

Dual Fuel – HP Controller

WF-DFHP2

Application

Two-stage or speed heat pump. This controller is used with split heat pump and gas furnace, without plenum heater or any resistance auxiliary unit. This provides all control and interface functions between the HP outdoor unit, room thermostat, utility load control device, temperature sensing outdoor and warm air delivery. The heat pump auxiliary or supplementary is any gas or oil furnace with standard fan center or wiring terminal block.

The furnace blower can be standard single speed or ECM variable speed. This controller interfaces with the G (low), Y1 (medium), and Y2 (high) terminals on the furnace.

Features

- Must use **conventional**, heat/cool, 4-wire or 6-wire room thermostat
- Direct connection and interface to the air source heat pump
- Self-contained outdoor sensing balance point switchover
- Furnace blower – energize for HP, de-energize for gas
- Blower purge cycles when changing modes
- Standard Electro load control, blue wires function and interface
- Standard Electro front panel **override** switch
- Front panel LED's – POWER ON, ELECTRIC MODE, HP STAGE 1, HP STAGE 2, THERMOSTAT, GAS
- HP defrost, forces GAS (optional)
- Plenum warm air sensing with timeout delay (secondary switchover)
- Safety backup SOT-S switchover
- WF-ANZ* allows set point field changes

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

Drawings: **HH117**
HH350
XX017



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Installation

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, Inc., cannot be held responsible for field modifications, incorrect installations, and conditions which may bypass or compromise the built-in safety features and controls.

WARNING

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

Reference hookup drawing HH117.

The 24-volt source for the complete system is contained within the gas or oil furnace. In most cases 40VA transformer is considered minimum, verify 40VA is large enough for the specific heat pump to be connected.

Controller Mounting

1. Any convenient location (usually next to the furnace) between the outdoor unit, room thermostat, and furnace wiring block.
2. This controller is totally low voltage, class 2.
3. Except for the two sensors, all hookup cables or wiring must be field provided.

Temperature Sensors

Outdoor sensor (OT) – 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.

Duct Sensor (ST) – install in the warm air plenum, at least 12” above the heat pump coil. Locate to one side so the air coming through the coil passes over the sensor tip. The ST sensor does not have an end cap; the small black electronic part just within the tube end is the actual temperature sensor. It is desirable for the air coming out of the coil to pass as close as possible to the black tip without warm-up or dampening delay.

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 can 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.

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 (total).
- 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 WarmFlo board has a plug-in 4-place terminal block. Before disconnecting, you will notice two red wires are under the red screw and two white wires is 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 destruct damage may result.

Room Thermostat

NOTE

The installer must be familiar with the manufacturer's low voltage wiring terminology, screw terminal terminology/colors, etc. This manufacturer's terminology must be related to Electro Industries' screw terminal identification within this controller. The intent of this instruction manual is **not** to train each installer on the terminology related to the specific product you are installing.

1. This controller can only use **conventional, heat/cool, H/C or 2H/2C** room thermostat.
2. Route and connect basic stat cable between the mounted roomstat and the upper left terminal block.
3. Conventional, **1H/1C, 4-wire** – connect letter by letter or wire by wire – R, W, G, Y. This controller can perform all 2-stage heat pump and 2-stage gas burner functions and ECM variable speed blower with this simple thermostat. However, there are some conditions which need to be observed.
 - a. The 1HEAT/2HEAT switch must be in the 1HEAT position.
 - b. The cool/SOT dial switch on the board selects the run time before high speed or stage 2 cooling (see setup section).
 - c. Gas furnace W2 is setup with timer within the gas furnace option arrangements. Gas furnace W1 could also be jumpered to W2.
4. Conventional, **2H/2C, 6-wire** – connect letter by letter to screw terminals R, W, G, Y. Stat terminals W2 and Y2 connected to spade terminals W2 and Y2. This thermostat provides high speed cooling with cool second stage and high burner with heat second stage. 1HEAT/2HEAT is optional, see setup section for additional details.

