Installation Manual: Core WQE, 3 ton to 5 ton, Heat Pump

R-454B, 60 Hertz

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6462887-UIM-C-0525

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Contents

General

WQ units are single package heat pumps designed for outdoor installation on a rooftop or slab and for non-residential use.

These units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require electric power and duct connections.

DS Solutions App

Johnson Controls believes in empowering our customers with unit-specific information at all times, even on the roof. Download the DS Solutions application, available through the Apple App Store and the Google Play store. Users can use DS Solutions to scan the QR code located on the rating plate that is unique to each unit and provides information specific to the product. Take advantage of the features available for all units: Nomenclature, Literature (Technical Guide, Installation Manual and Wiring Diagrams), Parts list, Product Registration, Claims Tracking, and more.

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

Before performing service or maintenance operations on unit, turn off 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 or service agency.

⚠ WARNING

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

Due to system pressure, moving parts, and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained service personnel should install, repair, or service this equipment. Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters.

Observe all precautions in the literature, labels, and tags accompanying the equipment whenever working on air conditioning equipment. Be sure to follow all other applicable safety precautions and codes that apply.

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

Inspection

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing.

Reference

Additional information is available in the following reference forms:

- *Technical Guide, WQ04-06*
- *General Installation, WQ04-06*
- Economizer Option or Accessory:
  Vertical Flow Dry Bulb Economizer Factory installed Option or Field Installed accessory
  Horizontal Flow Dry Bulb Economizer Field Installed accessory
- Power Exhaust Accessory:
  Vertical or Horizontal Flow Field Installed

Renewal parts

Contact your local Ducted Systems parts distribution center for authorized replacement parts.

Approvals

Design certified by CSA as follows:

- For use as a heat pump unit.
- For outdoor installation only.
- For installation on combustible material.

CAUTION

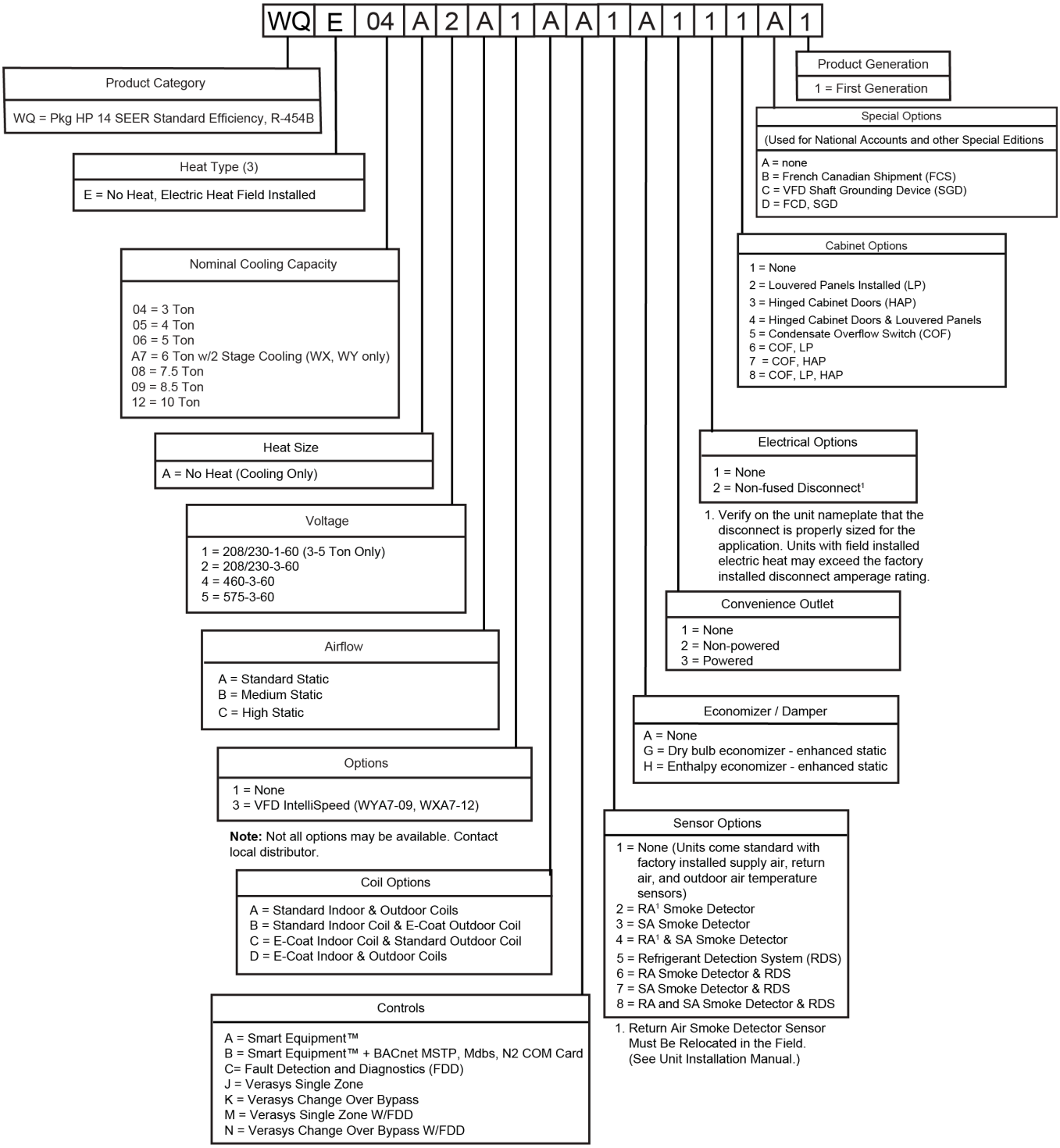
This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to, building, electrical, and mechanical codes.

WARNING

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

Nomenclature

3 to 5 Ton Model Number Nomenclature



Installation

Installation safety information

Read these instructions before continuing this appliance installation. This is an outdoor combination heating and cooling unit. The installer must assure that these instructions are made available to the consumer and with instructions to retain them for future reference.

1. Install this unit only in a location and position as specified in the location section of the manual.
2. This equipment is not to be used for temporary heating of buildings or structures under construction.

Preceding installation

1. Remove the two screws that hold the brackets in the fork-lift slots on the side of the unit.

Figure 1: Unit shipping bracket

Callout	Component
A	Bracket screws
B	Bracket

2. Turn each bracket toward the ground. The protective plywood covering drops to the ground.
3. Remove the protective covering from the condenser coil prior to operation.

Figure 2: Protective condenser covering

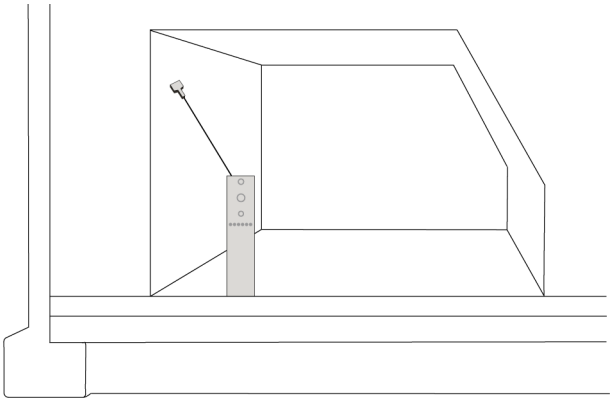
4. If a factory option convenience outlet is installed, you must install the weatherproof outlet cover in the field. The cover is located behind the filter access panel.
   a. Remove the shipping label that covers the convenience outlet.
   b. Follow the instructions on the back of the cover box.
   c. Attach the cover to the unit with the four screws provided.

CAUTION

208/230-3-60 and units with factory installed Powered Convenience Outlet Option are wired for 230v power supply. Change tap on transformer for 208-3-60 operation. See unit wiring diagram.

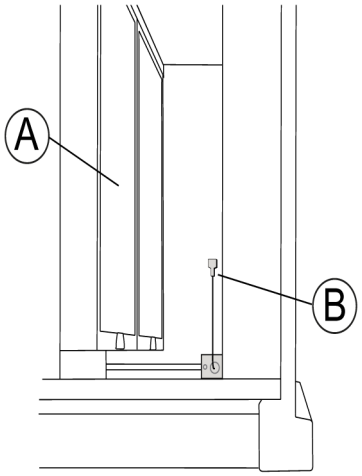
5. For gas heating models, you must move the supply air temperature (SAT) sensor to the working position to ensure proper SAT readings. The SAT sensor is shipped in the supply air compartment.
   a. Move the SAT sensor to the inside of the supply air duct. See item A in Figure 5.
   b. Use the excess wire available to its full length to drop or mount the SAT sensor in the duct.
   c. Use the shipping bracket to hold the SAT sensor in the supply air stream. See Figure 3 for the factory SAT sensor location and Figure 5 for the sensor relocation.

Figure 3: Supply air temperature sensor



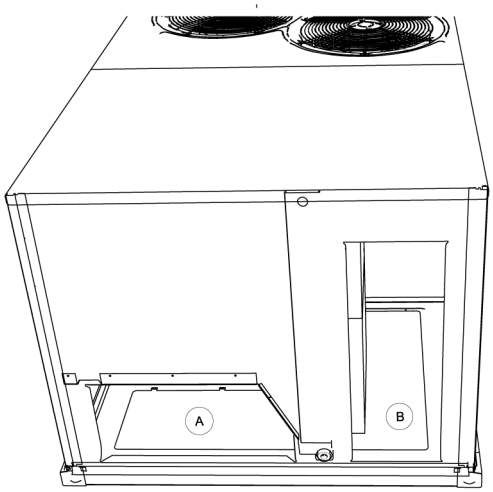
6. For units equipped with an economizer or motorized OD air damper, you must move the return air temperature (RAT) sensor to the working position to ensure proper RAT readings. See item B in Figure 5
   a. Move the RAT sensor to the inside of the return air duct verifying that the sensor is at least 6 in. below the unit duct opening. The sensor must read the return air temperature not mixed return air and outdoor air temperatures.
   b. Use the excess wire available to its full length to drop or mount the RAT sensor in the duct.
   c. You can use the shipping bracket to hold the RAT sensor in the return air stream. See Figure 4 for the factory RAT sensor location and Figure 5 for the sensor relocation.

Figure 4: Factory-mounted return air temperature sensor



Callout	Component
A	Filter rack and filters
B	RAT sensor

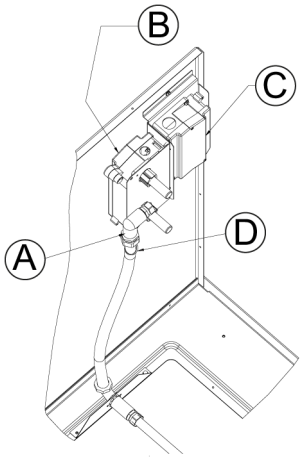
Figure 5: Supply and return air ducts



Callout	Component
A	Supply air duct
B	Return air duct

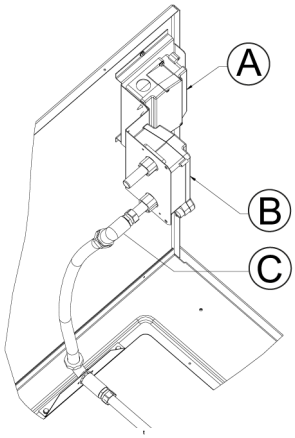
7. If an optional return air smoke detector is installed, you must move the return air sensor from the factory shipped position (upside down) to the working position (right side up). Then slide the flex tube over the stub and tighten, see Figure 7

Figure 6: Return air smoke detector - shipped position



Callout	Component
A	Flex tube secured to the bracket
B	Return air sensor
C	Controller
D	Wire tie

Figure 7: Return air smoke detector - working position



Callout	Component
A	Controller
B	Return air sensor
C	Flex tube in the working position

Limitations

These units must be installed in accordance with the following:

In U.S.A.:

- National Electrical Code, ANSI/NFPA No. 70 - Latest Edition
- Local building codes, and
- Local utility requirements

In Canada:

- Canadian Electrical Code, CSA C22.1
- Local plumbing and waste water codes, and
- Other applicable local codes.

See the unit application data found in this document.

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

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

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

Unit limitations

Table 1: WQ04-06 unit limitations

Model	Size (ton)	Unit voltage	SCCR (kVA)	Unit limitations		
				Applied voltage		Outdoor DB Temp
				Min	Max	Max (°F)
WQ	04 (3)	208/230-1-60	5	187	252	125
		208/230-3-60	5	187	252	125
		460-3-60	5	432	504	125
		575-3-60	5	540	630	125
WQ	05 (4)	208/230-1-60	5	187	252	125
		208/230-3-60	5	187	252	125
		460-3-60	5	432	504	125
		575-3-60	5	540	630	125
WQ	06 (5)	208/230-1-60	5	187	252	125
		208/230-3-60	5	187	252	125
		460-3-60	5	432	504	125
		575-3-60	5	540	630	125

Location

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

1. Unit is designed for *outdoor installation only*.
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.
3. Suitable for mounting on roof curb.
4. For ground level installation, use a level concrete slab with a minimum thickness of 4 in. The length and width should be at least 6 in. greater than the unit base rails. Do not tie slab to the building foundation.
5. Roof structures must be able to support the weight of the unit and its options/accessories. Unit must be installed on a solid, level roof curb or appropriate angle iron frame.
6. Maintain level tolerance to 1/2 in. across the entire width and length of unit.

Clearances

All units require particular clearances for proper operation and service. Installer must make provisions for adequate ventilation air. See unit clearances for clearances required for servicing and proper unit operation.

WARNING

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

Rigging and handling

Exercise care when moving the unit.

Do not remove any packaging until the unit is near the place of installation.

Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. Spreader bars, whose length exceeds the largest dimension across the unit, **must** be used across the top of the unit.

CAUTION

If a unit is to be installed on a roof curb other than a Ducted Systems roof curb, gasketing must be applied to all surfaces that come in contact with the unit underside.

CAUTION

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

Units may be moved or lifted with a forklift. Slotted openings in the base rails are provided for this purpose.

Length of forks must be a minimum of 60 in.

CAUTION

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

WQE04 to 06 unit weights

Figure 8: Unit 4 point load weight

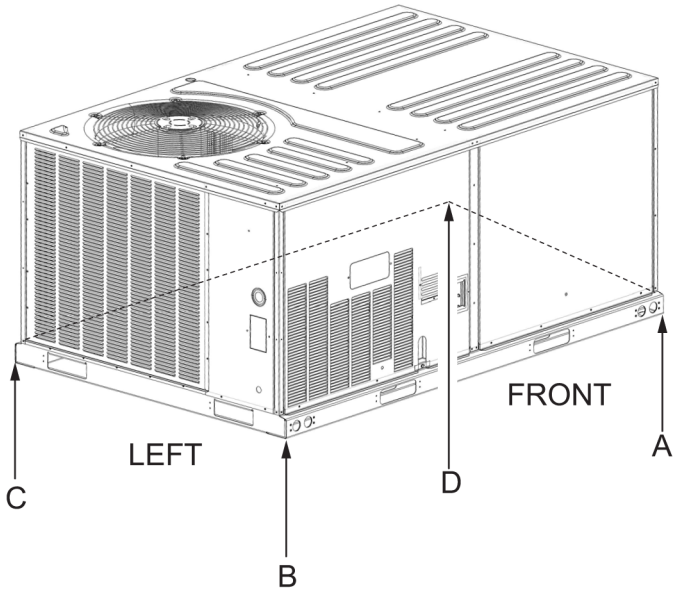


Figure 9: Unit 6 point load weight

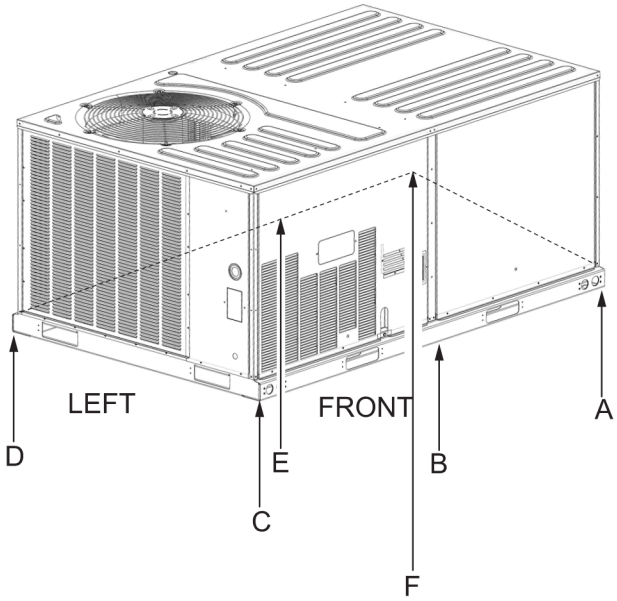


Figure 10: Center of gravity

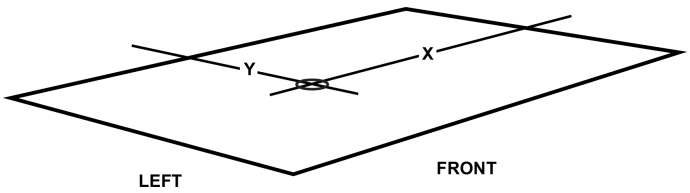


Table 2: WQE04-06 corner weights

Size (ton)	Model	Weight (lb)		Center of gravity		4 point load location (lb)				6 point load location (lb)					
		Shipping	Operating	X	Y	A	B	C	D	A	B	C	D	E	F
04 (3)	WQE	542	529	38.0	24.4	127	135	137	130	84	87	91	92	89	86
05 (4)	WQE	641	628	35.0	24.5	164	148	150	166	111	104	97	98	105	113
06 (5)	WQE	640	627	34.7	24.4	165	146	149	168	112	103	95	97	105	114

Table 3: WQ04 to 06 unit accessory weights

Unit accessory	Weights (lb)
Vertical flow dry bulb economizer small footprint	55
Vertical flow dry bulb economizer large footprint	60
Horizontal flow dry bulb economizer small footprint short	74
Horizontal flow dry bulb economizer small footprint tall	76
Horizontal flow dry bulb economizer large footprint short	79
Horizontal flow dry bulb economizer large footprint tall	82
Power exhaust vert flow small footprint	55
Power exhaust vert flow large footprint	75
Power exhaust horiz flow small footprint	40
Power exhaust horiz flow large footprint	80
Hail guard kit small short factory installed	18
Hail guard kit small tall factory installed	23
Hail guard kit large short factory installed	36
Hail guard kit large tall factory installed	44
Curb rigid 14 in. small footprint	94
Curb rigid 14 in. large footprint	126
Curb rigid 24 in. small footprint	148
Curb rigid 24 in. large footprint	222

