

# INSTALLATION INSTRUCTIONS

## R-410A Single Package Rooftop

### Cooling Only Unit

#### RAH 150

**RAH units for installation in the United States contain a 2-speed indoor fan control system. This complies with the U.S. Department of Energy (DOE) efficiency standard of 2018.**

**RAH units for installation outside the United States may or may not contain use of the 2-speed indoor fan control system as they are not required to comply with the U.S. Department of Energy (DOE) efficiency standard of 2018.**

**For specific details on operation of the 2-speed indoor fan system refer to the Variable Frequency Drive (VFD) Factory-Installed Option 2-Speed Motor Control Installation, Setup, and Troubleshooting manual.**


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## SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloths for brazing operations and have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and appropriate national electrical codes (in USA, ANSI/NFPA 70, National Electrical Code (NEC); in Canada, CSA C22.1) for special requirements.

It is important to recognize safety information. This is the safety-alert symbol . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices, which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

### **WARNING**

#### **ELECTRICAL SHOCK HAZARD**

Failure to follow this warning could cause personal injury or death.

Before performing service or maintenance operations on unit, always turn off main power switch to unit and install lock(s) and lockout tag(s). Unit may have more than one power switch.

### **WARNING**

#### **UNIT OPERATION AND SAFETY HAZARD**

Failure to follow this warning could cause personal injury, death and/or equipment damage.

R-410A refrigerant systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on R-410A refrigerant equipment.

### **WARNING**

#### **PERSONAL INJURY AND ENVIRONMENTAL HAZARD**

Failure to follow this warning could cause personal injury or death.

Relieve pressure and recover all refrigerant before system repair or final unit disposal.

Wear safety glasses and gloves when handling refrigerants. Keep torches and other ignition sources away from refrigerants and oils.

**CAUTION**

**CUT HAZARD**

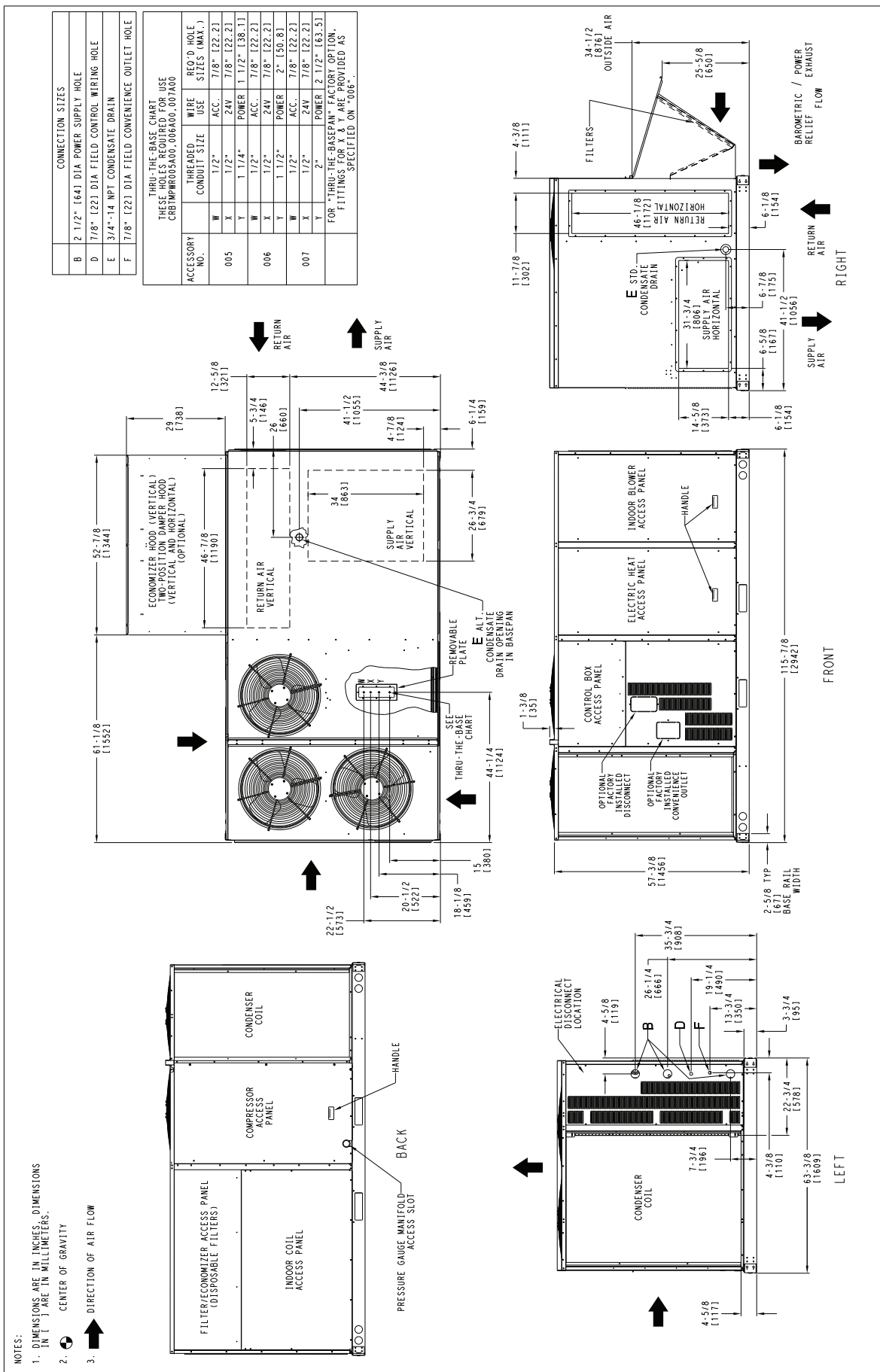
Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing air-conditioning equipment.

**Rated Indoor Airflow (cfm)** — The table below lists the rated indoor airflow used for the AHRI efficiency rating for the units covered in this document.

MODEL NUMBER	FULL LOAD AIRFLOW (CFM)
RAH150	4375

MODEL SERIES	R	A	H	1	8	1	H	0	A	A	0	A	A	T
Position Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
R = Rooftop														
A = Air Conditioning		Type												
H = High Efficiency			Efficiency											
150 = 12.5 Ton (Dual Compressor)				Nominal Cooling Capacity										
H= 208/230–3–60														
L = 460–3–60														
S = 575–3–60								Voltage						
0 = No Heat								Heating Capacity						
A = Standard Static Motor (Belt Drive) (12.5 Ton with 1 speed IFM, 3 phase only)														
C = Medium Static Motor (Belt Drive) (12.5 Ton with 1 speed IFM, 3 phase only)														
E = High Static - High Efficiency Motor (Belt Drive) (12.5 Ton with 1 speed IFM)														
G = High Static Motor / Drive with Hot Gas Re-Heat (12.5 Ton with 1 speed IFM)														
H = High Static Motor / Drive with Hot Gas Re-Heat (12.5 Ton with 2 speed IFM)								Motor Options						
A = None														
B = Economizer w/ Barometric Relief, OA Temp Sensor														
E = Economizer w/ Barometric Relief + CO Sensor, OA Temp Sensor														
H = Economizer w/ Barometric Relief, Enthalpy Sensor														
L = Economizer w/ Barometric Relief + CO Sensor, Enthalpy Sensor														
P = 2-Position Damper w/ Barometric Relief														
U = Temperature Ultra Low Leak Economizer w/ Barometric Relief														
W = Enthalpy Ultra Low Leak Economizer w/ Barometric Relief								Outdoor Air Options / Control						
0A = No Options														
4B = Non-Fused Disconnect														
AT= Non-Powered 115v C.O.														
BR = Supply Air Smoke Detector														
AA= Easy Access Hinged Panels													Factory-Installed Options	
A = Aluminum / Copper Condenser and Evaporator Coils														
B = Pre-Coat Aluminum / Copper Condenser and Aluminum / Copper Evaporator Coils														
C = E-Coat Aluminum / Copper Condenser and Aluminum / Copper Evaporator Coils														
D = E-Coat Aluminum / Copper Condenser and E-Coat Aluminum / Copper Evaporator Coils														
E = Copper / Copper Condenser and Aluminum / Copper Evaporator Coils														
F = Copper / Copper Condenser and Copper / Copper Evaporator Coils								Condenser / Evaporator Coil Configuration						
A = Standard Single Speed Indoor Fan Motor. For W7212 Controls														
B = Standard Single Speed Indoor Fan Motor. For W7220 Controls														
T = Two Speed Indoor Fan Motor (VFD) - Standard on U.S. models														Motor Type Option

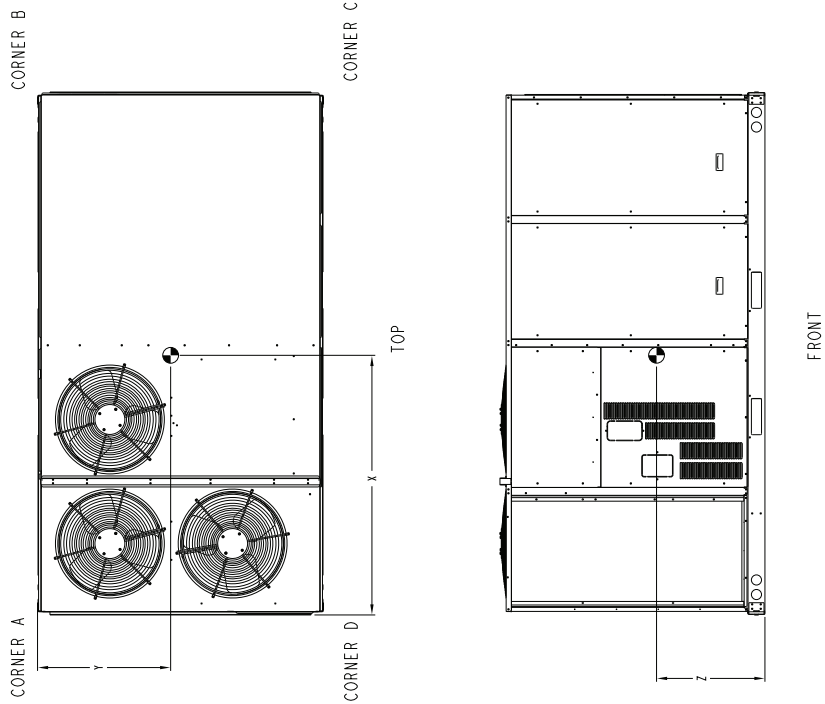
**Fig. 1 — Model Number Nomenclature (Example)**



**Fig. 2 — Unit Dimensional Drawing — RAH150**

UNIT	STD. UNIT WEIGHT (A) LBS. / KG.	CORNER WEIGHT (A) LBS. / KG.	CORNER WEIGHT (B) LBS. / KG.	CORNER WEIGHT (C) LBS. / KG.	CORNER WEIGHT (D) LBS. / KG.	C. G.		
						X	Y	Z
RAH150	1360 / 617	335 / 151	361 / 164	344 / 156	320 / 145	60 1/8 (1527)	31 (787)	21 1/8 (536)

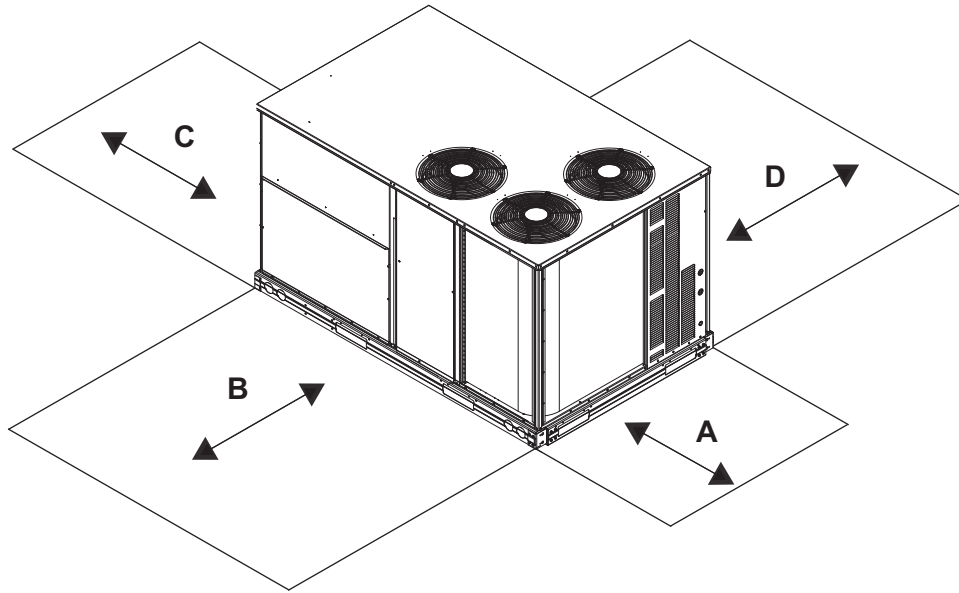
STANDARD UNIT WEIGHT IS WITHOUT ELECTRIC HEAT & WITHOUT PACKAGING.  
FOR OPTIONS & ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.



## HORIZONTAL ECONOMIZER

Fig. 2 — Unit Dimensional Drawing — RAH150 (cont)





LOCATION	DIMENSION	CONDITION
A	48-in. (1219 mm) 18-in. (457 mm) 18-in. (457 mm) 12-in. (305 mm)	Unit disconnect is mounted on panel No disconnect, convenience outlet option Recommended service clearance Minimum clearance
B	42-in. (1067 mm) 36-in. (914 mm)	Surface behind servicer is grounded (e.g., metal, masonry wall) Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)
C	36-in. (914 mm) 18-in. (457 mm)	Side condensate drain is used Minimum clearance
D	42-in. (1067 mm) 36-in. (914 mm)	Surface behind servicer is grounded (e.g., metal, masonry wall, another unit) Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)

NOTE: Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

**Fig. 3 — Service Clearance Dimensional Drawing**

## INSTALLATION

**Jobsite Survey** — Complete the following checks before installation.

1. Consult local building codes and the NEC (National Electrical Code) ANSI/NFPA 70 for special installation requirements.
2. Determine unit location (from project plans) or select unit location.
3. Check for possible overhead obstructions which may interfere with unit lifting or rigging.

**Step 1 — Plan for Unit Location** — Select a location for the unit and its support system (curb or other) that provides for at least the minimum clearances required for safety. This includes the clearance to combustible surfaces, unit performance and service access below, around and above unit as specified in unit drawings. See Fig. 3.

NOTE: Consider also the effect of adjacent units.

Unit may be installed directly on wood flooring or on Class A, B, or C roof-covering material when roof curb is used.

Do not install unit in an indoor location. Do not locate air inlets near exhaust vents, relief valves, or other sources of contaminated air.

Although unit is weatherproof, avoid locations that permit water from higher level runoff and overhangs to fall onto the unit.

Select a unit mounting system that provides adequate height to allow installation of condensate trap per requirements. Refer to Step 9 — Install External Condensate Trap and Line for required trap dimensions.

**ROOF MOUNT** — Check building codes for weight distribution requirements. Unit operating weight is shown in Table 1.

**Table 1 — Operating Weights**

RAH150 UNITS	
COMPONENT	LB (KG)
Base Unit	1360 (617)
Economizer	
Vertical	103 (47)
Horizontal	242 (110)
Hot Gas Re-Heat System	90 (41)
Powered Outlet	35 (16)
Curb	
14-in. (356 mm)	180 (82)
24-in. (610 mm)	255 (116)

## **Step 2 — Plan for Sequence of Unit Installation —**

The support method used for this unit will dictate different sequences for the steps of unit installation. For example, on curb-mounted units, some accessories must be installed on the unit before the unit is placed on the curb. Review the following for recommended sequences for installation steps.

### **CURB-MOUNTED INSTALLATION**

- Install curb
- Install field-fabricated ductwork inside curb
- Install accessory thru-base service connection package (affects curb and unit) (refer to accessory installation instructions for details)
- Prepare bottom condensate drain connection to suit planned condensate line routing (refer to Step 9 for details)
- Rig and place unit
- Install outdoor air hood
- Install condensate line trap and piping
- Make electrical connections
- Install other accessories

### **PAD-MOUNTED INSTALLATION**

- Prepare pad and unit supports
- Check and tighten the bottom condensate drain connection plug
- Rig and place unit
- Convert unit to side duct connection arrangement
- Install field-fabricated ductwork at unit duct openings
- Install outdoor air hood

Install condensate line trap and piping

Make electrical connections

Install other accessories

**FRAME-MOUNTED INSTALLATION** — Frame-mounted applications generally follow the sequence for a curb installation. Adapt as required to suit specific installation plan.

**Step 3 — Inspect Unit** — Inspect unit for transportation damage. File any claim with transportation agency.

Confirm before installation of unit that voltage, amperage and circuit protection requirements listed on unit data plate agree with power supply provided.

On units with hinged panel option, check to be sure all latches are snug and in closed position.

Locate the carton containing the outside air hood parts; see Fig. 11 and 12. Do not remove carton until unit has been rigged and located in final position.

## **Step 4 — Provide Unit Support**

**ROOF CURB MOUNT** — Accessory roof curb details and dimensions are shown in Fig. 4. Assemble and install accessory roof curb in accordance with instructions shipped with the curb.

NOTE: The gasketing of the unit to the roof curb is critical for a watertight seal. Install gasket supplied with the roof curb as shown in Fig. 4. Improperly applied gasket can also result in air leaks and poor unit performance.

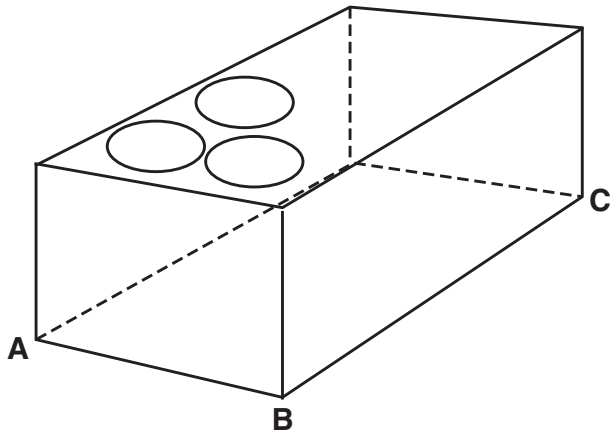
Curb should be level. This is necessary for unit drain to function properly. Unit leveling tolerances are shown in Fig. 5. Refer to Accessory Roof Curb Installation Instructions for additional information as required.

NOTES:

1. ROOF CURB ACCESSORY IS SHIPPED DISASSEMBLED.
2. DIMENSIONS: 1/2" TYP. HOLES; 1/2" TYP. HOLES; 1/2" TYP. HOLES; 1/2" TYP. HOLES.
3. DIMENSIONS: 1/2" TYP. HOLES; 1/2" TYP. HOLES; 1/2" TYP. HOLES; 1/2" TYP. HOLES.
4. ROOF CURB SIDEWALLS: 16 GAGE STEEL.
5. ATTACH DUCTWORK TO CURB (FLANGES OF DUCT REST ON CURB).
6. SERVICE CLEARANCE 4 FT ON EACH SIDE.
7. DIRECTION OF AIR FLOW.
8. "1" & "3" DESIGNATIONS DENOTE LOCATION OF COMMON CROSS RAIL. (POSITION "1" FOR LARGE DUCT OPENING CURB).