HP Outdoor Unit

1. Typically this requires a 6-wire cable. Although only five are required for normal operation.
2. Minimum connections, route and connect the five wires from the upper right terminal block – R, Y1, Y2, RV (O), C – to same function wires or terminal screws in the outdoor unit.
3. Optional defrost direct control – connect the 6th wire from the bottom brown pigtail to a typical W1 or W2 wire on the outdoor unit which goes high **during defrost only**.

- a. Comment – the defrost tab input (brown pigtail) provides its voltage direct to the gas furnace W. Thus the gas furnace will immediately come on with 24 volts on this wire. The normal operation of this controller continues with an HP-Y OUT needed to continue the heat pump compressor during the defrost cycle. **Do not use “E” for defrost.** This controller’s program also masks out any supply or plenum temperature sensing and restarts MU when the voltage on this brown wire goes to 0.
- b. It is the heat pump outdoor unit logic or manufacturers responsibility to drop this wire to 0 volts at the end of defrost **and** any other condition where defrost is interrupted, short cycles, lost, etc. A typical example – if the room thermostat is satisfied or in the middle of defrost or a utility load control interrupts HP-Y, this brown wire must go to 0 to make sure the gas furnace is not “hard on” and overheats or damages the building.

Furnace Fan Center or Wiring Strip

1. Typically a 4 or 6-wire cable is required.
2. Route and connect the minimum 4 wires – R, W, C, G – from the bottom left terminal block to the furnace wiring strip.
3. Furnace second stage, W2 – the following represents different arrangements and decision whether W2 should be used:
 - a. Conventional, 1H/1C roomstat and 1HEAT – W2 or furnace second stage must be handled within the furnace itself.
 - b. Conventional, 2H/2C roomstat and 1HEAT – add W2 wire.
 - c. Conventional, 2H/2C roomstat and 2HEAT – add W2 wire.
4. If this is an ECM variable speed blower there is a requirement to bring the blower to a higher speed during heat pump operation. When connecting G, Y, Y2 to the furnace this controller typically operates the blower at proper speeds for the proper heat pump mode. See next two pages, B/C peg jumper and WarmFlo temperature sensing blower speed control.
 - a. If your furnace does not have a Y2 terminal, omit this wire but the furnace Y function must be set for a proper required CFM when the heat pump is in its high speed or stage 2 mode.

Installation Setup

Switchover dial – this inside dial setting determines the lowest outdoor temperature heat pump operation. If warm air sensing is used, there may be operating times when the heat pump is terminated and the gas furnace is used above this setting.

| SW OVER Dial | |
|--------------|---------|
| 0 = 10° | 4 = 30° |
| 1 = 15° | 5 = 35° |
| 2 = 20° | 6 = 40° |
| 3 = 25° | 7 = 45° |

Factory default – #3

Warm Air Sensing Control – this is active only with temperatures **above switchover** and if the duct sensor is connected and installed.

See page 7 bottom, explaining this operation.

| Warm Air Dial | |
|---------------|----------|
| 0 = Disable | 4 = 98° |
| 1 = 92° | 5 = 100° |
| 2 = 94° | 6 = 102° |
| 3 = 96° | 7 = 104° |

Factory default – #3

Note: ST sensor must remain installed on the WF-DFHP2 board regardless if it has been disabled or not.

RV Logic Selection – on the inside top of the control board are three pins with a peg jumper. This jumper must be in place and in a position over the H or C depending upon whether the RV wire should be high during heating or cooling. Comment – the majority of the heat pump manufacturers’ products are high during cooling; therefore, factory default = C.

Cool SOT dial switch – this allows a run time setting, starting at the Y input, for supplying the Y2 controlled to the heat pump. When installing with 1H/1C roomstat, this is the primary method for engaging full cooling output. If installing with a 2H/2C roomstat, suggest setting this dial switch at its maximum position or 120 minutes.

| Cool SOT | |
|-------------|--------------|
| 0 = 30 min. | 2 = 90 min. |
| 1 = 60 min. | 3 = 120 min. |

Factory default – #2

1HEAT/2HEAT switch – typically the Electro recommended or default position is 1HEAT.

