Installation & Operating Instructions

WF-DHEMK

Application

This conversion kit is for use in applications with air conditioning or single stage heat pump. If interfacing with a 2-stage heat pump, order conversion kit WF-DHKIT2.

Conversion of existing Electro-Mate EM-L* or Heat Choice series plenum heaters to WarmFlo controlled plenum heaters.

> **Note: EM-L*104** models do not apply to this conversion kit. This kit is equipped for 20 kW maximum models. For 25 kW units please contact the factory for assistance.**

Conventional H/C Roomstat Only – either Heat Pump or Air Conditioning

Built-In ODT Switchover (Dual Setting) – When using this kit in a heat pump, electric strip, and gas backup application it must be realized that upon ODT cut off only the heat pump is terminated. The electric strip continues on at this point. See page 16 for further details.

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

Drawings: **EH812**
EH813
ES816
XX017

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Drawings Included:	EH812 EH813 ES816 XX017

Introduction

The intended application for this product is summarized on the cover page. If this does not fit your application needs please contract Electro Industries for other products to meet your needs.

This conversion kit comes equipped to convert 20kW Electro-Mates. If the Electro-Mate that you are going to convert is a 10kW or a 15kW watch for specific notes throughout this installation guide regarding necessary modifications to the installation for 10kW and 15kW units.

Once installation of this conversion kit has been completed, the plenum heater will be a fully functioning Warmflo plenum heater with all of the benefits typically associated with Electro Industries Warmflo products.

In addition, this upgrade kit has a special controller which allows for simplified control wiring, and easy heat pump interface.

- Smart controller, fully automatic
  - Outdoor and warm air temperature sensing
  - Knows building heat requirement
  - One room thermostat, entire system
  - Controls and reacts with heat pump and gas furnace
  - Applicable to single and ECM variable speed furnace blowers
  - Installer setup switch, selects heat pump or A/C

Installation Requirements

1. All installation work must be performed by trained, qualified contractors or technicians. Electro Industries sponsors installation and service schools to assist the installer. **Visit our web site at 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 and manufacturer product liability. Electro Industries cannot be held responsible for field modifications, incorrect installations, and conditions which may bypass or compromise the built-in safety features and controls.

2. This installation guide relates only to the addition of this upgrade kit to the existing Electro-Mate unit. 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

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

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.

⚠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.

Installation Overview

Installation of this upgrade kit is broken down into two main sections. Section one relates to the removal of unneeded components and wiring. Section two relates to the installation of the new components and wiring.

This installation kit is intended to be used to upgrade various revisions of the EM-L* and Heat Choice series Electro-Mates. Efforts have been made in the instructions below to cover as much detail as possible covering the various differences between older and newer models. For revisions that are not included in this manual, please contact the factory for assistance.

Section One (Disassembly)

Step 1
Disconnect all power sources from the unit and furnace.

Step 2
For split cover models open the door on the right hand side, remove the cover on the left, and remove the voltage barrier inside the cabinet. (Simply open the door on models with a single door.)

Note: For ease of removal and installation of components and wiring, you may want to temporarily remove the cabinet.

Step 3
Disconnect all wiring connected to the control board. Remove control board from door. (Models with the control board installed on a U shaped bracket must have the bracket removed first in order to gain access to the wiring).

Step 4
On EM-L* models cut the two red/white wires at the harness connector plug. Then disconnect the remaining harness wires and discard the harness. The two brown wires must also be disconnected from the furnace fan center. (EM-E* models disconnect the harness wires and discard the harness.)

Step 5
Remove all wires connected to the fan relay board (if equipped). The fan relay board has two orange wires attached to the relay; these wires must also be removed from the furnace fan center.

Step 6
If equipped, remove and discard the limit switch sensor tube assembly located on the left side of the unit. Note: This is the sensor tube that has the two black 18AWG wires that were connected to the fan relay.

Step 7
Detach the circuit breaker mounting bracket from the enclosure.

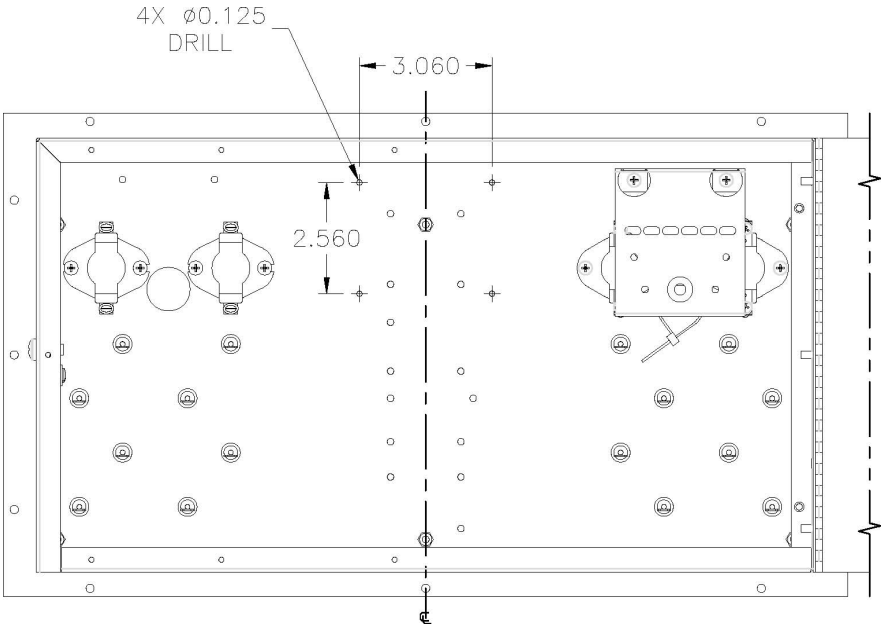
Step 8
Disconnect and discard only the wires connected to the contactors.

Step 9
Remove and discard contactors and furnace fan relay board (if equipped).

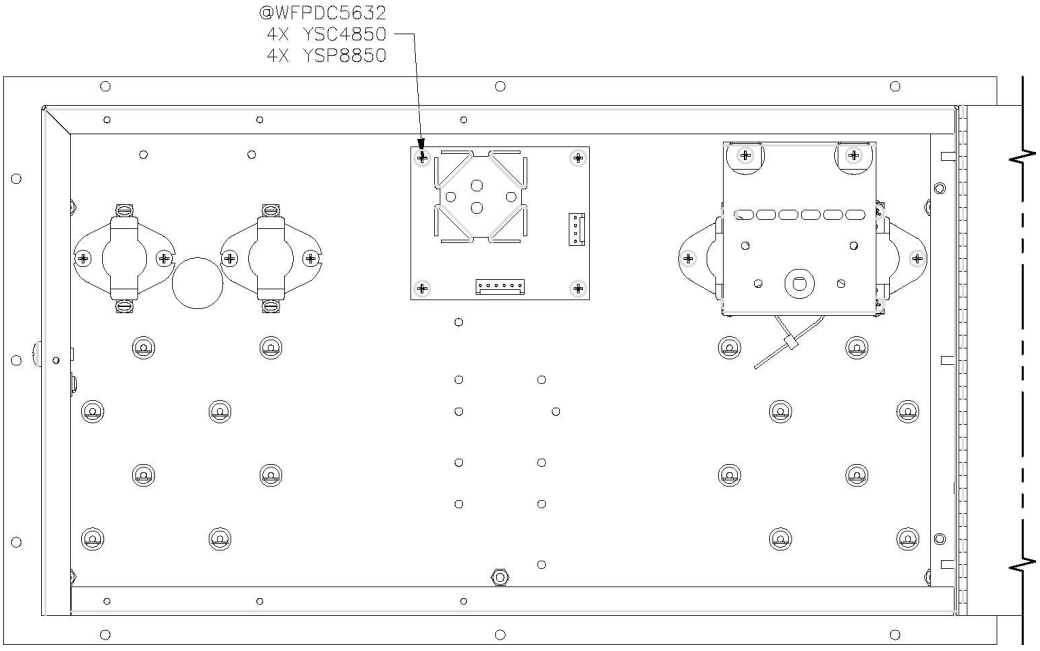
Section Two (Assembly)

Note:
This upgrade kit comes equipped for 20kW models. For models less than 20 kW simply omit the relays and wiring for the correct kW size that you are working on. **Example**: (Ref. ES816) relay K6 and wiring are omitted on a 15kW unit. Relays K4 – K6 and wiring are omitted on a 10kW unit. Cut and wire nut off the unused harness wires when working with 10 and 15kW models.

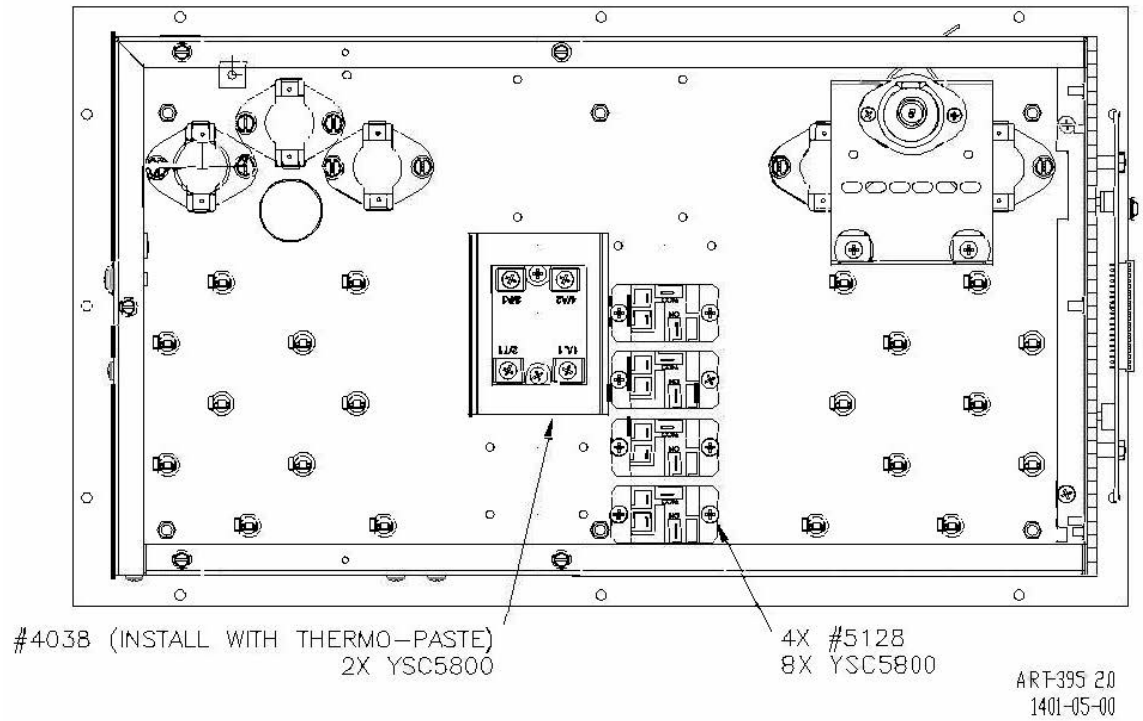
Step 1
Using a 1/8th inch drill bit, drill holes in the chassis for the power supply board.



Step 2
Install the power supply board using (4) supplied 1” thread cutting screws.

