

### ELECTRIC COOLING, R-410A SINGLE PACKAGE ROOFTOP 6 – 12.5 TONS (3-Phase)

#### BUILT TO LAST, EASY TO INSTALL AND SERVICE

- One-piece, high efficiency electric cooling with a low profile, prewired, tested, and charged at the factory
  - All units are convertible from downflow to horizontal air flow; no special adapter curbs are necessary
  - Full perimeter base rail with built-in rigging adapters and fork truck slots
  - Pre-painted exterior panels and primer-coated interior panels tested to 500 hours salt spray protection
  - Fully insulated cabinet
  - Single-stage or two stage cooling capacity control
  - Single or dual scroll compressor with internal line-break overload protection
  - All units have high and low pressure switches
  - Two inch disposable fiberglass type return air filters in dedicated rack with tool-less filter access door
  - Refrigerant circuits contain a liquid line filter drier to trap dirt and moisture
  - Indoor and outdoor coils constructed of aluminum fins mechanically bonded to seamless copper tubes
  - Newly-designed indoor refrigerant header for easier maintenance and replacement
  - Exclusive non-corrosive composite condensate pan in accordance with ASHRAE 62 Standard, sloping design; side or center drain
  - Belt drive evaporator-fan motor and pulley combinations available to meet any application
  - Access panels with easy grip handles provide quick and easy access to the blower and blower motor, control box, and compressor.
  - "No-strip" screw system has superior holding power and guides screws into position while preventing the screw from stripping the unit's metal.
  - Newly designed terminal board facilitates simple safety circuit troubleshooting and simplified control box arrangement
  - Outdoor temperature cooling operation range up to 115°F (46°C) and down to 25°F (-4°C) using winter start kit
  - Fixed orifice metering devices on all models to precisely control refrigerant flow
  - Large, laminated control wiring and power wiring drawings are affixed to unit to make troubleshooting easy
  - Capable of thru-the-base line routing
  - Single electrical connections
- WARRANTY**
- 5 Year limited warranty on compressor
  - 1 Year limited warranty on parts



RAS072



RAS090-121



Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to [www.ahridirectory.org](http://www.ahridirectory.org).

UNIT PERFORMANCE DATA – Single Stage Cooling								
UNIT	COOLING					Total Power (kW)	Unit Dimensions H x W x L	Unit Weight lb. [kg]
	Nominal Tons	Net Cap. (Btuh)	SEER	EER	IEER			
RAS072*0AA0AAA	6	70,000	N/A	11.2	11.4	6.4	41-3/8" x 44" x 74-3/8"	607 [275]
RAS091*0AA0AAA	7-1/2	88,000	N/A	11.2	11.4	8.0	41-3/8" x 59-1/2" x 88-1/8"	705 [320]
RAS101*0AA0AAA	8-1/2	97,000	N/A	11.2	11.4	8.8	49-3/8" x 59-1/2" x 88-1/8"	845 [384]
RAS121*0AA0AAA	10	117,000	N/A	11.2	11.4	10.6	49-3/8" x 59-1/2" x 88-1/8"	855 [388]

UNIT PERFORMANCE DATA – Dual Stage Cooling								
UNIT	COOLING					Total Power (kW)	Unit Dimensions H x W x L	Unit Weight lb. [kg]
	Nominal Tons	Net Cap. (Btuh)	SEER	EER	IEER			
RAS090*0AA0AAA	7-1/2	83,000	N/A	11.2	11.7	7.5	41-3/8" x 59-1/2" x 88-1/8"	760 [345]
RAS102*0AA0AAA	8-1/2	99,000	N/A	11.2	11.7	9.0	49-3/8" x 59-1/2" x 88-1/8"	855 [388]
RAS120*0AA0AAA	10	114,000	N/A	11.3	12.2	10.3	49-3/8" x 59-1/2" x 88-1/8"	865 [393]
RAS150*0AA0AAA	12-1/2	140,000	N/A	10.1	11.2	12.9	49-3/8" x 59-1/2" x 88-1/8"	1030 [467]

\* Indicates Unit voltage: H = 208/230-3-60, L = 460-3-60, S = 575-3-60

**NOTE: BASE MODEL NUMBERS LISTED. SEE MODEL NOMENCLATURE LISTING FOR ADDITIONAL OPTIONS**

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# MODEL NOMENCLATURE

MODEL SERIES	R	A	S	0	9	1	H	0	A	A	0	A	A	A
Position Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
R = Rooftop														
A = Air Conditioning (Cooling Only) H = Heat Pump G = Gas/Electric														
<b>Type</b>														
S = Standard ASHRAE 90.1–2010 Efficiency														
<b>Efficiency</b>														
072 = 6 Tons 091 = 7.5 Tons (Single Compressor) 090 = 7.5 Tons (Dual Compressor) 101 = 8.5 Tons (Single Compressor) 102 = 8.5 Tons (Dual Compressor) 121 = 10 Tons (Single Compressor) 120 = 10 Tons (Dual Compressor) 150 = 12.5 Tons (Dual Compressor)														
<b>Nominal Cooling Capacity</b>														
H = 208/230–3–60 L = 460–3–60 S = 575–3–60														
<b>Voltage</b>														
0 = No Heat														
<b>Heating Capacity (See spec sheet for actual capacity)</b>														
A = Standard Motor C = Medium Static Motor B = High Static Motor														
<b>Motor Option</b>														
A = None B = Economizer w/Bara-relief, OA Temp sensor														
<b>Outdoor Air Options / Control (See spec sheet for details)</b>														
0A = No Options														
<b>Factory Installed Options</b>														
A = Aluminum / Copper Cond & Evap Coil E = Copper/Copper Cond & Alum/Copper Evap														
<b>Condenser / Evaporator Coil Configuration</b>														
A = Sales Digit														

**Table 1 – FACTORY INSTALLED OPTIONS AND FIELD INSTALLED ACCESSORIES**

CATEGORY	ITEM	FACTORY INSTALLED OPTION	FIELD INSTALLED ACCESSORY
<b>Cabinet</b>	Thru-the-base electrical or gas-line connections		X
<b>Coil Options</b>	Copper/Copper outdoor coils	X	
<b>Condenser Protection</b>	Condenser coil hail guard (louvered design)		X
<b>Controls</b>	Time Guard II compressor delay control circuit		X
	Phase Monitor		X
	Filter status switch <sup>1</sup>		X
	Fan status switch <sup>1</sup>		X
<b>Economizers &amp; Outdoor Air Dampers</b>	Economizer (for electro-mechanical controlled RTUs)	X	X
	Motorized 2 position outdoor-air damper		X
	Manual outdoor-air damper		X
	Barometric relief <sup>2</sup>		X
	Power exhaust		X
<b>Economizer Sensors &amp; IAQ Devices</b>	Single dry bulb temperature sensors <sup>3</sup>		X
	Single enthalpy sensors <sup>3</sup>		X
	Differential enthalpy sensors <sup>3</sup>		X
	CO <sub>2</sub> sensor (wall, duct, or unit mounted) <sup>3</sup>		X
<b>Indoor Motor &amp; Drive</b>	Multiple motor and drive packages	X	
<b>Low Ambient Control</b>	Winter start kit <sup>4</sup>		X
	Head pressure controller <sup>4</sup>		X
<b>Roof Curbs</b>	Roof curb 14" (356mm)		X
	Roof curb 24" (610mm)		X

**NOTES:**

1. Use in conjunction with specialized thermostat or controls device.
2. Included with economizer.
3. Sensors used to optimize economizer performance.
4. See application data for assistance.

**FACTORY OPTIONS AND/OR ACCESSORIES**

**Economizer (dry-bulb or enthalpy)**

Economizers save money. They bring in fresh, outside air for ventilation; and provide cool, outside air to cool your building. This is the preferred method of low-ambient cooling. When coupled to CO<sub>2</sub> sensors, Economizers can provide even more savings by coupling the ventilation air to only that amount required based on occupancy.

Economizers are available, installed and tested by the factory, with either enthalpy or dry-bulb temperature inputs. There are also models for electromechanical as well as direct digital controllers. Additional sensors are available as accessories to optimize the economizers.

**CO<sub>2</sub> Sensor**

Improves productivity and saves money by working with the economizer to intake only the correct amount of outside air for ventilation. As occupants fill your building, the CO<sub>2</sub> sensor detects their presence through increasing CO<sub>2</sub> levels, and opens the economizer appropriately.

When the occupants leave, the CO<sub>2</sub> levels decrease, and the sensor appropriately closes the economizer. This intelligent control of the ventilation air, called Demand Control Ventilation (DCV) reduces the overall load on the rooftop, saving money. CO<sub>2</sub> sensors are available with the economizer, installed and tested by the factory.

## FACTORY OPTIONS AND/OR ACCESSORIES (CONT.)

### Louvered Hail Guards

Sleek, accessory louvered panels protect the condenser coil from hail damage, foreign objects, and incidental contact.

### Barometric Relief

Gravity controlled, barometric relief equalizes building pressure and ambient air pressures. This can be a cost effective solution to prevent building pressurization.

### Power Exhaust

Superior internal building pressure control. This field-installed accessory may eliminate the need for costly, external pressure control fans.

### Time Guard II Control Circuit

This accessory protects your compressor by preventing short-cycling in the event of some other failure, prevents the compressor from restarting for 30 seconds after stopping. Not required with authorized commercial thermostats.

### Filter or Fan Status Switches

Use these accessory differential pressure switches to detect a filter clog or indoor fan motor failure. When used in conjunction with a compatible unit controller/thermostat, the switches will activate an alarm to warn the appropriate personnel.

### Motorized 2-Position Damper

A 2-position, motorized outdoor air damper is available as a field installed accessory and admits up to 100% outside air. Using reliable, gear-driven technology, the 2-position damper opens to allow ventilation air and closes when the rooftop stops, stopping unwanted infiltration.

### Manual OA Damper

Accessory manual outdoor air dampers are an economical way to bring in ventilation air.

### Head Pressure Controller

The motor controller is a low ambient, head pressure controller kit that is designed to maintain the unit's condenser head pressure during periods of low ambient cooling operation. This device should be used as an alternative to economizer free cooling not when economizer usage is either not appropriate or desired. The controller will either cycle the outdoor-fan motors or operate them at reduced speed to maintain the unit operation, depending on the model.

### Winter Start Kit

The accessory winter start kit extends the low ambient limit of your rooftop to 25°F (-9°C). The kit bypasses the low pressure switch, preventing nuisance tripping of the low pressure switch. Other low ambient precautions may still be prudent.

### Alternate Motors and Drives

Some applications need larger horsepower motors, some need more airflow, and some need both. Regardless of the case, your unit has a factory installed combination to meet your application. A wide selection of motors and pulleys (drives) are available, factory installed, to handle nearly any application.

### Thru-the-Base Connections

Thru-the-base connections, available as an accessory, are necessary to ensure proper connection and seal when routing wire and piping through the rooftop's basepan and curb. These couplings eliminate roof penetration and should be considered for main power lines, as well as control power.

### Electric Heaters

RAS units offer a full-line of accessory heaters. The heaters are very easy to use / install and are pre-engineered and certified.

## ACCESSORIES – RAS072–150

FLAT ROOF CURBS		
Model Number	Description	Use With Model Size
CRRFCURB001A01	14" High Roof Curb. Ductwork attaches to the roof curb. Includes thru-the-bottom capability.	072
CRRFCURB003A01	14" High Roof Curb. Ductwork attaches to the roof curb. Includes thru-the-bottom capability.	090 – 150
CRRFCURB002A01	24" High Roof Curb. Ductwork attaches to the roof curb. Includes thru-the-bottom capability.	072
CRRFCURB004A01	24" High Roof Curb. Ductwork attaches to the roof curb. Includes thru-the-bottom capability.	090 – 150

ECONOMIZERS		
Model Number	Description	Use With Model Size
DNECOMZR020A02	Vertical EconoMi\$er IV with solid-state controller, gear-driven, modulating damper, spring return actuator, up to 100% barometric relief, supply and outdoor air sensors, and CO2 sensor compatible.	072
DNECOMZR021A02	Vertical EconoMi\$er IV with solid-state controller, gear-driven, modulating damper, spring return actuator, up to 100% barometric relief, supply and outdoor air sensors, and CO2 sensor compatible.	090 – 150
DNECOMZR024A02	Horizontal EconoMi\$er IV with solid-state controller, gear-driven, modulating damper, spring return actuator, up to 100% barometric relief, supply and outdoor air sensors, and CO2 sensor compatible.	072
DNECOMZR025A02	Horizontal EconoMi\$er IV with solid-state controller, gear-driven, modulating damper, spring return actuator, up to 100% barometric relief, supply and outdoor air sensors, and CO2 sensor compatible.	090 – 150

POWER EXHAUST		
Model Number	Description	Use With Model Size
DNPWREXH030A01	Vertical Power Exhaust 208/230 volt (1 or 3 Phase)	072
DNPWREXH021A01	Vertical Power Exhaust 460 volt	072
DNPWREXH022A01	Vertical Power Exhaust 208/230 volt (1 or 3 Phase)	090 – 150
DNPWREXH023A01	Vertical Power Exhaust 460 volt	090 – 150
DNPWREXH028A01	Horizontal Power Exhaust 208/230 & 575 volt (1 or 3 Phase) Mounted on return duct work	072 – 150
DNPWREXH029A01	Horizontal Power Exhaust 460 volt Mounted on return duct work	072 – 150

MANUAL OUTDOOR AIR DAMPERS		
Model Number	Description	Use With Model Size
DNMANDPR001A03	25% Open Manual Fresh Air Damper	072
CRMANDPR001A02	50% Open Manual Fresh Air Damper	072
DNMANDPR002A03	25% Open Manual Fresh Air Damper	090 – 150
CRMANDPR002A02	50% Open Manual Fresh Air Damper	090 – 150

MOTORIZED OUTDOOR AIR DAMPERS		
Model Number	Description	Use With Model Size
CRTWOPOS010A00	Motorized 2 position outdoor air damper (25–100% Outdoor Air)	072
CRTWOPOS011A00	Motorized 2 position outdoor air damper	090 – 150

## ACCESSORIES – RAS072–150

LOW AMBIENT CONTROLS *		
Model Number	Description	Use With Model Size
32LT900301 <sup>1</sup>	Motormaster I Single–Phase Solid–State Variable Speed Motor Controller enables cooling down to –20° F by varying the speed on the condenser fan.	072 – 121 208/203–3–60
32LT900611 <sup>1</sup>	MotorMaster I Single–Phase Solid–State Variable Speed Motor Controller enables cooling down to –20° F by varying the speed on the condenser fan.	072 – 121 460–3–60, 575–3–60
CPLOWAMB001A00	Motormaster® II Low Ambient Control – Enables cooling system to operate down to 0° F by cycling condenser fan on and off. The control is activated by a temperature sensor. No motor change–out required.	072 – 121 208/230–3–60, 460–3–60
1171974 <sup>2</sup>	Motormaster I Compatible Condenser Fan Motor	072 – 121 208/230–3–60
1171975 <sup>2</sup>	Motormaster I Compatible Condenser Fan Motor	072 – 121 460–3–60, 575–3–60
1171108 <sup>2</sup>	10 Micro Farad Run Capacitor	090–121 208/230–3–60
CRLOWAMB030A00 <sup>3</sup>	Motormaster V Low Ambient Kit. Mechanical cooling operation down to –20° F (– 29° C)	150 208/230–3–60
CRLOWAMB031A00 <sup>3</sup>	Motormaster V Low Ambient Kit. Mechanical cooling operation down to –20° F (– 29° C)	150 460–3–60
CRLOWAMB032A00 <sup>3</sup>	Motormaster V Low Ambient Kit. Mechanical cooling operation down to –20° F (– 29° C).	150 575–3–60

THROUGH–THE–BOTTOM/CURB POWER CONNECTION		
Model Number	Description	Use With Model Size
CRBTMPWR001A01	Thru–the–bottom electrical + thru–the–curb Gas	072
CRBTMPWR002A01	Thru–the–bottom electrical + thru–the–curb Gas	090 – 150
CRBTMPWR003A01	Thru–the–bottom electrical and Gas	072
CRBTMPWR004A01	Thru–the–bottom electrical and Gas	090 – 150

WINTER START KIT		
Model Number	Description	Use With Model Size
DNWINSTR001A00	Electronic phase monitor breaks “R” control signal if trouble is detected. (Allows operation down to 25°F from standard 40°F.)	072 – 150

ECONOMIZER SENSORS		
Model Number	Description	Use With Model Size
DNTEMPSN002A00	Outdoor or Return Dry Bulb Temperature Sensor used with Electro–Mechanical control.	ALL Economizers
DNCBDIOX005A00	CO <sub>2</sub> Sensor for use in return airstream. Also includes Aspirator Box required for Duct Mounting.	ALL Economizers
DNENTDIF004A00	Return Air Enthalpy Sensor used with Electro–Mechanical controls, use with AXB078ENT for differential enthalpy control.	ALL Economizers
AXB078ENT	Accusensor II Economizer Differential Enthalpy Control Upgrade	ALL Economizers

\*See usage tables in kit instructions.

<sup>1</sup> Requires motor change out.

<sup>2</sup> Available from FAST Parts.

<sup>3</sup> No motor change is required on these specific models

Field supplied relay also required when using with 120 size heat pumps: Relay Base (1179470), Relay (1179471)

## ACCESSORIES – RAS072–150 (cont.)

<b>CONTROL UPGRADE KITS</b>		
<b>Model Number</b>	<b>Description</b>	<b>Use With Model Size</b>
CRSTATUS001A00	Fan/Filter Status Switch	072 – 150
NRTIMEGD001A00	Time Guard II	072 – 150
1178184 <sup>2</sup>	Remote keyed attenuator / test / reset station	072 – 150
DNPBASE3001A01	Phase Monitor Control	072 – 150
<b>575V TRANSFORMER</b>		
<b>Model Number</b>	<b>Description</b>	<b>Use With Model Size</b>
1171494 <sup>2</sup>	Transformer for conversion from 575v to 208/230v power exhaust applications.	072 – 150
<b>HAIL GUARDS</b>		
<b>Model Number</b>	<b>Description</b>	<b>Use With Model Size</b>
DNLVHLGD013A00	Louvered Condenser Coil Hail Guard	072
DNLVHLGD014A00	Louvered Condenser Coil Hail Guard	091
DNLVHLGD020A00	Louvered Condenser Coil Hail Guard	090
DNLVHLGD015A00	Louvered Condenser Coil Hail Guard	101 / 102
DNLVHLGD016A00	Louvered Condenser Coil Hail Guard	121
DNLVHLGD021A00	Louvered Condenser Coil Hail Guard	120
DNLVHLGD022A00	Louvered Condenser Coil Hail Guard	150

<sup>2</sup> Available from FAST Parts.

<b>ELECTRIC HEATERS</b>			
<b>Model Number</b>	<b>Voltage</b>	<b>Nominal Power (kW)</b>	<b>Used With Model Size</b>
CRHEATER101A00	208/230	4.4	072
CRHEATER102A00	208/230	6.5	072
CRHEATER104B00	208/230	10.5	072
CRHEATER105A00	208/230	16	072
CRHEATER106A00	460	6	072
CRHEATER108A00	460	11.5	072
CRHEATER109A00	460	14	072
CRHEATER110A00	208/230	16	090 – 150
CRHEATER111A00	208/230	24.8	090 – 121
CRHEATER112A00	208/230	32	090 – 150
CRHEATER113A00	460	16.5	090 – 150
CRHEATER114A00	460	27.8	090 – 150
CRHEATER115A00	460	33	090 – 150
CRHEATER116A00	460	13.9	090 – 150
CRHEATER117A00	208/230	10.4	090 – 150
CRHEATER118A00	575	17	090 – 150
CRHEATER119A00	575	34	090 – 150



**Table 2 – AHRI COOLING RATING TABLE – Single Stage Cooling**

UNIT RAS	COOLING STAGES	NOM. CAPACITY (TONS)	NET COOLING CAPACITY (MBH)	TOTAL POWER (KW)	SEER	EER	IEER
072	1	6	70.0	6.4	–	11.2	11.4
091	1	7.5	88.0	8.0	–	11.2	11.4
101	1	8.5	97.0	8.8	–	11.2	11.4
121	1	10	117.0	10.6	–	11.2	11.4

**Table 3 – AHRI COOLING RATING TABLE – Two Stage Cooling**

UNIT RAS	COOLING STAGES	NOM. CAPACITY (TONS)	NET COOLING CAPACITY (MBH)	TOTAL POWER (kW)	SEER	EER	IEER
090	2	7.5	83.0	7.5	N/A	11.2	11.7
102	2	8.5	99.0	9.0	N/A	11.2	11.7
120	2	10	114.0	10.3	N/A	11.3	12.2
150	2	12.5	140.0	12.9	N/A	11.0	11.2

**LEGEND**

- AHRI – Air-Conditioning, Heating & Refrigeration Institute
- ASHRAE – American Society of Heating, Refrigerating and Air Conditioning, Inc.
- EER – Energy Efficiency Ratio
- IEER – Integrated Energy Efficiency Ratio
- SEER – Seasonal Energy Efficiency Ratio
- IPLV – Integrated Part Load Value

**NOTES:**

1. Rated and certified under AHRI Standard 340/360-04, as appropriate.
2. Ratings are based on:  
**Cooling Standard:** 80°F (27°C) db, 67°F (19°C) wb indoor air temp and 95°F (35°C) db outdoor air temp.  
**IPLV Standard:** 80°F (27°C) db, 67°F (19°C) wb indoor air temp and 80°F (27°C) db outdoor air temp.  
**IEER Standard:** Procedure described in AHRI Standard 340/360.
3. All RAS units comply with ASHRAE 90.1 2001, 2004 Energy Standard for minimum SEER and EER requirements.
4. RAS units comply with US Energy Policy Act (2005). To evaluate code compliance requirements, refer to state and local codes or visit the following website: <http://bcap-energy.org>.



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**Table 4 – MINIMUM – MAXIMUM AIRFLOWS ELECTRIC HEAT**

UNIT RAS	COOLING		ELECTRIC HEATERS	
	Minimum	Maximum	Minimum	Maximum
072	1800	3000	1800	3000
090/091	2250	3750	2250*	3750
101/102	2550	4250	2250*	4250
120/121	3000	5000	3000*	5000
150	3600	6000	3000*	6000

\* Minimum electric heat CFM exceptions :

UNIT RAS	UNIT VOLTAGE	HEATER KW	UNIT CONFIGURATION	REQUIRED MINIMUM CFM
120 150	208/230	42.4	Horizontal	3200
120 150	208/230	50.0	Horizontal	3200
120 150	460	50.0	Horizontal or Vertical	3200
090/091 101/102 120/121 150	575	17.0	Horizontal or Vertical	2800
		34.0		2350

**Table 5 – SOUND PERFORMANCE TABLE**

UNIT RAS	COOLING STAGES	OUTDOOR SOUND (dB)								
		A-WEIGHTED	63	125	250	500	1000	2000	4000	8000
072	1	78	88.8	81.8	76.9	74.4	73.3	69.8	66.3	62.7
091	1	82	90.1	82.6	81.0	79.4	77.0	73.0	70.4	66.7
090	2	82	85.8	84.3	80.5	78.7	76.4	72.7	68.3	65.1
101	1	83	91.2	86.4	81.9	81.0	78.3	73.9	71.4	67.3
102	2	82	88.6	85.0	81.6	79.5	77.4	74.1	71.0	66.3
121	1	82	88.6	85.0	81.6	79.5	77.4	74.1	71.0	66.3
120	2	82	89.0	83.1	80.5	78.5	75.5	71.6	69.6	69.3
150	2	87	87.0	85.2	84.6	84.9	82.2	78.4	75.3	72.9

**LEGEND**

dB – Decibel



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**NOTES:**

1. Outdoor sound data is measure in accordance with AHRI standard 270–95.
2. Measurements are expressed in terms of sound power. Do not compare these values to sound pressure values because sound pressure depends on specific environmental factors which normally do not match individual applications. Sound power values are independent of the environment and therefore more accurate.
3. A-weighted sound ratings filter out very high and very low frequencies, to better approximate the response of “average” human ear. A-weighted measurements are taken in accordance with AHRI standard 270–95.

**Table 6 – PHYSICAL DATA (COOLING) 6 – 8.5 TONS**

		RAS072	RAS091	RAS090	RAS101	RAS102
<b>Refrigeration System</b>						
# Circuits / # Comp. / Type		1 / 1 / Scroll	1 / 1 / Scroll	2 / 2 / Scroll	1 / 1 / Scroll	2 / 2 / Scroll
Refrig. (R-410A) charge per circuit A/B (lbs-oz)		14-2 / -	13 - 12	8 - 5 / 8 - 2	15 - 4	10 - 5 / 10 - 12
Metering Device		Fixed Metering Device				
High-press. Trip / Reset (psig)		630 / 505	630 / 505	630 / 505	630 / 505	630 / 505
Low-press. Trip / Reset (psig)		54 / 117	54 / 117	54 / 117	54 / 117	54 / 117
<b>Evap. Coil</b>						
Material		Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al
Coil type		3/8" RTPF	3/8" RTPF	3/8" RTPF	3/8" RTPF	3/8" RTPF
Rows / FPI		4 / 15	3 / 15	3 / 15	3 / 15	3 / 15
Total Face Area (ft <sup>2</sup> )		7.3	8.9	8.9	11.1	11.1
Condensate Drain Conn. Size		3/4"	3/4"	3/4"	3/4"	3/4"
<b>Evap. Fan and Motor</b>						
Standard Static 3 phase	Motor Qty / Drive Type	1 / Belt	1 / Belt	1 / Belt	1 / Belt	1 / Belt
	Max BHP	2.4	1.7	1.7	1.7	1.7
	RPM Range	1073-1457	489-747	489-747	518-733	518-733
	Motor Frame Size	56	56	56	56	56
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan Diameter (in)	10 x 10	15 x 15	15 x 15	15 x 15	15 x 15
Medium Static 3 phase	Motor Qty / Drive Type	1 / Belt	1 / Belt	1 / Belt	1 / Belt	1 / Belt
	Max BHP	2.9*	2.9	2.9	2.4	2.4
	RPM Range	1173-1518	733-949	733-949	690-936	690-936
	Motor Frame Size	56	56	56	56	56
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan Diameter (in)	10 x 10	15 x 15	15 x 15	15 x 15	15 x 15
High Static 3 phase	Motor Qty / Drive Type	1 / Belt	1 / Belt	1 / Belt	1 / Belt	1 / Belt
	Max BHP	3.7	4.7	4.7	3.7	3.7
	RPM Range	1474-1788	909-1102	909-1102	838-1084	838-1084
	Motor Frame Size	56	145TY	145TY	56	56
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan Diameter (in)	10 x 10	15 x 15	15 x 15	15 x 15	15 x 15
<b>Cond. Coil</b>						
Material		Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al
Coil type		3/8" RTPF	3/8" RTPF*	3/8" RTPF*	3/8" RTPF*	3/8" RTPF*
Rows / FPI		2 / 17	2 / 17	2 / 17	2 / 17	2 / 17
Total Face Area (ft <sup>2</sup> )		21.3	20.5	20.5	21.4	25.1
<b>Cond. fan / motor</b>						
Qty / Motor Drive Type		1 / Direct	2 / direct	2 / direct	2 / direct	2 / direct
Motor HP / RPM		1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100
Fan diameter (in)		22	22	22	22	22
<b>Filters</b>						
RA Filter # / Size (in)		4 / 16 x 16 x 2	4 / 16 x 20 x 2	4 / 16 x 20 x 2	4 / 20 x 20 x 2	4 / 20 x 20 x 2
OA inlet screen # / Size (in)		1 / 20 x 24 x 1	1 / 20 x 24 x 1	1 / 20 x 24 x 1	1 / 20 x 24 x 1	1 / 20 x 24 x 1

\* RTPF – Round Tube Plate Fin Coil Design

**Table 6 – (Cont.) PHYSICAL DATA (COOLING) 10 – 12.5 TONS**

		RAS121	RAS120	RAS150
<b>Refrigeration System</b>				
	# Circuits / # Comp. / Type	1 / 1 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll
	RTPF models R-410a charge A/B (lbs – oz)	20 – 0	10 – 5 / 10 – 3	11 – 0 / 11 – 6
	Metering device		Fixed Metering Device	
	High–press. Trip / Reset (psig)	630 / 505	630 / 505	630 / 505
	Low–press. Trip / Reset (psig)	54 / 117	54 / 117	54 / 117
<b>Evap. Coil</b>				
	Material	Cu / Al	Cu / Al	Cu / Al
	Coil type	3/8" RTPF	3/8" RTPF	3/8" RTPF
	Rows / FPI	4 / 15	4 / 15	4 / 15
	Total Face Area (ft <sup>2</sup> )	11.1	11.1	11.1
	Condensate drain conn. size	3/4"	3/4"	3/4"
<b>Evap. fan and motor</b>				
Standard Static 3 phase	Motor Qty / Drive type	1 / Belt	1 / Belt	1 / Belt
	Max BHP	2.4	2.4	2.9
	RPM range	591–838	591–838	652–843
	motor frame size	56	56	56
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan Diameter (in)	15 x 15	15 x 15	15 x 15
Medium Static 3 phase	Motor Qty / Drive type	1 / Belt	1 / Belt	1 / Belt
	Max BHP	3.7	3.7	3.7
	RPM range	838–1084	838–1084	838–1084
	motor frame size	56	56	56
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan Diameter (in)	15 x 15	15 x 15	15 x 15
High Static 3 phase	Motor Qty / Drive type	1 / Belt	1 / Belt	1 / Belt
	Max BHP	4.7	4.7	4.7
	RPM range	1022–1240	1022–1240	1022–1240
	motor frame size	145TY	145TY	145TY
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan Diameter (in)	15 x 15	15 x 15	15 x 15
<b>Cond. Coil</b>				
	Material	Cu / Al	Cu / Al	Cu / Al
	Coil type	3/8" RTPF*	3/8" RTPF*	3/8" RTPF*
	Rows / FPI	2 / 17	2 / 17	3 / 17
	total face area (ft <sup>2</sup> )	25.1	25.1	25.1
<b>Cond. fan / motor</b>				
	Qty / Motor drive type	2 / direct	2 / direct	1 / direct
	Motor HP / RPM	1/4 / 1100	1/4 / 1100	1 / 1175
	Fan diameter (in)	22	22	30
<b>Filters</b>				
	RA Filter # / size (in)	4 / 20 x 20 x 2	4 / 20 x 20 x 2	4 / 20 x 20 x 2
	OA inlet screen # / size (in)	1 / 20 x 24 x 1	1 / 20 x 24 x 1	1 / 20 x 24 x 1
* RTPF – Round Tube Plate Fin Coil Design				

**Table 7 – ELECTRIC HEAT – ELECTRICAL DATA, 6 – 12.5 TONS**

Unit	Voltage-Ph-Hz	IFM Type	Electric Heater Part Number CRHEATERXXXXXX	Nominal Power	APP Power	Single Point Kit Part Number CRSINGLEXXXXXX	
						No C.O. Or Unpwr'd C.O.	
						No P.E.	W/P.E. (pwr'd fro/unit)
RAS072	208/230-3-60	STD	102A00	6.5	4.9/6.0	-	-
			104B00	10.5	7.9/9.6	-	-
			105A00	16.0	12.0/14.7	037A00	037A00
			104B00,104B00	21.0	15.8/19.3	038A00	038A00
			104B00,105A00	26.5	19.9/24.3	038A00	038A00
		MED	102A00	6.5	4.9/6.0	-	-
			104B00	10.5	7.9/9.6	-	-
			105A00	16.0	12.0/14.7	037A00	037A00
			104B00,104B00	21.0	15.8/19.3	038A00	038A00
			104B00,105A00	26.5	19.9/24.3	038A00	038A00
		HIGH	102A00	6.5	4.9/6.0	-	-
			104B00	10.5	7.9/9.6	-	-
			105A00	16.0	12.0/14.7	037A00	037A00
			104B00,104B00	21.0	15.8/19.3	038A00	038A00
			104B00,105A00	26.5	19.9/24.3	038A00	038A00
	460-3-60	STD	106A00	6.0	5.5	-	-
			108A00	11.5	10.6	-	-
			109A00	14.0	12.9	-	-
			108A00,108A00	23.0	21.1	037A00	037A00
			108A00,109A00	25.5	23.4	037A00	037A00
		MED	106A00	6.0	5.5	-	-
			108A00	11.5	10.6	-	-
			109A00	14.0	12.9	-	-
			108A00,108A00	23.0	21.1	037A00	037A00
HIGH	106A00	6.0	5.5	-	-		
	108A00	11.5	10.6	-	-		
	109A00	14.0	12.9	-	-		
	108A00,108A00	23.0	21.1	037A00	037A00		
			108A00,109A00	25.5	23.4	037A00	037A00

**LEGEND**

- APP PWR – 208 / 230V / 460V / 575V
- C.O. – Convenient outlet
- FLA – Full load amps
- IFM – Indoor fan motor
- NOM PWR – 240V / 480V / 600V
- P.E. – Power exhaust
- UNPWRD – Unpowered convenient outlet