- **1HEAT, heating** – the basic W input always provides a Y1 and a Y2 to the heat pump (full output on any call for heat). The optional W2 terminal is connected directly to the furnace W2 terminal (during standby only).
- **1HEAT, cooling** – the Y terminal activates heat pump Y1 only (with the appropriate furnace G and Y). The heat pump Y2 is activated with the SOT timeout and/or stat Y2 tab (furnace Y2 is activated based upon B/C jumper).
- **2HEAT, heating** – the basic W1 provides a Y1 to the heat pump. Stat W2 provides Y2 to the heat pump. The optional W2 terminal is connected directly to the furnace W2 terminal (during standby only). MU timer starts with HP-Y2 (not basic W1 input).
- **2HEAT, cooling** – the Y terminal activates heat pump Y1 only (with the appropriate furnace G and Y). The heat pump Y2 is activated with the SOT timeout and/or stat Y2 tab (furnace Y2 is activated based upon B/C jumper).

B/C peg jumper (J2) – this applies to 1HEAT **only** – factory default, B position.

- B – HP-Y1 and HP-Y2 are direct to furnace Y1 and Y2.
- C – Reference WarmFlo spd. B function – if the ST is less than spd. B setup temp and OT is above setup temp, ECM blower is at Y1 speed. When spd. B is active HP-Y2 goes to furnace Y2.
- See next page, option – WarmFlo blower speed.

WarmFlo Analyzer or PC Software – see Troubleshooting section, there are six variables which can be accessed via the normal WarmFlo Analyzer plug-in port.

Additional Hookup

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”. Another choice is basic fan relay and ordering EE-5053 relay for T and T. Accompanying HD001 instruction sheet has hookup details.

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 controller properly handles W1 which is the main control function for the furnace.

Defrost Make-Up Heat, Using Gas Furnace

If during hookup (reference page 3, HP unit, paragraph 3) the gas furnace defrost heat option was selected, the installer needs to have a concern on whether the gas furnace will overheat the refrigerant coil or have excessive heat build-up after defrost causing outdoor unit high pressure. If this is the case there is an optional 100° sensor which can be installed between the gas furnace and the bottom of the coil to make sure the gas furnace does not run too long on defrost causing compressor high pressure.

Order **sensor probe EM5713** and install between the gas furnace outlet and the indoor coil **inlet**.

This will require a 7/8" hole and simply inserting this probe into the gas furnace air stream. Using the two wires from this sensor, series connect between the outdoor unit W1 and this controller board brown wire (T5). In essence, this 100° sensor will open the W call to the gas furnace when the gas furnace outlet reaches 100°. The gas furnace blower should continue as normal in the defrost mode, because there is a continued call for heat.

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 electric mode position during **cooling**.

Notes:

1. All override switches (front panel and any options) must be in normal or electric position during cooling.
2. Do not change status of either switch during active heat call.

Special System Operation Concerns

Disable ST and Warm Air Dial function – if there is a desire to use only switchover dial selection (based upon outdoor temp, OT), set "Warm Air" dial to 0. **Note:** ST sensor must remain installed on the WF-DFHP2 board regardless if it has been disabled or not.

Variable Speed Furnace, ECM Blower Motor – as previously stated and normally configured the bottom left terminal block "Y" goes to 24 volts whenever the heat pump is running – either roomstat Y or W input (the W input has a 10-second turn on delay and 60-second off delay). If the furnace has a single Y or a Y1 representing its programmed top speed, this would be the normal connection.

Option, WarmFlo temperature sensing high speed blower control (1HEAT only) – if the furnace has a Y1 and a Y2 and there is a desire to use this option, the B/C jumper needs to be changed. Factory default is B; however, this default provides full blower directly associated with Y2 and in 1HEAT mode this means there will always be a full blower with a W call for heat.

For this option, move peg jumper to position C. This uses plenum temperature greater than 105° or outdoor temperature below 35° F for the WarmFlo controller to activate a function called SPD B.

