

**48HC
High Efficiency
Gas Heat/Electric Cooling
Packaged Rooftop with EnergyX® System
3 to 12.5 Nominal Tons**



Product Data



C10222



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48HC EnergyX



Your new 3 to 12.5 Ton WeatherMaster Carrier rooftop unit (RTU) with EnergyX was designed to provide optimum comfort and control from a packaged rooftop.

The system uses the same base WeatherMaster rooftop but integrates the EnergyX System.

The EnergyX System is a factory installed Energy Recovery Ventilator (ERV) module. It is fully integrated with the WeatherMaster rooftop structurally, and electronically for optimum performance and installation.

Easy to install:

These new WeatherMaster units are designed for dedicated factory-supplied vertical air flow duct configurations. This new cabinet design also integrates a large control box that gives you room to work and room to mount Carrier accessory controls.

Further ease of installation is achieved with the factory installed and tested EnergyX System. This allows for more reliable start-ups and operation leading to less time on the job site.

Easy to maintain:

Easy access handles by Carrier provide quick and easy access to all normally serviced components. Our “no-strip” screw system has superior holding power and guides screws into position while preventing the screw from stripping the unit’s metal. Take accurate pressure readings by reading system pressures with panels in place as compressors are strategically located to eliminate any air bypass.

Easy to use:

The newly designed, central terminal board by Carrier puts all your connections and troubleshooting points in one convenient place, standard. Most low voltage connections are made to the same board and make it easy to find what you’re looking for and easy to access it.

Reliable:

Each unit comes with precision sized and tested scroll compressor that is internally protected from over temperature and pressures. In addition, each refrigerant circuit is further protected with a high pressure and low pressure switch as well as containing a liquid line filter drier. Each unit is factory tested prior to shipment to help ensure unit operation once properly installed.



FEATURES AND BENEFITS

- Energy recovery rated and certified in accordance with AHRI Standard 1060-2000.
- Carrier ComfortLink Controls allows added unit diagnostics and operation setup capabilities.
- Integrated EnergyX System with Energy Recovery Ventilator (ERV).
- Single stage cooling capacity control on 04 to 07 models. Two stage cooling capacity control on 08 to 14 models
- High performance copper tube / aluminum plate (RTPF) fin condenser and evaporator coils with optional coating.
- SEER UP TO 15.6, EER up to 13.0
- IEER's up to 13.0 with single speed indoor fan motor and up to 13.9 with 2-speed/VFD indoor fan motor
- Gas heating efficiencies up to 81% thermal efficiency.
- Dedicated vertical air flow duct configuration models. Field installed Horizontal Curb available for horizontal air flow applications.
- Utility connections through the side or bottom. Bottom connections are also in an enclosed environment to help prevent water entry.
- Standardized components and layout. Standardized components and controls make service and stocking parts easier.
- Scroll compressors on all units. This makes service, stocking parts, replacement, and trouble-shooting easier.
- Precision sized TXV metering device on each refrigerant circuit.
- Easy-adjust, belt-drive motor available. Motor assembly also contains a fan belt break protection system on all models and reliable pillow block bearing system that allows lubrication thru front of the unit.
- Single-point gas / electrical connection.
- Sloped, composite drain pan sheds water; and won't rust.
- Standardized controls and control box layout. Standardized components and controls make stocking parts and service easier.
- Clean, large, easy to use control box.
- Color-coded wiring.
- Large, laminated wiring and power wiring drawings which are affixed to unit make troubleshooting easy.
- Single, central terminal board for test and wiring connections.
- Fast-access, handled, panels for easy access on normally accessed service panels.
- "No-strip" screw system guides screws into the panel and captures them tightly without stripping the screw, the panel, or the unit.
- Mechanical cooling (125°F to 35°F / 52°C to -2°C) standard on all models. Low ambient controller allows operation down to -20°F / -29°C
- Redundant gas valve for two stage gas heating capacity control with induced-draft flue exhaust design to help ensure no flue gas can escape into the indoor air stream.
- Exclusive IGC solid state gas controller for on board diagnostics with LED error code designation, burner control logic and energy saving indoor fan motor delay.
- 2-in (51mm) disposable filters on all units, with 4-in (102mm) filter track field-installed.
- Refrigerant filter-drier on each circuit.
- High and low pressure switches. Added reliability with high pressure switch and low pressure switch.
- Many factory-installed options ranging from air management economizers, convenience outlets, disconnect switch and smoke detectors.
- Units use standard roofcurbs that require no field modifications such as support rails or stiffening brackets.
- Standard Parts Warranty: 10 year aluminized heat exchanger, 15 year stainless steel heat exchanger, 5 year compressor, 5 year energy wheel, 1 year others
- Optional Staged Air Volume (SAV) system utilizes a Variable Frequency Drive (VFD) to automatically adjust the indoor fan motor speed between cooling stages. Available on 2-stage cooling models only.

MODEL NUMBER NOMENCLATURE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
4	8	H	C	D	D	0	8	A	3	A	5	-	D	Q	0	A	0

48HC EnergyX

Product Type

48 – Gas Heat Pkg. Rooftop

Product Series

HC – High Efficiency

Heat Options

- D – Low Gas Heat
- E – Medium Gas Heat
- F – High Gas Heat
- L – Low Nox – Low Gas Heat
- M – Low Nox – Medium Gas Heat
- N – Low Nox – High Gas Heat
- S – Low Heat w/Stainless Steel Exchanger
- R – Med Heat w/Stainless Steel Exchanger
- T – High Heat w/Stainless Steel Exchanger

(Low Nox models include Stainless Steel HX)

Refrigerant & System Options

- A – Single Stage Cooling
- D – 2 Stage Cooling

Nominal Cooling Capacity (Tons)

- | | |
|------------|---------------|
| 04 – 3 ton | 08 – 7.5 ton |
| 05 – 4 ton | 09 – 8.5 ton |
| 06 – 5 ton | 12 – 10 ton |
| 07 – 6 ton | 14 – 12.5 ton |

Sensor Options

- A – None
- B – RA Smoke Detector
- C – SA Smoke Detector
- D – RA + SA Smoke Detector
- E – CO₂ Sensor
- F – RA Smoke Detector + CO₂
- G – SA Smoke Detector + CO₂
- H – RA + SA Smoke Detector + CO₂

Indoor Fan Options 3, 4, 5 Ton Models Only

- 0 – Electric (Direct) Drive X13 motor
- 2 – Medium Static Option – Belt Drive
- 3 – High Static Option – Belt Drive

Indoor Fan Options 6–12.5 Ton Models Only

- 1 – Standard Static Option – Belt Drive
- 2 – Medium Static Option – Belt Drive
- 3 – High Static Option – Belt Drive
- C = High Static Option w/Hi-Effy Motor – Belt Drive (14 size only)

Coil Options (RTPF) (Outdoor–Indoor–Hail Guard)

- A – Al/Cu – Al/Cu
- B – Pre-coat Al/Cu – Al/Cu
- C – E-coat Al/Cu – Al/Cu
- D – E-coat AL/Cu – E-coat AL/Cu
- E – Cu/Cu – Al/Cu
- F – Cu/Cu – Cu/Cu
- M – Al/Cu – Al/Cu – Louvered Hail Guard
- N – Pre-Coat Al/Cu – Al/Cu – Louvered Hail Guard
- P – E-Coat Al/Cu – Al/Cu Louvered Hail Guard
- Q – E-Coat Al/Cu – E-coat Al/Cu – Louvered Hail Guard
- R – Cu/Cu – Al/Cu – Louvered Hail Guard
- S – Cu/Cu – Cu/Cu – Louvered Hail Guard

Packaging

0 – Standard

Electrical Options

- A – None
- B – HACR breaker
- C – Non-fused disconnect
- D – Thru the base connections
- E – HACR & thru the base connections
- F – Non-fused disconnect & thru the base
- G – 2-speed indoor fan (VFD) controller
- H – 2-speed controller & HACR breaker
- J – 2-speed controller & non-fused disc.
- K – 2-speed controller & thru the base
- L – HACR breaker & thru the base
- M – 2-spd contr., non-fused & thru base

Service Options

- 0 – None
- 1 – Un-powered Convenience Outlet
- 2 – Powered Convenience Outlet
- 3 – Hinged Panels
- 4 – Hinged Panels, un-powered C.O.
- 5 – Hinged Panels, powered C.O.
- C – Foil faced insulation
- D – Foil faced insulation, un-powered C.O
- E – Foil faced insulation, powered C.O.
- F – Foil faced insulation, hinged access panels
- G – Foil faced insulation, hinged access panels & unpowered C.O.
- H – Foil faced insulation, hinged access panels & powered C.O.

Intake / Exhaust Options

- Q – EnergyX only
- R – EnergyX + Economizer only
- S – EnergyX + Frost Protection only
- T – EnergyX + Economizer + Frost Protection

Base Unit Controls

D – ComfortLink (Standard with EnergyX)

Factory Design Revision –

– Factory Design Revision

Voltage

- 1 – 575–3–60
- 5 – 208/230–3–60
- 6 – 460–3–60

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

CATEGORY	ITEM	FACTORY INSTALLED OPTION	FIELD INSTALLED ACCESSORY
EnergyX System	EnergyX	X	
	EnergyX with Economizer	X	
	EnergyX with Frost Protection	X	
	EnergyX with Frost Protection and Economizer	X	
	Filter Maintenance Sensor		X
	Motor Status Sensor		X
Cabinet	Dedicated Vertical Air Flow Duct Configuration	X	
	Thru-the-base electrical or gas-line connections	X	
	Hinged Access Panels	X	
Coil Options	Cu/Cu (indoor) coils	X	
	E-coated (outdoor & indoor) coils	X	
	Pre-coated outdoor coils	X	
Condenser Protection	Condenser coil hail guard (louvered design)	X	X
Controls	Thermostats, temperature sensors, and subbases		X
	Smoke detector (supply and/or return air) ¹	X	
	Phase Monitor		X
Economizer Sensors & IAQ Devices	Single enthalpy sensors ²	X	
	Differential enthalpy sensors ²		X
	Wall or duct mounted CO ₂ sensor ²		X
	Unit mounted CO ₂ sensor ^{2, 3}	X	
Gas Heat	Propane conversion kit		X
	Stainless steel heat exchanger	X	
	High altitude conversion kit		X
	Flue Discharge Deflector (04 – 12 models only)		X
Indoor Motor & Drive	Multiple motor and drive packages	X	
	Staged Air Volume (SAV) system w/VFD controller (2-stage cooling models only)	X	
	Display Kit for SAV system with VFD		X
Low Ambient Control	Winter start kit ⁴		X
	Motormaster head pressure controller ⁴		X
Power Options	Convenience outlet (powered)	X	
	Convenience outlet (unpowered)	X	
	Non-fused disconnect ⁵	X	
	HACR Circuit Breaker ⁶	X	
Roof Curbs	Roof curb 14-in (356mm)		X
	Roof curb 24-in (610mm)		X
	Horizontal Curb Adapter (Vertical to horizontal airflow)		X

48HC EnergyX

NOTES:

1. RA smoke detector not available on sizes 04–07. Device must be field furnished and installed in the appropriate duct work.
2. Sensors used to optimize economizer performance, standard on all EnergyX economizers.
3. Requires factory installed economizer.
4. See application data for assistance.
5. Non-fused disconnect switch cannot be used when MOCP electrical rating exceeds 70 amps at 460/575 volt and 150 amps at 208/230 volt. Carrier Packaged RTUBuilder selects this automatically.
6. HACR circuit breaker cannot be used when unit MOCP electrical rating exceeds 100 amps at 208/230V, 90 amps at 460V and 70 amps at 575V. 575V can only be used on Wye power supply systems. Delta power supply systems is prohibited.

FACTORY OPTIONS AND/OR ACCESSORIES

EnergyX Energy Recovery

The EnergyX System is a factory installed Energy Recovery Ventilator (ERV) module on a Carrier packaged rooftop unit. It is integrated with the base rooftop unit structurally, electrically and with regard to controls operation.

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 CO₂ sensors, economizers can provide even more savings by coupling the ventilation air to only that amount required.

Economizers are available, installed and tested by the factory, with either enthalpy or dry-bulb temperature inputs. Additional sensors are available as accessories to optimize the economizers.

Economizers include a powered exhaust system to help equalize building pressures.

CO₂ 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 CO₂ sensor detects their presence through increasing CO₂ levels, and opens the economizer appropriately.

When the occupants leave, the CO₂ 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.

Smoke Detectors

Trust the experts. Smoke detectors make your application safer and your job easier. Carrier smoke detectors immediately shut down the rooftop unit when smoke is detected. They are available, installed by the factory, for supply air, return air, or both.

Louvered Hail Guards

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

Convenience Outlet (powered or un-powered)

Reduce service and/or installation costs by including a convenience outlet in your specification. Carrier will install this service feature at our factory. Provides a convenient, 15 amp, 115v GFCI receptacle with “Wet in Use” cover. The “powered” option allows the installer to power the outlet from the line side of the disconnect or load side as required by code. The “unpowered” option is to be powered from a separate 115/120v power source.

Non-fused Disconnect

This OSHA-compliant, factory-installed, safety switch allows a service technician to locally secure power to the rooftop.

Staged Air Volume (SAV) Indoor Fan Speed System

Carrier’s Staged Air Volume (SAV) system saves energy and installation time by utilizing a Variable Frequency Drive (VFD) to automatically adjust the indoor fan motor speed in sequence with the units cooling operation. Per ASHRAE 90.1 2010 standard section 6.4.3.10.b, during the first stage of cooling operation the VFD will adjust the fan motor to provide 2/3rd of the total cfm established for the unit. When a call for the second stage of cooling is required, the VFD will allow the total cfm for the unit established (100%). During the heating mode the VFD will allow total design cfm (100%) operation and during the ventilation mode the VFD will allow operation to 2/3rd of total cfm.

Compared to single speed indoor fan motor systems, Carrier’s SAV system can save substantial energy, 25%+*, versus single speed indoor fan motor systems.

The VFD used in Carrier’s SAV system has soft start capabilities to slowly ramp up the speeds, thus eliminating any high inrush air volume during initial start-up. It also has internal over current protection for the fan motor and a field installed display kit that allows adjustment and in depth diagnostics of the VFD.

This SAV system is available on models with 2-stage cooling operation.

The SAV system is very flexible for initial fan performance set up and adjustment. The standard factory shipped VFD is pre-programmed to automatically stage the fan speed between the first and second stage of cooling. The unit fan performance static pressure and cfm can be easily adjusted using the traditional means of pulley adjustments. The other means to adjust the unit static and cfm performance is to utilize the field installed Display Kit and adjust the frequency and voltage in the VFD to required performance requirements. In either case, once set up, the VFD will automatically adjust the speed between the cooling stage operations.

