INSTALLATION INSTRUCTIONS

R–410A Single Package Rooftop Gas/Electric RGH181–303

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

⚠ 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.

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

FIRE, EXPLOSION HAZARD

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

Disconnect gas piping from unit when leak testing at pressure greater than 0.5 psig (3450 Pa). Pressures greater than 0.5 psig (3450 Pa) will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig (3450 Pa), it must be replaced before use. When pressure testing field−supplied gas piping at pressures of 0.5 psig (3450 Pa) or less, a unit connected to such piping must be isolated by closing the manual gas valve.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Before performing service or maintenance operations on unit, always turn off main power switch to unit and install lockout tag. 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.

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

⚠ CAUTION

CUT HAZARD

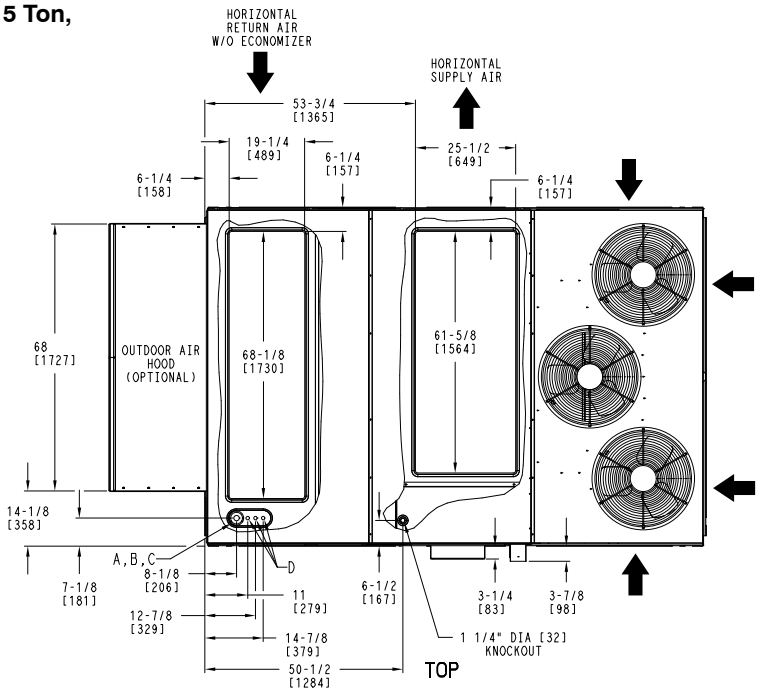
Failure to follow this caution may result in personal injury.

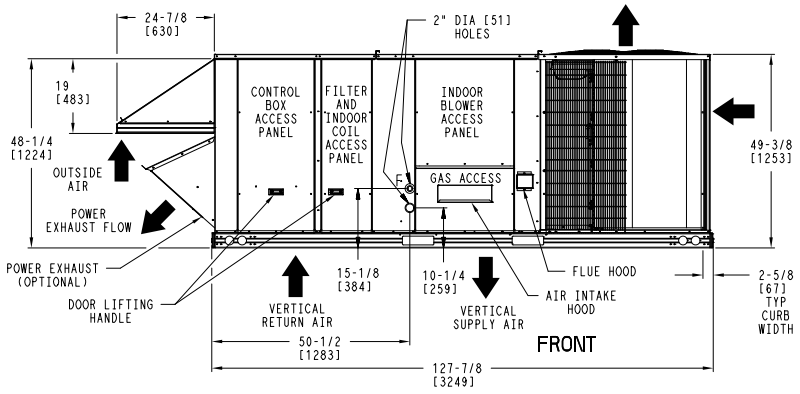
Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing air conditioning units.

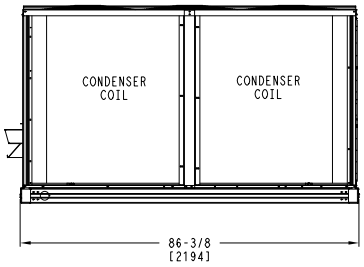
FIGURE 1 Unit Dimensional Drawing: 15 Ton, RGH181, 183

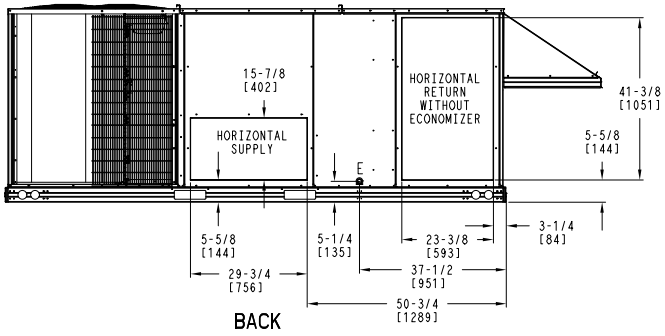
NOTES:

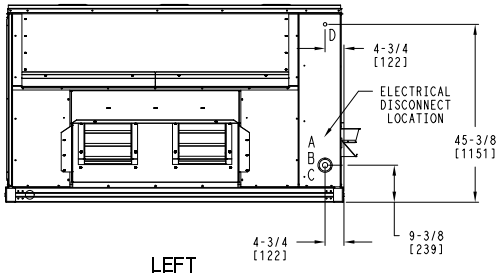
1. DIMENSIONS ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY
3. ➡ DIRECTION OF AIR FLOW





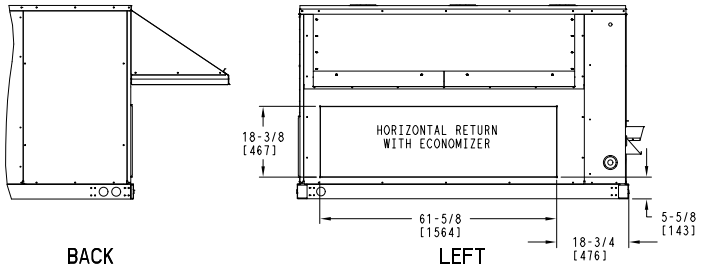






(HORIZONTAL DISCHARGE W/O ECON)
(WHEN ORDERED)

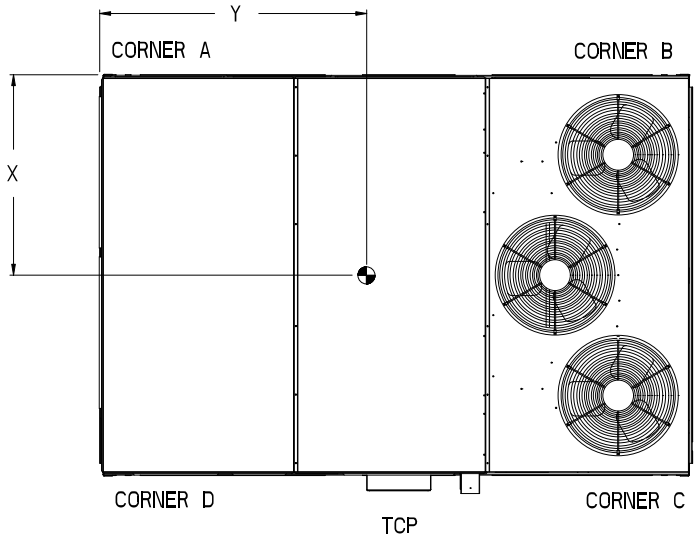
	Connection Sizes
A	1-3/8" [35] DIA Field Power Supply Hole
B	3" [76] Field Power Supply Knockout
C	3-5/8" [92] Field Power Supply Knockout
D	7/8" [22] Field Control Wiring Hole
E	3/4" 14 NPT Condensate Drain
F	3/4" 14 NPT Gas Connection (Not Shown)



(HORIZONTAL DISCHARGE W/ ECON)
(WHEN ORDERED)

Fig. 1 – Unit Dimensional Drawing – 15 Ton
RGH181, 183

	Unit Weight		Corner Weight (A)		Corner Weight (B)		Corner Weight (C)		Corner Weight (D)		C.G.		
Unit Size	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	X	Y	Z
15 Ton	1892	860	401	182	449	204	565	257	505	230	48 [1219]	67-3/8 [1711]	16-1/2 [419]



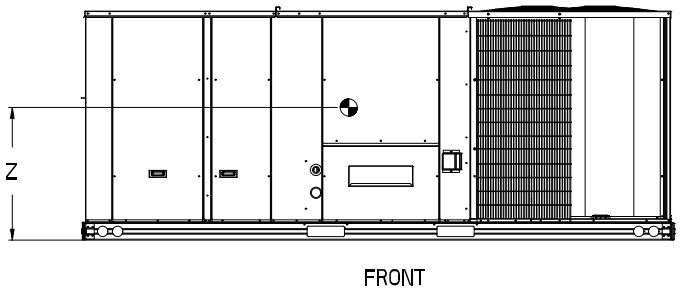
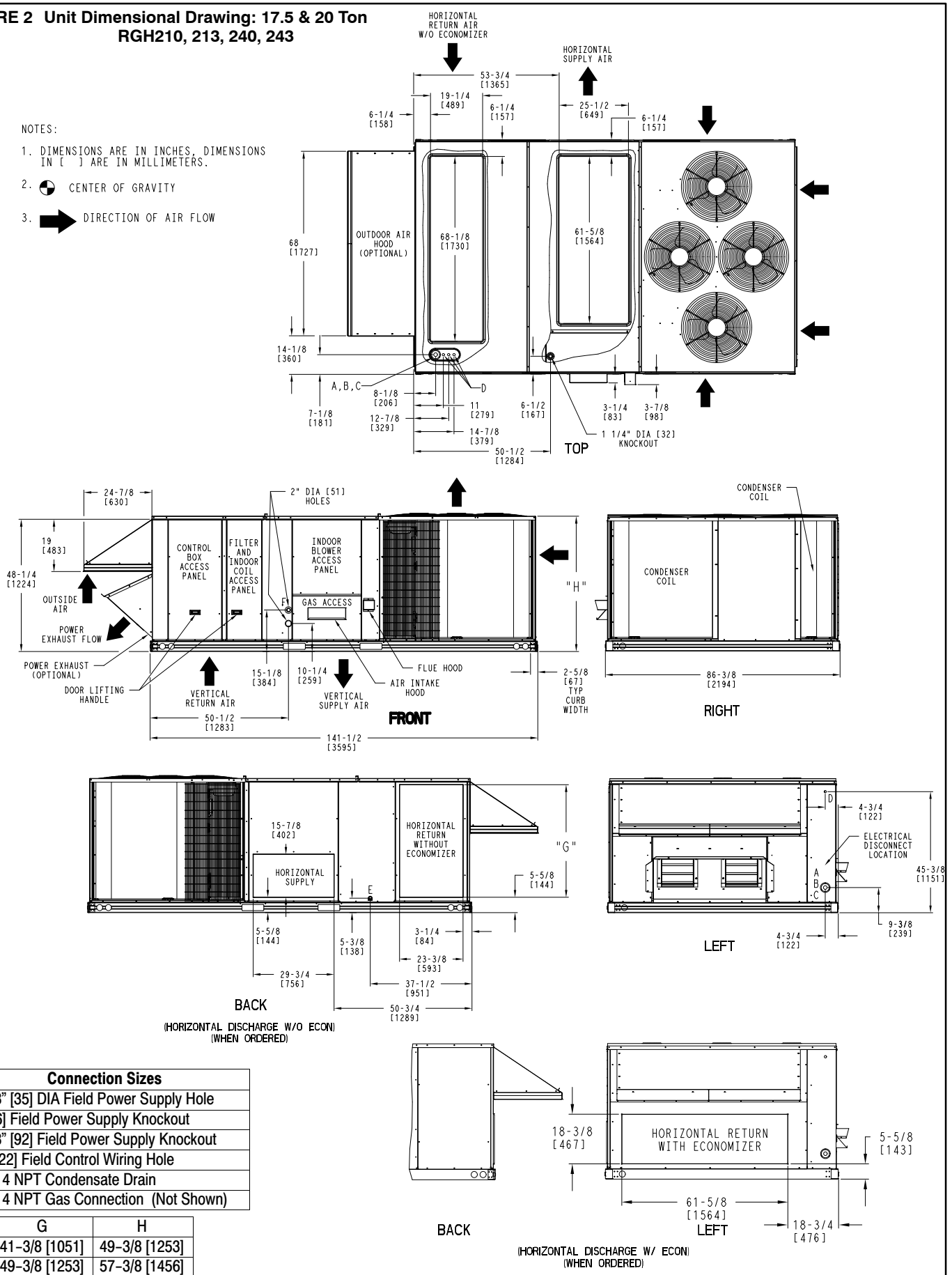