WQE04 to 06 unit dimensions

Figure 11: WQE04

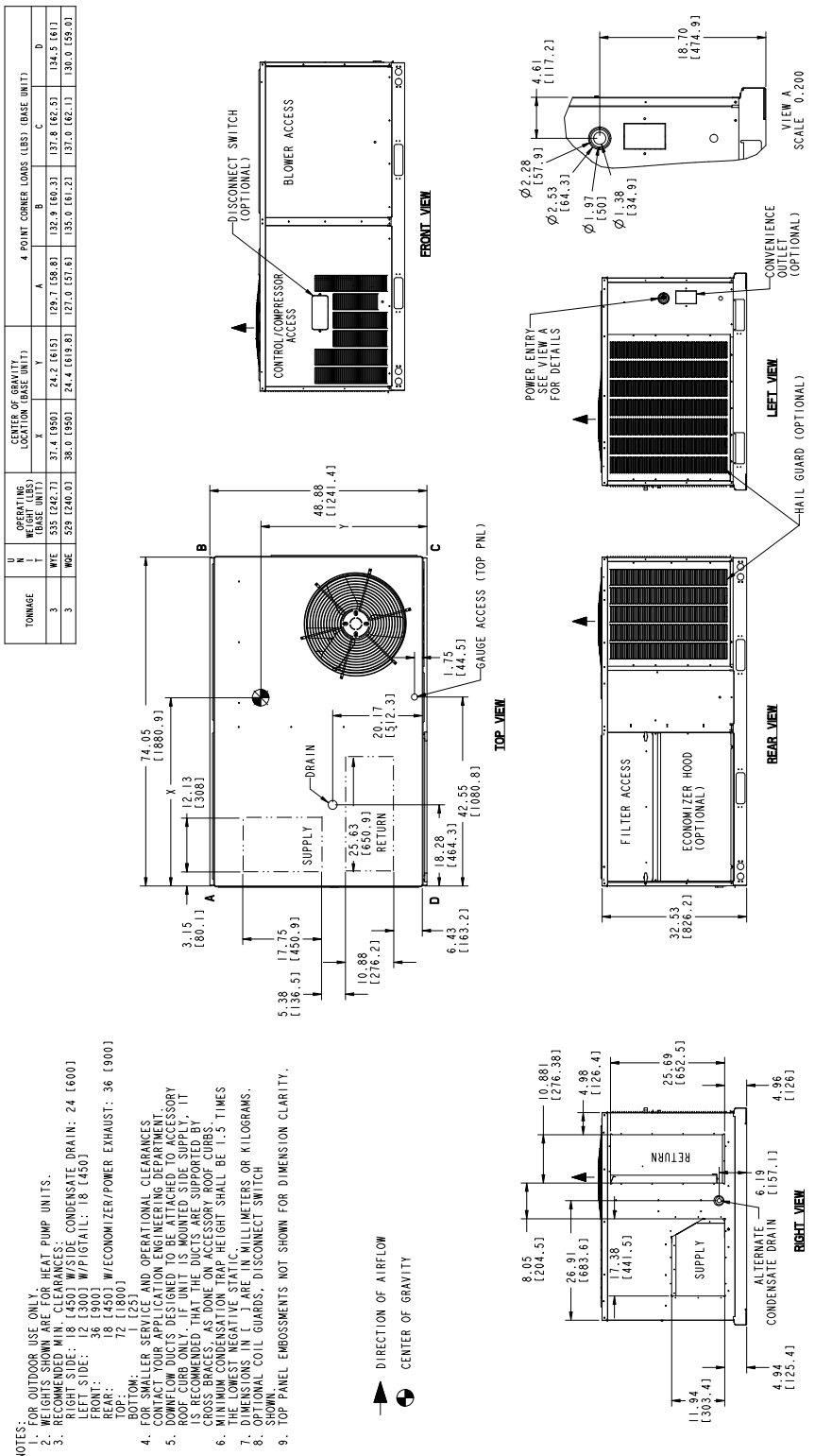
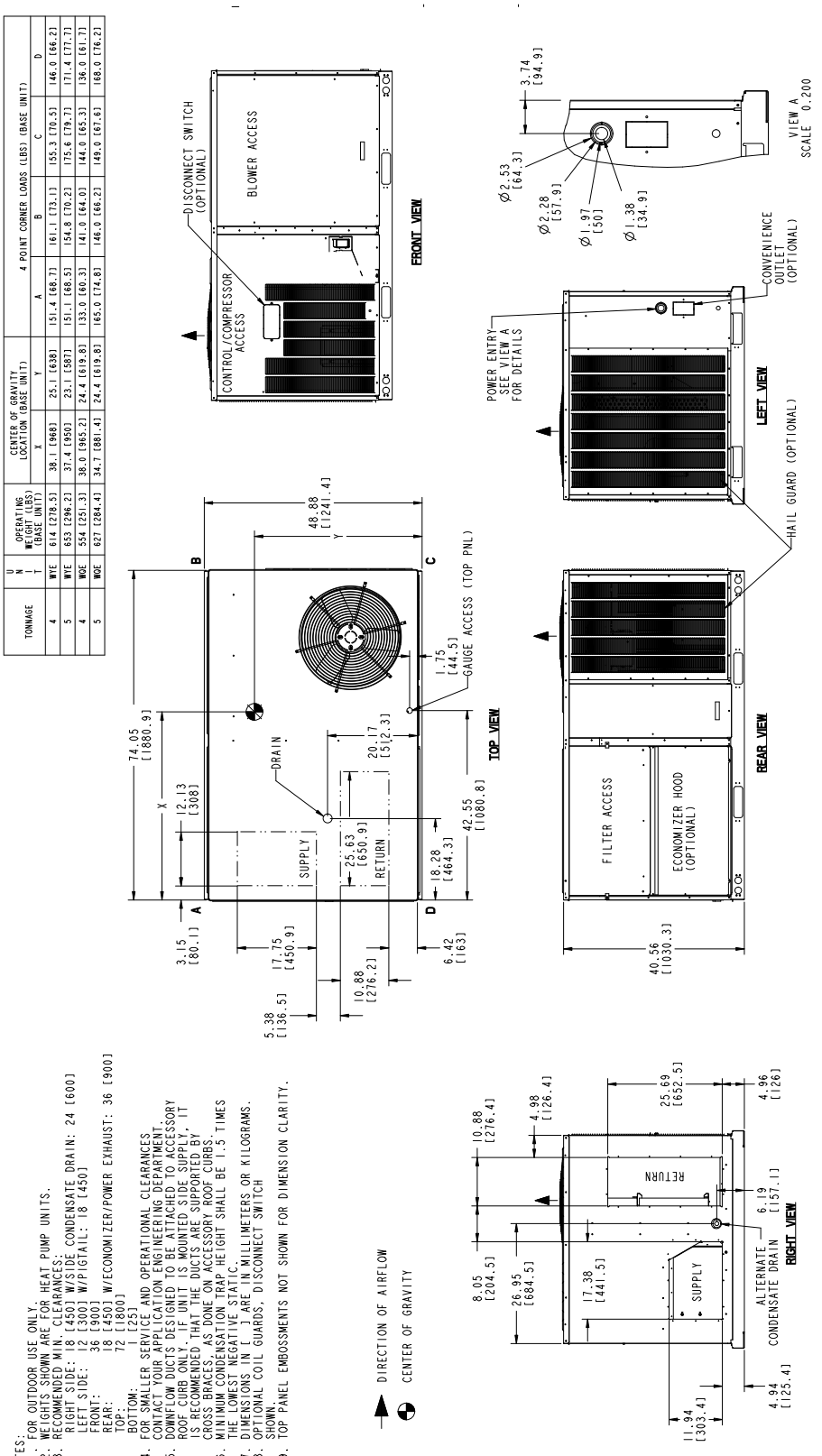


Figure 12: WQE05 - 06



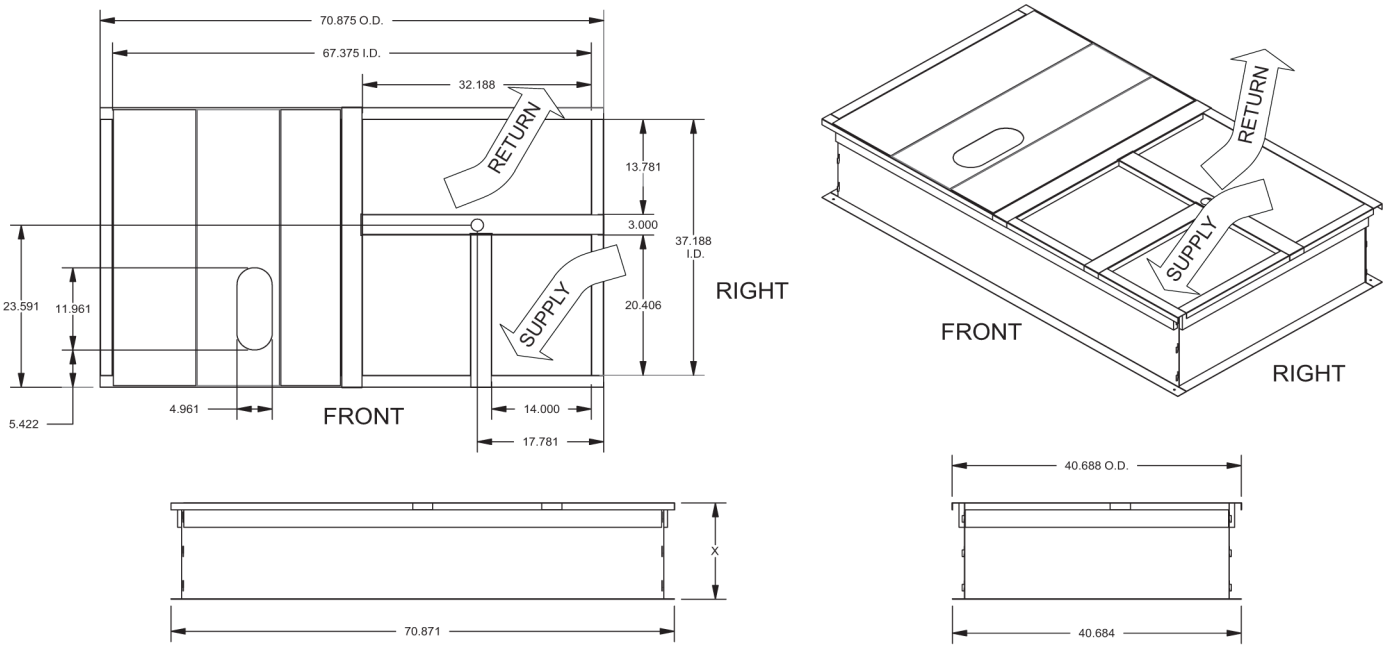
WQE04 to 06 roof curb dimensions

Table 4: WQE04 to 06 unit clearances

Direction	Distance (in.)	Direction	Distance (in.)
Top[1]	72	Right	18
Front	36	Left	12
Rear	18[2] /36[3]	Bottom[4]	1

Note:
1. Units must be installed outdoors. Over hanging structure or shrubs should not obscure condenser air discharge outlet.
2. Units without economizer or power exhaust.
3. Units equipped with an economizer or power exhaust. Flue products must not be discharged within 10 Feet of the rear of the unit.
4. Units may be installed on combustible floors made from wood or class A, B or C roof covering materials.

1RC0456, 1RC0458 roof curb dimensions



1RC0456 X= 14" Height
1RC0458 X= 24" Height

Notes:
1. Sides, ends and cross support are 18-G90. Deck pans, R/A & S/A supports are 20-G90.
2. Full perimeter wood nailer.
3. Insulated deck pans.

Unit models used with 1RC0456, 1RC0458 roof curb

- WQE04
- WQE05
- WQE06

Note: If utilities are required through the base of the unit or through the roof curb the following field installed accessories can be purchased through your dealer or contractor:

- 1TB0401: through the base electrical
- 1TB0402: through the base electrical
- 1TB0403: through the base electrical
- 1TB0404: through the base electrical

Ductwork

Ductwork should be designed and sized according to the methods in Manual D or Manual Q of the Air Conditioning Contractors of America (ACCA) or as recommended by any other recognized authority such as ASHRAE or SMACNA.

A closed return duct system should be used. This will not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize noise.

The supply and return air duct systems should be designed for the CFM and static pressure requirements of the job. They should NOT be sized to match the dimensions of the duct connections on the unit.

See Figure 11 and Figure 12 for bottom and side air duct openings.

Duct covers

Units are shipped with the side duct openings covered and a covering over the bottom of the unit. For side duct application, remove the side duct covers and install over the bottom duct openings. The panels removed from the side duct connections are designed to be reused by securing each panel to its respective bottom duct opening. But keep in mind that the supply and return panels are installed with the painted surface DOWN, facing the bottom duct opening.

The gasket must be removed from the insulation side of the duct cover so it is not directly exposed to the heating elements. The panels are secured by sliding them into slots in the back of the duct openings and screwing them to the base of the unit with screws Use screws removed from original panel location. Seals around duct openings must be tight.

⚠ CAUTION

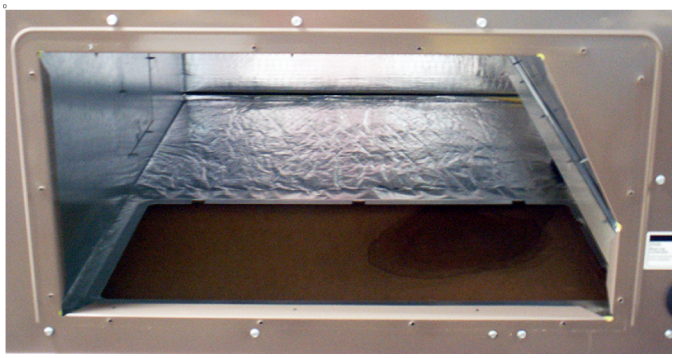
When fastening ductwork to side duct flanges on unit, insert screws through duct flanges only. DO NOT insert screws through casing. Outdoor ductwork must be insulated and water-proofed.

Figure 13: Side duct cover panels

ⓘ **Note:** Shown with duct connection cover panel as shipped.

Figure 14: Bottom return opening for side duct conversion

Figure 15: Bottom supply opening for side duct conversion

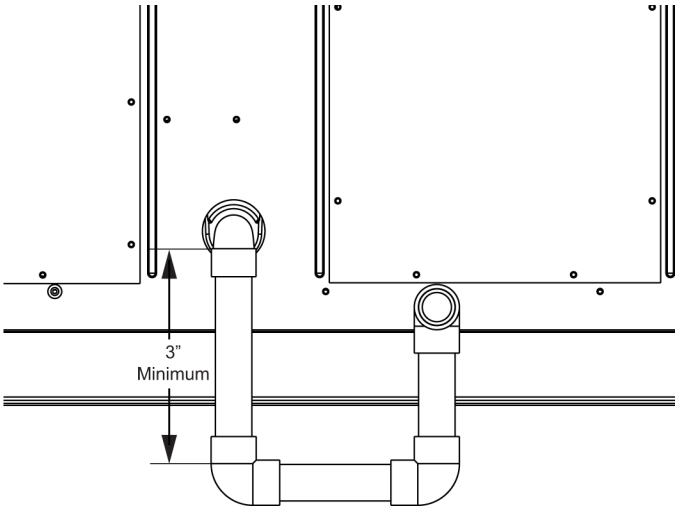


Condensate drain

A side condensate drain is provided to facilitate condensate piping. A condensate drain connection is available through the base pan for piping inside the roof curb. Trap the connection per Figure 16. The trap and drain lines should be protected from freezing.

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install condensate drain line from the 3/4 inch NPT female connection on the unit to an open drain.

Figure 16: Condensate drain



Compressors

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

The compressor also uses a refrigerant oil that is extremely hygroscopic, meaning it absorbs water readily. They can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere.

CAUTION

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

R-454B 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 performing any service that may risk exposure of compressor oil to the roof, take precautions to protect roofing.

Procedures which risk oil leakage include, but are not limited to, compressor replacement, repairing refrigerant leaks, replacing refrigerant components such as filter drier, pressure switch, metering device or coil.

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

CAUTION

Do not loosen compressor mounting bolts.

Refrigerant Detection System (RDS)

Units with the optional factory installed RDS come with the refrigerant detection sensor capable of detecting a refrigerant leak, according to *UL60335-2-40 4th edition*, with an accuracy of +/- 5% LFL across operating range, with response time <15 seconds.

For units without a factory installed economizer, the RDS sensor comes mounted to the lower section of the filter rack assembly and the sensor does not need to be moved or relocated for operation.

For units with a factory installed economizer, see Mounting the RDS sensor on units with a factory installed economizer.

Mounting the RDS sensor on units with a factory installed economizer

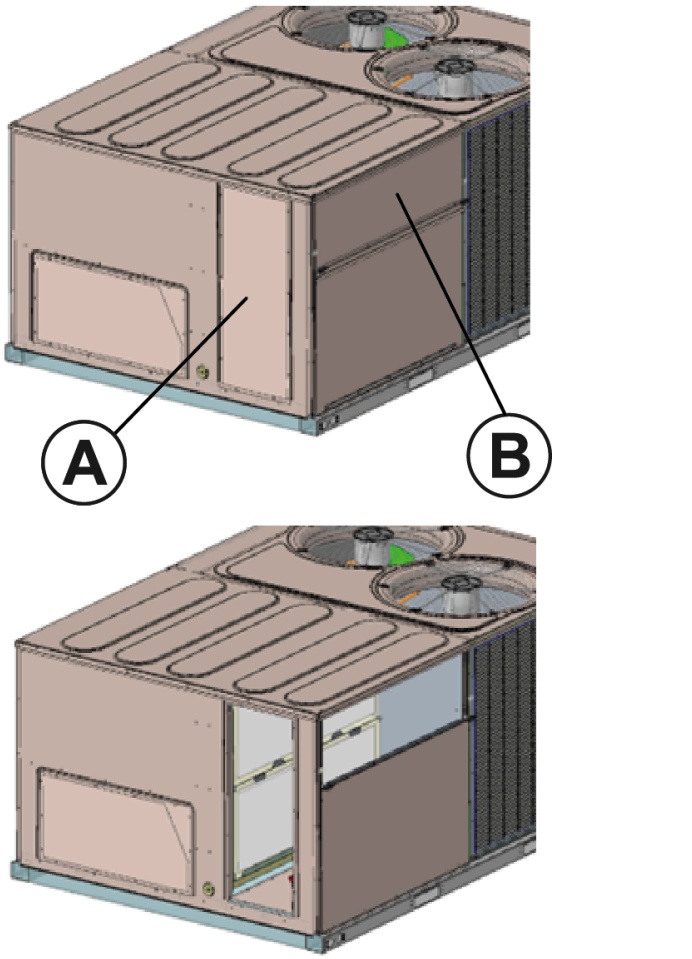
Before you begin:

Units with a factory installed economizer come with the RDS sensor temporarily mounted on the support plate of the economizer hood kit sub-assembly box.

You must remove the RDS sensor assembly from the temporary location and secure it to the correct location, as described in the following instructions.

1. Remove or open the return duct cover and top return access panels as shown in Figure 17.

Figure 17: Panel locations



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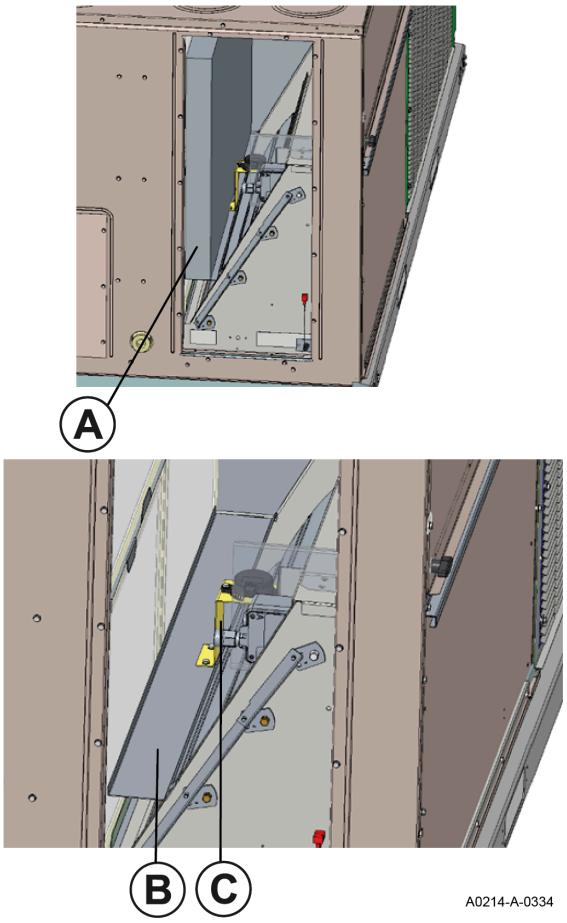
Callout	Component
A	Return duct cover
B	Top return access panel

2. Remove the economizer hood kit box and support plate from the unit.

Figure 18: Economizer hood kit box and support plate location



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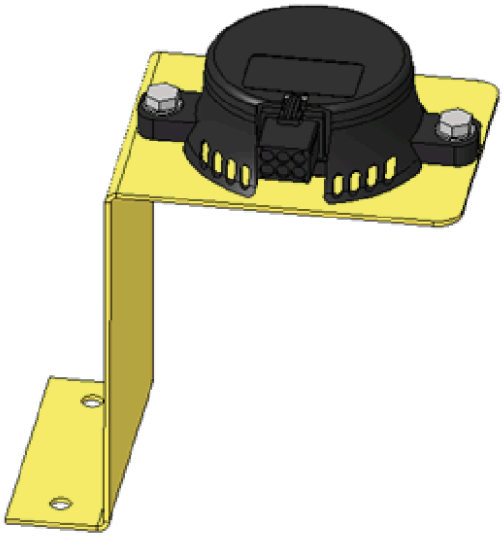
Callout	Component
A	Economizer hood kit box
B	Support plate for hood kit box
C	RDS sensor assembly

Figure 19: RDS sensor bracket assembly



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3. Remove the two Hex No. 10, ½ in. screws that attach the RDS sensor bracket assembly to the support plate.

Note: Retain the screws for use in subsequent steps.

