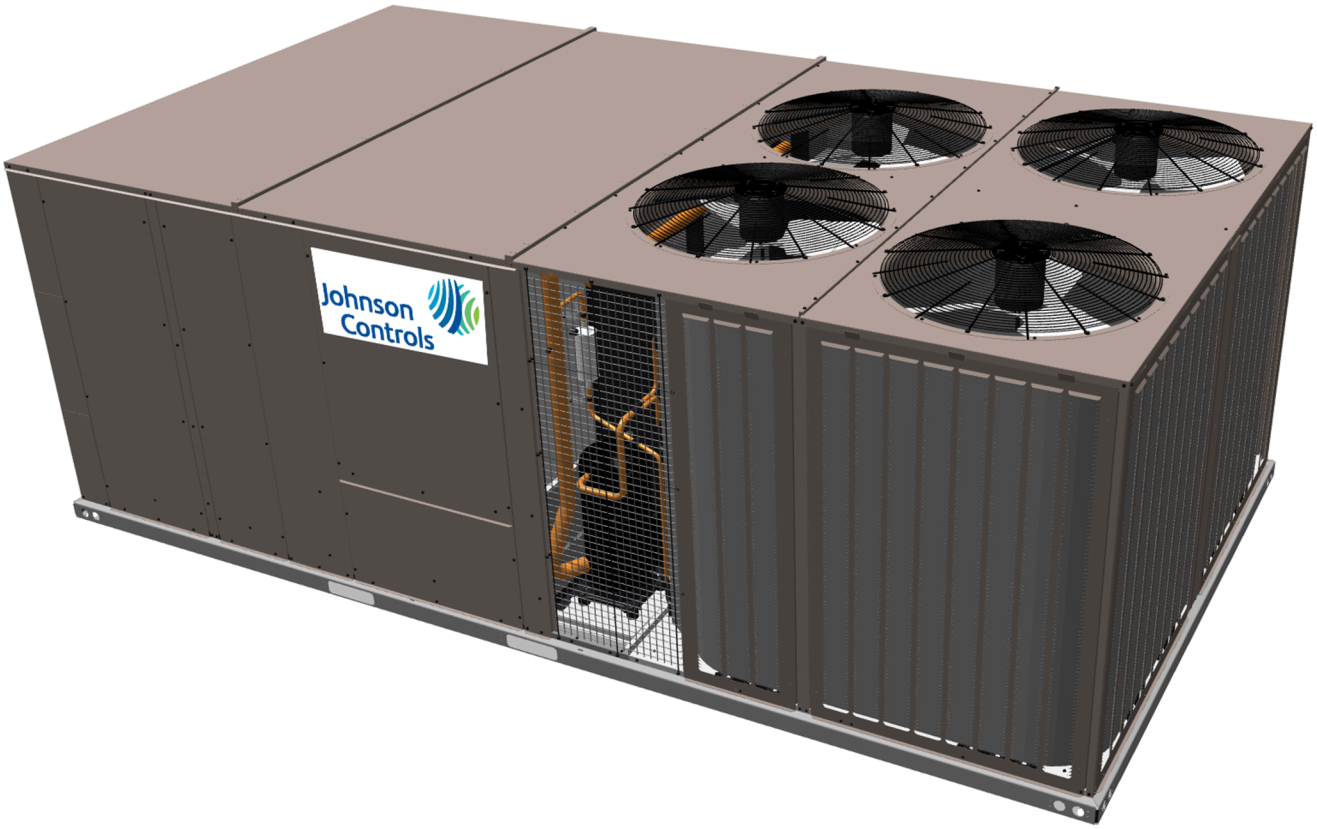
Installation Manual: Johnson Controls Choice KE13 to KE23

R-454B



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6520771-JIM-D-0526

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General

Certifications

Tested in accordance with:

GoTemp Pro App

BHC Residential and Light Commercial LLC believes in empowering our customers with up-to-date, unit-specific information. Download the GoTemp Pro app, a powerful-comprehensive app designed for contractors on the jobsite, available now in the App Store for iOS and Google Play for Android. Use the App to scan the unique QR code on the unit rating plate for easy access to product information and resources such as nomenclature, technical guide, installation manual, wiring diagrams, parts list, product registration, warranty and much more. Simplify your tasks, save time, and stay ahead with the most comprehensive app built for professionals.

GoTemp Pro integrates functionality previously provided by CWa and MAP, allowing you to utilize the on-board communication card or simply plug in the CWCVT to enable Bluetooth connectivity.

Safety considerations

This is a safety alert symbol. When you see this symbol on labels or in manuals, be alert to the potential for personal injury.

Understand and pay particular attention the signal words DANGER, WARNING or CAUTION.

DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

WARNING indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.

CAUTION indicates a potentially hazardous situation, which, if not avoided may result in minor or moderate injury. It is also used to alert against unsafe practices and hazards involving only property damage.

WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance or for additional information, consult a qualified contractor, installer, or service agency.

CAUTION

This product must be installed in strict compliance with the installation instructions and any applicable local, state and national codes including, but not limited to building, electrical, and mechanical codes.

WARNING

This unit is not intended for use by persons, including children, with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure they do not play with the unit. Cleaning and maintenance shall not be performed by children without supervision.

WARNING

Before you perform service or maintenance operations on the unit, turn off the main power switch to unit. Electrical shock could cause personal injury. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency, or the gas supplier.

WARNING

Do not use any other means to clean or accelerate the defrosting process, use only what is recommended by the manufacturer. Store the appliance in a room without continuously operating ignition sources. For example, open flames, an operating gas appliance, or an operating electric heater.
Do not pierce or burn.
Be aware that refrigerants may not have an odor.

WARNING

ELECTRICAL SHOCK, FIRE, OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death, or property damage.
Improper servicing could result in dangerous operation, serious injury, death, or property damage.
*Before servicing, disconnect all electrical power to the furnace.
*When servicing controls, label all wires prior to disconnecting. Reconnect the wires correctly.
*Verify proper operation after servicing.

CAUTION

R-454B is a mildly flammable refrigerant. Unit installation must comply with UL/CSA 60335-2-40, the installation and operations manuals available on Solution Navigator, the DS Solutions app, and documentation shipped with the unit.

WARNING

Risk of fire

This unit has over 4 lb of mildly flammable A2L refrigerant, which may require the installation of an RDS (Refrigerant Detection System) for specific applications. To determine if a specific application needs a field-installed RDS, use the RDS calculator on Solution Navigator or the DS Solutions App.

CAUTION

This system uses R-454B refrigerant, which is a mildly flammable refrigerant. Do not use any other refrigerant in this system. Gage sets, hoses, refrigerant containers, and recovery systems, must be designed to handle R-454B. If you are unsure, consult the equipment manufacturer. Failure to use R-454B compatible servicing equipment may result in property damage or injury.

WARNING

FIRE OR EXPLOSION HAZARD

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.
Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
WHAT TO DO IF YOU SMELL GAS:
- Do not try to light any appliance.
- Do not touch any electrical switch.
- Do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

Installation and service must be performed by a qualified installer or service agency.

The installation and servicing of air conditioning equipment can be hazardous, due to the system pressure, a mildly flammable refrigerant, moving parts, and electrical components. Only qualified and trained service personnel must install, repair, or service this equipment. Untrained personnel can perform the basic maintenance functions such as cleaning coils and cleaning or replacing filters.

Observe all the precautions in the literature, labels, and tags that accompany the equipment whenever you work on air conditioning equipment. Follow all other applicable safety precautions and codes including ANSI Z223.1 or CSA-B149.1-latest edition.

Wear safety glasses and work gloves. Use a quenching cloth and have a fire extinguisher available during brazing operations.

ⓘ **Note:** This unit is classified as an appliance not accessible to the general public and should be installed only in locations not accessible to the general public. Locate appliances in a secured location with restricted access, at a level that is not less than 2.5 m, or in secured areas such as rooftops or machine rooms.

Inspection

As soon as you receive a unit, you must inspect it for possible damage during transit. If damage is evident, note the extent of the damage on the carrier's freight bill. You must make a separate request for inspection by the carrier's agent in writing.

⚠ CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to, building, electrical, and mechanical codes.

The furnace and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing at pressures in excess of 1/2 PSIG. Pressures greater than 1/2 PSIG will cause gas valve damage resulting in a hazardous condition. If it is subjected to a pressure greater than 1/2 PSIG, the gas valve must be replaced.

The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG.

Reference

Additional information is available in the following reference forms:

- Technical Guide - 6604605
- General Installation - 6520771
- A2L Refrigerant Installation Manual - 6651753
- Smart Equipment Control Quick Start Guide

Renewal parts

Contact your local ducted systems parts distribution center for authorized replacement parts.

Approvals

The unit is certified by CSA as follows:

- For use as a cooling only unit, cooling unit with supplemental electric heat or a forced air furnace.
- For outdoor installation only.
- For installation on combustible material and may be installed directly on combustible flooring or, in the United States, on wood flooring or Class A, Class B, or Class C roof covering materials.
- For use with natural gas. The unit can be converted to LP with a kit.

⚠ CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to, building, electrical, and mechanical codes.

⚠ WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage.

-

⚠ CAUTION

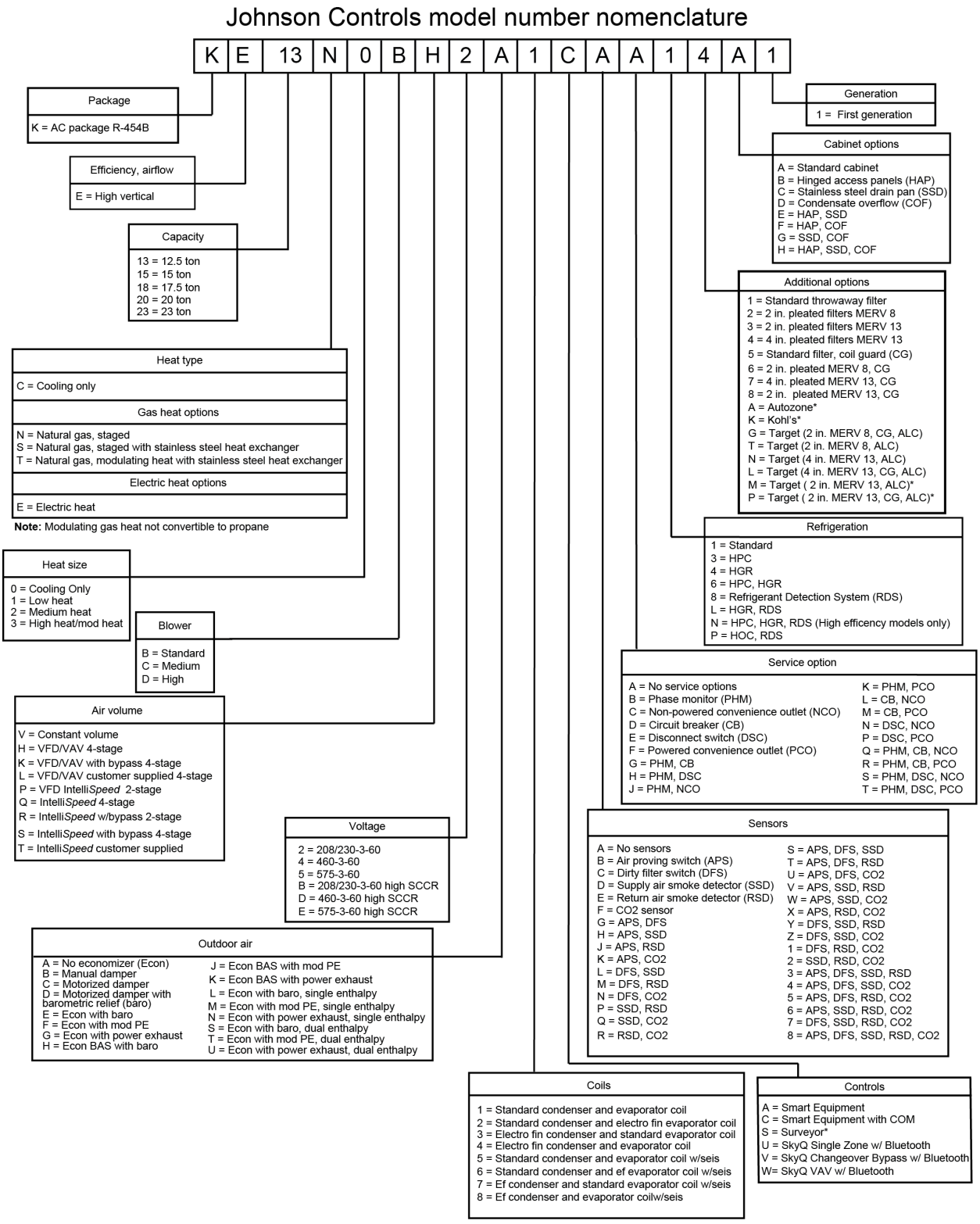
This system uses R-454B refrigerant, which is a mildly flammable refrigerant. Do not use any other refrigerant in this system.

⚠ CAUTION

Install this product only in locations not accessible to the general public. Appliances are to be located in a secured location with restricted access, such as machine rooms, rooftops, etc., at a level not less than 8.2 ft (2.5 m).

Nomenclature

Figure 1: Product nomenclature



Installation

Installation safety information

Read the following instructions before you install this appliance. This is an outdoor combination heating and cooling unit. The installer must assure that these instructions are made available to the consumer. The installer must instruct the consumer to retain the instructions for future reference.

- Refer to the unit rating plate for the approved type of gas for this product.
- Install this unit only in a location and position as specified in the Location section.
- Never test for gas leaks with an open flame. Use commercially available soap solution made specifically for the detection of leaks when you check all connections.
- Always install the furnace to operate within the furnace's intended temperature-rise range with the duct system and within the allowable external static pressure range. This information is specified on the unit name/rating plate. See Adjustment of temperature rise.
- Do not use this equipment for the temporary heating of buildings or structures under construction.
- Provide adequate combustion and ventilation air to the furnace space as specified in the section.

⚠ WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death, or property damage. 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. A fire or explosion may result causing property damage, personal injury, or loss of life.

Limitations

You must install these units in accordance with national wiring regulations and the following standards.

Requirements in the United States

- *National Electrical Code, ANSI/NFPA No. 70* - latest edition
- *National Fuel Gas Code, ANSI Z223.1* - latest edition
- *Gas-Fired Central Furnace Standard, ANSI Z21.47a.* - latest edition
- Local building codes
- Local gas utility requirements

Requirements in Canada

- *Canadian Electrical Code, CSA C22.1*
- *Installation Codes, CSA - B149.1*
- Local plumbing and wastewater codes
- Other applicable local codes

See the application data found in this document and refer to the *A2L Refrigerant Installation Manual*.

After the installation is complete, you must adjust gas fired units to obtain a temperature rise in the range specified on the unit rating plate.

If components are added to a unit to meet local codes, they are installed at the dealer's and/or customer's expense.

Base the size of the unit for the proposed installation on the heat loss/heat gain calculation made according to the methods of the Air Conditioning Contractors of America (ACCA).

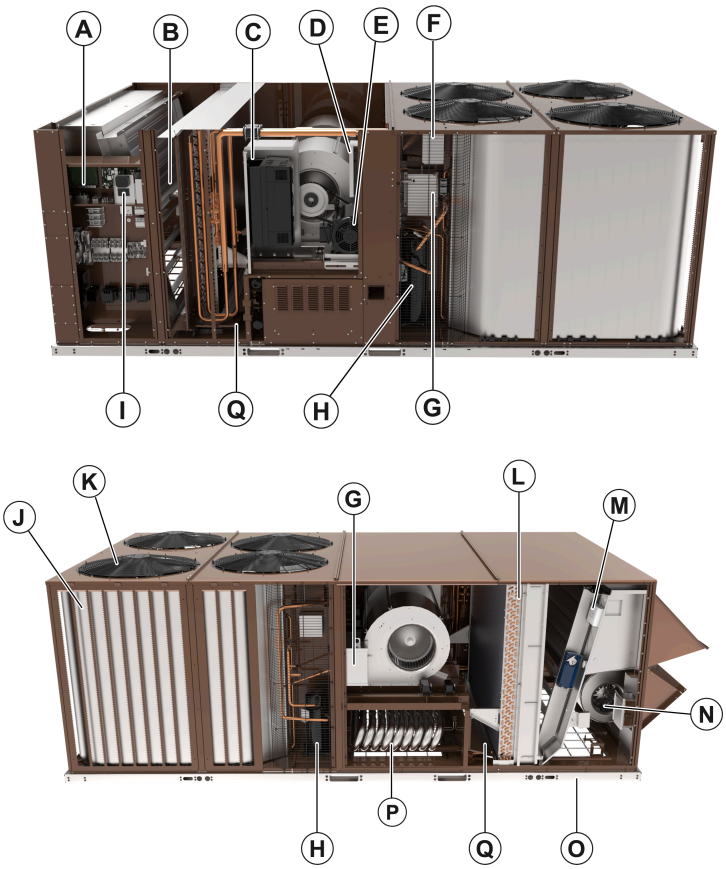
This furnace is not to be used for temporary heating of buildings or structures under construction.

NOTICE

The Smart Equipment control board used in this product can effectively operate the cooling system down to 0°F when this product is applied in a comfort cooling application for people. An economizer is typically included in this type of application. When you apply this product for process cooling applications, such as computer rooms or switchgear, call the applications department for Ducted Systems at 1-877-874-SERV for guidance. Additional accessories may be needed for stable operation at temperatures below 30°F.

Unit components

Figure 2: Component location



The previous figure shows the KEXX model. The following table lists the components of the unit.

Table 1: Component location table

Item	Description	Item	Description
A	Smart Equipment controls	J	Micro channel condenser coil
B	Filter access, 2 in. or 4 in. filter options.	K	Condenser fans with ECM motors
C	Compressor variable frequency drive	L	Copper tube/aluminum fin evaporator coil
D	Blower motor variable frequency drive	M	Optional economizer. Optional manual or motorized outside air dampers not shown.
E	Belt drive blower motor with dual centrifugal fan design	N	Optional powered exhaust. Optional barometric relief not shown
F	ECM controller for OD motor	O	Full perimeter base rails with holes for overhead rigging
G	ECM Controller Transformer (for 575 V unit only)	P	Optional staged or modulating gas heat with aluminized or stainless-steel heat exchanger. Optional electric heat not shown.
H	Combination of ultra-high efficiency, fixed-speed scroll compressor and variable speed scroll compressor	Q	Refrigerant detection sensor (RDS)
I	LCP for compressor and Blower VFD		

Unit limitations

Table 2: KE13 to KE23 unit limitations

Unit voltage	Applied voltage		Outdoor DB temperature
	Minimum	Maximum	Maximum (°F)
208/230-3-60	180	254	125
460-3-60	416	508	125
575-3-60	520	635	125

Location

Use the following guidelines to select a suitable location for these units:

- The unit is designed for outdoor installation only.
- Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either the north or the east side of the building.
- Suitable for mounting on a roof curb.
- For ground level installation, use a level concrete slab with a minimum thickness of 4 in. The length and width must be at least 6 in. greater than the unit base rails. Do not tie the slab to the building foundation.
- Roof structures must be able to support the weight of the unit and its options and accessories. The unit must be installed on a solid level roof curb or on an appropriate angle iron frame.

Maintain level tolerance to 1/2 in. across the entire width and length of the unit.

Clearances

All units require particular clearances for correct operation and service. The installer must make provisions for adequate combustion and ventilation air in accordance with section 5.3 of Air for Combustion and Ventilation of the National Fuel Gas Code, ANSI Z223.1 – latest edition (in the U.S.A.), or Sections 7.2, 7.3, or 7.4 of Gas Installation Codes, CSA-B149.1 (in Canada) - latest edition, and/or applicable provisions of the local building codes.

Detailed unit clearances required for combustible construction, servicing, and correct unit operation are available in the Weights and dimensions section.

WARNING

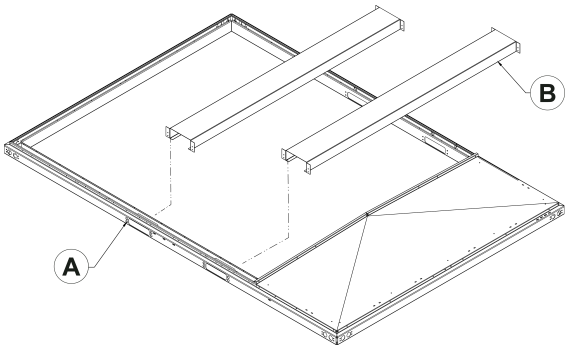
Do not permit overhanging structures or shrubs to obstruct the condenser air discharge outlet, combustion air inlet, or vent outlets.

Removing the forklift tunnels

Note: Before placing a unit on a roof curb, you must remove the protective fork lift tunnels from the underside of the unit.

1. To remove the protective forklift tunnels, locate the fork pockets visible on the exterior of the unit base rail shown in Figure 3.

Figure 3: Protective forklift tunnels



Item	Description
A	Example screw location
B	Fork tunnel

2. Remove the 16 screws securing the fork tunnels to the unit base rail and remove the fork tunnels from the bottom of the unit as the unit is lifted.

   Note: You can discard the fork tunnels and screws after they are removed.

Rigging and handling

Adhere to the following guidelines when rigging and handling the unit.

- Exercise care when you move the unit.
- Do not remove any packaging until the unit is near the place of installation.
- To rig the unit, attach chain or cable slings to the lifting holes provided in the base rails.
- You must use spreader bars across the top of the unit.
- The spreader bars must have a length that exceeds the largest dimension across the unit.

CAUTION

If a unit is installed on a roof curb other than a ducted systems roof curb, you must apply gasketing to all surfaces that come in contact with the unit underside.

CAUTION

Before lifting the unit, make sure that the unit weight is distributed equally on the rigging cables so that it lifts evenly.

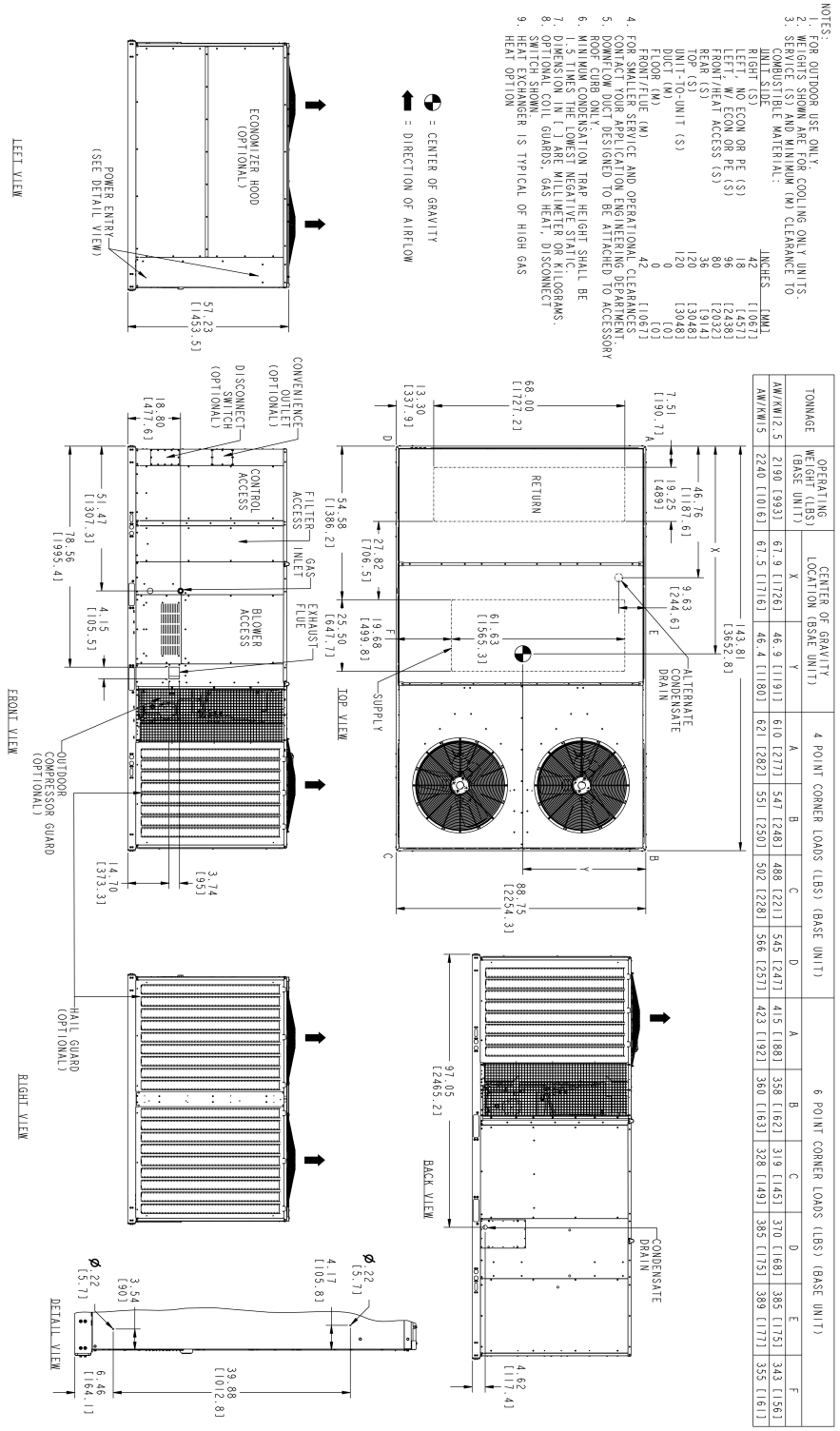
Units may be moved or lifted with a forklift from the side only.
The length of the forks must be a minimum of 52 in.

CAUTION

All panels must be secured in place when the unit is lifted. The condenser coils must be protected from rigging cable damage with plywood or other suitable material.

Weights and dimensions

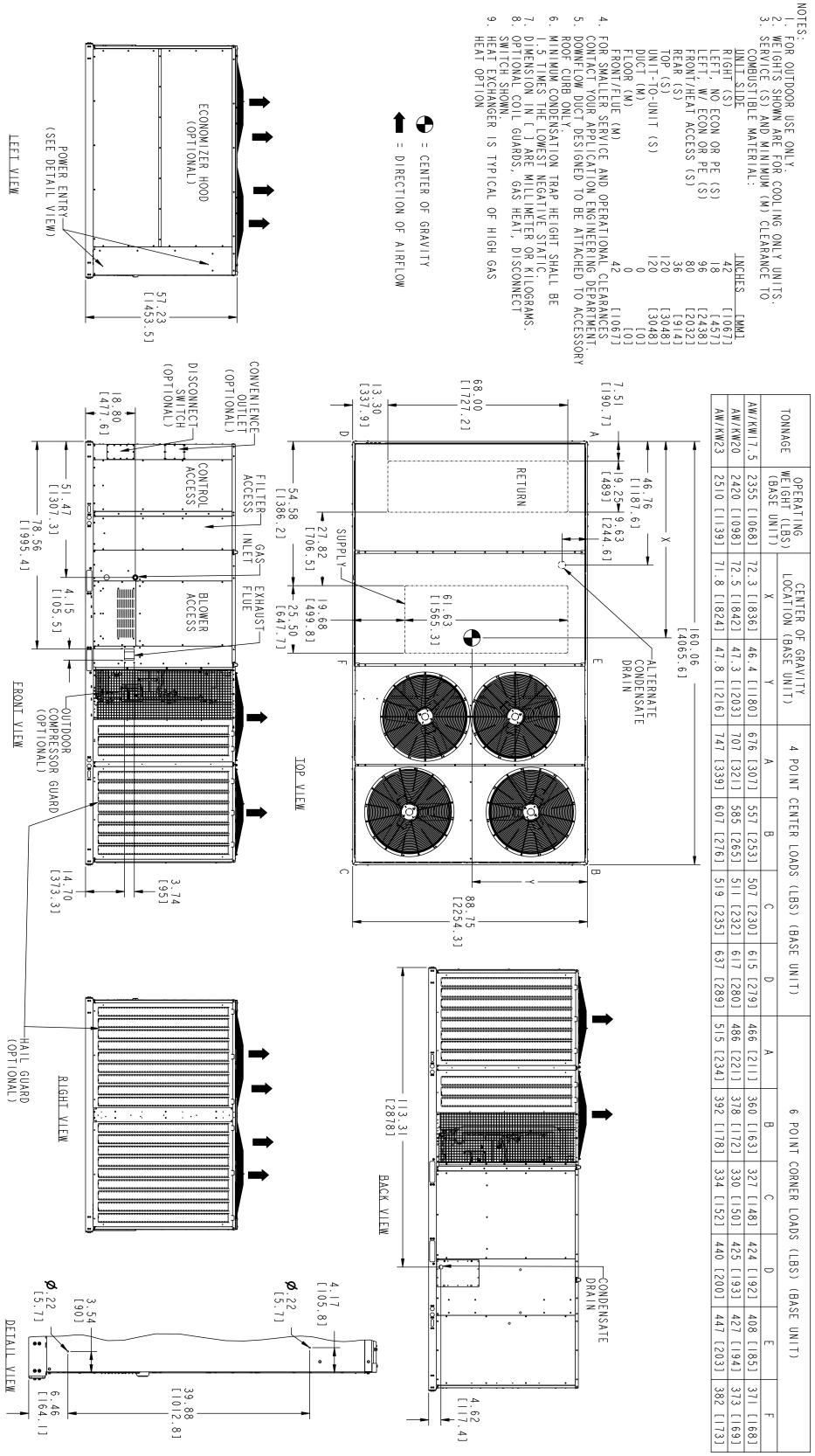
Figure 4: KE13 and KE15 physical dimensions



TONNAGE	OPERATING WEIGHT (LBS) (BASE UNIT)	CENTER OF GRAVITY LOCATION (BSAE UNIT)		4 POINT CORNER LOADS (LBS) (BASE UNIT)				6 POINT CORNER LOADS (LBS) (BASE UNIT)							
		X	Y	A	B	C	D	A	B	C	D	E	F
AW/KW12-5	2190 [993]	67.9 [726]	46.9 [191]	610 [277]	547 [248]	488 [221]	545 [247]	415 [188]	358 [162]	319 [145]	370 [168]	385 [175]	343 [156]
AW/KW15	2240 [1016]	67.5 [716]	46.4 [180]	621 [282]	551 [250]	502 [228]	566 [257]	423 [192]	360 [163]	328 [149]	385 [175]	389 [177]	355 [161]

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Figure 5: KE18, KE20, and KE23 physical dimensions



TONNAGE	OPERATING WEIGHT (LBS) (BASE UNIT)	CENTER OF GRAVITY LOCATION (BASE UNIT)		4 POINT CENTER LOADS (LBS) (BASE UNIT)				6 POINT CORNER LOADS (LBS) (BASE UNIT)						
		X	Y	A	B	C	D	A	B	C	D	E	F
AW/KW17.5	2355 [1068]	72.3 [1836]	46.4 [1180]	676 [307]	557 [253]	507 [230]	615 [279]	466 [211]	360 [163]	327 [148]	424 [192]	408 [185]	371 [168]
AW/KW20	2420 [1098]	72.5 [1842]	47.3 [1203]	707 [321]	585 [265]	511 [232]	617 [280]	486 [221]	378 [172]	330 [150]	425 [193]	427 [194]	373 [169]
AW/KW23	2510 [1139]	71.8 [1824]	47.8 [1216]	747 [339]	607 [276]	519 [235]	637 [289]	515 [234]	392 [178]	334 [152]	440 [200]	447 [203]	382 [173]

Economizer options

Figure 6: Economizer options

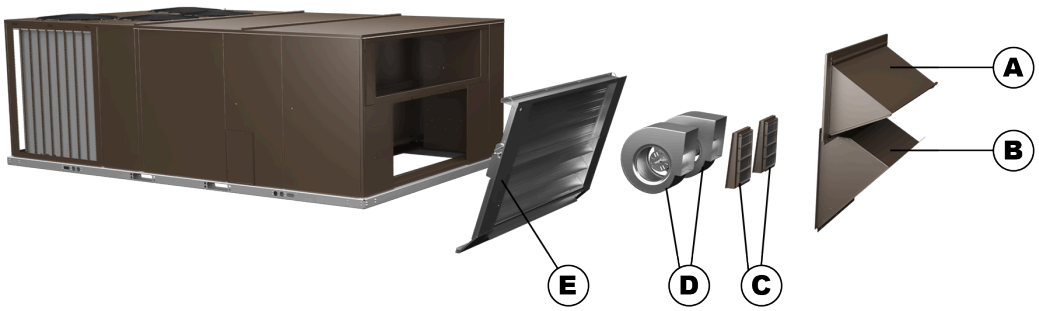


Table 3: Economizer components

Item	Description
A	Fresh air hood
B	Power exhaust hood
C	Power exhaust damper
D	Power exhaust
E	Low leak economizer

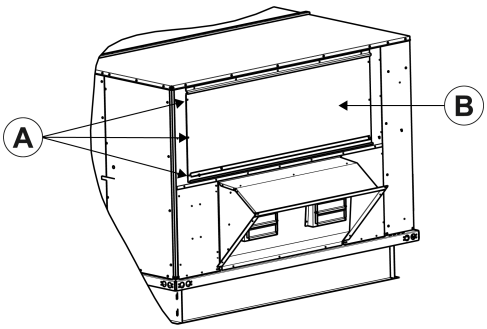
Assembling the outdoor air hood

After a unit with an economizer, manual damper, or motorized damper is installed in the field, assemble the outside air hood.

To install the outdoor air hood, complete the following steps.

1. While transporting the unit, the hood top panel is used as a shipping cover attached to the unit exterior as shown in Figure 7.

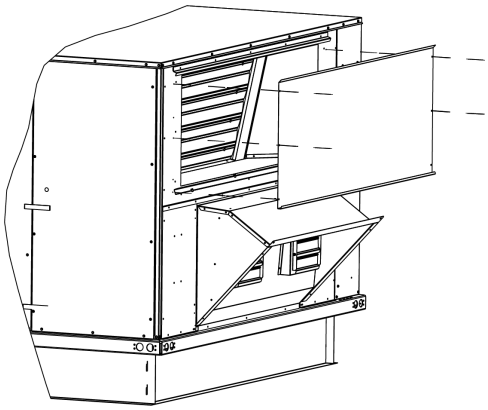
Figure 7: Hood top panel



Item	Description
A	Corner screws
B	Hood top panel

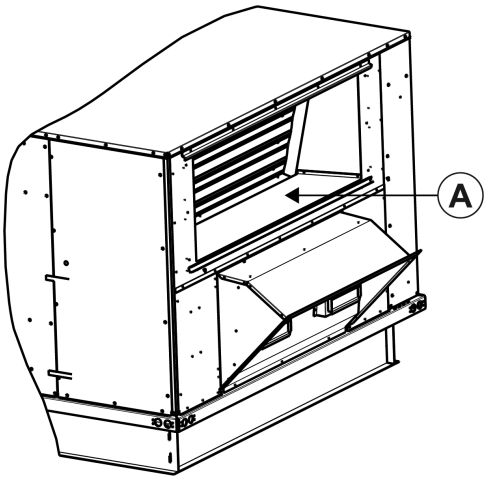
2. Remove the corner screws and the hood top panel as shown in Figure 7 and Figure 8. Keep both the screws and the top panel for use in a later step.

Figure 8: Removing the corner screws



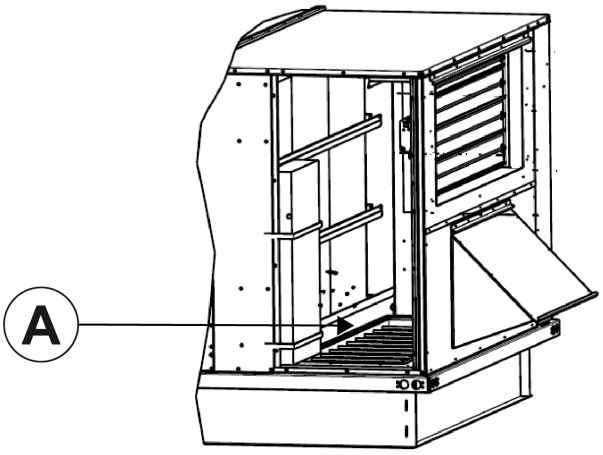
3. For units with an economizer, the additional outside air hood assembly parts are shipped behind the top panel removed in the previous step. This location is shown in Figure 9. For units with a manual or motorized damper, the additional outside air hood assembly parts are shipped in the return air section of the unit as shown in Figure 10.

Figure 9: Economizer hood assembly parts



Item	Description
A	Economizer hood assembly parts shipping location

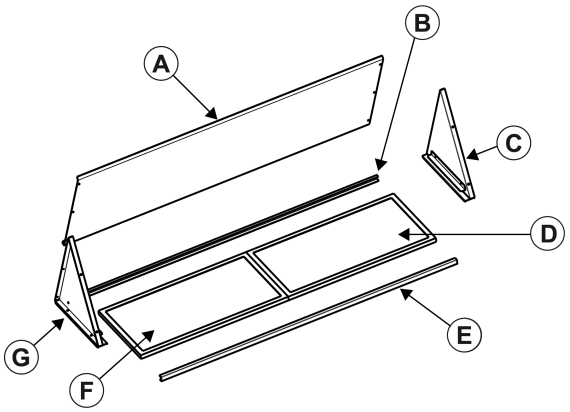
Figure 10: Manual or motorized damper hood assembly parts



Item	Description
A	Manual or motorized damper hood assembly parts shipping location

4. Before beginning assembly, check that you have all of the factory provided parts for the economizer outside air hood as shown in Figure 11.

Figure 11: Economizer outside air hood parts

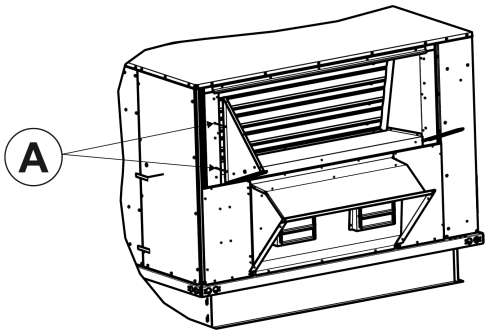


Item	Description
A	Hood top panel
B	Filter channel 1
C	Right side panel sub-assembly
D	Filter 1
E	Filter channel 2
F	Filter 2
G	Left side panel sub-assembly

5. Using two no. 10 screws from the hardware bag, fasten the left side panel sub-assembly on the unit as shown in Figure 12.

   Note: Orient the flange at the bottom of the side panel and facing the center of the unit.

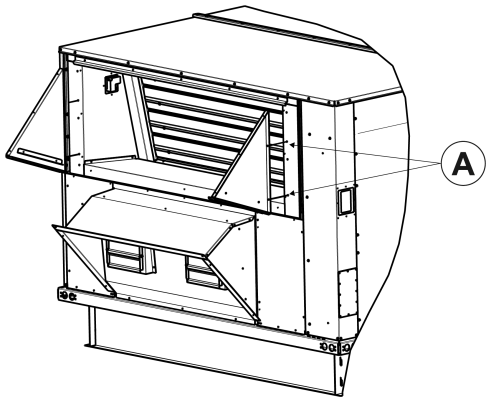
Figure 12: Fastening the left side panel



Item	Description
A	Screws

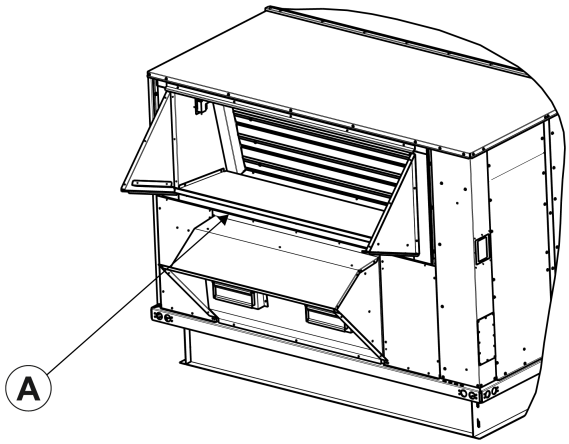
6. Using two no. 10 screws from the hardware bag, fasten the right side panel sub-assembly on the unit as shown in Figure 13. Note that the flange should be oriented at the bottom of the side panel and facing the center of the unit.

Figure 13: Right side panel



7. Before inserting the filter channel, ensure the open end of the channel is pointing away from the unit. The filters will be inserted into this opening. Insert filter channel 1 as shown in Figure 14. This should rest on top of the flange of both of the side panels installed in the previous step.

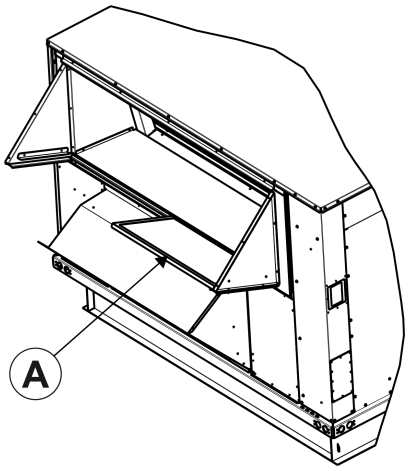
Figure 14: Filter channel 1



Item	Description
A	Filter channel 1

8. Insert the first filter into the filter channel to rest with one edge inside of the filter channel and the other on top of the flange of the side panel. See the following figure.

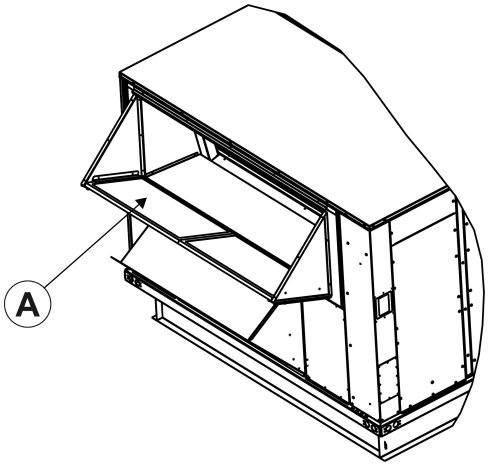
Figure 15: Filter



Item	Description
A	Filter

9. Insert the second filter into the filter channel in the same way the first filter was inserted in Step 8, and as shown in Figure 16.

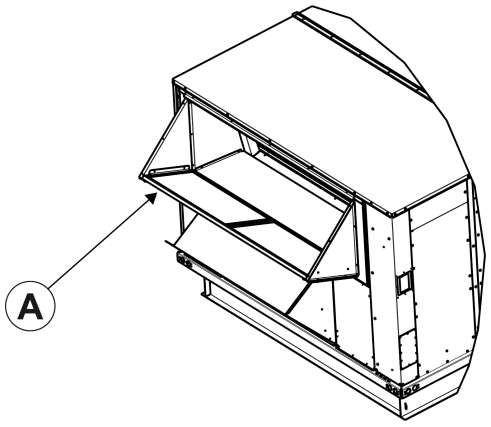
Figure 16: Filter



Item	Description
A	Filter

10. Insert filter channel 2 with the open end of the channel facing toward the unit and going over the end of the filters. See Figure 17.

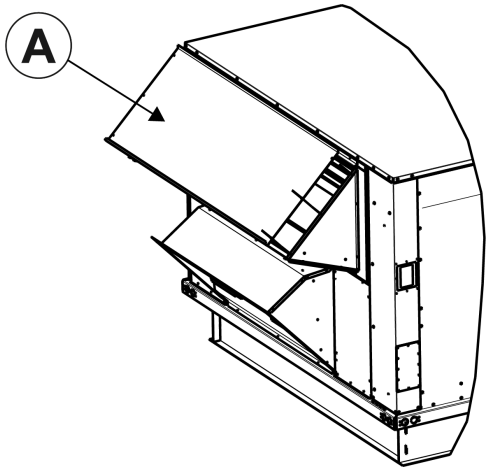
Figure 17: Inserting filter channel 2



Item	Description
A	Filter channel 2

11. Taking the hood top panel removed in Step 2, hook the angled flange under the top bracket and then set on top of the side panels. Using the screws removed earlier, attach the top panel to the side panels as shown in Figure 18.

Figure 18: Hood top panel



Item	Description
A	Hood top panel

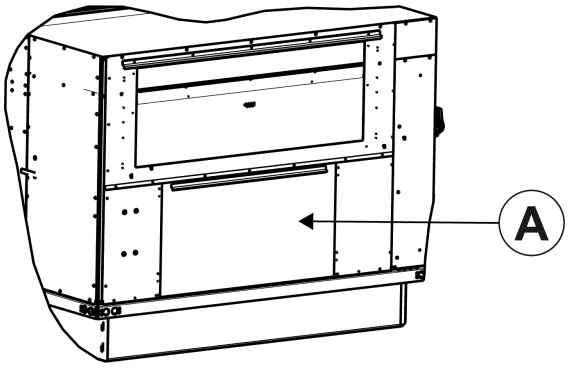
Assembling the barometric relief hood

After a unit with barometric relief is installed in the field, assemble the barometric relief hood.

To install the barometric relief hood, complete the following steps.

1. While transporting the unit, the hood top panel is used as a shipping cover attached to the unit exterior as shown in Figure 19.

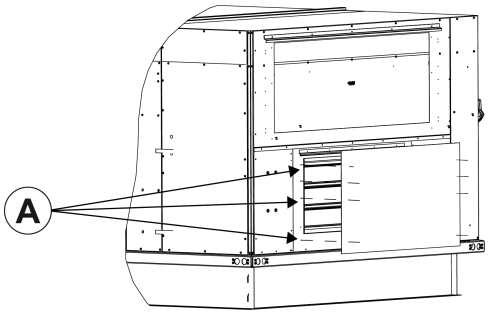
Figure 19: Hood top panel



Callout	Description
A	Hood top panel

2. Remove the corner screws and the hood top panel as shown in Figure 20. Keep both the screws and the top panel for use in a later step.

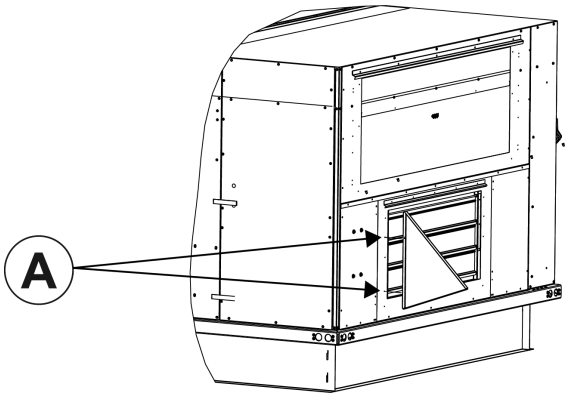
Figure 20: Removing the corner screws



Callout	Description
A	Corner screws

3. Unscrew the two triangular hood sides from inside the barometric relief assembly.
4. Using two of the No. 10 screws removed in step 3, fasten the left side panel sub-assembly on the unit as shown in Figure 21.

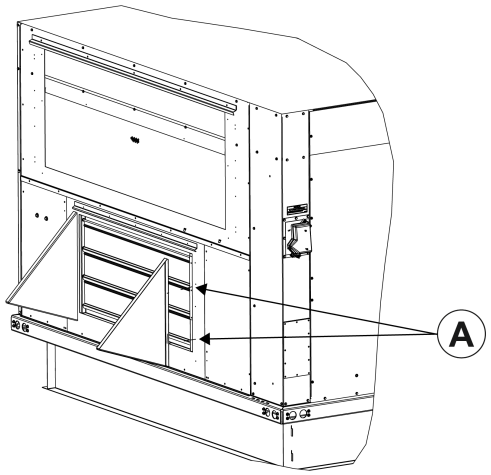
Figure 21: Fastening the left side panel sub-assembly



Callout	Description
A	Screws

5. Using two of the No. 10 screws removed in step 3, fasten the right side panel sub-assembly on the unit as shown in Figure 22.

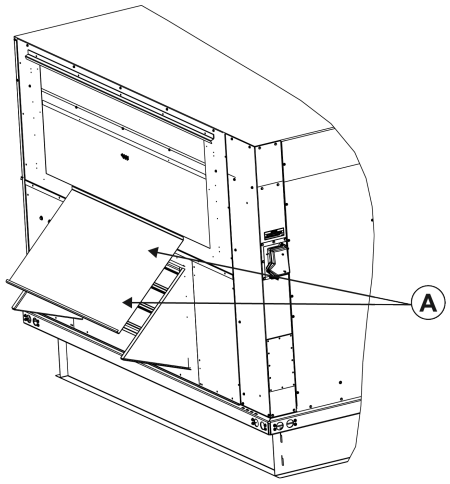
Figure 22: Fastening the right side panel sub-assembly



Callout	Description
A	Screws

6. Taking the hood top panel removed in Step 2, hook the angled flange under the top bracket and then set on top of the side panels. Using the screws removed earlier, attach the top panel to the side panels as shown in Figure 23.

Figure 23: Attaching the top panel



Callout	Description
A	Screws

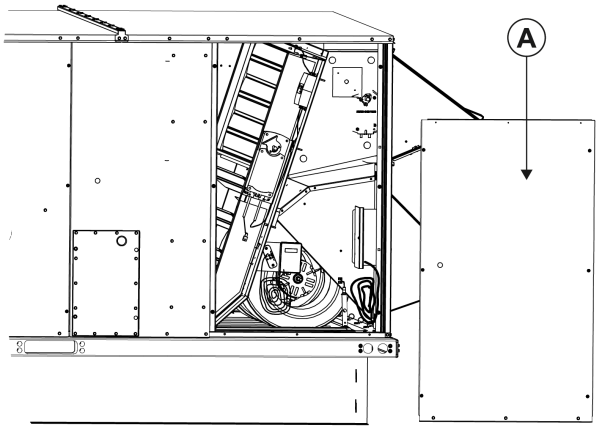
Power exhaust fold out instructions

After the unit is installed in the field the, power exhaust assembly requires field setup for operation.

To setup the power exhaust assembly, complete the following steps.

1. Remove the return air access panel shown in Figure 24.

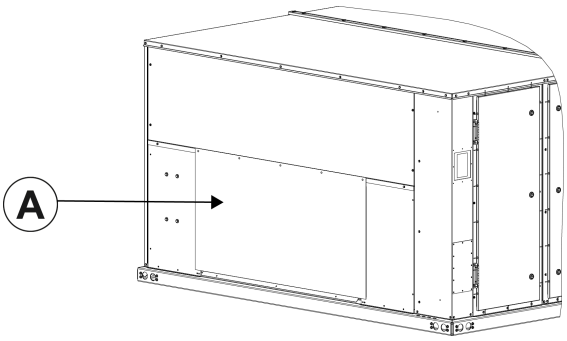
Figure 24: Removing the access panel



Item	Description
A	Return air access panel

2. Locate the power exhaust transit cover on the fresh air side of the unit as shown in Figure 25.

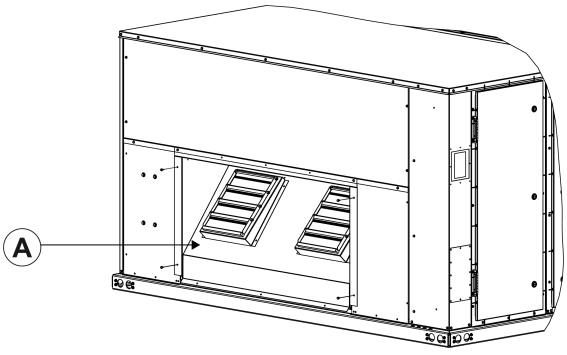
Figure 25: Cover



Item	Description
A	Cover

3. Remove the power exhaust transit cover by removing the screws at the top and bottom of the transit cover. Keep the screws for use in securing the power exhaust in a later step, the transit cover can be discarded.

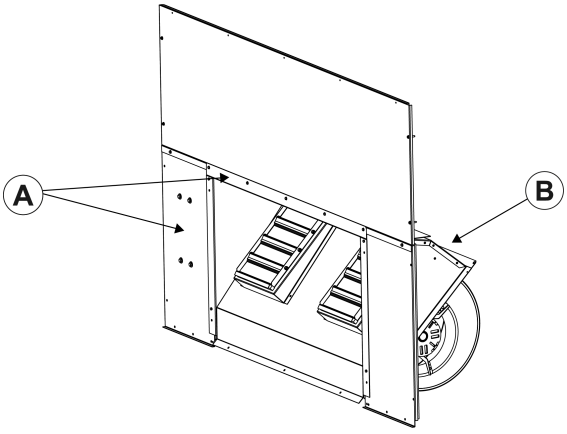
Figure 26: Removing the power exhaust transit cover



Item	Description
A	Power exhaust assembly

4. Before folding out the power exhaust assembly, ensure the wiring to the power exhaust motor is loose and not caught on internal components in the fresh air section of the unit. Visually locate the rear flange on the exhaust assembly shown in Figure 27, the mounting holes will need to be aligned with the through holes in the cabinet in the next steps.

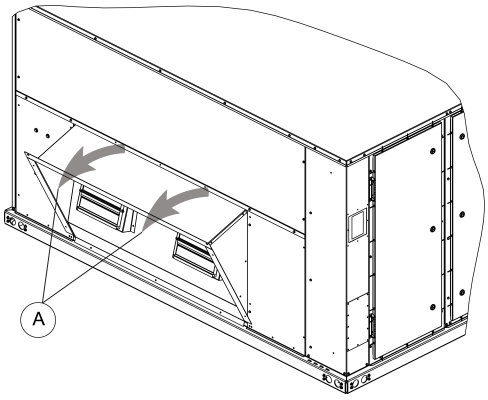
Figure 27: Rear flange location



Item	Description
A	Cabinet parts
B	Rear flange

5. From the outside of the unit, grabbing the top flange of the power exhaust assembly, pull the exhaust assembly away from the unit as shown in Figure 28. The assembly will rotate out and down using the base of the assembly as the pivot point.

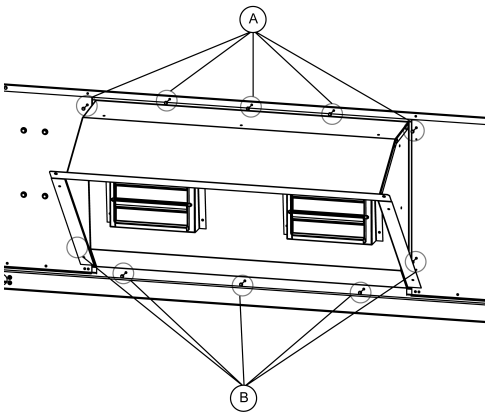
Figure 28: Exhaust Assembly



Item	Description
A	Pullout direction

6. While keeping the power exhaust assembly pivoted in its operational position, match the holes on the rear flange of the power exhaust assembly that was located in Step 4 to the holes on the corresponding cabinet parts.
7. Use the screws removed in Step 3 to attach the cabinet frame to the power exhaust assembly in the locations shown in Figure 29.

Figure 29: Flange screw locations



Item	Description
A	Top flange screw locations
B	Bottom flange screw locations

8. Use caulk, gasket, or other sealing means to ensure a watertight seal around the power exhaust assembly.
9. For a constant volume power exhaust, replace the return air access panel removed in Step 1. The setup is now complete. For a modulating power exhaust, continue to the next section for setting the location of the building pressure sensor.

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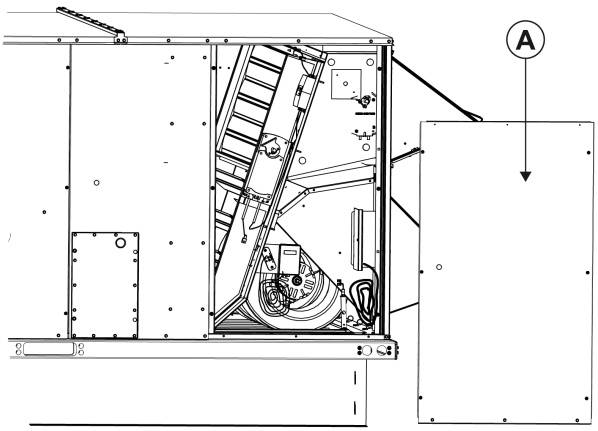
Relocating the RA pressure sensor

Field locating of building pressure sensor for modulating power exhaust

Complete these additional steps after completing the previous steps for field setup of a factory installed modulating power exhaust.

1. If not already removed, remove the return air access panel shown in Figure 30.

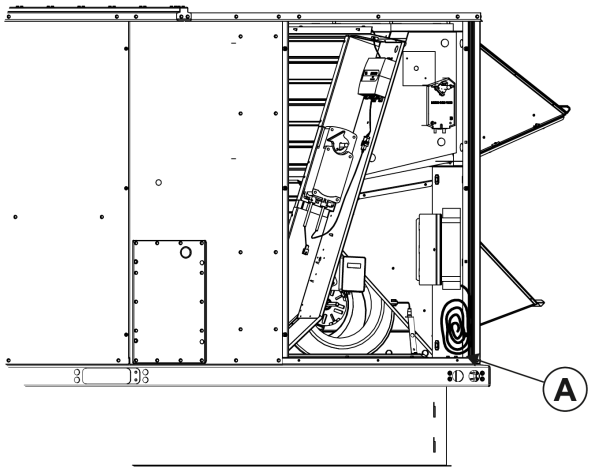
Figure 30: Removing the access panel



Item	Description
A	Return air access panel

2. The building pressure sensor and tubing are bundled from the factory and kept below the power exhaust control box as shown in Figure 31.

Figure 31: Building pressure sensor and tubing



Item	Description
A	RA pressure sensor tube bundled

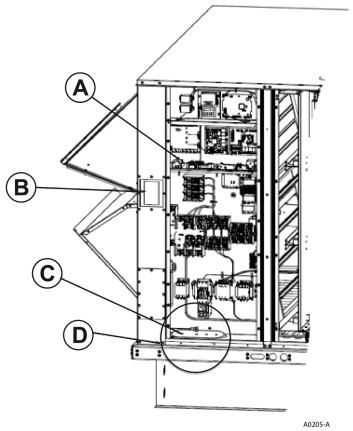
3. Cut the wire ties holding the tubing in place for shipping.
4. Lower the end of the tubing with the pressure sensor down into the return ductwork. Note that the provided sensor will negate the effects of return dynamic pressure to give a representative building pressure. If you require a different location for obtaining building pressure, you can route the tubing accordingly.
5. Use field-supplied gasket or other protective measures to keep the tube from rubbing on any sharp edges that could cut the tube over time.
6. Replace the return air compartment access panel.

Setting up pressure line connections for VAV

For VAV unit operation, field setup of the pressure lines is required to obtain readings of the supply duct pressure and building space pressure. Use the following instructions to complete this setup.