FIGURE 2 Unit Dimensional Drawing: 17.5 & 20 Ton RGH210, 213, 240, 243



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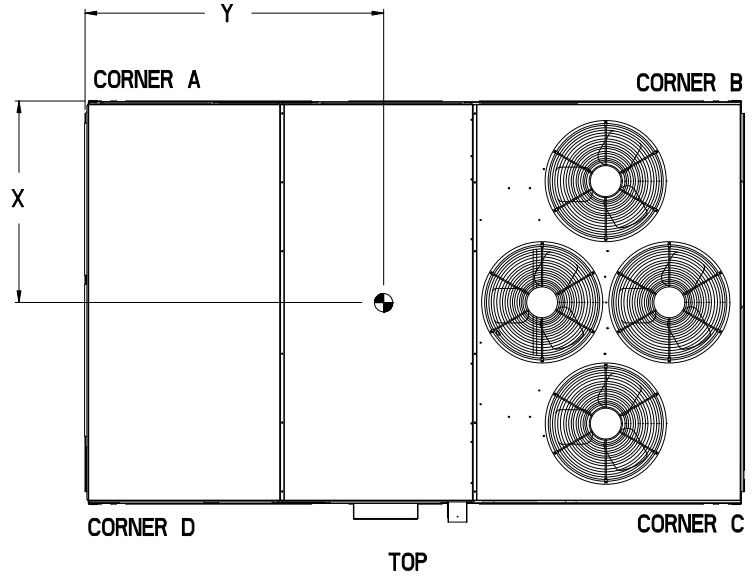
E	3/4" 14 NPT Condensate Drain
F	3/4" 14 NPT Gas Connection (Not Shown)

UNIT	G	H
17.5Ton	41-3/8 [1051]	49-3/8 [1253]
20 ton	49-3/8 [1253]	57-3/8 [1456]

Fig. 2 – Unit Dimensional Drawing – 17.5 & 20 Ton, RGH210, 213, 240, 243

	Unit Weight		Corner Weight (A)		Corner Weight (B)		Corner Weight (C)		Corner Weight (D)		C.G.		
Unit Size	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	X	Y	Z
17.5 Ton	2102	956	474	215	390	177	593	269	582	265	47-1/2 [1207]	71-1/4 [1810]	16-1/2 [419]
20 Ton	2247	1021	540	246	556	253	598	272	581	264	44-5/8 [1133]	71-5/8 [1819]	19 [483]



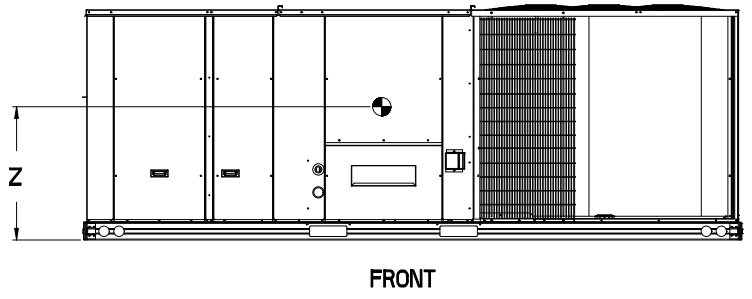
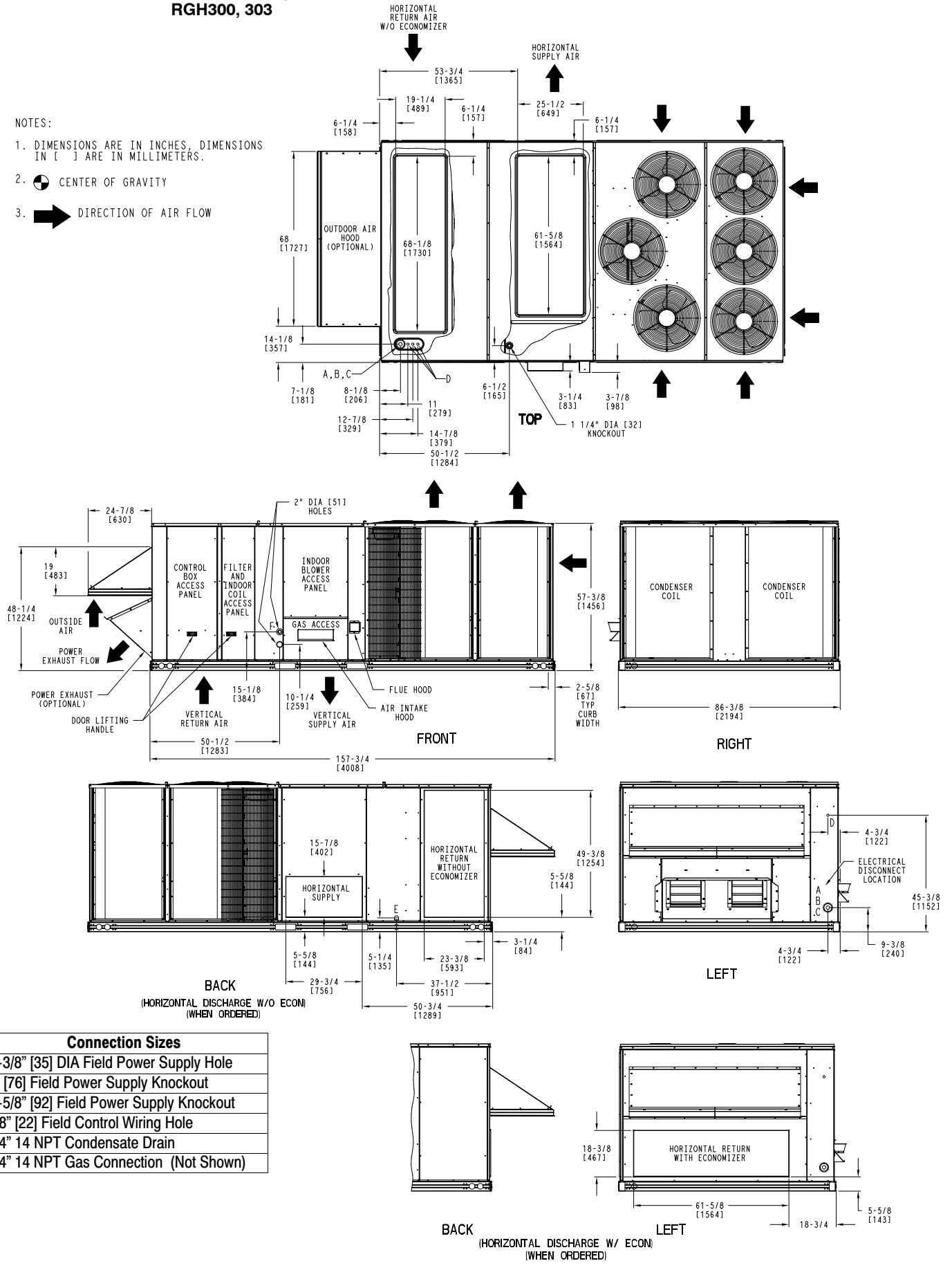


FIGURE 3 Unit Dimensional Drawing: 25 Ton, RGH300, 303

NOTES:

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



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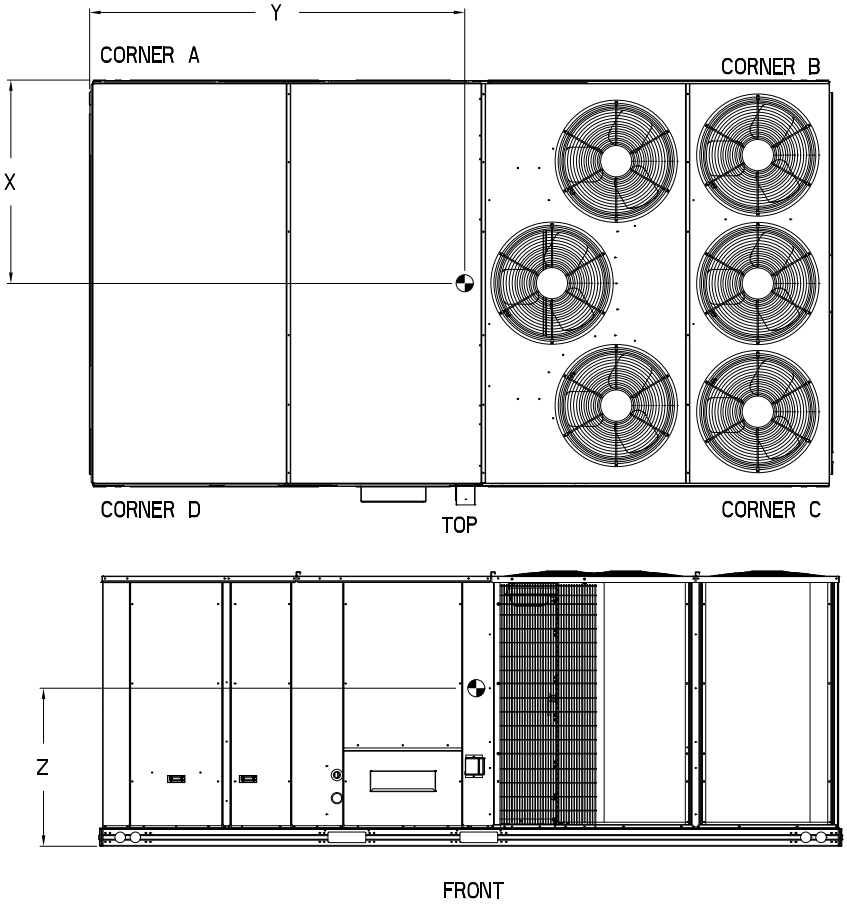
D	7/8" [22] Field Control Wiring Hole
E	3/4" 14 NPT Condensate Drain
F	3/4" 14 NPT Gas Connection (Not Shown)

Fig. 3 – Unit Dimensional Drawing – 25 Ton, RGH300, 303

	Unit Weight		Corner Weight (A)		Corner Weight (B)		Corner Weight (C)		Corner Weight (D)		C.G.		
Unit Size	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	X	Y	Z
25 Ton	2292	1042	577	262	559	254	583	265	602	274	44 [1118]	77-1/2 [1969]	19 [493]

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



INSTALLATION

Jobsite Survey

Complete the following checks before installation.