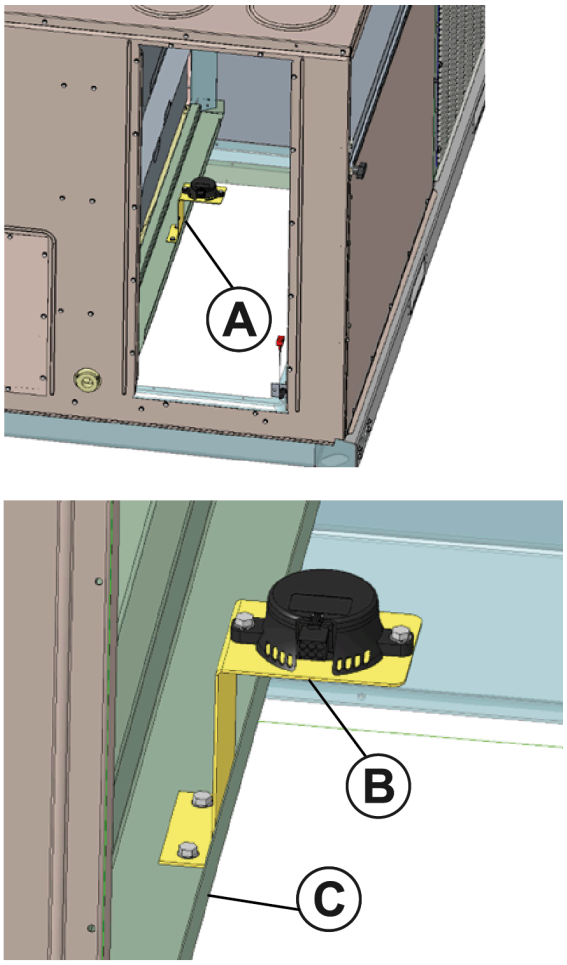
4. Remove the filters from the filter rack assembly to access the RDS mounting location in the bottom piece of the filter rack assembly

Note: Retain the filters to reinstall in subsequent steps.

5. Using the two Hex No. 10, ½ in. screws that were removed in Step 3, attach the RDS sensor bracket assembly to the bottom of the filter rack assembly in the location shown in Figure 20

Note: The unit economizer will be present, but is not shown in all figures.

Figure 20: RDS sensor bracket assembly mounting location



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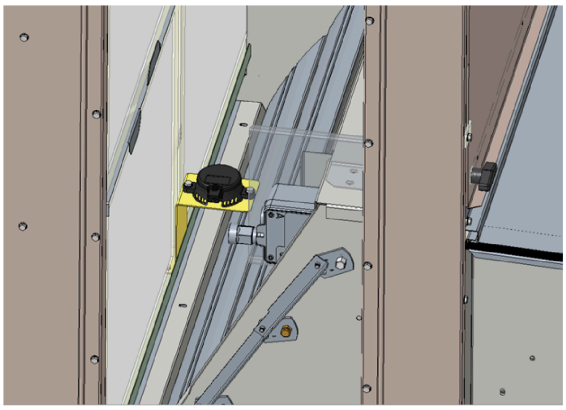
Callout	Component
A	RDS mounting location
B	RDS sensor bracket assembly
C	Filter rack bottom piece

Figure 21: RDS sensor bracket assembly mounting with economizer



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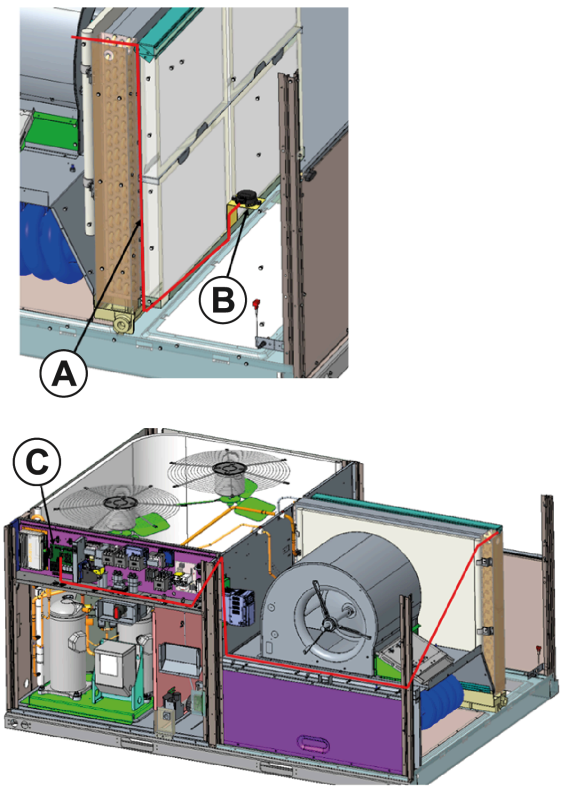
6. If it is not already in place, route the RDS wiring harness from the RDS sensor to the main unit control board following the path shown in Figure 22.
7. Connect the wiring harness to the unit control board according to the unit wiring diagram.

Figure 22: RDS harness routing



A0218-A-0334

Callout	Component
A	RDS harness in red
B	RDS
C	UCB

8. Reinstall the filters removed in Step 4.
9. Reinstall the external panels removed in Step 1.

Filters

2 in. filters are supplied with each unit. Filters must always be installed ahead of evaporator coil and must be kept clean or replaced with same size and type. Dirty filters reduce the capacity of the unit and result in frosted coils or safety shutdown. Refer to physical data tables, for the number and size of filters needed for the unit. The unit should not be operated without filters properly installed.

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. The unit must be electrically grounded in accordance with NEC and CEC as specified above and/or local codes.

Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and in Unit limitations.

CAUTION

208/230-3-60 and 208/230-1-60 units control transformers are factory wired for 230v. Change tap on transformer for 208v operation. See 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 should not be required. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.

A disconnect must be utilized for these units. Factory installed disconnects are available. If installing a disconnect (field supplied), see WQE04 to 06 unit weights for the recommended mounting location.

CAUTION

Avoid damage to internal components if drilling holes for disconnect mounting.

Note: Since not all local codes allow the mounting of a disconnect on the unit, please confirm compliance with local code before mounting a disconnect on the unit.

Electrical line must be sized properly to carry the load. **Use copper conductors only.** Each unit must be wired with a

separate branch circuit fed directly from the meter panel and properly fused.

CAUTION

When connecting electrical power and control wiring to the unit, water-proof connectors must be used so that water or moisture cannot be drawn into the unit during normal operation. The above water-proofing conditions will also apply when installing a field supplied disconnect switch.

CAUTION

When installing equipment in a facility with a 3 phase high-leg delta power supply, care must be taken to ensure that the high-leg conductor is not attached to either of the two legs of the (single phase, direct drive) X13 or ECM motors. Failure to do so can result in the motor acting erratically or not running at all.Check for the high leg conductor by checking voltage of each phase to ground.Example: A or L1 phase to ground, voltage reading is 120V. B or L2 phase to ground, voltage readingis 195 to 208V. C or L3 phase to ground, voltage reading is 120V. Therefore B or L2 phase is the high Leg. The high should always be wired to the center or B or L2 tap.Check all three phase motors and compressors for proper rotation after making a change. If it is necessary to change 3 phase motor rotation, swap A or L1 and C or L3 only.

Thermostat wiring

A two stage thermostat must be used and should be located on an inside wall approximately 56 in. above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow the manufacturer's instructions enclosed with thermostat for general installation procedure. 8 color-coded, insulated wires should be used to connect the thermostat to the unit. See Table 5 for control wire sizing and maximum length.

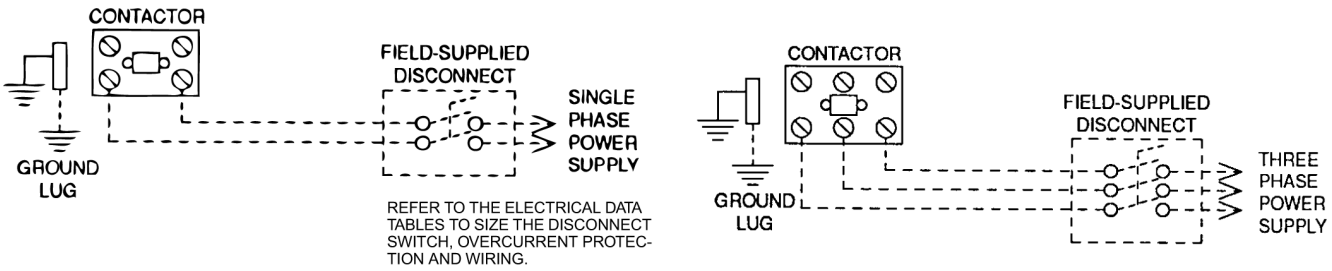
Table 5: Control wire sizes

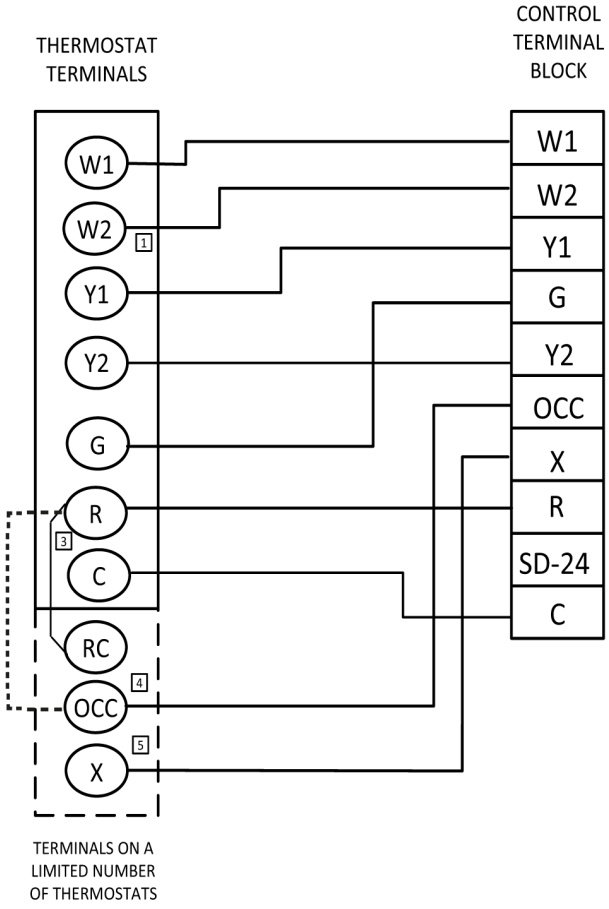
Wire size	Maximum length
18 AWG	150 ft[1]
From the unit to the thermostat and back to the unit.	

Typical field power and control wiring

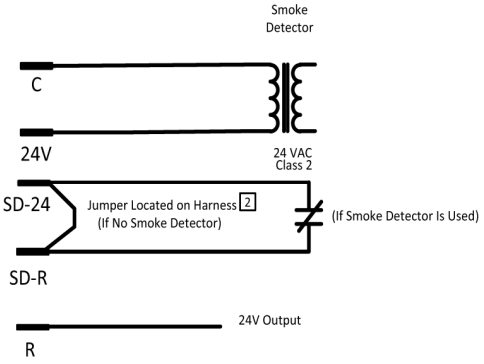
Typical power wiring

Figure 23: Typical Smart Equipment™ Control wiring





R~Occ Jumper:
Smart Equipment Control boards come from the factory with a jumper wire between R and OCC terminals on the thermostat terminal strip. Failure to remove this jumper will place the unit into the Occupied mode no matter what the occupancy demand is from the thermostat or EMS system. To allow Thermostat or EMS control of the Occupied mode for the unit, this jumper must be removed during commissioning.



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.

Physical data

WQE physical data

Table 6: WQE04 to 06

Component	Models		
	WQE04	WQE05	WQE06
Nominal tonnage	**3**	**4**	**5**
AHRI cooling performance			
Gross capacity @ AHRI A point (Btu)	36,500	49,500	58,500
AHRI net capacity (MBH)	35,600	48,000	57,000
EER2	12.2	12.2	11.8
SEER2	14.0	14.0	14.0
CFM	1,240	1,550	1,550
System power (kW)	2.9	3.9	4.8
Refrigerant type	R-454B	R-454B	R-454B
Refrigerant charge (lb-oz)			
System 1	9-2	11-14	12-4
System 2	—	—	—
ARI heating performance			
47ºF capacity rating (MBH)	34,500	45,600	53,000
System power (kW) / COP2	2.9 / 3.5	3.8 / 3.5	4.4 / 3.5
17ºF capacity rating (MBH)	19,500	24,600	29,000
System power (kW) / COP2	2.7 / 2.1	3.4 / 2.15	3.9 / 2.15
HSPF2 (Btu/Watts-hr)	6.7	6.7	6.7
Dimensions (in.)			
Length	74.1	74.1	74.1
Width	48.9	48.9	48.9
Height	32.5	40.6	40.6
Operating weight (lb)	529	554	627
Compressors			
Type	Scroll	Scroll	Scroll
Quantity	1	1	1
Outdoor coil data			
Face area (sq ft)	15.1	19.4	19.4
Rows	2	2	2
Fins per in.	17	17	17
Tube diameter	0.375	0.375	0.375
Circuitry type	Split-face	Split-face	Split-face
Refrigerant control	TXV	TXV	TXV
Indoor coil data			
Face area (sq ft)	5.5	7.3	7.3
Rows	4	3	4
Fins per in.	15	15	15
Tube diameter	0.375	0.375	0.375
Circuitry type	Intertwined	Intertwined	Intertwined
Refrigerant control	TXV	TXV	TXV
Outdoor fan data			
Quantity	1	1	1
Fan diameter (in.)	22	22	22
Type	Prop	Prop	Prop
Drive type	Direct drive	Direct drive	Direct drive
No. speeds	1	1	1
Number of motors	1	1	1
Motor HP each	1/2	1/2	1/2
RPM	1100	1085	1100
Total CFM	3600	4000	4300
Belt drive indoor fan data			
Quantity	1	1	1
Fan diameter (in.)	10 x 10	10 x 10	11 x 10

Table 6: WQE04 to 06

Component	Models					
	WQE04		WQE05		WQE06	
Nominal tonnage	**3**		**4**		**5**	
Type	Centrifugal		Centrifugal		Centrifugal	
Motor sheave	1VL34	1VL44	1VL34	1VL44	1VL34	1VL44
Blower sheave	AK46	AK46	AK46	AK46	AK46	AK46
Belt	A39	A40	A39	A40	A37	A39
Motor HP each, single-phase	1.5	—	1.5	—	1.5	—
Motor HP each, three-phase	2.4	2.4	2.4	2.4	2.4	2.9
RPM	1725		1725		1750	
Frame size	56Y		56Y		56HZ	
Direct drive indoor fan data						
Quantity	1		1		1	
Fan size (in.)	10 x 10		10 x 10		11 x 10	
Type	Centrifugal		Centrifugal		Centrifugal	
Motor HP each	3/4		1		1	
RPM	1050		1050		1050	
Filters						
Quantity - size	2 - (16 x 25 x 2)[1]		4 - (16 x 16 x 2)[1]		4 - (16 x 16 x 2)[1]	

Note:
1. 2 in. Throwaway, Standard, MERV 4 (Minimum Efficiency Reporting Value)

Electrical data

Note: This note applies to all electrical data tables.

- MCA = Minimum circuit ampacity.
- Max fuse = Dual element, time delay type.
- Breaker size = HACR type per NEC.
- Minimum disconnect rating = Non-fused disconnect, verify on the unit nameplate that the disconnect is properly sized for the application. Units with field-installed electric heat kits may exceed the factory-installed disconnect amperage rating.

WQE electrical data

Table 7: WQE04 to 06 standard indoor blower without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCAw/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-1-60	16.7	93.5	26	2	6.6	1.5	—	None	—	—	—	29.5	30	45	29	100	31	35	45	31	103
									10625	4.9	1	23.6	59	60	60	56	124	60.5	70	70	58	127
									11125	7.9	1	38	77	80	80	73	138	78.5	80	80	75	141
	230-1-60	16.7	93.5	26	2.3	6	1.3	—	None	—	—	—	29.2	30	45	29	100	30.5	35	45	30	103
									10625	6.5	1	27.1	63.1	70	70	60	128	64.4	70	70	61	130
									11125	10.5	1	43.8	84	90	90	79	144	85.3	90	90	81	147
	208-3-60	12.2	97.5	19	2	6.6	1.1	—	None	—	—	—	23.9	25	35	24	104	25	25	35	25	106
									10625	4.9	1	13.6	40.9	45	45	40	118	42	45	50	41	120
									11125	7.9	1	21.9	51.3	60	60	49	126	52.4	60	60	50	128

Table 7: WQE04 to 06 standard indoor blower without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCAw/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
									11625	12	1	33.3	65.5	70	70	62	137	66.6	70	70	63	140
	230-3-60	12.2	97.5	19	2.3	6	1	—	None	—	—	—	23.6	25	35	24	104	24.6	25	35	25	107
									10625	6.5	1	15.6	43.1	45	50	42	120	44.1	45	50	43	122
									11125	10.5	1	25.3	55.2	60	60	53	130	56.2	60	60	54	132
									11625	16	1	38.5	71.7	80	80	68	143	72.7	80	80	69	145
	460-3-60	5.8	44.3	9	1.3	3.2	0.5	—	None	—	—	—	11.8	15	15	12	49	12.3	15	15	12	50
									10646	6	1	7.2	20.8	25	25	20	56	21.3	25	25	21	58
									11146	11.5	1	13.8	29.1	30	30	28	63	29.6	30	30	28	64
									11446	14	1	16.8	32.8	35	35	31	66	33.3	35	35	32	67
	575-3-60	4.5	27.1	7	1	6	0.4	—	None	—	—	—	9	15	15	9	30	9.4	15	15	10	31
									11058	9.2	1	8.9	20.1	25	25	19	39	20.5	25	25	20	40
									11458	13.8	1	13.3	25.6	30	30	24	44	26	30	30	25	44
05 (4)	208-1-60	19.4	102	30	2	8.4	1.5	—	None	—	—	—	34.7	35	50	34	108	36.2	40	50	36	112
									10625	4.9	1	23.6	64.2	70	70	61	132	65.7	70	70	63	135
									11125	7.9	1	38	82.2	90	90	78	146	83.7	90	90	80	150
	230-1-60	19.4	102	30	2.3	7.6	1.3	—	None	—	—	—	34.2	35	50	34	109	35.5	40	50	35	112
									10625	6.5	1	27.1	68.1	70	80	65	136	69.4	70	80	66	139
									11125	10.5	1	43.8	89	90	90	84	153	90.3	100	100	86	156
	208-3-60	12	123	19	2	8.4	1.1	—	None	—	—	—	25.4	30	35	26	129	26.5	30	35	27	132
									10625	4.9	1	13.6	42.4	45	50	41	143	43.5	45	50	43	146
									11125	7.9	1	21.9	52.8	60	60	51	151	53.9	60	60	52	154
									11625	12	1	33.3	67	70	70	64	163	68.1	70	70	65	165
	230-3-60	12	123	19	2.3	7.6	1	—	None	—	—	—	24.9	25	35	25	130	25.9	30	35	26	132
									10625	6.5	1	15.6	44.4	45	50	43	146	45.4	50	50	44	148
									11125	10.5	1	25.3	56.5	60	60	54	155	57.5	60	60	55	158
									11625	16	1	38.5	73	80	80	69	168	74	80	80	71	171
	460-3-60	6.3	60	10	1.3	4	0.5	—	None	—	—	—	13.2	15	15	13	65	13.7	15	15	14	66
									10646	6	1	7.2	22.2	25	25	22	72	22.7	25	25	22	73
									11146	11.5	1	13.8	30.5	35	35	29	79	31	35	35	30	80
									11446	14	1	16.8	34.2	35	35	33	82	34.7	35	35	33	83
	575-3-60	4.4	41	7	1	7.6	0.4	—	None	—	—	—	9.5	15	15	10	44	9.9	15	15	10	45
									11058	9.2	1	8.9	20.6	25	25	20	53	21	25	25	20	54
									11458	13.8	1	13.3	26.1	30	30	25	57	26.5	30	30	25	58