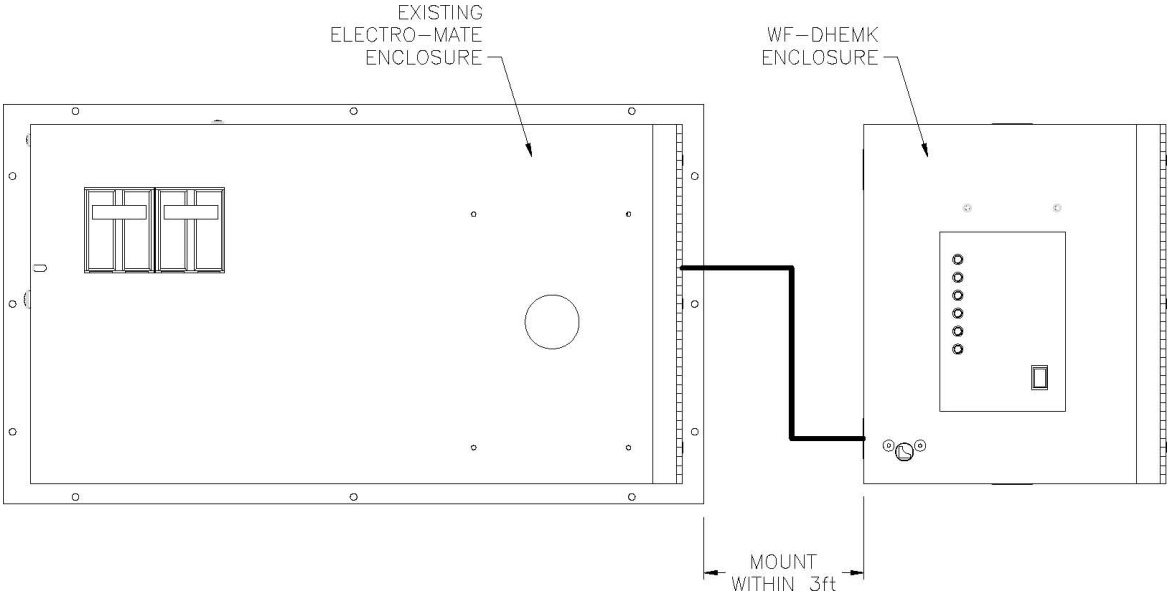


Step 3
Using (10) supplied ½” self drilling screws, install the solid state relay (SSR) using the supplied thermo-paste and cube relays to the chassis as shown. Then reinstall the cabinet, (if it has been removed.)



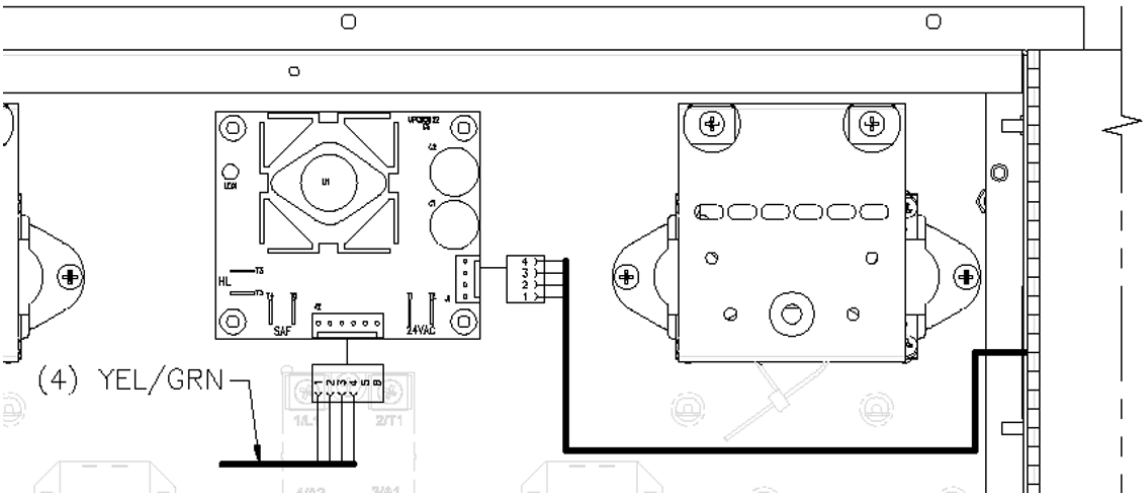
Note: Image shown is for 20kW units. If you are upgrading a 15kW or a 10kW unit, please refer to ES816 located at the back of this manual. Unused relays in the 15kW and 10kW units need to be omitted from the assembly according to ES816.

Step 4
Install the control box using (4) supplied ½" self drilling screws within 3ft. of the right hand side of the Electro-Mate.

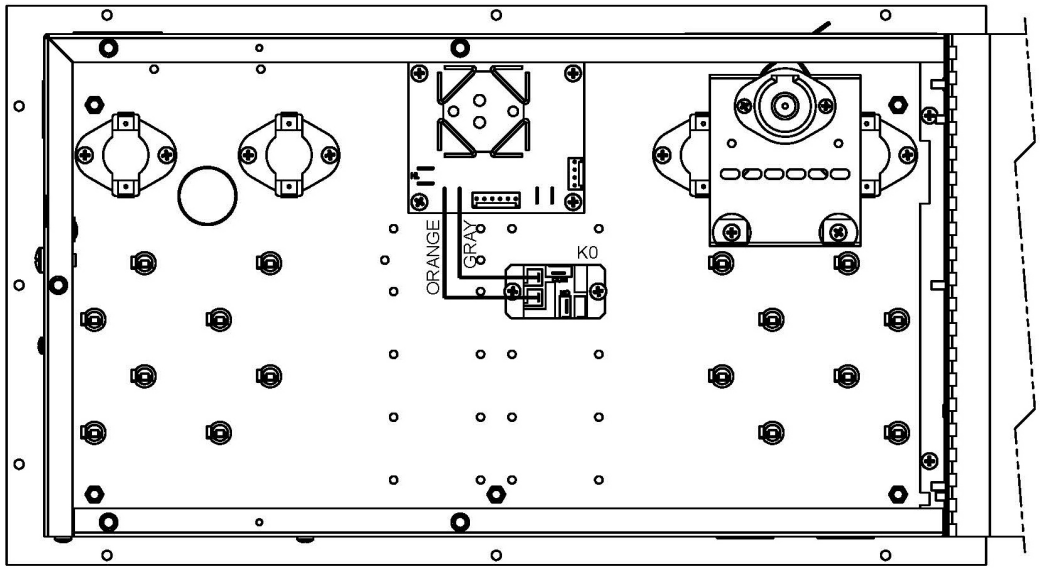


Step 5
Route the harness cable from the control box through the side of the Electro-Mate cabinet.

Step 6
Connect the control harness with the yellow/green wires to the bottom connector on the power supply board.

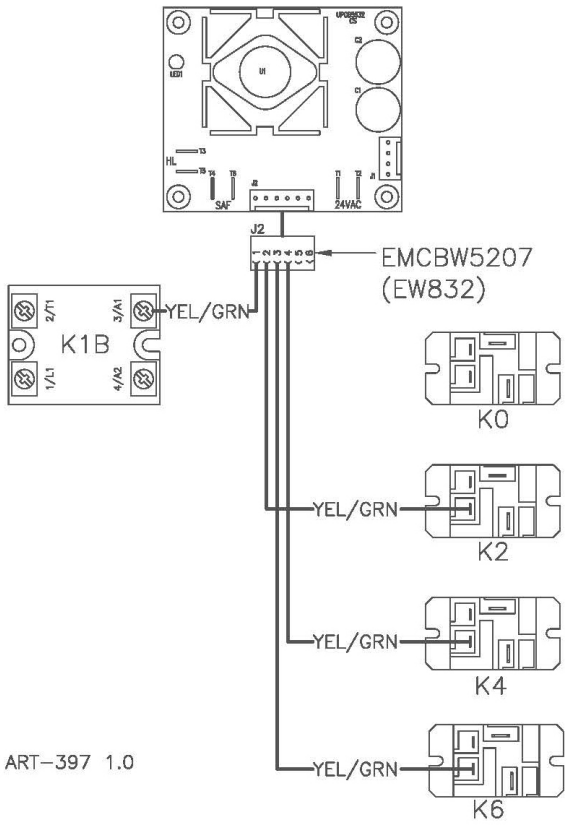


Step 7
Connect the orange and gray wires to the SAF tabs on the power supply board. Connect the other end of the orange and gray wires to relay K0.



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1401-06-00

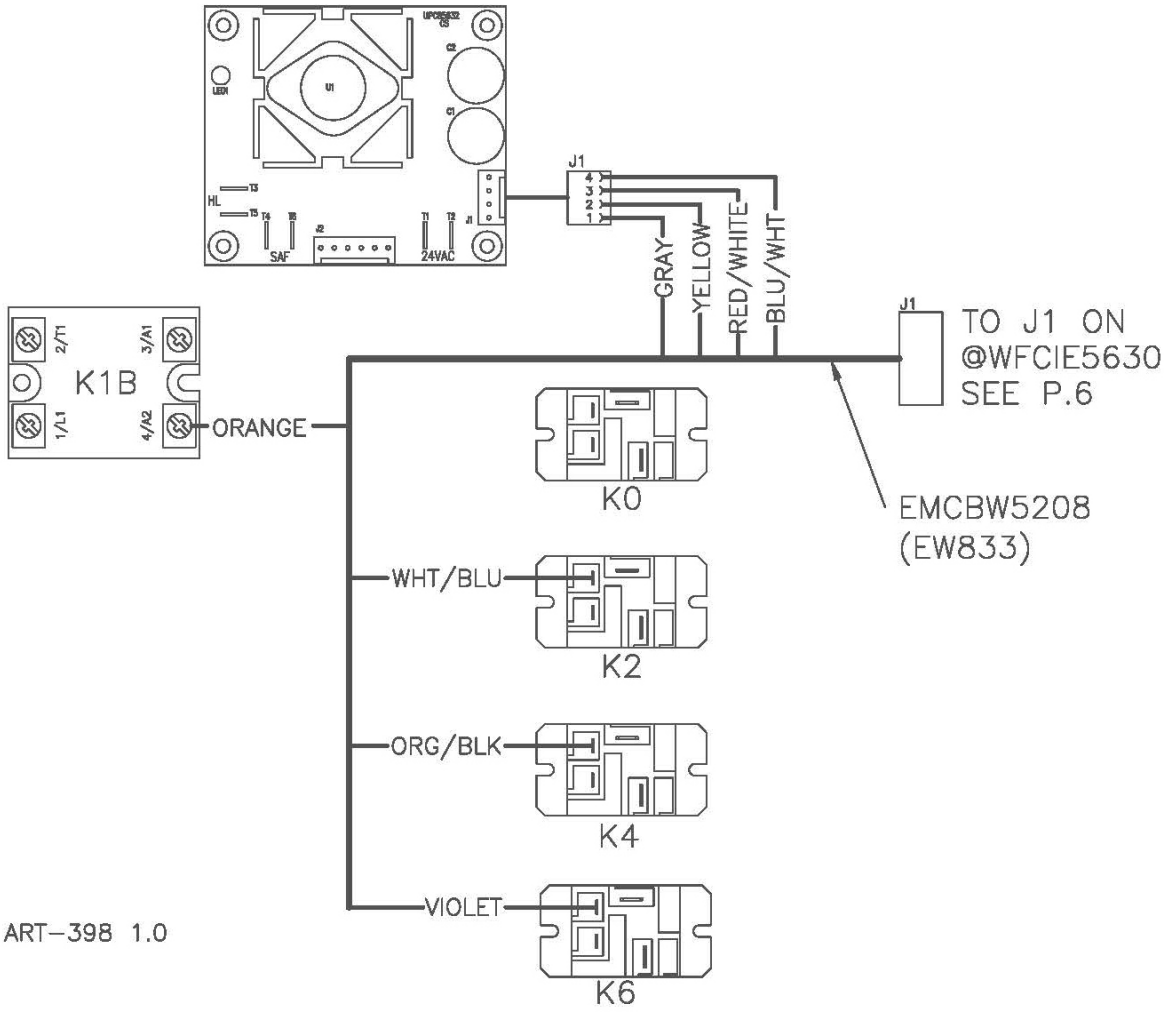
Step 8
Connect the yellow/green wires to their respective relays.



ART–397 1.0

Note: This kit is shipped from the factory setup for 20kW units. If the unit you are working on is a 15kW or a 10kW unit, refer to ES816 at the back of this manual. Cut and or cap off the unused harness wires according to ES816.