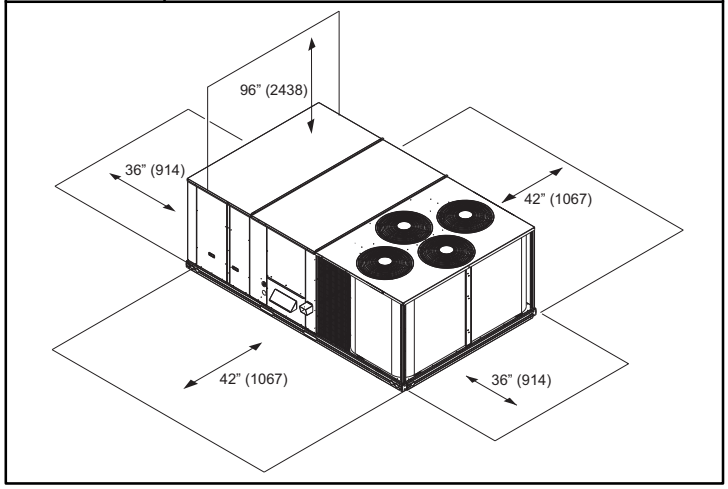
1. Consult local building codes and the NEC (National Electrical Code) ANSI/NFPA 70 for special installation requirements.
2. Determine unit location (from project plans) or select unit location.
3. Check for possible overhead obstructions which may interfere with unit lifting or rigging.

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. 4.

NOTE:Consider also the effect of adjacent units.

FIGURE 4 **Service Clearance Dimansional Drawing**



Be sure that the unit is installed such that snow will not block the combustion air intake or flute outlet.

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. For proper unit operation, adequate combustion and ventilation air must be provided in accordance with Section 5.3 (Air for Combustion and Ventilation) of the National Fuel Gas Code, ANSI Z223.1 (American National Standards Institute) and NFPA (National Fire Protection Association) 54 TIA–54–84–1. In Canada, installation must be in accordance with the CAN1–B149 installation codes for gas burning appliances.

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

Locate mechanical draft system flue assembly at least 4 ft (1.2 m) from any opening through which combustion products could enter the building, and at least 4 ft (1.2 m) from any adjacent building (or per local code). Locate the flue assembly at least 10 ft (3.05 m) from an adjacent unit's fresh air intake hood if within 3 ft (0.91 m) of same elevation (or per local code). When unit is located adjacent to public walkways, flue assembly must be at least 7 ft (2.1 m) above grade.

Select a unit mounting system that provides adequate height to allow installation of condensate trap per requirements. Refer to Step 11 — 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

RGH	UNIT LB (KG)			
Component	181 / 183	210 / 213	240 / 243	300 / 303
Base Unit	1892 (858)	2102 (954)	2247 (1019)	2292 (1040)
Economizer	245 (111)	245 (111)	245 (111)	245 (111)
Powered Outlet	32 (15)	32 (15)	32 (15)	32 (15)
Curb				
14–in/356 mm	273 (124)	273 (124)	273 (124)	273 (124)
24–in/610 mm	350 (159)	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 combustion air hood
Install flue hood
Install gas piping
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 combustion air hood
Install flue hood
Install gas piping
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, 7 and 8. 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, 7 and 8. Improperly applied gasket can also result in air leaks and poor unit performance.

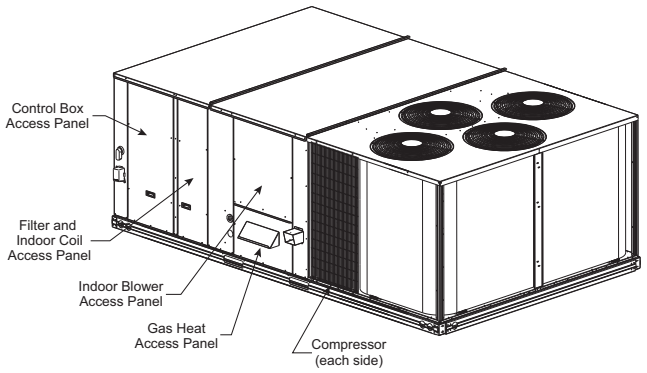
Curb should be level. This is necessary for unit drain to function properly. Unit leveling tolerances are show in Fig. 9. Refer to Accessory Roof Curb Installation Instructions for additional information as required.

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 field−installed thru−the−roof curb gas connections are desired remove knockout in basepan located in the gas section, see Fig. 17 for location. Gas connections and power connections to the unit must be field installed after the unit is installed 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, 2, or 3 for basepan knockout locations for location. Attach the service connections to the basepan. Fittings are field supplied.

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

FIGURE 5 **Typical Access Panel and Compressor 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.

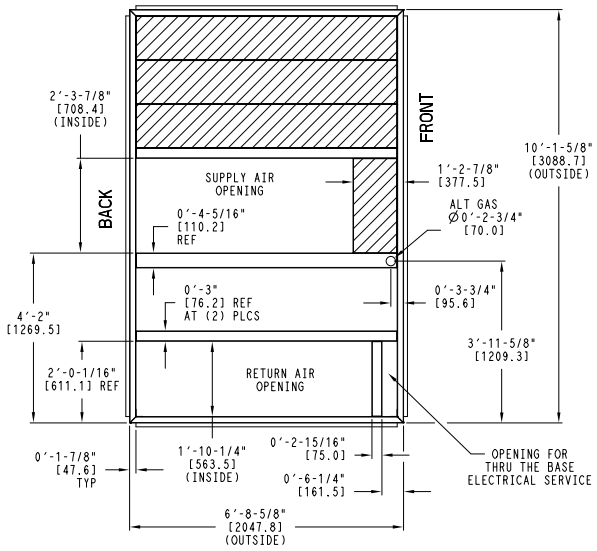
NOTE:Horizontal units may be installed on a roof curb if required.

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.

FIGURE 6 **Roof Curb Details – 15 Ton Units, RGH181, 183**

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



NOTES:

1 ROOF CURB ACCESSORY IS SHIPPED UNASSEMBLED.

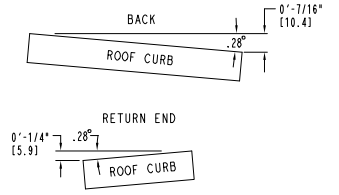
2 DIMENSIONS IN [ ] ARE IN MILLIMETERS.

3 ROOF CURB GALVANIZED STEEL.

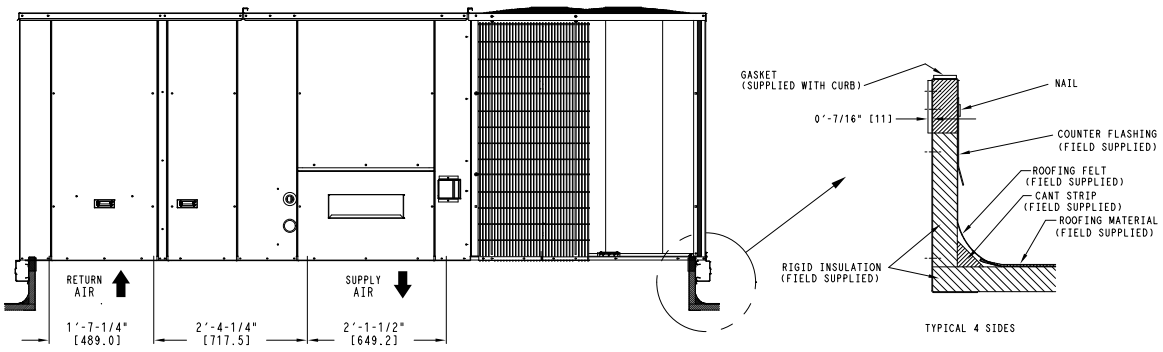
4 ATTACH DUCTWORK TO CURB (FLANGES ON DUCT REST ON CURB)

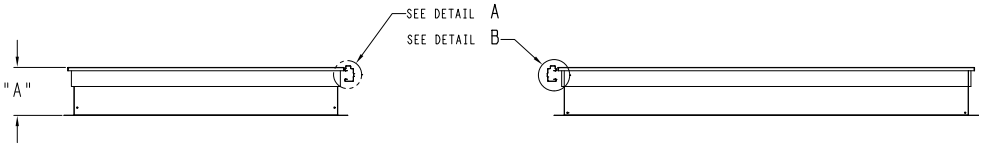
5 SERVICE CLEARANCE 4 ft ON EACH SIDE

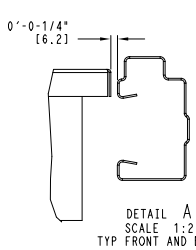
➡ DIRECTION OF AIR FLOW

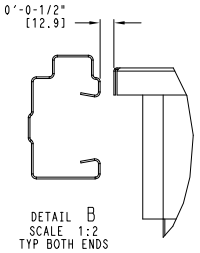


MAX CURB LEVELING TOLERANCES









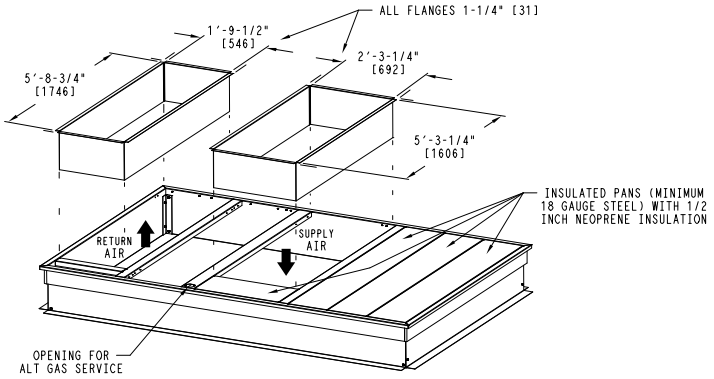
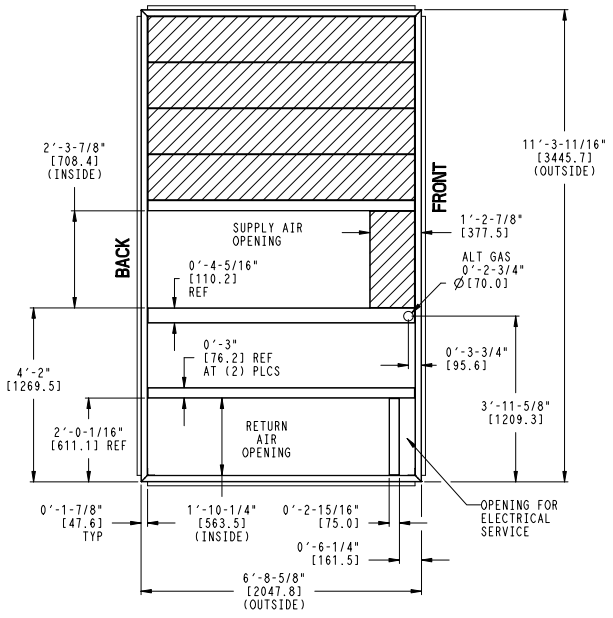


