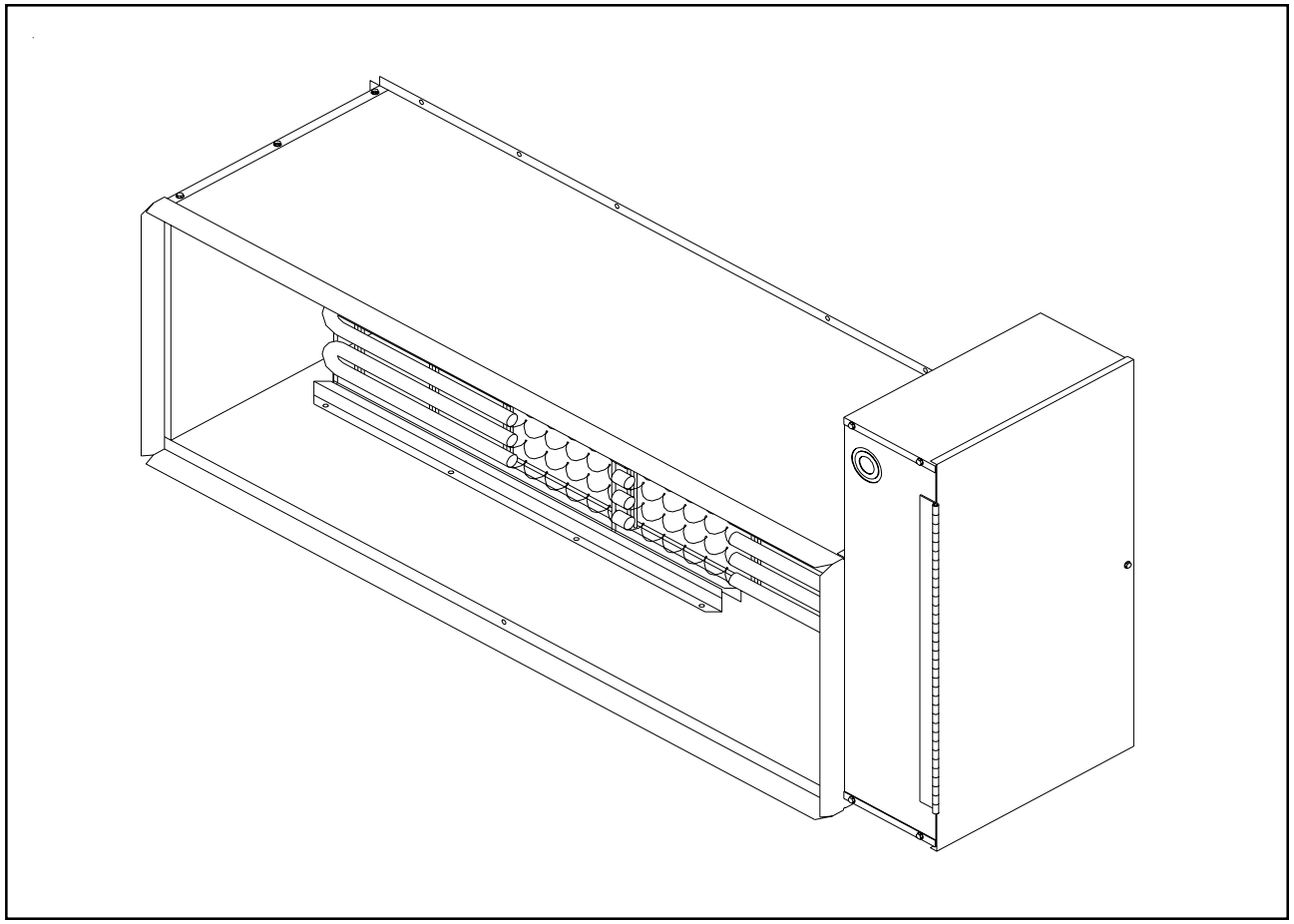
# AHKD SERIES
# ELECTRIC RESISTANCE HEAT KITS
# INSTALLATION & OPERATING INSTRUCTIONS



Made in the USA by:
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www.goodmanmfg.com

# Contents



# Introduction

## Product Description

The AHKD series of electric heat kits is an accessory designed for installation with the Goodman AR090 or AR120 Airhandler **ONLY**. **INSTALLATIONS WITH OTHER AIRHANDLERS IS NOT PERMITTED**. For installation guidelines of the AR090 or AR120, refer to the instructions which accompany the air handler, IO-227(Installation & Operating Instructions).

The AHKD provides supplemental electric heat for the AR90/120. The assembly is to be installed directly to the outlet of the AR090/120 and is not to be used as an independent duct heater.

The AHKD20 and AHKD30 heat kits have two stages. A two stage room thermostat determines the staging by room temperature.

The heat kit's control panel is "self contained" and is equipped with all of the safety circuit/limits required per UL1995. The heat kit employs a terminal block for installation of the high voltage wires used by both the heat kit and the airhandler (single point wiring).

