



EEH2-0521
45W30-WG1163-01

EEH ELECTRIC HEATERS INSTALLATION MANUAL

GENERAL

The information on the following pages is to provide the installer the necessary information to properly install the SpacePak EEH Series electric heaters.

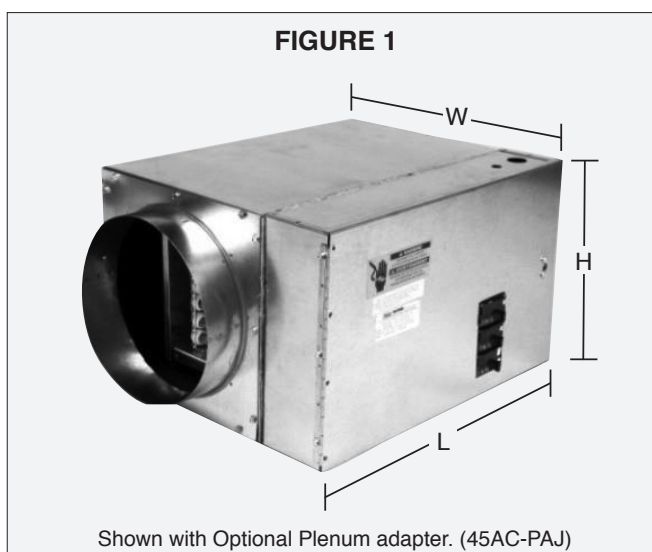
The electric heaters are designed to provide heating in a heat pump system. The model numbers, kW, and SpacePak match-ups are shown in the Table 1 below. See Table 1 and Figure 1 for dimensional information.

LOCATION AND MOUNTING

Before installing the heater, inspect the unit thoroughly for shipping damage. Check all porcelain insulators for any breaks and inspect the heater element wire to see that none have been deformed. Check the heating elements for loose connections that could cause overheating. If any shipping damage is found, notify the carrier immediately.

Install the heater by attaching it directly to the air handler using the adapter collar provided with the heater, as shown in Figure 2.

Position the unit so the arrow label on the cover of the electric heater control box is in the direction of the airflow.



AIR HANDLER MOUNTING INSTRUCTIONS:

Attach the adapter collar to the air handler centering the collar horizontally over the blower opening and flush with the bottom of the blower. Use #10 x 3/8" type AB sheet metal screws (field supplied).

TABLE 1: SPECIFICATIONS

| | Model | EEH-020 | EEH-050 | EEH-075 | EEH-100 | EEH-150 | EEH-200 |
|-------------------------|--|-------------------------|---------|---------|---------|-----------------|---------|
| Performance | Nominal Output (kw) | 2 | 5 | 7.5 | 10 | 15 | 20 |
| | Nominal Output (BTU's) | 6,830 | 17,076 | 25,614 | 34,152 | 51,228 | 68,304 |
| | Min Airflow (CFM)* | 100 | 200 | 300 | 500 | 600 | 800 |
| Dimensions | L x W x H (inches) Incl Electrical Panel | 26 x 19 x 10.5 | | | | 28 x 19 x 10.5 | |
| | Shipping (L x W x H inches) | 29 x 23 x 13.25 | | | | 31 x 23 x 13.25 | |
| | Shipping Weight (lbs) | 37 | | 38 | | 46 | 47 |
| Electrical*** | Power Supply (volts/ph/hz) | 240/1/60 | | | | | |
| | Control Volts (VDC) | 24 | | | | | |
| | Heater Amps (Ckt #1)** | 8.3 | 20 | 30 | 40 | 20 | 40 |
| | Heater Amps (Ckt #2)** | N/A | | | | 40 | 40 |
| | Min Wire Gauge Dual (AWG) | N/A | | | | #8 / #6 | #6/#6 |
| | Min Wire Gauge Single (AWG) | #10 | #8 | #6 | #6 | #4 | #2 |
| | Stages | 1 | | | | 2 | |
| | Air Handler Applicable | ESP/WCSP 2430 J (H & V) | YES | YES | YES | YES | NO |
| ESP/WCSP 3642 J (H & V) | | YES | | | | | YES |
| ESP/WCSP 4860 J (H & V) | | | | | | | |

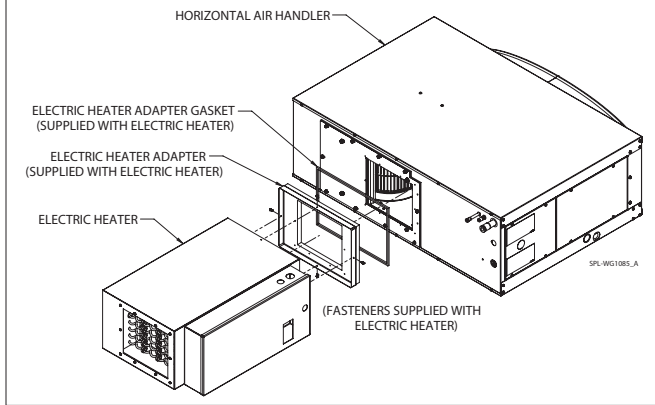
*Based upon 70°F entering air and discharge not to exceed 160°F

**@ 240VAC

***To achieve FLA value, air handler amp rating (found on data plate) needs to be added.

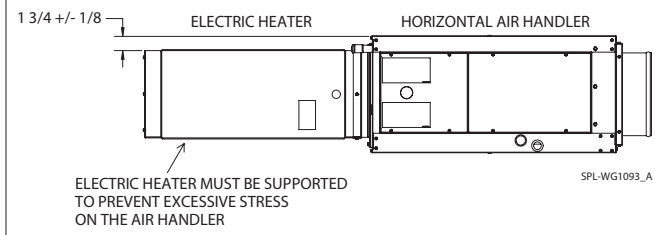


FIGURE 2: HEATER INSTALLATION



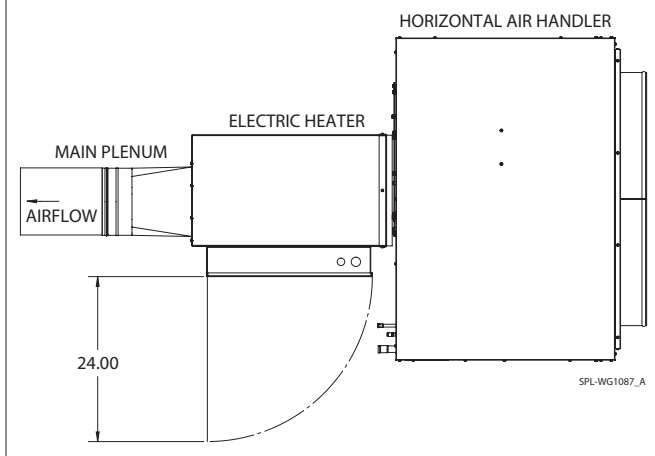
Insert the heater into the heater adapter and secure it using the (4) #8 x 3/4 modified Phillips head self drilling screws shipped with the electric heater.

FIGURE 3



All heaters are suitable for zero clearance between duct and combustible material. For servicing the control box, allow enough room to swing the cover open and to service the blower module, see Figure 4.