FIGURE 7 **Roof Curb Details – 17.5 & 20 Ton Units, RGH210, 213, 240, 243**

UNIT SIZE	"A"	ROOF CURB ACCESSORY
17.5, 20	1′-2" [356.0] 2′-0" [610.0]	CRRFCURB047A00 CRRFCURB048A00



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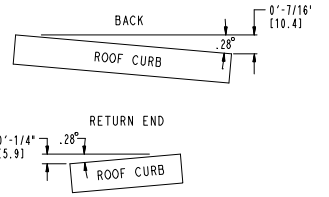
2 DIMENSIONS IN [ ] ARE IN MILLIMETERS.

3 ROOF CURB GALVANIZED STEEL.

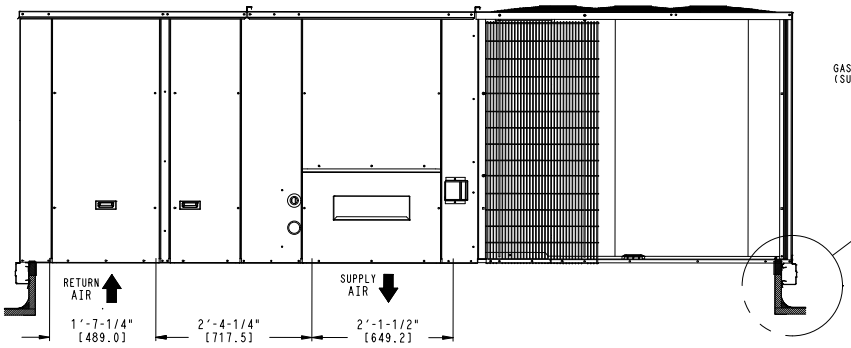
4 ATTACH DUCTWORK TO CURB (FLANGES ON DUCT REST ON CURB)

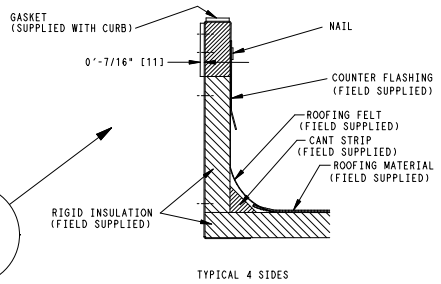
5 SERVICE CLEARANCE 4 ft ON EACH SIDE

DIRECTION OF AIR FLOW

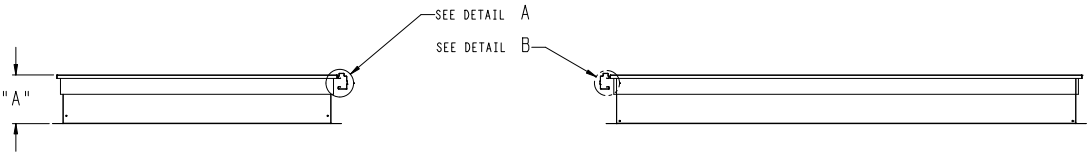


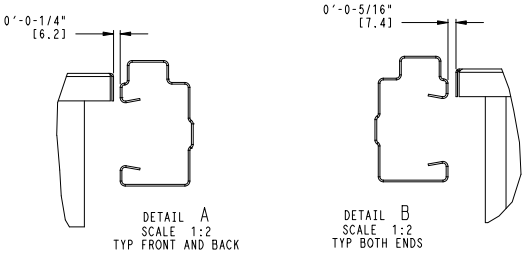
MAX CURB LEVELING TOLERANCES





TYPICAL 4 SIDES





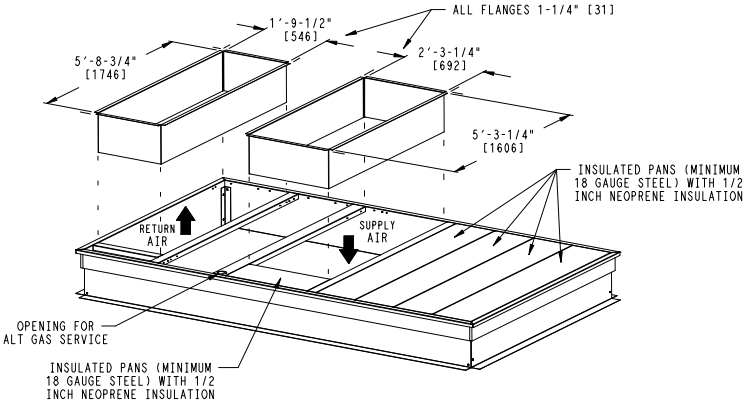
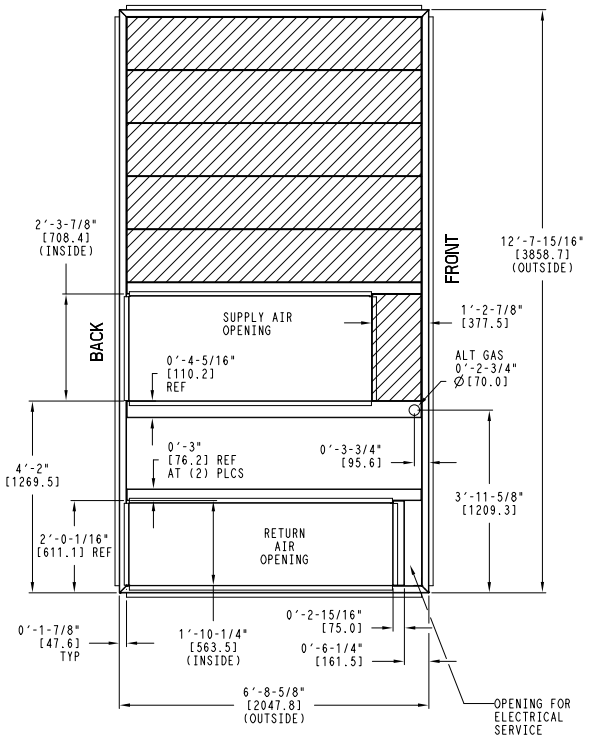


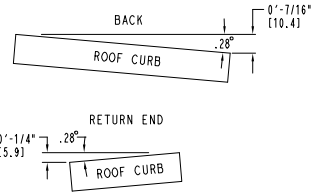
FIGURE 8 **Roof Curb Details – 25 Ton Units, RGH300, 303**

UNIT SIZE	"A"	ROOF CURB ACCESSORY
25	1′-2" [356.0] 2′-0" [610.0]	CRRFCURB049A00 CRRFCURB050A00

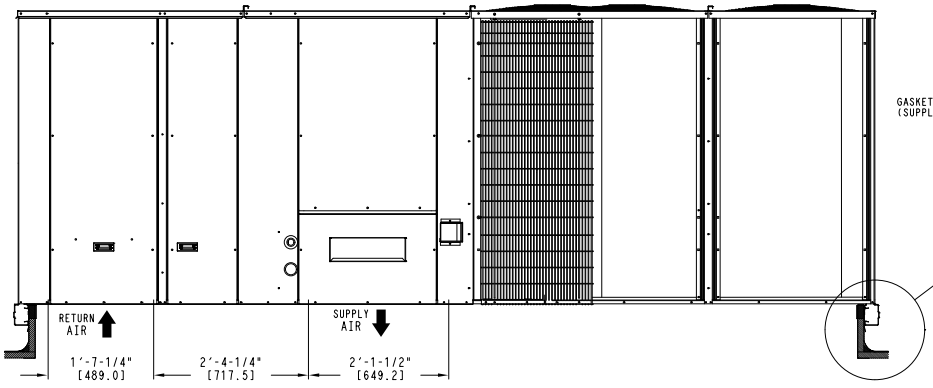


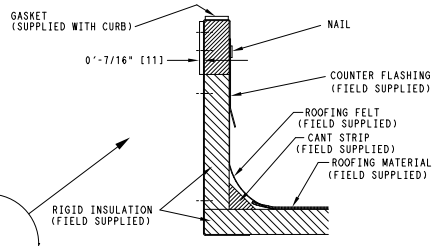
NOTES:
1 ROOF CURB ACCESSORY IS SHIPPED UNASSEMBLED.
2 BOLT HEADS TO BE ON INSIDE OF FLANGE. CLEARANCE IS [11] 0-0-7/16" TYP ALL CORNERS.
3 DIMENSIONS IN [ ] ARE IN MILLIMETERS.
4 ROOF CURB GALVANIZED STEEL.
5 ATTACH DUCTWORK TO CURB (FLANGES ON DUCT REST ON CURB)
6 SERVICE CLEARANCE 4 ft ON EACH SIDE
7 GAS SERVICE PLATE IS PART OF A SEPERATELY SHIPPED ACCESSORY PACKAGE.
8 GAS SERVICE PLATE CAN BE USED WITH EITHER ACCESSORY ROOFCURB.