## Checking Product Received

- Upon receiving the unit, inspect it for damage from shipment. Claims for damage, either shipping or concealed, should be filed immediately with the shipping company. Check the unit model number, specifications, electrical characteristics, and accessories to determine if they are correct. In the event an incorrect unit is shipped, it must be returned to the supplier and must NOT be installed. The manufacturer assumes no responsibility for the installation of incorrectly shipped units.

## Before Beginning Installation

- Carefully read all instructions for the installation prior to installing unit. Make sure each step or procedure is understood and any special considerations are taken into account before starting installation.
- Assemble all tools, hardware and supplies needed to complete the installation. Some items may need to be purchased locally. Make sure everything needed to install AHKD Electric Resistance Heat Kits is on hand before starting.

## Ordering Parts

- When reporting shortages or damages, or ordering repair parts, give the complete unit model and serial numbers as stamped on the unit's nameplate. Order parts through your local distributor.

# Important Safety Instructions

## Recognize Safety Symbols, Words, and Labels

The following symbols and labels are used throughout this manual to indicate immediate or potential hazards. It is owner's responsibility to read and comply with all safety information and instructions accompanying these symbols. Failure to heed safety information increases the risk of seious personal injury or death, property damage and/or product damage.

**DANGER**

**Danger -** Immediate hazards which **WILL** result in severe personal injury or death.

**WARNING**

**Warning** - Hazards or unsafe practices which **COULD** result in severe personal injury or death.

**CAUTION**

**Caution** - Hazards or unsafe practices, which **COULD** result in minor or moderate personal injury, product damage, or property damage.

**WARNING**

Before servicing or installing this equipment, the electrical power to this unit **MUST** be in the "OFF" position.

**IMPORTANT NOTE:**
More than one disconnect may exist. Failure to observe this warning may result in an electrical shock that could cause serious personal injury or death.

**WARNING**

This installation **must** have an uninterrupted, unbroken electrical ground to minimize the possibility of personnel injury if an electrical fault should occur. The electrical ground circuit may consist of an appropriately sized electrical wire connecting the ground lug in the unit control box wire to the building electrical service panel. Other methods of grounding are permitted if performed in accordance with the "National Electric Code" (NEC)/ "American National Standards Institute" (ANSI)/ "National Fire Protection Association" (NFPA) 70 and local/state codes. In Canada, electrical grounding is to be in accordance with the Canadian Electric Code CSA C22.1. Failure to observe this warning can result in electrical shock that could cause serious personal injury or death.

**WARNING**

ONLY TRAINED AND QUALIFIED PERSONNEL ARE PERMITTED TO INSTALL OR SERVICE THIS EQUIPMENT. Observe ALL warnings contained in this manual and labels/tags attached to the equipment.

When installing or servicing this equipment safety clothing including hand and eye protection is strongly advised. If installing this equipment in an area that has special safety requirements (hard hats etc.) observe these requirements.

Read these instructions before performing this installation or servicing this unit. All installations must be in accordance with all national, state, or local building codes.

# Model Identification

**WARNING**

The electrical characteristics of the airhandler, the electric heat kit, and the building power supply must agree.

Use the following table and the product's Series and Rating plate to determine the heating kW and electrical characteristics.

Table 1.

| AHKD Model Number | Nominal kW | Electrical Characteristics | Stages |
|---|---|---|---|
| AHKD15-3 | 15 | 208-230/3/60 | 1 |
| AHKD15-4 | 15 | 460/3/60 | 1 |
| AHKD20-3 | 20 | 208-230/3/60 | 2 |
| AHKD20-4 | 20 | 460/3/60 | 2 |
| AHKD30-3 | 30 | 208-230/3/60 | 2 |
| AHKD30-4 | 30 | 460/3/60 | 2 |

For all supply voltages, use the correction factors in Tables 2 & 3, multiplied by kW and (or) temperature rise to have corrected results.

Table 2.

| KW Correction Factors (-3 models) | | | | | |
|---|---|---|---|---|---|
| Supply Voltage | 240 | 230 | 220 | 210 | 208 |
| Correction Factor | 1.0 | 0.92 | 0.84 | 0.77 | 0.75 |

Table 3.

| KW Correction Factors (-4 models) | | | | | |
|---|---|---|---|---|---|
| Supply Voltage | 480 | 460 | 440 | 415 | 380 |
| Correction Factor | 1.0 | 0.92 | 0.84 | 0.75 | 0.63 |

# Temperature Rise

The heating mode temperature rise is dependent upon the system airflow, the supply voltage, and the heat kit size (kW) selected. Use Tables 4 & 5 to determine the temperature rise (°F):

Table 4.