**Table 7 ELECTRIC HEAT – ELECTRICAL DATA, 6 – 12.5 TONS**

Unit	Voltage–Ph–Hz	IFM Type	Electric Heater Part Number CRHEATERXXXXXX	Nominal Power	APP Power	Single Point Kit Part Number CRSINGLEXXXXXX	
						No C.O. Or Unpwrd C.O.	
						No P.E.	W/P.E. (pwrd fro/unit)
RAS091	208/230–3–60	STD	117A00	10.4	7.8/9.6	042A00	042A00
			110A00	16.0	12.0/14.7	042A00	042A00
			111A00	24.8	18.6/22.8	043A00	043A00
			112A00	32.0	24.0/29.4	043A00	043A00
			112A00,117A00	42.4	31.8/38.9	045A00	045A00
		MED	117A00	10.4	7.8/9.6	042A00	042A00
			110A00	16.0	12.0/14.7	042A00	043A00
			111A00	24.8	18.6/22.8	043A00	043A00
			112A00	32.0	24.0/29.4	043A00	043A00
			112A00,117A00	42.4	31.8/38.9	045A00	045A00
		HIGH	117A00	10.4	7.8/9.6	042A00	042A00
			110A00	16.0	12.0/14.7	043A00	043A00
	111A00		24.8	18.6/22.8	043A00	043A00	
	112A00		32.0	24.0/29.4	043A00	043A00	
	112A00,117A00		42.4	31.8/38.9	045A00	045A00	
	460–3–60	STD	116A00	13.9	12.8	042A00	042A00
			113A00	16.5	15.2	042A00	042A00
			114A00	27.8	25.5	042A00	042A00
			115A00	33.0	30.3	042A00	042A00
			114A00,116A00	41.7	38.3	044A00	044A00
		MED	116A00	13.9	12.8	042A00	042A00
			113A00	16.5	15.2	042A00	042A00
			114A00	27.8	25.5	042A00	042A00
			115A00	33.0	30.3	042A00	042A00
114A00,116A00			41.7	38.3	044A00	044A00	
HIGH		116A00	13.9	12.8	042A00	042A00	
		113A00	16.5	15.2	042A00	042A00	
	114A00	27.8	25.5	042A00	042A00		
	115A00	33.0	30.3	042A00	044A00		
	114A00,116A00	41.7	38.3	044A00	044A00		
575–3–60	STD	118A00	17.0	17.0	042A00	042A00	
		119A00	34.0	34.0	042A00	042A00	
	MED	118A00	17.0	17.0	042A00	042A00	
		119A00	34.0	34.0	042A00	042A00	
	HIGH	118A00	17.0	17.0	042A00	042A00	
		119A00	34.0	34.0	042A00	044A00	

**LEGEND**

- APP PWR – 208 / 230V / 460V / 575V
- C.O. – Convenient outlet
- FLA – Full load amps
- IFM – Indoor fan motor
- NOM PWR –240V / 480V / 600V
- P.E. – Power exhaust
- UNPWRD – Unpowered convenient outlet

**Table 7 ELECTRIC HEAT – ELECTRICAL DATA, 6 – 12.5 TONS**

Unit	Voltage–Ph–Hz	IFM Type	Electric Heater Part Number CRHEATERXXXXXX	Nominal Power	APP Power	Single Point Kit Part Number CRSINGLEXXXXXX	
						No C.O. Or Unpwr'd C.O.	
						No P.E.	W/P.E. (pwr'd fro/unit)
RAS090	208/230–3–60	STD	117A00	10.4	7.8/9.6	042A00	042A00
			110A00	16.0	12.0/14.7	042A00	042A00
			111A00	24.8	18.6/22.8	043A00	043A00
			112A00	32.0	24.0/29.4	043A00	043A00
			112A00,117A00	42.4	31.8/38.9	045A00	045A00
		MED	117A00	10.4	7.8/9.6	042A00	042A00
			110A00	16.0	12.0/14.7	042A00	043A00
			111A00	24.8	18.6/22.8	043A00	043A00
			112A00	32.0	24.0/29.4	043A00	043A00
			112A00,117A00	42.4	31.8/38.9	045A00	045A00
		HIGH	117A00	10.4	7.8/9.6	042A00	042A00
			110A00	16.0	12.0/14.7	043A00	043A00
	111A00		24.8	18.6/22.8	043A00	043A00	
	112A00		32.0	24.0/29.4	043A00	043A00	
	112A00,117A00		42.4	31.8/38.9	045A00	045A00	
	460–3–60	STD	116A00	13.9	12.8	042A00	042A00
			113A00	16.5	15.2	042A00	042A00
			114A00	27.8	25.5	042A00	042A00
			115A00	33.0	30.3	042A00	042A00
			114A00,116A00	41.7	38.3	044A00	044A00
		MED	116A00	13.9	12.8	042A00	042A00
			113A00	16.5	15.2	042A00	042A00
			114A00	27.8	25.5	042A00	042A00
			115A00	33.0	30.3	042A00	042A00
114A00,116A00			41.7	38.3	044A00	044A00	
HIGH		116A00	13.9	12.8	042A00	042A00	
		113A00	16.5	15.2	042A00	042A00	
	114A00	27.8	25.5	042A00	042A00		
	115A00	33.0	30.3	042A00	044A00		
	114A00,116A00	41.7	38.3	044A00	044A00		
575–3–60	STD	118A00	17.0	17.0	042A00	042A00	
		119A00	34.0	34.0	042A00	042A00	
	MED	118A00	17.0	17.0	042A00	042A00	
		119A00	34.0	34.0	042A00	042A00	
	HIGH	118A00	17.0	17.0	042A00	042A00	
		119A00	34.0	34.0	042A00	044A00	

**LEGEND**

- APP PWR – 208 / 230V / 460V / 575V
- C.O. – Convenient outlet
- FLA – Full load amps
- IFM – Indoor fan motor
- NOM PWR –240V / 480V / 600V
- P.E. – Power exhaust
- UNPWRD – Unpowered convenient outlet

**Table 7 ELECTRIC HEAT – ELECTRICAL DATA, 6 – 12.5 TONS**

Unit	Voltage–Ph–Hz	IFM Type	Electric Heater Part Number CRHEATERXXXXXX	Nominal Power	APP Power	Single Point Kit Part Number CRSINGLEXXXXXX	
						No C.O. Or Unpwr'd C.O.	
						No P.E.	W/P.E. (pwr'd fro/unit)
RAS101	208/230–3–60	STD	117A00	10.4	7.8/9.6	047A00	047A00
			110A00	16.0	12.0/14.7	047A00	047A00
			111A00	24.8	18.6/22.8	049A00	049A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
		MED	117A00	10.4	7.8/9.6	047A00	047A00
			110A00	16.0	12.0/14.7	047A00	047A00
			111A00	24.8	18.6/22.8	049A00	049A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
		HIGH	117A00	10.4	7.8/9.6	047A00	049A00
			110A00	16.0	12.0/14.7	049A00	049A00
	111A00		24.8	18.6/22.8	049A00	049A00	
	112A00		32.0	24.0/29.4	049A00	049A00	
	112A00,117A00		42.4	31.8/38.9	051A00	051A00	
	460–3–60	STD	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
			114A00	27.8	25.5	047A00	047A00
			115A00	33.0	30.3	047A00	047A00
			114A00,116A00	41.7	38.3	050A00	050A00
		MED	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
			114A00	27.8	25.5	047A00	047A00
			115A00	33.0	30.3	047A00	047A00
114A00,116A00			41.7	38.3	050A00	050A00	
HIGH		116A00	13.9	12.8	047A00	047A00	
		113A00	16.5	15.2	047A00	047A00	
	114A00	27.8	25.5	047A00	047A00		
	115A00	33.0	30.3	047A00	047A00		
	114A00,116A00	41.7	38.3	050A00	050A00		
575–3–60	STD	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	
	MED	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	
	HIGH	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	

**LEGEND**

- APP PWR – 208 / 230V / 460V / 575V
- C.O. – Convenient outlet
- FLA – Full load amps
- IFM – Indoor fan motor
- NOM PWR –240V / 480V / 600V
- P.E. – Power exhaust
- UNPWRD – Unpowered convenient outlet



**Table 7 ELECTRIC HEAT – ELECTRICAL DATA, 6 – 12.5 TONS**

Unit	Voltage–Ph–Hz	IFM Type	Electric Heater Part Number CRHEATERXXXXXX	Nominal Power	APP Power	Single Point Kit Part Number CRSINGLEXXXXXX	
						No C.O. Or Unpwr'd C.O.	
						No P.E.	W/P.E. (pwr'd fro/unit)
RAS102	208/230–3–60	STD	117A00	10.4	7.8/9.6	047A00	047A00
			110A00	16.0	12.0/14.7	047A00	047A00
			111A00	24.8	18.6/22.8	049A00	049A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
		MED	117A00	10.4	7.8/9.6	047A00	047A00
			110A00	16.0	12.0/14.7	047A00	047A00
			111A00	24.8	18.6/22.8	049A00	049A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
		HIGH	117A00	10.4	7.8/9.6	047A00	047A00
			110A00	16.0	12.0/14.7	049A00	049A00
	111A00		24.8	18.6/22.8	049A00	049A00	
	112A00		32.0	24.0/29.4	049A00	049A00	
	112A00,117A00		42.4	31.8/38.9	051A00	051A00	
	460–3–60	STD	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
			114A00	27.8	25.5	047A00	047A00
			115A00	33.0	30.3	047A00	047A00
			114A00,116A00	41.7	38.3	050A00	050A00
		MED	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
			114A00	27.8	25.5	047A00	047A00
			115A00	33.0	30.3	047A00	047A00
114A00,116A00			41.7	38.3	050A00	050A00	
HIGH		116A00	13.9	12.8	047A00	047A00	
		113A00	16.5	15.2	047A00	047A00	
	114A00	27.8	25.5	047A00	047A00		
	115A00	33.0	30.3	047A00	047A00		
	114A00,116A00	41.7	38.3	050A00	050A00		
575–3–60	STD	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	
	MED	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	
	HIGH	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	

**LEGEND**

- APP PWR – 208 / 230V / 460V / 575V
- C.O. – Convenient outlet
- FLA – Full load amps
- IFM – Indoor fan motor
- NOM PWR –240V / 480V / 600V
- P.E. – Power exhaust
- UNPWRD – Unpowered convenient outlet

**Table 7 ELECTRIC HEAT – ELECTRICAL DATA, 6 – 12.5 TONS**

Unit	Voltage–Ph–Hz	IFM Type	Electric Heater Part Number CRHEATERXXXXXX	Nominal Power	APP Power	Single Point Kit Part Number CRSINGLEXXXXXX	
						No C.O. Or Unpwr'd C.O.	
						No P.E.	W/P.E. (pwr'd fro/unit)
RAS121	208/230–3–60	STD	117A00	10.4	7.8/9.6	047A00	047A00
			110A00	16.0	12.0/14.7	047A00	047A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
			112A00,110A00	50.0	37.6/45.9	051A00	051A00
		MED	117A00	10.4	7.8/9.6	047A00	049A00
			110A00	16.0	12.0/14.7	049A00	049A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
			112A00,110A00	50.0	37.6/45.9	051A00	051A00
		HIGH	117A00	10.4	7.8/9.6	049A00	049A00
			110A00	16.0	12.0/14.7	049A00	049A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
			112A00,110A00	50.0	37.6/45.9	051A00	051A00
	460–3–60	STD	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
			115A00	33.0	30.3	047A00	047A00
			114A00,116A00	41.7	38.3	050A00	050A00
			115A00,113A00	50.0	45.9	050A00	050A00
		MED	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
			115A00	33.0	30.3	047A00	047A00
			114A00,116A00	41.7	38.3	050A00	050A00
			115A00,113A00	50.0	45.9	050A00	050A00
		HIGH	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
115A00			33.0	30.3	047A00	050A00	
114A00,116A00			41.7	38.3	050A00	050A00	
115A00,113A00			50.0	45.9	050A00	050A00	
575–3–60	STD	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	
		118A00,119A00	51.0	51.0	050A00	050A00	
	MED	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	
		118A00,119A00	51.0	51.0	050A00	050A00	
	HIGH	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	050A00	
		118A00,119A00	51.0	51.0	050A00	050A00	

**LEGEND**

- APP PWR – 208 / 230V / 460V / 575V
- C.O. – Convenient outlet
- FLA – Full load amps
- IFM – Indoor fan motor
- NOM PWR – 240V / 480V / 600V
- P.E. – Power exhaust
- UNPWRD – Unpowered convenient outlet

**Table 7 ELECTRIC HEAT – ELECTRICAL DATA, 6 – 12.5 TONS**

Unit	Voltage–Ph–Hz	IFM Type	Electric Heater Part Number CRHEATERXXXXXX	Nominal Power	APP Power	Single Point Kit Part Number CRSINGLEXXXXXX	
						No C.O. Or Unpwr'd C.O.	
						No P.E.	W/P.E. (pwr'd fro/unit)
RAS120	208/230–3–60	STD	117A00	10.4	7.8/9.6	047A00	047A00
			110A00	16.0	12.0/14.7	047A00	047A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
			112A00,110A00	50.0	37.6/45.9	051A00	051A00
		MED	117A00	10.4	7.8/9.6	047A00	047A00
			110A00	16.0	12.0/14.7	049A00	049A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
			112A00,110A00	50.0	37.6/45.9	051A00	051A00
		HIGH	117A00	10.4	7.8/9.6	047A00	049A00
			110A00	16.0	12.0/14.7	049A00	049A00
	112A00		32.0	24.0/29.4	049A00	049A00	
	112A00,117A00		42.4	31.8/38.9	051A00	051A00	
	460–3–60	STD	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
			115A00	33.0	30.3	047A00	047A00
			114A00,116A00	41.7	38.3	050A00	050A00
			115A00,113A00	50.0	45.9	050A00	050A00
		MED	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
			115A00	33.0	30.3	047A00	047A00
			114A00,116A00	41.7	38.3	050A00	050A00
			115A00,113A00	50.0	45.9	050A00	050A00
HIGH		116A00	13.9	12.8	047A00	047A00	
		113A00	16.5	15.2	047A00	047A00	
	115A00	33.0	30.3	047A00	050A00		
	114A00,116A00	41.7	38.3	050A00	050A00		
575–3–60	STD	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	
		118A00,119A00	51.0	51.0	050A00	050A00	
	MED	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	
		118A00,119A00	51.0	51.0	050A00	050A00	
	HIGH	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	050A00	
		118A00,119A00	51.0	51.0	050A00	050A00	

**LEGEND**

- APP PWR – 208 / 230V / 460V / 575V
- C.O. – Convenient outlet
- FLA – Full load amps
- IFM – Indoor fan motor
- NOM PWR – 240V / 480V / 600V
- P.E. – Power exhaust
- UNPWRD – Unpowered convenient outlet

**Table 7 ELECTRIC HEAT – ELECTRICAL DATA, 6 – 12.5 TONS**



Unit	Voltage–Ph–Hz	IFM Type	Electric Heater Part Number CRHEATERXXXXXX	Nominal Power	APP Power	Single Point Kit Part Number CRSINGLEXXXXXX	
						No C.O. Or Unpwr'd C.O.	
						No P.E.	W/P.E. (pwr'd fro/unit)
<b>RAS150</b>	208/230–3–60	STD	117A00	10.4	7.8/9.6	049A00	049A00
			110A00	16.0	12.0/14.7	049A00	049A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
			112A00,110A00	50.0	37.6/45.9	051A00	051A00
		MED	117A00	10.4	7.8/9.6	049A00	049A00
			110A00	16.0	12.0/14.7	049A00	049A00
			112A00	32.0	24.0/29.4	049A00	049A00
			112A00,117A00	42.4	31.8/38.9	051A00	051A00
			112A00,110A00	50.0	37.6/45.9	051A00	051A00
		HIGH	117A00	10.4	7.8/9.6	049A00	049A00
			110A00	16.0	12.0/14.7	049A00	049A00
	112A00		32.0	24.0/29.4	049A00	049A00	
	112A00,117A00		42.4	31.8/38.9	051A00	051A00	
	112A00,110A00		50.0	37.6/45.9	051A00	051A00	
	460–3–60	STD	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
			115A00	33.0	30.3	047A00	047A00
			114A00,116A00	41.7	38.3	050A00	050A00
			115A00,113A00	50.0	45.9	050A00	050A00
		MED	116A00	13.9	12.8	047A00	047A00
			113A00	16.5	15.2	047A00	047A00
			115A00	33.0	30.3	047A00	047A00
			114A00,116A00	41.7	38.3	050A00	050A00
115A00,113A00			50.0	45.9	050A00	050A00	
HIGH		116A00	13.9	12.8	047A00	047A00	
		113A00	16.5	15.2	047A00	047A00	
	115A00	33.0	30.3	047A00	050A00		
	114A00,116A00	41.7	38.3	050A00	050A00		
	115A00,113A00	50.0	45.9	050A00	050A00		
575–3–60	STD	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	
		118A00,119A00	51.0	51.0	050A00	050A00	
	MED	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	047A00	
		118A00,119A00	51.0	51.0	050A00	050A00	
	HIGH	118A00	17.0	17.0	047A00	047A00	
		119A00	34.0	34.0	047A00	050A00	
		118A00,119A00	51.0	51.0	050A00	050A00	

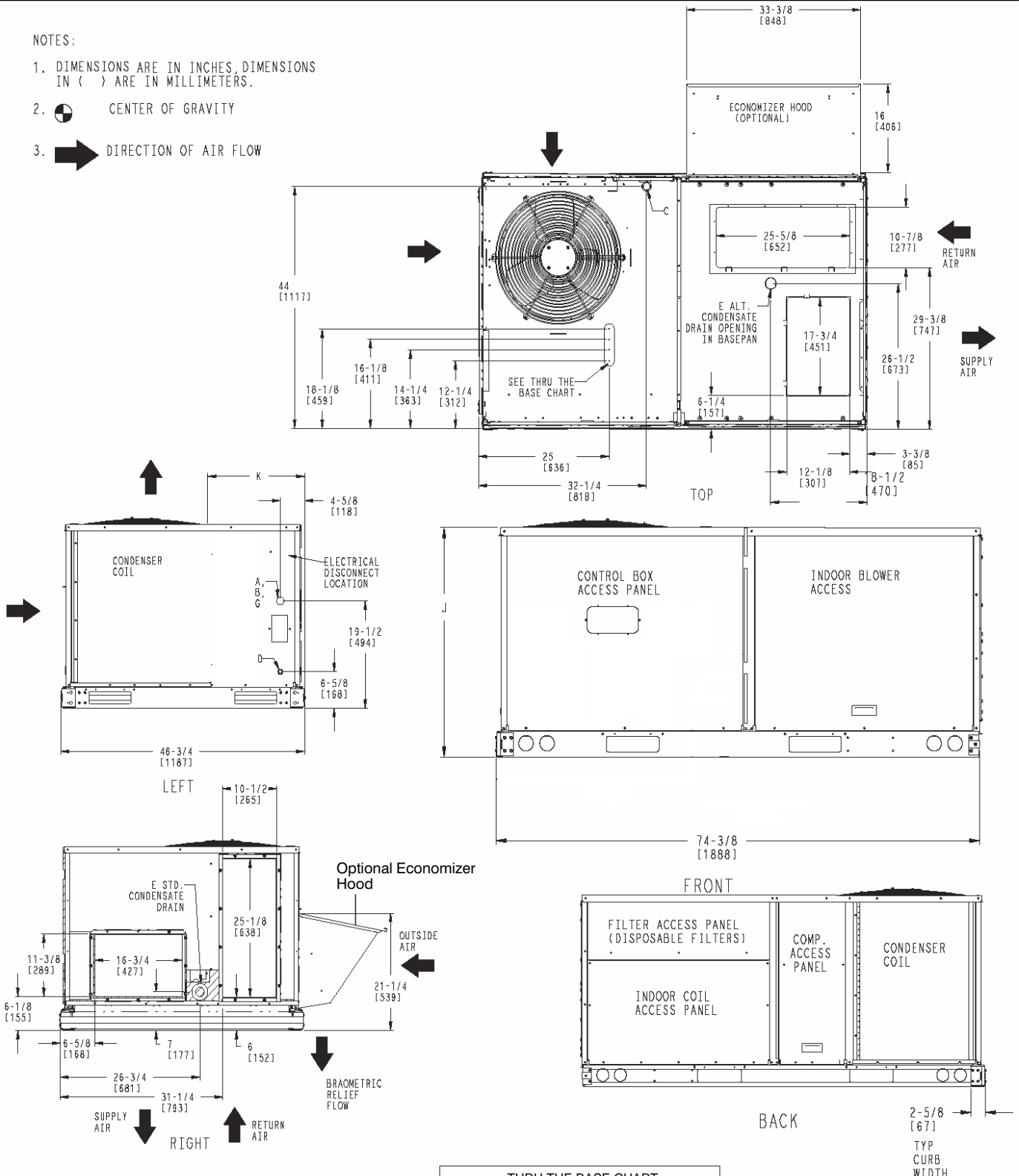
**LEGEND**

- APP PWR – 208 / 230V / 460V / 575V
- C.O. – Convenient outlet
- FLA – Full load amps
- IFM – Indoor fan motor
- NOM PWR – 240V / 480V / 600V
- P.E. – Power exhaust
- UNPWRD – Unpowered convenient outlet

# BASE UNIT DIMENSIONS – RAS072

**NOTES:**

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



CONNECTION SIZES	
A	1 3/8" DIA [35] FIELD POWER SUPPLY HOLE
B	2 1/2" [64] DIA POWER SUPPLY KNOCKOUT
C	1 3/4" DIA [51] GAUGE ACCESS PLUG
D	7/8" DIA [22] FIELD CONTROL WIRING HOLE
E	3/4"-14 NPT CONDENSATE DRAIN
G	2" DIA [51] POWER SUPPLY KNOCK-OUT

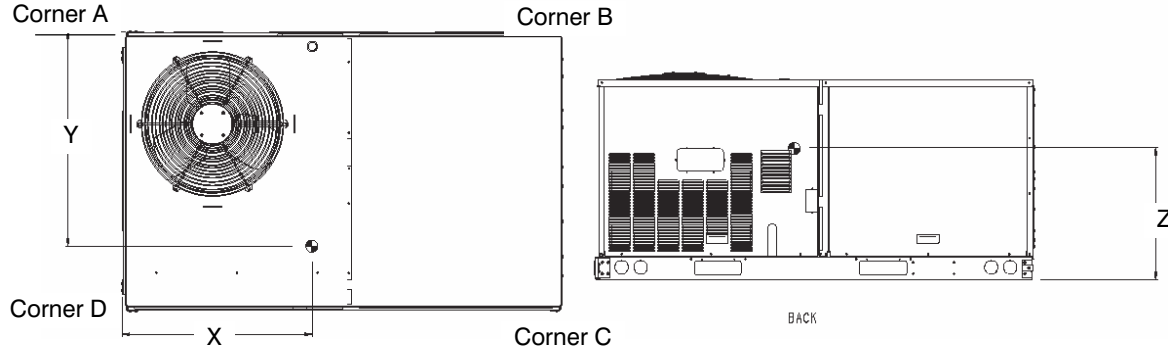
THRU THE BASE CHART THESE HOLES REQ'S FOR USE CRBTMPWR001A01, 002A01, 003A01, 004A01		
THREADED CONDUIT SIZE	WIRE USE	REQ'D HOLE SIZES (MAX.)
1/2"	ACC.	7/8" (22.2)
1/2"		7/8" (22.2)
3/4" (001,003)	POWER*	1 1/8" (28.4)
1 1/4" (002,004)	POWER*	1 3/4" (44.4)
* SELECT EITHER 3/4" OR 1 1/4" FOR POWER, DEPENDING ON WIRE SIZE		

Unit	J	K
072	41-3/8 [1051]	14-7/8 [377]

2-5/8 [67]  
TYP  
CURB  
WIDTH

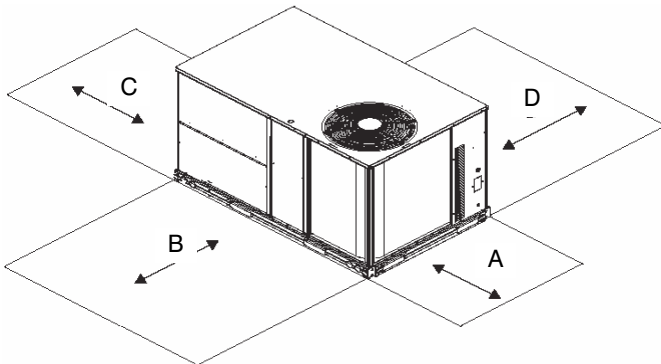
## WEIGHT & CLEARANCE DIMENSIONS – RAS072 (cont.)

UNIT	BASE UNIT WEIGHT		Corner Weight A		Corner Weight B		Corner Weight C		Corner Weight D		Center of Gravity In [mm]		
	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	X	Y	Z
RAS072	607	275	150	68	160	73	153	69	144	65	38 [965]	22 [559]	20–3/4 [527]



### UNIT CLEARANCES

LOC	DIMENSION	CONDITION
A	48" (1219 mm) 18" (457 mm) 18" (457 mm) 12" (305 mm)	Unit disconnect is mounted on panel No disconnect, convenience outlet option Recommended service clearance Minimum clearance
B	42" (1067 mm) 36" (914 mm) Special	Surface behind servicer is grounded (e.g., metal, masonry wall) Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass) Check for sources of flue products within 10-ft of unit fresh air intake hood
C	36" (914 mm) 18" (457 mm)	Side condensate drain is used Minimum clearance
D	48" (1219 mm) 42" (1067 mm) 36" (914 mm) Special	No flue discharge accessory installed, surface is combustible material Surface behind servicer is grounded (e.g., metal, masonry wall, another unit) Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass) Check for adjacent units or building fresh air intakes within 10-ft of this unit's flue outlet



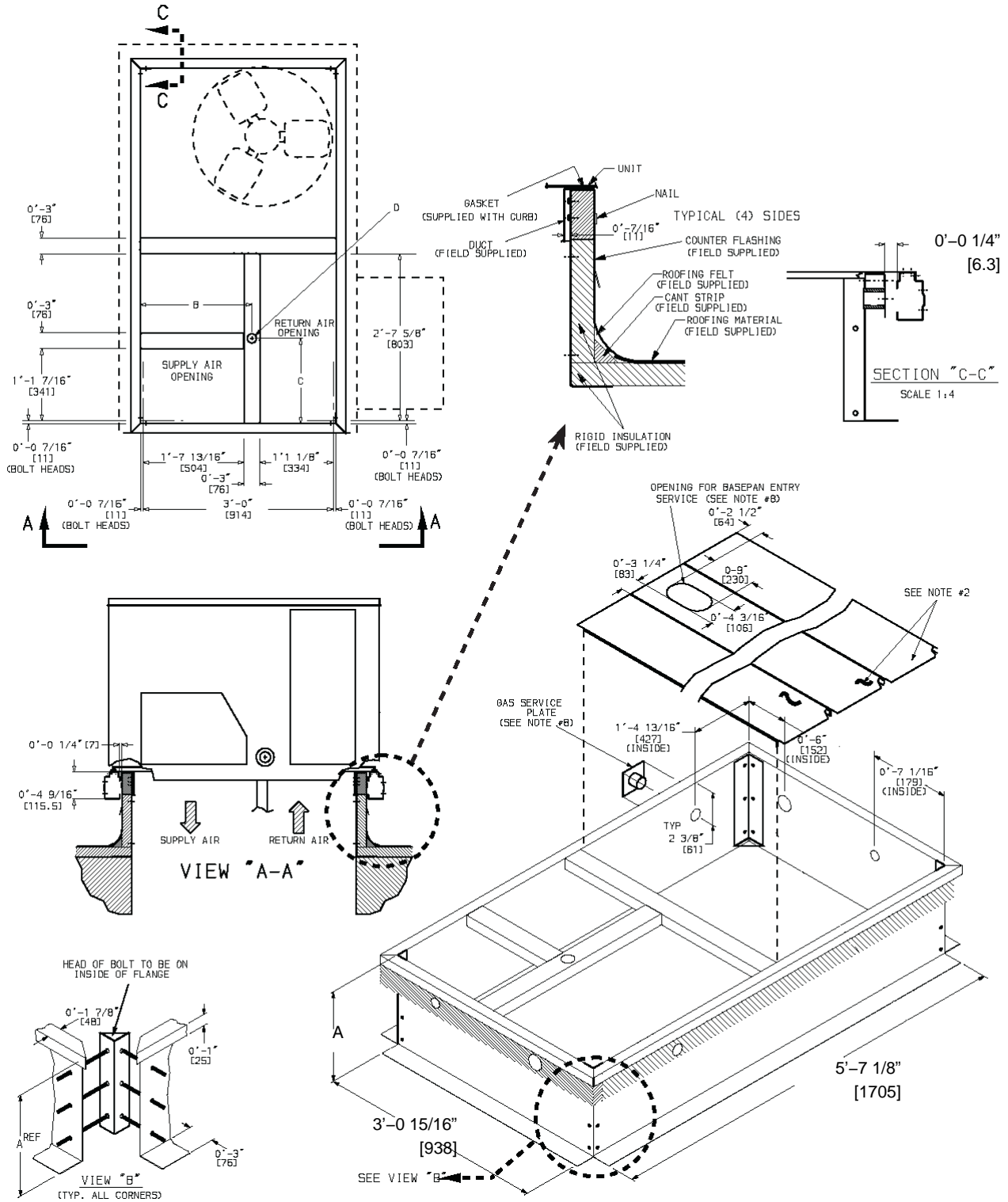
# ROOF CURB DETAILS – RAS072

RoofCurb Accessory	A	Unit Size
CRRFCURB001A01	1' 2" [356]	RAS072
CRRFCURB002A01	2' 0" [610]	

**NOTES:**

1. Roofcurb accessory is shipped disassembled.
2. Insulated panels, 1" thick polyurethane foam, 1-3/4# density.
3. Dimensions in. [ ] in millimeters.
4. Roofcurb 16ga steel.
5. Attach ductwork to curb (Flanges of duct rest on curb)
6. Service clearance 4' on each side.
7. ➡ Direction of airflow.
8. Connector pkg. CRBTMPWR001A01 is for thru-the-curb connections. Pkg. CRBTMPWR003A01 is for thru-the-bottom connections.

Connector Pkg. Acc.	B	C	D Alt. Drain Hole	Gas	Power	Control	Accessory Power
CRBTMPWR001A01	1' 9-11/16" [551]	1' 4" [406]	11-3/4" [44.5]	3/4" [19] NPT	3/4" [19] NPT	1/2" [12.7] NPT	1/2" [12.7] NPT
CRBTMPWR003A01				1/2" [12.7] NPT			



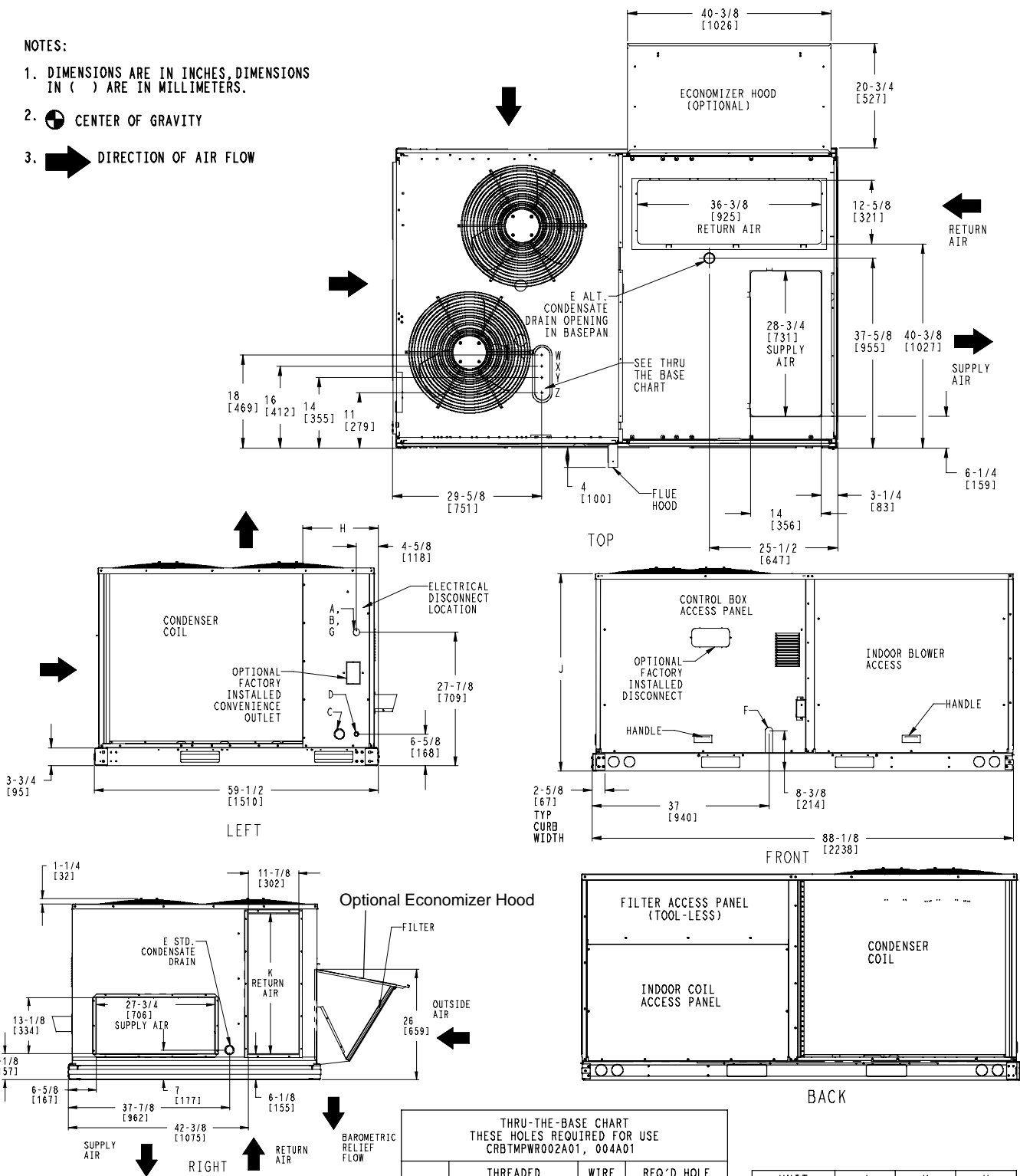
# BASE UNIT DIMENSIONS – RAS090-121

**NOTES:**

1. DIMENSIONS ARE IN INCHES, DIMENSIONS IN ( ) ARE IN MILLIMETERS.

2.  CENTER OF GRAVITY

3.  DIRECTION OF AIR FLOW



CONNECTION SIZES			
A	1 3/8" DIA [35]	FIELD POWER SUPPLY HOLE	
B	2 1/2" [64] DIA	POWER SUPPLY KNOCKOUT	
C	1 3/4" DIA [51]	GAUGE ACCESS PLUG	
D	7/8" DIA [22]	FIELD CONTROL WIRING HOLE	
E	3/4"-14 NPT	CONDENSATE DRAIN	
F	1/2"-14 NPT	GAS CONNECTION	
G	3/4"-14 NPT	GAS CONNECTION	
G	2" DIA [51]	POWER SUPPLY KNOCK-OUT	

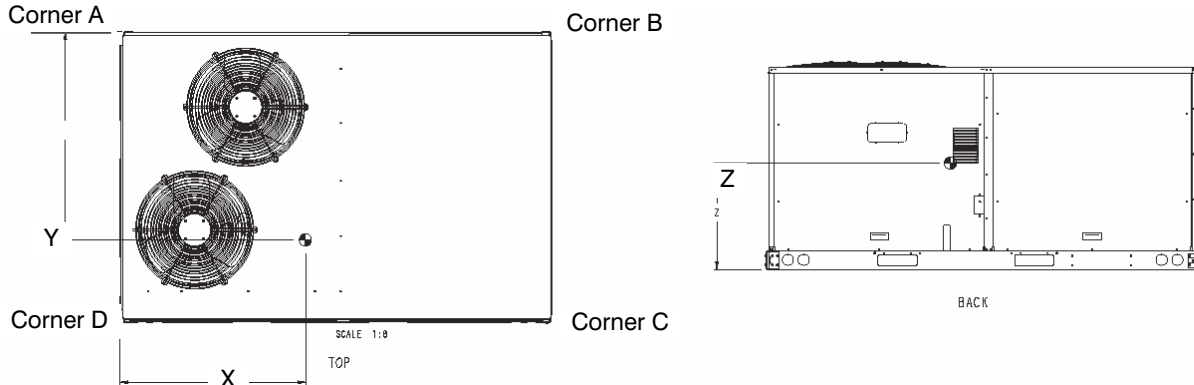
THRU-THE-BASE CHART THESE HOLES REQUIRED FOR USE CRBTMPWR002A01, 004A01			
	THREADED CONDUIT SIZE	WIRE USE	REQ'D HOLE SIZES (MAX.)
W	1/2"	ACC.	7/8" (22.2)
X	1/2"	24V	7/8" (22.2)
Y	1 1/4" (002,004)	POWER	1 3/4" (44.4)
Z **, *	(004) 3/4" FPT	GAS	1 5/8" (41.3)
FOR "THRU-THE-BASEPAN" FACTORY OPTION, FITTINGS FOR ONLY X, Y, & Z ARE PROVIDED			
* FOR HEAT SIZES "D" & "S" - A FIELD SUPPLIED 1/2" ADAPTER IS REQUIRED BETWEEN BASE PAN FITTING AND GAS VALVE.			
**	(002) PROVIDES 3/4" FPT THRU CURB FLANGE & FITTING.		