FIGURE 4: SERVICE CLEARANCE FOR HORIZONTAL INSTALLATIONS (TOP VIEW)



The hinge is located on the electric heater control box closest to the discharge end of the electric heater.

⚠ CAUTION DO NOT HANG UNIT DIRECTLY FROM HOUSING TO PREVENT DAMAGE TO THE ELECTRICAL ELEMENTS.

Support the heater on the rafters, floor, or platform with the air handler. If using a platform, make it large enough to support the entire heater and air handler.

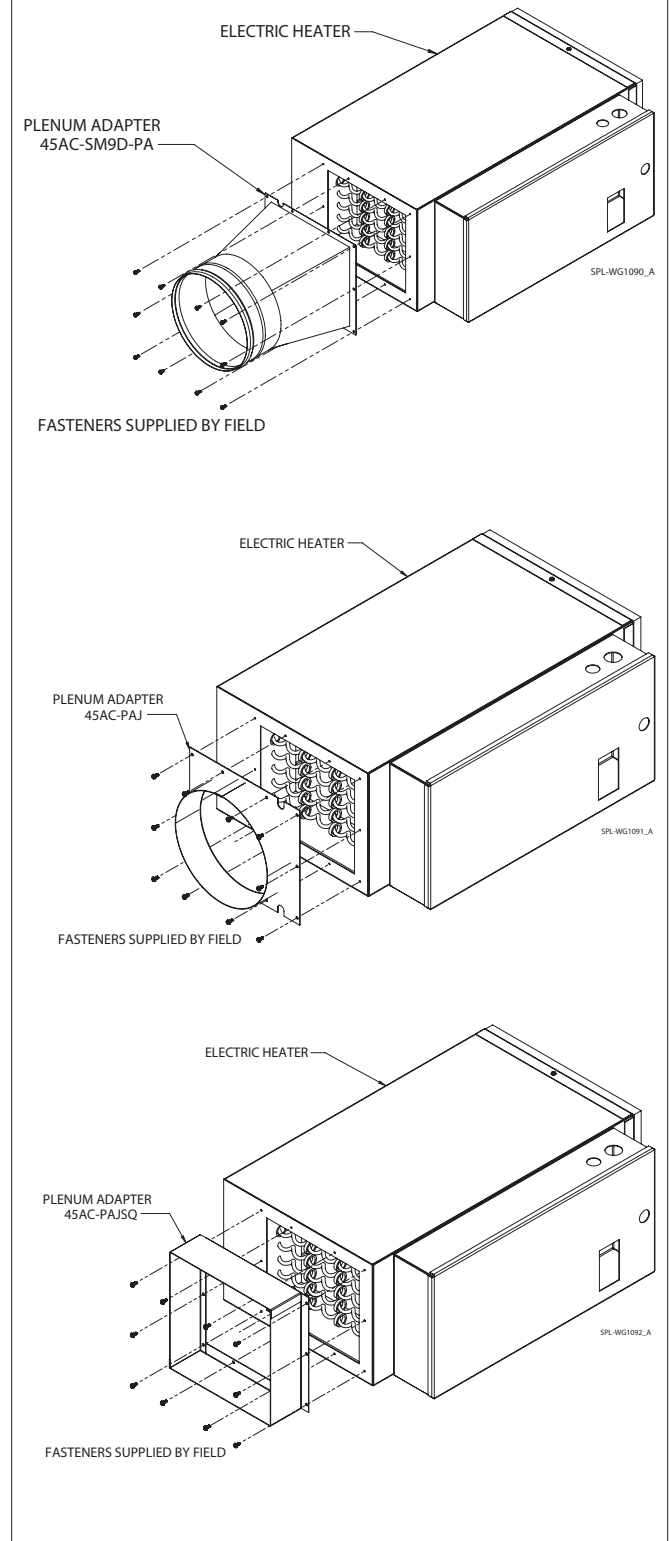
OPTIONAL ADAPTERS

Table 2 provides a list of optional plenum adapters available for the electric heater, as shown in Figure 5.

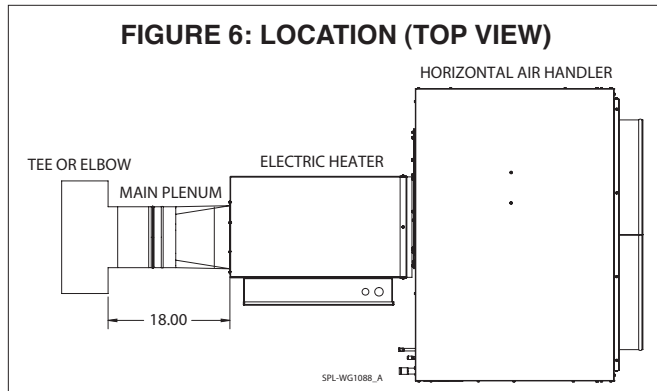
TABLE 2: (OPTIONAL) PLENUM ADAPTERS

| Part Number | Item Description |
|--------------|--|
| 45AC-SM9D-PA | SmartSeal Plenum Adapter - (J Series) |
| 45AC-PAJ | Sheet Metal Plenum Adaptor -(J Seies) |
| 45AC-PAJSQ | Fiberboard Plenum Adaptor - (J Series) |

FIGURE 5: OPTIONAL ADAPTER



For both vertical and horizontal installations always allow a minimum of 18 inches (457 mm) of straight duct between the discharge side of the electric heater and any tee or elbow as shown in Figure 6.



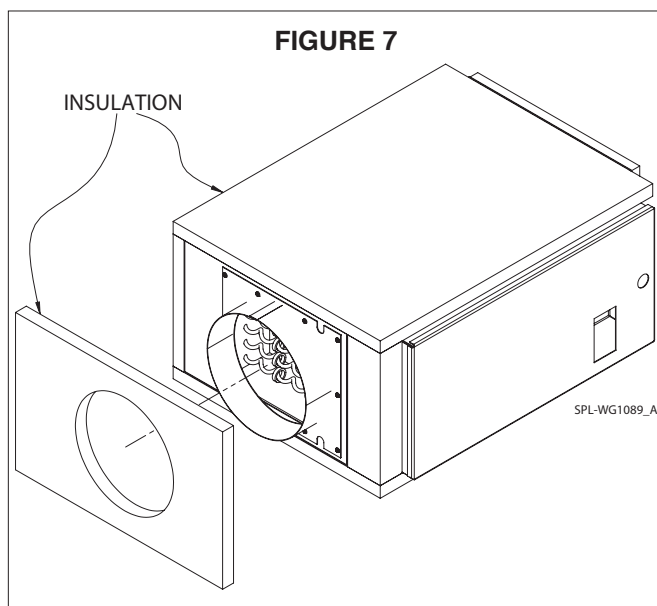
Note: All metal connections must be mechanically fastened with sheet metal screws and the joints and seams must be taped with UL- 181A-P foil faced tape or or sealed with UL-181A-M duct mastic.

INSULATION

Insulate all metal ducting with 1.5-inch (38-mm) minimum fiberglass insulation. For round duct, use either sleeve insulation or foil-faced duct wrap. For square duct use either fiberglass duct board or foil-faced duct wrap. Tape all seams to prevent air leaks.