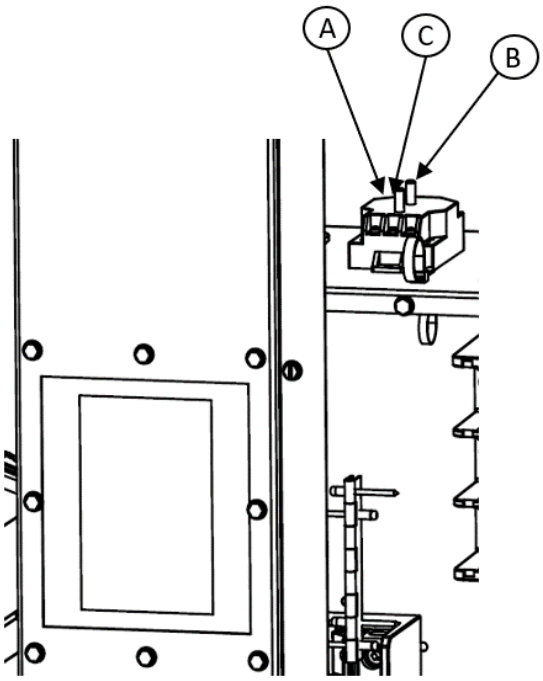
1. Open the control panel access door. The duct pressure sensor (DPS) will be located on the shelf as shown in Figure 32 and Figure 33.

Figure 32: Control panel



Item	Description
A	Duct pressure sensor
B	See Figure 33
C	Dimple embossment
D	See Figure 34

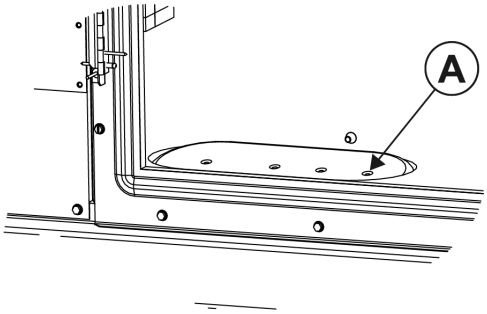
Figure 33: Duct pressure sensor detail



Callout	Description
A	DPS
B	High port
C	Low port

2. For best results, use a pressure-transmitting tubing with 3/16 in. I.D. for tubing lengths of up to 100 feet, ¼ in. I.D. for tubing lengths up to 300 feet, and 3/8 in. I.D. for tubing lengths up to 900 feet.
3. Drill a hole in the dimpled embossment in the bottom of the control box shown in Figure 32 and Figure 34. Drill the hole in a size that will fit both the building pressure and supply-air pressure tubes. Use protective measures to ensure that the tubing will not develop a cut from contact with any sharp edges.

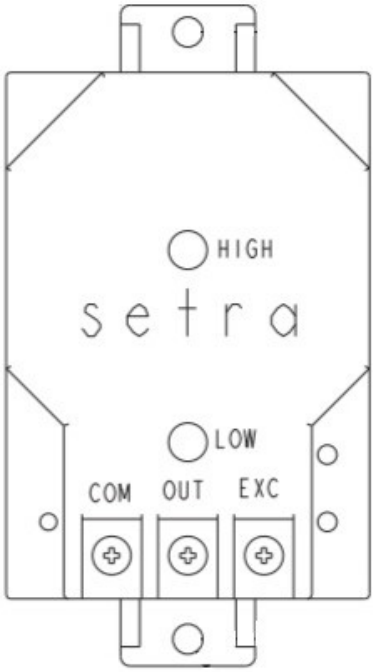
Figure 34: Dimple embossment detail



Callout	Description
A	Drill holes here for pressure tubes

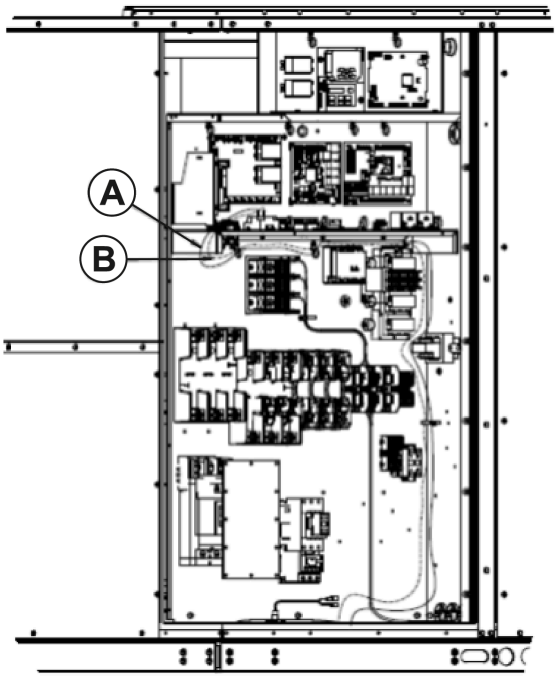
4. Determine the length of tubing required to run from the DPS (identified in Step 1), down through the hole drilled in the embossment in the bottom of the control box, and to the desired location for obtaining the building pressure.
5. Connect the field-supplied tubing to the Low pressure port of the DPS. The Low and High ports can be identified by the sticker and embossment on the sensor and are shown in Figure 33 and Figure 35.

Figure 35: DPS port locations



6. Route the tubing through the control box and down through the hole drilled in the control box base embossment, as shown in Figure 36 .

Figure 36: Routing the tubing



Callout	Description
A	High tube
B	Low tube

7. After exiting the unit base, route the tubing to the desired location for obtaining a constant building pressure reading.
8. Determine the length of tubing required to run from the DPS (identified in Step 1), down through the hole drilled in the embossment in the bottom of the control box, and to the desired location for obtaining the supply-air duct pressure.
9. Connect the field-supplied tubing to the High pressure port of the DPS. The Low and High ports can be identified by the sticker and embossment on the sensor and are shown in Figure 34 and Figure 35.
10. Following the same path as the building pressure tubing in Step 6, route the tubing through the control box and down through the hole drilled in the control box base embossment, as shown in Figure 36. Route both tubes along the cable straps and use wire ties to secure the tubes to the cable straps.
11. After exiting the unit base, route the tubing to a field-supplied static pressure tap in the supply duct located at a point where constant pressure is expected. An example of the full tubing routing can be seen in Figure 36.
12. To prevent an unstable signal due to air turbulence, there should be no obstructions, turns, or VAV terminal boxes up- or down-stream of the sensing tube location for at least a distance of 6 to 10 times the duct diameter.

Utilities entry

ⓘ **Note:** Field-seal all entry holes to prevent rainwater entry into the building.

Table 4: Utilities entry

Entry description		Opening size diameter (in.)
Control wiring	Left	Field drilled[1] to maximum of 7/8 in.
	Bottom	Field drilled[1] to maximum of 7/8 in.
Power wiring	Left	Field drilled[1] to maximum of 3 in.
	Bottom	Field drilled[1] to maximum of 3 in.
Gas piping	Left [2,3]	2 in. hole with 3/4 in. grommet
	Bottom[3]	1 1/4 in. hole
Condensate drain	Front[4]	1 1/2 in. hole
	Bottom[4]	2 in. hole with 1 1/4 in. grommet

ⓘ **Note:**
1. Factory provided dimples show the hole location to facilitate the drilling of entry holes.
2. 3/4 in. NPT gas piping is required.
3. You must insert the piping through the factory-installed grommet for a watertight seal.
4. 1 in. NPT female connection piping is required.

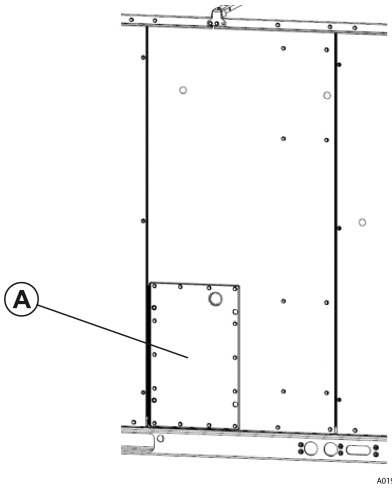
Installing the condensate drain line

After a unit is installed in the field, the condensate drain line will need to be connected to the field supplied drain line. The orientation of the condensate drain connection is adjustable. The drain connection leaves the factory oriented to the rear of the cabinet for a through the side connection. The drain connection can be reoriented downward through the base pan for piping inside the roof curb. Separate instructions are included in the following section for each orientation.

Through the side condensate drain:

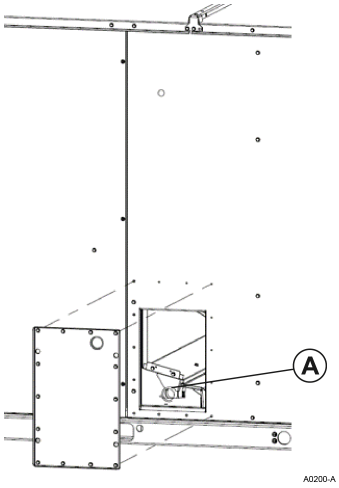
1. Remove the condensate drain line access patch plate shown in Figure 37 and Figure 38. Keep the screws for use in a later step.

Figure 37: Access patch plate



Item	Description
A	Access patch plate

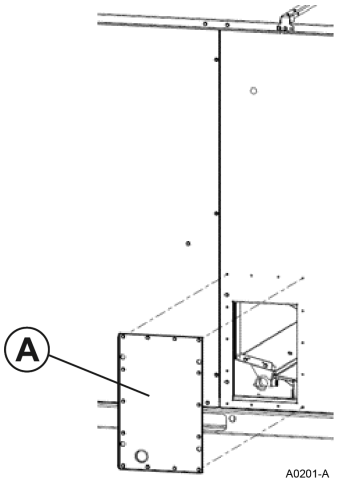
Figure 38: Patch plate removal



Item	Description
A	Threaded elbow

2. Rotate the patch plate 180° clockwise from its original orientation so that the drain line hole is in bottom left corner as shown in Figure 39.

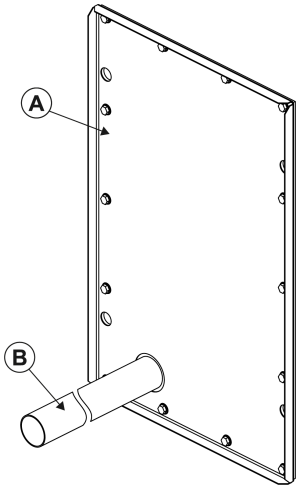
Figure 39: Access patch plate rotated orientation



Item	Description
A	Access patch plate rotated orientation

3. Pass the field-supplied condensate drain line through hole in the patch plate while it is detached from the unit. See Figure 40.

Figure 40: Detached patch plate

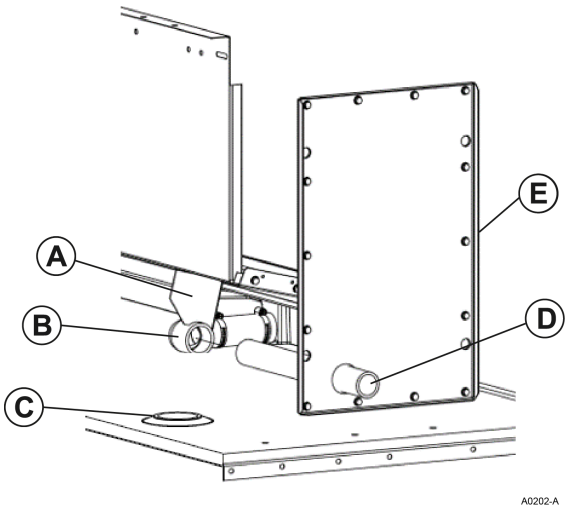


Item	Description
A	Access patch plate
B	Condensate drain line

4. Check that the plug C is fully inserted in the hole on the unit floor and the elbow is correctly secured and orientated using the elbow retaining bracket E. See Figure 41.
5. Connect the drain line to the 1 in. NPT female connection on the elbow located inside of the unit. Ensure that there is a correct seal between the drain line and the elbow. See Figure 41 for the component orientation.

Note: The condensate line should be supported external to the unit so it does not stress the internal connection

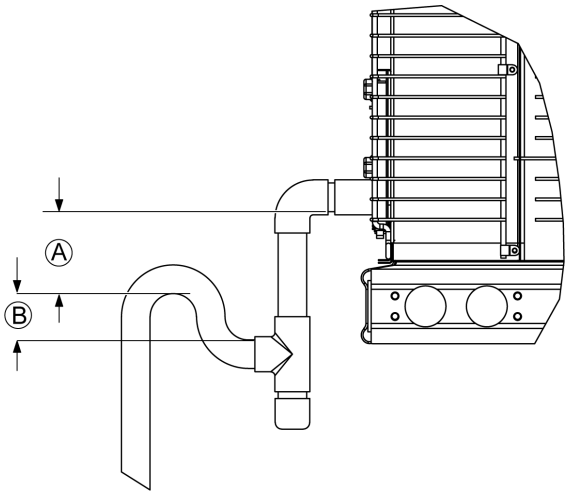
Figure 41: Correct component orientation



Item	Description
A	Elbow retaining bracket
B	Threaded elbow
C	Plug
D	Drain line
E	Patch plate

6. Trap the condensate drain line per Figure 42. The trap and drain lines should be protected from freezing and the plumbing must conform to local codes. Use a sealing compound on male pipe threads. The condensate line should be supported external to the unit so it does not stress the internal connection.

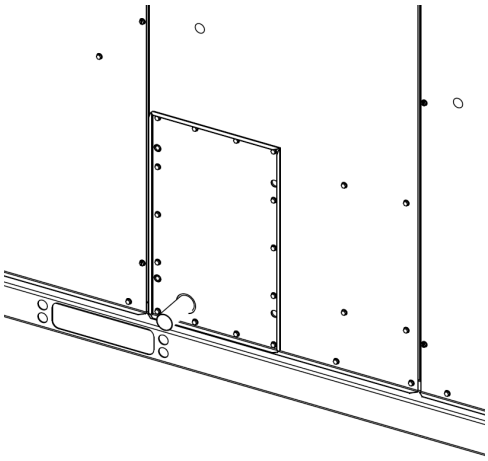
Figure 42: Trap and drain lines



Item	Description
A	3 in. minimum
B	2 in.

7. Using the screws that were removed in Step 1, attach the patch plate to the unit as shown in Figure 43. This will be in the same position the patch plate was rotated to in Step 2.

Figure 43: Attaching the patch plate

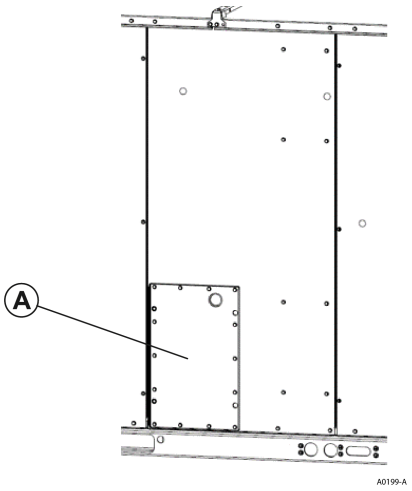


8. Use caulk, gasket, and/or other means to create a water-tight seal around the drain line where it passes through the patch plate to ensure no water enters the unit.
9. Ensure the drain line is installed horizontally level for proper drainage. If the drain line sags outside of the unit then the elbow/tube assembly inside lifts upward and do not allow proper drainage.

Through the base condensate drain:

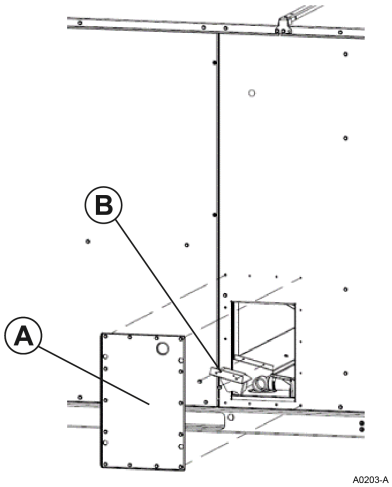
1. Remove the condensate drain line access patch plate shown in Figure 44 and the elbow retaining bracket as shown in Figure 45. Keep the screws for use in a later step.

Figure 44: Access patch plate



Item	Description
A	Access patch plate

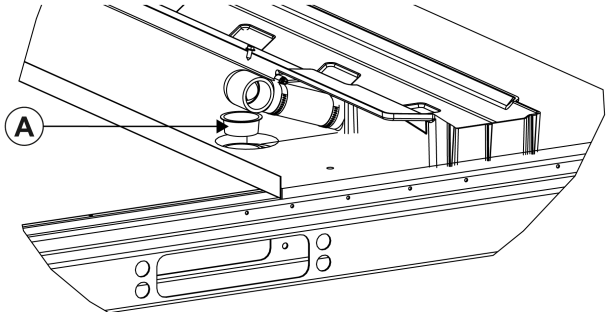
Figure 45: Access patch plate and elbow retaining bracket



Item	Description
A	Access patch plate
B	Elbow retaining bracket

2. Remove the plug from the grommet under the threaded elbow shown in Figure 45 and Figure 46.

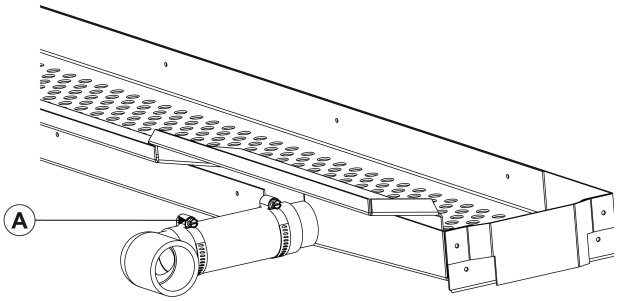
Figure 46: Removing the plug



Item	Description
A	Plug

3. Loosen the hose clamp holding the elbow to the hose. See Figure 47.

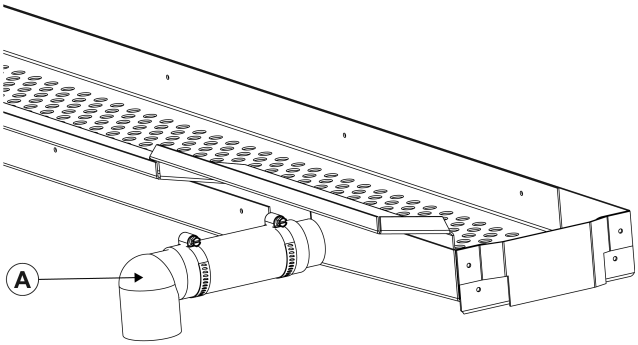
Figure 47: Loosening the hose clamp



Item	Description
A	Clamp

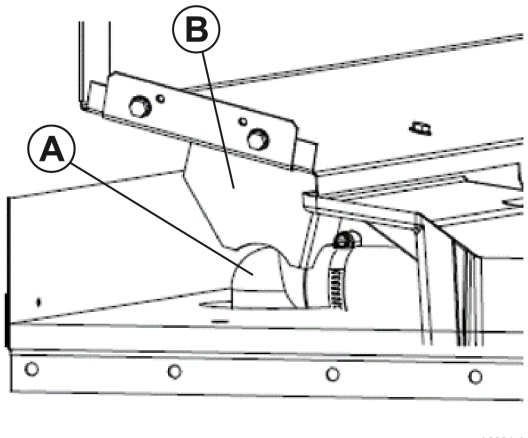
4. Rotate the elbow 90° so that the elbow points downward as shown in Figure 48. Push the elbow into the grommet as shown in Figure 49. Ensure that the hose from the drain pan to the elbow is horizontally level for proper drainage.

Figure 48: Rotating the elbow



Item	Description
A	Elbow rotated by 90°

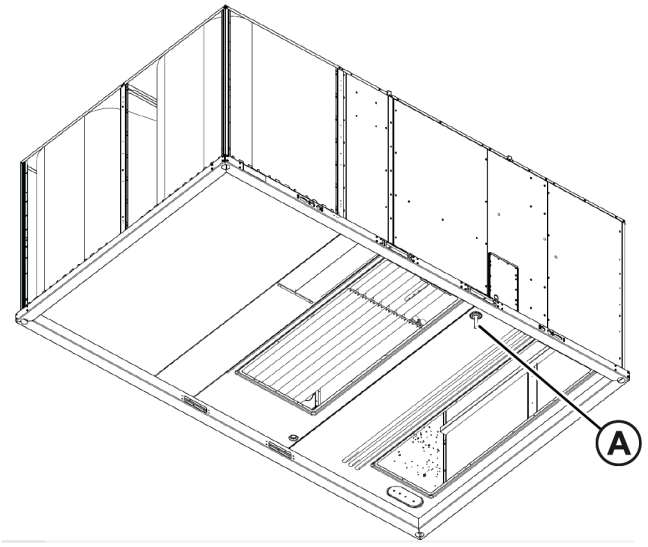
Figure 49: Inserting the elbow



Item	Description
A	Elbow inserted into grommet
B	Elbow retaining bracket

5. Tighten the hose clamp that you loosened in Step 3 to a maximum torque of 15 in-lb.
6. Secure the elbow firmly with the elbow retaining bracket as shown in Figure 49.
7. From below the unit, connect the field supplied drain line to the 1 in. NPT female connection on the elbow that is now sticking out of the grommet in the unit base pan. Ensure a proper seal is achieved between the drain line and the elbow. The through the base connection location can be seen in Figure 50.

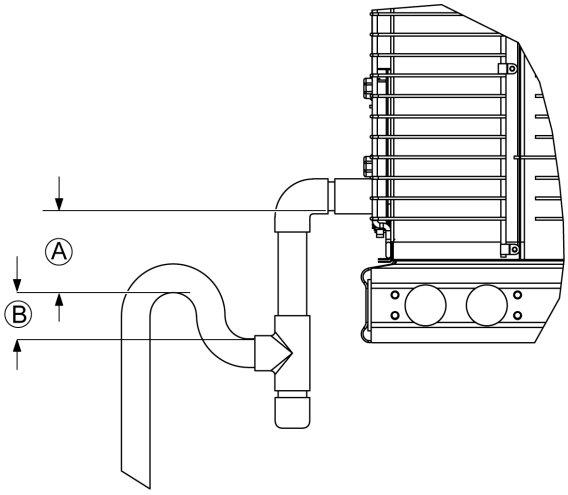
Figure 50: Connecting the drain line



Item	Description
A	Field supplied pipe

8. Route the field supplied drain line to the building exterior.
9. Trap the condensate drain line per Figure 51 .Protect the trap and drain lines from freezing. The plumbing must conform to local codes. Use a sealing compound on male pipe threads.

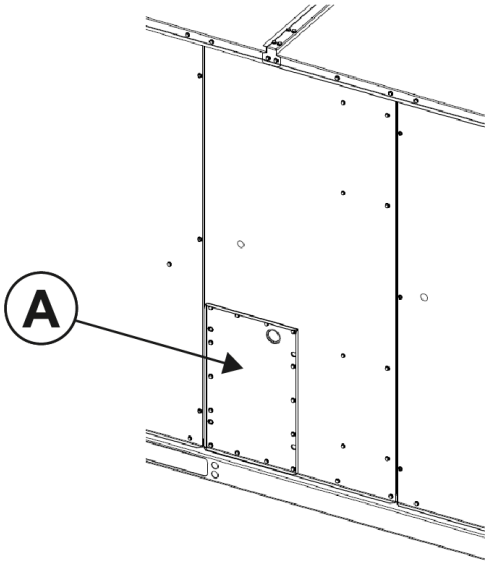
Figure 51: Trap and drain lines



Item	Description
A	3 in. minimum
B	2 in.

10. Using the screws that were removed in Step 1, replace the patch plate in its original orientation as shown in Figure 52.

Figure 52: Access patch plate



Item	Description
A	Access patch plate

Refrigerant detection system

Choice refrigeration detection systems (RDS) includes two refrigerant leak detection sensors to protect the unit from any damage caused by the leakage of the mildly flammable R454B refrigerant.

Choice units provide an RDS as factory and field installed options.

The RDS sensor can detect a refrigerant leak according to UL60335-2-40 (edition 4.0) with an accuracy of +/- 5% LFL across the working range (0-25% LFL)

Mounting suggestions are as follows:

- Mounting holes are sized for #10 sheet metal screws.
- For optimal performance, put the sensor on a flat, smooth, surface.
- Connector location is crucial. Position the sensor as indicated in the mounting instructions.
- Do not position sensors in an open-up orientation because this prevents any condensation on the mounting surface from dripping onto the sensor membrane.
- Refer to the *A2L Refrigerant Installation Manual* for RDS operation and safety requirements.

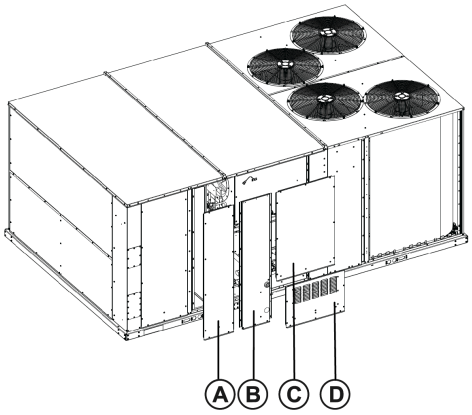


Field mounting the RDS

Mounting instructions for sensor 1

1. Remove or open the following section panels:
   - Filter
   - Blower
   - Heating section
   - Evaporator

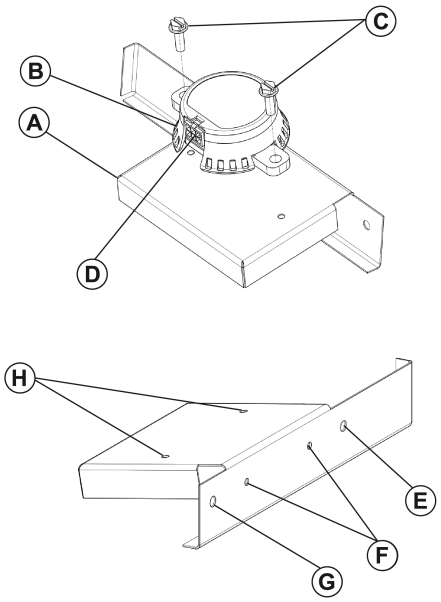
Figure 53: Unit with section panels



Item	Description
A	Filter section panel
B	Evaporator section panel
C	Blower section panel
D	Heating section panel

2. Use the bracket to install the RDS sensor 1. Secure the sub-assembly of the RDS sensor 1 and the bracket with two #10 screws as shown in Figure 54.

Figure 54: Refrigerant detection sensor



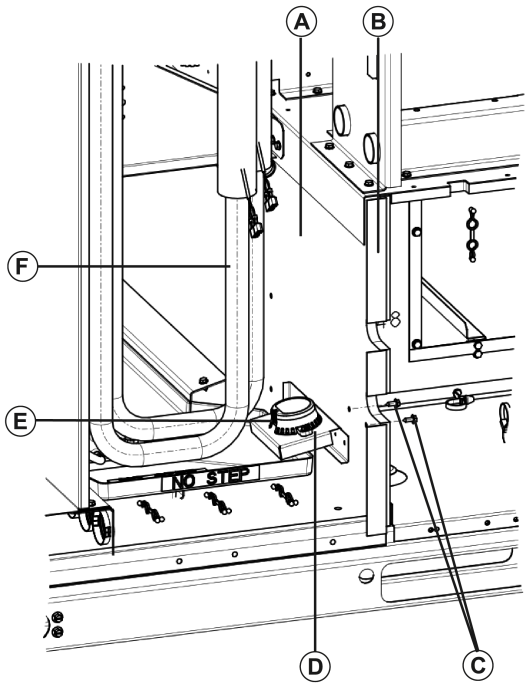
Item	Description
A	RDS bracket
B	RDS sensor
C	Number 10 screws
D	RDS connector position
E	Sensor 2 location mounting holes
F	Sensor 1 location mounting holes
G	Sensor 2 location mounting holes
H	Sensor mounting holes

3. Assemble the RDS sensor 1 and the bracket sub-assembly to the supply base pan, using the locating holes given on insulation.

   Note: The connector position for the RDS Sensor 1 is critical. The sensor position must be the same as shown in the sub-assembly, see Figure 54, Figure 55 and Figure 56

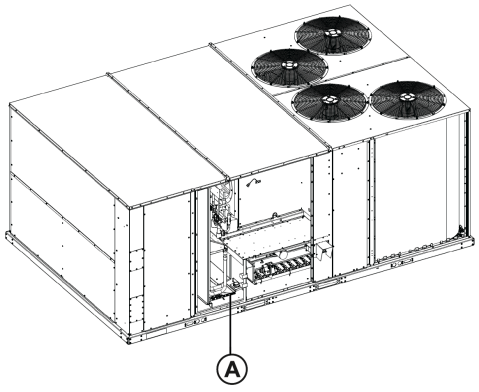
   Use two #10 screws to assemble the sub-assembly to the supply base pan.
   Mount the sub-assembly using the inner holes on the bracket. For the precise placement, see Figure 55
   Fasten the screws from the heating section toward the evaporator section.

Figure 55: Assembly for RDS detail



Item	Description
A	Insulation
B	Supply base pan
C	Number 10 screws
D	RDS 1 Sub assembly
E	Connector position facing evaporator
F	Evaporator headers

Figure 56: RDS location

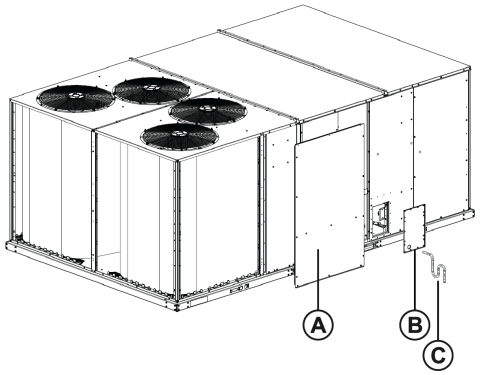


Item	Description
A	RDS sensor location

Mounting Instructions for sensor 2

1. Remove the access patch plate and drain-pipe. If necessary, remove the blower section panel.

Figure 57: Unit with access section panels

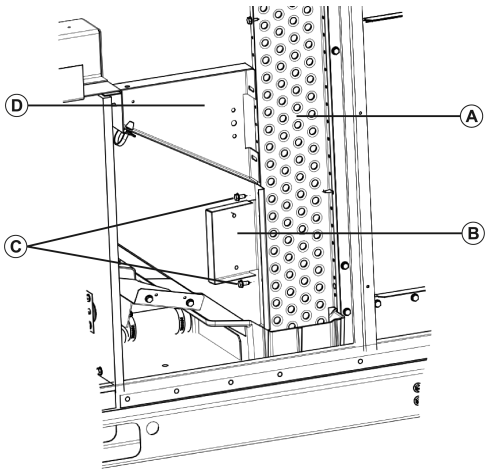


Item	Description
A	Blower section panel
B	Access patch plate
C	Drainpipe

2. Use the bracket to install RDS sensor 2. The sub-assembly of the RDS sensor 2 and the bracket requires two #10 screws, similar to the RDS sensor 1 sub-assembly, see Figure 54.
3. The sub-assembly of the RDS sensor 2 and the bracket must be placed below the evaporator coil support bracket to align with the locating holes. Use the outer holes on the bracket flange to connect the sub-assembly to the evaporator end sheet.

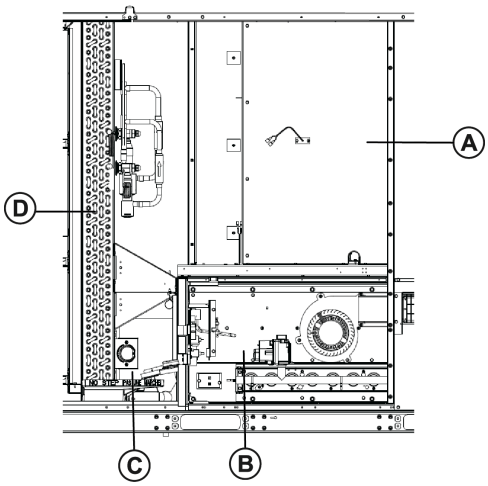
   Use two #10 screws to assemble the RDS sensor 2 and the bracket sub-assembly to the evaporator end sheet. See Figure 58

Figure 58: RDS Sensor 2 assembly



Item	Description
A	Evaporator end sheet
B	RDS sensor 2 sub assembly
C	#10 screws
D	Evaporator coil support

Figure 59: RDS Sensor 2 assembly - front side view



Item	Description
A	Blower
B	Heating section
C	Sensor 2 inside position
D	Evaporator

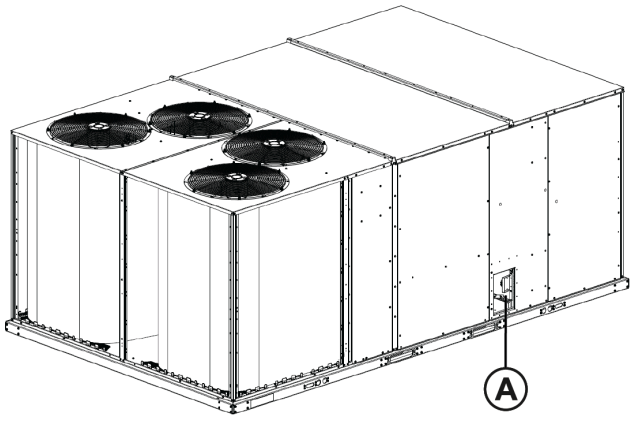
4. Position the RDS sensor 2 inside the unit facing toward the front side-panels. See Figure 60.

   Position the sensor inside the unit while you are assembling the RDS sensor 2 and the bracket sub-assembly. This positioning is critical for sensing the refrigerant leak.

   The refrigerant detection sensors have a common mounting bracket.

   Note: The connector position for RDS sensor 2 is critical. The sensor position must be the same as shown in the sub-assembly, see Figure 54 and Figure 60.

Figure 60: RDS sensor 2 location



Item	Description
A	RDS sensor 2 sub assembly

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Connecting the RDS sensors wiring harness

1. When you have installed both RDS sensors, you must connect the harness. Route the harness from the UCB board connector points, see Figure 61, to RDS sensor 1, and from RDS sensor 1 to RDS sensor 2, see Figure 62, the highlighted routing direction.

Figure 61: SSE board

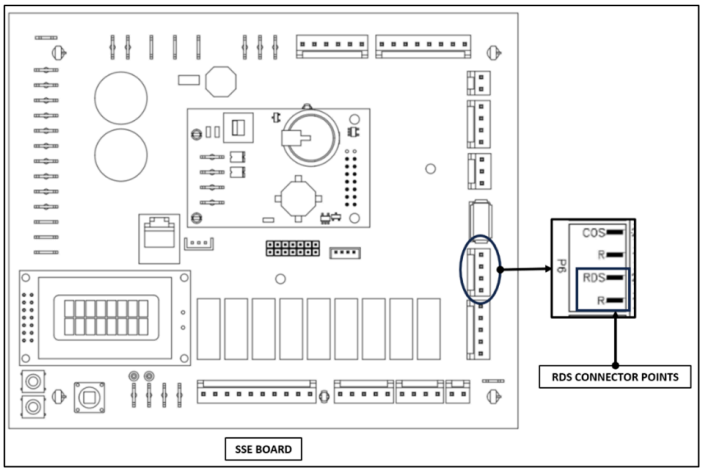
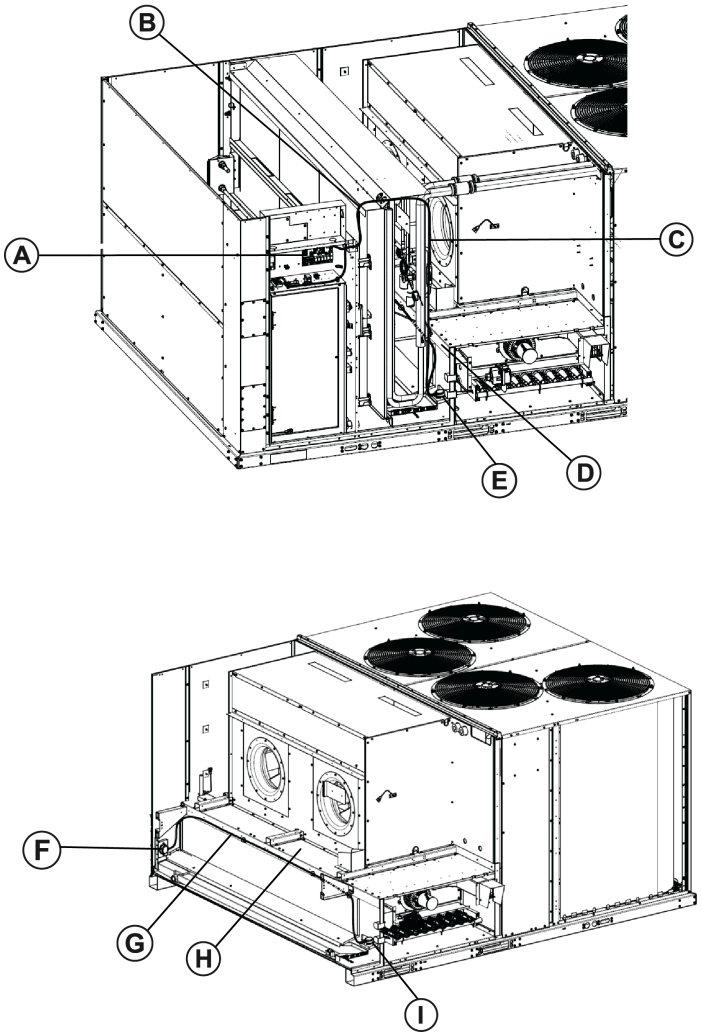


Figure 62: RDS sensor routing



Item	Description
A	SSE board
B	RDS harness
C	Wire routing
D	Blower deck
E	RDS sensor 1
F	RDS sensor 2
G	RDS harness
H	Blower deck
I	RDS sensor 1

2. After you complete routing the harness, close all the panels removed in Step 1 and Step 4.

Accessory weights

Unit accessory weights

Table 5: Unit accessory weights

Unit accessory	Unit size	
	12.5 ton and 15 ton	17.5 ton to 23 ton
Economizer	165	165
Motorized damper	75	75
Barometric damper	50	50
Power Exhaust (CV, Std CFM)	170	170
Power Exhaust (Mod, Std CFM)	212	212
Power Exhaust (CV/Mod, Hi CFM)	450	450
Electric heat (75 kW)	75	75
Gas heat (largest)	155	155
Hail guards	107	132
Wood skid and shipping brackets	70	80
Roof curb	230	250

Supply fan VFD weights

Table 6: Supply fan VFD weights

Supply fan motor	208/230V	460V	575V
2.9 HP	10	10	10
3.7 HP	10	10	10
5.3 HP	10	10	10
7.5 HP	15	15	15
10 HP	20	15	15

ⓘ **Note:** Add 5 lb. to the supply fan VFD weights if there is a bypass.

Roof curbs

The following figures show the roof curbs for the units. All dimensions are in inches.

Return air

Supply air

Figure 63: 1RC0444 and 1RC0447 roof curb dimensions

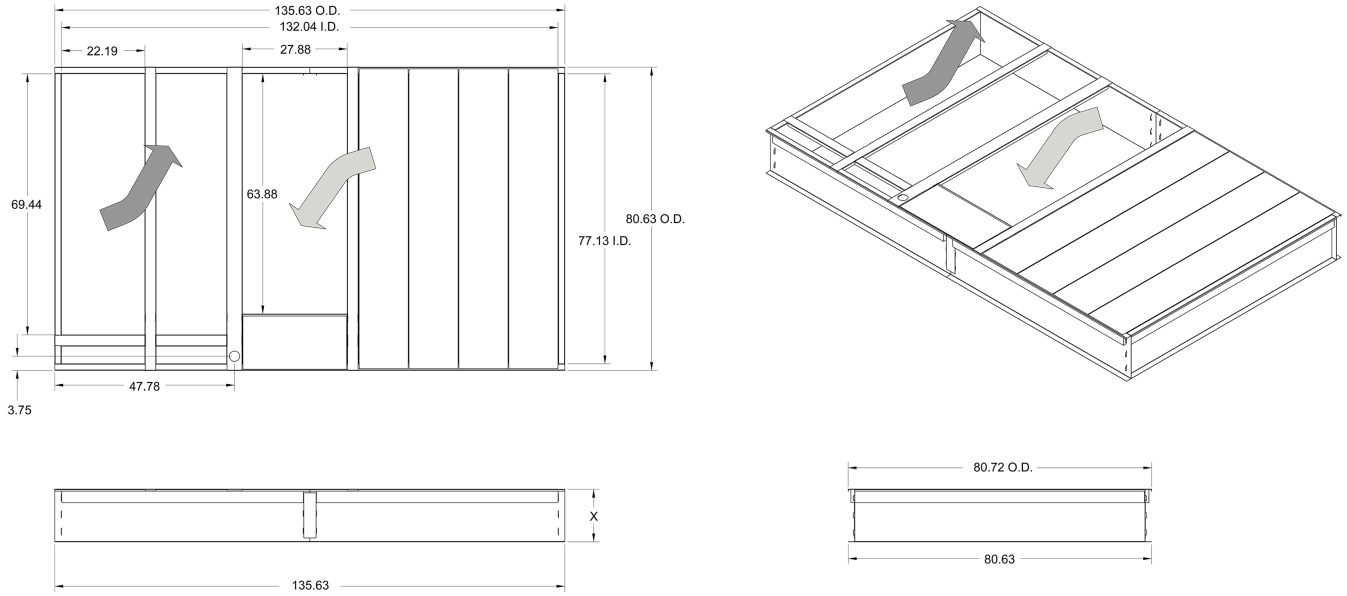


Table 7: 1RC0444 and 1RC0447 dimensions

Roof curb	X measurement (in.)
1RC0444	14
1RC0447	24

The following units are compatible with 1RC0444 and 1RC0447 roof curbs.

- KE13
- KE15

Figure 64: 1RC0445 and 1RC0448 roof curb dimensions

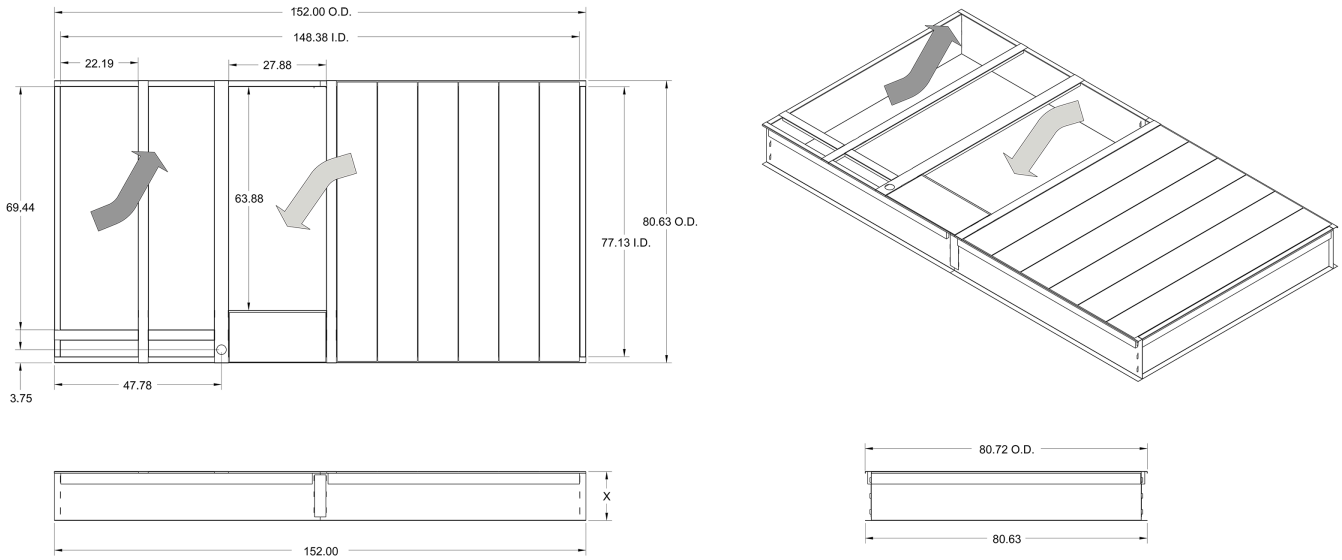


Table 8: 1RC0445 and 1RC0448 dimensions

Roof curb	X measurement (in.)
1RC0445	14
1RC0448	24

The following units are compatible with 1RC0445 and 1RC0448 roof curbs.

- KE18
- KE20
- KE23

Figure 65: Roof curb cutaway

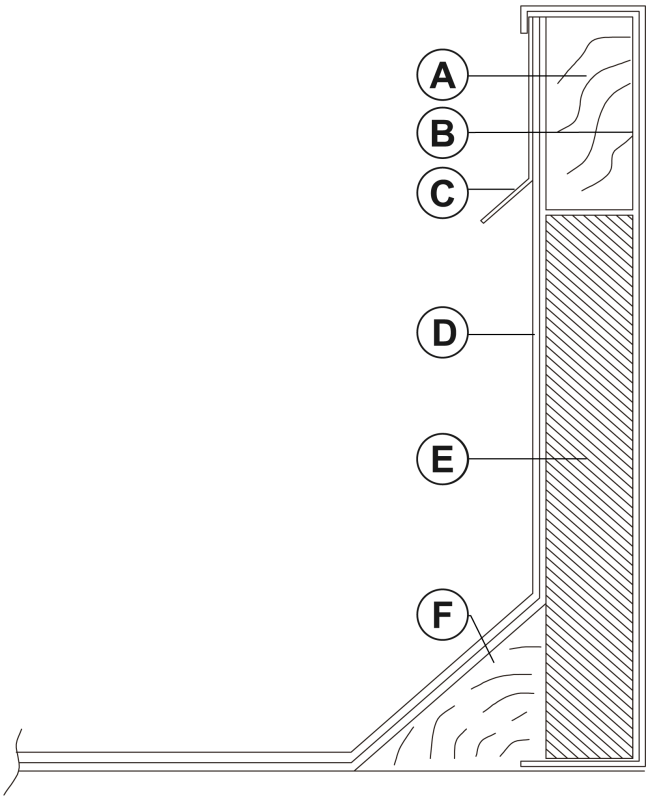


Table 9: Roof curb cutaway components

Item	Description	Item	Description
A	Wood nailer	D	Roof felt (field-supplied)
B	Curb frame	E	Rigid insulation (field-supplied)
C	Counter flashing (field-supplied)	F	Cant strip (field-supplied)

Ductwork

You must design and size ductwork according to the methods in Manual D of the Air Conditioning Contractors of America (ACCA) or as recommended by any other recognized authority such as ASHRAE or SMACNA. When you design the duct system, apply the following recommendations:

- Use a closed return duct system. This does not preclude the use of economizers or outdoor fresh air intake.
- Make the supply and return air duct connections at the unit with flexible joints to minimize noise.
- Design the supply and return air duct systems for the CFM and static pressure requirements of the job. Do not size them to match the dimensions of the duct connections on the unit.

See the Duct openings section for information on the side and bottom air duct openings.

Note: In Canada, it is recommended that the outlet duct be fitted with a removable access panel. It is recommended that this opening is accessible when the unit is installed in service, and of such a size that smoke or reflected light can be observed inside the casing to indicate the presence of leaks in the heat exchanger. You must attach the cover in a manner adequate to prevent leakage.

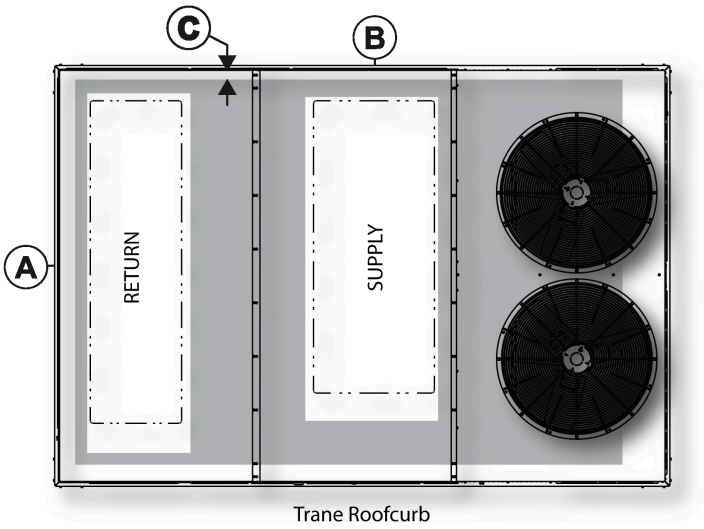
Placing the equipment over a Trane curb

When using this product to directly replace select Trane branded equipment without a transition curb, the placement of the unit on the existing Trane roof curb is required to follow these placement guidelines. The unit will be slightly longer and wider than the existing roof curb with the actual dimensional difference varying depending on tonnage. When positioning the unit on the roof curb the extra length and width will be left to overhang on the unit's right side (condenser end) and front (side with control access).

To properly align the supply and return air openings with the roof curb, complete the following step.

1. Leave a 1/2 in. gap between the unit baserail and the roof curb on both the left side (fresh air side) and back of the unit. See Figure 66.

Figure 66: Roof curb positioning



Item	Description
A	Left of Unit
B	Back of Unit
C	1/2 in. Gap

Compressors

The scroll compressor used in this product is specifically designed to operate with R-454B refrigerant and cannot be interchanged.

CAUTION

This system uses R-454B refrigerant which is a mildly flammable refrigerant. Do not use any other refrigerant in this system.

The compressor also uses a polyolester oil (POE oil). This oil is extremely hygroscopic, meaning that it absorbs water readily. POE oil can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all the necessary precautions to avoid exposure of the oil to the atmosphere. Refer to the compressor nameplate or label for the correct oil grade.

CAUTION

Do not leave the system open to the atmosphere. Unit damage could occur due to moisture being absorbed by the POE oil in the system. This type of oil is highly susceptible to moisture absorption.

POE compressor lubricants are known to cause long term damage to some synthetic roofing materials.

CAUTION

Exposure, even if immediately cleaned up, may cause embrittlement (leading to cracking) to occur in one year or more. When you perform any service that may risk exposure of compressor oil to the roof, take precautions to protect the roofing.

Procedures that risk oil leakage include, but are not limited to the following:

- Compressor replacement
- Repairing refrigerant leaks
- Replacing refrigerant components such as the filter drier, pressure switch, metering device, four-way reversing valve, or coil

Units are shipped with compressor mountings that are factory-adjusted and ready for operation.

CAUTION

Do not loosen compressor mounting bolts.

Filters

Units are provided with the selected 2 in. or 4 in. filter and can easily be converted in the field to accept either size in the standard filter rack.

Always install filters ahead of the evaporator coil. Keep the filters clean and replace them with filters of the same size and type. Dirty filters reduce the capacity of the unit and result in frosted coils or safety shutdown. See the physical data tables for the number and size of filters needed for the unit.

Do not operate the unit without filters correctly installed.

CAUTION

Ensure that panel latches are correctly positioned on the unit to maintain an airtight seal.

Dirty filter switch pressure setting

If a factory-installed dirty filter switch is present, you can change the pressure setting of the switch using the adjustment screw that is accessible with the metal cover removed. A setting of 0.5 in. WC serves as a general starting point but will likely need to be adjusted for the specific application to detect the increased pressure drop associated with a dirty filter.

Power and control wiring

Field wiring to the unit, fuses, and disconnects must conform to provisions of National Electrical Code (NEC), ANSI/NFPA No. 70 – Latest Edition (in U.S.A.), current Canadian Electrical Code C221, and/or local ordinances. You must electrically ground the unit in accordance with NEC and CEC as specified above and/or local codes.

Voltage tolerances must be maintained at the compressor terminals during starting and running conditions. The voltage tolerances are indicated on the unit rating plate and in the unit limitations table.

CAUTION

208/230-3-60 units control transformers are factory wired for 230 V power supply. Change the tap on the transformer for 208-3-60 operation. See the unit wiring diagram.

The internal wiring harnesses furnished with this unit are an integral part of the design certified unit. Field alteration to comply with electrical codes is not required.

If any of the wires supplied with the unit need to be replaced, you must replace them with the same type shown on the wiring diagram and the same minimum gauge as the replaced wire.

Use a disconnect with these units. Factory- and field-installed disconnects are available.

CAUTION

Avoid damage to internal components if you drill holes to install a disconnect.

Note: Not all local codes allow the installation of a disconnect on the unit. Confirm compliance with local code before you install a disconnect on the unit.

Electrical line must be sized properly to carry the load.

Note: Use copper conductors only.

Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

See the Figure 67 following figures for typical field wiring. Refer to the appropriate unit wiring diagram mounted inside the control doors for control circuit and power wiring information.

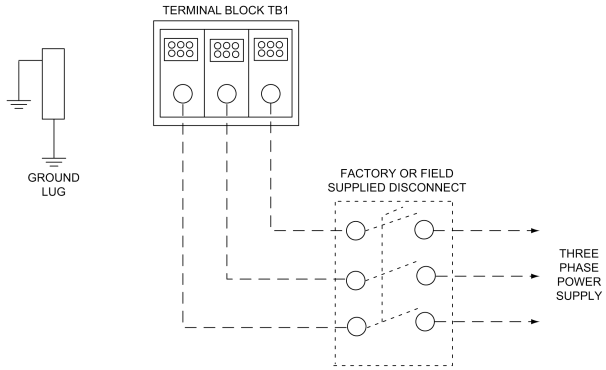
CAUTION

When you connect electrical power and control wiring to the unit, you must use water-proof connectors so that water or moisture cannot be drawn into the unit during normal operation. These water-proofing conditions also apply when you install a field-supplied disconnect switch.

Power wiring detail

Units are factory wired for the voltage shown on the unit nameplate. See the electrical data tables to size power wiring, fuses, and the disconnect switch. Power wiring is brought into the unit through the side of the unit or the basepan inside the curb.

Figure 67: Field wiring disconnect



Thermostat wiring

Install the thermostat on an inside wall approximately 56 in. above the floor. The thermostat must not be subject to drafts, sun exposure, or heat from electrical fixtures or appliances. Follow the manufacturer's instructions enclosed with the thermostat for the general installation procedure. Use color-coded, insulated wires to connect the thermostat to the unit. See the following table for control wire sizing and maximum length.

Table 10: Control wire sizes

Wire size	Maximum length[1]
18 AWG	150 ft

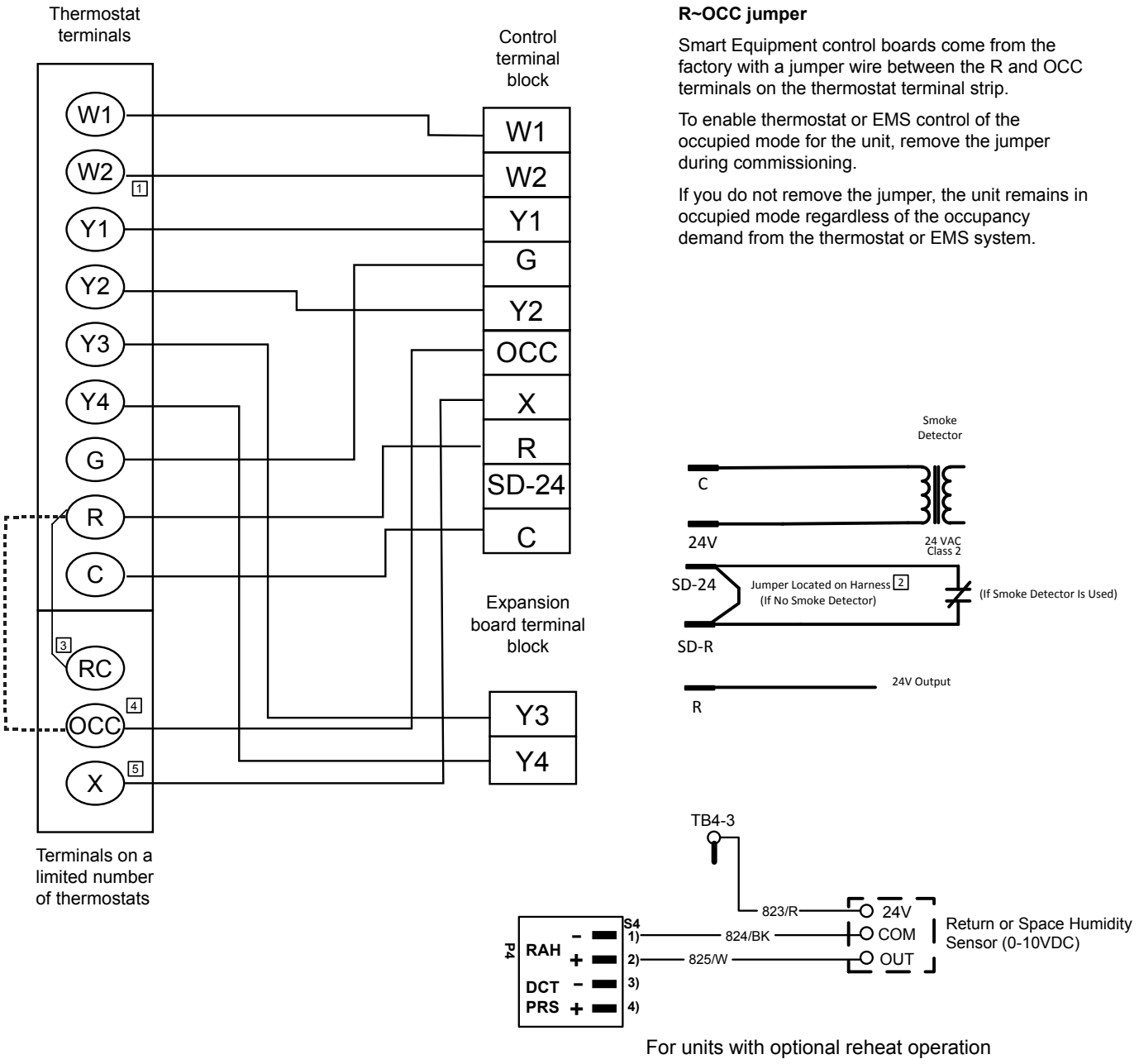
Note:

1. From the unit to the thermostat and back to the unit.

CAUTION

208/230-3-60 unit control transformer is factory wired for 230 V power supply. Change the tap on the transformer for 208-3-60 operation. See the unit wiring diagram.