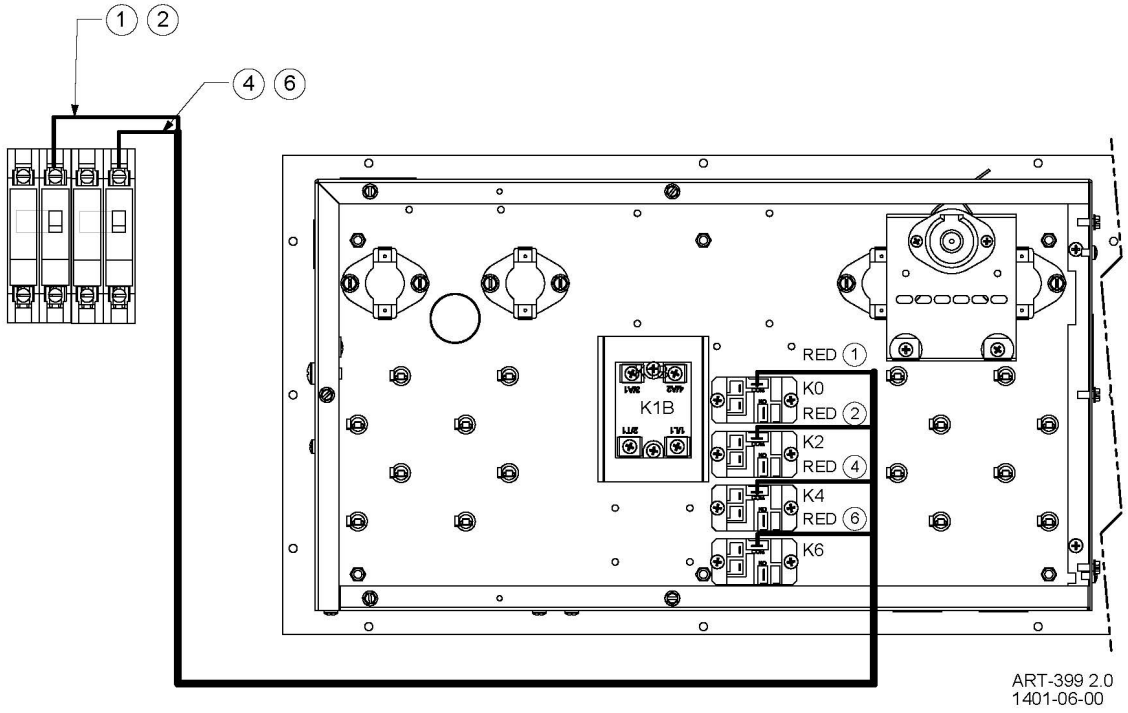
Step 9
Connect the harness wires from the control box to the connector on the side of the power supply board, and then connect the individual wires from the harness to their respective relays.



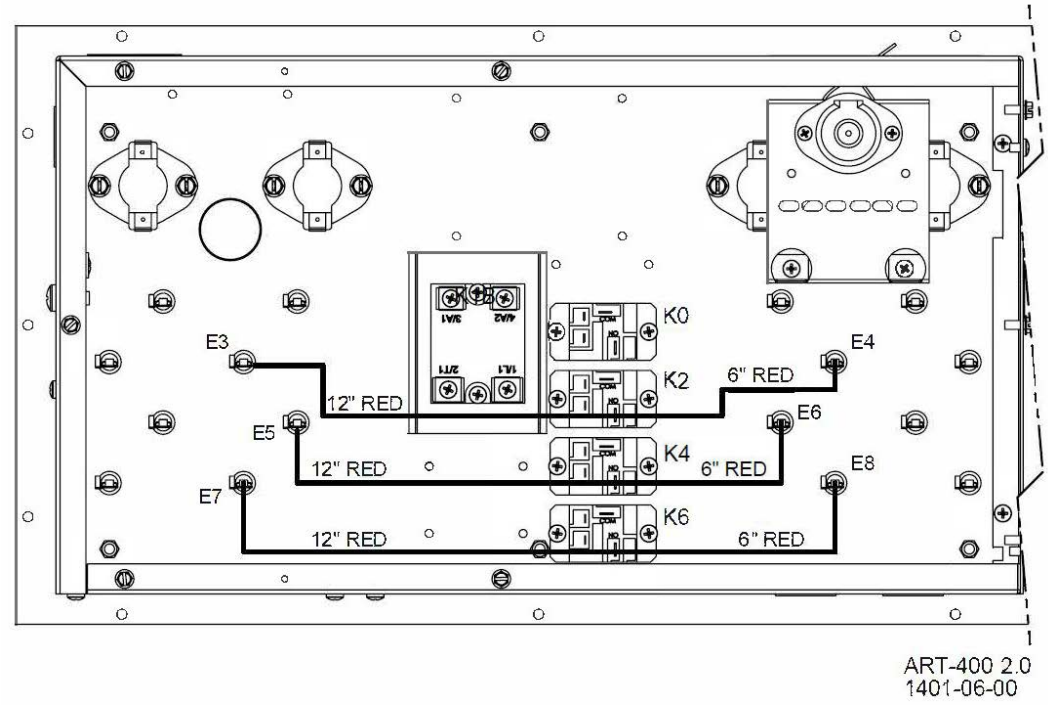
Step 10
There are two bundles of power wires included in this kit. One bundle is marked SD, the other is marked GE. Depending upon the revision of the Electro-Mate it may have either Square D brand circuit breaker(s) or General Electric brand circuit breaker(s). **Example:** If the unit you are working on has General Electric circuit breaker(s) use the package marked GE and discard the package marked SD. **Note:** If you are converting a unit that does not have circuit breaker(s) use the GE wire package.

Step 11
Referencing the image below, connect the power wires to the circuit breaker(s), relays, and SSR. Be sure to connect the power wires coming from the circuit breaker(s) to the COM tab on the relays.

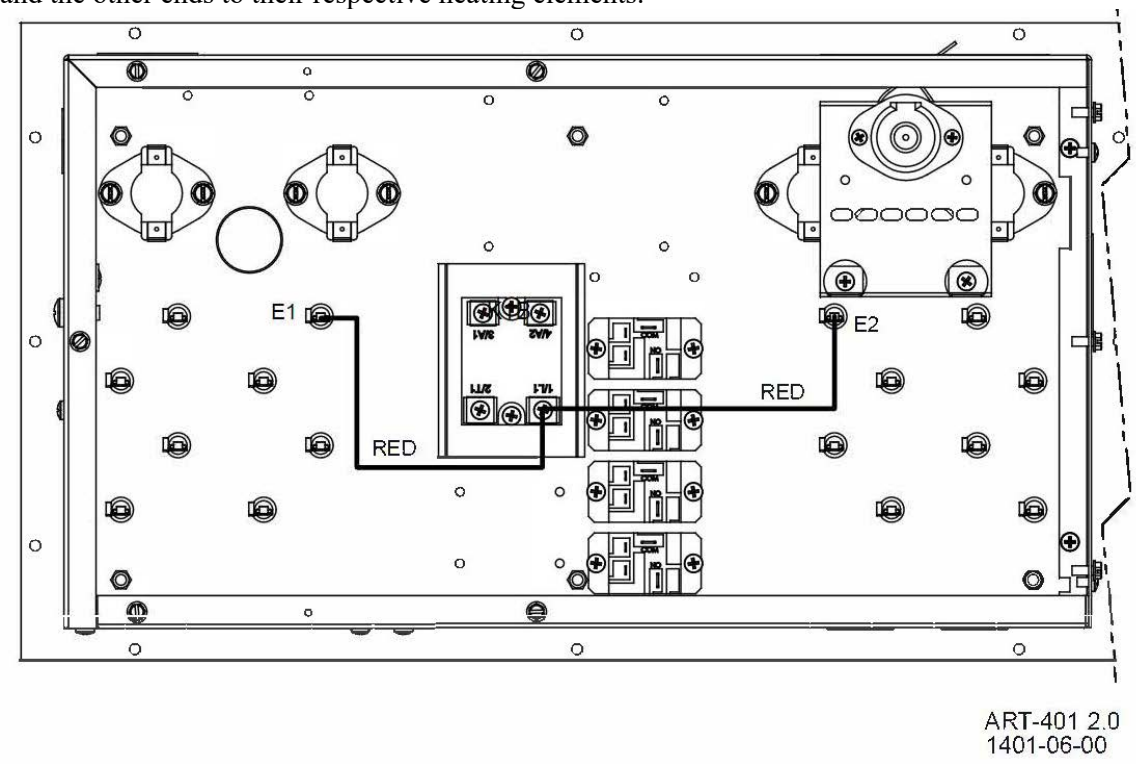
Note:
The image shown is the GE brand circuit breaker. When converting a unit with Square D brand circuit breaker(s) the power wires are routed from the bottom side of the circuit breakers instead of the top.



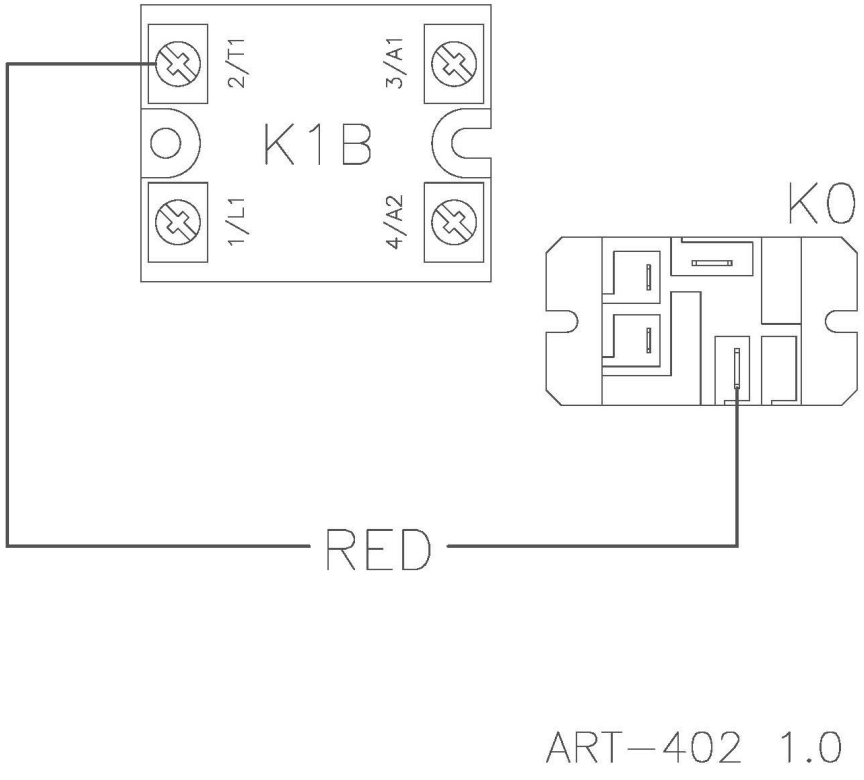
Step 12
Connect the red 16AWG wires to the NO tabs on the relays then connect the other end of the wires to their respective heating element.



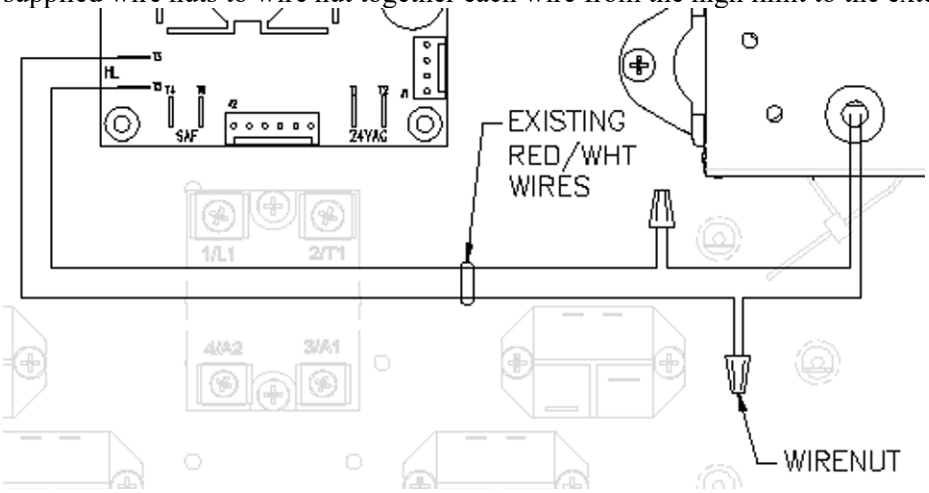
Step 13
Using the two 16AWG wires with the forks on one end, connect these two wires to tab 1/L1 on the SSR and the other ends to their respective heating elements.