When the heater is installed in high humidity areas, such as an unconditioned attic or crawlspace, there is a possibility of condensation forming on the heater cabinet during the cooling mode. To prevent condensation, cover the heater with 1-inch (25-mm) foil faced fiberglass insulation or duct board including the underside between the heater and support platform. Be sure to allow access to the control box cover for servicing. See Figure 7.

Insulate exterior cabinet, except the control panel, with a minimum of 1.0" [25mm] thick fiberglass or foam rubber.



WIRING

⚠ WARNING DISCONNECT ELECTRICAL SUPPLY BEFORE WIRING UNIT TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK.

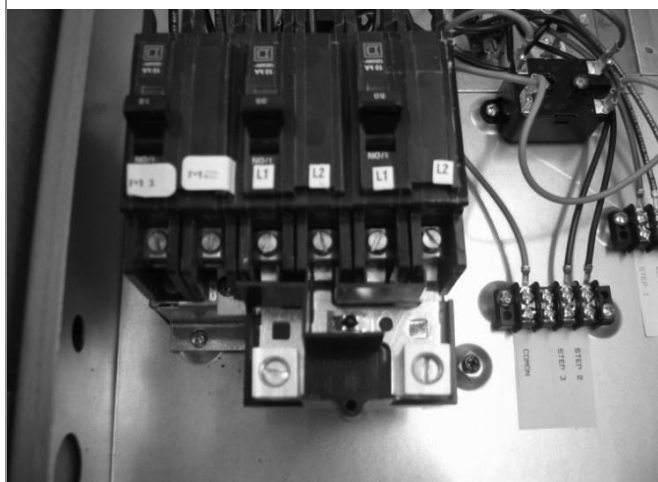
All electrical wiring must comply with all local codes and ordinances. Use the 15 amp breaker integrated into the heater for the air handler power supply.

Open the heater cover and connect the power supply to terminals L1 and L2 on the high voltage terminal block. See appropriate wiring diagram (Figures 9-14) to select the correct wire gauge for the specific amperage of the heater being installed. Connect a ground wire to the ground lug labeled G. Terminals M1 and M2 on the heaters are for output power to the blower. 15 and 20kw heaters there are two breakers so you can wire one (single) or two (dual) line input circuits. Refer to appropriate wiring diagram (Figures 9-14) and the label on the control box lid for specific wire sizes and amperage.

Connect the 24V control wiring as shown in the appropriate wiring diagram.

It is important to use a thermostat designed for use with electric heat or two-stage heating. The internal wiring diagrams are shown in Figures 9 through 14. The 15 and 20 kW single phase heaters contain two supply circuits. Supply wires can be run separately for each circuit, which is the default configuration. Using two supply circuits allows the use of smaller gauge wires. In some cases, it is necessary to use smaller gauge wire to comply with building codes that limit the maximum wire size that can be used for a single circuit.

FIGURE 8: JUMPER BAR SHOWN INSTALLED ON CIRCUIT BREAKERS.



Note: Circuit breakers installed in this device are the short-circuit protection of internal wiring and to serve as a service disconnect. Circuit breakers installed within this device DO NOT provide over current protection of the supply wiring.

SEQUENCE OF OPERATION

All heaters have a built-in delay feature to delay the heater from coming on before the air handler is operating. There is no delay-off feature. As soon as the thermostat is satisfied, the heater de-energizes and the air handler will continue running for approximately 1 minute. An air pressure switch is in series with the fan interlock relay for added protection and safety. The heater is designed for a softer start so that there is a short time delay between stages.

CAPACITY AT LOWER VOLTAGES

The elements are rated at 240 Volts and should not be used at higher voltages. Lower voltages are acceptable. However, heaters are resistive loads so capacity is reduced by the square of the voltage ratio.

$$\text{kW (output)} = \text{kW (rated)} \times (\text{V}/240)^2$$

Therefore, multiply the rated capacity by the factor shown in Table 3 to determine the actual output of the heater at other voltages.

TABLE 3: HEATER CAPACITY FACTOR AT OTHER VOLTAGES

| Voltage | Factor |
|---------|--------|
| 240 | 1.00 |
| 230 | 0.92 |
| 220 | 0.84 |

DUCT DESIGN

The design of the duct system must account for the added restriction of the heater. Table 4 lists the static pressure drop of the heaters. Usually it will be necessary to add additional outlets to account for the added restriction, particularly for the systems requiring more than 800 CFM (378 L/s). For these systems it is not unusual to have 7 outlets per ton.

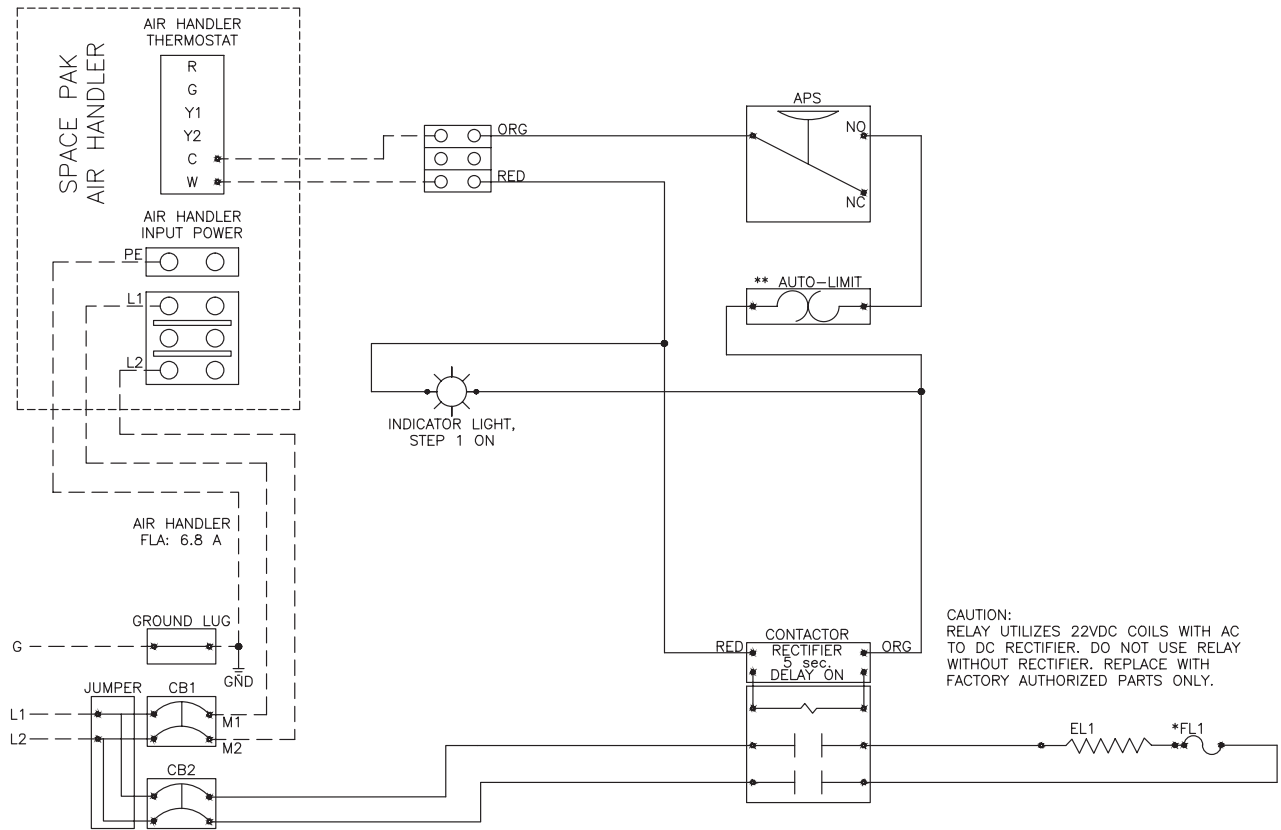
TABLE 4: PRESSURE DROP, INCHES OF WATER (PA)