Figure 68: Typical electronic thermostat field wiring



1 Second stage heating not required on single stage heating units.

2 Jumper is required if there is no Smoke Detector circuit.

3 Jumper is required for any combination of R, RC, or RH.

4 OCC is an output from the thermostat to indicate the Occupied condition.

5 X is an input to the thermostat to display Error Status conditions.

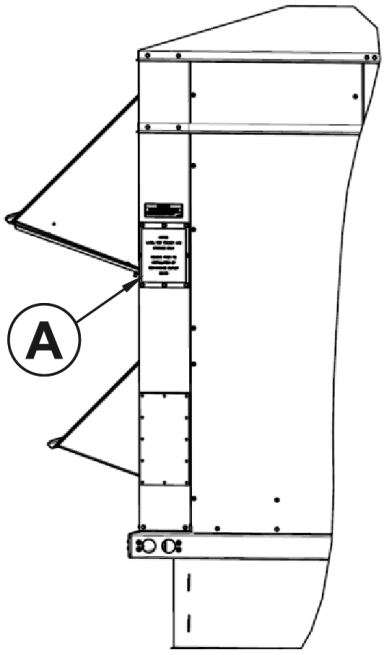
Convenience outlet cover installation

For units with a powered or non-powered convenience outlet, the convenience outlet cover is required to be installed in the field after the unit is installed.

To install the convenience outlet cover, complete the following steps.

1. The unit will leave the factory with a transit label covering the convenience outlet receptacle as shown in Figure 69. Remove and discard the convenience outlet transit label.

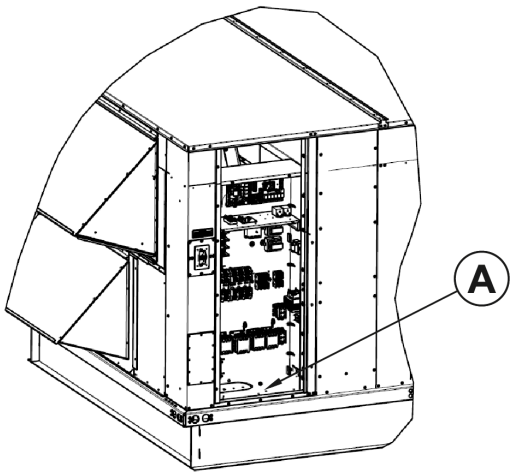
Figure 69: Convenience outlet transit label



Item	Description
A	Convenience outlet transit label

2. The convenience outlet cover will be shipped in the floor of the control box behind the high-voltage access panel as shown in Figure 70.

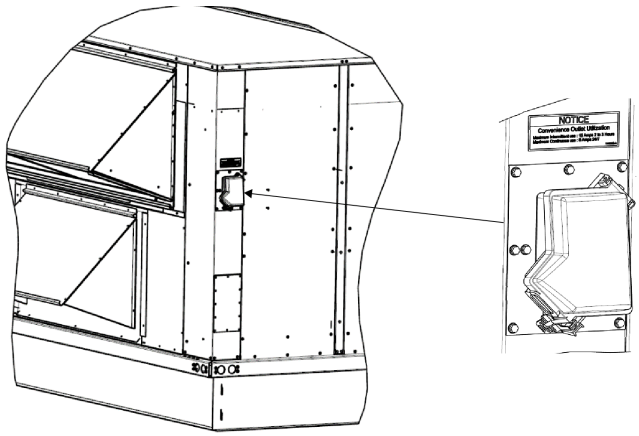
Figure 70: Location of convenience outlet cover



Item	Description
A	Location of convenience outlet cover

3. To mount the cover, follow the cover manufacturer's installation instructions that are provided with the cover. The final assembly should resemble Figure 71.

Figure 71: Convenience outlet cover



CAUTION

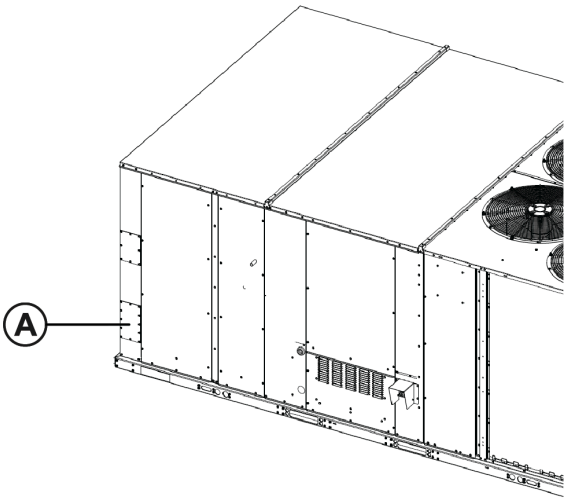
208/230-3-60 units with a factory-installed powered convenience outlet option are wired for 230v power supply. Change the tap on the transformer for 208-3-60 operation. See the unit wiring diagram.

Installing the circuit breaker and service disconnect handle

For units with a circuit breaker or a service disconnect, you must install the disconnect handle in the field after the unit is installed.

1. The unit will leave the factory with a patch plate covering the disconnect switch as shown in Figure 72.

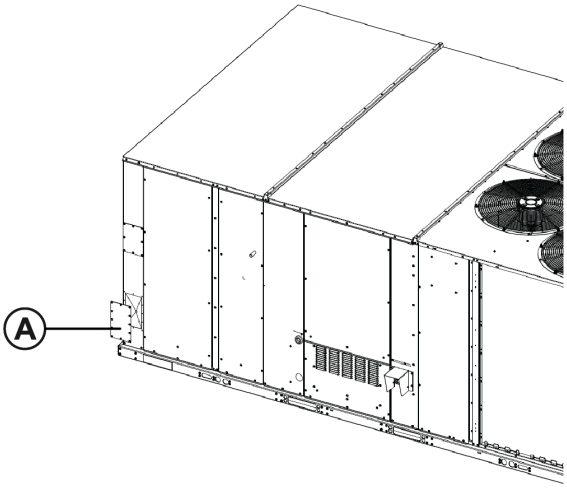
Figure 72: Patch plate



Item	Description
A	Patch plate

2. Remove the screws holding the patch plate to the unit cabinet as shown in Figure 73. Place the screws in a safe location to use in a later step. You can discard the patch plate.

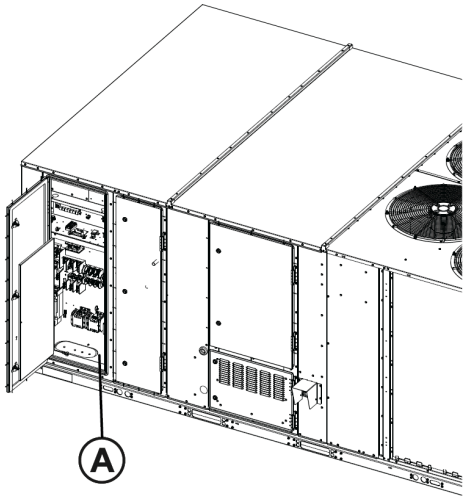
Figure 73: Removing the patch plate



Item	Description
A	Patch plate

3. The parts you need to complete the assembly are located in a box on the floor of the control box compartment, as shown in Figure 74. These parts include the permanent mounting plate with a hole for the disconnect handle, the disconnect handle, the handle manufacturer's installation instruction, and the additional parts to connect the handle to the disconnect switch.

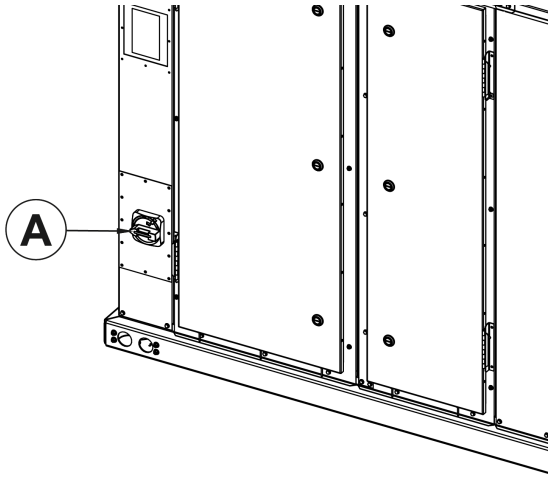
Figure 74: Disconnect handle and assembly parts



Item	Description
A	Control box floor

4. Attach the permanent mounting plate, gathered in Step 3, to the unit cabinet covering the opening that was created by removing the patch plate in Step 2. Attach the plate using the screws that you removed in step 2. Ensure that you attach the mounting plate with the hole aligned with the disconnect shaft.
5. To complete the field setup of the disconnect switch handle, follow the handle manufacturer's installation instructions that were included in the unit control box. These instructions show the installation of the disconnect handle and rod. The final assembly should resemble Figure 75.

Figure 75: Disconnect handle



Item	Description
A	Disconnect handle

Electrical data

The following note applies to all electrical data tables.

Note:

- MCA = minimum circuit ampacity
- f/b = fuse/breaker
- Fuse is a dual element, time delay type
- Breaker is a HACR type per NEC

VFD standard static

Table 11: KE13 to KE23 VFD standard static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	13.2	9.6	None	-	-	-	83.3	110	87	266	92.9	110	98	276
									2EH04522525	18.8	1	52.1	83.3	110	87	266	93.6	110	98	276
									2EH04525025	37.6	2	104.3	146.9	150	135	266	158.9	175	146	276
	230-3-60	30.0	53.1	23.2	142	4.7	13.2	8.7	None	-	-	-	83.3	110	87	274	92.0	110	97	282
									2EH04522525	23.0	1	57.7	88.6	110	87	274	99.5	110	97	282
									2EH04525025	45.9	2	115.2	160.5	175	148	274	171.4	175	158	282
	460-3-60	15.0	27.6	9.5	73.1	2.3	6.1	4.3	None	-	-	-	39.0	50	40	140	43.3	50	45	144
									2EH04522546	23.0	1	28.8	43.6	50	40	140	49.0	50	45	144
									2EH04525046	45.9	2	57.6	79.6	80	73	140	85.0	90	78	144
	575-3-60	13.0	21.6	7.8	55	1.9	4.9	3.5	None	-	-	-	32.8	45	34	107	36.3	45	38	110
									2EH04522558	23.0	1	23.0	34.9	45	34	107	39.3	45	38	110
									2EH04525058	45.9	2	46.0	63.6	70	59	107	68.0	70	63	110
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	13.2	9.6	None	-	-	-	90.2	110	94	303	99.8	125	105	312
									2EH04502525	18.8	1	52.1	90.2	110	94	303	99.8	125	105	312
									2EH04505025	37.6	2	104.3	146.9	150	135	303	158.9	175	146	312
									2EH04507525	56.3	2	156.2	172.7	200	195	303	184.7	200	206	312
	230-3-60	33.0	53.1	26.3	178.5	4.7	13.2	8.7	None	-	-	-	90.2	110	94	310	98.9	125	104	319
									2EH04502525	23.0	1	57.7	90.2	110	94	310	99.5	125	104	319
									2EH04505025	45.9	2	115.2	160.5	175	148	310	171.4	175	158	319
									2EH04507525	68.9	2	172.9	189.4	225	214	310	200.3	225	224	319
	460-3-60	16.0	27.6	11.0	95.3	2.3	6.1	4.3	None	-	-	-	41.7	50	43	162	46.0	60	48	166
									2EH04502546	23.0	1	28.8	43.6	50	43	162	49.0	60	48	166
									2EH04505046	45.9	2	57.6	79.6	80	73	162	85.0	90	78	166
									2EH04507546	68.9	2	86.4	94.0	110	106	162	99.4	110	111	166
	575-3-60	13.0	21.6	9.2	65	1.9	4.9	3.5	None	-	-	-	34.2	45	36	117	37.7	50	40	120
									2EH04502558	23.0	1	23.0	34.9	45	36	117	39.3	50	40	120
									2EH04505058	45.9	2	46.0	63.6	70	59	117	68.0	70	63	120
									2EH04507558	68.9	2	69.1	75.2	90	85	117	79.6	90	89	120
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	13.2	9.6	None	-	-	-	106.0	125	111	323	115.6	150	122	333
									2EH04502525	18.8	1	52.1	106.0	125	111	323	115.6	150	122	333
									2EH04505025	37.6	2	104.3	146.9	150	135	323	158.9	175	146	333
									2EH04507525	56.3	2	156.2	172.7	200	195	323	184.7	200	206	333
	230-3-60	37.0	53.1	27.7	178.5	4.7	13.2	8.7	None	-	-	-	106.0	125	111	331	114.7	150	121	340
									2EH04502525	23.0	1	57.7	106.0	125	111	331	114.7	150	121	340
									2EH04505025	45.9	2	115.2	160.5	175	148	331	171.4	175	158	340
									2EH04507525	68.9	2	172.9	189.4	225	214	331	200.3	225	224	340
	460-3-60	18.0	27.6	11.5	103	2.3	6.1	4.3	None	-	-	-	49.3	60	52	180	53.6	70	56	184
									2EH04502546	23.0	1	28.8	49.3	60	52	180	53.6	70	56	184
									2EH04505046	45.9	2	57.6	79.6	80	73	180	85.0	90	78	184
									2EH04507546	68.9	2	86.4	94.0	110	106	180	99.4	110	111	184
	575-3-60	15.0	21.6	9.0	78	1.9	4.9	3.5	None	-	-	-	40.3	50	42	147	43.8	50	46	151
									2EH04502558	23.0	1	23.0	40.3	50	42	147	43.8	50	46	151
									2EH04505058	45.9	2	46.0	63.6	70	59	147	68.0	70	63	151
									2EH04507558	68.9	2	69.1	75.2	90	85	147	79.6	90	89	151

Table 11: KE13 to KE23 VFD standard static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	20.4	9.6	None	-	-	-	131.7	175	137	397	141.3	175	148	407
									2EH04502525	18.8	1	52.1	131.7	175	137	397	141.3	175	148	407
									2EH04505025	37.6	2	104.3	155.9	175	143	397	167.9	175	154	407
									2EH04507525	56.3	2	156.2	181.7	200	203	397	193.7	200	214	407
	230-3-60	51.0	68.3	28.7	207.5	4.7	20.4	8.7	None	-	-	-	131.7	175	137	397	140.4	175	147	405
									2EH04502525	23.0	1	57.7	131.7	175	137	397	140.4	175	147	405
									2EH04505025	45.9	2	115.2	169.5	175	156	397	180.4	200	166	405
									2EH04507525	68.9	2	172.9	198.4	225	222	397	209.3	225	232	405
	460-3-60	25.0	35.7	12.4	100.2	2.3	9.9	4.3	None	-	-	-	62.8	80	65	196	67.1	90	70	200
									2EH04502546	23.0	1	28.8	62.8	80	65	196	67.1	90	70	200
									2EH04505046	45.9	2	57.6	84.4	90	78	196	89.8	90	83	200
									2EH04507546	68.9	2	86.4	98.8	110	111	196	104.2	110	116	200
	575-3-60	20.0	32.4	9.0	78	1.9	7.7	3.5	None	-	-	-	49.3	60	51	158	52.8	70	55	162
									2EH04502558	23.0	1	23.0	49.3	60	51	158	52.8	70	55	162
									2EH04505058	45.9	2	46.0	67.1	70	62	158	71.5	80	66	162
									2EH04507558	68.9	2	69.1	78.7	90	88	158	83.1	90	92	162
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	20.4	9.6	None	-	-	-	145.2	200	149	445	154.8	200	160	455
									2EH04502525	18.8	1	52.1	145.2	200	149	445	154.8	200	160	455
									2EH04505025	37.6	2	104.3	155.9	200	149	445	167.9	200	160	455
									2EH04507525	56.3	2	156.2	181.7	200	203	445	193.7	200	214	455
	230-3-60	62.0	68.3	28.5	255	4.7	20.4	8.7	None	-	-	-	145.2	200	149	444	153.9	200	159	453
									2EH04502525	23.0	1	57.7	145.2	200	149	444	153.9	200	159	453
									2EH04505025	45.9	2	115.2	169.5	200	156	444	180.4	200	166	453
									2EH04507525	68.9	2	172.9	198.4	225	222	444	209.3	225	232	453
	460-3-60	30.0	35.7	13.5	123	2.3	9.9	4.3	None	-	-	-	70.1	100	72	219	74.4	100	77	223
									2EH04502546	23.0	1	28.8	70.1	100	72	219	74.4	100	77	223
									2EH04505046	45.9	2	57.6	84.4	100	78	219	89.8	100	83	223
									2EH04507546	68.9	2	86.4	98.8	110	111	219	104.2	110	116	223
	575-3-60	25.0	32.4	10.7	93.7	1.9	7.7	3.5	None	-	-	-	57.3	80	59	174	60.8	80	63	177
									2EH04502558	23.0	1	23.0	57.3	80	59	174	60.8	80	63	177
									2EH04505058	45.9	2	46.0	67.1	80	62	174	71.5	80	66	177
									2EH04507558	68.9	2	69.1	78.7	90	88	174	83.1	90	92	177

Table 12: KE13 to KE23 VFD standard static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	13.2	5.0	9.6	None	-	-	-	93.3	110	99	287	102.9	125	110	297
										2EH04522525	18.8	1	52.1	94.1	110	99	287	106.1	125	110	297
										2EH04525025	37.6	2	104.3	159.4	175	147	287	171.4	175	158	297
	230-3-60	30.0	53.1	23.2	142	4.7	13.2	5.0	8.7	None	-	-	-	93.3	110	99	295	102.0	125	109	303
										2EH04522525	23.0	1	57.7	101.1	110	99	295	112.0	125	109	303
										2EH04525025	45.9	2	115.2	173.0	175	159	295	183.9	200	169	303
	460-3-60	15.0	27.6	9.5	73.1	2.3	6.1	2.2	4.3	None	-	-	-	43.4	50	46	149	47.7	60	50	153
										2EH04522546	23.0	1	28.8	49.1	50	46	149	54.5	60	50	153
										2EH04525046	45.9	2	57.6	85.1	90	78	149	90.5	100	83	153
	575-3-60	13.0	21.6	7.8	55	1.9	4.9	1.5	3.5	None	-	-	-	35.8	45	37	113	39.3	50	41	116
										2EH04522558	23.0	1	23.0	38.6	45	37	113	43.0	50	41	116
										2EH04525058	45.9	2	46.0	67.4	70	62	113	71.8	80	66	116
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	13.2	5.0	9.6	None	-	-	-	100.2	125	106	324	109.8	125	117	333
										2EH04502525	18.8	1	52.1	100.2	125	106	324	109.8	125	117	333
										2EH04505025	37.6	2	104.3	159.4	175	147	324	171.4	175	158	333
										2EH04507525	56.3	2	156.2	185.2	200	206	324	197.2	200	217	333
	230-3-60	33.0	53.1	26.3	178.5	4.7	13.2	5.0	8.7	None	-	-	-	100.2	125	106	331	108.9	125	116	340
										2EH04502525	23.0	1	57.7	101.1	125	106	331	112.0	125	116	340
										2EH04505025	45.9	2	115.2	173.0	175	159	331	183.9	200	169	340
										2EH04507525	68.9	2	172.9	201.9	225	226	331	212.8	225	236	340
	460-3-60	16.0	27.6	11.0	95.3	2.3	6.1	2.2	4.3	None	-	-	-	46.1	60	48	171	50.4	60	53	176
										2EH04502546	23.0	1	28.8	49.1	60	48	171	54.5	60	53	176
										2EH04505046	45.9	2	57.6	85.1	90	78	171	90.5	100	83	176
										2EH04507546	68.9	2	86.4	99.5	110	111	171	104.9	110	116	176
	575-3-60	13.0	21.6	9.2	65	1.9	4.9	1.5	3.5	None	-	-	-	37.2	50	39	123	40.7	50	43	126
										2EH04502558	23.0	1	23.0	38.6	50	39	123	43.0	50	43	126
										2EH04505058	45.9	2	46.0	67.4	70	62	123	71.8	80	66	126
										2EH04507558	68.9	2	69.1	79.0	90	89	123	83.4	90	93	126
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	13.2	5.0	9.6	None	-	-	-	116.0	150	123	344	125.6	150	134	354
										2EH04502525	18.8	1	52.1	116.0	150	123	344	125.6	150	134	354
										2EH04505025	37.6	2	104.3	159.4	175	147	344	171.4	175	158	354
										2EH04507525	56.3	2	156.2	185.2	200	206	344	197.2	200	217	354
	230-3-60	37.0	53.1	27.7	178.5	4.7	13.2	5.0	8.7	None	-	-	-	116.0	150	123	352	124.7	150	133	361
										2EH04502525	23.0	1	57.7	116.0	150	123	352	124.7	150	133	361
										2EH04505025	45.9	2	115.2	173.0	175	159	352	183.9	200	169	361
										2EH04507525	68.9	2	172.9	201.9	225	226	352	212.8	225	236	361
	460-3-60	18.0	27.6	11.5	103	2.3	6.1	2.2	4.3	None	-	-	-	53.7	70	57	189	58.0	70	62	194
										2EH04502546	23.0	1	28.8	53.7	70	57	189	58.0	70	62	194
										2EH04505046	45.9	2	57.6	85.1	90	78	189	90.5	100	83	194
										2EH04507546	68.9	2	86.4	99.5	110	111	189	104.9	110	116	194
	575-3-60	15.0	21.6	9.0	78	1.9	4.9	1.5	3.5	None	-	-	-	43.3	50	45	154	46.8	60	49	157
										2EH04502558	23.0	1	23.0	43.3	50	45	154	46.8	60	49	157
										2EH04505058	45.9	2	46.0	67.4	70	62	154	71.8	80	66	157
										2EH04507558	68.9	2	69.1	79.0	90	89	154	83.4	90	93	157

Table 12: KE13 to KE23 VFD standard static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	20.4	5.0	9.6	None	-	-	-	141.7	175	148	418	151.3	200	159	428
										2EH04502525	18.8	1	52.1	141.7	175	148	418	151.3	200	159	428
										2EH04505025	37.6	2	104.3	168.4	175	155	418	180.4	200	166	428
										2EH04507525	56.3	2	156.2	194.2	200	215	418	206.2	225	226	428
	230-3-60	51.0	68.3	28.7	207.5	4.7	20.4	5.0	8.7	None	-	-	-	141.7	175	148	418	150.4	200	158	426
										2EH04502525	23.0	1	57.7	141.7	175	148	418	150.4	200	158	426
										2EH04505025	45.9	2	115.2	182.0	200	167	418	192.9	200	177	426
										2EH04507525	68.9	2	172.9	210.9	225	234	418	221.8	225	244	426
	460-3-60	25.0	35.7	12.4	100.2	2.3	9.9	2.2	4.3	None	-	-	-	67.2	90	70	205	71.5	90	75	210
										2EH04502546	23.0	1	28.8	67.2	90	70	205	71.5	90	75	210
										2EH04505046	45.9	2	57.6	89.9	90	83	205	95.3	100	88	210
										2EH04507546	68.9	2	86.4	104.3	110	116	205	109.7	110	121	210
	575-3-60	20.0	32.4	9.0	78	1.9	7.7	1.5	3.5	None	-	-	-	52.3	70	54	164	55.8	70	58	168
										2EH04502558	23.0	1	23.0	52.3	70	54	164	55.8	70	58	168
										2EH04505058	45.9	2	46.0	70.9	80	65	164	75.3	80	69	168
										2EH04507558	68.9	2	69.1	82.5	90	92	164	86.9	90	96	168
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	20.4	5.0	9.6	None	-	-	-	155.2	200	161	466	164.8	225	172	476
										2EH04502525	18.8	1	52.1	155.2	200	161	466	164.8	225	172	476
										2EH04505025	37.6	2	104.3	168.4	200	161	466	180.4	225	172	476
										2EH04507525	56.3	2	156.2	194.2	200	215	466	206.2	225	226	476
	230-3-60	62.0	68.3	28.5	255	4.7	20.4	5.0	8.7	None	-	-	-	155.2	200	161	465	163.9	225	171	474
										2EH04502525	23.0	1	57.7	155.2	200	161	465	163.9	225	171	474
										2EH04505025	45.9	2	115.2	182.0	200	167	465	192.9	225	177	474
										2EH04507525	68.9	2	172.9	210.9	225	234	465	221.8	225	244	474
	460-3-60	30.0	35.7	13.5	123	2.3	9.9	2.2	4.3	None	-	-	-	74.5	100	77	228	78.8	100	82	232
										2EH04502546	23.0	1	28.8	74.5	100	77	228	78.8	100	82	232
										2EH04505046	45.9	2	57.6	89.9	100	83	228	95.3	100	88	232
										2EH04507546	68.9	2	86.4	104.3	110	116	228	109.7	110	121	232
	575-3-60	25.0	32.4	10.7	93.7	1.9	7.7	1.5	3.5	None	-	-	-	60.3	80	62	180	63.8	80	66	184
										2EH04502558	23.0	1	23.0	60.3	80	62	180	63.8	80	66	184
										2EH04505058	45.9	2	46.0	70.9	80	65	180	75.3	80	69	184
										2EH04507558	68.9	2	69.1	82.5	90	92	180	86.9	90	96	184

Table 13: KE13 to KE23 VFD standard static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	13.2	6.7	9.6	None	-	-	-	96.7	125	103	280	106.3	125	114	289
										2EH04522525	18.8	1	52.1	98.4	125	103	280	110.4	125	114	289
										2EH04525025	37.6	2	104.3	163.6	175	151	280	175.6	200	162	289
	230-3-60	30.0	53.1	23.2	142	4.7	13.2	6.7	8.7	None	-	-	-	96.7	125	103	287	105.4	125	113	296
										2EH04522525	23.0	1	57.7	105.4	125	103	287	116.3	125	113	296
										2EH04525025	45.9	2	115.2	177.3	200	163	287	188.1	200	173	296
	460-3-60	15.0	27.6	9.5	73.1	2.3	6.1	3.4	4.3	None	-	-	-	45.8	60	48	147	50.1	60	53	151
										2EH04522546	23.0	1	28.8	52.1	60	48	147	57.5	60	53	151
										2EH04525046	45.9	2	57.6	88.1	90	81	147	93.5	100	86	151
	575-3-60	13.0	21.6	7.8	55	1.9	4.9	2.7	3.5	None	-	-	-	38.2	50	40	112	41.7	50	44	115
										2EH04522558	23.0	1	23.0	41.6	50	40	112	46.0	50	44	115
										2EH04525058	45.9	2	46.0	70.4	80	65	112	74.8	80	69	115
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	13.2	6.7	9.6	None	-	-	-	103.6	125	110	316	113.2	125	121	326
										2EH04502525	18.8	1	52.1	103.6	125	110	316	113.2	125	121	326
										2EH04505025	37.6	2	104.3	163.6	175	151	316	175.6	200	162	326
										2EH04507525	56.3	2	156.2	189.5	200	210	316	201.5	225	221	326
	230-3-60	33.0	53.1	26.3	178.5	4.7	13.2	6.7	8.7	None	-	-	-	103.6	125	110	323	112.3	125	120	332
										2EH04502525	23.0	1	57.7	105.4	125	110	323	116.3	125	120	332
										2EH04505025	45.9	2	115.2	177.3	200	163	323	188.1	200	173	332
										2EH04507525	68.9	2	172.9	206.2	225	229	323	217.0	225	239	332
	460-3-60	16.0	27.6	11.0	95.3	2.3	6.1	3.4	4.3	None	-	-	-	48.5	60	51	169	52.8	60	56	173
										2EH04502546	23.0	1	28.8	52.1	60	51	169	57.5	60	56	173
										2EH04505046	45.9	2	57.6	88.1	90	81	169	93.5	100	86	173
										2EH04507546	68.9	2	86.4	102.5	110	114	169	107.9	110	119	173
	575-3-60	13.0	21.6	9.2	65	1.9	4.9	2.7	3.5	None	-	-	-	39.6	50	42	122	43.1	50	46	125
										2EH04502558	23.0	1	23.0	41.6	50	42	122	46.0	50	46	125
										2EH04505058	45.9	2	46.0	70.4	80	65	122	74.8	80	69	125
										2EH04507558	68.9	2	69.1	82.0	90	91	122	86.4	90	95	125
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	13.2	6.7	9.6	None	-	-	-	119.4	150	127	336	129.0	150	138	346
										2EH04502525	18.8	1	52.1	119.4	150	127	336	129.0	150	138	346
										2EH04505025	37.6	2	104.3	163.6	175	151	336	175.6	200	162	346
										2EH04507525	56.3	2	156.2	189.5	200	210	336	201.5	225	221	346
	230-3-60	37.0	53.1	27.7	178.5	4.7	13.2	6.7	8.7	None	-	-	-	119.4	150	127	344	128.1	150	137	353
										2EH04502525	23.0	1	57.7	119.4	150	127	344	128.1	150	137	353
										2EH04505025	45.9	2	115.2	177.3	200	163	344	188.1	200	173	353
										2EH04507525	68.9	2	172.9	206.2	225	229	344	217.0	225	239	353
	460-3-60	18.0	27.6	11.5	103	2.3	6.1	3.4	4.3	None	-	-	-	56.1	70	59	187	60.4	70	64	191
										2EH04502546	23.0	1	28.8	56.1	70	59	187	60.4	70	64	191
										2EH04505046	45.9	2	57.6	88.1	90	81	187	93.5	100	86	191
										2EH04507546	68.9	2	86.4	102.5	110	114	187	107.9	110	119	191
	575-3-60	15.0	21.6	9.0	78	1.9	4.9	2.7	3.5	None	-	-	-	45.7	60	48	153	49.2	60	52	156
										2EH04502558	23.0	1	23.0	45.7	60	48	153	49.2	60	52	156
										2EH04505058	45.9	2	46.0	70.4	80	65	153	74.8	80	69	156
										2EH04507558	68.9	2	69.1	82.0	90	91	153	86.4	90	95	156

Table 13: KE13 to KE23 VFD standard static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	20.4	6.7	9.6	None	-	-	-	145.1	175	152	411	154.7	200	163	420
										2EH04502525	18.8	1	52.1	145.1	175	152	411	154.7	200	163	420
										2EH04505025	37.6	2	104.3	172.6	175	159	411	184.6	200	170	420
										2EH04507525	56.3	2	156.2	198.5	200	219	411	210.5	225	230	420
	230-3-60	51.0	68.3	28.7	207.5	4.7	20.4	6.7	8.7	None	-	-	-	145.1	175	152	410	153.8	200	162	419
										2EH04502525	23.0	1	57.7	145.1	175	152	410	153.8	200	162	419
										2EH04505025	45.9	2	115.2	186.3	200	171	410	197.1	200	181	419
										2EH04507525	68.9	2	172.9	215.2	225	238	410	226.0	250	248	419
	460-3-60	25.0	35.7	12.4	100.2	2.3	9.9	3.4	4.3	None	-	-	-	69.6	90	73	203	73.9	90	78	207
										2EH04502546	23.0	1	28.8	69.6	90	73	203	73.9	90	78	207
										2EH04505046	45.9	2	57.6	92.9	100	85	203	98.3	100	90	207
										2EH04507546	68.9	2	86.4	107.3	110	119	203	112.7	125	124	207
	575-3-60	20.0	32.4	9.0	78	1.9	7.7	2.7	3.5	None	-	-	-	54.7	70	57	163	58.2	70	61	167
										2EH04502558	23.0	1	23.0	54.7	70	57	163	58.2	70	61	167
										2EH04505058	45.9	2	46.0	73.9	80	68	163	78.3	80	72	167
										2EH04507558	68.9	2	69.1	85.5	90	95	163	89.9	90	99	167
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	20.4	6.7	9.6	None	-	-	-	158.6	200	165	458	168.2	225	176	468
										2EH04502525	18.8	1	52.1	158.6	200	165	458	168.2	225	176	468
										2EH04505025	37.6	2	104.3	172.6	200	165	458	184.6	225	176	468
										2EH04507525	56.3	2	156.2	198.5	200	219	458	210.5	225	230	468
	230-3-60	62.0	68.3	28.5	255	4.7	20.4	6.7	8.7	None	-	-	-	158.6	200	165	458	167.3	225	175	466
										2EH04502525	23.0	1	57.7	158.6	200	165	458	167.3	225	175	466
										2EH04505025	45.9	2	115.2	186.3	200	171	458	197.1	225	181	466
										2EH04507525	68.9	2	172.9	215.2	225	238	458	226.0	250	248	466
	460-3-60	30.0	35.7	13.5	123	2.3	9.9	3.4	4.3	None	-	-	-	76.9	100	80	226	81.2	110	85	230
										2EH04502546	23.0	1	28.8	76.9	100	80	226	81.2	110	85	230
										2EH04505046	45.9	2	57.6	92.9	100	85	226	98.3	110	90	230
										2EH04507546	68.9	2	86.4	107.3	110	119	226	112.7	125	124	230
	575-3-60	25.0	32.4	10.7	93.7	1.9	7.7	2.7	3.5	None	-	-	-	62.7	80	65	179	66.2	90	69	183
										2EH04502558	23.0	1	23.0	62.7	80	65	179	66.2	90	69	183
										2EH04505058	45.9	2	46.0	73.9	80	68	179	78.3	90	72	183
										2EH04507558	68.9	2	69.1	85.5	90	95	179	89.9	90	99	183

VFD medium static

Table 14: KE13 to KE23 VFD medium static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	13.2	9.6	None	-	-	-	83.3	110	87	277	92.9	110	98	287
									2EH04522525	18.8	1	52.1	83.3	110	87	277	93.6	110	98	287
									2EH04525025	37.6	2	104.3	146.9	150	135	277	158.9	175	146	287
	230-3-60	30.0	53.1	23.2	142	4.7	13.2	8.7	None	-	-	-	83.3	110	87	285	92.0	110	97	294
									2EH04522525	23.0	1	57.7	88.6	110	87	285	99.5	110	97	294
									2EH04525025	45.9	2	115.2	160.5	175	148	285	171.4	175	158	294
	460-3-60	15.0	27.6	9.5	73.1	2.3	6.1	4.3	None	-	-	-	39.0	50	40	146	43.3	50	45	150
									2EH04522546	23.0	1	28.8	43.6	50	40	146	49.0	50	45	150
									2EH04525046	45.9	2	57.6	79.6	80	73	146	85.0	90	78	150
	575-3-60	13.0	21.6	7.8	55	1.9	4.9	3.5	None	-	-	-	32.8	45	34	120	36.3	45	38	124
									2EH04522558	23.0	1	23.0	34.9	45	34	120	39.3	45	38	124
									2EH04525058	45.9	2	46.0	63.6	70	59	120	68.0	70	63	124
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	13.2	9.6	None	-	-	-	90.2	110	94	314	99.8	125	105	323
									2EH04502525	18.8	1	52.1	90.2	110	94	314	99.8	125	105	323
									2EH04505025	37.6	2	104.3	146.9	150	135	314	158.9	175	146	323
									2EH04507525	56.3	2	156.2	172.7	200	195	314	184.7	200	206	323
	230-3-60	33.0	53.1	26.3	178.5	4.7	13.2	8.7	None	-	-	-	90.2	110	94	322	98.9	125	104	330
									2EH04502525	23.0	1	57.7	90.2	110	94	322	99.5	125	104	330
									2EH04505025	45.9	2	115.2	160.5	175	148	322	171.4	175	158	330
									2EH04507525	68.9	2	172.9	189.4	225	214	322	200.3	225	224	330
	460-3-60	16.0	27.6	11.0	95.3	2.3	6.1	4.3	None	-	-	-	41.7	50	43	168	46.0	60	48	172
									2EH04502546	23.0	1	28.8	43.6	50	43	168	49.0	60	48	172
									2EH04505046	45.9	2	57.6	79.6	80	73	168	85.0	90	78	172
									2EH04507546	68.9	2	86.4	94.0	110	106	168	99.4	110	111	172
	575-3-60	13.0	21.6	9.2	65	1.9	4.9	3.5	None	-	-	-	34.2	45	36	130	37.7	50	40	134
									2EH04502558	23.0	1	23.0	34.9	45	36	130	39.3	50	40	134
									2EH04505058	45.9	2	46.0	63.6	70	59	130	68.0	70	63	134
									2EH04507558	68.9	2	69.1	75.2	90	85	130	79.6	90	89	134
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	20.4	9.6	None	-	-	-	113.2	150	119	353	122.8	150	131	363
									2EH04502525	18.8	1	52.1	113.2	150	119	353	122.8	150	131	363
									2EH04505025	37.6	2	104.3	155.9	175	143	353	167.9	175	154	363
									2EH04507525	56.3	2	156.2	181.7	200	203	353	193.7	200	214	363
	230-3-60	37.0	53.1	27.7	178.5	4.7	20.4	8.7	None	-	-	-	113.2	150	119	352	121.9	150	129	361
									2EH04502525	23.0	1	57.7	113.2	150	119	352	121.9	150	129	361
									2EH04505025	45.9	2	115.2	169.5	175	156	352	180.4	200	166	361
									2EH04507525	68.9	2	172.9	198.4	225	222	352	209.3	225	232	361
	460-3-60	18.0	27.6	11.5	103	2.3	9.9	4.3	None	-	-	-	53.1	70	56	191	57.4	70	61	195
									2EH04502546	23.0	1	28.8	53.1	70	56	191	57.4	70	61	195
									2EH04505046	45.9	2	57.6	84.4	90	78	191	89.8	90	83	195
									2EH04507546	68.9	2	86.4	98.8	110	111	191	104.2	110	116	195
	575-3-60	15.0	21.6	9.0	78	1.9	7.7	3.5	None	-	-	-	43.1	50	45	147	46.6	60	49	151
									2EH04502558	23.0	1	23.0	43.1	50	45	147	46.6	60	49	151
									2EH04505058	45.9	2	46.0	67.1	70	62	147	71.5	80	66	151
									2EH04507558	68.9	2	69.1	78.7	90	88	147	83.1	90	92	151

Table 14: KE13 to KE23 VFD medium static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	20.4	9.6	None	-	-	-	131.7	175	137	397	141.3	175	148	407
									2EH04502525	18.8	1	52.1	131.7	175	137	397	141.3	175	148	407
									2EH04505025	37.6	2	104.3	155.9	175	143	397	167.9	175	154	407
									2EH04507525	56.3	2	156.2	181.7	200	203	397	193.7	200	214	407
	230-3-60	51.0	68.3	28.7	207.5	4.7	20.4	8.7	None	-	-	-	131.7	175	137	397	140.4	175	147	405
									2EH04502525	23.0	1	57.7	131.7	175	137	397	140.4	175	147	405
									2EH04505025	45.9	2	115.2	169.5	175	156	397	180.4	200	166	405
									2EH04507525	68.9	2	172.9	198.4	225	222	397	209.3	225	232	405
	460-3-60	25.0	35.7	12.4	100.2	2.3	9.9	4.3	None	-	-	-	62.8	80	65	196	67.1	90	70	200
									2EH04502546	23.0	1	28.8	62.8	80	65	196	67.1	90	70	200
									2EH04505046	45.9	2	57.6	84.4	90	78	196	89.8	90	83	200
									2EH04507546	68.9	2	86.4	98.8	110	111	196	104.2	110	116	200
	575-3-60	20.0	32.4	9.0	78	1.9	7.7	3.5	None	-	-	-	49.3	60	51	158	52.8	70	55	162
									2EH04502558	23.0	1	23.0	49.3	60	51	158	52.8	70	55	162
									2EH04505058	45.9	2	46.0	67.1	70	62	158	71.5	80	66	162
									2EH04507558	68.9	2	69.1	78.7	90	88	158	83.1	90	92	162
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	30.0	9.6	None	-	-	-	154.8	200	160	472	164.4	225	171	481
									2EH04502525	18.8	1	52.1	154.8	200	160	472	164.4	225	171	481
									2EH04505025	37.6	2	104.3	167.9	200	160	472	179.9	225	171	481
									2EH04507525	56.3	2	156.2	193.7	200	214	472	205.7	225	225	481
	230-3-60	62.0	68.3	28.5	255	4.7	30.0	8.7	None	-	-	-	154.8	200	160	472	163.5	225	170	480
									2EH04502525	23.0	1	57.7	154.8	200	160	472	163.5	225	170	480
									2EH04505025	45.9	2	115.2	181.5	200	167	472	192.4	225	177	480
									2EH04507525	68.9	2	172.9	210.4	225	233	472	221.3	225	243	480
	460-3-60	30.0	35.7	13.5	123	2.3	14.3	4.3	None	-	-	-	74.5	100	77	233	78.8	100	82	237
									2EH04502546	23.0	1	28.8	74.5	100	77	233	78.8	100	82	237
									2EH04505046	45.9	2	57.6	89.9	100	83	233	95.3	100	88	237
									2EH04507546	68.9	2	86.4	104.3	110	116	233	109.7	110	121	237
	575-3-60	25.0	32.4	10.7	93.7	1.9	11.5	3.5	None	-	-	-	61.1	80	63	183	64.6	80	67	186
									2EH04502558	23.0	1	23.0	61.1	80	63	183	64.6	80	67	186
									2EH04505058	45.9	2	46.0	71.9	80	66	183	76.3	80	70	186
									2EH04507558	68.9	2	69.1	83.5	90	93	183	87.9	90	97	186

Table 15: KE13 to KE23 VFD medium static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	13.2	5.0	9.6	None	-	-	-	93.3	110	99	298	102.9	125	110	308
										2EH04522525	18.8	1	52.1	94.1	110	99	298	106.1	125	110	308
										2EH04525025	37.6	2	104.3	159.4	175	147	298	171.4	175	158	308
	230-3-60	30.0	53.1	23.2	142	4.7	13.2	5.0	8.7	None	-	-	-	93.3	110	99	306	102.0	125	109	315
										2EH04522525	23.0	1	57.7	101.1	110	99	306	112.0	125	109	315
										2EH04525025	45.9	2	115.2	173.0	175	159	306	183.9	200	169	315
	460-3-60	15.0	27.6	9.5	73.1	2.3	6.1	2.2	4.3	None	-	-	-	43.4	50	46	155	47.7	60	50	159
										2EH04522546	23.0	1	28.8	49.1	50	46	155	54.5	60	50	159
										2EH04525046	45.9	2	57.6	85.1	90	78	155	90.5	100	83	159
	575-3-60	13.0	21.6	7.8	55	1.9	4.9	1.5	3.5	None	-	-	-	35.8	45	37	127	39.3	50	41	130
										2EH04522558	23.0	1	23.0	38.6	45	37	127	43.0	50	41	130
										2EH04525058	45.9	2	46.0	67.4	70	62	127	71.8	80	66	130
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	13.2	5.0	9.6	None	-	-	-	100.2	125	106	335	109.8	125	117	344
										2EH04502525	18.8	1	52.1	100.2	125	106	335	109.8	125	117	344
										2EH04505025	37.6	2	104.3	159.4	175	147	335	171.4	175	158	344
										2EH04507525	56.3	2	156.2	185.2	200	206	335	197.2	200	217	344
	230-3-60	33.0	53.1	26.3	178.5	4.7	13.2	5.0	8.7	None	-	-	-	100.2	125	106	343	108.9	125	116	351
										2EH04502525	23.0	1	57.7	101.1	125	106	343	112.0	125	116	351
										2EH04505025	45.9	2	115.2	173.0	175	159	343	183.9	200	169	351
										2EH04507525	68.9	2	172.9	201.9	225	226	343	212.8	225	236	351
	460-3-60	16.0	27.6	11.0	95.3	2.3	6.1	2.2	4.3	None	-	-	-	46.1	60	48	177	50.4	60	53	181
										2EH04502546	23.0	1	28.8	49.1	60	48	177	54.5	60	53	181
										2EH04505046	45.9	2	57.6	85.1	90	78	177	90.5	100	83	181
										2EH04507546	68.9	2	86.4	99.5	110	111	177	104.9	110	116	181
	575-3-60	13.0	21.6	9.2	65	1.9	4.9	1.5	3.5	None	-	-	-	37.2	50	39	137	40.7	50	43	140
										2EH04502558	23.0	1	23.0	38.6	50	39	137	43.0	50	43	140
										2EH04505058	45.9	2	46.0	67.4	70	62	137	71.8	80	66	140
										2EH04507558	68.9	2	69.1	79.0	90	89	137	83.4	90	93	140
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	20.4	5.0	9.6	None	-	-	-	123.2	150	131	374	132.8	150	142	384
										2EH04502525	18.8	1	52.1	123.2	150	131	374	132.8	150	142	384
										2EH04505025	37.6	2	104.3	168.4	175	155	374	180.4	200	166	384
										2EH04507525	56.3	2	156.2	194.2	200	215	374	206.2	225	226	384
	230-3-60	37.0	53.1	27.7	178.5	4.7	20.4	5.0	8.7	None	-	-	-	123.2	150	131	373	131.9	150	141	382
										2EH04502525	23.0	1	57.7	123.2	150	131	373	131.9	150	141	382
										2EH04505025	45.9	2	115.2	182.0	200	167	373	192.9	200	177	382
										2EH04507525	68.9	2	172.9	210.9	225	234	373	221.8	225	244	382
	460-3-60	18.0	27.6	11.5	103	2.3	9.9	2.2	4.3	None	-	-	-	57.5	70	61	200	61.8	70	66	204
										2EH04502546	23.0	1	28.8	57.5	70	61	200	61.8	70	66	204
										2EH04505046	45.9	2	57.6	89.9	90	83	200	95.3	100	88	204
										2EH04507546	68.9	2	86.4	104.3	110	116	200	109.7	110	121	204
	575-3-60	15.0	21.6	9.0	78	1.9	7.7	1.5	3.5	None	-	-	-	46.1	60	49	154	49.6	60	53	157
										2EH04502558	23.0	1	23.0	46.1	60	49	154	49.6	60	53	157
										2EH04505058	45.9	2	46.0	70.9	80	65	154	75.3	80	69	157
										2EH04507558	68.9	2	69.1	82.5	90	92	154	86.9	90	96	157

Table 15: KE13 to KE23 VFD medium static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	20.4	5.0	9.6	None	-	-	-	141.7	175	148	418	151.3	200	159	428
										2EH04502525	18.8	1	52.1	141.7	175	148	418	151.3	200	159	428
										2EH04505025	37.6	2	104.3	168.4	175	155	418	180.4	200	166	428
										2EH04507525	56.3	2	156.2	194.2	200	215	418	206.2	225	226	428
	230-3-60	51.0	68.3	28.7	207.5	4.7	20.4	5.0	8.7	None	-	-	-	141.7	175	148	418	150.4	200	158	426
										2EH04502525	23.0	1	57.7	141.7	175	148	418	150.4	200	158	426
										2EH04505025	45.9	2	115.2	182.0	200	167	418	192.9	200	177	426
										2EH04507525	68.9	2	172.9	210.9	225	234	418	221.8	225	244	426
	460-3-60	25.0	35.7	12.4	100.2	2.3	9.9	2.2	4.3	None	-	-	-	67.2	90	70	205	71.5	90	75	210
										2EH04502546	23.0	1	28.8	67.2	90	70	205	71.5	90	75	210
										2EH04505046	45.9	2	57.6	89.9	90	83	205	95.3	100	88	210
										2EH04507546	68.9	2	86.4	104.3	110	116	205	109.7	110	121	210
	575-3-60	20.0	32.4	9.0	78	1.9	7.7	1.5	3.5	None	-	-	-	52.3	70	54	164	55.8	70	58	168
										2EH04502558	23.0	1	23.0	52.3	70	54	164	55.8	70	58	168
										2EH04505058	45.9	2	46.0	70.9	80	65	164	75.3	80	69	168
										2EH04507558	68.9	2	69.1	82.5	90	92	164	86.9	90	96	168
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	30.0	5.0	9.6	None	-	-	-	164.8	225	172	493	174.4	225	183	502
										2EH04502525	18.8	1	52.1	164.8	225	172	493	174.4	225	183	502
										2EH04505025	37.6	2	104.3	180.4	225	172	493	192.4	225	183	502
										2EH04507525	56.3	2	156.2	206.2	225	226	493	218.2	225	237	502
	230-3-60	62.0	68.3	28.5	255	4.7	30.0	5.0	8.7	None	-	-	-	164.8	225	172	493	173.5	225	182	501
										2EH04502525	23.0	1	57.7	164.8	225	172	493	173.5	225	182	501
										2EH04505025	45.9	2	115.2	194.0	225	178	493	204.9	225	188	501
										2EH04507525	68.9	2	172.9	222.9	250	245	493	233.8	250	255	501
	460-3-60	30.0	35.7	13.5	123	2.3	14.3	2.2	4.3	None	-	-	-	78.9	100	82	242	83.2	110	87	246
										2EH04502546	23.0	1	28.8	78.9	100	82	242	83.2	110	87	246
										2EH04505046	45.9	2	57.6	95.4	100	88	242	100.8	110	93	246
										2EH04507546	68.9	2	86.4	109.8	110	121	242	115.2	125	126	246
	575-3-60	25.0	32.4	10.7	93.7	1.9	11.5	1.5	3.5	None	-	-	-	64.1	80	66	189	67.6	90	70	192
										2EH04502558	23.0	1	23.0	64.1	80	66	189	67.6	90	70	192
										2EH04505058	45.9	2	46.0	75.6	80	70	189	80.0	90	74	192
										2EH04507558	68.9	2	69.1	87.2	90	96	189	91.6	100	100	192

Table 16: KE13 to KE23 VFD medium static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	13.2	6.7	9.6	None	-	-	-	96.7	125	103	290	106.3	125	114	300
										2EH04522525	18.8	1	52.1	98.4	125	103	290	110.4	125	114	300
										2EH04525025	37.6	2	104.3	163.6	175	151	290	175.6	200	162	300
	230-3-60	30.0	53.1	23.2	142	4.7	13.2	6.7	8.7	None	-	-	-	96.7	125	103	299	105.4	125	113	307
										2EH04522525	23.0	1	57.7	105.4	125	103	299	116.3	125	113	307
										2EH04525025	45.9	2	115.2	177.3	200	163	299	188.1	200	173	307
	460-3-60	15.0	27.6	9.5	73.1	2.3	6.1	3.4	4.3	None	-	-	-	45.8	60	48	152	50.1	60	53	157
										2EH04522546	23.0	1	28.8	52.1	60	48	152	57.5	60	53	157
										2EH04525046	45.9	2	57.6	88.1	90	81	152	93.5	100	86	157
	575-3-60	13.0	21.6	7.8	55	1.9	4.9	2.7	3.5	None	-	-	-	38.2	50	40	126	41.7	50	44	129
										2EH04522558	23.0	1	23.0	41.6	50	40	126	46.0	50	44	129
										2EH04525058	45.9	2	46.0	70.4	80	65	126	74.8	80	69	129
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	13.2	6.7	9.6	None	-	-	-	103.6	125	110	327	113.2	125	121	337
										2EH04502525	18.8	1	52.1	103.6	125	110	327	113.2	125	121	337
										2EH04505025	37.6	2	104.3	163.6	175	151	327	175.6	200	162	337
										2EH04507525	56.3	2	156.2	189.5	200	210	327	201.5	225	221	337
	230-3-60	33.0	53.1	26.3	178.5	4.7	13.2	6.7	8.7	None	-	-	-	103.6	125	110	335	112.3	125	120	344
										2EH04502525	23.0	1	57.7	105.4	125	110	335	116.3	125	120	344
										2EH04505025	45.9	2	115.2	177.3	200	163	335	188.1	200	173	344
										2EH04507525	68.9	2	172.9	206.2	225	229	335	217.0	225	239	344
	460-3-60	16.0	27.6	11.0	95.3	2.3	6.1	3.4	4.3	None	-	-	-	48.5	60	51	175	52.8	60	56	179
										2EH04502546	23.0	1	28.8	52.1	60	51	175	57.5	60	56	179
										2EH04505046	45.9	2	57.6	88.1	90	81	175	93.5	100	86	179
										2EH04507546	68.9	2	86.4	102.5	110	114	175	107.9	110	119	179
	575-3-60	13.0	21.6	9.2	65	1.9	4.9	2.7	3.5	None	-	-	-	39.6	50	42	136	43.1	50	46	139
										2EH04502558	23.0	1	23.0	41.6	50	42	136	46.0	50	46	139
										2EH04505058	45.9	2	46.0	70.4	80	65	136	74.8	80	69	139
										2EH04507558	68.9	2	69.1	82.0	90	91	136	86.4	90	95	139
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	20.4	6.7	9.6	None	-	-	-	126.6	150	135	367	136.2	150	146	376
										2EH04502525	18.8	1	52.1	126.6	150	135	367	136.2	150	146	376
										2EH04505025	37.6	2	104.3	172.6	175	159	367	184.6	200	170	376
										2EH04507525	56.3	2	156.2	198.5	200	219	367	210.5	225	230	376
	230-3-60	37.0	53.1	27.7	178.5	4.7	20.4	6.7	8.7	None	-	-	-	126.6	150	135	366	135.3	150	145	375
										2EH04502525	23.0	1	57.7	126.6	150	135	366	135.3	150	145	375
										2EH04505025	45.9	2	115.2	186.3	200	171	366	197.1	200	181	375
										2EH04507525	68.9	2	172.9	215.2	225	238	366	226.0	250	248	375
	460-3-60	18.0	27.6	11.5	103	2.3	9.9	3.4	4.3	None	-	-	-	59.9	70	64	198	64.2	80	69	202
										2EH04502546	23.0	1	28.8	59.9	70	64	198	64.2	80	69	202
										2EH04505046	45.9	2	57.6	92.9	100	85	198	98.3	100	90	202
										2EH04507546	68.9	2	86.4	107.3	110	119	198	112.7	125	124	202
	575-3-60	15.0	21.6	9.0	78	1.9	7.7	2.7	3.5	None	-	-	-	48.5	60	51	153	52.0	60	55	156
										2EH04502558	23.0	1	23.0	48.5	60	51	153	52.0	60	55	156
										2EH04505058	45.9	2	46.0	73.9	80	68	153	78.3	80	72	156
										2EH04507558	68.9	2	69.1	85.5	90	95	153	89.9	90	99	156

Table 16: KE13 to KE23 VFD medium static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	20.4	6.7	9.6	None	-	-	-	145.1	175	152	411	154.7	200	163	420
										2EH04502525	18.8	1	52.1	145.1	175	152	411	154.7	200	163	420
										2EH04505025	37.6	2	104.3	172.6	175	159	411	184.6	200	170	420
										2EH04507525	56.3	2	156.2	198.5	200	219	411	210.5	225	230	420
	230-3-60	51.0	68.3	28.7	207.5	4.7	20.4	6.7	8.7	None	-	-	-	145.1	175	152	410	153.8	200	162	419
										2EH04502525	23.0	1	57.7	145.1	175	152	410	153.8	200	162	419
										2EH04505025	45.9	2	115.2	186.3	200	171	410	197.1	200	181	419
										2EH04507525	68.9	2	172.9	215.2	225	238	410	226.0	250	248	419
	460-3-60	25.0	35.7	12.4	100.2	2.3	9.9	3.4	4.3	None	-	-	-	69.6	90	73	203	73.9	90	78	207
										2EH04502546	23.0	1	28.8	69.6	90	73	203	73.9	90	78	207
										2EH04505046	45.9	2	57.6	92.9	100	85	203	98.3	100	90	207
										2EH04507546	68.9	2	86.4	107.3	110	119	203	112.7	125	124	207
	575-3-60	20.0	32.4	9.0	78	1.9	7.7	2.7	3.5	None	-	-	-	54.7	70	57	163	58.2	70	61	167
										2EH04502558	23.0	1	23.0	54.7	70	57	163	58.2	70	61	167
										2EH04505058	45.9	2	46.0	73.9	80	68	163	78.3	80	72	167
										2EH04507558	68.9	2	69.1	85.5	90	95	163	89.9	90	99	167
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	30.0	6.7	9.6	None	-	-	-	168.2	225	176	485	177.8	225	187	495
										2EH04502525	18.8	1	52.1	168.2	225	176	485	177.8	225	187	495
										2EH04505025	37.6	2	104.3	184.6	225	176	485	196.6	225	187	495
										2EH04507525	56.3	2	156.2	210.5	225	230	485	222.5	225	241	495
	230-3-60	62.0	68.3	28.5	255	4.7	30.0	6.7	8.7	None	-	-	-	168.2	225	176	485	176.9	225	186	494
										2EH04502525	23.0	1	57.7	168.2	225	176	485	176.9	225	186	494
										2EH04505025	45.9	2	115.2	198.3	225	182	485	209.1	225	192	494
										2EH04507525	68.9	2	172.9	227.2	250	249	485	238.0	250	259	494
	460-3-60	30.0	35.7	13.5	123	2.3	14.3	3.4	4.3	None	-	-	-	81.3	110	85	239	85.6	110	90	244
										2EH04502546	23.0	1	28.8	81.3	110	85	239	85.6	110	90	244
										2EH04505046	45.9	2	57.6	98.4	110	91	239	103.8	110	95	244
										2EH04507546	68.9	2	86.4	112.8	125	124	239	118.2	125	129	244
	575-3-60	25.0	32.4	10.7	93.7	1.9	11.5	2.7	3.5	None	-	-	-	66.5	90	69	188	70.0	90	73	191
										2EH04502558	23.0	1	23.0	66.5	90	69	188	70.0	90	73	191
										2EH04505058	45.9	2	46.0	78.6	90	72	188	83.0	90	76	191
										2EH04507558	68.9	2	69.1	90.2	100	99	188	94.6	100	103	191