*Data based on .10 (\$/kWh) in an office application utilizing Carrier’s HAP 4.6 simulation software program

HACR Breaker

These manual reset devices provide overload and short circuit protection for the unit. Factory wired and mounted with the units with access cover to help provide environment protection.

On 575V applications, HACR breaker can only be used with WYE power distribution systems. Use on Delta power distribution systems is prohibited.

FACTORY OPTIONS AND/OR ACCESSORIES (cont.)

Filter or Fan Status Switches

Use these 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.

Motormaster Head Pressure Controller

The Motormaster 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 Motormaster 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 winter start kit by Carrier 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.

Propane Heating

Convert your gas heat rooftop from standard natural gas operation to Propane using this field-installed kit.

High Altitude Heating

High altitudes have less oxygen, which means heat exchangers need less fuel. The new gas orifices in this field-installed kit make the necessary adjustment for high altitude applications. They restore the optimal fuel to air mixture and maintain healthy combustion at altitudes above 2000 ft (610m). Kits may not be required in all areas.

Optional Stainless Steel Heat Exchanger

The stainless steel heat exchanger option provides the tubular heat exchanger be made out of a minimum 20 gauge type 409 stainless steel for applications where the mixed air to the heat exchanger is expected to drop below 45°F (7°C). Stainless steel may be specified on applications where the presence of airborne contaminants require its use (applications such as paper mills) or in area with very high outdoor humidity that may result in severe condensation in the heat exchanger during cooling operation.

Flue Discharge Deflector (04-12 sizes only)

The flue discharge deflector is a useful accessory when flue gas recirculation is a concern. By venting the flue discharge upwards, the deflector minimizes the chance for a neighboring unit to intake the flue exhaust.

Motor Status Indicator Switch

Monitors the EnergyX wheel/motor and supply and exhaust fan motors to provide indication of operation.

Alternate Motors and Drives

Some applications need larger horsepower motors, some need more airflow, and some need both. Regardless of the case, your Carrier expert 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 a factory option, 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 gas lines, main power lines, as well as control power.

Hinged Access Panels

Allows access to unit's major components with specifically designed hinged access panels. Panels are filter, control box, indoor fan motor and ERV access.

Filter Status Indicator Switch

Monitors the EnergyX wheel/motor and supply and exhaust fan motors to provide indication of operation.

Table 2 – ERV WHEEL PERFORMANCE - SELECTED GEOGRAPHIC AREAS

UNIT	AHRI EER	ERV WHEEL	RTU AIR-FLOW (CFM)	ERV AIR-FLOW (CFM)	Atlanta		Miami		Phoenix		Montreal		Detroit	
					ERV RER	CEF	ERV RER	CEF	ERV RER	CEF	ERV RER	CEF	ERV RER	CEF
04	12.5	ERC-1904	1050	500	65.63	15.69	75.46	16.27	65.02	15.65	40.74	14.19	53.28	14.95
05	13.0	ERC-2513C	1400	1300	72.62	19.85	86.08	21.40	66.04	19.10	45.98	16.79	59.06	18.29
06	12.5	ERC-2513C	1750	1300	72.62	18.23	86.08	19.51	66.04	17.60	45.98	15.69	59.06	16.94
07	12.0	ERC-2513C	2100	1300	72.62	16.47	86.08	17.47	66.04	15.99	45.98	14.51	59.06	15.47
08	12.0	ERC-3019C	2625	1840	81.18	17.34	96.30	18.50	73.79	16.77	51.44	15.04	66.04	16.17
09	12.0	ERC-3019C	2975	2080	72.41	17.13	85.64	18.25	65.96	16.58	45.75	14.87	58.85	15.98
12	11.5	ERC-3019C	3500	2200	68.09	15.80	80.4	16.74	62.10	15.35	42.96	13.89	55.31	14.83
14	12.2	ERC-3628C	4375	3100	88.10	17.55	104.27	18.69	79.59	16.95	55.64	15.26	71.53	16.38

Energy recovery systems transfer heat from exhaust to intake air thus transferring up to 70% of the exhaust heat in the building. Evaluate heating needs and total EnergyX system heating capability using Carrier System Software.

Performance of areas shown above simulated with Carrier System Software. For CEF calculations for your application, use Carrier Software System Programs.

AHRI CEF = Combined Efficiency factor. As described in AHRI Guideline V, the CEF is the efficiency of a system incorporating an ERV component with a unitary packaged air conditioner, heat pump, etc. Units vary according to the application. CEF is a dimensionless value as it may be expressed in Btu/(W@h) or in W/W. CEF is calculated per ARI Guideline V calculations using nominal flow rates and temperatures. CEF is analogous to a “system EER” where the system consists of the RTU + ERV. Actual CEF value will vary based on actual location, airflows and temperatures. Contact your Carrier Sales Engineer for additional information.

RER = Net Conditioning recovered by ERV divided by total electrical power consumed by ERV.

Table 3 – AHRI COOLING RATING TABLE 1-STAGE COOLING

UNIT	COOLING STAGES	NOM. CAPACITY (TONS)	NET COOLING CAPACITY (MBH)	TOTAL POWER (kW)	SEER	EER	IEER
A04	1	3	36.0	2.9	15.00	12.50	-
A05	1	4	48.5	3.7	15.60	13.00	-
A06	1	5	57.5	4.6	15.20	12.45	-
A07	1	6	73.0	6.0	-	12.00	13.00

Table 4 – AHRI COOLING RATING TABLE 2-STAGE COOLING

UNIT	COOLING STAGES	NOM. CAPACITY (TONS)	NET COOLING CAPACITY (MBH)	TOTAL POWER (kW)	EER	IEER WITH SINGLE SPEED INDOOR MOTOR	IEER WITH 2-SPEED INDOOR MOTOR
D08	2	7.5	89.0	7.4	12.0	13.0	13.8
D09	2	8.5	97.0	8.1	12.0	13.0	13.8
D12	2	10.0	115.0	10.0	11.5	12.0	12.4
D14	2	12.5	146.0	11.9	12.2	13.0	13.9

LEGEND

- Not Applicable
- AHRI – Air Conditioning, Heating and Refrigeration Institute Test Standard
- ASHRAE – American Society of Heating, Refrigerating and Air Conditioning, Inc.
- EER – Energy Efficiency Ratio
- IEER – Integrated Energy Efficiency Ratio
- SEER – Seasonal Energy Efficiency Ratio

NOTES:

1. Rated in accordance with AHRI Standards 210/240 (04–06 size) and 340/360 (07–14 size).
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.
IEER Standard: A measure that expresses cooling part-load EER efficiency for commercial unitary air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities.
3. All 48HC units comply with ASHRAE 90.1 Energy Standard for minimum SEER and EER requirements.
4. 48HC units comply with US Energy Policy Act (2005). To evaluate code compliance requirements, refer to state and local codes.

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Table 5 – HEAT RATING TABLE - NATURAL GAS & PROPANE

UNITS	GAS HEAT	AL/SS HEAT EXCHANGER		TEMP RISE (DEG F)	THERMAL EFFICIENCY (%)	AFUE (%)	
		INPUT / OUTPUT STAGE 1 (MBH)	INPUT / OUTPUT STAGE 2 (MBH)				
Three Phase	04	LOW	50 / 41	72 / 56	25 – 55	82%	–
		MED	82 / 66	115 / 89	55 – 85	80%	–
		HIGH	–	–	–	–	–
	05	LOW	50 / 41	72 / 56	25 – 55	82%	–
		MED	82 / 66	115 / 90	35 – 65	81%	–
		HIGH	120 / 96	150 / 117	50 – 80	80%	–
	06	LOW	50 / 41	72 / 56	20 – 55	82%	–
		MED	82 / 66	115 / 90	30 – 65	81%	–
		HIGH	120 / 96	150 / 117	40 – 80	80%	–
	07	LOW	50 / 41	72 / 59	15 – 55	82%	–
		MED	90 / 73	125 / 103	20 – 50	82%	–
		HIGH	105 / 84	150 / 120	30 – 60	81%	–
08	LOW	90 / 73	125 / 103	20 – 50	82%	–	
	MED	120 / 98	180 / 148	35 – 65	82%	–	
	HIGH	180 / 147	224 / 184	45 – 75	82%	–	
09	LOW	90 / 73	125 / 103	20 – 50	82%	–	
	MED	120 / 98	180 / 148	30 – 65	82%	–	
	HIGH	180 / 147	224 / 184	40 – 75	82%	–	
12	LOW	120 / 98	180 / 148	25 – 65	82%	–	
	MED	180 / 147	224 / 184	30 – 65	82%	–	
	HIGH	200 / 160	250 / 205	35 – 70	80%	–	
14	LOW	120 / 96	150 / 120	15 – 60	80%	–	
	MED	144 / 118	180 / 146	20 – 55	81%	–	
	HIGH	192 / 156	240 / 195	25 – 60	81%	–	

– Not Applicable

NOTES:

Heat ratings are for natural gas heat exchangers operated at or below 2000 ft (610 m). For information on Propane or altitudes above 2000 ft (610 m), see the Application Data section of this book. Accessory Propane/High Altitude kits are also available.

In the USA the input rating for altitudes above 2000 ft (610m) must be derated by 4% for each 1000 ft (305 m) above sea level. In Canada, the input rating must be derated by 10% for altitudes of 2000 ft (610 m) to 4500 ft (1372 m) above sea level.

Table 6 – HEAT RATING TABLE - LOW NO_x¹

UNIT	GAS HEAT	LOW NO _x HEAT EXCHANGER		TEMP RISE (DEG F)	THERMAL EFFICIENCY (%)	AFUE (%)	
		INPUT / OUTPUT STAGE 1 (MBH)	INPUT / OUTPUT STAGE 2 (MBH)				
Three Phase	04	LOW	–	60 / 47	20 – 50	81%	–
		MED	–	90 / 72	30 – 60	81%	–
		HIGH	–	–	–	–	–
	05	LOW	–	60 / 47	20 – 50	81%	–
		MED	–	90 / 72	30 – 60	81%	–
		HIGH	–	120 / 97	40 – 70	81%	–
	06	LOW	–	60 / 47	15 – 50	81%	–
		MED	–	90 / 72	25 – 60	80%	–
		HIGH	–	120 / 97	35 – 70	80%	–

– Not Applicable

NOTE:

1. Units meet California’s South Coast Air Quality Management District (SCAQMD) Low–NO_x emissions requirement of 40 nanograms per joule or less.

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Table 7 – SOUND PERFORMANCE TABLE

UNIT	COOLING STAGES	OUTDOOR SOUND (dB) AT 60								
		A-WEIGHTED	63	125	250	500	1000	2000	4000	8000
A04	1	76	78.2	78.0	74.2	73.3	70.6	66.0	62.4	56.9
A05	1	78	84.7	83.6	77.1	74.6	72.3	68.3	64.7	60.9
A06	1	77	87.5	82.5	76.1	73.6	71.3	67.1	64.1	60.0
A07	1	82	90.1	82.6	81.0	79.4	77.0	73.0	70.4	66.7
D08	2	82	90.6	84.3	80.2	79.3	77.1	72.2	67.4	63.7
D09	2	82	88.6	85.0	81.6	79.5	77.4	74.1	71.0	66.3
D12	2	87	85.9	87.9	85.6	84.4	82.8	78.5	74.9	72.5
D14	2	83	89.3	86.0	82.9	80.7	78.5	73.6	69.6	64.5

LEGEND

dB – Decibel

NOTES:

1. Outdoor sound data is measure in accordance with AHRI.
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 for Carrier units are taken in accordance with AHRI.

48HC EnergyX

Table 8 – MINIMUM - MAXIMUM AIRFLOW RATINGS - NATURAL GAS & PROPANE

UNIT	HEAT LEVEL	COOLING		HEATING	
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
48HC**04	LOW	900	1500	990	2190
	MED			1000	1550
	HIGH			-	-
48HC**05	LOW	1200	2000	990	2190
	MED			1330	2460
	HIGH			1390	2220
48HC**06	LOW	1500	2500	990	2730
	MED			1330	2880
	HIGH			1390	2780
48HC**07	LOW	1800	3000	990	3640
	MED			1330	4750
	HIGH			1390	3750
48HC**08	LOW	2250 (1508)	3750	1900	4750
	MED			2100	3900
	HIGH			2270	3780
48HC**09	LOW	2550 (1625)	4250	1900	4750
	MED			2100	4560
	HIGH			2270	4250
48HC**12	LOW	3000 (2171)	5000	2100	5470
	MED			2620	5670
	HIGH			2650	5290
48HC**14	LOW	3750 (2754)	6250	1880	7500
	MED			2450	6750
	HIGH			3000	7200

() With Staged Air Volume (SAV) 2-speed indoor fan motor system only. Values are minimum for VFD controller at 40Hz.

PHYSICAL DATA

Table 9 – 48HC

3 - 6 TON

MODEL	HC 3 Ton		HC 4 – 5 Ton		HC 6 TON	
	Non Econo	Econo	Non Econo	Econo	Non Econo	Econo
EnergyX size (CFM)						
EnergyX unit type	Modulating Air Flow Capability					
ERV Wheel OA (CFM)	200–550		600–1400		600–1400	
ERV Wheel EAT (CFM)	200–550		600–1400		600–1400	
Max Economizer OA (CFM)	N/A	1200	N/A	1600/2000	N/A	2400
Max Economizer EAT (CFM)		1200		1600/2000		2400
ENERGY RECOVERY WHEEL						
Type	Enthalpy Lightweight Polymer with Silica Gel Desiccant Coating					
Model (AirXchange)	ERC–1904		ERC–2513C		ERC–2513C	
Size (Dia. X Depth) (in.)	19 x 1		25 x 3		25 x 3	
Nominal Drive Motor HP	0.1		0.1		0.1	
SUPPLY FAN						
Qty – Type	1 – Backward Curved					
Drive Type	Direct		Direct		Direct	
Blower Size (Diameter)	9.8–in.		15.75 in		15.75 in	
Nominal Motor HP	0.23		1.179		1.179	
EXHAUST FAN						
Qty – Type	1 – Backward Curved					
Drive Type	Direct		Direct		Direct	
Blower Size	15.75–in.		400mm	400mm	400mm	
Nominal Motor HP	1.179		1.179	1.179	1.179	
FILTERS						
Type	2–in. Pleated, 30% Efficiency					
Supply Air (Qty) – Size	(1) 10–in. X 20–in. X 2–in.		(1) 16–in. X 25–in. X 2–in.		(1) 16–in. X 25–in. X 2–in.	
Exhaust Air (Qty) – Size	(1) 10–in. X 20–in. X 2–in.		(1) 16–in. X 25–in. X 2–in.		(1) 16–in. X 25–in. X 2–in.	
Type	Aluminum Water Filter					
Water Entrapment (Qty) – Size	(1) 28.75–in x 12.25–in x 1–in		(1) 28.75–in. X 14.75–in. X 1–in.		(1) 35.75–in. X 14.75–in. X 1–in.	