Step 14
Connect the 12AWG between the NO tab on relay K0 and SSR tab 2/T1.



Step 15
Connect the two 18AWG red or red/white wires from the high limit on the right hand side of the unit to the HL tabs on the power supply board. **Note:** Depending upon the specific model that you are working on you may or may not have to use the supplied terminated 18AWG red/white extension wires. Use the supplied wire nuts to wire nut together each wire from the high limit to the extension wire.



Step 16
Trace all wires to ensure every wire is installed in its proper location and inspect each wire connection to ensure that it is not loose.

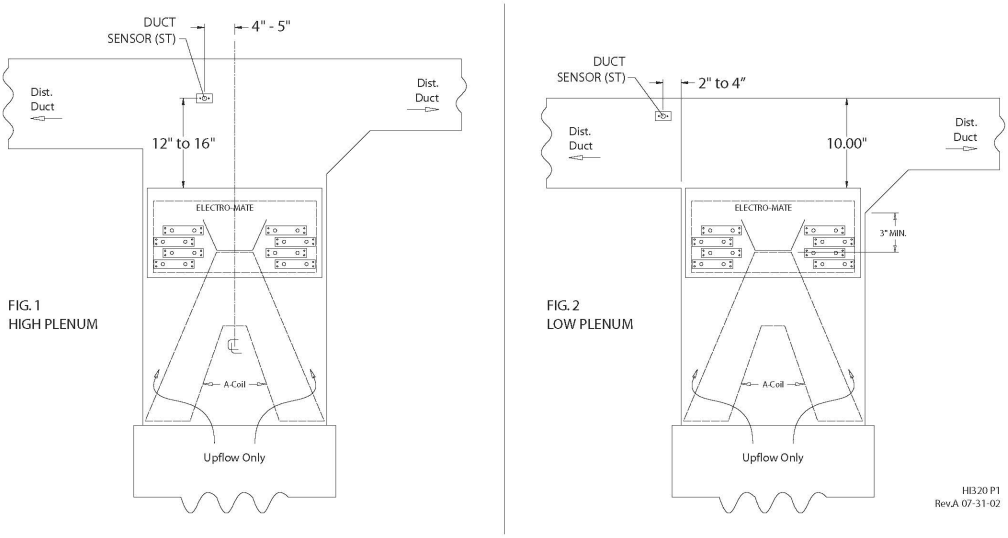
Step 17
Attach the circuit breaker bracket assembly back onto the cabinet.

Control Box Hookup

Remote Sensors

Reference hookup drawing EH812, pages 1 and 2 as appropriate.

Duct Sensor (ST) Install the duct sensor according to the illustration below. The supply warm air sensor (ST) needs to be installed 12” to 16” above the control box.



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.

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.

Outdoor sensor – extend sensor to an outdoor location properly sampling the outdoor temperature. The north side may pick up too much shading and winds, but the south side should be avoided unless there is a position which will shade the sun. Install bracket with the sensor tip up (cable downward).

Use care in selecting location so the sensor does not pick up false temperature from the heat pump outdoor unit, from refrigerant line sets, dryer vent, reflection off of steel siding, etc. Also do not install the sensor in a plastic box because it will falsely trap and pick up radiant sun temperature.

Other Sensor Related Comments
The factory supplied OT cable is 25 feet. If additional cable length is required, you must use the following rules for extending the cable.

- Use unshielded (low capacitance, preferred twisted) 3 or 4-wire low voltage cable.
- 50 feet is maximum.
- Do not, under any circumstances, use leftover wires within the thermostat cable going out to the outdoor unit.
- Route the sensor cable making sure you do not crimp, cut, staple, or damage the cable in any way.
- Keep sensor cables at least 12" away from any line voltage wiring, romex, etc.

For easy sensor cable disconnect and reconnect, the control board has a plug-in 4-place terminal block. Before disconnecting, you will notice two red wires are under one screw and two white wires are under the COM screw. The black wire represents the data information from each sensor and must be connected to the appropriate OT or ST screw.

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 damage may result.

Room Thermostat
Use conventional (not heat pump with O and compressor Y) heat/cool, 1H/1C. A conventional 2H/2C can be used for 2-stage AC and/or 2-stage gas. It can be mechanical, digital, power-robbing, battery operated, setback, etc. If required, set heat anticipator to 0.2.

> **Note**: Do not, even with heat pump, use a heat pump thermostat.

Connect the standard R, W, G, Y stat terminals to the control board upper left terminal block. If the specific roomstat requires common or C, this can be picked up from a tab on the board bottom right.

Outdoor Unit, Air Conditioning
Connect the outdoor unit two wires to the control board right **two** terminal block points marked AC.

Outdoor HP Unit (Single Speed)
This system is setup for the primary four wires – R, Y, O, C. Connect to the control board upper right four terminal block points marked HP.

Defrost – if the installer user desires faster plenum heat during defrost, the outdoor unit W1 (W2 or anything else) can be connected to the "E" tab. **Caution:** This is not necessarily universal with all heat pumps, this should and must be tested by the installer if so connected.

Gas Furnace (or Oil with Fan Center Terminal Wiring Strip)
The 24-volt power for this unit comes from the furnace 40VA transformer.

For single blower speed or basic furnace use the standard four wiring points – R, W, C, G. Connect to control board, bottom right.

If this is a variable speed blower, GE ECM motor, add the 5th wire for a Y to Y connection. With this 5th wire speed connection you will want to go to the highest speed furnace terminal. This will relate if you have a Y1 and a Y2. Suggest using Y2 unless installer elects to add relay as detailed on the next page.

Other Furnace Situations or Special Wiring Requirements
See next page for a variety of items which may or may not relate to your specific installation.

Additional Hookup or Special System Equipment Concerns

Special Oil Furnace Comment
This controller is designed to interface directly with a furnace fan center containing 24-volt transformer (40VA or larger), blower relay, and a "W" function to operate the furnace. If this installation is for an **oil furnace** with only oil control "T and T" terminals, a special fan center will need to be added with an isolation relay at the "W" terminal so only isolated contacts are connected to the oil burner master control "T and T", order EM-FC-OIL. Another choice is to use a standard fan center and order EE-5053 relay with accompanying HD001 instruction sheet.

Wood Furnace or Other Non-Automatic Standby Furnace
WarmFlo works well with a wood furnace because it modulates the electric element to maintain a fixed temperature output. Thus the wood fire can "die down" and the supply sensor (ST) will make up electric element heat to keep the building comfortable. The other operating extreme is a "hot" wood fire where it is adequate to heat the building. In this case the supply sensor will be measuring temperature greater than required and turn off all elements automatically. However, there must be adequate controls on the wood furnace so that the discharge temperature does not exceed 180°F.

2-Stage Gas Furnace
From Electro's experience all 2-stage gas furnaces must have a W1 before the furnace reacts to a W2 or special variable burner second control wire. Realizing this, the W2 functions from a 2H/2C roomstat can go directly to the furnace terminal block. There are some furnace manufacturers with a special variable burner and a special wire from the thermostat (typically V), simply route around this unit directly to the furnace. This upgrade kit properly handles W1 which is the main control function for the furnace.

2-Stage or 2-Speed AC Compressor
Load Control action may be required with the outdoor unit Y2. This can be accomplished by routing the roomstat Y2 through a relay contact (onboard tabs) and the outdoor Y2. With the door open, at the control board top center, notice three tabs.

- COM – roomstat Y2
- EL – outdoor unit Y2
- SB – not used

Note: Only operates during thermostat call.

Variable Speed, ECM Motor, Blower
Standard within this controller, the furnace Y connection will always have voltage relating to heating and cooling speed requirement. This Y function voltage is not present during standby. With this provided feature the ECM motor basically has two speeds – continuous air (G only) or G and Y combination for full heating and cooling speed. If the furnace being installed has additional intermediate blower speeds (Y1, Y2, BK, O, etc.) see next paragraph for the possibility of adding relays and using WarmFlo SPD B. If you're not implementing the intermediate speeds associated with a separate high speed in the next paragraph, the control board Y is probably connected to the furnace highest speed or Y2.

Variable Speed Blower, Operate a Low Speed During Low Heat Requirements
Fall 2003 new WF II features allow selecting an outdoor temperature to change furnace blower speed. The control board has a programmable temperature which can trigger one or two additional relays for activating these additional furnace blower speed functions. Drawing EH813 provides the hookup details for this feature. The factory temperature defaults are:

ST	OT
SPD B – 104°	SPD B – 30°

Zone Damper Systems
Because of WarmFlo temperature sensing, this unit works very well with zone dampers. However, the dampers need to be in the horizontal ducts and at least 24" away from these electric elements. Since this unit uses 4-wire, heat/cool, thermostat connections; the zone damper must be a basic 4-wire thermostat device with an HVAC equipment terminal block simply labeled R, W, G, Y. This terminal block is connected to the control board upper left same nomenclature terminal block.

> **Note:** Only operates during thermostat call.
> **Note**: Strongly suggest wiring damper motors as normally open (NO).

Load Control, Other Products or Hardware
If there is a need to "pass on" the utility load control receiver function to other heating equipment, radiant floor boiler, peak interrupter, etc; there is an isolated contact on this control board. Locate tabs COM/EL/SB. In the electric mode there is an isolated contact between COM and EL. This contact is for low voltage only, 1-amp maximum.

> **Note**: There may be a 1 or 2 minute delay between this relay contact action and the actual load control receiver. This delay coincides with various blower purge functions.

Remotely Located Standby Override Switch
On the bottom of the board is an "SBSW" tab. Using an external switch between this "SBSW" tab and a common tab provides the same function as the front override switch. Whichever switch is in the up or override position takes priority. In other words, they **both** need to be in the down position during **cooling**.

> **Note**: All override switches (front panel and any options) must be in normal or electric position during cooling.

Field Setup or Programming

It is extremely important the installer properly goes through this section and sets up the various switches to match the installation.

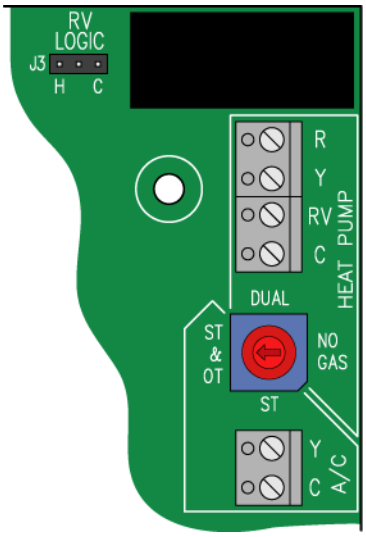
> **Warning**: Power-down reset required whenever changing any of the switch positions on the back side of the board.

HP Reversing Valve Logic
Since this control board creates the reversing valve control wire for the heat pump, it is important the installer select the required logic for the heat pump installed. The control board top has a peg jumper and

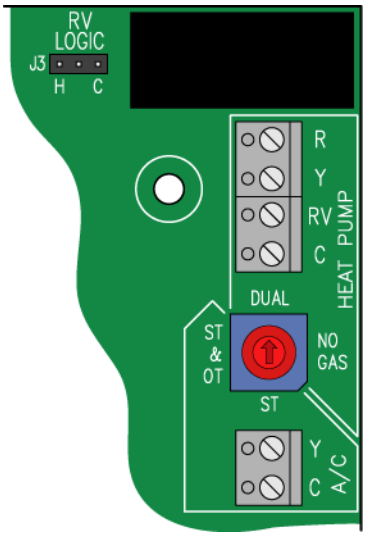
three pins. When the jumper is in the "C" position the heat pump O wire is high during cooling. If there is a requirement for high during heating, move jumper to the H position.