| External Electric Heater Models | | | | | | |
|---------------------------------|-------------|-------------|--------------|--------------|--------------|--------------|
| CFM (m ³ /min) | 2 Kw | 5 kW | 7.5 kW | 10 kW | 15 kW | 20 kW |
| 100(2.83) | 0(0.64) | | | | | |
| 125(3.54) | 0(1.0) | | | | | |
| 150(4.25) | 0.01(1.44) | | | | | |
| 175(4.96) | 0.01(1.96) | | | | | |
| 200(5.66) | 0.01(2.55) | 0.01(2.55) | | | | |
| 250(7.08) | 0.02(3.99) | 0.02(3.99) | | | | |
| 300(8.50) | 0.02(5.75) | 0.02(5.75) | 0.03(7.17) | | | |
| 350(9.91) | 0.03(7.82) | 0.03(7.82) | 0.04(9.76) | | | |
| 400(11.33) | 0.04(10.22) | 0.04(10.22) | 0.05(12.75) | | | |
| 450(12.74) | 0.05(12.93) | 0.05(12.93) | 0.06(16.14) | | | |
| 500(14.16) | 0.06(15.97) | 0.06(15.97) | 0.08(19.92) | 0.08(19.92) | | |
| 550(15.57) | 0.08(19.32) | 0.08(19.32) | 0.10(24.1) | 0.10(24.10) | | |
| 600(16.99) | 0.09(22.99) | 0.09(22.99) | 0.12(28.68) | 0.12(28.68) | 0.19(46.22) | |
| 650(18.41) | 0.11(26.98) | 0.11(26.98) | 0.14(33.66) | 0.14(33.66) | 0.22(54.25) | |
| 700(19.82) | 0.13(31.29) | 0.13(31.29) | 0.16(39.04) | 0.16(39.04) | 0.25(62.91) | |
| 750(21.24) | 0.14(35.92) | 0.14(35.92) | 0.18(44.82) | 0.18(44.82) | 0.29(72.22) | |
| 800(22.65) | 0.16(40.87) | 0.16(40.87) | 0.20(51.00) | 0.20(51.00) | 0.33(82.17) | 0.33(82.17) |
| 850(24.07) | 0.19(46.14) | 0.19(46.14) | 0.23(57.57) | 0.23(57.57) | 0.37(92.76) | 0.37(92.76) |
| 900(25.49) | 0.21(51.73) | 0.21(51.73) | 0.26(64.54) | 0.26(64.54) | 0.42(104.00) | 0.42(104.00) |
| 950(26.90) | 0.23(57.64) | 0.23(57.64) | 0.29(71.91) | 0.29(71.91) | 0.47(115.87) | 0.47(115.87) |
| 1000(28.32) | 0.26(63.87) | 0.26(63.87) | 0.32(79.68) | 0.32(79.68) | 0.52(128.39) | 0.52(128.39) |
| 1050(29.73) | 0.28(70.41) | 0.28(70.41) | 0.35(87.85) | 0.35(87.85) | 0.57(141.55) | 0.57(141.55) |
| 1100(31.15) | 0.31(77.28) | 0.31(77.28) | 0.39(96.41) | 0.39(96.41) | 0.62(155.35) | 0.62(155.35) |
| 1150(32.56) | 0.34(84.46) | 0.34(84.46) | 0.42(105.38) | 0.42(105.38) | 0.68(169.80) | 0.68(169.80) |
| 1200(33.98) | 0.37(91.97) | 0.37(91.97) | 0.46(114.74) | 0.46(114.74) | 0.74(184.88) | 0.74(184.88) |
| 1250(35.40) | 0.40(99.79) | 0.40(99.79) | 0.50(124.5) | 0.5(124.50) | 0.81(200.61) | 0.81(200.61) |

PRESSURE DROP, INCHES WC (Pa)

FIGURE 9: MODEL EEH-020 WIRING DIAGRAM

| | |
|-------------------------|----------|
| MODEL # | EEH-020 |
| KILOWATTS | 2.0 |
| VOLTS/PH/Hz | 240/1/60 |
| CONTROL VOLTS | 24 |
| STEPS | 1 |
| HEATER AMPS | 8.3 |
| CIRCUIT BREAKER 1/2 | 15 / 15 |
| V.A. (CONTACTOR RELAYS) | 15 |
| F.P.M. (AIR VELOCITY) | 350 |
| MIN. WIRE GA. CU | # 10 AWG |



CAUTION:
RELAY UTILIZES 22VDC COILS WITH AC
TO DC RECTIFIER. DO NOT USE RELAY
WITHOUT RECTIFIER. REPLACE WITH
FACTORY AUTHORIZED PARTS ONLY.