7



**MAXIMUM ALLOWABLE DIFFERENCE IN. (MM)**

A-B	B-C	A-C
0.5" (13)	1.0" (25)	1.0" (25)

**Fig. 5 — Unit Leveling Tolerances**

Install insulation, cant strips, roofing felt, and counter flashing as shown. *Ductwork must be attached to curb and not to the unit.*

**IMPORTANT:** If the unit's electric and control wiring is to be routed through the basepan and the unit is equipped with the factory-installed Thru-the-Base service option see the following sections:

- Factory-Option Thru-Base Connections on page 17

If using the field-installed Thru-the-Base accessory follow the instructions provided with the accessory kit.

**NOTE:** If electrical connection is not going to occur at this time, tape or otherwise cover the fittings so that moisture does not get into the building or conduit in the interim.

**SLAB MOUNT (HORIZONTAL UNITS ONLY)** — Provide a level concrete slab that extends a minimum of 6 in. (150 mm) beyond unit cabinet. Install a gravel apron in front of condenser coil air inlet to prevent grass and foliage from obstructing airflow.

**NOTE:** Horizontal units may be installed on a roof curb if required.

**ALTERNATE UNIT SUPPORT (IN LIEU OF CURB OR SLAB MOUNT)** — A non-combustible sleeper rail can be used in the unit curb support area. If sleeper rails cannot be used, support the long sides of the unit with a minimum of 3 equally spaced 4-in. x 4-in. (102 mm x 102 mm) pads on each side.

### Step 5 — Field Fabricate Ductwork

**NOTE:** Cabinet return-air static pressure (a negative condition) shall not exceed 0.35 in. wg (87 Pa) with economizer or 0.45 in. wg (112 Pa) without economizer.

For vertical ducted applications, secure all ducts to roof curb and building structure. *Do not connect ductwork to unit.*

Fabricate supply ductwork so that the cross sectional dimensions are equal to or greater than the unit supply duct opening dimensions for the first 18 in. (458 mm) of duct length from the unit basepan.

Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

Ducts passing through unconditioned spaces must be insulated and covered with a vapor barrier.

If a plenum return is used on a vertical unit, the return should be ducted through the roof deck to comply with applicable fire codes.

**FOR UNITS WITH ACCESSORY OR OPTIONAL ELECTRIC HEATERS** — All installations require a minimum clearance to combustible surfaces of 1-in. (25 mm) from duct for first 12-in. (305 mm) away from unit.

Outlet grilles must not lie directly below unit discharge.

**NOTE:** A 90-degree elbow must be provided in the ductwork to comply with UL (Underwriters Laboratories) code for use with electric heat.

### ⚠ WARNING

#### PERSONAL INJURY HAZARD

Failure to follow this warning could cause personal injury.

For vertical supply and return units, tools or parts could drop into ductwork and cause an injury. Install a 90-degree turn in the return ductwork between the unit and the conditioned space. If a 90-degree elbow cannot be installed, then a grille of sufficient strength and density should be installed to prevent objects from falling into the conditioned space. Due to electric heater, supply duct will require 90-degree elbow.

### ⚠ CAUTION

#### PROPERTY DAMAGE HAZARD

Failure to follow this caution may result in damage to roofing materials.

Membrane roofs can be cut by sharp sheet metal edges. Be careful when placing any sheet metal parts on such roof.

**Step 6 — Rig and Place Unit** — When the unit is ready to be rigged and no longer will be lifted by a fork truck, the wood protector under the basepan must be removed. Remove 4 screws from each base rail. Wood protector will drop to the ground. See instructions on the unit base rails.

Keep unit upright and do not drop. Spreader bars are required. Rollers may be used to move unit across a roof. Level by using unit frame as a reference. See Table 1 and Fig. 6 for additional information.

Lifting holes are provided in base rails as shown in Fig. 6. Refer to rigging instructions on unit.

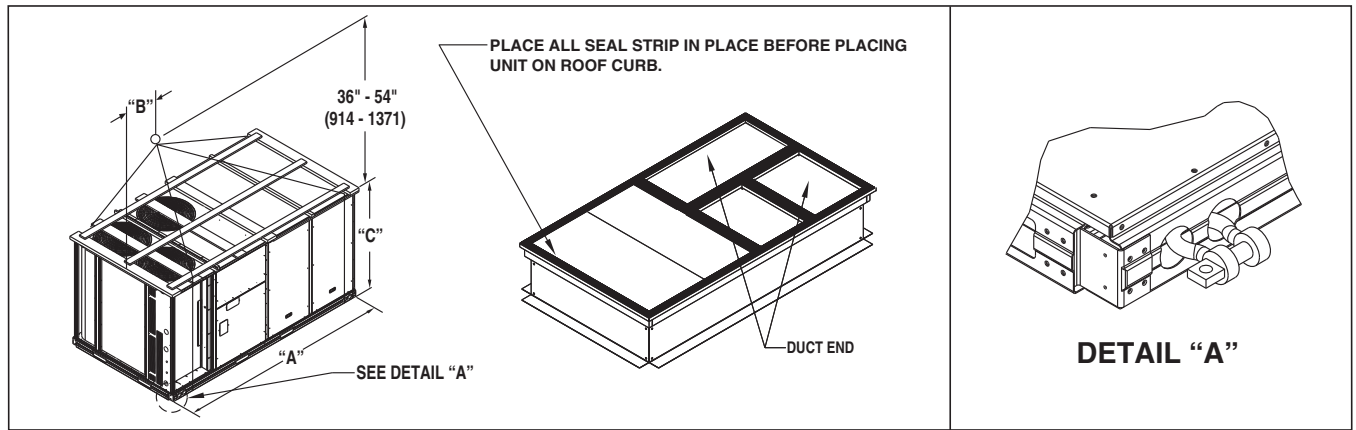
### ⚠ CAUTION

#### UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

All panels must be in place when rigging. Unit is not designed for handling by fork truck when panels or packaging are removed.

Before setting the unit onto the curb, recheck gasketing on curb.



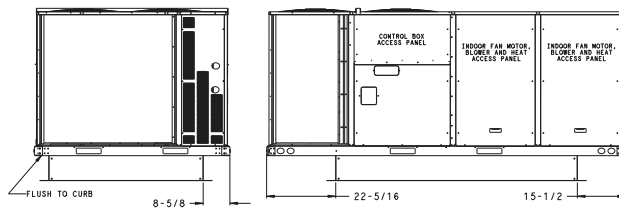
UNIT	MAX WEIGHT		DIMENSIONS					
			A		B		C	
	lb	kg	in.	mm	in.	mm	in.	mm
<b>RAH150</b>	2105	957	116.0	2945	62.5	1590	59.5	1510

**NOTES:**

1. SPREADER BARS REQUIRED — Top damage will occur if spreader bars are not used.
2. Dimensions in ( ) are in millimeters.
3. Hook rigging shackles through holes in base rail, as shown in detail "A." Holes in base rails are centered around the unit center of gravity. Use wooden top to prevent rigging straps from damaging unit.

**Fig. 6 — Rigging Details**

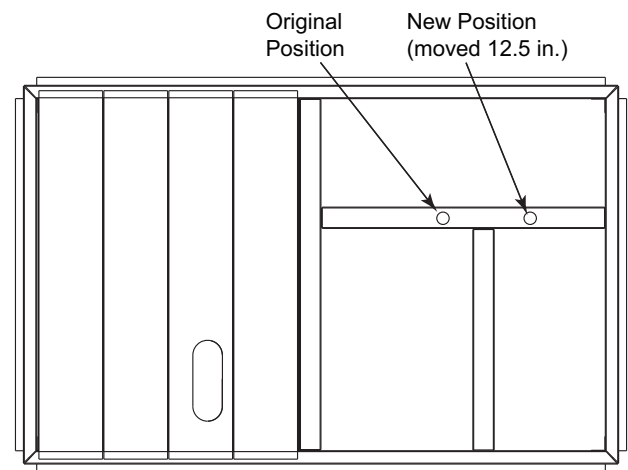
**POSITIONING ON CURB** — For full perimeter curbs CRRFCURB074A00 and 075A00, the clearance between the roof curb and the front and rear base rails should be  $\frac{1}{4}$  in. (6.4 mm). The clearance between the curb and the end base rails should be  $\frac{1}{2}$  in. (13 mm). For retrofit applications with curbs CRRFCURB003A01 and 4A01, the unit should be positioned as shown in Fig. 7. Maintain the 15.5 in. (394 mm) and  $8\frac{5}{8}$  in. (220 mm) clearances and allow the  $22\frac{5}{16}$  in. (567 mm) dimension to float if necessary.



**Fig. 7 — Retrofit Installation Dimensions**

If the alternative condensate drain location through the bottom of the unit is used in conjunction with a retrofit curb, the hole in the curb must be moved 12.5 in. (320 mm) towards the end of the unit. (See Fig. 8.)

Although unit is weatherproof, guard against water from higher level runoff and overhangs.



**Fig. 8 — Alternative Condensate Drain Hole Positions**

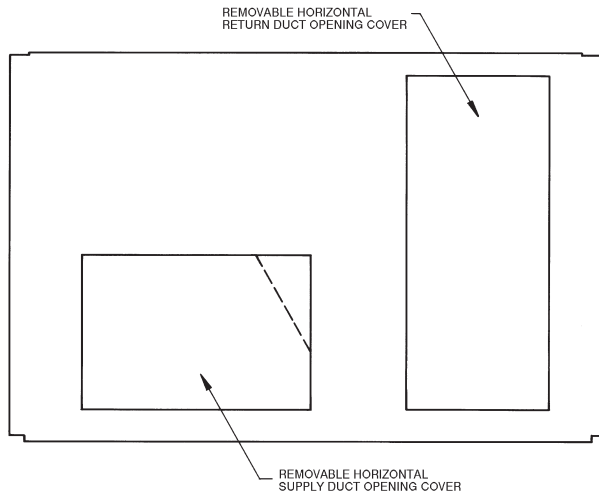
**IMPORTANT:** If the unit has the factory-installed Thru-the-Base option, make sure to complete installation of the option before placing the unit on the roof curb. See the following section:

- Factory-Option Thru-Base Connections on page 17

**NOTE:** If electrical connections are not going to occur at this time, tape or otherwise cover the fittings so that moisture does not get into the building or conduit in the interim.

Remove all shipping materials and top skid. Remove extra center post from the condenser end of the unit so that the condenser end of the unit matches Fig. 18-20. Recycle or dispose of all shipping materials.

**Step 7 — Convert to Horizontal and Connect Ductwork (When Required)** — Unit is shipped in the vertical duct configuration. Unit without factory-installed economizer or return air smoke detector option may be field-converted to horizontal ducted configuration using accessory CRDUCTCV002A00. To convert to horizontal configuration, remove screws from side duct opening covers and remove covers. See Fig. 9.



**Fig. 9 — Horizontal Conversion Panels**

Discard the supply duct cover. Install accessory CRDUCTCV002A00 to cover the vertical supply duct opening. Use the return duct cover removed from the end panel to cover the vertical return duct opening.

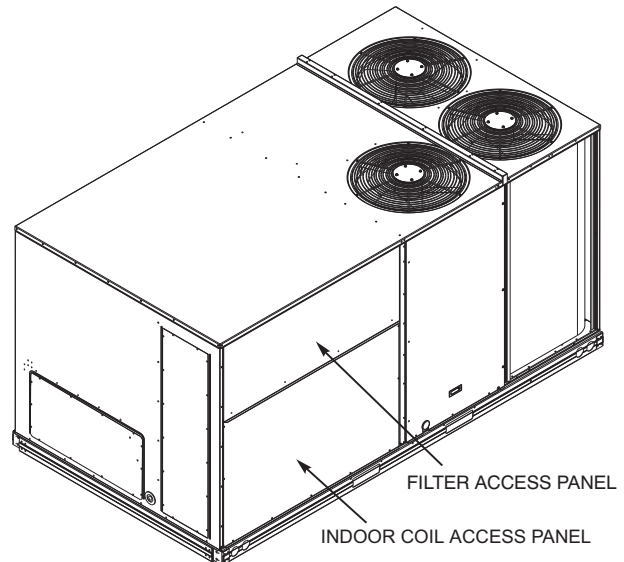
Field-supplied flanges should be attached to horizontal duct openings and all ductwork should be secured to the flanges. Insulate and weatherproof all external ductwork, joints, and roof or building openings with counter flashing and mastic in accordance with applicable codes.

Do not cover or obscure visibility to the unit's informative data plate when insulating horizontal ductwork.

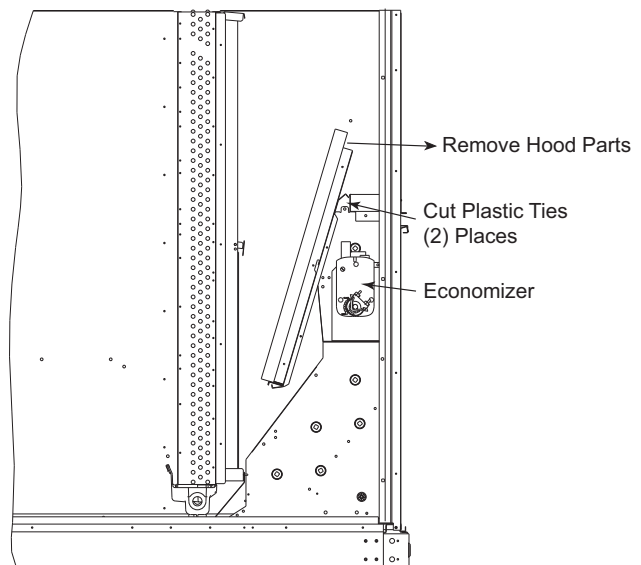
## Step 8 — Install Outside Air Hood

### ECONOMIZER HOOD REMOVAL AND SETUP — FACTORY OPTION

1. The hood is shipped in knock-down form and located in the return air compartment. It is attached to the economizer using two plastic tie-wraps.
2. To gain access to the hood, remove the filter access panel. (See Fig. 10.)
3. Locate and cut the (2) plastic tie-wraps, being careful to not damage any wiring. (See Fig. 11.)
4. Carefully lift the hood assembly through the filter access opening and assemble per the steps outlined in Economizer Hood and Two-Position Hood on page 11.



**Fig. 10 — Typical Access Panel Locations**



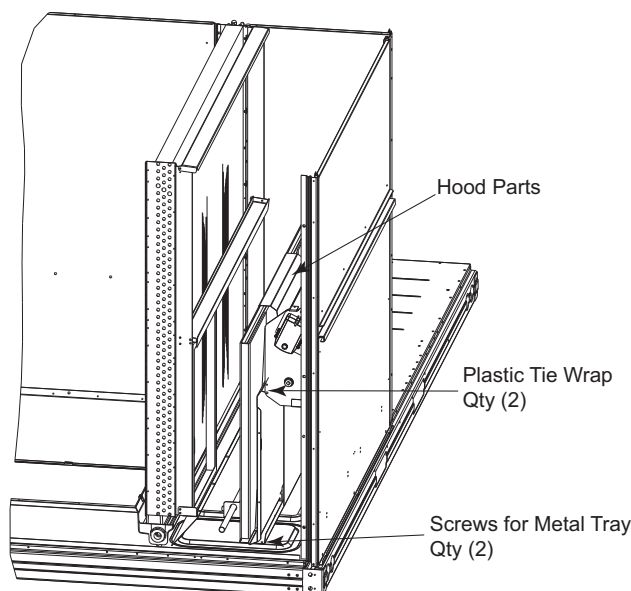
**Fig. 11 — Economizer Hood Package Location**

### TWO POSITION DAMPER HOOD REMOVAL AND SETUP — FACTORY OPTION

1. The hood is shipped in knock-down form and assembled to a metal support tray using plastic stretch wrap. Located in the return air compartment, the assembly's metal tray is attached to the basepan and also attached to the damper using two plastic tie-wraps.
2. To gain access to the hood, remove the filter access panel. (See Fig. 10.)
3. Locate the (2) screws holding the metal tray to the basepan and remove. In order to remove the screws, it may be necessary to remove the panel underneath the two-position damper. Remove the two screws. Locate and cut the (2) plastic tie-wraps securing the assembly to the damper. (See Fig. 12.) Be careful to not damage any wiring or cut tie-wraps securing any wiring.
4. Carefully lift the hood assembly (with metal tray) through the filter access opening and assemble per the steps outlined in Economizer Hood and Two-Position Hood on page 11.



5. If removed, reattach the panel under the damper.

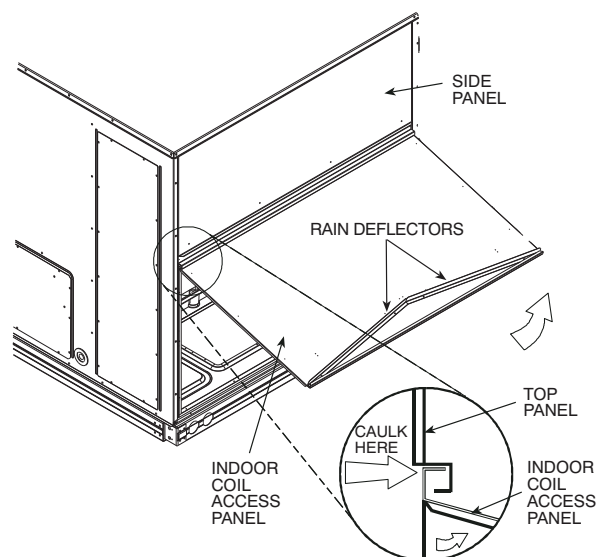


**Fig. 12 — Two-Position Damper Hood Package Location**

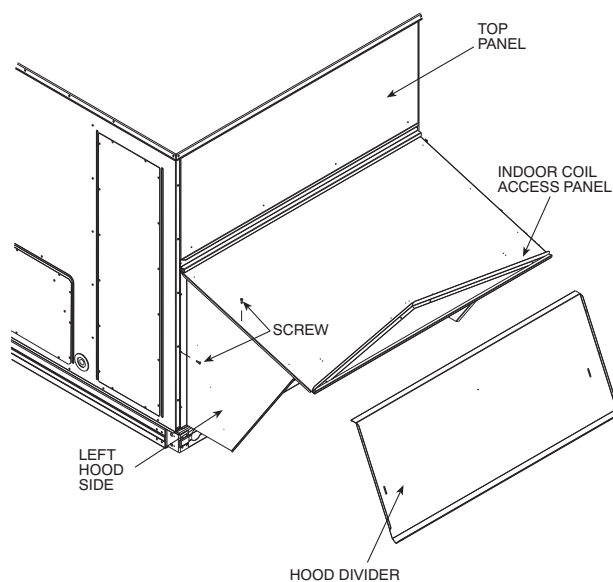
### ECONOMIZER HOOD AND TWO-POSITION HOOD

NOTE: If the power exhaust accessory is to be installed on the unit, the hood shipped with the unit will not be used and must be discarded. Save the aluminum filter for use in the power exhaust hood assembly.