Table 7: WQE04 to 06 standard indoor blower without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCAw/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-1-60	22.5	148	35	2	8.4	1.5	—	None	—	—	—	38.5	40	60	38	154	40	40	60	40	158
									10625	4.9	1	23.6	68	70	80	65	178	69.5	70	80	67	181
									11125	7.9	1	38	86	90	90	82	192	87.5	90	100	83	196
	230-1-60	22.5	148	35	2.3	7.6	1.3	—	None	—	—	—	38	40	60	37	155	39.3	40	60	39	158
									10625	6.5	1	27.1	71.9	80	80	68	182	73.2	80	80	70	185
									11125	10.5	1	43.8	92.8	100	100	88	199	94.1	100	100	89	202
	208-3-60	13.1	93	20	2	8.4	1.1	—	None	—	—	—	26.8	30	35	27	99	27.9	30	40	28	102
									10625	4.9	1	13.6	43.8	45	50	43	113	44.9	45	50	44	116
									11125	7.9	1	21.9	54.2	60	60	52	121	55.3	60	60	53	124
									11625	12	1	33.3	68.4	70	70	65	133	69.5	70	70	67	135
	230-3-60	13.1	93	20	2.3	7.6	1	—	None	—	—	—	26.3	30	35	26	100	27.3	30	40	28	102
									10625	6.5	1	15.6	45.8	50	50	44	116	46.8	50	50	46	118
									11125	10.5	1	25.3	57.9	60	60	56	125	58.9	60	60	57	128
									11625	16	1	38.5	74.4	80	80	71	138	75.4	80	80	72	141
	460-3-60	6.6	60	10	1.3	4	0.5	—	None	—	—	—	13.6	15	20	14	65	14.1	15	20	14	66
									10646	6	1	7.2	22.6	25	25	22	72	23.1	25	25	23	73
									11146	11.5	1	13.8	30.9	35	35	30	79	31.4	35	35	30	80
									11446	14	1	16.8	34.6	35	35	33	82	35.1	40	40	34	83
	575-3-60	4.8	41	8	1	7.6	0.4	—	None	—	—	—	10	15	15	10	44	10.4	15	15	11	45
									11458	13.8	1	13.3	26.6	30	30	25	57	27	30	30	26	58
									12358	23	1	22.1	37.6	40	40	36	66	38	40	40	36	67

Table 8: WQE04-06 standard indoor blower with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCA w/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-1-60	16.7	93.5	26	2	6.6	1.5	8.6	None	—	—	—	33.8	35	50	34	104	35.3	40	50	36	108
									10625	4.9	1	23.6	63.3	70	70	61	128	64.8	70	70	63	131
									11125	7.9	1	38	81.3	90	90	78	142	82.8	90	90	79	146
	230-1-60	16.7	93.5	26	2.3	6	1.3	8.6	None	—	—	—	33.5	35	50	34	105	34.8	35	50	35	108
									10625	6.5	1	27.1	67.4	70	70	65	132	68.7	70	70	66	135
									11125	10.5	1	43.8	88.3	90	90	84	149	89.6	90	90	86	151
	208-3-60	12.2	97.5	19	2	6.6	1.1	8.6	None	—	—	—	28.2	30	40	29	108	29.3	30	40	30	111
									10625	4.9	1	13.6	45.2	50	50	45	122	46.3	50	50	46	124
									11125	7.9	1	21.9	55.6	60	60	54	130	56.7	60	60	55	133
									11625	12	1	33.3	69.8	70	70	67	142	70.9	80	80	68	144
	230-3-60	12.2	97.5	19	2.3	6	1	8.6	None	—	—	—	27.9	30	40	29	109	28.9	30	40	30	111
									10625	6.5	1	15.6	47.4	50	50	46	124	48.4	50	50	48	127
									11125	10.5	1	25.3	59.5	60	60	58	134	60.5	70	70	59	136
									11625	16	1	38.5	76	80	80	73	147	77	80	80	74	150
	460-3-60	5.8	44.3	9	1.3	3.2	0.5	8.6	None	—	—	—	14	15	15	14	51	14.5	15	15	15	52
									10646	6	1	7.2	23	25	25	23	59	23.5	25	25	23	60
									11146	11.5	1	13.8	31.3	35	35	30	65	31.8	35	35	31	66
									11446	14	1	16.8	35	35	35	34	68	35.5	40	40	34	69
	575-3-60	4.5	27.1	7	1	6	0.4	8.6	None	—	—	—	10.7	15	15	11	32	11.1	15	15	12	33
									11058	9.2	1	8.9	21.8	25	25	21	41	22.2	25	25	22	42
									11458	13.8	1	13.3	27.3	30	30	26	45	27.7	30	30	27	46
05 (4)	208-1-60	19.4	102	30	2	8.4	1.5	8.6	None	—	—	—	39	40	50	39	113	40.5	45	50	41	116
									10625	4.9	1	23.6	68.5	70	80	66	136	70	70	80	68	140
									11125	7.9	1	38	86.5	90	90	83	151	88	90	90	85	154
	230-1-60	19.4	102	30	2.3	7.6	1.3	8.6	None	—	—	—	38.5	40	50	39	113	39.8	40	50	40	116
									10625	6.5	1	27.1	72.4	80	80	70	140	73.7	80	80	71	143
									11125	10.5	1	43.8	93.3	100	100	89	157	94.6	100	100	91	160
	208-3-60	12	123	19	2	8.4	1.1	8.6	None	—	—	—	29.7	30	40	31	134	30.8	35	40	32	136
									10625	4.9	1	13.6	46.7	50	50	46	147	47.8	50	50	48	150
									11125	7.9	1	21.9	57.1	60	60	56	156	58.2	60	60	57	158
									11625	12	1	33.3	71.3	80	80	69	167	72.4	80	80	70	170
	230-3-60	12	123	19	2.3	7.6	1	8.6	None	—	—	—	29.2	30	40	30	134	30.2	35	40	31	137
									10625	6.5	1	15.6	48.7	50	50	48	150	49.7	50	50	49	152
									11125	10.5	1	25.3	60.8	70	70	59	160	61.8	70	70	60	162
									11625	16	1	38.5	77.3	80	80	74	173	78.3	80	80	76	175
	460-3-60	6.3	60	10	1.3	4	0.5	8.6	None	—	—	—	15.4	20	20	16	67	15.9	20	20	16	68
									10646	6	1	7.2	24.4	25	25	24	74	24.9	25	25	25	75
									11146	11.5	1	13.8	32.7	35	35	32	81	33.2	35	35	32	82
									11446	14	1	16.8	36.4	40	40	35	84	36.9	40	40	36	85
	575-3-60	4.4	41	7	1	7.6	0.4	8.6	None	—	—	—	11.3	15	15	12	46	11.7	15	15	12	47
									11058	9.2	1	8.9	22.4	25	25	22	55	22.8	25	25	22	56
									11458	13.8	1	13.3	27.9	30	30	27	59	28.3	30	30	27	60

Table 8: WQE04-06 standard indoor blower with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCA w/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-1-60	22.5	148	35	2	8.4	1.5	8.6	None	—	—	—	42.8	45	60	43	159	44.3	45	60	45	162
									10625	4.9	1	23.6	72.3	80	80	70	182	73.8	80	90	72	186
									11125	7.9	1	38	90.3	100	100	86	197	91.8	100	100	88	200
	230-1-60	22.5	148	35	2.3	7.6	1.3	8.6	None	—	—	—	42.3	45	60	42	159	43.6	45	60	44	162
									10625	6.5	1	27.1	76.2	80	90	73	186	77.5	80	90	75	189
									11125	10.5	1	43.8	97.1	100	100	93	203	98.4	100	100	94	206
	208-3-60	13.1	93	20	2	8.4	1.1	8.6	None	—	—	—	31.1	35	40	32	104	32.2	35	45	33	106
									10625	4.9	1	13.6	48.1	50	50	48	117	49.2	50	50	49	120
									11125	7.9	1	21.9	58.5	60	60	57	126	59.6	60	60	58	128
									11625	12	1	33.3	72.7	80	80	70	137	73.8	80	80	72	140
	230-3-60	13.1	93	20	2.3	7.6	1	8.6	None	—	—	—	30.6	35	40	31	104	31.6	35	40	33	107
									10625	6.5	1	15.6	50.1	60	60	49	120	51.1	60	60	50	122
									11125	10.5	1	25.3	62.2	70	70	60	130	63.2	70	70	62	132
									11625	16	1	38.5	78.7	80	80	76	143	79.7	80	80	77	145
	460-3-60	6.6	60	10	1.3	4	0.5	8.6	None	—	—	—	15.8	20	20	16	67	16.3	20	20	17	68
									10646	6	1	7.2	24.8	25	25	24	74	25.3	30	30	25	75
									11146	11.5	1	13.8	33.1	35	35	32	81	33.6	35	35	33	82
									11446	14	1	16.8	36.8	40	40	36	84	37.3	40	40	36	85
	575-3-60	4.8	41	8	1	7.6	0.4	8.6	None	—	—	—	11.8	15	15	12	46	12.2	15	15	13	47
									11458	13.8	1	13.3	28.4	30	30	27	59	28.8	30	30	28	60
									12358	23	1	22.1	39.4	40	40	38	68	39.8	40	40	38	69

Table 9: WQE04-06 medium indoor blower without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCA w/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-1-60	16.7	93.5	26	2	7.6	1.5	—	None	—	—	—	30.5	35	45	30	131	32	35	45	32	134
									10625	4.9	1	23.6	60	60	70	57	155	61.5	70	70	59	158
									11125	7.9	1	38	78	80	80	74	169	79.5	80	80	76	172
	230-1-60	16.7	93.5	26	2.3	7	1.3	—	None	—	—	—	30.2	35	45	30	134	31.5	35	45	31	137
									10625	6.5	1	27.1	64.1	70	70	61	161	65.4	70	70	63	164
									11125	10.5	1	43.8	85	90	90	80	178	86.3	90	90	82	181
	208-3-60	12.2	97.5	19	2	5.2	1.1	—	None	—	—	—	22.5	25	30	22	124	23.6	25	35	24	127
									10625	4.9	1	13.6	39.5	40	45	38	138	40.6	45	45	39	140
									11125	7.9	1	21.9	49.9	50	50	47	146	51	60	60	49	149
									11625	12	1	33.3	64.1	70	70	61	158	65.2	70	70	62	160
	230-3-60	12.2	97.5	19	2.3	5.2	1	—	None	—	—	—	22.8	25	30	23	127	23.8	25	35	24	130
									10625	6.5	1	15.6	42.3	45	50	41	143	43.3	45	50	42	145
									11125	10.5	1	25.3	54.4	60	60	52	153	55.4	60	60	53	155
									11625	16	1	38.5	70.9	80	80	67	166	71.9	80	80	68	168
	460-3-60	5.8	44.3	9	1.3	2.6	0.5	—	None	—	—	—	11.2	15	15	11	60	11.7	15	15	12	61
									10646	6	1	7.2	20.2	25	25	19	67	20.7	25	25	20	68
									11146	11.5	1	13.8	28.5	30	30	27	74	29	30	30	28	75
									11446	14	1	16.8	32.2	35	35	30	77	32.7	35	35	31	78
	575-3-60	4.5	27.1	7	1	2	0.4	—	None	—	—	—	8.6	15	15	9	39	9	15	15	9	40
									11058	9.2	1	8.9	19.7	20	20	19	48	20.1	25	25	19	49
									11458	13.8	1	13.3	25.2	30	30	24	53	25.6	30	30	24	54
05 (4)	208-1-60	19.4	102	30	2	7.6	1.5	—	None	—	—	—	33.9	35	50	33	139	35.4	40	50	35	143
									10625	4.9	1	23.6	63.4	70	70	60	163	64.9	70	70	62	166
									11125	7.9	1	38	81.4	90	90	77	177	82.9	90	90	79	181
	230-1-60	19.4	102	30	2.3	7	1.3	—	None	—	—	—	33.6	35	50	33	142	34.9	35	50	35	145
									10625	6.5	1	27.1	67.5	70	80	64	170	68.8	70	80	66	172
									11125	10.5	1	43.8	88.4	90	90	83	186	89.7	90	90	85	189
	208-3-60	12	123	19	2	5.2	1.1	—	None	—	—	—	22.2	25	30	22	150	23.3	25	35	23	152
									10625	4.9	1	13.6	39.2	40	45	38	163	40.3	45	45	39	166
									11125	7.9	1	21.9	49.6	50	50	47	172	50.7	60	60	49	174
									11625	12	1	33.3	63.8	70	70	60	183	64.9	70	70	62	186
	230-3-60	12	123	19	2.3	5.2	1	—	None	—	—	—	22.5	25	30	22	153	23.5	25	35	24	155
									10625	6.5	1	15.6	42	45	50	40	169	43	45	50	42	171
									11125	10.5	1	25.3	54.1	60	60	52	178	55.1	60	60	53	181
									11625	16	1	38.5	70.6	80	80	67	191	71.6	80	80	68	194
	460-3-60	6.3	60	10	1.3	2.6	0.5	—	None	—	—	—	11.8	15	15	12	75	12.3	15	15	12	77
									10646	6	1	7.2	20.8	25	25	20	83	21.3	25	25	21	84
									11146	11.5	1	13.8	29.1	30	30	28	89	29.6	30	30	28	90
									11446	14	1	16.8	32.8	35	35	31	92	33.3	35	35	32	93
	575-3-60	4.4	41	7	1	2	0.4	—	None	—	—	—	8.5	15	15	9	53	8.9	15	15	9	54
									11058	9.2	1	8.9	19.6	20	20	19	62	20	20	20	19	63
									11458	13.8	1	13.3	25.1	30	30	24	67	25.5	30	30	24	68

Table 9: WQE04-06 medium indoor blower without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCA w/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-1-60	22.5	148	35	2	6.8	1.5	—	None	—	—	—	36.9	40	50	36	185	38.4	40	60	38	188
									10625	4.9	1	23.6	66.4	70	80	63	209	67.9	70	80	65	212
									11125	7.9	1	38	84.4	90	90	80	223	85.9	90	90	81	226
	230-1-60	22.5	148	35	2.3	6.2	1.3	—	None	—	—	—	36.6	40	50	36	186	37.9	40	60	37	189
									10625	6.5	1	27.1	70.5	80	80	67	213	71.8	80	80	68	216
									11125	10.5	1	43.8	91.4	100	100	86	230	92.7	100	100	88	233
	208-3-60	13.1	93	20	2	7	1.1	—	None	—	—	—	25.4	30	35	25	158	26.5	30	35	27	160
									10625	4.9	1	13.6	42.4	45	50	41	171	43.5	45	50	42	174
									11125	7.9	1	21.9	52.8	60	60	51	179	53.9	60	60	52	182
									11625	12	1	33.3	67	70	70	64	191	68.1	70	70	65	193
	230-3-60	13.1	93	20	2.3	7.2	1	—	None	—	—	—	25.9	30	35	26	160	26.9	30	35	27	162
									10625	6.5	1	15.6	45.4	50	50	44	175	46.4	50	50	45	178
									11125	10.5	1	25.3	57.5	60	60	55	185	58.5	60	60	56	187
									11625	16	1	38.5	74	80	80	70	198	75	80	80	71	201
	460-3-60	6.6	60	10	1.3	3.6	0.5	—	None	—	—	—	13.2	15	15	13	94	13.7	15	15	14	95
									10646	6	1	7.2	22.2	25	25	22	101	22.7	25	25	22	102
									11146	11.5	1	13.8	30.5	35	35	29	108	31	35	35	30	109
									11446	14	1	16.8	34.2	35	35	33	111	34.7	35	35	33	112
	575-3-60	4.8	41	8	1	2.5	0.4	—	None	—	—	—	9.5	15	15	10	61	9.9	15	15	10	62
									11458	13.8	1	13.3	26.1	30	30	25	74	26.5	30	30	25	75
									12358	23	1	22.1	37.1	40	40	35	83	37.5	40	40	35	84

Table 10: WQE04-06 medium indoor blower with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCA w/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-1-60	16.7	93.5	26	2	7.6	1.5	8.6	None	—	—	—	34.8	35	50	35	135	36.3	40	50	37	139
									10625	4.9	1	23.6	64.3	70	70	62	159	65.8	70	70	64	162
									11125	7.9	1	38	82.3	90	90	79	173	83.8	90	90	81	177
	230-1-60	16.7	93.5	26	2.3	7	1.3	8.6	None	—	—	—	34.5	35	50	35	138	35.8	40	50	36	141
									10625	6.5	1	27.1	68.4	70	70	66	165	69.7	70	70	68	168
									11125	10.5	1	43.8	89.3	90	90	85	182	90.6	100	100	87	185
	208-3-60	12.2	97.5	19	2	5.2	1.1	8.6	None	—	—	—	26.8	30	35	27	129	27.9	30	40	29	131
									10625	4.9	1	13.6	43.8	45	50	43	142	44.9	45	50	44	145
									11125	7.9	1	21.9	54.2	60	60	52	151	55.3	60	60	54	153
									11625	12	1	33.3	68.4	70	70	66	162	69.5	70	70	67	164
	230-3-60	12.2	97.5	19	2.3	5.2	1	8.6	None	—	—	—	27.1	30	35	28	132	28.1	30	40	29	134
									10625	6.5	1	15.6	46.6	50	50	46	147	47.6	50	50	47	150
									11125	10.5	1	25.3	58.7	60	60	57	157	59.7	60	60	58	159
									11625	16	1	38.5	75.2	80	80	72	170	76.2	80	80	73	173
	460-3-60	5.8	44.3	9	1.3	2.6	0.5	8.6	None	—	—	—	13.4	15	15	14	62	13.9	15	15	14	63
									10646	6	1	7.2	22.4	25	25	22	69	22.9	25	25	23	70
									11146	11.5	1	13.8	30.7	35	35	30	76	31.2	35	35	30	77
									11446	14	1	16.8	34.4	35	35	33	79	34.9	35	35	34	80
	575-3-60	4.5	27.1	7	1	2	0.4	8.6	None	—	—	—	10.3	15	15	11	41	10.7	15	15	11	42
									11058	9.2	1	8.9	21.4	25	25	21	50	21.8	25	25	21	51
									11458	13.8	1	13.3	26.9	30	30	26	54	27.3	30	30	26	55
05 (4)	208-1-60	19.4	102	30	2	7.6	1.5	8.6	None	—	—	—	38.2	40	50	38	144	39.7	40	50	40	147
									10625	4.9	1	23.6	67.7	70	80	65	167	69.2	70	80	67	171
									11125	7.9	1	38	85.7	90	90	82	182	87.2	90	90	84	185
	230-1-60	19.4	102	30	2.3	7	1.3	8.6	None	—	—	—	37.9	40	50	38	147	39.2	40	50	39	150
									10625	6.5	1	27.1	71.8	80	80	69	174	73.1	80	80	71	177
									11125	10.5	1	43.8	92.7	100	100	88	191	94	100	100	90	193
	208-3-60	12	123	19	2	5.2	1.1	8.6	None	—	—	—	26.5	30	35	27	154	27.6	30	35	28	157
									10625	4.9	1	13.6	43.5	45	50	43	168	44.6	45	50	44	170
									11125	7.9	1	21.9	53.9	60	60	52	176	55	60	60	53	179
									11625	12	1	33.3	68.1	70	70	65	187	69.2	70	70	67	190
	230-3-60	12	123	19	2.3	5.2	1	8.6	None	—	—	—	26.8	30	35	27	157	27.8	30	35	29	160
									10625	6.5	1	15.6	46.3	50	50	45	173	47.3	50	50	46	175
									11125	10.5	1	25.3	58.4	60	60	56	183	59.4	60	60	58	185
									11625	16	1	38.5	74.9	80	80	72	196	75.9	80	80	73	198
	460-3-60	6.3	60	10	1.3	2.6	0.5	8.6	None	—	—	—	14	15	20	14	78	14.5	15	20	15	79
									10646	6	1	7.2	23	25	25	23	85	23.5	25	25	23	86
									11146	11.5	1	13.8	31.3	35	35	30	91	31.8	35	35	31	92
									11446	14	1	16.8	35	35	35	34	94	35.5	40	40	34	95
	575-3-60	4.4	41	7	1	2	0.4	8.6	None	—	—	—	10.2	15	15	10	55	10.6	15	15	11	56
									11058	9.2	1	8.9	21.3	25	25	21	64	21.7	25	25	21	65
									11458	13.8	1	13.3	26.8	30	30	26	68	27.2	30	30	26	69