VFD high static

Table 17: KE13 to KE23 VFD high static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating 120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	20.4	9.6	None	-	-	-	90.5	110	95	307	100.1	125	106	317
									2EH04522525	18.8	1	52.1	90.6	110	95	307	102.6	125	106	317
									2EH04525025	37.6	2	104.3	155.9	175	143	307	167.9	175	154	317
	230-3-60	30.0	53.1	23.2	142	4.7	20.4	8.7	None	-	-	-	90.5	110	95	307	99.2	125	105	315
									2EH04522525	23.0	1	57.7	97.6	110	95	307	108.5	125	105	315
									2EH04525025	45.9	2	115.2	169.5	175	156	307	180.4	200	166	315
	460-3-60	15.0	27.6	9.5	73.1	2.3	9.9	4.3	None	-	-	-	42.8	50	45	156	47.1	60	50	161
									2EH04522546	23.0	1	28.8	48.4	50	45	156	53.8	60	50	161
									2EH04525046	45.9	2	57.6	84.4	90	78	156	89.8	90	83	161
	575-3-60	13.0	21.6	7.8	55	1.9	7.7	3.5	None	-	-	-	35.6	45	37	120	39.1	50	41	124
									2EH04522558	23.0	1	23.0	38.4	45	37	120	42.8	50	41	124
									2EH04525058	45.9	2	46.0	67.1	70	62	120	71.5	80	66	124
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	20.4	9.6	None	-	-	-	97.4	125	102	344	107.0	125	114	353
									2EH04502525	18.8	1	52.1	97.4	125	102	344	107.0	125	114	353
									2EH04505025	37.6	2	104.3	155.9	175	143	344	167.9	175	154	353
									2EH04507525	56.3	2	156.2	181.7	200	203	344	193.7	200	214	353
	230-3-60	33.0	53.1	26.3	178.5	4.7	20.4	8.7	None	-	-	-	97.4	125	102	343	106.1	125	112	352
									2EH04502525	23.0	1	57.7	97.6	125	102	343	108.5	125	112	352
									2EH04505025	45.9	2	115.2	169.5	175	156	343	180.4	200	166	352
									2EH04507525	68.9	2	172.9	198.4	225	222	343	209.3	225	232	352
	460-3-60	16.0	27.6	11.0	95.3	2.3	9.9	4.3	None	-	-	-	45.5	60	48	179	49.8	60	53	183
									2EH04502546	23.0	1	28.8	48.4	60	48	179	53.8	60	53	183
									2EH04505046	45.9	2	57.6	84.4	90	78	179	89.8	90	83	183
									2EH04507546	68.9	2	86.4	98.8	110	111	179	104.2	110	116	183
	575-3-60	13.0	21.6	9.2	65	1.9	7.7	3.5	None	-	-	-	37.0	50	39	130	40.5	50	43	134
									2EH04502558	23.0	1	23.0	38.4	50	39	130	42.8	50	43	134
									2EH04505058	45.9	2	46.0	67.1	70	62	130	71.5	80	66	134
									2EH04507558	68.9	2	69.1	78.7	90	88	130	83.1	90	92	134
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	30.0	9.6	None	-	-	-	122.8	150	131	380	132.4	150	142	390
									2EH04502525	18.8	1	52.1	122.8	150	131	380	132.4	150	142	390
									2EH04505025	37.6	2	104.3	167.9	175	154	380	179.9	200	165	390
									2EH04507525	56.3	2	156.2	193.7	200	214	380	205.7	225	225	390
	230-3-60	37.0	53.1	27.7	178.5	4.7	30.0	8.7	None	-	-	-	122.8	150	131	380	131.5	150	141	389
									2EH04502525	23.0	1	57.7	122.8	150	131	380	131.5	150	141	389
									2EH04505025	45.9	2	115.2	181.5	200	167	380	192.4	200	177	389
									2EH04507525	68.9	2	172.9	210.4	225	233	380	221.3	225	243	389
	460-3-60	18.0	27.6	11.5	103	2.3	14.3	4.3	None	-	-	-	57.5	70	61	205	61.8	70	66	209
									2EH04502546	23.0	1	28.8	57.5	70	61	205	61.8	70	66	209
									2EH04505046	45.9	2	57.6	89.9	90	83	205	95.3	100	88	209
									2EH04507546	68.9	2	86.4	104.3	110	116	205	109.7	110	121	209
	575-3-60	15.0	21.6	9.0	78	1.9	11.5	3.5	None	-	-	-	46.9	60	50	156	50.4	60	54	160
									2EH04502558	23.0	1	23.0	46.9	60	50	156	50.4	60	54	160
									2EH04505058	45.9	2	46.0	71.9	80	66	156	76.3	80	70	160
									2EH04507558	68.9	2	69.1	83.5	90	93	156	87.9	90	97	160

Table 17: KE13 to KE23 VFD high static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating 120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	30.0	9.6	None	-	-	-	141.3	175	148	424	150.9	200	159	434
									2EH04502525	18.8	1	52.1	141.3	175	148	424	150.9	200	159	434
									2EH04505025	37.6	2	104.3	167.9	175	154	424	179.9	200	165	434
									2EH04507525	56.3	2	156.2	193.7	200	214	424	205.7	225	225	434
	230-3-60	51.0	68.3	28.7	207.5	4.7	30.0	8.7	None	-	-	-	141.3	175	148	424	150.0	200	158	433
									2EH04502525	23.0	1	57.7	141.3	175	148	424	150.0	200	158	433
									2EH04505025	45.9	2	115.2	181.5	200	167	424	192.4	200	177	433
									2EH04507525	68.9	2	172.9	210.4	225	233	424	221.3	225	243	433
	460-3-60	25.0	35.7	12.4	100.2	2.3	14.3	4.3	None	-	-	-	67.2	90	70	210	71.5	90	75	214
									2EH04502546	23.0	1	28.8	67.2	90	70	210	71.5	90	75	214
									2EH04505046	45.9	2	57.6	89.9	90	83	210	95.3	100	88	214
									2EH04507546	68.9	2	86.4	104.3	110	116	210	109.7	110	121	214
	575-3-60	20.0	32.4	9.0	78	1.9	11.5	3.5	None	-	-	-	53.1	70	55	167	56.6	70	59	170
									2EH04502558	23.0	1	23.0	53.1	70	55	167	56.6	70	59	170
									2EH04505058	45.9	2	46.0	71.9	80	66	167	76.3	80	70	170
									2EH04507558	68.9	2	69.1	83.5	90	93	167	87.9	90	97	170
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	39.6	9.6	None	-	-	-	164.4	225	171	522	174.0	225	182	532
									2EH04502525	18.8	1	52.1	164.4	225	171	522	174.0	225	182	532
									2EH04505025	37.6	2	104.3	179.9	225	171	522	191.9	225	182	532
									2EH04507525	56.3	2	156.2	205.7	225	225	522	217.7	250	236	532
	230-3-60	62.0	68.3	28.5	255	4.7	39.6	8.7	None	-	-	-	164.4	225	171	522	173.1	225	181	531
									2EH04502525	23.0	1	57.7	164.4	225	171	522	173.1	225	181	531
									2EH04505025	45.9	2	115.2	193.5	225	178	522	204.4	225	188	531
									2EH04507525	68.9	2	172.9	222.4	250	244	522	233.3	250	254	531
	460-3-60	30.0	35.7	13.5	123	2.3	18.7	4.3	None	-	-	-	78.9	100	82	258	83.2	110	87	262
									2EH04502546	23.0	1	28.8	78.9	100	82	258	83.2	110	87	262
									2EH04505046	45.9	2	57.6	95.4	100	88	258	100.8	110	93	262
									2EH04507546	68.9	2	86.4	109.8	125	121	258	115.2	125	126	262
	575-3-60	25.0	32.4	10.7	93.7	1.9	14.2	3.5	None	-	-	-	63.8	80	66	205	67.3	90	70	209
									2EH04502558	23.0	1	23.0	63.8	80	66	205	67.3	90	70	209
									2EH04505058	45.9	2	46.0	75.3	80	69	205	79.6	90	73	209
									2EH04507558	68.9	2	69.1	86.9	100	96	205	91.2	100	100	209

Table 18: KE13 to KE23 VFD high static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	20.4	5.0	9.6	None	-	-	-	100.5	125	107	328	110.1	125	118	338
										2EH04522525	18.8	1	52.1	103.1	125	107	328	115.1	125	118	338
										2EH04525025	37.6	2	104.3	168.4	175	155	328	180.4	200	166	338
	230-3-60	30.0	53.1	23.2	142	4.7	20.4	5.0	8.7	None	-	-	-	100.5	125	107	328	109.2	125	117	336
										2EH04522525	23.0	1	57.7	110.1	125	107	328	121.0	125	117	336
										2EH04525025	45.9	2	115.2	182.0	200	167	328	192.9	200	177	336
	460-3-60	15.0	27.6	9.5	73.1	2.3	9.9	2.2	4.3	None	-	-	-	47.2	60	50	166	51.5	60	55	170
										2EH04522546	23.0	1	28.8	53.9	60	50	166	59.3	60	55	170
										2EH04525046	45.9	2	57.6	89.9	90	83	166	95.3	100	88	170
	575-3-60	13.0	21.6	7.8	55	1.9	7.7	1.5	3.5	None	-	-	-	38.6	50	41	127	42.1	50	45	130
										2EH04522558	23.0	1	23.0	42.1	50	41	127	46.5	50	45	130
										2EH04525058	45.9	2	46.0	70.9	80	65	127	75.3	80	69	130
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	20.4	5.0	9.6	None	-	-	-	107.4	125	114	365	117.0	150	125	374
										2EH04502525	18.8	1	52.1	107.4	125	114	365	117.0	150	125	374
										2EH04505025	37.6	2	104.3	168.4	175	155	365	180.4	200	166	374
										2EH04507525	56.3	2	156.2	194.2	200	215	365	206.2	225	226	374
	230-3-60	33.0	53.1	26.3	178.5	4.7	20.4	5.0	8.7	None	-	-	-	107.4	125	114	364	116.1	125	124	373
										2EH04502525	23.0	1	57.7	110.1	125	114	364	121.0	125	124	373
										2EH04505025	45.9	2	115.2	182.0	200	167	364	192.9	200	177	373
										2EH04507525	68.9	2	172.9	210.9	225	234	364	221.8	225	244	373
	460-3-60	16.0	27.6	11.0	95.3	2.3	9.9	2.2	4.3	None	-	-	-	49.9	60	53	188	54.2	70	58	192
										2EH04502546	23.0	1	28.8	53.9	60	53	188	59.3	70	58	192
										2EH04505046	45.9	2	57.6	89.9	90	83	188	95.3	100	88	192
										2EH04507546	68.9	2	86.4	104.3	110	116	188	109.7	110	121	192
	575-3-60	13.0	21.6	9.2	65	1.9	7.7	1.5	3.5	None	-	-	-	40.0	50	42	137	43.5	50	46	140
										2EH04502558	23.0	1	23.0	42.1	50	42	137	46.5	50	46	140
										2EH04505058	45.9	2	46.0	70.9	80	65	137	75.3	80	69	140
										2EH04507558	68.9	2	69.1	82.5	90	92	137	86.9	90	96	140
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	30.0	5.0	9.6	None	-	-	-	132.8	150	142	401	142.4	175	153	411
										2EH04502525	18.8	1	52.1	132.8	150	142	401	142.4	175	153	411
										2EH04505025	37.6	2	104.3	180.4	200	166	401	192.4	200	177	411
										2EH04507525	56.3	2	156.2	206.2	225	226	401	218.2	225	237	411
	230-3-60	37.0	53.1	27.7	178.5	4.7	30.0	5.0	8.7	None	-	-	-	132.8	150	142	401	141.5	175	152	410
										2EH04502525	23.0	1	57.7	132.8	150	142	401	141.5	175	152	410
										2EH04505025	45.9	2	115.2	194.0	200	178	401	204.9	225	188	410
										2EH04507525	68.9	2	172.9	222.9	250	245	401	233.8	250	255	410
	460-3-60	18.0	27.6	11.5	103	2.3	14.3	2.2	4.3	None	-	-	-	61.9	70	66	214	66.2	80	71	218
										2EH04502546	23.0	1	28.8	61.9	70	66	214	66.2	80	71	218
										2EH04505046	45.9	2	57.6	95.4	100	88	214	100.8	110	93	218
										2EH04507546	68.9	2	86.4	109.8	110	121	214	115.2	125	126	218
	575-3-60	15.0	21.6	9.0	78	1.9	11.5	1.5	3.5	None	-	-	-	49.9	60	53	162	53.4	60	57	166
										2EH04502558	23.0	1	23.0	49.9	60	53	162	53.4	60	57	166
										2EH04505058	45.9	2	46.0	75.6	80	70	162	80.0	90	74	166
										2EH04507558	68.9	2	69.1	87.2	90	96	162	91.6	100	100	166

Table 18: KE13 to KE23 VFD high static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	30.0	5.0	9.6	None	-	-	-	151.3	200	159	445	160.9	200	170	455
										2EH04502525	18.8	1	52.1	151.3	200	159	445	160.9	200	170	455
										2EH04505025	37.6	2	104.3	180.4	200	166	445	192.4	200	177	455
										2EH04507525	56.3	2	156.2	206.2	225	226	445	218.2	225	237	455
	230-3-60	51.0	68.3	28.7	207.5	4.7	30.0	5.0	8.7	None	-	-	-	151.3	200	159	445	160.0	200	169	454
										2EH04502525	23.0	1	57.7	151.3	200	159	445	160.0	200	169	454
										2EH04505025	45.9	2	115.2	194.0	200	178	445	204.9	225	188	454
										2EH04507525	68.9	2	172.9	222.9	250	245	445	233.8	250	255	454
	460-3-60	25.0	35.7	12.4	100.2	2.3	14.3	2.2	4.3	None	-	-	-	71.6	90	75	219	75.9	100	80	223
										2EH04502546	23.0	1	28.8	71.6	90	75	219	75.9	100	80	223
										2EH04505046	45.9	2	57.6	95.4	100	88	219	100.8	110	93	223
										2EH04507546	68.9	2	86.4	109.8	110	121	219	115.2	125	126	223
	575-3-60	20.0	32.4	9.0	78	1.9	11.5	1.5	3.5	None	-	-	-	56.1	70	59	173	59.6	70	63	177
										2EH04502558	23.0	1	23.0	56.1	70	59	173	59.6	70	63	177
										2EH04505058	45.9	2	46.0	75.6	80	70	173	80.0	90	74	177
										2EH04507558	68.9	2	69.1	87.2	90	96	173	91.6	100	100	177
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	39.6	5.0	9.6	None	-	-	-	174.4	225	183	543	184.0	225	194	553
										2EH04502525	18.8	1	52.1	174.4	225	183	543	184.0	225	194	553
										2EH04505025	37.6	2	104.3	192.4	225	183	543	204.4	225	194	553
										2EH04507525	56.3	2	156.2	218.2	250	237	543	230.2	250	248	553
	230-3-60	62.0	68.3	28.5	255	4.7	39.6	5.0	8.7	None	-	-	-	174.4	225	183	543	183.1	225	193	552
										2EH04502525	23.0	1	57.7	174.4	225	183	543	183.1	225	193	552
										2EH04505025	45.9	2	115.2	206.0	225	190	543	216.9	225	200	552
										2EH04507525	68.9	2	172.9	234.9	250	256	543	245.8	250	266	552
	460-3-60	30.0	35.7	13.5	123	2.3	18.7	2.2	4.3	None	-	-	-	83.3	110	87	267	87.6	110	92	271
										2EH04502546	23.0	1	28.8	83.3	110	87	267	87.6	110	92	271
										2EH04505046	45.9	2	57.6	100.9	110	93	267	106.3	110	98	271
										2EH04507546	68.9	2	86.4	115.3	125	126	267	120.7	125	131	271
	575-3-60	25.0	32.4	10.7	93.7	1.9	14.2	1.5	3.5	None	-	-	-	66.8	90	70	212	70.3	90	74	215
										2EH04502558	23.0	1	23.0	66.8	90	70	212	70.3	90	74	215
										2EH04505058	45.9	2	46.0	79.0	90	73	212	83.4	90	77	215
										2EH04507558	68.9	2	69.1	90.6	100	99	212	95.0	100	103	215

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Table 19: KE13 to KE23 VFD high static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	20.4	6.7	9.6	None	-	-	-	103.9	125	111	321	113.5	125	122	330
										2EH04522525	18.8	1	52.1	107.4	125	111	321	119.4	125	122	330
										2EH04525025	37.6	2	104.3	172.6	175	159	321	184.6	200	170	330
	230-3-60	30.0	53.1	23.2	142	4.7	20.4	6.7	8.7	None	-	-	-	103.9	125	111	320	112.6	125	121	329
										2EH04522525	23.0	1	57.7	114.4	125	111	320	125.3	150	121	329
										2EH04525025	45.9	2	115.2	186.3	200	171	320	197.1	200	181	329
	460-3-60	15.0	27.6	9.5	73.1	2.3	9.9	3.4	4.3	None	-	-	-	49.6	60	53	163	53.9	60	58	167
										2EH04522546	23.0	1	28.8	56.9	60	53	163	62.3	70	58	167
										2EH04525046	45.9	2	57.6	92.9	100	85	163	98.3	100	90	167
	575-3-60	13.0	21.6	7.8	55	1.9	7.7	2.7	3.5	None	-	-	-	41.0	50	43	126	44.5	50	47	129
										2EH04522558	23.0	1	23.0	45.1	50	43	126	49.5	50	47	129
										2EH04525058	45.9	2	46.0	73.9	80	68	126	78.3	80	72	129
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	20.4	6.7	9.6	None	-	-	-	110.8	125	118	357	120.4	150	129	367
										2EH04502525	18.8	1	52.1	110.8	125	118	357	120.4	150	129	367
										2EH04505025	37.6	2	104.3	172.6	175	159	357	184.6	200	170	367
										2EH04507525	56.3	2	156.2	198.5	200	219	357	210.5	225	230	367
	230-3-60	33.0	53.1	26.3	178.5	4.7	20.4	6.7	8.7	None	-	-	-	110.8	125	118	356	119.5	150	128	365
										2EH04502525	23.0	1	57.7	114.4	125	118	356	125.3	150	128	365
										2EH04505025	45.9	2	115.2	186.3	200	171	356	197.1	200	181	365
										2EH04507525	68.9	2	172.9	215.2	225	238	356	226.0	250	248	365
	460-3-60	16.0	27.6	11.0	95.3	2.3	9.9	3.4	4.3	None	-	-	-	52.3	60	56	185	56.6	70	60	190
										2EH04502546	23.0	1	28.8	56.9	60	56	185	62.3	70	60	190
										2EH04505046	45.9	2	57.6	92.9	100	85	185	98.3	100	90	190
										2EH04507546	68.9	2	86.4	107.3	110	119	185	112.7	125	124	190
	575-3-60	13.0	21.6	9.2	65	1.9	7.7	2.7	3.5	None	-	-	-	42.4	50	45	136	45.9	50	49	139
										2EH04502558	23.0	1	23.0	45.1	50	45	136	49.5	50	49	139
										2EH04505058	45.9	2	46.0	73.9	80	68	136	78.3	80	72	139
										2EH04507558	68.9	2	69.1	85.5	90	95	136	89.9	90	99	139
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	30.0	6.7	9.6	None	-	-	-	136.2	150	146	393	145.8	175	157	403
										2EH04502525	18.8	1	52.1	136.2	150	146	393	145.8	175	157	403
										2EH04505025	37.6	2	104.3	184.6	200	170	393	196.6	200	181	403
										2EH04507525	56.3	2	156.2	210.5	225	230	393	222.5	225	241	403
	230-3-60	37.0	53.1	27.7	178.5	4.7	30.0	6.7	8.7	None	-	-	-	136.2	150	146	393	144.9	175	156	402
										2EH04502525	23.0	1	57.7	136.2	150	146	393	144.9	175	156	402
										2EH04505025	45.9	2	115.2	198.3	200	182	393	209.1	225	192	402
										2EH04507525	68.9	2	172.9	227.2	250	249	393	238.0	250	259	402
	460-3-60	18.0	27.6	11.5	103	2.3	14.3	3.4	4.3	None	-	-	-	64.3	80	69	211	68.6	80	74	216
										2EH04502546	23.0	1	28.8	64.3	80	69	211	68.6	80	74	216
										2EH04505046	45.9	2	57.6	98.4	100	91	211	103.8	110	95	216
										2EH04507546	68.9	2	86.4	112.8	125	124	211	118.2	125	129	216
	575-3-60	15.0	21.6	9.0	78	1.9	11.5	2.7	3.5	None	-	-	-	52.3	60	56	161	55.8	70	60	165
										2EH04502558	23.0	1	23.0	52.3	60	56	161	55.8	70	60	165
										2EH04505058	45.9	2	46.0	78.6	80	72	161	83.0	90	76	165
										2EH04507558	68.9	2	69.1	90.2	100	99	161	94.6	100	103	165

Table 19: KE13 to KE23 VFD high static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	30.0	6.7	9.6	None	-	-	-	154.7	200	163	438	164.3	200	174	447
										2EH04502525	18.8	1	52.1	154.7	200	163	438	164.3	200	174	447
										2EH04505025	37.6	2	104.3	184.6	200	170	438	196.6	200	181	447
										2EH04507525	56.3	2	156.2	210.5	225	230	438	222.5	225	241	447
	230-3-60	51.0	68.3	28.7	207.5	4.7	30.0	6.7	8.7	None	-	-	-	154.7	200	163	438	163.4	200	173	446
										2EH04502525	23.0	1	57.7	154.7	200	163	438	163.4	200	173	446
										2EH04505025	45.9	2	115.2	198.3	200	182	438	209.1	225	192	446
										2EH04507525	68.9	2	172.9	227.2	250	249	438	238.0	250	259	446
	460-3-60	25.0	35.7	12.4	100.2	2.3	14.3	3.4	4.3	None	-	-	-	74.0	90	78	217	78.3	100	83	221
										2EH04502546	23.0	1	28.8	74.0	90	78	217	78.3	100	83	221
										2EH04505046	45.9	2	57.6	98.4	100	91	217	103.8	110	95	221
										2EH04507546	68.9	2	86.4	112.8	125	124	217	118.2	125	129	221
	575-3-60	20.0	32.4	9.0	78	1.9	11.5	2.7	3.5	None	-	-	-	58.5	70	62	172	62.0	80	66	176
										2EH04502558	23.0	1	23.0	58.5	70	62	172	62.0	80	66	176
										2EH04505058	45.9	2	46.0	78.6	80	72	172	83.0	90	76	176
										2EH04507558	68.9	2	69.1	90.2	100	99	172	94.6	100	103	176
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	39.6	6.7	9.6	None	-	-	-	177.8	225	187	536	187.4	225	198	545
										2EH04502525	18.8	1	52.1	177.8	225	187	536	187.4	225	198	545
										2EH04505025	37.6	2	104.3	196.6	225	187	536	208.6	225	198	545
										2EH04507525	56.3	2	156.2	222.5	250	241	536	234.5	250	252	545
	230-3-60	62.0	68.3	28.5	255	4.7	39.6	6.7	8.7	None	-	-	-	177.8	225	187	536	186.5	225	197	544
										2EH04502525	23.0	1	57.7	177.8	225	187	536	186.5	225	197	544
										2EH04505025	45.9	2	115.2	210.3	225	193	536	221.1	225	203	544
										2EH04507525	68.9	2	172.9	239.2	250	260	536	250.0	250	270	544
	460-3-60	30.0	35.7	13.5	123	2.3	18.7	3.4	4.3	None	-	-	-	85.7	110	90	265	90.0	110	95	269
										2EH04502546	23.0	1	28.8	85.7	110	90	265	90.0	110	95	269
										2EH04505046	45.9	2	57.6	103.9	110	96	265	109.3	110	101	269
										2EH04507546	68.9	2	86.4	118.3	125	129	265	123.7	125	134	269
	575-3-60	25.0	32.4	10.7	93.7	1.9	14.2	2.7	3.5	None	-	-	-	69.2	90	72	211	72.7	90	76	214
										2EH04502558	23.0	1	23.0	69.2	90	72	211	72.7	90	76	214
										2EH04505058	45.9	2	46.0	82.0	90	75	211	86.4	90	79	214
										2EH04507558	68.9	2	69.1	93.6	100	102	211	98.0	110	106	214

Customer supplied standard static

Table 20: KE13 to KE23 VFD customer supplied standard static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	8.9	9.6	None	-	-	-	79.0	100	82	266	88.6	110	93	276
									2EH04522525	18.8	1	52.1	79.0	100	82	266	88.6	110	93	276
									2EH04525025	37.6	2	104.3	141.5	150	130	266	153.5	175	141	276
	230-3-60	30.0	53.1	23.2	142	4.7	8.2	8.7	None	-	-	-	78.3	100	81	274	87.0	110	91	282
									2EH04522525	23.0	1	57.7	82.4	100	81	274	93.3	110	91	282
									2EH04525025	45.9	2	115.2	154.3	175	142	274	165.1	175	152	282
	460-3-60	15.0	27.6	9.5	73.1	2.3	4.1	4.3	None	-	-	-	37.0	50	38	140	41.3	50	43	144
									2EH04522546	23.0	1	28.8	41.1	50	38	140	46.5	50	43	144
									2EH04525046	45.9	2	57.6	77.1	80	71	140	82.5	90	76	144
	575-3-60	13.0	21.6	7.8	55	1.9	3.2	3.5	None	-	-	-	31.1	40	32	107	34.6	45	36	110
									2EH04522558	23.0	1	23.0	32.8	40	32	107	37.1	45	36	110
									2EH04525058	45.9	2	46.0	61.5	70	57	107	65.9	70	61	110
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	8.9	9.6	None	-	-	-	85.9	110	89	303	95.5	125	100	312
									2EH04502525	18.8	1	52.1	85.9	110	89	303	95.5	125	100	312
									2EH04505025	37.6	2	104.3	141.5	150	130	303	153.5	175	141	312
									2EH04507525	56.3	2	156.2	167.3	200	190	303	179.3	200	201	312
	230-3-60	33.0	53.1	26.3	178.5	4.7	8.2	8.7	None	-	-	-	85.2	110	88	310	93.9	125	98	319
									2EH04502525	23.0	1	57.7	85.2	110	88	310	93.9	125	98	319
									2EH04505025	45.9	2	115.2	154.3	175	142	310	165.1	175	152	319
									2EH04507525	68.9	2	172.9	183.2	200	208	310	194.0	225	218	319
	460-3-60	16.0	27.6	11.0	95.3	2.3	4.1	4.3	None	-	-	-	39.7	50	41	162	44.0	60	46	166
									2EH04502546	23.0	1	28.8	41.1	50	41	162	46.5	60	46	166
									2EH04505046	45.9	2	57.6	77.1	80	71	162	82.5	90	76	166
									2EH04507546	68.9	2	86.4	91.5	100	104	162	96.9	100	109	166
	575-3-60	13.0	21.6	9.2	65	1.9	3.2	3.5	None	-	-	-	32.5	45	34	117	36.0	45	38	120
									2EH04502558	23.0	1	23.0	32.8	45	34	117	37.1	45	38	120
									2EH04505058	45.9	2	46.0	61.5	70	57	117	65.9	70	61	120
									2EH04507558	68.9	2	69.1	73.1	80	83	117	77.5	80	87	120
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	9.9	9.6	None	-	-	-	102.7	125	107	323	112.3	125	118	333
									2EH04502525	18.8	1	52.1	102.7	125	107	323	112.3	125	118	333
									2EH04505025	37.6	2	104.3	142.8	150	131	323	154.8	175	142	333
									2EH04507525	56.3	2	156.2	168.6	200	191	323	180.6	200	202	333
	230-3-60	37.0	53.1	27.7	178.5	4.7	9.4	8.7	None	-	-	-	102.2	125	107	331	110.9	125	117	340
									2EH04502525	23.0	1	57.7	102.2	125	107	331	110.9	125	117	340
									2EH04505025	45.9	2	115.2	155.8	175	143	331	166.6	175	153	340
									2EH04507525	68.9	2	172.9	184.7	200	210	331	195.5	225	220	340
	460-3-60	18.0	27.6	11.5	103	2.3	4.7	4.3	None	-	-	-	47.9	60	50	180	52.2	70	55	184
									2EH04502546	23.0	1	28.8	47.9	60	50	180	52.2	70	55	184
									2EH04505046	45.9	2	57.6	77.9	80	72	180	83.3	90	77	184
									2EH04507546	68.9	2	86.4	92.3	100	105	180	97.7	110	110	184
	575-3-60	15.0	21.6	9.0	78	1.9	4.3	3.5	None	-	-	-	39.7	50	41	147	43.2	50	45	151
									2EH04502558	23.0	1	23.0	39.7	50	41	147	43.2	50	45	151
									2EH04505058	45.9	2	46.0	62.9	70	58	147	67.3	70	62	151
									2EH04507558	68.9	2	69.1	74.5	80	84	147	78.9	90	88	151

Table 20: KE13 to KE23 VFD customer supplied standard static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	13.5	9.6	None	-	-	-	124.8	175	129	397	134.4	175	140	407
									2EH04502525	18.8	1	52.1	124.8	175	129	397	134.4	175	140	407
									2EH04505025	37.6	2	104.3	147.3	175	135	397	159.3	175	147	407
									2EH04507525	56.3	2	156.2	173.1	200	195	397	185.1	200	206	407
	230-3-60	51.0	68.3	28.7	207.5	4.7	13.4	8.7	None	-	-	-	124.7	175	129	397	133.4	175	139	405
									2EH04502525	23.0	1	57.7	124.7	175	129	397	133.4	175	139	405
									2EH04505025	45.9	2	115.2	160.8	175	148	397	171.6	175	158	405
									2EH04507525	68.9	2	172.9	189.7	225	214	397	200.5	225	224	405
	460-3-60	25.0	35.7	12.4	100.2	2.3	6.7	4.3	None	-	-	-	59.6	80	61	196	63.9	80	66	200
									2EH04502546	23.0	1	28.8	59.6	80	61	196	63.9	80	66	200
									2EH04505046	45.9	2	57.6	80.4	90	74	196	85.8	90	79	200
									2EH04507546	68.9	2	86.4	94.8	110	107	196	100.2	110	112	200
	575-3-60	20.0	32.4	9.0	78	1.9	5.4	3.5	None	-	-	-	47.0	60	48	158	50.5	70	52	162
									2EH04502558	23.0	1	23.0	47.0	60	48	158	50.5	70	52	162
									2EH04505058	45.9	2	46.0	64.3	70	59	158	68.6	70	63	162
									2EH04507558	68.9	2	69.1	75.9	90	86	158	80.2	90	90	162
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	13.5	9.6	None	-	-	-	138.3	200	141	445	147.9	200	152	455
									2EH04502525	18.8	1	52.1	138.3	200	141	445	147.9	200	152	455
									2EH04505025	37.6	2	104.3	147.3	200	141	445	159.3	200	152	455
									2EH04507525	56.3	2	156.2	173.1	200	195	445	185.1	200	206	455
	230-3-60	62.0	68.3	28.5	255	4.7	13.4	8.7	None	-	-	-	138.2	200	141	444	146.9	200	151	453
									2EH04502525	23.0	1	57.7	138.2	200	141	444	146.9	200	151	453
									2EH04505025	45.9	2	115.2	160.8	200	148	444	171.6	200	158	453
									2EH04507525	68.9	2	172.9	189.7	225	214	444	200.5	225	224	453
	460-3-60	30.0	35.7	13.5	123	2.3	6.7	4.3	None	-	-	-	66.9	90	68	219	71.2	100	73	223
									2EH04502546	23.0	1	28.8	66.9	90	68	219	71.2	100	73	223
									2EH04505046	45.9	2	57.6	80.4	90	74	219	85.8	100	79	223
									2EH04507546	68.9	2	86.4	94.8	110	107	219	100.2	110	112	223
	575-3-60	25.0	32.4	10.7	93.7	1.9	5.4	3.5	None	-	-	-	55.0	80	56	174	58.5	80	60	177
									2EH04502558	23.0	1	23.0	55.0	80	56	174	58.5	80	60	177
									2EH04505058	45.9	2	46.0	64.3	80	59	174	68.6	80	63	177
									2EH04507558	68.9	2	69.1	75.9	90	86	174	80.2	90	90	177

Table 21: KE13 to KE23 VFD customer supplied standard static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	8.9	5.0	9.6	None	-	-	-	89.0	110	94	287	98.6	125	105	297
										2EH04522525	18.8	1	52.1	89.0	110	94	287	100.8	125	105	297
										2EH04525025	37.6	2	104.3	154.0	175	142	287	166.0	175	153	297
	230-3-60	30.0	53.1	23.2	142	4.7	8.2	5.0	8.7	None	-	-	-	88.3	110	93	295	97.0	125	103	303
										2EH04522525	23.0	1	57.7	94.9	110	93	295	105.8	125	103	303
										2EH04525025	45.9	2	115.2	166.8	175	153	295	177.6	200	163	303
	460-3-60	15.0	27.6	9.5	73.1	2.3	4.1	2.2	4.3	None	-	-	-	41.4	50	43	149	45.7	60	48	153
										2EH04522546	23.0	1	28.8	46.6	50	43	149	52.0	60	48	153
										2EH04525046	45.9	2	57.6	82.6	90	76	149	88.0	90	81	153
	575-3-60	13.0	21.6	7.8	55	1.9	3.2	1.5	3.5	None	-	-	-	34.1	45	35	113	37.6	50	39	116
										2EH04522558	23.0	1	23.0	36.5	45	35	113	40.9	50	39	116
										2EH04525058	45.9	2	46.0	65.3	70	60	113	69.6	70	64	116
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	8.9	5.0	9.6	None	-	-	-	95.9	125	101	324	105.5	125	112	333
										2EH04502525	18.8	1	52.1	95.9	125	101	324	105.5	125	112	333
										2EH04505025	37.6	2	104.3	154.0	175	142	324	166.0	175	153	333
										2EH04507525	56.3	2	156.2	179.8	200	201	324	191.8	200	212	333
	230-3-60	33.0	53.1	26.3	178.5	4.7	8.2	5.0	8.7	None	-	-	-	95.2	125	100	331	103.9	125	110	340
										2EH04502525	23.0	1	57.7	95.2	125	100	331	105.8	125	110	340
										2EH04505025	45.9	2	115.2	166.8	175	153	331	177.6	200	163	340
										2EH04507525	68.9	2	172.9	195.7	225	220	331	206.5	225	230	340
	460-3-60	16.0	27.6	11.0	95.3	2.3	4.1	2.2	4.3	None	-	-	-	44.1	60	46	171	48.4	60	51	176
										2EH04502546	23.0	1	28.8	46.6	60	46	171	52.0	60	51	176
										2EH04505046	45.9	2	57.6	82.6	90	76	171	88.0	90	81	176
										2EH04507546	68.9	2	86.4	97.0	110	109	171	102.4	110	114	176
	575-3-60	13.0	21.6	9.2	65	1.9	3.2	1.5	3.5	None	-	-	-	35.5	45	37	123	39.0	50	41	126
										2EH04502558	23.0	1	23.0	36.5	45	37	123	40.9	50	41	126
										2EH04505058	45.9	2	46.0	65.3	70	60	123	69.6	70	64	126
										2EH04507558	68.9	2	69.1	76.9	80	87	123	81.2	90	91	126
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	9.9	5.0	9.6	None	-	-	-	112.7	125	119	344	122.3	150	130	354
										2EH04502525	18.8	1	52.1	112.7	125	119	344	122.3	150	130	354
										2EH04505025	37.6	2	104.3	155.3	175	143	344	167.3	175	154	354
										2EH04507525	56.3	2	156.2	181.1	200	203	344	193.1	200	214	354
	230-3-60	37.0	53.1	27.7	178.5	4.7	9.4	5.0	8.7	None	-	-	-	112.2	125	118	352	120.9	150	128	361
										2EH04502525	23.0	1	57.7	112.2	125	118	352	120.9	150	128	361
										2EH04505025	45.9	2	115.2	168.3	175	155	352	179.1	200	165	361
										2EH04507525	68.9	2	172.9	197.2	225	221	352	208.0	225	231	361
	460-3-60	18.0	27.6	11.5	103	2.3	4.7	2.2	4.3	None	-	-	-	52.3	70	55	189	56.6	70	60	194
										2EH04502546	23.0	1	28.8	52.3	70	55	189	56.6	70	60	194
										2EH04505046	45.9	2	57.6	83.4	90	77	189	88.8	90	82	194
										2EH04507546	68.9	2	86.4	97.8	110	110	189	103.2	110	115	194
	575-3-60	15.0	21.6	9.0	78	1.9	4.3	1.5	3.5	None	-	-	-	42.7	50	45	154	46.2	60	49	157
										2EH04502558	23.0	1	23.0	42.7	50	45	154	46.2	60	49	157
										2EH04505058	45.9	2	46.0	66.6	70	61	154	71.0	80	65	157
										2EH04507558	68.9	2	69.1	78.2	90	88	154	82.6	90	92	157

Table 21: KE13 to KE23 VFD customer supplied standard static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	13.5	5.0	9.6	None	-	-	-	134.8	175	140	418	144.4	175	151	428
										2EH04502525	18.8	1	52.1	134.8	175	140	418	144.4	175	151	428
										2EH04505025	37.6	2	104.3	159.8	175	147	418	171.8	175	158	428
										2EH04507525	56.3	2	156.2	185.6	200	207	418	197.6	200	218	428
	230-3-60	51.0	68.3	28.7	207.5	4.7	13.4	5.0	8.7	None	-	-	-	134.7	175	140	418	143.4	175	150	426
										2EH04502525	23.0	1	57.7	134.7	175	140	418	143.4	175	150	426
										2EH04505025	45.9	2	115.2	173.3	175	159	418	184.1	200	169	426
										2EH04507525	68.9	2	172.9	202.2	225	226	418	213.0	225	236	426
	460-3-60	25.0	35.7	12.4	100.2	2.3	6.7	2.2	4.3	None	-	-	-	64.0	80	66	205	68.3	90	71	210
										2EH04502546	23.0	1	28.8	64.0	80	66	205	68.3	90	71	210
										2EH04505046	45.9	2	57.6	85.9	90	79	205	91.3	100	84	210
										2EH04507546	68.9	2	86.4	100.3	110	112	205	105.7	110	117	210
	575-3-60	20.0	32.4	9.0	78	1.9	5.4	1.5	3.5	None	-	-	-	50.0	70	52	164	53.5	70	56	168
										2EH04502558	23.0	1	23.0	50.0	70	52	164	53.5	70	56	168
										2EH04505058	45.9	2	46.0	68.0	70	63	164	72.4	80	67	168
										2EH04507558	68.9	2	69.1	79.6	90	89	164	84.0	90	93	168
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	13.5	5.0	9.6	None	-	-	-	148.3	200	153	466	157.9	200	164	476
										2EH04502525	18.8	1	52.1	148.3	200	153	466	157.9	200	164	476
										2EH04505025	37.6	2	104.3	159.8	200	153	466	171.8	200	164	476
										2EH04507525	56.3	2	156.2	185.6	200	207	466	197.6	200	218	476
	230-3-60	62.0	68.3	28.5	255	4.7	13.4	5.0	8.7	None	-	-	-	148.2	200	153	465	156.9	200	163	474
										2EH04502525	23.0	1	57.7	148.2	200	153	465	156.9	200	163	474
										2EH04505025	45.9	2	115.2	173.3	200	159	465	184.1	200	169	474
										2EH04507525	68.9	2	172.9	202.2	225	226	465	213.0	225	236	474
	460-3-60	30.0	35.7	13.5	123	2.3	6.7	2.2	4.3	None	-	-	-	71.3	100	73	228	75.6	100	78	232
										2EH04502546	23.0	1	28.8	71.3	100	73	228	75.6	100	78	232
										2EH04505046	45.9	2	57.6	85.9	100	79	228	91.3	100	84	232
										2EH04507546	68.9	2	86.4	100.3	110	112	228	105.7	110	117	232
	575-3-60	25.0	32.4	10.7	93.7	1.9	5.4	1.5	3.5	None	-	-	-	58.0	80	59	180	61.5	80	63	184
										2EH04502558	23.0	1	23.0	58.0	80	59	180	61.5	80	63	184
										2EH04505058	45.9	2	46.0	68.0	80	63	180	72.4	80	67	184
										2EH04507558	68.9	2	69.1	79.6	90	89	180	84.0	90	93	184

Table 22: KE13 to KE23 VFD customer supplied standard static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	8.9	6.7	9.6	None	-	-	-	92.4	110	98	280	102.0	125	109	289
										2EH04522525	18.8	1	52.1	93.0	110	98	280	105.0	125	109	289
										2EH04525025	37.6	2	104.3	158.3	175	146	280	170.3	175	157	289
	230-3-60	30.0	53.1	23.2	142	4.7	8.2	6.7	8.7	None	-	-	-	91.7	110	97	287	100.4	125	107	296
										2EH04522525	23.0	1	57.7	99.1	110	97	287	110.0	125	107	296
										2EH04525025	45.9	2	115.2	171.0	175	157	287	181.9	200	167	296
	460-3-60	15.0	27.6	9.5	73.1	2.3	4.1	3.4	4.3	None	-	-	-	43.8	50	46	147	48.1	60	51	151
										2EH04522546	23.0	1	28.8	49.6	50	46	147	55.0	60	51	151
										2EH04525046	45.9	2	57.6	85.6	90	79	147	91.0	100	84	151
	575-3-60	13.0	21.6	7.8	55	1.9	3.2	2.7	3.5	None	-	-	-	36.5	45	38	112	40.0	50	42	115
										2EH04522558	23.0	1	23.0	39.5	45	38	112	43.9	50	42	115
										2EH04525058	45.9	2	46.0	68.3	70	63	112	72.6	80	67	115
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	8.9	6.7	9.6	None	-	-	-	99.3	125	105	316	108.9	125	116	326
										2EH04502525	18.8	1	52.1	99.3	125	105	316	108.9	125	116	326
										2EH04505025	37.6	2	104.3	158.3	175	146	316	170.3	175	157	326
										2EH04507525	56.3	2	156.2	184.1	200	205	316	196.1	200	216	326
	230-3-60	33.0	53.1	26.3	178.5	4.7	8.2	6.7	8.7	None	-	-	-	98.6	125	104	323	107.3	125	114	332
										2EH04502525	23.0	1	57.7	99.1	125	104	323	110.0	125	114	332
										2EH04505025	45.9	2	115.2	171.0	175	157	323	181.9	200	167	332
										2EH04507525	68.9	2	172.9	199.9	225	224	323	210.8	225	234	332
	460-3-60	16.0	27.6	11.0	95.3	2.3	4.1	3.4	4.3	None	-	-	-	46.5	60	49	169	50.8	60	54	173
										2EH04502546	23.0	1	28.8	49.6	60	49	169	55.0	60	54	173
										2EH04505046	45.9	2	57.6	85.6	90	79	169	91.0	100	84	173
										2EH04507546	68.9	2	86.4	100.0	110	112	169	105.4	110	117	173
	575-3-60	13.0	21.6	9.2	65	1.9	3.2	2.7	3.5	None	-	-	-	37.9	50	40	122	41.4	50	44	125
										2EH04502558	23.0	1	23.0	39.5	50	40	122	43.9	50	44	125
										2EH04505058	45.9	2	46.0	68.3	70	63	122	72.6	80	67	125
										2EH04507558	68.9	2	69.1	79.9	90	89	122	84.2	90	93	125
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	9.9	6.7	9.6	None	-	-	-	116.1	150	123	336	125.7	150	134	346
										2EH04502525	18.8	1	52.1	116.1	150	123	336	125.7	150	134	346
										2EH04505025	37.6	2	104.3	159.5	175	147	336	171.5	175	158	346
										2EH04507525	56.3	2	156.2	185.3	200	206	336	197.3	200	217	346
	230-3-60	37.0	53.1	27.7	178.5	4.7	9.4	6.7	8.7	None	-	-	-	115.6	150	122	344	124.3	150	132	353
										2EH04502525	23.0	1	57.7	115.6	150	122	344	124.3	150	132	353
										2EH04505025	45.9	2	115.2	172.5	175	159	344	183.4	200	169	353
										2EH04507525	68.9	2	172.9	201.4	225	225	344	212.3	225	235	353
	460-3-60	18.0	27.6	11.5	103	2.3	4.7	3.4	4.3	None	-	-	-	54.7	70	58	187	59.0	70	63	191
										2EH04502546	23.0	1	28.8	54.7	70	58	187	59.0	70	63	191
										2EH04505046	45.9	2	57.6	86.4	90	79	187	91.8	100	84	191
										2EH04507546	68.9	2	86.4	100.8	110	113	187	106.2	110	118	191
	575-3-60	15.0	21.6	9.0	78	1.9	4.3	2.7	3.5	None	-	-	-	45.1	60	47	153	48.6	60	52	156
										2EH04502558	23.0	1	23.0	45.1	60	47	153	48.6	60	52	156
										2EH04505058	45.9	2	46.0	69.6	70	64	153	74.0	80	68	156
										2EH04507558	68.9	2	69.1	81.2	90	91	153	85.6	90	95	156

Table 22: KE13 to KE23 VFD customer supplied standard static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	13.5	6.7	9.6	None	-	-	-	138.2	175	144	411	147.8	175	155	420
										2EH04502525	18.8	1	52.1	138.2	175	144	411	147.8	175	155	420
										2EH04505025	37.6	2	104.3	164.0	175	151	411	176.0	200	162	420
										2EH04507525	56.3	2	156.2	189.8	200	211	411	201.8	225	222	420
	230-3-60	51.0	68.3	28.7	207.5	4.7	13.4	6.7	8.7	None	-	-	-	138.1	175	144	410	146.8	175	154	419
										2EH04502525	23.0	1	57.7	138.1	175	144	410	146.8	175	154	419
										2EH04505025	45.9	2	115.2	177.5	200	163	410	188.4	200	173	419
										2EH04507525	68.9	2	172.9	206.4	225	230	410	217.3	225	240	419
	460-3-60	25.0	35.7	12.4	100.2	2.3	6.7	3.4	4.3	None	-	-	-	66.4	90	69	203	70.7	90	74	207
										2EH04502546	23.0	1	28.8	66.4	90	69	203	70.7	90	74	207
										2EH04505046	45.9	2	57.6	88.9	90	82	203	94.3	100	87	207
										2EH04507546	68.9	2	86.4	103.3	110	115	203	108.7	110	120	207
	575-3-60	20.0	32.4	9.0	78	1.9	5.4	2.7	3.5	None	-	-	-	52.4	70	55	163	55.9	70	59	167
										2EH04502558	23.0	1	23.0	52.4	70	55	163	55.9	70	59	167
										2EH04505058	45.9	2	46.0	71.0	80	65	163	75.4	80	69	167
										2EH04507558	68.9	2	69.1	82.6	90	92	163	87.0	90	96	167
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	13.5	6.7	9.6	None	-	-	-	151.7	200	157	458	161.3	200	168	468
										2EH04502525	18.8	1	52.1	151.7	200	157	458	161.3	200	168	468
										2EH04505025	37.6	2	104.3	164.0	200	157	458	176.0	200	168	468
										2EH04507525	56.3	2	156.2	189.8	200	211	458	201.8	225	222	468
	230-3-60	62.0	68.3	28.5	255	4.7	13.4	6.7	8.7	None	-	-	-	151.6	200	157	458	160.3	200	167	466
										2EH04502525	23.0	1	57.7	151.6	200	157	458	160.3	200	167	466
										2EH04505025	45.9	2	115.2	177.5	200	163	458	188.4	200	173	466
										2EH04507525	68.9	2	172.9	206.4	225	230	458	217.3	225	240	466
	460-3-60	30.0	35.7	13.5	123	2.3	6.7	3.4	4.3	None	-	-	-	73.7	100	76	226	78.0	100	81	230
										2EH04502546	23.0	1	28.8	73.7	100	76	226	78.0	100	81	230
										2EH04505046	45.9	2	57.6	88.9	100	82	226	94.3	100	87	230
										2EH04507546	68.9	2	86.4	103.3	110	115	226	108.7	110	120	230
	575-3-60	25.0	32.4	10.7	93.7	1.9	5.4	2.7	3.5	None	-	-	-	60.4	80	62	179	63.9	80	66	183
										2EH04502558	23.0	1	23.0	60.4	80	62	179	63.9	80	66	183
										2EH04505058	45.9	2	46.0	71.0	80	65	179	75.4	80	69	183
										2EH04507558	68.9	2	69.1	82.6	90	92	179	87.0	90	96	183

Customer supplied medium static

Table 23: KE13 to KE23 VFD customer supplied medium static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	9.9	9.6	None	-	-	-	80.0	110	83	277	89.6	110	94	287
									2EH04522525	18.8	1	52.1	80.0	110	83	277	89.6	110	94	287
									2EH04525025	37.6	2	104.3	142.8	150	131	277	154.8	175	142	287
	230-3-60	30.0	53.1	23.2	142	4.7	9.4	8.7	None	-	-	-	79.5	100	83	285	88.2	110	93	294
									2EH04522525	23.0	1	57.7	83.9	100	83	285	94.8	110	93	294
									2EH04525025	45.9	2	115.2	155.8	175	143	285	166.6	175	153	294
	460-3-60	15.0	27.6	9.5	73.1	2.3	4.7	4.3	None	-	-	-	37.6	50	39	146	41.9	50	44	150
									2EH04522546	23.0	1	28.8	41.9	50	39	146	47.3	50	44	150
									2EH04525046	45.9	2	57.6	77.9	80	72	146	83.3	90	77	150
	575-3-60	13.0	21.6	7.8	55	1.9	4.3	3.5	None	-	-	-	32.2	45	33	120	35.7	45	37	124
									2EH04522558	23.0	1	23.0	34.1	45	33	120	38.5	45	37	124
									2EH04525058	45.9	2	46.0	62.9	70	58	120	67.3	70	62	124
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	9.9	9.6	None	-	-	-	86.9	110	90	314	96.5	125	101	323
									2EH04502525	18.8	1	52.1	86.9	110	90	314	96.5	125	101	323
									2EH04505025	37.6	2	104.3	142.8	150	131	314	154.8	175	142	323
									2EH04507525	56.3	2	156.2	168.6	200	191	314	180.6	200	202	323
	230-3-60	33.0	53.1	26.3	178.5	4.7	9.4	8.7	None	-	-	-	86.4	110	90	322	95.1	125	100	330
									2EH04502525	23.0	1	57.7	86.4	110	90	322	95.1	125	100	330
									2EH04505025	45.9	2	115.2	155.8	175	143	322	166.6	175	153	330
									2EH04507525	68.9	2	172.9	184.7	200	210	322	195.5	225	220	330
	460-3-60	16.0	27.6	11.0	95.3	2.3	4.7	4.3	None	-	-	-	40.3	50	42	168	44.6	60	47	172
									2EH04502546	23.0	1	28.8	41.9	50	42	168	47.3	60	47	172
									2EH04505046	45.9	2	57.6	77.9	80	72	168	83.3	90	77	172
									2EH04507546	68.9	2	86.4	92.3	100	105	168	97.7	110	110	172
	575-3-60	13.0	21.6	9.2	65	1.9	4.3	3.5	None	-	-	-	33.6	45	35	130	37.1	50	39	134
									2EH04502558	23.0	1	23.0	34.1	45	35	130	38.5	50	39	134
									2EH04505058	45.9	2	46.0	62.9	70	58	130	67.3	70	62	134
									2EH04507558	68.9	2	69.1	74.5	80	84	130	78.9	90	88	134
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	13.5	9.6	None	-	-	-	106.3	125	112	353	115.9	150	123	363
									2EH04502525	18.8	1	52.1	106.3	125	112	353	115.9	150	123	363
									2EH04505025	37.6	2	104.3	147.3	150	135	353	159.3	175	147	363
									2EH04507525	56.3	2	156.2	173.1	200	195	353	185.1	200	206	363
	230-3-60	37.0	53.1	27.7	178.5	4.7	13.4	8.7	None	-	-	-	106.2	125	111	352	114.9	150	121	361
									2EH04502525	23.0	1	57.7	106.2	125	111	352	114.9	150	121	361
									2EH04505025	45.9	2	115.2	160.8	175	148	352	171.6	175	158	361
									2EH04507525	68.9	2	172.9	189.7	225	214	352	200.5	225	224	361
	460-3-60	18.0	27.6	11.5	103	2.3	6.7	4.3	None	-	-	-	49.9	60	52	191	54.2	70	57	195
									2EH04502546	23.0	1	28.8	49.9	60	52	191	54.2	70	57	195
									2EH04505046	45.9	2	57.6	80.4	90	74	191	85.8	90	79	195
									2EH04507546	68.9	2	86.4	94.8	110	107	191	100.2	110	112	195
	575-3-60	15.0	21.6	9.0	78	1.9	5.4	3.5	None	-	-	-	40.8	50	43	147	44.3	50	47	151
									2EH04502558	23.0	1	23.0	40.8	50	43	147	44.3	50	47	151
									2EH04505058	45.9	2	46.0	64.3	70	59	147	68.6	70	63	151
									2EH04507558	68.9	2	69.1	75.9	90	86	147	80.2	90	90	151

Table 23: KE13 to KE23 VFD customer supplied medium static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	13.5	9.6	None	-	-	-	124.8	175	129	397	134.4	175	140	407
									2EH04502525	18.8	1	52.1	124.8	175	129	397	134.4	175	140	407
									2EH04505025	37.6	2	104.3	147.3	175	135	397	159.3	175	147	407
									2EH04507525	56.3	2	156.2	173.1	200	195	397	185.1	200	206	407
	230-3-60	51.0	68.3	28.7	207.5	4.7	13.4	8.7	None	-	-	-	124.7	175	129	397	133.4	175	139	405
									2EH04502525	23.0	1	57.7	124.7	175	129	397	133.4	175	139	405
									2EH04505025	45.9	2	115.2	160.8	175	148	397	171.6	175	158	405
									2EH04507525	68.9	2	172.9	189.7	225	214	397	200.5	225	224	405
	460-3-60	25.0	35.7	12.4	100.2	2.3	6.7	4.3	None	-	-	-	59.6	80	61	196	63.9	80	66	200
									2EH04502546	23.0	1	28.8	59.6	80	61	196	63.9	80	66	200
									2EH04505046	45.9	2	57.6	80.4	90	74	196	85.8	90	79	200
									2EH04507546	68.9	2	86.4	94.8	110	107	196	100.2	110	112	200
	575-3-60	20.0	32.4	9.0	78	1.9	5.4	3.5	None	-	-	-	47.0	60	48	158	50.5	70	52	162
									2EH04502558	23.0	1	23.0	47.0	60	48	158	50.5	70	52	162
									2EH04505058	45.9	2	46.0	64.3	70	59	158	68.6	70	63	162
									2EH04507558	68.9	2	69.1	75.9	90	86	158	80.2	90	90	162
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	19.8	9.6	None	-	-	-	144.6	200	148	472	154.2	200	160	481
									2EH04502525	18.8	1	52.1	144.6	200	148	472	154.2	200	160	481
									2EH04505025	37.6	2	104.3	155.1	200	148	472	167.1	200	160	481
									2EH04507525	56.3	2	156.2	181.0	200	202	472	193.0	200	213	481
	230-3-60	62.0	68.3	28.5	255	4.7	19.8	8.7	None	-	-	-	144.6	200	148	472	153.3	200	158	480
									2EH04502525	23.0	1	57.7	144.6	200	148	472	153.3	200	158	480
									2EH04505025	45.9	2	115.2	168.8	200	155	472	179.6	200	165	480
									2EH04507525	68.9	2	172.9	197.7	225	222	472	208.5	225	232	480
	460-3-60	30.0	35.7	13.5	123	2.3	9.9	4.3	None	-	-	-	70.1	100	72	233	74.4	100	77	237
									2EH04502546	23.0	1	28.8	70.1	100	72	233	74.4	100	77	237
									2EH04505046	45.9	2	57.6	84.4	100	78	233	89.8	100	83	237
									2EH04507546	68.9	2	86.4	98.8	110	111	233	104.2	110	116	237
	575-3-60	25.0	32.4	10.7	93.7	1.9	7.9	3.5	None	-	-	-	57.5	80	59	183	61.0	80	63	186
									2EH04502558	23.0	1	23.0	57.5	80	59	183	61.0	80	63	186
									2EH04505058	45.9	2	46.0	67.4	80	62	183	71.8	80	66	186
									2EH04507558	68.9	2	69.1	79.0	90	89	183	83.4	90	93	186

Table 24: KE13 to KE23 VFD customer supplied medium static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	9.9	5.0	9.6	None	-	-	-	90.0	110	95	298	99.6	125	106	308
										2EH04522525	18.8	1	52.1	90.0	110	95	298	102.0	125	106	308
										2EH04525025	37.6	2	104.3	155.3	175	143	298	167.3	175	154	308
	230-3-60	30.0	53.1	23.2	142	4.7	9.4	5.0	8.7	None	-	-	-	89.5	110	94	306	98.2	125	104	315
										2EH04522525	23.0	1	57.7	96.4	110	94	306	107.3	125	104	315
										2EH04525025	45.9	2	115.2	168.3	175	155	306	179.1	200	165	315
	460-3-60	15.0	27.6	9.5	73.1	2.3	4.7	2.2	4.3	None	-	-	-	42.0	50	44	155	46.3	60	49	159
										2EH04522546	23.0	1	28.8	47.4	50	44	155	52.8	60	49	159
										2EH04525046	45.9	2	57.6	83.4	90	77	155	88.8	90	82	159
	575-3-60	13.0	21.6	7.8	55	1.9	4.3	1.5	3.5	None	-	-	-	35.2	45	37	127	38.7	50	41	130
										2EH04522558	23.0	1	23.0	37.9	45	37	127	42.3	50	41	130
										2EH04525058	45.9	2	46.0	66.6	70	61	127	71.0	80	65	130
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	9.9	5.0	9.6	None	-	-	-	96.9	125	102	335	106.5	125	113	344
										2EH04502525	18.8	1	52.1	96.9	125	102	335	106.5	125	113	344
										2EH04505025	37.6	2	104.3	155.3	175	143	335	167.3	175	154	344
										2EH04507525	56.3	2	156.2	181.1	200	203	335	193.1	200	214	344
	230-3-60	33.0	53.1	26.3	178.5	4.7	9.4	5.0	8.7	None	-	-	-	96.4	125	101	343	105.1	125	111	351
										2EH04502525	23.0	1	57.7	96.4	125	101	343	107.3	125	111	351
										2EH04505025	45.9	2	115.2	168.3	175	155	343	179.1	200	165	351
										2EH04507525	68.9	2	172.9	197.2	225	221	343	208.0	225	231	351
	460-3-60	16.0	27.6	11.0	95.3	2.3	4.7	2.2	4.3	None	-	-	-	44.7	60	47	177	49.0	60	52	181
										2EH04502546	23.0	1	28.8	47.4	60	47	177	52.8	60	52	181
										2EH04505046	45.9	2	57.6	83.4	90	77	177	88.8	90	82	181
										2EH04507546	68.9	2	86.4	97.8	110	110	177	103.2	110	115	181
	575-3-60	13.0	21.6	9.2	65	1.9	4.3	1.5	3.5	None	-	-	-	36.6	45	38	137	40.1	50	42	140
										2EH04502558	23.0	1	23.0	37.9	45	38	137	42.3	50	42	140
										2EH04505058	45.9	2	46.0	66.6	70	61	137	71.0	80	65	140
										2EH04507558	68.9	2	69.1	78.2	90	88	137	82.6	90	92	140
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	13.5	5.0	9.6	None	-	-	-	116.3	150	123	374	125.9	150	134	384
										2EH04502525	18.8	1	52.1	116.3	150	123	374	125.9	150	134	384
										2EH04505025	37.6	2	104.3	159.8	175	147	374	171.8	175	158	384
										2EH04507525	56.3	2	156.2	185.6	200	207	374	197.6	200	218	384
	230-3-60	37.0	53.1	27.7	178.5	4.7	13.4	5.0	8.7	None	-	-	-	116.2	150	123	373	124.9	150	133	382
										2EH04502525	23.0	1	57.7	116.2	150	123	373	124.9	150	133	382
										2EH04505025	45.9	2	115.2	173.3	175	159	373	184.1	200	169	382
										2EH04507525	68.9	2	172.9	202.2	225	226	373	213.0	225	236	382
	460-3-60	18.0	27.6	11.5	103	2.3	6.7	2.2	4.3	None	-	-	-	54.3	70	57	200	58.6	70	62	204
										2EH04502546	23.0	1	28.8	54.3	70	57	200	58.6	70	62	204
										2EH04505046	45.9	2	57.6	85.9	90	79	200	91.3	100	84	204
										2EH04507546	68.9	2	86.4	100.3	110	112	200	105.7	110	117	204
	575-3-60	15.0	21.6	9.0	78	1.9	5.4	1.5	3.5	None	-	-	-	43.8	50	46	154	47.3	60	50	157
										2EH04502558	23.0	1	23.0	43.8	50	46	154	47.3	60	50	157
										2EH04505058	45.9	2	46.0	68.0	70	63	154	72.4	80	67	157
										2EH04507558	68.9	2	69.1	79.6	90	89	154	84.0	90	93	157