UNIT	J	K	H
<b>091</b>	41 1/4 [1048]	33 [658]	15 7/8 [403]
<b>101</b>	49 3/8 [1253]	37 1/4 [946]	23 7/8 [609]
<b>121</b>	49 3/8 [1253]	37 1/4 [946]	15 7/8 [403]
<b>090</b>	41 1/4 [1048]	33 [658]	15 7/8 [403]
<b>102</b>	49 3/8 [1253]	37 1/4 [946]	15 7/8 [403]
<b>120</b>	49 3/8 [1253]	37 1/4 [946]	15 7/8 [403]



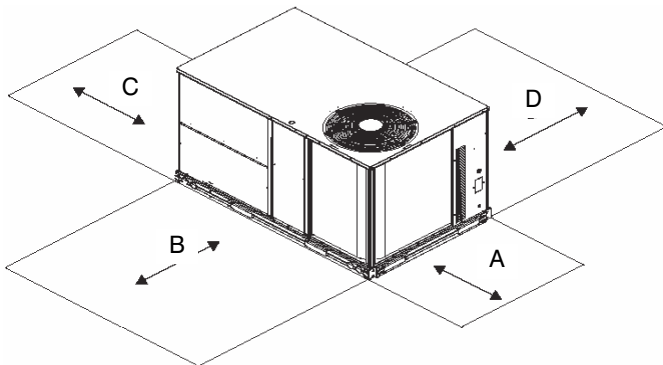
## WEIGHT & CLEARANCE DIMENSIONS – RAS090–121 (cont.)

UNIT	BASE UNIT WEIGHT		Corner Weight A		Corner Weight B		Corner Weight C		Corner Weight D		Center of Gravity In [mm]		
	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	X	Y	Z
RAS091	810	367	171	78	164	74	233	106	242	110	42 [1064]	34 [860]	20 [514]
RAS101	910	413	193	88	181	82	260	118	276	125	41 [1051]	23 [581]	23 [581]
RAS121	965	438	207	94	204	93	275	125	279	127	42 [1076]	24 [613]	24 [613]
RAS090	780	354	147	67	130	59	234	106	265	120	41 [1035]	37 [942]	21 [534]
RAS102	855	388	223	101	171	78	200	91	261	119	38 [975]	32 [816]	19 [486]
RAS120	850	385	192	87	170	77.2	229	104	258	117	40 [1019]	33 [841]	21 [534]



### UNIT CLEARANCES

LOC	DIMENSION	CONDITION
A	48" (1219 mm)	Unit disconnect is mounted on panel
	36" (914 mm)	If dimension-B is 12"
	18" (457 mm)	No disconnect, convenience outlet option
	18" (457 mm)	Recommended service clearance (use electric screwdriver)
	12" (305 mm)	Minimum clearance (use manual ratchet screwdriver)
B	36" (914 mm)	Unit has economizer
	12" (305 mm) Special	If dimension-A is 36" Check for sources of flue products within 10-ft of unit fresh air intake hood
C	36" (914 mm)	Side condensate drain is used
D	18" (457 mm)	Minimum clearance
	42" (1067 mm)	Surface behind servicer is grounded (e.g., metal, masonry wall, another unit)
	36" (914 mm)	Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)



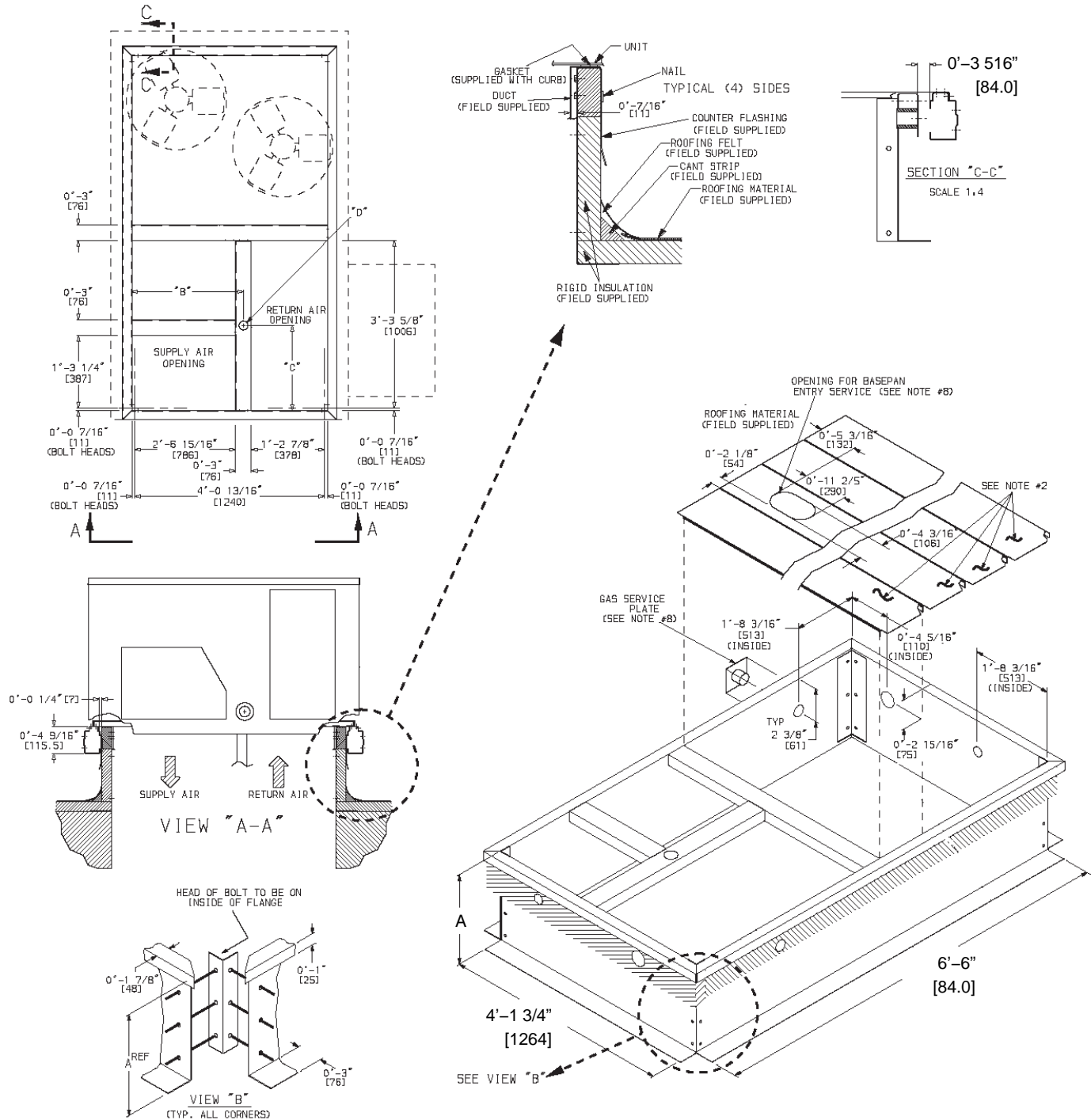
# ROOF CURB DETAILS – RAS090 – 150

RoofCurb Accessory	A	Unit Size
CRRFCURB003A01	1' 2" [356]	RAS090-150
CRRFCURB004A01	2' 0" [610]	

**NOTES:**



1. Roofcurb accessory is shipped disassembled.
2. Insulated panels, 1" thick polyurethane foam, 1-3/4# density.
3. Dimensions in. [ ] in millimeters.
4. Roofcurb 16ga steel.
5. Attach ductwork to curb (Flanges of duct rest on curb)
6. Service clearance 4' on each side.
7. Direction of airflow.
8. Connector pkg. CRBTMPWR002A01 is for thru-the-curb connections. Pkg. CRBTMPWR004A01 is for thru-the-bottom connections.

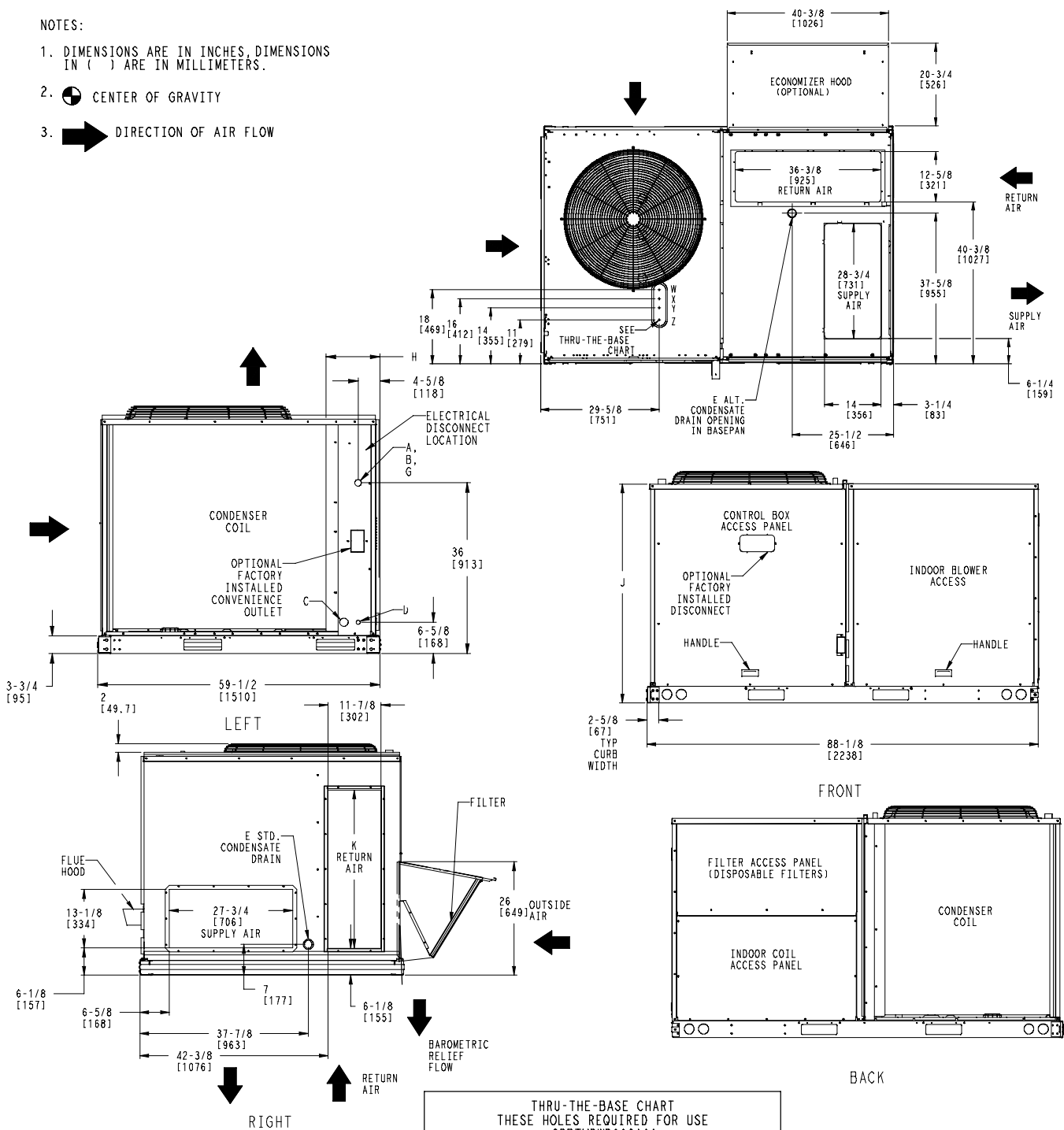
Connector Pkg. Acc.	B	C	D Alt. Drain Hole	Gas	Power	Control	Accessory Power
CRBTMPWR002A01	2' 8V-7/16" [827]	1' 10I-15/16" [583]	1I-3/4" [44.5]	3/4" [19] NPT	1I-1/4" [31.7] NPT	1/2" [12.7] NPT	1/2" [12.7] NPT
CRBTMPWR004A01							



# BASE UNIT DIMENSIONS – RAS150

**NOTES:**

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



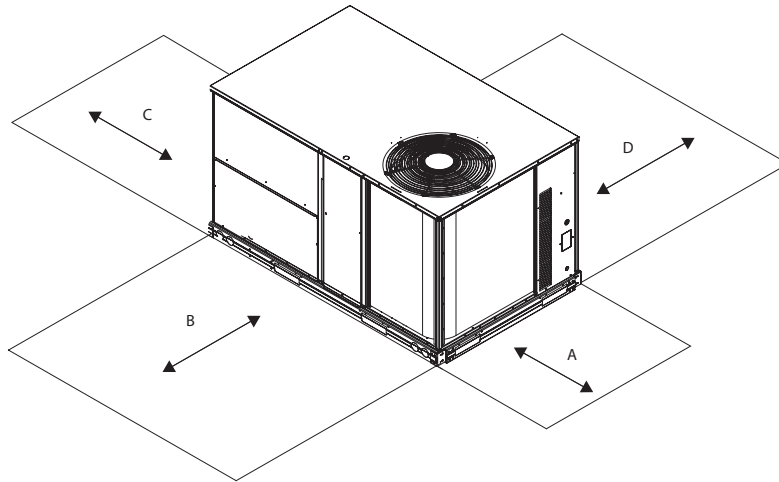
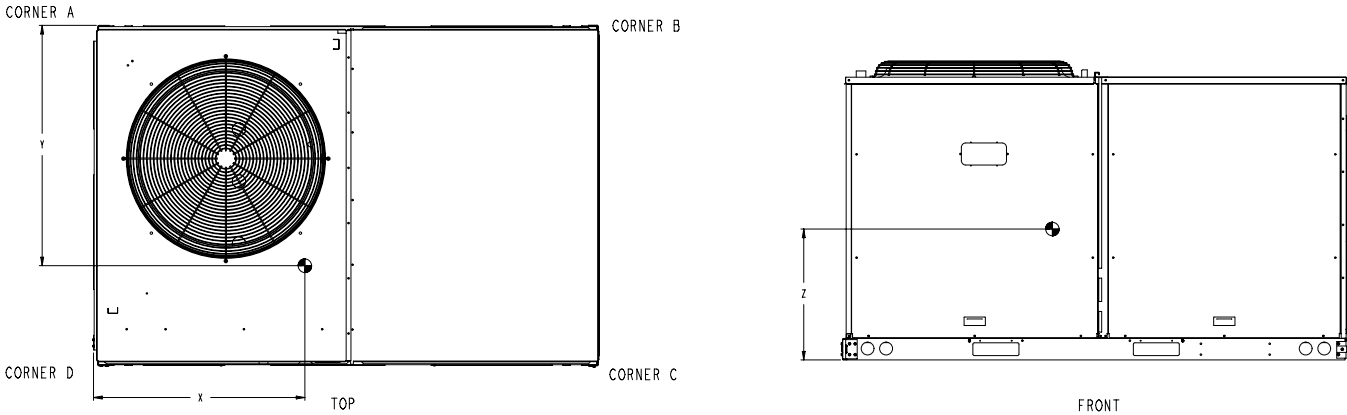
CONNECTION SIZES	
A	1 3/8" [35] DIA FIELD POWER SUPPLY HOLE
B	2 1/2" [64] DIA POWER SUPPLY KNOCKOUT
C	1 3/4" [51] DIA GAUGE ACCESS PLUG
D	7/8" [22] DIA FIELD CONTROL WIRING HOLE
E	3/4"-14 NPT CONDENSATE DRAIN
G	2" [51] DIA POWER SUPPLY KNOCK-OUT

THRU-THE-BASE CHART THESE HOLES REQUIRED FOR USE CRBTMPWR02A01			
	THREADED CONDUIT SIZE	WIRE USE	REQ'D HOLE SIZES (MAX.)
W	1/2"	ACC.	7/8" (22.2)
X	1/2"	24V	7/8" (22.2)
Y	1 1/4" (002,004)	POWER	1 3/4" (44.4)
FOR "THRU-THE-BASEPAN" FACTORY OPTION, FITTINGS FOR ONLY X, Y ARE PROVIDED			

UNIT	H	J	K
150	11 3/8 [289]	49 3/8 [1253]	35 5/8 [905]

# BASE UNIT DIMENSIONS – RAS150

UNIT	STD. UNIT WEIGHT		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C.G.		
	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z
<b>RAS150</b>	1030	467	294	133	146	66	197	89	395	179	28 3/8 (721)	33 1/8(841)	21 3/8 (543)



Service Clearance

LOC	DIMENSION	CONDITION
A	48" (1219 mm) 18" (457 mm) 18" (457 mm) 12" (305 mm)	Unit disconnect is mounted on panel No disconnect, convenience outlet option Recommended service clearance Minimum clearance
B	42" (1067 mm) 36" (914 mm) Special	Surface behind servicer is grounded (e.g., metal, masonry wall) Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass) Check for sources of flue products within 10-ft of unit fresh air intake hood
C	36" (914 mm) 18" (457 mm)	Side condensate drain is used Minimum clearance
D	42" (1067 mm) 36" (914 mm)	Surface behind servicer is grounded (e.g., metal, masonry wall, another unit) Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)

# APPLICATION DATA

## Min operating ambient temp (cooling):

In mechanical cooling mode, your rooftop can safely operate down to an outdoor ambient temperature of 25°F (-4°C), with an accessory winter start kit; 40°F (4°C) standard min operating temperature. It is possible to provide cooling at lower outdoor ambient temperatures by using less outside air, economizers, and/or accessory low ambient kits.

## Max operating ambient temp (cooling):

The maximum operating ambient temperature for cooling mode is 115°F (46°C). While cooling operation above 115°F (46°C) may be possible, it could cause either a reduction in performance, reliability, or a protective action by the unit's internal safety devices.

## Min and max airflow (heating and cooling):

To maintain safe and reliable operation of your rooftop, operate within the cooling airflow limits. Operating above the max may cause blow-off, undesired airflow noise, or airflow related problems with the rooftop unit. Operating below the min may cause problems with coil freeze-up.

### Airflow:

All units are draw-through in cooling mode.

## Outdoor air application strategies:

Economizers reduce operating expenses and compressor run time by providing a free source of cooling and a means of ventilation to match application changing needs. In fact, they should be considered for most applications. Also, consider the various economizer control methods and their benefits, as well as sensors required to accomplish your application goals. Please contact your local sales representative for assistance.

## Motor limits, break horsepower (BHP):

Due to the internal unit design, air path, and specially designed motors, the full horsepower (maximum continuous BHP) band, as listed in Table 6, can be used with the utmost confidence. There is no need for extra safety factors, the motors are designed and rigorously tested to use the entire, listed BHP range without either nuisance tripping or premature motor failure.

## Sizing a rooftop

Bigger isn't necessarily better. While an air conditioner needs to have enough capacity to meet the design loads, it doesn't need excess capacity. In fact, excess capacity typically results in very poor partload performance and humidity control.

Using higher design temperatures than ASHRAE recommends for your location, adding "safety factors" to the calculated load, are all signs of oversizing air conditioners. Oversizing the air conditioner leads to short cycling ( quick on-off cycles ) which results in poor humidity control, reduced efficiency, higher utility bills, larger indoor temperature swings, excessive noise, and increased wear and tear on the air conditioner.

Rather than oversizing an air conditioner, engineers should "right-size" or even slightly undersize air conditioners. Correctly sizing an air conditioner controls humidity better; promotes efficiency; reduces utility bills; extends equipment life, and maintains even, comfortable temperatures. Please contact your local representative for assistance.

## Low ambient applications

The optional economizer can adequately cool your space by bringing in fresh, cool outside air. In fact, when so equipped, accessory low-ambient kit may not be necessary. In low ambient conditions, unless the outdoor air is excessively humid or contaminated, economizer-based "free cooling" is the preferred less costly and energy conscious method.

In low ambient applications where outside air might not be desired (such as contaminated or excessively humid outdoor environments), your rooftop can operate to ambient temperatures down to -20°F (-29°C) using the recommended accessory Motormaster low ambient controller.

## Winter start

A winter start kit extends the low ambient limit of your rooftop to 25°F (-4°C). The kit bypasses the low pressure switch, preventing nuisance tripping of the low pressure switch. Other low ambient precautions may still be prudent.

# SELECTION PROCEDURE (WITH RAS072 EXAMPLE)<sup>1</sup>

## I. Determine cooling and heating loads.

### Given:

Mixed air drybulb	80°F (27°C)
Mixed air wetbulb	67°F (19°C)
Ambient drybulb	95°F (35°C)
TC <sub>Load</sub>	69.0 MBH
SHC <sub>Load</sub>	51.0 MBH
Vertical supply air	2100 CFM
Heating load	85.0 MBH
External static pressure	0.66 in.wg
Electrical characteristics	230–3–60

## II. Make an initial guess at cooling tons.

$$\text{Refrig. tons} = \text{TC}_{\text{Load}} / 12 \text{ MBH per ton}$$

$$\text{Refrig. tons} = 69.0 / 12 = 5.75 \text{ tons}$$

In this case, start by looking at the RAS072.

## III. Look up the rooftop's TC and SHC.

Table 8 shows that, at the application's supply air CFM, mixed air and ambient temperatures, the RAS072 supplies:

$$\text{TC} = 73.7 \text{ MBH}$$

$$\text{SHC} = 54.4 \text{ MBH.}$$

## IV. Calculate the building latent heat load.

$$\text{LHC}_{\text{Load}} = \text{TC}_{\text{Load}} - \text{SHC}_{\text{Load}}$$

$$\text{LHC}_{\text{Load}} = 69.0 \text{ MBH} - 51.0 \text{ MBH} = 18.0 \text{ MBH}$$

## V. Calculate RTU latent heat capacity.

$$\text{LHC} = \text{TC} - \text{SHC}$$

$$\text{LHC} = 73.7 \text{ MBH} - 54.3 \text{ MBH} = 19.4 \text{ MBH}$$

## VI. Compare RTU capacities to loads.<sup>2,3</sup>

Compare the rooftop's SHC and LHC to the building's sensible and latent heat loads.

## VII. Select factory options (FIOP)

Local code requires an economizer for any unit with TC less than 65.0 MBH.

## VIII. Calculate the total static pressure.

External static pressure	0.66 in. wg
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Sum of FIOP / Accessory static	+0.14 in. wg
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Total Static Pressure	0.80 in. wg
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## IX. Look up the indoor fan RPM & BHP.

Table 17 shows, at 2100 CFM & ESP= 0.8, RPM = 1268 & BHP = 1.52

## X. Determine electrical requirements.

Table 36 shows the MCA and MOCP of a RAS072 (without convenience outlet) as:

$$\text{MCA} = 30.5 \text{ amps} \ \& \ \text{MOCP} = 45.0 \text{ amps}$$

$$\text{Min. disconnect size: FLA} = 30 \ \& \ \text{LRA} = 157.$$

## LEGEND

BHP	— Break horsepower
FLA	— Full load amps
LC	— Latent capacity
LRA	— Lock rotor amp
MBH	— (1,000) BTUH
MCA	— Min. circuit ampacity
MOCP	— Max. over-current protection
RPM	— Revolutions per minute
RTU	— Rooftop unit
SHC	— Sensible heat capacity
TC	— Total capacity

## NOTES:

1. Selection software saves time by performing many of the steps above. Contact your sales representative for assistance.
2. Selecting a unit with a SHC slightly lower than the SHC<sub>Load</sub> is often better than oversizing. Slightly lower SHC's will help control indoor humidity, and prevent temperature swings.
3. If the rooftop's capacity meets the Sensible Heat Load, but not the Latent Heat Load.
4. Indoor fan motor efficiency is available in Tables 28–35. Use the decimal form in the equation, eg. 80% = .8.

**Table 8 – COOLING CAPACITIES**

**1 STAGE COOLING**

**6 TONS**

RAS072			AMBIENT TEMPERATURE											
			85			95			105			115		
			EAT (db)			EAT (db)			EAT (db)			EAT (db)		
			75	80	85	75	80	85	75	80	85	75	80	85
1800 Cfm	EAT (wb)	58 TC	64.9	64.9	73.3	62.1	62.1	70.0	58.9	58.9	66.4	55.6	55.6	62.7
		SHC	56.6	64.9	73.3	54.1	62.1	70.0	51.4	58.9	66.4	48.5	55.6	62.7
		62 TC	68.7	68.7	70.3	64.9	64.9	68.5	60.8	60.8	66.4	56.4	56.4	64.0
		SHC	51.7	61.0	70.3	49.9	59.2	68.5	47.9	57.2	66.4	45.7	54.9	64.0
		67 TC	75.6	75.6	75.6	71.7	71.7	71.7	67.4	67.4	67.4	62.5	62.5	62.5
	SHC	42.8	52.2	61.5	41.2	50.5	59.8	39.3	48.6	58.0	37.2	46.5	55.8	
	72 TC	82.6	82.6	82.6	78.5	78.5	78.5	73.7	73.7	73.7	67.8	67.8	67.8	
	SHC	33.5	42.8	52.2	31.9	41.3	50.6	30.0	39.3	48.6	27.8	36.9	45.9	
	76 TC	-	87.5	87.5	-	83.3	83.3	-	77.7	77.7	-	70.9	70.9	
	SHC	-	35.0	44.9	-	33.5	43.4	-	31.6	41.5	-	29.3	39.1	
2100 Cfm	EAT (wb)	58 TC	68.9	68.9	77.7	65.9	65.9	74.3	62.5	62.5	70.5	58.7	58.7	66.2
		SHC	60.1	68.9	77.7	57.4	65.9	74.3	54.5	62.5	70.5	51.2	58.7	66.2
		62 TC	70.9	70.9	76.9	67.1	67.1	75.0	63.0	63.0	72.5	58.7	58.7	68.7
		SHC	55.6	66.3	76.9	53.8	64.4	75.0	51.6	62.1	72.5	48.7	58.7	68.7
		67 TC	77.8	77.8	77.8	73.7	73.7	73.7	69.2	69.2	69.2	64.0	64.0	64.0
	SHC	45.4	56.1	66.8	43.7	54.4	65.2	41.8	52.5	63.2	39.6	50.2	60.7	
	72 TC	84.5	84.5	84.5	80.3	80.3	80.3	75.1	75.1	75.1	68.8	68.8	68.8	
	SHC	34.5	45.2	55.9	32.9	43.5	54.2	30.9	41.4	52.0	28.5	38.7	48.9	
	76 TC	-	89.2	89.2	-	84.7	84.7	-	78.8	78.8	-	71.6	71.6	
	SHC	-	36.3	47.8	-	34.7	46.0	-	32.6	43.7	-	30.1	40.9	
2400 Cfm	EAT (wb)	58 TC	72.0	72.0	81.2	68.7	68.7	77.5	65.2	65.2	73.5	61.1	61.1	68.9
		SHC	62.8	72.0	81.2	60.0	68.7	77.5	56.9	65.2	73.5	53.3	61.1	68.9
		62 TC	72.8	72.8	82.8	68.9	68.9	80.7	65.2	65.2	76.4	61.2	61.2	71.6
		SHC	59.1	71.0	82.8	57.2	68.9	80.7	54.1	65.2	76.4	50.7	61.2	71.6
		67 TC	79.4	79.4	79.4	75.2	75.2	75.2	70.5	70.5	70.5	65.1	65.1	65.3
	SHC	47.7	59.8	71.8	46.0	58.1	70.2	44.0	56.0	68.1	41.6	53.5	65.3	
	72 TC	86.0	86.0	86.0	81.6	81.6	81.6	76.1	76.1	76.1	69.6	69.6	69.6	
	SHC	35.3	47.2	59.2	33.7	45.6	57.5	31.7	43.3	55.0	29.1	40.3	51.4	
	76 TC	-	90.3	90.3	-	85.7	85.7	-	79.6	79.6	-	72.1	72.1	
	SHC	-	37.3	49.8	-	35.6	48.0	-	33.5	45.6	-	30.8	42.5	
2700 Cfm	EAT (wb)	58 TC	60.3	60.3	74.1	71.1	71.1	80.2	67.4	67.4	76.0	63.0	63.0	71.1
		SHC	46.4	60.3	74.1	62.0	71.1	80.2	58.8	67.4	76.0	55.0	63.0	71.1
		62 TC	65.4	65.4	69.3	71.2	71.2	83.3	67.5	67.5	79.0	63.1	63.1	73.8
		SHC	41.0	55.1	69.3	59.0	71.2	83.3	55.9	67.5	79.0	52.3	63.1	73.8
		67 TC	72.7	72.7	72.7	76.3	76.3	76.3	71.5	71.5	72.6	65.8	65.8	69.4
	SHC	33.8	48.0	62.2	48.2	61.6	74.9	46.1	59.3	72.6	43.5	56.5	69.4	
	72 TC	79.7	79.7	79.7	82.5	82.5	82.5	76.9	76.9	76.9	70.1	70.1	70.1	
	SHC	25.8	40.2	54.6	34.5	47.5	60.5	32.3	45.0	57.7	29.7	41.7	53.8	
	76 TC	-	85.1	85.1	-	86.4	86.4	-	80.2	80.2	-	72.5	72.5	
	SHC	-	33.5	48.4	-	36.5	49.9	-	34.3	47.3	-	31.5	44.0	
3000 Cfm	EAT (wb)	58 TC	64.9	64.9	78.8	73.1	73.1	82.5	69.2	69.2	78.0	64.5	64.5	72.7
		SHC	51.1	64.9	78.8	63.8	73.1	82.5	60.3	69.2	78.0	56.2	64.5	72.7
		62 TC	68.7	68.7	76.5	73.2	73.2	85.7	69.2	69.2	81.0	64.5	64.5	75.5
		SHC	45.5	61.0	76.5	60.7	73.2	85.7	57.4	69.2	81.0	53.5	64.5	75.5
		67 TC	75.6	75.6	75.6	77.2	77.2	79.4	72.2	72.2	76.8	66.3	66.3	73.0
	SHC	36.6	52.2	67.7	50.2	64.8	79.4	48.0	62.4	76.8	45.1	59.1	73.0	
	72 TC	82.6	82.6	82.6	83.3	83.3	83.3	77.5	77.5	77.5	70.5	70.5	70.5	
	SHC	27.2	42.8	58.5	35.1	49.2	63.3	32.9	46.6	60.3	30.2	43.0	55.9	
	76 TC	-	87.5	87.5	-	86.9	86.9	-	80.6	80.6	-	72.8	72.8	
	SHC	-	35.0	51.5	-	37.3	51.6	-	35.0	48.9	-	32.1	45.3	