➡ DIRECTION OF AIR FLOW

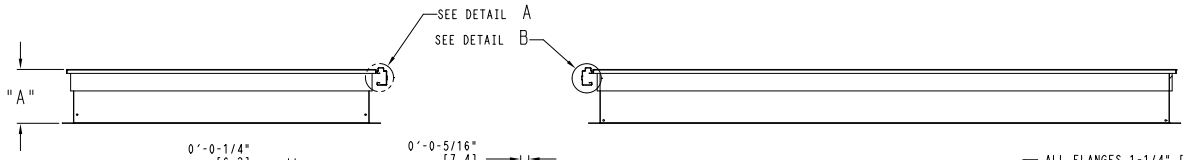


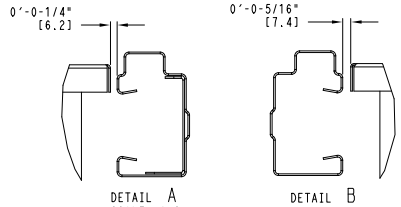
MAX CURB LEVELING TOLERANCES





TYPICAL 4 SIDES





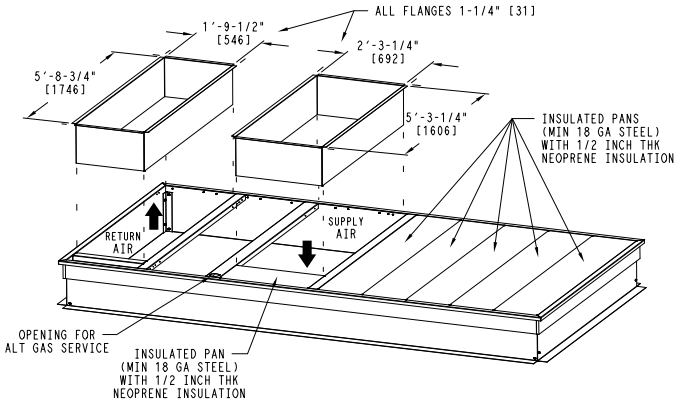
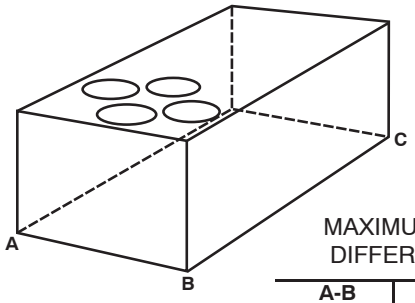


FIGURE 9 Unit Leveling Tolerances



MAXIMUM ALLOWABLE DIFFERENCE IN. (MM)

A-B	B-C	A-C
0.25” (6)	0.5” (12)	0.5” (12)

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.

A minimum clearance is not required around ductwork.

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

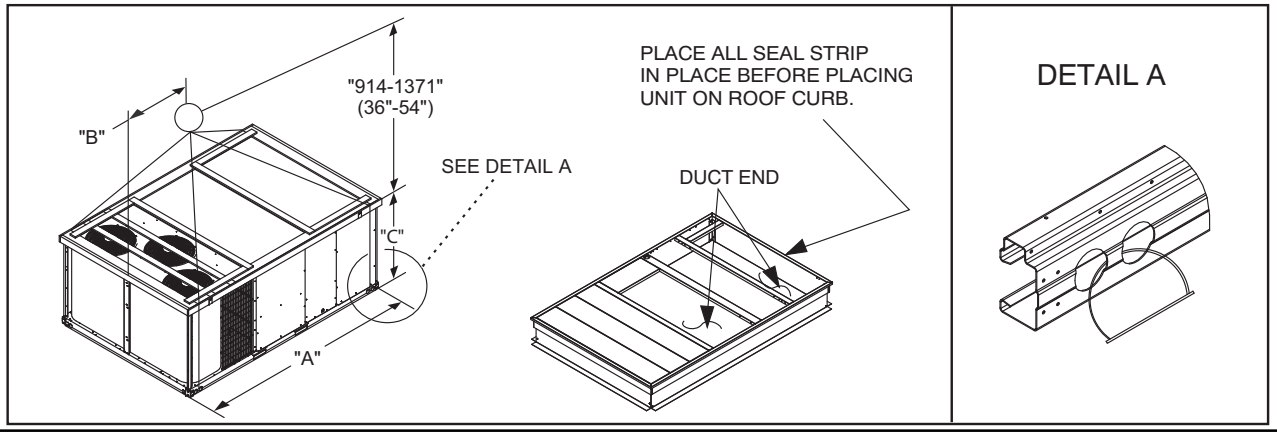
UNIT DAMAGE HAZARD

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.

FIGURE 10 Rigging Details



UNIT RGH	MAX WEIGHT		DIMENSIONS					
			A		B		C	
	LB	KG	IN	MM	IN	MM	IN	MM
181/183	2256	1023	127.8	3249	58.7	1491	52.3	1328
210/213	2466	1119	141.5	3595	71.5	1816	52.3	1328
240/243	2611	1184	141.5	3595	71.5	1816	60.3	1532
300/303	2656	1205	157.8	4007	80.3	2040	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.

Positioning on Curb —

Position unit on roof curb so that the following clearances are maintained: $^1/_4$ in. (6 mm) clearance between the roof curb and the base rail inside the right and left, $^1/_2$ 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 Details A and B in Figs. 6, 7 and 8.

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.

Flue vent discharge must have a minimum horizontal clearance of 48 in. (1220 mm) from electric and gas meters, gas regulators, and gas relief equipment. Minimum distance between unit and other electrically live parts is 48 inches (1220 mm).

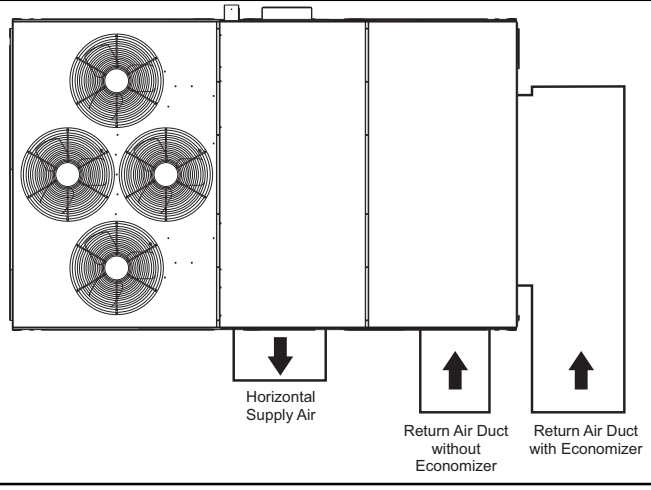
Flue gas can deteriorate building materials. Orient unit such that flue gas will not affect building materials. Locate mechanical draft system flue assembly at least 48 in. (1220 mm) from an adjacent building or combustible material.

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

Step 7 — Horizontal Duct Connection

Refer to Figs. 1, 2 and 3 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.

FIGURE 11 **Horizontal Duct Opening Dimensions**



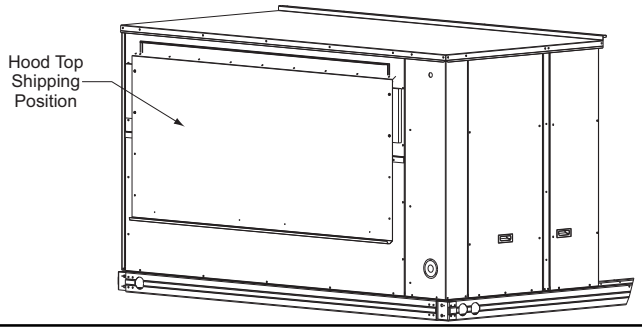
	Supply	Return without Economizer	Return with Economizer
Location	Back	Back	Left end
Height – In. (mm)	$15^7/_8$ (402)	$49^3/_8$ (1253)	$18^3/_8$ (467)
Width – in. (mm)	$29^3/_4$ (756)	$23^3/_8$ (593)	$61^5/_8$ (1564)

Field–supplied ($^3/_4$–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.

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).

FIGURE 12 **Hood Top – Shipping Position**

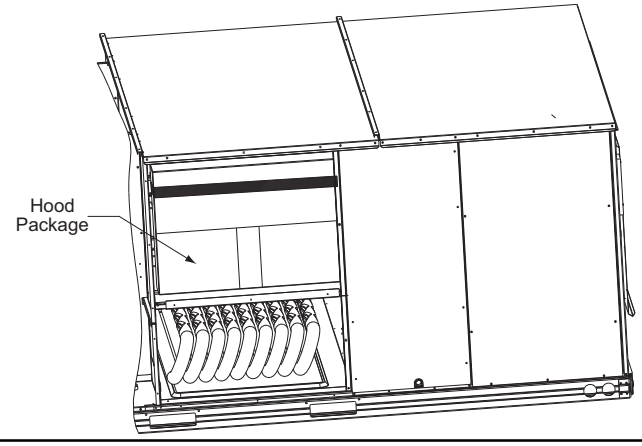


To remove the hood parts package:

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.

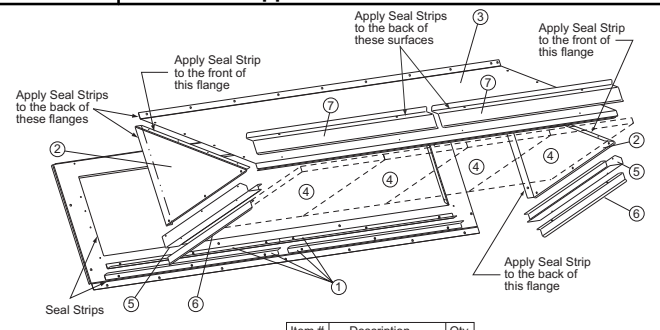
FIGURE 13 **Hood Package – Shipping Location**



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).

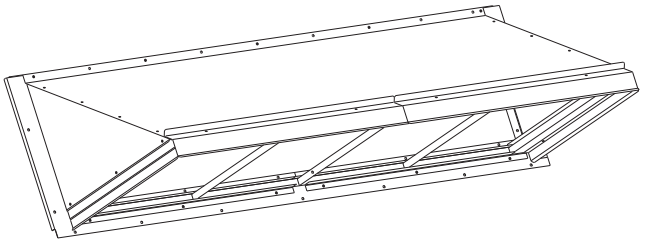
FIGURE 14 Hood Part Identification and Seal Strip Application Areas



Item #	Description	Qty
1	Angles	4
2	Side Plates	2
3	Hood	1
4	Outdoor Air Screens	4
5	Side Filter Supports	2
6	Side Drip Angles	2
7	Top Diverters	2

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**.

FIGURE 15 Hood Assembly – Completed

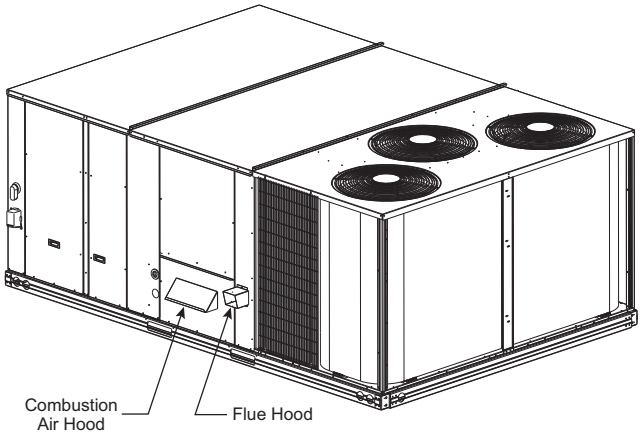


Step 9 — Install Flue Hood and Combustion Air Hood

The flue hood is shipped screwed to the fan deck inside the burner compartment. Remove the burner access panel and then remove the flue hood from its shipping location. Using the screws provided, install flue hood in the location shown in Fig. 16.