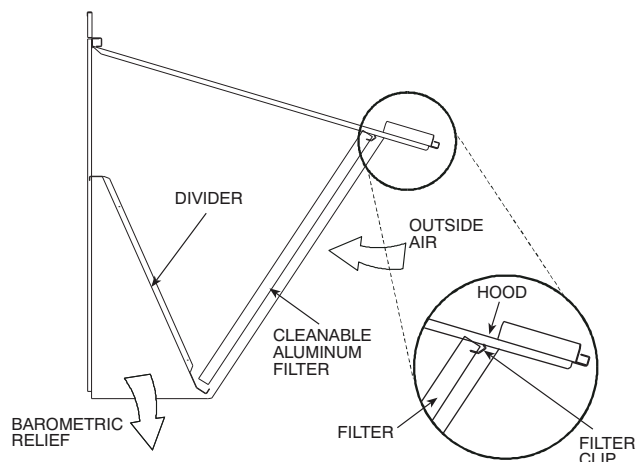
1. The indoor coil access panel will be used as the top of the hood. If the panel is still attached to the unit, remove the screws along the sides and bottom of the panel. See Fig. 13.
2. Swing out indoor coil access panel and insert the hood sides under the panel (hood top). *Be careful not to lift the panel too far as it might fall out.* Use the screws provided to attach the hood sides to the hood top. Use screws provided to attach the hood sides to the unit. See Fig. 14.
3. Remove the shipping tape holding the economizer barometric relief damper in place.
4. Insert the hood divider between the hood sides. See Fig. 14 and 15. Secure hood divider with 3 screws on each hood side. The hood divider is also used as the bottom filter rack for the aluminum filter.
5. Attach the post that separates the filters with the screws provided.
6. Open the filter clips which are located underneath the hood top. Insert the aluminum filters into the bottom filter rack (hood divider). Push the filter into position past the open filter clips. Close the filter clips to lock the filters into place. See Fig. 15.
7. Install the two rain deflectors on the edge of the hood top as shown in Fig. 13.
8. Caulk the ends of the joint between the unit top panel and the hood top as shown in Fig. 13.
9. Replace the filter access panel.



**Fig. 13 — Indoor Coil Access Panel Relocation**



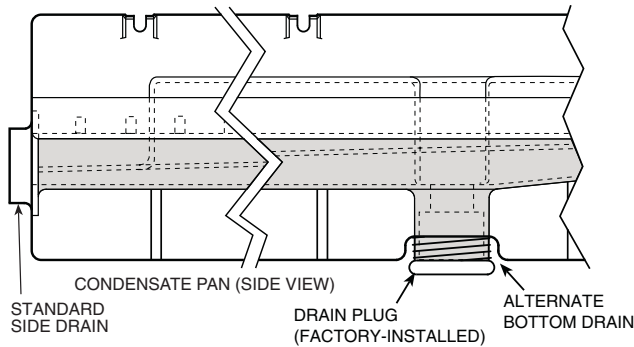
**Fig. 14 — Economizer Hood Construction**



**Fig. 15 — Economizer Filter Installation**



**Step 9 — Install External Condensate Trap and Line** — The unit has one  $\frac{3}{4}$ -in. condensate drain connection on the end of the condensate pan and an alternate connection on the bottom. See Fig. 16. Unit airflow configuration does not determine which drain connection to use. Either drain connection can be used with vertical or horizontal applications.



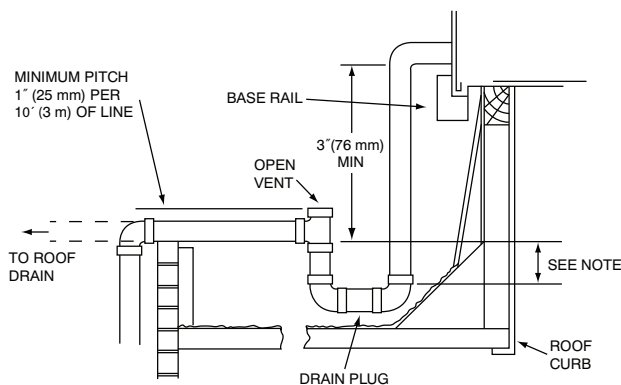
**Fig. 16 — Condensate Drain Pan (Side View)**

When using the standard side drain connection, ensure the red plug in the alternate bottom connection is tight. Do this before setting the unit in place. The red drain pan can be tightened with a  $\frac{1}{2}$ -in. square socket drive extension.

To use the alternate bottom drain connection, remove the red drain plug from the bottom connection (use a  $\frac{1}{2}$ -in. square socket drive extension) and install it in the side drain connection.

The piping for the condensate drain and external trap can be completed after the unit is in place. See Fig. 17.

*All units must have an external trap for condensate drainage. Install a trap at least 4-in. (102 mm) deep and protect against freeze-up. If drain line is installed downstream from the external trap, pitch the line away from the unit at 1-in. per 10 ft (25 mm in 3 m) of run. Do not use a pipe size smaller than the unit connection ( $\frac{3}{4}$ -in.).*



NOTE: Trap should be deep enough to offset maximum unit static difference. A 4 in. (102 mm) trap is recommended.

**Fig. 17 — Condensate Drain Piping Details**

## Step 10 — Make Electrical Connections

### ⚠ WARNING

#### ELECTRICAL SHOCK HAZARD

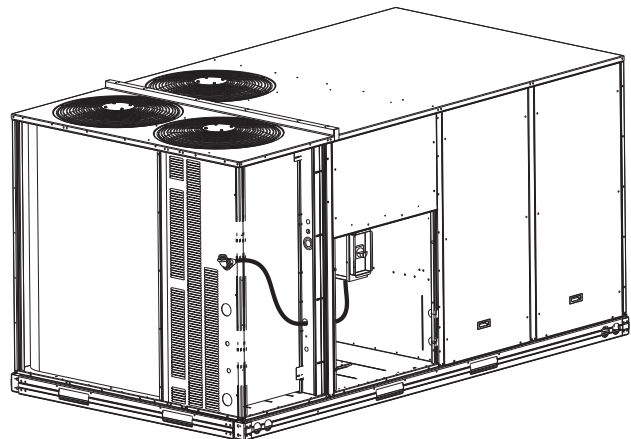
Failure to follow this warning could result in personal injury or death.

Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code); ANSI/NFPA 70, latest edition (in Canada, Canadian Electrical Code CSA [Canadian Standards Association] C22.1), and local electrical codes.

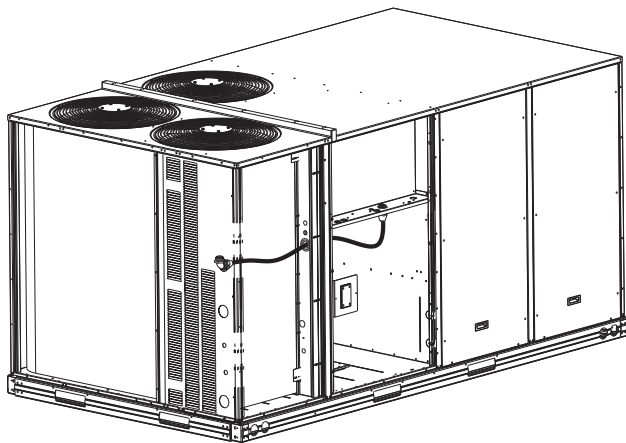
NOTE: Field-supplied wiring shall conform with the limitations of minimum 63°F (3°C) rise.

**FIELD POWER SUPPLY** — For those units without through-the-curb power, conduit must be used to route the main power from the condenser end, via the power entry in the corner post of the unit (see Fig. 18-20) to either the factory option disconnect or the bottom of the control box. 1-in. conduit is provided wrapped around compressor. A second conduit is provided with factory installed powered convenience outlet. For those units that require conduit larger than 1-in., it must be field supplied. Figures 18-20 show the wire routings.

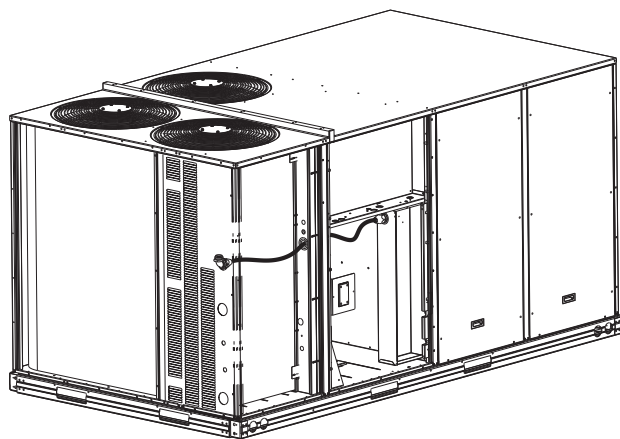
If the field disconnect is larger than 100A, it must be attached to the unit using accessory CRDISBKT001A00 — disconnect switch bracket (see Fig. 21). Follow the instructions provided with this accessory. For smaller field disconnects, be sure to use  $\frac{1}{2}$ -in. screws to mount the disconnect directly to the end panel (see Fig. 22). In either case, set the disconnect vertical location on the unit so that a 90 degree fitting can be used to connect the conduit to the disconnect.



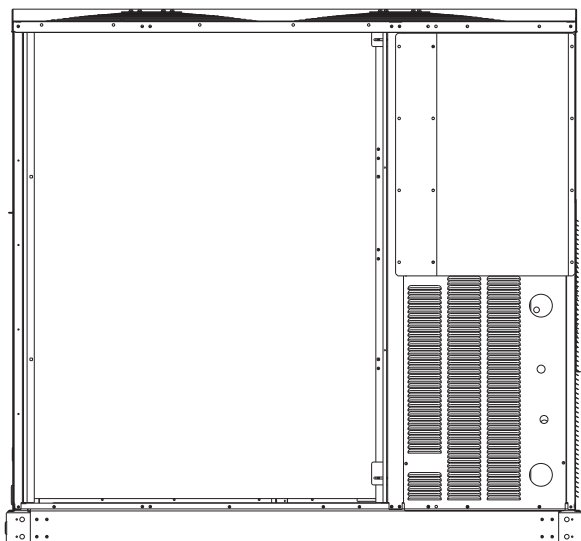
**Fig. 18 — Conduit into Factory Option Non-Fused Disconnect**



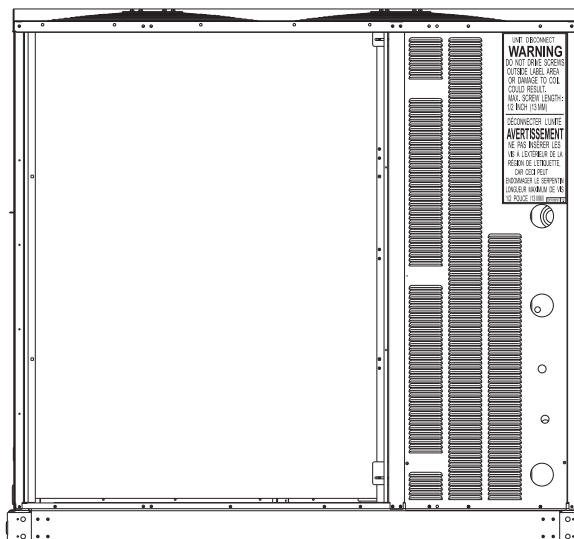
**Fig. 19 — Conduit into Control Box**



**Fig. 20 — Conduit into Single Point Box**



**Fig. 21 — Mounting Position for Field Disconnects (over 100A)**



**Fig. 22 — Mounting Position for Field Disconnects (up to 100A)**

Field power wires are connected to the unit at line-side pressure lugs at the main terminal block (TB1) or at factory-installed option non-fused disconnect switch, or field or factory-installed Single Point box for electric heat. Refer to Table 2 for maximum wire size at connection lugs. Use copper wire only. See Fig. 23.

**Table 2 — Connection Lug Min/Max Wire Sizes**

	MINIMUM	MAXIMUM
<b>Disconnect Option</b>	#14	#1
<b>Without Disconnect Option (TB1)</b>	#14	00

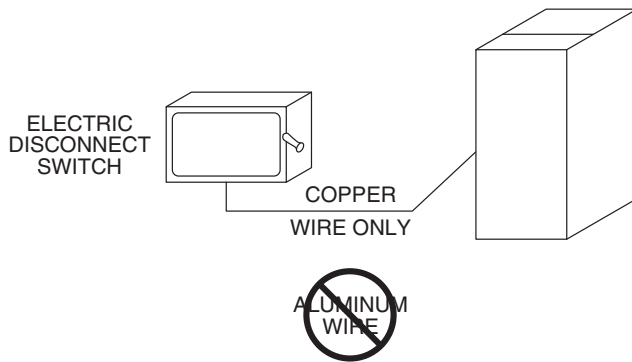
**NOTE: TEST LEADS** — Unit may be equipped with short leads (pigtails) on the field line connection points off the optional non-fused disconnect switch. These leads are for factory run-test purposes only; remove and discard before connecting field power wires to unit connection points. Make field power connections directly to line connection pressure lugs only.

**⚠ WARNING**

**FIRE HAZARD**

Failure to follow this warning could result in personal injury, death, or property damage intermittent operation or performance satisfaction.

Do not connect aluminum wire between disconnect switch and air conditioning unit. Use only copper wire. (See Fig. 23.)

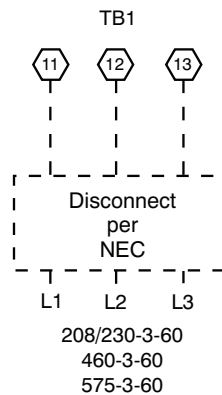


**Fig. 23 — Disconnect Switch and Unit**

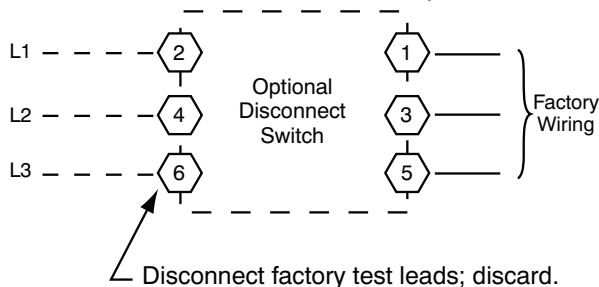
**ALL UNITS** — All field wiring must comply with NEC and all local requirements.

Size wire based on MCA (Minimum Circuit Amps) on the unit informative plate. See Fig. 23 and the unit label diagram for power wiring connections to the unit power terminal blocks and equipment ground. Refer to Table 2 for maximum wire size at connection lugs.

### Units Without Disconnect Option



### Units With Disconnect Option



**Fig. 24 — Power Wiring Connections**

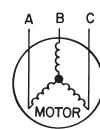
Provide a ground-fault and short-circuit over-current protection device (fuse or breaker) per NEC Article 440 (or local codes). Refer to unit informative data plate for MOCP (Maximum Over-current Protection) device size.

Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate. On 3-phase units, voltages between phases must be balanced within 2% and the current within 10%. Use the following formula to determine the percent of voltage imbalance.

% Voltage imbalance

$$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 230-3-60.



AB = 224 v  
BC = 231 v  
AC = 226 v

$$\begin{aligned} \text{Average Voltage} &= \frac{224 + 231 + 226}{3} \\ &= \frac{681}{3} \\ &= 227 \end{aligned}$$

Determine maximum deviation from average voltage.

(AB) 227 - 224 = 3 v  
(BC) 231 - 227 = 4 v  
(AC) 227 - 226 = 1 v

Maximum deviation is 4 v.

Determine percent of voltage imbalance.

$$\begin{aligned} \% \text{ Voltage Imbalance} &= 100 \times \frac{4}{226} \\ &= 1.76\% \end{aligned}$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

**IMPORTANT:** If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

All units except 208/230-v units are factory wired for the voltage shown on the nameplate. *If the 208/230-v unit is to be connected to a 208-v power supply, the control transformer must be rewired by moving the black wire with the 1/4-in. female spade connector from the 230-v connection and moving it to the 200-v 1/4-in. male terminal on the primary side of the transformer.* Refer to unit label diagram for additional information.

### ⚠ CAUTION

#### UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable ICP warranty.

**NOTE:** Check all factory and field electrical connections for tightness.

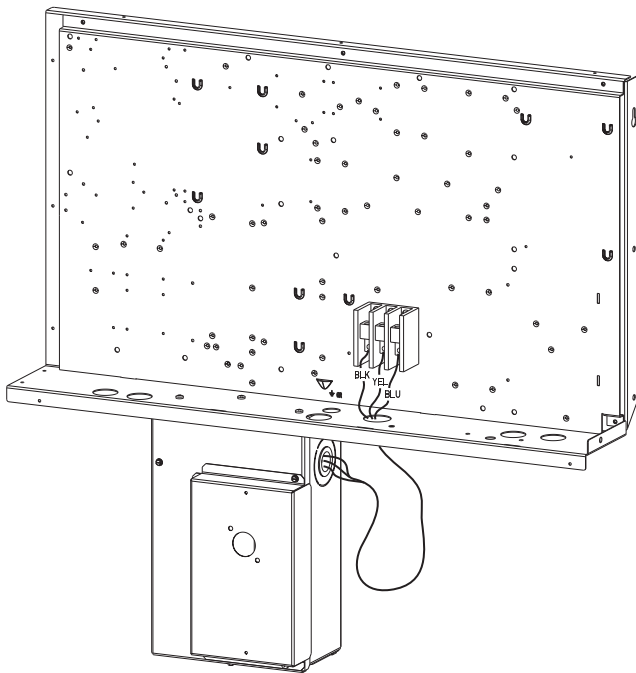
**UNITS WITHOUT FACTORY-INSTALLED NON-FUSED DISCONNECT** — When installing units, provide a disconnect switch of adequate size per NEC (National Electrical Code). Disconnect sizing data is provided on the unit informative plate. Locate on unit cabinet or within sight of the unit per national or local codes. Do not cover unit informative plate if mounting the disconnect on the unit cabinet.

**UNITS WITH FACTORY-INSTALLED NON-FUSED DISCONNECT** — The factory-installed option non-fused disconnect switch (NFD) is located in a weatherproof enclosure located under the main control box. The manual switch handle is accessible through an opening in the access panel. Discard the factory test leads (see Fig. 24). The factory disconnect is an 80A disconnect.