Table 10: WQE04-06 medium indoor blower with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCA w/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-1-60	22.5	148	35	2	6.8	1.5	8.6	None	—	—	—	41.2	45	60	41	189	42.7	45	60	43	193
									10625	4.9	1	23.6	70.7	80	80	68	213	72.2	80	80	70	216
									11125	7.9	1	38	88.7	90	100	85	227	90.2	100	100	86	231
	230-1-60	22.5	148	35	2.3	6.2	1.3	8.6	None	—	—	—	40.9	45	60	41	190	42.2	45	60	42	193
									10625	6.5	1	27.1	74.8	80	90	72	217	76.1	80	90	73	220
									11125	10.5	1	43.8	95.7	100	100	91	234	97	100	100	92	237
	208-3-60	13.1	93	20	2	7	1.1	8.6	None	—	—	—	29.7	30	40	30	162	30.8	35	40	32	164
									10625	4.9	1	13.6	46.7	50	50	46	175	47.8	50	50	47	178
									11125	7.9	1	21.9	57.1	60	60	56	184	58.2	60	60	57	186
									11625	12	1	33.3	71.3	80	80	69	195	72.4	80	80	70	198
	230-3-60	13.1	93	20	2.3	7.2	1	8.6	None	—	—	—	30.2	35	40	31	164	31.2	35	40	32	166
									10625	6.5	1	15.6	49.7	50	50	49	180	50.7	60	60	50	182
									11125	10.5	1	25.3	61.8	70	70	60	189	62.8	70	70	61	192
									11625	16	1	38.5	78.3	80	80	75	203	79.3	80	80	76	205
	460-3-60	6.6	60	10	1.3	3.6	0.5	8.6	None	—	—	—	15.4	20	20	16	96	15.9	20	20	16	97
									10646	6	1	7.2	24.4	25	25	24	103	24.9	25	25	25	104
									11146	11.5	1	13.8	32.7	35	35	32	110	33.2	35	35	32	111
									11446	14	1	16.8	36.4	40	40	35	113	36.9	40	40	36	114
	575-3-60	4.8	41	8	1	2.5	0.4	8.6	None	—	—	—	11.2	15	15	12	63	11.6	15	15	12	64
									11458	13.8	1	13.3	27.8	30	30	27	76	28.2	30	30	27	77
									12358	23	1	22.1	38.8	40	40	37	85	39.2	40	40	37	86

Table 11: WQE04-06 high indoor blower without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCA w/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-3-60	12.2	97.5	19	2	5.2	1.1	—	None	—	—	—	22.5	25	30	22	124	23.6	25	35	24	127
									10625	4.9	1	13.6	39.5	40	45	38	138	40.6	45	45	39	140
									11125	7.9	1	21.9	49.9	50	50	47	146	51	60	60	49	149
									11625	12	1	33.3	64.1	70	70	61	158	65.2	70	70	62	160
	230-3-60	12.2	97.5	19	2.3	5.2	1	—	None	—	—	—	22.8	25	30	23	127	23.8	25	35	24	130
									10625	6.5	1	15.6	42.3	45	50	41	143	43.3	45	50	42	145
									11125	10.5	1	25.3	54.4	60	60	52	153	55.4	60	60	53	155
									11625	16	1	38.5	70.9	80	80	67	166	71.9	80	80	68	168
	460-3-60	5.8	44.3	9	1.3	2.6	0.5	—	None	—	—	—	11.2	15	15	11	60	11.7	15	15	12	61
									10646	6	1	7.2	20.2	25	25	19	67	20.7	25	25	20	68
									11146	11.5	1	13.8	28.5	30	30	27	74	29	30	30	28	75
									11446	14	1	16.8	32.2	35	35	30	77	32.7	35	35	31	78
	575-3-60	4.5	27.1	7	1	2	0.4	—	None	—	—	—	8.6	15	15	9	39	9	15	15	9	40
									11058	9.2	1	8.9	19.7	20	20	19	48	20.1	25	25	19	49
									11458	13.8	1	13.3	25.2	30	30	24	53	25.6	30	30	24	54
05 (4)	208-3-60	12	123	19	2	5.2	1.1	—	None	—	—	—	22.2	25	30	22	150	23.3	25	35	23	152
									10625	4.9	1	13.6	39.2	40	45	38	163	40.3	45	45	39	166
									11125	7.9	1	21.9	49.6	50	50	47	172	50.7	60	60	49	174
									11625	12	1	33.3	63.8	70	70	60	183	64.9	70	70	62	186
	230-3-60	12	123	19	2.3	5.2	1	—	None	—	—	—	22.5	25	30	22	153	23.5	25	35	24	155
									10625	6.5	1	15.6	42	45	50	40	169	43	45	50	42	171
									11125	10.5	1	25.3	54.1	60	60	52	178	55.1	60	60	53	181
									11625	16	1	38.5	70.6	80	80	67	191	71.6	80	80	68	194
	460-3-60	6.3	60	10	1.3	2.6	0.5	—	None	—	—	—	11.8	15	15	12	75	12.3	15	15	12	77
									10646	6	1	7.2	20.8	25	25	20	83	21.3	25	25	21	84
									11146	11.5	1	13.8	29.1	30	30	28	89	29.6	30	30	28	90
									11446	14	1	16.8	32.8	35	35	31	92	33.3	35	35	32	93
	575-3-60	4.4	41	7	1	2	0.4	—	None	—	—	—	8.5	15	15	9	53	8.9	15	15	9	54
									11058	9.2	1	8.9	19.6	20	20	19	62	20	20	20	19	63
									11458	13.8	1	13.3	25.1	30	30	24	67	25.5	30	30	24	68

Table 11: WQE04-06 high indoor blower without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCA w/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-3-60	13.1	93	20	2	8.9	1.1	—	None	—	—	—	27.3	30	40	28	174	28.4	30	40	29	177
									10625	4.9	1	13.6	44.3	45	50	43	188	45.4	50	50	45	190
									11125	7.9	1	21.9	54.7	60	60	53	196	55.8	60	60	54	199
									11625	12	1	33.3	68.9	70	70	66	208	70	80	80	67	210
	230-3-60	13.1	93	20	2.3	8.2	1	—	None	—	—	—	26.9	30	35	27	177	27.9	30	40	28	179
									10625	6.5	1	15.6	46.4	50	50	45	193	47.4	50	50	46	195
									11125	10.5	1	25.3	58.5	60	60	56	202	59.5	60	60	57	205
									11625	16	1	38.5	75	80	80	71	215	76	80	80	73	218
	460-3-60	6.6	60	10	1.3	4.1	0.5	—	None	—	—	—	13.7	15	20	14	97	14.2	15	20	14	99
									10646	6	1	7.2	22.7	25	25	22	105	23.2	25	25	23	106
									11146	11.5	1	13.8	31	35	35	30	111	31.5	35	35	30	112
									11446	14	1	16.8	34.7	35	35	33	114	35.2	40	40	34	115
	575-3-60	4.8	41	8	1	3.2	0.4	—	None	—	—	—	10.2	15	15	10	69	10.6	15	15	11	70
									11458	13.8	1	13.3	26.8	30	30	26	83	27.2	30	30	26	84
									12358	23	1	22.1	37.8	40	40	36	92	38.2	40	40	36	92

Table 12: WQE04-06 high indoor blower with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCA w/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-3-60	12.2	97.5	19	2	5.2	1.1	8.6	None	—	—	—	26.8	30	35	27	129	27.9	30	40	29	131
									10625	4.9	1	13.6	43.8	45	50	43	142	44.9	45	50	44	145
									11125	7.9	1	21.9	54.2	60	60	52	151	55.3	60	60	54	153
									11625	12	1	33.3	68.4	70	70	66	162	69.5	70	70	67	164
	230-3-60	12.2	97.5	19	2.3	5.2	1	8.6	None	—	—	—	27.1	30	35	28	132	28.1	30	40	29	134
									10625	6.5	1	15.6	46.6	50	50	46	147	47.6	50	50	47	150
									11125	10.5	1	25.3	58.7	60	60	57	157	59.7	60	60	58	159
									11625	16	1	38.5	75.2	80	80	72	170	76.2	80	80	73	173
	460-3-60	5.8	44.3	9	1.3	2.6	0.5	8.6	None	—	—	—	13.4	15	15	14	62	13.9	15	15	14	63
									10646	6	1	7.2	22.4	25	25	22	69	22.9	25	25	23	70
									11146	11.5	1	13.8	30.7	35	35	30	76	31.2	35	35	30	77
									11446	14	1	16.8	34.4	35	35	33	79	34.9	35	35	34	80
	575-3-60	4.5	27.1	7	1	2	0.4	8.6	None	—	—	—	10.3	15	15	11	41	10.7	15	15	11	42
									11058	9.2	1	8.9	21.4	25	25	21	50	21.8	25	25	21	51
									11458	13.8	1	13.3	26.9	30	30	26	54	27.3	30	30	26	55

Table 12: WQE04-06 high indoor blower with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field-installed kit 2EK045*				MCA (amps)	Min fuse /breaker size (amps)	Max fuse /breaker size (amps)	Min disconnect rating		MCA w/pwr exh (amps)	Min fuse/breaker size w/pwr exh (amps)	Max fuse/ breaker size/pwr exh (amps)	Min disconnect rating/ pwr exh	
		RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
05 (4)	208-3-60	12	123	19	2	5.2	1.1	8.6	None	—	—	—	26.5	30	35	27	154	27.6	30	35	28	157
									10625	4.9	1	13.6	43.5	45	50	43	168	44.6	45	50	44	170
									11125	7.9	1	21.9	53.9	60	60	52	176	55	60	60	53	179
									11625	12	1	33.3	68.1	70	70	65	187	69.2	70	70	67	190
	230-3-60	12	123	19	2.3	5.2	1	8.6	None	—	—	—	26.8	30	35	27	157	27.8	30	35	29	160
									10625	6.5	1	15.6	46.3	50	50	45	173	47.3	50	50	46	175
									11125	10.5	1	25.3	58.4	60	60	56	183	59.4	60	60	58	185
									11625	16	1	38.5	74.9	80	80	72	196	75.9	80	80	73	198
	460-3-60	6.3	60	10	1.3	2.6	0.5	8.6	None	—	—	—	14	15	20	14	78	14.5	15	20	15	79
									10646	6	1	7.2	23	25	25	23	85	23.5	25	25	23	86
									11146	11.5	1	13.8	31.3	35	35	30	91	31.8	35	35	31	92
									11446	14	1	16.8	35	35	35	34	94	35.5	40	40	34	95
	575-3-60	4.4	41	7	1	2	0.4	8.6	None	—	—	—	10.2	15	15	10	55	10.6	15	15	11	56
									11058	9.2	1	8.9	21.3	25	25	21	64	21.7	25	25	21	65
									11458	13.8	1	13.3	26.8	30	30	26	68	27.2	30	30	26	69
06 (5)	208-3-60	13.1	93	20	2	8.9	1.1	8.6	None	—	—	—	31.6	35	40	33	179	32.7	35	45	34	181
									10625	4.9	1	13.6	48.6	50	50	48	192	49.7	50	50	49	195
									11125	7.9	1	21.9	59	60	60	58	200	60.1	70	70	59	203
									11625	12	1	33.3	73.2	80	80	71	212	74.3	80	80	72	214
	230-3-60	13.1	93	20	2.3	8.2	1	8.6	None	—	—	—	31.2	35	40	32	181	32.2	35	45	33	184
									10625	6.5	1	15.6	50.7	60	60	50	197	51.7	60	60	51	199
									11125	10.5	1	25.3	62.8	70	70	61	207	63.8	70	70	62	209
									11625	16	1	38.5	79.3	80	80	76	220	80.3	90	90	78	222
	460-3-60	6.6	60	10	1.3	4.1	0.5	8.6	None	—	—	—	15.9	20	20	16	100	16.4	20	20	17	101
									10646	6	1	7.2	24.9	25	25	25	107	25.4	30	30	25	108
									11146	11.5	1	13.8	33.2	35	35	32	113	33.7	35	35	33	114
									11446	14	1	16.8	36.9	40	40	36	116	37.4	40	40	36	117
	575-3-60	4.8	41	8	1	3.2	0.4	8.6	None	—	—	—	11.9	15	15	12	71	12.3	15	15	13	72
									11458	13.8	1	13.3	28.5	30	30	28	84	28.9	30	30	28	85
									12358	23	1	22.1	39.5	40	40	38	93	39.9	40	40	38	94

Operation

Sequence of operation

For WQ units, a Y1 call for the first stage of cooling is passed to the Unit Control Board (UCB) which then determines whether the requested operation is available and if so, which components to energize. With an Y1 call for first stage cooling the UCB will determine if a first stage cooling output is valid as long as all safeties and time-delays allow a C1 output for cooling. The C1 relay on the UCB will close and send 24 volts to the compressor relay starting the first stage compressor and also energizing a relay starting the associated condenser fans. During any call for fan or cooling the FAN output on the UCB will energize the appropriate relay starting the supply fan.

If at any time a call for both heating and cooling are present, the heating operation will be performed. If operating, the cooling system is halted as with a completion of a call for cooling. Heating always takes priority.

Continuous blower

By setting the room thermostat fan switch to ON, the supply air blower will operate 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 minimum off delay of 10 seconds.

No outdoor air options

When the thermostat calls for cooling, the low-voltage control circuit from R to Y1 and G is completed. The compressor and condenser fan motor are energized. After completing the specified fan on delay for cooling, the UCB will energize the blower motor.

Once the thermostat has been satisfied, it will de-energize Y1. If the compressor has satisfied its minimum run time, the compressor and condenser fan de-energize. Otherwise, the unit operates the cooling system until the minimum run time for the compressor has been completed. After the compressor de-energizes, the blower is stopped following the elapse of the fan off delay for cooling.

To be available, a compressor must not be locked-out due to a high or low-pressure switch or Evaporator Low Limit sensor (EC1) detecting a temperature below 26° F and the anti-short cycle delay (ASCD) must have elapsed.

Economizer with single enthalpy sensor

When the room thermostat calls for cooling, the low voltage control circuit from R to G and Y1 is completed. The UCB energizes the blower motor (if the fan switch on the room thermostat is set in the AUTO position) and drives the economizer dampers from fully closed to their minimum position. If the enthalpy of the outdoor air is below the setpoint of the enthalpy controller (previously determined), Y1 energizes the economizer. The dampers will modulate to maintain a constant supply air temperature as monitored by the discharge air sensor. If the outdoor air enthalpy is above the setpoint, Y1 energizes the compressor and condenser fan motor only.

Once the thermostat has been satisfied, it will de-energize Y1. If the compressor has satisfied its minimum run time, the compressor and condenser fan are de-energized. Otherwise, the unit operates the cooling system until the minimum run times for the compressor has been completed. After the compressor de-energizes, the blower is stopped following the elapse of the fan off delay for cooling, and the economizer damper goes to the closed position. If the unit is in continuous fan operation the economizer damper goes to the min. position.

Economizer with dual enthalpy sensors

The operation with the dual enthalpy sensors is identical to the single sensor except that a second enthalpy sensor is mounted in the return air. This return air sensor allows the economizer to choose between outdoor air and return air, whichever has the lowest enthalpy value, to provide maximum operating efficiency.

Economizer with power exhaust

A unit equipped with an economizer (single or dual enthalpy) and a power exhaust operates as specified above with one addition. The power exhaust motor is energized 45 seconds after the actuator position exceeds the exhaust fan set point on the economizer control. As always, the "R" to "G" connection provides minimum position but does not provide power exhaust operation.

Motorized outdoor air dampers

This system operation is the same as the units with no outdoor air options with one exception. When the R to G circuit is complete, the motorized damper drives open to a position set by the thumbwheel on the damper motor. When the R to G circuit is opened, the damper spring returns fully closed.

Refrigerant detection system (RDS) (Optional)

The A2L sensor is used to detect R454-B refrigerant. When R454-B refrigerant leak is detected, it is considered an alarm condition.

When an A2L alarm is detected, the unit shuts down any cooling and heating outputs and the supply fan turns on, if not already on, at 50%.

Heating and cooling remains off and the supply fan remains on as long as the A2L sensor is in the alarm condition, plus an additional 5 minutes after the sensor returns to the normal condition.

If the alarm happens three times within two hours, the unit will lockout and will require a reset (**ResetLO**) to go back to normal operation.

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.

High-pressure limit switch

During cooling operation, if a high-pressure limit switch opens, the UCB will de-energize the compressor, initiate the ASCD (Anti-short cycle delay), and stop the condenser fan. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the compressor.

Should a high-pressure switch open three times within two hours of operation, the UCB will lock-out the associated compressor and sends an error message.

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 will monitor the low-pressure switch to ensure it closes. If the low-pressure switch fails to

close after the 30-second monitoring phase, the UCB will de-energize the compressor, initiate the ASCD, and stop the condenser fan.

Once the low-pressure switch has been proven (closed during the 30-second monitor period described above), the UCB will monitor the low-pressure limit switch for any openings. If the low-pressure switch opens for greater than 5 seconds, the UCB will de-energize the compressor, initiate the ASCD, and stop the condenser fan.

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

Should a low-pressure switch open three times within one hour of operation, the UCB will lock-out the compressor and sends an error message.

Evaporator low limit

During cooling operation, if the Evaporator Low Limit Sensor (EC1) (Located on the Suction Line at the Evaporator Coil.) detects a temperature below 26 Deg. F (default), the UCB will de-energize the compressor, initiate the ASCD, and stop the condenser fan. If the call for cooling is still present at the conclusion of the ASCD and the evaporator temperature (EC1) is above 39ºF, the UCB will re-energize the halted compressor.

Should the evaporator low limit sensor (EC1) detect a temperature below 26°F three times within two hours of operation, the UCB will lock-out the associated compressor and flash an error message.

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 45ºF (default). When the OAT Sensor senses a temperature below the low ambient setpoint and the thermostat is calling for cooling, the UCB will operate in the low ambient mode.

Low ambient mode operates the compressors in this manner: 10 minutes on, 5 minutes off. The indoor blower is operated throughout the cycle. The 5-minute off period is necessary to defrost the indoor coil.

Low ambient mode always begins with compressor operation. Compressor minimum run time may extend the minutes of compressor operation. The off cycle will begin immediately following the elapse of the minimum run time.

When operating in low ambient mode, an Evaporator Low Limit Sensor (EC1) temperature below 26ºF will de-energize the compressor. If the call for cooling is still present at the end of the ASCD and the evaporator temperature **(EC1)** is above 39ºF, the unit will resume operation.

Safety controls

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

1. An evaporator low limit sensor **(EC1)** (Located on the Suction Line at the Evaporator Coil.) to protect against low evaporator temperatures due to a low airflow or a low return air temperature, set at 26°F.
2. A high-pressure switch to protect against excessive discharge pressures due to a blocked condenser coil or a condenser motor failure, (opens at 650 ± 25 psig).
3. A low-pressure switch to protect against loss of refrigerant charge, (opens at 7 ± 3 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 will be affected by any safety/preventive action.

The unit control board monitors the temperature limit switch of electric heat units.

Compressor protection

In addition to the external pressure switches, the compressor also has inherent (internal) protection. If there is an abnormal temperature rise in a compressor, the protector will open to shut down the compressor. The UCB incorporates features to minimize compressor wear and damage. An Anti-Short Cycle Delay (ASCD) is utilized 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.

Error message

The UCB will initiate a error message associated with errors within the system.

Reset

Remove the call for cooling, by raising thermostat setting higher than the conditioned space temperature. This resets any pressure or evaporator low limit error messages.

Heating sequence of operations

With or without electric heat

When the thermostat calls for the first stage of heating, the low voltage control circuit is completed between R and W1. The 24vac signal is passed through the UCB to the Fan, C1 and CN-Fan output Terminals and withholds a 24vac output to the H1 terminal assuring the reversing valve cannot be energized, except during defrost. If the ASCD timer is satisfied the UCB will energize compressor contactor M1.

If the compressor alone cannot satisfy the heating requirements, a second stage call from the thermostat completes the circuit between R and W2. This 24vac signal is passed through the UCB H2 output terminal to the electric

heat section (if available). The total available kW of electric heat will be energized on a call for W2.

Defrost initiation

Defrost control implements a temperature differential, demand defrost algorithm. The heat pump is allowed to operate in the heating mode until the combination of outdoor ambient temperature and outdoor coil temperature indicate that defrosting is necessary. When the coil temperature is maintained below the initiate point for a given ambient temperature, continuously for 4 1/2 minutes, the heat pump is put into a defrost cycle. This 4 1/2 minute timer eliminates unnecessary defrost cycles caused by refrigeration surges such as those that occur at the start of a heating cycle.

For defrost, the UCB will signal the energizing of the reversing valve and de-energizing the systems condenser fan motors. The unit's optional electric first-stage heater is also energized via a 24-volt VAC output terminal labeled H2.