Table 24: KE13 to KE23 VFD customer supplied medium static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	13.5	5.0	9.6	None	-	-	-	134.8	175	140	418	144.4	175	151	428
										2EH04502525	18.8	1	52.1	134.8	175	140	418	144.4	175	151	428
										2EH04505025	37.6	2	104.3	159.8	175	147	418	171.8	175	158	428
										2EH04507525	56.3	2	156.2	185.6	200	207	418	197.6	200	218	428
	230-3-60	51.0	68.3	28.7	207.5	4.7	13.4	5.0	8.7	None	-	-	-	134.7	175	140	418	143.4	175	150	426
										2EH04502525	23.0	1	57.7	134.7	175	140	418	143.4	175	150	426
										2EH04505025	45.9	2	115.2	173.3	175	159	418	184.1	200	169	426
										2EH04507525	68.9	2	172.9	202.2	225	226	418	213.0	225	236	426
	460-3-60	25.0	35.7	12.4	100.2	2.3	6.7	2.2	4.3	None	-	-	-	64.0	80	66	205	68.3	90	71	210
										2EH04502546	23.0	1	28.8	64.0	80	66	205	68.3	90	71	210
										2EH04505046	45.9	2	57.6	85.9	90	79	205	91.3	100	84	210
										2EH04507546	68.9	2	86.4	100.3	110	112	205	105.7	110	117	210
	575-3-60	20.0	32.4	9.0	78	1.9	5.4	1.5	3.5	None	-	-	-	50.0	70	52	164	53.5	70	56	168
										2EH04502558	23.0	1	23.0	50.0	70	52	164	53.5	70	56	168
										2EH04505058	45.9	2	46.0	68.0	70	63	164	72.4	80	67	168
										2EH04507558	68.9	2	69.1	79.6	90	89	164	84.0	90	93	168
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	19.8	5.0	9.6	None	-	-	-	154.6	200	160	493	164.2	225	171	502
										2EH04502525	18.8	1	52.1	154.6	200	160	493	164.2	225	171	502
										2EH04505025	37.6	2	104.3	167.6	200	160	493	179.6	225	171	502
										2EH04507525	56.3	2	156.2	193.5	200	214	493	205.5	225	225	502
	230-3-60	62.0	68.3	28.5	255	4.7	19.8	5.0	8.7	None	-	-	-	154.6	200	160	493	163.3	225	170	501
										2EH04502525	23.0	1	57.7	154.6	200	160	493	163.3	225	170	501
										2EH04505025	45.9	2	115.2	181.3	200	167	493	192.1	225	177	501
										2EH04507525	68.9	2	172.9	210.2	225	233	493	221.0	225	243	501
	460-3-60	30.0	35.7	13.5	123	2.3	9.9	2.2	4.3	None	-	-	-	74.5	100	77	242	78.8	100	82	246
										2EH04502546	23.0	1	28.8	74.5	100	77	242	78.8	100	82	246
										2EH04505046	45.9	2	57.6	89.9	100	83	242	95.3	100	88	246
										2EH04507546	68.9	2	86.4	104.3	110	116	242	109.7	110	121	246
	575-3-60	25.0	32.4	10.7	93.7	1.9	7.9	1.5	3.5	None	-	-	-	60.5	80	62	189	64.0	80	66	192
										2EH04502558	23.0	1	23.0	60.5	80	62	189	64.0	80	66	192
										2EH04505058	45.9	2	46.0	71.1	80	65	189	75.5	80	69	192
										2EH04507558	68.9	2	69.1	82.7	90	92	189	87.1	90	96	192

Table 25: KE13 to KE23 VFD customer supplied medium static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	9.9	6.7	9.6	None	-	-	-	93.4	110	99	290	103.0	125	110	300
										2EH04522525	18.8	1	52.1	94.3	110	99	290	106.3	125	110	300
										2EH04525025	37.6	2	104.3	159.5	175	147	290	171.5	175	158	300
	230-3-60	30.0	53.1	23.2	142	4.7	9.4	6.7	8.7	None	-	-	-	92.9	110	98	299	101.6	125	108	307
										2EH04522525	23.0	1	57.7	100.6	110	98	299	111.5	125	108	307
										2EH04525025	45.9	2	115.2	172.5	175	159	299	183.4	200	169	307
	460-3-60	15.0	27.6	9.5	73.1	2.3	4.7	3.4	4.3	None	-	-	-	44.4	50	47	152	48.7	60	52	157
										2EH04522546	23.0	1	28.8	50.4	60	47	152	55.8	60	52	157
										2EH04525046	45.9	2	57.6	86.4	90	79	152	91.8	100	84	157
	575-3-60	13.0	21.6	7.8	55	1.9	4.3	2.7	3.5	None	-	-	-	37.6	50	39	126	41.1	50	43	129
										2EH04522558	23.0	1	23.0	40.9	50	39	126	45.3	50	43	129
										2EH04525058	45.9	2	46.0	69.6	70	64	126	74.0	80	68	129
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	9.9	6.7	9.6	None	-	-	-	100.3	125	106	327	109.9	125	117	337
										2EH04502525	18.8	1	52.1	100.3	125	106	327	109.9	125	117	337
										2EH04505025	37.6	2	104.3	159.5	175	147	327	171.5	175	158	337
										2EH04507525	56.3	2	156.2	185.3	200	206	327	197.3	200	217	337
	230-3-60	33.0	53.1	26.3	178.5	4.7	9.4	6.7	8.7	None	-	-	-	99.8	125	105	335	108.5	125	115	344
										2EH04502525	23.0	1	57.7	100.6	125	105	335	111.5	125	115	344
										2EH04505025	45.9	2	115.2	172.5	175	159	335	183.4	200	169	344
										2EH04507525	68.9	2	172.9	201.4	225	225	335	212.3	225	235	344
	460-3-60	16.0	27.6	11.0	95.3	2.3	4.7	3.4	4.3	None	-	-	-	47.1	60	50	175	51.4	60	55	179
										2EH04502546	23.0	1	28.8	50.4	60	50	175	55.8	60	55	179
										2EH04505046	45.9	2	57.6	86.4	90	79	175	91.8	100	84	179
										2EH04507546	68.9	2	86.4	100.8	110	113	175	106.2	110	118	179
	575-3-60	13.0	21.6	9.2	65	1.9	4.3	2.7	3.5	None	-	-	-	39.0	50	41	136	42.5	50	45	139
										2EH04502558	23.0	1	23.0	40.9	50	41	136	45.3	50	45	139
										2EH04505058	45.9	2	46.0	69.6	70	64	136	74.0	80	68	139
										2EH04507558	68.9	2	69.1	81.2	90	91	136	85.6	90	95	139
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	13.5	6.7	9.6	None	-	-	-	119.7	150	127	367	129.3	150	138	376
										2EH04502525	18.8	1	52.1	119.7	150	127	367	129.3	150	138	376
										2EH04505025	37.6	2	104.3	164.0	175	151	367	176.0	200	162	376
										2EH04507525	56.3	2	156.2	189.8	200	211	367	201.8	225	222	376
	230-3-60	37.0	53.1	27.7	178.5	4.7	13.4	6.7	8.7	None	-	-	-	119.6	150	127	366	128.3	150	137	375
										2EH04502525	23.0	1	57.7	119.6	150	127	366	128.3	150	137	375
										2EH04505025	45.9	2	115.2	177.5	200	163	366	188.4	200	173	375
										2EH04507525	68.9	2	172.9	206.4	225	230	366	217.3	225	240	375
	460-3-60	18.0	27.6	11.5	103	2.3	6.7	3.4	4.3	None	-	-	-	56.7	70	60	198	61.0	70	65	202
										2EH04502546	23.0	1	28.8	56.7	70	60	198	61.0	70	65	202
										2EH04505046	45.9	2	57.6	88.9	90	82	198	94.3	100	87	202
										2EH04507546	68.9	2	86.4	103.3	110	115	198	108.7	110	120	202
	575-3-60	15.0	21.6	9.0	78	1.9	5.4	2.7	3.5	None	-	-	-	46.2	60	49	153	49.7	60	53	156
										2EH04502558	23.0	1	23.0	46.2	60	49	153	49.7	60	53	156
										2EH04505058	45.9	2	46.0	71.0	80	65	153	75.4	80	69	156
										2EH04507558	68.9	2	69.1	82.6	90	92	153	87.0	90	96	156

Table 25: KE13 to KE23 VFD customer supplied medium static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	13.5	6.7	9.6	None	-	-	-	138.2	175	144	411	147.8	175	155	420
										2EH04502525	18.8	1	52.1	138.2	175	144	411	147.8	175	155	420
										2EH04505025	37.6	2	104.3	164.0	175	151	411	176.0	200	162	420
										2EH04507525	56.3	2	156.2	189.8	200	211	411	201.8	225	222	420
	230-3-60	51.0	68.3	28.7	207.5	4.7	13.4	6.7	8.7	None	-	-	-	138.1	175	144	410	146.8	175	154	419
										2EH04502525	23.0	1	57.7	138.1	175	144	410	146.8	175	154	419
										2EH04505025	45.9	2	115.2	177.5	200	163	410	188.4	200	173	419
										2EH04507525	68.9	2	172.9	206.4	225	230	410	217.3	225	240	419
	460-3-60	25.0	35.7	12.4	100.2	2.3	6.7	3.4	4.3	None	-	-	-	66.4	90	69	203	70.7	90	74	207
										2EH04502546	23.0	1	28.8	66.4	90	69	203	70.7	90	74	207
										2EH04505046	45.9	2	57.6	88.9	90	82	203	94.3	100	87	207
										2EH04507546	68.9	2	86.4	103.3	110	115	203	108.7	110	120	207
	575-3-60	20.0	32.4	9.0	78	1.9	5.4	2.7	3.5	None	-	-	-	52.4	70	55	163	55.9	70	59	167
										2EH04502558	23.0	1	23.0	52.4	70	55	163	55.9	70	59	167
										2EH04505058	45.9	2	46.0	71.0	80	65	163	75.4	80	69	167
										2EH04507558	68.9	2	69.1	82.6	90	92	163	87.0	90	96	167
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	19.8	6.7	9.6	None	-	-	-	158.0	200	164	485	167.6	225	175	495
										2EH04502525	18.8	1	52.1	158.0	200	164	485	167.6	225	175	495
										2EH04505025	37.6	2	104.3	171.9	200	164	485	183.9	225	175	495
										2EH04507525	56.3	2	156.2	197.7	200	218	485	209.7	225	229	495
	230-3-60	62.0	68.3	28.5	255	4.7	19.8	6.7	8.7	None	-	-	-	158.0	200	164	485	166.7	225	174	494
										2EH04502525	23.0	1	57.7	158.0	200	164	485	166.7	225	174	494
										2EH04505025	45.9	2	115.2	185.5	200	171	485	196.4	225	181	494
										2EH04507525	68.9	2	172.9	214.4	225	237	485	225.3	250	247	494
	460-3-60	30.0	35.7	13.5	123	2.3	9.9	3.4	4.3	None	-	-	-	76.9	100	80	239	81.2	110	85	244
										2EH04502546	23.0	1	28.8	76.9	100	80	239	81.2	110	85	244
										2EH04505046	45.9	2	57.6	92.9	100	85	239	98.3	110	90	244
										2EH04507546	68.9	2	86.4	107.3	110	119	239	112.7	125	124	244
	575-3-60	25.0	32.4	10.7	93.7	1.9	7.9	2.7	3.5	None	-	-	-	62.9	80	65	188	66.4	90	69	191
										2EH04502558	23.0	1	23.0	62.9	80	65	188	66.4	90	69	191
										2EH04505058	45.9	2	46.0	74.1	80	68	188	78.5	90	72	191
										2EH04507558	68.9	2	69.1	85.7	90	95	188	90.1	100	99	191

Customer supplied high static

Table 26: KE13 to KE23 VFD customer supplied high static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	13.5	9.6	None	-	-	-	83.6	110	88	307	93.2	110	99	317
									2EH04522525	18.8	1	52.1	83.6	110	88	307	94.0	110	99	317
									2EH04525025	37.6	2	104.3	147.3	150	135	307	159.3	175	147	317
	230-3-60	30.0	53.1	23.2	142	4.7	13.4	8.7	None	-	-	-	83.5	110	87	307	92.2	110	97	315
									2EH04522525	23.0	1	57.7	88.9	110	87	307	99.8	110	97	315
									2EH04525025	45.9	2	115.2	160.8	175	148	307	171.6	175	158	315
	460-3-60	15.0	27.6	9.5	73.1	2.3	6.7	4.3	None	-	-	-	39.6	50	41	156	43.9	50	46	161
									2EH04522546	23.0	1	28.8	44.4	50	41	156	49.8	50	46	161
									2EH04525046	45.9	2	57.6	80.4	90	74	156	85.8	90	79	161
	575-3-60	13.0	21.6	7.8	55	1.9	5.4	3.5	None	-	-	-	33.3	45	35	120	36.8	45	39	124
									2EH04522558	23.0	1	23.0	35.5	45	35	120	39.9	45	39	124
									2EH04525058	45.9	2	46.0	64.3	70	59	120	68.6	70	63	124
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	13.5	9.6	None	-	-	-	90.5	110	95	344	100.1	125	106	353
									2EH04502525	18.8	1	52.1	90.5	110	95	344	100.1	125	106	353
									2EH04505025	37.6	2	104.3	147.3	150	135	344	159.3	175	147	353
									2EH04507525	56.3	2	156.2	173.1	200	195	344	185.1	200	206	353
	230-3-60	33.0	53.1	26.3	178.5	4.7	13.4	8.7	None	-	-	-	90.4	110	94	343	99.1	125	104	352
									2EH04502525	23.0	1	57.7	90.4	110	94	343	99.8	125	104	352
									2EH04505025	45.9	2	115.2	160.8	175	148	343	171.6	175	158	352
									2EH04507525	68.9	2	172.9	189.7	225	214	343	200.5	225	224	352
	460-3-60	16.0	27.6	11.0	95.3	2.3	6.7	4.3	None	-	-	-	42.3	50	44	179	46.6	60	49	183
									2EH04502546	23.0	1	28.8	44.4	50	44	179	49.8	60	49	183
									2EH04505046	45.9	2	57.6	80.4	90	74	179	85.8	90	79	183
									2EH04507546	68.9	2	86.4	94.8	110	107	179	100.2	110	112	183
	575-3-60	13.0	21.6	9.2	65	1.9	5.4	3.5	None	-	-	-	34.7	45	36	130	38.2	50	40	134
									2EH04502558	23.0	1	23.0	35.5	45	36	130	39.9	50	40	134
									2EH04505058	45.9	2	46.0	64.3	70	59	130	68.6	70	63	134
									2EH04507558	68.9	2	69.1	75.9	90	86	130	80.2	90	90	134
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	19.8	9.6	None	-	-	-	112.6	125	119	380	122.2	150	130	390
									2EH04502525	18.8	1	52.1	112.6	125	119	380	122.2	150	130	390
									2EH04505025	37.6	2	104.3	155.1	175	143	380	167.1	175	154	390
									2EH04507525	56.3	2	156.2	181.0	200	202	380	193.0	200	213	390
	230-3-60	37.0	53.1	27.7	178.5	4.7	19.8	8.7	None	-	-	-	112.6	125	119	380	121.3	150	129	389
									2EH04502525	23.0	1	57.7	112.6	125	119	380	121.3	150	129	389
									2EH04505025	45.9	2	115.2	168.8	175	155	380	179.6	200	165	389
									2EH04507525	68.9	2	172.9	197.7	225	222	380	208.5	225	232	389
	460-3-60	18.0	27.6	11.5	103	2.3	9.9	4.3	None	-	-	-	53.1	70	56	205	57.4	70	61	209
									2EH04502546	23.0	1	28.8	53.1	70	56	205	57.4	70	61	209
									2EH04505046	45.9	2	57.6	84.4	90	78	205	89.8	90	83	209
									2EH04507546	68.9	2	86.4	98.8	110	111	205	104.2	110	116	209
	575-3-60	15.0	21.6	9.0	78	1.9	7.9	3.5	None	-	-	-	43.3	50	45	156	46.8	60	49	160
									2EH04502558	23.0	1	23.0	43.3	50	45	156	46.8	60	49	160
									2EH04505058	45.9	2	46.0	67.4	70	62	156	71.8	80	66	160
									2EH04507558	68.9	2	69.1	79.0	90	89	156	83.4	90	93	160

Table 26: KE13 to KE23 VFD customer supplied high static without power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA				Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	19.8	9.6	None	-	-	-	131.1	175	136	424	140.7	175	147	434
									2EH04502525	18.8	1	52.1	131.1	175	136	424	140.7	175	147	434
									2EH04505025	37.6	2	104.3	155.1	175	143	424	167.1	175	154	434
									2EH04507525	56.3	2	156.2	181.0	200	202	424	193.0	200	213	434
	230-3-60	51.0	68.3	28.7	207.5	4.7	19.8	8.7	None	-	-	-	131.1	175	136	424	139.8	175	146	433
									2EH04502525	23.0	1	57.7	131.1	175	136	424	139.8	175	146	433
									2EH04505025	45.9	2	115.2	168.8	175	155	424	179.6	200	165	433
									2EH04507525	68.9	2	172.9	197.7	225	222	424	208.5	225	232	433
	460-3-60	25.0	35.7	12.4	100.2	2.3	9.9	4.3	None	-	-	-	62.8	80	65	210	67.1	90	70	214
									2EH04502546	23.0	1	28.8	62.8	80	65	210	67.1	90	70	214
									2EH04505046	45.9	2	57.6	84.4	90	78	210	89.8	90	83	214
									2EH04507546	68.9	2	86.4	98.8	110	111	210	104.2	110	116	214
	575-3-60	20.0	32.4	9.0	78	1.9	7.9	3.5	None	-	-	-	49.5	60	51	167	53.0	70	55	170
									2EH04502558	23.0	1	23.0	49.5	60	51	167	53.0	70	55	170
									2EH04505058	45.9	2	46.0	67.4	70	62	167	71.8	80	66	170
									2EH04507558	68.9	2	69.1	79.0	90	89	167	83.4	90	93	170
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	25.4	9.6	None	-	-	-	150.2	200	155	522	159.8	200	166	532
									2EH04502525	18.8	1	52.1	150.2	200	155	522	159.8	200	166	532
									2EH04505025	37.6	2	104.3	162.1	200	155	522	174.1	200	166	532
									2EH04507525	56.3	2	156.2	188.0	200	209	522	200.0	200	220	532
	230-3-60	62.0	68.3	28.5	255	4.7	25.4	8.7	None	-	-	-	150.2	200	155	522	158.9	200	165	531
									2EH04502525	23.0	1	57.7	150.2	200	155	522	158.9	200	165	531
									2EH04505025	45.9	2	115.2	175.8	200	162	522	186.6	200	172	531
									2EH04507525	68.9	2	172.9	204.7	225	228	522	215.5	225	238	531
	460-3-60	30.0	35.7	13.5	123	2.3	12.7	4.3	None	-	-	-	72.9	100	75	258	77.2	100	80	262
									2EH04502546	23.0	1	28.8	72.9	100	75	258	77.2	100	80	262
									2EH04505046	45.9	2	57.6	87.9	100	81	258	93.3	100	86	262
									2EH04507546	68.9	2	86.4	102.3	110	114	258	107.7	110	119	262
	575-3-60	25.0	32.4	10.7	93.7	1.9	10.5	3.5	None	-	-	-	60.1	80	62	205	63.6	80	66	209
									2EH04502558	23.0	1	23.0	60.1	80	62	205	63.6	80	66	209
									2EH04505058	45.9	2	46.0	70.6	80	65	205	75.0	80	69	209
									2EH04507558	68.9	2	69.1	82.2	90	92	205	86.6	90	96	209

Table 27: KE13 to KE23 VFD customer supplied high static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	13.5	5.0	9.6	None	-	-	-	93.6	110	99	328	103.2	125	110	338
										2EH04522525	18.8	1	52.1	94.5	110	99	328	106.5	125	110	338
										2EH04525025	37.6	2	104.3	159.8	175	147	328	171.8	175	158	338
	230-3-60	30.0	53.1	23.2	142	4.7	13.4	5.0	8.7	None	-	-	-	93.5	110	99	328	102.2	125	109	336
										2EH04522525	23.0	1	57.7	101.4	110	99	328	112.3	125	109	336
										2EH04525025	45.9	2	115.2	173.3	175	159	328	184.1	200	169	336
	460-3-60	15.0	27.6	9.5	73.1	2.3	6.7	2.2	4.3	None	-	-	-	44.0	50	46	166	48.3	60	51	170
										2EH04522546	23.0	1	28.8	49.9	50	46	166	55.3	60	51	170
										2EH04525046	45.9	2	57.6	85.9	90	79	166	91.3	100	84	170
	575-3-60	13.0	21.6	7.8	55	1.9	5.4	1.5	3.5	None	-	-	-	36.3	45	38	127	39.8	50	42	130
										2EH04522558	23.0	1	23.0	39.3	45	38	127	43.6	50	42	130
										2EH04525058	45.9	2	46.0	68.0	70	63	127	72.4	80	67	130
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	13.5	5.0	9.6	None	-	-	-	100.5	125	106	365	110.1	125	117	374
										2EH04502525	18.8	1	52.1	100.5	125	106	365	110.1	125	117	374
										2EH04505025	37.6	2	104.3	159.8	175	147	365	171.8	175	158	374
										2EH04507525	56.3	2	156.2	185.6	200	207	365	197.6	200	218	374
	230-3-60	33.0	53.1	26.3	178.5	4.7	13.4	5.0	8.7	None	-	-	-	100.4	125	106	364	109.1	125	116	373
										2EH04502525	23.0	1	57.7	101.4	125	106	364	112.3	125	116	373
										2EH04505025	45.9	2	115.2	173.3	175	159	364	184.1	200	169	373
										2EH04507525	68.9	2	172.9	202.2	225	226	364	213.0	225	236	373
	460-3-60	16.0	27.6	11.0	95.3	2.3	6.7	2.2	4.3	None	-	-	-	46.7	60	49	188	51.0	60	54	192
										2EH04502546	23.0	1	28.8	49.9	60	49	188	55.3	60	54	192
										2EH04505046	45.9	2	57.6	85.9	90	79	188	91.3	100	84	192
										2EH04507546	68.9	2	86.4	100.3	110	112	188	105.7	110	117	192
	575-3-60	13.0	21.6	9.2	65	1.9	5.4	1.5	3.5	None	-	-	-	37.7	50	40	137	41.2	50	44	140
										2EH04502558	23.0	1	23.0	39.3	50	40	137	43.6	50	44	140
										2EH04505058	45.9	2	46.0	68.0	70	63	137	72.4	80	67	140
										2EH04507558	68.9	2	69.1	79.6	90	89	137	84.0	90	93	140
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	19.8	5.0	9.6	None	-	-	-	122.6	150	130	401	132.2	150	141	411
										2EH04502525	18.8	1	52.1	122.6	150	130	401	132.2	150	141	411
										2EH04505025	37.6	2	104.3	167.6	175	154	401	179.6	200	165	411
										2EH04507525	56.3	2	156.2	193.5	200	214	401	205.5	225	225	411
	230-3-60	37.0	53.1	27.7	178.5	4.7	19.8	5.0	8.7	None	-	-	-	122.6	150	130	401	131.3	150	140	410
										2EH04502525	23.0	1	57.7	122.6	150	130	401	131.3	150	140	410
										2EH04505025	45.9	2	115.2	181.3	200	167	401	192.1	200	177	410
										2EH04507525	68.9	2	172.9	210.2	225	233	401	221.0	225	243	410
	460-3-60	18.0	27.6	11.5	103	2.3	9.9	2.2	4.3	None	-	-	-	57.5	70	61	214	61.8	70	66	218
										2EH04502546	23.0	1	28.8	57.5	70	61	214	61.8	70	66	218
										2EH04505046	45.9	2	57.6	89.9	90	83	214	95.3	100	88	218
										2EH04507546	68.9	2	86.4	104.3	110	116	214	109.7	110	121	218
	575-3-60	15.0	21.6	9.0	78	1.9	7.9	1.5	3.5	None	-	-	-	46.3	60	49	162	49.8	60	53	166
										2EH04502558	23.0	1	23.0	46.3	60	49	162	49.8	60	53	166
										2EH04505058	45.9	2	46.0	71.1	80	65	162	75.5	80	69	166
										2EH04507558	68.9	2	69.1	82.7	90	92	162	87.1	90	96	166

Table 27: KE13 to KE23 VFD customer supplied high static with on/off power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	19.8	5.0	9.6	None	-	-	-	141.1	175	148	445	150.7	200	159	455
										2EH04502525	18.8	1	52.1	141.1	175	148	445	150.7	200	159	455
										2EH04505025	37.6	2	104.3	167.6	175	154	445	179.6	200	165	455
										2EH04507525	56.3	2	156.2	193.5	200	214	445	205.5	225	225	455
	230-3-60	51.0	68.3	28.7	207.5	4.7	19.8	5.0	8.7	None	-	-	-	141.1	175	148	445	149.8	200	158	454
										2EH04502525	23.0	1	57.7	141.1	175	148	445	149.8	200	158	454
										2EH04505025	45.9	2	115.2	181.3	200	167	445	192.1	200	177	454
										2EH04507525	68.9	2	172.9	210.2	225	233	445	221.0	225	243	454
	460-3-60	25.0	35.7	12.4	100.2	2.3	9.9	2.2	4.3	None	-	-	-	67.2	90	70	219	71.5	90	75	223
										2EH04502546	23.0	1	28.8	67.2	90	70	219	71.5	90	75	223
										2EH04505046	45.9	2	57.6	89.9	90	83	219	95.3	100	88	223
										2EH04507546	68.9	2	86.4	104.3	110	116	219	109.7	110	121	223
	575-3-60	20.0	32.4	9.0	78	1.9	7.9	1.5	3.5	None	-	-	-	52.5	70	55	173	56.0	70	59	177
										2EH04502558	23.0	1	23.0	52.5	70	55	173	56.0	70	59	177
										2EH04505058	45.9	2	46.0	71.1	80	65	173	75.5	80	69	177
										2EH04507558	68.9	2	69.1	82.7	90	92	173	87.1	90	96	177
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	25.4	5.0	9.6	None	-	-	-	160.2	200	166	543	169.8	225	177	553
										2EH04502525	18.8	1	52.1	160.2	200	166	543	169.8	225	177	553
										2EH04505025	37.6	2	104.3	174.6	200	166	543	186.6	225	177	553
										2EH04507525	56.3	2	156.2	200.5	225	220	543	212.5	225	231	553
	230-3-60	62.0	68.3	28.5	255	4.7	25.4	5.0	8.7	None	-	-	-	160.2	200	166	543	168.9	225	176	552
										2EH04502525	23.0	1	57.7	160.2	200	166	543	168.9	225	176	552
										2EH04505025	45.9	2	115.2	188.3	200	173	543	199.1	225	183	552
										2EH04507525	68.9	2	172.9	217.2	225	240	543	228.0	250	250	552
	460-3-60	30.0	35.7	13.5	123	2.3	12.7	2.2	4.3	None	-	-	-	77.3	100	80	267	81.6	110	85	271
										2EH04502546	23.0	1	28.8	77.3	100	80	267	81.6	110	85	271
										2EH04505046	45.9	2	57.6	93.4	100	86	267	98.8	110	91	271
										2EH04507546	68.9	2	86.4	107.8	110	119	267	113.2	125	124	271
	575-3-60	25.0	32.4	10.7	93.7	1.9	10.5	1.5	3.5	None	-	-	-	63.1	80	65	212	66.6	90	69	215
										2EH04502558	23.0	1	23.0	63.1	80	65	212	66.6	90	69	215
										2EH04505058	45.9	2	46.0	74.4	80	68	212	78.8	90	72	215
										2EH04507558	68.9	2	69.1	86.0	90	95	212	90.4	100	99	215

Table 28: KE13 to KE23 VFD customer supplied high static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
13 (12.5)	208-3-60	30.0	53.1	23.2	142	4.7	13.5	6.7	9.6	None	-	-	-	97.0	125	103	321	106.6	125	114	330
										2EH04522525	18.8	1	52.1	98.8	125	103	321	110.8	125	114	330
										2EH04525025	37.6	2	104.3	164.0	175	151	321	176.0	200	162	330
	230-3-60	30.0	53.1	23.2	142	4.7	13.4	6.7	8.7	None	-	-	-	96.9	125	103	320	105.6	125	113	329
										2EH04522525	23.0	1	57.7	105.6	125	103	320	116.5	125	113	329
										2EH04525025	45.9	2	115.2	177.5	200	163	320	188.4	200	173	329
	460-3-60	15.0	27.6	9.5	73.1	2.3	6.7	3.4	4.3	None	-	-	-	46.4	60	49	163	50.7	60	54	167
										2EH04522546	23.0	1	28.8	52.9	60	49	163	58.3	60	54	167
										2EH04525046	45.9	2	57.6	88.9	90	82	163	94.3	100	87	167
	575-3-60	13.0	21.6	7.8	55	1.9	5.4	2.7	3.5	None	-	-	-	38.7	50	41	126	42.2	50	45	129
										2EH04522558	23.0	1	23.0	42.3	50	41	126	46.6	50	45	129
										2EH04525058	45.9	2	46.0	71.0	80	65	126	75.4	80	69	129
15 (15)	208-3-60	33.0	53.1	26.3	178.5	4.7	13.5	6.7	9.6	None	-	-	-	103.9	125	110	357	113.5	125	121	367
										2EH04502525	18.8	1	52.1	103.9	125	110	357	113.5	125	121	367
										2EH04505025	37.6	2	104.3	164.0	175	151	357	176.0	200	162	367
										2EH04507525	56.3	2	156.2	189.8	200	211	357	201.8	225	222	367
	230-3-60	33.0	53.1	26.3	178.5	4.7	13.4	6.7	8.7	None	-	-	-	103.8	125	110	356	112.5	125	120	365
										2EH04502525	23.0	1	57.7	105.6	125	110	356	116.5	125	120	365
										2EH04505025	45.9	2	115.2	177.5	200	163	356	188.4	200	173	365
										2EH04507525	68.9	2	172.9	206.4	225	230	356	217.3	225	240	365
	460-3-60	16.0	27.6	11.0	95.3	2.3	6.7	3.4	4.3	None	-	-	-	49.1	60	52	185	53.4	60	57	190
										2EH04502546	23.0	1	28.8	52.9	60	52	185	58.3	60	57	190
										2EH04505046	45.9	2	57.6	88.9	90	82	185	94.3	100	87	190
										2EH04507546	68.9	2	86.4	103.3	110	115	185	108.7	110	120	190
	575-3-60	13.0	21.6	9.2	65	1.9	5.4	2.7	3.5	None	-	-	-	40.1	50	42	136	43.6	50	46	139
										2EH04502558	23.0	1	23.0	42.3	50	42	136	46.6	50	46	139
										2EH04505058	45.9	2	46.0	71.0	80	65	136	75.4	80	69	139
										2EH04507558	68.9	2	69.1	82.6	90	92	136	87.0	90	96	139
18 (17.5)	208-3-60	37.0	53.1	27.7	178.5	4.7	19.8	6.7	9.6	None	-	-	-	126.0	150	134	393	135.6	150	145	403
										2EH04502525	18.8	1	52.1	126.0	150	134	393	135.6	150	145	403
										2EH04505025	37.6	2	104.3	171.9	175	158	393	183.9	200	169	403
										2EH04507525	56.3	2	156.2	197.7	200	218	393	209.7	225	229	403
	230-3-60	37.0	53.1	27.7	178.5	4.7	19.8	6.7	8.7	None	-	-	-	126.0	150	134	393	134.7	150	144	402
										2EH04502525	23.0	1	57.7	126.0	150	134	393	134.7	150	144	402
										2EH04505025	45.9	2	115.2	185.5	200	171	393	196.4	200	181	402
										2EH04507525	68.9	2	172.9	214.4	225	237	393	225.3	250	247	402
	460-3-60	18.0	27.6	11.5	103	2.3	9.9	3.4	4.3	None	-	-	-	59.9	70	64	211	64.2	80	69	216
										2EH04502546	23.0	1	28.8	59.9	70	64	211	64.2	80	69	216
										2EH04505046	45.9	2	57.6	92.9	100	85	211	98.3	100	90	216
										2EH04507546	68.9	2	86.4	107.3	110	119	211	112.7	125	124	216
	575-3-60	15.0	21.6	9.0	78	1.9	7.9	2.7	3.5	None	-	-	-	48.7	60	52	161	52.2	60	56	165
										2EH04502558	23.0	1	23.0	48.7	60	52	161	52.2	60	56	165
										2EH04505058	45.9	2	46.0	74.1	80	68	161	78.5	80	72	165
										2EH04507558	68.9	2	69.1	85.7	90	95	161	90.1	100	99	165

Table 28: KE13 to KE23 VFD customer supplied high static with modulating power exhaust

Size (ton)	Nominal unit voltage	Comp. 1		Comp. 2		OD fan motors each FLA	Supply blower motor FLA	Pwr exh motor FLA	120 V trans FLA	Electric heat option field installed kit				MCA A	Max f/b size A	Min disconnect rating		MCA with 120 V trans A	Max f/b size with 120 V trans A	Min disconnect rating/120 V trans	
		RLA	LRA	RLA	LRA					Model	kW	Stages	A			FLA	LRA			FLA	LRA
20 (20)	208-3-60	51.0	68.3	28.7	207.5	4.7	19.8	6.7	9.6	None	-	-	-	144.5	175	151	438	154.1	200	162	447
										2EH04502525	18.8	1	52.1	144.5	175	151	438	154.1	200	162	447
										2EH04505025	37.6	2	104.3	171.9	175	158	438	183.9	200	169	447
										2EH04507525	56.3	2	156.2	197.7	200	218	438	209.7	225	229	447
	230-3-60	51.0	68.3	28.7	207.5	4.7	19.8	6.7	8.7	None	-	-	-	144.5	175	151	438	153.2	200	161	446
										2EH04502525	23.0	1	57.7	144.5	175	151	438	153.2	200	161	446
										2EH04505025	45.9	2	115.2	185.5	200	171	438	196.4	200	181	446
										2EH04507525	68.9	2	172.9	214.4	225	237	438	225.3	250	247	446
	460-3-60	25.0	35.7	12.4	100.2	2.3	9.9	3.4	4.3	None	-	-	-	69.6	90	73	217	73.9	90	78	221
										2EH04502546	23.0	1	28.8	69.6	90	73	217	73.9	90	78	221
										2EH04505046	45.9	2	57.6	92.9	100	85	217	98.3	100	90	221
										2EH04507546	68.9	2	86.4	107.3	110	119	217	112.7	125	124	221
	575-3-60	20.0	32.4	9.0	78	1.9	7.9	2.7	3.5	None	-	-	-	54.9	70	57	172	58.4	70	61	176
										2EH04502558	23.0	1	23.0	54.9	70	57	172	58.4	70	61	176
										2EH04505058	45.9	2	46.0	74.1	80	68	172	78.5	80	72	176
										2EH04507558	68.9	2	69.1	85.7	90	95	172	90.1	100	99	176
23 (23)	208-3-60	62.0	68.3	28.5	255	4.7	25.4	6.7	9.6	None	-	-	-	163.6	225	170	536	173.2	225	181	545
										2EH04502525	18.8	1	52.1	163.6	225	170	536	173.2	225	181	545
										2EH04505025	37.6	2	104.3	178.9	225	170	536	190.9	225	181	545
										2EH04507525	56.3	2	156.2	204.7	225	224	536	216.7	225	235	545
	230-3-60	62.0	68.3	28.5	255	4.7	25.4	6.7	8.7	None	-	-	-	163.6	225	170	536	172.3	225	180	544
										2EH04502525	23.0	1	57.7	163.6	225	170	536	172.3	225	180	544
										2EH04505025	45.9	2	115.2	192.5	225	177	536	203.4	225	187	544
										2EH04507525	68.9	2	172.9	221.4	225	243	536	232.3	250	253	544
	460-3-60	30.0	35.7	13.5	123	2.3	12.7	3.4	4.3	None	-	-	-	79.7	100	83	265	84.0	110	88	269
										2EH04502546	23.0	1	28.8	79.7	100	83	265	84.0	110	88	269
										2EH04505046	45.9	2	57.6	96.4	100	89	265	101.8	110	94	269
										2EH04507546	68.9	2	86.4	110.8	125	122	265	116.2	125	127	269
	575-3-60	25.0	32.4	10.7	93.7	1.9	10.5	2.7	3.5	None	-	-	-	65.5	90	68	211	69.0	90	72	214
										2EH04502558	23.0	1	23.0	65.5	90	68	211	69.0	90	72	214
										2EH04505058	45.9	2	46.0	77.4	90	71	211	81.8	90	75	214
										2EH04507558	68.9	2	69.1	89.0	90	98	211	93.4	100	102	214

Physical data

Table 29: KE13 and KE15 physical data

Component	Models					
	KE13			KE15		
Nominal tonnage	**12.5**			**15**		
ARI cooling performance	Variable cooling control			Variable cooling control		
Gross Capacity @ ARI A point (Btu)	152,000			184,000		
ARI net capacity (Btu)	148,000			178,000		
EER	12.7[1] / 12.5[2]			12.2[1] / 12[2]		
IEER with Intellispeed	20.1[1] / 20[2]			20.3[1] / 20.1[2]		
IEER with VAV	20.1[1] / 20[2]			20.3[1] / 20.1[2]		
cfm	4,900			6,500		
System power (kW)	11.8			14.8		
Refrigerant type	R-454B			R-454B		
Refrigerant charge (lb-oz)						
System 1	10-08			11-02		
System 2	12-00			12-04		
ARI heating performance						
Heating model	N(S)1	N(S)3	T3	N(S)1	N(S)3	T3
Heating type	Stg. low	Stg. high	Mod. high	Stg. low	Stg. high	Mod. high
First stage heat input (kBtu)	165	300	140	165	300	140
Second stage heat input (kBtu)	220	400	400	220	400	400
First stage heat output (kBtu)	134	243	113	134	243	113
Second stage heat output (kBtu)	178	324	324	178	324	324
Steady state efficiency (%)	81	81	81	81	81	81
No. burners	5	9	9	5	9	9
No. stages / turn down	2	2	2.85 to 1	2	2	2.85 to 1
Temperature rise range (°F)	15-45	40-70	40-70	15-45	30-65	30-65
Gas piping connection (in.)	3/4	3/4	3/4	3/4	3/4	3/4
Dimensions (in.)						
Length (in.)	143 13/16					
Width (in.)	88 3/4					
Height (in.)	56 9/16					
Operating weight (lb)	2,190			2,240		
Compressors	Variable cooling control			Variable cooling control		
Type	Scroll			Scroll		
Quantity	2			2		
Unit capacity steps (%)	15-100			15-100		
Condenser coil data						
Face area (sq. ft.)	30.8			30.8		
Type	MCHX			MCHX		
Thickness (mm)	25			25		
FPI	23			23		
Circuitry type	Two-pass			Two-pass		
Evaporator coil data						
Face area (sq. ft.)	26.0			26.0		
Rows	4			4		
Fins per in.	15			15		
Tube diameter	3/8			3/8		
Circuitry type	Intertwined			Intertwined		
Refrigerant control	TXV			TXV		
Condenser fan data						
Quantity	2			2		
Fan diameter (in.)	30			30		
Type	Prop			Prop		

Table 29: KE13 and KE15 physical data

Component	Models					
	KE13			KE15		
Nominal tonnage	**12.5**			**15**		
Drive type	Direct			Direct		
Number of motors	2			2		
Motor hp each	1/2			1/2		
rpm	900			900		
Nominal total cfm	11,850			11,850		
Belt drive evaporator fan data						
Quantity	2			2		
Fan size (in.)	12 x 12			15 x 15		
Type	Centrifugal			Centrifugal		
Static range	Standard	Medium	High	Standard	Medium	High
Motor sheave	1VP40	1VP40	1VP60	1VP40	1VP40	1VM50
Blower sheave	1B5V66	1B5V54	1B5V74	1B5V74	1B5V64	1B5V74
Belt	AX36	BX34	BX40	BX40	BX38	BX40
Motor hp each	2.9	3.7	5.25	2.9	3.7	5.25
rpm	1,750	1,750	1,750	1,750	1,750	1,750
Frame size	56	56	145T	56	56	145T
Filters						
Quantity - size	9 - (16 x 25 x 2)[3,4,5]			9 - (16 x 25 x 2)[3,4,5]		
	9 - (16 x 25 x 4)[6]			9 - (16 x 25 x 4)[6]		

Note:

1. Cooling only unit or cooling unit with electric heat.
2. Cooling unit with gas heat.
3. 2 in. throwaway, standard, MERV (Minimum Efficiency Reporting Value).
4. 2 in. pleated, optional, MERV 8.
5. 2 in. pleated, optional, MERV 13.
6. 4 in. pleated, optional, MERV 13.

Table 30: KE18to KE23 physical data

Component	Models								
	KE18			KE20			KE23		
Nominal tonnage	**17.5**			**20**			**23**		
ARI cooling performance	Variable cooling control			Variable cooling control			Variable cooling control		
Gross Capacity @ ARI A point (Btu)	208,000			246,000			288,000		
ARI net capacity (Btu)	200,000			238,000			276,000		
EER	12.3[1] / 12.2[2]			12.2[1] / 12.1[2]			11.3[1] / 11.1[2]		
IEER with Intellispeed	19[1] / 18.8[2]			19.6[1] / 19.5[2]			18.8[1] / 18.6[2]		
IEER with VAV	19[1] / 18.8[2]			19.6[1] / 19.5[2]			18.8[1] / 18.6[2]		
cfm	6,840			7,070			8,570		
System power (kW)	16.39			19.67			24.86		
Refrigerant type	R-454B			R-454B			R-454B		
Refrigerant charge (lb-oz)									
System 1	13-02			12-02			12-08		
System 2	13-10			12-08			13-14		
ARI heating performance									
Heating model	N(S)1	N(S)3	T3	N(S)1	N(S)3	T3	N(S)1	N(S)3	T3
Heating type	Stg. low	Stg. high	Mod. high	Stg. low	Stg. high	Mod. high	Stg. low	Stg. high	Mod. high
First stage heat input (kBtu)	165	300	140	165	300	140	165	300	140
Second stage heat input (kBtu)	220	400	400	220	400	400	220	400	400
First stage heat output (kBtu)	134	243	113	134	243	113	134	243	113
Second stage heat output (kBtu)	178	324	324	178	324	324	178	324	324
Steady state efficiency (%)	81	81	81	81	81	81	81	81	81
No. burners	5	9	9	5	9	9	5	9	9
No. stages / turn down	2	2	2.85 to 1	2	2	2.85 to 1	2	2	2.85 to 1
Temperature rise range (°F)	15-45	30-65	30-65	15-45	30-65	30-65	10-40	20-55	20-55
Gas piping connection (in.)	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Dimensions (in.)									
Length (in.)	160 1/16								
Width (in.)	88 3/4								
Height (in.)	56 9/16								
Operating weight (lb)	2,355			2,420			2,510		
Compressors	Variable cooling control			Variable cooling control			Variable cooling control		
Type	Scroll			Scroll			Scroll		
Quantity	2			2			2		
Unit capacity steps (%)	15-100			15-100			15-100		
Condenser coil data									
Face area (sq. ft.)	35.4			35.4			35.4		
Type	MCHX			MCHX			MCHX		
Thickness (mm)	25			25			25		
FPI	23			23			23		
Circuitry type	Two-pass			Two-pass			Two-pass		
Evaporator coil data									
Face area (sq. ft.)	26.0			26.0			26.0		
Rows	4			4			4		
Fins per in.	15			15			15		
Tube diameter	3/8			3/8			3/8		
Circuitry type	Intertwined			Intertwined			Intertwined		
Refrigerant control	TXV			TXV			TXV		
Condenser fan data									
Quantity	4			4			4		
Fan diameter (in.)	30			30			30		
Type	Prop			Prop			Prop		
Drive type	Direct			Direct			Direct		
Number of motors	4			4			4		

Table 30: KE18to KE23 physical data

Component	Models								
	KE18			KE20			KE23		
Nominal tonnage	**17.5**			**20**			**23**		
Motor hp each	1/2			1/2			1/2		
rpm	900			900			900		
Nominal total cfm	26,200			26,200			26,200		
Belt drive evaporator fan data									
Quantity	2			2			2		
Fan size (in.)	15 x 15			15 x 15			15 x 15		
Type	Centrifugal			Centrifugal			Centrifugal		
Static range	Standard	Medium	High	Standard	Medium	High	Standard	Medium	High
Motor sheave	1VL44	1VM50	1VP71	1VM50	1VM50	1VP71	1VM50	1VP60	1VP60
Blower sheave	1B5V86	1B5V74	1B5V94	1B5V90	1B5V74	1B5V94	1B5V80	1B5V80	1B5V74
Belt	AX41	BX40	BX47	BX43	BX40	BX47	BX43	BX43	5VX450
Motor hp each	3.7	5.3	7.50	5.3	5.3	7.50	5.3	7.5	10.00
rpm	1750	1750	1760	1750	1750	1760	1750	1760	1765
Frame size	56	145T	213T	145T	145T	213T	145T	213T	215T
Filters									
Quantity - size	9 - (16 x 25 x 2)[3,4,5]			9 - (16 x 25 x 2)[3,4,5]			9 - (16 x 25 x 2)[3,4,5]		
	9 - (16 x 25 x 4)[6]			9 - (16 x 25 x 4)[6]			9 - (16 x 25 x 4)[6]		

Note:

1. Cooling only unit or cooling unit with electric heat.
2. Cooling unit with gas heat.
3. 2 in. throwaway, standard, MERV (Minimum Efficiency Reporting Value).
4. 2 in. pleated, optional, MERV 8.
5. 2 in. pleated, optional, MERV 13.
6. 4 in. pleated, optional, MERV 13.

Optional electric heat

The factory-installed heaters are wired for single point power supply. You only need to bring the power supply into the single point terminal block.

These CSA approved heaters are located within the central compartment of the unit with the heater elements extending in to the supply air chamber.

Fuses are supplied, where required, by the factory. See Table 31 for minimum CFM limitations. See the electrical data tables for electrical data.

Table 31: Minimum airflow requirements

Minimum airflow requirements (up to 2 in. external static)			
Unit ton	Heater kW		
	75	50	25
(12.5)	NA	3750	3750
(15)	6000	4500	4500
(17.5)	6000	5250	5250
(20)	6000	6000	6000
(23)	6900	6900	6900

Optional gas heat

The optional gas-fired heaters have aluminized-steel or optional stainless steel, tubular heat exchangers with spark ignition with proven pilot.

This unit is shipped from the factory for use with natural gas at elevations up to 2000 ft (610 m) above sea level. The unit may be field-converted for use with propane gas and/or elevations above 2000 ft with a listed conversion kit.

Note: Modulating furnaces, gas model T3, are not certified for use with propane and cannot be converted.

Note: Installation of this furnace at altitudes above 2000 ft (610 m) shall be in accordance with local codes, or in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or National Standard of Canada, Natural Gas and Propane Installation Code, CSA B149.1.

Table 32: Gas application data

Unit		Input (MBH)	Output (MBH)	Temp. rise (°F) [1]
Size (tons)	Heat size			
KE13 (12.5)	(N,S)1	220	178	15-45
	(N,S)3	400	324	40-70
	T3	400	324	40-70
KE15 (15)	(N,S)1	220	178	15-45
	(N,S)3	400	324	30-65
	T3	400	324	30-65
KE18 (17.5)	(N,S)1	220	178	15-45
	(N,S)3	400	324	30-65
	T3	400	324	30-65
KE20 (20)	(N,S)1	220	178	15-45
	(N,S)3	400	324	30-65
	T3	400	324	30-65

Table 32: Gas application data

Unit		Input (MBH)	Output (MBH)	Temp. rise (°F) [1]
Size (tons)	Heat size			
KE23 (23)	(N,S)1	220	178	10-40
	(N,S)3	400	324	20-55
	T3	400	324	20-55

1 On VAV units with a non-modulating furnace, individual VAV boxes must be full open in heating mode to ensure airflow falls within the temperature rise range.

Table 33: Gas heat allowable air flow

Unit		Supply air (CFM)	
Size (tons)	Heat size	Min	Max
KE13 (12.5)	(N,S)1	3660	6250
	(N,S)3	4280	6250
	T3	3530	6250
KE15 (15)	(N,S)1	3660	7500
	(N,S)3	4620	7500
	T3	3500	7500
KE18 (17.5)	(N,S)1	3660	8750
	(N,S)3	4620	8750
	T3	3500	8750
KE20 (20)	(N,S)1	3660	10000
	(N,S)3	4620	10000
	T3	3500	10000
KE23 (23)	(N,S)1	4120	11500
	(N,S)3	5450	11500
	T3	5000	11500

Gas piping

Proper sizing of gas piping depends on the cubic feet per hour of gas flow required, specific gravity of the gas, and the length of run.

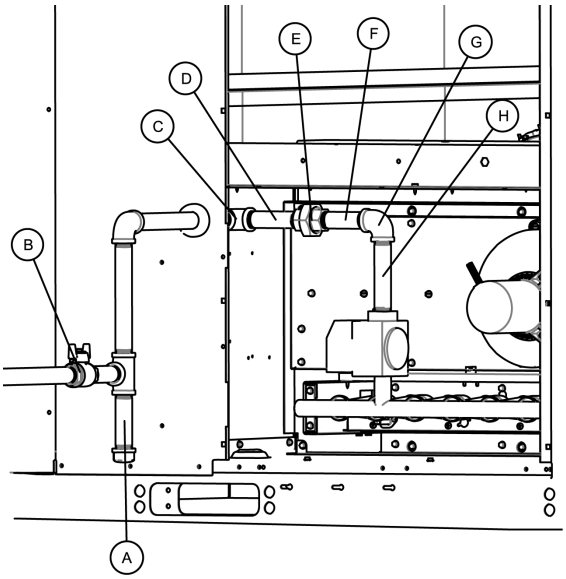
Follow the *National Fuel Gas Code Z223.1 (in U.S.A.)* or the current *Gas Installation Codes CSA-B149.1 (in Canada)* in all cases unless they are superseded by local codes or gas utility requirements.

See Table 34. The heating value of the gas may vary by locality. You must check the value with the local gas utility.

Note: There may be a local gas utility requirement specifying a minimum diameter for gas piping. All units require a 3/4 in. pipe connection at the entrance fitting. The supply line should not be sized smaller than the entrance fitting size.

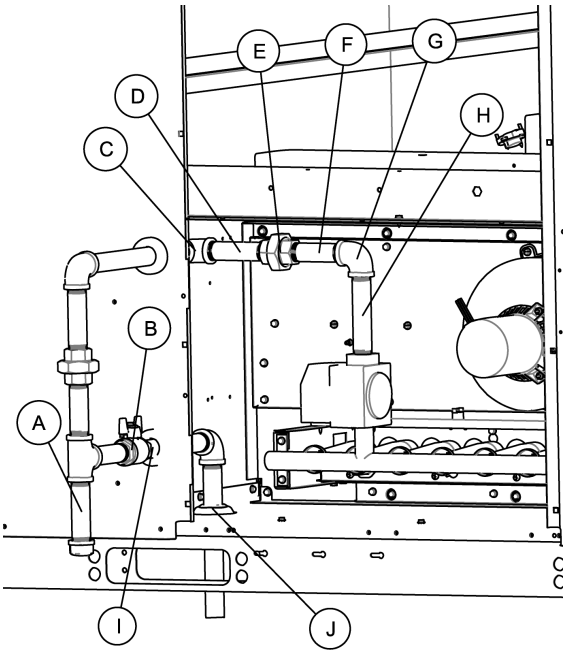
The following figures show the gas piping.

Figure 76: Side entry gas piping



Item	Description
A	Sediment trap
B	Manual shut-off valve
C	90° elbow
D	4 ½ in. long nipple
E	Union
F	4 in. long nipple
G	90° elbow
H	5 ½ in. long nipple

Figure 77: Bottom entry gas piping



Item	Description
A	Sediment trap
B	Manual shut-off valve
C	90° elbow
D	4 ½ in. long nipple
E	Union
F	4 in. long nipple
G	90° elbow
H	5 ½ in. long nipple
I	Extra piping grommet (included)
J	Caulk between pipe and base pan hole to provide watertight seal

Table 34: Gas pipe sizing - capacity of pipe

Length of pipe (ft.)	Nominal iron pipe size		
	3/4 in.	1 in.	1-1/4 in.
10	278	520	1050
20	190	350	730
30	152	285	590
40	130	245	500
50	115	215	440
60	105	195	400
70	96	180	370
80	90	170	350
90	84	160	320
100	79	150	305

Note: Maximum capacity of pipe in cubic feet of gas per hour based upon a pressure drop of 0.3 in. W.C. and 0.6 specific gravity gas.

Gas connection

The gas supply line can be routed within the space and roof curb with the exit through the unit's basepan. See the Physical dimensions for the gas piping inlet location. Typical supply piping arrangements are shown in the Gas piping section. All pipe nipples, fittings, and the gas cock are field supplied.

Apply the following gas piping recommendations.

- You must install a drip leg or sediment trap and a ground joint union in the gas piping.
- When required by local codes, install a manual shut-off valve outside of the unit.
- Use wrought iron or steel pipe for all gas lines. Apply pipe dope sparingly to male threads only.
- If local codes allow the use of a flexible gas appliance connector, always use a new listed connector. Do not use a connector which has previously serviced another gas appliance.

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WARNING

Natural gas may contain some propane. Propane is an excellent solvent and will quickly dissolve white lead and most standard commercial compounds. A special pipe dope must be used when assembling wrought iron or steel pipe. Shellac based compounds such as Gaskolac or Stalastic, and compounds such as Rectorseal #5, Clydes's, or John Crane may be used.

- Clean all piping of dirt and scale. Hammer on the outside of the pipe and blow out loose particles. Before initial start-up, make sure that all gas lines external to the unit are purged of air.
- The gas supply must be a separate line and installed in accordance with all safety codes as prescribed under Limitations.
- You must install a 1/8 in. NPT plugged tapping, accessible for test gage connection, immediately upstream of the gas supply connection to the unit.
- After the gas connections are complete, open the main shut-off valve admitting normal gas pressure to the mains. Check all joints for leaks with soap solution or other material suitable for the purpose. Never use a flame.

WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death, or property damage. 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. A fire or explosion may result causing property damage, personal injury, or loss of life.

CAUTION

The furnace and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing at pressures greater than 1/2 psig (3.5 kPa). Pressures greater than 1/2 psig (3.5 kPa) cause gas valve damage resulting in a hazardous condition. If the gas valve is subjected to a pressure greater than 1/2 psig (3.5 kPa), it must be replaced. The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig (3.5 kPa).

WARNING

Threaded joints must be coated with a sealing compound that is resistant to the action of liquefied petroleum gases. Do not use Teflon tape.

Propane units, tanks, and piping

All gas heat units are shipped from the factory equipped for natural gas use only. The unit can be converted in the field for use with propane gas with an accessory kit.

Note: Modulating gas furnaces, gas model T3, are **not certified** for use with propane and cannot be converted.

All propane gas equipment must conform to the safety standards of the National Fire Protection Association.

For satisfactory operation, propane gas pressure must be at the correct inlet pressure at the unit under full load. Refer to the conversion kit instructions for the minimum and maximum supply inlet pressure. Maintaining proper gas pressure depends on three main factors:

- The vaporization rate which depends on the temperature of the liquid and the wetted surface area of the containers.
- The proper pressure regulation. Two-stage regulation is recommended.
- The pressure drop in the lines between regulators and between the second stage regulator and the appliance. The pipe size required depends on the length of the pipe run and the total load of all appliances.

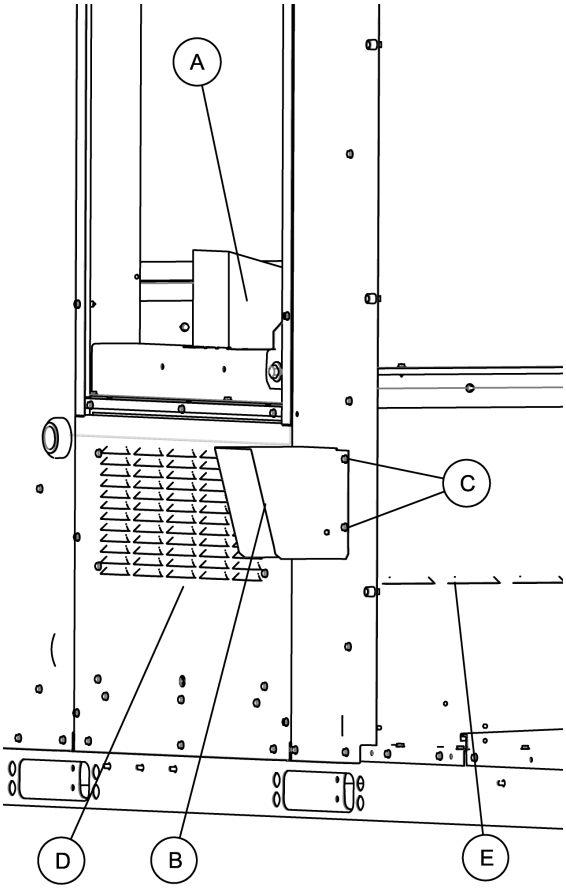
Complete information regarding tank sizing for vaporization, recommended regulator settings, and pipe sizing is available

from most regulator manufacturers and propane gas suppliers.