**AR090 Temperature Rise Table (Degrees F)**

| Airhandler | Heat Kit KW | CFM | Supply Voltage 208 | 240 | 480 |
|---|---|---|---|---|---|
| AR090 | 15 | 2800 | 14 | 19 | 19 |
| | | 2900 | 14 | 18 | 18 |
| | | 3000 | 13 | 18 | 18 |
| | | 3100 | 13 | 17 | 17 |
| | | 3200 | 12 | 17 | 17 |
| | 20 | 2800 | 19 | 25 | 25 |
| | | 2900 | 18 | 24 | 24 |
| | | 3000 | 18 | 24 | 24 |
| | | 3100 | 17 | 23 | 23 |
| | | 3200 | 17 | 22 | 22 |
| | 30 | 2800 | 28 | 38 | 38 |
| | | 2900 | 27 | 37 | 37 |
| | | 3000 | 27 | 35 | 35 |
| | | 3100 | 26 | 34 | 34 |
| | | 3200 | 25 | 33 | 33 |

Table 5.

**AR120 Temperature Rise Table (Degrees F)**

| Airhandler | Heat Kit KW | CFM | Supply Voltage 208 | 240 | 480 |
|---|---|---|---|---|---|
| AR120 | 15 | 3800 | 10 | 14 | 14 |
| | | 3900 | 10 | 14 | 14 |
| | | 4000 | 10 | 13 | 13 |
| | | 4100 | 10 | 13 | 13 |
| | | 4200 | 9 | 13 | 13 |
| | 20 | 3800 | 14 | 19 | 19 |
| | | 3900 | 14 | 18 | 18 |
| | | 4000 | 13 | 18 | 18 |
| | | 4100 | 13 | 17 | 17 |
| | | 4200 | 13 | 17 | 17 |
| | 30 | 3800 | 21 | 28 | 28 |
| | | 3900 | 20 | 27 | 27 |
| | | 4000 | 20 | 27 | 27 |
| | | 4100 | 19 | 26 | 26 |
| | | 4200 | 19 | 25 | 25 |

**Note:** Table 5 is calculated with both stages of electric heat engaged (2 stage heat systems).
For systems using staged electric heat, divide the temperature rise from the table by 2 for 1st stage operation.

# Electrical Supply Wire and MOP

**WARNING**

Before servicing or installing this equipment, the electrical power to this unit **MUST** be in the "OFF" position.

**IMPORTANT NOTE:**
More than one disconnect may exist. Failure to observe this warning may result in an electrical shock that could cause serious personal injury or death.

**WARNING**

The unit **must** have an uninterrupted, unbroken electrical ground to minimize the possibility of personall injury if an electrical fault should occur. The electrical ground circuit may consist of an appropriately sized electrical wire connecting the ground lug in the unit control box wire to the building electrical service panel. Other methods of grounding are permitted if performed in accordance with the "National Electric Code" (NEC)/"American National Standards Institute" (ANSI)/"National Fire Protection Association" (NFPA) 70 and local/state codes. In Canada, electrical grounding is to be in accordance with the Canadian Electric Code CSA C22.1. Failure to observe this warning can result in electrical shock that could cause serious personal injury or death.

**WARNING**

To avoid the risk of fire or equipment damages use only copper conductors

**WARNING**

Inspection of the Building Electrical Service. This unit is designed for 3-phase operation. **DO NOT OPERATE ON A SINGLE PHASE POWER SUPPLY. SEE THE "WARNING" ABOVE.** Measure the power supply to the unit. The supply voltage **MUST** be in agreement with the unit nameplate power requirements and within the range shown in Table 6.

Table 6.

| Nominal | Minimum Supply Voltage | Maximum Supply Voltage |
|---|---|---|
| 208 – 230 | 187 | 253 |
| 460 | 414 | 506 |

Voltage Balance The supply voltage shall be unbalance (phase to phase) within 2%. To calculate the percentage of voltage unbalance use the following formula:

$$\text{Percentage Voltage Unbalance} = 100 \times \frac{\text{Max Voltage Deviation From Avg}}{\text{Average Voltage}}$$

*Example*

*L1 – L2 = 220 V*
*L2 – L3 = 216 V*
*L1 – L3 = 213 V*

*Avg. Voltage = (220+216+213) / 3*
*= 649 / 3*
*= 216*

*Max. Deviation from Avg. = 220 – 216 = 4*

*% Voltage Unbalance = 100 x (4 / 216)*
*= 400 / 216*
*= 1.8%*

Determine Wire Size The selection of the appropriate supply wire size is important to the operation of the equipment. When selecting the wire size, the following are important elements of the decision:

- The wire size is adequately sized to carry the Minimum Circuit Ampacity (MCA). Refer to the NEC (USA) or CSA (Canada) for wire sizing. The unit MCA for the airhandler and the optional electric heat kit can be found on the equipment S&R plate and Table 7.