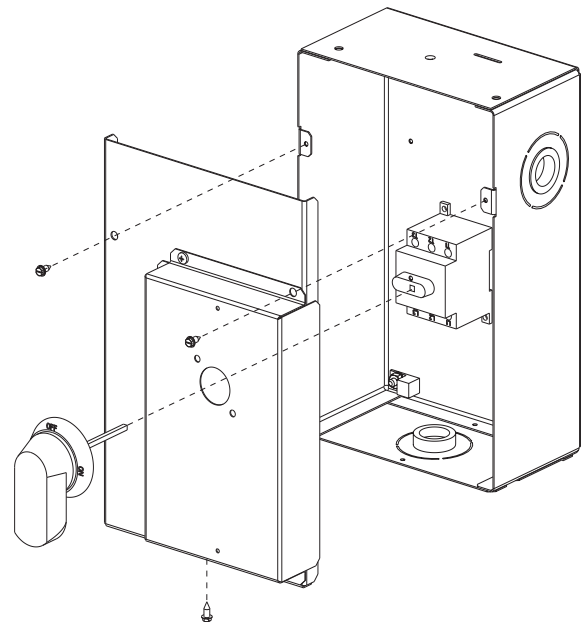
To field install the NFD shaft and handle:

1. Remove the unit front panel (see Fig. 2).

2. Remove (3) hex screws on the NFD enclosure - (2) on the face of the cover and (1) on the bottom.
3. Remove the front cover of the NFD enclosure.
4. Make sure the NFD shipped from the factory is at OFF position (the arrow on the black handle knob is at OFF).
5. Insert the shaft with the cross pin on the top of the shaft in the horizontal position.
6. Measure the tip of the shaft to the top surface of the pointer to be 3.75 to 3.88 in. (95 to 99 mm) for 80A and 100A NFD and 3.43 to 3.56 in. (87 to 90 mm) for 200A NFD.
7. Tighten the locking screw to secure the shaft to the NFD.
8. Turn the handle to the OFF position with red arrow pointing at OFF.
9. Install the handle on to the painted cover horizontally with the red arrow pointing to the left.
10. Secure the handle to the painted cover with (2) screws and lock washers supplied.
11. Engaging the shaft into the handle socket, re-install (3) hex screws on the NFD enclosure.
12. Re-install the unit front panel.



**Fig. 25 — Location of Non-Fused Disconnect Enclosure**



**Fig. 26 — Handle and Shaft Assembly for NFD CONVENIENCE OUTLETS**

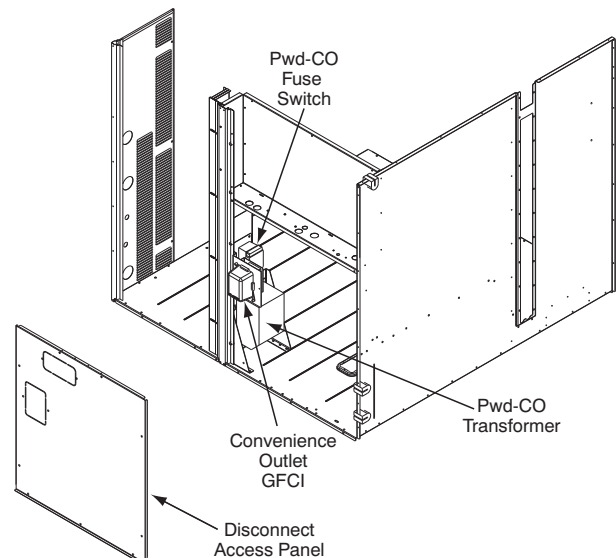
#### **⚠ WARNING**

##### **ELECTRICAL OPERATION HAZARD**

Failure to follow this warning could result in personal injury or death.

Units with convenience outlet circuits may use multiple disconnects. Check convenience outlet for power status before opening unit for service. Locate its disconnect switch, if appropriate, and open it. Lock-out and tag-out this switch, if necessary.

Two types of convenience outlets are offered on the RAH150 models: non-powered and unit-powered. Both types provide a 125-volt GFCI (ground-fault circuit-interrupter) duplex receptacle rated at 15-A behind a hinged waterproof access cover, located on the panel beneath the control box. See Fig. 27.

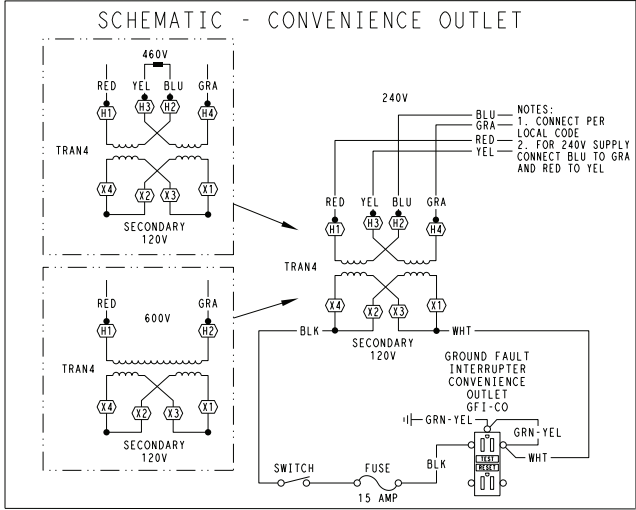


**Fig. 27 — Convenience Outlet Location**

**Non-powered type:** This type requires the field installation of a general-purpose 125-volt 15-A circuit powered from a source elsewhere in the building. Observe national and local codes when selecting wire size and conduit requirements, fuse or breaker requirements and disconnect switch size and location. Route 125-v power supply conductors into the bottom of the utility box containing the duplex receptacle.

**Unit-powered type:** A unit-mounted transformer is factory-installed to stepdown the main power supply voltage to the unit to 115-v at the duplex receptacle. This option also includes a manual switch with fuse, located in a utility box and mounted on a bracket behind the convenience outlet; access is through the unit’s control box access panel. See Fig. 27.

The primary leads to the convenience outlet transformer are not factory-connected. Selection of primary power source is a customer-option. If local codes permit, the transformer primary leads can be connected at the line-side terminals on the unit-mounted non-fused disconnect; this will provide service power to the unit when the unit disconnect switch is open. Other connection methods will result in the convenience outlet circuit being de-energized when the unit disconnect switch is open. See Fig. 28. On a unit without a unit-mounted disconnect, connect the source leads to the main terminal block (TB1).



UNIT VOLTAGE	CONNECT AS	PRIMARY CONNECTIONS	TRANSFORMER TERMINALS
208,230	240	L1: RED + YEL L2: BLU + GRA	H1 + H3 H2 + H4
460	480	L1: RED L2: Splice BLU + YEL L3: GRA	H1 H2 + H3 H4
575	600	L1: RED L2: GRA	H1 H2

**Fig. 28 — Unit Powered Convenience Outlet Wiring**

If the convenience outlet transformer is connected to the line side of a field disconnect, the conduit provided with the unit must be used to protect the wire as they are routed from the transformer to the field disconnect. The end of the conduit with the straight connector attaches to the field disconnect. The other end does not need to connect to the transformer; however, the conduit must be routed so that all wiring is either in the conduit or behind the access panel.

If the convenience outlet transformer is connected to the line side of the factory disconnect option, route the wires through the web bushing located on the bottom of the disconnect box. For the load side wiring to the factory option disconnect, route the wires through the hole on the right side of the disconnect. Be sure to create a drip loop at least 6-in. long.

Test the GFCI receptacle by pressing the TEST button on the face of the receptacle to trip and open the receptacle. Check for proper grounding wires and power line phasing if the GFCI receptacle does not trip as required. Press the RESET button to clear the tripped condition.

NOTICE/AVIS

Convenience Outlet Utilization

Maximum Intermittent Use 15 - Amps  
Maximum Continuous Use 8 - Amps  
Observe a 50% limit on the circuit  
Loading above 8 - Amps

Utilisation de la prise utilitaire

Usage intermittent maximum 15 - Amps  
Usage continu maximum 8 - Amps  
Observez une limite de 50% sur le circuit  
Chargement au-dessus de 8 - Amps

50HE5012882.0

**Fig. 29 — Convenience Utilization Notice**

**Fuse on power type:** The factory fuse is a Bussman “Fusetron” T-15, non-renewable screw-in (Edison base) type plug fuse.

WARNING

ELECTRICAL OPERATION HAZARD

Failure to follow this warning could result in personal injury or death.

Using unit-mounted convenience outlets: Units with unit-mounted convenience outlet circuits will often require that two disconnects be opened to de-energize all power to the unit. Treat all units as electrically energized until the convenience outlet power is also checked and de-energization is confirmed. Observe National Electrical Code Article 210, Branch Circuits, for use of convenience outlets.

**Installing Weatherproof Cover:** A weatherproof while-in-use cover for the factory-installed convenience outlets is now required by UL standards. This cover cannot be factory-mounted due its depth; it must be installed at unit installation. For shipment, the convenience outlet is covered with a blank cover plate.

The weatherproof cover kit is shipped in the unit’s control box. The kit includes the hinged cover, a backing plate and gasket.

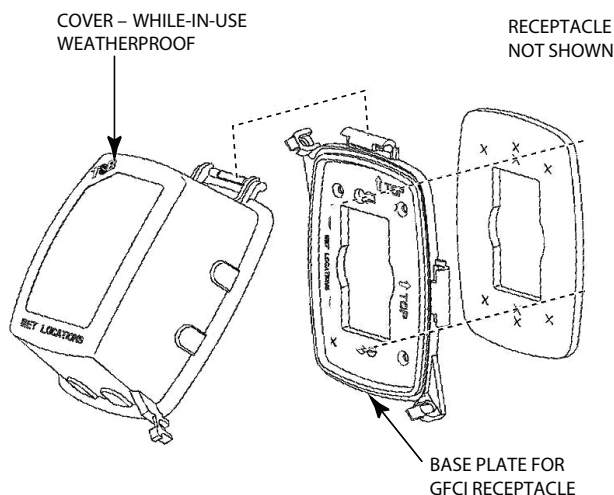
**DISCONNECT ALL POWER TO UNIT AND CONVE-NIENCE OUTLET. LOCK-OUT AND TAG-OUT ALL POWER.**

Remove the blank cover plate at the convenience outlet; discard the blank cover.

Loosen the two screws at the GFCI duplex outlet, until approximately 1/2-in. (13 mm) under screw heads are exposed. Press the gasket over the screw heads. Slip the backing plate over the screw heads at the keyhole slots and align with the gasket; tighten the two screws until snug (do not over-tighten).

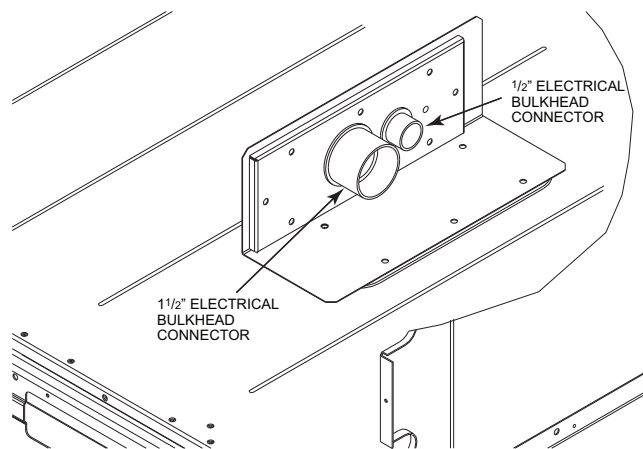
Mount the weatherproof cover to the backing plate as shown in Fig. 30. Remove two slot fillers in the bottom of the cover to permit service tool cords to exit the cover. Check for full closing and latching.





**Fig. 30 — Weatherproof Cover Installation**

**FACTORY OPTION THRU-BASE CONNECTIONS** — This service connection kit consists of a 1/2-in. electrical bulkhead connector and a 1 1/2-in. electrical bulkhead connector, connected to an “L” bracket covering the embossed (raised) section of the unit basepan in the condenser section. See Fig. 31. The 1/2-in. bulkhead connector enables the low-voltage control wires to pass through the basepan. The 1 1/2-in. electrical bulkhead connector allows the high-voltage power wires to pass through the basepan.



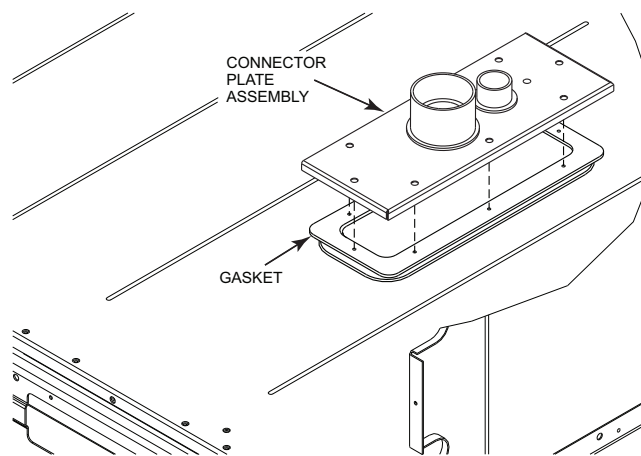
**Fig. 31 — Thru-the Base Option, Shipping Position**

1. Remove the “L” bracket assembly from the unit.
2. Remove connector plate assembly from the “L” bracket and discard the “L” bracket, but retain the washer head screws and the gasket (located between the “L” bracket and the connector plate assembly).

**NOTE:** Take care not to damage the gasket, as it is reused in the following step.

3. Place the gasket over the embossed area in the basepan, aligning the holes in the gasket to the holes in the basepan. See Fig. 32.
4. Install the connector plate assembly to the basepan using 8 of the washer head screws.

**NOTE:** If electrical connections are not going to occur at this time, tape or otherwise cover the fittings so that moisture does not get into the building or conduit in the interim.



**Fig. 32 — Installing Thru-the Base Option**

Check tightness of connector lock nuts before connecting electrical conduits.

Field-supplied and field-installed liquid-tight conduit connectors and conduit may be attached to the connectors on the basepan. Pull correctly rated high voltage and low voltage through appropriate conduits. Connect the power conduit to the internal disconnect (if unit is so equipped) or to the external disconnect (through unit side panel). Remove one of the two knockouts located on the bottom left side of the unit control box. Use this hole for the control conduit.

#### UNITS WITHOUT THRU-BASE CONNECTIONS

1. Install power wiring conduit through side panel openings. Install conduit between disconnect and control box.
2. Install power lines to terminal connections as shown in Fig. 23.

**FIELD CONTROL WIRING** — The RAH150 unit requires an external temperature control device. This device can be a thermostat emulation device provided as part of a third-party Building Management System.

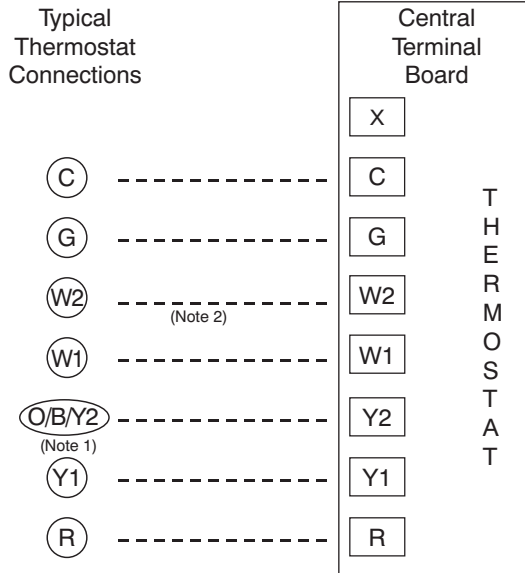
**THERMOSTAT** — Select an approved accessory thermostat. When electric heat is installed in the RAH unit, the thermostat must be capable of energizing the G terminal (to energize the Indoor Fan Contactor) whenever there is a space call for heat (energizing the W1 terminal). The accessory thermostats listed on the unit price pages can provide this signal but they are not configured to enable this signal as shipped.

Install the accessory thermostat according to installation instructions included with the accessory.

Locate the thermostat accessory on a solid wall in the conditioned space to sense average temperature in accordance with the thermostat installation instructions.

If the thermostat contains a logic circuit requiring 24-v power, use a thermostat cable or equivalent single leads of different colors with minimum of seven leads. If the thermostat does not require a 24-v source (no “C” connection required), use a thermostat cable or equivalent with minimum of six leads. Check the thermostat installation instructions for additional features which might require additional conductors in the cable.

For wire runs up to 50 ft (15 m), use no. 18 AWG (American Wire Gage) insulated wire (35°C minimum). For 50 to 75 ft (15 to 23 m), use no. 16 AWG insulated wire (35°C minimum). For over 75 ft (23 m), use no. 14 AWG insulated wire (35°C minimum). All wire sizes larger than no. 18 AWG cannot be directly connected to the thermostat and will require a junction box and splice at the thermostat.



Note 1: Typical multi-function marking. Follow manufacturer's configuration instructions to select Y2. Do not configure for O output.

Note 2: W2 connection not required on units without electric heating.

--- Field Wiring

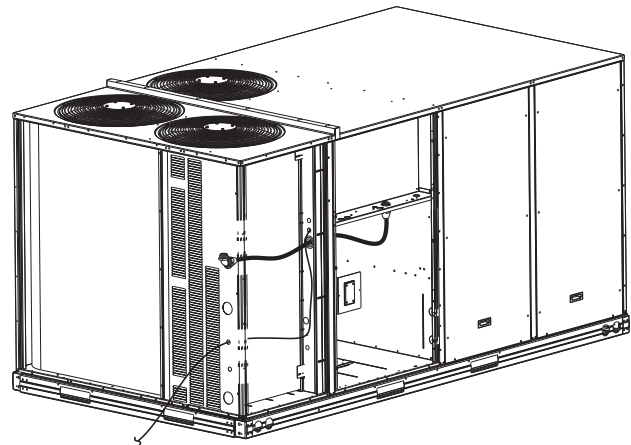
**Fig. 33 — Typical Low-Voltage Control Connections**

#### UNIT WITHOUT THRU-BASE CONNECTION KIT

— Pass the thermostat control wires through the bushing on the unit end panel. Route the wire through the snap-in wire tie and up to the web bushing near the control box. Route the wire through the bushing and into the bottom left side of the control box after removing one of the two knockouts in the corner of the box. Using a connector at the control box to protect the wire as it passes into the control box. Pull the wires over to the terminal strip at the upper left corner of the Central Terminal Board (CTB). Use the connector at the control box and the wire tie to take up any slack in the thermostat wire to

ensure that it will not be damaged by contact with the condenser coil. See Fig. 34.

NOTE: If thru-the-bottom connections accessory is used, refer to the accessory installation instructions for information on routing power and control wiring.