Defrost termination

The UCB terminates the defrost mode when either of the following two conditions are met;

1. The outdoor coil temperature sensor reaches 40°F, or
2. The maximum allowable defrost run time of 8 minutes.

Interval between defrosts

A timed inhibit feature prevents the system from responding to a call for defrost less than 40 minutes after the initiation of the previous defrost. After this inhibit time has expired, temperature conditions must call for defrost continuously for 4- 1/2 minutes before another defrost cycle is initiated. A temperature inhibit feature prohibits defrost if the coil temperature is above 40°F. All defrost timing occurs only while the compressor is on.

Forced defrost

A forced-defrost feature puts the system into a defrost cycle every 6 hours and 4 minutes to recirculate lubricants, unless the coil temperature is above 40°F. All defrost timing occurs only while the compressor is on.

For trouble shooting purposes, the defrost cycle can be manually initiated by selecting "Test Defrost" in the UCB menu.

Selectable defrost curves

Defrost initiation will occur when the outdoor coil temperature falls below a particular threshold value, which varies depending upon the selected Defrost curve. The relative behavior of the various defrost curves is as follows;

- Above an outdoor ambient temperature of approximately 20 F, defrost initiation would occur the soonest on Curves 4 or 5, followed by Curve 3, Curve 1 and the latest on Curve 2.
- Below an outdoor ambient temperature of approximately 20 F, defrost initiation would occur the soonest on Curve 3, followed by Curves 4 or 5, Curve 1 and the latest on Curve 2.

A customer that lives in colder climates, where temperatures under 20 are normal, with higher humidity, such as Boston, may want to use a more aggressive defrost curve like Curve 3. A customer that lives in a warmer climate, such as the Southeast United States, can use a less aggressive defrost curve like Curve 2. Each customer should decide for themselves which defrost curve will be suitable for their application.

Options/accessories

Economizer

The Economizer can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed Economizer accessories include complete instructions for installation.

There are two Economizer options. Each is specific to footprint:

1. Vertical Flow application with barometric relief standard.
2. Horizontal Flow application with barometric relief standard.

Power exhaust

The Power Exhaust is a field installed accessory. Field installed Power Exhaust accessories include complete instructions for installation.

The Power Exhaust factory installed option is for Down Flow application only.

There are two field installed Power Exhaust accessories. Each is specific to footprint and unit voltage:

1. Down Flow application.
2. Horizontal Flow application that requires the purchase of a barometric relief hood.

Rain hood

All of the hood components, including the mist eliminators, the gasketing and the hardware for assembling, are packaged and located between the condenser coil section and the main unit cabinet, if the unit has factory installed options. If field installed accessories are being installed all parts necessary for the installation comes in the accessory.

Condensate overflow switch

Factory- or field-installed option.

Mounted to the unit drain pan, the condensate overflow switch is a float switch that monitors the level of water in the drain pan to shut down unit operation and prevent drain pan overflow within the unit.

VFD Shaft Grounding Device

Factory- or field-installed option.

Available on units with a VFD, the shaft grounding device helps prevent electrical bearing fluting damage to the blower

motor shaft by safely diverting harmful shaft voltages and bearing currents to ground, increasing the motor longevity.

Blower phasing

WQ units are properly phased at the factory. Check for proper blower rotation. If the blower rotates in the wrong 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.

CAUTION

When installing equipment in a facility with a 3 phase high-leg delta power supply, care must be taken to ensure that the high-leg conductor is not attached to either of the two legs of the (single phase, direct drive) X13 or ECM motors. Failure to do so can result in the motor acting erratically or not running at all.Check for the high leg conductor by checking voltage of each phase to ground.Example: A or L1 phase to ground, voltage reading is 120V. B or L2 phase to ground, voltage reading is 195 to 208V. C or L3 phase to ground, voltage reading is 120V. Therefore B or L2 phase is the high Leg. The high should always be wired to the center or B or L2 tap.Check all three phase motors and compressors for proper rotation after making a change. If it is necessary to change 3 phase motor rotation, swap A or L1 and C or L3 only.

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 Blower Phasing.

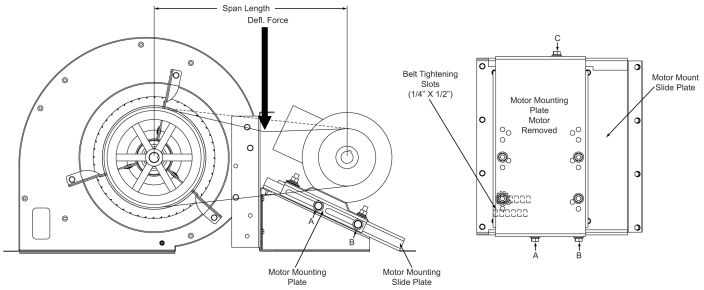
Table 13: Supply air limitations

Model (size)	Supply air (CFM)	
	Minimum	Maximum
WQ04 (3)	900	1500
WQ05 (4)	1200	2000
WQ06 (5)	1500	2500

Belt tension

The tension on the belt should be adjusted as shown in Figure 24.

Figure 24: Belt adjustment



CAUTION

Procedure for adjusting belt tension:

Loosen the three nuts (A and B on side and C on back) of motor mount slide plate.

Adjust tension by placing a flat heat screwdriver into the belt tightening slots (1/4 in. X 1/2 in.) in the motor mount slide plate and applying pressure against the motor mounting plate. See Figure Figure 24.

Tighten the three loosened nuts (A, B and C).

Determine the deflection distance from normal position, use a straight edge from sheave to sheave as reference line.

Use belt tension checker to apply a perpendicular force to the belt at the midpoint of the span as shown. Deflection distance of 4mm (5/32 in.) is obtained.

After adjustments are completed re-tighten nuts (A, B and C).

Altitude and temperature correction for CFM, static pressure and power

The information below should be used to assist in application of product when being applied at altitudes at or exceeding 1000 feet 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 will be generated and less power will be required than a similar application at sea level. Air density correction factors are shown in Table 14 and Figure 25.

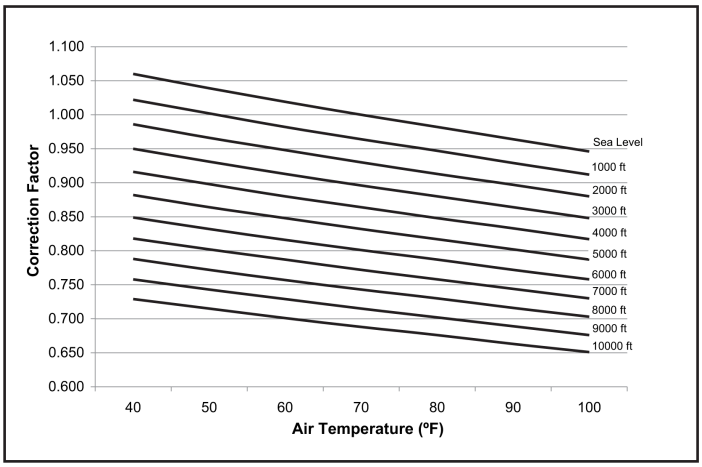
Table 14: Altitude/temperature correction factors

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

Table 14: Altitude/temperature correction factors

Air Temp.	Altitude (ft)										
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
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 25: Altitude/temperature correction factors



The examples below will 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 1,400 CFM, 0.6 IWC and 0.67 BHP?

Solution: At an elevation of 5,000 ft. the indoor blower will still deliver 1,400 CFM if the rpm is unchanged. However, Table Table 17 must be used to determine the static pressure and BHP. Since no temperature data is given, we will assume an air temperature of 70°F. Table Table 14 shows the correction factor to be 0.832.

Corrected static pressure = 0.6 x 0.832 = 0.499 IWC

Corrected BHP = 0.67 x 0.832 = 0.56

Example 2: A system, located at 5,000 feet of elevation, is to deliver 1,400 CFM at a static pressure of 1.5". Use the unit blower tables to select the blower speed and the BHP requirement.

Solution: As in the example above, 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 = 0.6 / .832 = 0.72 in.

Enter the blower table at 1,400 sCFM and static pressure of 0.72 in. The rpm listed will be the same rpm needed at 5,000 ft.

Suppose that the corresponding BHP listed in the table is 0.7. This value must be corrected for elevation.

BHP at 5,000 ft. = 0.7 x .832 = 0.58

Drive selection

1. Determine side or bottom supply duct application.
2. Determine desired airflow.
3. Calculate or measure the amount of external static pressure

Add or deduct any additional static resistance from the additional static resistance table.

4. Using the operating point determined from steps 1, 2 and 3, locate this point on the appropriate supply air blower performance table. (Linear interpolation may be necessary.)
5. Noting the RPM and BHP from step 4, locate the appropriate motor and, or drive.
6. Review the BHP compared to the motor options available. Select the appropriate motor and, or drive.
7. Review the RPM range for the motor options available. Select the appropriate drive if multiple drives are available for the chosen motor.
8. Determine turns open to obtain the desired operation point.

Example

1. 1600 CFM
2. 1.4 iwg
3. Using the airflow performance table below, the following data point was located: 1417 RPM & 1.28 BHP.
4. Using the RPM selection table below, Model WQ and Size 05 (4-ton) is found.
5. The High Static Option is selected to achieve the required 1417 RPM.
6. Using the High Static Option, 2 turns open will achieve 1417 RPM.

Airflow performance

Table 15: Example supply air blower performance WQE04 (3.0 ton) bottom duct

CFM	Available external static																			
	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
900	743	0.14	852	0.26	955	0.37	1050	0.48	1140	0.57	**1225**	**0.67**	**1306**	**0.77**	**1384**	**0.87**	**1460**	**0.98**	**1535**	**1.09**
1000	757	0.20	867	0.33	969	0.44	1065	0.54	1155	0.64	**1240**	**0.74**	**1321**	**0.84**	**1399**	**0.94**	**1475**	**1.04**	**1549**	**1.16**
1100	774	0.27	884	0.40	986	0.51	1082	0.61	1172	0.71	**1257**	**0.81**	**1338**	**0.91**	**1416**	**1.01**	**1492**	**1.11**	**1566**	**1.23**
1200	793	0.35	903	0.47	1005	0.58	1101	0.69	1191	0.78	**1276**	**0.88**	**1357**	**0.98**	**1435**	**1.08**	**1511**	**1.19**	**1585**	**1.30**
1300	814	0.42	924	0.54	1026	0.65	1122	0.76	**1212**	**0.86**	**1297**	**0.96**	**1378**	**1.05**	**1456**	**1.15**	**1532**	**1.26**	**1606**	**1.37**
1400	837	0.49	947	0.61	1049	0.72	1145	0.83	**1235**	**0.93**	**1320**	**1.03**	**1401**	**1.12**	**1479**	**1.23**	**1555**	**1.33**	**1629**	**1.45**
1500	862	0.56	972	0.68	1074	0.79	1170	0.90	**1260**	**1.00**	**1345**	**1.09**	**1426**	**1.19**	**1504**	**1.29**	**1580**	**1.40**	--	--

Note: kW = 0.929 x BHP

	Field-supplied AK51 x 3/4 in. fixed blower pulley with motor rated at 2.4 hp
	Medium static option with motor rated at 2.4 hp
Bold	High static option with motor rated at 2.4 hp
Bold	Field-supplied AK41 x 3/4 in. fixed blower pulley with motor rated at 2.4 hp
--	Exceeds recommended blower speed

Table 16: Example RPM selection

Model	Size (ton)	Airflow option	Phase	Max BHP	Blower sheave	Motor sheave	6 Turns open	5 Turns open	4 Turns open	3 Turns open	2 Turns open	1 Turns open	Fully closed
WQ	05 (4)	Std.	Direct drive										
		Med.	3	2.4	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		H. Static	3	2.4	AK46	1VL44	N/A	1167	1250	1333	1417	1500	1593

Table 17: Example additional static resistance

Model	Size (ton)	CFM	Economizer	4 in. filter	Electric heat kW				
					6/6.5	9.2/10.5/11	13.8/14/16	23	—
WQ	05 (4)	1200	0.24	—	0.01	0.01	0.02	0.03	—
		1300	0.28	—	0.01	0.01	0.03	0.03	—
		1400	0.33	—	0.02	0.02	0.03	0.04	—
		1500	0.44	—	0.02	0.02	0.04	0.04	—
		1600	0.52	—	0.02	0.02	0.04	0.05	—
		1700	0.59	—	0.03	0.03	0.05	0.05	—
		1800	0.66	—	0.03	0.03	0.05	0.06	—
		1900	0.74	—	0.04	0.04	0.06	0.07	—
		2000	0.81	—	0.04	0.04	0.07	0.08	—

WQE04 to 06 side duct application (belt drive)

Table 18: WQE04 (3.0 ton) side duct

CFM	Available external static																			
	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
900			810	0.27	922	0.38	1024	0.49	1118	0.59	1205	0.69	**1285**	**0.80**	**1359**	**0.91**	**1429**	**1.03**	**1496**	**1.16**
1000	703	0.19	826	0.31	938	0.43	1041	0.53	1135	0.64	**1221**	**0.74**	**1301**	**0.85**	**1376**	**0.96**	**1446**	**1.08**	**1513**	**1.21**
1100	721	0.25	843	0.37	956	0.48	1058	0.59	1152	0.69	**1239**	**0.80**	**1319**	**0.90**	**1393**	**1.01**	**1463**	**1.13**	**1530**	**1.26**
1200	738	0.31	861	0.43	973	0.54	1076	0.65	1170	0.75	**1256**	**0.86**	**1336**	**0.96**	**1411**	**1.08**	**1481**	**1.19**	**1548**	**1.33**
1300	756	0.38	879	0.50	991	0.61	1094	0.72	1188	0.82	**1274**	**0.92**	**1354**	**1.03**	**1429**	**1.14**	**1499**	**1.26**	**1566**	**1.39**
1400	774	0.45	897	0.57	1009	0.68	1112	0.79	1206	0.89	**1292**	**1.00**	**1372**	**1.10**	**1447**	**1.21**	**1517**	**1.33**	**1584**	**1.47**
1500	792	0.53	915	0.65	1027	0.76	1129	0.87	**1223**	**0.97**	**1310**	**1.07**	**1390**	**1.18**	**1464**	**1.29**	**1535**	**1.41**	**1602**	**1.54**

ⓘ **Note:** kW = 0.929 x BHP

	Field-supplied AK51 x 3/4 in.fixed blower pulley with motor rated at 2.4 hp
	Medium Static Option with Motor rated at 2.4 hp
Bold	High Static Option with Motor rated at 2.4 hp
Bold	Field-supplied AK41 x 3/4 in.fixed blower pulley with motor rated at 2.4 hp

Table 19: WQE05 (4.0 ton) side duct

CFM	Available external static																			
	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
1200	759	0.28	860	0.38	957	0.49	1050	0.62	1139	0.76	**1224**	**0.89**	**1306**	**1.03**	**1383**	**1.15**	**1457**	**1.26**	**1527**	**1.36**
1300	777	0.34	878	0.44	975	0.55	1068	0.68	1157	0.81	**1242**	**0.95**	**1324**	**1.08**	**1401**	**1.21**	**1475**	**1.32**	**1545**	**1.42**
1400	796	0.40	897	0.50	995	0.61	1088	0.74	1177	0.88	**1262**	**1.01**	**1343**	**1.15**	**1420**	**1.27**	**1494**	**1.38**	**1564**	**1.48**
1500	816	0.46	918	0.56	1015	0.68	1108	0.81	1197	0.94	**1282**	**1.08**	**1363**	**1.21**	**1440**	**1.34**	**1514**	**1.45**	**1584**	**1.54**
1600	837	0.53	938	0.63	1035	0.75	1129	0.88	**1218**	**1.01**	**1303**	**1.15**	**1384**	**1.28**	**1461**	**1.41**	**1535**	**1.52**	**1605**	**1.61**
1700	858	0.61	960	0.71	1057	0.83	1150	0.95	**1239**	**1.09**	**1324**	**1.22**	**1405**	**1.36**	**1482**	**1.48**	**1556**	**1.60**	**1626**	**1.69**
1800	880	0.69	981	0.79	1078	0.91	1171	1.04	**1260**	**1.17**	**1345**	**1.31**	**1427**	**1.44**	**1504**	**1.57**	**1578**	**1.68**	**1648**	**1.77**
1900	902	0.78	1003	0.88	1100	1.00	1193	1.12	**1282**	**1.26**	**1367**	**1.40**	**1448**	**1.53**	**1526**	**1.65**	**1599**	**1.77**	--	--
2000	924	0.88	1025	0.98	1122	1.09	**1215**	**1.22**	**1304**	**1.35**	**1389**	**1.49**	**1470**	**1.62**	**1548**	**1.75**	**1621**	**1.86**	--	--

ⓘ **Note:** kW = 0.929 x BHP

	Field-supplied AK51 x 3/4 in.fixed blower pulley with motor rated at 2.4 hp
	Medium static option with motor rated at 2.4 hp
Bold	High static option with motor rated at 2.4 hp
Bold	Field-supplied AK41 x 3/4 in. fixed blower pulley with motor rated at 2.4 hp
--	Exceeds recommended blower speed

Table 20: WQE06 (5.0 ton) side duct

CFM	Available external static																			
	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
1500	770	0.40	836	0.50	901	0.60	964	0.69	1025	0.79	1084	0.89	1142	0.98	1197	1.07	**1250**	**1.15**	**1300**	**1.23**
1600	779	0.45	845	0.54	910	0.64	973	0.74	1034	0.83	1093	0.93	1151	1.02	1206	1.11	**1259**	**1.20**	**1309**	**1.27**
1700	791	0.50	857	0.60	922	0.69	985	0.79	1046	0.89	1105	0.98	1162	1.07	**1218**	**1.16**	**1271**	**1.25**	**1321**	**1.33**
1800	805	0.56	872	0.66	936	0.75	999	0.85	1060	0.95	1120	1.04	1177	1.13	**1232**	**1.22**	**1285**	**1.31**	**1335**	**1.39**
1900	822	0.63	888	0.72	953	0.82	1016	0.92	1077	1.01	1136	1.11	1194	1.20	**1249**	**1.29**	**1302**	**1.38**	**1352**	**1.46**
2000	841	0.70	907	0.80	972	0.89	1035	0.99	1096	1.09	1155	1.18	**1212**	**1.27**	**1268**	**1.36**	**1321**	**1.45**	**1371**	**1.53**
2100	862	0.78	928	0.87	993	0.97	1056	1.07	1117	1.16	1176	1.26	**1233**	**1.35**	**1289**	**1.44**	**1341**	**1.53**	**1392**	**1.61**
2200	885	0.86	951	0.96	1016	1.05	1079	1.15	1140	1.25	1199	1.34	**1256**	**1.43**	**1311**	**1.52**	**1364**	**1.61**	**1415**	**1.69**
2300	910	0.95	976	1.04	1040	1.14	1103	1.23	1165	1.33	**1224**	**1.43**	**1281**	**1.52**	**1336**	**1.61**	**1389**	**1.69**	**1440**	**1.77**
2400	936	1.03	1002	1.13	1067	1.23	1130	1.32	1191	1.42	**1250**	**1.52**	**1307**	**1.61**	**1362**	**1.70**	**1415**	**1.78**	**1466**	**1.86**
2500	964	1.13	1030	1.22	1095	1.32	1158	1.41	**1219**	**1.51**	**1278**	**1.61**	**1335**	**1.70**	**1390**	**1.79**	**1443**	**1.87**	**1494**	**1.95**

Table 20: WQE06 (5.0 ton) side duct

CFM	Available external static																			
	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
ⓘ **Note:** kW = 0.857 x BHP																				
	Field-supplied AK51 x 3/4 in. fixed blower pulley with motor rated at 2.4 hp																			
	Medium static option with motor rated at 2.4 hp																			
Bold	High static option with motor rated at 2.9 hp																			

WQE04 to 06 bottom duct application (belt drive)

