAR (20) LIMITED WARRANTY ON SPIN FIN ELEMENTS**

Electro Industries, Inc. warrants that the spin fin elements of its products are free from defects in materials and workmanship through the twentieth year following date of original purchase. If any spin fin elements are found to have a manufacturing defect in materials or workmanship, Electro Industries, Inc. will replace them.

## **FIVE YEAR (5) LIMITED WARRANTY ON OPEN WIRE ELEMENTS**

Electro Industries, Inc. warrants that the open wire elements of its products are free from defects in materials and workmanship through the fifth year following date of original purchase. If any open wire elements are found to have a manufacturing defect in materials or workmanship, Electro Industries, Inc. will replace them.



## THESE WARRANTIES DO NOT COVER:

1. Costs for labor for removal and reinstallation of an alleged defective product or product parts, transportation to Electro Industries, and any other materials necessary to perform the exchange, except as stated in this warranty. Replacement material will be invoiced to the distributor in the usual manner and will be subject to adjustment upon verification of defect.
2. Any product that has been damaged as a result of being improperly serviced or operated, including, but not limited to, the following: operated with insufficient water or airflow, allowed to freeze, subjected to flood conditions, subjected to improper voltages or power supplies, operated with airflow or water conditions and/or fuels or additives which cause unusual deposits or corrosion in or on the product, chemical or galvanic erosion, improper maintenance or subject to any other abuse or negligence.
3. Any product that has been damaged as a result of natural disasters, including, but not limited to, the following: lightning, fire, earthquake, hurricanes, tornadoes or floods.
4. Any product that has been damaged as a result of shipment or handling by the freight carrier. It is the receiver's responsibility to claim and process freight damage with the carrier.
5. Any product that has been defaced, abused, or suffered unusual wear and tear as determined by Electro Industries or its authorized representative.
6. Workmanship of any installer of the product. This warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation.
7. Transportation charges for any replacement part or component, service calls, normal maintenance; replacement of fuses, filters, refrigerant, etc.

## CONDITIONS AND LIMITATIONS:

1. If at the time of a request for service the original owner cannot provide an original sales receipt or a warranty card registration then the warranty period for the product will have deemed to begin thirty (30) days after the date of manufacture and **NOT** the date of installation.
2. The product must have been sold and installed by a licensed electrical contractor, a licensed plumbing contractor, or a licensed heating contractor.
3. The application and installation of the product must be in compliance with Electro Industries' specifications as stated in the installation and instruction manual, and all state and federal codes and statutes. If not, the warranty will be null and void.
4. The purchaser shall have maintained the product in accordance with the manual that accompanies the unit. Annually, a qualified and licensed contractor must inspect the product to assure it is in proper working condition.
5. All related heating components must be maintained in good operating condition.
6. All lines must be checked to confirm that all condensation drains properly from the unit.
7. Replacement of a product or product part under this limited warranty does not extend the warranty term or period.
8. Replacement product parts are warranted to be free from defects in material and workmanship for ninety (90) days from the date of installation. All exclusions, conditions, and limitations expressed in this warranty apply.
9. Before warranty claims will be honored, Electro Industries shall have the opportunity to directly, or through its authorized representative, examine and inspect the alleged defective product or product parts. Remedies under this warranty are limited to repairing or replacing alleged defective product or product parts. The decision whether to repair or, in the alternative replace, products or product parts shall be made by Electro Industries or its authorized representative.

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