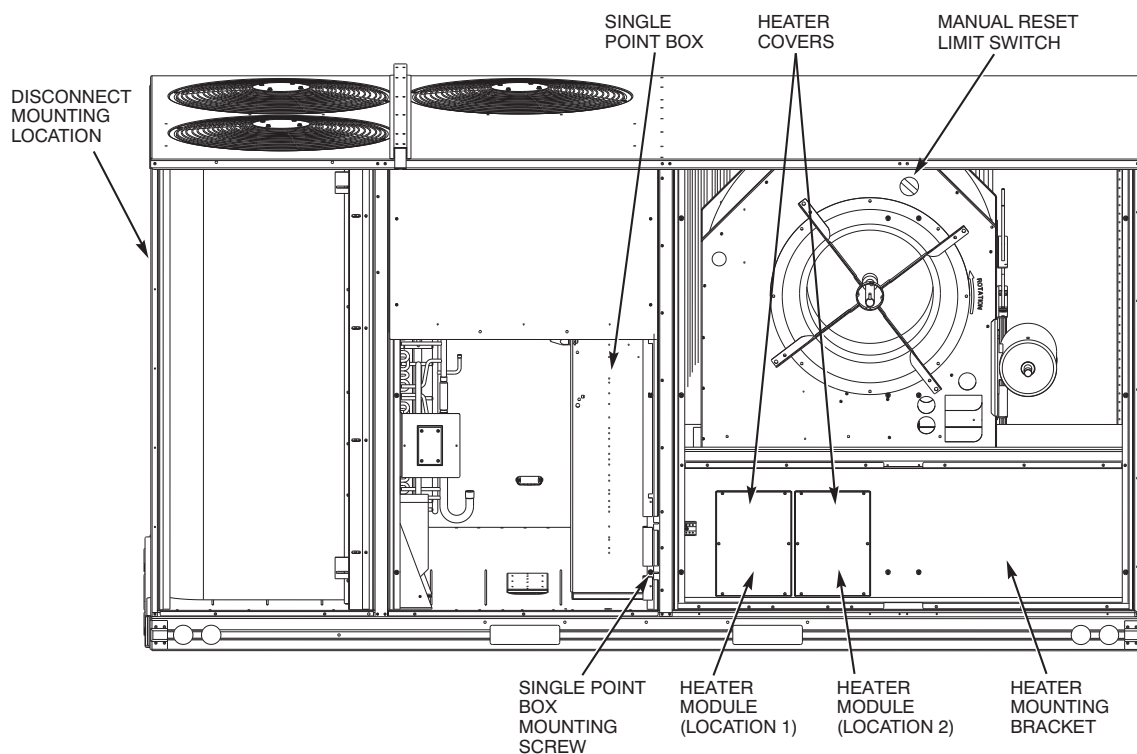


**Fig. 34 — Thermostat Wire Routing**

**HEAT ANTICIPATOR SETTINGS** — Set heat anticipator settings at 0.14 amp for the first stage and 0.14 amp for second-stage heating, when available.

**Electric Heaters** — The RAH150 units may be equipped with factory or field-installed electric heaters. The heaters are modular in design, with heater frames holding open coil resistance wires strung through ceramic insulators, line-break limit switches and a control contactor. One or two heater modules may be used in a unit.

Heater modules are installed in the compartment below the indoor (supply) fan outlet. Access is through the indoor access panel. Heater modules slide into the compartment on tracks along the bottom of the heater opening. See Fig. 35.



**Fig. 35 — Typical Component Location**

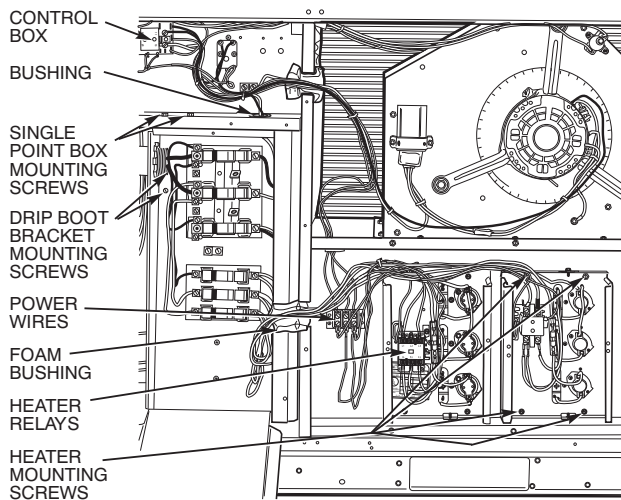


## UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Not all available heater modules and single point boxes may be used in every unit. Use only those heater modules that are UL listed for use in a specific size unit. Refer to the label on the unit cabinet for the list of approved heaters and single point boxes.

**Single Point Boxes** — When heaters are installed, power wiring to both heaters and the rest of the unit is connected via the single point box accessory, which will be installed directly under the unit control box, just to the left of the partition separating the indoor section (with electric heaters) from the outdoor section. The single point box has a hinged access cover. See Fig. 36. The single point box also includes pigtails to complete the wiring between the single point box and the unit's main control box terminals. The pigtails will already be connected into the unit's main control box on units with factory installed electric heat. Refer to the accessory heater and Single Point Box installation instructions for details on tap connections for field installed electric heat accessory.



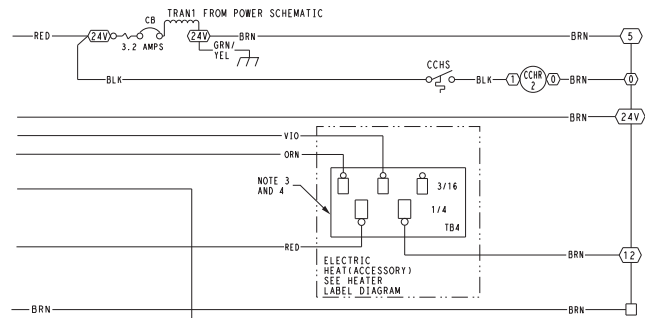
**Fig. 36 — Typical Single Point Installation**

**HEATER AND SUPPLEMENTARY FUSES** — When the unit MOCF device value exceeds 60-A, unit-mounted supplementary fuses are required for each heater circuit. These fuses are included in accessory Single Point Boxes, with power distribution and fuse blocks.

All fuses on RAH150 units are 60-A. (Note that all heaters are qualified for use with a 60-A fuse, regardless of actual heater ampacity, so only 60-A fuses are necessary.)

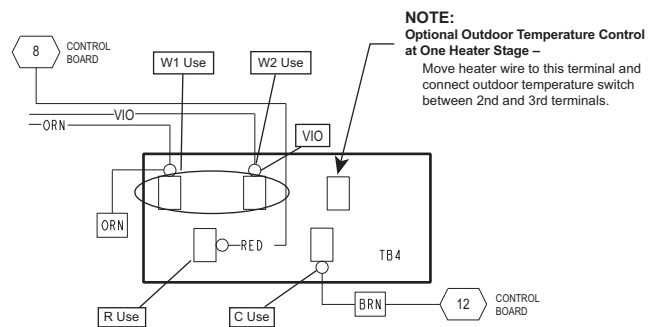
**HEATER LOW-VOLTAGE CONTROL CONNECTIONS** — One or two heaters can be installed in the unit. Use the wiring procedure listed below for each heater as determined by the number of stages in the heater.

**Single Stage Heaters:** Single-stage heaters will have an orange and a brown control wire. Connect these to the orange and brown wires located on TB4. See Fig. 37.



**Fig. 37 — Single Stage Heaters: TB4 Wiring Connections**

**Two Stage Heaters:** Two-stage heaters will have orange, violet, red and brown wires. The orange and the purple are the control wires and the red and brown wires feed the safety circuit. Connect both the orange and the purple wires to the orange wire locations of TB4. Connect the red and brown wires to red and brown wires on TB4. If more than one heater is installed, repeat the wiring procedure for the second heater. The 3 locations across the top of TB4 do allow a switch to be installed in series with some of the heaters in order to add additional heater control. See Fig. 38.



**Fig. 38 — Two Stage Heaters: TB4 Wiring Connections**

## Hot Gas Re-Heat System Control Connections

## HOT GAS RE-HEAT — SPACE RH CONTROLLER

NOTE: The Hot Gas Re-Heat system is a factory-installed option.

The Hot Gas Re-Heat dehumidification system requires a field-supplied and installed space relative humidity control device. This device may be a separate humidistat control (contact closes on rise in space RH above control setpoint) or a combination thermostat-humidistat control device with isolated contact set for dehumidification control. The humidistat is normally used in applications where a temperature control is already provided (such as a third-party Building Management System).

To connect a field-supplied humidistat:

1. Route the humidistat 2-conductor cable (field-supplied) through the bushing in the unit's louvered end panel (see Fig. 34).
2. Route the cable through the snap-in wire tie and up to the web bushing near the control box.
3. Feed the cable through the bushing and into the bottom left side of the control box after removing one of the two knockouts in the corner of the box. Use a connector to protect the cable as it enters the control box.
4. Use the connector and the wire tie to reduce any slack in the humidistat cable to ensure that it will not be damaged by contact with the condenser coil (see Fig. 34).
5. Use wire nuts to connect humidistat cable to two PINK leads in the low-voltage wiring as shown in Fig. 39).

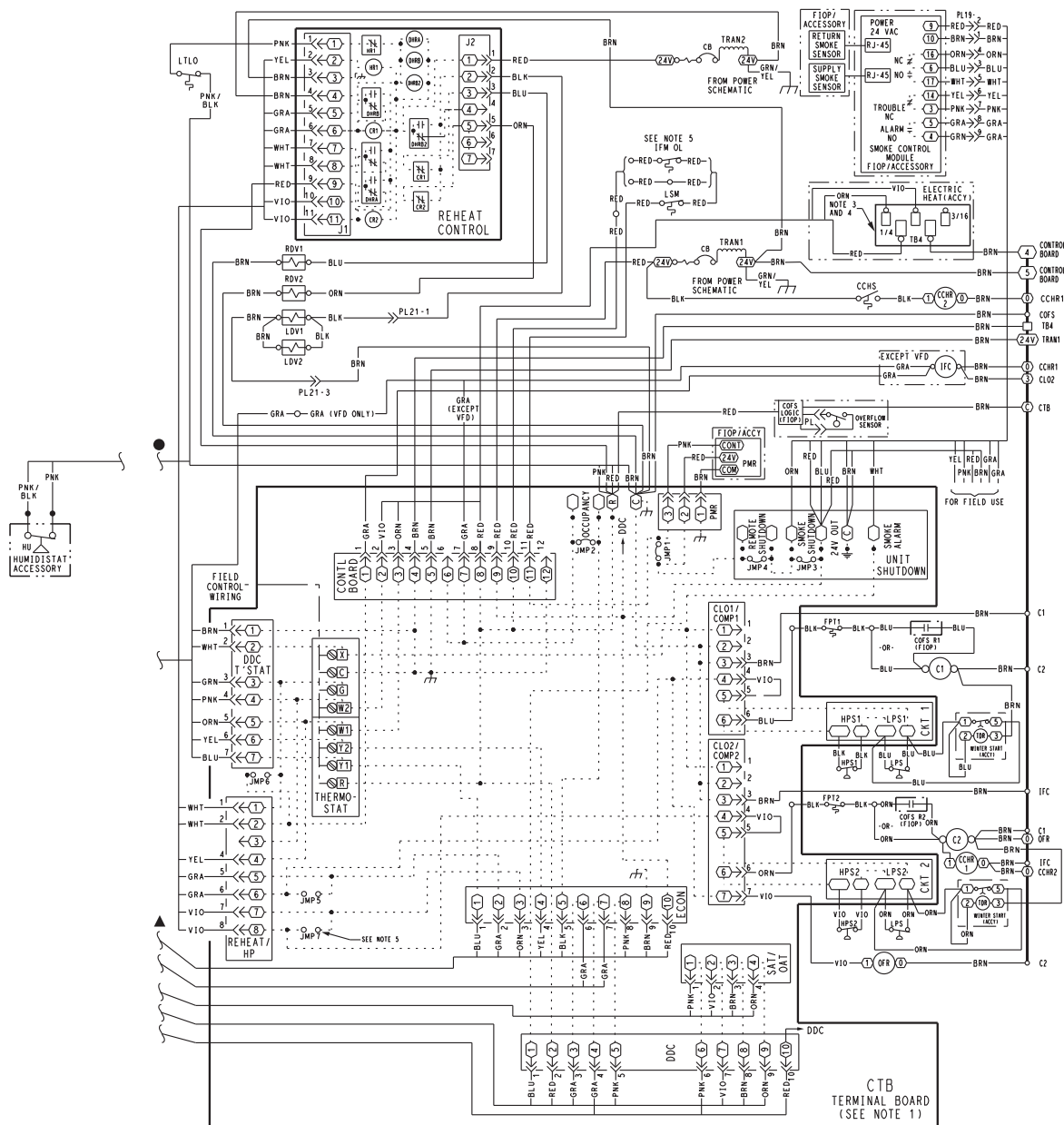


Fig. 39 — Typical Hot Gas Re-Heat Dehumidification System Humidistat Wiring

### EconoMi\$er® X (Factory-Installed Option)

**PRODUCT DESCRIPTION** — The EconoMi\$er X system is an expandable economizer control system, which includes a W7220 economizer module (controller) with an LCD and keypad (See Fig. 40). The W7220 can be configured with optional sensors.

The W7220 economizer module can be used as a stand-alone economizer module wired directly to a commercial set-back space thermostat and sensors to provide outside air dry-bulb economizer control.

The W7220 economizer module can be connected to optional sensors for single or differential enthalpy control. The W7220 economizer module provides power and communications for the sensors.

The W7220 economizer module automatically detects sensors by polling to determine which sensors are present. If a sensor loses communications after it has been detected, the W7220 economizer controller indicates a device fail error on its LCD.



Fig. 40 — W7220 Economizer Module

**SYSTEM COMPONENTS** — The EconoMiSer X system includes an economizer module, 20k mixed air sensor, damper actuator, and either a 20k outdoor air temperature sensor or S-Bus enthalpy sensors.

**Economizer Module** — The module is the core of the EconoMiSer X system. The module is mounted in the unit's control box, and includes the user interface for the system. The W7220 economizer module provides the basic inputs and outputs to provide simple economizer control. When used with the optional sensors, the economizer module provides more advanced economizer functionality.

**S-Bus Enthalpy Control Sensors** — The sensor is a combination temperature and humidity sensor which is powered by and communicates on the S-Bus. Up to three sensors may be configured with the W7220 economizer module.

**CO<sub>2</sub> Sensor (optional)** — The sensor can be added for Demand Controlled Ventilation (DCV).

## SPECIFICATIONS

**W7220 Economizer Module** — The module is designed for use with 2 to 10 Vdc or bus communicating actuator. The module includes terminals for CO<sub>2</sub> sensor, Mixed Air sensor, and an Outdoor Dry Bulb sensor. Enthalpy and other options are available with bus sensors.

**User Interface** — Provides status for normal operation, setup parameters, checkout tests, and alarm and error conditions with a 2-line 16 character LCD display and four button keypad.

### Electrical

Rated Voltage — 20 to 30 Vac RMS, 50/60 Hz

Transformer — 100 va maximum system input

Nominal Power Consumption (at 24 Vac, 60 Hz) — 11.5 VA without sensors or actuators

Relay Digital Output Rating at 30 Vac (maximum power from Class 2 input only) — 1.5A run:

3.5A inrush at 0.45PF (200,000 cycles) or

7.5A inrush at 0.45PF (100,000 cycles)

External Sensors Power Output — 21 Vdc ± 5% at 48mA

**IMPORTANT:** All inputs and outputs must be Class 2 wiring.

## INPUTS

### Sensors

NOTE: A Mixed Air (MA) analog sensor is required on all W7220 units; either an Outdoor Air (OA) sensor for dry bulb change over or an OA bus sensor for outdoor enthalpy change over is required in addition to the MA sensor. An additional Return Air (RA) bus sensor can be added to the system for differential enthalpy or dry bulb changeover. For differential dry bulb changeover a 20k ohm sensor is required in the OA and a bus sensor in the RA. DIP switch on RA bus sensor must be set in the RA position.

*Dry Bulb Temperature (optional) and Mixed Air (required), 20k NTC*

2-wire (18 to 22 AWG);

Temperature range -40 to 150°F (-40 to 65°C)

Temperature accuracy -0°F/+2°F

*Temperature and Humidity, C7400S1000 (optional)*

S-Bus; 2-wire (18 to 22 AWG)

Temperature: range -40 to 150°F (-40 to 65°C)

Temperature accuracy -0°F/+2°F

Humidity: range 0 to 100% RH with 5% accuracy.

NOTE: Up to three (3) S-Bus sensors may be connected to the W7220 economizer module. For outdoor air (OA), return air (RA) and discharge (supply) air (DA).

4 Binary Inputs 1-wire 24 Vac + common GND.

24 Vac power supply 20 to 30 Vac 50/60Hz; 100 VA Class 2 transformer.

## OUTPUTS

**Actuator Signal:** 2-10 Vdc; minimum actuator impedance is 2k ohm; bus two-wire output for bus communicating actuators.

**Exhaust fan, Y1, Y2 and AUX1 O:**

All Relay Outputs (at 30 Vac):

Running: 1.5A maximum

Inrush: 7.5A maximum

## ENVIRONMENTAL

### Operating Temperature:

-40 to 150°F (-40 to 65°C).

Exception of display operation down to -4°F with full recovery at -4 F from exposure to -40°F

### Storage Temperature:

-40 to 150°F (-40 to 65°C)

### Shipping Temperature:

-40 to 150°F (-40 to 65°C)

### Relative Humidity:

5% to 95% RH non-condensing

**ECONOMIZER MODULE WIRING DETAILS** — Use Tables 3 and 4 and Fig. 41 to locate the wiring terminals for the Economizer module.

NOTE: The four terminal blocks are removable. You can slide out each terminal block, wire it, and then slide it back into place.