Select Configuration or Hardware Mode

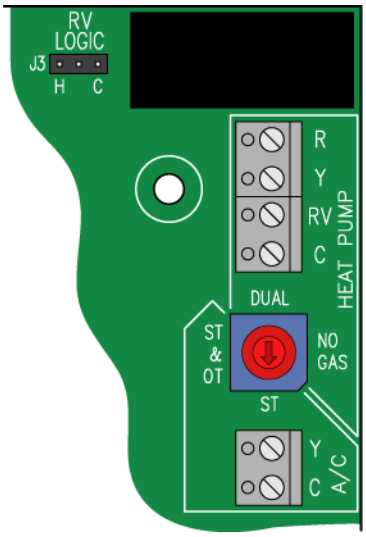
A/C only – ST & OT



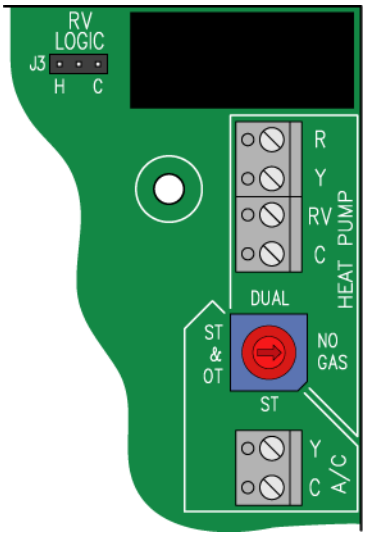
Heat Pump – Dual



A/C only – ST



Heat Pump – No gas furnace, max. electric



Important

Located on the WF+ board is a firmware chip that, along with the position of the application selection dial, determines a specific set of defaults. However, this can be programmed (altered) with optional plug-in WarmFlo Analyzer (WF-ANZ7).

⚠ WARNING

ADJUSTING THE APPLICATION SELECTION DIAL WILL ERASE ALL SPECIAL PROGRAMMING CHANGES.

Switchover Temperature (SW OVER)
Select the temperature where the unit will terminate the heat pump. The electric section will continue to be used below the selected temperature. Using the WF-ANZ7, special programming can terminate both to allow total gas operation below ODT temp. The table relating to heat loss house size and location may help.

Ø = Disabled, no ODT switch-over
1 = -15°F
2 = -10°F
3 = 0°F
4 = 5°F
5 = 10°F
6 = 20°F
7 = 30°F

Factory set on #3.

Heat Loss	Minneapolis		Bismarck		Denver		DesMoines		Akron	
	HP	Non-HP	HP	Non-HP	HP	Non-HP	HP	Non-HP	HP	Non-HP
65,000	+5	③	+10	③	+10	③	+5	③	+10	③
55,000	0	+15	0	+10	+5	+20	0	+15	+5	+20
45,000	-10	+5	-10	0	0	+10	-10	+5	0	+10
35,000	-15	-10	-15	-15	-15	0	-15	-10	-15	0

Comment: For minimal gas use, suggest one setting colder than above.

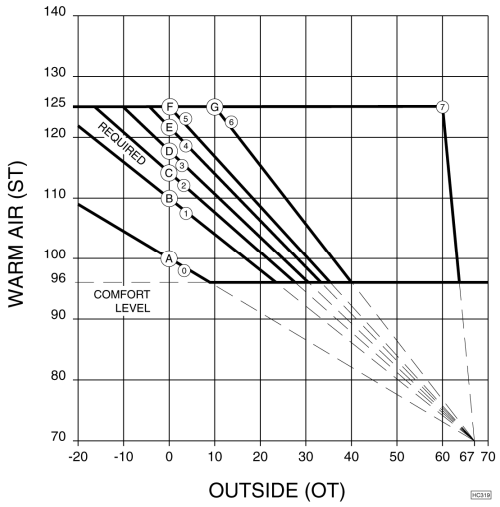
Minimum Warm Air
This dial switch sets a "floor" or minimum operating temperature level. The supply temperature will never go below this point independent of outdoor temperature, heat pump output, etc.

0 = 90
1 = 92
2 = 94
3 = 96
4 = 98
5 = 100
6 = 102
7 = 104

Factory set on #3.

Comment: Suggest 94 or 96 for heat pump but probably 102 for non-heat pump.

Temperature (Efficiency Dial)
Located on the front cover is a red screwdriver adjustment dial with selection A through G. These A through G selections represent a supply temperature point at 0° outdoor. The closer the user or installer selection is to A, the flatter the heat loss curve or the higher the operating efficiency. The closer a selected setting is to G, the steeper the heat loss curve or the lower overall heat pump system efficiency. If the knob is turned to "full", the controller DT is set at its maximum or 125°. It will bring in stages or electric elements as required to run at the "flat" or 125° point. This does **not** necessarily mean all stages are on or this is not the same as the "E" input tab. If there is not adequate airflow for the capacity of the unit and the 125° is reached before all stages or all modulation is on, it will simply operate at that point (see E input staging override paragraph under Troubleshooting section).



Heat loss curve – within the "brain" of the WarmFlo+ controller is a relationship of supply temperature (ST) to outdoor temperature (OT) measurement. As it gets colder outside, the higher the supply temperature in order to properly overcome the heat loss within the structure. This is the diagonal line between 67° outdoor and maximum Btuh (heat loss) at the coldest outdoor temperature. The slope of this line or the exact warm air position at the coldest temperature is established by the "efficiency" adjustment knob or dial.

Operation Indicators

Front Panel LED's

- **Hi-limit** – when the hi-limit probe (automatic reset or manual reset) opens this top red LED is on. The electric elements will be interrupted via a safety relay circuit whenever this HL LED is illuminated.
- **PWR ON** – indicates good fuse and 24-volt power source from the furnace terminal block.
- **EL mode** – this illuminates during electric heat function. In some ways this can be a utility load control indicator, but there are additional programmable functions which cause this unit to go to standby (see list in the Troubleshooting section).
- **HP/AC call** – the output "Y" screw terminal is active at 24 volts high. The outdoor unit should be on and running. This LED will be off when the OT sensor is below the setup ODT value.
- **T-stat call** – the room thermostat Y or E is active or 24 volts high.
- **Gas call** – the furnace "W" or terminal block feeding fan center W is 24 volts high.

Override Switch – the front panel slide switch (very similar to standard Electro-Mate DFC) is a direct hardware disabling of any WarmFlo and electric elements functions. The room thermostat heat call wire or function is directly controlling the fossil fuel or gas furnace. This function can also be on a remote switch, see previous statement for "SBSW" tab.

⚠ WARNING

THIS FRONT PANEL MANUAL OVERRIDE SWITCH IS A HARDWARE DIRECT TO GAS FURNACE FUNCTION. THUS THERE ARE NO BLOWER PURGE CYCLES. IF THE ELECTRIC ELEMENTS ARE ON AND HOT WHEN SWITCHING TO OVERRIDE AND IMMEDIATELY ALLOWING THE GAS FURNACE, OVERHEAT ON THE ELECTRIC ELEMENTS AND POTENTIAL ELECTRO-MATE MANUAL RESET IS POSSIBLE. THIS FRONT PANEL OVERRIDE SWITCH SHOULD ONLY BE ACTIVATED WHEN THERE IS NOT A ROOMSTAT HEAT CALL.

Note: This switch must be in the normal position during cooling.

Strip Heat Disable – To maximize heat pump system energy efficiency and preventing "accidental" unnecessary resistant strip heat when it is not required, this WarmFlo II disables or locks out strip heat elements based upon outdoor temperature.

Non-Heat Pump	Heat Pump
Stage 1 - 90°F	Stage 1 - 50°F
Stage 2 - 38°F	Stage 2 - 38°F
Stage 3 - 36°F	Stage 3 - 36°F
Stage 4 - 34°	Stage 4 - 34°

Sensor Monitor Indicators – in addition to using WarmFlo Analyzer or WarmFlo PC software to readout the temperature sensors, there is a built-in go/no-go type monitor visible on the green PWR ON second from the top LED.

- If there is detection of miss-wired or totally inoperative sensor, this LED has a blinking or pulse mode. By checking the pulsing pattern, the appropriate sensor can be identified.
- OT sensor - 100 ms blink every second
- ST sensor - two, 100 ms blinks every second
- Both bad - ½ second on, ½ second off, alternating.

Inside Power Supply Converter Board (top center inside cabinet) – the LED is illuminated whenever there is a T-call and the power supply is in correct, working order.

Stat Override Timer (SOT)

This is a field option internal timer which can be field programmed with WF analyzer to select a roomstat cycle run time. If this downloaded run time is exceeded before the thermostat is satisfied, the system automatically switches to either full electric elements or standby.

- SOT S – this is the longer set timer which allows transfer to standby if something might have happened to the electric system unmonitored (typically 90 minutes).
- SOT E – this must be shorter time than above, is typically used to overcome morning setback pickup issues. In other words, if you would field download 20 minutes and you program the setback stat to begin bringing up the temperature 20 minutes prior to the wakeup time; and the system is not at the new higher temperature at the 20-minute point it will automatically add stages (DT flat) in order to more rapidly raise the building temperature. However, this also means you will be "short cycling" the HP compressor during other heat calls. The maximum run time for the compressor is then about 20 minutes at any time of the day or at any particular heat call.

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.

See the enclosed "WarmFlo Information" document (HD320) for functional details.

Troubleshooting

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

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, use WarmFlo 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 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.

Override Staging, "E" Tab Input – during a normal roomstat heat call and E is jumpered to W, it brings on all four stages and essentially bypasses any temperature sensing or stage modulation functions. In other words, with an E input (still need the normal W stat input) this is simply a turn-on/turn-off device.

Heat pump application – with the E input the heat pump is still on and the user must have concern for adequate airflow when energizing all elements. E jumpered to W should never be considered a normal usage. This can be used during defrost, see previous hookup paragraph.

Operational Conditions, Forcing Standby – these conditions are also monitored by the front panel EL mode light being off.

1. Utility Load Control
2. SOT S timeout
3. MU timeout
4. OT below switchover set point - configuration mode setup dial switch also defines switchover function
5. Front override switch

Operational Conditions Which May Prevent Standby or Gas On

1. No call for heat - T-call LED is off
2. LED EL ON mode- utility is not controlling or front panel is not in override
3. Somehow stat terminal block Y is also energized or at 24 volts
4. Board K1 or K2 open/inoperative
5. Hang-up - power down, 10 seconds, power up

Operational Conditions Which May Prevent EL Stages On (No Stage LED's)

1. No call for heat - T-call LED is off
2. In standby mode, see previous section
3. Hang-up - power down, 10 seconds, power up

Conditions Which May Prevent Electric Elements On, With Staging LED's On

1. Mechanical hi-limit, front panel top LED on
2. Board K1 or K2 open/inoperative
3. Inoperative element relays
4. Inside AC to DC power supply board bad
5. Circuit breakers off
6. Burn 240 inside wires
7. Building power panel fusing or breakers

Outdoor Sensor (OT) Location – direct sunlight has a definite affect on sensor temperature reading. The outdoor sensor must be "shadowed" from direct sun rays.

Troubleshooting/Repair Helps

1. This WarmFlo+ 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+ controller is "acting strange", one immediate step would be power down reset. Simply turn off the 24-volt source power (probably furnace or air handler 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. The outdoor sensor must be located outdoors for this controller to correctly operate. Do not leave the outdoor sensor "hang in conditioned space" and attempt to run this system.
5. Acquiring the WarmFlo 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 controller. Either test set device can display all temperatures, real time evaluation of WarmFlo 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.

- OT sensor – approximately 1/10 second blip every ½ second
- ST sensor – two, 1/10 second blips every ½ second
- Both bad – ½ second on and ½ second off, alternating

Bad sensor, operating default condition – the detection of bad sensor forces the controller to a fixed stage operation.