Combustion air intake and flue exhaust

Combustion air intake louvers are incorporated into the heating compartment right outside wall and access panel. The flue exhaust is discharged out the front of the unit. Remove the factory shipping label and the four screws that cover the exhaust opening. The flue exhaust hood is shipped in the blower compartment and must be installed over the discharge opening, as shown in Figure 78, using these four screws. If necessary, you can install a flue exhaust extension accessory in place of the hood.

Figure 78: Flue exhaust hood detail



Item	Description
A	Flue exhaust hood (shipping location)
B	Flue exhaust hood (field-installed location)
C	Mounting screws, 4 x (included)
D	Combustion air intake louvers
E	Combustion air intake louvers

Options and accessories

The following sections describe options and accessories.

Electric heat

Electric heaters are available as factory-installed options or field-installed accessories. These heaters mount in the heat compartment with the heating elements extending into the supply air chamber. All electric heaters are fused and intended for use with a single point power supply and refrigerant detection system.

Motorized outdoor damper

The motorized outdoor damper can be a factory-installed option or a field-installed accessory. Field-installed motorized outdoor damper accessories include complete instructions for installation.

Economizer sequences

Several functions can drive the economizer, including: minimum position, free cooling, economizer loading, and minimum outdoor air supply.

Economizer minimum position

The economizer minimum position is set during occupied mode when outside air is not suitable for free cooling. The position of the damper is set proportionally between the economizer minimum position and the economizer minimum position low speed fan setpoints, in relationship to the VFD output percentage. On a constant volume single speed supply fan system, set both setpoints to the same value.

Free cooling

Four types of free cooling options are available: dry bulb changeover, single enthalpy, dual enthalpy changeover, and auto.

Dry bulb changeover

For dry bulb economizer operation, the outside air is suitable for free cooling if the outside air temperature is 1°F below the economizer OAT enable setpoint and 1°F below the return air temperature (RAT).

Free cooling is no longer available if the outside air temperature rises above either the economizer OAT enable setpoint or the return air temperature.

Single enthalpy changeover

For single enthalpy economizer operation, the outside air is suitable for free cooling if the outside air enthalpy is at least 1 Btu/lb below the economizer outside air enthalpy setpoint and the outside air temperature is no greater than the RAT plus 9°F.

If the outside air temperature rises above the RAT plus 10°F, free cooling is no longer available. The outside air temperature must drop to no greater than RAT plus 9°F to enter free cooling again.

Free cooling is no longer available if the outside air enthalpy rises above the economizer outside air enthalpy setpoint.

Dual enthalpy changeover

For dual enthalpy economizer operation, the outside air enthalpy must be lower than the return air enthalpy by 1 Btu/lb and the outside air temperature is no greater than the RAT plus 9°F.

Auto

The control determines the type of free cooling changeover based on which sensors are present and reliable. Conditions include the following:

- Return and outside air dry bulb = dry bulb changeover
- Return and outside air dry bulb and outside air humidity = single enthalpy
- Return and outside air dry bulb and return and outside air humidity = dual enthalpy
- If either the return or outside air dry bulb sensors are unreliable, free cooling is not available

Free cooling operation

When the control determines that the outside air is suitable, the first stage of cooling is always free cooling.

Thermostat

In free cooling, with a thermostat input to Y1, the dampers modulate to control the supply air temperature to the economizer setpoint +/- 1°F (default 55°F).

If the thermostat provides an input to Y2 and the parameter COMPRESSORS OFF IN FREE COOLING is turned OFF, a compressor output energizes. The economizer dampers continue to modulate to control the supply air temperature to the economizer setpoint.

If the supply air temperature cannot be maintained within 5°F of the economizer setpoint, the first stage compressor (C1) is turned on. The second stage compressor (C2) is added as needed to keep the supply air temperature within the 5°F of the economizer setpoint.

Sensor

In free cooling, with a demand from the zone/return sensor for the first stage of cooling, the dampers modulate to control the supply air temperature to the economizer setpoint +/- 1°F.

If the economizer output is at 100% and the SAT is greater than the economizer setpoint + 1°F, the control starts a 12 minute timer to energize a compressor output.

If at any time the economizer output drops below 100%, the timer stops and resets when the economizer output returns to 100%.

When a compressor output is turned ON, the economizer dampers continue to modulate to control the supply air temperature to the economizer setpoint.

At no time is a compressor output turned ON if the economizer output is less than 100%, even if the differential between zone (or return) temperature and the current cooling setpoint is great enough to demand more than one stage of cooling.

If the economizer output goes to minimum position and the SAT is less than economizer setpoint -1°F, the control starts a 12 minute timer to de-energize a compressor output.

If at any time the economizer output goes above the minimum position, the timer stops and resets when the economizer output returns to minimum position.

If the demand for cooling from the space/return is satisfied, the economizer output modulates to minimum position and the compressor outputs are de-energized as long as their minimum run timers have expired.

Power exhaust

Setpoints

- Economizer enable: ON
- Power exhaust enable: ON
- Modulating power exhaust: OFF
- Exhaust VFD installed: OFF
- Building pressure sensor enabled: OFF
- Econo damper position for exh fan: ON Percent
- Econo damper position for exh fan: OFF Percent

Inputs

No inputs are present for non-modulating power exhaust.

Outputs

- 2-10 VDC from ECON on the economizer expansion module
- 24 VAC from EX-FAN to energize the exhaust fan on the economizer expansion module

Operation

Operation details include the following items:

- Compares the economizer output to the economizer damper position for exhaust fan on and off
- Energizes the exhaust fan when the economizer output is above the economizer damper position for exhaust fan on
- De-energizes the exhaust fan when the economizer output is below the economizer damper position for exhaust fan off

Modulating power exhaust

Set points and related data

The set points and related data include the following items:

- Power exhaust fan type (ExFType) variable frequency fan
- Building pressure setpoint (Bldg-Sp)
- Building pressure reading (Bldg-Pres)

Inputs

The input for modulating power exhaust is: 0 to 5 VDC from building pressure sensor to terminal Bldg-Pres.

Outputs

The outputs include the following items:

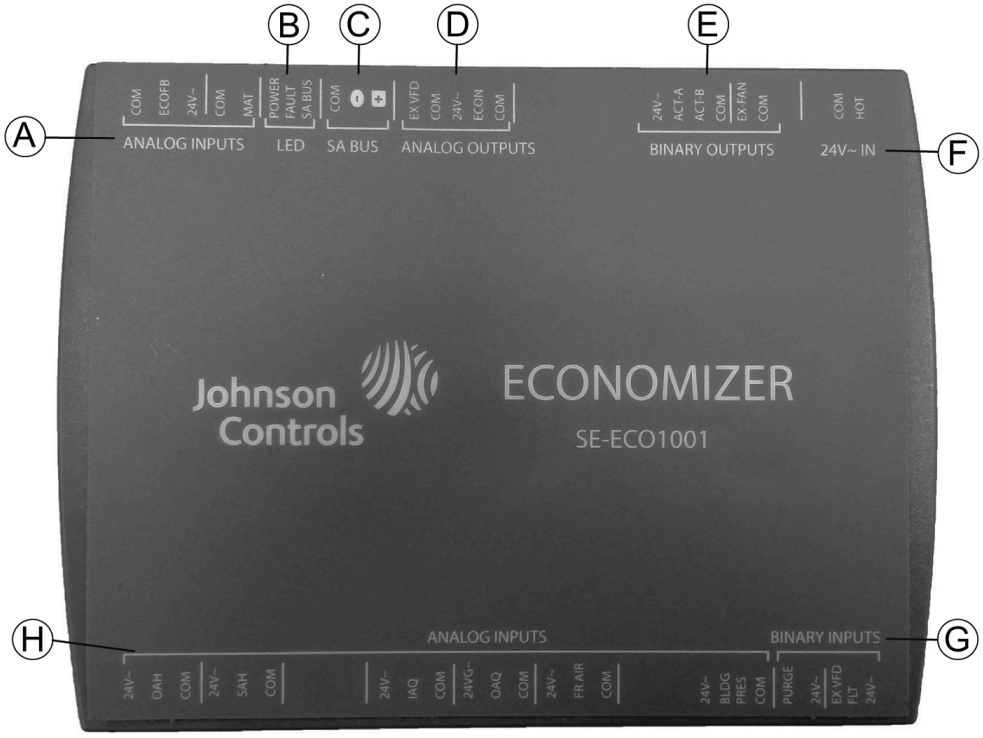
- 2 to 10 VDC from EX VFD for exhaust discharge damper modulation.
- 24 VAC from EX-FAN to energize exhaust fan.

Operation

If the building pressure is above the building pressure setpoint, the exhaust output (EX VFD) increases. If the building pressure is below the building pressure set point, the exhaust output (EX VFD) decreases. The EX-FAN binary output energizes when the EX VFD analog output is greater than 2.16 VDC. The EX-FAN binary output de-energizes when the EX VFD analog output is less than or equal to 2.16 VDC. The rate of change of the analog output is determined by the deviation from the set point and the length of time away from set point.

Smart Equipment economizer board

Figure 79: SE-ECO1001 economizer controller



The following tables describe the details of the economizer board. See the previous figure for connection locations.

Table 35: Smart Equipment economizer board - analog inputs

Location	Board label	Cover label	Description	Function and comments
A	C	COM	24 VAC common/0-10 VDC negative for economizer actuator position feedback	Connects through circuit trace to 24V~ IN pin COM
	IN2	ECOFB	0-10 VDC positive input from economizer actuator position feedback	The EconDampPos parameter reports input status (0-100%). Used to meet California Title 24 requirements for economizer actuator position feedback.
	R	24V~	24 VAC hot supplied for economizer actuator position feedback	Connects through circuit trace to 24V~ IN pin HOT
	C	COM	Mixed air temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	The MAT parameter reports input status (°F/°C), 3.65 VDC reading MAT (+) to COM (–) with open circuit. Read-only use in current control revision.
	IN1	MAT		

Table 35: Smart Equipment economizer board - analog inputs

Location	Board label	Cover label	Description	Function and comments
H	R	24V~	24 VAC hot supplied for the outdoor air humidity sensor	Connects through circuit trace to 24V~ IN pin HOT
	IN3	OAH	0-10 VDC positive input from the Outdoor Air Humidity sensor	OAH parameter reports input status (0-100%H). Used in outdoor air enthalpy calculation for dual enthalpy economizer free cooling changeover.
	C	COM	24 VAC common/0-10 VDC negative for the outdoor air humidity sensor	Connects through circuit trace to 24V~ IN pin COM
	R	24V~	24 VAC hot supplied for the supply air humidity sensor	Connects through circuit trace to 24V~ IN pin HOT
	IN4	SAH	0-10 VDC positive input from the Supply Air Humidity sensor	SAH parameter reports input status (0-100%H). Unused in current control revision.
	C	COM	24 VAC common/0-10 VDC negative for the supply air humidity sensor	Connects through circuit trace to 24V~ IN pin COM
	R	24V~	24 VAC hot supplied for the indoor air quality sensor	Connects through circuit trace to 24V~ IN pin HOT
	IN5	IAQ	0-10 VDC positive input from the Indoor Air Quality sensor	IAQRange parameter sets the CO2 parts per million measured by the indoor air quality sensor when it outputs 10 VDC; IAQ parameter reports input status (0-5000ppm). Used for demand ventilation functions if the NetIAQ parameter indicates ?Unrel.
	C	COM	24 VAC common/0-10 VDC negative for the indoor air quality sensor	Connects through circuit trace to 24V~ IN pin COM
	R	24V~	24 VAC hot supplied for the outdoor air quality sensor	Connects through circuit trace to 24V~ IN pin HOT
	IN6	OAQ	0-10 VDC positive input from the Outdoor Air Quality sensor	OAQRange parameter sets the CO2 parts per million measured by the outdoor air quality sensor when it outputs 10 VDC; OAQ parameter reports input status (0-5000ppm). Used for demand ventilation function when DVent-Mode selection is Diff between IAQ and OAQ and the NetOAQ parameter indicates ?Unrel.
	C	COM	24 VAC common/0-10 VDC negative for the outdoor air quality sensor	Connects through circuit trace to 24V~ IN pin COM
	R	24V~	24 VAC hot supplied for the air monitoring station sensor	Connects through circuit trace to 24V~ IN pin HOT
	IN7	FR AIR	0-10 VDC positive input from the air monitoring station sensor	MOA-Range parameter sets the cubic feet per minute/liters per second measured by the air monitoring station sensor when it outputs 10 VDC; Fr Air parameter reports input status (0-50000CFM/23595lps). Used for economizer minimum position reset in speed-controlled indoor blower applications.
	C	COM	24 VAC common/0-10 VDC negative for the air monitoring station sensor	Connects through circuit trace to 24V~ IN pin COM
	R	24V~	24 VAC hot supplied for the building pressure sensor	Connects through circuit trace to 24V~ IN pin HOT
	IN8	BLDG PRES	0-5 VDC positive input from the Building Pressure sensor	BldgPres parameter reports input status (-.250-.250”/w/-.062-.062kPa). Used for modulating power exhaust functions when ExFType selection is Modulating Damper or Variable Frequency Fan.
	C	COM	24 VAC common/0-5 VDC negative for the building pressure sensor	Connects through circuit trace to 24V~ IN pin COM

Table 36: Smart Equipment economizer board - LED details

Location	Board label	Cover label	Description	Function and comments
B	POWER	POWER	Green UCB power indicator	Lit indicates 24 VAC is present at 24V~ IN COM and HOT pins
	FAULT	FAULT	Red networking error and firmware error indicator	1/10th second on/off flashing indicates a networking error (polarity, addressing, etc.) or a firmware error (likely correctable with re-loading from USB flash drive)
	SA BUS	SA BUS	Green UCB SA bus communication transmission indicator	Lit/flickering indicates UCB-to-economizer board SA bus communication is currently active, off indicates the economizer board is awaiting SA bus communication

Table 37: Smart Equipment economizer board - SA bus details

Location	Board label	Cover label	Description	Function and comments
[1]C	C	COM	Common for SA BUS power and communication circuits	EconCtrlr parameter reports UCB-to-economizer board SA bus communication status. Negative of the SA BUS communication circuit to the UCB. Through the unit wiring harness, may continue on to the 4-stage board and/or fault detection and diagnostics board
	–	–	Communication for SA BUS devices	EconCtrlr parameter reports UCB-to-economizer board SA BUS communication status. Positive of the VDC (typically, a fluctuating 1.5 V to 3.5 V reading to C; at least 0.25 V lower than +) SA BUS communication circuit to the UCB. Through the unit wiring harness, may continue on to the 4-stage board and/or fault detection and diagnostics board
	+	+	Communication for SA BUS devices	EconCtrlr parameter reports UCB-to-economizer board SA BUS communication status. Positive of the VDC (typically, a fluctuating 1.5 V to 3.5 V reading to C; at least 0.25 V higher than –) SA BUS communication circuit to the UCB. Through the unit wiring harness, may continue on to the 4-stage board and/or fault detection and diagnostics board

1 When wiring the unit and other devices using the SA Bus and FC Bus, see.

Table 38: Smart Equipment economizer board - analog outputs

Location	Board label	Cover label	Description	Function and comments
D	J4	EX VFD	2-10 VDC positive output for the modulating power Exhaust fan Variable Frequency Drive/discharge damper modulating power exhaust actuator	ExFanVFD parameter reports output status (0-100%) when ExFType selection is Variable Frequency Fan; EAD-O parameter reports output status (0-100%) when ExFType selection is Modulating Damper. Used to ramp the power exhaust fan VFD/ position the discharge damper actuator.
		COM	24 VAC common/0-10 VDC negative for the power exhaust variable frequency drive/discharge damper modulating power exhaust actuator	Connects through circuit trace to 24V~ IN pin COM
		24V~	24 VAC hot supplied for the discharge damper modulating power exhaust actuator and economizer actuator	Connects through circuit trace to 24V~ IN pin HOT
		ECON	2-10 VDC output for the Economizer actuator	Econ parameter reports output status (0-100%). Used to position the economizer actuator for minimum position, free cooling, demand ventilation, cooling economizer loading and purge functions
		COM	24 VAC common/0-10 VDC negative for economizer actuator	Connects through circuit trace to 24V~ IN pin COM

Table 39: Smart Equipment economizer board - binary outputs

Location	Board label	Cover label	Description	Function and comments
E	J3	24V~	24 VAC hot supplied for an incremental (floating control) economizer actuator	Connects through circuit trace to 24V~ IN pin HOT
		ACT-A	24 VAC hot outputs to position an incremental (floating control) economizer actuator	Unused in current control revision
		ACT-B	24 VAC return	Unused in current control revision
		COM	24 VAC common for an incremental (floating control) economizer actuator	Connects through circuit trace to 24V~ IN pin COM
		EX-FAN	24 VAC hot output to energize power exhaust fan contactor coil/VFD enable relay coil	ExFan parameter reports output status (Off-On) when ExFType selection is Non-Modulating, Modulating Damper or Variable Frequency Fan. Used to turn on/enable the power exhaust fan motor.
		COM	24 VAC common/0-10 VDC negative for economizer actuator	Connects through circuit trace to 24V~ IN pin COM

Table 40: Smart Equipment economizer board - 24 V~ IN connections

Location	Board label	Cover label	Description	Function and comments
F	C	COM	24 VAC transformer Common referenced to cabinet ground	24 VAC common connection to power the economizer board. Connects through circuit traces to C/COM terminals and pins distributed on the economizer board.
	R	HOT	24 VAC transformer HOT	24 VAC hot connection to power the economizer board. Connects through circuit traces to R/24V~ terminals and pins distributed on the economizer board.

Table 41: Smart Equipment economizer board - binary inputs

Location	Board label	Cover label	Description	Function and comments
G	IN9	PURGE	24 VAC hot input from the PURGE dry contact	Purge parameter reports input status (False with 0 VAC input-True with 24 VAC input). When Purge status is True, heating and cooling operation is prevented, the indoor blower and power exhaust fan operate, the economizer actuator is positioned to 100%.
		24 V~	24 VAC hot supplied for the purge dry contact	Connects through circuit trace to 24V~ IN pin HOT
	IN10	EX VFD FLT	24 VAC hot input from the power Exhaust Variable Frequency Drive Fault contact	ExFanVFDFlt parameter reports input status (Normal with 0 VAC input-Alarm with 24 VAC input) when ExFType selection is Variable Frequency Fan. When ExFanVFDFlt status is Alarm, EX-FAN fan output is prevented.
		24 V~	24 VAC hot supplied for the power exhaust variable frequency drive fault contact	Connects through circuit trace to 24V~ IN pin HOT

Indoor air quality

Indoor air quality (IAQ) is regulated by an indoor sensor input. The IAQ sensor is connected to the economizer board through the IAQ analog input terminal and the associated COM and 24V~ inputs on the economizer board. Terminal IAQ accepts a 0 to +10 VDC signal with respect to the IAQ terminal. When the signal is below its setpoint, the actuator can modulate normally in accordance with the enthalpy and mixed air sensor inputs. When the IAQ signal exceeds its setpoint setting and there is no call for free cooling, the actuator is proportionately modulated from the 0 to 10 VDC signal, with 0 VDC corresponding to full closed and 10 VDC corresponding to full open. When there is no call for free cooling, the damper position is limited by the IAQ maximum damper position setting. When the signal exceeds its setpoint (demand control ventilation setpoint) setting and there is a call for free cooling, the actuator modulates from the minimum position to the full open position based on the highest call from either the mixed air sensor input or the IAQ voltage input.

- Optional CO_2 space sensor kit (wall mount) - part no. 2AQ04700724
- Optional CO_2 sensor kit (unit mount) - part no. 2AQ04700624

Phasing

All units are properly phased at the factory. Check for proper compressor rotation. If the blower or compressors rotate in the incorrect direction at start-up, the electrical connection to the unit is misphased. Change the phasing of the field line connection at the factory or field supplied disconnect to obtain proper rotation. Scroll compressors operate in only one direction. The scroll is misphased if it is drawing low amperage, has similar suction and discharge pressures, or it produces a high noise level.

⚠ CAUTION

Scroll compressors require proper rotation to operate correctly. Units are properly phased at the factory. Do not change the internal wiring to make the blower condenser fans or compressor rotate correctly.

Blower rotation

Check for proper supply air blower rotation. If the blower is rotating backwards, the line voltage at the unit point of power connection is misphased. See Phasing.

Adjusting the belt tension

To adjust the belt tension, complete the following steps.

1. Loosen the four sled bolts (A).

Figure 80: Top view

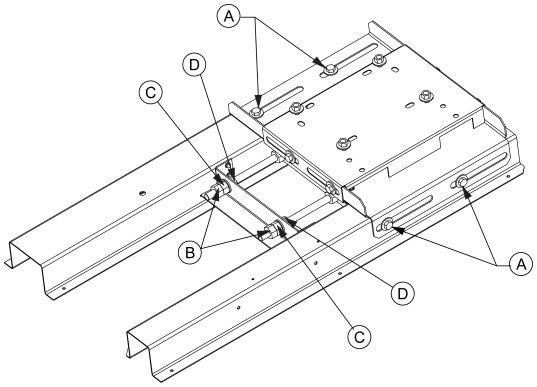
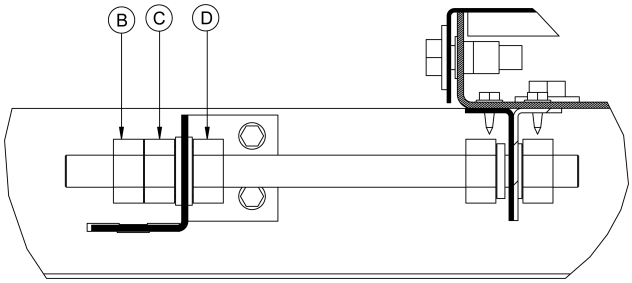


Figure 81: Side view



2. Break lock between nuts (B) and (C).
3. Adjust the belt tension using the adjustment nuts:
   a. Clear nuts (C) away from bracket and turn adjustment nuts (D) against bracket to increase belt tension.
   b. Clear nuts (D) away from bracket and turn adjustment nuts (C) against bracket to decrease belt tension.

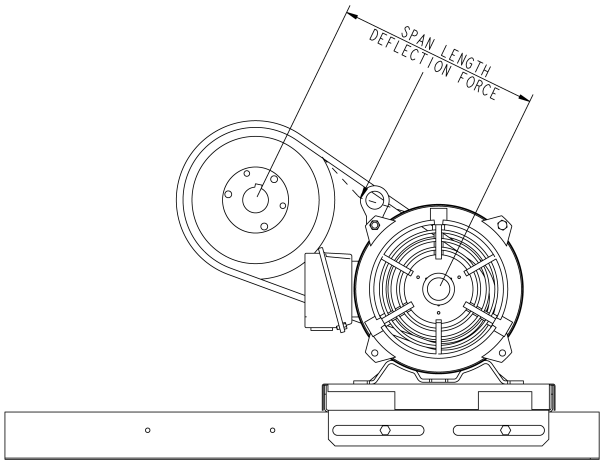
   Note: For two-belt applications, adjust the two nut/bolt assemblies so that equal tension is obtained for both belts.

   Note: New belts should be tensioned to the maximum deflection force recommended for the belt section. Table 42 contains the values to be used after break-in of new belts.

CAUTION

Check the belt tension at least two times during the first 24 hours of operation. After 24 hours of operation, retension to the recommended values in Table 42.

Figure 82: Measuring belt tension



4. To measure the belt tension complete the following steps:
   a. Use a belt tension checker to apply a perpendicular force to one belt at the midpoint of the span as shown in the following figure. To determine the deflection distance from normal position, reference the adjacent belt (if applicable) or use a straight edge from sheave to sheave as a reference line.
   b. Increase applied force until a deflection distance of 0.2 in. is obtained and compare the measured deflection force against recommended deflection force in Table 42
   c. Adjust belt tension until recommended deflection force is measured.
5. After belt(s) have been tensioned properly, move all nuts (B, C, and D) against bracket and lock nut (B) against nut (C).
6. Tighten the four sled bolts (A).

Table 42: Belt tension

Belt tension		
Application (tons and static)	**Deflection force (lb.)**	**Deflection distance (in.)**
12.5T Std	2.78	0.18
12.5T Med	4.06	0.18
12.5T High	4.66	0.17
15T Std	4.11	0.17
15T Med	4.79	0.18
15T High	5.27	0.18
17.5T Std	3.67	0.19
17.5T Med	5.3	0.19
17.5T High	5.53	0.18
20T Std	5.25	0.19
20T Med	5.08	0.19
20T High	5.53	0.18
23T Std	5.31	0.19
23T Med	6.06	0.19
23T High	7.18	0.19

BHC Residential & Light Commercial LLC

CFM static pressure and power-altitude and temperature corrections

Use the following information to assist in the application of the product at altitudes at or exceeding 1,000 ft above sea level.

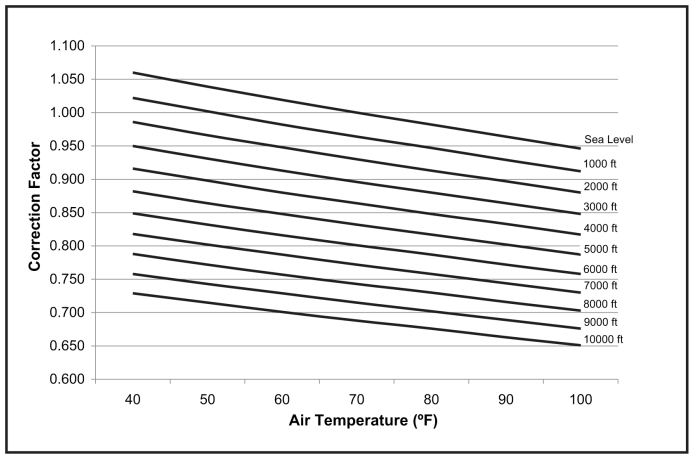
The air flow rates listed in the standard blower performance tables are based on standard air at sea level. As the altitude or temperature increases, the density of air decreases. In order to use the indoor blower tables for high altitude applications, certain corrections are necessary.

A centrifugal fan is a constant volume device. This means that, if the rpm remains constant, the CFM delivered is the same regardless of the density of the air. However, since the air at high altitude is less dense, less static pressure is generated and less power is required than a similar application at sea level. Air density correction factors are shown in the following table and figure.

Table 43: Altitude or temperature correction factors

Air temp.	Altitude, ft										
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
40	1.060	1.022	0.986	0.950	0.916	0.882	0.849	0.818	0.788	0.758	0.729
50	1.039	1.002	0.966	0.931	0.898	0.864	0.832	0.802	0.772	0.743	0.715
60	1.019	0.982	0.948	0.913	0.880	0.848	0.816	0.787	0.757	0.729	0.701
70	1.000	0.964	0.930	0.896	0.864	0.832	0.801	0.772	0.743	0.715	0.688
80	0.982	0.947	0.913	0.880	0.848	0.817	0.787	0.758	0.730	0.702	0.676
90	0.964	0.929	0.897	0.864	0.833	0.802	0.772	0.744	0.716	0.689	0.663
100	0.946	0.912	0.880	0.848	0.817	0.787	0.758	0.730	0.703	0.676	0.651

Figure 83: Altitude/temperature correction factors



Use the following examples to assist in determining the airflow performance of the product at altitude.

Example 1

What are the corrected CFM, static pressure, and bhp at an elevation of 5,000 ft. if the blower performance data is 6,000 CFM, 1.5 IWC and 4.0 bhp?

Solution 1

At an elevation of 5,000 ft. the indoor blower will still deliver 6,000 CFM if the rpm is unchanged. However, you must use the supply air limitations table to determine the static pressure and bhp. Since no temperature data is given, we will assume an air temperature of 70°F. The airflow performance table shows the correction factor to be 0.832.

Corrected static pressure = 1.5 x 0.832 = 1.248 IWC

Corrected bhp = 4.0 x 0.832 = 3.328

Example 2

A system, located at 5,000 feet of elevation, is to deliver 6,000 CFM at a static pressure of 1.5 in. Use the unit blower tables to select the blower speed and the bhp requirement.

Solution 2

As in the previous example, no temperature information is given so 70°F is assumed.

The 1.5 in. static pressure given is at an elevation of 5,000 ft. The first step is to convert this static pressure to equivalent sea level conditions.

Sea level static pressure = 1.5 / .832 = 1.80 in.

Enter the blower table at 6,000 CFM and static pressure of 1.8 in. The rpm listed will be the same rpm needed at 5,000 ft.

Suppose that the corresponding bhp listed in the table is 3.2. You need to correct this value for elevation.

Bhp at 5,000 ft. = 3.2 x .832 = 2.66

Drive selection

1. Determine the required airflow.
2. Calculate or measure the amount of external static pressure.
3. With the operating point determined from the previous steps, locate this point on the appropriate supply air blower performance table. Linear interpolation may be necessary.
4. Note the rpm and bhp from the previous step and locate the appropriate motor and/or drive.
5. Review the bhp compared to the motor options available. Select the appropriate motor and/or drive.
6. Review the rpm range for the motor options available. Select the appropriate drive if multiple drives are available for the chosen motor.
7. Determine the turns open to obtain the required operation point.

Example:

1. 4500 cfm
2. 1.0 iwg
3. Using the following supply air blower performance table, the following data point was located: 1,070 rpm and 2.34 bhp.
4. Using the following rpm selection table below, Size X and Model Y is found.
5. 2.34 bhp does not exceed the maximum continuous bhp rating of any of the 3 motor options, so all 3 motors are still eligible for selection.
6. 1,070 rpm falls within the range of the 3.7 hp drive.
7. Using the 3.7 hp motor, 2.5 turns open achieves 1,070 rpm.

Table 44: Example supply air blower performance

cfm	Available external static pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
	Standard 2.9 hp and field drive		Standard static 2.9 hp and drive						Medium static 3.7 hp and drive						High static 5.25 hp and drive					
3250	637	0.87	756	1.12	861	1.35	930	1.54	1019	1.72	1102	1.88	1179	2.03	1251	2.17	1319	2.31	1383	2.46
3500	655	0.99	771	1.24	874	1.46	940	1.66	1029	1.84	1111	2.00	1187	2.14	1259	2.29	1326	2.43	1390	2.58
3750	673	1.11	786	1.36	887	1.58	951	1.78	1038	1.96	1120	2.12	1196	2.26	1267	2.41	1334	2.55	1397	2.70
4000	691	1.23	802	1.48	901	1.71	962	1.90	1048	2.08	1129	2.24	1204	2.39	1275	2.53	1342	2.67	1404	2.83
4250	709	1.36	818	1.61	916	1.83	973	2.03	1059	2.20	1139	2.36	1214	2.51	1284	2.66	1350	2.80	1412	2.95
4500	729	1.49	835	1.74	931	1.96	985	2.16	1070	2.34	1149	2.49	1223	2.64	1293	2.79	1359	2.93	1421	3.08
4750	749	1.62	852	1.88	946	2.10	998	2.30	1082	2.47	1161	2.63	1234	2.78	1303	2.92	1368	3.07	1430	3.22
5000	770	1.77	871	2.02	963	2.24	1013	2.44	1095	2.62	1173	2.77	1246	2.92	1314	3.07	1379	3.21	1440	3.36
5250	793	1.92	891	2.17	981	2.40	1028	2.59	1110	2.77	1186	2.93	1258	3.08	1326	3.22	1390	3.36	1451	3.51
5500	817	2.08	912	2.34	1001	2.56	1045	2.76	1125	2.93	1201	3.09	1272	3.24	1339	3.38	1403	3.53	---	---
5750	842	2.26	935	2.51	1022	2.73	1063	3.05	1142	3.10	1217	3.26	1287	3.41	1353	3.56	---	---	---	---
6000	869	2.44	960	2.70	1044	3.06	1083	3.21	1161	3.29	1234	3.45	1303	3.60	---	---	---	---	---	---
6250	898	2.64	986	3.07	1068	3.20	1105	3.32	1181	3.49	1253	3.65	---	---	---	---	---	---	---	---
													High static 5.25 hp and Field Drive							

Note:

1. Blower performance includes gas heat exchangers and 2 in. filters. See static resistance table for additional applications.
2. See rpm selection table to determine desired motor sheave setting and to determine the maximum continuous bhp.
3. kW = bhp x 0.858.

Table 45: Example rpm selection

Size	Model	hp	Max bhp	Motor sheave	Blower sheave	6 turns open	5 turns open	4 turns open	3 turns open	2 turns open	1 turn open	Fully closed
13	KE	2.9	2.90	1VP40	1B5V66	NA	711	766	820	875	929	984
		3.7	3.70	1VP40	1B5V54	860	921	983	1044	1106	1167	NA
		5.0	5.75	1VP60	1B5V74	1142	1192	1240	1289	1338	1386	1435

Airflow performance

Table 46: KE13 bottom duct application

SCFM	Available external static pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Standard static 2.9 HP and field drive		Standard static 2.9 HP and drive						Medium static 3.7 HP and drive						High static 5.25 HP and drive					
3250	637	0.87	756	1.12	861	1.35	930	1.54	1019	1.72	1102	1.88	1179	2.03	1251	2.17	1319	2.31	1383	2.46
3500	655	0.99	771	1.24	874	1.46	940	1.66	1029	1.84	1111	2.00	1187	2.14	1259	2.29	1326	2.43	1390	2.58
3750	673	1.11	786	1.36	887	1.58	951	1.78	1038	1.96	1120	2.12	1196	2.26	1267	2.41	1334	2.55	1397	2.70
4000	691	1.23	802	1.48	901	1.71	962	1.90	1048	2.08	1129	2.24	1204	2.39	1275	2.53	1342	2.67	1404	2.83
4250	709	1.36	818	1.61	916	1.83	973	2.03	1059	2.20	1139	2.36	1214	2.51	1284	2.66	1350	2.80	1412	2.95
4500	729	1.49	835	1.74	931	1.96	985	2.16	1070	2.34	1149	2.49	1223	2.64	1293	2.79	1359	2.93	1421	3.08
4750	749	1.62	852	1.88	946	2.10	998	2.30	1082	2.47	1161	2.63	1234	2.78	1303	2.92	1368	3.07	1430	3.22
5000	770	1.77	871	2.02	963	2.24	1013	2.44	1095	2.62	1173	2.77	1246	2.92	1314	3.07	1379	3.21	1440	3.36
5250	793	1.92	891	2.17	981	2.40	1028	2.59	1110	2.77	1186	2.93	1258	3.08	1326	3.22	1390	3.36	1451	3.51
5500	817	2.08	912	2.34	1001	2.56	1045	2.76	1125	2.93	1201	3.09	1272	3.24	1339	3.38	1403	3.53	---	---
5750	842	2.26	935	2.51	1022	2.73	1063	3.05	1142	3.10	1217	3.26	1287	3.41	1353	3.56	---	---	---	---
6000	869	2.44	960	2.70	1044	3.06	1083	3.21	1161	3.29	1234	3.45	1303	3.60	---	---	---	---	---	---
6250	898	2.64	986	3.07	1068	3.20	1105	3.32	1181	3.49	1253	3.65	---	---	---	---	---	---	---	---
															High static 5.25 HP and Field Drive					

Note:

1. Blower performance includes gas heat exchangers and 2 in. filters. See the static resistance table for additional applications.
2. See the RPM selection table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.858.

Table 47: KE15 bottom duct application

SCFM	Available external static pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Standard static 2.9 HP and Field Drive		Standard static 2.9 HP and drive						Medium static 3.7 HP and drive						High static 5.25 HP and drive					
3900	561	0.68	648	1.04	726	1.35	797	1.63	862	1.88	923	2.11	980	2.35	1032	2.58	1082	2.84	1128	3.12
4200	575	0.83	660	1.19	737	1.51	807	1.78	871	2.04	932	2.27	988	2.50	1040	2.74	1089	3.00	1135	3.28
4500	589	0.99	672	1.35	747	1.66	816	1.94	880	2.19	940	2.43	996	2.66	1048	2.90	1096	3.15	1142	3.43
4800	602	1.14	684	1.50	758	1.81	826	2.09	889	2.34	948	2.58	1004	2.81	1055	3.05	1103	3.30	1149	3.58
5100	616	1.29	696	1.65	769	1.96	836	2.24	899	2.49	957	2.72	1012	2.96	1063	3.19	1111	3.45	1156	3.73
5400	629	1.43	708	1.79	780	2.11	846	2.38	908	2.64	966	2.87	1020	3.10	1071	3.34	1118	3.60	1163	3.88
5700	643	1.58	720	1.94	791	2.26	856	2.53	917	2.79	975	3.02	1028	3.25	1079	3.49	1126	3.75	1170	4.03
6000	657	1.74	733	2.10	802	2.41	867	2.69	927	2.94	984	3.18	1037	3.41	1087	3.65	1134	3.90	1178	4.19
6300	672	1.90	746	2.26	814	2.57	878	2.85	938	3.10	994	3.34	1047	3.57	1096	3.81	1143	4.06	1186	4.34
6600	687	2.07	759	2.43	827	2.74	890	3.02	949	3.27	1004	3.50	1056	3.74	1106	3.97	1152	4.23	---	---
6900	703	2.24	774	2.60	840	2.92	902	3.19	960	3.45	1015	3.68	1067	3.91	1116	4.15	---	---	---	---
7200	720	2.44	789	2.80	854	3.11	915	3.39	973	3.64	1027	3.87	1078	4.11	---	---	---	---	---	---
7500	737	2.64	805	3.00	880	3.50	929	3.59	986	3.84	1039	4.08	1090	4.31	---	---	---	---	---	---
															High static 5.25 HP and Field Drive					

Note:

1. Blower performance includes gas heat exchangers and 2 in. filters. See the static resistance table for additional applications.
2. See the RPM selection table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.858.

Table 48: KE18 bottom duct application

SCFM	Available external static pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Standard static 3.7 HP and Field Drive		Standard static 3.7 HP and drive						Medium static 5.25 HP and drive						High static 7.5 HP and drive					
4375	583	0.95	667	1.32	743	1.64	812	1.93	877	2.19	936	2.43	992	2.67	1044	2.91	1093	3.18	1139	3.47
4813	603	1.18	684	1.55	758	1.87	827	2.15	890	2.41	949	2.66	1004	2.90	1055	3.14	1104	3.40	1149	3.69
5250	622	1.40	702	1.77	774	2.09	841	2.38	903	2.64	961	2.88	1016	3.12	1067	3.36	1115	3.63	1159	3.92
5688	642	1.62	719	1.99	790	2.32	856	2.60	917	2.86	974	3.10	1028	3.34	1078	3.59	1126	3.85	1170	4.14
6125	663	1.86	738	2.23	807	2.55	871	2.83	932	3.09	988	3.33	1041	3.57	1091	3.82	1138	4.08	1182	4.37
6563	685	2.10	758	2.47	825	2.80	888	3.08	947	3.34	1003	3.58	1055	3.82	1104	4.07	1151	4.33	1194	4.62
7000	708	2.37	779	2.74	845	3.07	906	3.35	964	3.61	1019	3.85	1071	4.09	1119	4.34	1165	4.60	1208	4.89
7438	734	2.67	802	3.04	866	3.37	926	3.65	983	3.91	1037	4.15	1087	4.39	1135	4.64	1180	4.90	---	---
7875	761	3.01	827	3.38	889	3.70	948	3.99	1004	4.25	1056	4.49	1106	4.73	1153	4.97	---	---	---	---
8313	790	3.40	854	3.77	915	4.09	972	4.37	1026	4.63	1078	4.88	1126	5.11	---	---	---	---	---	---
8750	822	3.84	884	4.21	942	4.53	998	4.81	1051	5.07	1101	5.32	1149	5.55	---	---	---	---	---	---

Note:

1. Blower performance includes gas heat exchangers and 2 in. filters. See the static resistance table for additional applications.
2. See the RPM selection table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.834.

Table 49: KE20 bottom duct application

SCFM	Available external static pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Standard static 5.25 HP and field drive				Standard static 5.25 HP and drive				Medium static 5.25 HP and drive						High static 7.5 HP and drive					
5000	602	0.52	682	0.90	759	1.36	833	1.85	903	2.35	968	2.83	1026	3.26	1079	3.59	1124	3.80	1161	3.86
5500	639	0.90	714	1.28	788	1.73	860	2.23	928	2.73	991	3.21	1048	3.63	1099	3.97	1144	4.18	1181	4.24
6000	677	1.32	749	1.71	820	2.16	889	2.66	955	3.16	1016	3.64	1072	4.06	1122	4.39	1166	4.61	1202	4.66
6500	717	1.79	785	2.17	853	2.63	920	3.12	983	3.63	1043	4.11	1098	4.53	1147	4.86	1189	5.07	1225	5.13
7000	759	2.30	823	2.68	888	3.14	952	3.63	1014	4.14	1072	4.62	1125	5.04	1173	5.37	1215	5.58	1250	5.64
7500	800	2.85	862	3.23	924	3.68	986	4.18	1046	4.68	1102	5.16	1154	5.58	1200	5.92	1241	6.13	1275	6.19
8000	842	3.43	901	3.81	961	4.26	1020	4.76	1078	5.26	1133	5.74	1183	6.16	1229	6.50	1269	6.71	---	---
8500	884	4.04	939	4.42	997	4.87	1055	5.37	1111	5.87	1164	6.35	---	---	---	---	---	---	---	---
9000	924	4.67	978	5.05	1033	5.51	1089	6.00	1143	6.50	---	---	---	---	---	---	---	---	---	---
9500	980	5.62	1015	5.71	1069	6.16	1123	6.66	---	---	---	---	---	---	---	---	---	---	---	---
10000	1002	6.00	1052	6.38	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
															High static 7.5 HP and Field Drive					

Note:

1. Blower performance includes gas heat exchangers and 2 in. filters. See the static resistance table for additional applications.
2. See the RPM selection table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.834

Table 50: KE23 bottom duct application

Air flow (CFM)	Available external static pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Standard static 5.25 HP and Field Drive				Standard static 5.25 HP and drive				Standard static 7.5 HP and drive						Medium static 10 HP and drive					
5750	658	1.11	731	1.49	804	1.94	874	2.44	941	2.94	1003	3.42	1060	3.84	1110	4.18	1154	4.39	1191	4.44
6325	703	1.62	772	2.01	841	2.46	909	2.96	973	3.46	1033	3.94	1089	4.36	1138	4.69	1181	4.91	1217	4.96
6900	750	2.20	815	2.58	881	3.03	946	3.53	1008	4.03	1066	4.51	1120	4.93	1168	5.27	1210	5.48	1245	5.54
7475	798	2.82	860	3.20	922	3.66	984	4.15	1044	4.65	1100	5.13	1152	5.56	1199	5.89	1240	6.10	1274	6.16
8050	846	3.49	904	3.87	964	4.32	1024	4.82	1081	5.32	1136	5.80	1186	6.22	1232	6.56	1271	6.77	1305	6.83
8625	894	4.19	949	4.57	1006	5.03	1063	5.52	1119	6.03	1171	6.51	1220	6.93	1265	7.26	1303	7.47	1336	7.53
9200	940	4.93	993	5.31	1048	5.77	1103	6.26	1156	6.76	1207	7.24	1255	7.67	1298	8.00	1336	8.21	1367	8.27
9775	985	5.69	1035	6.07	1088	6.53	1141	7.02	1193	7.53	1242	8.01	1289	8.43	1331	8.76	---	---	---	---
10350	1028	6.48	1082	6.86	1127	7.31	1178	7.81	1229	8.31	1277	8.79	---	---	---	---	---	---	---	---
10925	1080	7.27	1115	7.65	1164	8.10	1214	8.60	---	---	---	---	---	---	---	---	---	---	---	---
11500	1106	8.07	1151	8.45	1199	8.90	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Note:

1. Blower performance includes gas heat exchangers and 2 in. filters. See the static resistance table for additional applications.
2. See the RPM selection table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.834

Air balance

CAUTION

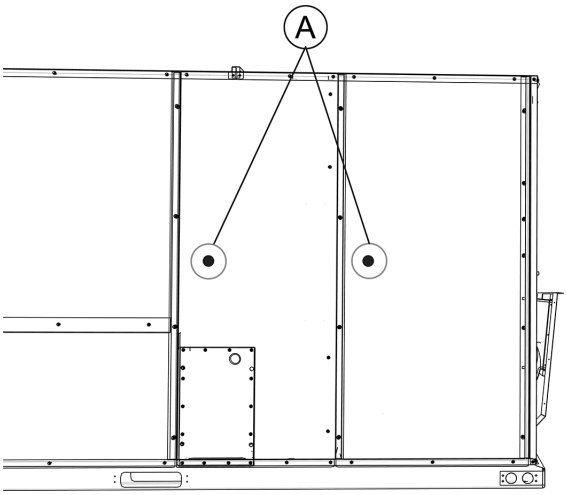
On these units verify that the blower drive is set to maximum output, exhaust dampers are closed, and individual space damper boxes are fully open.

Start the supply air blower motor. Adjust the resistances in both the supply and the return air duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.

Checking air quantity

1. Remove the dot plugs from the supply and return air access panels on the back side of the unit. See Figure 84.

Figure 84: Dot plug location



Item	Description
A	Dot plug location

2. Insert at least 8 in. of 1/4 in. tubing into each of these holes for sufficient penetration into the air flow on both sides of the indoor coil.

   Note: You must insert the tubes and hold them in a position perpendicular to the air flow so that velocity pressure does not affect the static pressure readings.

3. Use an inclined manometer to determine the pressure drop across the dry evaporator coil and filters. The moisture on an evaporator coil may vary greatly, measuring the pressure drop across a wet coil under field conditions could be inaccurate. To ensure that the coil is dry, deactivate the compressors while the test is being run.

   Note: De-energize the compressors before taking any test measurements to ensure that the indoor coil is dry.

4. Use the pressure drop across a dry coil, to determine the actual CFM through the unit from the curve in the following figure.

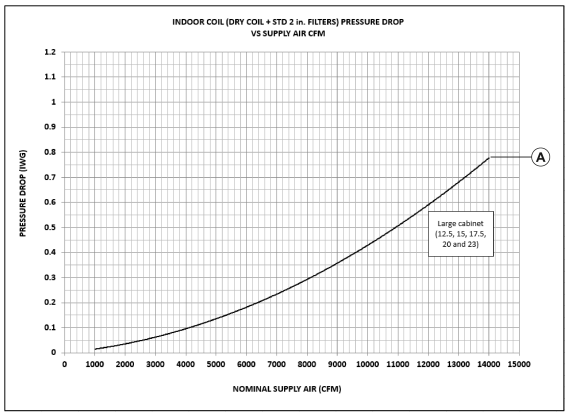
WARNING

Failure to properly adjust the total system air quantity can result in extensive blower damage.

Table 51: Pressure drop vs supply air cfm

Nominal cfm	Pressure drop (IWG)
1000	0.01
1500	0.02
2000	0.04
2500	0.05
3000	0.06
3500	0.08
4000	0.10
4500	0.11
5000	0.14
5500	0.16
6000	0.18
6500	0.21
7000	0.23
7500	0.26
8000	0.29
8500	0.32
9000	0.36
9500	0.39
10000	0.43
10500	0.47
11000	0.51
11500	0.55
12000	0.59
12500	0.63
13000	0.68
13500	0.73
14000	0.78

Figure 85: Pressure drop



Callout	Description
A	12.5 ton to 23 ton

Supply air drive adjustment

The rpm of the supply air blower depends on the required cfm, the unit accessories or options, and the static resistances of both the supply and the return air duct systems. With this information, the rpm for the supply air blower and the motor pulley adjustment (turns open) can be determined from the blower performance data tables.

CAUTION

You must adjust the belt drive blower systems to the specific static and cfm requirements for the application. The belt drive blowers are not set at the factory for any specific static or cfm. You must adjust the blower speed and belt tension. Verify proper sheave alignment. Tighten the blower pulley and motor sheave set screws after these adjustments. Re-check the set screws after 10 to 12 hours of run time.

See the blower motor and drive data table.

Note the following:

- The supply air cfm must be within the limitations shown in the blower performance tables.
- You can adjust pulleys in half turn increments.
- Adjust the belt tension.
- Tighten the blower pulley and motor sheave set screws after any adjustments. Re-check the set screws after 10 to 12 hours run time.

Table 52: Additional static resistance

Model	CFM	Cooling only	Reheat coil	Economizer	Electric heat kW			4 in. MERV 13	2 in. MERV 8	2 in. MERV 13
					25	50	75			
KE13 to KE23	3500	0.05	0.01	0.01	0.01	0.01	0.02	0.04	0.05	0.04
	4000	0.09	0.01	0.01	0.01	0.01	0.02	0.04	0.05	0.04
	5000	0.11	0.01	0.05	0.02	0.02	0.03	0.05	0.05	0.05
	6000	0.15	0.03	0.07	0.04	0.04	0.05	0.06	0.05	0.06
	7000	0.20	0.04	0.11	0.05	0.06	0.07	0.07	0.06	0.07
	8000	0.28	0.06	0.13	0.07	0.08	0.09	0.09	0.07	0.09
	9000	0.38	0.07	0.16	0.09	0.10	0.11	0.10	0.08	0.10
	10000	0.49	0.08	0.19	0.12	0.13	0.14	0.13	0.09	0.13
	11000	0.60	0.10	0.23	0.18	0.20	0.22	0.15	0.11	0.15
	12000	0.70	0.11	0.28	0.26	0.29	0.32	0.18	0.13	0.18

Note:

- For cooling only models, add the cooling only value to the available static resistance in the respective blower performance tables.
- For models with electric heat, add the electric heat value for your heater size to the available static resistance in the respective blower performance tables.
- If the unit contains a reheat coil or economizer, deduct the corresponding value from the available external static pressure shown in the respective blower performance tables.
- The pressure drop through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct is less than 0.25 IWG, the unit delivers less cfm during full economizer operation.

Operation

The following sections describe the sequences of operation for the units.

Cooling sequence of operation

Compressor operation

4 stage cooling (12.5 ton to 15 ton)

Refrigeration circuit 1 will consist of only a modulating compressor. The C1 output of the UCB will control the On/Off command of the modulating compressor. The speed of the modulating compressor will be controlled using the C1-MOD output of the 4-Stage controller.

Refrigeration circuit 2 will consist of a 2 stage compressor. The primary stage will be controlled by the C2 output of the UCB. The secondary stage will be controlled by the C3 output of the 4-Stage controller. Modulating Hot Gas Reheat will be associated with this circuit

4 stage cooling (17.5 ton to 23 ton)

Refrigeration circuit 1 will consist of only a modulating compressor. The C1 output of the UCB will control the On/Off command of the modulating compressor. The speed of the modulating compressor will be controlled using the C1-MOD output of the 4-Stage controller.

Refrigeration circuit 2 will consist only of a Single stage fixed speed compressor. The C2 output of the UCB will control the Single stage fixed speed compressor. Modulating Hot Gas Reheat will be associated with this circuit.

CAUTION

This product is equipped with overloads for the system 1 compressor. Do not change the settings on the overload relay as it may cause performance issues. Refer to the electrical wiring diagrams for additional information, consult the equipment manufacturer, installer or service agency.

Continuous blower

When the room thermostat fan switch is set to ON, the supply air blower operates continuously.

Intermittent blower

With the room thermostat fan switch set to AUTO and the system switch set to either the AUTO or HEAT settings, the blower is energized whenever a cooling or heating operation is requested. The blower is energized after any specified delay associated with the operation

When energized, the indoor blower has a minimum run time of 30 seconds. Additionally, the indoor blower has a delay of 10 seconds minimum off.

Optional VAV startup and control

CAUTION

If the unit is operated with the manual bypass switch in the LINE (BYPASS) position and there are VAV boxes present in the duct system, then boxes must be driven to the full-open position using a customer-supplied power source to prevent over-pressurizing and possible damage to the ductwork.

For units with VFD and VAV control, you must put the unit into the occupied mode to start operation. The default setting for all VAV units is unoccupied. The installer must either keep the jumper wire between terminals R - OCC or use a network command from a BAS control system to switch between the unoccupied and occupied modes.

When placed into the occupied mode, the speed of the indoor blower motor is controlled by duct static pressure. The duct static setpoint (default = 1.5 in.WC) is the pressure that the VFD drive maintains when operating the unit in VAV mode. If the duct static pressure reaches or exceeds the high-limit setpoint (default = 4.5 in.WC .), then the supply fan motor is shutdown.

The supply air temperature (SAT) is controlled by staging compressors on and off to satisfy the Operating Cooling Supply Air Temperature Setpoint. There are three factors that determine the resulting Operating Cooling Supply Air Temperature Setpoint:

1. VAV cooling supply air temp upper setpoint (default 60°F)
2. VAV cooling supply air temp lower setpoint (default 55°F)
3. VAV supply air temp reset setpoint (default 72°F)

When the return air temperature (RAT) is above the VAV supply air temperature reset setpoint the SAT is maintained at +/- 5 degrees of the VAV cooling supply air temperature lower setpoint.

When the return air temperature (RAT) is below the VAV supply air temperature reset setpoint the SAT is maintained at +/- 5 degrees of the VAV cooling supply air temperature upper setpoint.

When the outdoor air condition is sufficient for free cooling, the economizer modulates to control the SAT to +/- 1 degrees of the operational setpoint.

Cooling operation errors

Each cooling system is monitored for operation outside of the intended parameters. Errors are handled as described below. All system errors override minimum run times for compressors.

Note: The following components are needed to access the control points in the Smart Equipment control.

- Local LCD on the unit control board.

BHC Residential & Light Commercial LLC

or

- Mobile Access Portal (MAP) Gateway (Portable).
  - Source 1 P/N S1-JC-MAP1810-OP
  - MAP Gateway Quick Start Guide P/N 24-10737-16
  - MAP Gateway Instruction P/N 24-10737-8

Modulating compressor control

Choice ultra-high efficiency units are equipped with a variable speed drive compressor, the capacity modulates via vernier control. The first stage on refrigeration circuit 1 is variable speed, while all other stages are constant speed for circuit 2. The variable speed compressor is always the first compressor ON and last compressor OFF, except in dehumidification mode.

Modulating condenser fans

The condenser fan on circuit 1 will be controlled by the CF1 MOD output on the 4 Stage controller. The condenser fan on circuit 2 will be controlled by CF2 MOD outputs on the 4 Stage controller. The CF1 MOD and CF2 MOD outputs will be 0V when the corresponding compressor/condenser fan command is off, and 2-10V when the command is on.

The modulating speed of condenser fans will depend on the corresponding circuit's saturated discharge temp if it's reliable. If the circuit's saturated discharge temp is not reliable, the speed for that condenser fan will be set to the Maximum speed.

High-pressure limit switch

During cooling operation, if a high-pressure limit switch opens, the UCB de-energizes the associated compressor, initiates the ASCD (anti-short cycle delay), and stops the associated condenser fan(s). If the call for cooling is still present and high-pressure switch is closed at the conclusion of the ASCD, the UCB re-energizes the halted compressor. If a high-pressure switch opens three times within two hours of operation, the UCB locks out the associated compressor and the condenser fan(s) are de-energized.

Low-pressure limit switch

The low-pressure limit switch is not monitored during the initial 30 seconds of a cooling system's operation. For the following 30 seconds, the UCB monitors the low-pressure switch to ensure it closes. If the low-pressure switch fails to close after the 30- second monitoring phase, the UCB de-energizes the associated compressor, initiates the ASCD, and stops the associated condenser fan(s). If the LPS is still open after the ASCD, the compressor is not to be energized for 30 seconds. The second and third times that the UCB sees an open LPS counts towards the three occurrences that cause a UCB lock-out.

When the low-pressure switch is proven (closed during the 30- second monitor period described above), the UCB monitors the low-pressure limit switch for any openings. If the low-pressure switch opens for greater than 5 seconds, the UCB de-energizes the associated compressor, initiates the ASCD, and stops the associated condenser fan(s).

If the call for cooling is still present at the conclusion of the ASCD, the UCB re-energizes the halted compressor.

If a low-pressure switch opens three times within one hour of operation, the UCB locks out the associated compressor and the associated condenser fan(s) are deenergized.

Evaporator low limit

The evaporator low limit sensor is located on the suction line at the evaporator coil.

During cooling operation, if the evaporator low limit sensor (EC1, EC2) detects a temperature below 26°F (default), the UCB de-energizes the associated compressor, initiates the ASCD, and stops the associated condenser fan(s). If the call for cooling is still present at the conclusion of the ASCD, the UCB re-energizes the halted compressor. If the UCB detects the evaporator low limit sensor (EC1, EC2) falling below 26°F (default) three times within two hours of operation, the UCB locks out the associated compressor and the associated condenser fan(s) are de-energized.

Envelope control

Envelope control keeps the variable speed drive compressor within the allowable range of saturated suction and saturated discharge temperature for the compressor. Oil management algorithms are designed to keep the oil level above the minimum on variable speed drive compressors. Overall cooling demand, oil management, saturated discharge temperature, and saturated suction temperature all influence the allowable operational speed of the variable speed drive compressor. The controller monitors each of those requirements to provide the appropriate minimum and maximum speeds to the compressor.

If the Suction Superheat temperature is below 5 degrees F after 1 minute of compressor operation, the module will go into Slowdown mode. Superheat slowdown mode shall be done at a rate of 2 percent per second. If an envelope Slowdown mode is also present at this time, the module will use the larger of the rates of speed reduction. If an envelope speedup is also present at this time, the module will hold the current compressor speed adjustment. This replicates existing functionality when in a dead band

If after 1 minute of compressor operation the Suction Superheat temperature is below 2 degrees F for more than 300 seconds, the variable speed compressor shall be disabled, and its associated condenser fans will be de-energized.

Compressor discharge line temperature protection

This functionality requires that a discharge line temperature sensor be installed on the circuit 1 (the one with the modulating compressor) discharge line, to protect the compressor from high discharge temperatures. If the discharge line temperature exceeds 245°F (118°C), the

controller shall shutdown the modulating compressor and its associated condenser fan(s).

This function is to prevent the compressor from running in an over-temperature situation.

The lockout will automatically reset if the discharge line temperature has been below 245°F (118°C) for 10 minutes. It can also be reset using the Hardware Reset point.

Low ambient cooling

To determine when to operate in low ambient mode, the UCB has an outdoor air temperature sensor (OAT) with a low ambient setpoint at 45°F (default).