Table 7.

| AIR | VOLTAGE | HEAT KIT | MCA |
|---|---|---|---|
| AR090 | 208 - 230 | AHKD15-3 | 48.6 |
| | | AHKD20-3 | 63.0 |
| | | AHKD30-3 | 91.9 |
| | 460 | AHKD15-4 | 24.3 |
| | | AHKD20-4 | 31.5 |
| | | AHKD30-4 | 46.0 |
| AR120 | 208 - 230 | AHKD15-3 | 49.4 |
| | | AHKD20-3 | 63.8 |
| | | AHKD30-3 | 92.7 |
| | 460 | AHKD15-4 | 24.7 |
| | | AHKD20-4 | 31.9 |
| | | AHKD30-4 | 46.4 |

- The wire size is appropriately sized to allow for no more than a 2% voltage drop from the building breaker/fuse panel to the unit.
- Refer to the latest edition of the National Electric Code or in Canada the Canadian Electric Code when determining the correct wire size.

Table 8 shows the current carrying capabilities for copper conductors rated at 75°C with a 2% voltage drop.

Table 8.

| Max. Allowable Length in Feet to Limit Voltage Drop to 2% | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Wire Size (AWG) | Min. Circuit Ampacity (MCA) | | | | | | | |
| | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| 14 | 75 | 50 | 37 | NR | NR | NR | NR | NR |
| 12 | 118 | 79 | 59 | 47 | NR | NR | NR | NR |
| 10 | 188 | 125 | 95 | 75 | 63 | 54 | NR | NR |
| 8 | 301 | 201 | 150 | 120 | 100 | 86 | 75 | 68 |
| 6 | 471 | 314 | 235 | 188 | 157 | 134 | 118 | 110 |

Based on NEC 1996

Maximum Overcorrect Protection (MOP)

Every installation must include an NEC (USA) or CEC (Canada) approved overcorrect protection device. Also check with local or state codes for any special regional requirements.

This protection can be in the form of fusing or HACR style circuit breakers. The following table can be used as a guide for selecting the MAXIMUM overcurrent device. This information is also stated on the equipment S&R plate. Note: fuses or circuit breakers are to be sized larger than the equipment MCA but not to exceed the MOP listed in Table 9.

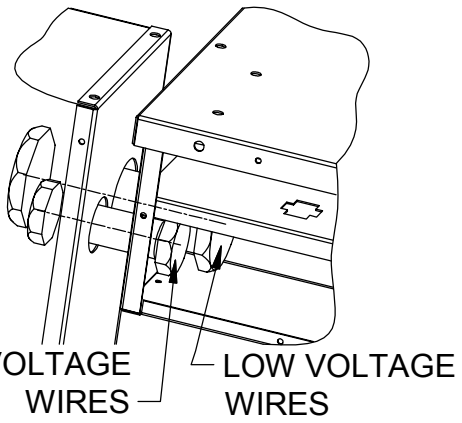
Table 9.

| AIR HANDLER | HEAT KIT | MOP |
|---|---|---|
| AR090<br>AR120 | AHKD15-3 | 60 |
| | AHKD20-3 | 70 |
| | AHKD30-3 | 100 |
| | AHKD15-4 | 30 |
| | AHKD20-4 | 35 |
| | AHKD30-4 | 50 |

# Attaching the Heat Kit

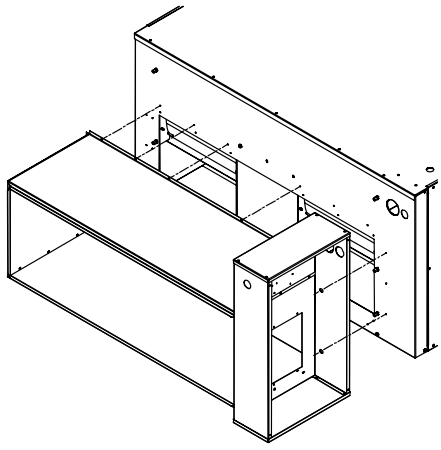
1. Secure the high voltage and low voltage conduits to the heat kit electrical panel using the supplied plastic bushing nuts as shown in Figure 1.

Figure 1.




2. Position the heat kit onto the airhandler at the air discharge end with the control box orientated toward the airhandler front. See Figure 2.

Figure 2.



3. Route the two electrical conduits (attached in step 1.) through the panel on the airhandler. Secure the conduits to the airhandler panel with the supplied plastic bushing nuts.
4. Using the supplied ½" long #10 screws, attach the heat kit to the airhandler outlet panel. **Note:** Open the heat kit electrical panel door to obtain access to the three screws on that side.
5. Follow the "Electrical Connections" section of this manual for wiring details.

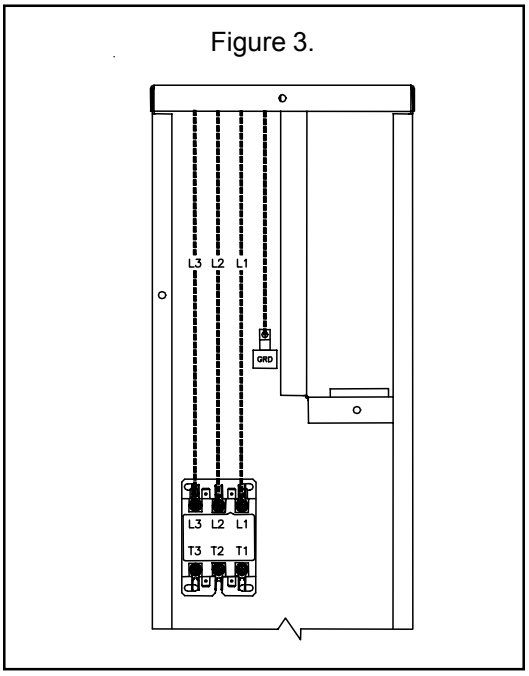
# Electrical Connections

Supply Voltage A single point supply voltage termination is provided in the heat kit control box.