- In this temperature sensing mode, when **not** in the SPD B mode there is no furnace Y2 output (ECM blower should be running in Y1 speed). The SPD B mode activates furnace Y2 (ECM motor should then be in Y2 speed or highest speed).
- Comment – if all is working correctly and normally configured heat pump, plenum temperatures less than 105° should be okay for the heat pump output. Temperatures below 35° outdoor additional CFM is required to "heat the building". Thus with these two conditions (ST > 105° F or OT < 35° F) high speed blower is definitely needed. Additional heat pump comfort (higher plenum temperature or register temperature) may be a benefit if this option applies or is used.

Blower purge cycles – whenever there is a transfer from heat pump to standby, the furnace blower is on for 60 seconds, the furnace W is held off.

Whenever there is a transfer from standby to heat pump, the heat pump “Y” is held off for 3 minutes with the furnace “G” function active.

Rapid OT or ST temperature change – when either sensor real time value crosses a set point or threshold point during an active W input (heat call), there must be a completion of the heat call before the mode or temperature triggered condition changes the internal operation. Typical example – changing an OT temperature with Analyzer or ice or changing the switchover settings, cycle the room thermostat to send it to the opposite condition.

Stat override timer (SOT-S) – built into this controller is a programmed timer which begins at room thermostat heat call (W goes high). When this timer runs out, there is an automatic switchover to standby or gas. Any time during this set time there is an interrupt with a W input (or the end of heat call) the timer is terminated and again at 0.

The factory provided **default is 90 minutes**. This can be field changed with the WarmFlo Analyzer feature. A setup of “00” disables this function; however, this is not suggested.

Front Panel Monitor Lights

Top green – **POWER ON** – indicates 24-volt source, active. Also can blink if bad sensor.

Amber – **ELECTRIC MODE** – illuminated, conditioned for heat pump operation. Not illuminated, conditioned for gas furnace operation.

Note: The OT sensor (temperature) and override dial switch control this mode light independent of heat call.

Amber – **HP STAGE 1** – 24 volts at the upper right terminal block, Y1 screw.

Amber – **HP STAGE 2** – 24 volts at the upper right terminal block, Y2 screw.

Red – **THERMOSTAT** – room thermostat has 24 volts on either upper left W or Y.

Red – **GAS** – the lower left terminal block W screw has 24 volts.

Operational Sequence (1HEAT)

Below switchover point – the setting of SW OVER selects ODT value.

1. Each thermostat call – immediate gas, same as basic standby.

Above switchover – the SW OVER dial switch determines ODT, but ST can also cause GAS.

1. THERMOSTAT call – HP on, Y1 and Y2.
2. 10-minute delay (use MU set pt.) – begin ST monitor.
3. Use **warm air dial** setting to determine a new switchover point (DT).
4. If ST is above DT, no action, continue ST monitor.
5. If the ST is below DT for continuous 10 seconds, declare switchover to gas for the remainder of THERMOSTAT cycle.
6. Standard 1-minute blower purge cycle.

Options

1. Dial switch position 0 disables the above and HP/gas is only controlled by SW OVER setting.
Note: ST sensor must remain installed on the WF-DFHP2 board regardless if it has been disabled or not.

2. SOT-S is active for a long-term switch to gas.
3. E input, hardware switchover to GAS.

Front Panel Override Switch (Up)

1. Each thermostat call – immediate gas, same as basic standby.
Note: Do not change status of either switch during active heat call.

Utility Load Control – Standard Blue Wire Function.

1. Each thermostat call – immediate gas, same as basic standby (blower purge cycles apply).

HP Defrost

1. Outdoor unit W1 (or W2) connected to bottom right T5 tab (CT scrapped off) – decal “Defrost-W1”.
2. Immediate W1 connects its voltage to gas furnace – W.
3. HP-Y is still a stat function and remains high.
4. Gas furnace G remains high.
5. ST monitor is disabled, MU restarts.

Cooling – THERMOSTAT call – Y conditions heat pump reversing valve (depends upon RV logic jumper) and simply controls output Y. Standard Load Control interrupts compressor.

Troubleshooting

Additional 2HEAT mode comments – consider the following if setup is arranged for 2HEAT.