**LEGEND:**

- Do not operate in this region
- Cfm - Cubic feet per minute (supply air)
- EAT(db) - Entering air temperature (dry bulb)
- EAT(wb) - Entering air temperature (wet bulb)
- SHC - Sensible heat capacity
- TC - Total cooling capacity

**Table 9 – COOLING CAPACITIES**

**1 STAGE COOLING**

**7.5 TONS**

RAS091			AMBIENT TEMPERATURE											
			85			95			105			115		
			EAT (db)			EAT (db)			EAT (db)			EA (db)		
Cfm	EAT (wb)	TC SHC	75	80	85	75	80	85	75	80	85	75	80	85
			2250	58	TC	81.2	81.2	91.8	77.5	77.5	87.7	73.6	73.6	83.3
		SHC	70.5	81.2	91.8	67.3	77.5	87.7	63.9	73.6	83.3	60.4	69.5	78.7
	62	TC	86.9	86.9	86.9	82.3	82.3	84.0	77.2	77.2	81.5	71.9	71.9	78.8
		SHC	63.6	74.9	86.2	61.4	72.7	84.0	58.9	70.2	81.5	56.3	67.6	78.8
	67	TC	95.2	95.2	95.2	90.7	90.7	90.7	85.7	85.7	85.7	79.9	79.9	79.9
		SHC	52.8	64.2	75.6	50.9	62.2	73.6	48.8	60.1	71.5	46.3	57.6	68.9
	72	TC	103.5	103.5	103.5	98.9	98.9	98.9	93.8	93.8	93.8	87.3	87.3	87.3
		SHC	41.5	53.1	64.6	39.7	51.2	62.7	37.7	49.2	60.6	35.3	46.6	57.8
	76	TC	-	109.6	109.6	-	104.8	104.8	-	99.1	99.1	-	91.6	91.6
		SHC	-	43.7	56.0	-	42.0	54.3	-	40.0	52.4	-	37.4	49.8
2625	58	TC	85.9	85.9	97.2	82.2	82.2	93.1	78.1	78.1	88.4	73.9	73.9	83.6
		SHC	74.6	85.9	97.2	71.4	82.2	93.1	67.9	78.1	88.4	64.1	73.9	83.6
	62	TC	89.6	89.6	94.1	85.1	85.1	91.7	80.1	80.1	89.1	74.6	74.6	86.0
		SHC	68.1	81.1	94.1	65.9	78.8	91.7	63.4	76.3	89.1	60.6	73.3	86.0
	67	TC	97.9	97.9	97.9	93.2	93.2	93.2	88.1	88.1	88.1	82.0	82.0	82.0
		SHC	55.7	68.7	81.7	53.7	66.7	79.8	51.6	64.6	77.6	49.0	62.0	74.9
	72	TC	106.0	106.0	106.0	101.3	101.3	101.3	95.9	95.9	95.9	89.0	89.0	89.0
		SHC	42.7	55.8	68.9	40.9	53.9	67.0	38.8	51.8	64.7	36.2	48.9	61.7
	76	TC	-	111.8	111.8	-	106.9	106.9	-	100.7	100.7	-	92.7	92.7
		SHC	-	45.3	59.8	-	43.6	58.0	-	41.4	55.6	-	38.7	52.6
3000	58	TC	89.6	89.6	101.4	85.9	85.9	97.2	81.7	81.7	92.5	77.0	77.0	87.1
		SHC	77.9	89.6	101.4	74.6	85.9	97.2	71.0	81.7	92.5	66.9	77.0	87.1
	62	TC	91.8	91.8	101.1	87.2	87.2	98.6	82.3	82.3	95.5	77.1	77.1	90.6
		SHC	72.2	86.7	101.1	69.9	84.3	98.6	67.2	81.3	95.5	63.5	77.1	90.6
	67	TC	99.9	99.9	99.9	95.2	95.2	95.2	89.9	89.9	89.9	83.6	83.6	83.6
		SHC	58.3	72.9	87.5	56.4	71.0	85.5	54.2	68.8	83.4	51.6	66.1	80.5
	72	TC	107.9	107.9	107.9	103.0	103.0	103.0	97.3	97.3	97.3	90.1	90.1	90.1
		SHC	43.7	58.3	72.8	41.9	56.4	70.9	39.7	54.1	68.4	37.0	51.0	65.0
	76	TC	-	113.8	113.8	-	108.4	108.4	-	102.0	102.0	-	93.4	93.4
		SHC	-	46.7	62.5	-	44.8	60.4	-	42.6	57.9	-	39.6	54.7
3375	58	TC	92.7	92.7	104.9	88.8	88.8	100.5	84.6	84.6	95.7	79.6	79.6	90.0
		SHC	80.5	92.7	104.9	77.1	88.8	100.5	73.4	84.6	95.7	69.1	79.6	90.0
	62	TC	93.7	93.7	107.3	89.1	89.1	104.7	84.6	84.6	99.5	79.6	79.6	93.6
		SHC	75.8	91.6	107.3	73.5	89.1	104.7	69.8	84.6	99.5	65.6	79.6	93.6
	67	TC	101.5	101.5	101.5	96.7	96.7	96.7	91.3	91.3	91.3	84.8	84.8	85.7
		SHC	60.8	76.9	93.0	58.8	74.9	91.0	56.7	72.8	88.9	53.9	69.8	85.7
	72	TC	109.4	109.4	109.4	104.3	104.3	104.3	98.4	98.4	98.4	90.9	90.9	90.9
		SHC	44.6	60.5	76.4	42.8	58.6	74.4	40.5	56.2	71.8	37.7	52.8	68.0
	76	TC	-	115.1	115.1	-	109.5	109.5	-	102.8	102.8	-	94.0	94.0
		SHC	-	47.8	64.9	-	45.9	62.7	-	43.5	60.1	-	40.4	56.5
3750	58	TC	95.3	95.3	107.8	91.3	91.3	103.3	86.9	86.9	98.3	81.7	81.7	92.4
		SHC	82.7	95.3	107.8	79.3	91.3	103.3	75.5	86.9	98.3	70.9	81.7	92.4
	62	TC	95.5	95.5	112.2	91.3	91.3	107.4	87.0	87.0	102.2	81.7	81.7	96.0
		SHC	78.7	95.5	112.2	75.3	91.3	107.4	71.7	87.0	102.2	67.4	81.7	96.0
	67	TC	102.8	102.8	102.8	97.9	97.9	97.9	92.3	92.3	94.0	85.7	85.7	90.5
		SHC	63.1	80.6	98.2	61.2	78.7	96.3	59.0	76.5	94.0	56.0	73.2	90.5
	72	TC	110.6	110.6	110.6	105.4	105.4	105.4	99.2	99.2	99.2	91.5	91.5	91.5
		SHC	45.5	62.7	79.9	43.5	60.7	77.8	41.3	58.1	75.0	38.3	54.5	70.7
	76	TC	-	116.1	116.1	-	110.3	110.3	-	103.5	103.5	-	94.5	94.5
		SHC	-	48.9	67.0	-	46.8	64.8	-	44.4	62.0	-	41.1	58.1

**LEGEND:**

- Do not operate in this region
- Cfm – Cubic feet per minute (supply air)
- EAT(db) – Entering air temperature (dry bulb)
- EAT(wb) – Entering air temperature (wet bulb)
- SHC – Sensible heat capacity
- TC – Total cooling capacity



**Table 10 – COOLING CAPACITIES**

**2 STAGE COOLING**

**7.5 TONS**

RAS090				AMBIENT TEMPERATURE											
				85			95			105			115		
				EAT (db)			EAT (db)			EAT (db)			EA (db)		
				75	80	85	75	80	85	75	80	85	75	80	85
2250 Cfm	EAT (wb)	58	TC	77.4	77.4	87.8	73.8	73.8	83.8	70.1	70.1	79.5	66.0	66.0	74.9
			SHC	66.9	77.4	87.8	63.9	73.8	83.8	60.6	70.1	79.5	57.1	66.0	74.9
		62	TC	82.2	82.2	83.9	77.5	77.5	81.7	72.6	72.6	79.2	67.3	67.3	76.4
			SHC	60.8	72.4	83.9	58.6	70.1	81.7	56.3	67.7	79.2	53.6	65.0	76.4
		67	TC	90.1	90.1	90.1	86.0	86.0	86.0	81.4	81.4	81.4	75.9	75.9	75.9
			SHC	50.2	61.8	73.3	48.5	60.1	71.6	46.5	58.1	69.7	44.2	55.8	67.4
		72	TC	98.0	98.0	98.0	94.0	94.0	94.0	89.5	89.5	89.5	84.3	84.3	84.3
			SHC	39.1	50.7	62.4	37.5	49.2	60.9	35.8	47.5	59.2	33.8	45.5	57.2
		76	TC	–	104.3	104.3	–	100.4	100.4	–	95.9	95.9	–	90.7	90.7
			SHC	–	41.7	54.0	–	40.3	52.7	–	38.7	51.0	–	36.8	49.0
2625 Cfm	EAT (wb)	58	TC	82.1	82.1	93.2	78.4	78.4	89.0	74.4	74.4	84.4	70.0	70.0	79.5
			SHC	71.0	82.1	93.2	67.8	78.4	89.0	64.3	74.4	84.4	60.6	70.0	79.5
		62	TC	84.9	84.9	91.8	80.4	80.4	89.5	75.4	75.4	86.7	70.2	70.2	82.9
			SHC	65.4	78.6	91.8	63.2	76.3	89.5	60.6	73.7	86.7	57.6	70.2	82.9
		67	TC	92.5	92.5	92.5	88.3	88.3	88.3	83.6	83.6	83.6	78.3	78.3	78.3
			SHC	53.0	66.3	79.5	51.3	64.6	78.0	49.4	62.8	76.1	47.2	60.6	73.9
		72	TC	100.4	100.4	100.4	96.4	96.4	96.4	91.7	91.7	91.7	86.4	86.4	86.4
			SHC	40.2	53.5	66.7	38.7	52.0	65.3	36.9	50.3	63.7	35.0	48.4	61.8
		76	TC	–	106.5	106.5	–	102.6	102.6	–	98.0	98.0	–	92.7	92.7
			SHC	–	43.3	57.6	–	41.8	55.9	–	40.2	54.1	–	38.4	52.2
3000 Cfm	EAT (wb)	58	TC	85.7	85.7	97.3	82.2	82.2	93.3	78.0	78.0	88.6	73.5	73.5	83.4
			SHC	74.1	85.7	97.3	71.1	82.2	93.3	67.5	78.0	88.6	63.6	73.5	83.4
		62	TC	86.9	86.9	98.7	82.8	82.8	96.4	78.2	78.2	92.3	73.6	73.6	86.9
			SHC	69.3	84.0	98.7	67.2	81.8	96.4	64.1	78.2	92.3	60.3	73.6	86.9
		67	TC	94.3	94.3	94.3	90.1	90.1	90.1	85.2	85.2	85.2	79.8	79.8	80.1
			SHC	55.6	70.5	85.4	54.0	68.9	83.9	52.1	67.1	82.2	49.9	65.0	80.1
		72	TC	102.2	102.2	102.2	98.1	98.1	98.1	93.3	93.3	93.3	87.9	87.9	87.9
			SHC	41.2	56.0	70.7	39.7	54.6	69.5	38.0	53.0	68.0	36.0	51.1	66.2
		76	TC	–	108.1	108.1	–	104.2	104.2	–	99.5	99.5	–	94.2	94.2
			SHC	–	44.5	60.2	–	43.2	58.7	–	41.6	57.0	–	39.8	55.2
3375 Cfm	EAT (wb)	58	TC	88.5	88.5	100.4	85.0	85.0	96.4	81.0	81.0	92	76.5	76.5	86.8
			SHC	76.5	88.5	100.4	73.5	85.0	96.4	70.1	81.0	92	66.1	76.5	86.8
		62	TC	88.9	88.9	103.9	85.1	85.1	100.4	81.1	81.1	95.7	76.5	76.5	90.3
			SHC	72.3	88.1	103.9	69.7	85.1	100.4	66.5	81.1	95.7	62.7	76.5	90.3
		67	TC	95.8	95.8	95.8	91.5	91.5	91.5	86.6	86.6	87.9	81.1	81.1	85.8
			SHC	58.0	74.4	90.9	56.4	73.0	89.6	54.6	71.3	87.9	52.4	69.1	85.8
		72	TC	103.6	103.6	103.6	99.4	99.4	99.4	94.6	94.6	94.6	89.1	89.1	89.1
			SHC	42.0	58.3	74.5	40.6	57.0	73.4	38.9	55.5	72.0	37.0	53.7	70.3
		76	TC	–	109.2	109.2	–	105.4	105.4	–	100.7	100.7	–	95.3	95.3
			SHC	–	45.6	62.6	–	44.4	61.3	–	42.8	59.7	–	41.0	58.0
3750 Cfm	EAT (wb)	58	TC	90.8	90.8	103.0	87.3	87.3	99.1	83.3	83.3	94.5	78.8	78.8	89.4
			SHC	78.5	90.8	103.0	75.5	87.3	99.1	72.0	83.3	94.5	68.2	78.8	89.4
		62	TC	90.9	90.9	107.2	87.4	87.4	103.1	83.3	83.3	98.4	78.9	78.9	93.1
			SHC	74.5	90.9	107.2	71.6	87.4	103.1	68.3	83.3	98.4	64.7	78.9	93.1
		67	TC	97.0	97.0	97.0	92.6	92.6	95.1	87.6	87.6	93.4	82.1	82.1	91.2
			SHC	60.3	78.2	96.2	58.8	76.9	95.1	56.9	75.2	93.4	54.8	73.0	91.2
		72	TC	104.7	104.7	104.7	100.5	100.5	100.5	95.6	95.6	95.6	90.1	90.1	90.1
			SHC	42.9	60.5	78.1	41.4	59.3	77.1	39.8	57.8	75.9	37.9	56.1	74.3
		76	TC	–	110.2	110.2	–	106.2	106.2	–	101.6	101.6	–	96.1	96.1
			SHC	–	46.7	64.8	–	45.4	63.6	–	44.0	62.3	–	42.2	60.6

**LEGEND:**

- Do not operate in this region
- Cfm – Cubic feet per minute (supply air)
- EAT(db) – Entering air temperature (dry bulb)
- EAT(wb) – Entering air temperature (wet bulb)
- SHC – Sensible heat capacity
- TC – Total capacity

**Table 11 – COOLING CAPACITIES**

**1 STAGE COOLING**

**8.5 TONS**

RAS101				AMBIENT TEMPERATURE											
				85			95			105			115		
				EAT (db)			EAT (db)			EAT (db)			EAT (db)		
				75	80	85	75	80	85	75	80	85	75	80	85
2550 Cfm	EAT (wb)	58	TC	88.1	88.1	99.9	84.1	84.1	95.3	79.6	79.6	90.3	74.9	74.9	84.9
			SHC	76.4	88.1	99.9	72.8	84.1	95.3	69.0	79.6	90.3	64.9	74.9	84.9
		62	TC	93.9	93.9	95.2	88.6	88.6	92.6	82.8	82.8	89.7	76.6	76.6	86.5
			SHC	69.4	82.3	95.2	66.8	79.7	92.6	64.1	76.9	89.7	61.0	73.8	86.5
		67	TC	103.8	103.8	103.8	98.7	98.7	98.7	93.0	93.0	93.0	86.7	86.7	86.7
			SHC	57.8	70.7	83.6	55.6	68.5	81.4	53.1	66.1	79.0	50.5	63.4	76.4
		72	TC	113.1	113.1	113.1	108.0	108.0	108.0	102.4	102.4	102.4	96.1	96.1	96.1
			SHC	45.2	58.3	71.3	43.2	56.3	69.3	41.1	54.1	67.1	38.7	51.7	64.7
		76	TC	–	119.9	119.9	–	114.7	114.7	–	109.0	109.0	–	102.7	102.7
			SHC	–	47.9	61.9	–	46.0	60.1	–	44.1	58.1	–	41.9	55.8
2975 Cfm	EAT (wb)	58	TC	93.6	93.6	106.1	89.3	89.3	101.2	84.6	84.6	96.0	79.6	79.6	90.3
			SHC	81.1	93.6	106.1	77.4	89.3	101.2	73.3	84.6	96.0	69.0	79.6	90.3
		62	TC	97.5	97.5	104.3	92.0	92.0	101.4	86.1	86.1	98.3	79.8	79.8	94.1
			SHC	74.7	89.5	104.3	72.0	86.7	101.4	69.1	83.7	98.3	65.6	79.8	94.1
		67	TC	106.7	106.7	106.7	101.5	101.5	101.5	95.7	95.7	95.7	89.2	89.2	89.2
			SHC	61.0	75.8	90.6	58.8	73.6	88.5	56.4	71.3	86.1	53.8	68.7	83.6
		72	TC	115.8	115.8	115.8	110.6	110.6	110.6	104.9	104.9	104.9	98.4	98.4	98.4
			SHC	46.5	61.3	76.2	44.5	59.4	74.2	42.3	57.2	72.1	40.0	54.8	69.7
		76	TC	–	122.4	122.4	–	117.0	117.0	–	111.1	111.1	–	104.5	104.5
			SHC	–	49.8	66.1	–	47.8	63.9	–	45.7	61.6	–	43.4	59.0
3400 Cfm	EAT (wb)	58	TC	98.1	98.1	111.3	93.7	93.7	106.2	88.9	88.9	100.8	83.7	83.7	94.9
			SHC	85.0	98.1	111.3	81.2	93.7	106.2	77.0	88.9	100.8	72.5	83.7	94.9
		62	TC	100.0	100.0	112.3	94.9	94.9	108.6	89.1	89.1	104.9	83.8	83.8	98.7
			SHC	79.3	95.8	112.3	76.3	92.5	108.6	73.2	89.1	104.9	68.8	83.8	98.7
		67	TC	109.0	109.0	109.0	103.6	103.6	103.6	97.6	97.6	97.6	91.0	91.0	91.0
			SHC	63.9	80.5	97.2	61.8	78.5	95.2	59.4	76.1	92.9	56.8	73.5	90.3
		72	TC	117.9	117.9	117.9	112.5	112.5	112.5	106.6	106.6	106.6	100.0	100.0	100.0
			SHC	47.6	64.1	80.6	45.6	62.1	78.7	43.4	60.0	76.6	41.1	57.6	74.2
		76	TC	–	124.2	124.2	–	118.6	118.6	–	112.5	112.5	–	105.7	105.7
			SHC	–	51.2	69.0	–	49.2	66.7	–	47.0	64.4	–	44.7	61.9
3825 Cfm	EAT (wb)	58	TC	101.6	101.6	115.1	97.2	97.2	110.1	92.3	92.3	104.6	87.0	87.0	98.6
			SHC	88.0	101.6	115.1	84.2	97.2	110.1	80.0	92.3	104.6	75.4	87.0	98.6
		62	TC	101.9	101.9	120.0	97.3	97.3	114.6	92.4	92.4	108.9	87.1	87.1	102.6
			SHC	83.7	101.8	120.0	79.9	97.3	114.6	75.9	92.4	108.9	71.6	87.1	102.6
		67	TC	110.7	110.7	110.7	105.3	105.3	105.3	99.2	99.2	99.3	92.5	92.5	96.7
			SHC	66.7	85.0	103.4	64.6	83.0	101.5	62.2	80.8	99.3	59.6	78.2	96.7
		72	TC	119.4	119.4	119.4	114.0	114.0	114.0	108.0	108.0	108.0	101.3	101.3	101.3
			SHC	48.5	66.6	84.6	46.6	64.7	82.7	44.4	62.6	80.7	42.1	60.2	78.4
		76	TC	–	125.5	125.5	–	119.8	119.8	–	113.6	113.6	–	106.7	106.7
			SHC	–	52.4	71.5	–	50.4	69.3	–	48.2	67.0	–	45.9	64.4
4250 Cfm	EAT (wb)	58	TC	104.4	104.4	118.3	99.9	99.9	113.2	95.0	95.0	107.6	89.5	89.5	101.5
			SHC	90.4	104.4	118.3	86.6	99.9	113.2	82.3	95.0	107.6	77.6	89.5	101.5
		62	TC	104.4	104.4	123.0	99.9	99.9	117.8	95.0	95.0	112.0	89.6	89.6	105.6
			SHC	85.8	104.4	123.0	82.1	99.9	117.8	78.1	95.0	112.0	73.6	89.6	105.6
		67	TC	112.1	112.1	112.1	106.6	106.6	107.5	100.4	100.4	105.3	93.6	93.6	102.7
			SHC	69.2	89.2	109.2	67.2	87.3	107.5	64.9	85.1	105.3	62.3	82.5	102.7
		72	TC	120.7	120.7	120.7	115.1	115.1	115.1	109.0	109.0	109.0	102.2	102.2	102.2
			SHC	49.4	68.9	88.4	47.4	67.0	86.5	45.3	64.9	84.6	42.9	62.6	82.3
		76	TC	–	126.6	126.6	–	120.8	120.8	–	114.5	114.5	–	107.4	107.4
			SHC	–	53.5	73.9	–	51.5	71.7	–	49.3	69.4	–	46.9	66.8

**LEGEND:**

- Do not operate in this region
- Cfm – Cubic feet per minute (supply air)
- EAT(db) – Entering air temperature (dry bulb)
- EAT(wb) – Entering air temperature (wet bulb)
- SHC – Sensible heat capacity
- TC – Total capacity

**Table 12 – COOLING CAPACITIES**

**2 STAGE COOLING**

**8.5 TONS**

RAS102				AMBIENT TEMPERATURE											
				85			95			105			115		
				EA (dB)			EA (dB)			EA (dB)			EA (dB)		
				75	80	85	75	80	85	75	80	85	75	80	85
2550 Cfm	EAT (wb)	58	TC	89.7	89.7	101.6	85.2	85.2	96.5	79.6	79.6	90.1	73.8	73.8	83.6
			SHC	77.8	89.7	101.6	73.9	85.2	96.5	69.0	79.6	90.1	64.0	73.8	83.6
		62	TC	94.3	94.3	97.9	88.7	88.7	95.2	81.3	81.3	91.5	74.3	74.3	86.5
			SHC	71.0	84.4	97.9	68.2	81.7	95.2	64.7	78.1	91.5	60.6	73.6	86.5
		67	TC	105.0	105.0	105.0	99.3	99.3	99.3	92.2	92.2	92.2	84.1	84.1	84.1
			SHC	59.0	72.6	86.1	56.6	70.1	83.7	53.6	67.1	80.7	50.3	63.8	77.3
		72	TC	115.9	115.9	115.9	110.4	110.4	110.4	104.2	104.2	104.2	96.0	96.0	96.0
			SHC	46.4	60.0	73.6	44.3	57.9	71.5	41.9	55.5	69.1	38.8	52.4	65.9
		76	TC	–	123.7	123.7	–	118.3	118.3	–	112.4	112.4	–	105.7	105.7
			SHC	–	49.3	63.3	–	47.3	61.4	–	45.3	59.3	–	42.9	56.7
2975 Cfm	EAT (wb)	58	TC	95.3	95.3	107.9	90.7	90.7	102.7	84.8	84.8	96.1	78.7	78.7	89.1
			SHC	82.6	95.3	107.9	78.6	90.7	102.7	73.5	84.8	96.1	68.2	78.7	89.1
		62	TC	97.9	97.9	107.8	92.1	92.1	104.7	85.4	85.4	99.4	78.8	78.8	92.8
			SHC	76.7	92.2	107.8	73.9	89.3	104.7	69.6	84.5	99.4	64.8	78.8	92.8
		67	TC	108.5	108.5	108.5	102.6	102.6	102.6	95.4	95.4	95.4	86.9	86.9	86.9
			SHC	62.8	78.4	94.1	60.4	76.0	91.7	57.4	73.1	88.8	54.0	69.7	85.3
		72	TC	119.1	119.1	119.1	113.5	113.5	113.5	107.2	107.2	107.2	99.2	99.2	99.2
			SHC	47.9	63.5	79.2	45.8	61.5	77.1	43.5	59.2	74.9	40.6	56.3	72.0
		76	TC	–	126.4	126.4	–	120.8	120.8	–	114.8	114.8	–	108.2	108.2
			SHC	–	51.1	67.4	–	49.2	65.3	–	47.0	63.0	–	44.8	60.7
3400 Cfm	EAT (wb)	58	TC	100.0	100.0	113.3	95.2	95.2	107.9	89.3	89.3	101.1	82.9	82.9	93.9
			SHC	86.7	100.0	113.3	82.6	95.2	107.9	77.4	89.3	101.1	71.8	82.9	93.9
		62	TC	101.1	101.1	115.8	95.7	95.7	111.7	89.4	89.4	105.3	83.0	83.0	97.7
			SHC	81.5	98.7	115.8	78.2	94.9	111.7	73.5	89.4	105.3	68.2	83.0	97.7
		67	TC	111.1	111.1	111.1	105.1	105.1	105.1	97.8	97.8	97.8	89.1	89.1	93.0
			SHC	66.2	83.9	101.6	63.9	81.6	99.3	61.0	78.7	96.5	57.5	75.3	93.0
		72	TC	121.3	121.3	121.3	115.6	115.6	115.6	109.4	109.4	109.4	101.5	101.5	101.5
			SHC	49.2	66.7	84.3	47.1	64.7	82.3	44.9	62.5	80.2	42.1	59.9	77.7
		76	TC	–	128.3	128.3	–	122.6	122.6	–	116.3	116.3	–	109.7	109.7
			SHC	–	52.7	70.7	–	50.7	68.6	–	48.6	66.4	–	46.4	64.2
3825 Cfm	EAT (wb)	58	TC	104.0	104.0	117.8	99.1	99.1	112.3	93.2	93.2	105.5	86.5	86.5	97.9
			SHC	90.2	104.0	117.8	86.0	99.1	112.3	80.8	93.2	105.5	75.0	86.5	97.9
		62	TC	104.2	104.2	122.7	99.3	99.3	116.9	93.3	93.3	109.8	86.6	86.6	101.9
			SHC	85.7	104.2	122.7	81.7	99.3	116.9	76.7	93.3	109.8	71.2	86.6	101.9
		67	TC	113.1	113.1	113.1	107.1	107.1	107.1	99.9	99.9	103.8	91.0	91.0	100.3
			SHC	69.4	89.1	108.8	67.1	86.8	106.5	64.3	84.1	103.8	60.9	80.6	100.3
		72	TC	123.0	123.0	123.0	117.2	117.2	117.2	110.9	110.9	110.9	103.3	103.3	103.3
			SHC	50.3	69.7	89.0	48.3	67.7	87.1	46.1	65.6	85.2	43.5	63.3	83.0
		76	TC	–	129.7	129.7	–	124.0	124.0	–	117.5	117.5	–	110.8	110.8
			SHC	–	54.0	73.7	–	52.1	71.7	–	50.0	69.5	–	47.8	67.4
4250 Cfm	EAT (wb)	58	TC	107.4	107.4	121.7	102.5	102.5	116.1	96.5	96.5	109.3	89.5	89.5	101.4
			SHC	93.1	107.4	121.7	88.9	102.5	116.1	83.7	96.5	109.3	77.6	89.5	101.4
		62	TC	107.5	107.5	126.6	102.6	102.6	120.8	96.6	96.6	113.7	89.6	89.6	105.5
			SHC	88.4	107.5	126.6	84.4	102.6	120.8	79.5	96.6	113.7	73.7	89.6	105.5
		67	TC	114.7	114.7	115.6	108.7	108.7	113.5	101.7	101.7	110.8	92.6	92.6	107.2
			SHC	72.5	94.0	115.6	70.2	91.8	113.5	67.5	89.2	110.8	64.0	85.6	107.2
		72	TC	124.3	124.3	124.3	118.5	118.5	118.5	112.1	112.1	112.1	104.7	104.7	104.7
			SHC	51.3	72.4	93.4	49.3	70.5	91.7	47.2	68.5	89.9	44.7	66.4	88.1
		76	TC	–	130.7	130.7	–	125.0	125.0	–	118.5	118.5	–	111.6	111.6
			SHC	–	55.3	76.5	–	53.5	74.6	–	51.3	72.4	–	49.2	70.3

**LEGEND:**

- Do not operate in this region
- Cfm – Cubic feet per minute (supply air)
- EAT(db) – Entering air temperature (dry bulb)
- EAT(wb) – Entering air temperature (wet bulb)
- SHC – Sensible heat capacity
- TC – Total capacity

**Table 13 – COOLING CAPACITIES**

**1 STAGE COOLING**

**10 TONS**

RAS121				AMBIENT TEMPERATURE											
				85			95			105			115		
				EAT (db)			EAT (db)			EAT (db)			EAT (db)		
				75	80	85	75	80	85	75	80	85	75	80	85
3000 Cfm	EAT (wb)	58	TC	106.3	106.3	120.5	101.7	101.7	115.2	96.6	96.6	109.4	91.0	91.0	103.1
			SHC	92.2	106.3	120.5	88.2	101.7	115.2	83.8	96.6	109.4	78.9	91.0	103.1
		62	TC	112.5	112.5	115.2	106.5	106.5	112.3	99.9	99.9	109.0	92.7	92.7	105.2
			SHC	83.8	99.5	115.2	81.0	96.6	112.3	77.8	93.4	109.0	74.2	89.7	105.2
		67	TC	123.5	123.5	123.5	117.8	117.8	117.8	111.3	111.3	111.3	104.0	104.0	104.0
	SHC		69.2	85.0	100.7	66.8	82.5	98.3	64.1	79.8	95.5	61.0	76.8	92.5	
	72	TC	134.3	134.3	134.3	128.5	128.5	128.5	122.0	122.0	122.0	114.7	114.7	114.7	
		SHC	53.8	69.6	85.5	51.6	67.4	83.2	49.1	64.9	80.7	46.3	62.1	77.9	
	76	TC	–	142.4	142.4	–	136.3	136.3	–	129.5	129.5	–	121.8	121.8	
		SHC	–	56.8	73.3	–	54.7	71.2	–	52.3	68.8	–	49.7	66.2	
3500 Cfm	EAT (wb)	58	TC	112.9	112.9	127.8	108.0	108.0	122.3	102.7	102.7	116.3	96.8	96.8	109.7
			SHC	97.9	112.9	127.8	93.6	108.0	122.3	89.0	102.7	116.3	83.9	96.8	109.7
		62	TC	116.3	116.3	126.2	110.5	110.5	123.3	103.8	103.8	119.5	97.1	97.1	114.3
			SHC	90.2	108.2	126.2	87.4	105.3	123.3	84.0	101.8	119.5	79.8	97.1	114.3
		67	TC	126.9	126.9	126.9	120.9	120.9	120.9	114.3	114.3	114.3	106.8	106.8	106.8
	SHC		73.2	91.3	109.4	70.8	88.9	107.1	68.1	86.2	104.4	65.0	83.2	101.3	
	72	TC	137.5	137.5	137.5	131.4	131.4	131.4	124.7	124.7	124.7	117.2	117.2	117.2	
		SHC	55.3	73.4	91.5	53.1	71.1	89.2	50.6	68.7	86.7	47.8	65.9	83.9	
	76	TC	–	145.1	145.1	–	138.8	138.8	–	131.7	131.7	–	123.6	123.6	
		SHC	–	59.0	78.2	–	56.7	75.8	–	54.3	73.1	–	51.5	70.0	
4000 Cfm	EAT (wb)	58	TC	117.8	117.8	133.5	113.0	113.0	128.0	107.5	107.5	121.8	101.5	101.5	115.0
			SHC	102.2	117.8	133.5	98.0	113.0	128.0	93.3	107.5	121.8	88.0	101.5	115.0
		62	TC	119.1	119.1	136.0	113.5	113.5	132.5	107.7	107.7	126.7	101.6	101.6	119.6
			SHC	95.8	115.9	136.0	92.8	112.6	132.5	88.6	107.7	126.7	83.6	101.6	119.6
		67	TC	129.4	129.4	129.4	123.3	123.3	123.3	116.5	116.5	116.5	108.9	108.9	109.8
	SHC		76.9	97.3	117.7	74.5	95.0	115.4	71.8	92.3	112.8	68.8	89.3	109.8	
	72	TC	139.7	139.7	139.7	133.5	133.5	133.5	126.6	126.6	126.6	118.8	118.8	118.8	
		SHC	56.7	76.8	97.0	54.4	74.6	94.7	51.9	72.1	92.3	49.1	69.3	89.5	
	76	TC	–	147.0	147.0	–	140.5	140.5	–	133.2	133.2	–	124.9	124.9	
		SHC	–	60.6	81.7	–	58.4	79.3	–	55.8	76.5	–	53.0	73.5	
4500 Cfm	EAT (wb)	58	TC	121.7	121.7	137.9	116.8	116.8	132.3	111.2	111.2	126.0	105.0	105.0	118.9
			SHC	105.6	121.7	137.9	101.3	116.8	132.3	96.4	111.2	126.0	91.0	105.0	118.9
		62	TC	121.8	121.8	143.4	116.9	116.9	137.6	111.3	111.3	131.0	105.1	105.1	123.7
			SHC	100.2	121.8	143.4	96.1	116.9	137.6	91.6	111.3	131.0	86.5	105.1	123.7
		67	TC	131.3	131.3	131.3	125.1	125.1	125.1	118.2	118.2	120.8	110.5	110.5	117.7
	SHC		80.3	102.9	125.5	78.0	100.7	123.3	75.3	98.0	120.8	72.3	95.0	117.7	
	72	TC	141.5	141.5	141.5	135.1	135.1	135.1	128.0	128.0	128.0	120.1	120.1	120.1	
		SHC	57.9	80.0	102.1	55.6	77.7	99.9	53.1	75.2	97.4	50.3	72.4	94.6	
	76	TC	–	148.3	148.3	–	141.8	141.8	–	134.3	134.3	–	125.8	125.8	
		SHC	–	62.1	84.9	–	59.8	82.5	–	57.3	79.7	–	54.4	76.6	
5000 Cfm	EAT (wb)	58	TC	125.0	125.0	141.6	120.0	120.0	135.9	114.3	114.3	129.5	107.9	107.9	122.3
			SHC	108.4	125.0	141.6	104.0	120.0	135.9	99.1	114.3	129.5	93.6	107.9	122.3
		62	TC	125.1	125.1	147.2	120.1	120.1	141.4	114.4	114.4	134.7	108.0	108.0	127.2
			SHC	102.9	125.1	147.2	98.8	120.1	141.4	94.1	114.4	134.7	88.9	108.0	127.2
		67	TC	132.8	132.8	133.0	126.5	126.5	130.8	119.6	119.6	128.2	111.8	111.8	125.1
	SHC		83.6	108.3	133.0	81.2	106.0	130.8	78.6	103.4	128.2	75.6	100.3	125.1	
	72	TC	142.8	142.8	142.8	136.3	136.3	136.3	129.1	129.1	129.1	121.1	121.1	121.1	
		SHC	59.0	82.9	106.9	56.7	80.7	104.7	54.1	78.2	102.2	51.3	75.4	99.4	
	76	TC	–	149.4	149.4	–	142.8	142.8	–	135.1	135.1	–	126.5	126.5	
		SHC	–	63.4	87.9	–	61.2	85.5	–	58.6	82.7	–	55.6	79.4	