The supply wire is to be routed through conduit from the service disconnect box to the heater kit. The heat kit is equipped with a knockout suitable for conduit. The supply voltage is to be installed on the terminal block located in the heater kit control box.

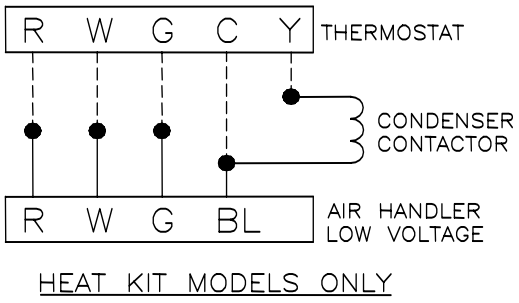
Route the air handler supply voltage and ground conductors though the ½" conduit that connects the heat kit to the airhandler. Attach the supply voltage wires to the airhandler contactor and the equipment ground to the airhandler ground lug. To assist with possible troubleshooting follow the wire color conventions indicated on the wiring diagram.

Figure 3.




Low Voltage. The low voltage connection from the airhandler to the heat kit is provided through a multi-pin plug that connects to a mating plug in the airhandler. Route the heat kit low voltage harness through the 1 ½" conduit to the airhandler control box and plug into the airhandler low voltage harness. **Note:** Low voltage from the room thermostat is terminated in the airhandler control box. Wiring options for the thermostat wiring are shown in the airhandler installation manual.

Figure 4.

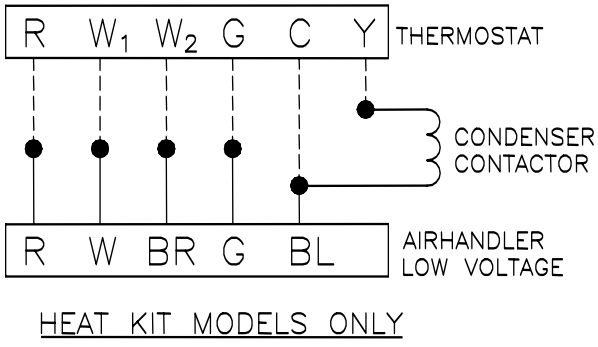



Single Stage Heat - Single Stage Cooling where

R - Red
W - White
G - Green
BL - Blue

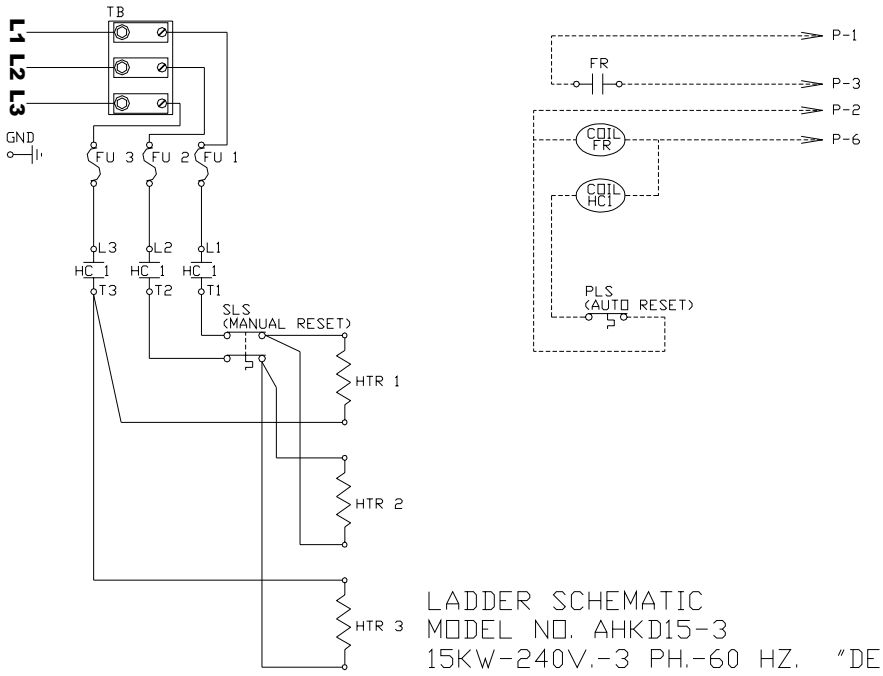
***Note:*** *Brown wire is not used and is to be taped*.

Figure 5.