The combustion air hood is attached to the back of the burner access panel. Remove the two screws securing the hood to the back of the burner access panel. Using the two screws, re–attach the hood to the front of the burner access panel as shown in Fig. 16.

FIGURE 16 Flue Hood and Combustion Air Hood Details



Step 10 — Install Gas Piping

Installation of the gas piping must be in accordance with local building codes and with applicable national codes. In U.S.A., refer to NFPA 54/ANSI Z223.1 National Fuel Gas Code (NFGC). In Canada, installation must be accordance with the CAN/CSA B149.1 and CAN/CSA B149.2 installation codes for gas burning appliances.

This unit is factory equipped for use with Natural Gas fuel at elevations up to 2000 ft (610 m) above sea level. Unit may be field converted for operation at elevations above 2000 ft (610 m) and/or for use with liquefied petroleum fuel. See accessory kit installation instructions regarding these accessories.

NOTE:Furnace gas input rate on rating plate is for installation up to 2000 ft (610 m) above sea level. In U.S.A. the input rating for altitudes above 2000 ft (610 m) must be derated by 4% for each 1000 ft (305 m) above sea level. In Canada the input rating must be derated by 10% for altitudes of 2000 ft (610 m) to 4500 ft (1372 m) above sea level.

For natural gas applications, gas pressure at unit gas connection must not be less than 5 in. wg (1246 Pa) or greater than 13 in. wg (3240 Pa) while the unit is operating. For liquified petroleum applications, the gas pressure must not be less than 11 in. wg (2740 Pa) or greater than 13 in. wg (3240 Pa) at the unit connection.

Gas Supply Line —

The gas supply pipe enters the unit adjacent to the burner access panel on the front side of the unit, through the grommeted hole. The gas connection to the unit is made to the $^{3}/_{4}$ in. FPT gas inlet port on the unit gas valve.

Table 2 lists typical $^{3}/_{4}$ inch NPT (National Pipe Thread) field supplied pipe fittings required for thru–the–base gas supply, starting from the unit gas valve (see Fig. 18).

Table 2—Typical $^3/_4$–in NPT Field Supplied Piping Parts

Item	Qty	Description
1	1	90 Deg Street Elbow
2	1	5 Inch Long Nipple
3	1	Ground–Joint Union
4	1	3 Inch Long Nipple
5	1	90 Deg Elbow
6	1	12 Inch Long Nipple
7	1	90 Deg Elbow
8	1	3 Inch Long Nipple
9	1	TEE
10	1	4 Inch Long Nipple (Sediment Trap)
11	1	Cap
12	1	3 $^1/_2$ Inch Long Nipple
13	1	NIBCO® Ball Valve
14	1	8 Inch Long Nipple
15	1	90 Deg Elbow

For typical $^3/_4$ inch NPT field supplied fittings required for gas supply starting from the unit gas valve, pipe gas supply into TEE. See Fig. 18.

FIGURE 17 Gas Supply Line Piping with Thru–Base

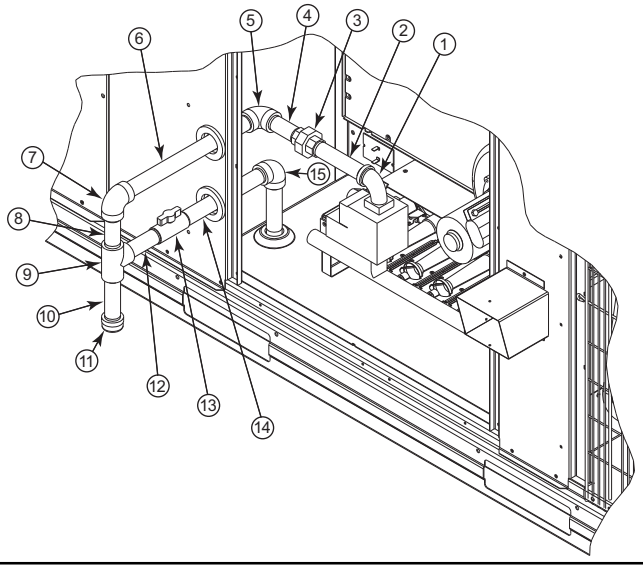


FIGURE 18 Gas Supply Line Piping

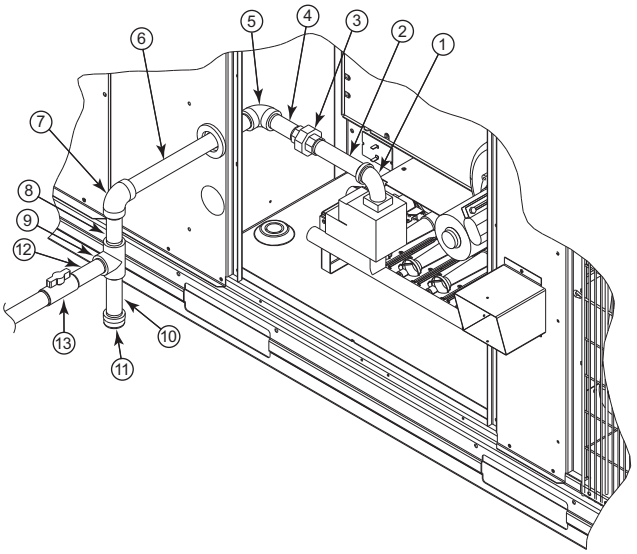


Table 3—Natural Gas Supply Line Pressure Ranges

UNIT MODEL	UNIT SIZE	MIN	MAX
RGH	All	5.0 in. wg (1246 Pa)	13.0 in. wg (3240 Pa)

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in damage to equipment.

When connecting the gas line to the unit gas valve, the installer MUST use a backup wrench to prevent damage to the valve.

Some municipal codes require that the manual shutoff valve be located upstream of the sediment trap. See Fig. 17 for typical piping arrangements for gas piping that has been routed through the sidewall of the base pan.

When installing the gas supply line, observe local codes pertaining to gas pipe installations. Refer to the NFPA 54/ANSI Z223.1 NFGC latest edition (in Canada, CAN/CSA B149.1). In the absence of local building codes, adhere to the following pertinent recommendations:

1. Avoid low spots in long runs of pipe. Grade all pipe $^1/_4$–in. in every 15 ft (7 mm in every 5 m) to prevent traps. Grade all horizontal runs downward to risers. Use risers to connect to heating section and to meter.
2. Protect all segments of piping system against physical and thermal damage. Support all piping with appropriate straps, hangers, etc. Use a minimum of one hanger every 6 ft (1.8 m). For pipe sizes larger than $^1/_2$–in., follow recommendations of national codes.
3. Apply joint compound (pipe dope) sparingly and only to male threads of joint when making pipe connections. Use only pipe dope that is resistant to action of liquefied petroleum gases as specified by local and/or national codes. If using PTFE (Teflon) tape, ensure the material is Double

Density type and is labeled for use on gas lines. Apply tape per manufacturer's instructions.

4. Pressure–test all gas piping in accordance with local and national plumbing and gas codes before connecting piping to unit.

NOTE:Pressure test the gas supply system after the gas supply piping is connected to the gas valve. The supply piping must be disconnected from the gas valve during the testing of the piping systems when test pressure is in excess of 0.5 psig (3450 Pa). Pressure test the gas supply piping system at pressures equal to or less than 0.5 psig (3450 Pa). The unit heating section must be isolated from the gas piping system by closing the external main manual shutoff valve and slightly opening the ground–joint union.

Check for gas leaks at the field–installed gas lines after all piping connections have been completed. Use soap–and–water solution (or method specified by local codes and/or regulations).

⚠ WARNING

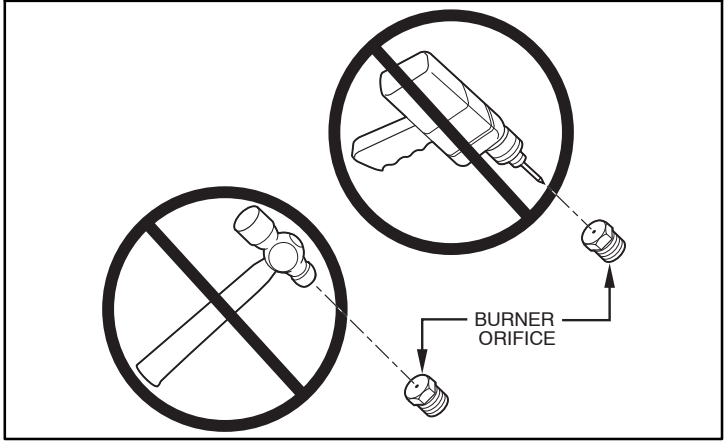
FIRE OR EXPLOSION HAZARD

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

- Connect gas pipe to unit using a backup wrench to avoid damaging gas controls.
- Never purge a gas line into a combustion chamber.
- Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections.
- Use proper length of pipe to avoid stress on gas control manifold.

NOTE: If orifice hole appears damaged or it is suspected to have been redrilled, check orifice hole with a numbered drill bit of correct size. Never redrill an orifice. A burr–free and squarely aligned orifice hole is essential for proper flame characteristics.

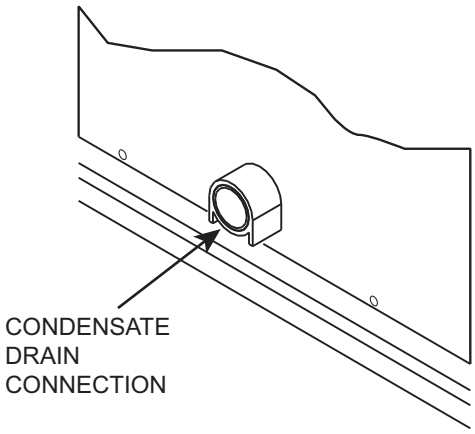
FIGURE 19 Orifice Hole



Step 11 — Install External Condensate Trap and Line

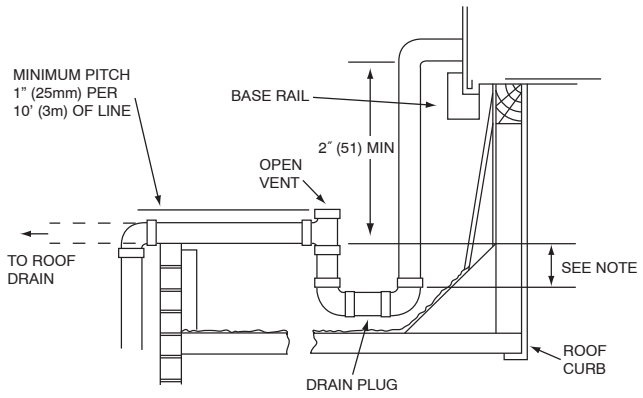
The unit has one $^3/_4$-in. condensate drain connection on the end of the condensate pan (see Fig. 20). See Figs. 1, 2 and 3, item "E", in the view labeled "BACK (HORIZONTAL DISCHARGE)" for the location of the condensate drain connection.