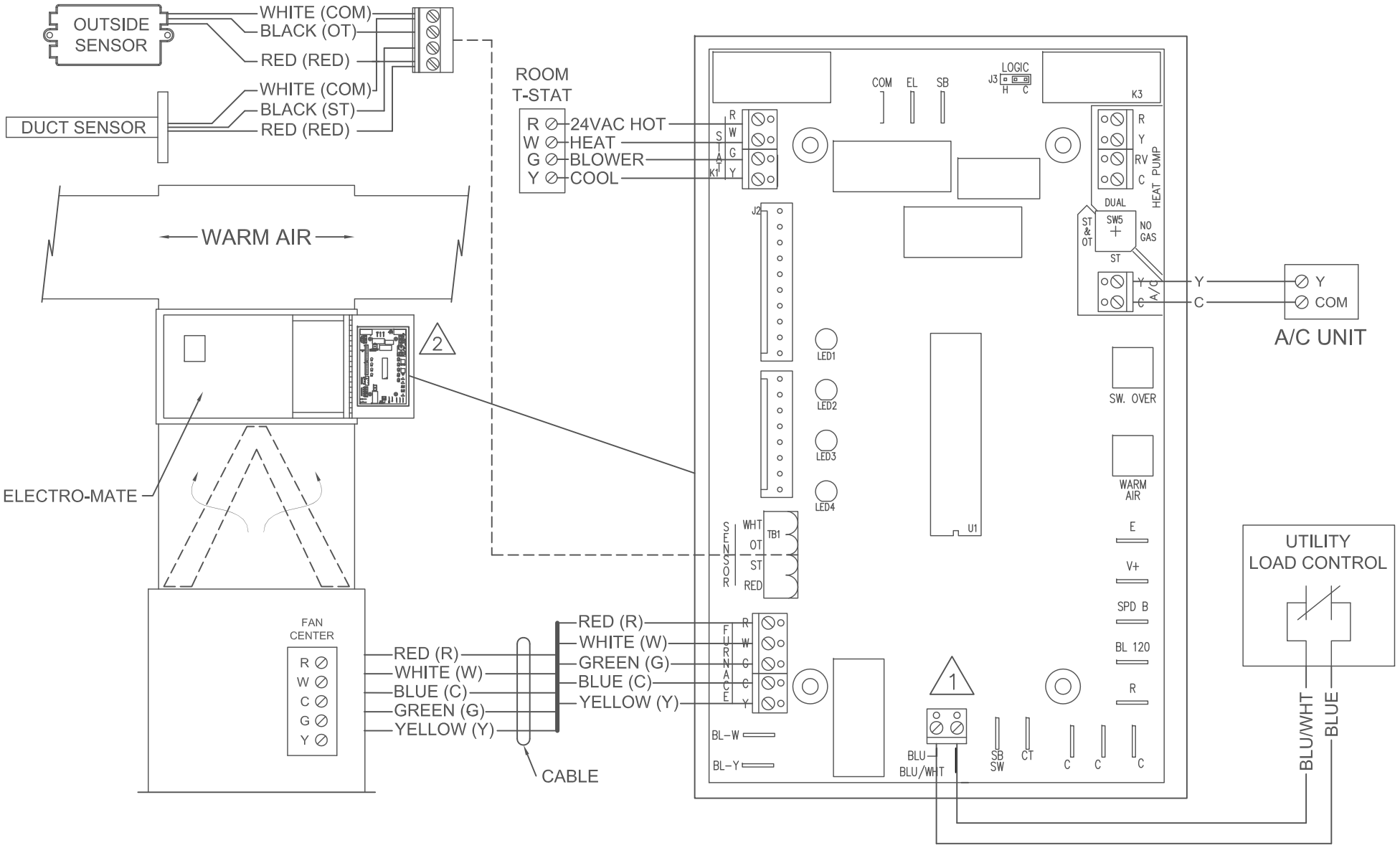
- OT sensor
  - Stages 1 and 2 on, stages 3 and 4 off (5 kW maximum)
  - If the switchover set point is 0° or less, will go directly to standby
  - The WF-ANZ screen reads “254”
- ST sensor
  - Stages 1 and 2 on, stages 3 and 4 off (5 kW maximum)
  - The WF-ANZ screen reads “254”

Bad sensor, could disable cooling – depending upon the ODT setting a bad sensor, even during cooling, can affect the ODT of the compressor and the compressor will be off. Temporary fix is to set the ODT dial to “0” position and get the sensor fixed. Verify with plug-in Analyzer and/or no blinking green LED.

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.

WARMFLO+ UPGRADE KIT-
AIR CONDITIONER HOOKUP

NOTES:
1. REMOVE BLUE JUMPER AND CONNECT TO UTLITY CONTROL RECEIVER. IF NOT USED, KEEP BLUE JUMPER IN PLACE.
2. DO NOT CONNECT TO HP BLOCK.

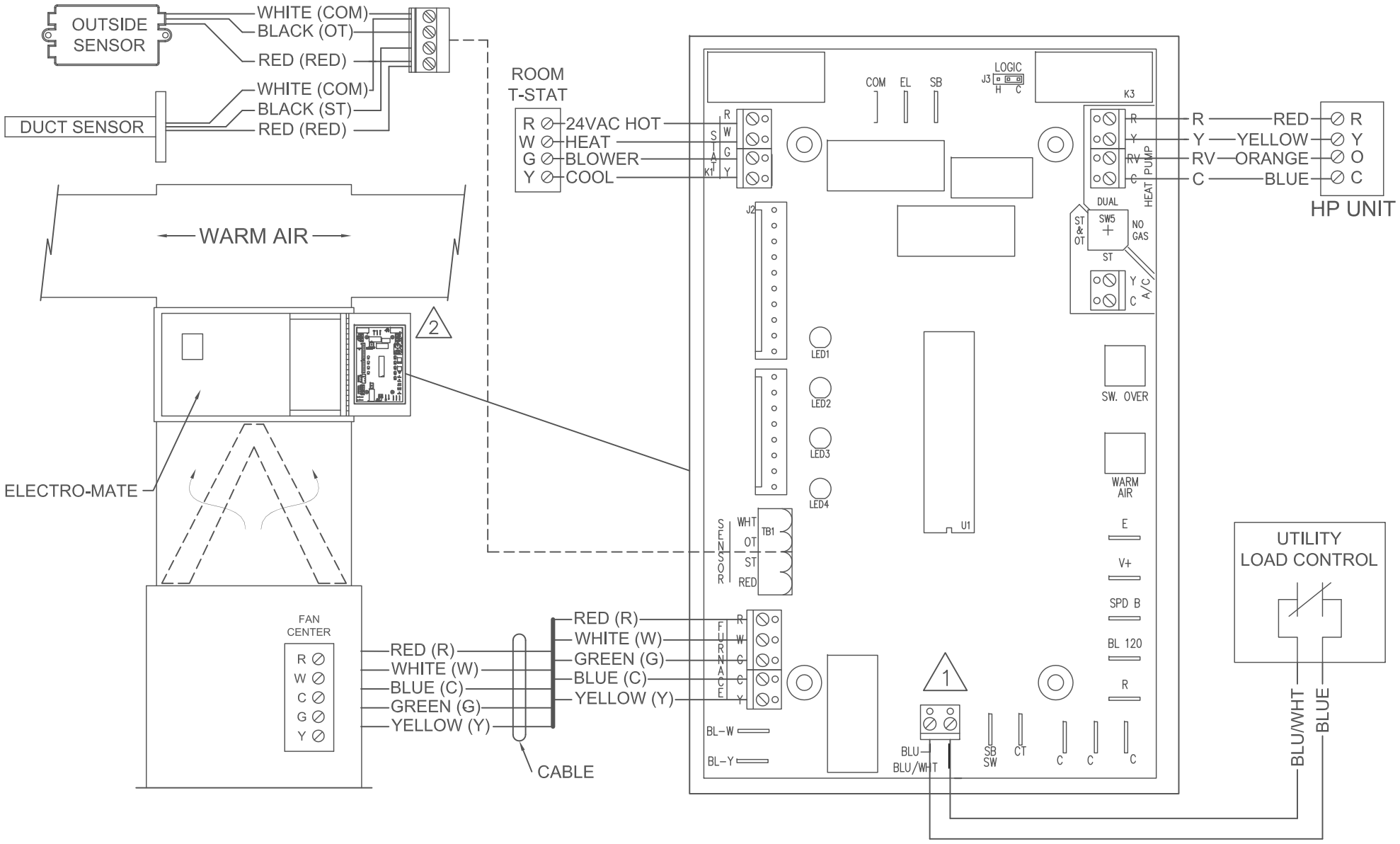


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EH812 P1
Rev A 8-23-2012

WARMFLO+ UPGRADE KIT-
HEAT PUMP HOOKUP

NOTES:
1. REMOVE BLUE JUMPER AND CONNECT TO UTLITY CONTROL RECEIVER. IF NOT USED, KEEP BLUE JUMPER IN PLACE.
2. DO NOT CONNECT TO A/C BLOCK.

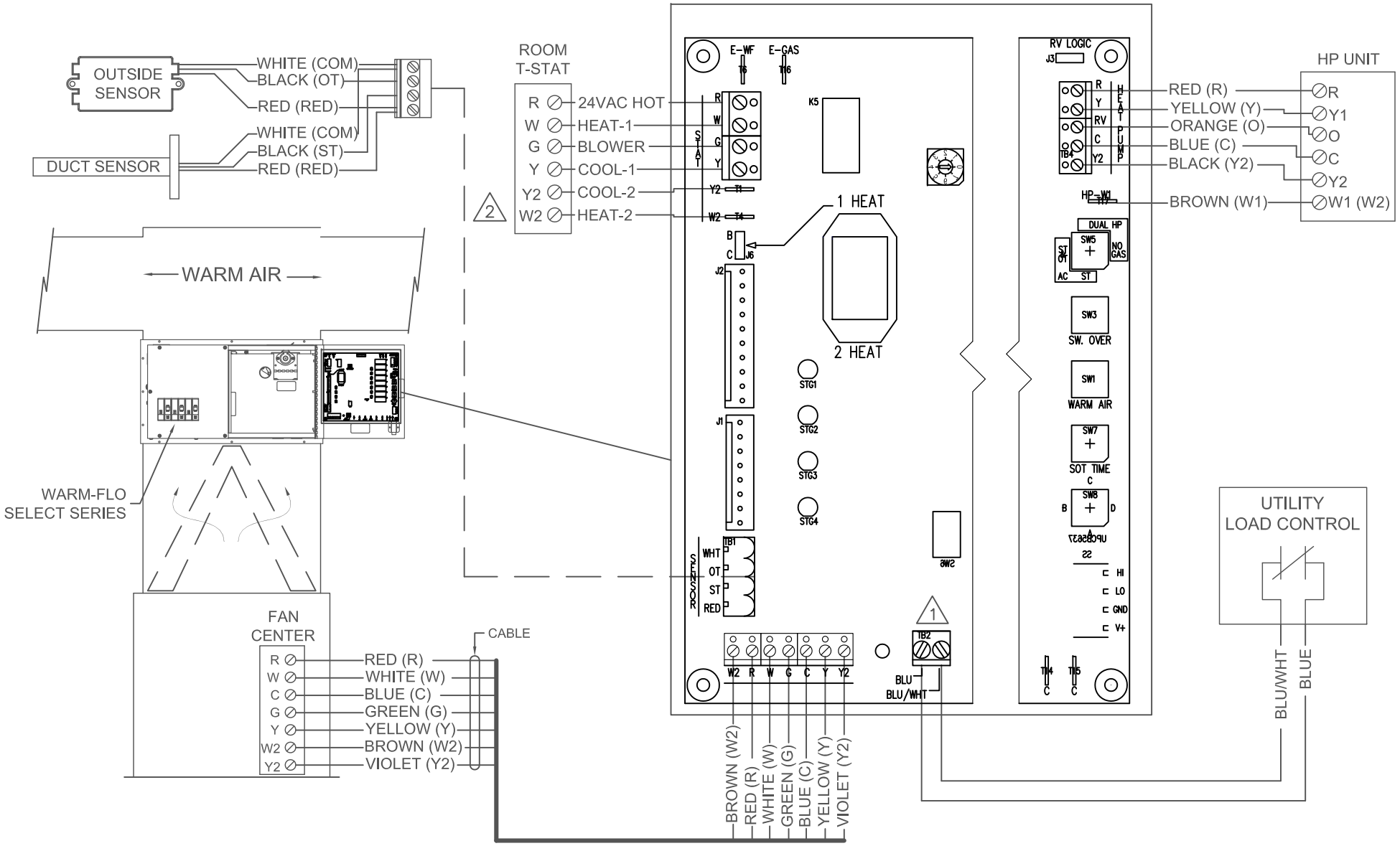


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EH812 P2
Rev A 8-23-2012

WARMFLO+ UPGRADE KIT-
HEAT PUMP HOOKUP

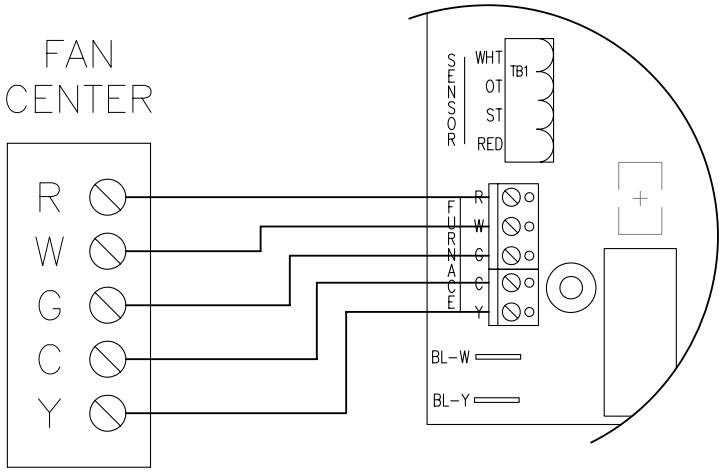
NOTES:
1. REMOVE BLUE JUMPER AND CONNECT TO UTLITY CONTROL RECEIVER. IF NOT USED, KEEP BLUE JUMPER IN PLACE.
2. SHOWN WITH 2H/2C CONVENTIONAL STAT, 1H/1C CAN BE USED, SEE INSTALL MANUAL.