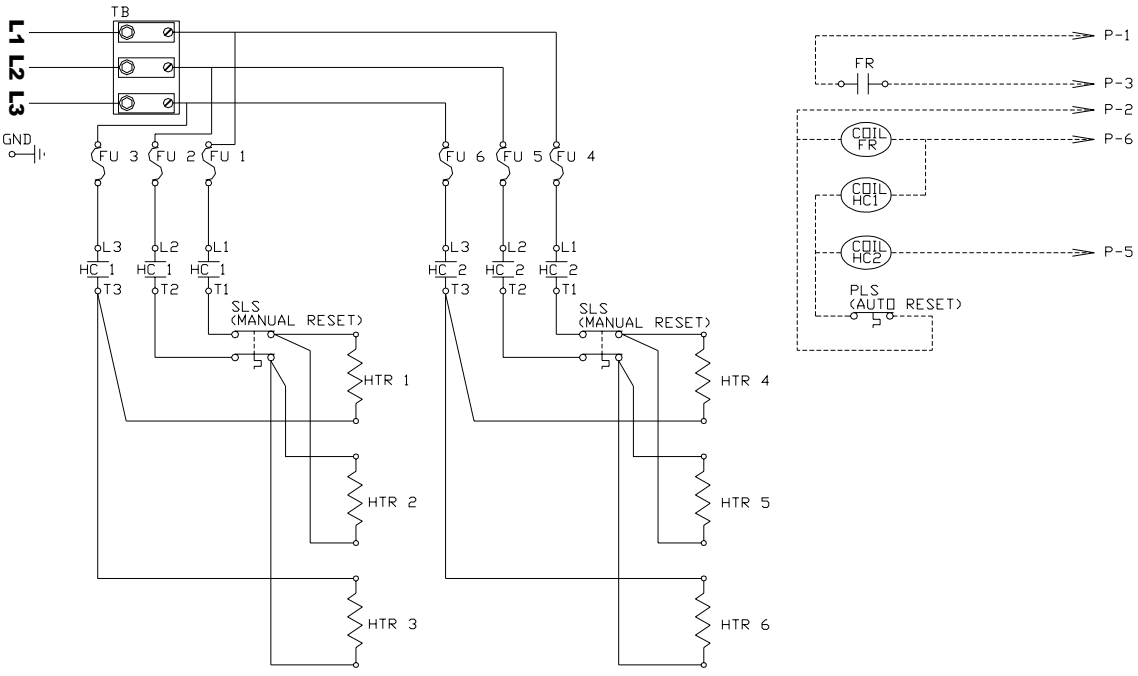

Two-Stage Heat - Single Stage Cooling where

R - Red
W - White
BR - Brown
G - Green
BL - Blue

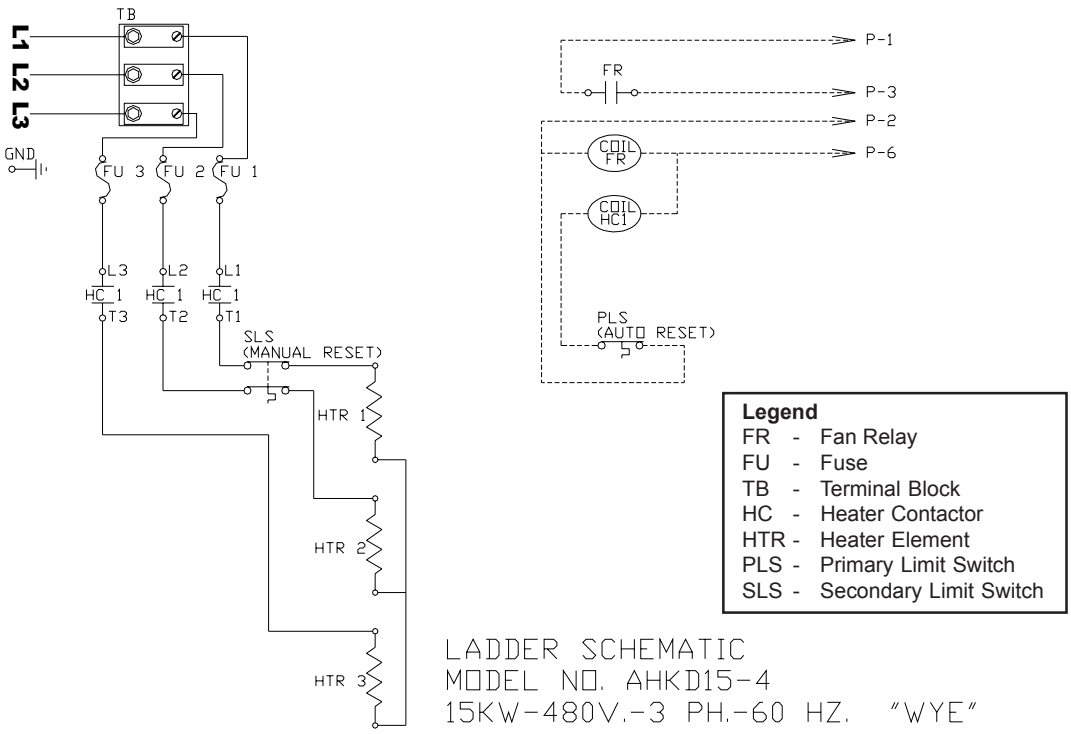



**Legend**
FR – Fan Relay
FU – Fuse
TB – Terminal Block
HC – Heater Contactor
HTR – Heater Element
PLS – Primary Limit Switch
SLS – Secondary Limit Switch