FIGURE 20 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. 21.

FIGURE 21 Condensate Drain Piping Details



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

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 12 — Make Electrical Connections

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

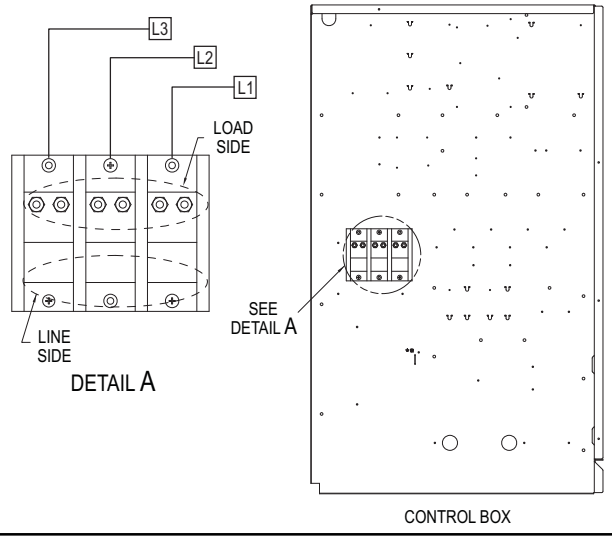
Do not use gas piping as an electrical ground. Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit 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 line side with unit field power leads. See Fig. 22.

FIGURE 22 Location of TB1



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.

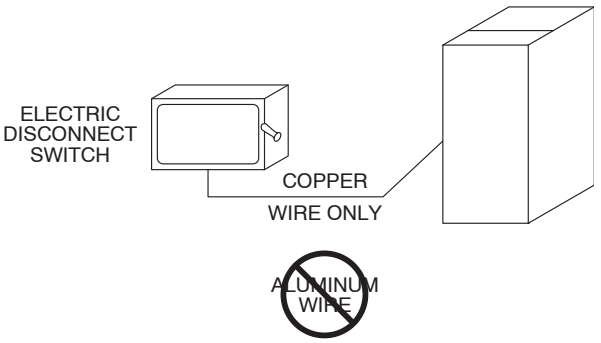
⚠ WARNING

FIRE HAZARD

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

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

FIGURE 23 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. 24.

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. 24 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. See Table 11. On 3–phase units, voltages between phases must be balanced within 2% and the current within 10%. Use the formula shown in the legend for Table 11 (see Note 2 on page 24) to determine the percent of voltage imbalance.

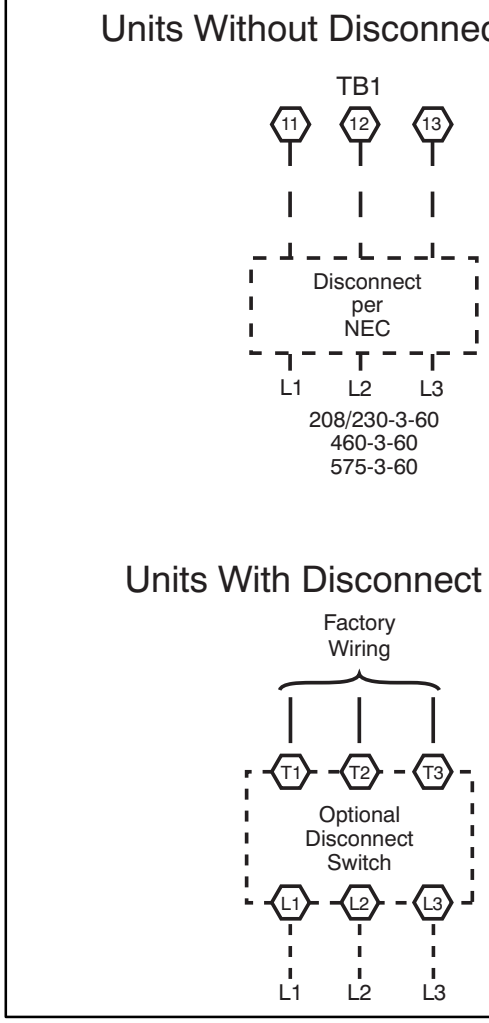
⚠ CAUTION

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 24 **Power Wiring Connections**



Convenience Outlets —

⚠ WARNING

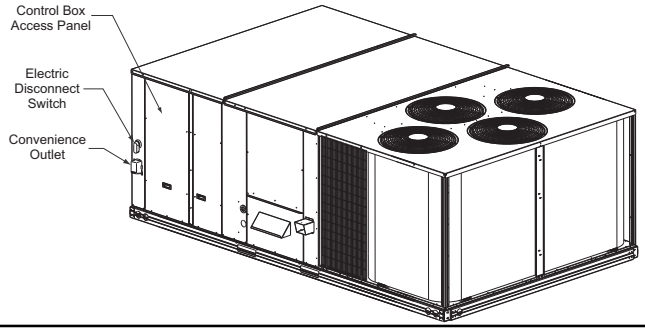
ELECTRICAL OPERATION HAZARD

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 RGH 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. 25.

FIGURE 25 **Convenience Outlet Location**



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.

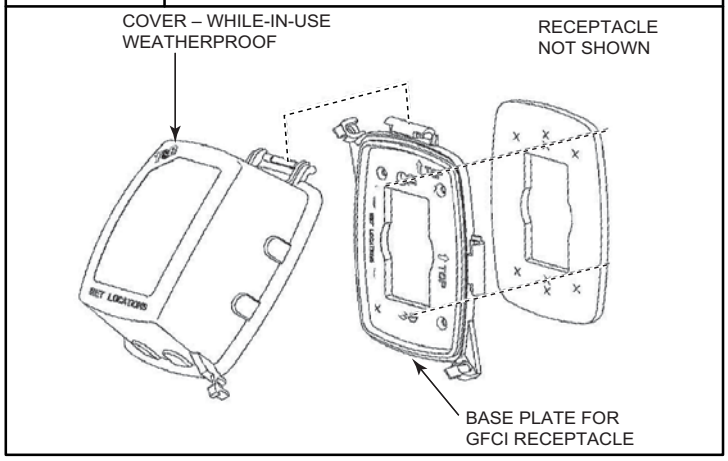
DISCONNECT ALL POWER TO UNIT AND CONVENIENCE OUTLET.

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

Loosen the two screws at the GFCI duplex outlet, until approximately $^1/_2$-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. 26. 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 26 **Weatherproof 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 outlets: Units with unit–mounded 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 RGH unit requires an external temperature control device. This device can be a thermostat (field–supplied).

Thermostat —

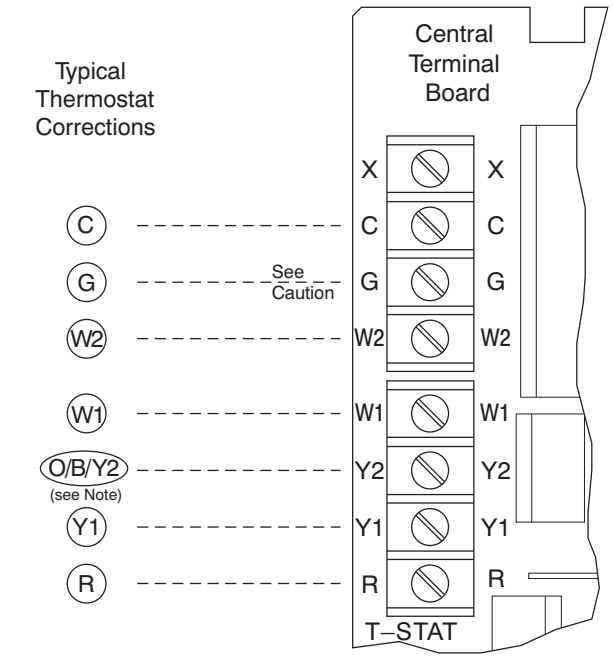
Install an approved accessory 2–stage thermostat according to installation instructions included with the accessory. Locate the thermostat accessory on a solid wall in the conditioned space to sense average temperature in accordance with the thermostat installation instructions.

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.

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. 27.

FIGURE 27 **Typical Low–Voltage Control Connections**



Note: Typical multi-function marking. Follow manufacturer's configuration instructions to select Y2.

– – – Field Wiring

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may cause a short circuit.

Carefully check the connection of control coductor 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.

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

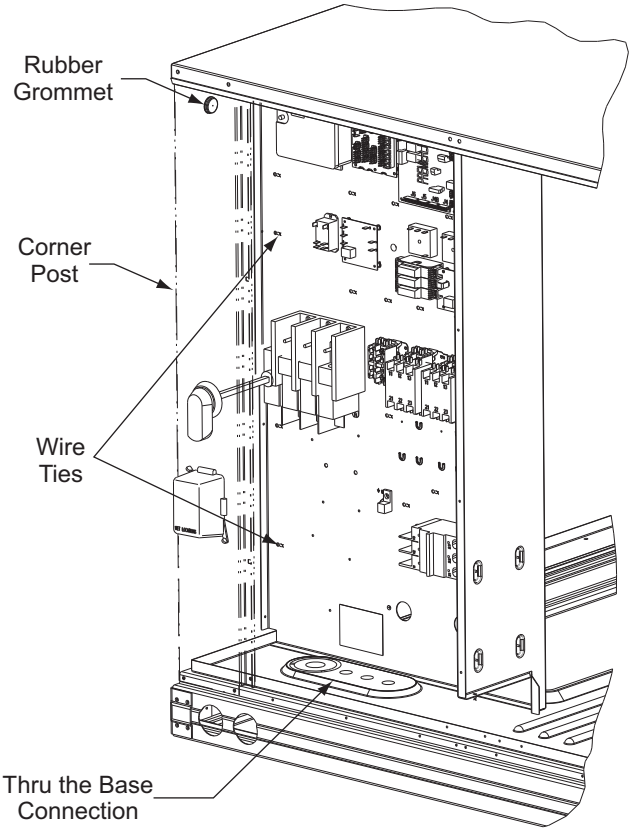
Heat Anticipator Settings —

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.

FIGURE 28 **Field Control Wiring Raceway**



Smoke Detectors

Smoke detectors are available as factory–installed options on RGH 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. 29. Its operating location is in the return air section of the unit (see Fig. 30, unit without economizer, or Fig. 31, unit with economizer), inserted into the return air sensor module housing which protrudes through the back of the control box.