1. Warm air sensing control (MU) only applies after stat W2.
2. SOT-S switchover timing begins after stat W2.
3. There may be sequence conditions where HP-Y2 does not open during standby/load control. This assumes HP-Y1 is primary control wire.
4. B/C pin jumper relates to 1HEAT only.
5. Some sequence conditions continue until the end of heat call.

WarmFlo Analyzer, Field Setup Changes – normal WF-ANZ* or WarmFlo PC software allows the following field modifications. The column on the right is the factory default.

| | |
|--|------------|
| SOT-S (timer which begins at THERMOSTAT and switches to standby) | 90 minutes |
| MU (delay time before ST begins monitor) | 10 minutes |
| OT offset | 0 |
| ST offset | 0 |
| SPD B – ST | 105° |
| SPD B – OT | 20° |

E Tab Input – jumpering the E to W is the same as standby mode.

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.

- 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
 - Goes to 0°, same as forced standby
 - Analyzer screen reads “254” or “BAD”
- ST sensor
 - Same as above
 - Switchover dial has total control

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.

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. OT below switchover set point - configuration mode setup dial switch also defines switchover function
4. Front override switch
5. ST not above min warm set point and MU time

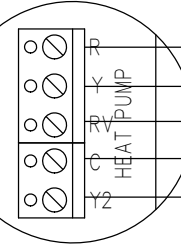
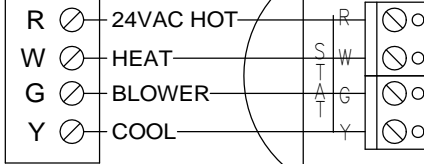
Operational Conditions Which May Prevent Standby or Gas On

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

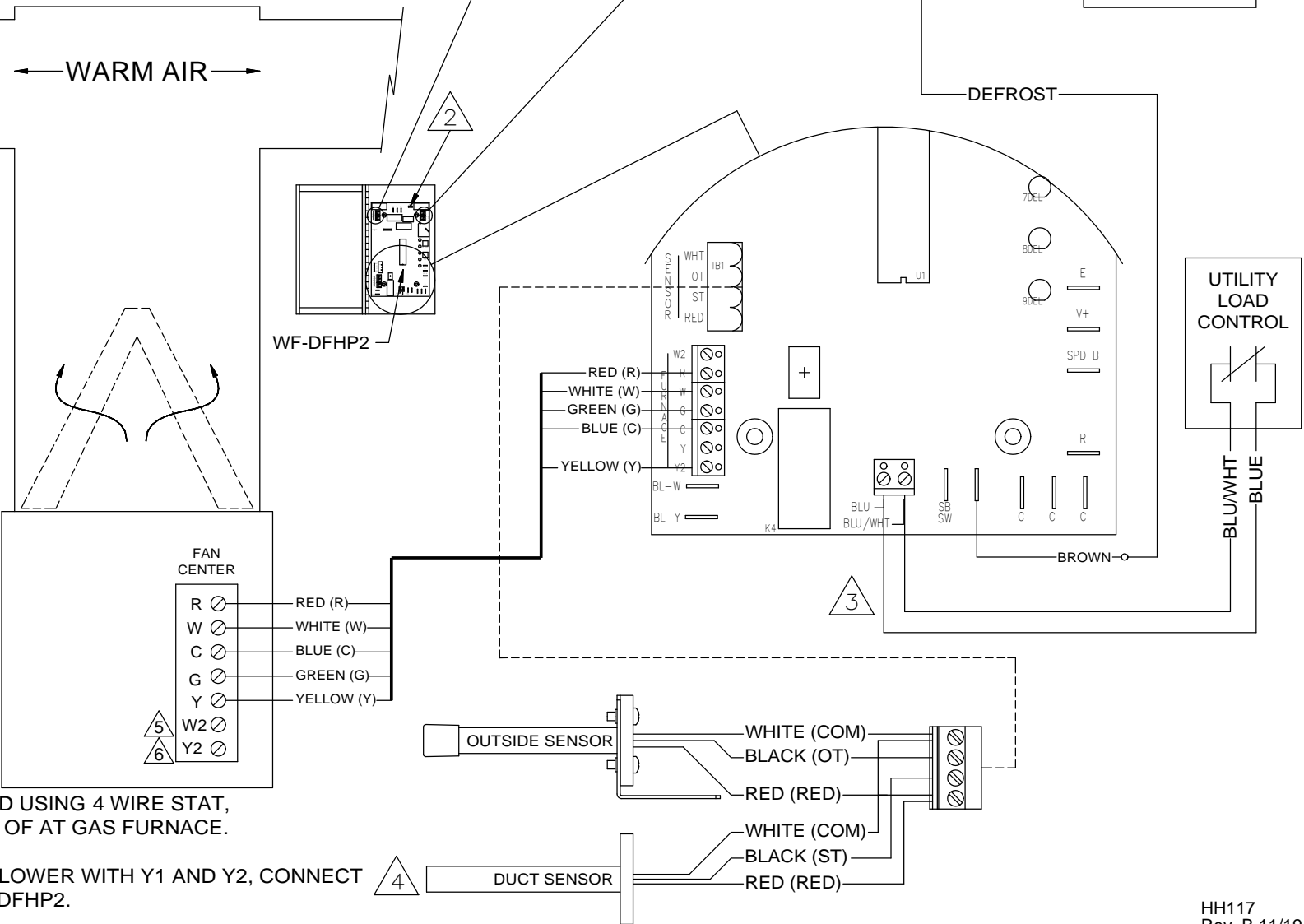
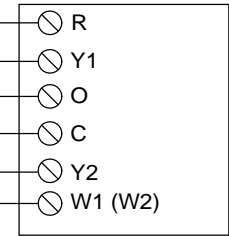
WF-DFHP2 HOOKUP