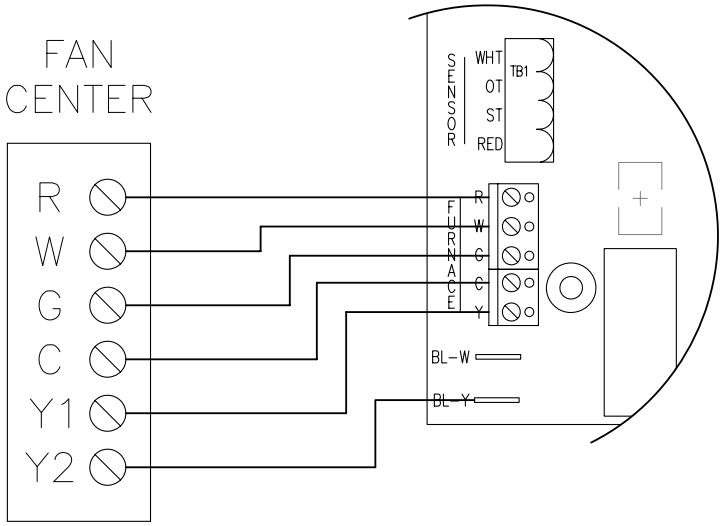
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WARMFLO+ UPGRADE KIT
VARIABLE-SPEED BLOWER OPTIONS

FURNACE – G & Y ONLY.

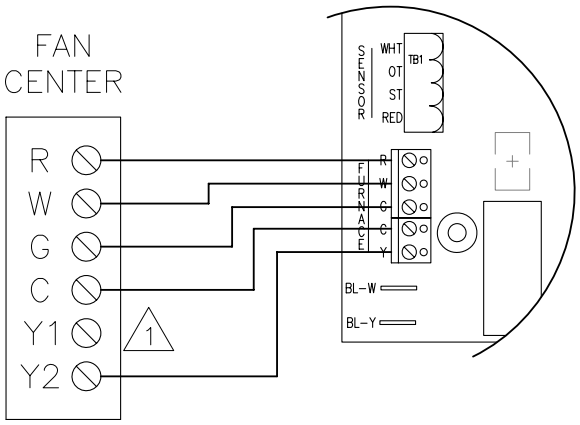


FURNACE – G, Y1, Y2
Y1 FOR HEAT, Y2 FOR COOL



WARMFLO+ UPGRADE KIT
VARIABLE-SPEED BLOWER OPTIONS

FURNACE – G, Y1, Y2
ALWAYS RUN IN HIGH SPEED

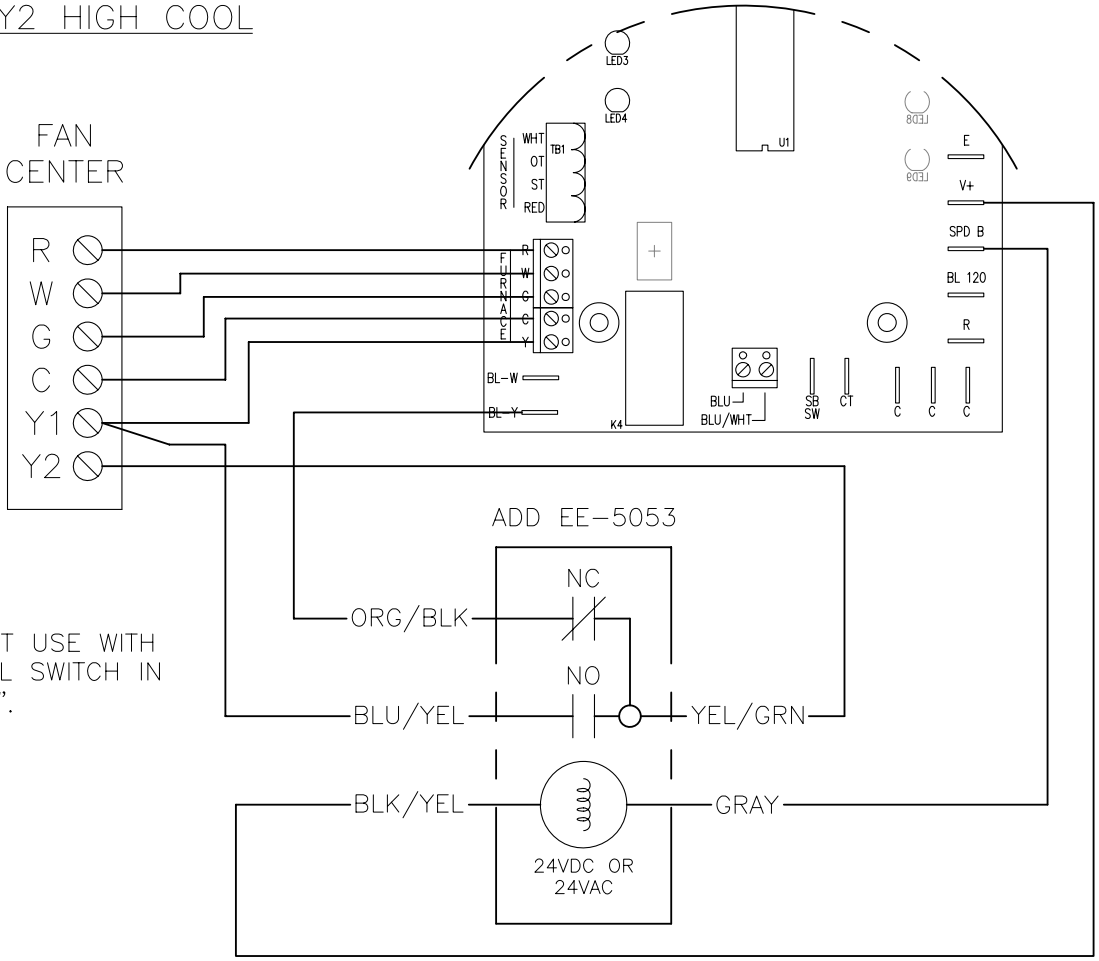


NOTES:

1. SOME FURNACES REQUIRE Y1 WITH Y2. IF THIS IS YOUR CASE, JUMPER AS REQUIRED.

1

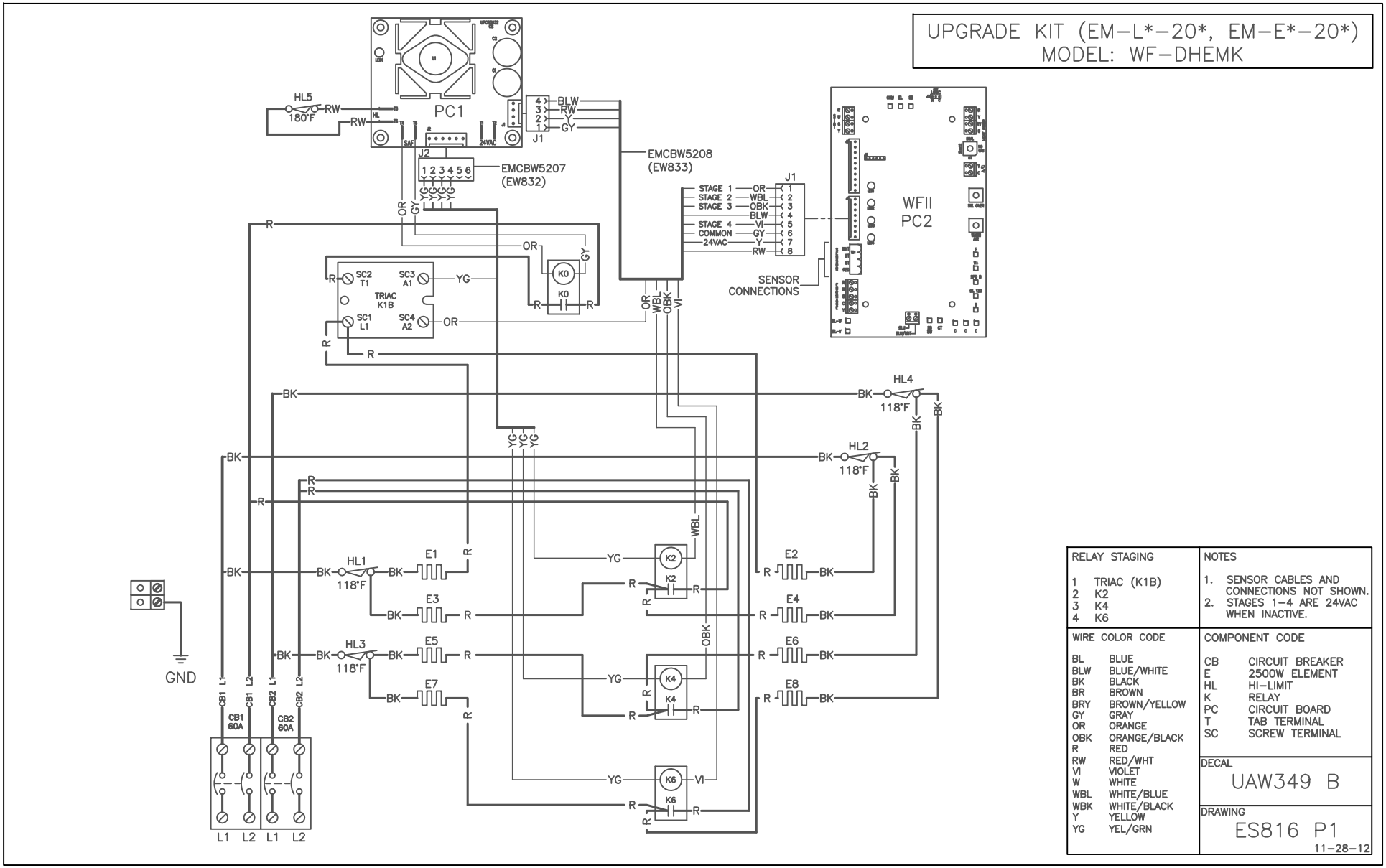
FURNACE – G, Y1, Y2
Y1 LOW HEAT
Y2 WF ST>105 OT<30
Y2 HIGH COOL



NOTES:

1. DO NOT USE WITH MODE DIAL SWITCH IN "ST ONLY".

WARMFLO+ EM Upgrade Kit WF-DHEMK



RELAY STAGING	
1	TRIAC (K1B)
2	K2
3	K4
4	K6

WIRE COLOR CODE	
BL	BLUE
BLW	BLUE/WHITE
BK	BLACK
BR	BROWN
BRY	BROWN/YELLOW
GY	GRAY
OR	ORANGE
OBK	ORANGE/BLACK
R	RED
RW	RED/WHT
VI	VIOLET
W	WHITE
WBL	WHITE/BLUE
WBK	WHITE/BLACK
Y	YELLOW
YG	YEL/GRN