LADDER SCHEMATIC
MODEL NO. AHKD15-3
15KW-240V.-3 PH.-60 HZ. "DELTA"



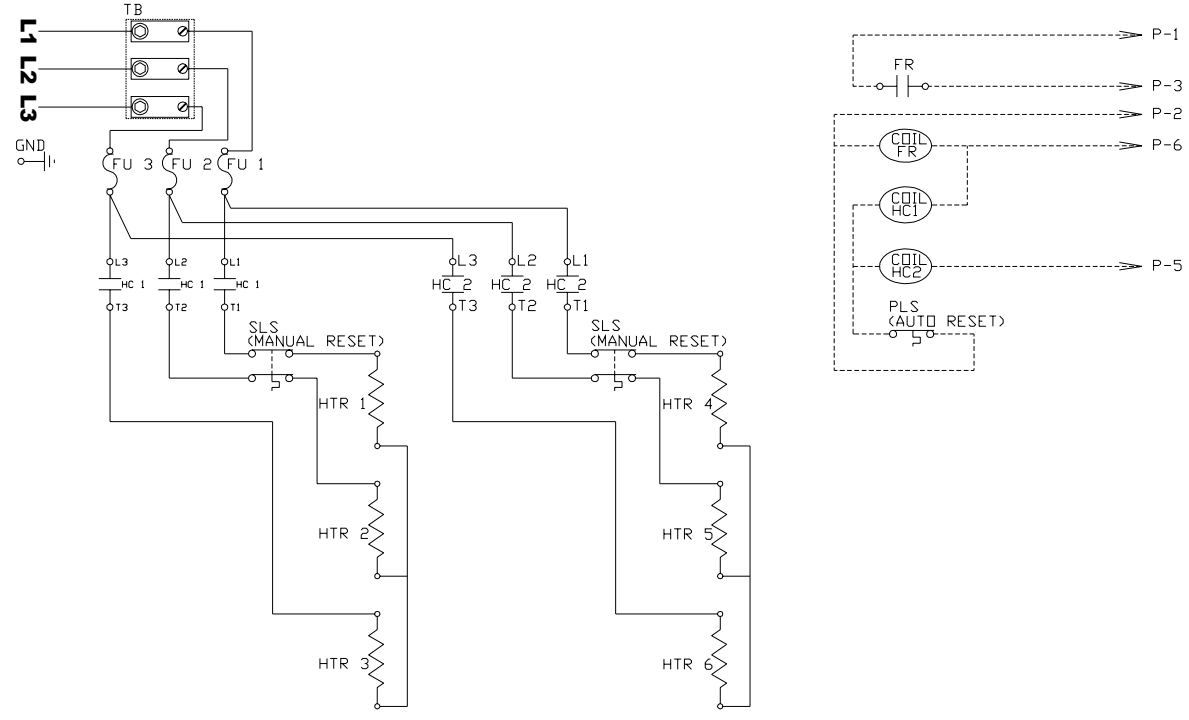

LADDER SCHEMATIC
MODEL NO. AHKD20-3 & AHKD30-3
20 & 30KW-240V.-3 PH.-60 HZ. "DELTA"




**Legend**

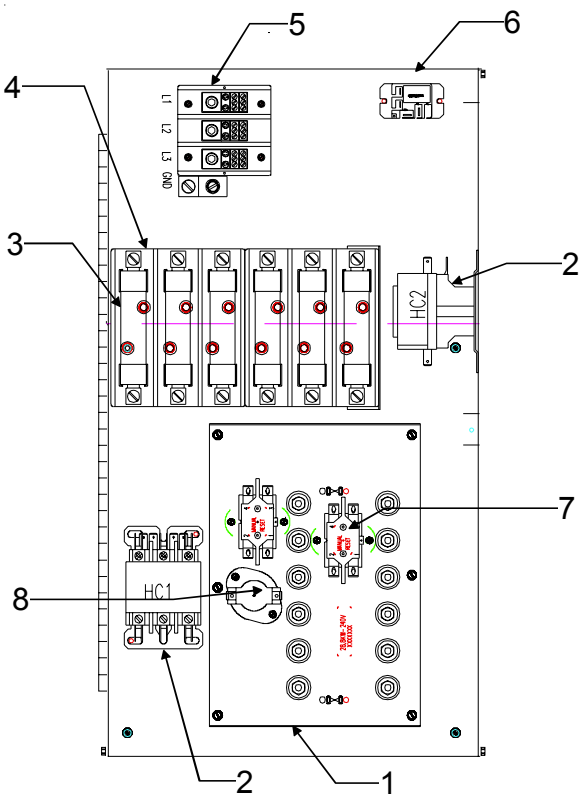
| | | |
|---|---|---|
| FR | - | Fan Relay |
| FU | - | Fuse |
| TB | - | Terminal Block |
| HC | - | Heater Contactor |
| HTR | - | Heater Element |
| PLS | - | Primary Limit Switch |
| SLS | - | Secondary Limit Switch |