**LEGEND:**

- Do not operate in this region
- Cfm – Cubic feet per minute (supply air)
- EAT(db) – Entering air temperature (dry bulb)
- EAT(wb) – Entering air temperature (wet bulb)
- SHC – Sensible heat capacity
- TC – Total capacity

**Table 14 – COOLING CAPACITIES**

**2 STAGE COOLING**

**10 TONS**

RAS120				AMBIENT TEMPERATURE											
				85			95			105			115		
				EAT (db)			EAT (db)			EAT (db)			EAT (db)		
				75	80	85	75	80	85	75	80	85	75	80	85
3000 Cfm	EAT (wb)	58	TC	107.6	107.6	121.9	102.5	102.5	116.2	96.8	96.8	109.7	90.5	90.5	102.6
			SHC	93.2	107.6	121.9	88.8	102.5	116.2	83.9	96.8	109.7	78.4	90.5	102.6
		62	TC	113.6	113.6	116.5	107.1	107.1	113.4	99.7	99.7	109.8	91.8	91.8	104.9
			SHC	84.6	100.6	116.5	81.5	97.4	113.4	78.0	93.9	109.8	73.7	89.3	104.9
		67	TC	124.4	124.4	124.4	118.4	118.4	118.4	111.5	111.5	111.5	103.3	103.3	103.3
	SHC		69.7	85.7	101.7	67.1	83.2	99.2	64.3	80.3	96.3	60.8	76.8	92.8	
	72	TC	135.8	135.8	135.8	129.7	129.7	129.7	122.8	122.8	122.8	115	115	115	
		SHC	54.3	70.4	86.6	52.0	68.1	84.2	49.3	65.4	81.6	46.4	62.5	78.6	
	76	TC	–	145.3	145.3	–	139	139	–	131.9	131.9	–	124.1	124.1	
		SHC	–	57.8	74.3	–	55.6	72.1	–	53.1	69.6	–	50.4	66.9	
3500 Cfm	EAT (wb)	58	TC	114.2	114.2	129.4	108.9	108.9	123.4	102.9	102.9	116.6	96.3	96.3	109.1
			SHC	98.9	114.2	129.4	94.3	108.9	123.4	89.1	102.9	116.6	83.4	96.3	109.1
		62	TC	117.2	117.2	127.9	111.0	111.0	124.7	104.0	104.0	119.5	96.5	96.5	113.7
			SHC	91.1	109.5	127.9	88.1	106.4	124.7	83.9	101.7	119.5	79.3	96.5	113.7
		67	TC	127.8	127.8	127.8	121.7	121.7	121.7	114.5	114.5	114.5	106.6	106.6	106.6
	SHC		73.8	92.3	110.8	71.3	89.8	108.3	68.4	87.0	105.5	65.2	83.8	102.3	
	72	TC	139.4	139.4	139.4	133.0	133.0	133	125.8	125.8	125.8	117.9	117.9	117.9	
		SHC	56.0	74.6	93.1	53.7	72.2	90.8	51.0	69.6	88.2	48.1	66.7	85.4	
	76	TC	–	148.8	148.8	–	142.2	142.2	–	134.9	134.9	–	126.8	126.8	
		SHC	–	60.2	79.5	–	58.0	77.1	–	55.4	74.5	–	52.7	71.6	
4000 Cfm	EAT (wb)	58	TC	119.0	119.0	134.9	114.0	114.0	129.2	108.0	108.0	122.4	101.1	101.1	114.6
			SHC	103.1	119.0	134.9	98.7	114.0	129.2	93.6	108.0	122.4	87.6	101.1	114.6
		62	TC	120.3	120.3	137.1	114.7	114.7	132.8	108.2	108.2	127.5	101.3	101.3	119.3
			SHC	96.5	116.8	137.1	93.0	112.9	132.8	88.9	108.2	127.5	83.2	101.3	119.3
		67	TC	130.5	130.5	130.5	124.1	124.1	124.1	116.8	116.8	116.8	108.7	108.7	111.1
	SHC		77.7	98.6	119.5	75.2	96.2	117.2	72.3	93.3	114.4	69.1	90.1	111.1	
	72	TC	142.1	142.1	142.1	135.5	135.5	135.5	128.2	128.2	128.2	120.0	120.0	120.0	
		SHC	57.6	78.4	99.3	55.2	76.1	97.1	52.5	73.6	94.6	49.7	70.7	91.8	
	76	TC	–	151.4	151.4	–	144.7	144.7	–	137.1	137.1	–	–	–	
		SHC	–	62.3	83.8	–	60.0	81.4	–	57.5	78.8	–	–	–	
4500 Cfm	EAT (wb)	58	TC	123.0	123.0	139.5	117.8	117.8	133.6	111.9	111.9	126.9	105.3	105.3	119.3
			SHC	106.6	123.0	139.5	102.1	117.8	133.6	97.0	111.9	126.9	91.2	105.3	119.3
		62	TC	123.4	123.4	144.4	117.9	117.9	139.0	112.0	112.0	132.0	105.4	105.4	124.2
			SHC	100.9	122.7	144.4	96.9	117.9	139	92.1	112.0	132	86.6	105.4	124.2
		67	TC	132.6	132.6	132.6	126.0	126	126.0	118.7	118.7	122.9	110.4	110.4	119.6
	SHC		81.4	104.6	127.9	78.9	102.3	125.7	76.1	99.5	122.9	72.9	96.2	119.6	
	72	TC	144.2	144.2	144.2	137.4	137.4	137.4	129.9	129.9	129.9	121.6	121.6	121.6	
		SHC	59.0	82.1	105.2	56.6	79.8	103.1	54.0	77.3	100.7	51.1	74.5	98	
	76	TC	–	153.4	153.4	–	146.6	146.6	–	138.9	138.9	–	–	–	
		SHC	–	64.1	87.8	–	61.9	85.6	–	59.4	83	–	–	–	
5000 Cfm	EAT (wb)	58	TC	126.5	126.5	143.3	121.2	121.2	137.4	115.1	115.1	130.5	108.4	108.4	122.8
			SHC	109.6	126.5	143.3	105.0	121.2	137.4	99.8	115.1	130.5	93.9	108.4	122.8
		62	TC	126.5	126.5	149.1	121.3	121.3	142.9	115.2	115.2	135.8	108.5	108.5	127.8
			SHC	104.0	126.5	149.1	99.7	121.3	142.9	94.7	115.2	135.8	89.1	108.5	127.8
		67	TC	134.2	134.2	135.9	127.5	127.5	133.8	120.1	120.1	131.0	111.9	111.9	127.6
	SHC		84.9	110.4	135.9	82.4	108.1	133.8	79.6	105.3	131	76.4	102.0	127.6	
	72	TC	145.8	145.8	145.8	139.0	139.0	139.0	131.3	131.3	131.3	122.9	122.9	122.9	
		SHC	60.3	85.6	110.8	57.9	83.4	108.9	55.3	81.0	106.6	52.5	78.2	104	
	76	TC	–	155.1	155.1	–	148.2	148.2	–	–	–	–	–	–	
		SHC	–	65.9	91.5	–	63.7	89.5	–	–	–	–	–	–	

**LEGEND:**

- Do not operate in this region
- Cfm – Cubic feet per minute (supply air)
- EAT(db) – Entering air temperature (dry bulb)
- EAT(wb) – Entering air temperature (wet bulb)
- SHC – Sensible heat capacity
- TC – Total capacity

**Table 15 – COOLING CAPACITIES**

**2 STAGE COOLING**

**12.5 TONS**

RAS150				AMBIENT TEMPERATURE											
				85			95			105			115		
				EAT (db)			EAT (db)			EAT (db)			EAT (db)		
				75	80	85	75	80	85	75	80	85	75	80	85
3600 Cfm	EAT (wb)	58	TC	127.6	127.6	142.9	121.7	121.7	137.6	115.0	115.0	130	108.3	108.3	122.6
			SHC	110.3	126.6	142.9	105.8	121.7	137.6	99.9	115.0	130	94.1	108.3	122.6
		62	TC	136.1	136.1	136.1	131.1	131.1	131.1	123.8	123.8	124.5	114.9	114.9	120.3
			SHC	96.6	112.8	129.0	94.7	111.2	127.7	91.4	108.0	124.5	87.3	103.8	120.3
		67	TC	146.2	146.2	146.2	142.0	142.0	142.0	136.2	136.2	136.2	128.8	128.8	128.8
			SHC	78.5	94.4	110.3	76.9	93.1	109.2	74.7	91.0	107.3	71.7	88.1	104.6
		72	TC	155.9	155.9	155.9	152.4	152.4	152.4	147.2	147.2	147.2	140.1	140.1	140.1
			SHC	60.1	76.6	93.2	58.7	75.2	91.7	56.8	73.3	89.7	54.2	70.6	87.0
		76	TC	–	163.0	163	–	160.0	160	–	155.1	155.1	–	148.2	148.2
			SHC	–	62.0	81.8	–	61.1	80.9	–	59.5	79.3	–	57.0	76.3
4200 Cfm	EAT (wb)	58	TC	132.2	132.2	149.5	128.2	128.2	144.9	121.9	121.9	137.8	115.0	115.0	130.1
			SHC	115.0	132.2	149.5	111.5	128.2	144.9	106.0	121.9	137.8	99.9	115.0	130.1
		62	TC	139.6	139.6	139.6	134.7	134.7	138	128.0	128.0	135.6	119.1	119.1	131.2
			SHC	102.5	120.8	139	100.8	119.4	138	98.1	116.8	135.6	93.9	112.6	131.2
		67	TC	149.5	149.5	149.5	145.4	145.4	145.4	139.6	139.6	139.6	132.1	132.1	132.1
			SHC	81.8	99.6	117.4	80.6	98.7	116.8	78.5	96.9	115.2	75.7	94.3	112.8
		72	TC	159.0	159.0	159.0	155.5	155.5	155.5	150.3	150.3	150.3	143.1	143.1	143.1
			SHC	61.4	79.6	97.8	60.2	78.5	96.8	58.3	76.7	95	55.8	74.2	92.5
		76	TC	–	165.7	165.7	–	162.8	162.8	–	157.8	157.8	–	150.8	150.8
			SHC	–	64.6	87.7	–	63.5	86.3	–	61.5	83.3	–	58.9	79.9
4800 Cfm	EAT (wb)	58	TC	136.7	136.7	154.5	133.0	133.0	150.3	127.7	127.7	144.3	120.6	120.6	136.4
			SHC	118.9	136.7	154.5	115.7	133.0	150.3	111.0	127.7	144.3	104.9	120.6	136.4
		62	TC	142.2	142.2	147.8	137.4	137.4	147.1	131.0	131.0	144.7	122.8	122.8	140.3
			SHC	107.7	127.8	147.8	106.2	126.7	147.1	103.6	124.2	144.7	99.3	119.8	140.3
		67	TC	152.1	152.1	152.1	148.0	148	148	142.2	142.2	142.2	134.6	134.6	134.6
			SHC	84.8	104.3	123.7	83.8	103.8	123.7	82.0	102.3	122.6	79.4	99.9	120.4
		72	TC	161.3	161.3	161.3	157.8	157.8	157.8	152.5	152.5	152.5	145.4	145.4	145.4
			SHC	62.6	82.2	101.9	61.4	81.4	101.3	59.7	79.7	99.8	57.2	77.3	97.5
		76	TC	–	167.7	167.7	–	164.9	164.9	–	159.9	159.9	–	152.8	152.8
			SHC	–	66.4	91.4	–	65	89.2	–	63.1	86.4	–	60.5	83.1
5400 Cfm	EAT (wb)	58	TC	140.5	140.5	158.8	136.9	136.9	154.7	131.8	131.8	149	125.2	125.2	141.6
			SHC	122.2	140.5	158.8	119	136.9	154.7	114.7	131.8	149	108.9	125.2	141.6
		62	TC	144.3	144.3	155.7	139.6	139.6	155	133.5	133.5	152.4	125.8	125.8	147.8
			SHC	112.2	133.9	155.7	110.9	132.9	155	108.1	130.2	152.4	103.9	125.8	147.8
		67	TC	154.2	154.2	154.2	150.0	150.0	150.0	144.2	144.2	144.2	136.7	136.7	136.7
			SHC	87.6	108.6	129.6	86.8	108.5	130.1	85.2	107.3	129.4	82.8	105.1	127.4
		72	TC	163.1	163.1	163.1	159.7	159.7	159.7	154.3	154.3	154.3	147.1	147.1	147.1
			SHC	63.6	84.6	105.6	62.5	83.9	105.4	60.8	82.5	104.2	58.4	80.2	102
		76	TC	–	169.3	169.3	–	166.5	166.5	–	161.5	161.5	–	154.2	154.2
			SHC	–	67.6	93.7	–	66.4	91.7	–	64.5	89.2	–	61.9	86.1
6000 Cfm	EAT (wb)	58	TC	143.6	143.6	162.3	140.1	140.1	158.3	135.1	135.1	152.7	128.7	128.7	145.5
			SHC	124.9	143.6	162.3	121.8	140.1	158.3	117.5	135.1	152.7	111.9	128.7	145.5
		62	TC	146.1	146.1	162.4	141.7	141.7	161.5	135.6	135.6	159.2	128.8	128.8	151.2
			SHC	116.1	139.3	162.4	114.7	138.1	161.5	112.1	135.6	159.2	106.4	128.8	151.2
		67	TC	155.8	155.8	155.8	151.6	151.6	151.6	145.9	145.9	145.9	138.3	138.3	138.3
			SHC	90.1	112.6	135	89.6	112.8	136	88.3	112.0	135.8	85.9	110.0	134.1
		72	TC	164.5	164.5	164.5	161.2	161.2	161.2	155.8	155.8	155.8	148.5	148.5	148.5
			SHC	64.5	86.7	108.9	63.5	86.3	109.1	61.9	85.1	108.2	59.6	82.9	106.3
		76	TC	–	170.6	170.6	–	167.8	167.8	–	162.8	162.8	–	155.5	155.5
			SHC	–	68.7	95.8	–	67.5	94.1	–	65.7	91.8	–	63.3	88.8

**LEGEND:**

- Do not operate in this region
- Cfm – Cubic feet per minute (supply air)
- EAT(db) – Entering air temperature (dry bulb)
- EAT(wb) – Entering air temperature (wet bulb)
- SHC – Sensible heat capacity
- TC – Total capacity

**Table 16 – STATIC PRESSURE ADDERS (Factory Options and/or Accessories)**

**Economizer**

6 TONS											
CFM	600	800	1000	1250	1500	1750	2000	2250	2500	2750	3000
Vertical Economizer	0.01	0.02	0.04	0.05	0.07	0.09	0.12	0.15	0.18	0.22	0.26
Horizontal Economizer*	0.02	0.03	0.04	0.06	0.08	0.10	0.13	0.15	0.18	0.23	0.28

7.5 – 12.5 TONS															
CFM	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000	5500	5750	6000
Vertical Economizer	0.06	0.08	0.09	0.12	0.13	0.15	0.17	0.20	0.22	0.25	0.29	0.33	0.40	0.44	0.48
Horizontal Economizer*	0.08	0.10	0.13	0.15	0.18	0.21	0.25	0.28	0.30	0.34	0.39	0.43	0.51	0.56	0.60

\* Available as field installed accessories only.

**Electric Heaters**

6 TONS										
CFM (in. wg)	600	900	1200	1400	1600	1800	2000	2200	2400	2600
1 Electric Heater Module	0.03	0.05	0.07	0.09	0.09	0.10	0.11	0.11	0.12	0.13
2 Electric Heater Modules	0.13	0.15	0.16	0.16	0.16	0.17	0.17	0.17	0.18	0.18

7.5 – 12.5 TONS																
CFM (in. wg)	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000	5250	5500	5750	6000
1 Electric Heater Module	0.03	0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.18
2 Electric Heater Modules	0.04	0.05	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.15	0.16	0.17	0.19	0.20

**General fan performance notes:**

1. Interpolation is permissible. Do not extrapolate.
2. External static pressure is the static pressure difference between the return duct and the supply duct plus the static pressure caused by any FIOPs or accessories.
3. Tabular data accounts for pressure loss due to clean filters, unit casing, and wet coils. Factory options and accessories may add static pressure losses, as shown in Table 16. Selection software is available, through your salesperson, to help you select the best motor/drive combination for your application.
4. The Fan Performance tables offer motor/drive recommendations. In cases when two motor/drive combinations would work, recommend the lower horsepower option.
5. For information on the electrical properties of motors, please see the Electrical information section of this book.
6. For more information on the performance limits of motors, see the application data section of this book.
7. The EPACT (Energy Policy Act of 1992) regulates energy requirements for specific types of indoor fan motors. Motors regulated by EPACT include any general purpose, T-frame (three-digit, 143 and larger), single-speed, foot mounted, polyphase, squirrel cage induction motors of NEMA (National Electrical Manufacturers Association) design A and B, manufactured for use in the United States. Ranging from 1 to 200 Hp, these continuous-duty motors operate on 230 and 460 volt, 60 Hz power. If a motor does not fit into these specifications, the motor does not have to be replaced by an EPACT compliant energy-efficient motor. Variable-speed motors are exempt from EPACT compliance requirements. Therefore, the indoor fan motors for the RAS072-150 units are exempt from these requirements.

# FAN PERFORMANCE

Table 17 – RAS072, 3 PHASE, 6 TON HORIZONTAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Drive <sup>1</sup>				Standard Static Option					
1800	<b>822</b>	<b>0.51</b>	<b>927</b>	<b>0.66</b>	<b>1018</b>	<b>0.82</b>	1100	0.98	1174	1.15
1950	<b>872</b>	<b>0.62</b>	<b>973</b>	<b>0.79</b>	<b>1061</b>	<b>0.95</b>	1140	1.13	1213	1.31
2100	<b>923</b>	<b>0.75</b>	<b>1019</b>	<b>0.92</b>	1104	1.10	1182	1.29	1253	1.48
2250	<b>974</b>	<b>0.90</b>	<b>1067</b>	<b>1.08</b>	1149	1.27	1224	1.46	1294	1.66
2400	<b>1026</b>	<b>1.06</b>	1115	1.26	1195	1.46	1268	1.66	1336	1.87
2550	1079	1.25	1164	1.46	1241	1.67	1312	1.88	1379	2.10
2700	1132	1.46	1214	1.67	1289	1.90	1358	2.12	1422	2.35
2850	1186	1.69	1264	1.92	1336	2.15	1404	2.39	1467	2.63
3000	1240	1.94	1315	2.18	1385	2.43	1451	2.68	1512	2.93

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Standard Static Option						Medium Static Option			
1800	1244	1.33	1308	1.51	1369	1.70	1427	1.90	1483	2.10
1950	1281	1.49	1345	1.68	1405	1.88	1462	2.09	1517	2.30
2100	1320	1.67	1382	1.87	1441	2.08	1498	2.29	1552	2.51
2250	1359	1.87	1420	2.08	1479	2.29	1534	2.51	1587	2.74
2400	1400	2.09	1460	2.31	1517	2.53	1572	2.76	1624	2.99
2550	1441	2.33	1500	2.55	1557	2.79	1610	3.03	1662	3.27
2700	1483	2.59	1541	2.83	1597	3.07	1650	3.32	1701	3.57
2850	1527	2.87	1583	3.12	1638	3.37	1690	3.63	–	–
3000	1571	3.18	1626	3.44	1680	3.70	–	–	–	–

NOTE: For more information, see General Fan Performance Notes.

■ – Medium Static Option

■ – High Static Option

**Boldface** indicates field-supplied drive is required.

1. Recommend using field-supplied fan pulley (part no. 1175830), motor pulley (part no. 1175849) and belt (part no. 1178128).

Table 18 – RAS072, 3 PHASE, 6 TON VERTICAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Drive <sup>1</sup>				Standard Static Option					
1800	<b>907</b>	<b>0.63</b>	<b>1006</b>	<b>0.80</b>	1092	0.97	1169	1.14	1239	1.32
1950	<b>965</b>	<b>0.77</b>	<b>1060</b>	<b>0.95</b>	1143	1.13	1218	1.32	1287	1.51
2100	<b>1024</b>	<b>0.93</b>	1115	1.12	1195	1.32	1268	1.52	1335	1.72
2250	1083	1.11	1170	1.32	1248	1.53	1319	1.74	1385	1.96
2400	1143	1.32	1227	1.54	1302	1.76	1371	1.99	1435	2.22
2550	1203	1.55	1284	1.78	1357	2.02	1424	2.26	1487	2.50
2700	1264	1.81	1342	2.06	1412	2.31	1478	2.56	1539	2.82
2850	1326	2.09	1400	2.36	1469	2.62	1532	2.89	1592	3.16
3000	1387	2.41	1459	2.69	1525	2.97	1587	3.25	1646	3.53

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Standard Static Option						Medium Static Option		High Static Option	
1800	1304	1.51	1365	1.69	1422	1.88	1477	2.08	1528	2.28
1950	1350	1.71	1410	1.91	1467	2.11	1520	2.31	1572	2.52
2100	1398	1.93	1457	2.14	1512	2.35	1565	2.57	1616	2.79
2250	1446	2.18	1504	2.40	1559	2.62	1611	2.85	1661	3.09
2400	1496	2.45	1552	2.68	1606	2.92	1658	3.16	1707	3.40
2550	1546	2.75	1601	2.99	1654	3.24	1705	3.50	–	–
2700	1597	3.07	1651	3.33	1703	3.59	–	–	–	–
2850	1648	3.43	1702	3.70	–	–	–	–	–	–
3000	–	–	–	–	–	–	–	–	–	–

NOTE: For more information, see General Fan Performance Notes.

**Boldface** indicates field-supplied drive is required.

1. Recommend using field-supplied fan pulley (part no. 1175830), motor pulley (part no. 1175849) and belt (part no. 1178128).



# FAN PERFORMANCE (cont.)

Table 19 – RAS090 / 091, 3 PHASE, 7.5 TON HORIZONTAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Field Supplied Drive<sup>1</sup></b>		<b>Standard Static Option</b>						<b>Medium Static Option</b>	
2250	<b>465</b>	<b>0.43</b>	555	0.64	629	0.86	694	1.10	753	1.34
2438	<b>488</b>	<b>0.51</b>	575	0.73	648	0.97	712	1.21	769	1.47
2625	510	0.60	595	0.84	666	1.09	729	1.34	786	1.62
2813	533	0.70	616	0.95	686	1.22	748	1.49	804	1.77
3000	557	0.82	637	1.08	705	1.36	766	1.64	822	1.94
3188	581	0.94	659	1.23	726	1.51	785	1.81	840	2.12
3375	606	1.08	681	1.38	746	1.68	805	2.00	859	2.32
3563	630	1.24	703	1.55	767	1.87	825	2.20	878	2.53
3750	655	1.41	726	1.74	789	2.07	845	2.41	897	2.76

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Medium Static Option</b>						<b>High Static Option</b>			
2250	806	1.60	856	1.87	903	2.15	947	2.45	988	2.75
2438	822	1.74	872	2.03	918	2.32	961	2.62	1003	2.93
2625	839	1.90	887	2.19	933	2.49	977	2.81	1018	3.13
2813	856	2.06	904	2.37	949	2.68	992	3.01	1033	3.34
3000	873	2.24	921	2.56	966	2.89	1008	3.22	1049	3.56
3188	891	2.44	938	2.77	982	3.10	1025	3.45	1065	3.81
3375	909	2.65	955	2.99	1000	3.34	1041	3.70	1081	4.06
3563	927	2.88	973	3.23	1017	3.59	1059	3.96	1098	4.34
3750	946	3.12	992	3.48	1035	3.86	1076	4.24	<b>1115</b>	<b>4.63<sup>2</sup></b>

NOTE: For more information, see General Fan Performance Notes.

**Boldface** indicates field-supplied drive is required.

1. Recommend using field-supplied fan pulley (part no. 1178189), motor pulley (part no. 1175832) and belt (part no. 1178128).
2. Recommend using field-supplied fan pulley (part no. 1175896) and belt (part no. 1178182).

Table 20 – RAS090 / 091, 3 PHASE, 7.5 TON VERTICAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Standard Static Option</b>						<b>Medium Static Option</b>			
2250	511	0.53	591	0.73	660	0.95	722	1.19	779	1.44
2438	540	0.64	616	0.85	683	1.08	743	1.33	799	1.59
2625	569	0.76	642	0.99	706	1.23	765	1.49	819	1.76
2813	599	0.90	669	1.14	731	1.39	788	1.66	841	1.94
3000	630	1.06	696	1.31	756	1.58	811	1.86	863	2.15
3188	661	1.23	724	1.50	782	1.78	836	2.07	886	2.38
3375	692	1.43	753	1.71	809	2.00	861	2.31	910	2.62
3563	723	1.65	782	1.94	836	2.25	887	2.56	934	2.89
3750	755	1.89	811	2.20	864	2.52	913	2.84	959	3.18

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Medium Static Option</b>						<b>High Static Option</b>			
2250	832	1.71	882	1.99	928	2.29	973	2.59	1015	2.92
2438	851	1.87	899	2.16	945	2.46	989	2.78	1031	3.11
2625	870	2.04	918	2.34	963	2.66	1006	2.98	1048	3.32
2813	890	2.24	937	2.55	982	2.87	1024	3.21	1065	3.55
3000	912	2.46	958	2.78	1001	3.11	1043	3.45	1083	3.80
3188	934	2.69	979	3.02	1022	3.36	1063	3.72	1102	4.08
3375	956	2.95	1000	3.29	1042	3.64	1083	4.00	<b>1122</b>	<b>4.38</b>
3563	980	3.23	1023	3.58	1064	3.94	<b>1104</b>	<b>4.32</b>	<b>1142</b>	<b>4.70</b>
3750	1004	3.54	1046	3.90	1086	4.27	<b>1125</b>	<b>4.65</b>	–	–

NOTE: For more information, see General Fan Performance Notes.

**Boldface** indicates field-supplied drive is required.

1. Recommend using field-supplied fan pulley (part no. 1175896) and belt (part no. 1178182).

# FAN PERFORMANCE (cont.)

Table 21 – RAS101 / 102, 3 PHASE, 8.5 TON HORIZONTAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Field Supplied Drive<sup>1</sup></b>		<b>Standard Static Option</b>							
2550	<b>438</b>	<b>0.39</b>	523	0.50	595	0.64	658	0.78	716	0.94
2763	<b>459</b>	<b>0.47</b>	541	0.60	611	0.73	673	0.88	730	1.05
2975	<b>481</b>	<b>0.56</b>	560	0.70	628	0.84	689	1.00	745	1.16
3188	<b>504</b>	<b>0.67</b>	580	0.82	646	0.97	705	1.13	760	1.30
3400	526	0.80	600	0.95	664	1.11	722	1.27	776	1.45
3613	550	0.94	620	1.10	683	1.26	740	1.43	793	1.62
3825	573	1.09	641	1.26	702	1.43	758	1.61	810	1.80
4038	597	1.26	663	1.44	722	1.62	777	1.81	827	2.00
4250	621	1.45	685	1.64	743	1.83	796	2.02	845	2.22

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Medium Static Option</b>					<b>High Static Option</b>				
2550	769	1.11	819	1.30	865	1.49	909	1.70	951	1.92
2763	782	1.22	831	1.41	877	1.60	921	1.81	963	2.04
2975	796	1.34	845	1.53	890	1.73	933	1.94	974	2.16
3188	811	1.48	858	1.67	903	1.88	946	2.09	987	2.31
3400	826	1.63	873	1.83	917	2.04	959	2.25	1000	2.48
3613	842	1.81	888	2.01	932	2.22	973	2.44	1013	2.67
3825	858	2.00	903	2.20	946	2.42	988	2.64	1027	2.87
4038	875	2.20	919	2.41	962	2.63	1002	2.86	1041	3.10
4250	892	2.43	936	2.65	978	2.87	1018	3.10	1056	3.34

NOTE: For more information, see General Fan Performance Notes.

**Boldface** indicates field-supplied drive is required.

1. Recommend using field-supplied fan pulley (part no. 1178189) and belt (part no. 1179767).

Table 22 – RAS101 / 102, 3 PHASE, 8.5 TON VERTICAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Field Supplied Drive<sup>1</sup></b>		<b>Standard Static Option</b>						<b>Medium Static Option</b>	
2550	<b>477</b>	<b>0.43</b>	556	0.57	624	0.71	685	0.85	742	0.99
2763	<b>503</b>	<b>0.52</b>	578	0.67	644	0.82	704	0.97	759	1.13
2975	529	0.62	601	0.79	665	0.95	724	1.11	777	1.28
3188	556	0.74	625	0.92	687	1.09	744	1.26	796	1.44
3400	583	0.88	650	1.06	710	1.24	765	1.43	816	1.62
3613	611	1.03	675	1.22	733	1.42	787	1.61	836	1.81
3825	639	1.19	701	1.40	757	1.61	809	1.81	857	2.02
4038	668	1.38	727	1.60	781	1.81	832	2.03	879	2.25
4250	696	1.58	753	1.81	806	2.04	855	2.27	901	2.50

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Medium Static Option</b>					<b>High Static Option</b>				
2550	794	1.14	842	1.29	888	1.44	932	1.59	973	1.75
2763	810	1.28	858	1.44	903	1.60	946	1.77	987	1.93
2975	827	1.44	874	1.61	919	1.78	961	1.95	1001	2.13
3188	845	1.62	891	1.79	935	1.98	977	2.16	1017	2.34
3400	864	1.80	909	1.99	952	2.18	993	2.38	1033	2.57
3613	883	2.01	928	2.21	970	2.41	1010	2.61	1049	2.82
3825	903	2.23	947	2.44	988	2.65	1028	2.87	1066	3.08
4038	924	2.47	967	2.70	1008	2.92	1047	3.14	1084	3.37
4250	945	2.73	987	2.97	1027	3.20	1066	3.43	<b>1103</b>	<b>3.67<sup>2</sup></b>

NOTE: For more information, see General Fan Performance Notes.

**Boldface** indicates field-supplied drive is required.

1. Recommend using field-supplied fan pulley (part no. 1178189) and belt (part no. 1179767).

2. Recommend using field-supplied fan pulley (part no. 1175896), motor pulley (part no. 1178133) and belt (part no. 1178182).

# FAN PERFORMANCE (cont.)

Table 23 – RAS120 / 121, 3 PHASE, 10 TON HORIZONTAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Field Supplied Drive<sup>1</sup></b>		<b>Standard Static Option</b>							
3000	<b>523</b>	<b>0.58</b>	592	0.73	657	0.88	718	1.05	775	1.22
3250	<b>555</b>	<b>0.71</b>	620	0.87	681	1.04	739	1.21	794	1.39
3500	<b>588</b>	<b>0.86</b>	649	1.03	707	1.21	762	1.39	815	1.58
3750	621	1.03	679	1.21	734	1.40	786	1.59	837	1.79
4000	655	1.23	709	1.42	761	1.61	812	1.82	860	2.03
4250	689	1.45	741	1.65	790	1.86	838	2.07	885	2.29
4500	723	1.69	773	1.90	820	2.12	866	2.35	910	2.57
4750	758	1.96	805	2.19	850	2.42	894	2.65	937	2.89
5000	793	2.26	838	2.50	881	2.74	923	2.98	965	3.23

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Standard Static Opt.</b>		<b>Medium Static Option</b>							
3000	830	1.39	883	1.57	934	1.76	982	1.95	1029	2.14
3250	847	1.57	897	1.76	946	1.96	993	2.16	1039	2.36
3500	865	1.77	914	1.97	961	2.18	1007	2.38	1051	2.60
3750	885	1.99	932	2.20	978	2.42	1022	2.64	1065	2.86
4000	907	2.24	952	2.46	996	2.68	1038	2.91	1080	3.14
4250	930	2.51	973	2.74	1015	2.97	1057	3.21	1097	3.45
4500	954	2.81	996	3.05	1037	3.29	1076	3.54	1115	3.79
4750	979	3.13	1019	3.38	1059	3.63	1097	3.89	1135	4.15
5000	1005	3.49	1044	3.74	1082	4.01	1119	4.27	1156	4.55

NOTE: For more information, see General Fan Performance Notes.