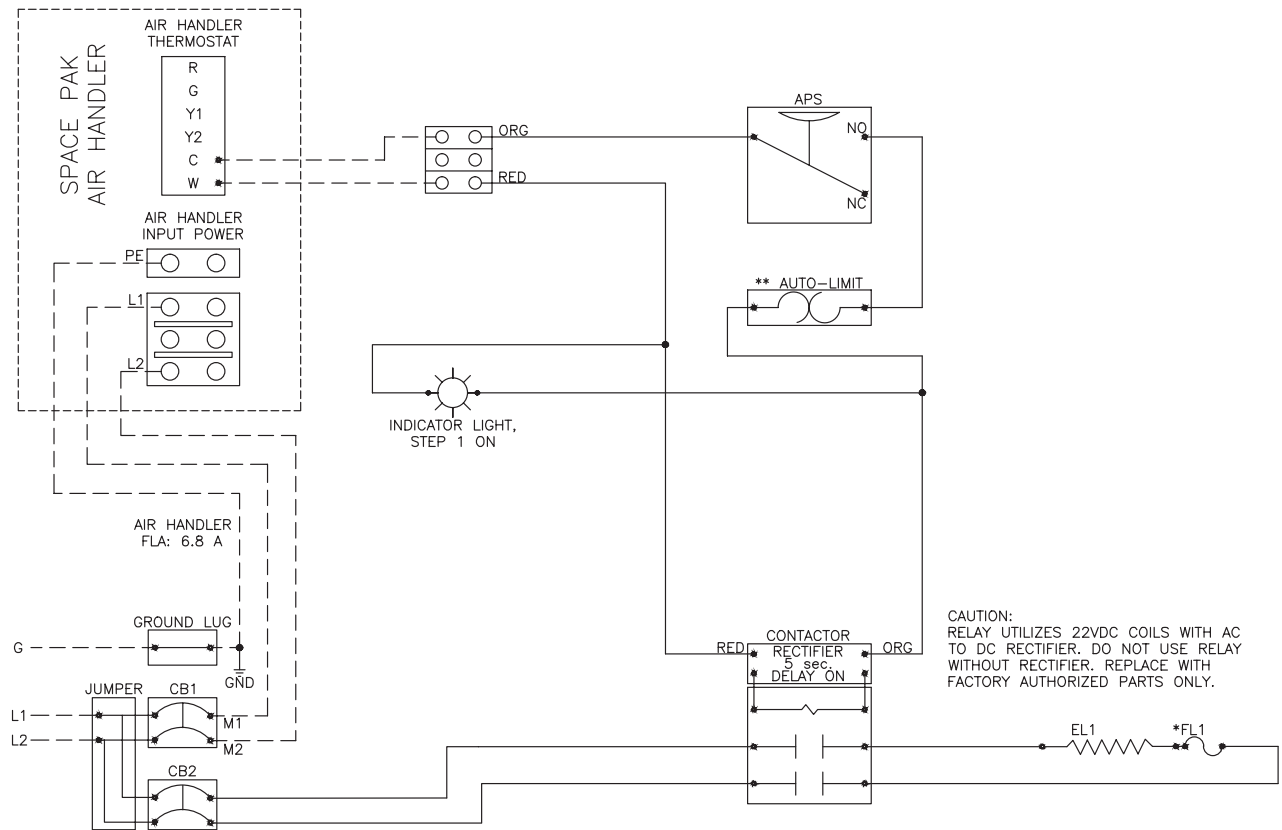
NOTES:

1. WIRE CODE:
POWER WIRING _____
CONTROL WIRING _____
FIELD WIRING _____
2. * REPLACE FUSE LINKS WITH G5-AM0400121C, USE COPPER WIRE ONLY
SUITABLE FOR AT LEAST 75 C.
3. ** REPLACE AUTO-RESET WITH THERMO DISC TYPE 60TX11-L133
4. FIELD WIRING PER NEC CLASS 1
5. 24VAC, CLASS 2 POWER SOURCE MUST NOT EXCEED 26.4VAC UNDER ANY
PRIMARY INPUT VOLTAGE CONDITION PER UL/NEC.

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FIGURE 10: MODEL EEH-050 WIRING DIAGRAM

| | |
|-------------------------|----------|
| MODEL # | EEH-050 |
| KILOWATTS | 4.8 |
| VOLTS/PH/Hz | 240/1/60 |
| CONTROL VOLTS | 24 |
| STEPS | 1 |
| HEATER AMPS | 20 |
| CIRCUIT BREAKER 1/2 | 15 / 25 |
| V.A. (CONTACTOR RELAYS) | 15 |
| F.P.M. (AIR VELOCITY) | 560 |
| MIN. WIRE GA. CU | # 8 AWG |



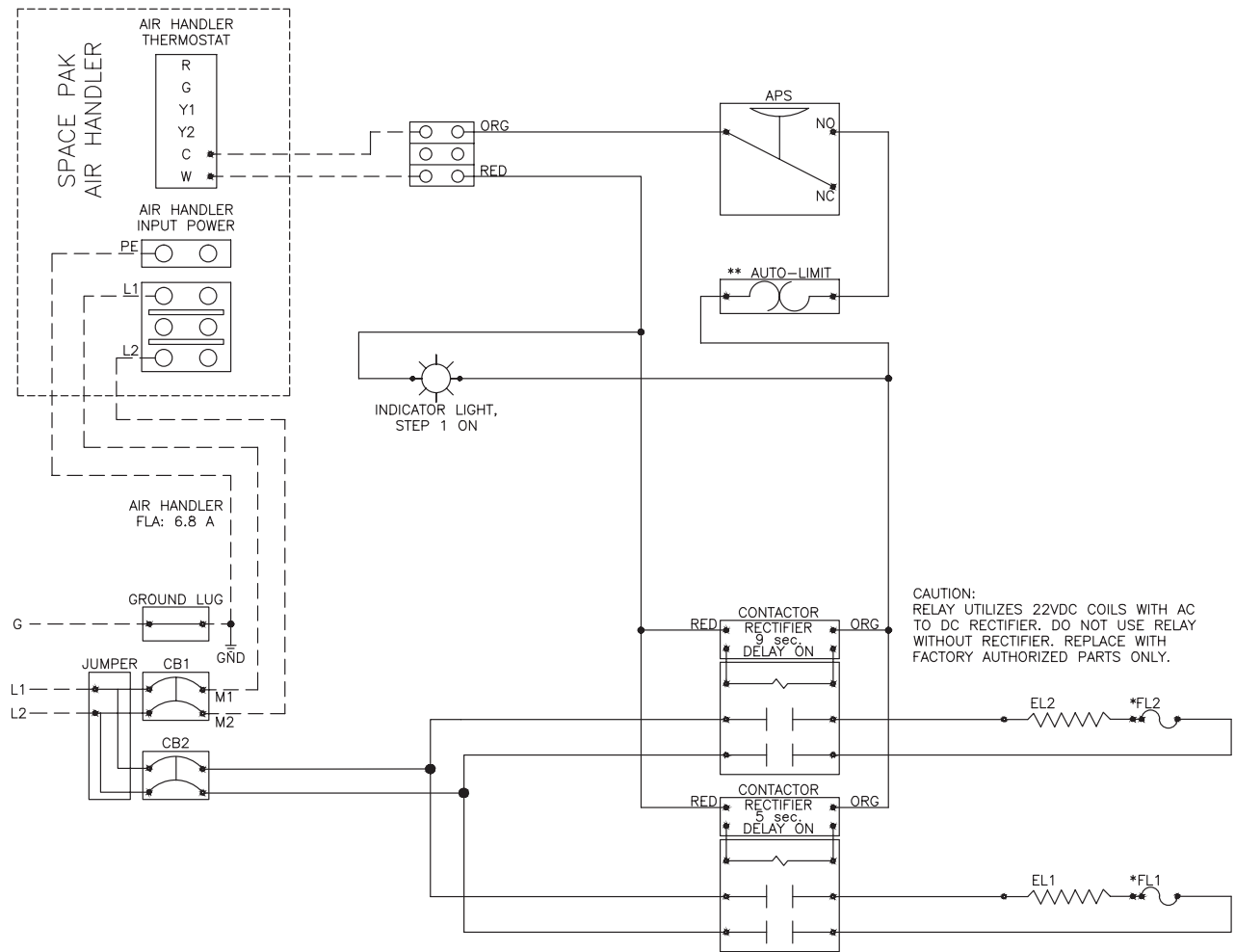
CAUTION:
RELAY UTILIZES 22VDC COILS WITH AC
TO DC RECTIFIER. DO NOT USE RELAY
WITHOUT RECTIFIER. REPLACE WITH
FACTORY AUTHORIZED PARTS ONLY.