The high efficiency units have a user adjustable cooling OAT cutout setpoint at 0°F per circuit (45°F is default).

If Cooling OAT Cutout Enable is set to yes, the compressor operation is not permitted if the OAT is less than the Cooling OAT Cutout. High efficiency units should have the Cooling OAT Cutout Enable set to Yes, and the Cooing OAT Cutout setpoint set to 0°F. The upper range of this adjustable limit is 100°F.

If Cooling OAT Cutout Enable is set to no, the compressors cycle 10 minutes on and 5 minutes off. If the OAT is less than the low ambient 10 on 5 off setpoint (LowAmb10On5OffSp) setpoint. This option is available, but not necessary with units having modulating condenser fans (high efficiency models).

All condenser fans on Choice Ultra-High Efficiency units are equipped with ECM motors as standard, allowing them to modulate based on the saturated discharge temperature. This helps to keep the unit running during low ambient conditions.

If the circuit's saturated discharge temperature is not stable and a modulating condenser fan is installed on that circuit, then the effective OAT Cooling Enable setpoint for that circuit will be the maximum of the user setpoint and 60°F. Effectively that means that the OAT Cooling Enable setpoint will be at least 60°F when the saturated discharge temperature is unreliable, and a modulating condenser fan is installed.

When operating in this mode, if the variable speed compressor operates outside of operating envelope limits, the compressor is operated and protected as described in the envelope control section.

When operating in this mode, an evaporator low limit sensor (EC1, EC2) temperature below 26ºF, the UCB de-energizes the associated compressor. If the call for cooling is still present at the end of the ASCD and the evaporator temperature sensor (EC1, EC2) temperature is above 26°F, the unit resumes operation.

OAT cooling cutout

The unit shall have a user adjustable OAT Cooling Enable setpoint (45°F is default) per circuit. Compressor cooling shall be disabled below this setpoint, and re-enabled when OAT rises 5°F above the setpoint. The upper range of this adjustable limit shall be 100°F.

Modulating condenser fan motors allows the unit to operate to an ambient temperature of -10°F. This functionality is only available for a circuit when a modulating condenser fan is installed, and the saturated discharge temperature is reliable.

If the circuit's saturated discharge temperature is not reliable, then the effective OAT Cooling Enable setpoint for that circuit with be the max of the user setpoint and 60°F. Effectively that means that the OAT Cooling Enable setpoint will be at least 60°F when saturated discharge temp is unreliable.

When operating in this mode, If the variable speed compressor operates outside of operating envelope limits, the compressor will be operated and protected as described in Envelope control section.

When operating in this mode, an evaporator low limit sensor (EC1, EC2) temperature below 26ºF, the UCB de-energizes the associated compressor. If the call for cooling is still present at the end of the ASCD and the evaporator temperature sensor (EC1, EC2) temperature is above 26°F, the unit resumes operation.

Safety controls

The unit control board monitors the following inputs for each cooling system:

1. An evaporator low limit sensor (EC1, EC2) to protect against low evaporator temperatures due to a low airflow or a low return air temperature, set at 26°F. The sensor is located on the suction line at the evaporator coil.
2. A high-pressure switch to protect against excessive discharge pressures due to a blocked condenser coil or a condenser motor failure. The switch opens at 625 ± 10 psig.
3. A low-pressure switch to protect against loss of refrigerant charge. The switch opens at 50 ± 5 psig.

The above pressure switches are hard soldered to the unit. The refrigeration systems are independently monitored and controlled. On any fault, only the associated system is affected by any safety/preventive action. The other refrigerant system continues in operation unless it is affected by the fault as well.

The unit control board monitors the temperature limit switch of electric heat units and the temperature limit switch and the gas valve of gas furnace units.

Compressor protection

In addition to the external pressure switches, the compressors also have inherent (internal) protection. If there is an abnormal temperature rise in a compressor, the protector opens to shut down the compressor. The UCB incorporates features to minimize compressor wear and damage. An anti-short cycle delay (ASCD) is used to prevent operation of a compressor too soon after its previous run. Additionally, a minimum run time is imposed any time a compressor is energized.

The ASCD is initiated on unit start-up and on any compressor reset or lock-out.

Reset

Remove the call for cooling by raising thermostat setting higher than the conditioned space temperature.

Reheat sequence of operation

Dehumidification (hot gas reheat)

The rooftop unit can have an optional hot gas reheat (HGRH) system factory installed. HGRH is utilized to help dehumidify the interior space.

- This is accomplished by controlling the compressors to the evaporator leaving air setpoint, which is typically set lower than the active DAT cooling setpoint
- The colder air allows for more moisture removal from the discharge air
- The discharge air then passes through the HGRH coil, which adds heat to the discharge air
- Reheating the air allows dehumidification of the space while preventing over-cooling, which keeps building personnel comfortable

The HGRH Hot gas reheat will be always on the circuit2, which is the opposite circuit than the modulating compressor. The HGRH system uses a three-way modulating valve controlled by a stepper motor. The HGRH coil is located after the evaporator coil in the airstream. There is a solenoid installed on the outlet of the HGRH coil. This HGRH bleed solenoid valve allows excess refrigerant and oil to bleed back into the suction line when HGRH operation is not needed

During modulating hot gas reheat, the modulating compressor is not required to be the first on and last off.

For 12.5 and 15 ton models will have two stage compressor on the mod HGR circuit That requires the demand to get high enough to turn on all the compressors on circuit 2 and for 17.5 to 23 ton models will have one single stage compressor on mod HGR circuit. The modulating compressor on circuit 1 will be allowed to turn on and off as needed

Dehumidification sequence

The unit controller continuously monitors a %RH value. This value can be either from the space or return air.

When the current humidity level rises above the dehumidification setpoint, the unit enables the HGRH system.

Setpoints for the dehumidification sequence can be found under the *Details* > *Humidity Control* > *Setup* menu.

There are two different operating sequences for HGRH.

Unit in active cooling mode

When the unit is in an active cooling mode and there is a demand for dehumidification, the HGRH valve is controlled to the active DAT cooling setpoint.

The compressors are controlled to the active evaporator air temperature (EAT) setpoint.

Typically, the active EAT setpoint is lower than the active DAT cooling setpoint. This allows for additional humidity to be removed while still providing sensible cooling.

Unit in idle mode

When the unit is not in an active cooling mode and there is a demand for dehumidification, the HGRH valve is controlled to an active DAT setpoint based on a reset schedule utilizing the effective cooling DAT setpoint and the current RAT. See Figure 86.

The compressors are controlled to the active EAT setpoint. This allows for humidity to be removed from the air while not over-cooling the space

The unit controller uses the current humidity level as the basis for the active EAT setpointt.

- When the humidity level first increases above the active humidity setpoint, the active EAT setpoint is equal to the low cooling DAT setpoint.
- When the humidity level continues to increase, the active EAT setpoint resets lower to allow for moisture removal.

If at any time during an active dehumidification sequence the changeover sensor sees a demand for heat, HGRH operation is terminated regardless of the current humidity level.

Figure 86: Active DAT setpoint when unit is in idle mode

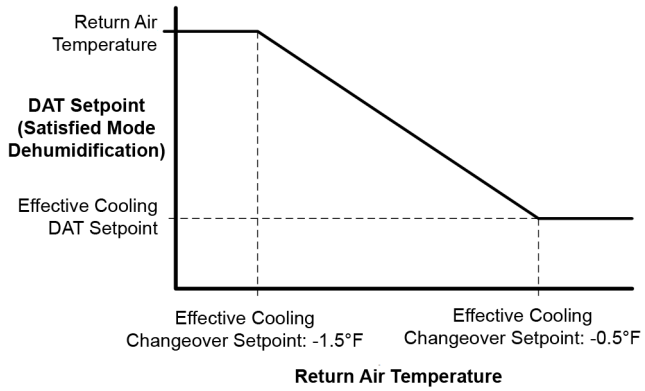
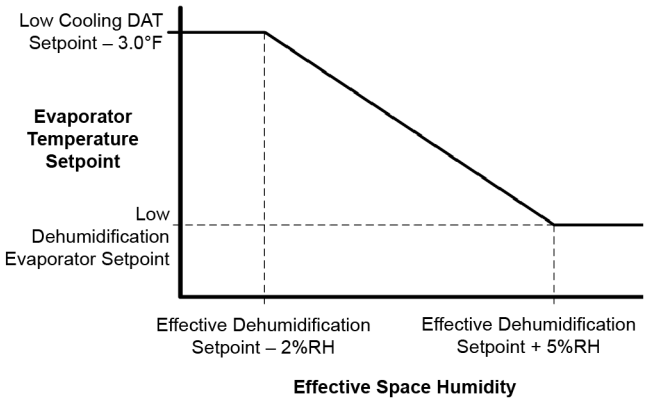
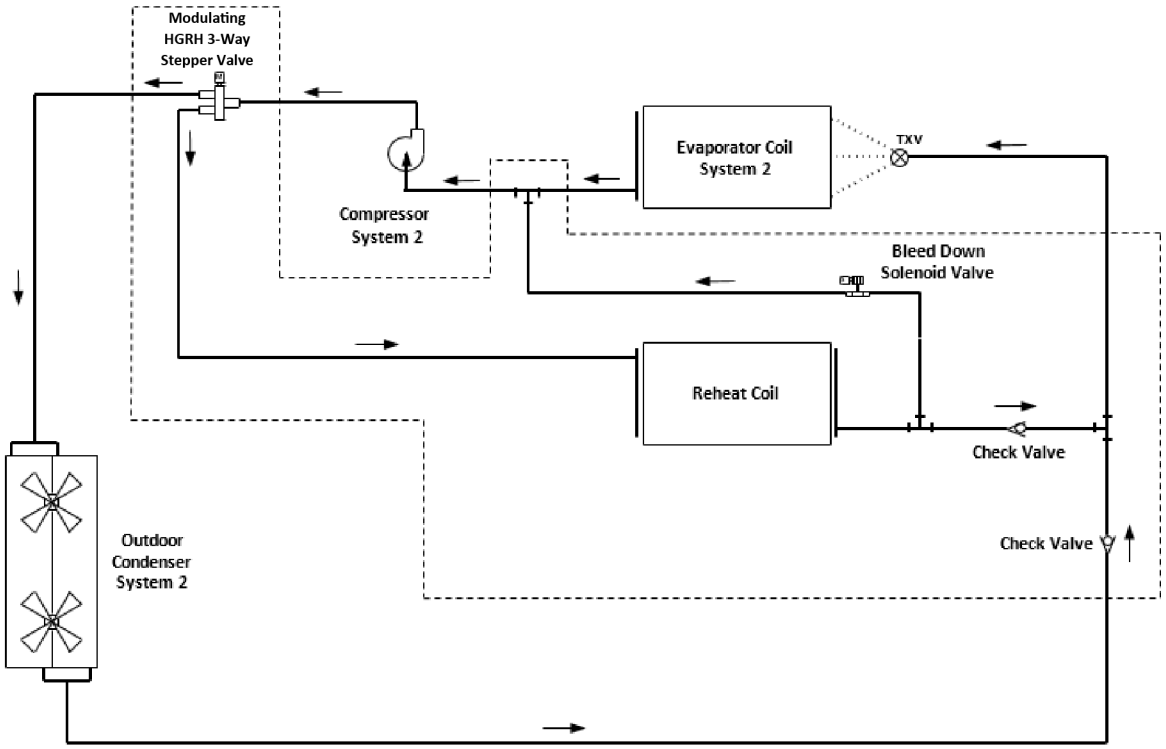


Figure 87: Active EAT setpoint based on humidity level



BHC Residential & Light Commercial LLC

Figure 88: HGRH schematic



Modulating HGRH three-way stepper valve

The refrigerant flow is modulated using a three-way modulating valve. This valve is closed when HGRH is not required. Once HGRH is required, the three-way valve opens. In HGRH mode, the three-way valve has a minimum position of 40% and a maximum position of 100% for all models The valve can open to 100% if it is not meeting the requirement after running at the maximum position for 1 min.

Condenser fan control

In HGRH mode, system 2 condenser fan(s) are off when OAT drops to 75.0°F or below and /or when 3 way valve opens more than or equal to 65% for 12.5 ton, 15 ton, 17.5 ton, 20 ton, and 23 ton models.

Hot gas reheat valve

The HGRH bleed valve is energized when not in HGRH Mode that is piped between the HGRH coil and the compressor system 2 suction line. The HGRH bleed valve prevents refrigerant and oil from being trapped in the HGRH coils when HGRH is inactive.

Electric heating sequence of operations

The following sequence describes the operation of the electric heat section.

CAUTION

For units with VFD and electric heat, the speed of the indoor blower motor continues to be controlled by duct static pressure via the VAV control board. If there are VAV boxes present in the duct system, the boxes must be driven to the full-open position using a customer-supplied power source to ensure adequate airflow across the heating elements.

Electric heat operation errors

Temperature limit

If the UCB senses zero volts from the high temperature limit, the indoor blower motor is immediately energized.

The limit is monitored at all times when the unit is in an operational mode where the electric heaters may be turned on.

If the temperature limit opens three times within one hour, it locks on the indoor blower.

Electric heat safety controls

The UCB monitors the temperature limit switch of electric heat units.
The control circuit includes the following safety controls:

Temperature limit switch

Temperature limit switch (LS1A, LS1B)

This control is located inside the heater compartment and is set to open at 180°F for 12.5 ton unit, and 140°F for other units. These temperature limit switches reset automatically. The limit switch operates when a high temperature condition, caused by inadequate supply air flow occurs, this shuts down the heater and energizing the blower.

Temperature limit switch (LS2A, LS2B)

This control is located inside the heater compartment and is set to open at 220°F for 12.5 ton unit, and 180°F for other units. These temperature limit switches are single use limit and de-energize the heaters if the primary limit fails to open or the contactors fail to open in a failure mode. When the backup limit trips it will need to be replaced for the heater to be operational again.

Reset

Removes the call for heating by lowering the thermostat setting lower than the conditioned space temperature.

Gas heat sequence of operation

1. When the thermostat calls for the first stage of heating, the low-voltage control circuit from R to W1 is complete. If the outdoor air temperature is above the adjustable balance point (default 40°F) the unit operates in heat pump heating (compressors). If the outdoor air temperature is below the balance point the unit operates in gas heating. For gas heat, a call for heat passes through the UCB to the Ignition Control Board (ICB).
2. When the pre-ignition process is complete the ignition module energizes the gas valve and provides a 24 V input to the MV terminal on the UCB.
3. The FAN ON HEAT DELAY timer starts as soon as 24 V is present on MV terminal. When the timer expires the FAN output for the indoor fan operation energizes. If 24 V is not received on the MV terminal within 6 minutes, an alarm appears and the fan output energizes immediately and remains On until the alarm clears.
4. When the thermostat heat inputs are lost and the 120 second Minimum Heat Run Timers have expired, heating outputs stage off. The FAN OFF HEAT DELAY timer starts when 24 V is removed from the MV terminal. When the timer expires, the FAN output for the indoor fan operation de-energizes.

   ⓘ **Note:** If 24 V is lost on the MV terminal during the same heat cycle, an alarm appears and the fan output energizes and remains on until 24 V is present again on the MV terminal.

   ⓘ **Note:** If 24 V is present on the MV terminal without a call for heat, an alarm triggers and the fan output energizes. If this condition occurs for 6 minutes an alarm triggers, and remains, until the alarm condition is cleared.

5. At any time, if 24 V is lost on the LIMIT terminal, the FAN output for indoor fan operation is energized. If 24 V is lost on the LIMIT input 3 times in 1 hour, an alarm appears and the FAN output is energized. The heating H2 outputs are de-energized until the alarm is cleared.

Additional heating operation for modulating furnaces

Normal heating

The modulating furnace control (MFC) is circuited between the UCB and ignition control board (ICB). The MFC determines the appropriate heat level demand to send to the ICB. When the MFC receives a W1 input (H2 output from the UCB), the MFC maintains the added value of W1 SAT plus W2 SAT ADDED VALUE pin selections. The MFC sends heat level demands to the ICB through a serial communication signal.

Air tempering mode

In air tempering mode, the MFC tries to maintain neutral supply air temperature to the conditioned air space when it senses cold incoming mixed air. This condition is typically created when there is a fresh outside air demand in cold ambient conditions.

If the air tempering pin jumper is set to any value other than OFF, the MFC initiates furnace operation if the mixed air temperature (MAT) sensor input reading is 3°F below the selected value. The MFC then adjusts the heat demand level to control the supply air temperature (SAT) to the selected value.

To operate Air Tempering, air proving switch (APS) input must be on, W1/W2 heat call from the UCB must be off, and all compressor inputs must have been off for 10 minutes. If the MFC has been in tempering mode (heating) for 10 minutes and the SAT reading is 5°F or more above the air tempering selected value, heating is ended. If all conditions for Air Tempering are still met, it re-initiates after a 10 minute minimum off delay.

Two-stage gas heat ignition control board function

Ignition control board on standby

The Ignition Control Board (ICB) has all outputs de-energized and monitors the thermostat and flame sense. The ICB resets ignition trial and flame loss counters. The ICB begins a call for heat when W1 is energized at the Unit Control Board (UCB).

Pressure switch proving

The ICB energizes the induced draft motor and waits for the low pressure switch to close. When the low pressure switch closes, the control begins a Pre-purge period. If the call for heat is lost, the control de-energizes the inducer without post-purge and returns to standby.

If the low pressure switch does not close within 10 seconds of inducer energizing, the control flashes 2 on the LED. If the

pressure switch does not close within 5 minutes of inducer energizing, the control shuts off the inducer for 30 seconds, then energizes the inducer for another 5 minutes try to close the pressure switch. This cycle continues indefinitely until either the pressure switch is proved closed, or the call for heat ends.

Pre-purge

The ICB monitors the low pressure switch and ensures it remains closed during pre-purge. If the pressure switch opens, the control returns to pressure switch proving mode. The control waits for a 15 seconds pre-purge period, and then begins the ignition trial.

Ignition trial period

When the ICB energizes the main gas valve, the second stage gas valve and the spark outputs for a 10 second ignition trial. The control de-energizes the spark when a flame is sensed and enters a flame stabilization period.

If a flame is not established within the ignition trial period, the control de-energizes the spark and gas valve and checks for the maximum number of ignition trials. The ICB has a maximum number of three ignition trials. If the control has attempted the maximum number of ignition trials in the same call for heat without flame, the control locks out flashing 4 on the LED. If the control has attempted less than maximum ignition trials, it begins an inter-purge period before attempting another ignition trial.

If the call for heat is lost during an ignition trial period, the control immediately de-energizes spark and gas. The control runs the inducer motor through a post purge period before de-energizing.

If the pressure switch is lost during an ignition trial period, the control immediately de-energizes spark and gas. The control begins pressure switch proving before an inter-purge and re-ignition attempt.

Flame stabilization period

If a flame is detected during the Ignition Trial Period, the ICB then enters the flame stabilization period. If a flame is not detected in 2 seconds, the main valve is de-energized and a retry operation begins. The flame stabilization period lasts 10 seconds. A flame detection must be lost for 2 seconds during flame stabilization for the main valve to be de-energized. When the flame stabilization period has ended, a loss of flame detection for 3/4 seconds results in the main valve being de-energized.

If a flame is lost during the flame stabilization period, the control counts it as a flame loss and retries ignition or locks out as described in Low heat section.

Main burner operation

High heat warm-up

Upon receiving W1 (H2 from the UCB board), the gas heat ignition control turns on high heat for the normal 1 minute warmup and flame stabilization period.

High heat

After the high heat warm-up, the gas heat ignition control remains in high heat until the heat call ends. The ICB keeps the main gas valve and induced draft motor energized while continuously monitoring the call for heat, low pressure switch and flame status.

If the call for heat (W1) is lost, the control de-energizes the gas valve and begins post purge.

If the low pressure switch opens, the control deenergizes the gas valve and begins pressure switch proving mode.

If the flame is lost, the control de-energizes the gas valve within 2 seconds and counts the flame loss. If a flame is lost more than five times within the same call for heat, the control locks out flashing 5 on the LED. If the flame is lost less than five times, the control attempts reignition after a 30 second inter-purge period

Post purge

The ICB runs the induced draft motor for a 5 second post-purge period, then de-energizes the inducer. If a call for heat occurs during post-purge, the control finishes the post-purge, drops inducer out to re-prove open pressure switch before continuing with the heat cycle.

Lockout

While in lockout, the ICB keeps the main gas valve and induced draft motor de-energized.

Lockouts due to failed ignition or flame losses may be reset by removing the call for heat (W1) for more than 1 seconds, but less than 20 seconds, or by removing power from the control for over 1/4 seconds. The control automatically resets lockout after 60 minutes.

Lockouts due to detected internal control faults reset after 60 minutes or power interruption.

High temperature limit switch

If the high temperature limit switch is open the control runs the inducer, de-energizes the gas valve, and flashes 6 on the LED. When the high temperature switch closes, the control restarts the ignition sequence beginning with pre-purge.

If the high temperature limit is open for more than 6 minutes continuously during a call for heat, it is assumed that the main blower has failed and the control enters a hard lockout and flashes a 9 on the LED. During the hard lockout, the control continues to run the inducer as long as the limit switch is open. If the limit switch closes again in this hard lockout condition, the inducer runs a post-purge and then shuts off. The control remains locked out until power is removed and does not reset automatically.

Roll-out switch

If the roll-out switch opens for more than 1/4 seconds, the ICB runs the inducer for a post-purge period, immediately de-energizes the gas valve, and flashes 7 on the LED.

If the roll-out switch closes, the control remains locked out until power is removed or W is removed. Roll-out switch lockout does not reset automatically.

Power interruptions

Power interruptions less than 0.80 seconds do not cause the ICB to interrupt the heat sequence. Power interruptions over 1/4 seconds cause the control reset lockout and ignition trial counters. Power interruptions of any duration do not cause lockout or any operation requiring manual intervention.

Flame present with gas off

If a flame is sensed for longer than 2 seconds during a period when the gas valve should be closed, the ICB enters lockout. The control turns on the inducer blower while the flame is present.

Welded gas valve relay response

If either or both Main and Second Stage Gas valve outputs are sensed to be off for more than 1 second when commanded to be **ON**, the ICB shuts off all outputs and enters lockout.

If the Main valve output is sensed to be energized for more than 1 second when commanded to be off, the control de-energizes the induced draft motor (if flame is not present) to attempt to open the pressure switch to de-energize the gas valve. If the main gas valve is still sensed as energized after the inducer has been off for 15 seconds, the control re-energizes the inducer to attempt to vent the unburned gas. In either case, the control locks out.

Modulating gas heat ignition control board function

Ignition control board on standby

The ignition control board (ICB) has all outputs de-energized and monitors the communications port and flame sense. The ICB resets ignition trial and flame loss counters. The ICB begins a call for heat when a communicated demand level is requested from the modulating furnace control (MFC) on the RS485 port.

Call for heat

The ICB checks to see if the pressure switch is open and the RPM sensor input indicates that the inducer motor is not currently active. If the pressure switch is closed or the RPM sensor detects that the inducer is active, the ICB flashes 3 on the LED and waits indefinitely for it to become inactive. When the inducer is sensed as inactive, the ICB begins an air flow proving period. If the call for heat is lost, the ICB goes back to Standby.

Air flow proving

The ICB energizes the induced draft motor and waits for the low pressure switch to close and for the RPM sensor to provide a feedback signal of at least a level of 500 RPM. When the low pressure switch closes and the RPM sensor indicates at least 500 RPM, the control begins a pre-purge period. If the call for heat is lost, the control de-energizes the inducer without post-purge and returns to standby. If the low pressure switch does not close and the RPM sensor does not reach 500 RPM within 10 seconds of the inducer energizing, the control flashes 2 on the LED. If the pressure switch does not close and the RPM sensor does not indicate at least 500 RPM within 5 minutes of inducer energizing, the control shuts off the inducer for 30 seconds, then energizes the inducer for another 5 minutes to try to close the pressure switch and reach 500 RPM. This cycle continues indefinitely until either the airflow is proven, or the call for heat ends.

Pre-purge

The ICB monitors the low pressure switch and RPM sensor to ensure air flow remains present during pre-purge. If the pressure switch opens or the RPM sensor drops under 500 RPM, the control goes back to pressure switch proving mode. The control waits for a 30 second pre-purge period, then begins the ignition trial.

Ignition trial period

The ICB energizes the main gas valve and spark outputs for a 10 second ignition trial. The control de-energizes the spark when flame is sensed and enters a flame stabilization period. If a flame is not established within the ignition trial period, the control de-energizes the spark and gas valves and checks for maximum number of ignition trials.

The ICB has a maximum number of 3 ignition trials. If the control has attempted the maximum number of ignition trials within the same call for heat without flame, the control locks out flashing 4 on the LED. If the control has attempted less than the maximum ignition trials, it begins an inter-purge period before attempting another ignition trial.

If the call for heat is lost during an ignition trial period, the control immediately de-energizes the spark and gas. The control runs the inducer motor through a post purge period before de-energizing.

If the pressure switch is lost during an ignition trial period, the control immediately de-energizes the spark and gas. The control begins pressure switch proving before an inter-purge and re-ignition attempt.

If the rpm sensor indicates a loss of air flow during an ignition trial period, the control de-energizes the spark and gas after the 10 second ignition period. The control begins air flow proving before an inter-purge and re-ignition attempt.

Flame stabilization period

If a flame is detected during the ignition trial period, the ICB then enters the flame stabilization period. If a flame is not detected in 3 seconds (+/-1 second), the main valve is de-energized and a retry operation begins. The flame stabilization period lasts 10 seconds. Flame detection must be lost for 3 seconds (+/-1 second) during flame stabilization for the main valve to be de-energized. When the flame stabilization period has ended, a loss of flame detection

within 1 seconds to 2 seconds results in the main valve being de-energized. If flame is lost during the flame stabilization period, the control counts it as a flame loss and retries ignition, or locks out as described in the Steady heat section.

Main burner operation

High heat warm-up

The ICB runs high heat for the first 30 seconds following flame stabilization period regardless of demand. If high heat is not requested at the end of this 30 second period the control reduces the high gas output and steps the inducer to a lower speed requested by the demand level. If high heat is requested the control remains on high heat.

Steady heat

The ICB keeps the main gas valve and induced draft motor energized while continuously monitoring the call for heat, low pressure switch, RPM sensor, and flame status. If the call for heat demand is lost, the control de-energizes the gas valve and begins post purge. If the low pressure switch opens or the inducer motor RPM sensor drops below 500 RPM, the control de-energizes the gas valve and begins pressure switch proving mode. If the flame is lost, the control de-energizes the gas valve within 2 seconds and counts the flame loss. If the flame is lost more than 5 times within the same call for heat, the control locks out flashing 5 on the LED. If the flame is lost less than 5 times, the control attempts re-ignition after a 30 second inter-purge period.

Post purge

The ICB runs the induced draft motor for a 5 second post-purge period, then de-energizes the inducer. If a call for heat occurs during post-purge, the control finishes the post-purge, drops inducer out to re-prove air flow before continuing with the heat cycle.

Lockout

While in lockout, the ICB keeps the main gas valve and induced draft motor de-energized. Lockouts due to failed ignition or flame losses can be reset by removing the call for heat (communicated demand) for more than 1 second, but less than 20 seconds, or by removing power from the control for over 1/4 seconds. The control automatically resets lockout after 60 minutes. Lockouts due to detected internal control faults resets after 60 minutes or power interruption.

High temperature limit switch

Any time the high temperature limit switch is open the ICB runs the inducer, de-energize the gas valve, and flash 6 on the LED. When the high temperature switch closes, the control restarts the ignition sequence beginning with pre-purge. If the high temperature limit is open for more than 6 minutes continuously during a call for heat, it is assumed that the main blower has failed and the control enters a hard lockout and flash a 9 on the LED. During the hard lockout, the control continues to run the inducer as long as the limit switch is open. If the limit switch recloses in this hard lockout condition, the inducer runs a post purge and then shutoff. The control remains locked out until power is removed and does not reset automatically.

Roll-out switch

If the roll-out switch opens for more than 1/4 seconds, the ICB runs the inducer for a post-purge period, immediately de-energizes the gas valve, and flashes 7 on the LED. If the roll-out switch closes, the control remains locked out until the power is removed or the demand is removed. The roll-out switch lockout does not reset automatically.

Power interruptions

Power interruptions less than 80mS do not cause a change in operating mode. Power interruptions more than 100 mS may cause the ICB to interrupt its current operational mode and re-start the operational sequence. Power interruptions of any duration are not to cause lockout or any operation requiring manual intervention to recover.

Flame present with gas off

If a flame is sensed for longer than 2 seconds during a period when the gas valve should be closed, the ICB enters lockout. The control turns on the inducer blower while the flame is present.

Welded gas valve relay response

If the main gas valve output is sensed to be off for more than 1 second when commanded to be on, the ICB shuts off all outputs and enters lockout. If the main valve output is sensed to be energized for more than 1 second when commanded to be off, the control de-energizes the induced draft motor (if flame is not present) to attempt to open the pressure switch to de-energize the gas valve. If the main gas valve is still sensed as energized after the inducer has been off for 10 seconds, the control re-energizes the inducer to attempt to vent the unburned gas. In either case, the control locks out.

Cooling start-up

The following sections describe the cooling start-up procedures.

Cooling pre-start checklist

When the installation is complete, perform the following checks:

1. Check the electrical supply voltage being supplied. Verify that it is the same as the voltage listed on the unit nameplate.
2. Set the room thermostat to the off position.
3. Turn on the electrical power to the unit.
4. Set the room thermostat fan switch to on.
5. Check the indoor blower rotation.

   If the blower rotation is in the wrong direction, see Phasing section.

   a. Check the blower drive belt tension.
6. Check the unit supply air (CFM).

7. Measure the evaporator fan motor's amp draw.
8. Set the room thermostat fan switch to off.
9. Turn off electrical power to the unit.

Operating the unit

1. Turn on the electrical power to the unit.
2. Set the room thermostat setting lower than the room temperature.

   First stage compressors energize after the built-in time delay of 5 minutes.

   Additional stages of cooling will be energized by the thermostat if needed.

Post-start checklist

1. Verify proper system pressures for both circuits.
2. Measure the temperature drop across the evaporator coil.
3. Measure the system amperage draw across all legs of the three-phase power wires.
4. Measure the condenser fan amperage draw.

Gas heat start-up

The following sections describe the gas heat start-up procedures.

Gas heat pre-start checklist

When the installation is complete, perform the following checks.

1. Check the type of gas supply. Verify that it is the same as the gas supply listed on the unit nameplate.
2. Verify that the combustion air intake and flue exhaust are free of any debris or obstruction.
3. Verify that the hood is installed over the flue exhaust discharge opening.
4. For modulating furnaces, set the System Selection bottom pin jumper to COMMISSION on the Modulating Furnace Control to properly check the input rate and manifold pressure.

Operating instructions

CAUTION

This furnace is equipped with an automatic re-ignition system. DO NOT attempt to manually light the burners.

Lighting the main burners

1. Turn off the electrical power to unit.
2. Set the room thermostat to the lowest setting.
3. Turn the gas valve switch to the ON position.
4. Turn on the electrical power to the unit.
5. Set the room thermostat to the required temperature.

   If the set temperature on the thermostat is above room temperature, the main burners ignite.

Gas heat post-start checklist

After the entire control circuit has been energized and the heating section is operating, perform the following checks:

1. Check for gas leaks in the unit piping and the supply piping.

WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death, or property damage. 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. A fire or explosion may result causing property damage, personal injury, or loss of life.

2. Check for the correct manifold gas pressures, input rates, and air temperature rise. See Checking gas heat input section.
3. Check the supply gas pressure. It must be within the limits shown on the rating nameplate.

   Note: You must check the supply pressure with all gas appliances in the building at full fire. The standby gas pressure must never exceed 13 in. or the operating pressure drop below the minimum as specified on the unit rating plate. If the gas pressure is outside these limits, contact the local gas utility or propane supplier for corrective action.

Table 53: Natural gas inputs and pressures

Gas Model	Gas Input (MBH)		Manifold Pressure (in. w.c.)		Supply Pressure (in. w.c.)	
	Normal	Reduced	Normal	Reduced	Min	Max
(N,S)1	220	165	3.5	2.1	4.5	10.5
(N,S)3	400	300	3.5	2.1	4.8	10.5
T3	400	140	3.5	0.6	5.0	10.5

Note: Propane inputs and pressures are provided in the listed conversion kit instructions.

Note: Modulating furnaces, gas model T3, are **not certified** for use with propane and cannot be converted.

Shutting down the unit

1. Set the thermostat to the lowest temperature setting.
2. Turn off all electrical power to unit.

3. Open the gas heat access panel.
4. Turn the gas valve switch to the OFF position.
5. For modulating furnaces, when commissioning is complete return the System Selection bottom pin jumper to NORM OPERATION on the Modulating Furnace Control.

Checking gas heat input

For two-stage and modulating furnaces, input rate should be checked at full input and minimum input. The intended input for each furnace is shown in the physical data tables and on the unit rating plate. The table applies to units operating on 60 Hz power only.

Important

If this is a modulating furnace, the Modulating Furnace Control board must be in COMMISSION mode on the System Selection pin jumper when checking input rate. Otherwise, the furnace input will fluctuate automatically and not maintain a steady rate. In COMMISSION mode, a second stage thermostat call will run the furnace at full input and a first stage call will run at minimum input.

To determine the rate of gas flow at second stage (full input)

To determine the rate of gas flow at second stage (full input):

1. Turn off all other gas appliances connected to the gas meter.
2. Turn on the furnace and make sure the thermostat is calling for Second stage (100% input) heat.
3. Measure the time needed for one revolution of the hand on the lowest increment dial on the meter. A typical gas meter has a 1/2 ft^3 or a 1 ft^3 test dial.
4. Using the number of seconds it takes for one revolution of the dial, calculate the cubic feet of gas consumed per hour.
5. If necessary, adjust the high pressure regulator as discussed in the section Manifold gas pressure adjustment. **Be sure not to over-fire the furnace on second stage.** If in doubt, it is better to leave the second stage of the furnace slightly under-fired. Repeat Step 1 to Step 5.

To determine the rate of gas flow at first stage (minimum input)

1. Turn off all other gas appliances connected to the gas meter.
2. Turn on the furnace and make sure the thermostat is calling for first stage (minimum input) heat.
3. Even when the thermostat is calling for first stage heat, the unit will light on second stage and will run on second stage for 1 minute. Allow this one-minute time period to expire and be certain the unit is running on first stage.
4. Measure the time taken for one revolution of the hand on the lowest increment dial on the meter. A typical gas meter has a 1/2 or a 1 ft^3 test dial.
5. Using the number of seconds it takes for one revolution of the dial, calculate the cubic feet of gas consumed per hour (See example below).
6. If necessary, adjust the low pressure regulator as discussed in the section Manifold Gas Pressure Adjustment. **Be sure not to under-fire the furnace on first stage.** If in doubt, it is better to leave the first stage of the furnace slightly over-fired. Repeat Steps 1 to 6.

Manifold gas pressure adjustment

Two stage

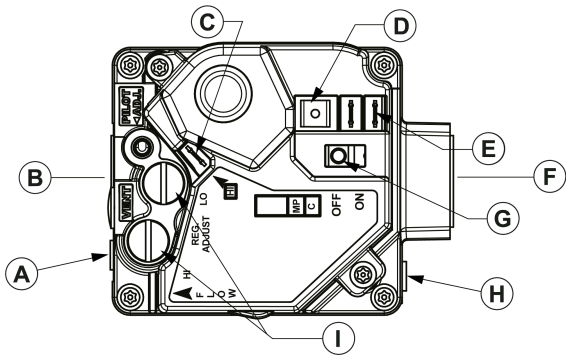
This gas furnace has two heat stages. Therefore, the gas valve has two adjustment screws located under two cover screws. The second stage adjustment screw is adjacent to the HI marking on the valve and the first stage adjustment screw is located adjacent to the LO marking on the valve.

Manifold pressure adjustment procedure.

Adjust the second stage first, then adjust the first stage pressure. See the in the physical data tables or the unit rating plate.

1. Turn off all power to the unit.
2. Using the outlet pressure port on the gas valve, connect a manometer to monitor the manifold pressure.
3. Remove the cover screws covering the HI and LO pressure adjustment screws.
4. Turn on the power to the unit.
5. Set the thermostat to call for second stage heat and start the furnace.
6. If necessary, using a screwdriver, turn the second stage adjustment screw (adjacent to the HI marking on the valve) clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure.
7. After the high manifold pressure has been checked, you can adjust the thermostat to call for first stage heat.
8. If necessary, using a screwdriver, turn the first stage adjustment screw (adjacent to the LO marking on the valve) clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure.
9. After you have checked the pressure, replace the cover screws covering the HI and LO pressure adjustment screws.

Figure 89: Two Stage Gas Valve



Item	Description
A	Outlet pressure tap 1/8 in. - 27 NPT
B	Outlet
C	3/16 in. x .032 in. thk. male spade terminal - 2nd stage coil
D	External jumper
E	1/4 in. x .032 in. thk. male spade terminals (2) - common
F	Inlet
G	On/Off switch
H	Inlet pressure tap 1/8 in. - 27 NPT
I	Regulator cover screws (reg. adj. beneath these screws)

Modulating gas furnace

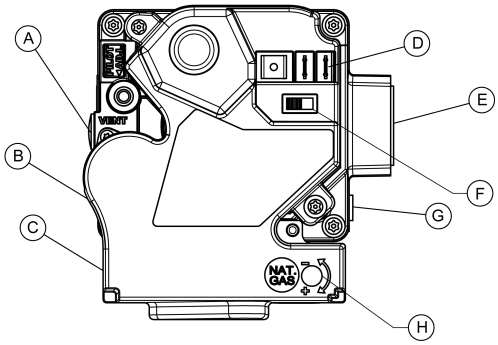
This gas furnace is a fully modulating system. The modulating furnace requires manifold pressure adjustment at both the highest setting (100%, full input) and lowest setting (35%, minimum input) of the gas valve to ensure it regulates correctly across the full range. Both settings are adjusted by a single Rotary DIP Switch on the valve. See Figure 90).

Important: The Modulating Furnace Control (MFC) board must be in COMMISSION mode on the System Selection pin jumper when checking input rate. Otherwise, the manifold pressure fluctuates automatically and does not maintain a steady rate. In COMMISSION mode, the MFC maintains a 100% (full input) heat demand with a second stage thermostat call and a 35% (minimum input) heat demand with a first stage call.

1. Turn off all power to the unit.
2. Using the outlet pressure port on the gas valve, connect a manometer to monitor the manifold pressure.
3. Remove the plastic cap covering the pressure adjustment rotary DIP switch.
4. Turn on power to the unit.
5. Set thermostat to call for second stage heat and start furnace.
6. If necessary, using a small flat-head screwdriver, turn the rotary DIP switch clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure.

   Note: When adjusting the rotary DIP switch, wait 1 second between steps to allow the software to register the change. If a change is not registered, the offset returns to its original setting.
7. After you have checked the manifold pressure at its highest setting, adjust the thermostat to call for the first stage heat to set the manifold pressure at its lowest setting.
8. Wait at least one minute for the furnace to step down to its lowest setting and adjust the manifold pressure, if necessary, using the same procedure in Step 6.
9. After you have checked the pressure, replace the plastic cap covering the rotary DIP switch.

Figure 90: Gas valve



Item	Description
A	Outlet
B	Outlet pressure tap, 1/8 in. – 27 NPT
C	5 pin plug (modulator)
D	1/4 in. x 0.032 in. thk male spade terminals (2) – main and common
E	Inlet
F	On/Off switch
G	Inlet pressure tap, 1/8 in. – 27 NPT
H	Regulator cap (regulator adjustment rotary dip switch beneath)

Adjustment of temperature rise

The temperature rise (the difference of temperature between the mixed air entering the furnace and the heated air leaving the furnace) must lie within the range shown on the unit rating plate and the data in the physical data tables when the unit is operating as full input.

Air temperature rise should be determined when the furnace is firing at full input. Two stage furnaces require a second stage thermostat call. Modulating furnaces require a second

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stage thermostat call and the Modulating Furnace Control must be in COMMISSION mode to maintain full input.

After the temperature rise has been determined, you can calculate the CFM using the following formula:

$$CFM = \text{Btu Input} \cdot \frac{0.8}{(1.08 \cdot \Delta°F)}$$

After about 20 minutes of operation, determine the furnace temperature rise. Take readings of both the return air and the heated air in the ducts (about 6 feet from the furnace) where they will not be affected by radiant heat. Increase the blower CFM to decrease the temperature rise; decrease the blower CFM to increase the rise (See supply air drive adjustment).

Note: Each gas heat exchanger size has a minimum allowable CFM. Below this CFM, the limit will open.

Burners, orifices inspection, and servicing

Before checking or changing burners or orifices, **close main manual shut-off valve and shut off all power to the unit**.

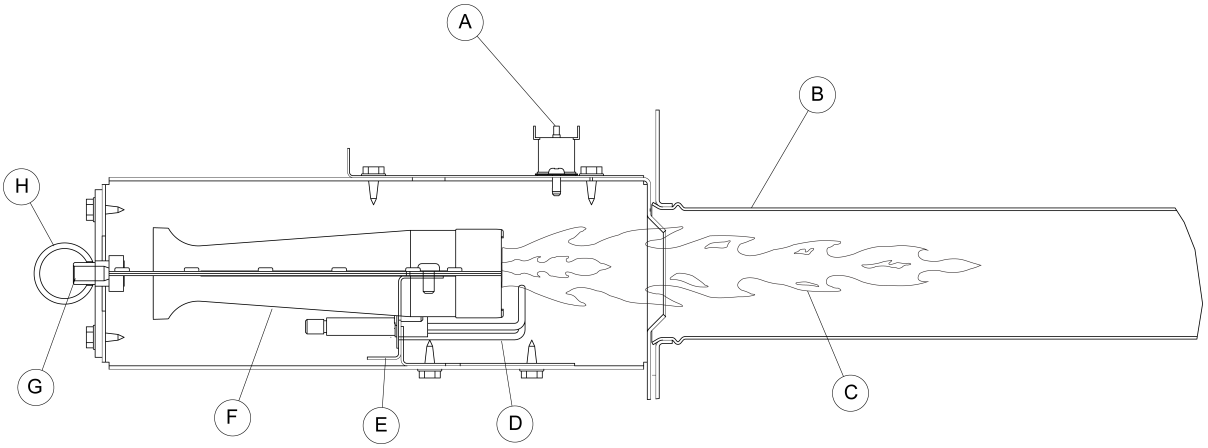
1. Open the union fitting just upstream of the unit gas valve and downstream from the main manual shut-off valve in the gas supply line.
2. Remove the screws holding each end of the manifold to the manifold supports.
3. Disconnect the wiring to the gas valve. Remove the manifold and gas valve assembly. The orifices can now be inspected or replaced.

   To service burners, complete step 4.
4. Remove the heat shield on top of the manifold supports. Burners are now accessible for inspection or replacement.

   Note: Reverse the previous procedure to replace the assemblies.

When reassembling, ensure that the burners are level and sit at the rear of the gas orifice.

Figure 91: Typical Flame



Item	Description
A	Roll out switch
B	Heat exchanger tube
C	Burner flame (blue only)
D	Ignitor
E	Burner bracket
F	Burner
G	Orifice
H	Manifold

Charging the unit

Table 55: KE13 charging table - system 1

Air flow Indoor DB/WB	Outdoor DB °F	Suction pressure psig	Suction temp °F	Liquid pressure psig	Liquid temp °F	Delta T indoor DB °F
300 Cfm/ Ton; 80/62	75	121	57	245	85	33
	85	122	57	285	92	32
	95	123	58	327	102	32
300 Cfm/ Ton; 80/67	75	132	61	249	86	28
	85	134	62	290	93	28
	95	135	63	332	103	27
300 Cfm/ Ton; 80/72	75	145	66	253	88	23
	85	146	67	295	94	23
	95	148	67	338	104	22
300 Cfm/ Ton; 75/62	75	120	56	247	82	28
	85	122	57	286	90	28
	95	123	58	328	100	27
400 Cfm/ Ton; 80/62	75	129	60	247	86	29
	85	130	61	288	94	28
	95	133	62	330	104	27
400 Cfm/ Ton; 80/67	75	139	64	252	86	24
	85	140	64	293	93	24
	95	142	65	336	103	23
400 Cfm/ Ton; 80/72	75	152	68	257	88	19
	85	153	69	298	94	19
	95	155	70	342	103	18
400 Cfm/ Ton; 75/62	75	127	59	249	83	24
	85	128	60	289	91	24
	95	129	61	331	101	23

Table 56: KE13 charging table - system 2

Air flow Indoor DB/WB	Outdoor DB °F	Suction pressure psig	Suction temp °F	Liquid pressure psig	Liquid temp °F	Delta T indoor DB °F
300 Cfm/ Ton; 80/62	75	124	59	267	83	33
	85	125	59	311	91	32
	95	127	61	356	101	32
300 Cfm/ Ton; 80/67	75	136	63	272	85	28
	85	138	64	316	93	28
	95	140	65	362	103	27
300 Cfm/ Ton; 80/72	75	149	68	277	87	23
	85	151	68	322	95	23
	95	153	70	368	105	22
300 Cfm/ Ton; 75/62	75	124	58	268	82	28
	85	125	59	312	91	28
	95	127	60	357	101	27
400 Cfm/ Ton; 80/62	75	131	61	270	84	29
	85	132	62	314	92	28
	95	134	63	358	103	27
400 Cfm/ Ton; 80/67	75	144	66	276	86	24
	85	145	67	320	94	24
	95	147	68	366	104	23
400 Cfm/ Ton; 80/72	75	158	70	281	87	19
	85	159	71	327	95	19
	95	161	72	374	105	18
400 Cfm/ Ton; 75/62	75	131	61	271	83	24
	85	133	62	316	91	24
	95	134	63	361	101	23

Table 57: KE15 charging table - system 1

Air flow Indoor DB/WB	Outdoor DB °F	Suction pressure psig	Suction temp °F	Liquid pressure psig	Liquid temp °F	Delta T indoor DB °F
300 Cfm/ Ton; 80/62	75	115	57	263	88	33
	85	117	58	305	97	32
	95	118	59	350	106	32
300 Cfm/ Ton; 80/67	75	126	62	268	90	28
	85	128	62	311	98	28
	95	129	63	357	107	27
300 Cfm/ Ton; 80/72	75	138	66	274	91	23
	85	140	67	317	100	23
	95	141	68	364	108	22
300 Cfm/ Ton; 75/62	75	115	57	265	86	28
	85	117	58	306	95	28
	95	118	58	352	105	27
400 Cfm/ Ton; 80/62	75	123	60	266	91	29
	85	125	61	308	99	28
	95	127	62	354	108	27
400 Cfm/ Ton; 80/67	75	133	64	272	89	24
	85	134	65	315	98	24
	95	135	65	361	108	23
400 Cfm/ Ton; 80/72	75	145	69	277	91	19
	85	146	69	321	100	19
	95	147	70	368	108	18
400 Cfm/ Ton; 75/62	75	121	60	268	86	24
	85	122	60	309	96	24
	95	124	61	355	105	23

Table 58: KE15 charging table - system 2

Air flow Indoor DB/WB	Outdoor DB °F	Suction pressure psig	Suction temp °F	Liquid pressure psig	Liquid temp °F	Delta T indoor DB °F
300 Cfm/ Ton; 80/62	75	120	56	276	87	33
	85	121	57	318	97	32
	95	123	58	364	106	32
300 Cfm/ Ton; 80/67	75	132	61	281	90	28
	85	133	62	324	99	28
	95	135	63	371	109	27
300 Cfm/ Ton; 80/72	75	144	65	288	92	23
	85	146	66	331	101	23
	95	148	67	379	111	22
300 Cfm/ Ton; 75/62	75	119	56	276	86	28
	85	121	57	319	96	28
	95	123	58	366	106	27
400 Cfm/ Ton; 80/62	75	127	59	279	89	29
	85	128	60	321	98	28
	95	130	61	367	109	27
400 Cfm/ Ton; 80/67	75	139	64	285	90	24
	85	141	64	329	100	24
	95	143	65	375	110	23
400 Cfm/ Ton; 80/72	75	152	68	292	93	19
	85	154	69	336	102	19
	95	156	70	384	111	18
400 Cfm/ Ton; 75/62	75	127	59	280	87	24
	85	128	60	323	97	24
	95	130	60	369	106	23

Table 59: KE18 charging table - system 1

Air flow Indoor DB/WB	Outdoor DB °F	Suction pressure psig	Suction temp °F	Liquid pressure psig	Liquid temp °F	Delta T indoor DB °F
300 Cfm/ Ton; 80/62	75	117	55	246	76	33
	85	118	56	287	86	32
	95	120	56	332	96	32
300 Cfm/ Ton; 80/67	75	128	59	248	76	28
	85	129	60	289	86	28
	95	131	61	336	96	27
300 Cfm/ Ton; 80/72	75	139	64	250	77	23
	85	141	64	293	87	23
	95	143	65	340	96	22
300 Cfm/ Ton; 75/62	75	116	55	247	76	28
	85	118	55	288	86	28
	95	119	56	333	96	27
400 Cfm/ Ton; 80/62	75	123	57	246	76	29
	85	125	58	287	86	28
	95	127	59	333	96	27
400 Cfm/ Ton; 80/67	75	134	62	250	77	24
	85	135	62	293	86	24
	95	137	63	339	96	23
400 Cfm/ Ton; 80/72	75	146	66	253	77	19
	85	147	67	296	87	19
	95	149	67	343	96	18
400 Cfm/ Ton; 75/62	75	122	57	248	76	24
	85	124	58	290	86	24
	95	125	58	335	96	23

Table 60: KE18 charging table - system 2

Air flow Indoor DB/WB	Outdoor DB °F	Suction pressure psig	Suction temp °F	Liquid pressure psig	Liquid temp °F	Delta T indoor DB °F
300 Cfm/ Ton; 80/62	75	121	57	243	74	33
	85	123	58	287	84	32
	95	124	59	333	94	32
300 Cfm/ Ton; 80/67	75	132	61	244	75	28
	85	134	62	290	84	28
	95	136	63	338	94	27
300 Cfm/ Ton; 80/72	75	145	66	246	75	23
	85	147	67	294	84	23
	95	149	67	343	94	22
300 Cfm/ Ton; 75/62	75	121	56	246	74	28
	85	123	57	288	84	28
	95	124	59	337	94	27
400 Cfm/ Ton; 80/62	75	128	59	244	74	29
	85	129	60	288	84	28
	95	131	61	334	94	27
400 Cfm/ Ton; 80/67	75	140	64	247	75	24
	85	141	65	294	84	24
	95	143	66	341	94	23
400 Cfm/ Ton; 80/72	75	152	68	249	75	19
	85	154	69	298	84	19
	95	156	70	347	94	18
400 Cfm/ Ton; 75/62	75	128	59	248	74	24
	85	129	60	291	84	24
	95	131	61	340	94	23

Table 61: KE20 charging table - system 1

Air flow Indoor DB/WB	Outdoor dry bulb °F	Suction pressure psig	Suction temp °F	Liquid pressure psig	Liquid temp °F	Delta T indoor DB °F
300 Cfm/ Ton; 80/62	75	115	54	254	77	33
	85	117	55	296	86	32
	95	118	56	342	96	32
300 Cfm/ Ton; 80/67	75	126	58	257	77	28
	85	128	59	299	87	28
	95	130	60	345	96	27
300 Cfm/ Ton; 80/72	75	138	63	258	78	23
	85	140	64	302	87	23
	95	142	65	349	97	22
300 Cfm/ Ton; 75/62	75	115	54	255	77	28
	85	116	54	297	86	28
	95	118	55	343	96	27
400 Cfm/ Ton; 80/62	75	122	57	256	77	29
	85	123	58	297	87	28
	95	125	58	343	96	27
400 Cfm/ Ton; 80/67	75	134	61	259	77	24
	85	135	62	301	87	24
	95	137	63	348	97	23
400 Cfm/ Ton; 80/72	75	145	66	261	78	19
	85	147	67	305	87	19
	95	149	68	352	97	18
400 Cfm/ Ton; 75/62	75	122	57	257	77	24
	85	123	57	299	86	24
	95	125	58	345	96	23

Table 62: KE20 charging table - system 2

Air flow Indoor DB/WB	Outdoor DB °F	Suction pressure psig	Suction temp °F	Liquid pressure psig	Liquid temp °F	Delta T indoor DB °F
300 Cfm/ Ton; 80/62	75	117	55	256	80	33
	85	118	56	299	91	32
	95	120	57	345	101	32
300 Cfm/ Ton; 80/67	75	128	59	258	81	28
	85	129	60	302	91	28
	95	131	61	349	102	27
300 Cfm/ Ton; 80/72	75	140	64	261	82	23
	85	142	65	305	92	23
	95	144	66	353	102	22
300 Cfm/ Ton; 75/62	75	116	55	257	80	28
	85	118	56	299	91	28
	95	120	57	346	101	27
400 Cfm/ Ton; 80/62	75	124	58	258	81	29
	85	125	59	300	91	28
	95	127	60	346	102	27
400 Cfm/ Ton; 80/67	75	135	62	261	81	24
	85	137	63	304	91	24
	95	138	64	351	102	23
400 Cfm/ Ton; 80/72	75	147	67	263	82	19
	85	149	67	308	92	19
	95	150	68	356	102	18
400 Cfm/ Ton; 75/62	75	123	58	259	80	24
	85	125	58	302	91	24
	95	126	59	348	101	23

Table 63: KE23 charging table - system 1

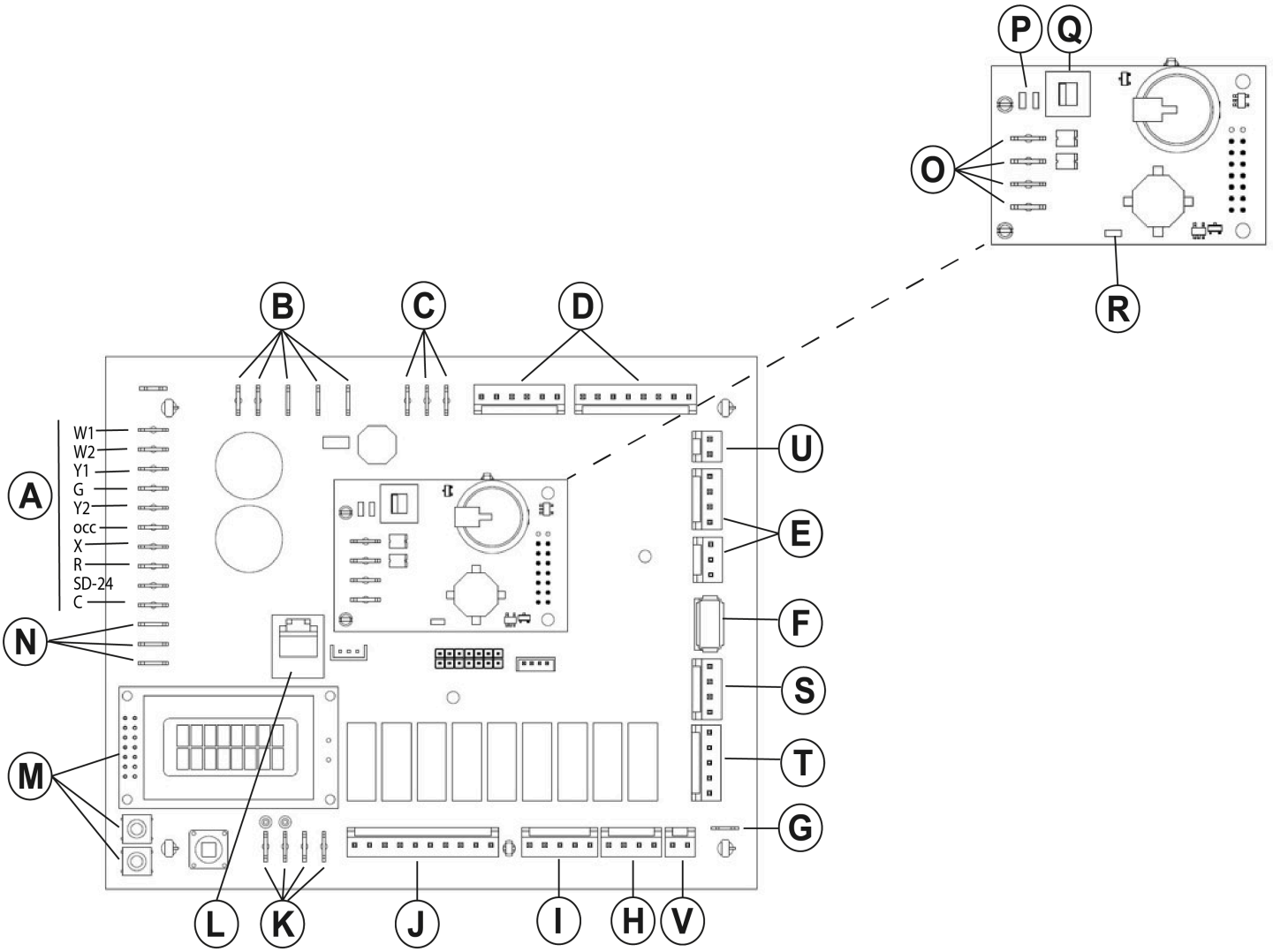
Air flow Indoor DB/WB	Outdoor DB °F	Suction pressure psig	Suction temp °F	Liquid pressure psig	Liquid temp °F	Delta T indoor DB °F
300 Cfm/ Ton; 80/62	75	112	52	256	78	33
	85	113	53	298	88	32
	95	115	54	344	98	32
300 Cfm/ Ton; 80/67	75	123	57	259	79	28
	85	124	58	301	89	28
	95	126	59	348	99	27
300 Cfm/ Ton; 80/72	75	135	62	261	81	23
	85	136	62	305	90	23
	95	138	63	352	100	22
300 Cfm/ Ton; 75/62	75	112	52	257	78	28
	85	113	53	299	88	28
	95	115	54	345	98	27
400 Cfm/ Ton; 80/62	75	119	55	258	79	29
	85	120	56	300	89	28
	95	121	57	346	99	27
400 Cfm/ Ton; 80/67	75	130	60	261	80	24
	85	131	60	304	89	24
	95	133	61	351	99	23
400 Cfm/ Ton; 80/72	75	142	64	264	81	19
	85	143	65	308	91	19
	95	145	66	355	100	18
400 Cfm/ Ton; 75/62	75	118	55	259	78	24
	85	120	56	301	88	24
	95	121	56	348	98	23

Table 64: KE23 charging table - system 2

Air flow Indoor DB/WB	Outdoor DB °F	Suction pressure psig	Suction temp °F	Liquid pressure psig	Liquid temp °F	Delta T indoor DB °F
300 Cfm/ Ton; 80/62	75	119	56	253	76	33
	85	121	57	294	86	32
	95	123	58	340	96	32
300 Cfm/ Ton; 80/67	75	131	60	256	77	28
	85	133	61	297	87	28
	95	134	62	343	97	27
300 Cfm/ Ton; 80/72	75	143	65	258	77	23
	85	145	66	301	87	23
	95	147	67	347	97	22
300 Cfm/ Ton; 75/62	75	119	56	253	76	28
	85	121	57	295	86	28
	95	123	58	341	96	27
400 Cfm/ Ton; 80/62	75	127	59	255	77	29
	85	128	60	296	87	28
	95	130	61	341	97	27
400 Cfm/ Ton; 80/67	75	138	63	258	77	24
	85	140	64	300	87	24
	95	142	65	346	97	23
400 Cfm/ Ton; 80/72	75	151	67	261	77	19
	85	152	68	303	87	19
	95	154	69	350	97	18
400 Cfm/ Ton; 75/62	75	126	58	256	76	24
	85	128	59	298	86	24
	95	129	60	343	96	23

Smart Equipment unit control board

Figure 92: Unit control board



The following tables describe the details of the UCB, see the previous figure for the connection locations.