**Boldface** indicates field-supplied drive is required.

1. Recommend using field-supplied fan pulley (part no. 1178190) and belt (part no. 1178181).

Table 24 – RAS120 / 121, 3 PHASE, 10 TON VERTICAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Field Supplied Drive<sup>1</sup></b>		<b>Standard Static Option</b>							
3000	<b>556</b>	<b>0.65</b>	623	0.80	684	0.95	738	1.11	789	1.26
3250	<b>590</b>	<b>0.79</b>	655	0.96	713	1.13	766	1.29	815	1.46
3500	625	0.96	687	1.14	742	1.32	794	1.50	841	1.68
3750	661	1.16	719	1.35	773	1.54	822	1.73	869	1.93
4000	697	1.37	753	1.58	804	1.79	852	1.99	897	2.20
4250	733	1.62	787	1.84	836	2.06	883	2.28	926	2.49
4500	770	1.89	821	2.13	869	2.36	914	2.59	956	2.82
4750	807	2.20	856	2.45	902	2.69	945	2.94	986	3.18
5000	844	2.54	891	2.80	936	3.06	978	3.31	1018	3.57

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Medium Static Option</b>									
3000	836	1.42	881	1.57	923	1.73	963	1.89	1001	2.05
3250	861	1.63	904	1.79	945	1.96	985	2.13	1023	2.30
3500	886	1.86	929	2.04	969	2.22	1008	2.40	1045	2.58
3750	912	2.12	954	2.31	994	2.50	1031	2.70	1068	2.89
4000	940	2.40	980	2.61	1019	2.81	1056	3.02	1092	3.22
4250	968	2.71	1007	2.93	1045	3.15	1081	3.36	1117	3.58
4500	996	3.05	1035	3.28	1072	3.51	1108	3.74	1142	3.97
4750	1026	3.42	1063	3.66	1100	3.91	1135	4.15	1168	4.39
5000	1056	3.82	1093	4.08	1128	4.34	1162	4.59	–	–

NOTE: For more information, see General Fan Performance Notes.

**Boldface** indicates field-supplied drive is required.

1. Recommend using field-supplied fan pulley (part no. 1178190) and belt (part no. 1178181).

# FAN PERFORMANCE (cont.)

Table 25 – RAS150, 3 PHASE, 12.5 TON HORIZONTAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Field Supplied Drive<sup>1</sup></b>		<b>Standard Static Option</b>							
3438	<b>580</b>	<b>0.82</b>	642	0.99	700	1.16	756	1.34	809	1.53
3750	<b>621</b>	<b>1.03</b>	679	1.21	734	1.40	786	1.59	837	1.79
4063	663	1.28	717	1.47	769	1.67	818	1.88	866	2.09
4375	706	1.56	757	1.77	805	1.98	<b>852</b>	<b>2.20</b>	897	2.43
4688	749	1.89	797	2.11	843	2.34	887	2.57	930	2.81
5000	793	2.26	838	2.50	881	2.74	923	2.98	965	3.23
5313	837	2.69	880	2.93	921	3.19	961	3.44	<b>1000</b>	<b>3.71</b>
5625	882	3.16	922	3.42	961	3.68	<b>999</b>	<b>3.95</b>	<b>1037</b>	<b>4.23</b>
5938	926	3.68	<b>964</b>	<b>3.96</b>	<b>1001</b>	<b>4.23</b>	<b>1038</b>	<b>4.52</b>	–	–
6250	<b>971</b>	<b>4.26</b>	<b>1007</b>	<b>4.55</b>	–	–	–	–	–	–

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Medium Static Option</b>									
3438	860	1.72	910	1.92	957	2.12	1003	2.32	1048	2.54
3750	885	1.99	932	2.20	978	2.42	1022	2.64	1065	2.86
4063	912	2.31	957	2.53	1001	2.75	1043	2.98	1084	3.22
4375	941	2.66	984	2.89	1026	3.13	1066	3.37	1106	3.62
4688	972	3.05	1013	3.29	1053	3.54	1092	3.80	1130	4.06
5000	1005	3.49	1044	3.74	1082	4.01	1119	4.27	1156	4.55
5313	1038	3.97	1076	4.24	1113	4.52	–	–	–	–
5625	1073	4.51	–	–	–	–	–	–	–	–
5938	–	–	–	–	–	–	–	–	–	–
6250	–	–	–	–	–	–	–	–	–	–

NOTE: For more information, see General Fan Performance Notes.

**Boldface** indicates field-supplied drive is required.

1. Recommend using field-supplied fan pulley (part no. 1178189) and belt (part no. 1179767).
2. Recommend using field-supplied fan pulley (part no. 1175896), motor pulley (part no. 1178133) and belt (part no. 1178182).

Table 26 – RAS150, 3 PHASE, 12.5 TON VERTICAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Field Supplied Drive<sup>1</sup></b>		<b>Standard Static Option</b>							
3438	<b>616</b>	<b>0.92</b>	679	1.10	735	1.27	786	1.45	835	1.62
3750	661	1.16	719	1.35	773	1.54	822	1.73	869	1.93
4063	706	1.43	761	1.64	812	1.85	860	2.06	904	2.27
4375	752	1.75	804	1.98	852	2.20	898	2.43	941	2.65
4688	798	2.12	847	2.36	894	2.60	937	2.85	979	3.09
5000	844	2.54	891	2.80	936	3.06	978	3.31	1018	3.57
5313	891	3.01	936	3.28	978	3.56	<b>1019</b>	<b>3.83</b>	<b>1057</b>	<b>4.11</b>
5625	938	3.53	<b>981</b>	<b>3.83</b>	<b>1022</b>	<b>4.12</b>	<b>1060</b>	<b>4.41</b>	<b>1097</b>	<b>4.70</b>
5938	<b>986</b>	<b>4.12</b>	<b>1026</b>	<b>4.43</b>	–	–	–	–	–	–
6250	–	–	–	–	–	–	–	–	–	–

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	<b>Medium Static Option</b>									
3438	880	1.80	922	1.98	963	2.15	1002	2.33	1039	2.51
3750	912	2.12	954	2.31	994	2.50	1031	2.70	1068	2.89
4063	947	2.48	987	2.68	1025	2.89	1062	3.10	1098	3.31
4375	982	2.88	1021	3.10	1058	3.32	1094	3.55	1129	3.77
4688	1018	3.33	1056	3.57	1093	3.81	1128	4.04	1162	4.29
5000	1056	3.82	1093	4.08	1128	4.34	1162	4.59	–	–
5313	1094	4.38	1130	4.65	–	–	–	–	–	–
5625	–	–	–	–	–	–	–	–	–	–
5938	–	–	–	–	–	–	–	–	–	–
6250	–	–	–	–	–	–	–	–	–	–

NOTE: For more information, see General Fan Performance Notes.

**Boldface** indicates field-supplied drive is required.

1. Recommend using field-supplied fan pulley (part no. 1178189) and belt (part no. 1179767).
2. Recommend using field-supplied fan pulley (part no. 1175896), motor pulley (part no. 1178133) and belt (part no. 1178182).

## FAN PERFORMANCE (cont.)

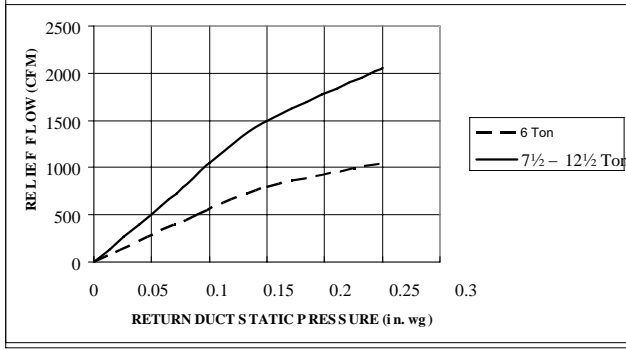
**Table 27 – PULLEY ADJUSTMENT**

UNIT RAS		MOTOR/DRIVE COMBO	MOTOR PULLEY TURNS OPEN										
			0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
072	3 phase	Standard Static	1457	1419	1380	1342	1303	1265	1227	1188	1150	1111	1073
		Medium Static	1518	1484	1449	1415	1380	1346	1311	1277	1242	1208	1173
		High Static	1788	1757	1725	1694	1662	1631	1600	1568	1537	1505	1474
090/091	3 phase	Standard Static	747	721	695	670	644	618	592	566	541	515	489
		Medium Static	949	927	906	884	863	841	819	798	776	755	733
		High Static	1102	1083	1063	1044	1025	1006	986	967	948	928	909
101/102	3 phase	Standard Static	733	712	690	669	647	626	604	583	561	540	518
		Medium Static	936	911	887	862	838	813	788	764	739	715	690
		High Static	1084	1059	1035	1010	986	961	936	912	887	863	838
120/121	3 phase	Standard Static	838	813	789	764	739	715	690	665	640	616	591
		Medium Static	1084	1059	1035	1010	986	961	936	912	887	863	838
		High Static	1240	1218	1196	1175	1153	1131	1109	1087	1066	1044	1022
150	3 phase	Standard Static	838	813	789	764	739	715	690	665	640	616	591
		Medium Static	1084	1059	1035	1010	986	961	936	912	887	863	838
		High Static	1240	1218	1196	1175	1153	1131	1109	1087	1066	1044	1022

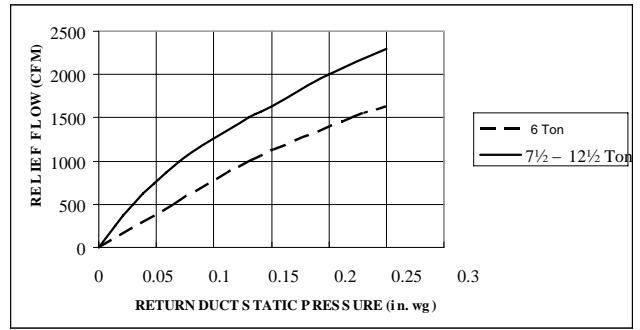
**NOTE:** Do not adjust pulley further than 5 turns open.

■ – Factory settings

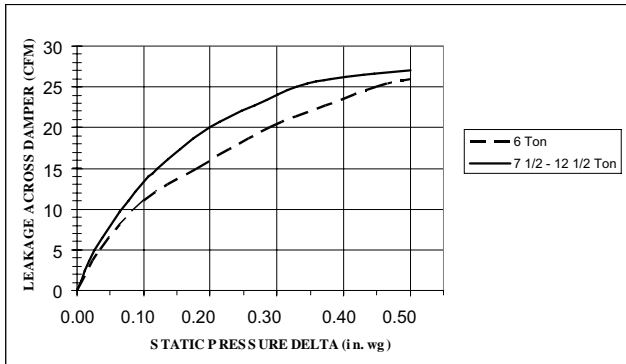
# ECONOMIZER, BAROMETRIC RELIEF, AND PERFORMANCE



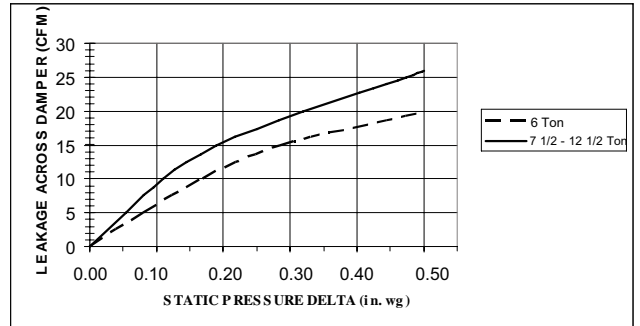
**Horizontal Economizer  
Barometric Relief Flow Capacity**



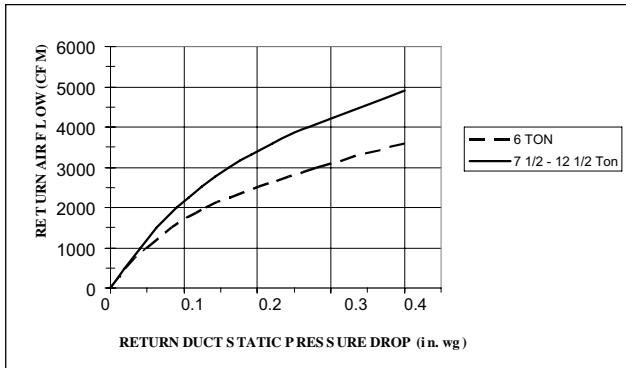
**Vertical Economizer  
Barometric Relief Flow Capacity**



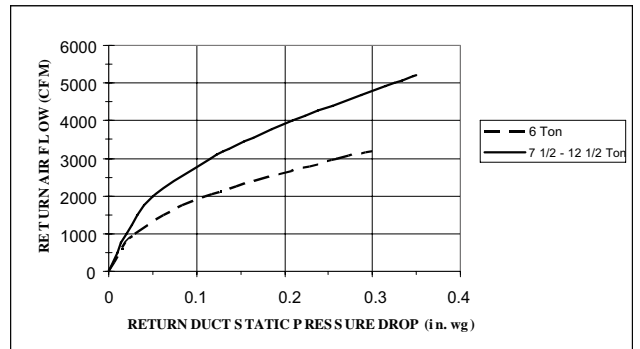
**Horizontal Economizer  
Outdoor Air Damper Leakage**



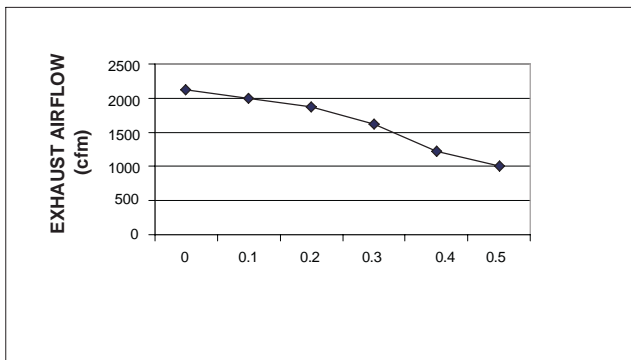
**Vertical Economizer  
Outdoor Air Damper Leakage**



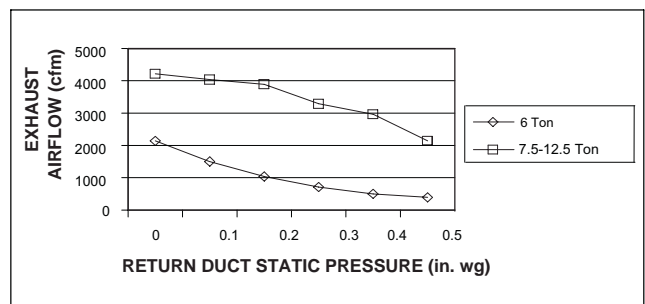
**Horizontal Economizer  
Return Air Pressure Drop**



**Vertical Economizer  
Return Air Pressure Drop**



**Horizontal Economizer  
Power Exhaust Performance**



**Power Exhaust Performance**

# ELECTRICAL INFORMATION

**Table 28 – RAS072, 6 TONS**

V-Ph-Hz	VOLTAGE RANGE		COMP (ea)		OFM (ea)		IFM				
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	Max WATTS	Max AMP Draw	EFF at Full Load	FLA
208-3-60	187	253	19.0	123	325	1.5	Std Static	2120	5.5	80%	5.2
							Med Static	2615	7.9	81%	7.5
							High Static	2615	7.9	81%	7.5
230-3-60	187	253	19.0	123	325	1.5	Std Static	2120	5.5	80%	5.2
							Med Static	2615	7.9	81%	7.5
							High Static	2615	7.9	81%	7.5
460-3-60	414	506	9.7	62	325	0.8	Std Static	2120	2.7	80%	2.6
							Med Static	2615	3.6	81%	3.4
							High Static	3775	4.6	81%	4.4
575-3-60	518	633	7.4	50	325	0.6	Std Static	2120	2.1	80%	2.0
							Med Static	3775	2.9	81%	2.8
							High Static	3775	2.9	81%	2.8

**Table 29 – RAS091, 7.5 TONS – 1 Stage Cooling**

V-Ph-Hz	VOLTAGE RANGE		COMP (ea)		OFM (ea)		IFM				
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	Max WATTS	Max AMP Draw	EFF at Full Load	FLA
208-3-60	187	253	25.0	164	325	1.5	Std Static	1448	5.5	80%	5.2
							Med Static	2278	7.9	81%	7.5
							High Static	4400	15.0	81%	15.0
230-3-60	187	253	25.0	164	325	1.5	Std Static	1448	5.5	80%	5.2
							Med Static	2278	7.9	81%	7.5
							High Static	4400	15.0	81%	15.0
460-3-60	414	506	12.2	100	325	0.8	Std Static	1448	2.7	80%	2.6
							Med Static	2278	3.6	81%	3.4
							High Static	4400	7.4	81%	7.4
575-3-60	518	633	9.0	78	325	0.6	Std Static	1379	2.5	80%	2.4
							Med Static	3775	2.9	81%	2.8
							High Static	4400	5.9	81%	5.6

**Table 30 – RAS090, 7.5 TONS – 2 Stage Cooling**

V-Ph-Hz	VOLTAGE RANGE		COMP (Cir 1)		COMP (Cir 2)		OFM (ea)		IFM				
	MIN	MAX	RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	Max WATTS	Max AMP Draw	EFF at Full Load	FLA
208-3-60	187	253	13.6	83	13.6	83	325	1.5	STD	1448	5.5	80%	5.2
									MED	2278	7.9	81%	7.5
									HIGH	4400	15.0	81%	15.0
230-3-60	187	253	13.6	83	13.6	83	325	1.5	STD	1448	5.5	80%	5.2
									MED	2278	7.9	81%	7.5
									HIGH	4400	15.0	81%	15.0
460-3-60	414	506	6.1	41	6.1	41	325	0.8	STD	1448	2.7	80%	2.6
									MED	2278	3.6	81%	3.4
									HIGH	4400	7.4	81%	7.4
575-3-60	518	633	4.2	33	4.2	33	325	0.6	STD	1379	2.5	80%	2.4
									MED	3775	2.9	81%	2.8
									HIGH	4400	5.9	81%	5.6

# ELECTRICAL INFORMATION (cont.)

## Table 31 – RAS101, 8.5 TONS – 1 Stage Cooling

V-Ph-Hz	VOLTAGE RANGE		COMP (ea)		OFM (ea)		IFM				
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	Max WATTS	Max AMP Draw	EFF at Full Load	FLA
208-3-60	187	253	29.5	195	325	1.5	Std Static	1448	5.5	80%	5.2
							Med Static	2120	5.5	80%	5.2
							High Static	2694	10.5	80%	10.0
230-3-60	187	253	29.5	195	325	1.5	Std Static	1448	5.5	80%	5.2
							Med Static	2120	5.5	80%	5.2
							High Static	2694	10.5	80%	10.0
460-3-60	414	506	14.7	95	325	0.8	Std Static	1448	2.7	80%	2.6
							Med Static	2120	2.7	80%	2.6
							High Static	2694	4.6	80%	4.4
575-3-60	518	633	12.2	80	325	0.6	Std Static	1379	2.5	80%	2.4
							Med Static	1390	2.1	80%	2.0
							High Static	3775	2.9	81%	2.8

## Table 32 – RAS102, 8.5 TONS – 2 Stage Cooling

V-Ph-Hz	VOLTAGE RANGE		COMP (Cir 1)		COMP (Cir 2)		OFM (ea)		IFM				
	MIN	MAX	RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	Max WATTS	Max AMP Draw	EFF at Full Load	FLA
208-3-60	187	253	14.5	98	13.7	83	325	1.5	STD	1448	5.5	80%	5.2
									MED	2120	5.5	80%	5.2
									HIGH	2694	10.5	80%	10.0
230-3-60	187	253	14.5	98	13.7	83	325	1.5	STD	1448	5.5	80%	5.2
									MED	2120	5.5	80%	5.2
									HIGH	2694	10.5	80%	10.0
460-3-60	414	506	6.3	55	6.2	41	325	0.8	STD	1448	2.7	80%	2.6
									MED	2120	2.7	80%	2.6
									HIGH	2694	4.6	80%	4.4
575-3-60	518	633	6.0	41	4.8	33	325	0.6	STD	1379	2.5	80%	2.4
									MED	1390	2.1	80%	2.0
									HIGH	3775	2.9	81%	2.8

## Table 33 – RAS121, 10 TONS – 1 Stage Cooling

V-Ph-Hz	VOLTAGE RANGE		COMP (ea)		OFM (ea)		IFM				
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	Max WATTS	Max AMP Draw	EFF at Full Load	FLA
208-3-60	187	253	30.1	225	325	1.5	Std Static	2120	5.5	80%	5.2
							Med Static	3775	10.5	81%	10.0
							High Static	4400	15.0	81%	15.0
230-3-60	187	253	30.1	225	325	1.5	Std Static	2120	5.5	80%	5.2
							Med Static	3775	10.5	81%	10.0
							High Static	4400	15.0	81%	15.0
460-3-60	414	506	16.7	114	325	0.8	Std Static	2120	2.7	80%	2.6
							Med Static	3775	4.6	81%	4.4
							High Static	4400	7.4	81%	7.4
575-3-60	518	633	12.2	80	325	0.6	Std Static	1390	2.1	80%	2.0
							Med Static	3775	2.9	81%	2.8
							High Static	4400	5.9	81%	5.6



# ELECTRICAL INFORMATION (cont.)

## Table 34 – RAS120, 10 TONS – 2 Stage Cooling

V-Ph-Hz	VOLTAGE RANGE		COMP (Cir 1)		COMP (Cir 2)		OFM (ea)		IFM				
			RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	Max WATTS	Max AMP Draw	EFF at Full Load	FLA
	MIN	MAX											
208-3-60	187	253	15.6	110	15.9	110	325	1.5	STD	2120	5.5	80%	5.2
									MED	3775	10.5	81%	10.0
									HIGH	4400	15.0	81%	15.0
230-3-60	187	253	15.6	110	15.9	110	325	1.5	STD	2120	5.5	80%	5.2
									MED	3775	10.5	81%	10.0
									HIGH	4400	15.0	81%	15.0
460-3-60	414	506	7.7	52	7.7	52	325	0.8	STD	2120	2.7	80%	2.6
									MED	3775	4.6	81%	4.4
									HIGH	4400	7.4	81%	7.4
575-3-60	518	633	5.8	39	5.7	39	325	0.6	STD	1390	2.1	80%	2.0
									MED	3775	2.9	81%	2.8
									HIGH	4400	5.9	81%	5.6

## Table 35 – RAS150, 12.5 TONS – 2 Stage Cooling

V-Ph-Hz	VOLTAGE RANGE		COMP (Cir 1)		COMP (Cir 2)		OFM (ea)		IFM				
			RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	Max WATTS	Max AMP Draw	EFF at Full Load	FLA
	MIN	MAX											
208-3-60	187	253	19.0	123	22.4	149	1288	6.2	STD	2615	7.9	81%	7.5
									MED	3775	10.5	81%	10.0
									HIGH	4400	15.0	81%	15.0
230-3-60	187	253	19.0	123	22.4	149	1288	6.2	STD	2615	7.9	81%	7.5
									MED	3775	10.5	81%	10.0
									HIGH	4400	15.0	81%	15.0
460-3-60	414	506	9.7	62	10.6	75	1288	3.1	STD	2615	3.6	81%	3.4
									MED	3775	4.6	81%	4.4
									HIGH	4400	7.4	81%	7.4
575-3-60	518	633	7.4	50	7.7	54	1288	2.5	STD	3775	2.9	81%	2.8
									MED	3775	2.9	81%	2.8
									HIGH	4400	5.9	81%	5.6

**Table 36 – MCA/MOCP DETERMINATION NO C.O. OR UNPWRD C.O.**

UNIT	NOM. V- PH- HZ	IFM TYPE	ELECTRIC HEATER		NO C.O. or UNPWR C.O.							
			Nom* (kW)	FLA	NO P.E.				w/ P.E. (pwrd fr/unit)			
					MCA	MOCP	DISC. SIZE		MCA	MOCP	DISC. SIZE	
							FLA	LRA			FLA	LRA
RAS072	208/230-3-60	STD	None	None	30.5	45	30	157	32.4	50	32	159
			4.9/6.5	13.6/15.6	30.5/30.5	45/45	30/30	157/157	32.4/32.4	50/50	32/32	159/159
			7.9/10.5	21.9/25.3	33.9/38.1	45/45	31/35	157/157	36.3/40.5	50/50	33/37	159/159
			12.0/16.0	33.4/38.5	48.3/54.6	50/60	44/50	157/157	50.6/57.0	60/60	47/52	159/159
			15.8/21.0	43.8/50.5	61.3/69.6	70/70	56/64	157/157	63.6/72.0	70/80	59/66	159/159
		19.9/26.5	55.2/63.8	75.5/86.3	80/90	69/79	157/157	77.9/88.6	80/90	72/82	159/159	
		MED	None	None	32.8	50	32	183	34.7	50	34	185
			4.9/6.5	13.6/15.6	32.8/32.8	50/50	32/32	183/183	34.7/34.7	50/50	34/34	185/185
			7.9/10.5	21.9/25.3	36.8/41.0	50/50	34/38	183/183	39.1/43.4	50/50	36/40	185/185
	12.0/16.0		33.4/38.5	51.1/57.5	60/60	47/53	183/183	53.5/59.9	60/60	49/55	185/185	
	15.8/21.0		43.8/50.5	64.1/72.5	70/80	59/67	183/183	66.5/74.9	70/80	61/69	185/185	
	19.9/26.5	55.2/63.8	78.4/89.1	80/90	72/82	183/183	80.8/91.5	90/100	74/84	185/185		
	HIGH	None	None	32.8	50	32	183	34.7	50	34	185	
		4.9/6.5	13.6/15.6	32.8/32.8	50/50	32/32	183/183	34.7/34.7	50/50	34/34	185/185	
		7.9/10.5	21.9/25.3	36.8/41.0	50/50	34/38	183/183	39.1/43.4	50/50	36/40	185/185	
		12.0/16.0	33.4/38.5	51.1/57.5	60/60	47/53	183/183	53.5/59.9	60/60	49/55	185/185	
		15.8/21.0	43.8/50.5	64.1/72.5	70/80	59/67	183/183	66.5/74.9	70/80	61/69	185/185	
	19.9/26.5	55.2/63.8	78.4/89.1	80/90	72/82	183/183	80.8/91.5	90/100	74/84	185/185		
	460-3-60	STD	None	None	15.5	25	15	79	16.5	25	16	80
			6.0	7.2	15.5	25	15	79	16.5	25	16	80
			11.5	13.8	20.5	25	19	79	21.8	25	20	80
			14.0	16.8	24.3	25	22	79	25.5	30	23	80
			23.0	27.7	37.9	40	35	79	39.1	40	36	80
		25.5	30.7	41.6	45	38	79	42.9	45	39	80	
MED		None	None	16.3	25	16	92	17.3	25	17	93	
		6.0	7.2	16.3	25	16	92	17.3	25	17	93	
		11.5	13.8	21.5	25	20	92	22.8	25	21	93	
		14.0	16.8	25.3	30	23	92	26.5	30	24	93	
		23.0	27.7	38.9	40	36	92	40.1	45	37	93	
25.5		30.7	42.6	45	39	92	43.9	45	40	93		
HIGH		None	None	17.3	25	17	101	18.3	25	18	102	
		6.0	7.2	17.3	25	17	101	18.3	25	18	102	
		11.5	13.8	22.8	25	21	101	24.0	25	22	102	
	14.0	16.8	26.5	30	24	101	27.8	30	26	102		
	23.0	27.7	40.1	45	37	101	41.4	45	38	102		
25.5	30.7	43.9	45	40	101	45.1	50	42	102			
575-3-60	STD	None	None	11.9	15	12	63	13.8	20	14	65	
	MED	None	None	12.7	20	12	74	14.6	20	15	76	
	HIGH	None	None	12.7	20	12	74	14.6	20	15	76	

\* Nominal valves, listed as 208/240V, 480V or 600V as appropriate. See Legend and calculations on page 58.

**Table 36 (cont.) MCA/MOCP DETERMINATION NO C.O. OR UNPWRD C.O.**

UNIT	NOM. V—PH—HZ	IFM TYPE	ELECTRIC HEATER		NO C.O. or UNPWR C.O.							
			Nom* (kW)	FLA	NO P.E.				w/ P.E. (pwrd fr/unit)			
					MCA	MOCP	DISC. SIZE		MCA	MOCP	DISC. SIZE	
							FLA	LRA			FLA	LRA
RAS091	208/230—3—60	STD	None	None	39.5	60	38	191	43.3	60	43	195
			7.8/10.4	21.7/25.0	39.5/39.5	60/60	38/38	191/191	43.3/43.3	60/60	43/43	195/195
			12.0/16.0	33.4/38.5	48.3/54.6	60/60	44/50	191/191	53.0/59.4	60/60	49/55	195/195
			18.6/24.8	51.7/59.7	71.1/81.1	80/90	65/75	191/191	75.9/85.9	80/90	70/79	195/195
			24.0/32.0	66.7/77.0	89.9/102.8	90/110	83/95	191/191	94.6/107.5	100/110	87/99	195/195
		31.8/42.4	88.4/102.0	117.0/134.0	125/150	108/123	191/191	121.8/138.8	125/150	112/128	195/195	
		MED	None	None	41.8	60	41	228	45.6	60	45	232
			7.8/10.4	21.7/25.0	41.8/41.8	60/60	41/41	228/228	45.6/45.6	60/60	45/45	232/232
			12.0/16.0	33.4/38.5	51.1/57.5	60/60	47/53	228/228	55.9/62.3	60/70	51/57	232/232
	18.6/24.8		51.7/59.7	74.0/84.0	80/90	68/77	228/228	78.8/88.8	80/90	72/82	232/232	
	24.0/32.0		66.7/77.0	92.8/105.6	100/110	85/97	228/228	97.5/110.4	100/125	90/102	232/232	
	31.8/42.4	88.4/102.0	119.9/136.9	125/150	110/126	228/228	124.6/141.6	125/150	115/130	232/232		
	HIGH	None	None	49.3	60	49	254	53.1	60	54	258	
		7.8/10.4	21.7/25.0	49.3/50.0	60/60	49/49	254/254	53.1/54.8	60/60	54/54	258/258	
		12.0/16.0	33.4/38.5	60.5/66.9	70/70	56/62	254/254	65.3/71.6	70/80	60/66	258/258	
		18.6/24.8	51.7/59.7	83.4/93.4	90/100	77/86	254/254	88.1/98.1	90/100	81/90	258/258	
		24.0/32.0	66.7/77.0	102.1/115.0	110/125	94/106	254/254	106.9/119.8	110/125	98/110	258/258	
	31.8/42.4	88.4/102.0	129.3/146.3	150/150	119/135	254/254	134.0/151.0	150/175	123/139	258/258		
	460—3—60	STD	None	None	19.5	30	19	113	21.3	30	21	115
			13.9	16.7	24.1	30	22	113	26.4	30	24	115
			16.5	19.8	28.0	30	26	113	30.3	35	28	115
			27.8	33.4	45.0	50	41	113	47.3	50	43	115
			33.0	39.7	52.9	60	49	113	55.1	60	51	115
		41.7	50.2	66.0	70	61	113	68.3	70	63	115	
MED		None	None	20.3	30	20	132	22.1	30	22	134	
		13.9	16.7	25.1	30	23	132	27.4	30	25	134	
		16.5	19.8	29.0	30	27	132	31.3	35	29	134	
		27.8	33.4	46.0	50	42	132	48.3	50	44	134	
		33.0	39.7	53.9	60	50	132	56.1	60	52	134	
41.7		50.2	67.0	70	62	132	69.3	70	64	134		
HIGH		None	None	24.3	30	24	145	26.1	30	26	147	
		13.9	16.7	30.1	35	28	145	32.4	35	30	147	
		16.5	19.8	34.0	35	31	145	36.3	40	33	147	
	27.8	33.4	51.0	60	47	145	53.3	60	49	147		
	33.0	39.7	58.9	60	54	145	61.1	70	56	147		
41.7	50.2	72.0	80	66	145	74.3	80	68	147			
575—3—60	STD	None	None	14.9	20	14	89	18.7	25	19	93	
		17.0	20.4	28.5	30	26	89	33.3	35	31	93	
		34.0	40.9	54.1	60	50	89	58.9	60	54	93	
	MED	None	None	15.3	20	15	104	19.1	25	19	108	
		17.0	20.4	29.0	30	27	104	33.8	35	31	108	
		34.0	40.9	54.6	60	50	104	59.4	60	55	108	
	HIGH	None	None	18.1	25	18	118	21.9	30	23	122	
		17.0	20.4	32.5	35	30	118	37.3	40	34	122	
		34.0	40.9	58.1	60	53	118	62.9	70	58	122	

\* Nominal valves, listed as 208/240V, 480V or 600V as appropriate.  
See Legend and calculations on page 58.

