

# INSTALLATION INSTRUCTIONS

## R-410A Single Package Heat Pump

### RHS181-243

**RHS181-243 units for installation in the United States contain use of the 2-speed indoor fan control system. This complies with the U.S. Department of Energy (DOE) efficiency standard of 2018.**

**RHS181-243 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.**

**NOTE:** Read the entire instruction manual before starting the installation.

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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, turn off main power switch to unit and install lock(s) and lockout tag(s). Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate. 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 to the right lists the rated indoor airflow used for the AHRI efficiency rating for the units covered in this document.

Model Number	Full Load Airflow (cfm)
RHS181/183	5250
RHS240/243*	6500

\* Standard Static Indoor Fan Motor is not available on RHS243 units.

## MODEL NUMBER NOMENCLATURE

MODEL SERIES	R	H	S	1	8	1	H	0	A	B	0	A	A	T
Position Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
R = Rooftop														
H = Heat Pump		Type												
S = Standard Efficiency			Efficiency											
181 = 181,000 = 15Tons Dedicated Vertical SA/RA (SA = Supply Air, RA = Return Air)														
183 = 180,000 = 15Tons Dedicated Horizontal SA/RA														
240 = 240,000 = 20Tons Dedicated Vertical SA/RA														
243 = 240,000 = 20Tons Dedicated Horizontal SA/RA														
H = 208/230-3-60														
L = 460-3-60														
S = 575-3-60														
0 = No Heat														
A = Standard Option														
B = High Static Option (15 ton only w/ 1-Speed IFM, 15 and 20 ton with 2-Speed IFM)														
C = Medium Static Option (15 ton only w/ 1-Speed IFM, 15 and 20 ton with 2-Speed IFM)														
E = High Static Option - High Efficiency Motor (20 ton only w/ 1-Speed IFM)														
F = Medium Static Option -High Efficiency Motor (20 ton only w/ 1-Speed IFM)														
A = None														
B = Economizer w/ Barometric Relief, OA Temp Sensor														
E = Economizer w/ Barometric Relief + CO <sub>2</sub> Sensor, OA Temp Sensor														
H = Economizer w/ Barometric Relief, Enthalpy Sensor														
L = Economizer w/ Barometric Relief + CO <sub>2</sub> Sensor, Enthalpy Sensor														
P = 2-Position Damper w/ Barometric Relief														
U = Ultra Low Leak Economizer w/ Barometric Relief, OA Temp Sensor														
W = Ultra Low Leak Economizer w/ Barometric Relief, Enthalpy Sensor														
0A = No 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														
T = 2-Speed Indoor Motor Controller (VFD) - Standard on U.S. models														
A = Standard Single Speed Indoor Fan Motor. For W7212 controls														
B = Standard Single Speed Indoor Fan Motor. For W7220 controls														

\* See RHS 15 to 20 ton Product Specification for details.

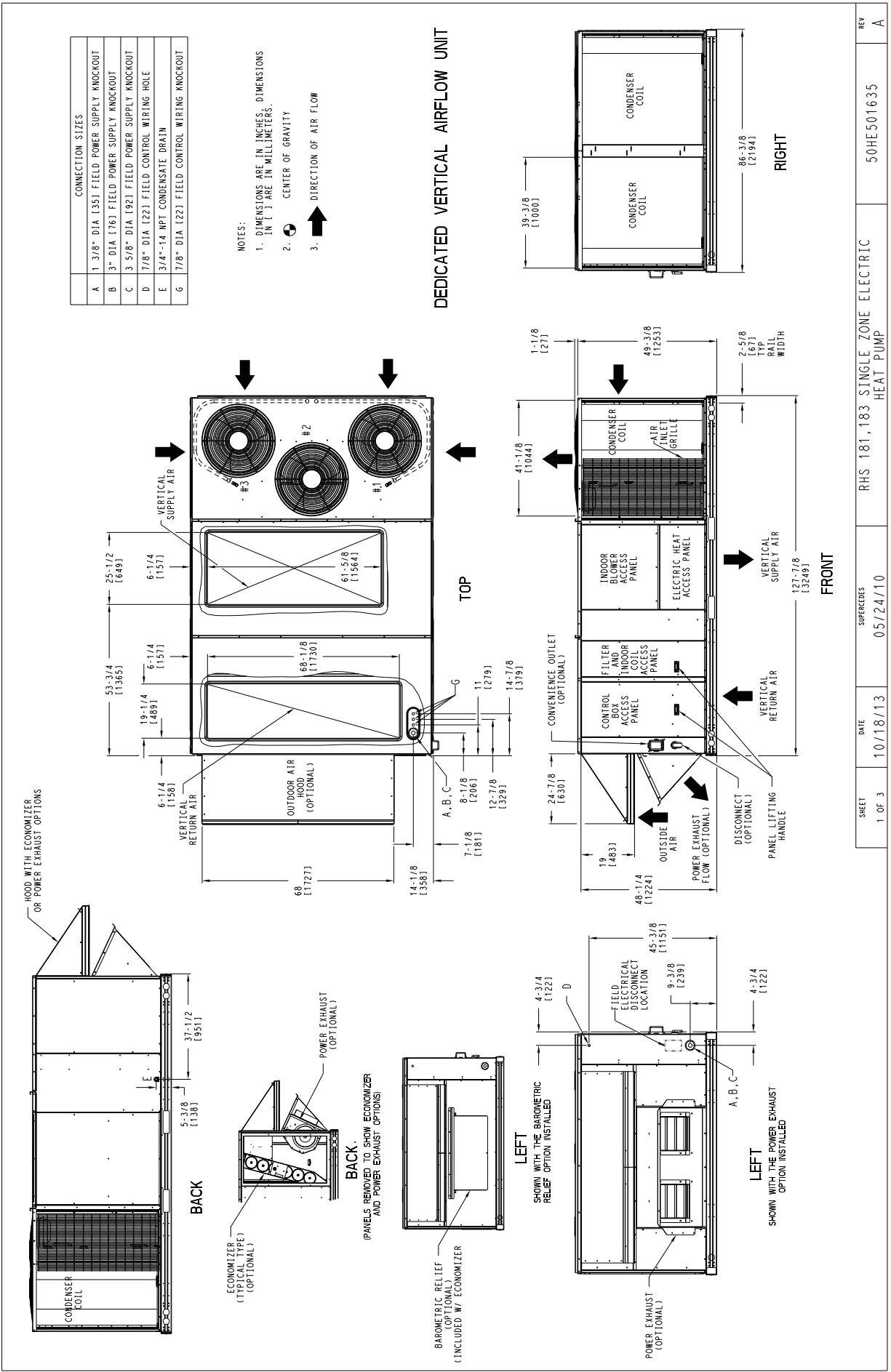


Fig. 1 - RHS181-183 Unit Dimensional Drawing

RHS-001

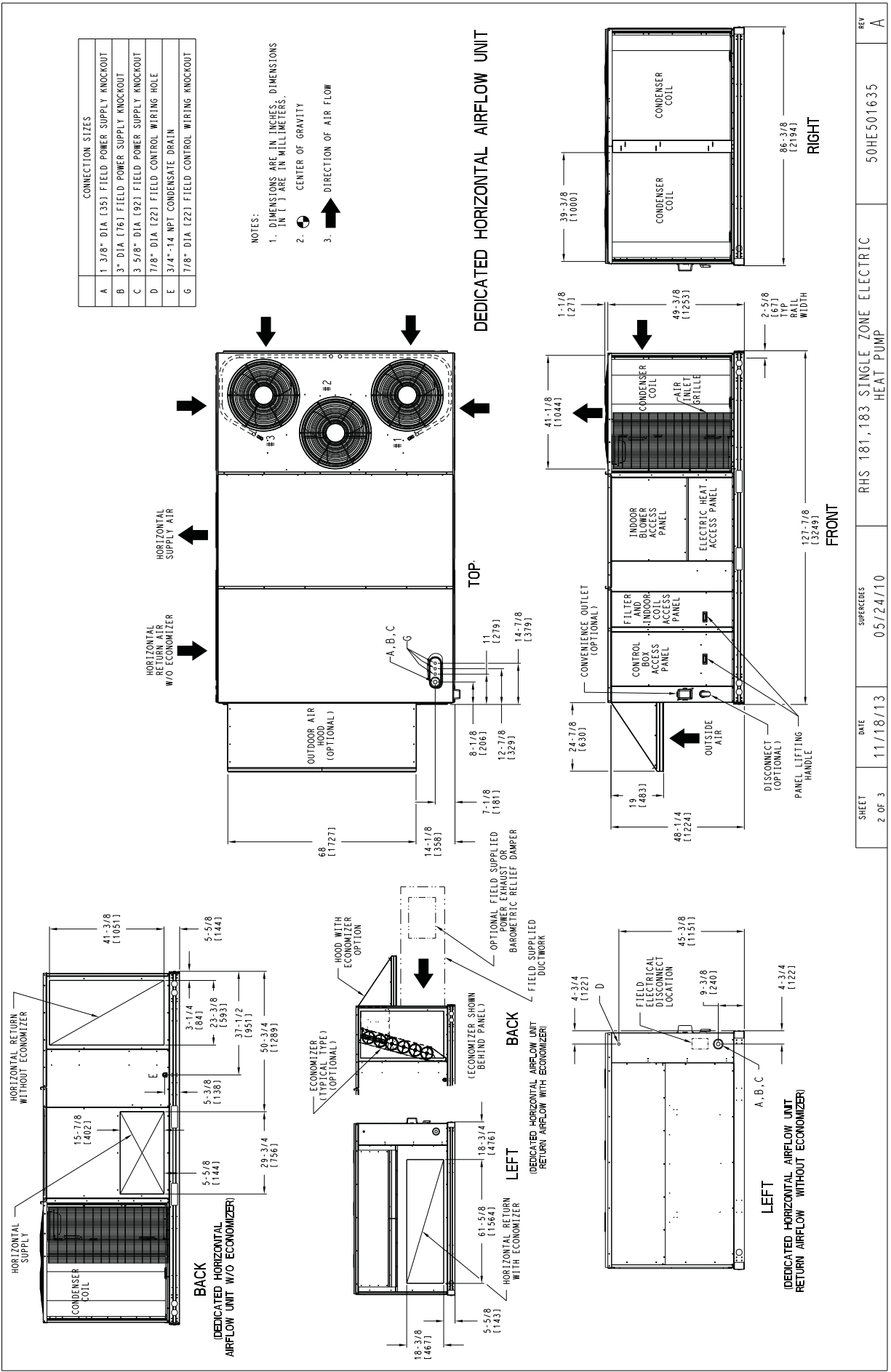
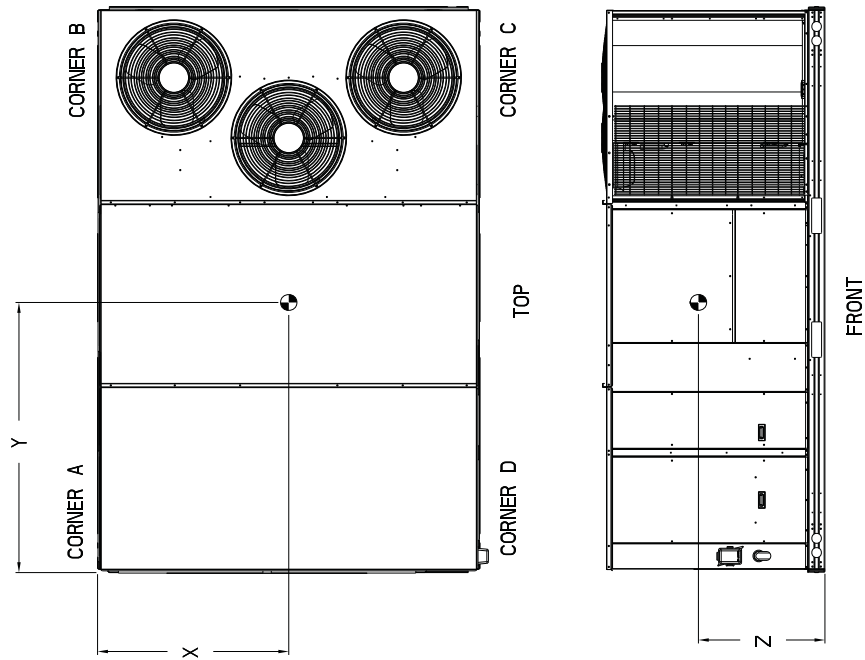


Fig. 1 - RHS181-183 Unit Dimensional Drawing (cont)

RHS-002

UNIT	STD UNIT WEIGHT *		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C.G.			
	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z	
RHS181,183	1775	807	479	218	364	166	403	183	83	530	241	45 1/4 [1149]	55 1/4 [1403]	16 1/2 [419]

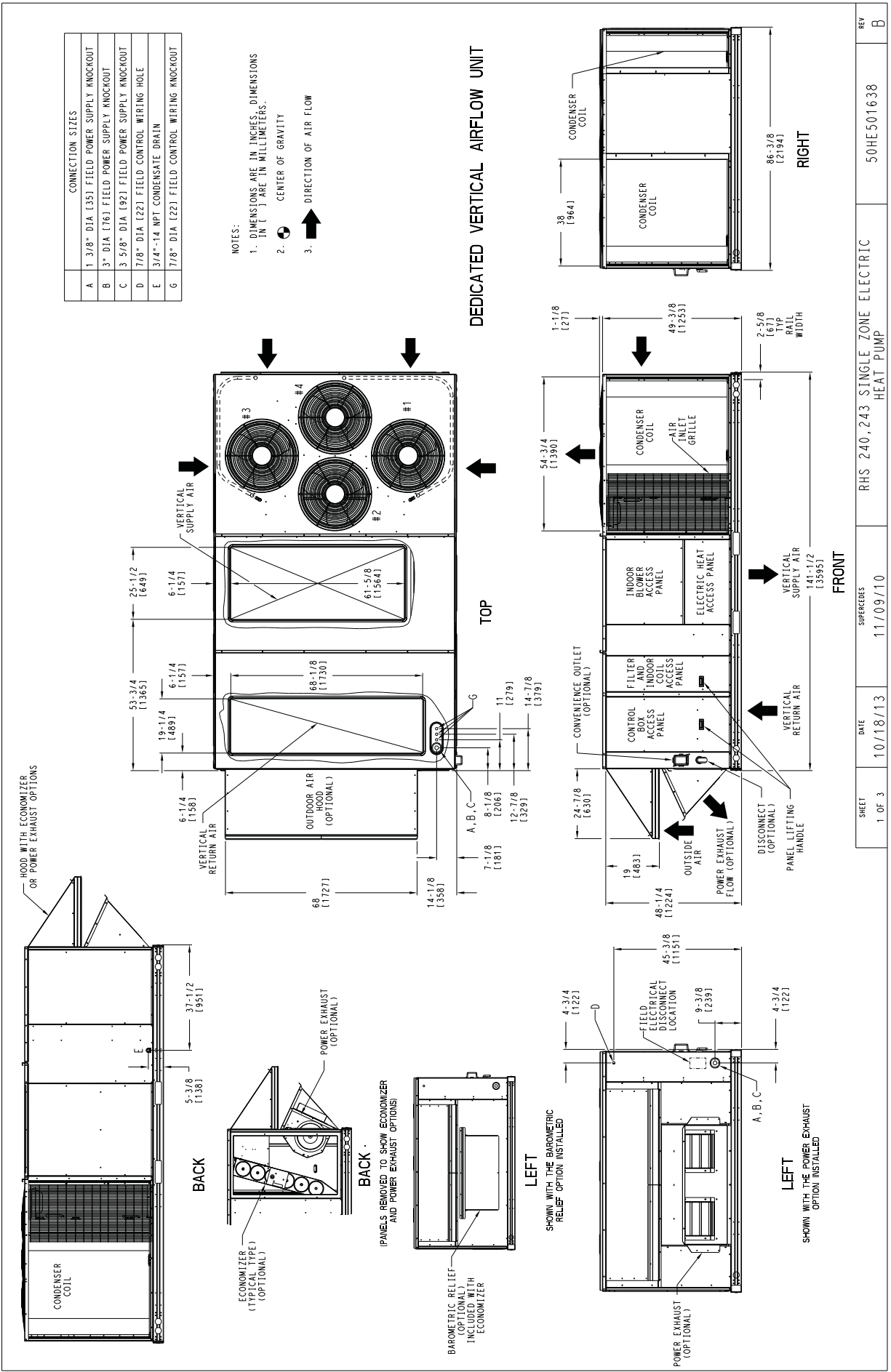
\* STANDARD UNIT WEIGHT IS WITHOUT ELECTRIC HEAT AND WITHOUT PACKAGING.  
FOR OTHER OPTIONS AND ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.