Table 65: Smart Equipment UCB - thermostat connection strip

Location	Label	Description	Function and comments
A	W1	1st stage heating request, 24 VAC input switched from R	Not effective for cooling-only units
	W2	2nd stage heating request, 24 VAC input switched from R	Not effective for cooling-only units or units with single-stage heat sections
	Y1	1st stage cooling request, 24 VAC input switched from R	
	Y2	2nd stage cooling request, 24 VAC input switched from R	Visible in the display menu when the #ClgStgs parameter is set for 2 or more, also effective for economizer free cooling supply air temperature reset when the #ClgStgs parameter is set for one or more
	G	Continuous indoor blower request, 24 VAC input switched from R	
	OCC	Occupancy request, 24 VAC input switched from R	Must have the OccMode parameter set for external to be effective
	X	Hard lockout indicator, 24 volt output to a light thermostat LED	
	R	24 VAC hot for thermostat switching and power	If field-added external accessories for unit shutdown are used, 24 VAC hot return from smoke detector, or user shutdown relay switching in series
	SD-24	If field-added external accessories for unit shutdown are used, 24 VAC hot out for smoke detector, or user shutdown relay switching in series.	Unit wiring harness jumper plug for factory shutdown accessories must be removed if the switching of field-added external accessories for unit shutdown are wired between the thermostat connection strip SD-24 and R.
	C	24 VAC common for thermostat power	
	+	MOD BUS	Future
	-	MOD BUS	Future
	C	MOD BUS	Future

Table 66: Smart Equipment UCB - limit, 24 VAC power, and shutdown connections

Location	Label	Description	Function and comments
B	LIMIT	Monitored 24 VAC input through heat section limit switch(es)	If voltage is absent, indicating the heat section is over-temperature, the UCB turns on the indoor blower.
	C	24 VAC, 75 VA transformer Common referenced to cabinet ground	Connects through circuit traces to thermostat connection strip C and indoor blower VFD pin C.
	24V	24 VAC, 75 VA transformer hot	Powers the UCB microprocessor, that connects through circuit trace to the SD 24 terminal.
	SD 24	24 VAC hot out for factory accessory smoke detector, and/or user shutdown relay switching in series	Connects through the circuit trace to the thermostat connection strip SD-24. A wiring harness jumper plug connecting SD 24 to SD R is in place if the factory accessories for unit shutdown are not used - this jumper plug must be removed if the switching of field-added external accessories for unit shutdown are wired between the thermostat connection strip SD-24 and R.
	SD R	24 VAC hot return from factory accessory smoke detector, and user shutdown relay switching in series	Connects through the circuit trace to the R terminal on the upper left of the board.
	R	24 VAC hot for switched inputs to the UCB	Connects through the circuit trace to the thermostat connection strip R terminal, right FAN OVR pin, right HPS1 pin, right HPS2 pin, lower DFS pin and lower APS pin.

Table 67: Smart Equipment UCB - space temperature sensor connections

Location	Label	Description	Function and comments
C	ST	Space Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor.	Positive of VDC circuit, 3.625 VDC reading to COM with open circuit, is effective if the thermostat only control parameter is set to OFF, space sensor override momentary shorts ST to COM to initiate and terminate temporary occupancy.
	COM	Common for ST and SSO inputs	Negative of VDC circuit for ST and SSO inputs.
	SSO	Space Sensor Offset input from 0 to 20KΩ potentiometer	Positive of VDC circuit (3.625 VDC reading to COM with open circuit), 10KΩ/2.5 VDC is 0°F offset, 0Ω/0 VDC is maximum above offset and 20KΩ/3.4 VDC is maximum below offset from active space temperature setpoint

Table 68: Smart Equipment UCB - temperature sensor connections

Location	Label	Description	Function and comments
D	SAT+	Supply Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading SAT+ to SAT– with open circuit. Used in heat/cool staging cutouts, free cooling operation, demand ventilation operation, comfort ventilation operation, economizer loading operation, VAV cooling operation, hydronic heat operation.
	RAT+	Return Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading RAT+ to RAT– with open circuit. Used in return air enthalpy calculation. Substitutes for space temperature if no other space temperature input is present.
	OAT+	Outside Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation but may be a communicated value; 3.625 VDC reading OAT+ to OAT– with open circuit. Used in heat/cool cutouts, low ambient cooling determination, dry bulb free cooling changeover, outside air enthalpy calculation, economizer loading operation, heat pump demand defrost calculation.
	CC1+	#1 refrigerant circuit Condenser Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for heat pump units, not required for A/C units; 3.625 VDC reading CC1+ to CC1– with open circuit. Used in heat pump demand defrost calculation.
	EC1+	#1 refrigerant circuit Evaporator Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading EC1+ to EC1– with open circuit. Used in suction line temperature safety.
	CC2+	#2 refrigerant circuit Condenser Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for 2-compressor heat pump units, not required for 2-compressor A/C units, not active for 1-compressor units; 3.625 VDC reading CC2+ to CC2– with open circuit. Used in heat pump demand defrost calculation.
	EC2+	#2 refrigerant circuit Evaporator Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation of 2-compressor units, not active for 1-compressor units; 3.625 VDC reading EC2+ to EC2– with open circuit. Used in suction line temperature safety.

Table 69: Smart Equipment UCB - pinned connections

Location	Label	Description	Function and comments
E	RAH+	Return Air Humidity input from 0-10 VDC @ 0-100% RH sensor	Input required for reheat units, optional in all other units, may be a communicated value. Used in return air enthalpy calculation, temperature/humidity setpoint reset, reheat operation.
	DCT PRS+	Supply Duct Pressure input from 0-5 VDC @ 0-5" w.c. sensor	Input required for variable air volume units. Used in VAV indoor blower operation.
	C	Common for the VFD output	Negative of the VDC circuit for the VFD output
	VFD	2-10 VDC (0-100%) output for the indoor blower Variable Frequency Drive	Output is active with indoor blower operation. For CV units: this output provides stepped IntelliSpeed control of the indoor blower VFD based on fan-only, cooling stage and heating stage outputs. For VAV units: this output provides control of the indoor blower VFD based on supply duct static pressure input and setpoint.
	VFDFLT	24 VAC hot input from the normally open VFD alarm contact	The VFD alarm contact switches from R within the unit wiring harness. 24 VAC input results in unit shutdown and a "VFD fault" alarm

Table 70: Smart Equipment UCB - USB connector

Location	Label	Description	Function and comments
F	J10	Type A female Universal Serial Bus connector	Used for backup, restoration, and copying of board parameters as well as board software updating through a flash drive
	J15	Factory wired SA Bus connector	

Table 71: Smart Equipment UCB - 24 V terminal

Location	Label	Description	Function and comments
G	24V FOR OUTPUTS	24 VAC hot for H1, H2, CN-FAN, AUX HGR, FAN C1 and C2 output relay contact switching	Output relay circuitry is isolated from other UCB components and the 24 VAC hot source may be from a second transformer in the unit

Table 72: Smart Equipment UCB - heat section connections

Location	Label	Description	Function and comments
H	H1	24 VAC hot output for heat section stage 1	Not effective for cooling-only units. Output if demand is present and permissions allow one stage or two stages of heat section operation
	H2	24 VAC hot output for heat section stage 2	Not effective for cooling-only units or units with single-stage heat sections. Output if demand is present and permissions allow two stages of heat section operation
	MV	24 VAC hot input confirming heat section operation	Sourced from gas valve in gas heat units or first stage heat contactor in electric heat units. Input within 5 minutes from initiation of H1 output initiates the "Heat On Fan Delay" timer, loss of input following the termination of H1 output initiates the "Heat On Fan Delay" timer, no input within 5 minutes from initiation of H1 output initiates an "Ignition Failure" alarm, input for longer than 5 minutes without H1 output initiates a "Gas Valve Mis-wire" alarm

Table 73: Smart Equipment UCB - pin cooling and fan output

Location	Label	Description	Function and comments
I	CN-FAN	24 VAC hot output for the condenser fan contactor coil	Output with C1 output (not used in ultra-high efficiency units)
	AUX HGR	24 VAC hot output for hot gas reheat components	Effective only for reheat units, output with reheat operation
	FAN	24 VAC hot output for indoor blower contactor coil/indoor blower VFD enable relay coil	Output with heat/cool operation, G input or schedule demand
	C1	24 VAC hot output for compressor 1	If demand is present and permissions allow compressor 1 operation; output with compressor cooling, comfort ventilation cooling, reheat or heat pump heating demands
	C2	24 VAC hot output for compressor 2	Not effective for one stage compressor UCBs. If demand is present and permissions allow compressor 2 operation; output with compressor cooling, comfort ventilation cooling or heat pump heating demands

Table 74: Smart Equipment UCB - refrigerant circuit safety switch and indoor blower overload connections

Location	Label	Description	Function and comments
J	HPS1 (right pin)	24 VAC hot out for refrigerant circuit 1 High Pressure Switch	Connects through circuit trace to the R terminal
	HPS1 (left pin)	24 VAC hot return from refrigerant circuit 1 High Pressure Switch	Input is only considered if C1 output is needed; input must be present to allow C1 output. Three HPS1 trips in a two hour period cause a “High Pressure Switch 1 Lockout” and C1 output is then prevented until alarm reset. Connects through circuit trace to the right LPS1 pin.
	LPS1 (right pin)	24 VAC hot out for refrigerant circuit 1 Low Pressure Switch	Connects through circuit trace to the left HSP1 pin
	LPS1 (left pin)	24 VAC hot return from refrigerant circuit 1 Low Pressure Switch	Input is only considered after 30 seconds of C1 output; afterwards, input must be present to allow C1 output. Three LPS1 trips in a one hour period cause a “Low Pressure Switch 1 Lockout” and C1 output is then prevented until alarm reset.
	HPS2 (right pin)	24 VAC hot out for refrigerant circuit 2 High Pressure Switch	Not effective for one stage compressor UCBs. Connects through circuit trace to the R terminal
	HPS2 (left pin)	24 VAC hot return from refrigerant circuit 2 High Pressure Switch	Not effective for one stage compressor UCBs. Input is only considered if C2 output is needed; input must be present to allow C1 output. Three HPS2 trips in a two hour period cause a “High Pressure Switch 1 Lockout” and C2 output is then prevented until alarm reset. Connects through circuit trace to the right LPS2 pin.
	LPS2 (right pin)	24 VAC hot out for refrigerant circuit 2 Low Pressure Switch	Not effective for one stage compressor UCBs. Connects through circuit trace to the left HSP2 pin
	LPS2 (left pin)	24 VAC hot return from refrigerant circuit 2 Low Pressure Switch	Not effective for one stage compressor UCBs. Input is only considered after 30 seconds of C2 output; afterwards, input must be present to allow C2 output. Three LPS2 trips in a one hour period cause a “Low Pressure Switch 2 Lockout” and C2 output is then prevented until alarm reset.
	FAN OVR (right pin)	24 VAC hot out for indoor blower FAN Overload relay contact/ motor protector switch	Connects through circuit trace to the R terminal
	FAN OVR (left pin)	24 VAC hot return from indoor blower FAN Overload relay contact/motor protector switch	Input is only considered if FAN output is needed; input must be present to allow FAN output and unit operation. One FAN OVR trip lasting longer than 5 minutes or three FAN OVR trips in a two hour period cause a “Fan Overload Lockout” and unit operation is then prevented until alarm reset.

Table 75: Smart Equipment UCB - SA BUS connections

Location	Label	Description	[1]Function and comments
K	PWR	Power for SA (“Sensor-Actuator”) BUS devices	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Positive of the 15 VDC (reading to C) circuit for powering an optional netstat and/or Multi Touch gateway
	C	Common for SA BUS power and communication circuits	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Negative of the SA BUS circuits
	–	Communication for SA BUS devices	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to C; at least 0.25 volts lower than +) SA BUS communication circuit to optional economizer board, 4-stage board, fault detection and diagnostics board, netstat and/or Multi Touch gateway
	+	Communication for SA BUS devices	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to C; at least 0.25 volts higher than –) SA BUS communication circuit to optional economizer board, 4-stage board, fault detection and diagnostics board, netstat and/or Multi Touch gateway
L	J8	6-pin phone jack connector	Incorporates the SA BUS terminals for convenience/alternate connection of SA BUS devices, primarily used for temporary service connection of the Multi Touch gateway

1 When wiring unit and other devices using the SA Bus and FC Bus, see Cable type for FC buses and SA buses in order of preference.

Table 76: Smart Equipment UCB - user interface

Location	Label	Description	Function and comments
M	Display	On-board, 2-line x 8-character back-lit display	On-board display, buttons and joystick allow access to UCB, economizer, 4-stage and FDD board parameters
	ENTER	Button for display menu acknowledgment and navigation	
	CANCEL	Button for display menu navigation and zeroing of active compressor ASCD timer	
	JOY	4-way Joystick for display menu navigation	

Table 77: Smart Equipment UCB - LEDs

Location	Label	Description	Function and comments
N	POWER	Green UCB power indicator	Lit indicates 24 VAC is present at C and 24V terminals
	FAULT	Red hard lockout, networking error and firmware error indicator	1/2 second on/off flashing indicates one or more alarm is currently active, 1/10th second on/off flashing indicates a networking error (polarity, addressing) or a firmware error (likely correctable with re-loading from USB flash drive)
	SA BUS	Green UCB SA bus communication transmission indicator	Lit/flickering indicates UCB SA bus communication is currently active, off indicates the UCB is awaiting SA bus communication

Table 78: Smart Equipment UCB - optional communication sub-board

Location	Label	Description	Function and comments
O Terminal FC BUS connections	FC+	FC (“Field Connected”) BUS BACnet MSTP communication	Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to COM; at least 0.25 volts higher than –) FC bus BACnet MSTP communication circuit
	FC–	FC (“Field Connected”) BUS BACnet MSTP communication	Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to COM; at least 0.25 volts lower than +) FC bus BACnet MSTP communication circuit
	COM	Common for the FC (“Field Connected”) BUS BACnet MSTP communication circuit	Negative of the VDC FC bus BACnet MSTP communication circuit
	SHLD	Shield for the FC (“Field Connected”) BUS BACnet MSTP communication circuit	Earth ground reference of the cable to prevent interference on the FC bus BACnet MSTP communication circuit
Q	EOL switch	End Of Line selector switch for the FC BUS BACnet MSTP communication circuit	ON selected only for the UCB that is the terminus of the FC bus BACnet MSTP communication cable to prevent signal “bounce-back”
P	EOL	Green End Of Line indicator	Lit indicates the EOL switch is selected ON
	FC BUS	Green FC bus communication transmission indicator	Lit/flickering indicates outgoing UCB FC bus communication is currently active, off indicates the UCB is awaiting incoming FC bus communication
R	ISO PWR	Green communication board Isolated Power indicator	Lit indicates the UCB is supplying power to the communication sub-board

Table 79: Smart Equipment UCB - pinned connections

Location	Label	Description	Function and comments
S	COS	Condensate Overflow Switch	COS is 24V input that senses the switch is closed if 24V is present. Binary Input – just senses 24V on/off. If COS opens, the compressor outputs are disabled. When COS is closed, compressors run normally. COS can be enabled/disabled by a menu option on the control board.
	R	R pin is 24V supply to the switch	Connects through circuit trace to the R terminal
	RDS	Refrigerant Detection System or Switch	If the switch opens, the control shuts off all outputs, except the indoor blower. Energizes the indoor blower, if it was off at the time. If the switch re-closes, there will be a five minute delay, then return to normal operation. For products without an RDS, these pins must be jumpered. There are no menu options to turn this function off.
	R	R pin is 24V supply to the Sensor	Connects through circuit trace to the R terminal

Table 80: Smart Equipment UCB - pinned connections

Location	Label	Description	Function and comments
T	DFS (upper pin)	24 VAC hot return from Dirty Filter Switch	Optional input; switch closure for greater than 15 seconds during indoor blower operation initiates a notification alarm
	DFS (lower pin)	24 VAC hot out for Dirty Filter Switch	Connects through circuit trace to the R terminal
	APS (upper pin)	24 VAC hot return from Air Proving Switch	When this optional input is enabled: the air proving switch must close within 30 seconds of initiation of indoor blower operation and not open for greater than 10 seconds during indoor blower operation to allow heat/cool operation and prevent an “APS open” alarm; the air proving switch must open within 30 seconds of termination of indoor blower operation to prevent an “APS stuck closed” notification alarm
	APS (lower pin)	24 VAC hot out for Air Proving Switch	Connects through circuit trace to the R terminal

Table 81: Smart Equipment UCB - pinned connections

Location	Label	Description	Function and comments
U	AI1 +	Not used	Not used
	AI1 -	Not used	Not used

Table 82: Smart Equipment UCB - pinned connections

Location	Label	Description	Function and comments
V	BO1	Not used	Not used
	BO2	Not used	Not used

Table 83: Smart Equipment UCB - Unique Equipment Identifier (UEI) settings

Unique Equipment Identifier				
Model	Tonnage	4-stage compressor layout		UEI*
		Circuit 1	Circuit 2	
KW/KE/LW/LE	13	Inverter	2	6
	15	Inverter	2	6
	18	Inverter	1	7
	20	Inverter	1	7
	23	Inverter	1	7

*Enum Member	Config Description in SSE
UEI=0	Standard
UEI=3	2-Stage Cir 1, Single Cir 2
UEI=4	Tandem Cir 1, Single Cir 2
UEI=7	Single ModCir1 with Single Cir 2
UEI=6	Single ModCir1 with 2-Stage Cir 2

Table 84: Cable for FC buses and SA buses in order of preference

Bus and cable type	Non-plenum applications		Plenum applications	
	Part number	O.D.	Part number	O.D.
[1]FC Bus: 22 AWG stranded, 3-wire twisted shielded cable[2]	Anixter: CBL-22/3-FC-PVC Belden®: B5501FE	0.138 in.	Anixter: CBL-22/3-FC-PLN Belden: B6501FE	0.140 in.
SA Bus (Terminal Block): 22 AWG stranded, 4-wire, two twisted-pair shielded cable	Anixter: CBL-22/2P-SA-PVC Belden: B5541FE	0.209 in.	Anixter: CBL-22/2P-SA-PLN Belden: B6541FE	0.206 in.
SA Bus (Modular Jack): [2]26 AWG solid six-wire, three twisted-pair cable[2]	—	—	Anixter preassembled: CBL-NETWORK25 CBL-NETWORK50 CBL-NETWORK75 CBL-NETWORK100	0.15 in.

Table 84: Cable for FC buses and SA buses in order of preference

Bus and cable type	Non-plenum applications		Plenum applications	
	Part number	O.D.	Part number	O.D.
FC Bus: 22 AWG stranded, 3-wire twisted non-shielded cable	Belden: B5501UE	0.135 in.	Belden: B6501UE	0.131 in.
SA Bus (Terminal Block): 22 AWG stranded, 4-wire, two twisted-pair non-shielded cable	Belden: B5541UE	0.206 in.	Belden: B6541UE	0.199 in.

1 Use a 3-wire (for FC bus) and 4-wire, 2 twisted-pair (for SA bus), 22 AWG stranded, shielded cable. A 22 gauge cable offers the best performance for various baud rates, cable distances, and number of trunk devices primarily due to lower conductor-to-conductor capacitance. Shielded cable offers better overall electrical noise immunity than non-shielded cable. Observe the shield grounding requirements.

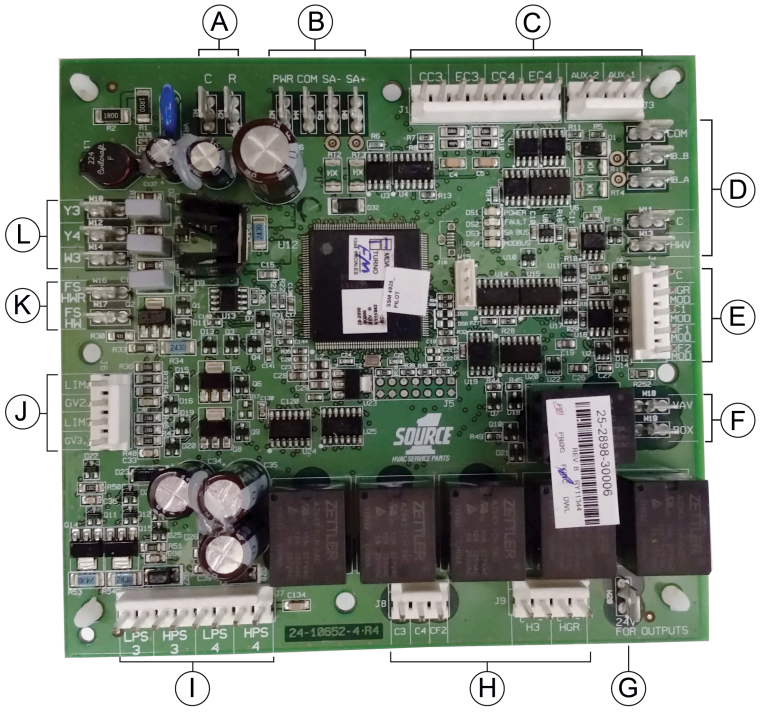
2 Use a 26 AWG solid, 6-wire (3 twisted pairs) cable as the best fit for fabricating modular cables with the modular jack housing assembly. Be sure the cable you use fits the modular jack housing. The preassembled cables that are available from Anixter (Part No. CBL-NETWORKxxx) use 24 gauge wire.

Table 85: Ignition control flash codes

Flashes	Fault conditions	Check
Steady on	Control failure	Control
Heartbeat	Normal operation	
1	Not applicable	
2	Pressure switch stuck closed	Pressure switch
3	Pressure switch failed to close	Venter pressure switch vent blocked
4	Limit switch open	Main limit AUX limit
5	Flame present with gas off first stage gas valve Energized with W1 off second stage gas valve Energized with first stage gas valve off	Gas valve
6	Ignition lockout	Gas Flow Gas pressure Gas valve Flame Sensor
Steady off	No power or control failure	24VAC or control

Four-stage board

Figure 93: Four-stage board



The following tables describe the details of the four-stage board, see the previous figure for the connection locations.

Table 86: Four-stage board - power and communication terminals

Location	Label	Description	Function and comments
A	C	24VAC common for 4-stage board power	
	R	24VAC hot for 4-stage board power	
B	PWR	Sensor Actuator (SA) Bus Power for SA bus devices	Not used on 4-stage board
	COM	Common for SA BUS power and communication circuits	Negative of the SA BUS circuits
	SA-	Communication for SA BUS devices	Negative of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to C; at least 0.25 volts lower than +) SA BUS communication circuit to optional economizer board, 4-stage board, fault detection and diagnostics board, netstat and/or MAP Gateway
	SA+	Communication for SA BUS devices	Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to C; at least 0.25 volts higher than –) SA BUS communication circuit to optional economizer board, 4-stage board, fault detection and diagnostics board, netstat and/or MAP Gateway

Table 87: Four-stage board - temperature sensor connections

Location	Label	Description	Function and comments
C	CC3+	#3 refrigerant circuit Condenser Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for heat pump units, not required for A/C units; 3.625 VDC reading CC3+ to CC3– with open circuit. Used in heat pump demand defrost calculation.
	EC3+	#3 refrigerant circuit Evaporator Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading EC3+ to EC3– with open circuit. Used in suction line temperature safety.
	CC4+	#4 refrigerant circuit Condenser Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for heat pump units, not required for A/C units; 3.625 VDC reading CC4+ to CC4– with open circuit. Used in heat pump demand defrost calculation.
C	EC4+	#4 refrigerant circuit Evaporator Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading EC4+ to EC4– with open circuit. Used in suction line temperature safety.
	AUX-2+	Not used	Not used
	AUX-1+	Not used	Not used

Table 88: Four-stage board - quick connect

Location	Label	Description	Function and comments
D	COM	Common for Modbus connection to staged heat board	Future
	MB_B	Terminal B for Modbus connection to staged heat board	Future
	MB_A	Terminal A for Modbus connection to staged heat board	Future
	C	Common for HW Valve connection	0-10VDC
	HWV	Analog out for HW Valve	0-10VDC
F	VAV	VAV box Common relay contact	Used to interlock the VAV boxes with RTU morning warm-up
	BOX	VAV box normally open relay contact	Used to interlock the VAV boxes with RTU morning warm-up

Table 89: Four-stage board - harness connectors

Location	Label	Description	Function and comments
E	C	Common for analog outputs	Common for analog outputs
	HGRMOD	0 VDC to 10 VDC analog output for hot gas reheat	Modulating HGR Valve Output
	C1MOD	0 VDC to 10 VDC analog output for C1 modulation	Variable Speed Compressor Output (For ultra-high efficiency unit only)
	CF1MOD	0 VDC to 10 VDC analog output for Condenser Fan 1 modulation	Variable Speed Condenser Fan 1 Output (For ultra-high efficiency unit only)
	CF2 MOD	0 VDC to 10 VDC analog output for Condenser Fan 2 modulation	Variable Speed Condenser Fan 2 Output (For ultra-high efficiency unit only)

Table 90: Four-stage board - outputs and cool and heat section connections

Location	Label	Description	Function and comments
G	24VFOR OUTPUTS	24 VAC hot for C3, C4, CF2, H3, and HGR	Output relay circuitry is isolated from other 4-stage components and the 24 VAC hot source may be from a second transformer in the unit
H	C3	24 VAC hot output for compressor 3	If demand is present and permissions allow compressor 3 operation
	C4	24 VAC hot output for compressor 4	If demand is present and permissions allow compressor 4 operation
	CF2	24 VAC hot output for the condenser fan contactor coil	Output with either C3 or C4 outputs. (not used in ultra-high efficiency unit units)
	H3	24 VAC hot output for heat section stage 3	Not effective for cooling-only units. Output if demand is present and permissions allow heat section operation
	HGR	24 VAC hot output for hot gas reheat	HGRH bleed valve output

Table 91: Four-stage board - refrigerant circuit safety switches

Location	Label	Description	Function and comments
I	LPS3 (right pin)	24 VAC hot out for refrigerant circuit 3 Low Pressure Switch	Connects through circuit trace to the left HSP3 pin
	LPS3 (left pin)	24 VAC hot return from refrigerant circuit 3 Low Pressure Switch	Input is only considered after 30 seconds of C3 output; afterwards, input must be present to allow C3 output. Three LPS3 trips in a one hour period cause a “Low Pressure Switch 3 Lockout” and C3 output is then prevented until alarm reset.
	HPS3 (right pin)	24 VAC hot out for refrigerant circuit 3 High Pressure Switch	Connects through circuit trace to the R terminal
	HPS3 (left pin)	24 VAC hot return from refrigerant circuit 3 High Pressure Switch	Input is only considered if C3 output is needed; input must be present to allow C3 output. Three HPS3 trips in a two hour period cause a “High Pressure Switch 3 Lockout” and C3 output is then prevented until alarm reset. Connects through circuit trace to the right LPS3 pin.
	LPS4 (right pin)	24 VAC hot out for refrigerant circuit 4 Low Pressure Switch	Connects through circuit trace to the left HSP4 pin
	LPS4 (left pin)	24 VAC hot return from refrigerant circuit 4 Low Pressure Switch	Input is only considered after 30 seconds of C4 output; afterwards, input must be present to allow C4 output. Three LPS4 trips in a one hour period cause a “Low Pressure Switch 4 Lockout” and C4 output is then prevented until alarm reset.
	HPS4 (right pin)	24 VAC hot out for refrigerant circuit 4 High Pressure Switch	Connects through circuit trace to the R terminal
	HPS4 (left pin)	24 VAC hot return from refrigerant circuit 4 High Pressure Switch	Input is only considered if C4 output is needed; input must be present to allow C4 output. Three HPS4 trips in a two hour period cause a “High Pressure Switch 4 Lockout” and C4 output is then prevented until alarm reset. Connects through circuit trace to the right LPS4 pin.

Table 92: Four-stage board - heat safety circuit

Location	Label	Description	Function and comments
J	LIM2	Monitored 24 VAC input through heat section limit switches	If voltage is absent, indicating the heat section is over temperature, the UCB will bring on the indoor blower
	GV2	24 VAC hot input confirming heat section operation	Sourced from gas valve 2 in gas heat units or second stage heat contactor in electric heat units. Input within 5 minutes from initiation of H2 output initiates the Heat On Fan Delay timer, loss of input following the termination of H2 output initiates the Heat On Fan Delay timer, no input within 5 minutes from initiation of H2 output initiates an Ignition Failure alarm, input for longer than 5 minutes without H2 output initiates a Gas Valve Mis-wire alarm
	LIM3	Monitored 24 VAC input through heat section limit switches	If voltage is absent, indicating the heat section is over temperature, the UCB will bring on the indoor blower
	GV3,4	24 VAC hot input confirming heat section operation	

Table 93: Four-stage board - hot water safety quick connects and thermostat inputs

Location	Label	Description	Function and comments
K	FSHWR	Flow switch for Hydronic heat – 24VAC hot output	Flow switch interlock for hot water coil or Oil Level Sensor input (For ultra-high efficiency unit unit only)
	FSHW	Flow switch for Hydronic heat – 24VAC hot return	Flow switch interlock for hot water coil or Oil Level Sensor input (For ultra-high efficiency unit unit only)
L	Y3	3rdstage cooling request, 24 VAC input switched from R	Visible in the display menu when the #ClgStgs parameter is set to 4, also effective for economizer free cooling supply air temperature reset when the #ClgStgs parameter is set to 4
	Y4	4thstage cooling request, 24 VAC input switched from R	Visible in the display menu when the #ClgStgs parameter is set to 4, also effective for economizer free cooling supply air temperature reset when the #ClgStgs parameter is set to 4
	W3	3rdstage heating request, 24 VAC input switched from R	Not effective for cooling-only units

Cable specifications

Table 94: Cable type for FC buses and SA buses in order of preference

Bus and cable type	Non-plenum applications		Plenum applications	
	Part number	O.D.	Part number	O.D.
[1]FC Bus: 22 AWG stranded, 3-wire twisted shielded cable[1]	Anixter: CBL-22/3-FC-PVC Belden®: B5501FE	0.138 in.	Anixter: CBL-22/3-FC-PLN Belden: B6501FE	0.140 in.
SA Bus (Terminal Block): 22 AWG stranded, 4-wire, 2 twisted-pair shielded cable	Anixter: CBL-22/2P-SA-PVC Belden: B5541FE	0.209 in.	Anixter: CBL-22/2P-SA-PLN Belden: B6541FE	0.206 in.
SA Bus (Modular Jack): [2]26 AWG solid 6-wire, 3 twisted-pair cable[2]	—	—	Anixter preassembled: CBL-NETWORK25 CBL-NETWORK50 CBL-NETWORK75 CBL-NETWORK100	0.15 in.
FC Bus: 22 AWG stranded, 3-wire twisted non-shielded cable	Belden: B5501UE	0.135 in.	Belden: B6501UE	0.131 in.
SA Bus (Terminal Block): 22 AWG stranded, 4-wire, 2 twisted-pair non-shielded cable	Belden: B5541UE	0.206 in.	Belden: B6541UE	0.199 in.

1 Use 3-wire for FC bus and 4-wire, 2 twisted-pair for SA bus, 22 AWG stranded, shielded cable. A 22 gauge cable offers the best performance for various baud rates, cable distances, and number of trunk devices primarily due to lower conductor-to-conductor capacitance. Shielded cable offers better overall electrical noise immunity than non-shielded cable. Observe the shield grounding requirements.

2 Use 26 AWG solid, 6-wire (3 twisted pairs) cable as the best fit for fabricating modular cables with the modular jack housing assembly. Be sure the cable you use fits the modular jack housing. The preassembled cables that are available from Anixter (Part No. CBL-NETWORKxxx) use 24 gauge wire.

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FDD board

Figure 94: FDD board

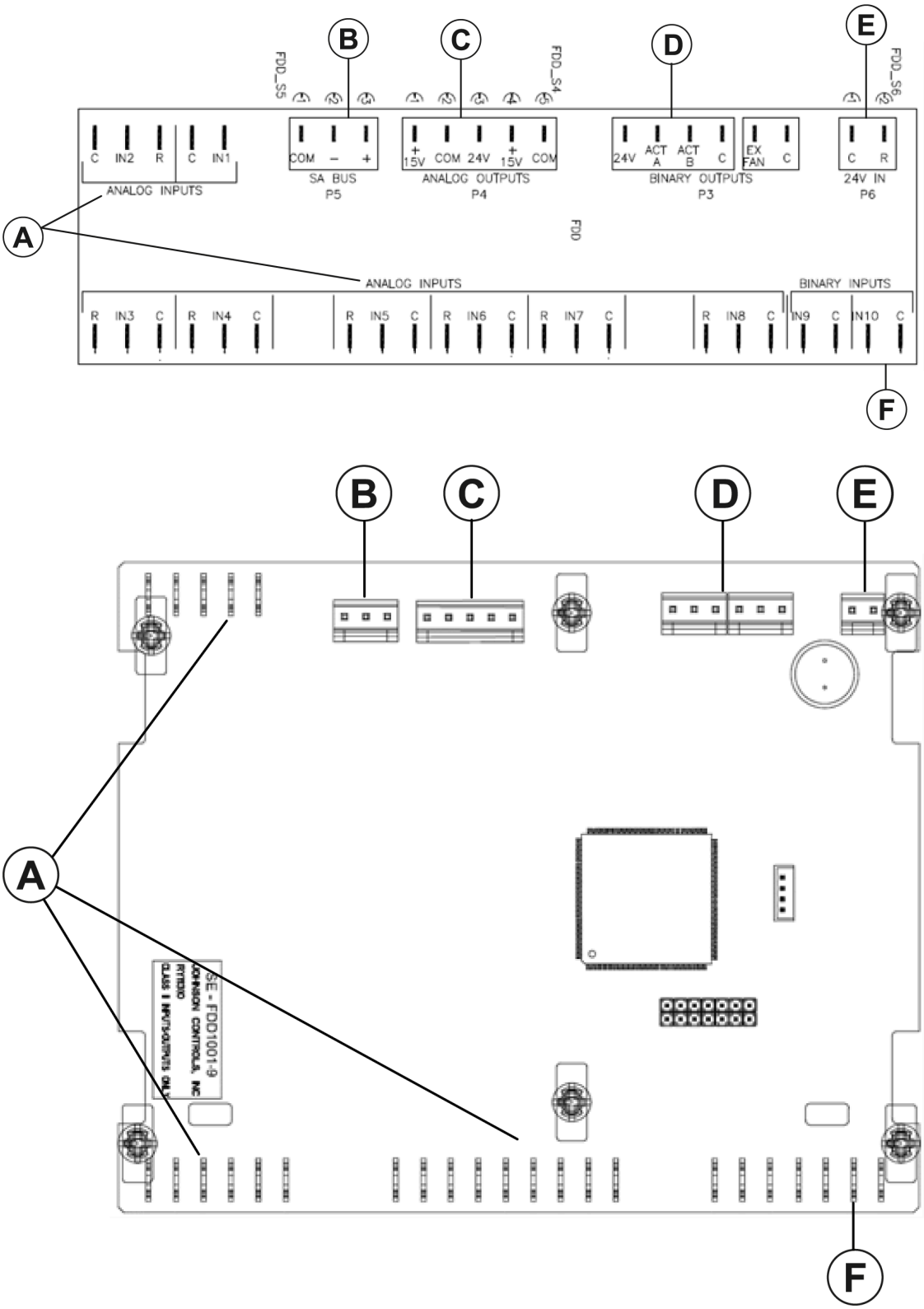


Table 95: Smart Equipment FDD – analog inputs

Location	Label	Description	Function and comments
A	C	Common for IN1 input	Common for suction line temperature of system1 SLT-A
	IN1	Analog input 1	Input of suction line temperature of system1 SLT-A
	R	R – Input for IN2	Not used
	IN2	Analog input 2	Input of suction pressure transducer of system1 SPT-A
	C	Common for IN2 input	Common for suction pressure transducer of system1 SPT-A
	R	R – input for IN3	Not used
	IN3	Analog input 3	Input of discharge pressure transducer of system1 DPT-A
	C	Common for IN3 input	Common for discharge pressure transducer of system1 DPT-A
	R	R – input for IN4	Not used
	IN4	Analog input 4	Input of discharge line temperature of system1 DLT-A
	C	Common for IN4 input	Common for discharge line temperature of system1 DLT-A
	R	R – input for IN5	Not used
	IN5	Analog input 5	Not used
	C	Common for IN5 input	Not used
	R	R – input for IN6	Not used
	IN6	Analog input 6	Not used
	C	Common for IN6 input	Not used
	R	R – input for IN7	Not used
	IN7	Analog input 7	Input discharge pressure transducer of system 2 DPT-B
	C	Common for IN7 input	Common for discharge pressure transducer of system 2 DPT-B
	R	R – input for IN8	Not used
	IN8	Analog input 8	Not used
	C	Common for IN8 input	Not used

Table 96: Smart Equipment FDD – SA bus connections (Port P5)

Location	Label	Description	Function and comments
B	C	Common for SA BUS power and communication circuits	Negative of the SA BUS circuits
	–	Communication for SA BUS devices	Positive of the VDC (typically, a fluctuating 1.5 V to 3.5 V reading to C; at least 0.25 V slower than +) SA BUS communication circuit to optional economizer board, 4-stage board, fault detection and diagnostics board, netstat and/or Multi Touch gateway
	+	Communication for SA BUS devices	Positive of the VDC (typically, a fluctuating 1.5 V to 3.5 V reading to C; at least 0.25 V higher than –) SA BUS communication circuit to optional economizer board, 4-stage board, fault detection and diagnostics board, netstat and/or Multi Touch gateway

Table 97: Smart Equipment FDD – analog outputs (Port P4)

Location	Label	Description	Function and comments
C	+15 V	15 V Supply for the input devices	Used to provide 15 V supply to system 1 pressure transducers
	COM	Negative voltage for the input devices	Not used
	24+	24 V supply for the input devices	Not used
	+15 V	15 V supply for the input devices	Used to provide 15 V supply to system 2 pressure transducers
	COM	Negative voltage for the input devices	Not used

Table 98: Smart Equipment FDD – binary outputs (Port P3)

Location	Label	Description	Function and comments
D	24 V	24 V supply for the output devices	Not used
	ACT A	24 V output for actuator 1	Not used
	ACT B	24 V output for actuator 2	Not used
	C	Common output for output devices	Not used
	EX FAN	Output for exhaust fan	Not used
	C	Common output for exhaust fan output	Not used

Table 99: Smart Equipment FDD – binary outputs (Port P6)

Location	Label	Description	Function and comments
E	C	Common 24 V supply for FDD board	Common 24 V supply for FDD board
	R	Hot 24 V supply for FDD board	Hot 24 V supply for FDD board

Table 100: Smart Equipment FDD – binary outputs

Location	Label	Description	Function and comments
F	IN9	Binary input 1	Used for the input of Compressor VFD fault status
	C	Common for IN9 input	Not used
	IN10	Binary input 2	Not used
	C	Common for IN10 input	Not used

Modulating furnace control

Figure 95: Modulating furnace control board

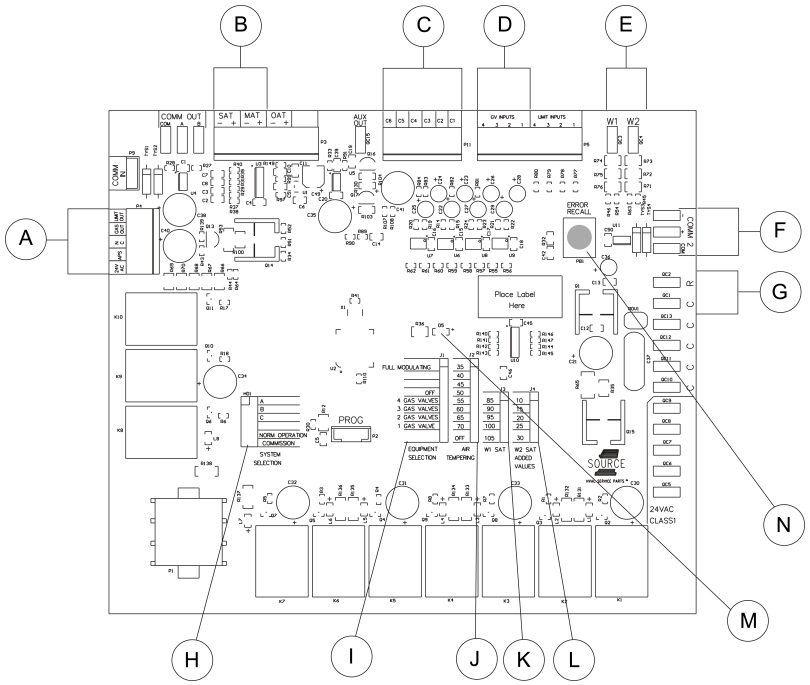


Table 101: Modulating furnace control board details

	Description		Function and comments
A	APS	24 VAC hot return from Air Proving Switch	Air Proving Switch input verifies indoor airflow operation. During Normal Heating, if APS input (closed switch) is not received within 2 min of heat call, LED alarm flashes **5** but does not interrupt heat demand output. APS input is required to operate Air Tempering.
	NC	Not used	Not used
	GAS OUT	24 VAC output confirming heat section operation	Sends gas valve operation signal to UCB. During Normal Heating, when GV INPUT is received the MFC immediately outputs gas signal to UCB. In Air Tempering, the MFC does not output gas signal to the UCB; this is to avoid UCB alarm (Air Tempering operates without thermostat heating call from UCB).
B	SAT+	Supply Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Senses temperature of air leaving heat section. Input required for normal operation; 5.0 VDC reading SAT+ to SAT– with open circuit. Used in Normal Heating and Air Tempering to adjust heat demand output to maintain target supply air temperature. If MFC receives invalid SAT input (indicating bad thermistor) during Normal Heating, heat demand defaults to 35% heat output (lowest level). MFC will not operate Air Tempering with invalid SAT input. LED alarm flashes **3** with invalid SAT.
	MAT+	Mixed Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Senses temperature of air entering heat section. 5.0 VDC reading SAT+ to SAT– with open circuit. Used in Normal Heating to limit air temperature rise (SAT minus MAT) to a maximum of 65°F. Used in Air Tempering to determine if MAT is below value on **AIR TEMPERING** pin selection. The MFC does not operate Air Tempering with invalid MAT input. LED alarm flashes **4** with invalid MAT.
C	C1 through C6	Compressor signals, 24 VAC inputs (not all used)	Sourced from compressor control voltage signals. Monitors all compressors in the unit. If any compressors are on, the LED flashes 6 (non-fault condition) and the MFC does not operate Air Tempering.
D	GV INPUTS, 1	24 VAC input confirming heat section operation	Sourced from main gas valve ON signal. Used in MFC logic for **GAS OUT** output. If GV INPUT is not received within 5 min of heat demand output, LED alarm flashes **2** but does not interrupt heat demand output.

Table 101: Modulating furnace control board details

	Description		Function and comments
E	W1	1st stage heating request, 24 VAC input from H1 on UCB	With W1 input only from the UCB, the MFC adjusts heat demand level to maintain supply air temperature value on **W1 SAT** pin selection.
	W2	2nd stage heating request, 24 VAC input from H2 on UCB	With W2 input (plus W1) from the UCB, the MFC adjusts heat demand level to maintain supply air temperature of the added value of **W1 SAT** plus **W2 SAT ADDED VALUE** pin selections.
F	COMM 2, -	Communication for ignition control	Heat call and demand level to ignition control. Negative of the VDC (typically, a fluctuating 1.5 V to 3.5 V reading to C; at least 0.25 V lower than +).
	COMM 2, +	Communication for ignition control	Heat call and demand level to ignition control. Positive of the VDC (typically, a fluctuating 1.5 V to 3.5 V reading to C; at least 0.25 V lower than -).
	COMM, COM	Common for ignition control communication circuit	
G	R	24 VAC hot for MFC board power	
	C	24 VAC common for MFC board power	
H	SYSTEM SELECTION (2 jumper pins)	System and operating mode pin selections	There are 2 jumpers for this pin bank. **A** and **NORM OPERATION** yields normal operation. **A** and **COMMISSION** is for rating the furnace and adjusting manifold pressure; automated modulation is bypassed, W1 input outputs a steady 35% (lowest) heat demand, W1 and W2 input outputs a steady 100% (highest) heat demand. **(BLANK)** and **COMMISSION** step through an auto-sequence routine with a W1 or W1 and W2 input.
I	EQUIPMENT SELECTION (2 jumper pins)	Equipment type pin selections	There are 2 jumpers for this pin bank. **FULL MODULATING** and **1 GAS VALVE** should always be selected for this system.
J	AIR TEMPERING (1 jumper pin)	Air Tempering pin selection.	Used to select whether the Air Tempering function is allowed to operate. If jumper is set to any value other than **OFF**, the MFC initiates furnace operation if the MAT sensor input reading is 3°F below the selected value. To operate Air Tempering, APS input must be on, W1/W2 heat call from UCB must be off, and all compressor inputs must have been off for 10 min. If MFC has been in tempering mode (heating) for 10 min and SAT reading is 5°F or more above the Air Tempering selected value, heating is ended. If all conditions for Air Tempering are still met, it is re-initiated after a 10 min minimum off delay.
K	W1 SAT (1 jumper pin)	W1 SAT setpoint pin selection.	With W1 input only from the UCB, the MFC adjusts heat demand level to maintain supply air temperature value on **W1 SAT** pin selection.
L	W2 SAT ADDED VALUE (1 jumper pin)	W2 SAT Added Value setpoint pin selection.	With W2 input (plus W1) from the UCB, the MFC adjusts heat demand level to maintain supply air temperature of the added value of **W1 SAT** plus **W2 SAT ADDED VALUE** pin selections.
M	LED Light	LED status or alarm code	Flash count corresponds to status or fault condition.
N	ERROR RECALL (Button)	Error recall button	When pushed, the last 5 alarms are flashed by the LED. The most recent is flashed first, followed by the next most recent, and continuing until all the alarms stored (5 maximum) are flashed.

Start-up & Service Data Instruction

Commercial Package Units

3.0 To 50.0 tons

Start-up Checklist

Date: _____

Job Name: _____

Customer Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Model Number: _____ Serial Number: _____

Qualified Start-up Technician: _____ Signature: _____

HVAC Contractor: _____ Phone: _____

Address: _____

Contractor's E-mail Address: _____

Electrical Contractor: _____ Phone: _____

Distributor Name: _____ Phone: _____

Warranty Statement

BHC Residential & Light Commercial LLC is confident that this equipment will operate to the owner's satisfaction if the proper procedures are followed and checks are made at initial start-up. This confidence is supported by the 30 day dealer protection coverage portion of our standard warranty policy which states that BHC Residential & Light Commercial LLC will cover parts and labor on new equipment start-up failures that are caused by a defect in factory workmanship or material, for a period of 30 days from installation. Refer to the current standard warranty policy and warranty manual for details.

In the event that communication with BHC Residential & Light Commercial LLC is required regarding technical and/or warranty concerns, all parties to the discussion should have a copy of the equipment start-up sheet for reference. A copy of the original start-up sheet should be filed with the Technical Services Department.

The packaged unit is available in constant or variable air volume versions with a large variety of custom options and accessories available. Therefore, some variation in the startup procedure will exist depending upon the products capacity, control system, options and accessories installed.

This start-up sheet covers all startup check points common to all package equipment. In addition it covers essential startup check points for a number of common installation options. Depending upon the particular unit being started not all sections of this startup sheet will apply. Complete those sections applicable and use the notes section to record any additional information pertinent to your particular installation.

Warranty claims are to be made through the distributor from whom the equipment was purchased.

Equipment Startup

Use the local LCD or GoTemp Pro mobile application to complete the start-up.

A copy of the completed start-up sheet should be kept on file by the distributor providing the equipment and a copy sent to:

BHC Residential & Light Commercial LLC
Technical Services Department
5005 York Drive
Norman, OK 73069

1034349-UCL-L-0426

Safety Warnings

The inspections and recording of data outlined in this procedure are required for start-up of BHC Residential & Light Commercial LLC' packaged products. Industry recognized safety standards and practices must be observed at all times. General industry knowledge and experience are required to assure technician safety. It is the responsibility of the technician to assess all potential dangers and take all steps warranted to perform the work in a safe manner. By addressing those potential dangers, prior to beginning any work, the technician can perform the work in a safe manner with minimal risk of injury.

⚠WARNING

Lethal voltages are present during some start-up checks. Extreme caution must be used at all times.

⚠WARNING

Moving parts may be exposed during some startup checks. Extreme caution must be used at all times.

NOTE: Read and review this entire document before beginning any of the startup procedures.

Design Application Information

This information will be available from the specifying engineer who selected the equipment. If the system is a VAV system the CFM will be the airflow when the remote VAV boxes are in the full open position and the frequency drive is operating at 60 HZ. **Do not proceed with the equipment start-up without the design CFM information.**

Design Supply Air CFM: _____ Design Return Air CFM:_____

Design Outdoor Air CFM At Minimum Position: _____

Total External Static Pressure: _____

Supply Static Pressure: _____

Return Static Pressure: _____

Design Building Static Pressure: _____

Outside Air Dilution: Economizer Position Percentage: _____ CFM: _____

Supply Gas Pressure After Regulator W/o Heat Active _____ Inches_____

ADDITIONAL APPLICATION NOTES FROM SPECIFYING ENGINEER:

Reference

General Inspection	Completed	See Notes
Unit inspected for shipping, storage, or rigging damage	☐	☐
Unit installed with proper clearances	☐	☐
Unit installed within slope limitations	☐	☐
Refrigeration system checked for gross leaks (presence of oil)	☐	☐
Terminal screws and wiring connections checked for tightness	☐	☐
Filters installed correctly and clean	☐	☐
Economizer hoods installed in operating position	☐	☐
Condensate drain trapped properly, refer to Installation Manual	☐	☐
Economizer damper linkage tight	☐	☐
Gas Heat vent hood installed	☐	☐
All field wiring (power and control) complete	☐	☐

Air Moving Inspection	Completed	See Notes
Alignment of drive components	☐	☐
Belt tension adjusted properly	☐	☐
Blower pulleys tight on shaft, bearing set screws tight, wheel tight to shaft	☐	☐
Pressure switch or transducer tubing installed properly	☐	☐

Exhaust Inspection Powered ☐ Barometric Relief ☐	Completed	See Notes
Check hub for tightness	☐	☐
Check fan blade for clearance	☐	☐
Check for proper rotation	☐	☐
Check for proper mounting (screen faces towards unit)	☐	☐
Prove operation by increasing minimum setting on economizer	☐	☐

Economizer Inspection Standard ☐ BAS ☐	Completed	See Notes
CO_2 sensor installed Yes ☐ No ☐	☐	☐
Check economizer setting (Reference Smart Equipment Control Board LCD menu location)	☐	☐
Prove economizer open/close through Smart Equipment Board Setting	☐	☐

Reheat Mode Normal ☐ or Alternate ☐ Not Applicable ☐
Humidity Sensor (2SH0401) _____

Operating Measurements - Air Flow

Fan operates with proper rotation (All VFD equipped units with the optional Manual Bypass must be phased for correct blower rotation with the Bypass switch set in the LINE position) ID Fans ☐ Exh. Fans ☐ Cond. Fans ☐	
Pressure drop across dry evaporator coil (At maximum design CFM) [1]	IWC
External Static Pressure	IWC
Return Static Pressure	IWC
Supply Static Pressure	IWC
Supply Air CFM Using Dry Coil Chart	CFM
Final Adjusted Supply Air CFM[2]	CFM

1. Consult the proper airflow to pressure drop table to obtain the actual airflow at the measured pressure differential.
2. Was a motor pulley adjustment or change required to obtain the correct airflow?
   Was it necessary to increase of decrease the airflow to meet the design conditions?
   If the motor pulley size was changed, measure the outside diameters of the motor and blower pulleys and record those diameters here;

Blower Motor HP _____ FLA_____ RPM_____

Pulley Pitch Diameter _____Turns Out_____ Final Turns Out_____

Blower Pulley Pitch Diameter _____ Fixed Sheave_____

Electrical Data

T1 - T2 _____ Volts T2 - T3 _____ Volts

Control Voltage _____ Volts T1 - T3 _____ Volts

Device	Nameplate	Measured List All Three Amperages
Supply Fan Motor[1, 2]	AMPS	AMPS
Exhaust Motor (Dampers 100%)	AMPS	AMPS
Condenser Fan #1	AMPS	AMPS
Condenser Fan #2 (if equipped)	AMPS	AMPS
Condenser Fan #3 (if equipped)	AMPS	AMPS
Condenser Fan #4 (if equipped)	AMPS	AMPS
Compressor #1	AMPS	AMPS
Compressor #2 (if equipped)	AMPS	AMPS
Compressor #3 (if equipped)	AMPS	AMPS
Compressor #4 (if equipped)	AMPS	AMPS

1. VAV units with heat section - simulate heat call to drive VAV boxes and VFD/IGV to maximum design airflow position.
2. VAV units without heat section - VAV boxes must be set to maximum design airflow position.

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Refrigerant Safeties

Action	Completed	See Notes
Prove Compressor Rotation (3 phase only) by gauge pressure	☐	☐
Prove High Pressure Safety, All Systems	☐	☐
Prove Low Pressure Safety, All Systems	☐	☐

Refrigerant Detection System (RDS) Safety Test

Action	Completed	See Notes
Does the System have a Refrigerant Detection System (RDS) installed for R-454B?	☐	☐
Does Control Board Show any RDS alarms?	☐	☐
Are all available RDS Sensors pulsing with a green light?	☐	☐
Caution do not continue until any RDS alarms are resolved		
Prove Refrigerant Detection System Alarm Mitigation (Heating Units) – Shuts Down Active Heat Call[1]	☐	☐
Prove Refrigerant Detection System Alarm Mitigation (Cooling Mode) – Shuts Down Active Cooling Call[1]	☐	☐

1. Complete the above steps by pulling the J1 harness off the UCB during an active call for heat/cooling

Operating Measurements - Cooling

Stage	Discharge Pressure	Discharge Temp.	Liquid Line Temp.[1]	Subcooling[2]	Suction Pressure	Suction Temp.	Superheat
First	#	°	°	°	#	°	°
Second (if equipped)	#	°	°	°	#	°	°
Third (if equipped)	#	°	°	°	#	°	°
Fourth (if equipped)	#	°	°	°	#	°	°
Reheat 1st Stage	#	°	°	°	#	°	°

1. Liquid temperature should be taken before filter/drier.
2. Subtract 10 psi from discharge pressure for estimated liquid line pressure

Outside air temperature	_____	°F db	_____	°F wb	_____ %RH
Return Air Temperature	_____	°F db	_____	°F wb	_____ %RH
Mixed Air Temperature	_____	°F db	_____	°F wb	_____ %RH
Supply Air Temperature	_____	°F db	_____	°F wb	_____ %RH

Operating Measurements - Gas Heating

Fuel Type: ☐ Natural Gas ☐ LP Gas

Action		Completed	See Notes
Check for gas leaks		☐	☐
Prove Ventor Motor Operation		☐	☐
Prove Primary Safety Operation		☐	☐
Prove Auxiliary Safety Operation		☐	☐
Prove Rollout Switch Operation		☐	☐
Prove Smoke Detector Operation		☐	☐
Manifold Pressure	Stage 1	IWC	☐
	Stage 2 (If Equipped)	IWC	☐
	Stage 3 (If Equipped)	IWC	☐
Supply gas pressure at full fire		IWC	☐
Check temperature rise[1]	☐ measured at full fire	°F	☐

1. Input X Eff. (BTU output)
   1.08 X Temp. Rise

Operating Measurements Electric Heating

Heater kW _____kW Heater Voltage, Nameplate _____ Volts

Heater Model Number: _____

Serial Number: _____

Heater	Nameplate	Measured List All Three Amperages		
Stage 1	_____AMPS	_____AMPS	_____AMPS	_____AMPS
Stage 2	_____AMPS	_____AMPS	_____AMPS	_____AMPS
Stage 3	_____AMPS	_____AMPS	_____AMPS	_____AMPS
Stage 4	_____AMPS	_____AMPS	_____AMPS	_____AMPS
Checked Heater Limit			Yes ☐	No ☐
Air Moving Switch Installed?			Yes ☐	No ☐

Operating Measurements - Staging Controls

Verify Proper Operation of Heating/Cooling Staging Controls	
Create a cooling demand at the Thermostat, BAS System or Smart Equipment Verify that cooling/economizer stages are energized.	☐
Create a heating demand at the Thermostat, BAS System or Smart Equipment Verify that heating stages are energized.	☐
Verify Proper Operation of the Variable Frequency Drive (If Required)	
Verify that motor speed modulates with duct pressure change.	☐

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Final - Inspection

Verify that all operational control set points have been set to desired value Scroll through all setpoints and change as may be necessary to suit the occupant requirements.	☐
Verify that all option parameters are correct Scroll through all option parameters and ensure that all installed options are enabled in the software and all others are disabled in the software. (Factory software settings should match the installed options)	☐
Verify that all access panels have been closed and secured	☐
Save a backup file from the unit control board onto a USB flash drive.	☐

Observed Product Deficiencies & Concerns:

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