- NOTES:
1. WIRE CODE:
POWER WIRING ———
CONTROL WIRING - - - -
FIELD WIRING - - - -
 2. * REPLACE FUSE LINKS WITH C5-AM0400121C, USE COPPER WIRE ONLY
SUITABLE FOR AT LEAST 75 C.
 3. ** REPLACE AUTO-RESET WITH THERMO DISC TYPE 60TX11-L133
 4. FIELD WIRING PER NEC CLASS 1
 5. 24VAC, CLASS 2 POWER SOURCE MUST NOT EXCEED 26.4VAC UNDER ANY
PRIMARY INPUT VOLTAGE CONDITION PER UL/NEC.

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FIGURE 11: MODEL EEH-075 WIRING DIAGRAM

| | |
|-------------------------|----------|
| MODEL # | EEH-075 |
| KILOWATTS | 7.2 |
| VOLTS/PH/Hz | 240/1/60 |
| CONTROL VOLTS | 24 |
| STEPS | 1 |
| HEATER AMPS | 30 |
| CIRCUIT BREAKER 1/2 | 15 / 40 |
| V.A. (CONTACTOR RELAYS) | 17 |
| F.P.M. (AIR VELOCITY) | 750 |
| MIN. WIRE GA. CU | # 6 AWG |

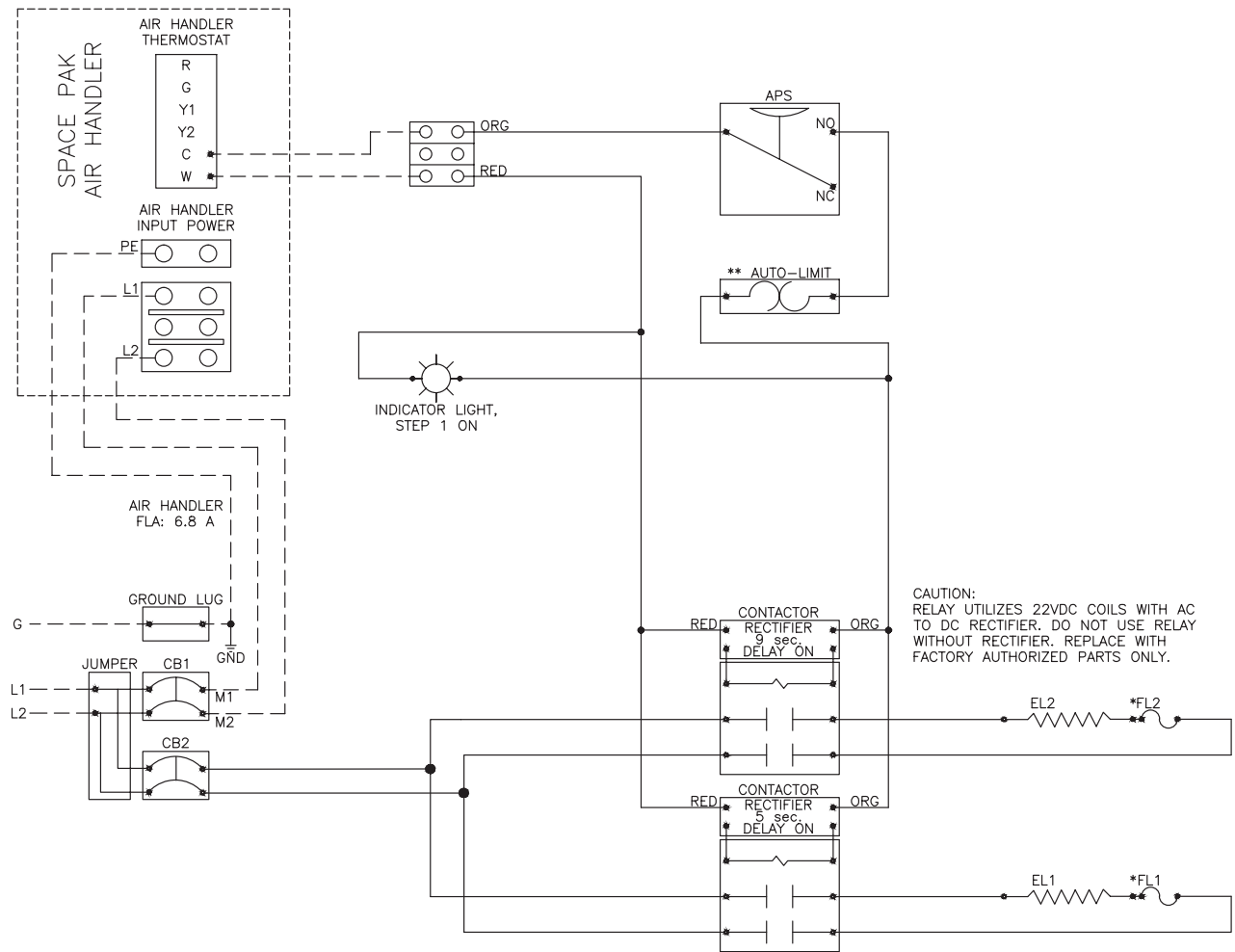


- NOTES:
1. WIRE CODE:
POWER WIRING _____
CONTROL WIRING _____
FIELD WIRING _____
 2. * REPLACE FUSE LINKS WITH G5-AM0400121C, USE COPPER WIRE ONLY SUITABLE FOR AT LEAST 75 C.
 3. ** REPLACE AUTO-RESET WITH THERMO DISC TYPE 60TX11-L133
 4. FIELD WIRING PER NEC CLASS 1
 5. 24VAC, CLASS 2 POWER SOURCE MUST NOT EXCEED 26.4VAC UNDER ANY PRIMARY INPUT VOLTAGE CONDITION PER UL/NEC.

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FIGURE 12: MODEL EEH-100 WIRING DIAGRAM

| | |
|-------------------------|----------|
| MODEL # | EEH-100 |
| KILOWATTS | 9.6 |
| VOLTS/PH/Hz | 240/1/60 |
| CONTROL VOLTS | 24 |
| STEPS | 1 |
| HEATER AMPS | 40 |
| CIRCUIT BREAKER 1/2 | 15 / 50 |
| V.A. (CONTACTOR RELAYS) | 17 |
| F.P.M. (AIR VELOCITY) | 1150 |
| MIN. WIRE GA. CU | # 6 AWG |