SHEET	DATE	SUPERCEDES	RHS 181,183 SINGLE ZONE ELECTRIC HEAT PUMP	REV
3 OF 3	10/18/13	05/24/10	50HE501635	A

Fig. 1 - RHS181-183 Unit Dimensional Drawing (cont)

RHS-003



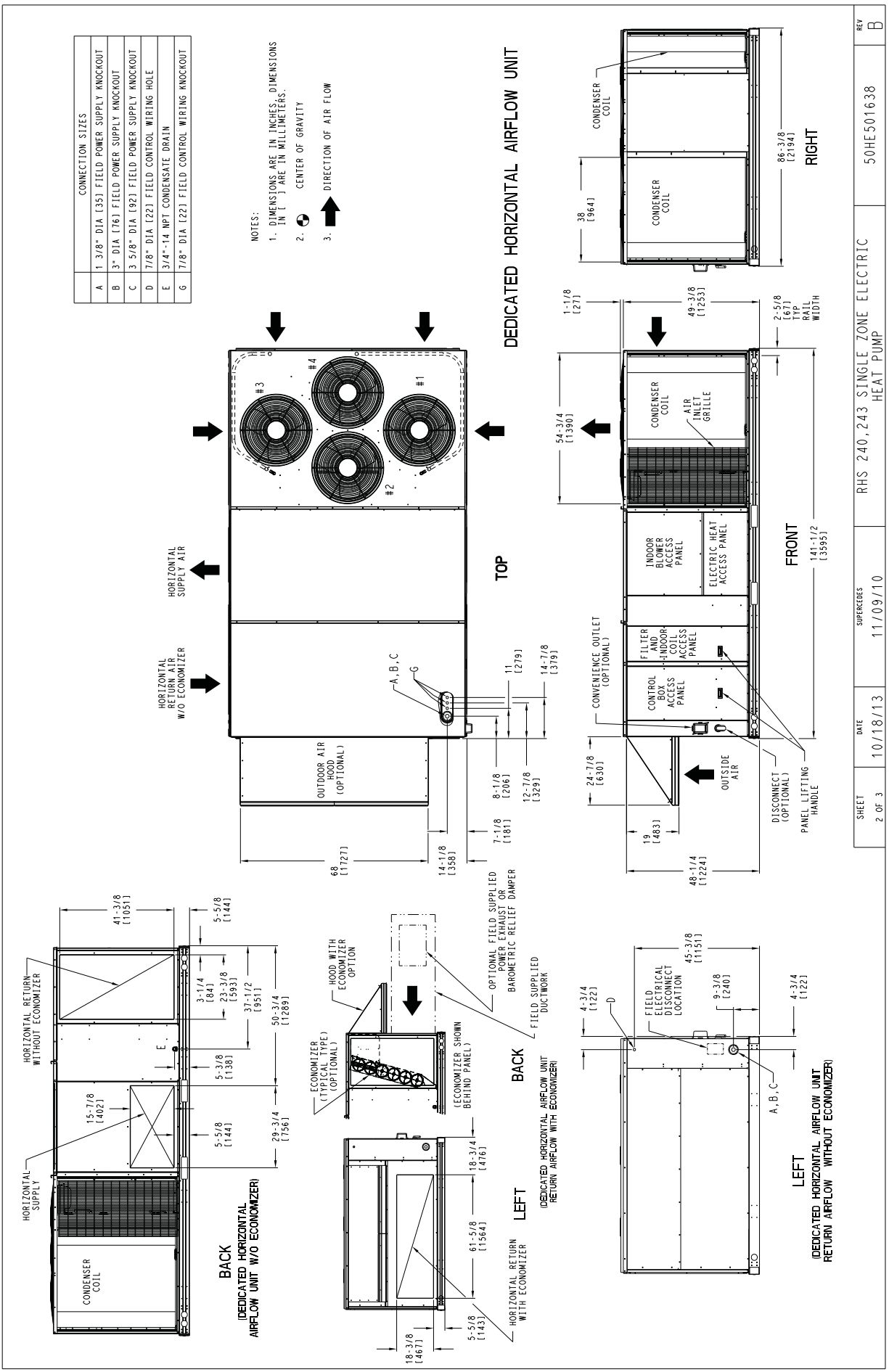


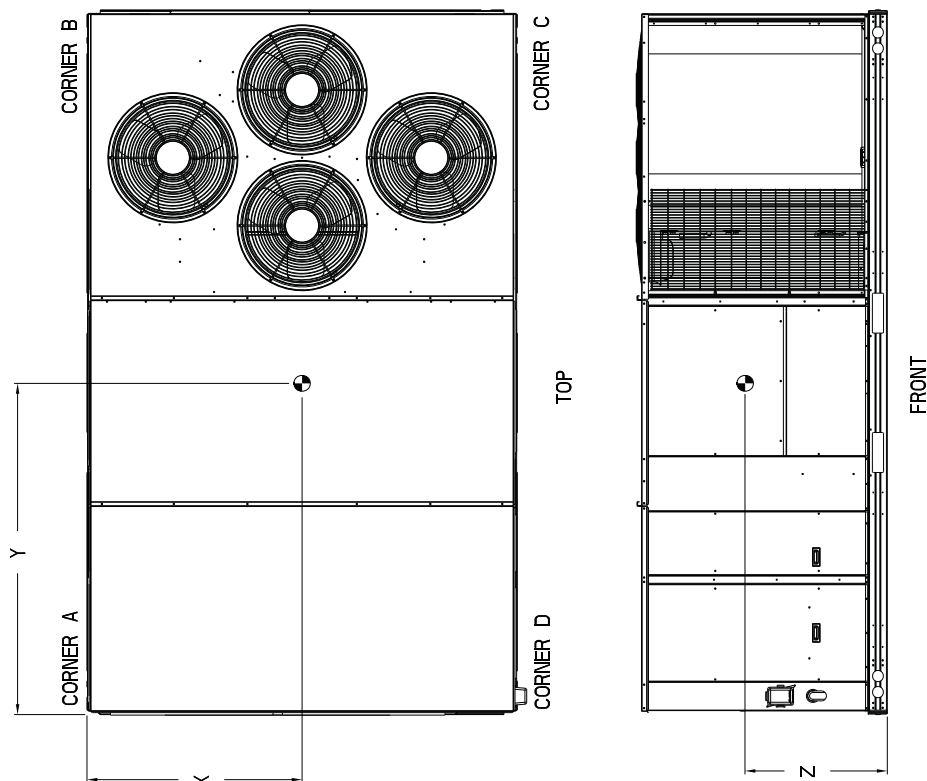
Fig. 2 - RHS240-243 Unit Dimensional Drawing (cont)

RHS-005



UNIT	STD UNIT WEIGHT *		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C.G.		
	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z
RHS240,243	2100	955	534	243	517	235	516	235	533	242	43 [1092]	69 1/2 [1765]	16.5 [419]

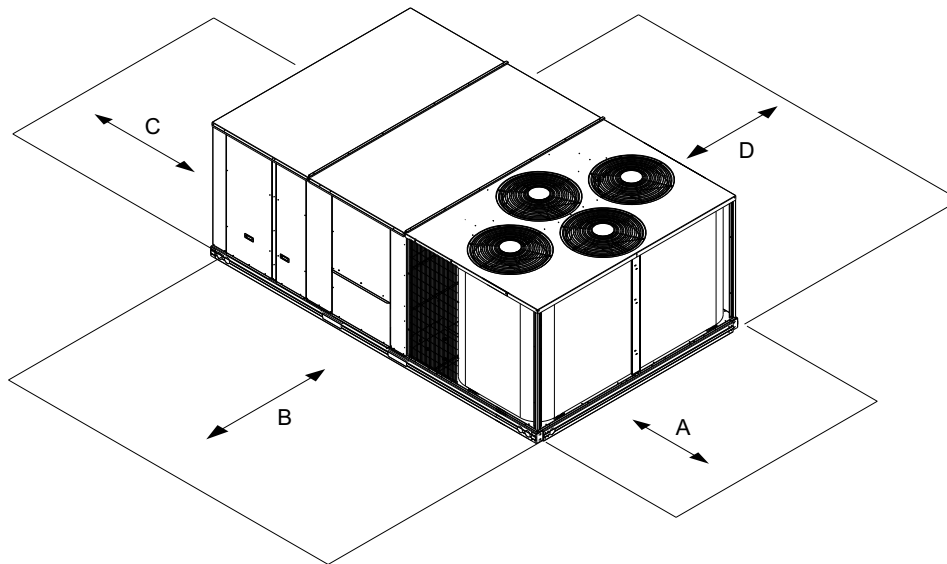
\* STANDARD UNIT WEIGHT IS WITHOUT ELECTRIC HEAT AND WITHOUT PACKAGING.  
FOR OTHER OPTIONS AND ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.



SHEET	DATE	SUPERCEDS	RHS 240,243 SINGLE ZONE ELECTRIC HEAT PUMP	50HE501638	REV
3 OF 3	10/18/13	11/09/10			B

Fig. 2 - RHS240-243 Unit Dimensional Drawing (cont)

RHS-006



C12392

LOCATION	DIMENSION	CONDITION
A	36-in. (914 mm)	• Recommended clearance for air flow and service
B	42-in. (1067 mm)	• Recommended clearance for air flow and service
C	18-in. (457 mm)	• No Convenience Outlet • No Economizer • No field installed disconnect on economizer hood side (Factory-installed disconnect installed).
	36-in. (914 mm)	• Convenience Outlet installed. • Vertical surface behind servicer is electrically non-conductive (e.g.: wood, fiberglass).
	42-in. (1067 mm)	• Convenience Outlet installed. • Vertical surface behind servicer is electrically conductive (e.g.: metal, masonry).
	96-in. (2438 mm)	• Economizer and/or Power Exhaust installed. • Check for sources of flue products with 10 feet (3 meters) of economizer fresh air intake.
D	42-in. (1067 mm)	• Recommended clearance for service.

**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**

## REFRIGERATION SYSTEM COMPONENTS

Each heat pump refrigeration system includes a compressor, accumulator, reversing valve, dual-function outdoor coil with vapor header check valve, cooling liquid line with a filter drier and a check valve, dual-function indoor coil with a vapor header check valve, and heating liquid line with a check valve and a strainer. RHS181-243 units have two compressor-circuits. See Fig. 4 for typical unit piping schematic (4-row indoor coil with two compressor-circuits is shown).

Dual-function outdoor and indoor coils are designed to provide parallel coil circuits during evaporator-function operation and converging coil circuits during the condenser-function operation.

### Reversing Valve and Check Valve Position

See Fig. 4 (on page 11) and Tables 1, 2, and 3.

### Troubleshooting Refrigerant Pressure Problems and Check Valves

Refer to Fig. 4 and the Cooling Mode and Heating Mode tables (Tables 1 and 2).

### Refrigerant System Pressure Access Ports

There are two access ports on the suction tube and the discharge tube near the compressor. These are brass fittings with black plastic caps. The hose connection fittings are standard 1/4-in. SAE male flare couplings.

The brass fittings are two-piece High Flow valves, with a receptacle base brazed to the tubing and an integral spring-closed check valve core screwed into the base. See Fig. 5 on page 11. This check valve is permanently assembled into this core body and cannot be serviced separately. Replace the entire core body if necessary. Service tools are available from Replacement Components that allow the replacement of the check valve core without having to recover the entire system refrigerant charge. Apply compressor refrigerant oil to the check valve core's bottom O-ring. Install the fitting body and torque to 96 ±10 in-lbs (10.9 ± 1 Nm). Do not exceed 106 in-lbs (11.9 Nm) when tightening.

**Table 1 – Cooling Mode (each circuit)**

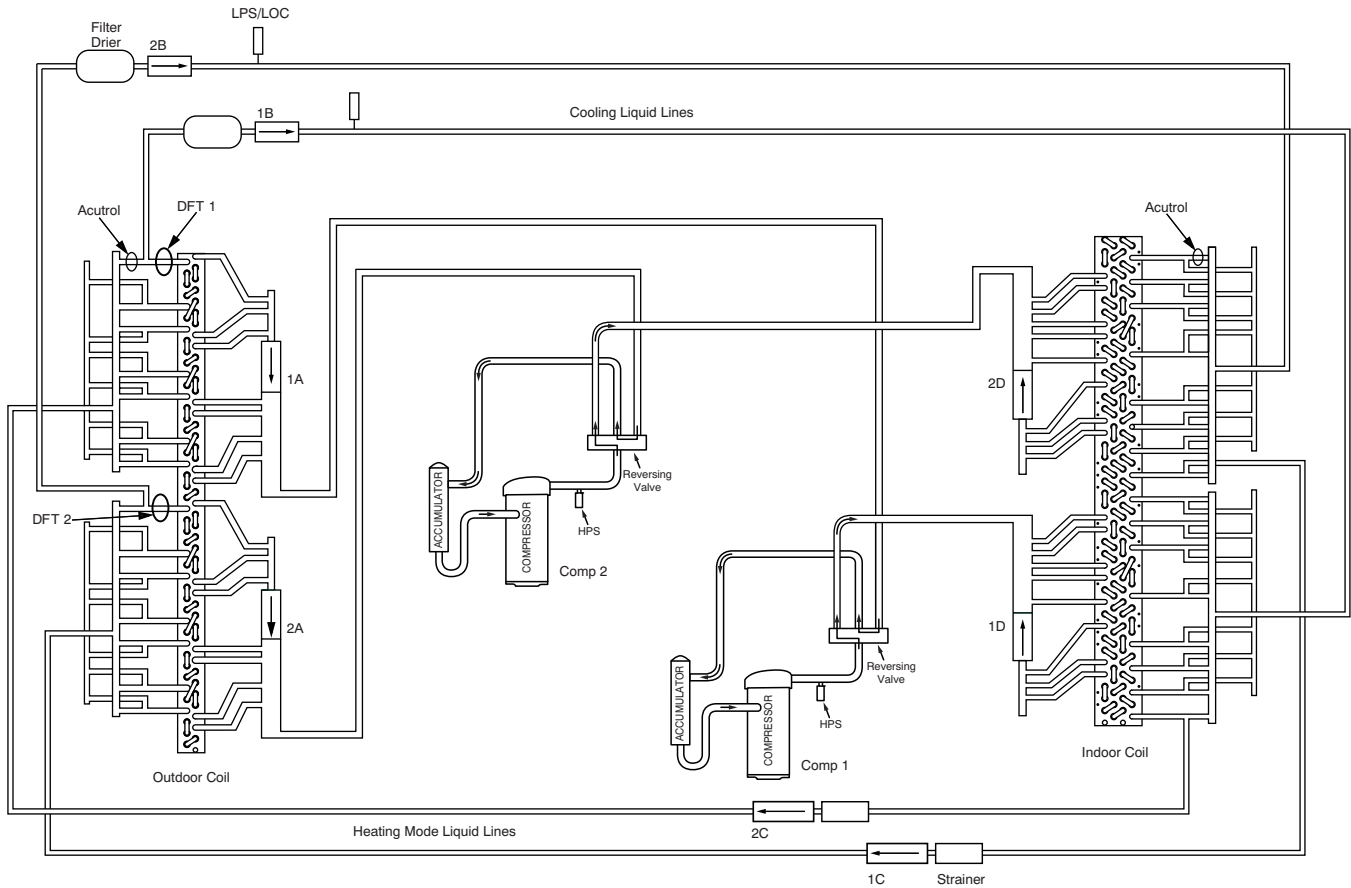
Component	Status/Position
Reversing Valve	Energized
Check Valve A	Closed
Check Valve B	Open
Check Valve C	Closed
Check Valve D	Open

**Table 2 – Heating Mode (each circuit)**

Component	Status/Position
Reversing Valve	De-energized
Check Valve A	Open
Check Valve B	Closed
Check Valve C	Open
Check Valve D	Closed

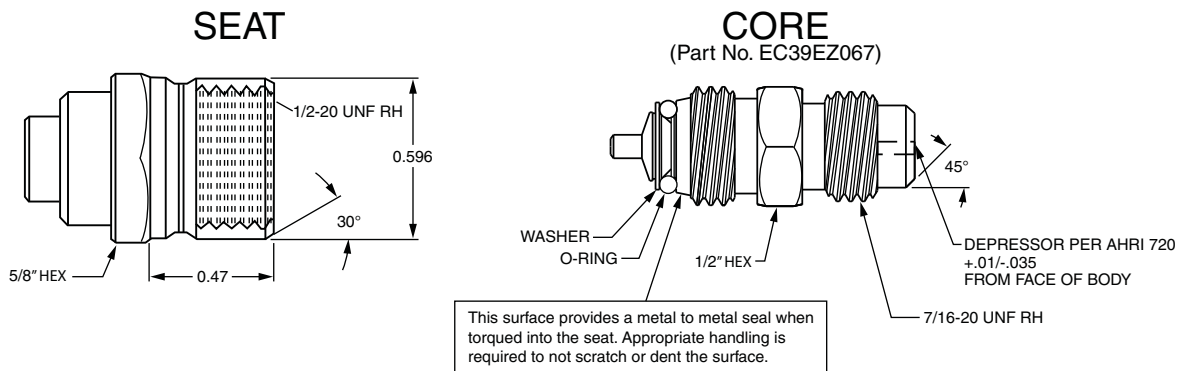
**Table 3 – Defrost Mode**

Component	Status/Position
Defrost Thermostat	Closed
Outdoor Fan(s)	Off
Reversing Valve	Energized
Check Valve A	Closed
Check Valve B	Open
Check Valve C	Closed
Check Valve D	Open



C160139

**Fig. 4 - Typical Unit Piping Schematic (with TXV valves on Indoor Coils)**



a548J-009

**Fig. 5 - CoreMax\* Access Port Assembly**

\*CoreMax is a registered trademark of FasTest Inc.

# 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 (on page 10).

**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 for removal and disposal of frost and ice that will form during the heating-defrost mode as well as allow installation of condensate trap per requirements. Refer to Step 9 — Install External Condensate Trap and Line – (on page 17) for required trap dimensions.

### Roof Mount —

Check building codes for weight distribution requirements. Unit operating weight is shown in Table 4.