**Table 36 (cont.) MCA/MOCP DETERMINATION NO C.O. OR UNPWRD C.O.**

UNIT	NOM. V—PH—HZ	IFM TYPE	ELECTRIC HEATER		NO C.O. or UNPWR C.O.							
			Nom* (kW)	FLA	NO P.E.		w/ P.E. (pwrd fr/unit)					
					MCA	MOCP	DISC. SIZE		MCA	MOCP	DISC. SIZE	
							FLA	LRA			FLA	LRA
RAS090	208/230—3—60	STD	—	—	38.8	50	41	193	42.6	50	45	197
			7.8/10.4	21.7/25.0	38.8/38.8	50/50	41/41	193/193	42.6/42.6	50/50	45/45	197/197
			12.0/16.0	33.4/38.5	48.3/54.6	50/60	44/50	193/193	53.0/59.4	60/60	49/55	197/197
			18.6/24.8	51.7/59.7	71.1/81.1	80/90	65/75	193/193	75.9/85.9	80/90	70/79	197/197
			24.0/32.0	66.7/77.0	89.9/102.8	90/110	83/95	193/193	94.6/107.5	100/110	87/99	197/197
		31.8/42.4	88.4/102.0	117.0/134.0	125/150	108/123	193/193	121.8/138.8	125/150	112/128	197/197	
		MED	—	—	41.1	50	43	230	44.9	50	48	234
			7.8/10.4	21.7/25.0	41.1/41.1	50/50	43/43	230/230	44.9/45.4	50/50	48/48	234/234
			12.0/16.0	33.4/38.5	51.1/57.5	60/60	47/53	230/230	55.9/62.3	60/70	51/57	234/234
	18.6/24.8		51.7/59.7	74.0/84.0	80/90	68/77	230/230	78.8/88.8	80/90	72/82	234/234	
	24.0/32.0		66.7/77.0	92.8/105.6	100/110	85/97	230/230	97.5/110.4	100/125	90/102	234/234	
	31.8/42.4	88.4/102.0	119.9/136.9	125/150	110/126	230/230	124.6/141.6	125/150	115/130	234/234		
	HIGH	—	—	49.0	60	52	256	52.8	60	56	260	
		7.8/10.4	21.7/25.0	49.0/50.0	60/60	52/52	256/256	52.8/54.8	60/60	56/56	260/260	
		12.0/16.0	33.4/38.5	60.5/66.9	70/70	56/62	256/256	65.3/71.6	70/80	60/66	260/260	
		18.6/24.8	51.7/59.7	83.4/93.4	90/100	77/86	256/256	88.1/98.1	90/100	81/90	260/260	
		24.0/32.0	66.7/77.0	102.1/115.0	110/125	94/106	256/256	106.9/119.8	110/125	98/110	260/260	
	31.8/42.4	88.4/102.0	129.3/146.3	150/150	119/135	256/256	134.0/151.0	150/175	123/139	260/260		
	460—3—60	STD	—	—	17.9	20	19	95	19.7	25	21	97
			13.9	16.7	24.1	25	22	95	26.4	30	24	97
			16.5	19.8	28.0	30	26	95	30.3	35	28	97
			27.8	33.4	45.0	50	41	95	47.3	50	43	97
			33.0	39.7	52.9	60	49	95	55.1	60	51	97
		41.7	50.2	66.0	70	61	95	68.3	70	63	97	
MED		—	—	18.7	25	20	114	20.5	25	22	116	
		13.9	16.7	25.1	30	23	114	27.4	30	25	116	
		16.5	19.8	29.0	30	27	114	31.3	35	29	116	
		27.8	33.4	46.0	50	42	114	48.3	50	44	116	
		33.0	39.7	53.9	60	50	114	56.1	60	52	116	
41.7		50.2	67.0	70	62	114	69.3	70	64	116		
HIGH		—	—	23.1	30	24	127	24.9	30	26	129	
		13.9	16.7	30.1	35	28	127	32.4	35	30	129	
		16.5	19.8	34.0	35	31	127	36.3	40	33	129	
	27.8	33.4	51.0	60	47	127	53.3	60	49	129		
	33.0	39.7	58.9	60	54	127	61.1	70	56	129		
41.7	50.2	72.0	80	66	127	74.3	80	68	129			
575—3—60	STD	—	—	13.1	15	14	77	16.9	20	18	81	
		17.0	20.4	28.5	30	26	77	33.3	35	31	81	
		34.0	40.9	54.1	60	50	77	58.9	60	54	81	
	MED	—	—	13.5	15	14	92	17.3	20	19	96	
		17.0	20.4	29.0	30	27	92	33.8	35	31	96	
		34.0	40.9	54.6	60	50	92	59.4	60	55	96	
	HIGH	—	—	16.6	20	17	106	20.4	25	22	110	
		17.0	20.4	32.5	35	30	106	37.3	40	34	110	
		34.0	40.9	58.1	60	53	106	62.9	70	58	110	

\* Nominal valves, listed as 208/240V, 480V or 600V as appropriate.  
See Legend and calculations on page 58.

**Table 36 (cont.) MCA/MOCP DETERMINATION NO C.O. OR UNPWRD C.O.**

UNIT	NOM. V-PH-HZ	IFM TYPE	ELECTRIC HEATER		NO C.O. or UNPWR C.O.							
			Nom* (kW)	FLA	NO P.E.				w/ P.E. (pwrd fr/unit)			
					MCA	MOCP	DISC. SIZE		MCA	MOCP	DISC. SIZE	
							FLA	LRA			FLA	LRA
RAS101	208/230-3-60	STD	None	None	45.1	60	43	222	48.9	60	48	226
			7.8/10.4	21.7/25.0	45.1/45.1	60/60	43/43	222/222	48.9/48.9	60/60	48/48	226/226
			12.0/16.0	33.4/38.5	48.3/54.6	60/60	44/50	222/222	53.0/59.4	60/60	49/55	226/226
			18.6/24.8	51.7/59.7	71.1/81.1	80/90	65/75	222/222	75.9/85.9	80/90	70/79	226/226
			24.0/32.0	66.7/77.0	89.9/102.8	90/110	83/95	222/222	94.6/107.5	100/110	87/99	226/226
			31.8/42.4	88.4/102.0	117.0/134.0	125/150	108/123	222/222	121.8/138.8	125/150	112/128	226/226
		MED	None	None	45.1	60	43	233	48.9	60	48	237
			7.8/10.4	21.7/25.0	45.1/45.1	60/60	43/43	233/233	48.9/48.9	60/60	48/48	237/237
			12.0/16.0	33.4/38.5	48.3/54.6	60/60	44/50	233/233	53.0/59.4	60/60	49/55	237/237
	18.6/24.8		51.7/59.7	71.1/81.1	80/90	65/75	233/233	75.9/85.9	80/90	70/79	237/237	
	24.0/32.0		66.7/77.0	89.9/102.8	90/110	83/95	233/233	94.6/107.5	100/110	87/99	237/237	
	31.8/42.4		88.4/102.0	117.0/134.0	125/150	108/123	233/233	121.8/138.8	125/150	112/128	237/237	
	HIGH	None	None	49.9	60	49	276	53.7	80	53	280	
		7.8/10.4	21.7/25.0	49.9/49.9	60/60	49/49	276/276	53.7/53.7	80/80	53/53	280/280	
		12.0/16.0	33.4/38.5	54.3/60.6	60/70	50/56	276/276	59.0/65.4	80/80	54/60	280/280	
		18.6/24.8	51.7/59.7	77.1/87.1	80/90	71/80	276/276	81.9/91.9	90/100	75/85	280/280	
		24.0/32.0	66.7/77.0	95.9/108.8	100/110	88/100	276/276	100.6/113.5	110/125	93/104	280/280	
		31.8/42.4	88.4/102.0	123.0/140.0	125/150	113/129	276/276	127.8/144.8	150/150	118/133	280/280	
	460-3-60	STD	None	None	22.6	30	22	108	24.4	30	24	110
			13.9	16.7	24.1	30	22	108	26.4	30	24	110
			16.5	19.8	28.0	30	26	108	30.3	35	28	110
			27.8	33.4	45.0	50	41	108	47.3	50	43	110
			33.0	39.7	52.9	60	49	108	55.1	60	51	110
			41.7	50.2	66.0	70	61	108	68.3	70	63	110
MED		None	None	22.6	30	22	114	24.4	30	24	116	
		13.9	16.7	24.1	30	22	114	26.4	30	24	116	
		16.5	19.8	28.0	30	26	114	30.3	35	28	116	
		27.8	33.4	45.0	50	41	114	47.3	50	43	116	
		33.0	39.7	52.9	60	49	114	55.1	60	51	116	
		41.7	50.2	66.0	70	61	114	68.3	70	63	116	
HIGH		None	None	24.4	30	24	136	26.2	30	26	138	
		13.9	16.7	26.4	30	24	136	28.6	30	26	138	
		16.5	19.8	30.3	35	28	136	32.5	40	30	138	
		27.8	33.4	47.3	50	43	136	49.5	50	46	138	
		33.0	39.7	55.1	60	51	136	57.4	60	53	138	
		41.7	50.2	68.3	70	63	136	70.5	80	65	138	
575-3-60	STD	None	None	18.9	30	18	91	22.7	30	23	95	
		17.0	20.4	28.5	30	26	91	33.3	35	31	95	
		34.0	40.9	54.1	60	50	91	58.9	60	54	95	
	MED	None	None	18.5	30	18	95	22.3	30	22	99	
		17.0	20.4	28.0	30	26	95	32.8	35	30	99	
		34.0	40.9	53.6	60	49	95	58.4	60	54	99	
	HIGH	None	None	19.3	30	19	106	23.1	30	23	110	
		17.0	20.4	29.0	30	27	106	33.8	35	31	110	
		34.0	40.9	54.6	60	50	106	59.4	60	55	110	

\* Nominal valves, listed as 208/240V, 480V or 600V as appropriate.  
See Legend and calculations on page 58.

**Table 36 (cont.) MCA/MOCP DETERMINATION NO C.O. OR UNPWRD C.O.**

UNIT	NOM. V—PH—HZ	IFM TYPE	ELECTRIC HEATER		NO C.O. or UNPWR C.O.							
			Nom (kW)	FLA	NO P.E.				w/ P.E. (pwrd fr/unit)			
					MCA	MOCP	DISC. SIZE		MCA	MOCP	DISC. SIZE	
							FLA	LRA			FLA	LRA
RAS102	208/230—3—60	STD	—	—	40.0	50	42	208	43.8	50	46	212
			7.8/10.4	21.7/25.0	40.0/40.0	50/50	42/42	208/208	43.8/43.8	50/50	46/46	212/212
			12.0/16.0	33.4/38.5	48.3/54.6	50/60	44/50	208/208	53.0/59.4	60/60	49/55	212/212
			18.6/24.8	51.7/59.7	71.1/81.1	80/90	65/75	208/208	75.9/85.9	80/90	70/79	212/212
			24.0/32.0	66.7/77.0	89.9/102.8	90/110	83/95	208/208	94.6/107.5	100/110	87/99	212/212
		31.8/42.4	88.4/102.0	117.0/134.0	125/150	108/123	208/208	121.8/138.8	125/150	112/128	212/212	
		MED	—	—	40.0	50	42	219	43.8	50	46	223
			7.8/10.4	21.7/25.0	40.0/40.0	50/50	42/42	219/219	43.8/43.8	50/50	46/46	223/223
			12.0/16.0	33.4/38.5	48.3/54.6	50/60	44/50	219/219	53.0/59.4	60/60	49/55	223/223
	18.6/24.8		51.7/59.7	71.1/81.1	80/90	65/75	219/219	75.9/85.9	80/90	70/79	223/223	
	24.0/32.0		66.7/77.0	89.9/102.8	90/110	83/95	219/219	94.6/107.5	100/110	87/99	223/223	
	31.8/42.4	88.4/102.0	117.0/134.0	125/150	108/123	219/219	121.8/138.8	125/150	112/128	223/223		
	HIGH	—	—	44.8	50	47	262	48.6	60	52	266	
		7.8/10.4	21.7/25.0	44.8/44.8	50/50	47/47	262/262	48.6/48.6	60/60	52/52	266/266	
		12.0/16.0	33.4/38.5	54.3/60.6	60/70	50/56	262/262	59.0/65.4	60/70	54/60	266/266	
		18.6/24.8	51.7/59.7	77.1/87.1	80/90	71/80	262/262	81.9/91.9	90/100	75/85	266/266	
		24.0/32.0	66.7/77.0	95.9/108.8	100/110	88/100	262/262	100.6/113.5	110/125	93/104	266/266	
	31.8/42.4	88.4/102.0	123.0/140.0	125/150	113/129	262/262	127.8/144.8	150/150	118/133	266/266		
	460—3—60	STD	—	—	18.3	20	19	109	20.1	25	21	111
			13.9	16.7	24.1	25	22	109	26.4	30	24	111
			16.5	19.8	28.0	30	26	109	30.3	35	28	111
			27.8	33.4	45.0	50	41	109	47.3	50	43	111
			33.0	39.7	52.9	60	49	109	55.1	60	51	111
		41.7	50.2	66.0	70	61	109	68.3	70	63	111	
MED		—	—	18.3	20	19	115	20.1	25	21	117	
		13.9	16.7	24.1	25	22	115	26.4	30	24	117	
		16.5	19.8	28.0	30	26	115	30.3	35	28	117	
		27.8	33.4	45.0	50	41	115	47.3	50	43	117	
		33.0	39.7	52.9	60	49	115	55.1	60	51	117	
41.7		50.2	66.0	70	61	115	68.3	70	63	117		
HIGH		—	—	20.1	25	21	137	21.9	25	23	139	
		13.9	16.7	26.4	30	24	137	28.6	30	26	139	
		16.5	19.8	30.3	35	28	137	32.5	35	30	139	
	27.8	33.4	47.3	50	43	137	49.5	50	46	139		
	33.0	39.7	55.1	60	51	137	57.4	60	53	139		
41.7	50.2	68.3	70	63	137	70.5	80	65	139			
575—3—60	STD	—	—	15.9	20	17	85	19.7	25	21	89	
		17.0	20.4	28.5	30	26	85	33.3	35	31	89	
		34.0	40.9	54.1	60	50	85	58.9	60	54	89	
	MED	—	—	15.5	20	16	89	19.3	25	20	93	
		17.0	20.4	28.0	30	26	89	32.8	35	30	93	
		34.0	40.9	53.6	60	49	89	58.4	60	54	93	
	HIGH	—	—	16.3	20	17	100	20.1	25	21	104	
		17.0	20.4	29.0	30	27	100	33.8	35	31	104	
		34.0	40.9	54.6	60	50	100	59.4	60	55	104	

\* Nominal valves, listed as 208/240V, 480V or 600V as appropriate.  
See Legend and calculations on page 58.

**Table 36 (cont.) MCA/MOCP DETERMINATION NO C.O. OR UNPWRD C.O.**

UNIT	NOM. V-PH-HZ	IFM TYPE	ELECTRIC HEATER		NO C.O. or UNPWR C.O.							
			Nom* (kW)	FLA	NO P.E.				w/ P.E. (pwrd fr/unit)			
					MCA	MOCP	DISC. SIZE		MCA	MOCP	DISC. SIZE	
							FLA	LRA			FLA	LRA
RAS121	208/230-3-60	STD	None	None	45.8	60	44	263	49.6	60	48	267
			7.8/10.4	21.7/25.0	45.8/45.8	60/60	44/44	263/263	49.6/49.6	60/60	48/48	267/267
			12.0/16.0	33.4/38.5	48.3/54.6	60/60	44/50	263/263	53.0/59.4	60/60	49/55	267/267
			24.0/32.0	66.7/77.0	89.9/102.8	90/110	83/95	263/263	94.6/107.5	100/110	87/99	267/267
			31.8/42.4	88.4/102.0	117.0/134.0	125/150	108/123	263/263	121.8/138.8	125/150	112/128	267/267
		37.6/50.0	104.2/120.3	136.8/126.8	150/150	126/144	263/263	141.5/131.6	150/150	130/149	267/267	
		MED	None	None	50.6	60	50	306	54.4	80	54	310
			7.8/10.4	21.7/25.0	50.6/50.6	60/60	50/50	306/306	54.4/54.4	80/80	54/54	310/310
			12.0/16.0	33.4/38.5	54.3/60.6	60/80	50/56	306/306	59.0/65.4	80/80	54/60	310/310
	24.0/32.0		66.7/77.0	95.9/108.8	100/110	88/100	306/306	100.6/113.5	110/125	93/104	310/310	
	31.8/42.4		88.4/102.0	123.0/140.0	125/150	113/129	306/306	127.8/144.8	150/150	118/133	310/310	
	37.6/50.0	104.2/120.3	142.8/132.8	150/150	131/150	306/306	147.5/137.6	150/150	136/154	310/310		
	HIGH	None	None	55.6	80	55	315	59.4	80	60	319	
		7.8/10.4	21.7/25.0	55.6/55.6	80/80	55/55	315/315	59.4/59.4	80/80	60/60	319/319	
		12.0/16.0	33.4/38.5	60.5/66.9	80/80	56/62	315/315	65.3/71.6	80/80	60/66	319/319	
		24.0/32.0	66.7/77.0	102.1/115.0	110/125	94/106	315/315	106.9/119.8	110/125	98/110	319/319	
		31.8/42.4	88.4/102.0	129.3/146.3	150/150	119/135	315/315	134.0/151.0	150/175	123/139	319/319	
	37.6/50.0	104.2/120.3	149.0/139.1	150/175	137/156	315/315	153.8/143.8	175/175	141/160	319/319		
	460-3-60	STD	None	None	25.1	30	24	133	26.9	40	26	135
			13.9	16.7	25.1	30	24	133	26.9	40	26	135
			16.5	19.8	28.0	30	26	133	30.3	40	28	135
			33.0	39.7	52.9	60	49	133	55.1	60	51	135
			41.7	50.2	66.0	70	61	133	68.3	70	63	135
		50.0	60.1	63.4	70	72	133	65.6	70	74	135	
MED		None	None	26.9	40	26	155	28.7	45	28	157	
		13.9	16.7	26.9	40	26	155	28.7	45	28	157	
		16.5	19.8	30.3	40	28	155	32.5	45	30	157	
		33.0	39.7	55.1	60	51	155	57.4	60	53	157	
		41.7	50.2	68.3	70	63	155	70.5	80	65	157	
50.0		60.1	65.6	80	74	155	67.9	80	76	157		
HIGH		None	None	29.9	45	30	159	31.7	45	32	161	
		13.9	16.7	30.1	45	30	159	32.4	45	32	161	
		16.5	19.8	34.0	45	31	159	36.3	45	33	161	
	33.0	39.7	58.9	60	54	159	61.1	70	56	161		
	41.7	50.2	72.0	80	66	159	74.3	80	68	161		
50.0	60.1	69.4	80	78	159	71.6	80	80	161			
575-3-60	STD	None	None	18.5	30	18	95	22.3	30	22	99	
		17.0	20.4	28.0	30	26	95	32.8	35	30	99	
		34.0	40.9	53.6	60	49	95	58.4	60	54	99	
	MED	None	None	19.3	30	19	106	23.1	30	23	110	
		17.0	20.4	29.0	30	27	106	33.8	35	31	110	
		34.0	40.9	54.6	60	50	106	59.4	60	55	110	
	HIGH	None	None	22.1	30	22	120	25.9	30	26	124	
		17.0	20.4	32.5	35	30	120	37.3	40	34	124	
		34.0	40.9	58.1	60	53	120	62.9	70	58	124	
51.0	61.3	68.3	80	77	120	73.1	80	81	124			

\* Nominal valves, listed as 208/240V, 480V or 600V as appropriate. See Legend and calculations on page 58.

**Table 36 (cont.) MCA/MOCP DETERMINATION NO C.O. OR UNPWRD C.O.**

UNIT	NOM. V-PH-HZ	IFM TYPE	ELECTRIC HEATER		NO C.O. or UNPWR C.O.							
			Nom* (kW)	FLA	NO P.E.				w/ P.E. (pwrd fr/unit)			
					MCA	MOCP	DISC. SIZE		MCA	MOCP	DISC. SIZE	
							FLA	LRA			FLA	LRA
RAS120	208/230-3-60	STD	-	-	43.7	50	46	258	47.5	60	50	262
			7.8/10.4	21.7/25.0	43.7/43.7	50/50	46/46	258/258	47.5/47.5	60/60	50/50	262/262
			12.0/16.0	33.4/38.5	48.3/54.6	50/60	46/50	258/258	53.0/59.4	60/60	50/55	262/262
			24.0/32.0	66.7/77.0	89.9/102.8	90/110	83/95	258/258	94.6/107.5	100/110	87/99	262/262
			31.8/42.4	88.4/102.0	117.0/134.0	125/150	108/123	258/258	121.8/138.8	125/150	112/128	262/262
		37.6/50.0	104.2/120.3	136.8/126.8	150/150	126/144	258/258	141.5/131.6	150/150	130/149	262/262	
		MED	-	-	48.5	60	51	301	52.3	60	56	305
			7.8/10.4	21.7/25.0	48.5/48.5	60/60	51/51	301/301	52.3/52.3	60/60	56/56	305/305
			12.0/16.0	33.4/38.5	54.3/60.6	60/70	51/56	301/301	59.0/65.4	60/70	56/60	305/305
	24.0/32.0		66.7/77.0	95.9/108.8	100/110	88/100	301/301	100.6/113.5	110/125	93/104	305/305	
	31.8/42.4		88.4/102.0	123.0/140.0	125/150	113/129	301/301	127.8/144.8	150/150	118/133	305/305	
	37.6/50.0	104.2/120.3	142.8/132.8	150/150	131/150	301/301	147.5/137.6	150/150	136/154	305/305		
	HIGH	-	-	53.5	60	57	310	57.3	70	61	314	
		7.8/10.4	21.7/25.0	53.5/53.5	60/60	57/57	310/310	57.3/57.3	70/70	61/61	314/314	
		12.0/16.0	33.4/38.5	60.5/66.9	70/70	57/62	310/310	65.3/71.6	70/80	61/66	314/314	
		24.0/32.0	66.7/77.0	102.1/115.0	110/125	94/106	310/310	106.9/119.8	110/125	98/110	314/314	
		31.8/42.4	88.4/102.0	129.3/146.3	150/150	119/135	310/310	134.0/151.0	150/175	123/139	314/314	
	37.6/50.0	104.2/120.3	149.0/139.1	150/175	137/156	310/310	153.8/143.8	175/175	141/160	314/314		
	460-3-60	STD	-	-	21.5	25	23	123	23.3	30	25	125
			13.9	16.7	24.1	25	23	123	26.4	30	25	125
			16.5	19.8	28.0	30	26	123	30.3	35	28	125
			33.0	39.7	52.9	60	49	123	55.1	60	51	125
			41.7	50.2	66.0	70	61	123	68.3	70	63	125
		50.0	60.1	63.4	70	72	123	65.6	70	74	125	
MED		-	-	23.3	30	25	145	25.1	30	27	147	
		13.9	16.7	26.4	30	25	145	28.6	30	27	147	
		16.5	19.8	30.3	35	28	145	32.5	35	30	147	
		33.0	39.7	55.1	60	51	145	57.4	60	53	147	
		41.7	50.2	68.3	70	63	145	70.5	80	65	147	
50.0		60.1	65.6	80	74	145	67.9	80	76	147		
HIGH		-	-	26.3	30	28	149	28.1	35	30	151	
		13.9	16.7	30.1	35	28	149	32.4	35	30	151	
		16.5	19.8	34.0	35	31	149	36.3	40	33	151	
	33.0	39.7	58.9	60	54	149	61.1	70	56	151		
	41.7	50.2	72.0	80	66	149	74.3	80	68	151		
50.0	60.1	69.4	80	78	149	71.6	80	80	151			
575-3-60	STD	-	-	16.2	20	17	93	20.0	25	21	97	
		17.0	20.4	28.0	30	26	93	32.8	35	30	97	
		34.0	40.9	53.6	60	49	93	58.4	60	54	97	
	51.0	61.3	63.8	70	73	93	68.6	80	77	97		
	MED	-	-	17.0	20	18	104	20.8	25	22	108	
		17.0	20.4	29.0	30	27	104	33.8	35	31	108	
		34.0	40.9	54.6	60	50	104	59.4	60	55	108	
	51.0	61.3	64.8	70	74	104	69.6	80	78	108		
	HIGH	-	-	19.8	25	21	118	23.6	30	25	122	
17.0		20.4	32.5	35	30	118	37.3	40	34	122		
34.0		40.9	58.1	60	53	118	62.9	70	58	122		
51.0	61.3	68.3	80	77	118	73.1	80	81	122			

\* Nominal valves, listed as 208/240V, 480V or 600V as appropriate. See Legend and calculations on page 58.



**Table 36 (cont.) MCA/MOCP DETERMINATION NO C.O. OR UNPWRD C.O.**

UNIT	NOM. V-PH-HZ	IFM TYPE	ELECTRIC HEATER		NO C.O. or UNPWR C.O.							
			Nom* (kW)	FLA	NO P.E.				w/ P.E. (pwrd fr/unit)			
					MCA	MOCP	DISC. SIZE		MCA	MOCP	DISC. SIZE	
							FLA	LRA			FLA	LRA
RAS150	208/230-3-60	STD	-	-	60.7	80	63	360	64.5	80	68	364
			7.8/10.4	21.7/25.0	60.7/60.7	80/80	63/63	360/360	64.5/64.5	80/80	68/68	364/364
			12.0/16.0	33.4/38.5	60.7/60.7	80/80	63/63	360/360	64.5/64.5	80/80	68/68	364/364
			24.0/32.0	66.7/77.0	92.8/105.6	100/110	85/97	360/360	97.5/110.4	100/125	90/102	364/364
			31.8/42.4	88.4/102.0	119.9/136.9	125/150	110/126	360/360	124.6/141.6	125/150	115/130	364/364
		37.6/50.0	104.2/120.3	139.6/129.7	150/150	128/147	360/360	144.4/134.4	150/150	133/151	364/364	
		MED	-	-	63.2	80	66	377	67.0	80	71	381
			7.8/10.4	21.7/25.0	63.2/63.2	80/80	66/66	377/377	67.0/67.0	80/80	71/71	381/381
			12.0/16.0	33.4/38.5	63.2/63.2	80/80	66/66	377/377	67.0/67.0	80/80	71/71	381/381
	24.0/32.0		66.7/77.0	95.9/108.8	100/110	88/100	377/377	100.6/113.5	110/125	93/104	381/381	
	31.8/42.4		88.4/102.0	123.0/140.0	125/150	113/129	377/377	127.8/144.8	150/150	118/133	381/381	
	37.6/50.0	104.2/120.3	142.8/132.8	150/150	131/150	377/377	147.5/137.6	150/150	136/154	381/381		
	HIGH	-	-	68.2	80	72	386	72.0	80	76	390	
		7.8/10.4	21.7/25.0	68.2/68.2	80/80	72/72	386/386	72.0/72.0	80/80	76/76	390/390	
		12.0/16.0	33.4/38.5	68.2/68.2	80/80	72/72	386/386	72.0/72.0	80/80	76/76	390/390	
		24.0/32.0	66.7/77.0	102.1/115.0	110/125	94/106	386/386	106.9/119.8	110/125	98/110	390/390	
		31.8/42.4	88.4/102.0	129.3/146.3	150/150	119/135	386/386	134.0/151.0	150/175	123/139	390/390	
	37.6/50.0	104.2/120.3	149.0/139.1	150/175	137/156	386/386	153.8/143.8	175/175	141/160	390/390		
	460-3-60	STD	-	-	29.5	40	31	181	31.3	40	33	183
			13.9	16.7	29.5	40	31	181	31.3	40	33	183
			16.5	19.8	29.5	40	31	181	31.3	40	33	183
			33.0	39.7	53.9	60	50	181	56.1	60	52	183
			41.7	50.2	67.0	70	62	181	69.3	70	64	183
		50.0	60.1	64.4	70	73	181	66.6	70	75	183	
MED		-	-	30.5	40	32	190	32.3	40	34	192	
		13.9	16.7	30.5	40	32	190	32.3	40	34	192	
		16.5	19.8	30.5	40	32	190	32.5	40	34	192	
		33.0	39.7	55.1	60	51	190	57.4	60	53	192	
		41.7	50.2	68.3	70	63	190	70.5	80	65	192	
50.0		60.1	65.6	80	74	190	67.9	80	76	192		
HIGH		-	-	33.5	40	35	194	35.3	45	37	196	
		13.9	16.7	33.5	40	35	194	35.3	45	37	196	
		16.5	19.8	34.0	40	35	194	36.3	45	37	196	
	33.0	39.7	58.9	60	54	194	61.1	70	56	196		
	41.7	50.2	72.0	80	66	194	74.3	80	68	196		
50.0	60.1	69.4	80	78	194	71.6	80	80	196			
575-3-60	STD	-	-	22.3	30	23	142	26.1	30	28	146	
		17.0	20.4	29.0	30	27	142	33.8	35	31	146	
		34.0	40.9	54.6	60	50	142	59.4	60	55	146	
	51.0	61.3	64.8	70	74	142	69.6	80	78	146		
	MED	-	-	22.3	30	23	142	26.1	30	28	146	
		17.0	20.4	29.0	30	27	142	33.8	35	31	146	
		34.0	40.9	54.6	60	50	142	59.4	60	55	146	
	51.0	61.3	64.8	70	74	142	69.6	80	78	146		
	HIGH	-	-	25.1	30	27	156	28.9	35	31	160	
17.0		20.4	32.5	35	30	156	37.3	40	34	160		
34.0		40.9	58.1	60	53	156	62.9	70	58	160		
51.0	61.3	68.3	80	77	156	73.1	80	81	160			

\* Nominal valves, listed as 208/240V, 480V or 600V as appropriate. See Legend and calculations on page 58.

**Table 36 (cont.) MCA/MOCP DETERMINATION NO C.O. OR UNPWRD C.O.**

**LEGEND:**

- CO - Convenient outlet
- DISC - Disconnect
- FLA - Full load amps
- IFM - Indoor fan motor
- LRA - Locked rotor amps
- MCA - Minimum circuit amps
- MOCP - Maximum over current protection
- PE - Power exhaust
- UNPWRD CO - Unpowered convenient outlet



Example: Supply voltage is 230-3-60



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

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

Determine maximum deviation from average voltage.

(AB)  $227 - 224 = 3$  v

(BC)  $231 - 227 = 4$  v

(AC)  $227 - 226 = 1$  v

Maximum deviation is 4 v.

Determine percent of voltage imbalance.

$$\begin{aligned} \% \text{ Voltage Imbalance} &= 100 \times \frac{4}{227} \\ &= 1.76\% \end{aligned}$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

**IMPORTANT:** If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

**NOTES:**

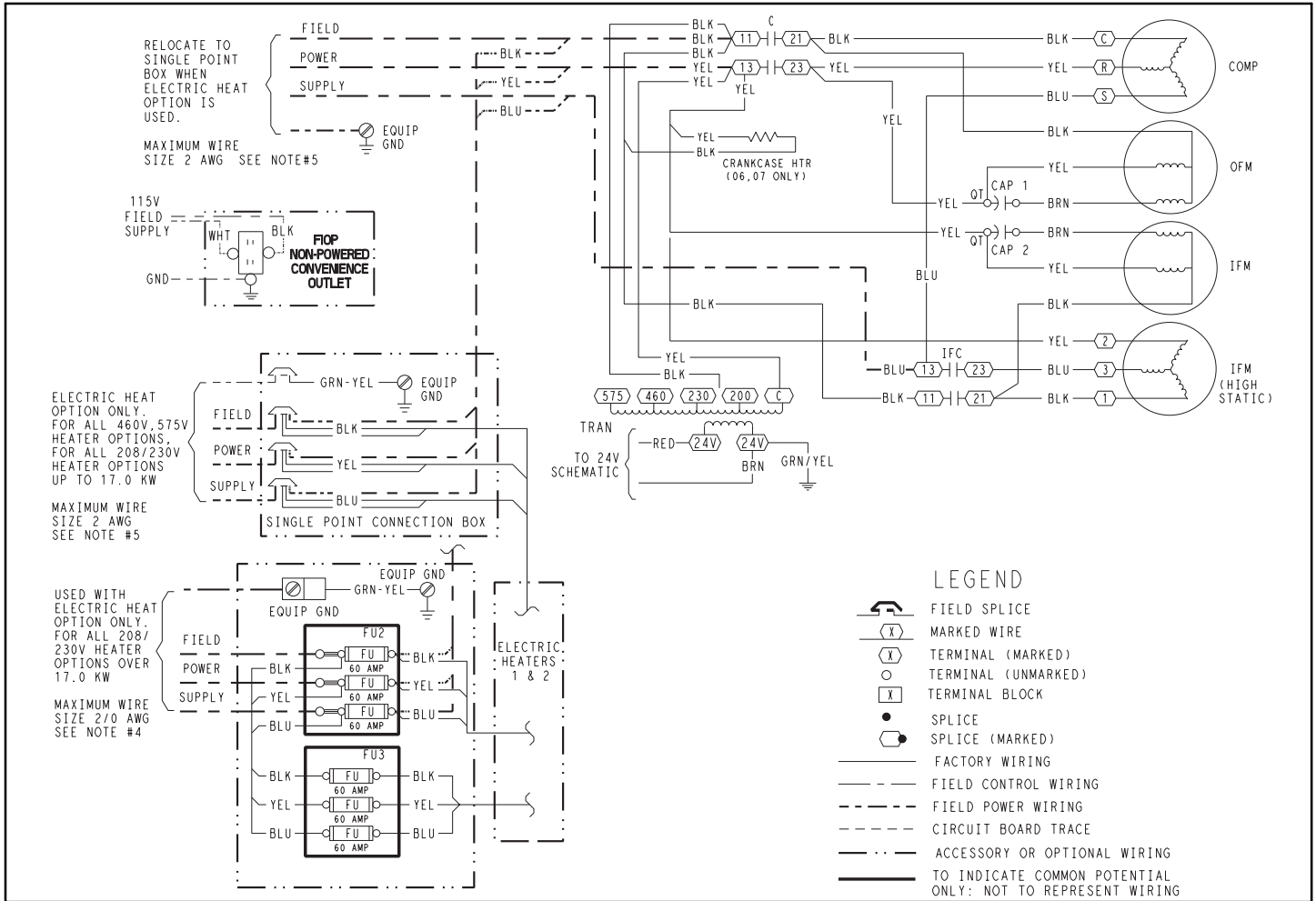
1. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker.