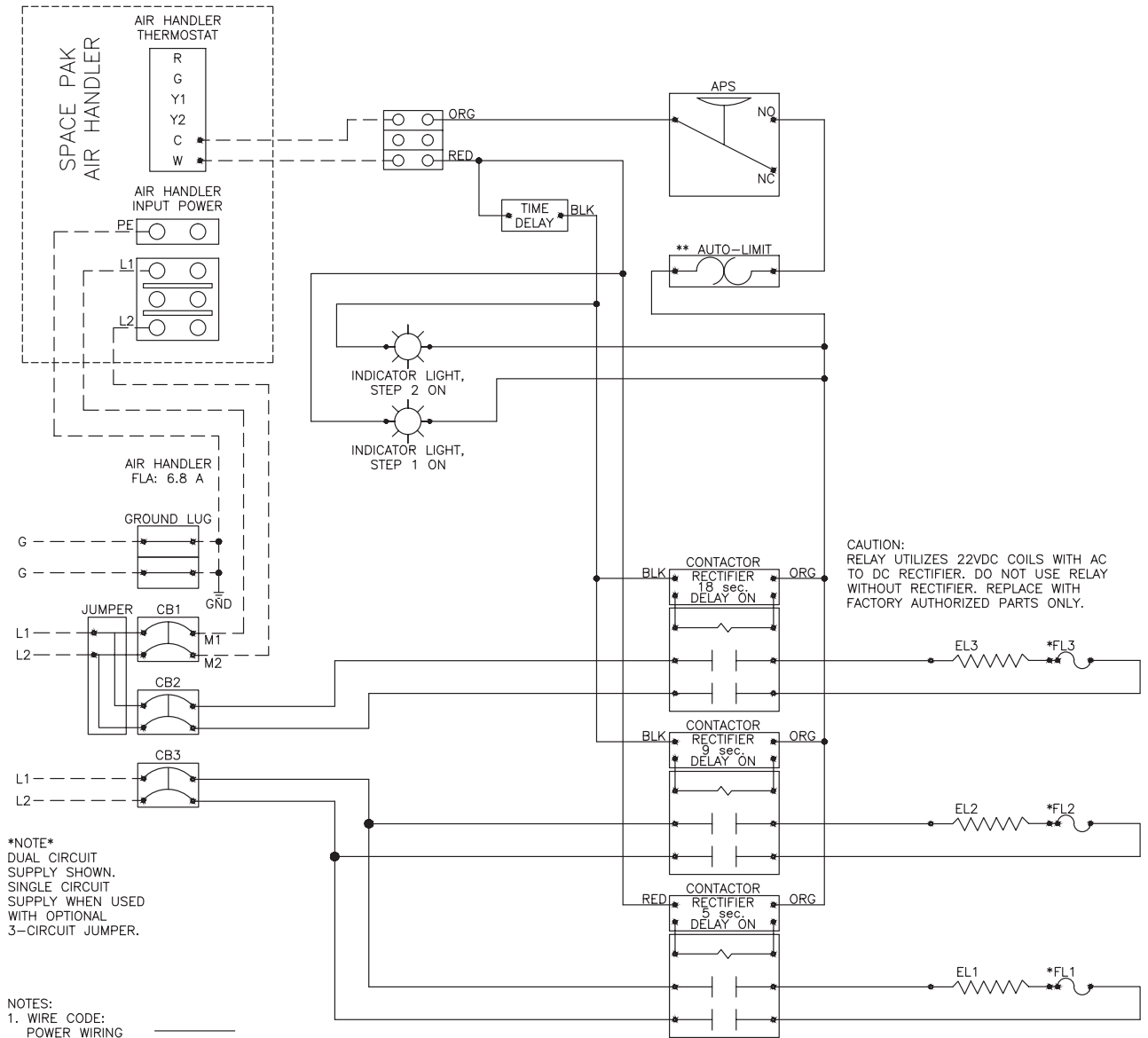


- NOTES:
1. WIRE CODE:
POWER WIRING ———
CONTROL WIRING ———
FIELD WIRING - - - -
 2. * REPLACE FUSE LINKS WITH G5-AM0400121C, USE COPPER WIRE ONLY SUITABLE FOR AT LEAST 75 C.
 3. ** REPLACE AUTO-RESET WITH THERMO DISC TYPE 60TX11-L133
 4. FIELD WIRING PER NEC CLASS 1
 5. 24VAC, CLASS 2 POWER SOURCE MUST NOT EXCEED 26.4VAC UNDER ANY PRIMARY INPUT VOLTAGE CONDITION PER UL/NEC.

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FIGURE 13: MODEL EEH-150 WIRING DIAGRAM

| | |
|-------------------------------------|---------------|
| MODEL # | EEH-150 |
| KILOWATTS | 14.4 |
| VOLTS/PH/Hz | 240/1/60 |
| CONTROL VOLTS | 24 |
| STEPS | 2 |
| HEATER AMPS | 20.0 / 40.0 |
| CIRCUIT BREAKER 1/2/3 | 15 / 25 / 50 |
| V.A. (CONTACTOR RELAYS) | 26 |
| F.P.M. (AIR VELOCITY) | 1150 |
| MIN. WIRE GA. CU, DUAL (JMPR / CB3) | # 8 / # 6 AWG |
| MIN. WIRE GA. CU, SINGLE | # 4 AWG |



CAUTION:
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TO DC RECTIFIER. DO NOT USE RELAY
WITHOUT RECTIFIER. REPLACE WITH
FACTORY AUTHORIZED PARTS ONLY.

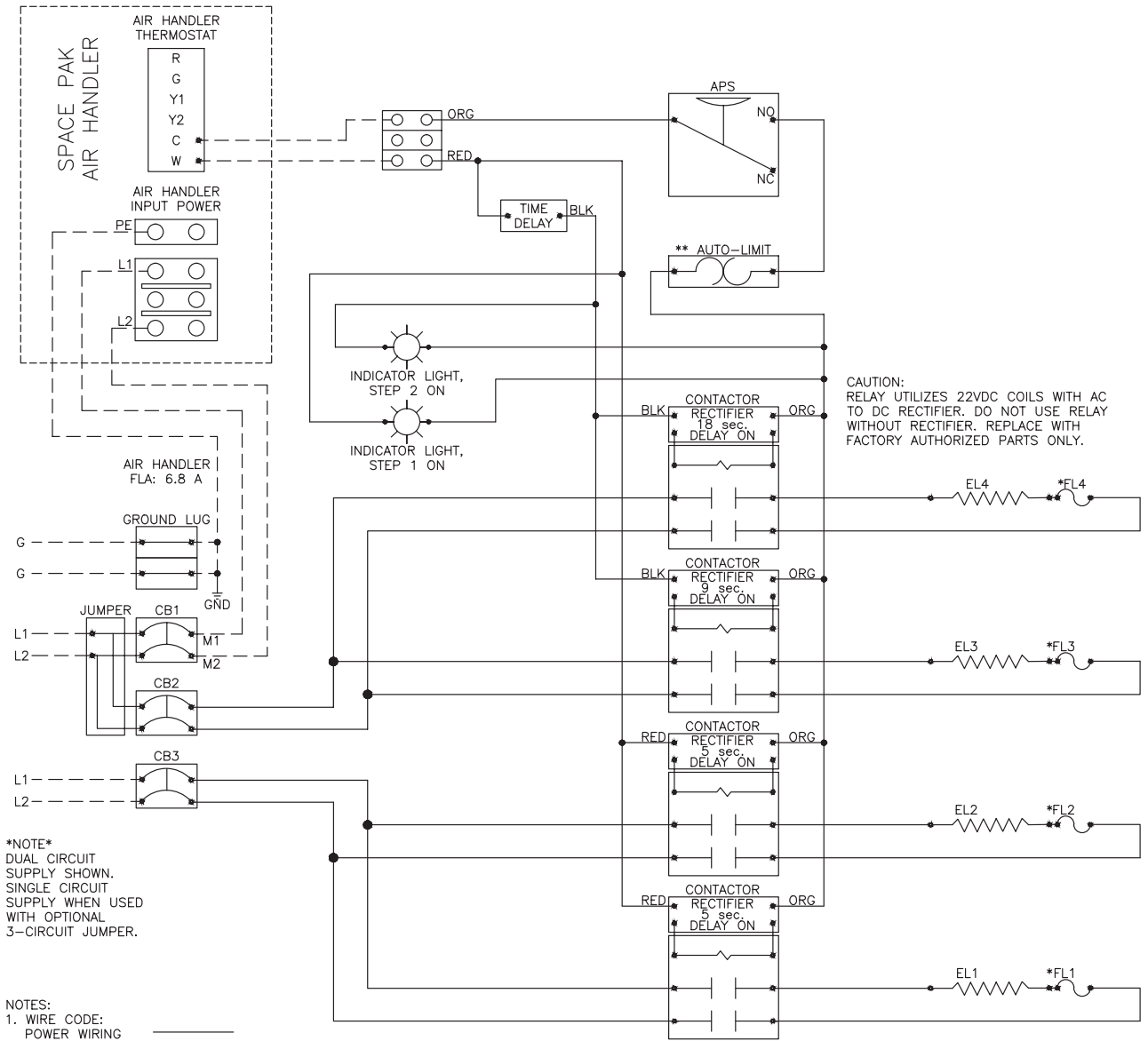
NOTE
DUAL CIRCUIT
SUPPLY SHOWN.
SINGLE CIRCUIT
SUPPLY WHEN USED
WITH OPTIONAL
3-CIRCUIT JUMPER.