Table 21: WQE04 (3.0 ton) bottom duct

CFM	Available external static																			
	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
900	743	0.14	852	0.26	955	0.37	1050	0.48	1140	0.57	**1225**	**0.67**	**1306**	**0.77**	**1384**	**0.87**	**1460**	**0.98**	**1535**	**1.09**
1000	757	0.20	867	0.33	969	0.44	1065	0.54	1155	0.64	**1240**	**0.74**	**1321**	**0.84**	**1399**	**0.94**	**1475**	**1.04**	**1549**	**1.16**
1100	774	0.27	884	0.40	986	0.51	1082	0.61	1172	0.71	**1257**	**0.81**	**1338**	**0.91**	**1416**	**1.01**	**1492**	**1.11**	**1566**	**1.23**
1200	793	0.35	903	0.47	1005	0.58	1101	0.69	1191	0.78	**1276**	**0.88**	**1357**	**0.98**	**1435**	**1.08**	**1511**	**1.19**	**1585**	**1.30**
1300	814	0.42	924	0.54	1026	0.65	1122	0.76	**1212**	**0.86**	**1297**	**0.96**	**1378**	**1.05**	**1456**	**1.15**	**1532**	**1.26**	**1606**	**1.37**
1400	837	0.49	947	0.61	1049	0.72	1145	0.83	**1235**	**0.93**	**1320**	**1.03**	**1401**	**1.12**	**1479**	**1.23**	**1555**	**1.33**	**1629**	**1.45**
1500	862	0.56	972	0.68	1074	0.79	1170	0.90	**1260**	**1.00**	**1345**	**1.09**	**1426**	**1.19**	**1504**	**1.29**	**1580**	**1.40**	--	--

ⓘ **Note:** kW = 0.929 x BHP

	Field-supplied AK51 x 3/4 in. fixed blower pulley with motor rated at 2.4 hp
	Medium static option with motor rated at 2.4 hp
Bold	High static option with motor rated at 2.4 hp
Bold	Field-supplied AK41 x 3/4 in. fixed blower pulley with motor rated at 2.4 hp
--	Exceeds recommended blower speed

Table 22: WQE05 (4.0 ton) bottom duct

CFM	Available external static																			
	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
1200	801	0.25	903	0.38	999	0.51	1089	0.63	1173	0.76	1252	0.88	1327	1.00	1396	1.11	1461	1.22	1521	1.33
1300	822	0.31	924	0.44	1020	0.57	1110	0.69	1194	0.82	1273	0.94	1348	1.06	1417	1.17	1482	1.28	1542	1.39
1400	844	0.38	946	0.51	1042	0.64	1132	0.76	1216	0.89	1295	1.01	1370	1.13	1439	1.24	1504	1.35	1564	1.46
1500	867	0.46	969	0.59	1065	0.71	1155	0.84	1239	0.96	1319	1.08	1393	1.20	1462	1.32	1527	1.43	1587	1.53
1600	891	0.54	993	0.67	1089	0.79	1179	0.92	1264	1.04	1343	1.16	1417	1.28	1486	1.40	1551	1.51	**1612**	**1.61**
1700	917	0.63	1019	0.75	1115	0.88	1205	1.01	1289	1.13	1368	1.25	1442	1.37	1512	1.48	1577	1.60	**1637**	**1.70**
1800	943	0.72	1045	0.85	1141	0.97	1231	1.10	1316	1.22	1395	1.34	1469	1.46	1538	1.58	**1603**	**1.69**	--	--
1900	971	0.81	1073	0.94	1169	1.07	1259	1.19	1344	1.32	1423	1.44	1497	1.56	1566	1.67	**1631**	**1.78**	--	--
2000	1000	0.92	1102	1.04	1198	1.17	1288	1.29	1372	1.42	1452	1.54	1526	1.66	1595	1.77	--	--	--	--

ⓘ **Note:** kW = 0.929 x BHP

	Medium static option with motor rated at 2.4 hp
	High static option with motor rated at 2.4 hp
Bold	Field-supplied AK41 x 3/4 in. fixed blower pulley with motor rated at 2.4 hp
--	Exceeds recommended blower speed

Table 23: WQE06 (5.0 ton) bottom duct

CFM	Available external static																			
	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
1500	812	0.36	869	0.46	931	0.55	997	0.64	1063	0.74	1129	0.84	1193	0.94	1253	1.05	1307	1.16	1354	1.27
1600	829	0.43	886	0.52	948	0.61	1013	0.71	1080	0.80	1146	0.90	1210	1.01	1270	1.11	1324	1.22	1370	1.34
1700	846	0.50	904	0.59	966	0.68	1031	0.78	1097	0.87	1164	0.97	1227	1.07	1287	1.18	1341	1.29	1388	1.41
1800	865	0.57	922	0.66	985	0.75	1050	0.85	1116	0.95	1182	1.05	1246	1.15	1306	1.25	1360	1.36	1407	1.48
1900	885	0.65	943	0.74	1005	0.83	1070	0.93	1136	1.02	1203	1.12	1266	1.23	1326	1.33	1380	1.44	1427	1.56
2000	907	0.73	964	0.82	1026	0.92	1092	1.01	1158	1.11	1224	1.21	1288	1.31	1348	1.42	1402	1.53	1449	1.64
2100	930	0.82	987	0.91	1049	1.01	1115	1.10	1181	1.20	1247	1.30	1311	1.40	1371	1.51	1425	1.62	1472	1.73
2200	955	0.92	1012	1.01	1074	1.10	1139	1.20	1206	1.29	1272	1.39	1336	1.50	1396	1.60	1450	1.71	1496	1.83
2300	981	1.02	1038	1.11	1101	1.20	1166	1.30	1232	1.39	1298	1.49	1362	1.60	1422	1.70	1476	1.81	1523	1.93
2400	1009	1.12	1066	1.22	1128	1.31	1194	1.40	1260	1.50	1326	1.60	1390	1.70	1450	1.81	1504	1.92	1551	2.03
2500	1038	1.24	1096	1.33	1158	1.42	1223	1.52	1290	1.61	1356	1.71	1420	1.82	1480	1.92	1534	2.03	1580	2.15

Table 23: WQE06 (5.0 ton) bottom duct

CFM	Available external static																			
	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
ⓘ **Note:** kW = 0.857 x BHP																				
	Medium static option with motor rated at 2.4 hp																			
	High static option with motor rated at 2.9 hp																			

WQE04 to 06 side duct application (direct drive)

Table 24: WQE04-06 side duct

Unit (ton)	Motor speed	Available external static														
		0.2			0.4			0.6			0.8			1.0		
		CFM	Watts	RPM	CFM	Watts	RPM	CFM	Watts	RPM	CFM	Watts	RPM	CFM	Watts	RPM
WQE04 (3)	1 (Low)	987	120	651	813	145	774	698	162	864	541	180	959	383	201	1047
	2 (Med/Low)	1079	144	677	936	171	795	793	190	886	692	214	975	521	232	1063
	3 (Med)	1153	166	701	1037	195	812	875	221	913	786	239	986	654	263	1076
	4 (Med/Hi)	1191	178	712	1086	206	815	927	233	916	837	257	998	711	278	1083
	5 (Hi)	1326	229	757	1235	261	856	1124	291	951	973	319	1035	896	336	1099
WQE05 (4)	1 (Low)	1302	207	727	1188	240	841	1037	266	933	941	296	1022	882	318	1098
	2 (Med/Low)	1421	247	757	1323	282	861	1209	315	958	1064	346	1043	993	368	1116
	3 (Med)	1538	297	795	1453	332	888	1343	367	982	1216	396	1058	1093	427	1146
	4 (Med/Hi)	1571	315	809	1496	352	898	1385	389	996	1288	420	1072	1135	444	1147
	5 (Hi)	1779	432	878	1707	470	960	1615	511	1042	1516	544	1123	1165	468	1160
WQE06 (5)	1 (Low)	1588	298	695	1517	330	761	1409	358	835	1273	393	913	1167	418	973
	2 (Med/Low)	1756	395	760	1640	420	820	1525	444	875	1421	467	920	1305	496	1005
	3 (Med)	1942	504	792	1881	536	852	1800	565	908	1714	605	969	1611	644	1038
	4 (Med/Hi)	2146	631	840	2064	692	908	2001	713	954	1932	757	1007	1843	794	1065
	5 (Hi)	2316	812	892	2240	861	954	2181	894	1000	2113	938	1045	2003	946	1093

WQE04 to 06 bottom duct application (direct drive)

Table 25: WQE04-06 bottom duct

Unit (ton)	Motor speed	Available external static														
		0.2			0.4			0.6			0.8			1.0		
		CFM	Watts	RPM	CFM	Watts	RPM	CFM	Watts	RPM	CFM	Watts	RPM	CFM	Watts	RPM
WQE04 (3)	1 (Low)	929	128	699	782	148	794	663	164	880	514	187	976	377	202	1053
	2 (Med/Low)	1036	157	732	870	177	827	803	198	905	649	217	996	508	236	1074
	3 (Med)	1106	181	760	956	204	849	878	225	928	755	245	1010	616	266	1092
	4 (Med/Hi)	1147	197	776	1042	218	860	916	243	944	820	262	1017	671	286	1103
	5 (Hi)	1272	252	830	1177	277	909	1037	304	986	975	323	1053	872	347	1125
WQE05 (4)	1 (Low)	1256	220	776	1170	242	851	1077	266	931	988	298	1025	872	321	1113
	2 (Med/Low)	1350	272	828	1279	292	893	1196	320	966	1105	347	1048	1003	372	1131
	3 (Med)	1449	323	866	1380	350	937	1303	370	996	1223	402	1071	1133	428	1149
	4 (Med/Hi)	1488	345	882	1418	374	954	1357	394	1006	1264	424	1083	1160	442	1155
	5 (Hi)	1677	471	966	1602	507	1034	1543	525	1083	1475	545	1131	1209	465	1162
WQE06 (5)	1 (Low)	1548	310	720	1441	336	792	1337	370	864	1213	397	928	1097	421	988
	2 (Med/Low)	1686	395	745	1570	429	820	1445	462	888	1351	490	953	1235	522	1016
	3 (Med)	1880	532	827	1792	563	890	1719	588	944	1632	629	1006	1527	652	1061
	4 (Med/Hi)	2066	689	895	1999	712	942	1907	761	999	1830	773	1048	1734	809	1100
	5 (Hi)	2237	862	949	2163	882	996	2097	929	1036	1998	946	1085	1815	883	1115

RPM selection

Table 26: RPM selection

Model	Size (ton)	Airflow option	Phase	Max BHP	Blower sheave	Motor sheave	6 Turns open	5 Turns open	4 Turns open	3 Turns open	2 Turns open	1 Turns open	Fully closed
WQ	04 (3)	Std.	Direct drive										
		Med	1	1.5	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		Med	3	2.4	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		H. Static	3	2.4	AK46	1VL44	N/A	1167	1250	1333	1417	1500	1593
WQ	05 (4)	Std.	Direct drive										
		Med	1	1.5	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		Med	3	2.4	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		H. Static	3	2.4	AK46	1VL44	N/A	1167	1250	1333	1417	1500	1593
WQ	06 (5)	Std.	Direct drive										
		Med	1	1.5	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		Med	3	2.4	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		H. Static	3	2.9	AK46	1VL44	N/A	1167	1250	1333	1417	1500	1593

Indoor blower specification

Table 27: Indoor blower specifications

Model	Size (ton)	Airflow option	Motor						Motor sheave			Blower sheave			Belt
			Phase	Max BHP	RPM	Eff.	SF	Frame	Datum Dia. (in.)	Bore (in.)	Model	Datum Dia. (in.)	Bore (in.)	Model	
WQ	04 (3)	Std.	Direct drive												
		Med.	1	1.5	1725	0.79	1.15	56HZ	1.9 - 2.9	5/8	1VL34	4.2	3/4	AK46	A39
		Med.	3	2.4	1725	0.80	1.15	56Y	1.9 - 2.9	5/8	1VL34	4.2	3/4	AK46	A39
		H. Static	3	2.4	1725	0.80	1.15	56Y	2.8 - 3.8	5/8	1VL44	4.2	3/4	AK46	A40
WQ	05 (4)	Std.	Direct drive												
		Med.	1	1.5	1725	0.79	1.15	56HZ	1.9 - 2.9	5/8	1VL34	4.2	3/4	AK46	A39
		Med.	3	2.4	1725	0.80	1.15	56Y	1.9 - 2.9	5/8	1VL34	4.2	3/4	AK46	A39
		H. Static	3	2.4	1725	0.80	1.15	56Y	2.8 - 3.8	5/8	1VL44	4.2	3/4	AK46	A40

Table 27: Indoor blower specifications

Model	Size (ton)	Airflow option	Motor						Motor sheave			Blower sheave			Belt
			Phase	Max BHP	RPM	Eff.	SF	Frame	Datum Dia. (in.)	Bore (in.)	Model	Datum Dia. (in.)	Bore (in.)	Model	
WQ	06 (5)	Std.	Direct drive												
		Med.	1	1.5	1750	0.83	1.15	56H	1.9 - 2.9	5/8	1VL34	4.2	3/4	AK46	A37
		Med.	3	2.4	1750	0.87	1.15	56HZ	1.9 - 2.9	5/8	1VL34	4.2	3/4	AK46	A37
		H. Static	3	2.9	1750	0.87	1.15	56Z	2.8 - 3.8	7/8	1VL44	4.2	3/4	AK46	A39

Supply air drive adjustment

CAUTION

Before making any blower speed changes review the installation for any installation errors, leaks or undesirable systems effects that can result in loss of airflow. Even small changes in blower speed can result in substantial changes in static pressure and BHP. BHP and AMP draw of the blower motor will increase by the cube of the blower speed. Static pressure will increase by the square of the blower speed. Only qualified personnel should make blower speed changes, strictly adhering to the fan laws.

At unit start-up, the measured CFM may be higher or lower than the required CFM. To achieve the required CFM, the speed of the drive may have adjusted by changing the datum diameter (DD) of the variable pitch motor sheave as described below:

$$\left(\frac{\text{Required CFM}}{\text{Measured CFM}}\right) \bullet \text{Existing DD} = \text{New DD}$$

Use the following tables and the DD calculated per the above equation to adjust the motor variable pitch sheave.

Example new datum diameter

A 4 ton unit was selected to deliver 1,600 CFM with a 1VL34 motor sheave, but the unit is delivering 1,350 CFM. The variable pitch motor sheave is set at 4 turns open. Use the equation to determine the required DD for the new motor sheave,

$$\left(\frac{1{,}600\ \text{CFM}}{1{,}350\ \text{CFM}}\right) \bullet 2.1\ \text{in.} = 2.48\ \text{in.}$$

Use Table Table 28 to locate the DD nearest to 2.48 in. Close the sheave to 2 turn open.

EXAMPLE NEW BHP = (Speed increase)^3 • Original BHP = New BHP

= (Speed increase)^3 • BHP at 1,350 CFM

EXAMPLE NEW MOTOR AMPS

= (Speed increase)^3 • Original Amps = New Amps

= (Speed increase)^3 • Amps at 1,350 CFM

Table 28: Motor Sheave Datum Diameters

1VL34		1VL44		1VP50	
Turns Open	Datum Diameter	Turns Open	Datum Diameter	Turns Open	Datum Diameter
0	2.9	0	3.8	0	4.4
1/2	2.8	1/2	3.7	1/2	4.3
1	2.7	1	3.6	1	4.2
1-1/2	2.6	1-1/2	3.5	1-1/2	4.1
2	2.5	2	3.4	2	4.0
2-1/2	2.4	2-1/2	3.3	2-1/2	3.9
3	2.3	3	3.2	3	3.8
3-1/2	2.2	3-1/2	3.1	3-1/2	3.7
4	2.1	4	3.0	4	3.6
4-1/2	2.0	4-1/2	2.9	4-1/2	3.5
5	1.9	5	2.8	5	3.4

CAUTION

Belt drive blower systems MUST be adjusted 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. Adjustments of the blower speed and belt tension are REQUIRED. Verify proper sheave alignment; tighten blower pulley and motor sheave set screws after these adjustments. Re-checking set screws and belt tension after 10-12 hrs. run time is recommended.

Table 29: Additional static resistance - WQE04-06

Model	Size (ton)	CFM	Economizer[1,2]	Electric heat kW[2]				
				6/6.5	9.2/ 10.5/11	13.8/ 14/16	23	—
WQE	04 (3)	900	0.03	0.00	0.00	0.01	0.01	—
		1000	0.03	0.00	0.00	0.02	0.02	—
		1100	0.03	0.01	0.01	0.02	0.03	—
		1200	0.04	0.01	0.01	0.02	0.03	—
		1300	0.04	0.01	0.01	0.03	0.03	—
		1400	0.04	0.02	0.02	0.03	0.04	—
		1500	0.04	0.02	0.02	0.04	0.04	—

Table 29: Additional static resistance - WQE04-06

Model	Size (ton)	CFM	Economizer[1,2]	Electric heat kW[2]				
				6/6.5	9.2/ 10.5/11	13.8/ 14/16	23	—
WQE	05 (4)	1200	0.04	0.01	0.01	0.02	0.03	—
		1300	0.05	0.01	0.01	0.03	0.03	—
		1400	0.06	0.02	0.02	0.03	0.04	—
		1500	0.07	0.02	0.02	0.04	0.04	—
		1600	0.08	0.02	0.02	0.04	0.05	—
		1700	0.09	0.03	0.03	0.05	0.05	—
		1800	0.09	0.03	0.03	0.05	0.06	—
		1900	0.1	0.04	0.04	0.06	0.07	—
		2000	0.11	0.04	0.04	0.07	0.08	—
WQE	06 (5)	1800	0.09	0.03	0.03	0.05	0.06	—
		2000	0.11	0.04	0.04	0.07	0.08	—
		2200	0.13	0.06	0.06	0.08	0.09	—
		2400	0.15	0.07	0.07	0.10	0.11	—
		2500	0.17	0.08	0.08	0.11	0.12	—

Note:
1. Deduct these values from the available external static pressure shown in the respective Blower Performance Tables.
2. 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 will deliver less CFM during full economizer operation.

Operation

Compressor operation

Compressor Operation details include:

1. Compressors are controlled by the Y1 through Y2 thermostat inputs. If the Lead/Lag function is turned OFF, a Y1 input energizes the C1 output when the compressor number 1 anti-short cycle delay is at 0 and all refrigerant safety devices are closed (Default 5 minutes).
2. The FAN output for indoor fan operation energizes with any cooling output after the Indoor Fan Cool On Delay expires.
3. When the thermostat cooling inputs are lost and the minimum runtime expires, the compressor outputs stage off (Default 3 minutes).
4. A 30 second interstage delay occurs when multiple stages are requested.

Note: A Y2 input without a Y1 input energizes a C1 first and then C2 30 seconds later.

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" set points. On a constant volume single speed supply fan system both set-points should be set 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.

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:

- 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 will always be 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) will be turned on.

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%.

Once 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 will a compressor output be 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 will modulate to minimum position and the compressor outputs will be de-energized as long as their minimum run timers have expired.

Power exhaust

Setpoints

1. Economizer Enable ON
2. Power Exhaust Enable ON
3. Modulating Power Exhaust OFF
4. Exhaust VFD Installed OFF
5. Building Pressure Sensor Enabled OFF
6. Econo Damper Position For Exh Fan ON Percent
7. Econo Damper Position For Exh Fan OFF Percent

Inputs

No inputs are present for non-modulating power exhaust.