**Table 3 — Economizer Module - Left Hand Terminal Blocks**

LABEL	TYPE	DESCRIPTION
<b>Top Left Terminal Block</b>		
MAT MAT	20k NTC and COM	Mixed Air Temperature Sensor (Polarity Insensitive Connection)
OAT OAT	20k NTC and COM	Outdoor Air Temperature Sensor (Polarity Insensitive Connection)
S-BUS S-BUS	S-BUS (Sylk Bus)	Enthalpy Control Sensor (Polarity Insensitive Connection)
<b>Bottom Left Terminal Block</b>		
IAQ 2-10	2-10 vdc	Air Quality Sensor Input (e.g. CO <sub>2</sub> sensor)
IAQ COM	COM	Air Quality Sensor Common
IAQ 24V	24 vac	Air Quality Sensor 24 vac Source
ACT 2-10	2-10 vdc	Damper Actuator Output (2-10 vdc)
ACT COM	COM	Damper Actuator Output Common
ACT 24v	24 vac	Damper Actuator 24 vac Source

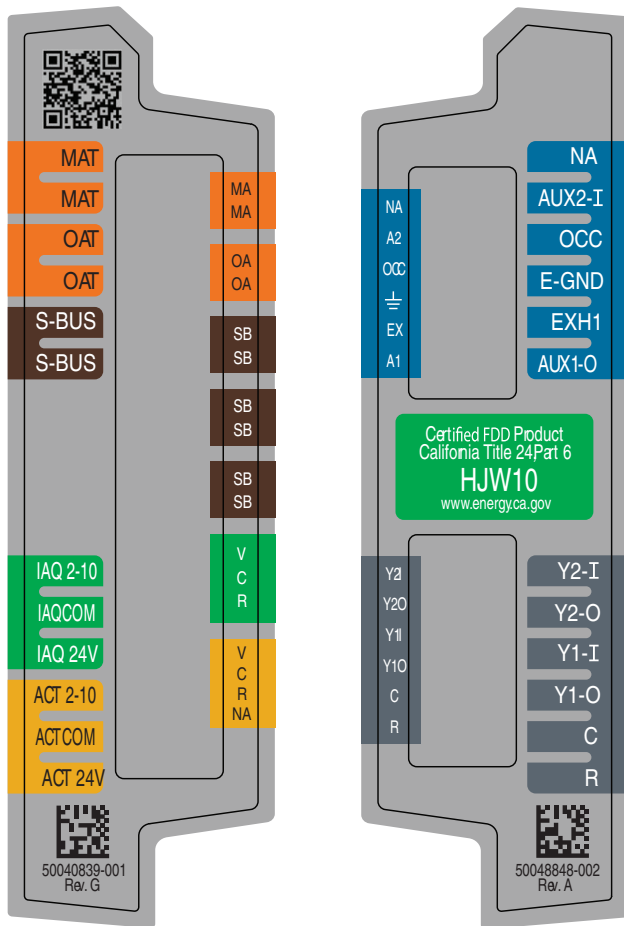


Fig. 41 — W7220 Wiring Terminals

Table 4 — Economizer Module - Right Hand Terminal Blocks

LABEL	TYPE	DESCRIPTION
<b>Top Right Terminal Blocks</b>		
AUX2 I	24 vac IN	The first terminal is not used.
OCC	24 vac IN	Shut Down (SD) or HEAT (W) Conventional only and Heat Pump Changeover (O-B) in Heat Pump mode.
E-GND	E-GND	Occupied/Unoccupied Input
EXH1	24 vac OUT	Exhaust Fan 1 Output
AUX1 O	24 vac OUT	Programmable: Exhaust fan 2 output or ERV or System alarm output
<b>Bottom Right Terminal Blocks</b>		
Y2-I	24 vac IN	Y2 in - Cooling Stage 2 Input from space thermostat
Y2-O	24 vac OUT	Y2 out - Cooling Stage 2 Output to stage 2 mechanical cooling
Y1-I	24 vac IN	Y1 in - Cooling Stage 2 Input from space thermostat
Y1-O	24 vac OUT	Y1 out - Cooling Stage 2 Output to stage 2 mechanical cooling
C	COM	24 vac Common
R	24 vac	24 vac Power (hot)

**S-BUS SENSOR WIRING** — The labels on the sensors and controller are color coded for ease of installation. Orange labeled sensors can only be wired to orange terminals on the controller. Brown labeled sensors can only be wired to S-bus (brown) terminals. Use Fig. 42 and Table 5 to locate the wiring terminals for each S-Bus sensor.

Use Fig. 42 and Table 5 to locate the wiring terminals for each enthalpy control sensor.

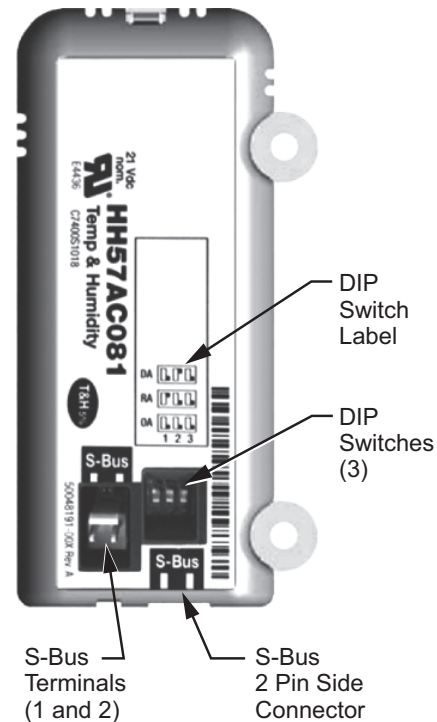


Fig. 42 — S-Bus Sensor DIP Switches

Table 5 — HH57AC081 Sensor Wiring Terminations

TERMINAL		TYPE	DESCRIPTION
NUMBER	LABEL		
1	S-BUS	S-BUS	S-BUS Communications (Enthalpy Control Sensor Bus)
2	S-BUS	S-BUS	S-BUS Communications (Enthalpy Control Sensor Bus)

Use Fig. 42 and Table 6 to set the DIP switches for the desired use of the sensor.

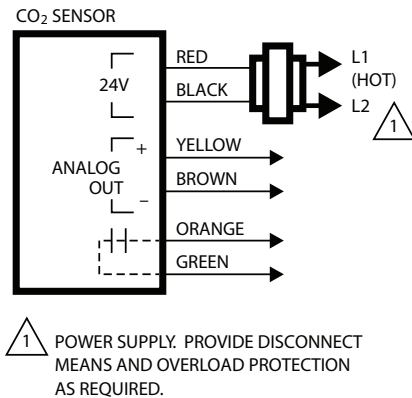
Table 6 — HH57AC081 Sensor DIP Switch

USE	DIP SWITCH POSITIONS FOR SWITCHES 1, 2, AND 3		
	1	2	3
DA	OFF	ON	OFF
RA	ON	OFF	OFF
OA	OFF	OFF	OFF

NOTE: When a S-Bus sensor is connected to an existing network, it will take 60 minutes for the network to recognize and auto-configure itself to use the new sensor.

During the 60 minute setup period, no alarms for sensor failures (except SAT) will be issued and no economizing function will be available.

**CO<sub>2</sub> SENSOR WIRING** — When using a CO<sub>2</sub> sensor the black and brown common wires are internally connected and only one is connected to “IAQ COM” on the W7220. Use the power from the W7220 to power the CO<sub>2</sub> sensor OR make sure the ground for the power supplies are common. See Fig. 43 for CO<sub>2</sub> sensor wiring.



**Fig. 43 — CO<sub>2</sub> Sensor Wiring**

**INTERFACE OVERVIEW** — This section describes how to use the Economizer’s user interface for:

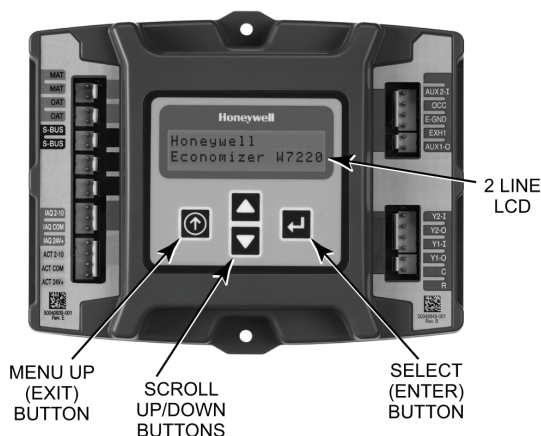
- Keypad and menu navigation
- Settings and parameter changes
- Menu structure and selection

**USER INTERFACE** — The user interface consists of a 2-line LCD display and a 4-button keypad on the front of the economizer controller.

**KEYPAD** — The four navigation buttons (see Fig. 44) are used to scroll through the menus and menu items, select menu items, and to change parameter and configuration settings.

To use the keypad when working with menus:

- Press the ▲ (Up arrow) button to move to the previous menu.
- Press the ▼ (Down arrow) button to move to the next menu.
- Press the ↵ (Enter) button to display the first item in the currently displayed menu.



**Fig. 44 — W7220 Controller Navigation Buttons**

Press the ⬆ (Menu Up/Exit) button to exit a menu’s item and return to the list of menus. To use the keypad when working with Setpoints, System and Advanced Settings, Checkout tests and Alarms:

1. Navigate to the desired menu.
2. Press the ↵ (Enter) button to display the first item in the currently displayed menu.

3. Use the ▲ and ▼ buttons to scroll to the desired parameter.
4. Press the ↵ (Enter) button to display the value of the currently displayed item.
5. Press the ▲ button to increase (change) the displayed parameter value.
6. Press the ▼ button to decrease (change) the displayed parameter value.

**NOTE:** When values are displayed, pressing and holding the or button causes the display to automatically increment.

7. Press the ↵ (Enter) button to accept the displayed value and store it in nonvolatile RAM.
8. “CHANGE STORED” displays.
9. Press the ↵ (Enter) button to return to the current menu parameter.
10. Press the ⬆ (Menu Up/Exit) button to return to the previous menu.

**MENU STRUCTURE** — Table 7 illustrates the complete hierarchy of menus and parameters for the EconoMiSer® X system.

The Menus in display order are:

- STATUS
- SETPOINTS
- SYSTEM SETUP
- ADVANCED SETUP
- CHECKOUT
- ALARMS

**IMPORTANT:** Table 7 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration.

For example if you do not have a DCV (CO<sub>2</sub>) sensor, then none of the DCV parameters appear and only MIN POS will display. If you have a CO<sub>2</sub> sensor, the DCV MIN and DCV MAX will appear AND if you have 2 speed fan DCV MIN (high and low speed) and DCV MAX (high and low speed will appear).

**NOTE:** Some parameters in the menus use the letters MA or MAT, indicating a mixed air temperature sensor location before the cooling coil. This unit application has the control sensor located after the cooling coil, in the fan section, where it is designated as (Cooling) Supply Air Temperature or SAT sensor.

**SETUP AND CONFIGURATION** — Before being placed into service, the W7220 Economizer module must be setup and configured for the installed system.

**IMPORTANT:** During setup, the economizer module is live at all times.

The setup process uses a hierarchical menu structure that is easy to use. Press the ▲ and ▼ arrow buttons to move forward and backward through the menus and press the button to select and confirm setup item changes.

**TIME-OUT AND SCREENSAVER** — When no buttons have been pressed for 10 minutes, the LCD displays a screen saver, which cycles through the Status items. Each Status items displays in turn and cycles to the next item after 5 seconds.



**Table 7 — Menu Structure**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT	NOTES
STATUS	ECONO AVAIL	NO	YES/NO	FIRST STAGE COOLING DEMAND (Y1-IN) YES = economizing available; the system can use outside air for free cooling when required
	ECONOMIZING	NO	YES/NO	FIRST STAGE COOLING RELAY OUTPUT YES = outside air being used for 1 stage cooling
	OCCUPIED	NO	YES/NO	OCCUPIED YES = OCC signal received from space thermostat or unitary controller YES = 24 Vac on terminal OCC NO = 0 Vac on terminal OCC
	HEAT PUMP	N/A	COOL HEAT	HEAT PUMP MODE Displays COOL or HEAT when system is set to heat pump (Non-conventional)
	COOL Y1—IN	OFF	ON/OFF	FIRST STAGE COOLING DEMAND (Y1-IN) Y1-I signal from space thermostat or unitary controller for cooling stage 1. ON = 24 Vac on terminal Y1-I OFF = 0 Vac on terminal Y1-I
	COOL Y1—OUT	OFF	ON/OFF	FIRST STAGE COOLING RELAY OUTPUT Cool stage 1 Relay Output to stage 1 mechanical cooling (Y1—OUT terminal)
	COOL Y2—IN	OFF	ON/OFF	SECOND STAGE COOLING DEMAND (Y2-IN) Y2-I signal from space thermostat or unitary controller for second stage cooling. ON = 24 Vac on terminal Y2-I OFF = 0 Vac on terminal Y2-I
	COOL Y2—OUT	OFF	ON/OFF	SECOND STAGE COOLING RELAY OUTPUT Cool Stage 2 Relay Output to mechanical cooling (Y2—OUT terminal)
	MA TEMP	__ . __ F	0 to 140 F	SUPPLY AIR TEMPERATURE, Cooling Mode Displays value of measured mixed air from MAT sensor. Displays __ . __ F if not connected, short or out-of-range.
	DA TEMP	__ . __ F	0 to 140 F	DISCHARGE AIR TEMPERATURE, after Heating section Displays when Discharge Air sensor is connected and displays measured discharge temperature. Displays __ . __ F if sensor sends invalid value, if not connected, short or out-of-range.
	OA TEMP	__ . __ F	-40 to 140 F	OUTSIDE AIR TEMP Displays measured value of outdoor air temperature. Displays __ . __ F if sensor sends invalid value, short or out-of-range.
	OA HUM	__ %	0 to 100%	OUTSIDE AIR RELATIVE HUMIDITY Displays measured value of outdoor humidity from OA sensor. Displays __ % if not connected short, or out-of-range.
	RA TEMP	__ . __ F	0 to 140 F	RETURN AIR TEMPERATURE Displays measured value of return air temperature from RAT sensor. Displays __ . __ F if sensor sends invalid value, if not connected, short or out-of-range
	RA HUM	__ %	0 to 100%	RETURN AIR RELATIVE HUMIDITY Displays measured value of return air humidity from RA sensor. Displays __ % if sensor sends invalid value, if not connected, short or out-of-range
	IN CO2	__ __ ppm	0 TO 2000 ppm	SPACE/RETURN AIR CO <sub>2</sub> Displays value of measured CO <sub>2</sub> from CO <sub>2</sub> sensor. Invalid if not connected, short or out-of-range
	DCV STATUS	N/A	ON/OFF	DEMAND CONTROLLED VENTILATION STATUS Displays ON if above setpoint and OFF if below setpoint, and ONLY if a CO <sub>2</sub> sensor is connected.
	DAMPER OUT	2.0v	2.0 TO 10.0v	Displays voltage output to the damper actuator.
	ACT POS	N/A	0 to 100%	Displays actual position of outdoor air damper actuator

**Table 7 — Menu Structure (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT	NOTES
STATUS (CONT)	ACT COUNT	N/A	1 to 65535	Displays number of times actuator has cycled. 1 cycles equals 180 deg. of actuator movement in any direction.
	ACTUATOR	N/A	OK/Alarm (on Alarm menu)	Displays ERROR if voltage or torque is below actuator range.
	EXH1 OUT	OFF	ON/OFF	EXHAUST STAGE 1 RELAY OUTPUT Output of EXH1 terminal: ON = relay closed OFF = relay open
	EXH2 OUT	OFF	ON/OFF	EXHAUST STAGE 2 RELAY OUTPUT Output of AUX terminal; displays only if AUX = EXH2
	ERV	OFF	ON/OFF	ENERGY RECOVERY VENTILATOR Output of AUX terminal; displays only if AUX = ERV
	MECH COOL ON or HEAT STAGES ON	0	0, 1, or 2	Displays stage of mechanical cooling that is active.  Displays the stage of heat pump heating that is active.
	FAN SPEED	N/A	LOW or HIGH	SUPPLY FAN SPEED Displays speed setting of fan on a 2-speed fan unit.
	W (HEAT ON)	N/A	ON/OFF	HEAT DEMAND STATUS Displays status of heat demand on a 2-speed fan unit.
SETPOINTS	MAT SET	53F	38 to 65 F; increment by 1	SUPPLY AIR SETPOINT Setpoint determines where the economizer will modulate the OA damper to maintain the mixed air temperature.
	LOW T LOCK	32F	-45 to 80 F; increment by 1	COMPRESSOR LOW TEMPERATURE LOCKOUT Setpoint determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout.
	DRYBLB SET	63F	48 to 80 F; increment by 1	OA DRY BULB TEMPERATURE CHANGEOVER SETPOINT Setpoint determines where the economizer will assume outdoor air temperature is good for free cooling; e.g.; at 63 F unit will economize at 62 F and below and not economize at 64 F and above. There is a 2 F dead-band.
	ENTH CURVE	ES3	ES1,ES2,ES3,ES4, or ES5	ENTHALPY CHANGEOVER CURVE Enthalpy boundary "curves" for economizing using single enthalpy.
	DCV SET	1100ppm	500 to 2000ppm; increment by 100	DEMAND CONTROLLED VENTILATION Displays only if CO <sub>2</sub> sensor is connected. Setpoint for Demand Control Ventilation of space. Above the setpoint, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the setpoint.
	MIN POS	2.8 V	2 to 10 Vdc	VENTILATION MINIMUM POSITION Displays ONLY if a CO <sub>2</sub> sensor is NOT connected.
	VENTMAX With 2-speed fan units VENTMAX L (low speed fan) and VENTMAX H (high speed fan) settings are required	2.8 V	2 to 10 Vdc	DCV MAXIMUM DAMPER POSITION Displays only if a CO <sub>2</sub> sensor is connected. Used for Vbz (ventilation max cfm) setpoint. Displays 2 to 10 V if <3 sensors (RA,OA, and MA). In AUTO mode dampers controlled by CFM.
			100 to 9990 cfm; increment by 10	If OA, MA, RA, and CO <sub>2</sub> sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 CFM.
			2 to 10 Vdc	With 2-speed fan units VENT L (low speed fan) and MIN POS H (high speed fan) settings are required. Default for VENTMAX L is 3.2V and VENTMAX H is 2.8V
	VENTMIN With 2-speed fan units VENTMIN L (low speed fan) and VENTMIN H (high speed fan) set	2.25 V	2 to 10 Vdc or 100 to 9990 cfm increment by 10	DCV MINIMUM DAMPER POSITION Displays only if a CO <sub>2</sub> sensor is connected. Used for Ba (ventilation min cfm) setpoint. Displays 2 to 10 V if <3 sensors (RA, OA, and MA). Va is only set if DCV is used. This is the ventilation for less than maximum occupancy of the space. In AUTO mode dampers controlled by CFM.
			100 to 9990 cfm; increment by 10	If OA, MA, RA, and CO <sub>2</sub> sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 CFM.
			2 to 10 Vdc	With 2-speed fan units VENTMIN L (low speed fan) and MIN POS H (high speed fan) settings are required. Default for VENTMIN L is 3.2V and VENTMIN H is 2.8V
	ERV OAT SP	32°F	0 to 50 F; increment by 1	ENERGY RECOVERY VENTILATOR UNIT OUTDOOR AIR TEMPERATURE SETPOINT Only when AUX1 O = ERV
	EXH1 SET With 2-speed fan units Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required	50%	0 to 100%; increment by 1	EXHAUST FAN STAGE 1 SETPOINT Setpoint for OA damper position when exhaust fan 1 is powered by the economizer. With 2-speed fan units Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required. Default for Exh1 L is 65% and Exh1 H is 50%
	EXH2 SET With 2-speed fan units Exh2 L (low speed fan) and Exh2 H (high speed fan) settings are required	75%	0 to 100%; increment by 1	EXHAUST FAN STAGE 2 SETPOINT Setpoint for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX1 O is set to EXH2. With 2-speed fan units Exh2 L (low speed fan) and Exh2 H (high speed fan) settings are required. Default for Exh2 L is 80% and Exh2 H is 75%