48HC EnergyX

Table 10 – 48HC

7.5 - 12.5 TON

MODEL	HC 7.5 / 8.5 / 10 Ton		HC 12.5 Ton	
	Non Econo	Econo	Non Econo	Econo
EnergyX size (CFM)				
EnergyX unit type	Modulating Air Flow Capability		Modulating Air Flow Capability	
ERV Wheel OA (CFM)	900–2000		682–3675	
ERV Wheel EAT (CFM)	900–2000		682–3675	
Max Economizer OA (CFM)	N/A	3000/3400/4000	N/A	5000
Max Economizer EAT (CFM)		3000/3400/4000		5000
ENERGY RECOVERY WHEEL				
Type				
Model (AirXchange)	ERC–3019C		ERC–3628	
Size (Dia. X Depth) (in.)	30 x 3		36 x 3	
Nominal Drive Motor HP	0.1		1/20	
SUPPLY FAN				
Qty – Type	1 – Backward Curved		1 – Backward Curved	
Drive Type	Direct		Direct	
Blower Size (Diameter)	15.75 in		19.7 in	
Nominal Motor HP	1.179		3.619	
EXHAUST FAN				
Qty – Type	1 – Backward Curved		1 – Backward Curved	
Drive Type	Direct		Direct	
Blower Size	500mm		500mm	
Nominal Motor HP	3.619		3.619	
FILTERS				
Type				
Supply Air (Qty) – Size	(2) 16–in. X 16–in. X 2–in.		(2) 24 x 20 x 2	
Exhaust Air (Qty) – Size	(2) 16–in. X 16–in. X 2–in.		(2) 24 x 20 x 2	
Type				
Water Entrapment (Qty) – Size	(1) 35.75–in. X 17.5–in. X 1–in.		(1) 48.219–in. X 17.15–in. X 1–in.	

CURBS & WEIGHTS DIMENSIONS - 48HC 04-06

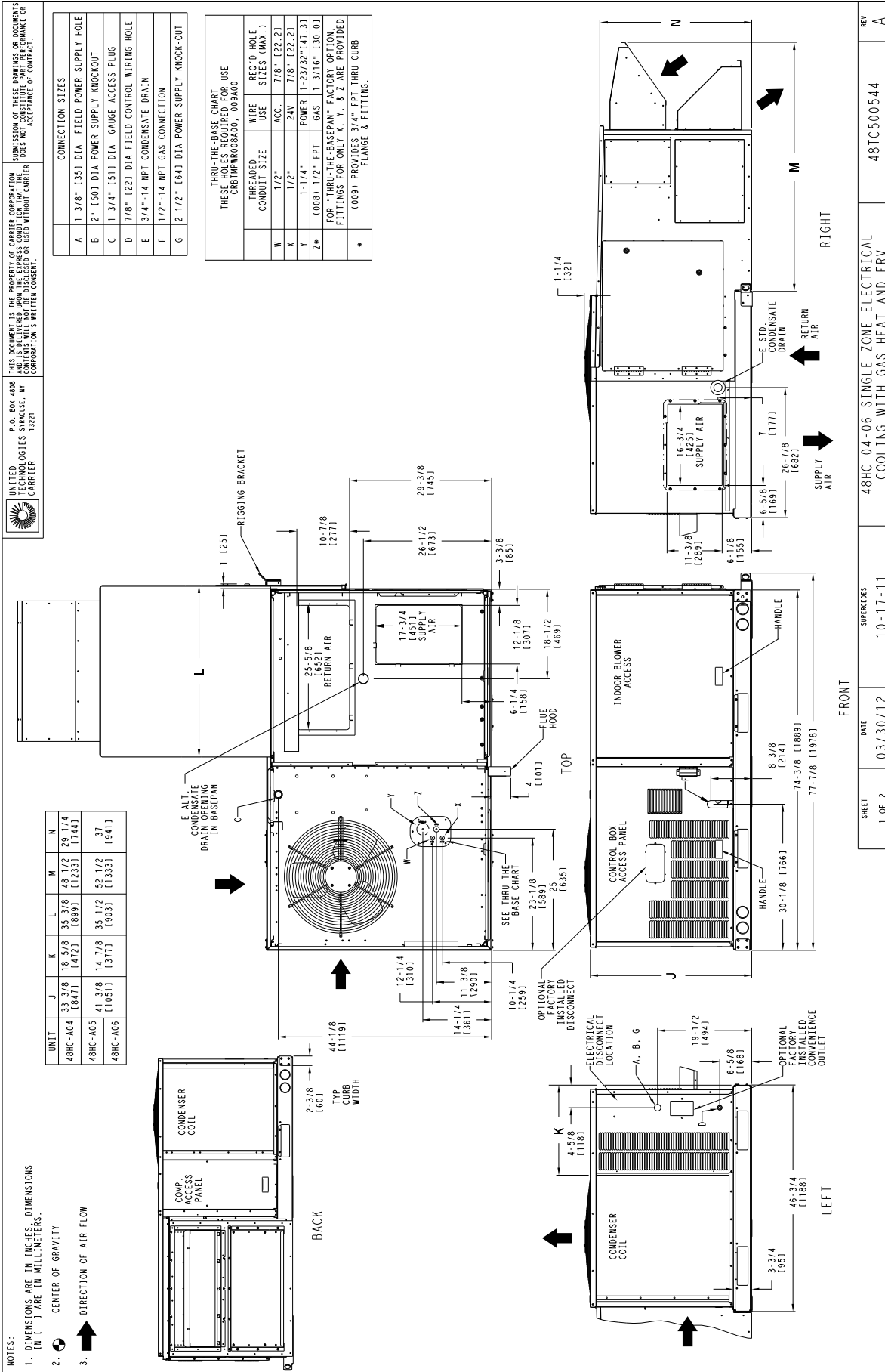


Fig. 1 - Dimensions 48HC 04-06

CURBS & WEIGHTS DIMENSIONS - 48HC 04-06 (cont.)

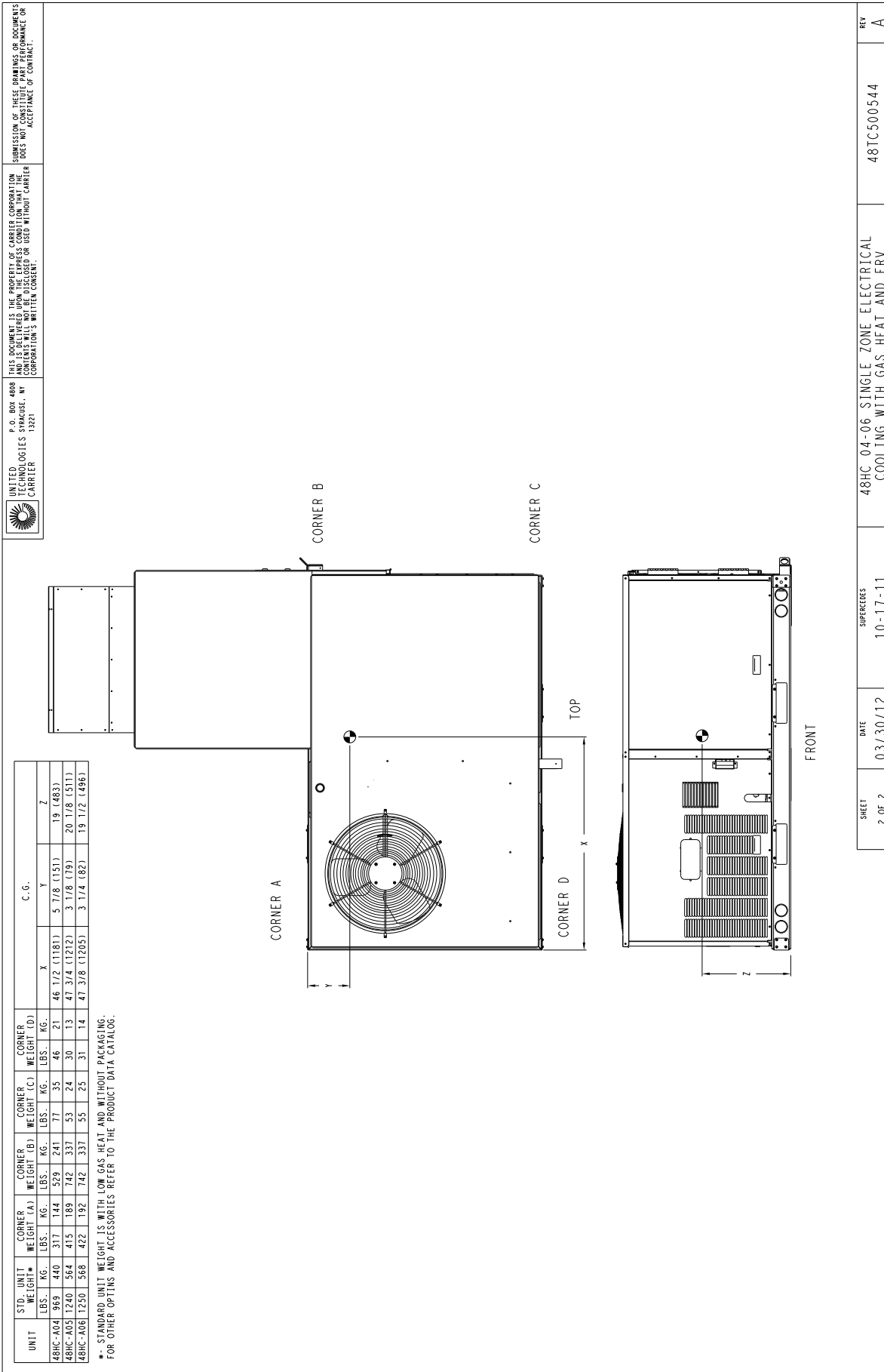


Fig. 2 - Dimensions 48HC 04-06



CURBS & WEIGHTS DIMENSIONS - 48HC 04-06 (cont.)

CONNECTOR PKG. ACCY.	B	C	D ALT DRAIN HOLE	GAS	POWER	CONTROL	ACCESSORY POWER
CRBTMPWR001A01	1'-9 11/16" [551]	1'-4" [406]	1 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			

ROOFCURB ACCESSORY	A	UNIT SIZE
CRRFCURB001A01	1'-2" [356]	48HC**04-06
CRRFCURB002A01	2'-0" [610]	

NOTES:

1. Roof curb accessory is shipped disassembled.
2. Insulated panels.
3. Dimensions in [] are in millimeters.
4. Roof curb: galvanized steel.
5. Attach ductwork to curb (flanges of duct rest on curb).
6. Service clearance: 4 ft on each side.
7. Direction of airflow.
8. Connector package CRBTMPWR001A01 is for thru-the-curb type gas.
CRBTMPWR003A01 is for thru-the-base type gas connections.

48HC EnergyX

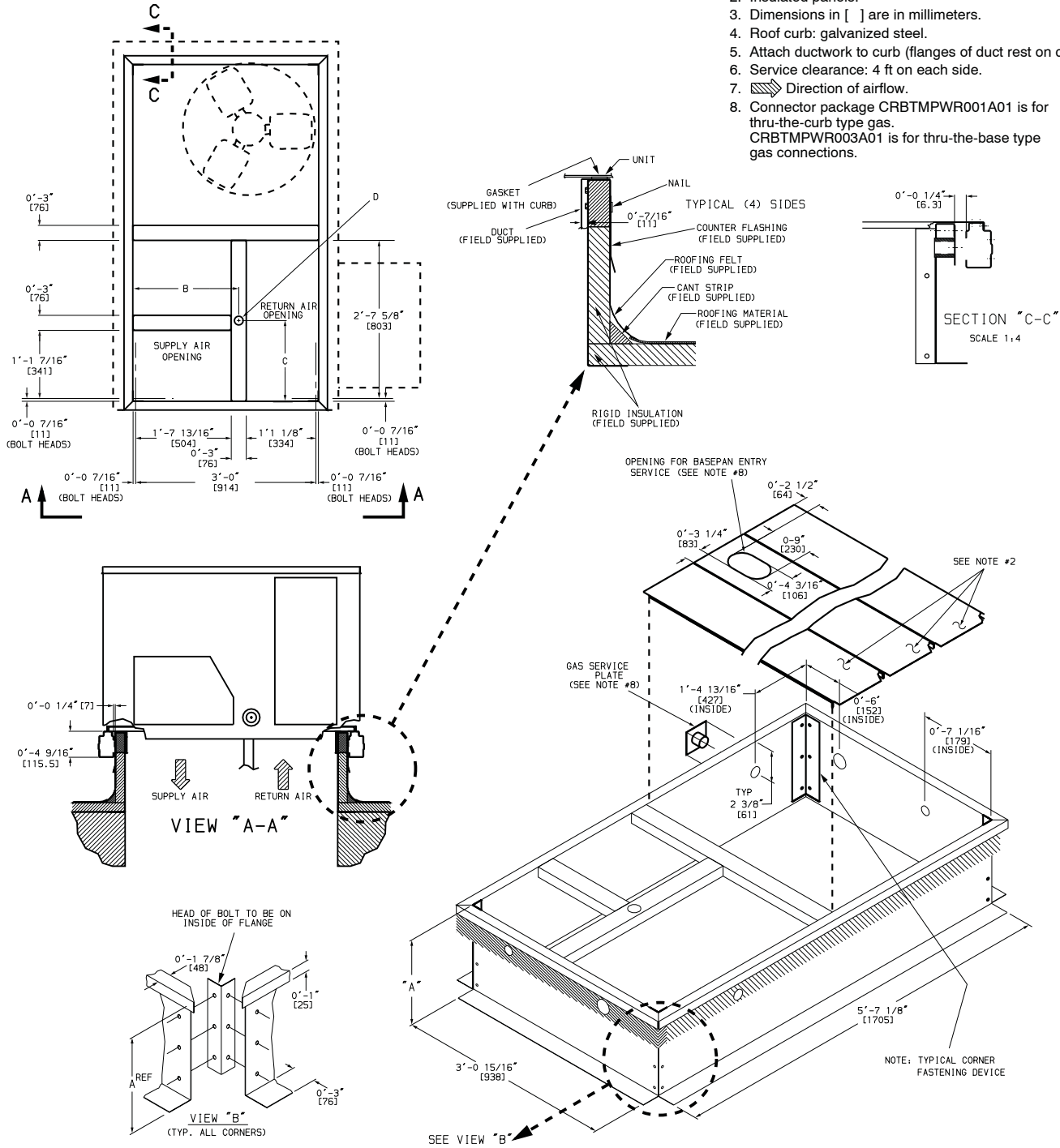
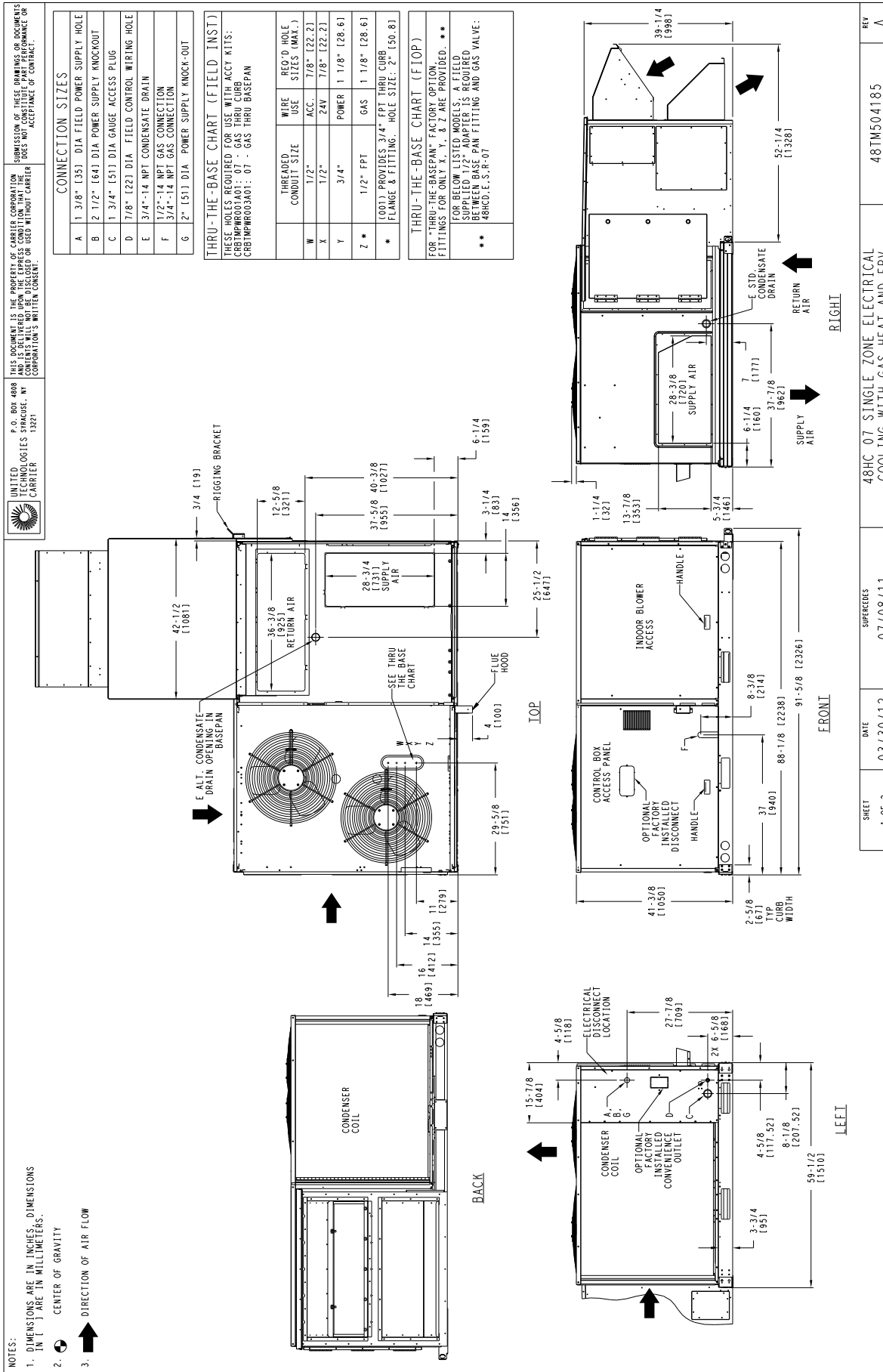