Conventional, 1H/1C, Four Wire

ROOM
T-STAT



HP UNIT



NOTES:

1. 24V SOURCE IS FAN CENTER, FUSED WITHIN WF-DFHP2, AS SHOWN POWERS ROOM STAT & HP.

2. SELECT RV LOGIC. JUMPER SETS "HI" ON RV WIRE.

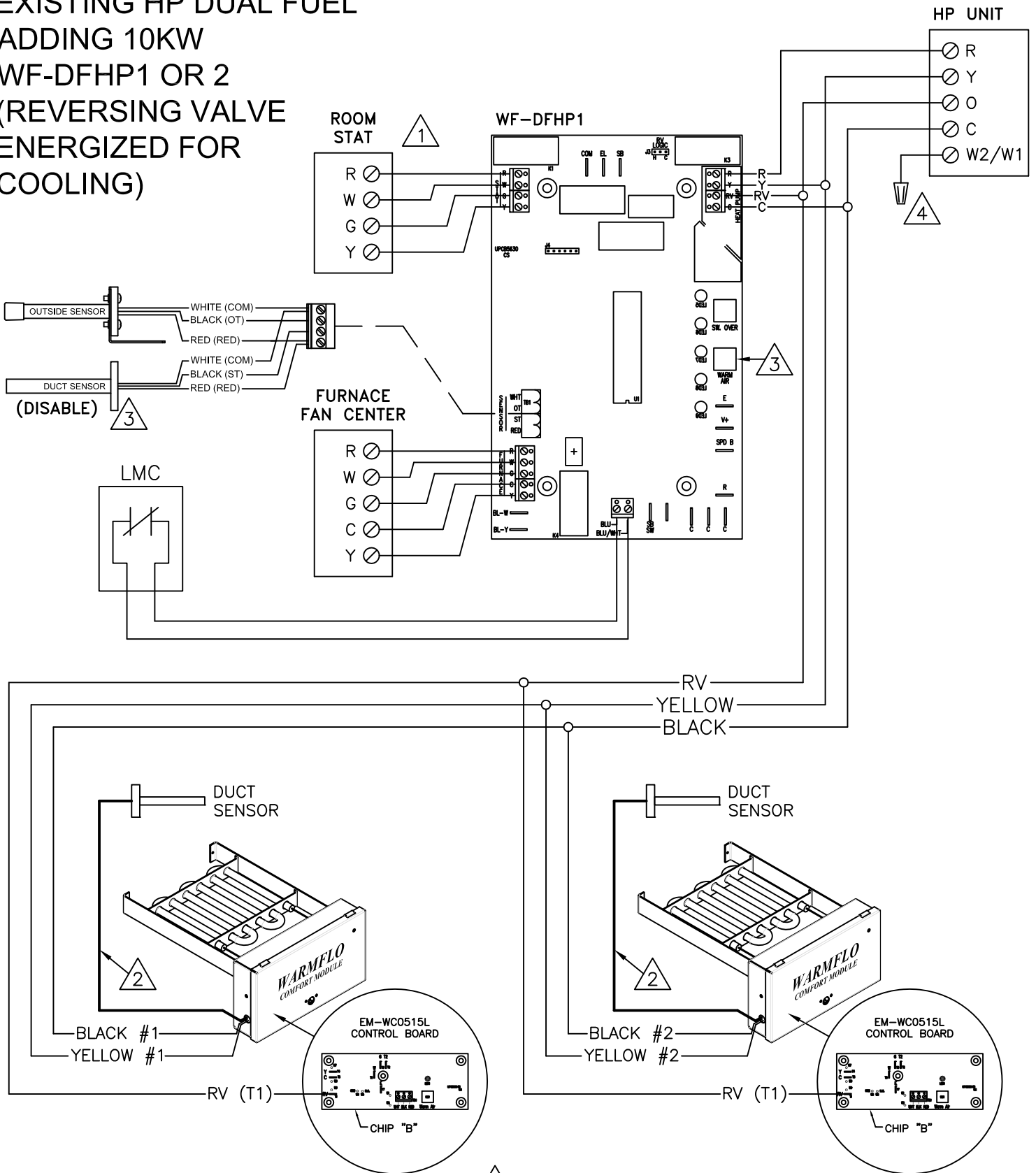
3. REMOVE BLUE JUMPER AND CONNECT TO UTILITY CONTROL RECEIVER. IF NOT USED, KEEP BLUE JUMPER IN PLACE.