**Table 7 — Menu Structure (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT	NOTES
SYSTEM SETUP	INSTALL	01/01/10	N/A	Display order = MM/DD/YY Setting order = DD, MM, then YY.
	UNITS DEG	F	F or C	Sets economizer controller in degrees Fahrenheit or Celsius
	EQUIPMENT	CONV	Conventional or HP	CONV = conventional; HP O/B = Enable Heat Pump mode. Use AUX2 I for Heat Pump input from thermostat or controller. See Menu Note 7.
	AUX2 IN	W	SD/W or HP(O)/ HP(B)	In CONV mode: SD + Enables configuration of shutdown (default); W = Informs controller that system is in heating mode. NOTE: If using 2-speed fan mode, you must program CONV mode for W. Shutdown is not available in 2-speed fan mode. See Menu Note 7. In HP O/B mode: HP(O) = energize heat pump on Cool (default); HP(B) = energize heat pump on heat.
	FAN SPEED	2 speed	1 speed/2 speed	Sets the economizer controller for operation of 1 speed or 2 speed supply fan. NOTE: 2-speed fan option also needs Heat (W1) programmed in AUX 2 In. See Menu Note 7.
	FAN CFM	5000cfm	100 to 15000 cfm; increment by 100	UNIT DESIGN AIRFLOW (CFM) Enter only if using DCVAL ENA = AUTO The value is found on the nameplate label for the specific unit.
	AUX1 OUT	NONE	NONE ERV EXH2 SYS	Select OUTPUT for AUX1 O relay • NONE = not configured (output is not used) • ERV = Energy Recovery Ventilator • EXH2 = second damper position relay closure for second exhaust fan • SYS = use output as an alarm signal
	OCC	INPUT	INPUT or ALWAYS	OCCUPIED MODE BY EXTERNAL SIGNAL When using a setback thermostat with occupancy out (24 vac), the 24 vac is input "INPUT" to the OCC terminal. If no occupancy output from the thermostat then change program to "ALWAYS" OR add a jumper from terminal R to OCC terminal.
	FACTORY DEFAULT	NO	NO or YES	Resets all set points to factory defaults when set to YES. LCD will briefly flash YES and change to NO but all parameters will change to the factory default values. NOTE: RECHECK AUX2 IN and FANTYPE for required 2-speed values.
ADVANCED SETUP	MA LO SET	45°F	35 to 55 F; Incremented by 10	SUPPLY AIR TEMPERATURE LOW LIMIT Temperature to achieve Freeze Protection (close damper and alarm if temperature falls below setup value).
	FREEZE POS	CLO	CLO or MIN	FREEZE PROTECTION DAMPER POSITION Damper position when freeze protection is active (closed or MIN POS).
	CO2 ZERO	0ppm	0 to 500 ppm; Increment by 10	CO <sub>2</sub> ppm level to match CO <sub>2</sub> sensor start level.
	CO2 SPAN	2000ppm	1000 to 3000 ppm; Increment by 10	CO <sub>2</sub> ppm span to match CO <sub>2</sub> sensor.
	STG3 DLY	2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4 hrs or OFF	COOLING STAGE 3 DELAY Delay after stage 2 cool has been active. Turns on 2nd stage of cooling when economizer is 1st stage and mechanical cooling is 2nd stage. Allows three stages of cooling, 1 economizer and 2 mechanical. OFF = no Stage 3 cooling
	SD DMPR POS	CLO	CLO or OPN	Indicates shutdown signal from space thermostat or unitary controller. When controller receives 24 Vac input on the SD terminal in conventional mode, the OA damper will open if programmed for OPN and OA damper will close if programmed for CLO. All other controls, e.g., fans, etc. will shut off.
	DA LO ALM	45 F (7 C)	35 to 65 F; (2 to 18 C) Incremented by 5 deg.	Used for alarm for when the DA air temperature is too low. Set lower range of alarm, below this temperature the alarm will show on the display.
	DA HI ALM	80 F (27 C)	70 to 180 F; (21 to 82 C) Incremented by 5 deg.	Used for alarm for when the DA air temperature is too high. Set upper range of alarm, above this temperature the alarm will show on the display.
	DCVCAL ENA	MAN	MAN (manual) AUTO	Turns on the DCV automatic control of the dampers. Resets ventilation based on the RA, OA, and MA sensor conditions. Requires all 3 RA, OA, and MA sensors.

**Table 7 — Menu Structure (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT	NOTES
<b>ADVANCED SETUP (CONT)</b>	MAT T CAL	0.0°F	±2.5 F	SUPPLY AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	OAST CAL	0.0°F	±2.5 F	OUTSIDE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	OA H CAL	0% RH	±10% RH	OUTSIDE AIR HUMIDITY CALIBRATION Allows for operator to adjust for an out of calibration humidity sensor.
	RA T CAL	0.0°F	±2.5 F	RETURN AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	RA H CAL	0% RH	±10% RH	RETURN AIR HUMIDITY CALIBRATION Allows for operator to adjust for an out of calibration humidity sensor.
	DA T CAL	0.0°F	±2.5 F	DISCHARGE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	2SP FAN DELAY	5 Minutes	0 to 20 minutes in 1 minute increments	TIME DELAY ON 2nd STAGE ECONOMIZING When in economizing mode this is the delay for the high speed fan to try to satisfy the call for second stage cooling before the first stage mechanical cooling is enabled.
<b>CHECKOUT</b>	DAMPER MINIMUM POSITION	N/A	N/A	The checkout for the damper minimum position is based on the system. See Table 8.
	DAMPER OPEN	N/A	N/A	Position damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure you pause in the mode to allow exhaust contacts to energize due to the delay in the system.
	DAMPER CLOSE	N/A	N/A	Positions damper to the fully closed position
	CONNECT Y1-O	N/A	N/A	Closes the Y1-O relay (Y1-O)
	CONNECT Y2-O	N/A	N/A	Closes the Y2-O relay (Y2-O)
	CONNECT AUX1-O	N/A	N/A	Energizes the AUX output. If Aux setting is: • NONE — not action taken • ERV — 24 Vac out. Turns on or signals an ERV that the conditions are not good for economizing but are for ERV operation. • SYS — 24 Vac out. Issues a system alarm
	CONNECT EXH1	N/A	N/A	Closes the power exhaust fan 2 relay (EXH1)
<b>ALARMS</b>	Alarms display only when they are active. The menu title "ALARMS(#)" includes the number of active alarms in parenthesis ( ). When using SYLK bus sensors, "SYLK" will appear on the screen, and when using 20k OA temperature sensors, "SENS T" will appear on the screen			
	MAT SENS ERR	N/A	N/A	SUPPLY AIR TEMPERATURE SENSOR ERROR Mixed air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	CO2 SENS ERR	N/A	N/A	CO <sub>2</sub> SENSOR ERROR CO <sub>2</sub> sensor has failed, gone out of range or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SYLK T ERR	N/A	N/A	OUTSIDE AIR S-BUS SENSOR ERROR Outdoor air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SYLK H ERR	N/A	N/A	
	RA SYLK T ERR	N/A	N/A	RETURN AIR S-BUS SENSOR ERROR Return air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	RA SYLK H ERR	N/A	N/A	
	DA SYLK T ERR	N/A	N/A	DISCHARGE AIR S-BUS SENSOR ERROR Discharge air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SENS T ERR	N/A	N/A	OUTSIDE AIR TEMPERATURE SENSOR ERROR Outdoor air temperature sensor has failed or become disconnected - check wiring then replace if the alarm continues.
	ACT ERROR	N/A	N/A	ACTUATOR ERROR Actuator has failed or become disconnected - check for stall, over voltage, under voltage and actuator count. Replace actuator if damper is movable and supply voltage is between 21.6 V and 26.4 V. Check actuator count on STATUS menu.
	FREEZE ALARM	N/A	N/A	Check if outdoor temperature is below the LOW Temp Lockout on set-point menu. Check if Mixed air temperature on STATUS menu is below the Lo Setpoint on Advanced menu. When conditions are back in normal range then the alarm will go away.

**Table 7 —Menu Structure (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT	NOTES
<b>ALARMS (CONT)</b>	SHUTDOWN ACTIVE	N/A	N/A	AUX2 IN is programmed for SHUTDOWN and 24 V has been applied to AUX2 IN terminal.
	DMP CAL RUNNING	N/A	N/A	DAMPER CALIBRATION ROUTINE RUNNING If DCV Auto enable has been programmed, when the W7220 is completing a calibration on the dampers, this alarm will display. Wait until the calibration is completed and the alarm will go away. Must have OA, MA and RA sensors for DCV calibration; set up in the Advanced setup menu.
	DA SENS ALM	N/A	N/A	DISCHARGE AIR TEMPERATURE SENSOR ALARM Discharge air temperature is out of the range set in the ADVANCED SETUP Menu. Check the temperature of the discharge air.
	SYS ALARM	N/A	N/A	When AUX1-0 is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX1-0 terminal has 24 Vac out.
	ACT UNDER V	N/A	N/A	ACTUATOR VOLTAGE LOW Voltage received by actuator is above expected range.
	ACT OVER V	N/A	N/A	ACTUATOR VOLTAGE HIGH Voltage received by actuator is below expected range.
	ACT STALLED	N/A	N/A	ACTUATOR STALLED Actuator stopped before achieving commanded position.

**LEGEND**

**CLO** — Compressor Lockout  
**ERV** — Energy Recovery Ventilator  
**LCD** — Liquid Crystal Display  
**MA** — Mixed Air  
**MAT** — Mixed Air Temperature  
**N/A** — Not Applicable  
**OA** — Outdoor Air  
**OAT** — Outdoor Air Temperature  
**OCC** — Occupied  
**RA** — Return Air  
**RAT** — Return Air Temperature  
**RTU** — Rooftop Unit  
**SYS** — System

**NOTES:**

- Table 7 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration. For example if you do not have a DCV (CO<sub>2</sub>) sensor, then none of the DCV parameters appear.
- When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.
- ERV Operation: When in cooling mode AND the conditions are NOT OK for economizing - the ERV terminal will be energized. In the Heating mode, the ERV terminal will be energized when the OA is below the ERV OAT setpoint in the setpoint menu.

- STATUS —> OCCUPIED — The factory-standard Occupancy signal originates with a thermostat or other controller call for indoor fan operation at CTB terminal G. This signal passes through the Central Terminal Board's OCCUPIED jumper JMP1 to the ECONO connector and to the W7220's OCC input terminal. An external timeclock or relay is required to implement an Occupancy schedule on the economizer damper position.
- STATUS —> MA TEMP, SETPOINTS —> MAT SET — The W7220 menu parameters and labels include designations MA, MAT and Mixed Air for the economizer cooling control sensor. On these rooftop units, the economizer control sensor is located downstream of the evaporator/indoor coil in the supply fan section where this sensor is designated as Supply Air Temperature (SAT) sensor.
- SETPOINTS —> DRYBLB SET — This point is not displayed if a Return Air (differential) temperature sensor or an Outdoor Air enthalpy sensor is connected.
- SYSTEM SETUP parameters must be configured as noted for 2-Speed unit operation:  
EQUIPMENT = CONV  
AUX2 IN = W  
FAN SPEED = 2SPEED

For damper minimum position settings and checkout menu readings, see Table 8. For dry bulb operation with a 1 speed indoor fan, with or without DCV, see Tables 9 and 10. For enthalpy operation with a 1 speed indoor fan, with or without DCV,

see Tables 11 and 12. For dry bulb operation with a 2 speed indoor fan, with or without DCV, see Tables 13 and 14. For enthalpy operation with a 2 speed indoor fan, with or without DCV, see Tables 15 and 16.

**Table 8 — Damper Minimum Position Settings and Readings on Checkout Menu**

DEMAND CONTROLLED VENTILATION (CO <sub>2</sub> SENSOR)	FAN SPEED	SETPOINTS	CHECKOUT
NO	1	MIN POS	VMAX-HS
		N/A	N/A
	2	MIN POS H	VMAX-HS
		MIN POS L	VMAX-LS
YES	1	VENT MIN	VMAX-HS
		VENT MAX	VMAX-HS
	2	VENT MIN H	VMAX-HS
		VENT MAX H	VMAX-LS
		VENT MIN L	N/A
		VENT MAX L	N/A

**Table 9 — Dry Bulb Operation No DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
NONE	No	OFF	OFF	HIGH	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	HIGH	24v/On	0v/Off	MIN POS	Closed
		ON	ON	HIGH	24v/On	24v/On	MIN POS	Closed
NONE	Yes	OFF	OFF	HIGH	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	MIN POS to Full Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	MIN POS to Full Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 10 — Dry Bulb Operation With DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
Below CO <sub>2</sub> Set	No	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	HIGH	24v/On	0v/Off	VENTMIN	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN	Closed
	Yes	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
Above CO <sub>2</sub> Set	No	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	HIGH	24v/On	0v/Off	VENTMIN to VENTMAX	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN to VENTMAX	Closed
	Yes	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	VENTMIN to Full-Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 11 — Enthalpy Operation No DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
NONE	No	OFF	OFF	HIGH	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	HIGH	24v/On	0v/Off	MIN POS	Closed
		ON	ON	HIGH	24v/On	24v/On	MIN POS	Closed
NONE	Yes	OFF	OFF	HIGH	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	MIN POS to Full Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	MIN POS to Full Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 12 — Enthalpy Operation With DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
Below CO <sub>2</sub> Set	No	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	HIGH	24v/On	0v/Off	VENTMIN	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN	Closed
	Yes	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
Above CO <sub>2</sub> Set	No	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	HIGH	24v/On	0v/Off	VENTMIN to VENTMAX	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN to VENTMAX	Closed
	Yes	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	VENTMIN to Full-Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 13 — Dry Bulb Operation No DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
NONE	No	OFF	OFF	LOW	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	LOW	24v/On	0v/Off	MIN POS	Closed
		ON	ON	HIGH	24v/On	24v/On	MIN POS	Closed
NONE	Yes	OFF	OFF	LOW	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	LOW	0v/Off	0v/Off	MIN POS to Full Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	MIN POS to Full Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 14 — Dry Bulb Operation With DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
Below CO <sub>2</sub> Set	No	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	LOW	24v/On	0v/Off	VENTMIN	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN	Closed
	Yes	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	LOW	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
Above CO <sub>2</sub> Set	No	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	LOW	24v/On	0v/Off	VENTMIN to VENTMAX	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN to VENTMAX	Closed
	Yes	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	LOW	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	VENTMIN to Full-Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 15 — Enthalpy Operation No DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

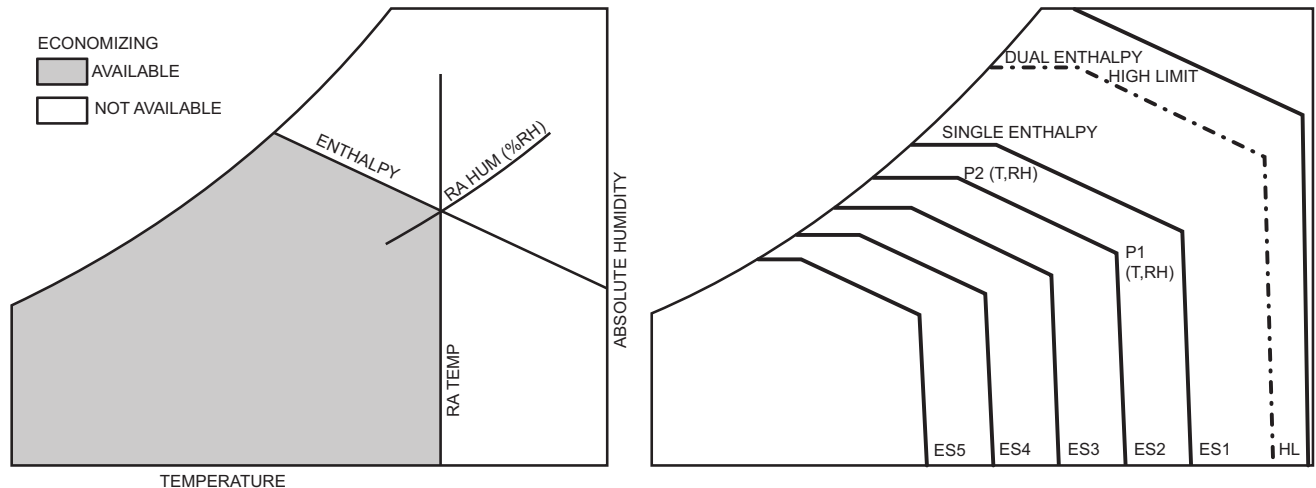
DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
NO CO <sub>2</sub> SENSOR	No	OFF	OFF	LOW	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	LOW	24v/On	0v/Off	MIN POS	Closed
		ON	ON	HIGH	24v/On	24v/On	MIN POS	Closed
	Yes	OFF	OFF	LOW	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	LOW	0v/Off	0v/Off	MIN POS to Full Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	MIN POS to Full Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 16 — Enthalpy Operation With DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
Below CO <sub>2</sub> Set	No	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	LOW	24v/On	0v/Off	VENTMIN	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN	Closed
	Yes	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	LOW	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
Above CO <sub>2</sub> Set	No	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	LOW	24v/On	0v/Off	VENTMIN to VENTMAX	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN to VENTMAX	Closed
	Yes	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	LOW	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	VENTMIN to Full-Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.



**Fig. 45 — Single Enthalpy Curve Boundaries**

**Table 17 — Single Enthalpy and Dual Enthalpy High Limit Curves**

ENTHALPY CURVE	TEMP. DRY BULB (F)	TEMP. DEWPOINT (F)	ENTHALPY (btu/lb/da)	POINT P1		POINT P2	
				TEMP. (F)	HUMIDITY (%RH)	TEMP. (F)	HUMIDITY (%RH)
ES1	80	60	28.0	80	36.8	66.3	80.1
ES2	75	57	26.0	75	39.6	63.3	80.0
ES3	70	54	24.0	70	42.3	59.7	81.4
ES4	65	51	22.0	65	44.8	55.7	84.2
ES5	60	48	20.0	60	46.9	51.3	88.5
HL	86	66	32.4	86	38.9	72.4	80.3

**ENTHALPY SETTINGS** — When the OA temperature, enthalpy and dew point are below the respective setpoints, the Outdoor Air can be used for economizing. Fig. 45 shows the new single enthalpy boundaries in the W7220. There are 5 boundaries (setpoints ES1 through ES5), which are defined by dry bulb temperature, enthalpy and dew point.

Refer to Table 17 for ENTH CURVE setpoint values.

The W7220 calculates the enthalpy and dew point using the OA temperature and humidity input from the OA enthalpy sensor. When the OA temperature, OA humidity and OA dew point are all below the selected boundary, the economizer sets the economizing mode to YES, economizing is available.

When all of the OA conditions are above the selected boundary, the conditions are not good to economize and the mode is set to NO.