Fig. 3 - Roof Curb Details 48HC 04-06

C10040A

CURBS & WEIGHTS DIMENSIONS - 48HC 07



BACK

CONDENSER COIL

TOP

INDOOR BLOWER ACCESS

CONTROL BOX ACCESS PANEL

OPTIONAL FACTORY INSTALLED DISCONNECT

HANDLE

OPTIONAL FACTORY INSTALLED DISCONNECT

HANDLE

FRONT

INDOOR BLOWER ACCESS

CONTROL BOX ACCESS PANEL

OPTIONAL FACTORY INSTALLED DISCONNECT

HANDLE

OPTIONAL FACTORY INSTALLED DISCONNECT

HANDLE

LEFT

RIGHT

BACK

TOP

FRONT

LEFT

RIGHT

BACK

TOP

FRONT

LEFT

RIGHT

Fig. 4 - Dimensions 48HC 07

CURBS & WEIGHTS DIMENSIONS - 48HC 07 (cont.)

48HC EnergyX

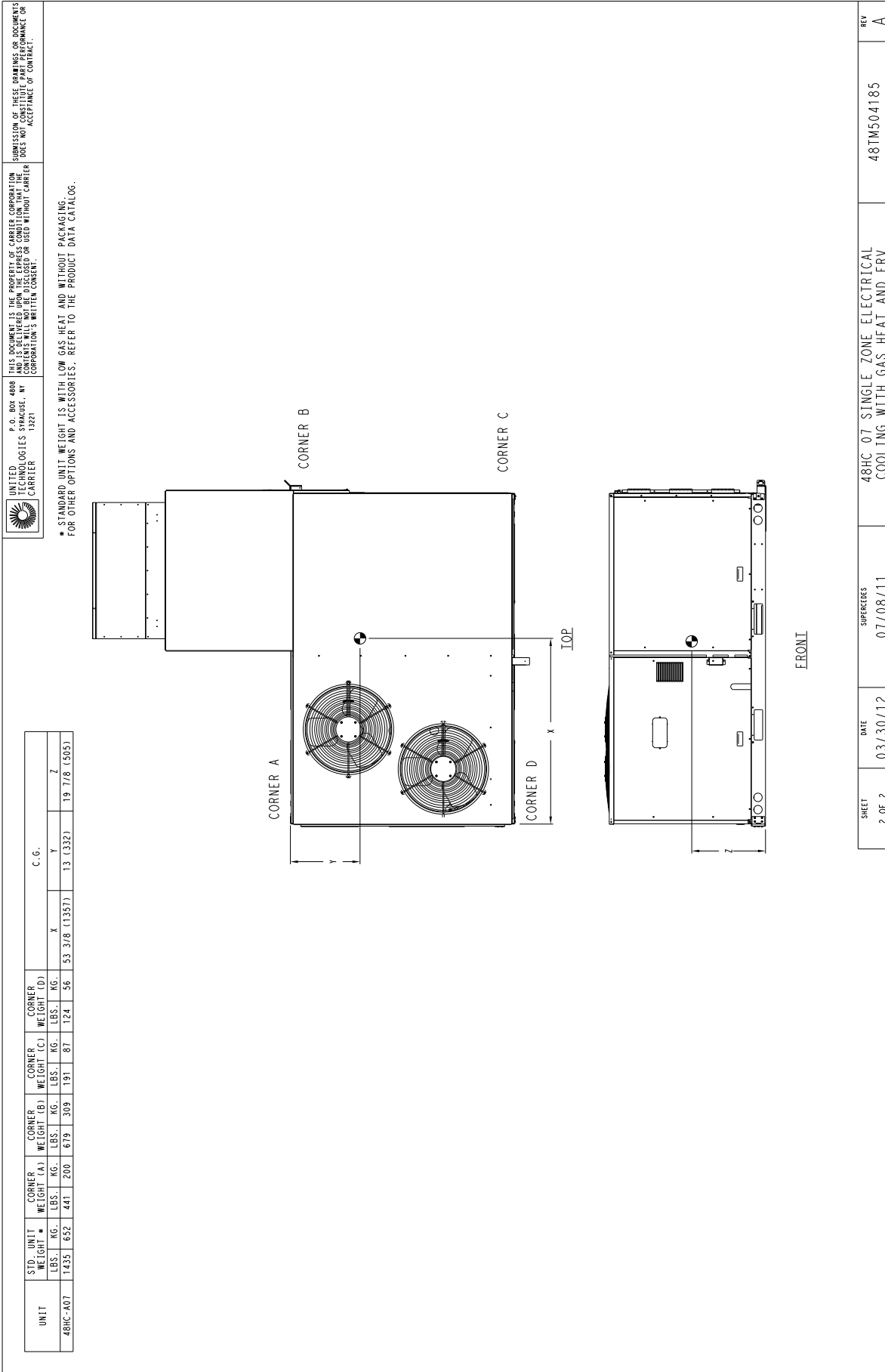


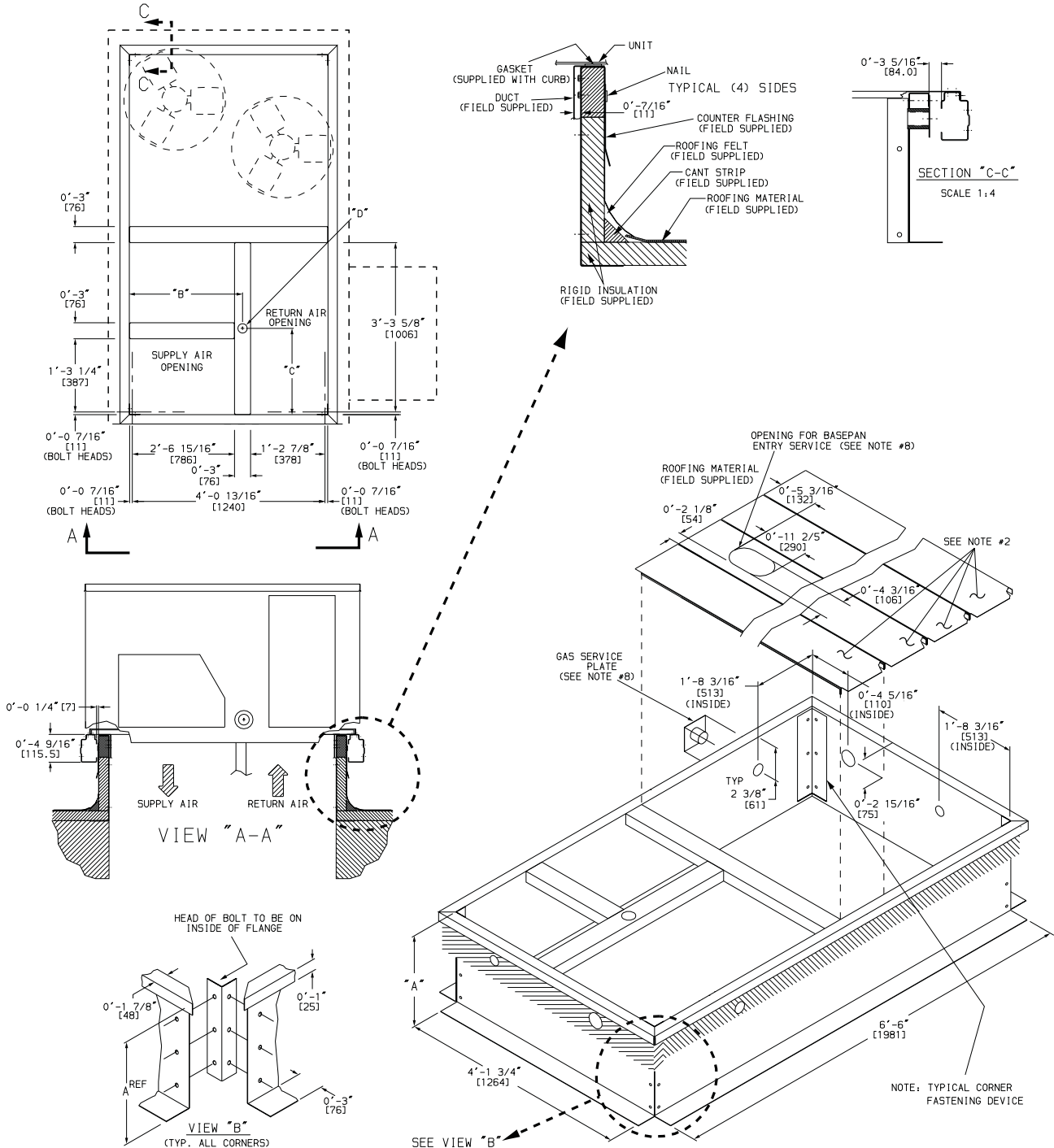
Fig. 5 - Dimensions 48HC 07

CURBS & WEIGHTS DIMENSIONS - 48HC 07 (cont.)

ROOFCURB ACCESSORY	A	UNIT SIZE
CRRFCURB003A01	1'-2" [356]	48HC**07-09
CRRFCURB004A01	2'-0" [610]	

- NOTES:
1. ROOFCURB ACCESSORY IS SHIPPED DISASSEMBLED.
 2. INSULATED PANELS: 1" THK. POLYURETHANE FOAM, 1-3/4 # DENSITY.
 3. DIMENSIONS IN [] ARE IN MILLIMETERS.
 4. ROOFCURB: 16 GAGE STEEL.
 5. ATTACH DUCTWORK TO CURB. (FLANGES OF DUCT REST ON CURB)
 6. SERVICE CLEARANCE 4' ON EACH SIDE.
 7. DIRECTION OF AIR FLOW.
 8. CONNECTOR PACKAGE CRBTMPWR002A01 IS FOR THRU-THE-CURB GAS TYPE. CONNECTOR PACKAGE CRBTMPWR004A01 IS FOR THRU-THE-BOTTOM TYPE GAS CONNECTIONS.