**Table 4 – Operating Weights**

RHS***	UNITS LB (KG)	
	181/183	240/243
Base Unit	1775 (807)	2100 (955)
Economizer	246 (112)	246 (112)
Powered Outlet	35 (16)	35 (16)
Curb		
14-in./356 mm	240 (109)	255 (116)
24-in./610 mm	340 (154)	355 (161)

### 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 on page 17 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.

### Step 4 — Provide Unit Support

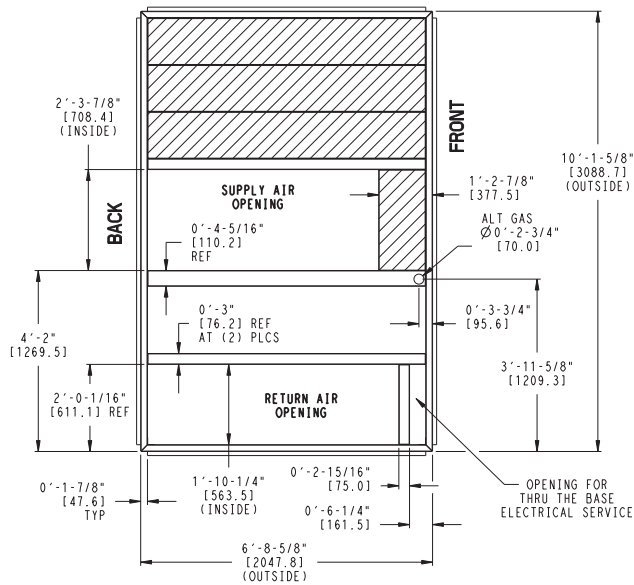
#### Roof Curb Mount —

Accessory roof curb details and dimensions are shown in Fig. 6 (15 ton units) and Fig. 7 (20 ton units). 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. 6 and Fig. 7. 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. 8 (on page 15). Refer to Accessory Roof Curb Installation Instructions for additional information as required.

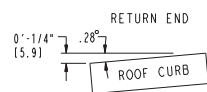
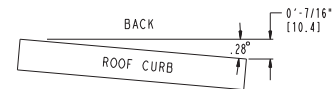
UNIT SIZE	"A"	ROOF CURB ACCESSORY
15 TON	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB045A00 CRRFCURB046A00



#### NOTES:

- 1 ROOF CURB ACCESSORY IS SHIPPED UNASSEMBLED.
- 2 DIMENSIONS IN ( ) ARE IN MILLIMETERS.
- 3 ROOF CURB GALVANIZED STEEL.
- 4 ATTACH DUCTWORK TO CURB (FLANGES ON DUCT REST ON CURB)
- 5 SERVICE CLEARANCE 4 ft ON EACH SIDE

➔ DIRECTION OF AIR FLOW



MAX CURB LEVELING TOLERANCES

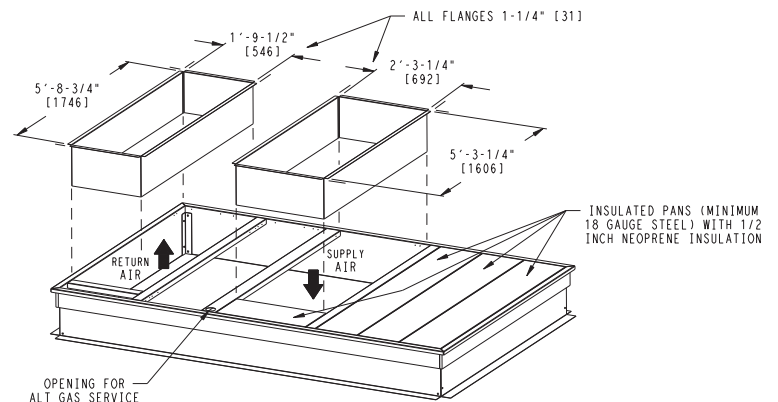
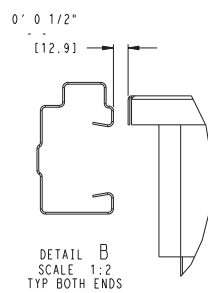
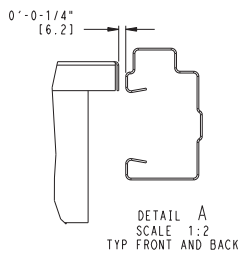
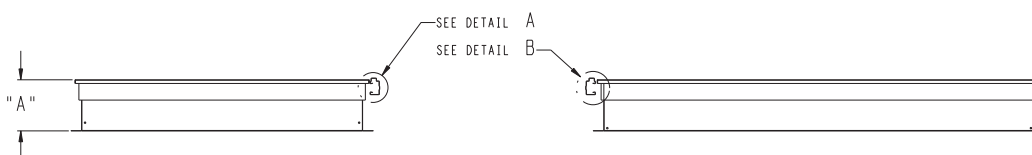
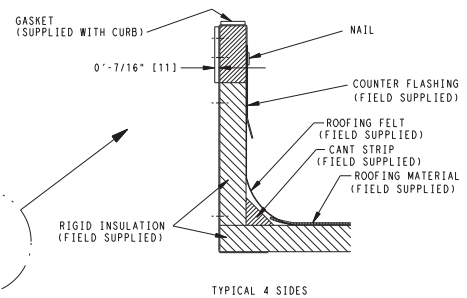
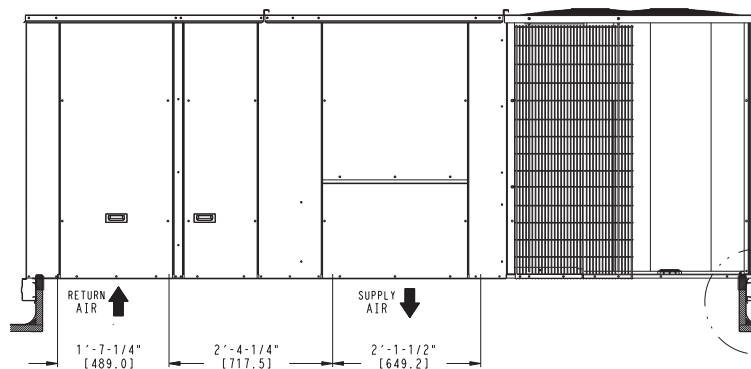
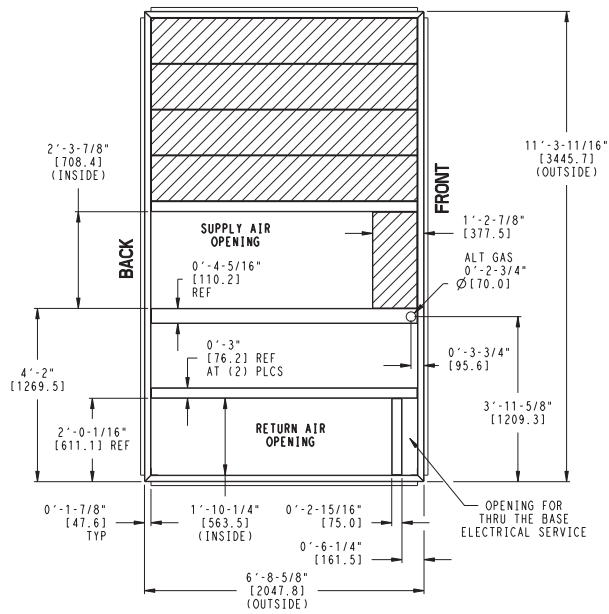


Fig. 6 - Roof Curb Details – 15 Ton Units

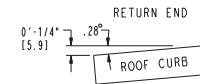
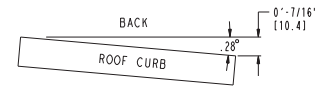
RHS-007

UNIT SIZE	"A"	ROOF CURB ACCESSORY
20 TON	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB047A00 CRRFCURB048A00



- NOTES:
- 1 ROOF CURB ACCESSORY IS SHIPPED UNASSEMBLED.
  - 2 DIMENSIONS IN ( ) ARE IN MILLIMETERS.
  - 3 ROOF CURB GALVANIZED STEEL.
  - 4 ATTACH DUCTWORK TO CURB (FLANGES ON DUCT REST ON CURB)
  - 5 SERVICE CLEARANCE 4 ft ON EACH SIDE

➡ DIRECTION OF AIR FLOW



MAX CURB LEVELING TOLERANCES

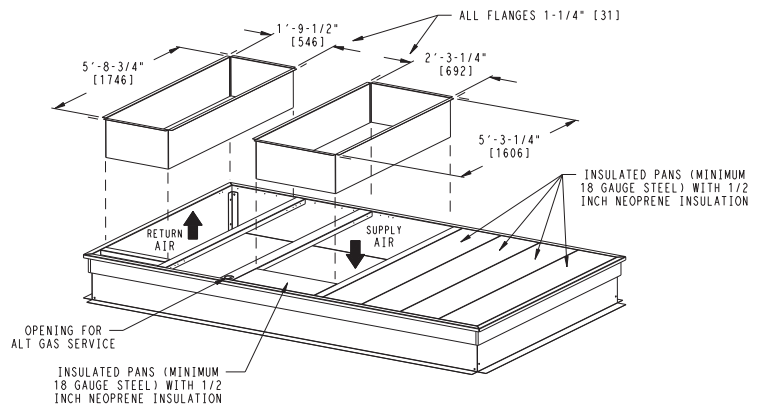
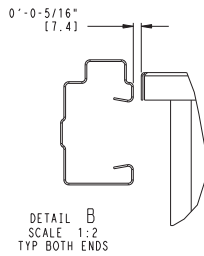
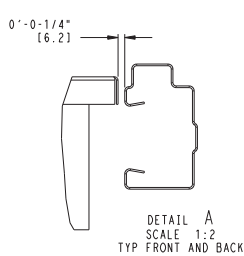
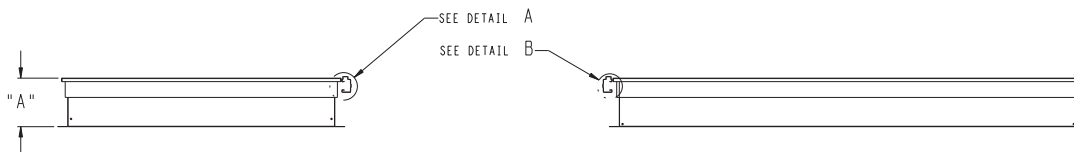
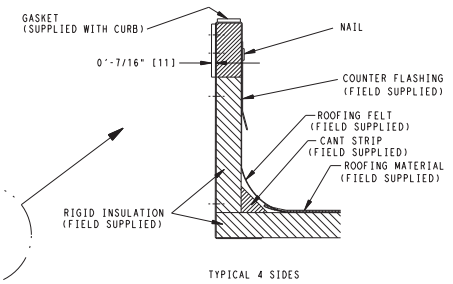
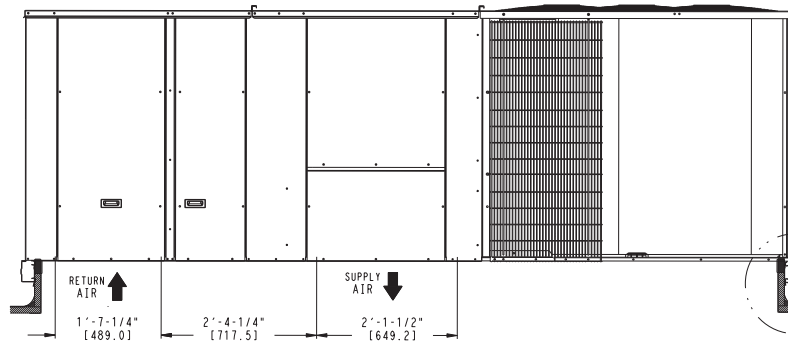
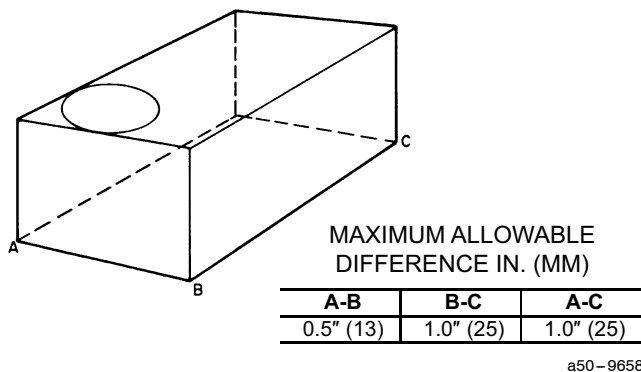


Fig. 7 - Roof Curb Details – 20 Ton Units

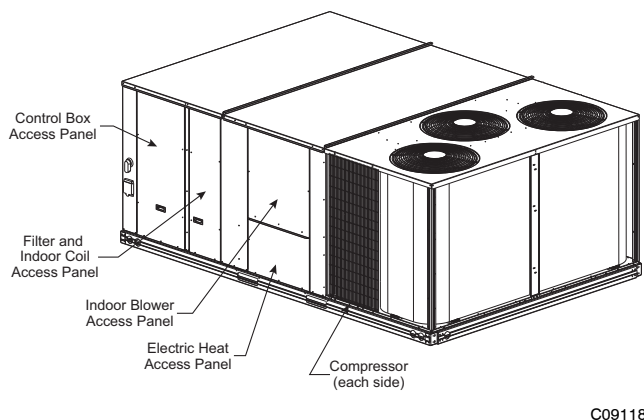
RHS-008



**Fig. 8 - 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. The accessory thru-the-base power package must be installed before the unit is set on the roof curb.*

If electric and control wiring is to be routed through the basepan remove knockouts in basepan located in control box area, see Fig. 9 for location. Attach the service connections to the basepan.



**Fig. 9 - Typical Access Panel Locations**

#### 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 4 equally spaced 4-in. x 4-in. (102 mm x 102 mm) pads on each side. Locate pads so that they support the rails. Make sure to avoid the fork openings.

#### Step 5 — Field Fabricate Ductwork

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.*

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 electric heaters, minimum clearance is not required around ductwork. One inch (25 mm) clearance to combustible materials must be maintained for the first 48 inches (1220 mm) of ductwork exiting the unit. This applies to horizontal and vertical applications.

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.

#### Step 6 — Rig and Place Unit

Keep unit upright and do not drop. Spreader bars are not required if top crating is left on unit. Rollers may be used to move unit across a roof. Level by using unit frame as a reference. See Table 4 (on page 12) and Fig. 10 for additional information.

Lifting holes are provided in base rails as shown in Fig. 10. Refer to rigging instructions on unit.

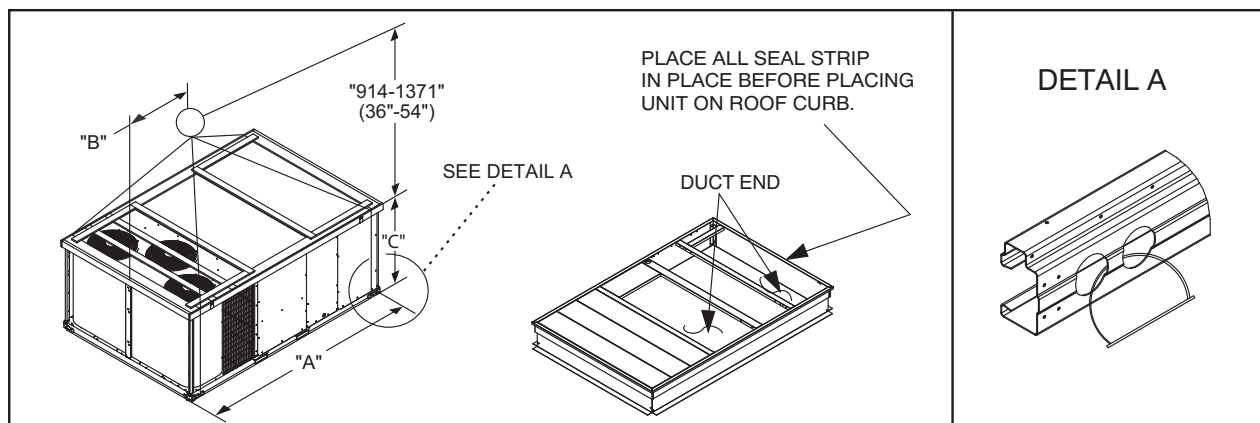
## ⚠ CAUTION

### 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.

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



C09107

UNIT	MAX WEIGHT		DIMENSIONS					
			A		B		C	
	LB	KG	IN.	MM	IN.	MM	IN.	MM
RHS181/183	2070	940	127.8	3249	58.7	1491	52.3	1328
RHS240/243	2358	1071	141.5	3595	58.7	1491	52.3	1328

**NOTES:**

1. Dimensions in ( ) are in millimeters.
2. 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. 10 - Rigging Details**

**Positioning on Curb —**

Position unit on roof curb so that the following clearances are maintained:  $\frac{1}{4}$  in. (6 mm) clearance between the roof curb and the base rail inside the right and left,  $\frac{1}{2}$  in. (12 mm) clearance between the roof curb and the base rail inside the front and back. This will result in the distance between the roof curb and the base rail inside on the condenser end of the unit being approximately equal to Detail A in Fig. 6 and 7.

Do not attempt to slide unit on curb after unit is set. Doing so will result in damage to the roof curb seal.