**2. Unbalanced 3-Phase Supply Voltage**

Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance.

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

## Typical Power Diagram – 1 Stage Cooling



### LEGEND

C – Contactor, compressor  
 CAP – Capacitor  
 CB – Circuit breaker  
 COMP – Compressor motor  
 DDC – Direct digital control  
 FU – Fuse  
 GND – Ground  
 HPS – High pressure switch  
 IAQ – Indoor air quality sensors  
 IFC – Indoor fan contactor  
 IFM – Indoor fan motor  
 LA – Low ambient lockout  
 LPS – Low pressure switch

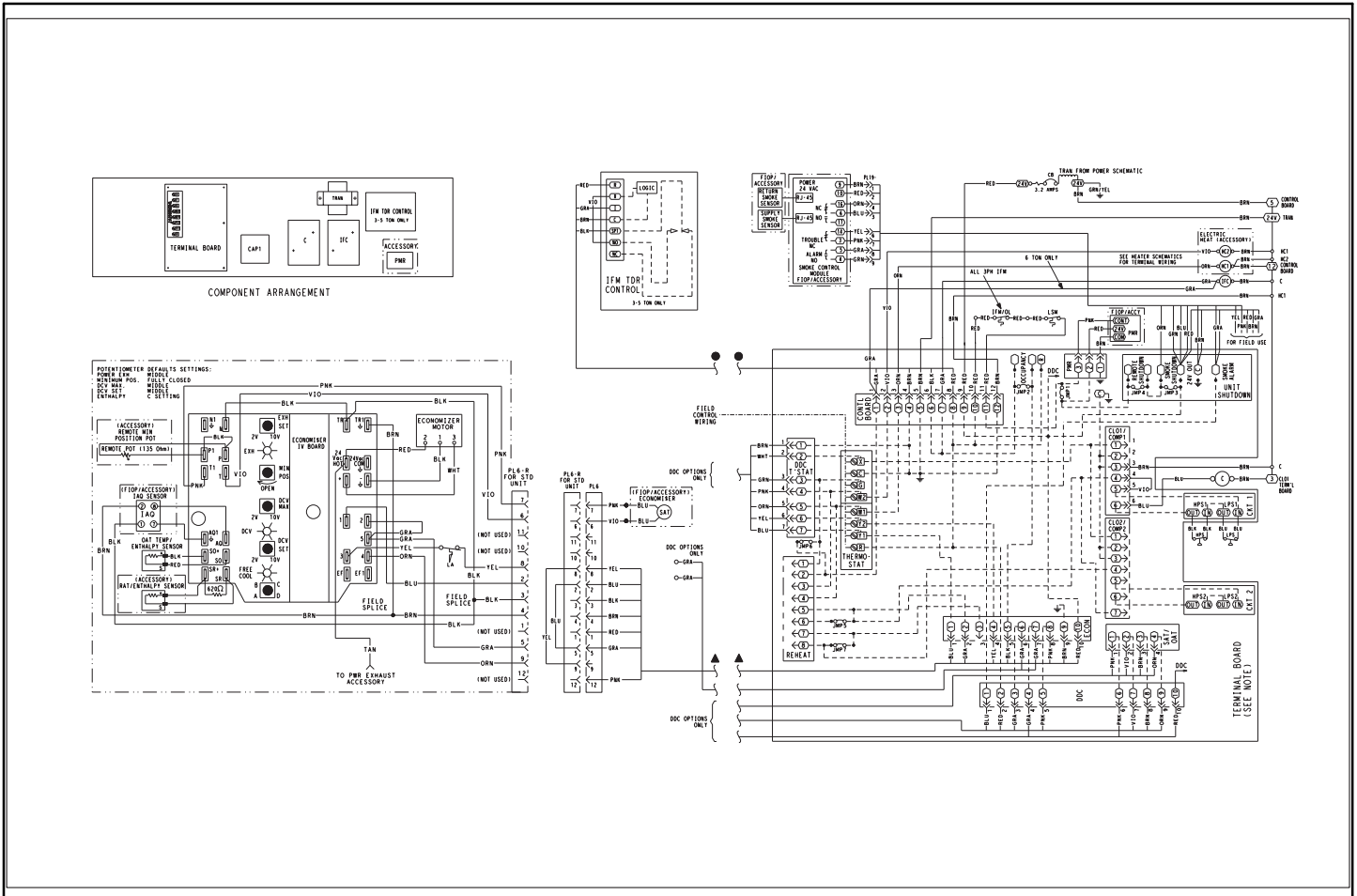
OAT – Outdoor air temp sensor  
 OFM – Outdoor fan motor  
 OLR – Overload relay  
 PL – Plug assembly  
 POT – Potentiometer  
 PMR – Phase monitor relay  
 QT – Quadruple terminal  
 R – Relay  
 RAT – Return air temp sensor  
 SAT – Supply air temp sensor  
 TDR – Time delay relay  
 TRAN – Transformer

### NOTES:

1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Compressor and fan motors are thermally protected. Three phase motors are protected against primary single phasing conditions.
3. On 208/230V units, transformer is wired for 230V. If unit is to be run with 208V power supply, disconnect black wire from 230V tap and connect to 200V tap. 230V, 200V taps on transformer do not appear on 575V transformer and 575V tap does not appear on 208/23/460V transformer.
4. Use copper, copper clad, aluminum or aluminum connectors.
5. Use copper conductor only.



## Typical Wiring Diagram –1 Stage Cooling



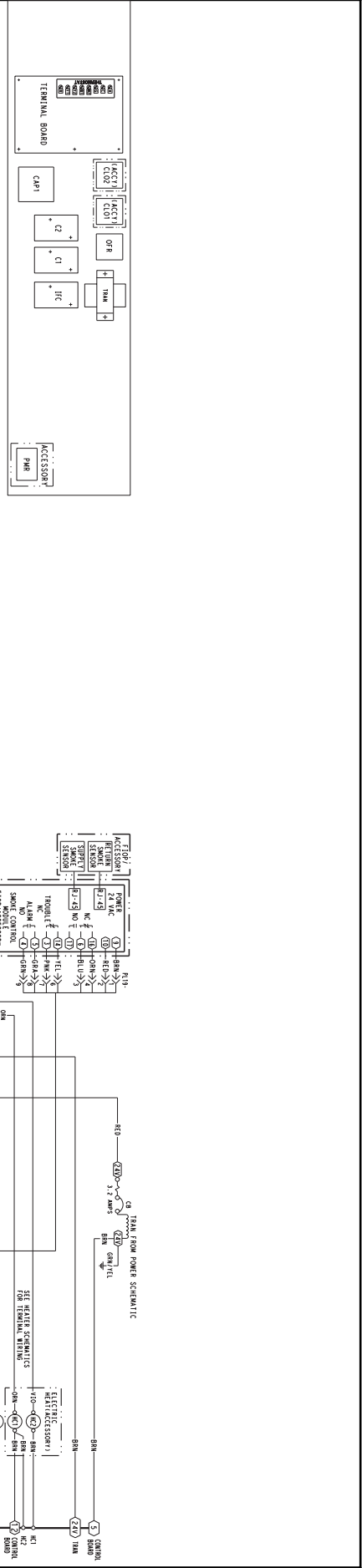
**NOTES:**

Terminal board schematic layout does not match actual terminal board to simplify circuit traces. Ensure designated jumpers on terminal board are cut when adding smoke detectors, phase loss relay and remote shutdown.

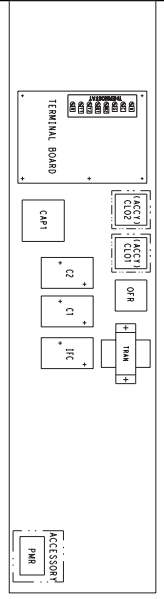
**ECONOMIZER NOTES:**

1. 620 ohm, 1 watt, 5% resistor should be removed only when using differential enthalpy or dry bulb.
2. If a separate field-supplied 24V transformer is used for the IAQ sensor power supply, it cannot have the secondary of the transformer grounded.
3. For field-installed remote minimum position POT, remove black wire jumper between P and P1 and set control minimum position POT to the minimum position.

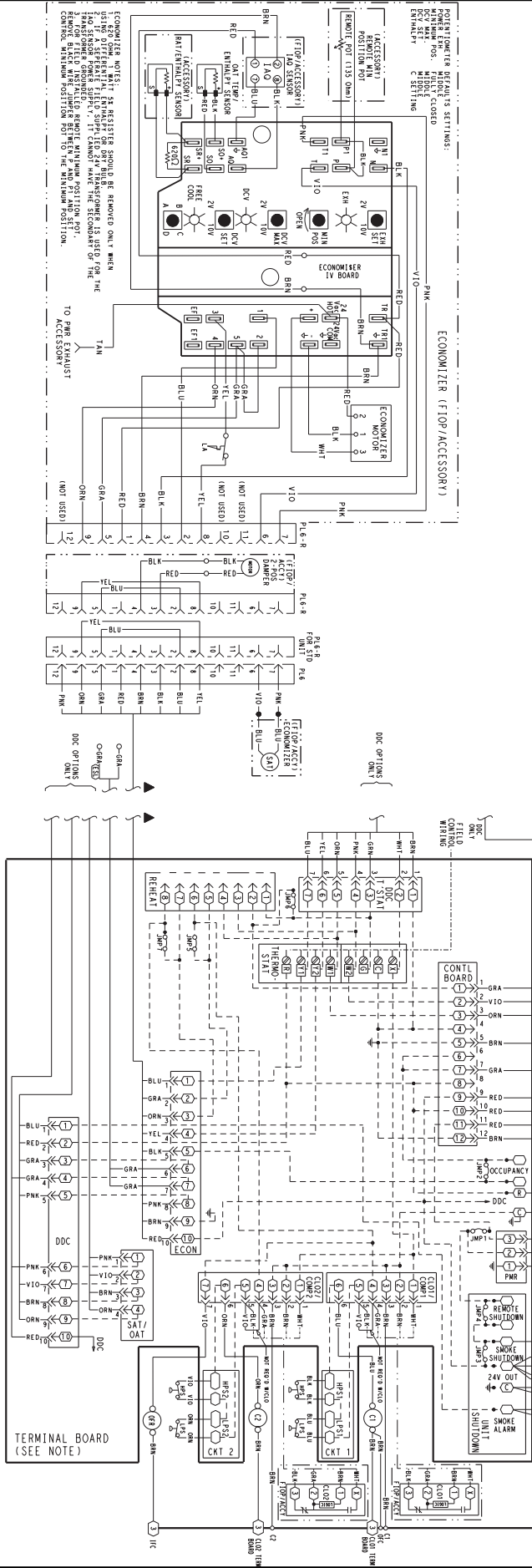
# Typical Wiring Diagram – 2 Stage Cooling



## COMPONENT ARRANGEMENT



- NOTES:
1. TERMINAL BOARD SCHEMATIC LAYOUT DOES NOT MATCH ACTUAL TERMINAL BOARD TO SIMPLIFY CIRCUIT TRACES. ON TERMINAL BOARD ARE CUT WHEN ADDING SMOKE DETECTORS. PHASE LOSS RELAY, OCCUPANCY AND REMOTE SHUTDOWN.
  2. ENSURE DESIGNATED JUMPERS ON TERMINAL BOARD ARE CUT WHEN ADDING SMOKE DETECTORS. PHASE LOSS RELAY, OCCUPANCY AND REMOTE SHUTDOWN.



TERMINAL BOARD (SEE NOTE)

# SEQUENCE OF OPERATION

## General

The sequence below describes the sequence of operation for an electro-mechanical unit with and without a factory installed EconoMi\$er™ IV (called “economizer” in this sequence). For information regarding a direct digital controller, see the start-up, operations, and troubleshooting manual for the applicable controller.

### Electro-mechanical units with no economizer

#### Cooling

When the thermostat calls for cooling, terminals G and Y1 are energized. As a result, the indoor-fan contactor (IFC) and the compressor contactor (C1) are energized, causing the indoor-fan motor (IFM), compressor #1, and outdoor fan to start. If the unit has 2 stages of cooling, the thermostat will additionally energize Y2. The Y2 signal will energize compressor contactor #2 (C2), causing compressor #2 to start. Regardless of the number of stages, the outdoor-fan motor runs continuously while unit is cooling.

#### Heating

**NOTE:** The RAS is sold as cooling only. If electric heaters are required, use only factory-approved electric heaters. They will operate as described below.

Units have either 1 or 2 stages of electric heat. When the thermostat calls for heating, power is applied to the W1 terminal at the unit. The unit control will energize the indoor fan contactor and the first stage of electric heat. On units with two-stage heating, when additional heating is required, the second stage of electric heat (if equipped) will be energized when power is applied at the W2 terminal on the unit.

### Electro-mechanical units with an economizer

#### Cooling

When free cooling is not available, the compressors will be controlled by the zone thermostat. When free cooling is available, the outdoor-air damper is modulated by the EconoMi\$er IV control to provide a 50°F (10°C) to 55°F (13°C) mixed-air temperature into the zone. As the mixed air temperature fluctuates above 55°F (13°C) or below 50°F (10°C) dampers will be modulated (open or close) to bring the mixed-air temperature back within control. If mechanical cooling is utilized with free cooling, the outdoor-air damper will maintain its current position at the time the compressor is started. If the increase in cooling capacity causes the mixed-air temperature to drop below 45°F (9°C), then the outdoor-air damper position will be decreased to the minimum position. If the mixed-air temperature continues to fall, the outdoor-air damper will close. Control returns to normal once the mixed-air temperature rises above 48°F (9°C). The power exhaust fans will be energized and de-energized, if installed, as the outdoor-air damper opens and closes.

If accessory CO<sub>2</sub> sensors are connected to the EconoMi\$er IV control, a demand controlled ventilation strategy will begin to operate. As the CO<sub>2</sub> level in the zone increases above the CO<sub>2</sub> setpoint, the minimum position of the damper will be increased proportionally. As the CO<sub>2</sub> level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed. For EconoMi\$er IV operation, there must be a thermostat call for the fan (G). If the unit is occupied and the fan is on, the damper will operate at minimum position. Otherwise, the damper will be closed.

When the EconoMi\$er IV control is in the occupied mode and a call for cooling exists (Y1 on the thermostat), the control will first check for indoor fan operation. If the fan is not on, then cooling will not be activated. If the fan is on, then the control will open the EconoMi\$er IV damper to the minimum position.

On the initial power to the EconoMi\$er IV control, it will take the damper up to 2 1/2 minutes before it begins to position itself. After the initial power-up, further changes in damper position can take up to 30 seconds to initiate. Damper movement from full closed to full open (or vice versa) will take between 1 1/2 and 2 1/2 minutes. If free cooling can be used as determined from the appropriate changeover command (switch, dry bulb, enthalpy curve, differential dry bulb, or differential enthalpy), then the control will modulate the dampers open to maintain the mixed-air temperature setpoint at 50°F (10°C) to 55°F (13°C). If there is a further demand for cooling (cooling second stage – Y2 is energized), then the control will bring on compressor stage 1 to maintain the mixed-air temperature setpoint. The EconoMi\$er IV damper will be open at maximum position. EconoMi\$er IV operation is limited to a single compressor.

#### Heating

The sequence of operation for the heating is the same as an electromechanical unit with no economizer. The only difference is how the economizer acts. The economizer will stay at the Economizer Minimum Position while the evaporator fan is operating. The outdoor-air damper is closed when the indoor fan is not operating.

# GUIDE SPECIFICATIONS – RAS072–150

Note about this specification:

## COOLING ONLY/ELECTRIC HEAT PACKAGED ROOFTOP

### HVAC Guide Specifications

Size Range: 6 to 12.5 Nominal Tons



<u>Section</u>	<u>Description</u>
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<b>23 06 80</b>	<b>Schedules for Decentralized HVAC Equipment</b>
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23 06 80.13	Decentralized Unitary HVAC Equipment Schedule
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23 06 80.13.A.	Rooftop unit schedule
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1. Schedule is per the project specification requirements.

<b>23 07 16</b>	<b>HVAC Equipment Insulation</b>
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23 07 16.13	Decentralized, Rooftop Units:
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23 07 16.13.A.	Evaporator fan compartment:
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1. Interior cabinet surfaces shall be insulated with a minimum 1/2-in. thick, minimum 1 1/2 lb density, flexible fiberglass insulation bonded with a phenolic binder, neoprene coated on the air side.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 07 16.13.B.	Electric heat compartment:
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1. Aluminum foil-faced fiberglass insulation shall be used.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

<b>23 09 13</b>	<b>Instrumentation and Control Devices for HVAC</b>
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23 09 13.23	Sensors and Transmitters
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23 09 13.23.A.	Thermostats
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1. Thermostat must
  - a. energize both "W" and "G" when calling for heat.
  - b. have capability to energize 2 different stages of cooling, and 2 different stages of heating.
  - c. include capability for occupancy scheduling.

<b>23 09 33</b>	<b>Electric and Electronic Control System for HVAC</b>
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23 09 33.13	Decentralized, Rooftop Units:
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23 09 33.13.A.	General:
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1. Shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-v transformer side. Transformer shall have 75VA capability.
2. Shall utilize color-coded wiring.
3. Shall include a central control terminal board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, economizer, thermostat, DDC control options, and low and high pressure switches.
4. Unit shall include a minimum of one 8-pin screw terminal connection board for connection of control wiring.

23 09 33.23.B.	Safeties:
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1. Compressor over-temperature, over current.
2. Low-pressure switch.
  - a. Units with 2 compressors shall have different sized connectors for the circuit 1 and circuit 2 low and high pressure switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.
  - b. Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
3. High-pressure switch.
  - a. Units with 2 compressors shall have different sized connectors for the circuit 1 and circuit 2 low and high pressure switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.



b. High pressure switch shall use different color wire than the low pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.

4. Automatic reset, motor thermal overload protector.

### **23 09 93 Sequence of Operations for HVAC Controls**

23 09 93.13 Decentralized, Rooftop Units:

23 09 93.13 INSERT SEQUENCE OF OPERATION

### **23 40 13 Panel Air Filters**

23 40 13.13 Decentralized, Rooftop Units:

23 40 13.13.A. Standard filter section

1. Shall consist of factory-installed, low velocity, throwaway 2-in. thick fiberglass filters of commercially available sizes.
2. Unit shall use only one filter size. Multiple sizes are not acceptable.
3. Filters shall be accessible through an access panel with "no-tool" removal as described in the unit cabinet section of this specification (23 81 19.13.H).

### **23 81 19 Self-Contained Air Conditioners**

23 81 19.13 Small-Capacity Self-Contained Air Conditioners

23 81 19.13.A. General

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a(n) hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.
2. Factory assembled, single-piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.
3. Unit shall use environmentally safe, R-410A refrigerant.
4. Unit shall be installed in accordance with the manufacturer's instructions.
5. Unit must be selected and installed in compliance with local, state, and federal codes.

23 81 19.13.B. Quality Assurance

1. Unit meets ASHRAE 90.1-2004 minimum efficiency requirements.
2. 3 phase units are Energy Star qualified.
3. Unit shall be rated in accordance with AHRI Standards 210/240 and 340/360.
4. Unit shall be designed to conform to ASHRAE 15, 2001.
5. Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards and UL-listed and certified under Canadian standards as a total package for safety requirements.
6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
7. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
8. Unit casing shall be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 5000-hour salt spray.
9. Unit shall be designed in accordance with ISO 9001:2000, and shall be manufactured in a facility registered by ISO 9001:2000.
10. Roof curb shall be designed to conform to NRCA Standards.
11. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
12. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.
13. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
14. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.

23 81 19.13.C. Delivery, Storage, and Handling

1. Unit shall be stored and handled per manufacturer's recommendations.
2. Lifted by crane requires either shipping top panel or spreader bars.
3. Unit shall only be stored or positioned in the upright position.

23 81 19.13.D. Project Conditions

1. As specified in the contract.

23 81 19.13.E. Project Conditions

1. As specified in the contract.

23 81 19.13.F. Operating Characteristics

1. Unit shall be capable of starting and running at 115°F (46°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at ± 10% voltage.
2. Compressor with standard controls shall be capable of operation from 40°F (4°C) , ambient outdoor temperatures. Accessory winter start kit is necessary if mechanically cooling at ambient temperatures below 25°F (-4°C).
3. Unit shall discharge supply air vertically or horizontally as shown on contract drawings.
4. Unit shall be factory configured for vertical supply & return configurations.
5. Unit shall be field convertible from vertical to horizontal configuration
6. Unit shall be capable of mixed operation: vertical supply with horizontal return or horizontal supply with vertical return.

23 81 19.13.G. Electrical Requirements

1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.

23 81 19.13.H. Unit Cabinet

1. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 0.003 inches minimum, gloss (per ASTM D523, 60°F): 60, Hardness: H-2H Pencil hardness.
3. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 210/240 or 340/360 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum 1/2-in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the heat compartment.
4. Base of unit shall have a minimum of four locations for thru-the-base gas and electrical connections (factory installed or field installed), standard.
5. Base Rail
  - a. Unit shall have base rails on a minimum of 2 sides.
  - b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
  - c. Holes shall be provided in the base rail for moving the rooftop by fork truck.
  - d. Base rail shall be a minimum of 16 gauge thickness.
6. Condensate pan and connections:
  - a. Shall be a sloped condensate drain pan made of a non-corrosive material.
  - b. Shall comply with ASHRAE Standard 62.
  - c. Shall use a 3/4" -14 NPT drain connection, possible either through the bottom or end of the drain pan. Connection shall be made per manufacturer's recommendations.

7. Top panel:

- a. Shall be a single piece top panel on 072 thru 121 sizes, two piece on 150 size.

8. Electrical Connections

- a. All unit power wiring shall enter unit cabinet at a single, factory-prepared, knockout location.
- b. Thru-the-base capability
  - (1.) Standard unit shall have a thru-the-base electrical location(s) using a raised, embossed portion of the unit basepan.
  - (2.) Optional, factory-approved, water-tight connection method must be used for thru-the-base electrical connections.
  - (3.) No basepan penetration, other than those authorized by the manufacturer, is permitted.

9. Component access panels (standard)

- a. Cabinet panels shall be easily removable for servicing.
- b. Unit shall have one factory installed, tool-less, removable, filter access panel.
- c. Panels covering control box, indoor fan, indoor fan motor, gas components (where applicable), and compressors shall have molded composite handles.
- d. Handles shall be UV modified, composite. permanently attached, and recessed into the panel.
- e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.
- f. Collars shall be removable and easily replaceable using manufacturer recommended parts.

23 81 19.13.I. N/A

23 81 19.13.J. Coils

1. Standard Aluminum/Copper Coils: (072 – 121 single compressor/single stage cooling models only)

- a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
  - b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.
  - c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.
2. Optional Copper–fin condenser coils: (072 – 121 single compressor/single stage cooling models only)
- a. Shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets.
  - b. Galvanized steel tube sheets shall not be acceptable.
  - c. A polymer strip shall prevent coil assembly from contacting the sheet metal coil pan to minimize potential for galvanic corrosion between coil and pan.
3. Standard Coils: (090 – 150 two compressor models/two stage cooling models only)
- a. Standard evaporator coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
  - b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.
  - c. Standard condenser coils shall have all aluminum RTPF Heat Exchanger Technology design consisting of aluminum multi port flat tube design and aluminum fin. Coils shall be a furnace brazed design and contain epoxy lined shrink wrap on all aluminum to copper connections.
  - d. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.

#### 23 81 19.13.K. Refrigerant Components

1. Refrigerant circuit shall include the following control, safety, and maintenance features:
  - a. Fixed orifice metering system shall prevent mal–distribution of two–phase refrigerant by including multiple fixed orifice devices in each refrigeration circuit. Each orifice is to be optimized to the coil circuit it serves.
  - b. Refrigerant filter drier.
  - c. Service gauge connections on suction and discharge lines.
  - d. Pressure gauge access through a specially designed access port in the top panel of the unit.
2. There shall be gauge line access port in the skin of the rooftop, covered by a black, removable plug.
  - a. The plug shall be easy to remove and replace.
  - b. When the plug is removed, the gauge access port shall enable maintenance personnel to route their pressure gauge lines.
  - c. This gauge access port shall facilitate correct and accurate condenser pressure readings by enabling the reading with the compressor access panel on.
  - d. The plug shall be made of a leak proof, UV–resistant, composite material.
3. Compressors
  - a. Unit shall use one fully hermetic, scroll compressor for each independent refrigeration circuit.
  - b. Models shall be available with single compressor designs on 072 – 121 models, plus additional 2 compressor (stage) models from 090 – 150 sizes.
  - c. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
  - d. Compressors shall be internally protected from high discharge temperature conditions.
  - e. Compressors shall be protected from an over–temperature and over–amperage conditions by an internal, motor overload device.
  - f. Compressor shall be factory mounted on rubber grommets.
  - g. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.
  - h. Crankcase heaters shall not be required for normal operating range, unless provided by the factory.

#### 23 81 19.13.L. Filter Section

1. Filters access is specified in the unit cabinet section of this specification.
2. Filters shall be held in place by a pivoting filter tray, facilitating easy removal and installation.
3. Shall consist of factory–installed, low velocity, throw–away 2–in. thick fiberglass filters.
4. Filters shall be standard, commercially available sizes.
5. Only one size filter per unit is allowed.

#### 23 81 19.13.M. Evaporator Fan and Motor

1. Evaporator fan motor:

- a. Shall have permanently lubricated bearings.
  - b. Shall have inherent automatic–reset thermal overload protection or circuit breaker.
  - c. Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating shall be required.
2. Belt–driven Evaporator Fan:
- a. Belt drive shall include an adjustable–pitch motor pulley.
  - b. Shall use sealed, permanently lubricated ball–bearing type.
  - c. Blower fan shall be double–inlet type with forward–curved blades.
  - d. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.
- 23 81 19.13.N. Condenser Fans and Motors
1. Condenser fan motors:
- a. Shall be a totally enclosed motor.
  - b. Shall use permanently lubricated bearings.
  - c. Shall have inherent thermal overload protection with an automatic reset feature.
  - d. Shall use a shaft–down design on 072 – 121 models and shaft–up design on 150 size with rain shield.
2. Condenser Fans:
- a. Shall be a direct–driven propeller type fan.
  - b. Shall have aluminum blades riveted to corrosion–resistant steel spiders and shall be dynamically balanced.
- 23 81 19.13.O. Special Features, Options and Accessories
1. Integrated Economizers:
- a. Integrated, gear–driven parallel modulating blade design type capable of simultaneous economizer and compressor operation.
  - b. Independent modules for vertical or horizontal return configurations shall be available. Vertical return modules shall be available as a factory installed option.
  - c. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.
  - d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints.
  - e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
  - f. Shall be equipped with low–leakage dampers, not to exceed 2% leakage at 1 in. wg pressure differential.
  - g. Shall be capable of introducing up to 100% outdoor air.
  - h. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air.
  - i. Shall be designed to close damper(s) during loss–of–power situations with spring return built into motor.
  - j. Dry bulb outdoor–air temperature sensor shall be provided as standard. Outdoor air sensor setpoint shall be adjustable and shall range from 40 to 100°F / 4 to 38°C. Additional sensor options shall be available as accessories.
  - k. The economizer controller shall also provide control of an accessory power exhaust unit. function. Factory set at 100%, with a range of 0% to 100%.
  - l. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy. A remote potentiometer may be used to override the damper setpoint.
  - m. Dampers shall be completely closed when the unit is in the unoccupied mode.
  - n. Economizer controller shall accept a 2–10Vdc CO<sub>2</sub> sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor–air damper to provide ventilation based on the sensor input.
  - o. Compressor lockout sensor shall open at 35°F (2°C) and close closes at 50°F (10°C).
  - p. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.
  - q. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
2. Two–Position Damper
- a. Damper shall be a Two–Position Damper. Damper travel shall be from the full closed position to the field adjustable %–open setpoint.
  - b. Damper shall include adjustable damper travel from 25% to 100% (full open).
  - c. Damper shall include single or dual blade, gear driven dampers and actuator motor.
  - d. Actuator shall be direct coupled to damper gear. No linkage arms or control rods shall be acceptable.
  - e. Damper will admit up to 100% outdoor air for applicable rooftop units.

- f. Damper shall close upon indoor (evaporator) fan shutoff and/or loss of power.
  - g. The damper actuator shall plug into the rooftop unit's wiring harness plug. No hard wiring shall be required.
  - h. Outside air hood shall include aluminum water entrainment filter
3. Manual damper
    - a. Manual damper package shall consist of damper, air inlet screen, and rain hood which can be preset to admit up to 50% outdoor air for year round ventilation.
  4. Head Pressure Control Package
    - a. Controller shall control coil head pressure by condenser–fan speed modulation or condenser–fan cycling and wind baffles.
    - b. Shall consist of solid–state control and condenser–coil temperature sensor to maintain condensing temperature between 90°F (32°C) and 110°F (43°C) at outdoor ambient temperatures down to –20°F (–29°C).
  5. Condenser Coil Hail Guard Assembly
    - a. Shall protect against damage from hail.
    - b. Shall be louvered design.
  6. Unit–Mounted, Non–Fused Disconnect Switch:
    - a. Switch shall be factory–installed, internally mounted.
    - b. National Electric Code (NEC) and UL approved non–fused switch shall provide unit power shutoff.
    - c. Shall be accessible from outside the unit
    - d. Shall provide local shutdown and lockout capability.
  7. Thru–the–Base Connectors:
    - a. Kits shall provide connectors to permit electrical connections to be brought to the unit through the unit basepan.
    - b. Minimum of four connection locations per unit.
  8. Propeller Power Exhaust:
    - a. Power exhaust shall be used in conjunction with an integrated economizer.
    - b. Independent modules for vertical or horizontal return configurations shall be available.
    - c. Horizontal power exhaust is shall be mounted in return ductwork.
    - d. Power exhaust shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0–100% adjustable setpoint on the economizer control.
  9. Roof Curbs (Vertical):
    - a. Full perimeter roof curb with exhaust capability providing separate air streams for energy recovery from the exhaust air without supply air contamination.
    - b. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
    - c. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.
  10. High–Static Indoor Fan Motor(s) and Drive(s) (072–150 ):
    - a. High–static motor(s) and drive(s) shall be factory–installed to provide additional performance range.
  11. Condenser Coil Grille:
    - a. The grille protects the condenser coil from damage by large objects without increasing unit clearances.
  12. Thru–the–Bottom Utility Connectors:
    - a. Kit shall provide connectors to permit gas and electrical connections to be brought to the unit through the basepan.
  13. Outdoor Air Enthalpy Sensor:
    - a. The outdoor air enthalpy sensor shall be used to provide single enthalpy control. When used in conjunction with a return air enthalpy sensor, the unit will provide differential enthalpy control. The sensor allows the unit to determine if outside air is suitable for free cooling.
  14. Return Air Enthalpy Sensor:
    - a. The return air enthalpy sensor shall be used in conjunction with an outdoor air enthalpy sensor to provide differential enthalpy control.
  15. Indoor Air Quality (CO<sub>2</sub>) Sensor:
    - a. Shall be able to provide demand ventilation indoor air quality (IAQ) control.
    - b. The IAQ sensor shall be available in duct mount, wall mount, or wall mount with LED display. The setpoint shall have adjustment capability.
  16. Smoke detectors (factory–installed only):
    - a. Shall be a Four–Wire Controller and Detector.
    - b. Shall be environmental compensated with differential sensing for reliable, stable, and drift–free sensitivity.

- c. Shall use magnet-activated test/reset sensor switches.
- d. Shall have tool-less connection terminal access.
- e. Shall have a recessed momentary switch for testing and resetting the detector.
- f. Controller shall include:
  - (1.) One set of normally open alarm initiation contacts for connection to an initiating device circuit on a fire alarm control panel.
  - (2.) Two Form-C auxiliary alarm relays for interface with rooftop unit or other equipment.
  - (3.) One Form-C supervision (trouble) relay to control the operation of the Trouble LED on a remote test/reset station.
  - (4.) Capable of direct connection to two individual detector modules.
  - (5.) Can be wired to up to 14 other duct smoke detectors for multiple fan shutdown applications.
- 17. Winter start kit
  - a. Shall contain a bypass device around the low pressure switch.
  - b. Shall be required when mechanical cooling is required down to 25°F (-4°C).
  - c. Shall not be required to operate on an economizer when below an outdoor ambient of 40°F (4°C).
- 18. Time Guard
  - a. Shall prevent compressor short cycling by providing a 5-minute delay ( $\pm 2$  minutes) before restarting a compressor after shutdown for any reason.
  - b. One device shall be required per compressor.
- 19. Electric Heat:
  - a. Heating Section
    - (1.) Heater element open coil resistance wire, nickel-chrome alloy, 0.29 inches inside diameter, strung through ceramic insulators mounted on metal frame. Coil ends are staked and welded to terminal screw slots.
    - (2.) Heater assemblies are provided with integral fusing for protection of internal heater circuits not exceeding 48 amps each. Auto reset thermo limit controls, magnetic heater contactors (24 v coil) and terminal block all mounted in electric heater control box (minimum 18 ga galvanized steel) attached to end of heater assembly.