CONNECTOR PKG. ACC.	B	C	D ALT DRAIN HOLE	GAS	POWER	CONTROL	ACCESSORY PWR
CRBTMPWR002A01	2'-8 7/16" [827]	1'-10 15/16" [583]	1 3/4" [44.5]	3/4" [19]NPT	1 1/4 [31.7]	1/2" [12.7]NPT	1/2" [12.7]NPT
CRBTMPWR004A01							



48HC EnergyX

Fig. 6 - Roof Curb Details 48HC 07-09

CURBS & WEIGHTS DIMENSIONS - 48HC 08-12

48HC EnergyX

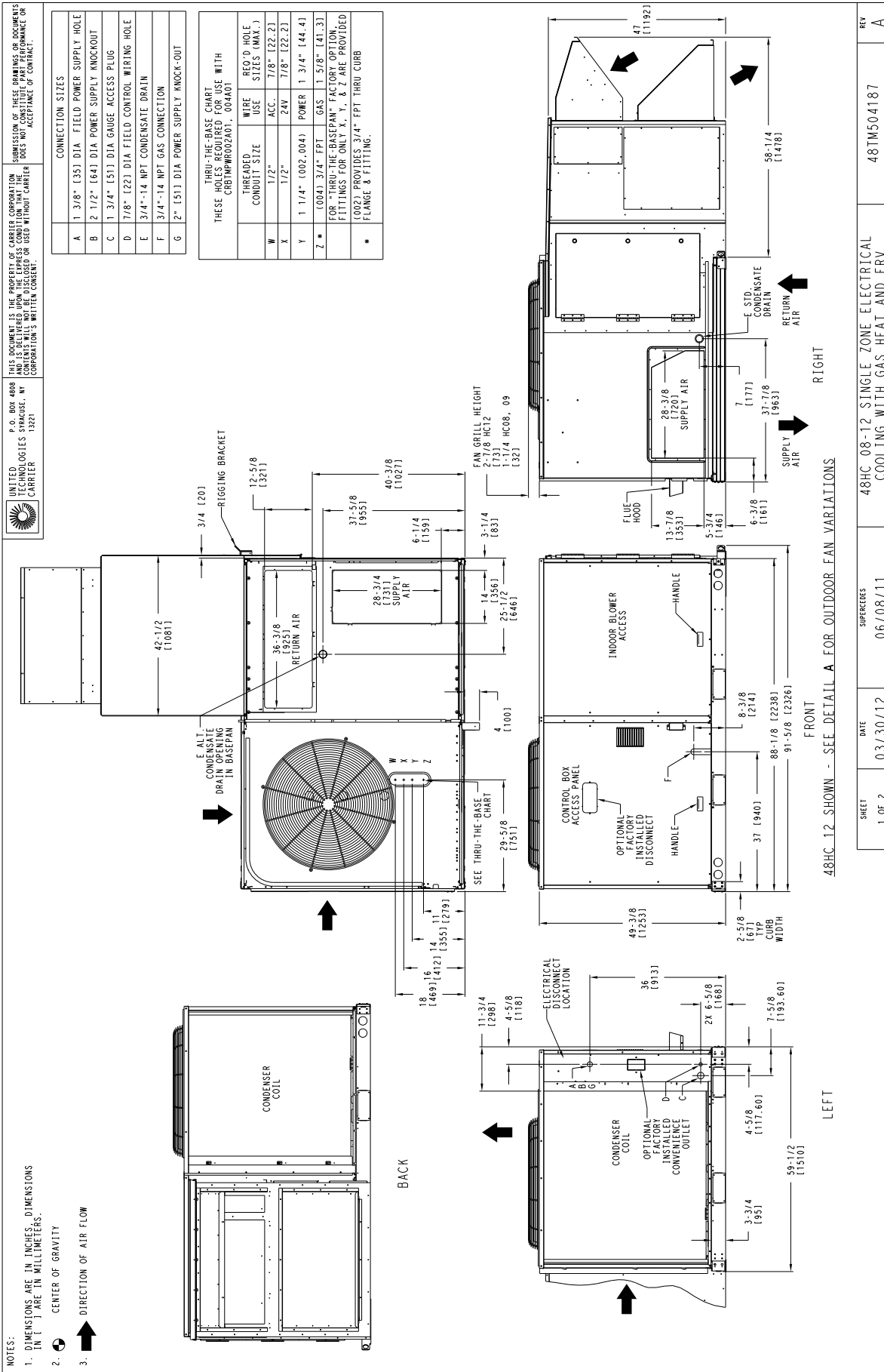
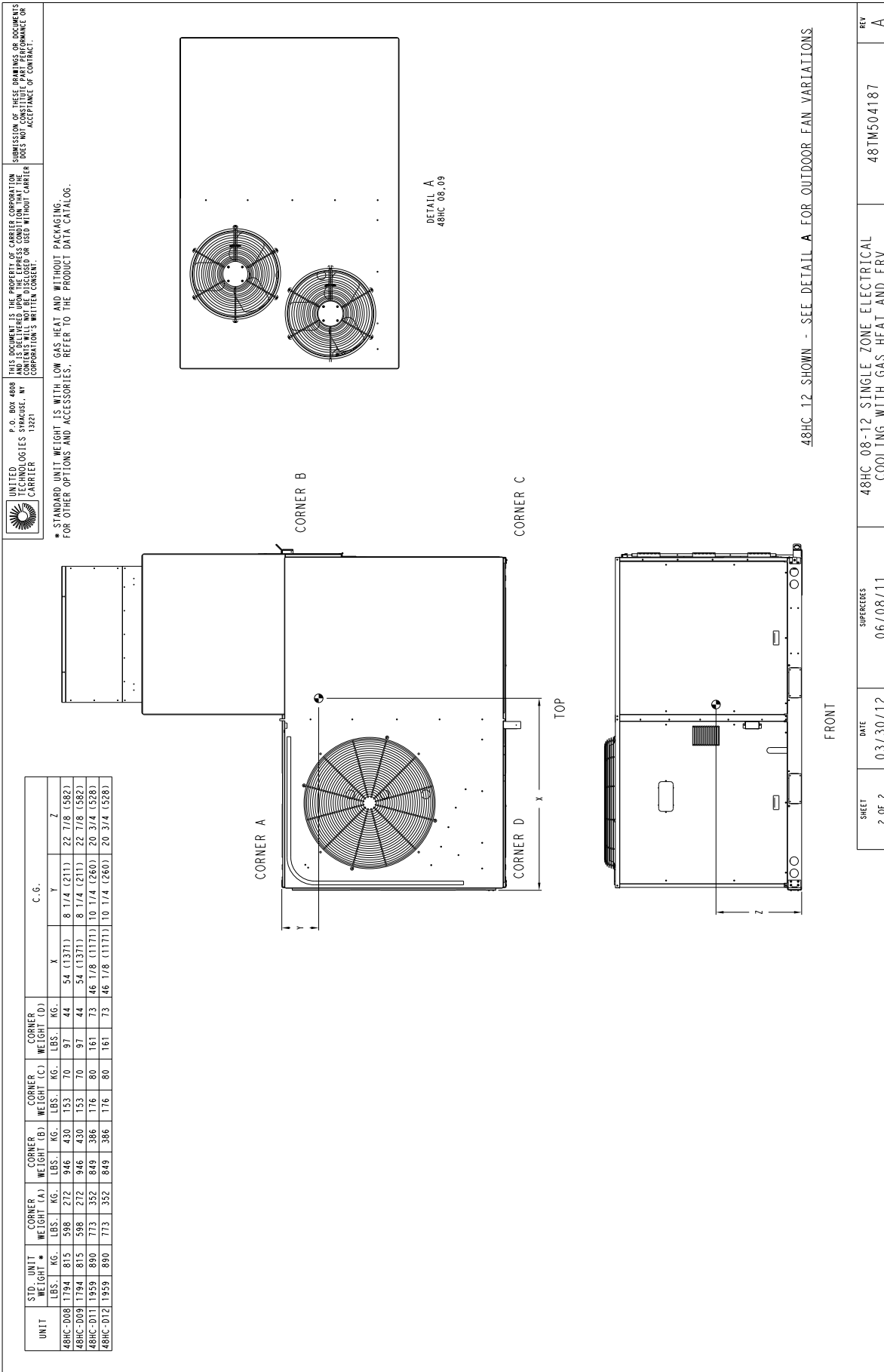


Fig. 7 - Dimensions 48HC 08-12

CURBS & WEIGHTS DIMENSIONS - 48HC 08-12 (cont.)



48HC EnergyX

Fig. 8 - Dimensions 48HC 08-12

CURBS & WEIGHTS DIMENSIONS - 48HC 12 (cont.)

ROOFCURB ACCESSORY	A	UNIT SIZE
CRRFCURB003A01	1'-2" [356]	48HC**12
CRRFCURB004A01	2'-0" [610]	

- NOTES:
1. ROOFCURB ACCESSORY IS SHIPPED DISASSEMBLED.
 2. INSULATED PANELS: 1" THK. POLYURETHANE FOAM, 1-3/4 # DENSITY.
 3. DIMENSIONS IN [] ARE IN MILLIMETERS.
 4. ROOFCURB: 16 GAGE STEEL.
 5. ATTACH DUCTWORK TO CURB. (FLANGES OF DUCT REST ON CURB)
 6. SERVICE CLEARANCE 4' ON EACH SIDE.
 7. DIRECTION OF AIR FLOW.
 8. CONNECTOR PACKAGE CRBTMPWR002A01 IS FOR THRU-THE-CURB GAS TYPE. CONNECTOR PACKAGE CRBTMPWR004A01 IS FOR THRU-THE-BOTTOM TYPE GAS CONNECTIONS.

CONNECTOR PKG. ACC.	B	C	D ALT DRAIN HOLE	GAS	POWER	CONTROL	ACCESSORY PWR
CRBTMPWR002A01	2'-8 7/16" [827]	1'-10 15/16" [583]	1 3/4" [44.5]	3/4" [19]NPT	1 1/4 [31.7]	1/2" [12.7]NPT	1/2" [12.7]NPT
CRBTMPWR004A01							

48HC EnergyX

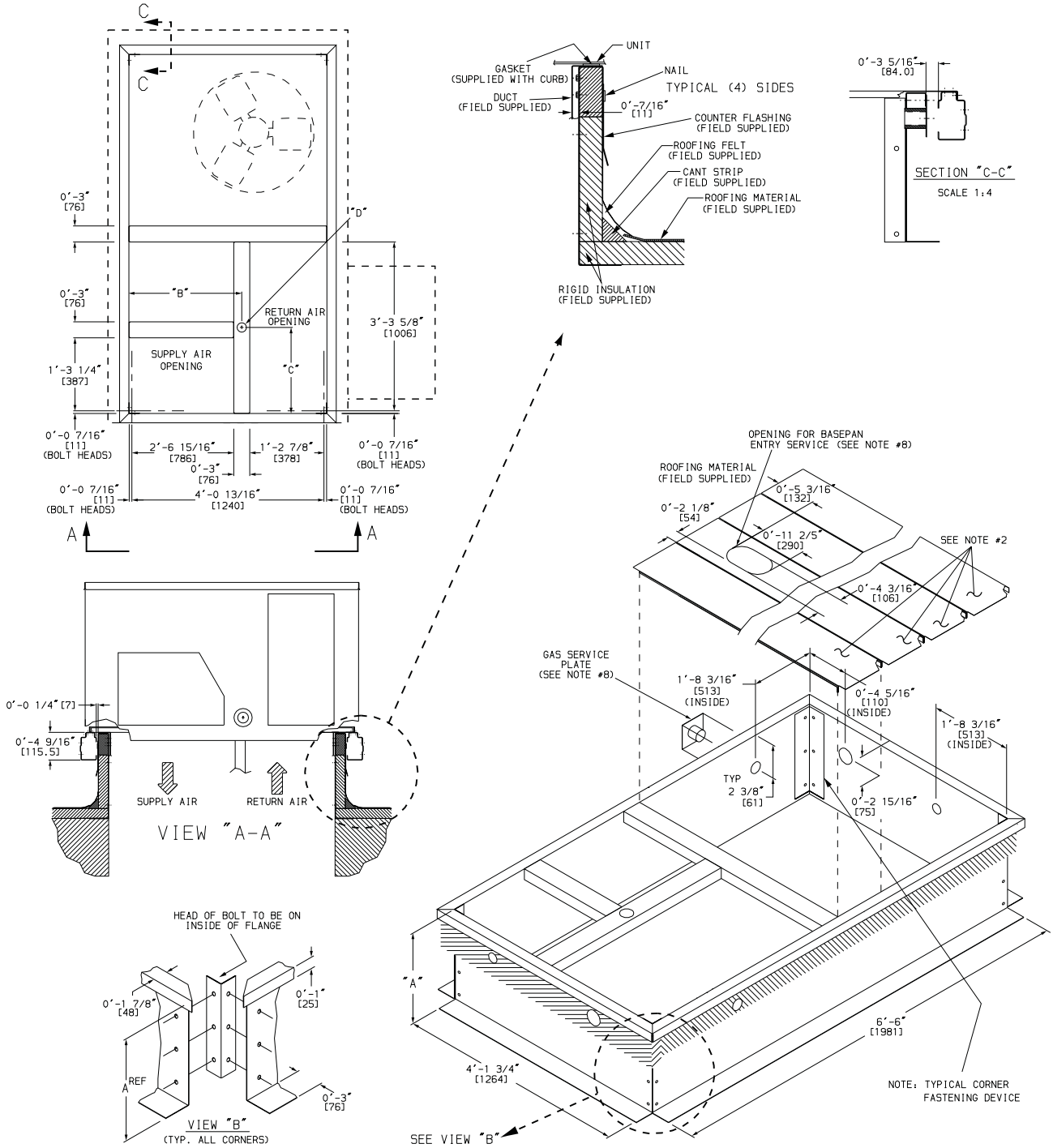
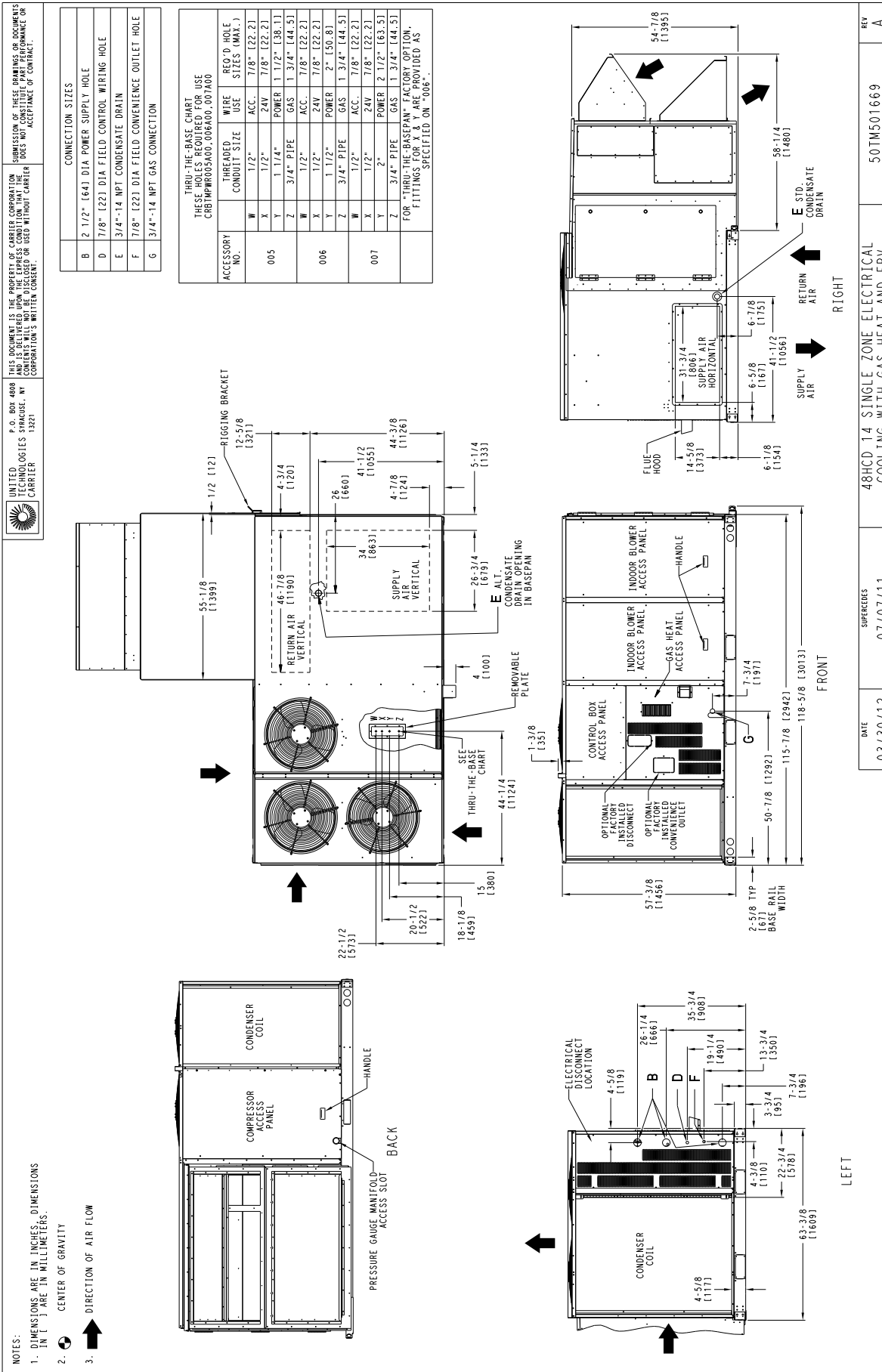


Fig. 9 - Roof Curb Details 48HC 12

C10144B

CURBS & WEIGHTS DIMENSIONS - 48HC 14



DATE 03/30/12	SUPERCEDES 07/07/11	REV A	50TM501669
48HC 14 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT AND ERV			



CURBS & WEIGHTS DIMENSIONS - 48HC 14 (cont.)