Outputs

1. 2-10 VDC from ECON on Economizer Expansion module
2. VAC from EX-FAN to energize exhaust fan on Economizer Expansion module

Operation

Operation details include:

1. Compares economizer output to the Economizer Damper Position For Exhaust Fan On and OFF.
2. Energizes exhaust fan when economizer output is above Economizer Damper Position For Exhaust Fan On.
3. De-energizes exhaust fan when economizer output is below the Economizer Damper Position for Exhaust Fan OFF

Figure 26: SE-ECO1001-1 Economizer controller

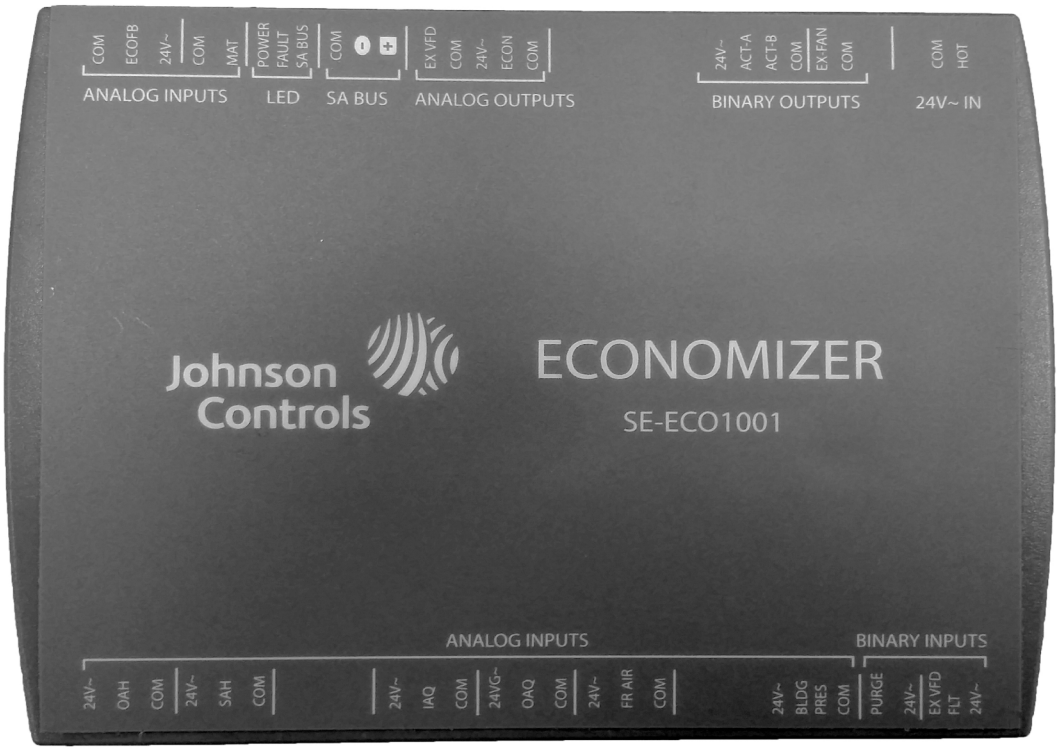


Table 30: Smart Equipment™ Economizer Board details

Board Label	Cover Label	Description	Function & Comments
		Directional orientation: viewed with the center text of the cover label upright	
		ANALOG INPUTS Terminal at left on upper edge of economizer board	
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	EconDampPos parameter reports input status (0-100%). Used to meet Cali. 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	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		
		LEDs at left on upper edge of economizer board	
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
		SA BUS[1] Pin connections at left on upper edge of economizer board	
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 & 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 to 3.5 volts reading to C; at least 0.25 volts 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 & 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 to 3.5 volts reading to C; at least 0.25 volts 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 & diagnostics board
		ANALOG OUTPUTS Pin at center on upper edge of economizer board	

Table 30: Smart Equipment™ Economizer Board details

Board Label	Cover Label	Description	Function & Comments
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
		BINARY OUTPUTS Pin at right on upper edge of economizer board	
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
		24V~ IN Pin connections at right on upper edge of economizer board	
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.
		ANALOG INPUTS Terminal on lower edge of economizer board	
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

Table 30: Smart Equipment™ Economizer Board details

Board Label	Cover Label	Description	Function & Comments
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
		BINARY INPUTS at right on lower edge of economizer board	
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%.
	24V~	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.
	24V~	24 VAC hot supplied for the power exhaust variable frequency drive fault contact	Connects through circuit trace to 24V~ IN pin HOT

1 When wiring unit and other devices using the SA Bus and FC Bus, see Table 29.

Indoor air quality (IAQ)

Indoor Air Quality (indoor sensor input): Terminal AQ accepts a +2 to +10 VDC signal with respect to the (AQ1) terminal. When the signal is below it's set point, the actuator is allowed to modulate normally in accordance with the enthalpy and mixed air sensor inputs. When the AQ signal exceeds it's set point setting and there is no call for free cooling, the actuator is proportionately modulated from the 2 to 10 VDC signal, with 2 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 Max damper position setting. When the signal exceeds it's set point (Demand Control Ventilation Set Point) 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 AQ voltage input.

- Optional CO_2 Space Sensor Kit Part # 2AQ04700524B
- Optional CO_2 Sensor Kit Part # 2AQ04700624C

Start-up

Prestart check list

After installation has been completed:

1. Check the electrical supply voltage being supplied. Be sure that it is the same as listed on the unit nameplate.
2. Set the room thermostat to the off position.
3. Turn unit electrical power on.
4. Set the room thermostat fan switch to on.
5. Check indoor blower rotation.
   - If blower rotation is in the wrong direction. Refer to Phasing Section in general information section.

   Check blower drive belt tension.
6. Check the unit supply air (CFM).
7. Measure evaporator fan motor's amp draw.
8. Set the room thermostat fan switch to off.
9. Turn unit electrical power off.

Operating instructions

1. Turn unit electrical power on.

   Note: Prior to each cooling season, the crankcase heaters must be energized at least 10 hours before the system is put into operation.
2. Set the room thermostat setting to lower than the room temperature.
3. First stage compressors will energize after the built-in time delay (five minutes).

Post start check list

1. Verify proper system pressures.
2. Measure the temperature drop across the evaporator coil.

Troubleshooting

WARNING

Troubleshooting of components may require opening the electrical control box with the power connected to the unit. **Use extreme care when working with live circuits!** Check the unit nameplate for the correct line voltage and set the voltmeter to the correct range before making any connections with line terminals.When not necessary, shut off all electric power to the unit prior to any of the following maintenance procedures so as to prevent personal injury.

CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation, which could cause injury to person and/or damage unit components. Verify proper operation after servicing.

Charging tables

Table 31: WQE04 charging table

Air flow indoor Db/Wb	Outdoor DB (F)	Suction P (psig)	Suction Temp. (F)	Liquid P (psig)	Liquid Temp. (F)	Delta T Db (F)	Compr. amps
300 Cfm/ton 80/62	75	129	63	253	85	-26	7.5
	85	126	64	293	95	-27	8.7
	95	124	64	333	104	-28	9.8
300 Cfm/ton 80/67	75	129	63	254	85	-26	7.5
	85	131	65	295	95	-25	8.7
	95	134	67	337	105	-24	9.8
300 Cfm/ton 80/72	75	128	62	254	85	-26	7.5
	85	136	66	298	96	-22	8.7
	95	145	70	341	106	-19	9.8
300 Cfm/ton 75/62	75	123	61	252	85	-24	7.5
	85	123	62	292	95	-23	8.7
	95	123	63	333	104	-23	9.8
400 Cfm/ton 80/62	75	133	64	255	86	-24	7.6
	85	134	65	296	95	-24	8.7
	95	135	67	337	105	-24	9.8
400 Cfm/ton 80//67	75	135	65	255	86	-23	7.6
	85	138	66	297	96	-22	8.7
	95	140	68	339	106	-21	9.8
400 Cfm/ton 80/72	75	137	65	256	86	-22	7.6
	85	141	67	298	96	-21	8.7
	95	146	69	341	106	-19	9.8
400 Cfm/ton 75/62	75	129	62	253	85	-21	7.6
	85	130	64	294	95	-21	8.7
	95	132	65	335	105	-20	9.8

Table 32: WQE05 charging table

Air flow indoor Db/Wb	Outdoor DB (F)	Suction P (psig)	Suction Temp. (F)	Liquid P (psig)	Liquid Temp. (F)	Delta T Db (F)	Compr. amps
300 Cfm/ton 80/62	75	129	60	263	79	-26	10.3
	85	128	60	305	90	-26	11.9
	95	126	59	346	100	-27	13.6
300 Cfm/ton 80/67	75	126	63	262	79	-25	10.3
	85	130	65	306	89	-24	12.0
	95	134	66	350	100	-23	13.7
300 Cfm/ton 80/72	75	123	65	261	78	-25	10.3

Table 32: WQE05 charging table

Air flow indoor Db/Wb	Outdoor DB (F)	Suction P (psig)	Suction Temp. (F)	Liquid P (psig)	Liquid Temp. (F)	Delta T Db (F)	Compr. amps
	85	133	70	308	89	-22	12.1
	95	142	74	355	99	-19	13.8
300 Cfm/ton 75/62	75	123	57	261	79	-23	10.3
	85	125	57	303	90	-23	12.0
	95	126	57	346	101	-23	13.6
400 Cfm/ton 80/62	75	133	63	264	80	-24	10.3
	85	134	63	306	90	-24	11.9
	95	135	63	349	100	-23	13.6
400 Cfm/ton 80//67	75	133	64	264	79	-23	10.3
	85	137	66	307	90	-22	12.0
	95	140	67	351	100	-21	13.7
400 Cfm/ton 80/72	75	134	66	263	79	-22	10.2
	85	139	69	308	90	-20	12.0
	95	145	71	353	100	-18	13.7
400 Cfm/ton 75/62	75	128	60	262	79	-21	10.3
	85	130	61	305	90	-20	12.0
	95	132	61	348	100	-20	13.6

Table 33: WQ06 charging table

Air flow indoor Db/Wb	Outdoor DB (F)	Suction P (psig)	Suction Temp. (F)	Liquid P (psig)	Liquid Temp. (F)	Delta T Db (F)	Compr. amps
300 Cfm/ton 80/62	75	130	63	272	83	-26	13.0
	85	130	59	314	95	-26	15.3
	95	130	56	356	106	-26	17.5
300 Cfm/ton 80/67	75	130	63	271	83	-26	13.0
	85	133	61	315	94	-25	15.3
	95	136	60	359	105	-23	17.5
300 Cfm/ton 80/72	75	129	63	270	83	-26	13.0
	85	136	63	317	94	-23	15.2
	95	142	64	363	105	-20	17.5
300 Cfm/ton 75/62	75	125	61	270	83	-23	13.0
	85	126	58	312	95	-23	15.2
	95	128	55	355	106	-22	17.5
400 Cfm/ton 80/62	75	135	66	273	84	-23	13.0
	85	137	65	316	95	-23	15.2
	95	138	64	359	106	-22	17.5
400 Cfm/ton 80//67	75	136	66	273	84	-23	13.0
	85	139	66	317	95	-22	15.2
	95	141	66	362	105	-21	17.5
400 Cfm/ton 80/72	75	137	66	272	84	-22	12.9
	85	141	67	318	95	-21	15.2
	95	144	68	364	105	-19	17.5
400 Cfm/ton 75/62	75	130	63	271	84	-21	13.0
	85	132	63	315	95	-20	15.2
	95	134	62	358	106	-19	17.4

Smart Equipment Control Board Navigation components

You need the following components to access the control points in the Smart Equipment control.

Note: Installation and operation guides are available from your equipment dealer or distributor.

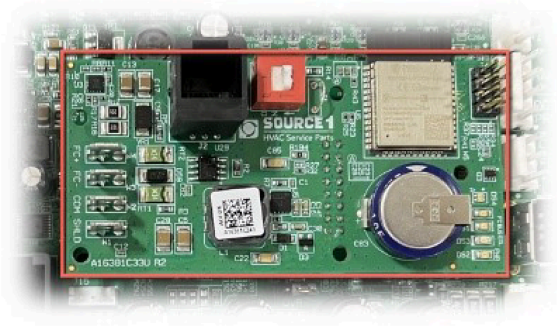
1. A local LCD on the unit control board.
2. Tools to interact with the UCB.
   Choose from the following two options:
   a. • Connected Workflow app (CWa) (available for iOS or Android)

      Note: You can connect the CWa to the controller via bluetooth through the Connected Workflow Converter (CWCVT) or directly to the UCB if the controller has a communication card.

      • *CWCVT Wireless MS/TP Converter User Guide*, literature part no. 12014120
      • *Connected Workflow Applications User Guide*, literature part no. 12014106

Figure 27: CWCVT (S1-TL-CWCVT-0)

Figure 28: Communication card



   b. Mobile Access Portal (MAP) Gateway (portable)
      • Source 1 part no. S1-YK-MAP1810-0P (no longer available for purchase)

        Note: Although the MAP is no longer available for purchase, it continues to work with the UCB. The MAP does not receive firmware updates, so as additional points are added to the UCB those points will not render properly. However, the MAP will continue to work for the majority of typical applications.

      • *MAP Gateway Quick Start Guide*, part no. 24-10737-16
      • *MAP Gateway Instruction*, part no. 24-10737-8

For more information on the Smart Equipment unit control board navigation, refer to the *Smart Equipment Quick Start Guide*.

Note: For more in-depth sequence of operation of the Smart Equipment control, refer to the *Smart Equipment Controls Sequence of Operation Overview*, literature part no. 12011950.

Smart Equipment

Figure 29: Unit control board

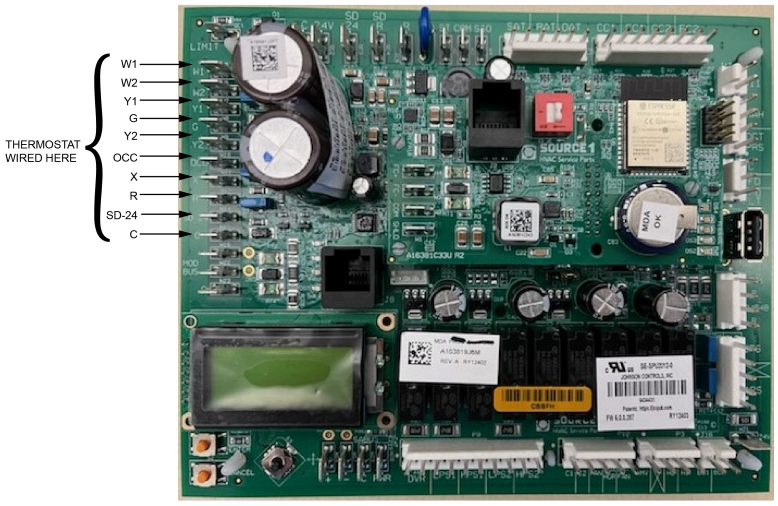


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Table 34: Smart Equipment™ UCB Details (Version 5 Hardware)

Description		Function and comments
Terminal directional orientation: viewed with silkscreen labels upright		
Limit, 24 VAC power and shutdown connections from unit wiring harness at left on upper edge of UCB		
Limit	Monitored 24 VAC input through heat section limit switches	If the voltage is absent, indicating the heat section is over-temperature, the UCB brings 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, connects through circuit trace to the SD 24 terminal
SD 24	24 VAC hot out for factory accessory smoke detector, condensate overflow and/or user shutdown relay switching in series	Connects through circuit trace to thermostat connection strip SD-24. A wiring harness jumper plug connecting SD 24 to SD R is in place if 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 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 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 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
Terminal thermostat connection strip on left edge of UCB		
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 1 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	24V positive half-wave rectified
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, condensate overflow and/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, condensate over- flow and/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 thermo- stat connection strip SD-24 and R
C	24 VAC common for thermostat power	
+	Modbus Terminal +	N/A - Future
-	Modbus Terminal -	N/A - Future
C	Modbus Terminal C	N/A - Future

Table 34: Smart Equipment™ UCB Details (Version 5 Hardware)

Description		Function and comments
LEDs on left edge of UCB		
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, etc.) 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
Terminal space temperature sensor connections at center on upper edge of UCB		
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), effective if "Thermo- stat-only Control" parameter is set OFF, space sensor override momentary shorts ST to COM to initiate/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
Pin Temperature sensor connections at right on upper edge of UCB		
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.
Pinned connections on right edge of UCB		
AI1	Analog Input 1	Future - 0-10 VDC input
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 in. 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.
VFD FLT	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
J10	Type A female Universal Serial Bus connector	Used for backup, restoration, & copying of board parameters as well as board software updating through a flash drive
COS	24 VAC hot return from Condensate Overflow Switch	Optional input; switch opening will disable the control outputs to the unit compressors. Upon closure, the compressors will begun unit operation after off delay expires
R	24 VAC hot out for COS	Connects through circuit trace to the R terminal
RDS	24 VAC hot return from Refrigerant Detection System	Required input for RDS; when flammable refrigerant is used and RDS is required, the unit will monitor this input and enter mitigation mode if unit RDS contact opens
R	24 VAC hot out for RDS	Connects through circuit trace to the R terminal

Table 34: Smart Equipment™ UCB Details (Version 5 Hardware)

Description		Function and comments
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 in- door 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
Terminal at lower right corner of UCB		
24V	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
Pin heat section connections at right on lower edge of UCB		
BO2	Binary output 2	Future
BO1	Binary output 2	Future
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
Pin cooling and fan output connections at right on lower edge of UCB		
CN-FAN	24 VAC hot output for the condenser fan contactor coil	Output with either C1 or C2 output; interrupted during defrost cycle for heat pump 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
Pin refrigerant circuit safety switch and indoor blower overload connections at center on lower edge of UCB		
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

Table 34: Smart Equipment™ UCB Details (Version 5 Hardware)

Description		Function and comments
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.
Terminal SA BUS[1] connections on at left on lower edge and center of UCB		
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 & 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 & diagnostics board, netstat and/or Multi Touch gateway
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
Item Integrated user interface at lower left corner of UCB		
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	
Item USB connector at right of UCB		
J15	Factory wired SA Bus connector	
Optional communication sub-board at center of UCB		
Terminal FC BUS[1] connections on left edge of the communication board		
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
Item selector in red housing at left on top edge of the communication board		
EOLswitch	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
RJ12	Connection to the TMR	Connection used for the wireless Transparent MS/TP Repeater (TMR)
LEDs on the communication board		
Bluetooth (DS4)	Bluetooth signal	Solid OFF means bluetooth disabled. Flashing means the bluetooth is available for a connection. Solid ON means a connection has been made
N/A (DS5)	N/A - No function defined	
FC BUS (DS1)	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
EOL (DS2)	Green end of line indicator	Lit indicates the EOL switch is selected ON
ISO PWR (DS3)	Green communication board Isolated Power indicator	Lit indicates the UCB is supplying power to the communication sub-board

Note:
1. When wiring the unit and other devices using the SA Bus and FC Bus, see Table 35.

Table 35: 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 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): 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.

Note:

1. We strongly recommend 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. We recommend 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.

START-UP & SERVICE DATA INSTRUCTION

COMMERCIAL PACKAGE SYSTEMS

3.0 To 50.0 TON

START-UP CHECKLIST

Date: _____

Job Name: _____

Customer Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Evaporator Model Number: _____ Serial Number:_____

Condenser 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

Johnson Controls/Ducted Systems 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 Johnson Controls/ Ducted Systems 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 Johnson Controls/Ducted Systems 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 Mobile Access Portal (MAP) Gateway 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:

Johnson Controls/Ducted Systems
Technical Services Department
5005 York Drive
Norman, OK 73069

1034349-UCL-G-0924

SAFETY WARNINGS

The inspections and recording of data outlined in this procedure are required for start-up of Johnson Controls/Ducted Systems' 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: _____

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	☐	☐
Condensate drain trapped properly, refer to Installation Manual	☐	☐
All field wiring (power and control) complete	☐	☐

Refrigerant Line Inspection	System 1		System 2	
Is Condenser below Evaporator?	Yes ☐	No ☐	Yes ☐	No ☐
Total Line Length end to end.	_____ Ft.		_____ Ft.	
Vertical Lift in Ft.	_____ Ft.		_____ Ft.	
Vertical Fall in Ft.	_____ Ft.		_____ Ft.	
Number of Elbows?	_____ Ea.		_____ Ea.	
Liquid Line Size	_____ Ea.		_____ Ea.	
Suction Line Size	_____ Ea.		_____ Ea.	
Solenoid Valve?	Yes ☐	No ☐	Yes ☐	No ☐
Check Valves?	Yes ☐	No ☐	Yes ☐	No ☐
Check Valves / Solenoid arrangements installed as per the Ducted Systems Piping Guide	Yes ☐	No ☐	Yes ☐	No ☐
Oil Separator ?	Yes ☐	No ☐	Yes ☐	No ☐
Accumulator ?	Yes ☐	No ☐	Yes ☐	No ☐
TXV - Hard shutoff	Yes ☐	No ☐	Yes ☐	No ☐
Heatpump	Yes ☐	No ☐	Yes ☐	No ☐

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	☐	☐

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
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.
   Notes above apply for 3rd party application only.

OPERATING MEASUREMENTS - COOLING

Stage	Discharge Pressure	Discharge Temp.	Liquid Line Pressure At Service Valve	Liquid Line Temp.[1]	Subcooling[2]	Suction Pressure	Suction Temp.	Superheat
First[3]	#	°	#	°	°	#	°	°
Second (if equipped)	#	°	#	°	°	#	°	°
Third (if equipped)	#	°	#	°	°	#	°	°
Fourth (if equipped)	#	°	#	°	°	#	°	°
Heat Pump 1st Stage	#	°	#	°	°	#	°	°

1. Liquid line temperature should be taken before filter/drier.
2. Subtract 10 psi from discharge pressure for estimated liquid line pressure
3. If Rawal valve installed, contact Technical Service.

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

REFRIGERANT SAFETIES

Action	Completed	See Notes
Prove Compressor Rotation (3 phase only) by guage 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 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 ☐

OPERATIONAL 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.	☐

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:

_____

_____

_____

_____

_____

_____

_____

_____