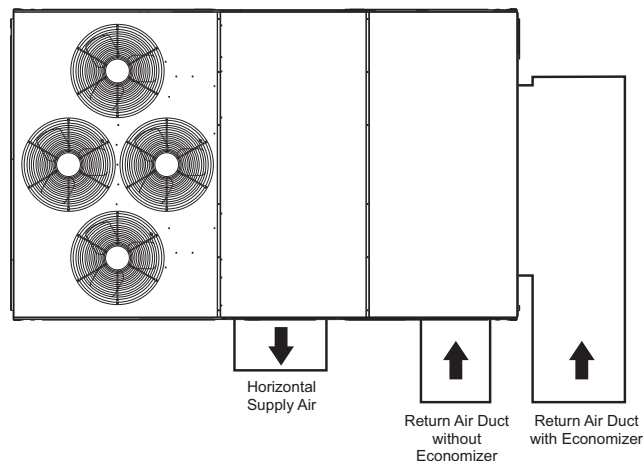
Although unit is weatherproof, guard against water from higher level runoff and overhangs.

After unit is in position, remove rigging skids and shipping materials.

**Step 7 — Horizontal Duct Connection**

Refer to Fig. 1 and 2 for locations and sizes of the horizontal duct connections. Note that there are two different return air duct connection locations – one for unit without an economizer (on back side of unit) and a different one for unit equipped with an economizer (on left end, under the economizer hood). The supply air duct connection is on the back side. See Fig. 11 for top view depicting typical horizontal duct arrangements.

Field-supplied ( $\frac{3}{4}$ -inch) flanges should be attached to horizontal duct openings (see Fig. 11) 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.



C10740

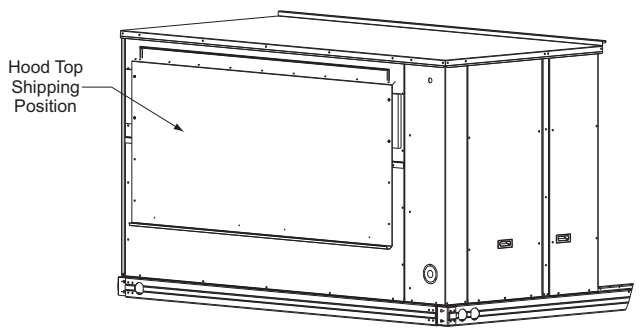
UNIT		Supply	Return without Economizer	Return with Economizer
	Location	Back	Back	Left end
<b>RHS 181/183</b>	Height – in. (mm)	15 $\frac{7}{8}$ (402)	41 $\frac{3}{8}$ (1051)	18 $\frac{3}{8}$ (467)
	Width – in. (mm)	29 $\frac{3}{4}$ (756)	23 $\frac{3}{8}$ (593)	61 $\frac{5}{8}$ (1564)
<b>RHS 240/243</b>	Height – in. (mm)	15 $\frac{7}{8}$ (402)	49 $\frac{3}{8}$ (1253)	18 $\frac{3}{8}$ (467)
	Width – in. (mm)	29 $\frac{3}{4}$ (756)	23 $\frac{3}{8}$ (593)	61 $\frac{5}{8}$ (1564)

**Fig. 11 - Horizontal Duct Opening Dimensions**

**Step 8 — Install Outside Air Hood — Factory Option**

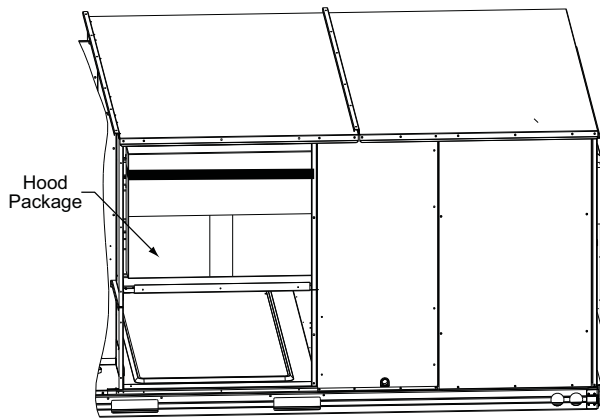
The outside air hood for factory-option economizer and two-position damper is shipped in knock-down form and requires field assembly. The panel for the hood top is shipped on the end of the unit (see Fig. 12). The remaining parts for the hood assembly (including side panels, filters and tracks) are shipped in a carton that is secured to the rear of the blower assembly. Access the carton location through rear panel (see Fig. 13).





C09134

**Fig. 12 - Hood Top – Shipping Position**



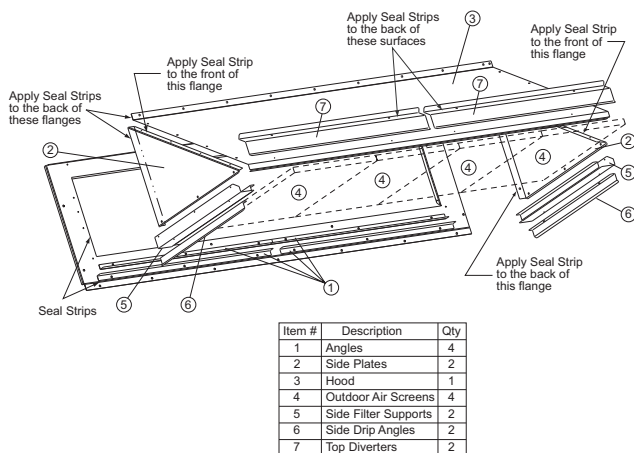
C13785

**Fig. 13 - Hood Package – Shipping Location**

**To remove the hood parts package:**

1. Remove the back blower access panel.
2. Locate and cut the strap, being careful to not damage any wiring.
3. Carefully lift the hood package carton through the back blower access opening.

See Fig. 14 for identification of the various parts of the hood assembly.



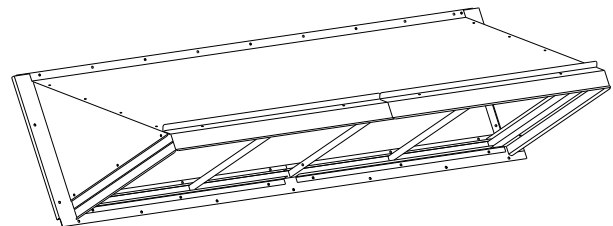
C09079

**Fig. 14 - Hood Part Identification and Seal Strip Application Areas**

**To assemble the outside air hood:**

1. Remove hood top panel from shipping position on unit end.

2. Install four angles to the upper end panel using the screws provided
3. Apply seal strip to mating flanges on the side plates of the hood (see Fig. 14).
4. Secure side plates to panel using the screws provided.
5. Apply seal strip to mating flange of the hood (see Fig. 14).
6. Secure top flange using screws provided in kit.
7. Install outdoor air screens by sliding them into the channel formed by the four angles installed in Step 2. Make sure that the screens extend across the entire length of the hood.
8. Install side filter supports using the screws provided
9. Install side drip angles using the screws provided.
10. Run a continuous length of seal strip across the hood covering the engagement holes in the lower hood.
11. Install top diverter using the screws provided.
12. On units with barometric relief, remove screws at bottom of relief damper. **Do not discard damper door.**

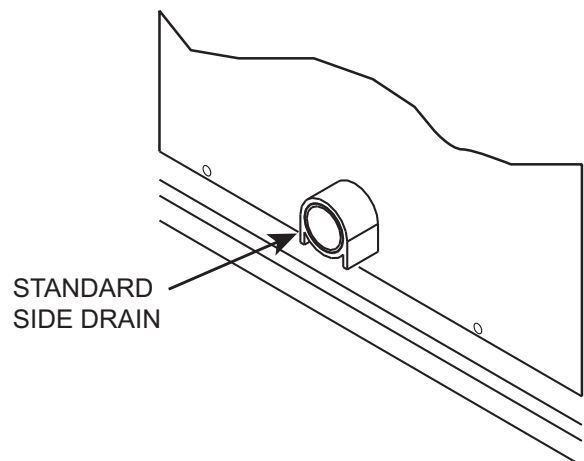


C09090

**Fig. 15 - Hood Assembly – Completed**

**Step 9 — Install External Condensate Trap and Line**

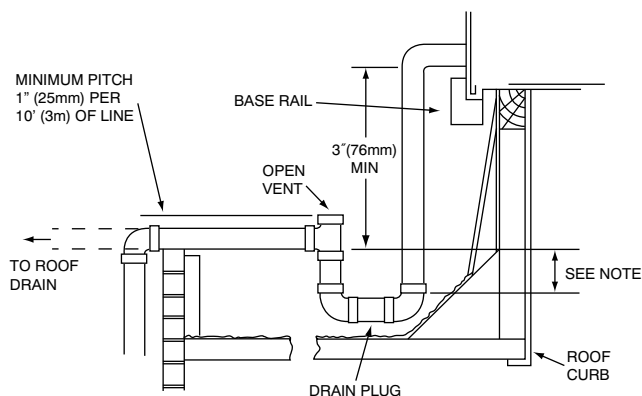
The unit has one  $\frac{3}{4}$ -in. condensate drain connection on the end of the condensate pan (see Fig. 16). See Fig. 1 (or Fig. 2), item “E”, in the view labeled “BACK” for the location of the condensate drain connection.



C09056

**Fig. 16 - Condensate Drain Pan Connection**

The piping for the condensate drain and external trap can be completed after the unit is in place. Hand tighten fittings to the drain pan fitting. Provide adequate support for the drain line. Failure to do so can result in damage to the drain pan. See Fig. 17.



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

a50-9660

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

*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 ( $3/4$ -in.).*

### Step 10 — Make Electrical Connections

## ⚠ WARNING

### ELECTRICAL SHOCK HAZARD

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

*Do not use gas piping as an electrical ground.* 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:** Check all factory and field electrical connections for tightness. Field-supplied wiring shall conform with the limitations of 63°F (33°C) rise.

### Field Power Supply —

If equipped with optional Powered Convenience Outlet: The power source leads to the convenience outlet's transformer primary are not factory connected. Installer must connect these leads according to required operation of the convenience outlet. If an always-energized convenience outlet operation is desired, connect the source leads to the line side of the unit-mounted disconnect. (Check with local codes to ensure this method

is acceptable in your area.) If a de-energize via unit disconnect switch operation of the convenience outlet is desired, connect the source leads to the load side of the unit disconnect. On a unit without a unit-mounted disconnect, connect the source leads to the terminal block with unit field power leads.

Field power wires are connected to the unit at line-side pressure lugs on the terminal block (see wiring diagram label for control box component arrangement) or at factory-installed option non-fused disconnect switch. Use copper conductors only.

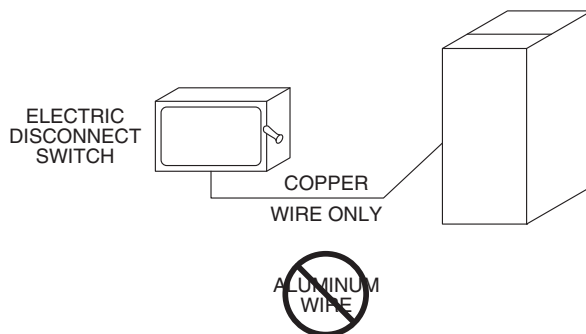
**NOTE:** Make field power connections directly to line connection pressure lugs only.

## ⚠ WARNING

### FIRE HAZARD

Failure to follow this warning could result in intermittent operation or performance satisfaction.

Do not connect aluminum wire between disconnect switch and furnace. Use only copper wire. (See Fig. 18.)



A93033

**Fig. 18 - Disconnect Switch and Unit**

### Units Without Factory-Installed Non-Fused Disconnect —

When installing units, provide a disconnect switch per NEC (National Electrical Code) of adequate size. 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 the main control box. The manual switch handle and shaft are shipped in the control box and must be mounted on the corner post adjacent to the control box (see Fig. 21). Note that the tape covering the hole for the shaft in the corner post must be removed prior to handle and shaft installation.