48HC EnergyX

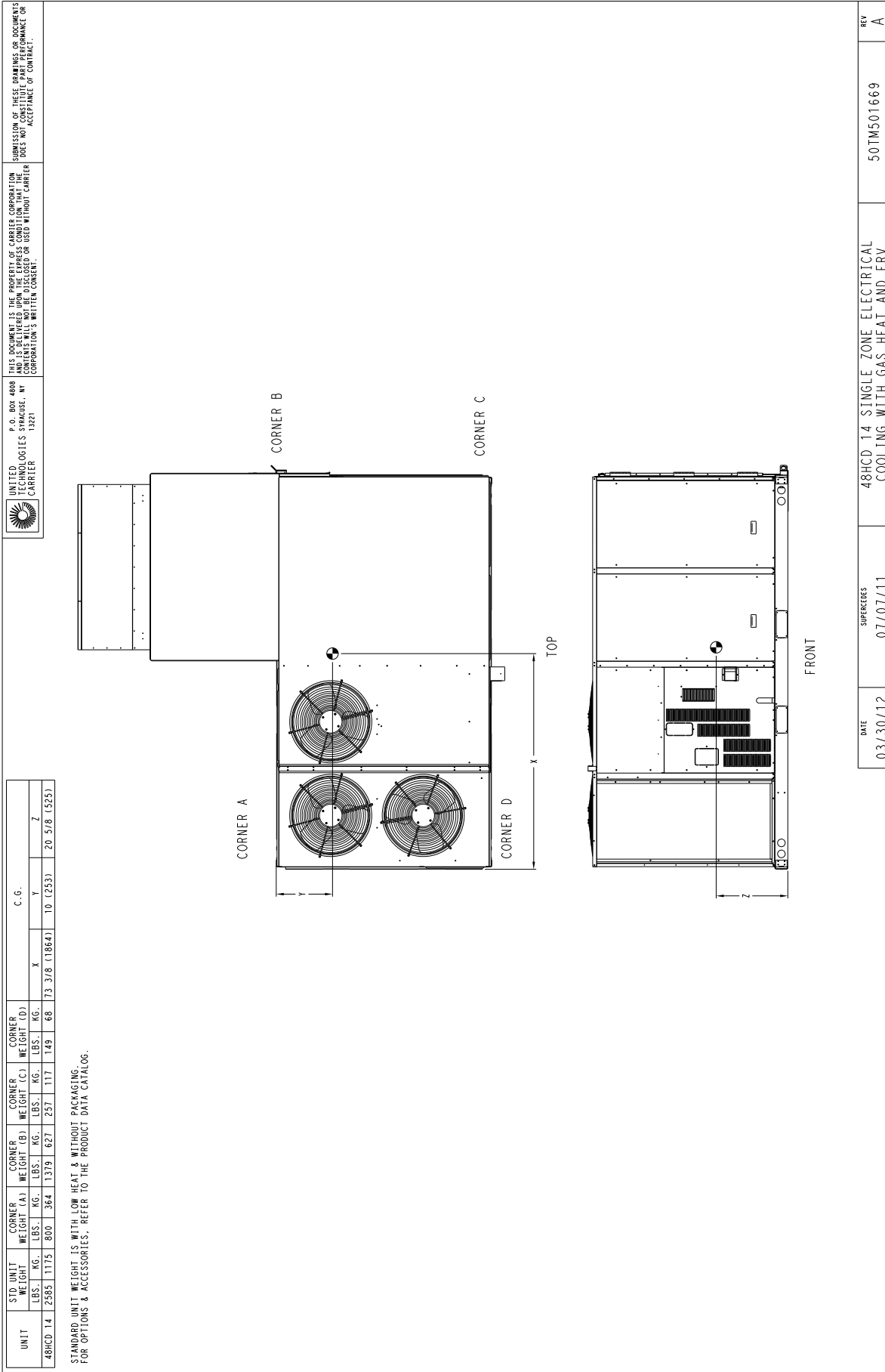
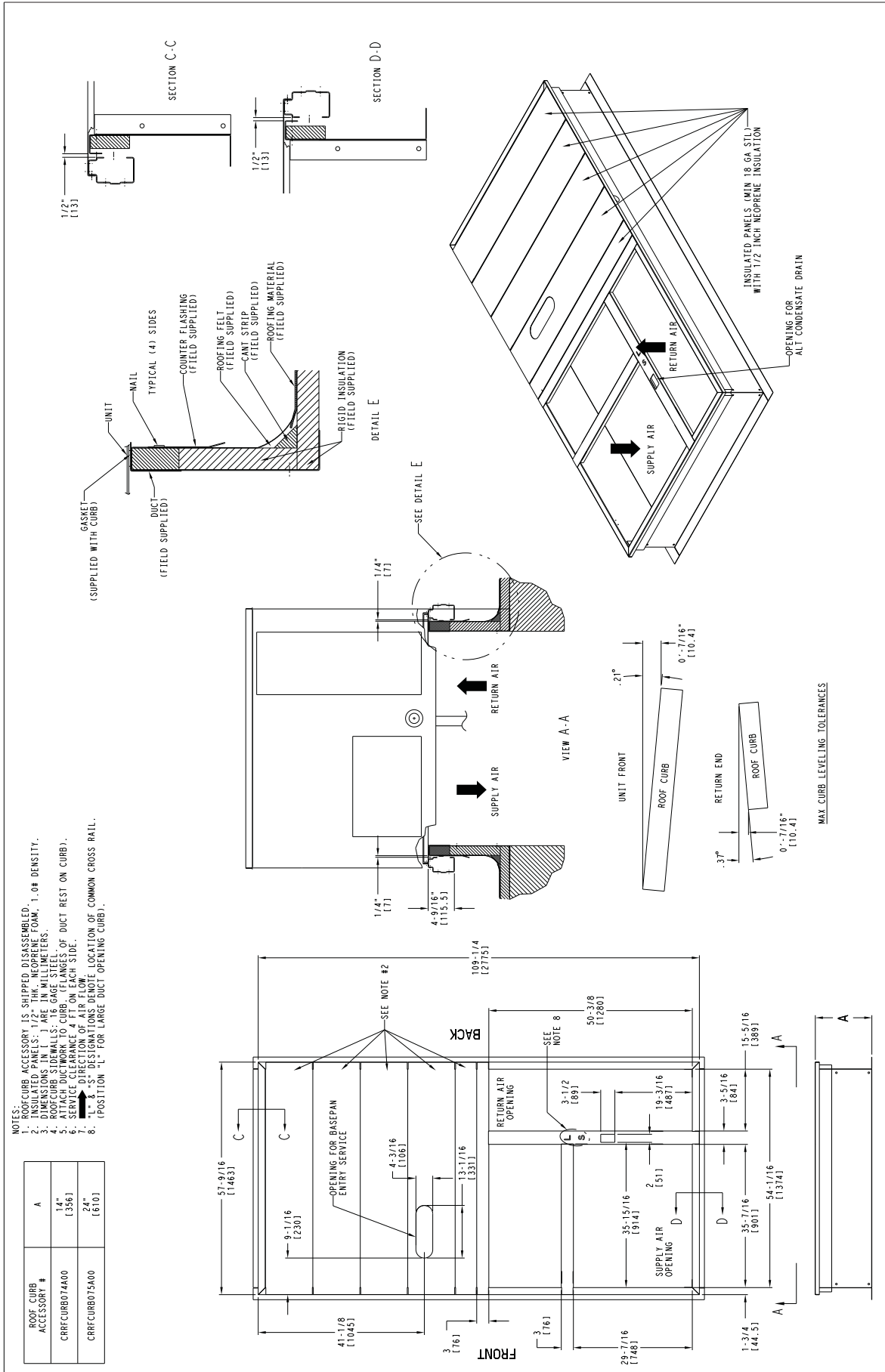


Fig. 11 - Dimensions 48HC 14

CURBS & WEIGHTS DIMENSIONS - 48HC 14 (cont.)