NOTES

1. SENSOR CABLES AND CONNECTIONS NOT SHOWN.
2. STAGES 1–4 ARE 24VAC WHEN INACTIVE.

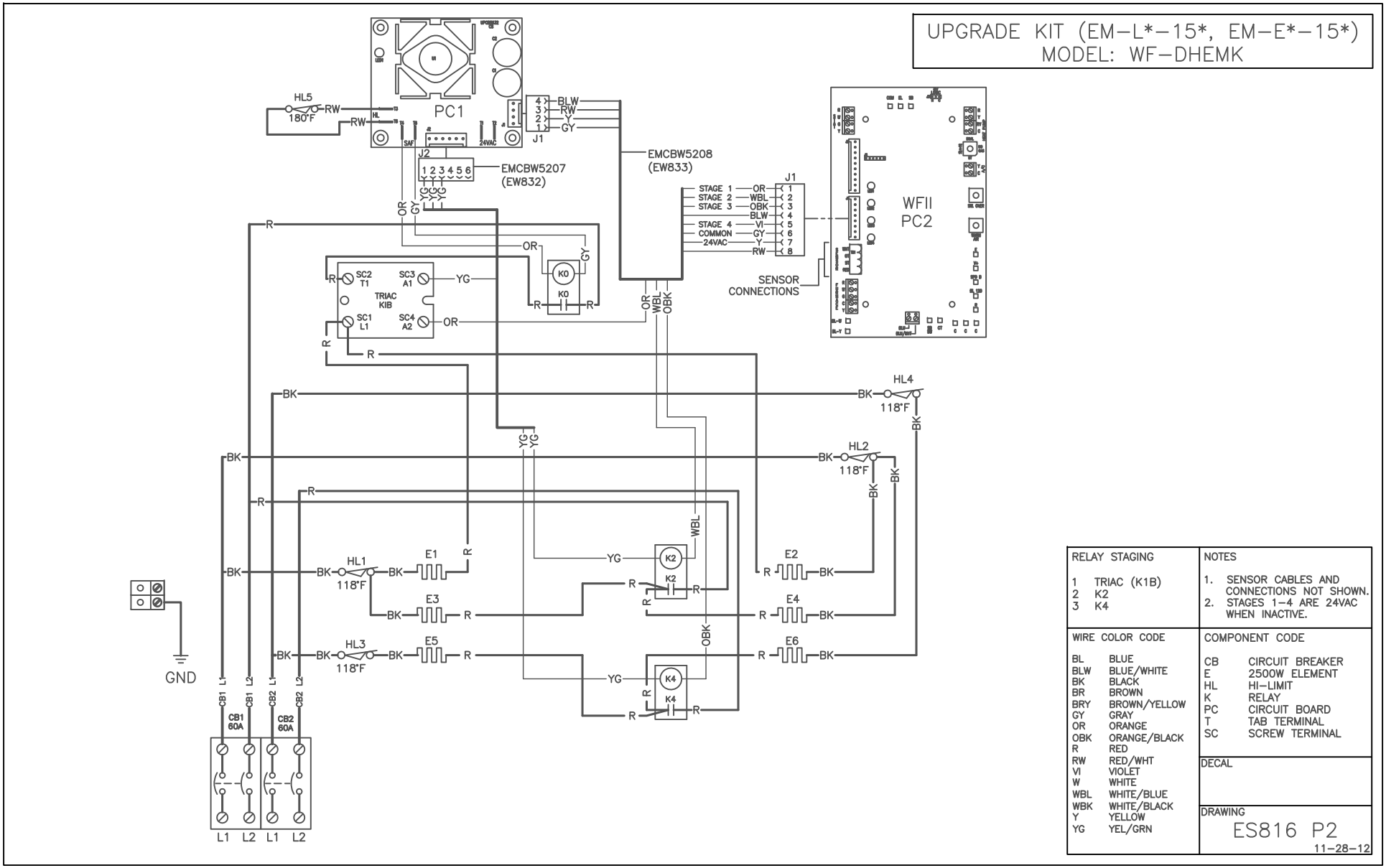
COMPONENT CODE	
CB	CIRCUIT BREAKER
E	2500W ELEMENT
HL	HI–LIMIT
K	RELAY
PC	CIRCUIT BOARD
T	TAB TERMINAL
SC	SCREW TERMINAL

DECAL
UAW349 B

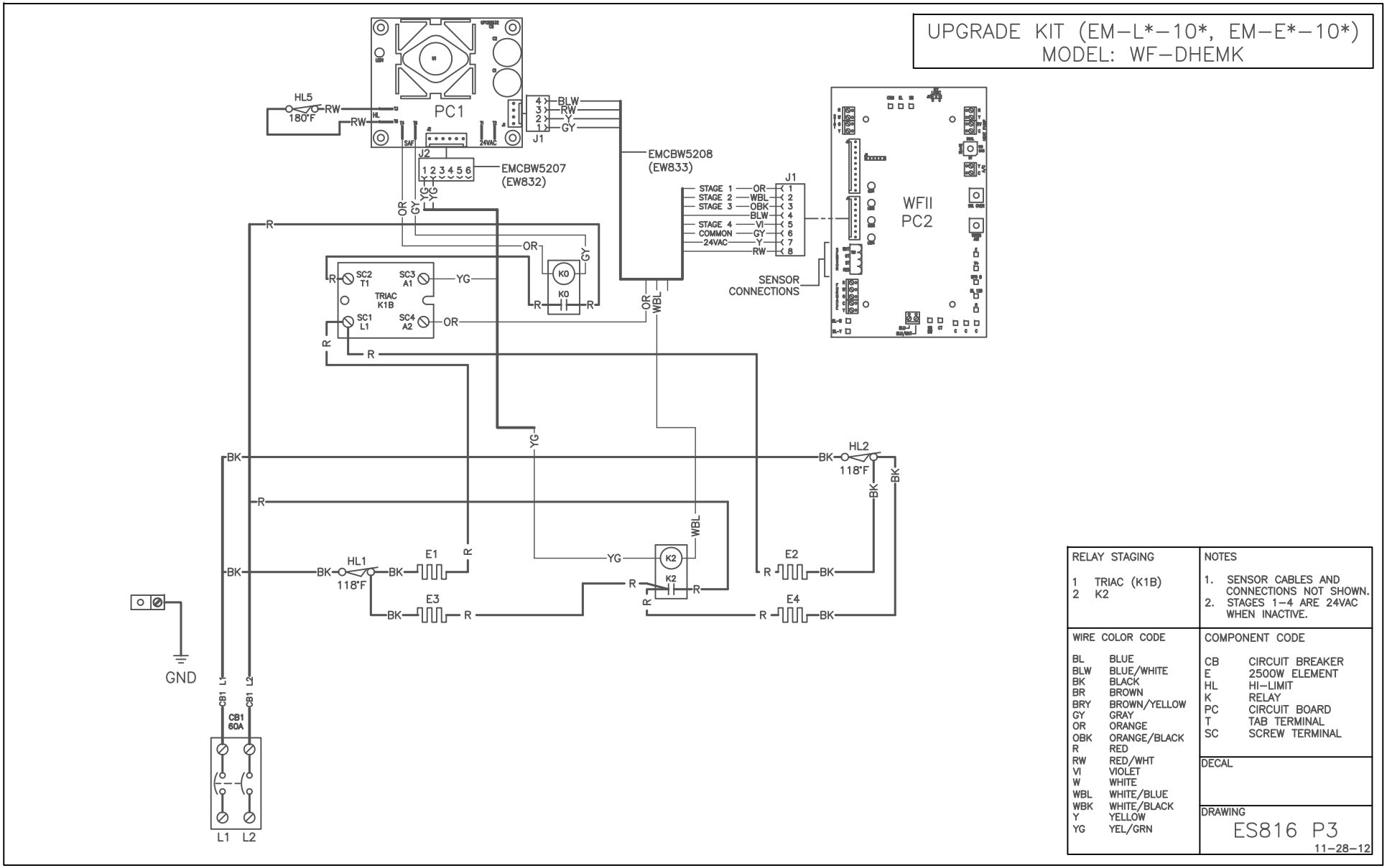
DRAWING
ES816 P1
11–28–12

ELECTRO INDUSTRIES, INC.
MONTICELLO, MN 55362

WARMFLO+ EM Upgrade Kit WF-DHEMK



WARMFLO+ EM Upgrade Kit WF-DHEMK



ELECTRO INDUSTRIES, INC.
MONTICELLO, MN 55362

Electro Industries Residential Limited Product Warranty

Effective November 1, 2009

Electro Industries 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 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 If any product or product parts manufactured by Electro Industries are found to have manufacturing defects in materials or workmanship, such will be repaired or replaced by Electro Industries Electro Industries, shall have the opportunity to directly, or through its authorized representative, examine and inspect the alleged defective product or product parts. Electro Industries may request that the materials be returned to Electro Industries 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 or its authorized representative.

Electro Industries 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 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 will replace them.

TWENTY YEAR (20) LIMITED WARRANTY ON SPIN FIN ELEMENTS

Electro Industries 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 will replace them.

FIVE YEAR (5) LIMITED WARRANTY ON OPEN WIRE ELEMENTS

Electro Industries 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 will replace them.

ELECTRO INDUSTRIES
Monticello, MN · 800.922.4138 · www.electromn.com

CONDITIONS AND LIMITATIONS:

1. This warranty is limited to residential, single family dwelling installations only. Any commercial or multi-unit dwelling installations fall under the Electro Industries Commercial Limited Product Warranty.
2. Electro Industries shall not be liable for performance related issues resulting from improper installation, improper sizing, improper duct or distribution system, or any other installation deficiencies.
3. 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 the date the product is shipped from the factory and **NOT** the date of original purchase.
4. The product must have been sold and installed by a licensed electrician, plumbing, or heating contractor.
5. 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, provincial and federal codes and statutes. If not, the warranty will be null and void.
6. 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.
7. All related heating components must be maintained in good operating condition.
8. All lines must be checked to confirm that all condensation drains properly from the unit.
9. Replacement of a product or product part under this limited warranty does not extend the warranty term or period.
10. 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.
11. 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.

THIS WARRANTY DOES NOT COVER:

1. Costs for labor for diagnosis, removal or reinstallation of an alleged defective product or product part, 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 or product part that has been damaged as a result of being improperly serviced or operated, including, but not limited to, the following: operated during construction phase, with insufficient water or air flow; allowed to freeze; subjected to flood conditions; subjected to improper voltages or power supplies; operated with air flow 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 or product part that has been damaged as a result of natural disasters, including, but not limited to, lightning, fire, earthquake, hurricanes, tornadoes or floods.
4. Any product or product part 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 or product part 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 or product part. This warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation.
7. Transportation charges for any replacement product, product part or component, service calls, normal maintenance; replacement of fuses, filters, refrigerant, etc.

THESE WARRANTIES DO NOT EXTEND TO ANYONE EXCEPT THE ORIGINAL PURCHASER AT RETAIL AND ONLY WHEN THE PRODUCT IS IN THE ORIGINAL INSTALLATION SITE. THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE.

ALL IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED WITH RESPECT TO ALL PURCHASERS OR OWNERS. ELECTRO INDUSTRIES IS NOT BOUND BY PROMISES MADE BY OTHERS BEYOND THE TERMS OF THESE WARRANTIES. FAILURE TO RETURN THE WARRANTY CARD SHALL HAVE NO EFFECT ON THE DISCLAIMER OF THESE IMPLIED WARRANTIES.

ALL EXPRESS WARRANTIES SHALL BE LIMITED TO THE DURATION OF THIS EXPRESS LIMITED WARRANTIES SET FORTH HEREIN AND EXCLUDE ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES RESULTING FROM THE BREACH THEREOF. SOME STATES OR PROVINCES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY. PRODUCTS OR PARTS OF OTHER MANUFACTURERS ATTACHED ARE SPECIFICALLY EXCLUDED FROM THE WARRANTY.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY HAVE OTHER RIGHTS WHICH VARY UNDER THE LAWS OF EACH STATE. IF ANY PROVISION OF THIS WARRANTY IS PROHIBITED OR INVALID UNDER APPLICABLE STATE OR PROVINCIAL LAW, THAT PROVISION SHALL BE INEFFECTIVE TO THE EXTENT OF THE PROHIBITION OR INVALIDITY WITHOUT INVALIDATING THE REMAINDER OF THE AFFECTED PROVISION OR THE OTHER PROVISIONS OF THIS WARRANTY.