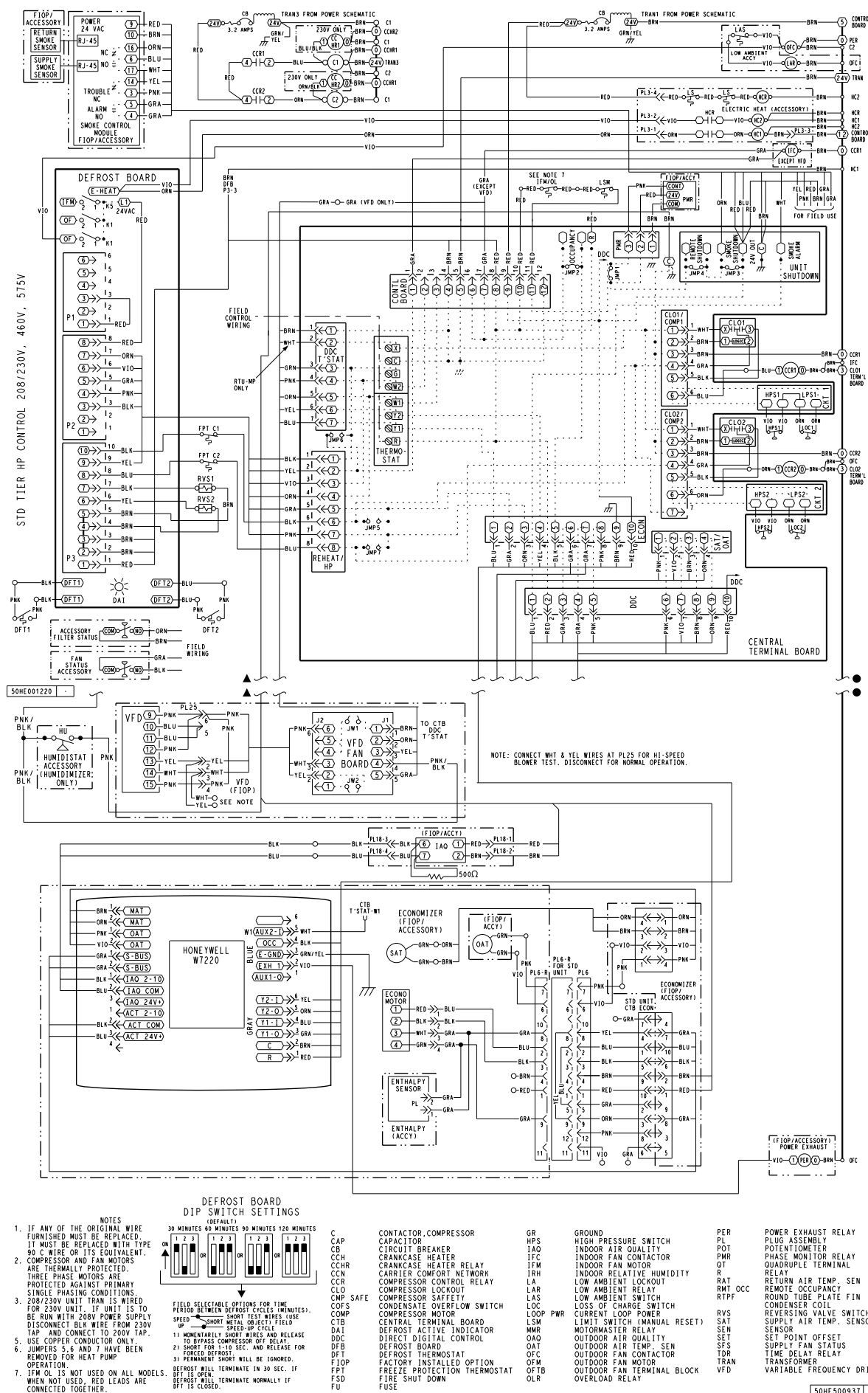


Fig. 19 - RHS181-243 Control Wiring Diagram with VFD Option

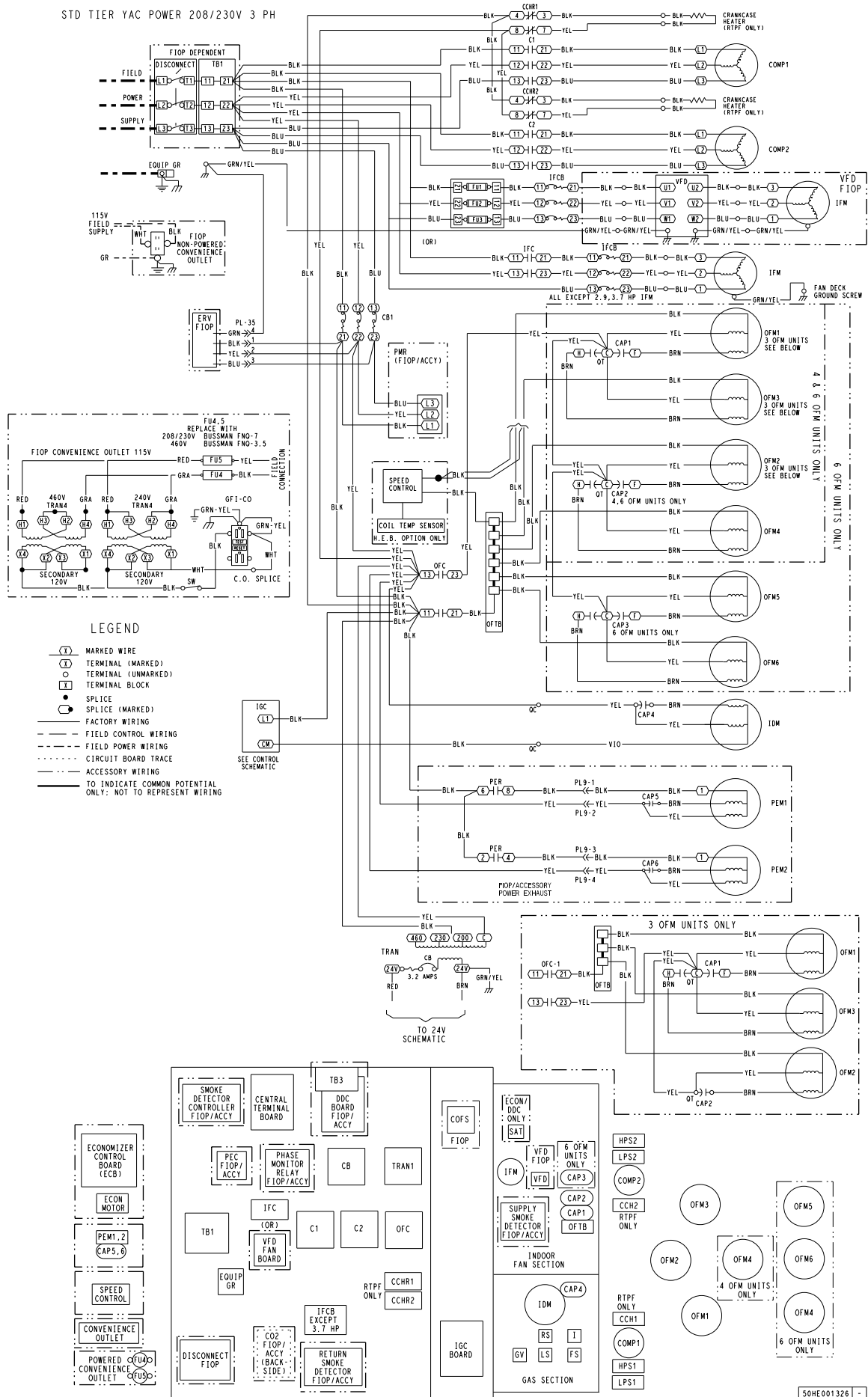
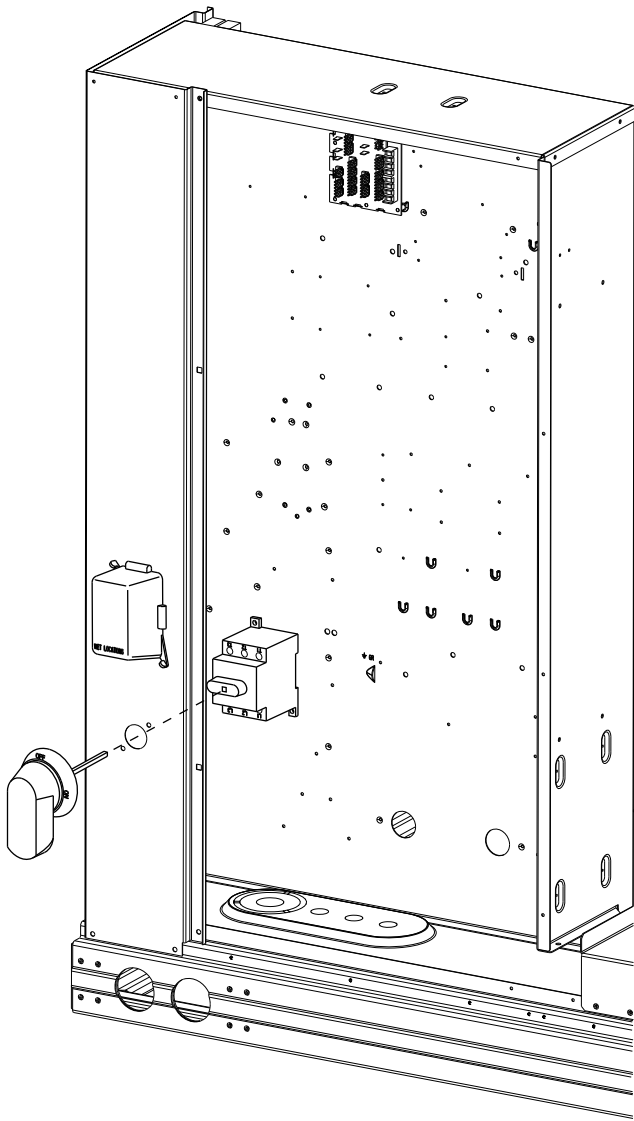


Fig. 20 - Typical RHS181-243 Power Wiring Diagram (208/230V 3 Phase 60Hz unit shown)

### To field install the NFD shaft and handle:

1. Open the control box panel.
2. Make sure the NFD shipped from the factory is at OFF position (the arrow on the black handle knob or on the silver metal collar is at OFF).
3. Insert the shaft with the cross pin on the top of the shaft in the horizontal position.
4. Measure the tip of the shaft to the outside surface of the corner post to be 0.88 in.
5. Tighten the locking screw to secure the shaft to the NFD.
6. Turn the handle to OFF position with red arrow pointing at OFF.
7. Install the handle on to the corner post vertically with the red arrow pointing up.
8. Secure the handle to the corner post with (2) screws and lock washers supplied.



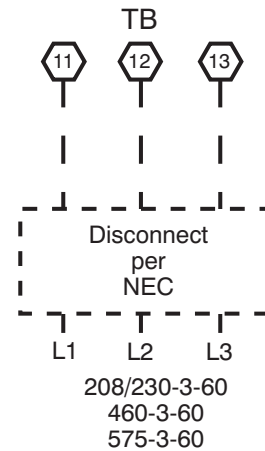
**Fig. 21 - Handle and Shaft Assembly for NFD**

### All Units -

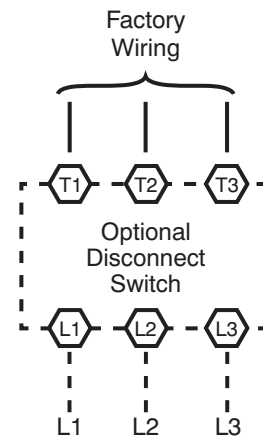
All field wiring must comply with NEC and all local code requirements.

Size wire based on MCA (Minimum Circuit Amps) on the unit informative plate. See Fig. 22 for power wiring connections to the unit power terminal block and equipment ground.

### Units Without Disconnect Option



### Units With Disconnect Option



C09057

**Fig. 22 - 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.

## ⚠ 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 warranty.

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 formula below to determine the percent of voltage imbalance.

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

Example: Supply voltage is 230-3-60



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

$$\text{Average Voltage} = \frac{(224 + 231 + 226)}{3} = \frac{681}{3} = 227$$

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.

$$\% \text{ Voltage Imbalance} = 100 \times \frac{4}{227} = 1.76\%$$

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.

### 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. Tag-out this switch, if necessary.

Two types of convenience outlets are offered as factory-installed options on RHS units: 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 end panel of the unit. See Fig. 23.

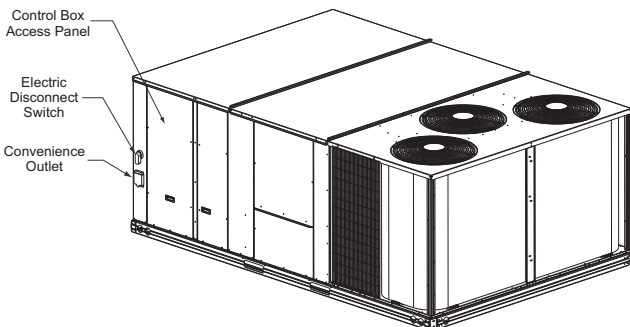


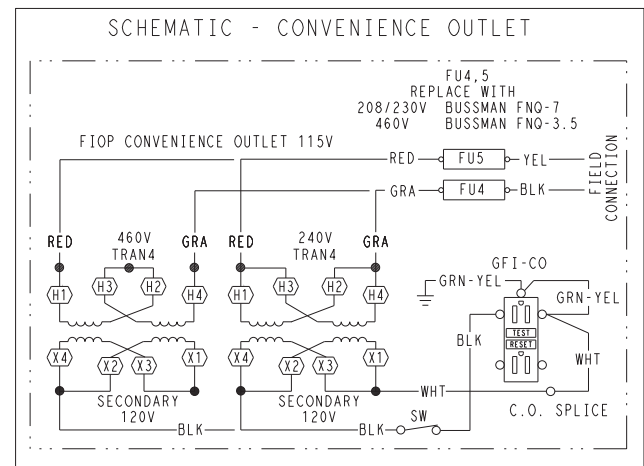
Fig. 23 - Convenience Outlet Location

A 20 amp non-powered convenience outlet is available as a field-installed accessory.

**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, 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. 23.

The primary leads to the convenience outlet transformer are not factory-connected. If local codes permit, the transformer primary leads can be connected at the line-side terminals on the unit-mounted non-fused disconnect switch; this will provide service power to the unit when the unit disconnect switch is open. See Fig. 24.



C09250

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 Splice BLU + YEL L2: GRA	H1 H2 + H3 H4
575	600	L1: RED L2: GRA	H1 H2

Fig. 24 - Powered Convenience Outlet Wiring

**Duty cycle:** the unit-powered convenience outlet has a duty cycle limitation. The transformer is intended to provide power on an intermittent basis for service tools, lamps, etc; it is not intended to provide 15-amps loading for continuous duty loads (such as electric heaters for overnight use). Observe a 50% limit on circuit loading above 8-amps (i.e., limit loads exceeding 8-amps to 30 minutes of operation every hour).



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.

Fuse on power type: The factory fuse is a Bussman FNQ-7 dual element time delay fuse.

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.

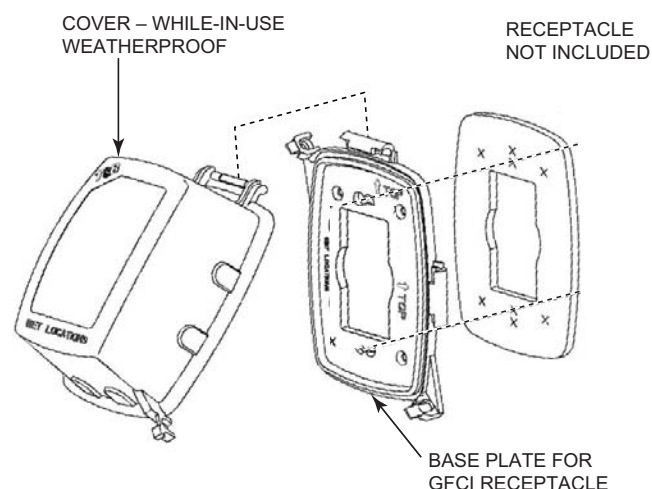
The weatherproof cover kit is shipped in the unit's control box. The kit includes the hinged cover, a backing plate and gasket.

**DISCONNECT ALL POWER TO UNIT AND CONVENIENCE OUTLET.**

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

Loosen the two screws at the GFCI duplex outlet, until approximately  $\frac{1}{2}$ -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. 25. 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. 25 - Weatherproof Cover Installation**

## Factory-Option Thru-Base Connections —

All units are equipped with the ability to bring utilities through the base.

The electrical entrance is located in the control box area and can be accessed through the control box access panel. An embossed area is provided with three knock outs. High voltage is brought through the multi knock out by removing the appropriate size for the size of the fitting required. A  $\frac{7}{8}$ -in. knock out is provided for low voltage. An additional  $\frac{7}{8}$ -in. knock out is provided for a 115 volt line which is used when the unit is equipped with the non-powered convenience outlet option.

All required fittings are field supplied. Install fittings when access to both top and bottom of the base pan is available.

## Units Without Thru-Base Connections —

1. Install conduit, liquid tight, between disconnect and control box.
2. Pull correctly rated high voltage wires through the conduit.
3. Install power lines to terminal connections as shown in Fig. 22.

## Field Control Wiring —

The RHS unit requires a field-supplied commercial grade programmable (occupied and unoccupied setpoints) external temperature control device.

## Thermostat —

Select a commercial grade two stage accessory thermostat. The RHS models do not require a thermostat with an O function to control the reversing valve operation. When electric heat is installed in the RHS 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).

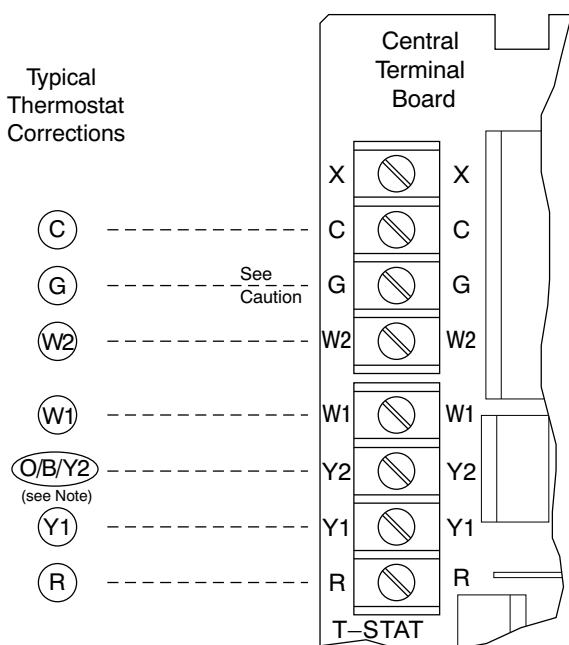
Install the accessory thermostat according to installation instructions included with the accessory.

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.

### Typical Thermostat Corrections



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

--- Field Wiring

## CAUTION

### UNIT DAMAGE HAZARD

Failure to follow this caution may cause a short circuit.

Carefully check the connection of control conductor for indoor fan control at terminal G. Connecting the indoor fan lead to terminal C will cause a short circuit condition which can cause component damage inside the unit or at thermostat.

C14067

Fig. 26 - Typical Low-Voltage Control Connections

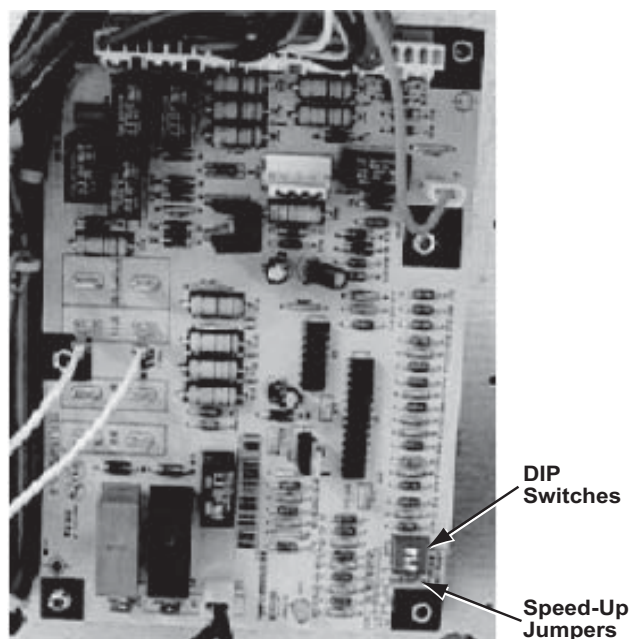
### Central Terminal Board

The Central Terminal Board (CTB) is a pass through connection point. The CTB provides the capability to add factory-installed options and field-installed accessories to the units by cutting jumper wires without having to change or reroute wires through the structure of the unit. The CTB does not provide any microprocessor control; it is simply a basic multifunction wiring terminal configuration.

### Commercial Defrost Control

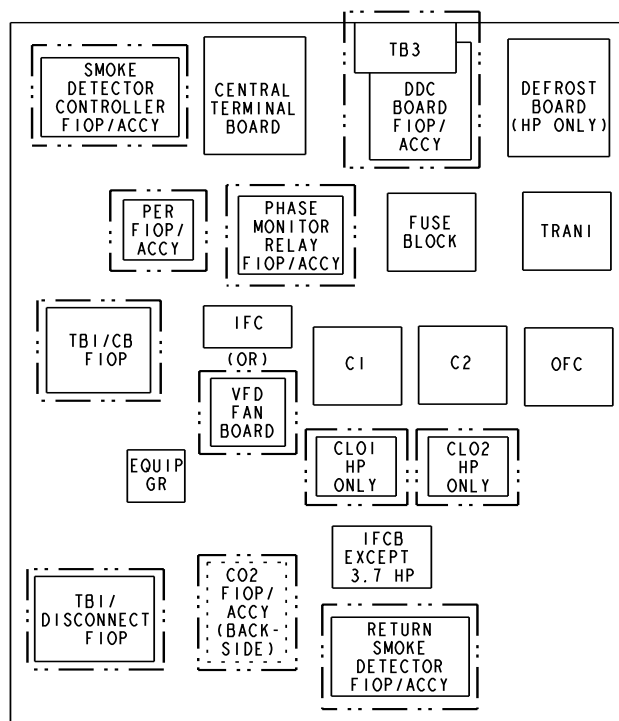
The Commercial Defrost Control Board (DFB) coordinates thermostat demands for supply fan control, 1 or 2 stage cooling, 2 stage heating, emergency heating and defrost control with unit operating sequences. The DFB also provides an indoor fan off delay feature (user selectable). See Fig. 27 for board arrangement.

The DFB is located in the RHS unit's main control box (see Fig. 28). All connections are factory-made through harnesses to the unit's CTB, to IFC (belt-drive motor) or to ECM (direct-drive motor), reversing valve solenoids and to defrost thermostats. Refer to Table 5 (on page 25) for details of DFB Inputs and Outputs.



C09275

Fig. 27 - Defrost Control Board Arrangement



C14049

Fig. 28 - Defrost Control Board Location

**Reversing valve control** — The DFB has two outputs for unit reversing valve control. Operation of the reversing valves is based on internal logic; this application does not use an "O" or "B" signal to determine reversing valve position. Reversing valves are energized during the cooling stages and the defrost cycle and de-energized during heating cycles. Once energized at the start of a cooling stage, the reversing valve will remain energized until the next heating cycle demand is received. Once de-energized at the start of a Heating cycle, the reversing valves will remain de-energized until the next cooling stage is initiated.



**Table 5 – RHS Defrost Board I/O and Jumper Configurations**

**Inputs**

Point Name	Type of I/O	Connection Pin Number	Unit Connection	Note
G Fan	DI, 24Vac	P2-3	CTB-G	
Y1 Cool 1	DI, 24Vac	P2-5	CTB-Y1	
Y2 Cool 2	DI, 24Vac	P2-4	CTB-Y2	
W1 Heat 1	DI, 24Vac	P2-7	CTB-W1	
W2 Heat 2	DI, 24Vac	P2-6	CTB-W2	
R Power	24Vac	P3-1	CONTL BRD-8	
C Common	24Vac	P3-2	CONTL BRD-4	
DFT1	DI, 24Vac	DFT-1 to DFT-1	—	
DFT 2	DI, 24Vac	DFT-2 to DFT-2	—	

**Outputs**

Point Name	Type of I/O	Connection Pin Number	Unit Connection	Note
IFO Fan On	DO, 24Vac	P3-9	REHEAT/HP-2	
OF OD Fan On	DO, 24Vac	OF	OFR	
RVS1	DO, 24Vac	P3-7 to P3-5	—	Energize in COOL
RVS2	DO, 24Vac	P3-6 to P3-4	—	Energize in COOL
COMP 1	DO, 24Vac	P3-10	FPT1 – REHEAT/HP-6	
COMP 2	DO, 24Vac	P3-8	FPT2 – REHEAT/HP-8	
HEAT 2	DO, 24Vac	E-HEAT	TB4-1	
COM	24Vac	P3-3	TB4-3	

**Configuration**

Point Name	Type of I/O	Connection Pin Number	Unit Connection	Note
Select Jumper	24Vac	P1-1	—	
2 Compressor	24Vac	P1-3	—	2-stage units only

**Speed-Up Configuration**

Point Name	Type of I/O	Connection Pin Number	Unit Connection	Note
Speed-Up Jumper	—	JMP17	—	
Speed-Up Jumper	—	JMP18	—	

Jumper for 1–3 seconds: Factory Test — The defrost interval timing is reduced by a factor of 0.1 seconds/minute based on the positions of DIP switches SW1 and SW2 (i.e. 90 minutes will be reduced to 9 seconds).

Jumper for 5–20 seconds: Forced Defrost — Defrost runs for 30 seconds if DFT2 is open.

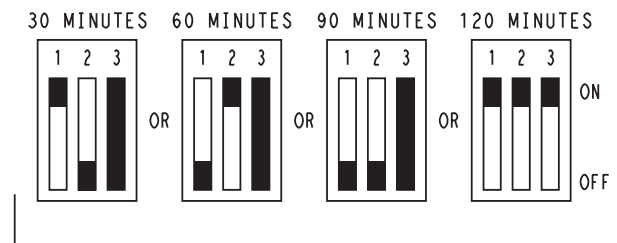
**Compressor control** — The DFB receives inputs indicating Stage 1 Cooling, Stage 2 Cooling and Stage 1 Heating from the space thermostat or unit control system (RTU Open controller); it generates commands to start compressors with or without reversing valve operation to produce Stage 1 Cooling (one compressor runs), Stage 2 Cooling (both compressors run) or Stage 1 Heating (both compressors run).

**Auxiliary (Electric) Heat control** — The RHS unit can be equipped with one or two auxiliary electric heaters, to provide a second stage of heating. The DFB will energize this Heating System for a Stage 2 Heating Command (heaters operate concurrently with compressor(s) in the Stage 1 Heating cycle), for an Emergency Heating sequence (compressors are off and only the electric heaters are energized) and also during the Defrost cycle (to eliminate a “cold blow” condition in the space).

**Defrost** — The defrost control mode is a time/temperature sequence. There are two time components: The continuous run period and the test/defrost cycle period. The temperature component is provided by Defrost Thermostat 1 and 2 (DFT1 and DFT2) mounted on the outdoor coil.

The continuous run period is a fixed time period between the end of the last defrost cycle (or start of the current Heating cycle) during which no defrost will be permitted. This period can be set at 30, 60, 90 or 120 minutes by changing the positions of DIP switches SW1 and SW2 (see Fig. 29 and Table 6). The default run period is 60 minutes for RHS181-243 units.

**DIP SWITCH SETTINGS - DEFROST BD**



FIELD SELECTABLE OPTIONS FOR TIME PERIOD BETWEEN DEFROST CYCLES (MINUTES).

a50-9688

**Fig. 29 - DIP Switch Settings — Defrost Board**

**Table 6 – DIP Switch Position**

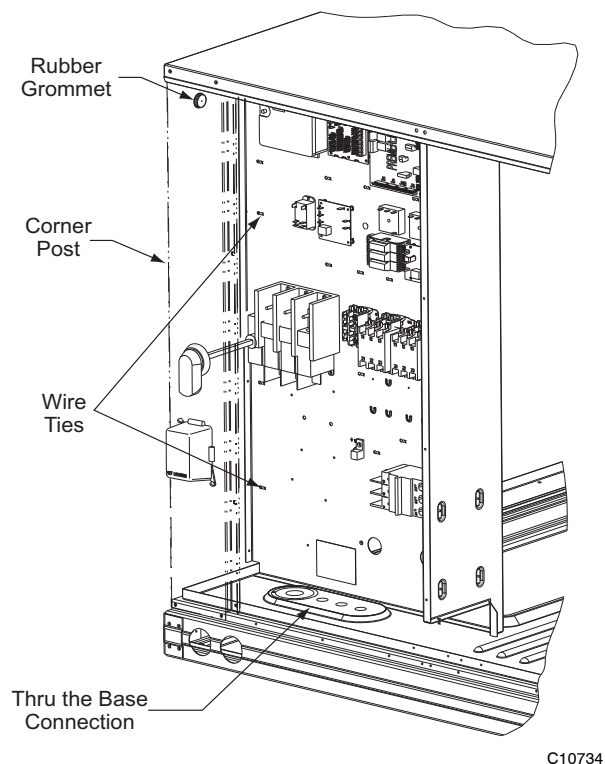
Switch No.		1	2	1	2	1	2	1	2	1	2	3	
1	■			1	■	1		1	■	■	1	■	On
0		■		0	■	0	■	0	■		0		Off
		30 minutes		60 minutes (Factory default)		90 minutes		120 minutes		Fan Delay			

Shorting the jumpers for a period of 5 to 20 seconds bypasses the remaining continuous run period and places the unit in a Forced Defrost mode. If the controlling DFT is closed when this mode is initiated, the unit will complete a normal defrost period that will terminate when the controlling DFT opens or the 10 minute defrost cycle limit is reached. If the controlling DFT is open when this mode is initiated, the Defrost cycle will run for 30 seconds. Both modes end at the end of the Defrost cycle.

#### Unit Without Thru-Base Connection Kit —

Correctly rated low voltage wire can be routed through the rubber grommet located on the corner post adjacent to the control box access panel. Route wire through the grommet and then route the wire behind the corner post utilizing the factory provided wire ties secured to the control box. This will ensure separation of the field low voltage wire and the high voltage circuit. Route the low voltage wire to the central terminal board. See Fig. 30.

**NOTE:** If utilizing the through the base connections, route the low voltage wire through the wire ties to the central terminal board.



**Fig. 30 - Field Control Wiring Raceway**

#### 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.

#### Transformer Connection for 208-v Power Supply —

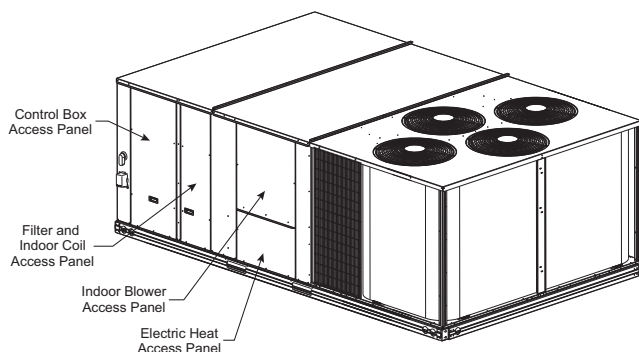
All units except 208/230-v units are factory wired for the voltage shown on the nameplate. *If the 208/230-v unit is to be connected to a 208-v power supply, the control transformer must be rewired by moving the black wire with the 1/4-in. female spade connector from the 230-v connection and moving it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

#### Electric Heaters

RHS units may be equipped with field-installed accessory electric heaters. The heaters are modular in design.

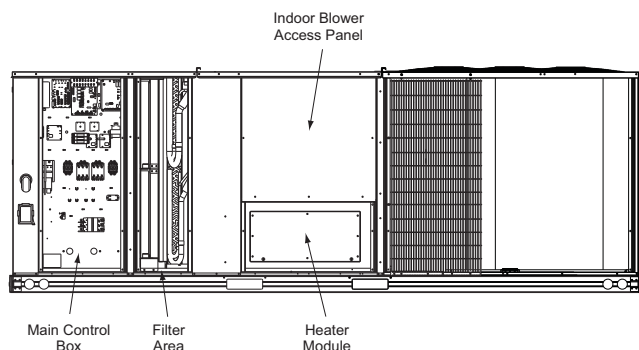
Heater modules are installed in the compartment below the indoor blower access panel. Access is through the electric heat access panel. Heater modules slide into the compartment on tracks along the bottom of the heater opening. See Fig. 31, 32 and 33. Refer to the Electric Heater Kit Installation Instructions for complete details.

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



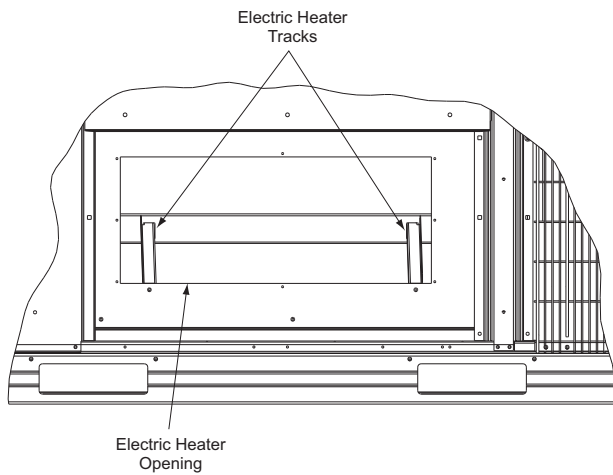
C10631

**Fig. 31 - Typical Access Panel Location**



C10632

**Fig. 32 - Typical Component Location**

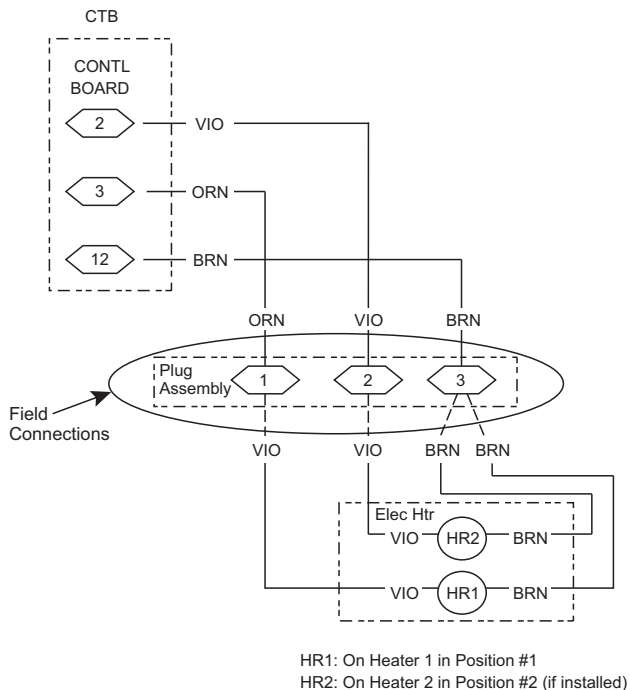


**Fig. 33 - Electric Heater Compartment  
(Cover Removed)**

C09142

#### Low-Voltage Control Connections —

Locate the plug assembly in the electric heater section of the main unit. Connect the plug with the mating low voltage plug located on the heater.



C09149

**Fig. 34 - Accessory Electric Heater Control  
Connections**

### **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. 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.



C14154

**Fig. 35 - W7220 Economizer Module**

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.

#### System Components —

The EconoMi\$er 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:** This is the core of the EconoMi\$er X system, 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 S-Bus enthalpy control 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. See page 29 for details.

**CO<sub>2</sub> Sensor (optional):** A CO<sub>2</sub> 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  $\pm$  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 (see page 29 for wiring details). 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)

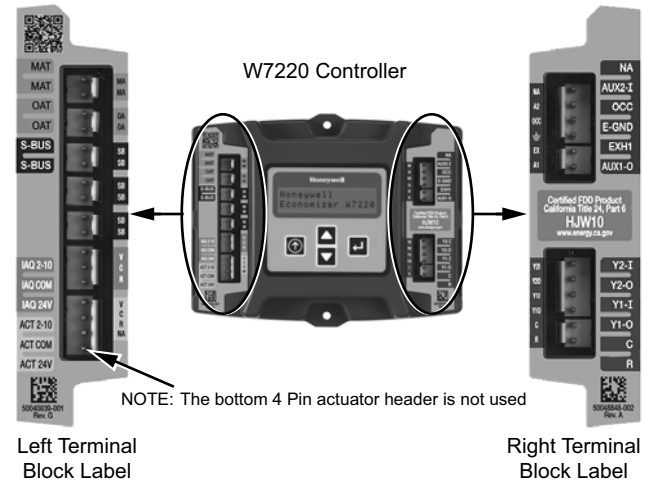
**Shipping Temperature:** -40 to 150°F (-40 to 65°C)

**Relative Humidity:** 5% to 95% RH non-condensing

## Economizer Module Wiring Details —

Use Fig. 36 and Tables 7 and 8 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.



**Fig. 36 - W7220 Economizer Module Terminal Connection Labels**

**Table 7 – Economizer Module - Left Hand Terminal Blocks**

Label	Type	Description
<b>Top Left Terminal Block</b>		
MAT MAT	20k NTC and COM	Supply 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
	n/a	The bottom pin is not used.

\* Sylk is a trademark of Honeywell International Inc.

**Table 8 – Economizer Module -  
Right Hand Terminal Blocks**

Label	Type	Description
<b>Top Right Terminal Block</b>		
	n/a	The first pin is not used
AUX2 I	24 Vac IN	Shut Down (SD) or Heat (W) Conventional only or Heat Pump Changeover (O/B) in Heat Pump mode.
OCC	24 Vac IN	Occupied / Unoccupied Input
E–GND	E–GND	Earth Ground – System Required
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 Block</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 1 Input from space thermostat
Y1–O	24 Vac OUT	Y1 out – Cooling Stage 1 Output to stage 1 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. 37 and Table 9 to locate the wiring terminals for each S-Bus sensor.

Use Fig. 37 and Table 10 to set the DIP switches for the desired use of the sensor.

**Table 9 – Enthalpy Control Sensor Wiring Terminations\***

Terminal		Type	Description
Nbr	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)

\* Terminals are polarity insensitive.

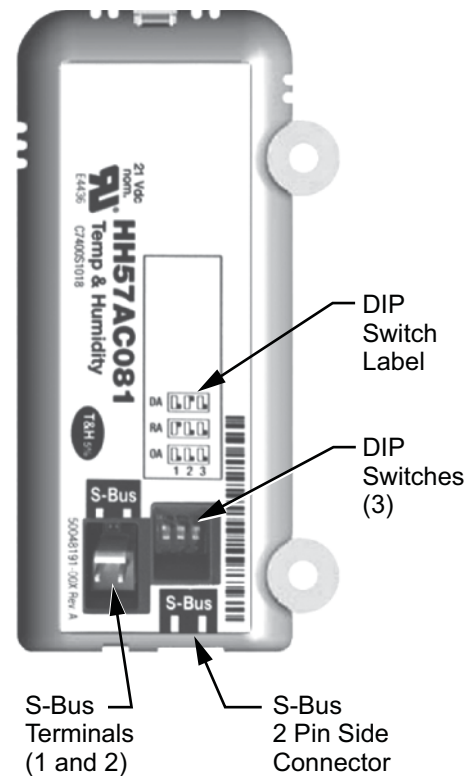
**Table 10 – Enthalpy Control Sensor DIP Switch Settings**

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

\* DA = Discharge Air

† RA = Return Air

\*\* OA = Outside Air



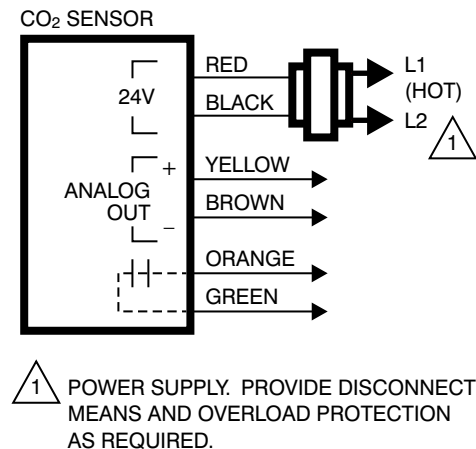
**Fig. 37 - S-Bus Sensor DIP Switches**

C14178

**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. 38 for CO<sub>2</sub> sensor wiring.



**Fig. 38 - Wiring for CO<sub>2</sub> Sensor**

C14158

## 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.

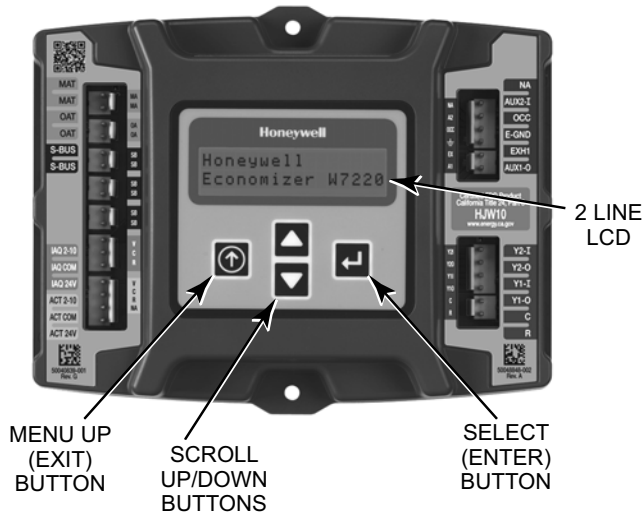


Fig. 39 - W7220 Controller

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### Keypad —

The four navigation buttons (see Fig. 39) 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.
- 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 11 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 11 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. You 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 item displays in turn and cycles to the next item after 5 seconds.

**Table 11 – Menu Structure \***

Menu	Parameter	Parameter Default Value	Parameter Range and Increment †	EXPANDED PARAMETER NAME Notes
STATUS	ECON AVAIL	NO	YES/NO	ECONOMIZING AVAILABLE YES = economizing available; the system can use outside air for free cooling when required
	ECONOMIZING	NO	YES/NO	ECONOMIZING ACTIVE YES = Outside air being used for first stage cooling. NO = Economizing not active
	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 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 Cooling Stage 2. 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 (or — — °C)	–40 to 150 °F (–18 to 60 °C)	SUPPLY AIR TEMPERATURE, Cooling Mode Displays value of measured mixed/cooled air from SAT sensor in fan section. Displays — — if not connected, short or out-of-range. See Menu Note 2
	DA TEMP	— — °F (or — — °C)	–40 to 150 °F (–18 to 60 °C)	DISCHARGE AIR TEMPERATURE, after Heating section (Accessory sensor required) 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 (or — — °C)	–40 to 140 °F (–40 to 60 °C)	OUTSIDE AIR TEMPERATURE Displays measured value of outdoor air temperature. Displays — — °F if sensor sends invalid value, if not connected, short or out-of-range.
	OA HUM	— %	0 to 100%	OUTSIDE AIR RELATIVE HUMIDITY Displays measured value of outdoor humidity from OA enthalpy sensor.
	RA TEMP	— — °F (or — — °C)	0 to 140 °F (–18 to 60 °C)	RETURN AIR TEMPERATURE (Accessory sensor required) 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 (Accessory enthalpy sensor required) 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 CO2 (CO2 sensor required, accessory or factory option) Displays value of measured CO2 from CO2 sensor. Invalid if not connected, short or out-of-range. May be adjusted in Advanced menu by Zero offset and Span.
	DCV STATUS	n/a	ON/OFF	DEMAND CONTROLLED VENTILATION STATUS (CO2 sensor required, accessory or factory option) Displays ON if IN CO2 value above setpoint DCV SET and OFF if below setpoint DCV SET.
	DAMPER OUT	2.0V	2.0 to 10.0V	Displays output voltage or position to the damper actuator. ***
	ACT POS	n/a	0 to 100%	Displays actual position of outdoor air damper actuator
	ACT COUNT	n/a	1 to 65535	Displays number of times actuator has cycled. 1 Cycle equals accrued 180° of actuator movement in any direction



**Table 11 - Menu Structure\* (cont)**

Menu	Parameter	Parameter Default Value	Parameter Range and Increment †	EXPANDED PARAMETER NAME Notes
<b>STATUS (cont)</b>	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. Displays On when damper position reaches programmed percentage setpoint. ON = 24 Vac Output; OFF = No Output.
	EXH2 OUT	OFF	ON/OFF	EXHAUST STAGE 2 RELAY OUTPUT Output of AUX1 O terminal Displays ON when damper position reaches programmed percentage setpoint ON = 24 Vac Output, OFF = No Output; displays only if AUX1 O = EXH2
	ERV	OFF	ON/OFF	ENERGY RECOVERY UNIT RELAY OUTPUT Output of AUX1 O terminal, ON = 24 Vac Output, OFF = No Output; displays only if AUX1 O = 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.
<b>SETPOINTS</b>	MAT SET	53°F (12°C)	38 to 70°F; (3 to 21°C) increment by 1	SUPPLY AIR SETPOINT Setpoint determines where the economizer will modulate the OA damper to maintain the mixed air temperature. See Menu Note 2.
	LOW T LOCK	32°F (0°C)	-45 to 80°F; (-43 to 27°C) 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. At or below the setpoint the Y1-O and Y2-O will not be energized on the controller.
	DRYBLB SET	63°F (17°C)	48 to 80°F (9 to 27°C) 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 (17°C), unit will economize at 62°F (16.7°C) and below and not economize at 64°F (17.8°C) and above. There is a 2°F (1.1°C) deadband. See Menu Note 3
	ENTH CURVE	ES3	ES1, ES2, ES3, ES4, or ES5	ENTHALPY CHANGEOVER CURVE (Requires enthalpy sensor option) Enthalpy boundary "curves" for economizing using single enthalpy. See page 40 for description of enthalpy curves.
	DCV SET	1100ppm	500 to 2000 ppm; increment by 100	DEMAND CONTROLLED VENTILATION SETPOINT Displays only if CO <sub>2</sub> sensor is connected. Setpoint for Demand Controlled 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.  With 2-speed fan units MIN POS L (low speed fan) and MIN POS H (high speed fan) settings are required. Default for MIN POS L is 3.2V and MIN POS H is 2.8V.
	VENTMAX	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. VENTMAX is the same setting as MIN POS would be if you did not have the CO <sub>2</sub> sensor.
			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 VENTMAX L (low speed fan) and VENTMAX H (high speed fan) settings are required. Default for VENTMAX L is 3.2V and VENTMAX H is 2.8V.
	VENTMIN	2.25 V	2 to 10 Vdc	DCV MINIMUM DAMPER POSITION Displays only if CO <sub>2</sub> sensor is connected. Used for Va (ventilation min cfm) setpoint. This is the ventilation requirement for less than maximum occupancy of the space.
			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 VENTMIN H (high speed fan) settings are required. Default for VENTMIN L is 2.5V and VENTMIN H is 2.25V.



**Table 11 - Menu Structure\* (cont)**

Menu	Parameter	Parameter Default Value	Parameter Range and Increment <sup>†</sup>	EXPANDED PARAMETER NAME Notes
<b>SETPOINTS (cont)</b>	ERV OAT SP <sup>††</sup>	32°F (0°C)	0 to 50°F; (-18 to 10°C) increment by 1	ENERGY RECOVERY VENTILATION UNIT OUTDOOR AIR TEMPERATURE SETPOINT Only when AUX1 O = ERV
	EXH1 SET	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	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%
<b>SYSTEM SETUP</b>	INSTALL	01/01/10		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 4
	AUX2 IN	n/a	Shutdown (SD) Heat (W1) HP (O) HP (B)	In CONV mode: SD = Enables configuration of shutdown (default); W = Informs controller that system is in heating mode. <b>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 4.</b>  In HP O/B mode: HP(O) = energize heat pump on Cool (default); HP(B) = energize heat pump on Heat.
	FAN SPEED	1speed	1 speed/ 2 speed	Sets economizer controller for operation of 1 speed or 2 speed supply fan. The controller does not control the fan but positions the OA and RA dampers to the heating or cooling mode. See page 34 for modes and position. <b>NOTE: 2-speed fan option also needs Heat (W1) programmed in AUX 2 In. See Menu Note 4.</b>
	FAN CFM	5000cfm	100 to 15000 cfm; increment by 100	UNIT DESIGN AIRFLOW (CFM) Enter ONLY if using DCV CAL ENA = AUTO The value is found the nameplate label for the specific RTU.
	AUX1 OUT	NONE	NONE ERV EXH2 SYS	Select OUTPUT for AUX1 O relay NONE = not configured (output is not used) ERV = Energy Recovery Ventilator <sup>††</sup> EXH2 = second damper position 24 Vac out 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. See Menu Note 1.
	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. <b>NOTE: RECHECK AUX2 IN and FANTYPE for required 2-speed values.</b>

**Table 11 - Menu Structure\* (cont)**

Menu	Parameter	Parameter Default Value	Parameter Range and Increment <sup>†</sup>	EXPANDED PARAMETER NAME Notes
<b>ADVANCED SETUP</b>	MA LO SET	45°F (7°C)	35 to 65°F; (2 to 18°C) Incremented by 1°	SUPPLY AIR TEMPERATURE LOW LIMIT Temperature to activate 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 CLO = closed MIN = MIN POS or VENTMAX
	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 50	CO <sub>2</sub> ppm span to match CO <sub>2</sub> sensor. e.g.; 500–1500 sensor output would be 500 CO <sub>2</sub> zero and 1000 CO <sub>2</sub> span.
	STG3 DLY	2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4 h or OFF	COOLING STAGE 3 DELAY Delay after stage 2 for cool has been active. Turns on second stage of mechanical cooling when economizer is first stage call and mechanical cooling is second stage call. 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., Y1–O, Y2–O, EXH1, etc. will shut off. <b>NOTE: Function NOT AVAILABLE with 2–speed mode</b>
	DA LO ALM	45°F (7°C)	NONE 35 to 65°F; (2 to 18°C) Incremented by 5°	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)	NONE 70 to 180°F; (21 to 82°C) Incremented by 5°	Used for alarm for when the DA air temperature is too high. Set high 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 sensors (RA, OA, MA and CO <sub>2</sub> ). <b>NOTE: This operation is not operable with a 2–speed fan unit.</b>
	MAT T CAL	0.0°F (or C)	+/-2.5°F (+/-1.4°C)	SUPPLY AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration supply air temperature (SAT) sensor
	OAS T CAL	1.0°F (or C)	+/-2.5°F (+/-1.4°C)	OUTSIDE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration outside air temperature (OAT) sensor
	OAS H CAL	0% RH	+/-10% RH	OUTSIDE AIR HUMIDITY CALIBRATION Allows for the operator to adjust for an out of outside air enthalpy sensor
	RA T CAL	0.0°F (or C)	+/-2.5°F (+/-1.4°C)	RETURN AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration return air temperature (RA) sensor
	RA H CAL	0% RH	+/-10% RH	RETURN AIR HUMIDITY CALIBRATION Allows for the operator to adjust for an out of calibration return air enthalpy sensor
	DA T CAL	0.0°F (or C)	+/-2.5°F (+/-1.4°C)	DISCHARGE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration discharge air temperature (DAT) sensor
	2SP FAN DELAY	5 Minutes	0 to 20 minutes in 1 minute increments	TIME DELAY ON 2 <sup>nd</sup> 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 positions is based on the system. See Table 12.
	DAMPER OPEN	n/a	n/a	Positions damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure you pause in this mode to allow for 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). See <b>CAUTION</b> on page 41.
	CONNECT Y2–O	n/a	n/a	Closes the Y2–O relay (Y2–O) See <b>CAUTION</b> on page 41.
	CONNECT AUX1–O	n/a	n/a	Energizes the AUX1–O output. If AUX1–O 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 good for ERV operation. †† • SYS – 24 Vac out. Issues a system alarm.
	CONNECT EXH1	n/a	n/a	Closes the power exhaust fan 1 relay (EXH1)

Table 11 - Menu Structure\* (cont)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment †	EXPANDED PARAMETER NAME Notes
ALARMS(#)				<b>Alarms display only when they are active. The menu title "ALARMS(#)" includes the number of active alarms in parenthesis ( ). When using S-Bus sensors, "SYLK" will appear on the screen, and when using 20k OA temperature sensors, "SENS T" will appear on the screen.</b>
	MA T SENS ERR	n/a	n/a	SUPPLY AIR TEMPERATURE SENSOR ERROR Supply 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
	OA SYLK H ERR	n/a	n/a	Outside air enthalpy sensor has failed or become disconnected – check wiring then replace sensor if the alarm continues
	RA SYLK T ERR	n/a	n/a	RETURN AIR S-BUS SENSOR ERROR
	RA SYLK H ERR	n/a	n/a	Return air enthalpy sensor has failed or become disconnected – check wiring then replace sensor if the alarm continues
	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 Outside air temperature sensor has failed or become disconnected – check wiring then replace sensor 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 moveable 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 setpoint menu. Check if Mixed air temperature on STATUS menu is below the Lo Setpoint on Advanced setup menu. When conditions are back in normal range then the alarm will go away.
	SHUTDOWN ACTIVE	n/a	n/a	AUX2 IN is programmed for SHUTDOWN and 24 V has been applied to AUX 2IN 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 is 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-O is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX1-O terminal has 24 Vac out.
	ACT UNDER V	n/a	n/a	ACTUATOR VOLTAGE LOW Voltage received at actuator is below expected range
	ACT OVER V	n/a	n/a	ACTUATOR VOLTAGE HIGH Voltage received at actuator is above expected range
	ACT STALLED	n/a	n/a	ACTUATOR STALLED Actuator stopped before reaching commanded position

\* Table 11 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.

\*\* n/a = not applicable

†† 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.

\*\*\* When used with communicating actuator the damper out is reported in XX.X% open verses XX.X Vdc.

††† After 10 minutes without a command or mode change, the controller will change to normal operation.

#### Menu Notes

- 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

**Table 12 – Damper Minimum Position Settings and Readings on Checkout Menu**

Fan Speed	Demand Controlled Ventilation (CO <sub>2</sub> Sensor)	Setpoints	Checkout
1	NO	MIN POS	VMAX – HS
1	NO	N/A	N/A
2	NO	MIN POS H	VMAX – HS
2	NO	MIN POS L	VMAX – LS
1	YES	VENT MIN	VMIN – HS
1	YES	VENT MAX	VMAX – HS
2	YES	VENT MIN H	VMIN – HS
2	YES	VENT MAX H	VMAX – LS
2	YES	VENT MIN L	N/A
2	YES	VENT MAX L	N/A

### Sequence of Operation

**Table 13 – 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	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	24-v/On	0-v/Off	MIN POS	Closed
		On	On	High	24-v/On	24-v/On	MIN POS	Closed
None	Yes	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	0-v/Off	0-v/Off	MIN POS to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/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) - 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	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off*	VENTMIN to Full-Open	Closed to Full-Open
Above CO <sub>2</sub> set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN to VENTMAX	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/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) - 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	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	24-v/On	0-v/Off	MIN POS	Closed
		On	On	High	24-v/On	24-v/On	MIN POS	Closed
None	Yes	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	0-v/Off	0-v/Off	MIN POS to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/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) - 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 set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off*	VENTMIN to Full-Open	Closed to Full-Open
Above set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	DELAY <sup>†</sup> 24-v/On	0-v/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.

<sup>†</sup> With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

**Table 17 – 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	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	24-v/On	0-v/Off	MIN POS L	Closed
		On	On	High	24-v/On	24-v/On	MIN POS H	Closed
None	Yes	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	0-v/Off	0-v/Off	MIN POS L to Full-Open	Closed to Full-Open
		On	On	High	DELAY <sup>†</sup> 24-v/On	0-v/Off *	MIN POS H 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.

† With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

**Table 18 – 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 set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off*	VENTMIN H to Full-Open	Closed to Full-Open
Above set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	DELAY <sup>†</sup> 24-v/On	0-v/Off *	VENTMIN H 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.

† With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

**Table 19 – 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	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	24-v/On	0-v/Off	MIN POS L	Closed
		On	On	High	24-v/On	24-v/On	MIN POS H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	0-v/Off	0-v/Off	MIN POS L to Full-Open	Closed to Full-Open
		On	On	High	DELAY <sup>†</sup> 24-v/On	0-v/Off *	MIN POS H 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.

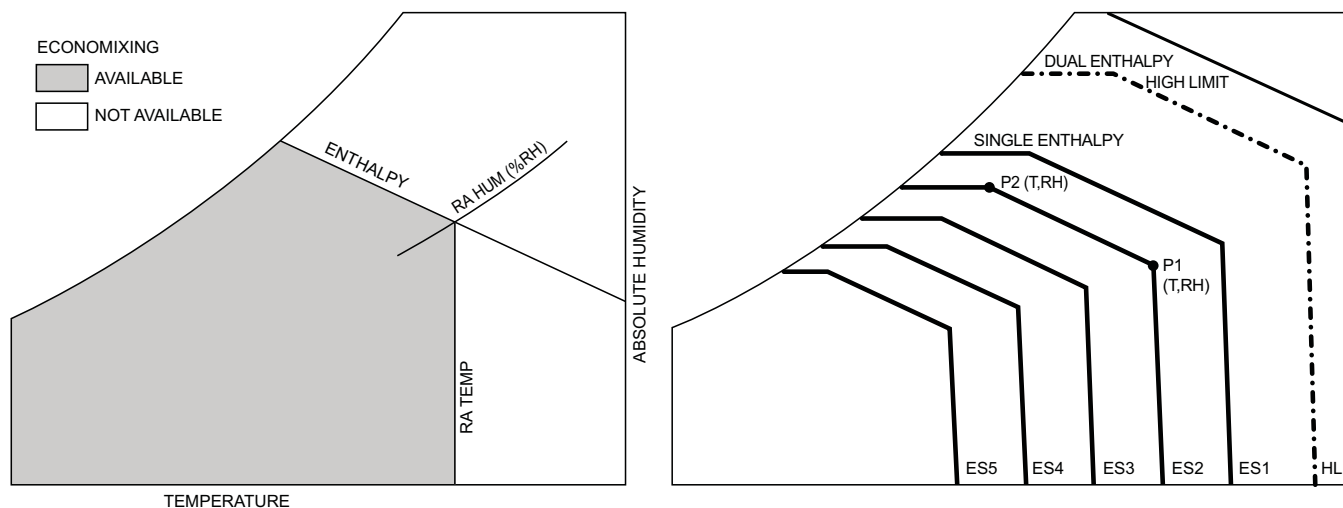
† With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

**Table 20 – 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 set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off*	VENTMIN H to Full-Open	Closed to Full-Open
Above set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	DELAY <sup>†</sup> 24-v/On	0-v/Off*	VENTMIN H 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.

† With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.



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**Fig. 40 - Single Enthalpy Curve and Boundaries**

**Table 21 – Single Enthalpy and Dual Enthalpy High Limit Curves (EN Units)**

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	80.0	60.0	28.0	80.0	36.8	66.3	80.1
ES2	75.0	57.0	26.0	75.0	39.6	63.3	80.0
ES3	70.0	54.0	24.0	70.0	42.3	59.7	81.4
ES4	65.0	51.0	22.0	65.0	44.8	55.7	84.2
ES5	60.0	48.0	20.0	60.0	46.9	51.3	88.5
HL	86.0	66.0	32.4	86.0	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. 40 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 21 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. 40 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 21 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.

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.

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

**NOTE:** See “Interface Overview” on page 30 for information about menu navigation and use of the keypad.

## **⚠ WARNING**

### **ELECTRICAL SHOCK HAZARD**

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

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).

### **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.

### **Status —**

Use the Status menu (see Table 11) to check the parameter values for the various devices and sensors configured.

**NOTE:** See “Interface Overview” on page 30 for information about menu navigation and use of the keypad.

### **Checkout Tests —**

Use the Checkout menu (on page 34) to test the damper operation and any configured outputs. Only items that are configured are shown in the Checkout menu.

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

**NOTE:** See “Interface Overview” on page 30 for information about menu navigation and use of the keypad.

To perform a Checkout test:

1. Scroll to the desired test in the Checkout menu using the 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.

## **⚠ CAUTION**

### **EQUIPMENT DAMAGE HAZARD**

Failure to follow this caution may result in equipment damage.

Be sure to allow enough time for compressor startup and shutdown between checkout tests so that you do not short-cycle the compressors.

## **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.

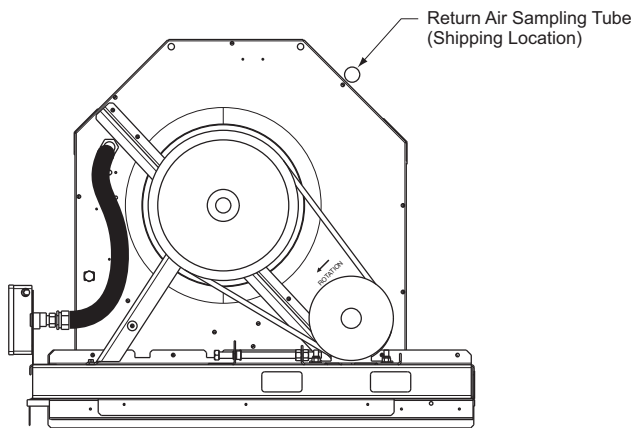
**NOTE:** If the alarm still exists after you clear it, it is redisplayed within 5 seconds.

## Smoke Detectors

Smoke detectors are available as factory-installed options on RHS units. 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. 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.

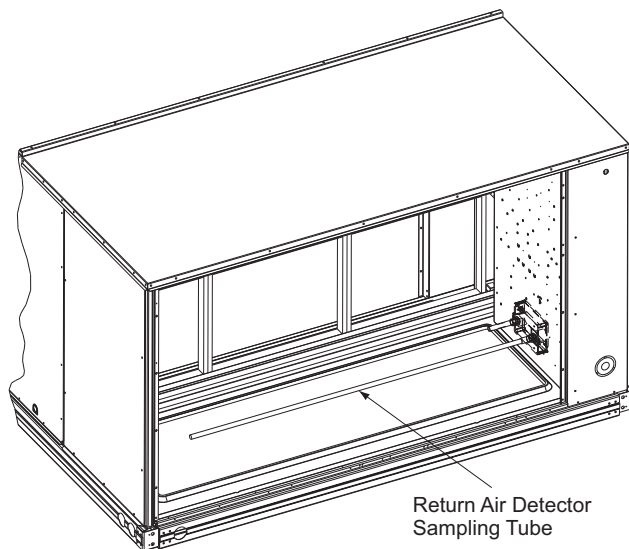
### Return Air Sensor Tube Installation —

The return air sampling tube is shipped in the unit's supply fan section, attached to the blower housing (see Fig. 41). Its operating location is in the return air section of the unit (see Fig. 42, unit without economizer, or Fig. 43, unit with economizer), inserted into the return air sensor module housing which protrudes through the back of the control box.



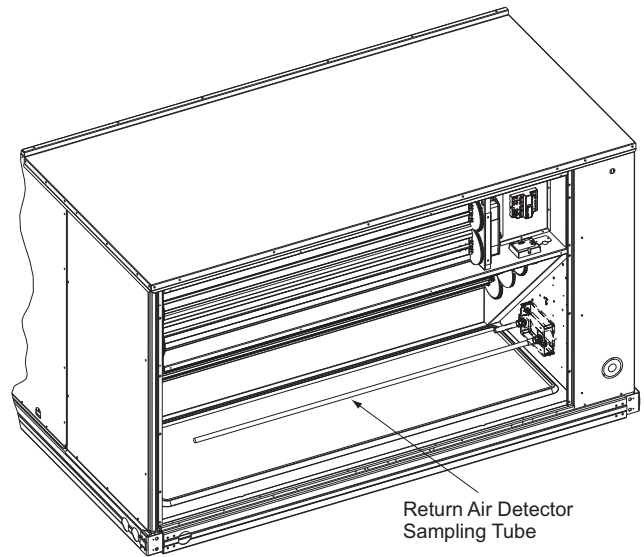
C09102

**Fig. 41 - Typical Supply Air Smoke Detector Sensor Location**



C09135

**Fig. 42 - Return Air Sampling Tube Location in Unit without Economizer**



C09136

**Fig. 43 - Return Air Sampling Tube Location in Unit with Economizer**

### To install the return air sensor sampling tube:

1. Remove the tube from its shipping location.
2. Open the unit end to access the return air sensor (located on right-hand partition)
3. Orient the tube's sampling holes into the return air flow direction. Position the sampling holes on the bottom of the tube, facing into the bottom return duct opening for vertical unit's and on the side of the tube, facing the unit's end panel for horizontal units.
4. Insert the sampling tube into the return air sensor module until the tube snaps into position.
5. Replace end panel or outside air hood.

### Smoke Detector Test Magnet —

Locate the magnet; it is shipped in the control box area.

### Additional Application Data —

Refer to *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.

## Step 11 — Adjust Factory-Installed Options

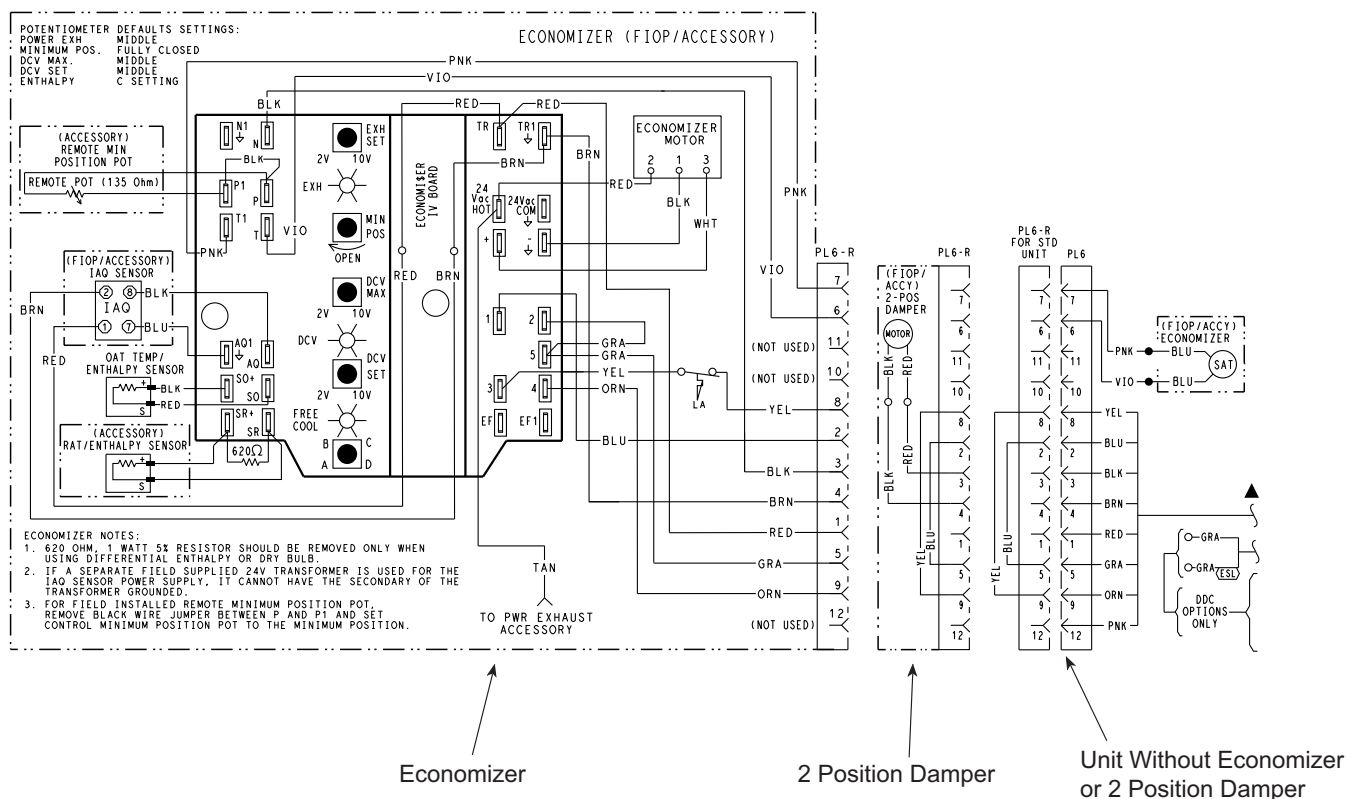
### Smoke Detectors —

Smoke detector(s) will be connected at the Controls Connections Board, at terminals marked "Smoke Shutdown". Remove jumper JMP 3 when ready to energize unit.

### EconoMiSer® IV Occupancy Switch —

Refer to Fig. 44 for general EconoMiSer IV wiring. External occupancy control is managed through a connection on the Central Terminal Board.

If external occupancy control is desired, connect a time clock or remotely controlled switch (closed for Occupied, open for Unoccupied sequence) at terminals marked OCCUPANCY on CTB. Remove or cut jumper JMP 2 to complete the installation.



**Fig. 44 - Wiring for Optional Economizer**

C160126

## Step 12 — Install Accessories

Available accessories include:

- Roof curb
- Thru-base connection kit (must be installed before unit is set on curb)
- Manual outside air damper
- Two-position motorized outside air damper
- Economizer (with control and integrated barometric relief)
- Winter start kit
- Power exhaust
- Outdoor enthalpy sensor
- Differential enthalpy sensor
- Differential dry-bulb sensor (Economizer)
- Electric heaters
- Single point kits
- CO<sub>2</sub> sensor
- Louvered hail guard
- Phase monitor control

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

## Step 13 — Check Belt Tension

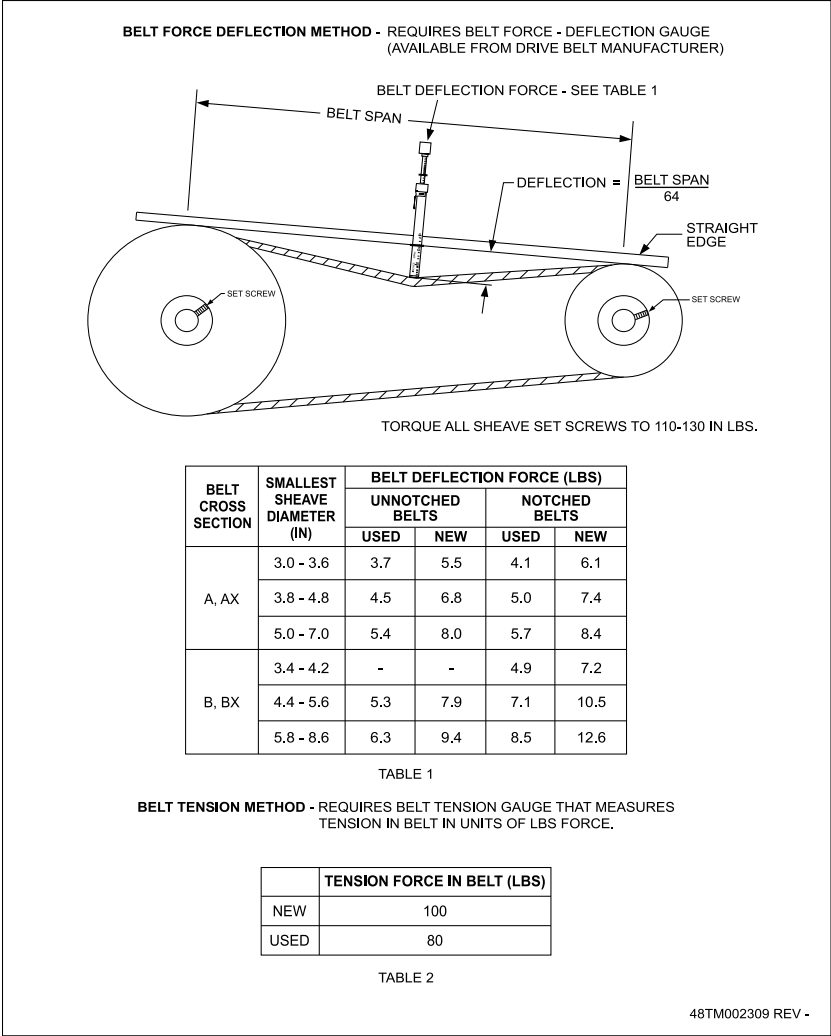
Measure the belt span length as shown in Fig. 45. Calculate the required deflection by multiplying the belt span length by 1/64. For example, if the belt span length is 32 inches:  $32 \times 1/64 = 1/2$  inch deflection.

### Belt Force - Deflection Method -

Check the belt tension with a spring-force belt force deflection gauge.

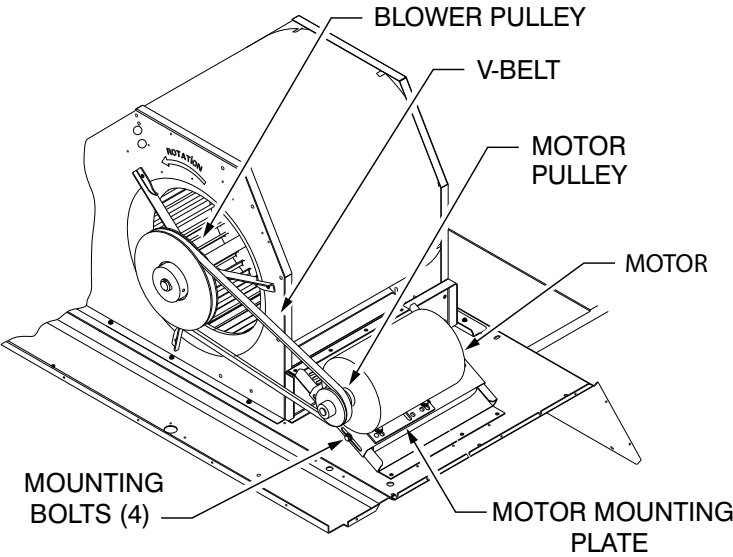
1. Place a straightedge along the belt between the two pulleys. Measure the distance between the motor shaft and the blower shaft.
2. Set the tension gauge to the desired tension (see Table 1 in Fig. 45 on page 44). Place the large O-ring at that point.
3. Press the tension checker downward on the belt until the large O-ring is at the bottom of the straightedge.
4. Adjust the belt tension as needed.

Adjust belt tension by loosening the motor mounting plate front bolts and rear bolt (see Fig. 46) and sliding the plate towards the fan (to reduce tension) or away from the fan (to increase tension). Ensure the blower shaft and motor shaft are parallel to each other (pulleys aligned). Tighten all bolts securely when finished.



C160146

**Fig. 45 - V-Belt Force Label**



**Fig. 46 - Belt Drive Motor Mounting**

C11504





# UNIT START-UP CHECKLIST

(Remove and Store in 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 judgement, follow safe practices, and adhere to the safety considerations/information as outlined in the 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 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

### COOLING CYCLE -

#### 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

### HEATING CYCLE -

#### 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)

HEAT 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

## REPEAT PROCESS FOR 2 COMPRESSOR SYSTEMS