48HC EnergyX

Fig. 12 - Roof Curb Details 48HC 14

CURBS & WEIGHT DIMENSIONS - SERVICE CLEARANCES

48HC EnergyX

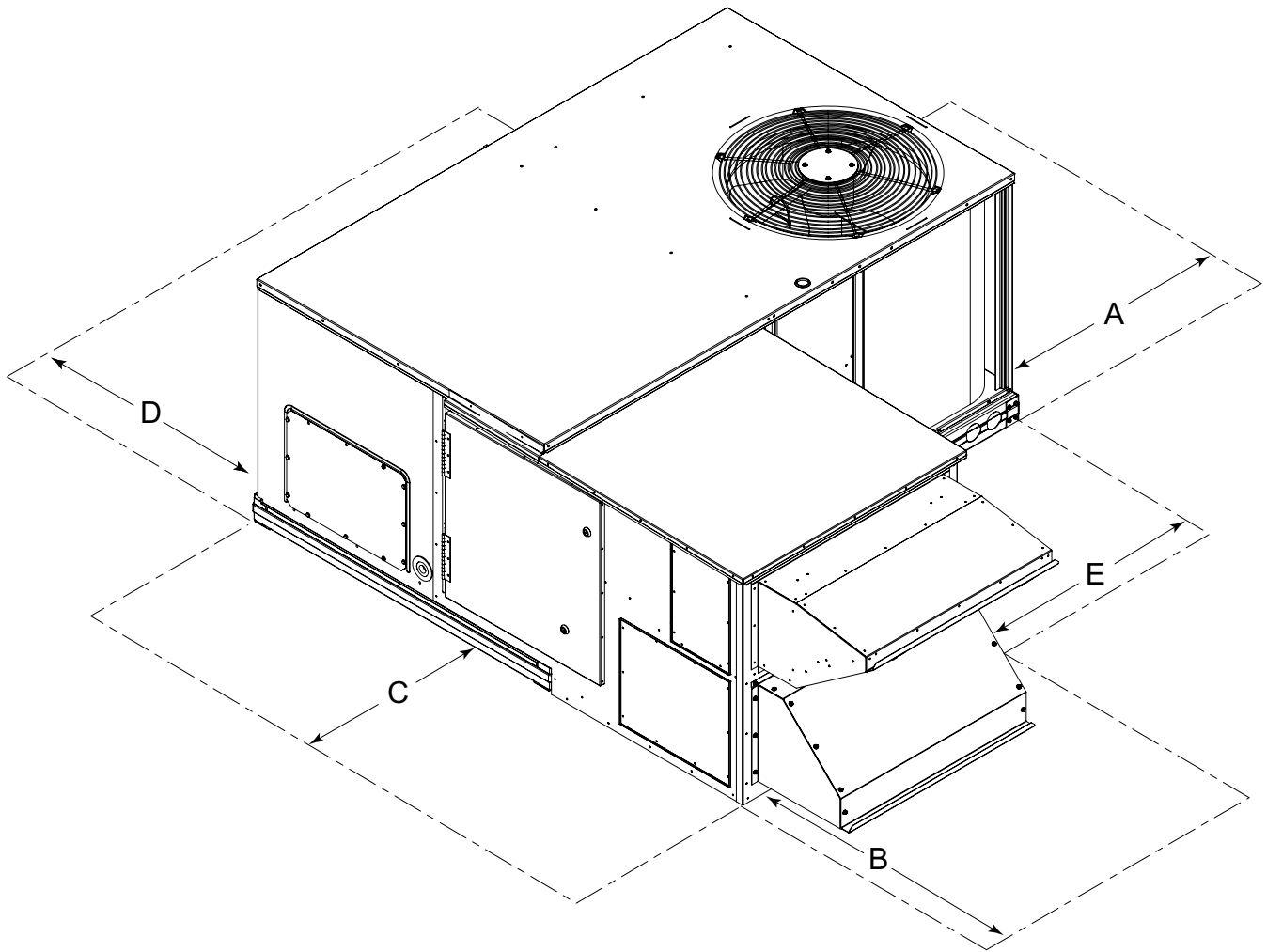


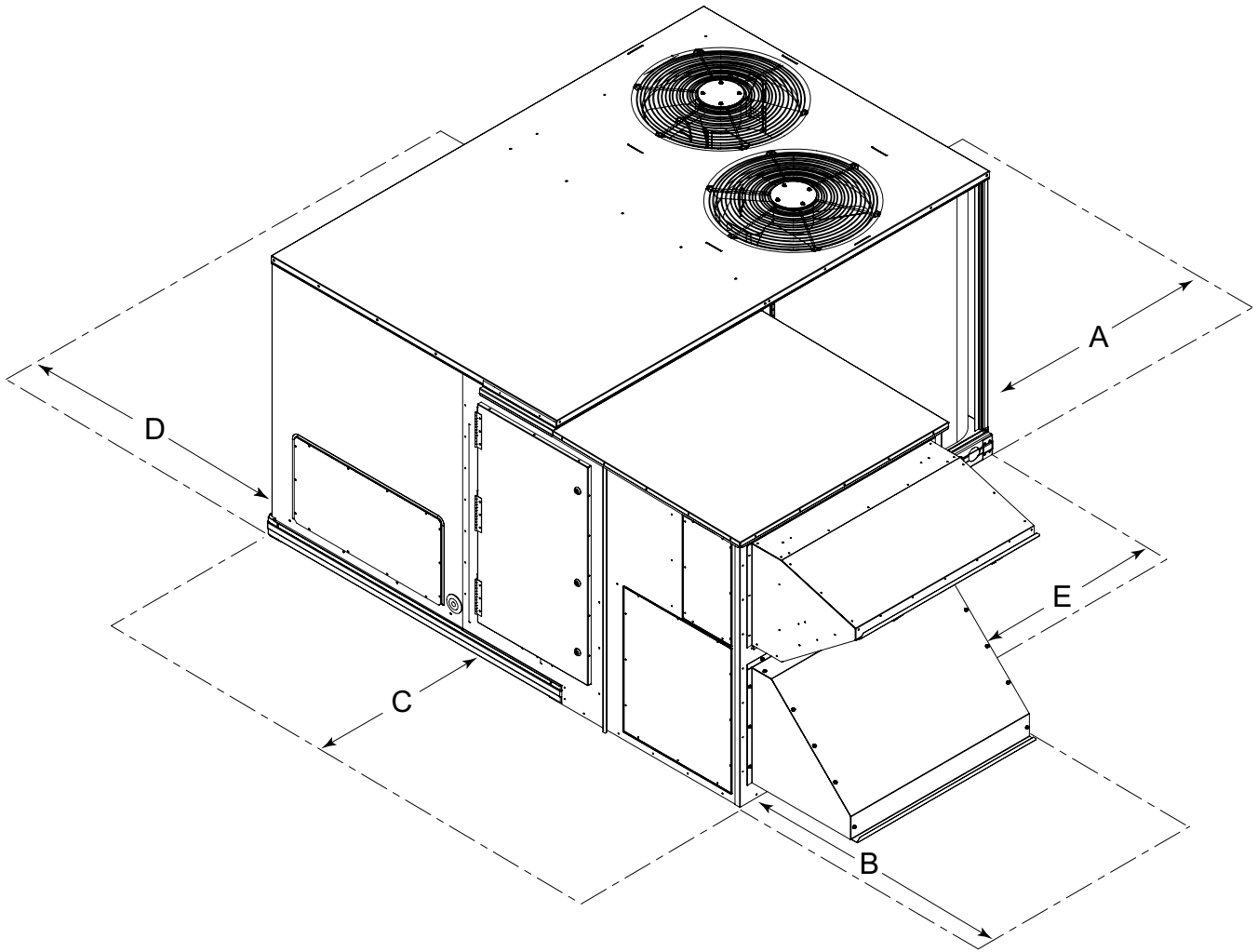
Fig. 13 - Service Clearance

C12184

LOCATION	DIMENSION	CONDITION
A	48-in (1219 mm) 18-in (457 mm) 18-in (457 mm) 12-in (305 mm)	Unit disconnect is mounted on panel No disconnect, convenience outlet option Recommended service clearance Minimum clearance
B	36-in (914 mm)	Recommended service clearance
C	36-in (914 mm)	Recommended service clearance
D	48-in (1219 mm) 42-in (1067 mm) 36-in (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 (3 m) of this unit's flue outlet
E	36-in (914 mm)	Recommended service clearance

NOTE: Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

CURBS & WEIGHT DIMENSIONS - SERVICE CLEARANCES (cont.)



48HC EnergyX

Fig. 14 - Service Clearance

C12185

LOCATION	DIMENSION	CONDITION
A	48-in (1219 mm) 18-in (457 mm) 18-in (457 mm) 12-in (305 mm)	Unit disconnect is mounted on panel No disconnect, convenience outlet option Recommended service clearance Minimum clearance
B	36-in (914 mm)	Recommended service clearance
C	36-in (914 mm)	Recommended service clearance
D	48-in (1219 mm) 42-in (1067 mm) 36-in (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 (3 m) of this unit's flue outlet
E	36-in (914 mm)	Recommended service clearance

NOTE: Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

CURBS & WEIGHT DIMENSIONS - SERVICE CLEARANCES (cont.)

48HC EnergyX

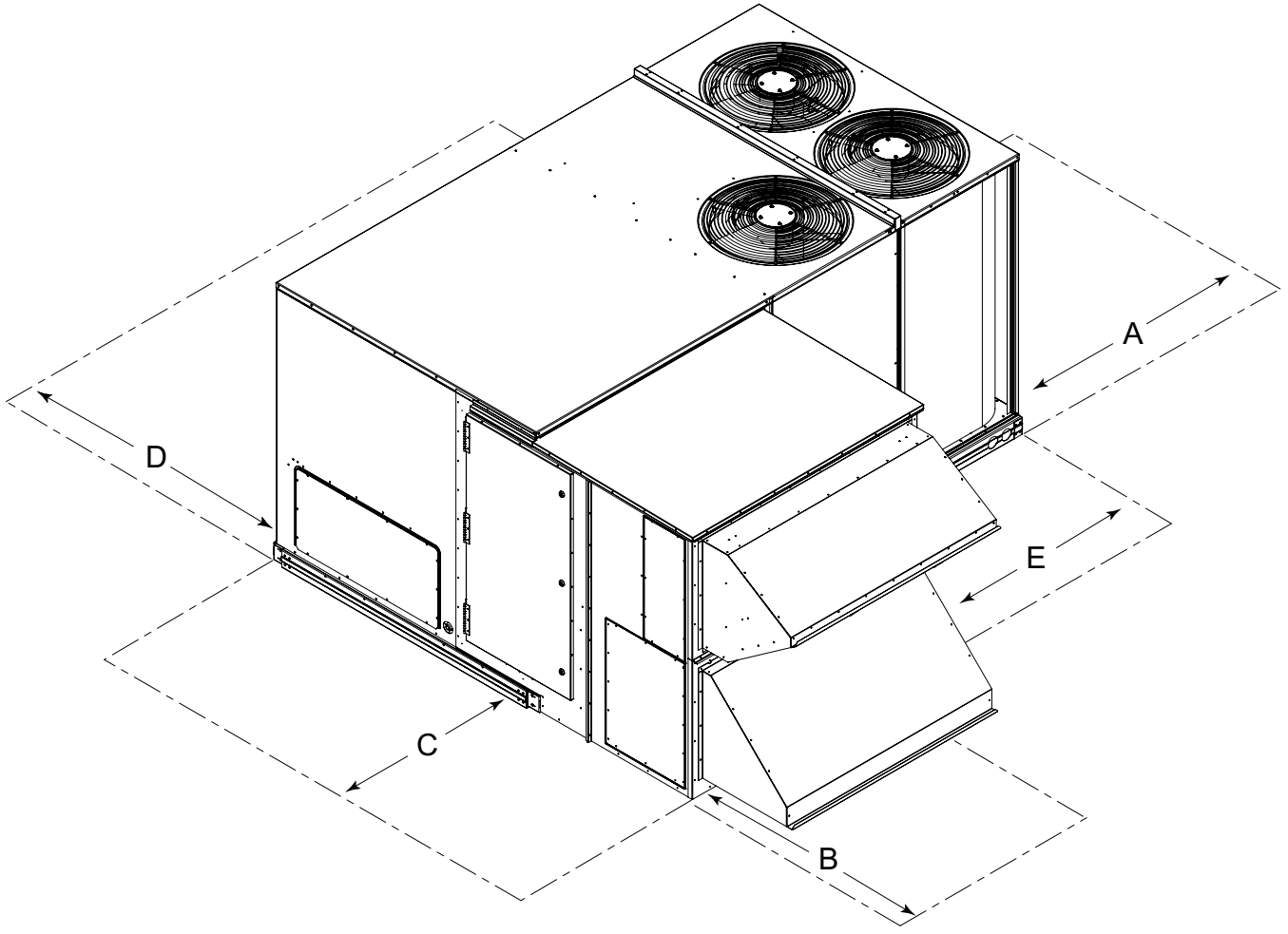


Fig. 15 - Service Clearance

C12186

LOCATION	DIMENSION	CONDITION
A	48-in (1219 mm) 18-in (457 mm) 18-in (457 mm) 12-in (305 mm)	Unit disconnect is mounted on panel No disconnect, convenience outlet option Recommended service clearance Minimum clearance
B	36-in (914 mm)	Recommended service clearance
C	36-in (914 mm)	Recommended service clearance
D	48-in (1219 mm) 42-in (1067 mm) 36-in (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 (3 m) of this unit's flue outlet
E	36-in (914 mm)	Recommended service clearance

NOTE: Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

OPTIONS & ACCESSORY WEIGHTS

OPTION / ACCESSORY	OPTION / ACCESSORY WEIGHTS															
	04		05		06		07		08		09		12		14	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
EconoMi\$er vertical	50	23	50	23	50	23	75	34	75	34	75	34	75	34	132	60
Medium Gas Heat	12	5	9	4	9	4	15	7	15	7	15	7	18	8	18	8
High Gas Heat	–	–	17	8	17	8	29	13	29	13	29	13	35	16	42	19
Hail Guard (louvered)	16	7	16	7	16	7	34	15	34	15	34	15	34	15	45	20
Cu/Cu Condenser Coil	35	16	35	16	35	16	95	43	95	43	95	43	170	77	190	86
Cu/Cu Condenser and Evaporator Coils	60	27	60	27	90	41	140	64	140	64	195	88	270	122	280	127
Roof Curb (14–in. curb)	115	52	115	52	115	52	143	65	143	65	143	65	143	65	180	82
Roof Curb (24–in. curb)	197	89	197	89	197	89	245	111	245	111	245	111	245	111	255	116
CO ₂ sensor	5	2	5	2	5	2	5	2	5	2	5	2	5	2	5	2
Flue Discharge Deflector (04–12 only)	7	3	7	3	7	3	7	3	7	3	7	3	7	3	–	–
Optional Indoor Motor/Drive	10	5	10	5	10	5	15	7	15	7	15	7	15	7	45	20
Motor Master Controller	35	16	35	16	35	16	35	16	35	16	35	16	35	16	40	18
Return Smoke Detector (08–14 only)	5	2	5	2	5	2	5	2	5	2	5	2	5	2	5	2
Supply Smoke Detector	5	2	5	2	5	2	5	2	5	2	5	2	5	2	5	2
Fan/Filter Status Switch	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1
Non–Fused Disconnect	15	7	15	7	15	7	15	7	15	7	15	7	15	7	15	7
Powered Convenience outlet	35	16	35	16	35	16	35	16	35	16	35	16	35	16	35	16
Non–Powered Convenience outlet	5	2	5	2	5	2	5	2	5	2	5	2	5	2	5	2
HACR Breaker	15	7	15	7	15	7	15	7	15	7	15	7	15	7	15	7
Enthalpy Sensor	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1
Differential Enthalpy Sensor	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1
SAV System with VFD	–	–	–	–	–	–	–	–	20	9	20	9	20	9	20	9

NOTE: Where multiple variations are available, the heaviest combination is listed.

– Not Available

APPLICATION DATA

EnergyX

When selecting the WeatherMaster Series Unit and EnergyX system to use on a given application, it is strongly recommended that the Carrier Packaged RTU Builder (PRB) Selection Software be used. This is because there are a number of variables which become complex when manual calculations are performed, but can easily be accounted for in a computer operation. Most specifically, the AHRI certified ratings use Standard CFM values, but due to real world operation, variances in altitude and air density are very important. The Carrier PRB software uses altitude corrected airflows (ACFM).

See Carrier's Packaged Rooftop Builder selection software for automated calculation of unit selection and Combined Efficiency Factor (CEF) values.

Typical Energy Recovery unit selection involves the following steps:

1. Determine the zone cooling and heating requirements at the design conditions.
2. Select Energy Recovery unit based on desired outdoor airflow rate.
Note: It is recommended that the outdoor airflow and exhaust airflow rates be designed at the same or close to the same value. If the difference between the two airflows becomes large enough, the energy recovery unit's cooling capacity, heating capacity and overall efficiency will be negatively impacted.
3. Calculate the Energy Recovery unit's leaving air conditions and unit capacities based on the outside airflow rate, temperature (dB & WB) and exhaust airflow rate and temperatures (dB and WB) at the design temperatures and maximum ventilation rate.
4. Subtract the Energy Recovery unit's cooling and heating capacities from the design zone requirements. The value that remains is the necessary design size of the rooftop unit.
5. Use the Energy Recovery unit's leaving air temperatures (dB and WB) as the ventilation air temperatures entering the rooftop unit to be mixed with the return air before passing through the rooftop unit's evaporator.
6. After selecting the desired Energy Recovery unit and rooftop unit, use AHRI's Guideline V to calculate the Combine Efficiency Factor (system EER).

Additional information on Energy Recovery capacity calculations and leaving air temperature calculations can be found in the two AHRI documents below:

AHRI Guideline V – Calculating the efficiency of energy recovery ventilation and its effect on efficiency and sizing of building HVAC systems.

AHRI Standard 1060 - Performance rating of air-to-air heat exchangers for energy recovery ventilation equipment.

Airxchange Energy Recovery Cassette

UL certified, AHRI listed, silica gel enthalpy desiccant, wheels > 25-in diameter are segmented for easy cleaning, washable with detergent and water, 5 year std limited warranty.

Operation

Energy recovery wheels rotate between the incoming outdoor airstream and the building exhaust airstream. As the wheel rotates, it transfers heat and moisture from one airstream to the other. Result = outdoor air is pre-conditioned, significantly reducing the capacity and energy needed from the mechanical HVAC system.

Factory installed accessories

Economizer option – allows true modulating economizer capability when OA is suitable for free cooling

- operates as a true wheel bypass damper
- uses stop/jog operation for wheel
- required when using CO₂ sensor for DCV operation

Frost control option – uses exhaust air to defrost the wheel when necessary.

EnergyX System ComfortLink V5 integrated controls

All ERV configuration, setup and troubleshooting is done via ComfortLink controls.

- Modulating OA ventilation damper
- New “Outside Air Unit” points table
- New control functions for accessory devices:
 - Cold air tempering kit
 - Exhaust fan building pressure control

ComfortLink Controls

Carrier ComfortLink Controls allows added unit diagnostics and operation set up capabilities.

The ComfortLink control is your link to a world of simple and easy to use rooftop units that offer outstanding performance and value. When used with a space temperature sensor, the ComfortLink control's intelligence maintains control over the economizer and condenser fans. It optimizes the performance of the refrigeration circuits as conditions change, resulting in the following features:

- Better control of temperature and humidity
- Superior reliability
- Automatic redundancy
- Low ambient cooling operation to 0°F
- More accurate diagnostics, at unit or remote

APPLICATION DATA (cont.)