4. DUCT SENSOR IS OPTIONAL, BUT REQUIRED FOR MIN. WARM AIR SETTING.

5. IF FURNACE HAS W2 AND USING 4 WIRE STAT, W2 MUST BE TAKEN CARE OF AT GAS FURNACE.

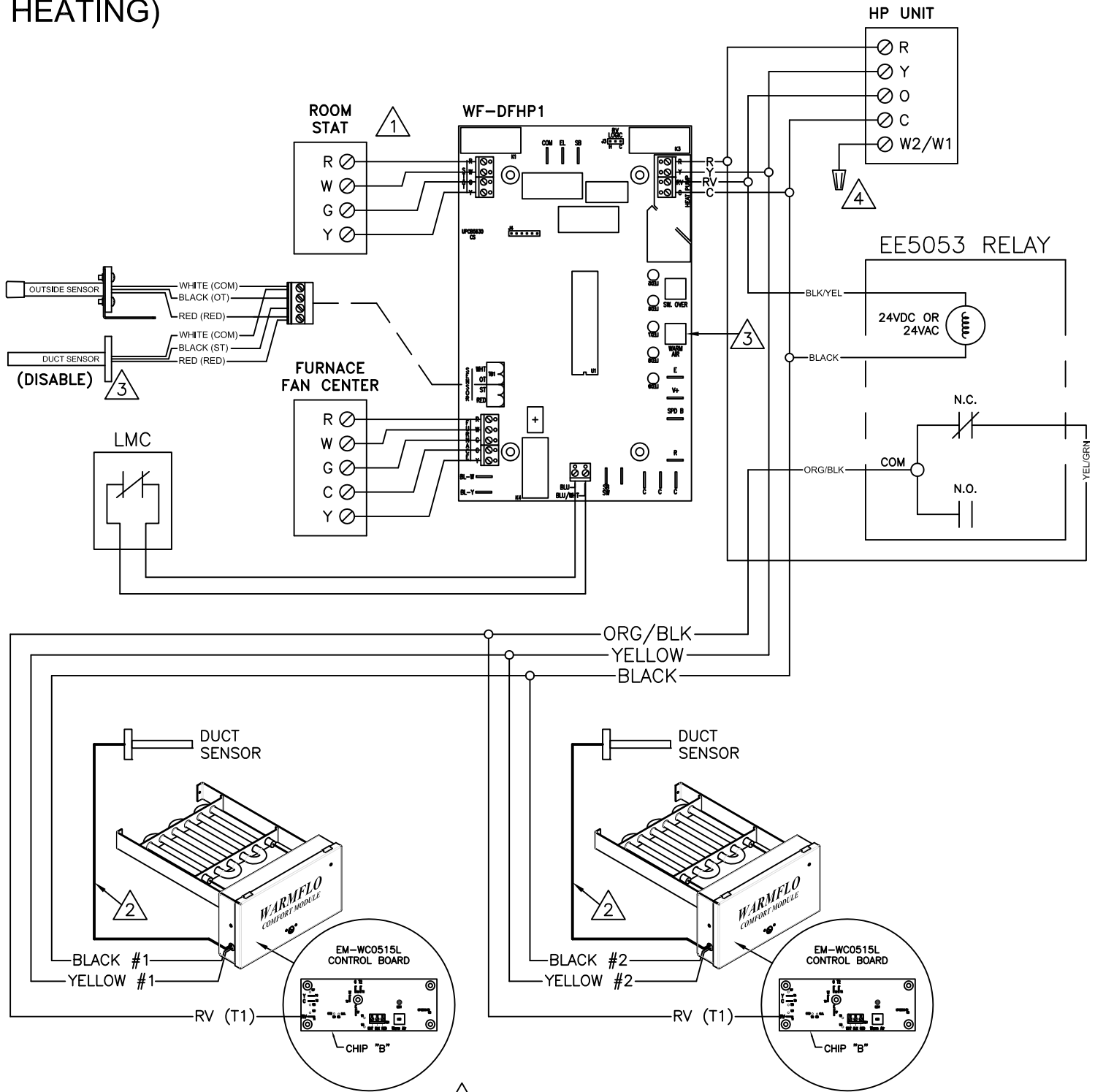
6. IF FURNACE HAS ECM BLOWER WITH Y1 AND Y2, CONNECT LETTER BY LETTER TO WF-DFHP2.

**EXISTING HP DUAL FUEL
 ADDING 10KW
 WF-DFHP1 OR 2
 (REVERSING VALVE
 ENERGIZED FOR
 COOLING)**



- 1 WF-DFHP1 CAN ONLY BE USED WITH BASIC H/C STAT (NOT HP STAT).
- 2 5-FOOT SENSOR CABLE
- 3 IN THIS APPLICATION, SET MIN. WARM AIR DIAL TO 0 (ZERO).
- 4 SUGGEST NO DEF CONNECTION WF SENSOR WILL TURN ON HEAT.

**EXISTING HP DUAL FUEL
 ADDING 10KW
 WF-DFHP1 OR 2
 (REVERSING VALVE ENERGIZED FOR
 HEATING)**



- ① WF-DFHP1 CAN ONLY BE USED WITH BASIC H/C STAT (NOT HP STAT).
- ② 5-FOOT SENSOR CABLE
- ③ IN THIS APPLICATION, SET MIN. WARM AIR DIAL TO 0 (ZERO).
- ④ SUGGEST NO DEF CONNECTION WF SENSOR WILL TURN ON HEAT.

Electro Industries, Inc.

Limited Product Warranty

Effective February 5, 2009

Electro Industries, Inc. warrants to the original owner, at the original installation site, for a period of two (2) years from date of installation, 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 the 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 reasonable labor costs to repair defective product or product parts for ninety (90) days after installation.

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 installation. 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, 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 installation. 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, 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 installation. If any open wire elements are found to have a manufacturing defect in materials or workmanship, Electro Industries will replace them.



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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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