Fig. 45 shows the 5 current boundaries. There is also a high limit boundary for differential enthalpy. The high limit boundary is ES1 when there are no stages of mechanical cooling energized and HL (high limit) when a compressor stage is energized.

Table 17 provides the values for each boundary limit.

**TWO-SPEED FAN OPERATION** — The W7220 controller has the capability to work with a system using a 2-speed supply fan. The W7220 does not control the supply directly but uses the following input status to determine the speed of the supply fan and controls the OA damper to the required position, see Table 18.

**Table 18 — Fan Speed**

STATE	FAN SPEED
OCC	Low
Y1	Low
Y2	High
W	High

The W (heating mode) is not controlled by the W7220 but it requires the status to know where to position the OA damper for minimum position for the fan speed.

The 2 speed fan delay is available when the system is programmed for 2 speed fan (in the System Setup menu item). The 2 speed fan delay is defaulted to 5 minutes and can be changed in the Advanced Setup menu item. When the unit has a call for Y1 In and in the free cooling mode and there is a call for Y2 In, the 2-speed fan delay starts and the OA damper will modulate 100% open, the supply fan should be set to high speed by the unit controller.

After the delay one of two actions will happen:

- The Y2 In call will be satisfied with the damper 100% open and fan on high speed and the call will turn off  
OR
- If the call for additional cooling in the space has not been satisfied then the first stage of mechanical cooling will be enabled through Y1 Out or Y2 Out.

**CHECKOUT** — Inspect all wiring connections at the economizer module's terminals, and verify compliance with the installation wiring diagrams.

**⚠ WARNING**

Failure to follow this warning could result in personal injury, property damage, or death.

Before performing service or maintenance operations on unit, always turn off main power switch to unit and install lock(s) and lockout tag(s). Unit may have more than one power switch. Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate.

If any wiring changes are required, first be sure to remove power from the Economizer module before starting work. Pay particular attention to verifying the power connection (24 Vac).

For checkout, review the Status of each configured parameter and perform the Checkout tests.

**NOTE:** For information about menu navigation and use of the keypad see Interface Overview on page 23.

**Power Up** — After the W7220 module is mounted and wired, apply power.

**Initial Menu Display** — On initial start up, Honeywell displays on the first line and economizer W7220 on the second line. After a brief pause, the revision of the software appears on the first line and the second line will be blank.

**Power Loss (Outage or Brownout)** — All setpoints and advanced settings are restored after any power loss or interruption.

**NOTE:** All settings are stored in non-volatile flash memory.

**Status** — Use the Status menu (see Table 7) to check the parameter values for the various devices and sensors configured.

**NOTE:** For information about menu navigation and use of the keypad see Interface Overview on page 23.

**Checkout Tests** — Use the Checkout menu (on page 27) to test the damper operation and any configured outputs. Only items that are configured are shown in the Checkout menu.

**NOTE:** For information about menu navigation and use of the keypad see Interface Overview on page 23.

To perform a Checkout test:

1. Scroll to the desired test in the Checkout menu using the ▲ and ▼ buttons.
2. Press the ⏏ button to select the item.
3. RUN? appears.
4. Press the ⏏ button to start the test.
5. The unit pauses and then displays IN PROGRESS.
6. When the test is complete, DONE appears.
7. When all desired parameters have been tested, press the ⏏ (Menu Up) button to end the test.

The Checkout tests can all be performed at the time of installation or at any time during the operation of the system as a test that the system is operable.



## TROUBLESHOOTING

**Alarms** — The economizer module provides alarm messages that display on the 2-line LCD.




**NOTE:** Upon power up, the module waits 60 minutes before checking for alarms. This allows time for all the configured devices (e.g. sensors, actuator) to become operational. The exception is the SAT sensor which will alarm immediately.

If one or more alarms are present and there has been no keypad activity for at least 5 minutes, the Alarms menu displays and cycles through the active alarms.

You can also navigate to the Alarms menu at any time.

**Clearing Alarms** — Once the alarm has been identified and the cause has been removed (e.g. replaced faulty sensor) the alarm can be cleared from the display.

To clear an alarm, perform the following:

1. Navigate to the desired alarm.
2. Press the  button.
3. ERASE? displays.
4. Press the  button.
5. ALARM ERASED displays.
6. Press the  (Menu up/Exit) button to complete the action and return to the previous menu.

**NOTE:** If the alarm still exists after you clear it, it is redisplayed within 5 seconds.

### ⚠ CAUTION

Failure to follow this caution may result in damage to equipment. Be sure to allow enough time for compressor start-up and shutdown between checkout tests so that you do not short-cycle the compressors.

**Low Ambient Control (Factory Option)** — If the unit comes with Electro-Mechanical (EM) control, then no adjustment is necessary.

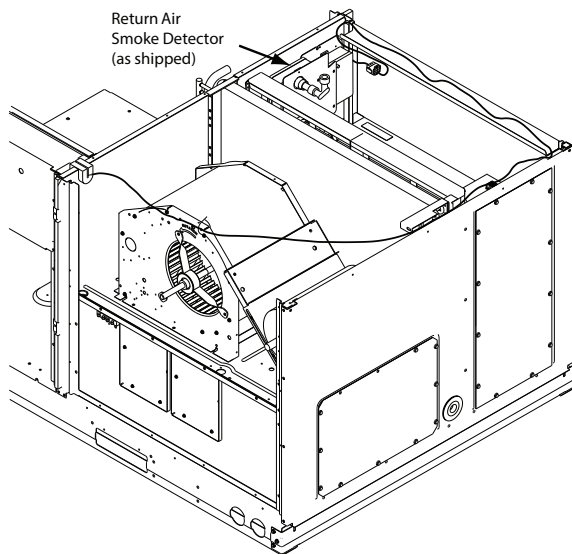
**Smoke Detectors** — Smoke detectors are available as factory-installed options on RAH150 models. Smoke detectors may be specified for Supply Air only or for Return Air without or with economizer or in combination of Supply Air and Return Air. Return Air smoke detectors are arranged for vertical return configurations only. All components necessary for operation are factory-provided and mounted. The unit is factory-configured for immediate smoke detector shutdown operation; additional wiring or modifications to unit terminal board may

be necessary to complete the unit and smoke detector configuration to meet project requirements.

Units equipped with factory-optional Return Air smoke detectors require a relocation of the sensor module at unit installation. See Fig. 46 for the as shipped location.

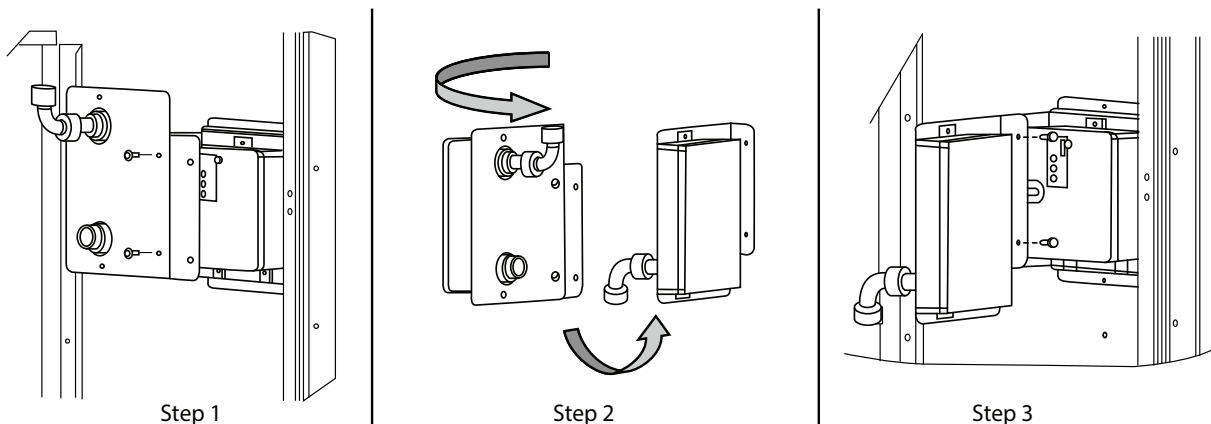
### Completing Installation of Return Air Smoke Sensor:

1. Unscrew the two screws holding the Return Air Smoke Detector assembly. See Fig. 47, Step 1. Save the screws.
2. Turn the assembly 90° and then rotate end to end. Make sure that the elbow fitting is pointing down. See Fig. 47, Step 2.
3. Screw the sensor and detector plate into its operating position using screws from Step 1. See Fig. 47, Step 3.
4. Connect the flexible tube on the sampling inlet to the sampling tube on the basepan.

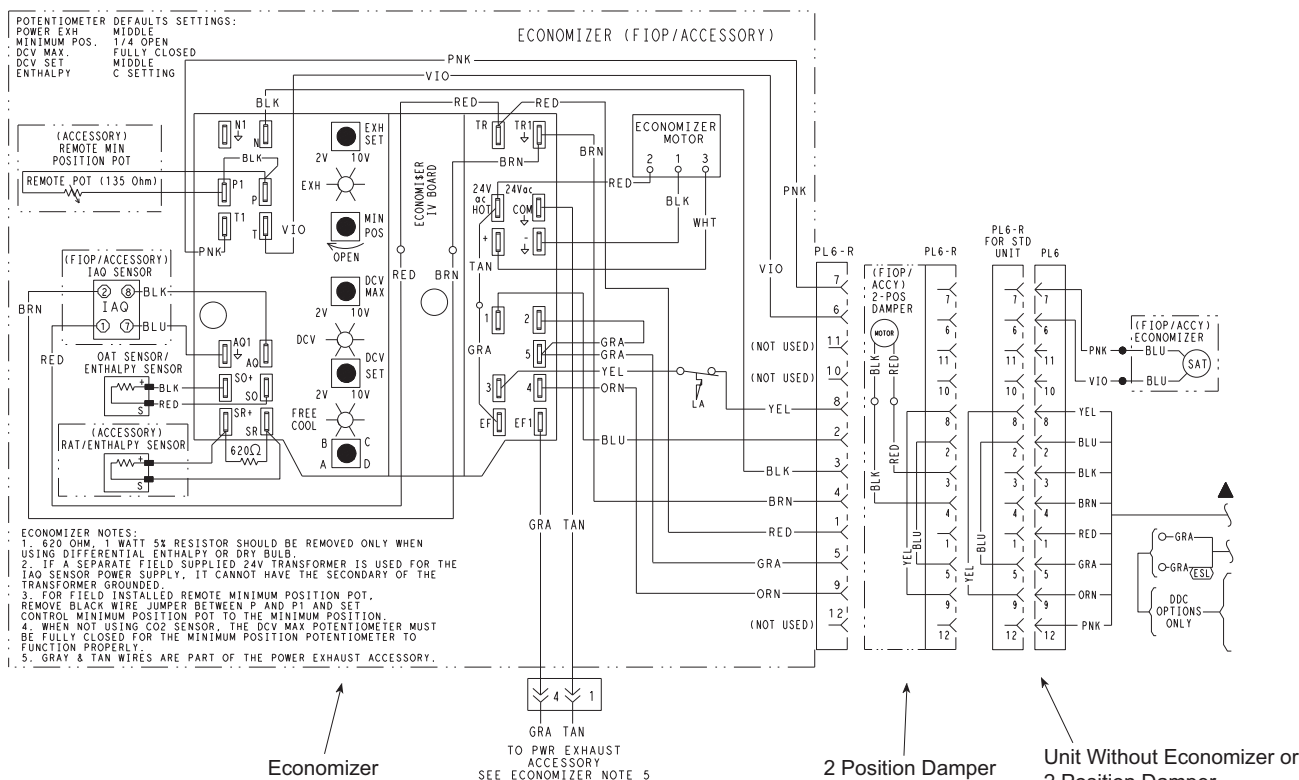


**Fig. 46 — Return Air Smoke Detector, Shipping Position**

**ADDITIONAL APPLICATION DATA** — Refer to the Application Data sheet titled Factory Installed Smoke Detectors for Small and Medium Rooftop Units 2 to 25 Tons for discussions on additional control features of these smoke detectors including multiple unit coordination.



**Fig. 47 — Completing Installation of Return Air Smoke Sensor**



**Fig. 48 — EconoMiSer® IV Wiring**

### Step 11 — Adjust Factory-Installed Options

**SMOKE DETECTORS** — Smoke detector(s) will be connected at the Controls Connections Board, at terminals marked “Smoke Shutdown.” Cut jumper JMP 3 when ready to energize unit.

**ECONOMISER IV OCCUPANCY SWITCH** — Refer to Fig. 48 for general EconoMiSer IV wiring. External occupancy control is managed through a connection on the Controls Connections Board.

If external occupancy control is desired, connect a time clock or remotely controlled switch (closed for Occupied, open for Un-occupied sequence) at terminals marked OCCUPANCY. Cut jumper JMP 2 to complete the installation.

**Step 12 — Install Accessories** — Available accessories include:

- Roof Curb (must be installed before unit)
- Thru-base connection kit (must be installed before unit is set on curb)
- Manual outside air damper
- Two-Position motorized outside air damper

- EconoMiSer IV (with control and integrated barometric relief)
- Barometric relief
- Power Exhaust
- Differential dry-bulb sensor (EconoMiSer IV)
- Outdoor enthalpy sensor
- Differential enthalpy sensor
- Time Guard II compressor anti-cycle control
- Outdoor coil protector grille
- Head pressure control
- Programmable setback thermostat
- Electrical/Mechanical thermostat and subbase
- Thermidistat device
- Humidistat
- Thermostat / Sensors
- CO<sub>2</sub> sensor
- Louvered hail guard
- Phase monitor control

Refer to separate installation instructions for information on installing these accessories.

**Pre-Start and Start-Up** — This completes the mechanical installation of the unit. Refer to the unit’s Service Manual for detailed Pre-Start and Start-Up instructions.

**START-UP CHECKLIST**  
(Remove and use for job file)

**NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation Instructions document.**

MODEL NO.: \_\_\_\_\_ SERIAL NO.: \_\_\_\_\_

**I. PRE-START-UP**

- ☐ VERIFY THAT ALL PACKAGING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ VERIFY INSTALLATION OF OUTDOOR AIR HOOD
- ☐ VERIFY INSTALLATION OF FLUE EXHAUST AND INLET HOOD
- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTRUCTIONS
- ☐ VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
- ☐ CHECK THAT INDOOR-AIR FILTERS ARE CLEAN AND IN PLACE
- ☐ CHECK THAT OUTDOOR AIR INLET SCREENS ARE IN PLACE
- ☐ VERIFY THAT UNIT IS LEVEL
- ☐ CHECK FAN WHEELS AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE AND VERIFY SETSCREW IS TIGHT
- ☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
- ☐ VERIFY THAT SCROLL COMPRESSORS ARE ROTATING IN THE CORRECT DIRECTION
- ☐ VERIFY INSTALLATION OF THERMOSTAT

**II. START-UP**

**ELECTRICAL**

SUPPLY VOLTAGE	L1-L2 _____	L2-L3 _____	L3-L1 _____
COMPRESSOR AMPS 1	L1 _____	L2 _____	L3 _____
COMPRESSOR AMPS 2	L1 _____	L2 _____	L3 _____
SUPPLY FAN AMPS	L1 _____	L2 _____	L3 _____

**TEMPERATURES**

OUTDOOR-AIR TEMPERATURE	_____ °F DB (DRY BULB)	
RETURN-AIR TEMPERATURE	_____ °F DB	_____ °F WB (WET BULB)
COOLING SUPPLY AIR TEMPERATURE	_____ °F	

**PRESSURES**

REFRIGERANT SUCTION	CIRCUIT A	_____ PSIG
	CIRCUIT B	_____ PSIG
REFRIGERANT DISCHARGE	CIRCUIT A	_____ PSIG
	CIRCUIT B	_____ PSIG

- ☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS

**GENERAL**

- ☐ ECONOMIZER MINIMUM VENT AND CHANGEOVER SETTINGS TO JOB REQUIREMENTS (IF EQUIPPED)
- ☐ VERIFY SMOKE DETECTOR UNIT SHUTDOWN BY UTILIZING MAGNET TEST

### III. HOT GAS RE-HEAT SYSTEM START-UP

#### STEPS

- ☐ 1. CHECK CTB FOR JUMPER 5, 6, 7  
JUMPER 5, 6, 7 MUST BE CUT AND OPEN
- ☐ 2. OPEN HUMIDISTAT CONTACTS
- ☐ 3. START UNIT IN COOLING (CLOSE Y1)

#### OBSERVE AND RECORD

- A. SUCTION PRESSURE \_\_\_\_\_ PSIG
- B. DISCHARGE PRESSURE \_\_\_\_\_ PSIG
- C. ENTERING AIR TEMPERATURE \_\_\_\_\_ °F
- D. LIQUID LINE TEMPERATURE AT OUTLET OR REHEAT COIL \_\_\_\_\_ °F
- E. CONFIRM CORRECT ROTATION FOR COMPRESSOR
- F. CHECK FOR CORRECT RAMP-UP OF OUTDOOR FAN MOTOR AS CONDENSER COIL WARMS
- ☐ 4. CHECK UNIT CHARGE PER CHARGING CHART
- ☐ 5. SWITCH UNIT TO HIGH-LATENT MODE (SUBCOOLER) BY CLOSING HUMIDISTAT WITH Y1 CLOSED

#### OBSERVE

- ☐ A. REDUCTION IN SUCTION PRESSURE (5 TO 7 PSI EXPECTED)
- ☐ B. DISCHARGE PRESSURE UNCHANGED
- ☐ C. LIQUID TEMPERATURE DROPS TO 50 TO 55°F RANGE
- ☐ D. LIQUID SOLENOID VALVE (LSV) ENERGIZED (VALVE CLOSSES)
- ☐ 6. SWITCH UNIT TO DEHUMID (REHEAT) BY OPENING Y1

#### OBSERVE

- ☐ A. SUCTION PRESSURE INCREASES TO NORMAL COOLING LEVEL
- ☐ B. DISCHARGE PRESSURE DECREASES (35 TO 50 PSI)
- ☐ C. LIQUID TEMPERATURE RETURNS TO NORMAL COOLING LEVEL
- ☐ D. LIQUID SOLENOID VALVE (LSV) ENERGIZED (VALVE CLOSSES)
- ☐ E. DISCHARGE SOLENOID VALVE (DSV) ENERGIZED, VALVE OPENS
- ☐ 7. WITH UNIT IN DEHUMID MODE CLOSE W1  
COMPRESSOR AND OUTDOOR FAN STOP; LSV AND DSV SOLENOIDS DE-ENERGIZED
- ☐ 8. OPEN W1 RESTORE UNIT TO DEHUMID MODE
- ☐ 9. OPEN HUMIDISTAT INPUT  
COMPRESSOR AND OUTDOOR FAN STOP; LSV AND DSV SOLENOIDS DE-ENERGIZED
- ☐ 10. RESTORE SETPOINTS FOR THERMOSTAT AND HUMIDISTAT

#### REPEAT PROCESS FOR 2 COMPRESSOR SYSTEMS

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE