

INSTALLATION INSTRUCTIONS

R-410A Single Package Rooftop Electric Cooling

RAS210-303

These instructions must be read and understood completely before attempting installation

Safety Labeling and Signal Words

DANGER, WARNING, CAUTION, and NOTE

The signal words **DANGER**, **WARNING**, **CAUTION**, and **NOTE** are used to identify levels of hazard seriousness. The signal word **DANGER** is only used on product labels to signify an immediate hazard. The signal words **WARNING**, **CAUTION**, and **NOTE** will be used on product labels and throughout this manual and other manual that may apply to the product.

DANGER – Immediate hazards which will result in severe personal injury or death.

WARNING – Hazards or unsafe practices which could result in severe personal injury or death.

CAUTION – Hazards or unsafe practices which may result in minor personal injury or product or property damage.

NOTE – Used to highlight suggestions which will result in enhanced installation, reliability, or operation.

Signal Words in Manuals

The signal word **WARNING** is used throughout this manual in the following manner:

 **WARNING**

The signal word **CAUTION** is used throughout this manual in the following manner:

 **CAUTION**

Signal Words on Product Labeling

Signal words are used in combination with colors and/or pictures or product labels.

TABLE OF CONTENTS

SAFETY CONSIDERATIONS	2
DIMENSIONS & WEIGHTS	3
INSTALLATION	7
Step 1 – Plan for Unit Location	7
Step 2 – Plan for Sequence of Unit Installation ..	8
Step 3 – Inspect Unit	8
Step 4 – Provide Unit Support	8
Step 5 – Field Fabricate Ductwork	11
Step 6 – Rig and Place Unit	11
Step 7 – Horizontal Duct Connection	12
Step 8 – Install Outside Air Hood	13
Step 9 – Install External condensate Trap & Piping	14
Step 10 – Make Electrical Connections	14
Step 11 – Adjust Factory-Installed Options	24
Step 12 – Install Accessories	24

 **WARNING**

PERSONAL INJURY, AND/OR PROPERTY DAMAGE HAZARD

Failure to carefully read and follow this warning could result in equipment malfunction, property damage, personal injury and/or death.

Installation or repairs made by unqualified persons could result in equipment malfunction, property damage, personal injury and/or death.

The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures and equipped with proper tools and test instruments.

Installation must conform with local building codes and with the national Electrical Code NFPA70 current edition or Canadian Electrical Code part 1 CSA C.22.1.


IMPORTANT – READ BEFORE INSTALLING

1. Read and become familiar with these installation instructions before installing this unit.
2. Be sure the installation conforms to all applicable local and national codes.
3. These instructions contain important information for the proper maintenance and repair of this equipment. Retain these instructions for future use.

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/NFPA70, National Electrical Code (NEC); in Canada, CSA C22.1) for special requirements.

Recognize safety information. This is the safety-alert symbol . When you see this symbol 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 serious injury or death. **WARNING** signifies a hazard which **could** result in serious 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.

These instructions cover minimum requirements and conform to existing national standards and safety codes. In some instances, these instructions exceed certain local codes and ordinances, especially those that may not have kept up with

changing residential construction practices. We require these instructions as a minimum for a safe installation.



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 lockout tag. 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, and/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

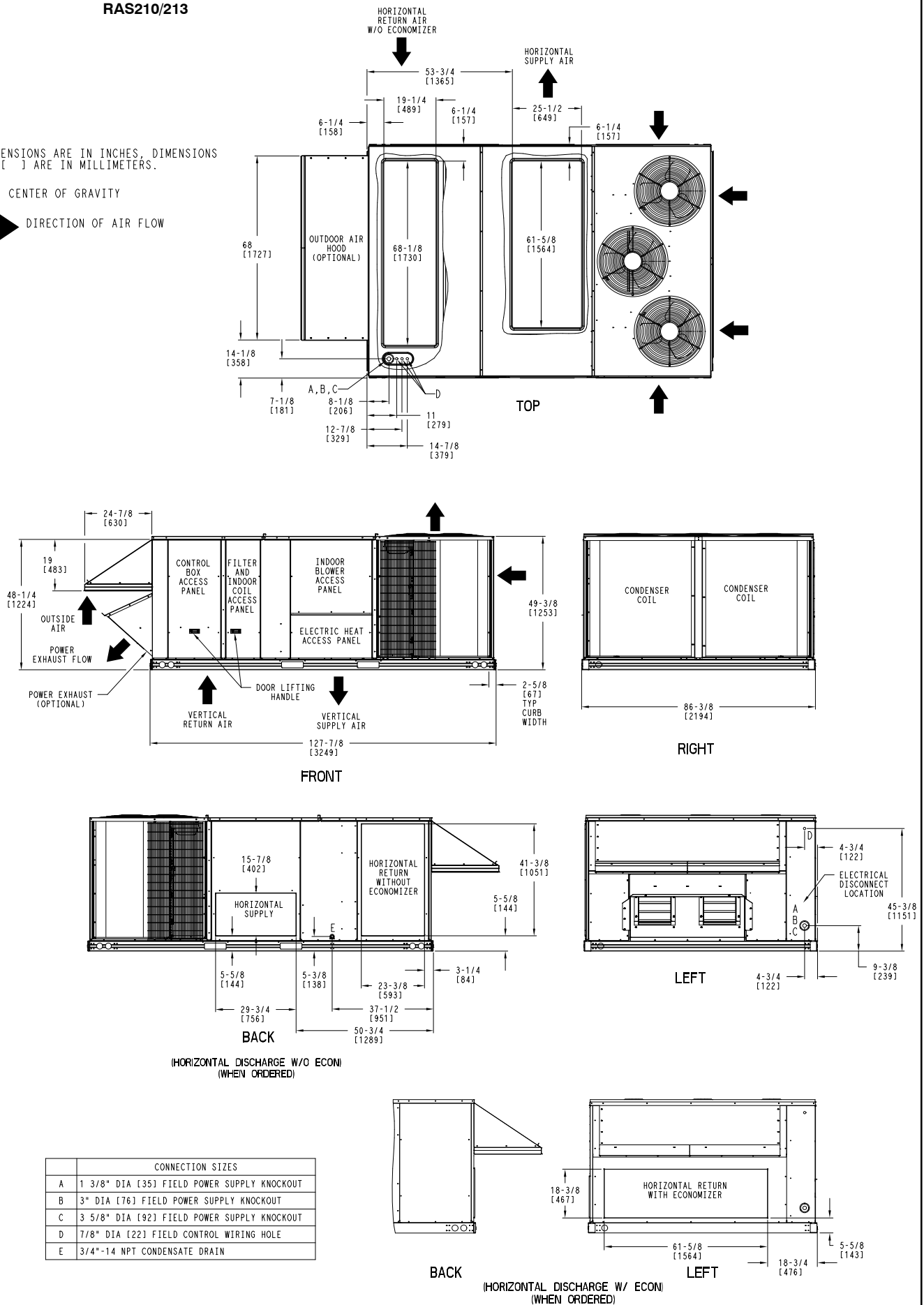
Failure to follow this caution may result in personal injury.

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 units.

**FIGURE 1 Base Unit Dimensions: 17.5 Ton
RAS210/213**

NOTES:

1. DIMENSIONS ARE IN INCHES. DIMENSIONS IN [] ARE IN MILLIMETERS.
2.  CENTER OF GRAVITY
3.  DIRECTION OF AIR FLOW



**Fig. 1 – Unit Dimensional Drawing: 17.5 Ton
RAS210/213**

Unit Size	Unit Weight		Corner Weight (A)		Corner Weight (B)		Corner Weight (C)		Corner Weight (D)		C.G.		
	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	X	Y	Z
17.5 Ton	1823	829	419	190	496	226	493	224	415	189	42-7/8 [1090]	69-1/4 [1759]	16-1/2 [419]

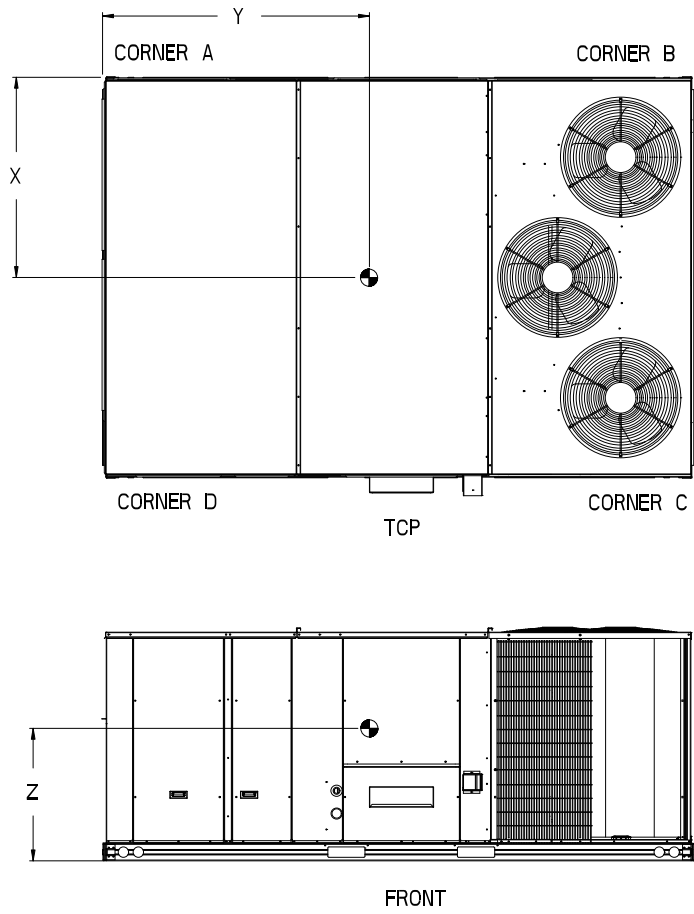




FIGURE 2

**Base Unit Dimensions: 20 & 25 Ton
RAS240/243, 300/303**

NOTES:

1. DIMENSIONS ARE IN INCHES. DIMENSIONS IN [] ARE IN MILLIMETERS.
2.  CENTER OF GRAVITY
3.  DIRECTION OF AIR FLOW

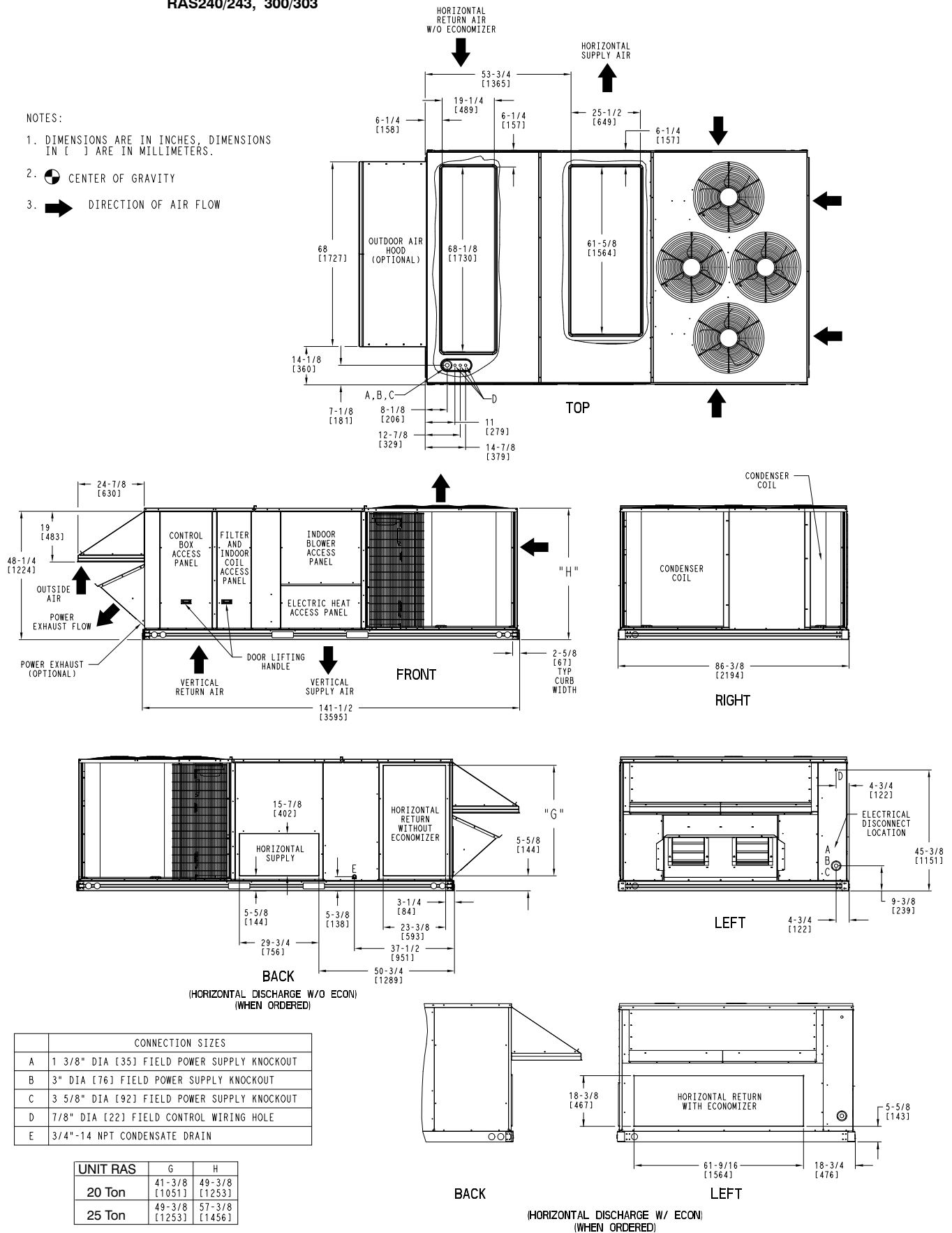
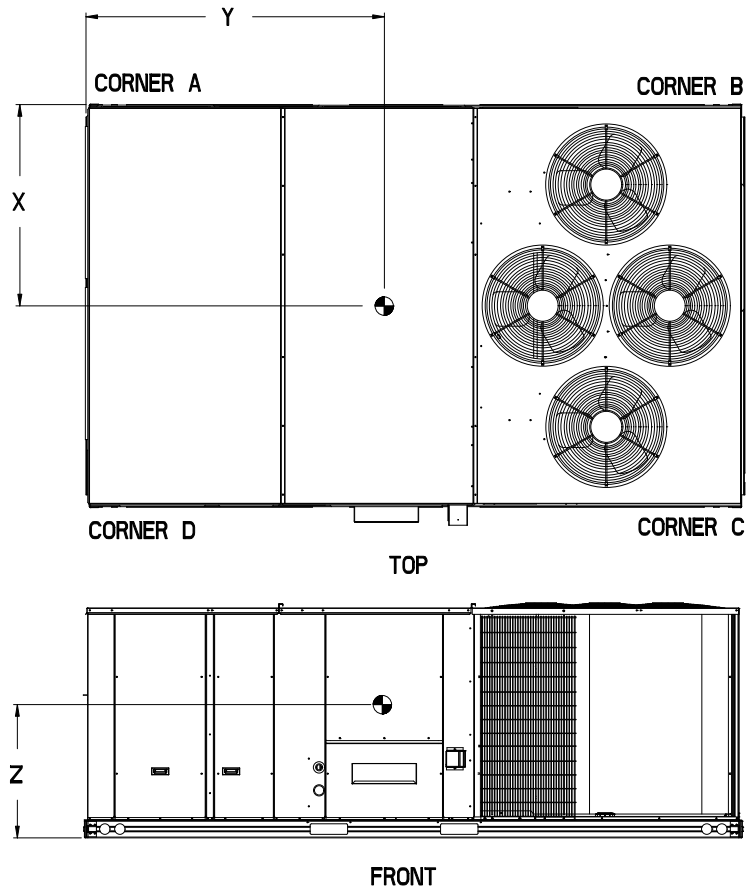


Fig. 2 – Unit Dimensional Drawing: 20 & 25 Ton, RAS240/243, 300/303

Unit Size	Unit Weight		Corner Weight (A)		Corner Weight (B)		Corner Weight (C)		Corner Weight (D)		C.G.		
	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	X	Y	Z
20 Ton	1973	897	532	242	522	237	456	207	464	211	40-1/8 [1020]	70 [1778]	16-1/2 [419]
25 Ton	2098	954	545	248	539	245	504	229	510	232	41-11/16 [1058]	70-1/4 [1784]	19 [493]



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 the minimum clearances required for safety. This includes the clearance to combustible surfaces, unit performance and service access below, around and above unit as specified in unit drawings. See Fig. 3.

NOTE: Consider also the effect of adjacent units.

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

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

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

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

Roof Mount —

Check building codes for weight distribution requirements. Unit operating weight is shown in Table 1.

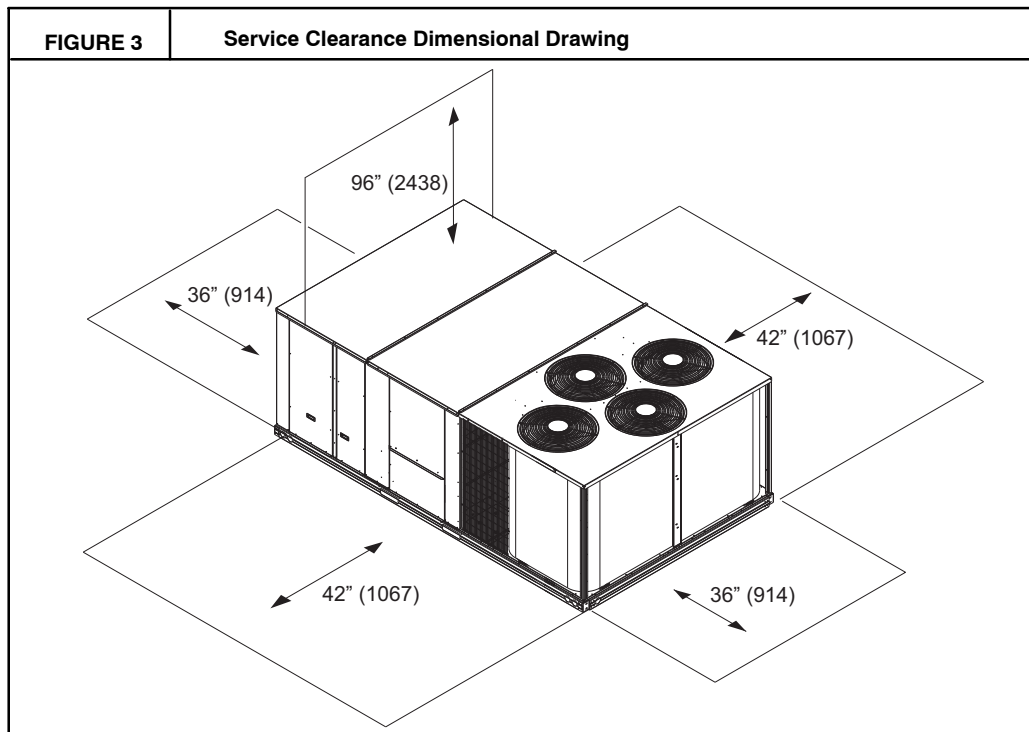


Table 1—Operating Weights

RAS	UNIT LB (KG)		
Component	210, 213	240, 243	300, 303
Base Unit	1823 (827)	1973 (895)	2098 (952)
Economizer	245 (111)	245 (111)	245 (111)
Powered Outlet	32 (15)	32 (15)	32 (15)
Curb			
14-in/356 mm	273 (124)	273 (124)	273 (124)
24-in/610 mm	350 (159)	350 (159)	350 (159)

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 field supplied thru-the-base service connection fittings (affects curb and unit)
- Rig and place unit
- Remove top skid
- Install outside air hood
- Install smoke detector tube
- Install condensate line trap and piping
- Make electrical connections
- Install other accessories

Pad-mounted installation —

- Prepare pad and unit supports
- Rig and place unit
- Remove duct covers and top skid
- Install field-fabricated ductwork at unit duct openings
- Install outside 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.

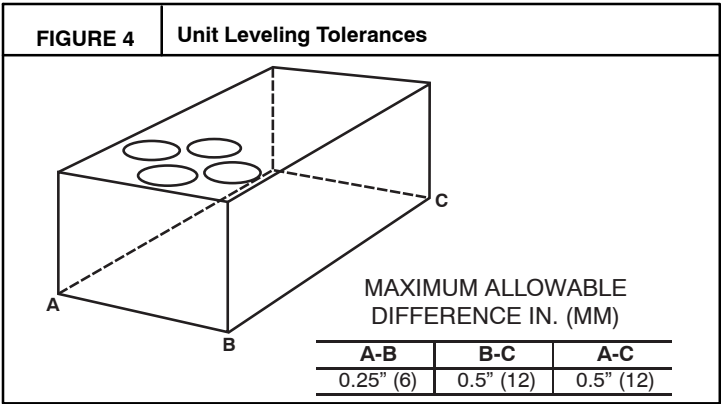
Step 4 — Provide Unit Support

Roof Curb Mount —

Accessory roof curb details and dimensions are shown in Figs. 6 and 7. 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 Figs. 6 and 7. Improperly applied gasket can also result in air leaks and poor unit performance.

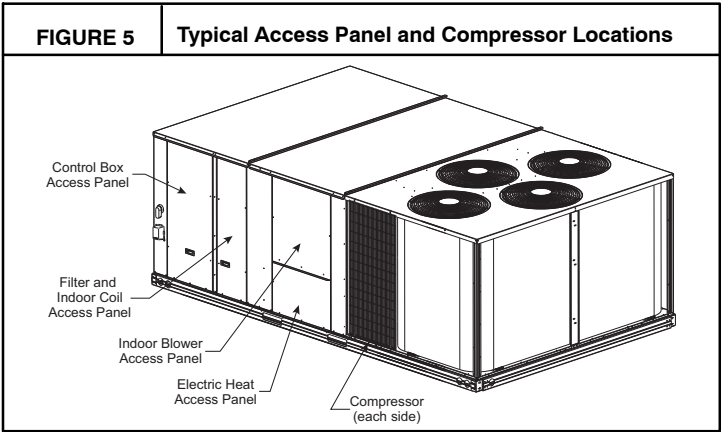
Curb should be level. This is necessary for unit drain to function properly. Unit leveling tolerances are show in Fig. 5. Refer to Accessory Roof Curb Installation Instructions for additional information as required.



Install insulation, cant strips, roofing felt, and counter flashing as shown. *Ductwork must be attached to curb and not to the unit. Thru-the-base power connection, field supplied and field installed, 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 of access panel; see Fig. 1 or 2 for basepan knockout locations.. Attach the service connections to the basepans.

IMPORTANT: Make sure field supplied and field installed fittings for electric wiring create a water proof seal so water will not enter the building.



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.

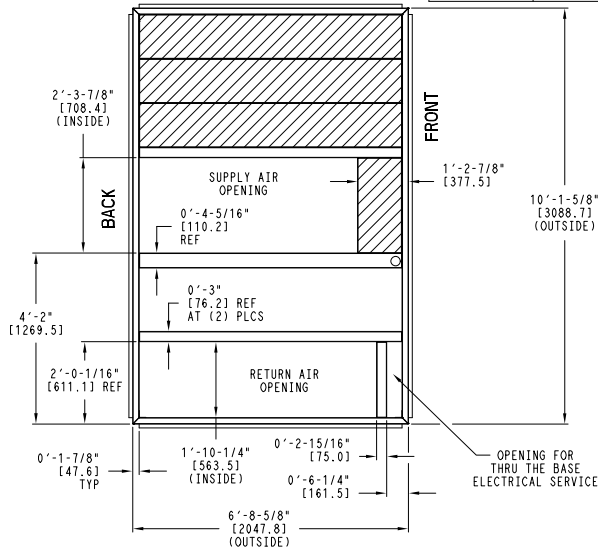
Alternate Unit Support (In Lieu of Curb or Slab Mount) —

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.

FIGURE 6

Roof Curb Details – RAS210/213

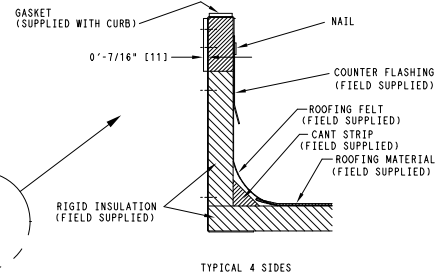
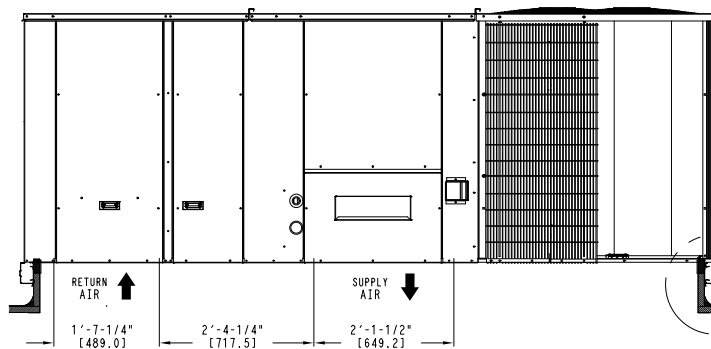
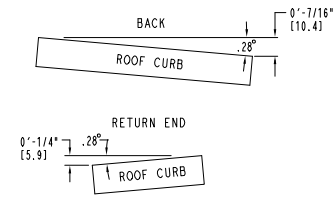
Unit Size	"A"	ROOF CURB ACCESSORY
17.5 Ton	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB045A00 CRRFCURB046A00



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



TYPICAL 4 SIDES

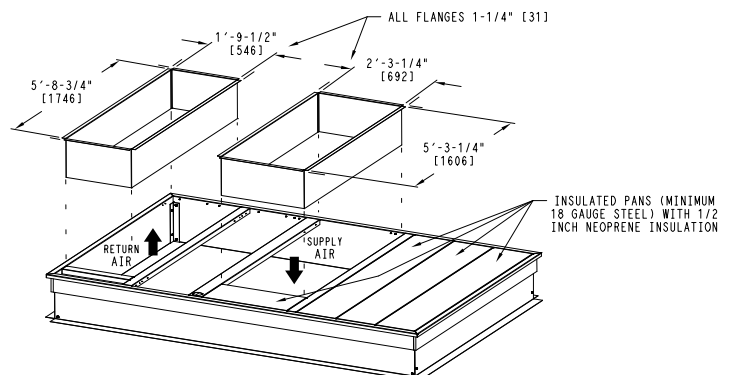
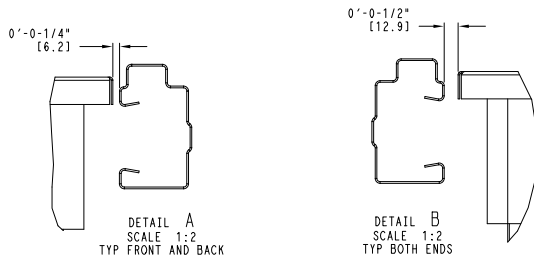
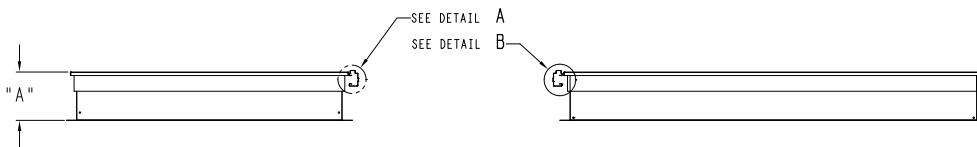
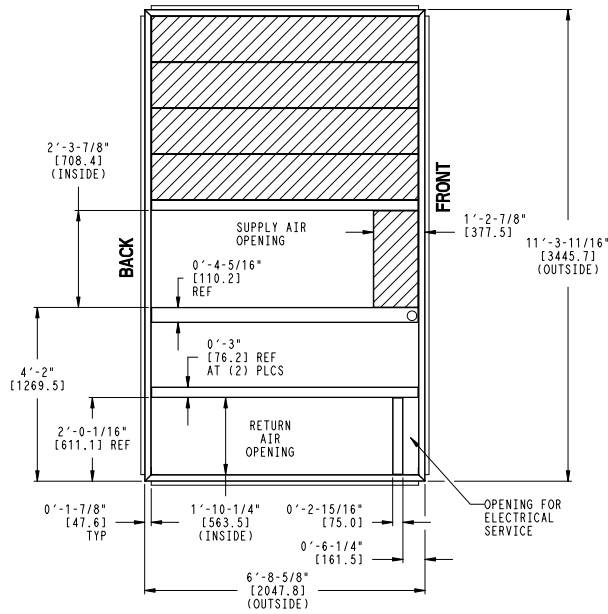


FIGURE 7

Roof Curb Details – RAS240/243, 300/303

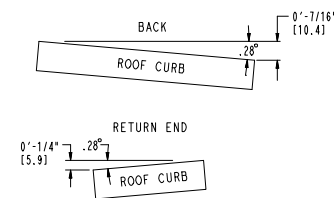
Unit Size	"A"	ROOF CURB ACCESSORY
20 & 25 Ton	1'-2" [356.0]	CRRFCURB047A00
	2'-0" [610.0]	CRRFCURB048A00



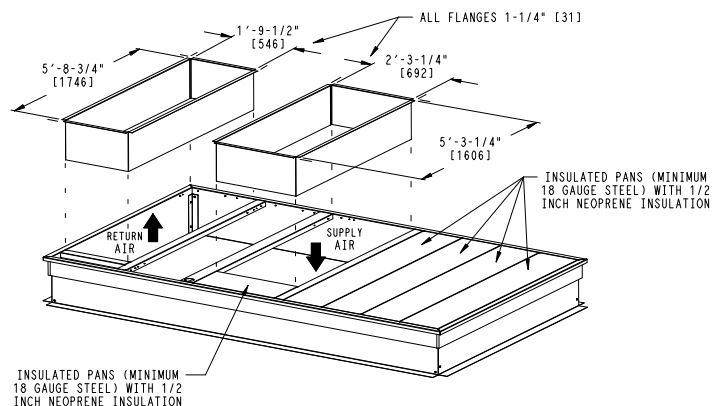
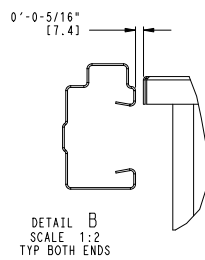
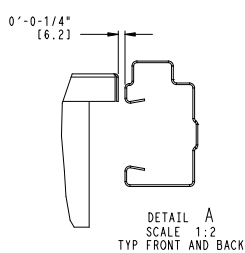
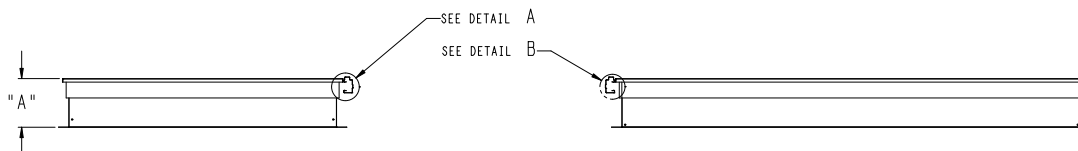
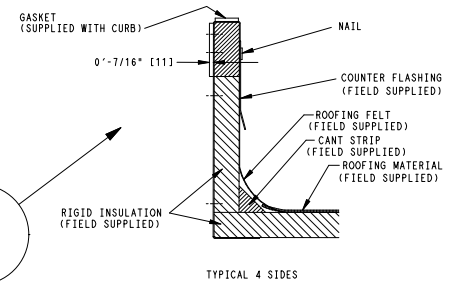
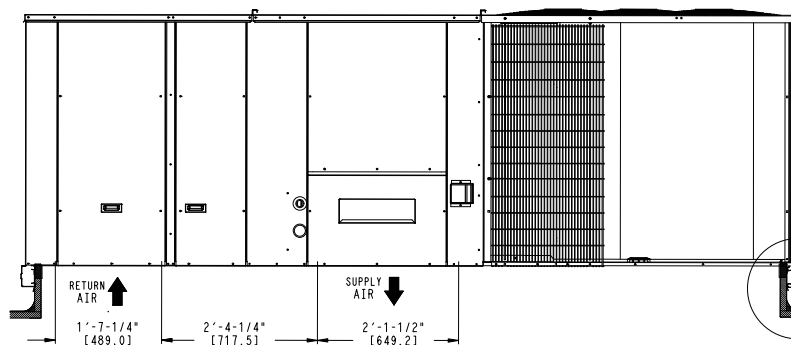
NOTES:

- 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



Step 5 — Field Fabricate Ductwork

Cabinet return-air static pressure (a negative condition) shall not exceed 0.5 in. wg (87 Pa) with economizer or 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.

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 1 (on page 9) 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 when packaging is removed.

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

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 being approximately equal to Detail A and Detail B in Figs. 7, 8 and 9.

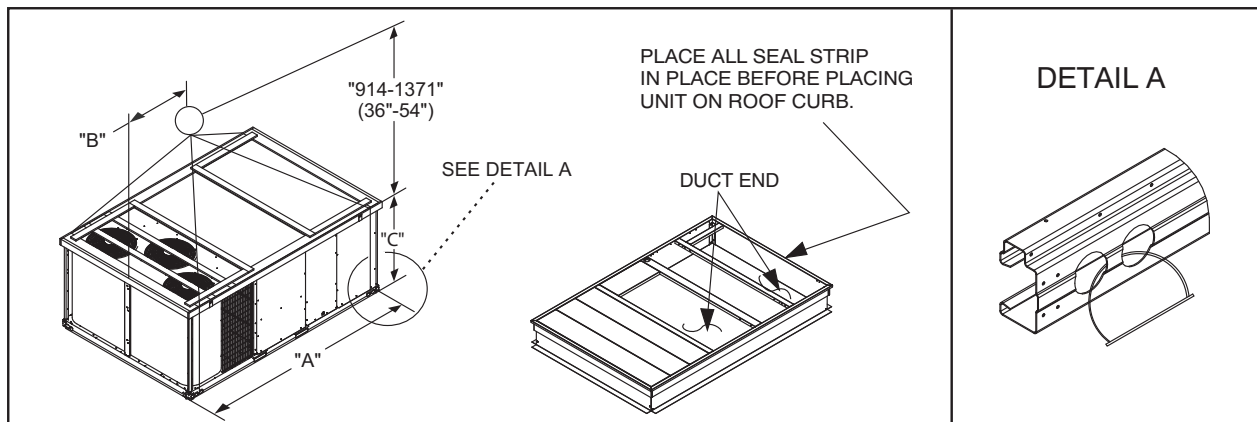
Do not attempt to slide unit on curb after unit is set. Doing so will result in damage to the roof curb seal.

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

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

FIGURE 8

Rigging Details



UNIT RAS	MAX WEIGHT		DIMENSIONS					
			A		B		C	
	LB	KG	IN	MM	IN	MM	IN	MM
210, 213	2159	981	127.8	3249	58.7	1491	52.3	1328
240, 243	2197	999	141.5	3595	71.5	1816	52.3	1328
300, 303	2434	1106	141.5	3595	71.5	1816	60.3	1532

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.

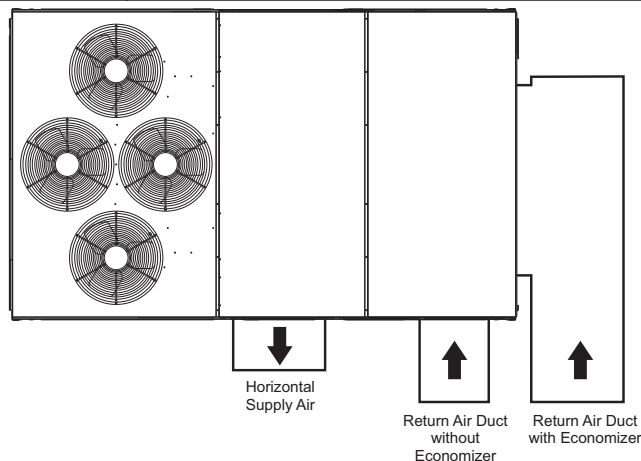
Step 7 — Horizontal Duct Connection

Refer to Figs. 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. 9 for top view depicting typical horizontal duct arrangements.

Field-supplied ($\frac{3}{4}$ -inch) flanges should be attached to horizontal duct openings (see Fig. 9) 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.

FIGURE 9

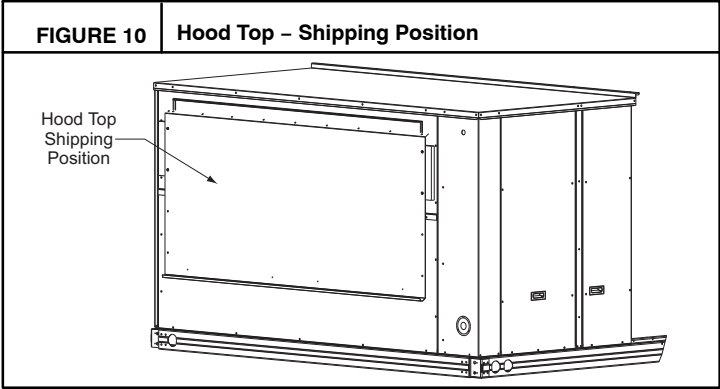
Horizontal Duct Opening Positions



	Supply	Return without Economizer	Return with Economizer
Location	Back	Back	Left end
Height – In. (mm)	15 ⁷ / ₈ (402)	49 ³ / ₈ (1253)	18 ³ / ₈ (467)
Width – in. (mm)	29 ³ / ₄ (756)	23 ³ / ₈ (593)	61 ⁵ / ₈ (1564)

Step 8 — Install Outside Air Hood — Factory Option

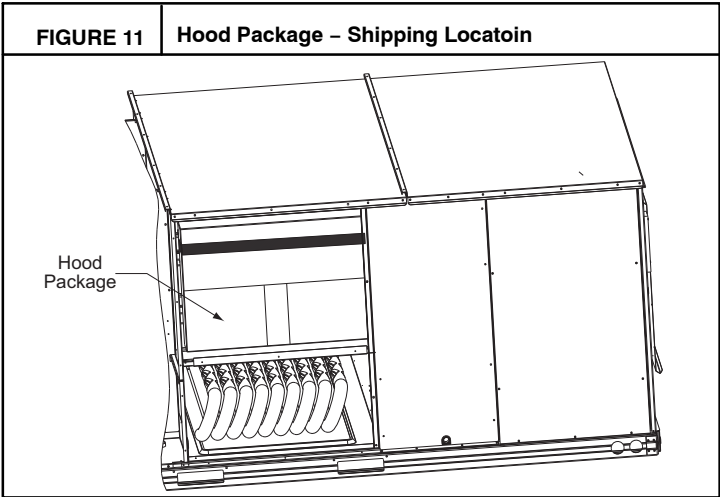
The outside air hood for factory-option economizer and two-position damper is shipped in knock-down form and requires field assembly. The panel for the hood top is shipped on the end of the unit (see Fig. 10). The remaining parts for the hood assembly (including side panels, filters and tracks) are shipped in a carton that is secured to the rear of the blower assembly. Access the carton location through rear panel (see Fig. 11).



To remove the hood parts package:

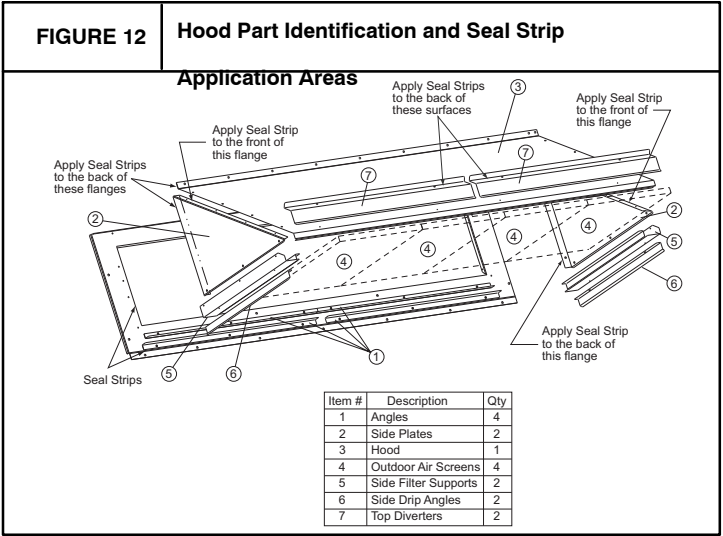
1. Remove the back blower access panel.
2. Locate and cut the strap, being careful to not damage any wiring.
3. Carefully lift the hood package carton through the back blower access opening.

See Fig. 12 for identification of the various parts of the hood assembly.

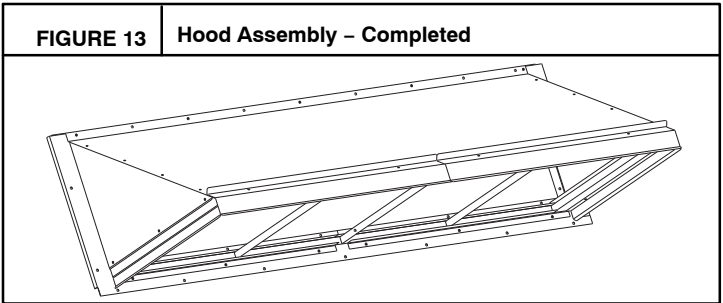


To assemble the outside air hood:

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. 12).

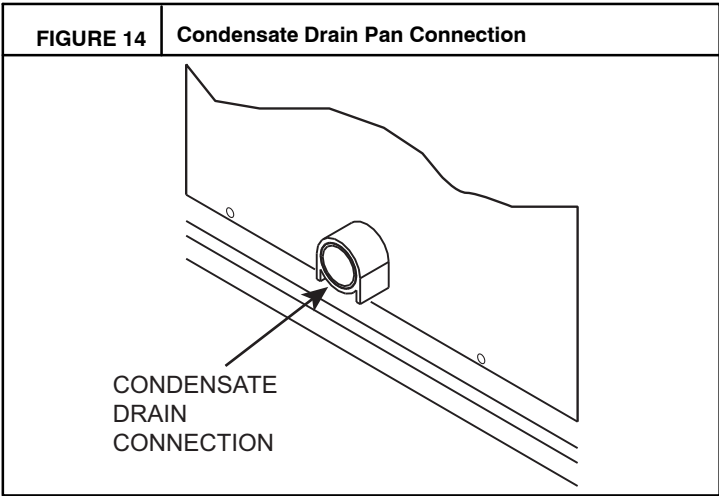


4. Secure side plates to panel using the screws provided.
5. Apply seal strip to mating flange of the hood (see Fig. 12).
6. Secure top flange using screws provided in kit.
7. Install outdoor air screens by sliding them into the channel formed by the four angles installed in step 2. Make sure that the 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.**

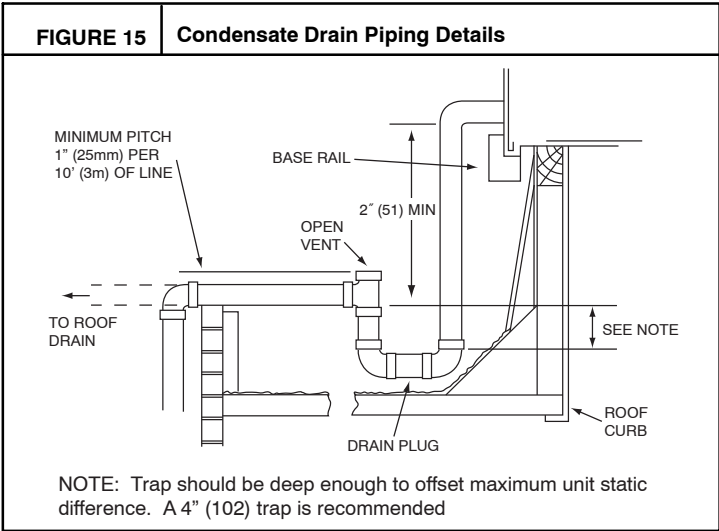


Step 9 — Install External Condensate Trap and Line

The unit has one 3/4-in. condensate drain connection on the end of the condensate pan (see Fig. 14). See Figs. 1 and 2, item “E”, in the view labeled “BACK (HORIZONTAL DISCHARGE W/O ECON)” for the location of the condensate drain 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. 15.



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

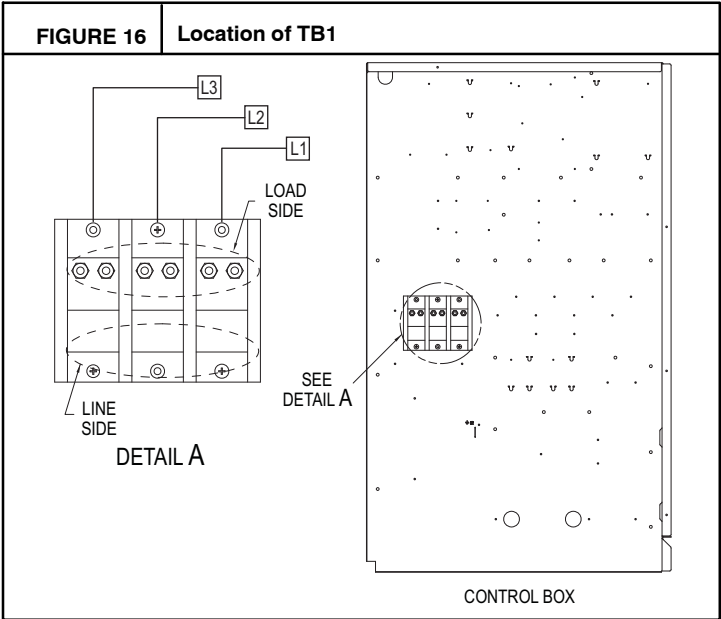
Failure to follow this warning could result in personal injury or death.

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 —

On a unit without a unit-mounted disconnect, connect the source leads to the terminal block with unit field power leads. See Fig. 16.



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.

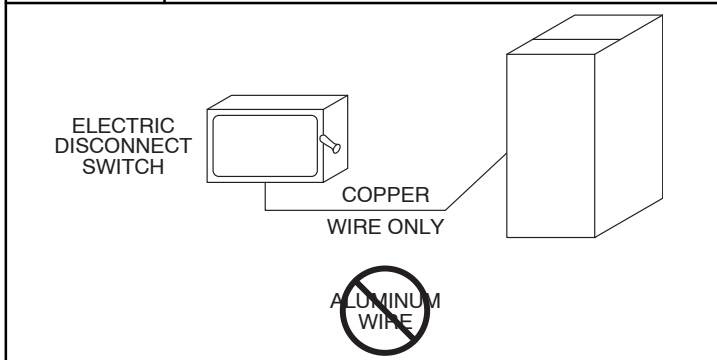
⚠ WARNING

FIRE HAZARD

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

Do not connect aluminum wire between disconnect switch and air conditioning unit. Use only copper wire. (See Fig. 17.)

FIGURE 17 Disconnect Switch and Unit



Units Without Factory-Installed 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.

1. Install liquid tight conduit 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. 18.

Units with Factory-Installed Disconnect —

The factory-installed option disconnect switch is located in the main control box. The manual switch handle is accessible on the corner post adjacent to the control box access panel.

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. 18 for power wiring connections to the unit power terminal block and equipment ground. Maximum wire size is 2/0 AWG per pole.

Provide a ground-fault and short-circuit over-current protection device (fuse or breaker) per NEC Article 440 (or

local codes). Refer to unit informative data plate for MOCP (Maximum Over-current Protection) device size.

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

⚠ CAUTION

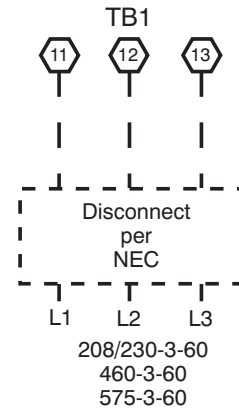
UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

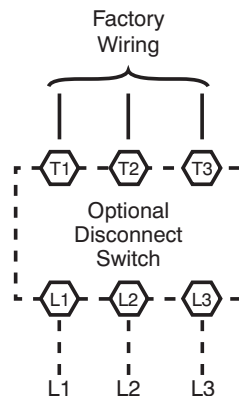
Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable warranty.

FIGURE 18 Power Wiring Connections

Units Without Disconnect Option



Units With Disconnect Option



Convenience Outlets —

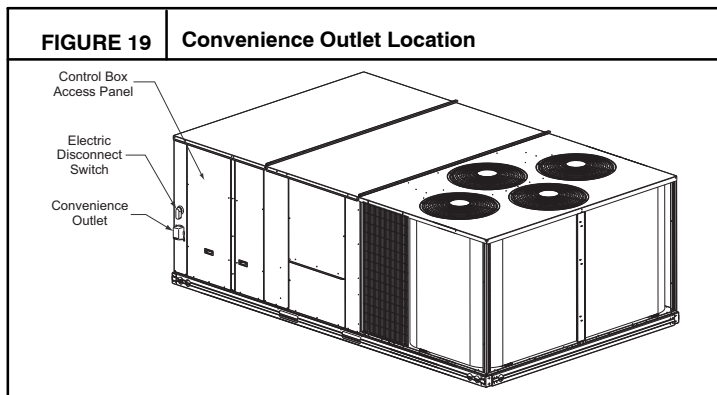
⚠ WARNING

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.

Non-unit powered convenience outlets are offered on RAS models. It provides a 125-volt GFCI (ground-fault circuit-interrupter) duplex receptacle rated at 15-A behind a hinged access cover, located on the corner panel of the unit. See Fig. 19.



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 to 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.

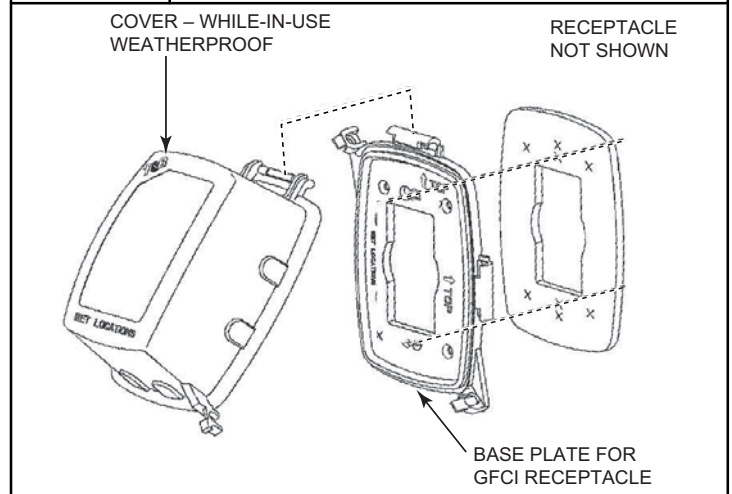
DISCONNECT ALL POWER TO UNIT AND CONVENIENCE OUTLET.

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. 20. 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.

FIGURE 20 Waterproof Cover Installation



Non-unit 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.

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.

Using unit-mounted convenience outlet: 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.

Field Control Wiring —

The RAS unit requires an external temperature control device. This device can be a thermostat (field-supplied).

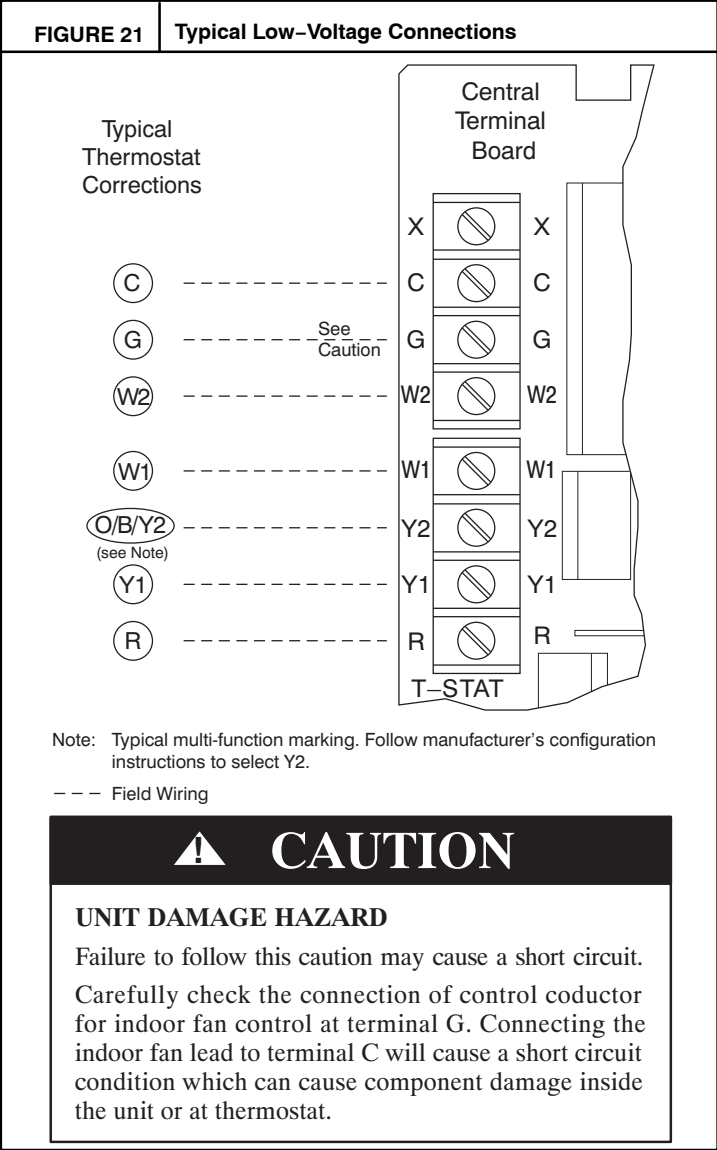
Thermostat —

Install an approved accessory thermostat according to installation instructions included with the accessory. For complete economizer function, select a two-stage cooling thermostat. 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.

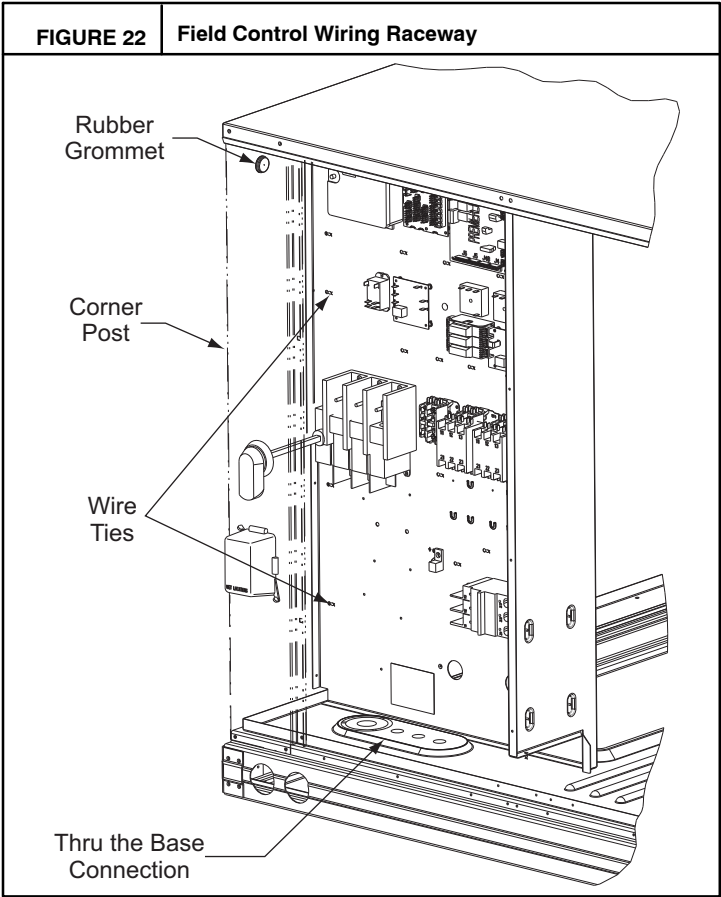
For wire runs up to 50 ft. (15 m), use no. 18 AWG (American Wire Gage) insulated wire (35°C minimum). For 50 to 75 ft. (15 to 23 m), use no. 16 AWG insulated wire (35°C minimum). For over 75 ft. (23 m), use no. 14 AWG insulated wire (35°C minimum). All wire sizes larger than no. 18 AWG cannot be directly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



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 insure separation of the field low voltage wire and the high voltage circuit. Route the low voltage wire to the central terminal board. See Fig. 22.

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



Heat Anticipator Settings —

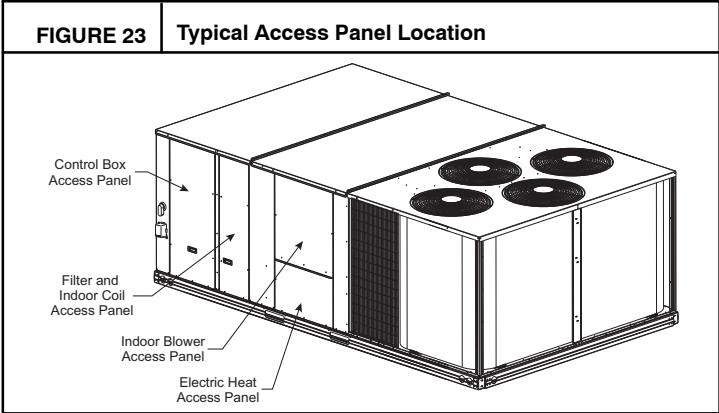
Set heat anticipator settings at 0.14 amp for the first stage and 0.14 amp for second-stage heating.

Transformer Connection for 208-v Power Supply —

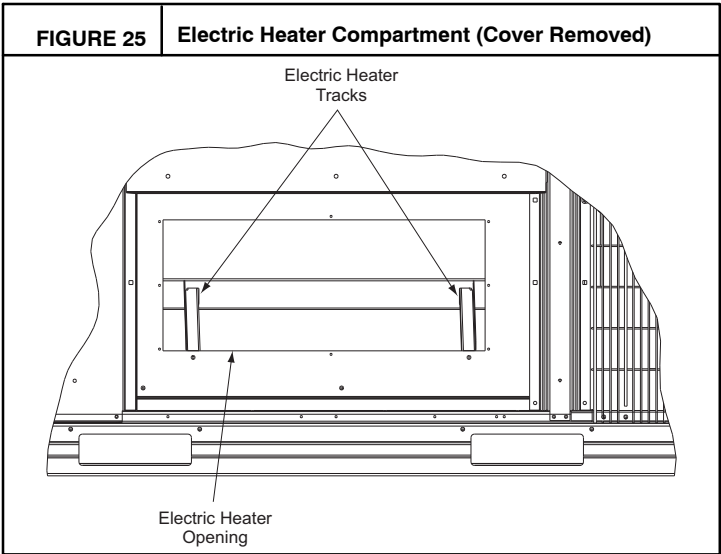
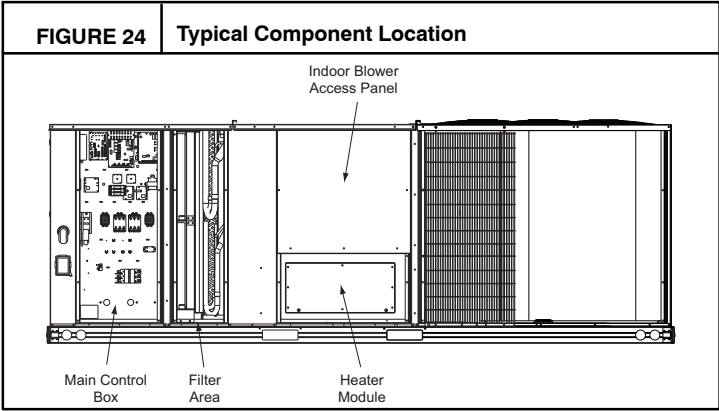
All units except 208/230-v units are factory wired for the voltage shown on the nameplate. *If the 208/230-v unit is to be connected to a 208-v power supply, the control transformer must be rewired by moving the black wire with the 1/4-in. female spade connector from the 230-v connection and moving it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

RAS 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. 23, Fig. 24 and Fig. 25. Refer to the Electric Heater Kit Installation Instructions for complete details.

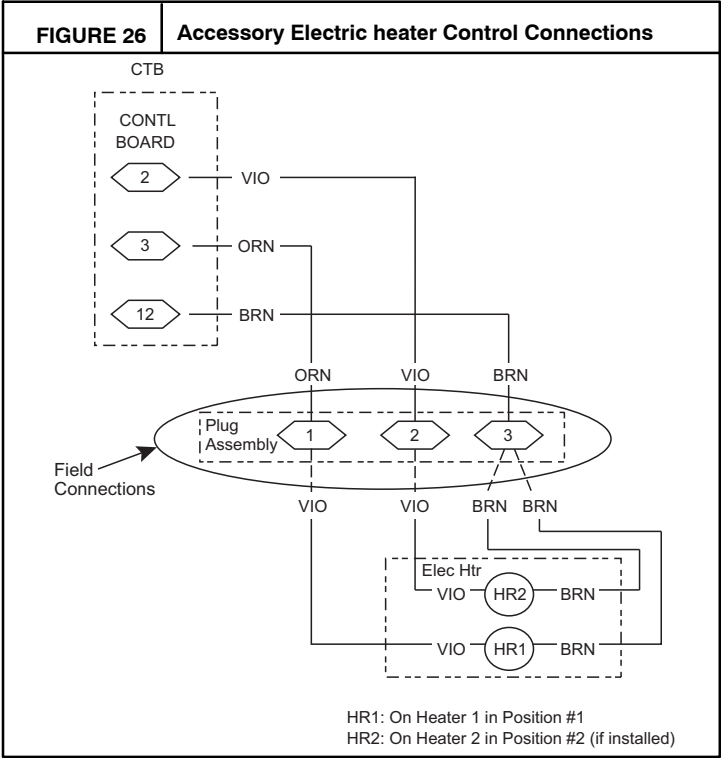


Not all available heater modules may be used in every unit. Use only those heater modules that are ETL listed for use in a specific size unit. Refer to the label on the unit cabinet for the list of approved heaters.



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.



Smoke Detectors

Smoke detectors are available as factory-installed options on RAS models. Smoke detectors may be specified for Supply Air only or for Return Air without or with economizer or in combination of Supply Air and Return Air. Return Air smoke detectors are arranged for vertical return configurations only. 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. 27. Its operating location is in the return air section of the unit (see Fig. 28, unit without economizer, or Fig. 29, unit with economizer), inserted into the return air sensor module housing which protrudes through the back of the control box.

FIGURE 27 Typical Supply Air Smoke Detector Sensor Location

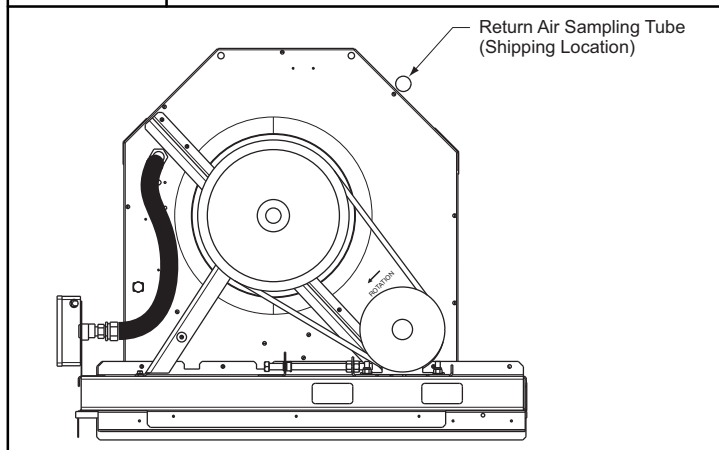


FIGURE 28 Return Air Sampling Tube Location in Unit Without Economizer

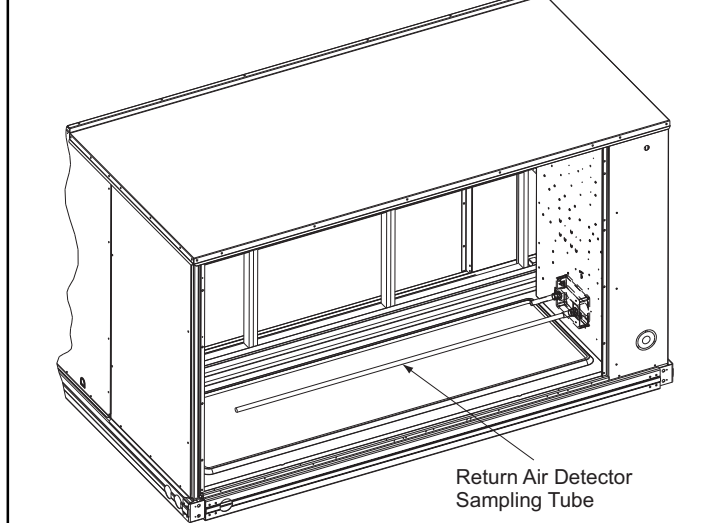
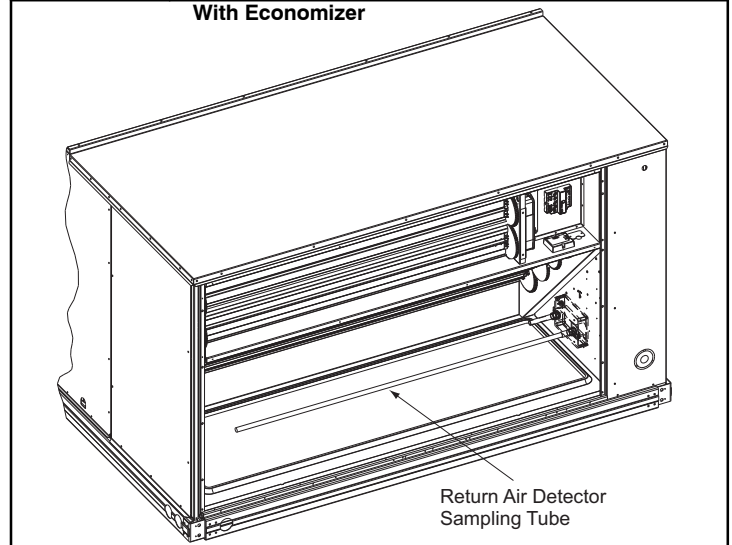


FIGURE 29

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. For vertical application, position the sampling holes on the bottom of the tube, facing into the bottom return duct opening. For horizontal application, position the sampling holes on the side of the tube, facing the unit's end panel.
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.

Table 2—Unit Wire/Fuse or HACR Breaker Sizing Data

UNIT RAS	NO M. V—Ph—HZ	IFM TYPE	ELEC. HTR			PE	NO C.O. or UNPWR C.O.							
			CRHEATER***A00	Nom (kW)	FLA	FL A	NO P.E.				w/ P.E. (pwrd fr/unit)			
							MCA	FUSE or HACR BRKR	DISC. SIZE		MCA	FUSE or HACR BRKR	DISC. SIZE	
									FLA	LRA			FLA	LRA
210, 213	208/230—3—60	STD	NONE	—	—	5.9	81.8	100.0	85	502	93.6	110.0	99	522
			279A00	18.8/25.0	52.1/60.1		81.8/87.9	100/100	85/85	502/502	93.6/102.6	110/110	99/99	522/522
			280A00	37.6/50.0	104.2/120.3		143.0/133.1	150/150	132/150	502/502	157.8/147.8	175/175	145/164	522/522
			281A00	56.3/75.0	156.4/180.4		169.2/193.2	200/225	192/219	502/502	183.9/207.9	200/225	205/233	522/522
		MED	NONE	—	—	5.9	86.6	100.0	91	511	98.4	125.0	105	531
			279A00	18.8/25.0	52.1/60.1		86.6/93.9	100/100	91/91	511/511	98.6/108.6	125/125	105/105	531/531
			280A00	37.6/50.0	104.2/120.3		149.0/139.1	150/175	137/156	511/511	163.8/153.8	175/175	151/169	531/531
			281A00	56.3/75.0	156.4/180.4		175.2/199.2	200/225	197/225	511/511	189.9/213.9	200/250	211/238	531/531
		HIGH	NONE	—	—	5.9	92.0	100.0	97	521	103.8	125.0	111	541
			279A00	18.8/25.0	52.1/60.1		92.0/100.6	100/110	97/97	521/521	105.4/115.4	125/125	111/111	541/541
			280A00	37.6/50.0	104.2/120.3		155.8/145.8	175/175	143/162	521/521	170.5/160.6	175/175	157/175	541/541
			281A00	56.3/75.0	156.4/180.4		181.9/205.9	200/250	203/231	521/521	196.7/220.7	200/250	217/244	541/541
	460—3—60	STD	NONE	—	—	3.1	43.1	50.0	45	252	49.3	60.0	52	264
			282A00	25.0	30.1		43.6	50.0	45	252	51.4	60.0	52	264
			283A00	50.0	60.1		66.1	80.0	75	252	73.9	80.0	82	264
			284A00	75.0	90.2		96.2	100	109	252	104.0	110	116	264
		MED	NONE	—	—	3.1	45.7	60.0	48	256	51.9	60.0	55	268
			282A00	25.0	30.1		46.9	60.0	48	256	54.6	60.0	55	268
			283A00	50.0	60.1		69.4	80.0	78	256	77.1	80.0	85	268
			284A00	75.0	90.2		99.5	110	112	256	107.2	125	119	268
		HIGH	NONE	—	—	3.1	48.5	60.0	51	261	54.7	60.0	58	273
			282A00	25.0	30.1		50.4	60.0	51	261	58.1	60	58	273
			283A00	50.0	60.1		72.9	80.0	81	261	80.6	90	88	273
			284A00	75.0	90.2		103.0	125	115	261	110.7	125	123	273
	575—3—60	STD	NONE	—	—	2.4	32.1	40.0	33	188	36.9	45.0	39	196
			285A00	24.8	23.9		33.4	40.0	33	188	39.4	45.0	39	196
			286A00	49.6	47.7		63.1	70.0	58	188	69.1	70.0	64	196
			287A00	74.4	71.6		75.1	80	86	188	81.1	90	91	196
		MED	NONE	—	—	2.4	34.9	45.0	37	202	39.7	50.0	42	210
			285A00	24.8	23.9		36.9	45.0	37	202	42.9	50.0	42	210
			286A00	49.6	47.7		66.6	70.0	61	202	72.6	80.0	67	210
			287A00	74.4	71.6		78.6	90	89	202	84.6	90	94	210
		HIGH	NONE	—	—	2.4	38.3	50.0	40	200	43.1	50.0	46	208
			285A00	24.8	23.9		41.1	50.0	40	200	47.1	50	46	208
			286A00	49.6	47.7		70.9	80.0	65	200	76.9	80	71	208
			287A00	74.4	71.6		82.9	90	93	200	88.9	90	98	208

NOTE:See page 23 for table legend and notes.

Table 2 – Unit Wire/Fuse or HACR Breaker Sizing Data (cont)

UNIT RAS	NO M. V—Ph—HZ	IFM TYPE	ELEC. HTR			PE	NO C.O. or UNPWR C.O.							
			CRHEATER***A00	Nom (kW)	FLA	FL A	NO P.E.				w/ P.E. (pwrdr fr/unit)			
							MCA	FUSE or HACR BRKR	DISC. SIZE		MCA	FUSE or HACR BRKR	DISC. SIZE	
									FLA	LRA			FLA	LRA
240, 243	208/230—3—60	STD	NONE	—	—	5.9	110.6	150.0	113	534	122.4	150.0	127	554
			279A00	18.8/25.0	52.1/60.1		110.6/110.6	150/150	113/113	534/534	122.4/122.4	150/150	127/127	554/554
			280A00	37.6/50.0	104.2/120.3		149.0/139.1	150/175	137/156	534/534	163.8/153.8	175/175	151/169	554/554
			281A00	56.3/75.0	156.4/180.4		175.2/199.2	200/225	197/225	534/534	189.9/213.9	200/250	211/238	554/554
		MED	NONE	—	—	5.9	116.0	150.0	120	544	127.8	175	133	564
			279A00	18.8/25.0	52.1/60.1		116.0/116.0	150/150	120/120	544/544	127.8/127.8	175/175	133/133	564/564
			280A00	37.6/50.0	104.2/120.3		155.8/145.8	175/175	143/162	544/544	170.5/160.6	175/175	157/175	564/564
			281A00	56.3/75.0	156.4/180.4		181.9/205.9	200/250	203/231	544/544	196.7/220.7	200/250	217/244	564/564
		HIGH	NONE	—	—	5.9	128.7	175.0	134	618	140.5	175.0	148	638
			279A00	18.8/25.0	52.1/60.1		128.7/128.7	175/175	134/134	618/618	140.5/140.5	175/175	148/148	638/638
			280A00	37.6/50.0	104.2/120.3		171.6/161.7	175/175	158/176	618/618	186.4/176.4	200/200	171/190	638/638
			281A00	56.3/75.0	156.4/180.4		197.8/221.8	225/250	218/246	618/618	212.5/236.5	225/250	231/259	638/638
	460—3—60	STD	NONE	—	—	3.1	49.0	60.0	51	269	55.2	60.0	58	281
			282A00	25.0	30.1		49.0	60.0	51	269	55.2	60.0	58	281
			283A00	50.0	60.1		69.4	80.0	78	269	77.1	80.0	85	281
			284A00	75.0	90.2		99.5	110	112	269	107.2	125	119	281
		MED	NONE	—	—	3.1	51.8	60.0	54	274	58	70	61	286
			282A00	25.0	30.1		51.8	60.0	54	274	58.1	70	61	286
			283A00	50.0	60.1		72.9	80.0	81	274	80.6	90	88	286
			284A00	75.0	90.2		103.0	125	115	274	110.7	125	123	286
		HIGH	NONE	—	—	3.1	57.8	70.0	61	311	64.0	80.0	68	323
			282A00	25.0	30.1		57.9	70.0	61	311	65.6	80	68	323
			283A00	50.0	60.1		80.4	90.0	88	311	88.1	100	95	323
			284A00	75.0	90.2		110.5	125	122	311	118.2	125	129	323
	575—3—60	STD	NONE	—	—	2.4	38.6	50.0	40	224	43.4	50.0	46	232
			285A00	24.8	23.9		38.6	50.0	40	224	43.4	50.0	46	232
			286A00	49.6	47.7		66.6	70.0	61	224	72.6	80.0	67	232
			287A00	74.4	71.6		78.6	90	89	224	84.6	90	94	232
		MED	NONE	—	—	2.4	42.0	50.0	44	222	46.8	60	50	230
			285A00	24.8	23.9		42.0	50.0	44	222	47.1	60	50	230
			286A00	49.6	47.7		70.9	80.0	65	222	76.9	80	71	230
			287A00	74.4	71.6		82.9	90	93	222	88.9	90	98	230
		HIGH	NONE	—	—	2.4	42.5	50.0	45	249	47.3	60.0	50	257
			285A00	24.8	23.9		42.5	50.0	45	249	47.8	60	50	257
			286A00	49.6	47.7		71.5	80.0	66	249	77.5	80	71	257
			287A00	74.4	71.6		83.5	90	93	249	89.5	100	99	257

NOTE:See page 23 for table legend and notes.

Table 2 – Unit Wire/Fuse or HACR Breaker Sizing Data (cont)

UNIT RAS	NO M. V—Ph—HZ	IFM TYPE	ELEC. HTR			PE	NO C.O. or UNPWR C.O.							
			CRHEATER***A00	Nom (kW)	FLA	FL A	NO P.E.				w/ P.E. (pwrdr fr/unit)			
							MCA	FUSE or HACR BRKR	DISC. SIZE		MCA	FUSE or HACR BRKR	DISC. SIZE	
									FLA	LRA			FLA	LRA
300, 303	208/230—3—60	STD	NONE	—	—	5.9	129.2	175.0	135	584	141.0	175.0	148	604
			279A00	18.8/25.0	52.1/60.1		129.2/129.2	175/175	135/135	584/584	141.0/141.0	175/175	148/148	604/604
			280A00	37.6/50.0	104.2/120.3		149.0/139.1	175/175	137/156	584/584	163.8/153.8	175/175	151/169	604/604
			281A00	56.3/75.0	156.4/180.4		175.2/199.2	200/225	197/225	584/584	189.9/213.9	200/250	211/238	604/604
		MED	NONE	—	—	5.9	134.6	175.0	141	594	146.4	175.0	155	614
			279A00	18.8/25.0	52.1/60.1		134.6/134.6	175/175	141/141	594/594	146.4/146.4	175/175	155/155	614/614
			280A00	37.6/50.0	104.2/120.3		155.8/145.8	175/175	143/162	594/594	170.5/160.6	175/175	157/175	614/614
			281A00	56.3/75.0	156.4/180.4		181.9/205.9	200/250	203/231	594/594	196.7/220.7	200/250	217/244	614/614
		HIGH	NONE	—	—	5.9	147.3	175.0	156	668	159.1	200.0	169	688
			279A00	18.8/25.0	52.1/60.1		147.3/147.3	175/175	156/156	668/668	159.1/159.1	200/200	169/169	688/688
			280A00	37.6/50.0	104.2/120.3		171.6/161.7	175/175	158/176	668/668	186.4/176.4	200/200	171/190	688/688
			281A00	56.3/75.0	156.4/180.4		197.8/221.8	225/250	218/246	668/668	212.5/236.5	225/250	231/259	688/688
	460—3—60	STD	NONE	—	—	3.1	52.9	60.0	55	299	59.1	70.0	63	311
			282A00	25.0	30.1		52.9	60.0	55	299	59.1	70.0	63	311
			283A00	50.0	60.1		69.4	80.0	78	299	77.1	80.0	85	311
			284A00	75.0	90.2		99.5	110	112	299	107.2	125	119	311
		MED	NONE	—	—	3.1	55.7	70.0	59	304	61.9	80.0	66	316
			282A00	25.0	30.1		55.7	70.0	59	304	61.9	80.0	66	316
			283A00	50.0	60.1		72.9	80.0	81	304	80.6	90.0	88	316
			284A00	75.0	90.2		103.0	125	115	304	110.7	125	123	316
		HIGH	NONE	—	—	3.1	61.7	80.0	66	341	67.9	80.0	73	353
			282A00	25.0	30.1		61.7	80.0	66	341	67.9	80.0	73	353
			283A00	50.0	60.1		80.4	90.0	88	341	88.1	100.0	95	353
			284A00	75.0	90.2		110.5	125	122	341	118.2	125	129	353
	575—3—60	STD	NONE	—	—	2.4	41.1	50.0	43	244	45.9	60.0	49	252
			285A00	24.8	23.9		41.1	50.0	43	244	45.9	60.0	49	252
			286A00	49.6	47.7		66.6	70.0	61	244	72.6	80.0	67	252
			287A00	74.4	71.6		78.6	90	89	244	84.6	90	94	252
		MED	NONE	—	—	2.4	44.5	50.0	47	242	49.3	60.0	52	250
			85A00	24.8	23.9		44.5	50.0	47	242	49.3	60.0	52	250
			286A00	49.6	47.7		70.9	80.0	65	242	76.9	80.0	71	250
			287A00	74.4	71.6		82.9	90	93	242	88.9	90	98	250
		HIGH	NONE	—	—	2.4	45.0	50.0	47	269	49.8	60.0	53	277
			285A00	24.8	23.9		45.0	50.0	47	269	49.8	60.0	53	277
			286A00	49.6	47.7		71.5	80.0	66	269	77.5	80.0	71	277
			287A00	74.4	71.6		83.5	90	93	269	89.5	100	99	277

NOTE: See page 23 for table legend and notes.

Legend and Notes for Table 2

LEGEND:

- BRKR - Circuit breaker
- CO - Convenience outlet
- DISC - Disconnect
- FLA - Full load amps
- LRA - Locked rotor amps
- MCA - Minimum circuit amps
- PE - Power exhaust
- UNPWR CO - Unpowered convenient outlet



NOTES:

- In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker.
- Unbalanced 3-Phase Supply Voltage**
Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance.

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

Example: Supply voltage is 230-3-60



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

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.

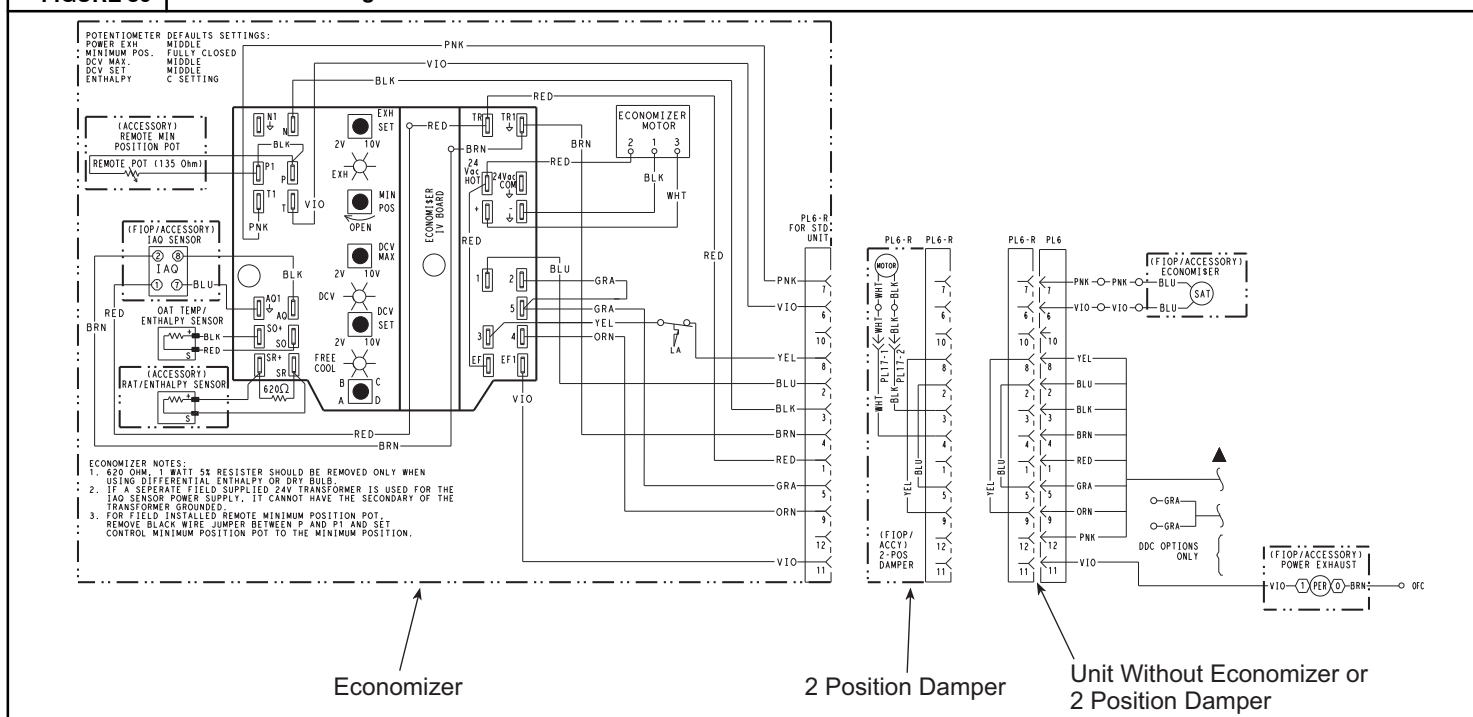
Determine percent of voltage imbalance.

% Voltage Imbalance = 100 x $\frac{4}{227}$
= 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.

FIGURE 30 Economizer Wiring



Step 11 — Adjust Factory-Installed Options

Smoke Detectors —

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

EconoMi\$er IV Occupancy Switch —

Refer to Fig. 66 for general EconoMi\$er 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.

Step 12 — Install Accessories

Available accessories include:

- Roof Curb
- Manual outside air damper
- Two-Position motorized outside air damper

EconoMi\$er IV (with control and integrated barometric relief)

Power Exhaust

Differential dry-bulb sensor (EconoMi\$er IV)

Outdoor enthalpy sensor

Differential enthalpy sensor

Electric Heaters

Single Point kits

Low Ambient Controls

Thermostat / Sensors

CO₂ sensor

Louvered hail guard

Phase monitor control

Winter Start kit

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

Pre-Start and Start-Up

This completes the mechanical installation of the unit. Refer to the unit's Service and Maintenance manual for detailed Pre-Start and Start-up instructions.