- NOTES:
1. WIRE CODE:
POWER WIRING ———
CONTROL WIRING - - - -
FIELD WIRING
 2. * REPLACE FUSE LINKS WITH G5-AM0400121C, USE COPPER WIRE ONLY
SUITABLE FOR AT LEAST 75 C.
 3. ** REPLACE AUTO-RESET WITH THERMO DISC TYPE 60TX11-L133
 4. FIELD WIRING PER NEC CLASS 1
 5. 24VAC, CLASS 2 POWER SOURCE MUST NOT EXCEED 26.4VAC UNDER ANY
PRIMARY INPUT VOLTAGE CONDITION PER UL/NEC.

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FIGURE 14: MODEL EEH-200 WIRING DIAGRAM

| | |
|-------------------------------------|---------------|
| MODEL # | EEH-200 |
| KILOWATTS | 19.20 |
| VOLTS/PH/Hz | 240/1/60 |
| CONTROL VOLTS | 24 |
| STEPS | 2 |
| HEATER AMPS | 40.0 / 40.0 |
| CIRCUIT BREAKER 1/2/3 | 15 / 50 / 50 |
| V.A. (CONTACTOR RELAYS) | 26 |
| F.P.M. (AIR VELOCITY) | 1150 |
| MIN. WIRE GA. CU, DUAL (JMPR / CB3) | # 6 / # 6 AWG |
| MIN. WIRE GA. CU, SINGLE | # 2 AWG |



NOTE
DUAL CIRCUIT
SUPPLY SHOWN.
SINGLE CIRCUIT
SUPPLY WHEN USED
WITH OPTIONAL
3-CIRCUIT JUMPER.

- NOTES:
1. WIRE CODE:
POWER WIRING _____
CONTROL WIRING _____
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 2. * REPLACE FUSE LINKS WITH G5-AM0400121C, USE COPPER WIRE ONLY
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PRIMARY INPUT VOLTAGE CONDITION PER UL/NEC.

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TABLE 5: REPLACEMENT PARTS LIST

| Item | SP Part No. | Quantity Per Unit | | | | | |
|------------------------------|-----------------|-------------------|---------|---------|---------|---------|---------|
| | | EEH-020 | EEH-050 | EEH-075 | EEH-100 | EEH-150 | EEH-200 |
| Limit Switch, 133F | 45W41-WG1098-01 | 1 | 1 | 1 | 1 | 1 | 1 |
| Circuit Breaker, 2 POLE, 50A | 45W41-WG1099-01 | 0 | 0 | 0 | 1 | 1 | 2 |
| Circuit Breaker, 2 POLE, 40A | 45W41-WG1167-01 | 0 | 0 | 1 | 0 | 0 | 0 |
| Circuit Breaker, 2 POLE, 25A | 45W41-WG1100-01 | 0 | 1 | 0 | 0 | 1 | 0 |
| Circuit Breaker, 2 POLE, 15A | 45W41-WG1101-01 | 2 | 1 | 1 | 1 | 1 | 1 |
| Contactor, 2 pole, 40A | 45W41-WG1102-01 | 1 | 1 | 1 | 2 | 2 | 4 |
| Ground Lug, #6-#14 awg | 45W41-WG1103-01 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ground Lug, 1/0-#14 awg | 45W41-WG1104-01 | 0 | 0 | 0 | 1 | 1 | 1 |
| Jumper Bar, 4-Pole | 45W41-WG1105-01 | 1 | 1 | 1 | 1 | 1 | 1 |
| Latch | 45W41-WG1106-01 | 1 | 1 | 1 | 1 | 1 | 1 |
| Thermal cutoff switch, 158C | 45W41-WG1107-01 | 1 | 1 | 2 | 2 | 3 | 4 |
| Element rack, 2 kW | 45W41-WG1168-01 | 1 | 0 | 0 | 0 | 0 | 0 |
| Element rack, 5 kW | 45W41-WG1169-01 | 0 | 1 | 0 | 0 | 0 | 0 |
| Element rack, 7.5 kW | 45W41-WG1170-01 | 0 | 0 | 1 | 0 | 0 | 0 |
| Element rack, 10 kW | 45W41-WG1108-01 | 0 | 0 | 0 | 1 | 0 | 0 |
| Element rack, 15 kW | 45W41-WG1109-01 | 0 | 0 | 0 | 0 | 1 | 0 |
| Element rack, 20 kW | 45W41-WG1110-01 | 0 | 0 | 0 | 0 | 0 | 1 |
| Rectifier with 5 sec delay | 45W41-WG1111-01 | 1 | 0 | 1 | 1 | 1 | 1 |
| Rectifier with 9 sec delay | 45W41-WG1112-01 | 0 | 1 | 1 | 1 | 1 | 1 |
| Rectifier with 18 sec delay | 45W41-WG1113-01 | 0 | 0 | 0 | 0 | 1 | 1 |
| Terminal block, 3 pole | 45W41-WG1114-01 | 1 | 1 | 1 | 1 | 1 | 1 |
| Switch, diff P, .05" WC | 45W41-WG1115-01 | 1 | 1 | 1 | 1 | 1 | 1 |
| Timer, delay on make | 45W41-WG1116-01 | 0 | 0 | 0 | 0 | 1 | 1 |
| Lamp, indicator, red | 45W41-WG1117-01 | 1 | 1 | 1 | 1 | 2 | 2 |



IN UNITED STATES: 260 NORTH ELM ST. WESTFIELD, MA 01085 800-465-8558
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