LADDER SCHEMATIC
MODEL NO. AHKD15-4
15KW-480V.-3 PH.-60 HZ. "WYE"




LADDER SCHEMATIC
MODEL NO. AHKD20-4 & AHKD30-4
20 & 30KW-480V.-3 PH.-60 HZ. "WYE"

# Repair Parts




| ITEM | PART NO. | DESCRIPTION | MANUFACTURER | MFR. PART NO. | AHKD | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 15-3 | 15-4 | 20-3 | 20-4 | 30-3 | 30-4 |
| 1 | B1037600 | HEATER ASM. 15KW-240V-3PH | HEATCRAFT | 043-490532-01 | 1 | | | | | |
| | B1037601 | HEATER ASM. 20KW-240V-3PH | HEATCRAFT | 043-490532-02 | | | 1 | | | |
| | B1037602 | HEATER ASM. 30KW-240V-3PH | HEATCRAFT | 043-490532-03 | | | | | 1 | |
| | B1037603 | HEATER ASM. 15KW-480V-3PH | HEATCRAFT | 043-490532-04 | | 1 | | | | |
| | B1037604 | HEATER ASM. 20KW-480V-3PH | HEATCRAFT | 043-490532-05 | | | | 1 | | |
| | B1037605 | HEATER ASM. 30KW-480V-3PH | HEATCRAFT | 043-490532-06 | | | | | | 1 |
| 2 | B1360338 | CONTACTOR | WHITE ROGERS<br>PRODUCT UNLIMITED | 154-412221-5700PA<br>3100-30010191PL | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | B1170600 | FUSE, 60A / 240V | BUSSMAN MFG.<br>RELANCE FUSE<br>GOULD-SHAWMUT<br>LITTELFUSE | FRN-R60<br>ECNR-60<br>TR-60R<br>FLNR60 | 3 | | | | 6 | |
| | B1170601 | FUSE, 40A / 240V | BUSSMAN MFG.<br>LITTELFUSE | FRN-R40<br>FLNR40 | | | 6 | | | |
| | B1170602 | FUSE, 30A / 480V | BUSSMAN MFG.<br>LITTELFUSE | JJS30<br>FLNR30 | | 3 | | | | |
| | B1170603 | FUSE, 35A / 480V | BUSSMAN MFG.<br>LITTELFUSE | JJS35<br>JLLS35 | | | | 3 | | |
| | B1170604 | FUSE, 50A / 480V | BUSSMAN MFG.<br>MARATHON | JJS50<br>JLLS50 | | | | | | 3 |
| 4 | B1170605 | FUSE BLOCK, 3P/60A/250V | MARATHON<br>BUSSMAN MFG.<br>GOULD-SHAWMUT | RF60A3B<br>H25060-3C<br>20608 | 1 | | 2 | | 2 | |
| | B1170606 | FUSE BLOCK, 3P/30A/600V | BUSSMAN MFG.<br>MARATHON | T60030-3CR<br>6T30A3B | | 1 | | | | |
| | B1170607 | FUSE BLOCK, 3P/60A/600V | BUSSMAN MFG.<br>MARATHON | 1B0078<br>4263806 | | | | 1 | | 1 |
| 5 | B1368274 | TERMINAL BLOCK | MARATHON<br>BUSSMAN MFG. | 1423570<br>16220-3 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | B1370785 | RELAY | AMERICAN ZETTLER | AZ2280-1A-24AEF(208) | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | B1370198 | LIMIT, MANUAL RESET 160 °. F. | Klixon | 20493L3-105 | 1 | 1 | 2 | 2 | 2 | 2 |
| 8 | B1370199 | LIMIT, AUTO RESET 140 °. F. | Thermo-Disc | 60TX11-314463 | 1 | 1 | 1 | 1 | 1 | 1 |

**NOTE: SPECIFICATIONS AND PERFORMANCE DATA LISTED HEREIN ARE SUBJECT TO CHANGE WITHOUT NOTICE**

## Quality Makes the Difference!

All of our systems are designed and manufactured with the same high quality standards regardless of size of efficiency. Our designs virtually eliminate the most frequent causes of product failure. They are simple to service and forgiving to operate. We use the highest quality materials and components available because if a part fails then the unit fails. Finally, every unit is run tested before it leaves the factory. That's why we know...

***There's No Better Quality.***

Visit our website at www.goodmanmfg.com for information on:

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- Customer Services
- Parts
- Contractor Programs and Training
- Financing Options