FIGURE 29 **Typical Supply Air Smoke Detector Sensor Location**

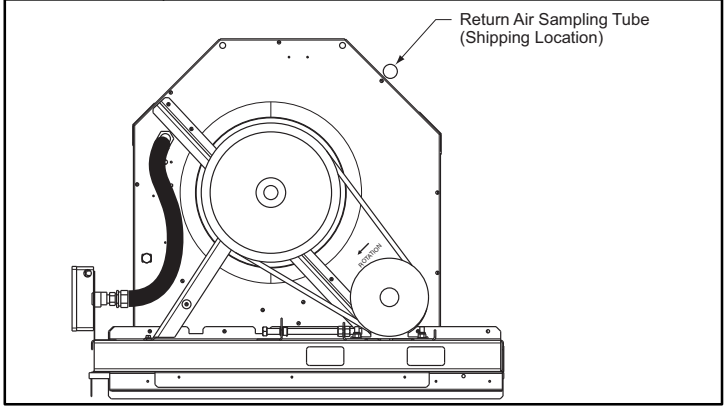


FIGURE 30 **Return Air Sampling Tube Location in Unit without Economizer**

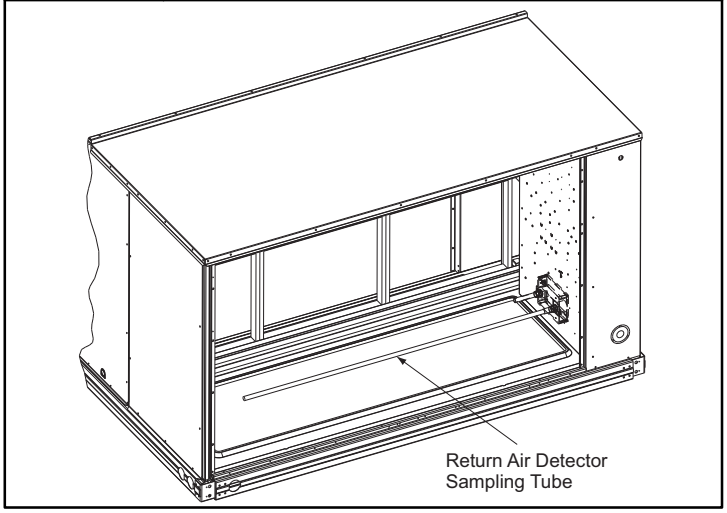
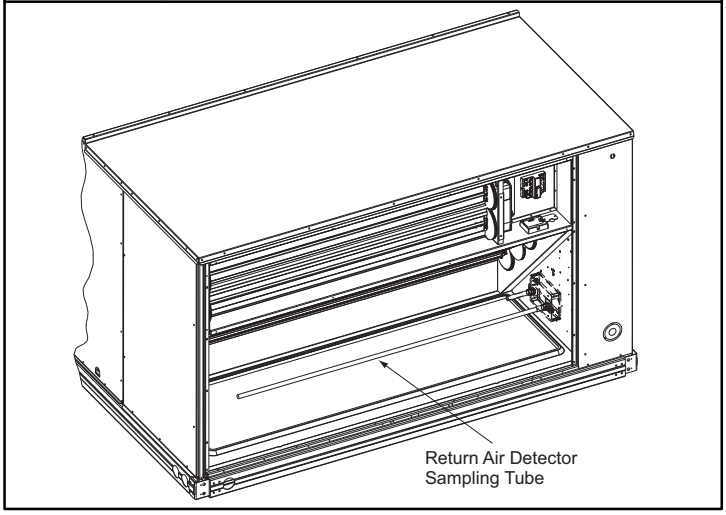


FIGURE 31 **Return Air Sampling Tube Location in Unit with Economizer**



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 4—Unit Wire/Fuse or HACR Breaker Sizing Data

Unit RGH	NOM. V–Ph–Hz	IFM TYPE	Combustion Fan Motor	Power Exhaust	NO C.O. or UNPWR C.O.							
					NO P.E.				w/ P.E. (pwrd fr/ unit)			
						FUSE or HACR BRKR	DISC. SIZE			FUSE or HACR BRKR	DISC. SIZE	
			FLA	FLA	MCA		FLA	LRA	MCA		FLA	LRA
180/183	208/230–3–60	STD	0.52	5.9	68.3	90.0	71	393	80.1	100.0	85	413
		MED			71.0	90.0	74	410	82.8	100.0	88	430
		HIGH			75.8	100.0	80	419	87.6	100.0	93	439
	460–3–60	STD	0.3	3.1	34.9	45.0	36	234	41.1	50.0	44	246
		MED			36.3	45.0	38	243	42.5	50.0	45	255
		HIGH			38.9	50.0	41	247	45.1	50.0	48	259
	575–3–60	STD	0.24	2.4	26.2	30.0	27	184	31.0	40.0	33	192
		MED			26.2	30.0	27	184	31.0	40.0	33	192
		HIGH			29	35	31	198	33.8	40	36	206
210/213	208/230–3–60	STD	0.52	5.9	75.7	100	79	440	87.5	100	93	460
		MED			80.5	100	85	449	92.3	100	98	469
		HIGH			85.9	100	91	459	97.7	125	104	479
	460–3–60	STD	0.3	3.1	36.6	45	38	245	42.8	50	46	257
		MED			39.2	50	41	249	45.4	50	49	261
		HIGH			42	50	45	254	48.2	60	52	266
	575–3–60	STD	0.24	2.4	26.2	30	27	186	31	40	33	194
		MED			29	35	31	200	33.8	40	36	208
		HIGH			32.4	40	35	198	37.2	45	40	206
240/243	208/230–3–60	STD	0.52	5.9	88.7	100.0	93	544	100.5	125.0	107	564
		MED			94.1	110	100	554	105.9	125	113	574
		HIGH			107.6	125	114	628	119.4	150	128	648
	460–3–60	STD	0.3	3.1	48.6	60.0	51	277	54.8	60.0	58	289
		MED			51.4	60	54	282	57.6	70	61	294
		HIGH			57.4	70	61	319	63.6	80	68	331
	575–3–60	STD	0.24	2.4	35.5	45.0	37	204	40.3	50.0	43	212
		MED			38.9	50	41	202	43.7	50	47	210
		HIGH			39.4	50	42	229	44.2	50	47	237
300/303	208/230–3–60	STD	0.52	5.9	117.4	150.0	121	584	129.2	175.0	135	604
		MED			122.8	150	127	594	134.6	175	141	614
		HIGH			135.5	175	142	668	147.3	175	156	688
	460–3–60	STD	0.3	3.1	54.0	60.0	57	303	60.2	70.0	64	315
		MED			56.8	70	60	308	63	80	67	320
		HIGH			62.8	80	67	345	69	80	74	357
	575–3–60	STD	0.24	2.4	40.4	50.0	42	228	45.2	50.0	48	236
		MED			43.8	50	46	226	48.6	60	52	234
		HIGH			44.3	50	47	253	49.1	60	52	261

NOTE:See page 24 for table legend and notes.

Legend and Notes for Table 11

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:

1. 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.
2. **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.

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

Example: Supply voltage is 230-3-60

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

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

$$= 227$$

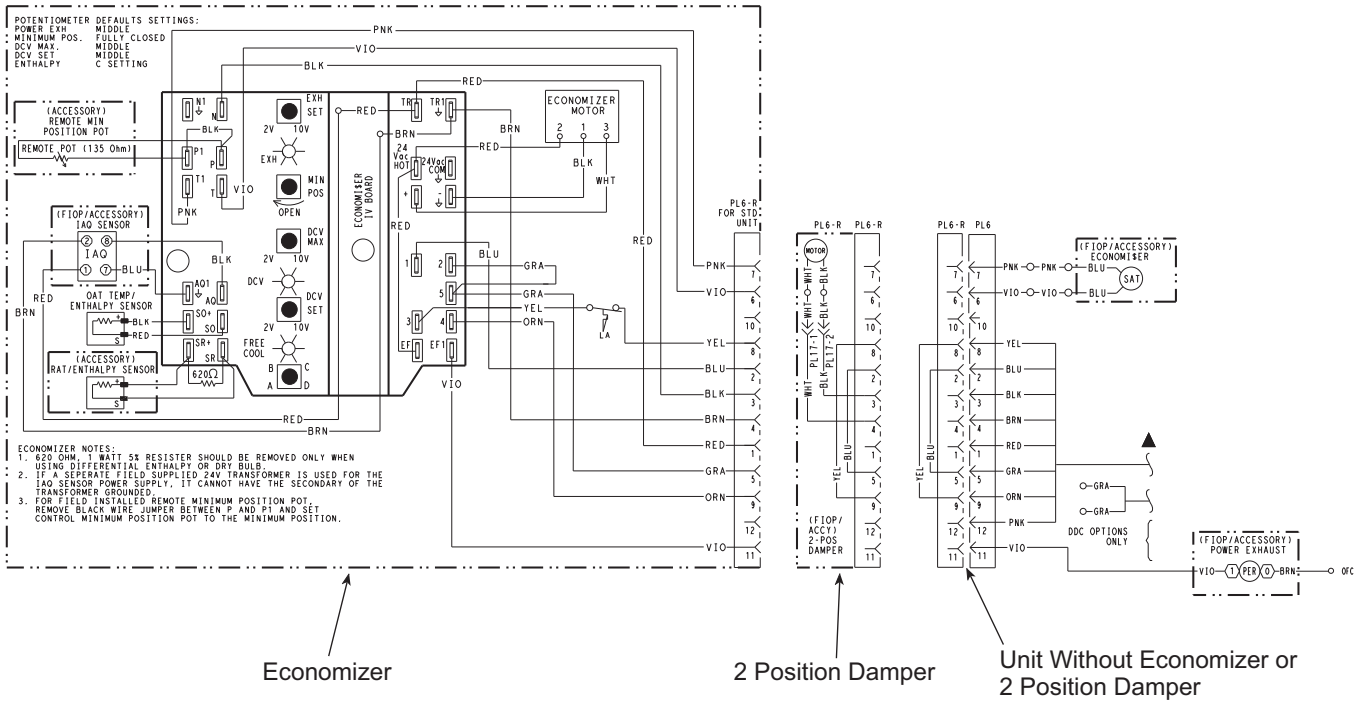
Determine maximum deviation from average voltage.
(AB) 227 – 224 = 3 v
(BC) 231 – 227 = 4 v
(AC) 227 – 226 = 1 v
Maximum deviation is 4 v.
Determine percent of voltage imbalance.

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

$$= 1.76\%$$

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.

FIGURE 32 **Field Control Wiring Raceway**



Step 13 — Adjust Factory–Installed Options

Smoke Detectors —

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

EconoMi$er IV Occupancy Switch —

Refer to Fig. 32 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 14 — Install Accessories

Available accessories include:

Roof Curb
LP conversion kit
Manual outside air damper
High Altitude Gas kits
EconoMi$er IV (with control and integrated barometric relief)
Low Ambient Controls
Thermostat / Sensors
Two–Position motorized outside air damper
Power Exhaust
Differential dry–bulb sensor (EconoMi$er IV)
Outdoor enthalpy sensor
Differential enthalpy sensor
CO_2 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.