ComfortLink Controls (cont.)

The ComfortLink Scrolling Marquee is very easy to use. The messages are displayed in easy to understand English, no decoding is required. A scrolling readout provides detailed explanations of control information. Only four, large, easy-to-use buttons are required to maneuver through the entire menu. The readout is designed to be visible even in the brightest sunlight. A handheld Navigator accessory or wall-mounted System Pilot™ accessory can be used for added service flexibility.

The ComfortLink control provides unparalleled service diagnostic information. Temperature and pressure can be read directly from the display with no need for separate gauges. Other data, such as compressor cycles, unit run time hours, current alarms, can also be accessed. A history of alarms is also available for viewing.

The service run test can be very helpful when troubleshooting. The user can run test major components to determine the root cause of a problem. The unit can be run-tested before an installation is complete to ensure satisfactory start-up. To ensure reliability, the ComfortLink control prevents reverse compressor rotation. No laptop computers are required for start-up.

Time schedules are built in and the Scrolling Marquee display provides easy access to setpoints. The ComfortLink control accepts input from a CO2 sensor and a smoke detector. Both are available as factory installed options or as field installed accessories.

Field installed accessories

Horizontal roofcurb adaptors – used when horizontal supply &/or return is desired.

Motor status indicator accessory – monitors wheel, supply & exhaust motors and provides indication if not operating.

Filter status indicator accessory – monitors static pressure across supply & exhaust filters and provides indication when filters become clogged.

Motorized exhaust damper accessory – replaces the standard barometric exhaust damper blades with motorized (open/shut) damper.

Min operating ambient temp (cooling):

In mechanical cooling mode, your Carrier rooftop unit can safely operate down to an outdoor ambient temperature of 35°F (-2°C). 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 125°F (52°C). While cooling operation above 125°F (52°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 mixed air temp (heating):

Using the factory settings, the minimum temperatures for the mixed air (the combined temperature of the warm return air and the cold outdoor air) entering the dimpled, gas heat exchangers are:

Aluminized

50°F (10°C) continuous

45°F (7°C) intermittent

Stainless Steel

40°F (4°C) continuous

35°F (2°C) intermittent

Operating at lower mixed-air temperatures may be possible, if a field-supplied, outdoor air thermostat initiates both heat stages when the temperature is less than the minimum temperatures listed above. Please contact your local Carrier representative for assistance.

Min and max airflow (heating and cooling):

To maintain safe and reliable operation of your rooftop, operate within the heating airflow limits during heating mode and cooling airflow limits during cooling mode. 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 and unsafe heating operation. Heating and cooling limitations differ when evaluating operating CFM, the minimum value is the HIGHER of the cooling and heating minimum CFM values published in Table 8 and the maximum value is the LOWER of the cooling and heating minimum values published in Table 8.

Heating-to-cooling changeover:

Your unit will automatically change from heating to cooling mode when using a thermostat with an auto-change-over feature.

Airflow:

All units are draw-through in cooling mode and blow-through in heating 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 Carrier representative for assistance.

Motor limits, break horsepower (BHP):

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

APPLICATION DATA (cont.)

Propane heating:

Propane has different physical qualities than natural gas. As a result, Propane requires different fuel to air mixture. To optimize the fuel/air mixture for Propane, Carrier sells different burner orifices in an easy to install accessory kit. To select the correct burner orifices or determine the heat capacity for an Propane application, use either the selection software, or the unit's service manual.

High altitude heating:

High altitudes have less oxygen, which affects the fuel/air mixture in heat exchangers. In order to maintain a proper fuel/air mixture, heat exchangers operating in altitudes above 2000 ft (610 m) require different orifices. To select the correct burner orifices or determine the heat capacity for a high altitude application, use either the selection software, or the unit's service manual.

High altitudes have less oxygen, which means heat exchangers need less fuel. The new gas orifices in this field-installed kit make the necessary adjustment for high altitude applications. They restore the optimal fuel to air mixture and maintain healthy combustion on altitudes above 2000 ft (610 m).

NOTE: Typical natural gas heating value ranges from 975 to 1050 Btu/ft³ at sea level nationally. The heating value goes down approximately 1.7% per every thousand feet elevation. Standard factory orifices can typically be used up to 2000 ft (610m) elevation without any operational issues.

NOTE: For installations in Canada, the input rating should be derated by 10% for altitudes from 2000 ft (610m) to 4500 ft (1372m) above sea level.

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 part load 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 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 Carrier representative for assistance.

Low ambient applications

The optional Carrier 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 Carrier rooftop can operate to ambient temperatures down to -20° F (-29° C) using the recommended accessory Motormaster low ambient controller.

Application/Selection Option

Selection software by Carrier saves time by performing many of the steps above. Contact your Carrier sales representative for assistance.

Table 11 – COOLING CAPACITIES

1-STAGE COOLING

3 TONS

48HC*A04				AMBIENT TEMPERATURE															
				85			95			105			115			125			
				EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)			
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85	
900 Cfm	EAT (wb)	58	TC	32.1	32.1	36.3	30.8	30.8	34.9	29.4	29.4	33.4	28.0	28.0	31.7	26.3	26.3	29.8	
			SHC	27.8	32.1	36.3	26.7	30.8	34.9	25.5	29.4	33.4	24.2	28.0	31.7	22.8	26.3	29.8	
		62	TC	34.0	34.0	34.3	32.3	32.3	33.5	30.6	30.6	32.6	28.7	28.7	31.7	26.6	26.6	30.6	
			SHC	25.0	29.7	34.3	24.2	28.9	33.5	23.4	28.0	32.6	22.5	27.1	31.7	21.5	26.0	30.6	
		67	TC	37.3	37.3	37.3	35.5	35.5	35.5	33.6	33.6	33.6	31.5	31.5	31.5	29.2	29.2	29.2	
			SHC	20.7	25.4	30.0	20.0	24.6	29.3	19.2	23.8	28.4	18.3	22.9	27.6	17.4	22.0	26.6	
	72	TC	40.8	40.8	40.8	38.9	38.9	38.9	36.9	36.9	36.9	34.6	34.6	34.6	32.2	32.2	32.2		
		SHC	16.3	21.0	25.7	15.6	20.3	25.0	14.8	19.5	24.1	13.9	18.6	23.3	13.0	17.7	22.3		
	76	TC	-	43.9	43.9	-	41.8	41.8	-	39.6	39.6	-	37.2	37.2	-	34.6	34.6		
		SHC	-	17.4	22.4	-	16.7	21.7	-	15.9	20.8	-	15.1	19.9	-	14.2	19.0		
	1050 Cfm	EAT (wb)	58	TC	33.8	33.8	38.4	32.5	32.5	36.8	31.0	31.0	35.1	29.4	29.4	33.3	27.6	27.6	31.3
				SHC	29.3	33.8	38.4	28.1	32.5	36.8	26.9	31.0	35.1	25.5	29.4	33.3	23.9	27.6	31.3
62			TC	35.1	35.1	37.5	33.3	33.3	36.6	31.5	31.5	35.7	29.6	29.6	34.5	27.7	27.7	32.6	
			SHC	26.9	32.2	37.5	26.0	31.3	36.6	25.1	30.4	35.7	24.1	29.3	34.5	22.7	27.7	32.6	
67			TC	38.4	38.4	38.4	36.5	36.5	36.5	34.5	34.5	34.5	32.3	32.3	32.3	29.9	29.9	29.9	
			SHC	22.0	27.3	32.7	21.2	26.5	31.9	20.3	25.7	31.0	19.4	24.8	30.1	18.5	23.8	29.1	
72		TC	42.0	42.0	42.0	40.0	40.0	40.0	37.8	37.8	37.8	35.5	35.5	35.5	32.9	32.9	32.9		
		SHC	16.9	22.3	27.6	16.1	21.5	26.9	15.3	20.7	26.0	14.4	19.8	25.1	13.5	18.8	24.2		
76		TC	-	45.0	45.0	-	42.9	42.9	-	40.6	40.6	-	38.0	38.0	-	35.3	35.3		
		SHC	-	18.1	23.8	-	17.4	23.0	-	16.6	22.2	-	15.7	21.3	-	14.8	20.3		
1200 Cfm		EAT (wb)	58	TC	35.3	35.3	40.0	33.9	33.9	38.4	32.3	32.3	36.6	30.6	30.6	34.7	28.7	28.7	32.5
				SHC	30.6	35.3	40.0	29.4	33.9	38.4	28.0	32.3	36.6	26.5	30.6	34.7	24.9	28.7	32.5
	62		TC	35.9	35.9	40.5	34.2	34.2	39.4	32.4	32.4	38.1	30.6	30.6	36.1	28.7	28.7	33.9	
			SHC	28.6	34.5	40.5	27.7	33.6	39.4	26.6	32.4	38.1	25.2	30.6	36.1	23.6	28.7	33.9	
	67		TC	39.3	39.3	39.3	37.3	37.3	37.3	35.2	35.2	35.2	32.9	32.9	32.9	30.5	30.5	31.6	
			SHC	23.1	29.1	35.2	22.3	28.3	34.4	21.4	27.5	33.5	20.5	26.6	32.6	19.5	25.6	31.6	
	72	TC	42.9	42.9	42.9	40.8	40.8	40.8	38.5	38.5	38.5	36.1	36.1	36.1	33.4	33.4	33.4		
		SHC	17.3	23.4	29.5	16.6	22.6	28.7	15.7	21.8	27.9	14.8	20.9	27.0	13.9	19.9	26.0		
	76	TC	-	45.9	45.9	-	43.7	43.7	-	41.3	41.3	-	38.7	38.7	-	35.9	35.9		
		SHC	-	18.8	25.1	-	18.0	24.3	-	17.2	23.4	-	16.3	22.5	-	15.4	21.5		
	1350 Cfm	EAT (wb)	58	TC	36.6	36.6	41.5	35.1	35.1	39.7	33.4	33.4	37.9	31.6	31.6	35.8	29.6	29.6	33.6
				SHC	31.7	36.6	41.5	30.4	35.1	39.7	28.9	33.4	37.9	27.4	31.6	35.8	25.7	29.6	33.6
62			TC	36.7	36.7	43.2	35.1	35.1	41.3	33.4	33.4	39.4	31.6	31.6	37.3	29.6	29.6	34.9	
			SHC	30.2	36.7	43.2	28.8	35.1	41.3	27.5	33.4	39.4	26.0	31.6	37.3	24.4	29.6	34.9	
67			TC	39.9	39.9	39.9	37.9	37.9	37.9	35.8	35.8	35.9	33.4	33.4	34.9	30.9	30.9	33.9	
			SHC	24.2	30.9	37.6	23.4	30.1	36.8	22.5	29.2	35.9	21.6	28.3	34.9	20.6	27.2	33.9	
72		TC	43.6	43.6	43.6	41.4	41.4	41.4	39.1	39.1	39.1	36.6	36.6	36.6	33.9	33.9	33.9		
		SHC	17.8	24.5	31.3	17.0	23.7	30.5	16.1	22.9	29.6	15.2	22.0	28.7	14.3	21.0	27.7		
78		TC	-	46.7	46.7	-	44.4	44.4	-	41.9	41.9	-	39.2	39.2	-	36.3	36.3		
		SHC	-	19.4	26.3	-	18.6	25.5	-	17.8	24.6	-	16.9	23.7	-	15.9	22.7		
1500 Cfm		EAT (wb)	58	TC	37.7	37.7	42.7	36.1	36.1	40.9	34.3	34.3	38.9	32.5	32.5	36.8	30.4	30.4	34.4
				SHC	32.6	37.7	42.7	31.3	36.1	40.9	29.8	34.3	38.9	28.1	32.5	36.8	26.3	30.4	34.4
	62		TC	37.7	37.7	44.4	36.1	36.1	42.5	34.4	34.4	40.5	32.5	32.5	38.3	30.4	30.4	35.8	
			SHC	31.0	37.7	44.4	29.7	36.1	42.5	28.3	34.4	40.5	26.7	32.5	38.3	25.0	30.4	35.8	
	67		TC	40.5	40.5	40.5	38.4	38.4	39.1	36.2	36.2	38.2	33.8	33.8	37.2	31.2	31.2	36.1	
			SHC	25.2	32.6	40.0	24.4	31.7	39.1	23.5	30.8	38.2	22.5	29.9	37.2	21.5	28.8	36.1	
	72	TC	44.2	44.2	44.2	41.9	41.9	41.9	39.6	39.6	39.6	37.0	37.0	37.0	34.2	34.2	34.2		
		SHC	18.2	25.6	33.0	17.4	24.8	32.2	16.5	23.9	31.3	15.6	23.0	30.4	14.7	22.0	29.4		
	76	TC	-	47.2	47.2	-	44.9	44.9	-	42.3	42.3	-	39.6	39.6	-	36.7	36.7		
		SHC	-	19.9	27.5	-	19.1	26.7	-	18.3	25.8	-	17.4	24.9	-	16.4	23.9		

48HC EnergyX

LEGEND:

- Do not operate
- 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

1-STAGE COOLING

4 TONS

48HC EnergyX

48HC*A05			AMBIENT TEMPERATURE																
			85			95			105			115			125				
			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)				
			75	80	85	75	80	85	75	80	85	75	80	85	75	80	85		
1200 Cfm	EAT (wb)	58	TC	43.2	43.2	49.1	41.5	41.5	47.2	39.7	39.7	45.1	37.7	37.7	42.9	35.6	35.6	40.4	
			SHC	37.3	43.2	49.1	35.9	41.5	47.2	34.3	39.7	45.1	32.6	37.7	42.9	30.7	35.6	40.4	
		62	TC	45.9	45.9	46.0	43.7	43.7	45.0	41.3	41.3	43.8	38.8	38.8	42.6	36.0	36.0	41.2	
			SHC	33.5	39.8	46.0	32.5	38.7	45.0	31.3	37.6	43.8	30.1	36.3	42.6	28.8	35.0	41.2	
		67	TC	50.5	50.5	50.5	48.0	48.0	48.0	45.4	45.4	45.4	42.6	42.6	42.6	39.6	39.6	39.6	
			SHC	27.9	34.1	40.4	26.8	33.1	39.4	25.7	32.0	38.2	24.5	30.8	37.1	23.2	29.5	35.8	
	72	TC	55.4	55.4	55.4	52.7	52.7	52.7	49.9	49.9	49.9	46.8	46.8	46.8	43.5	43.5	43.5		
		SHC	22.0	28.4	34.7	21.0	27.3	33.7	19.9	26.2	32.5	18.7	25.0	31.3	17.4	23.8	30.1		
	76	TC	-	59.7	59.7	-	56.8	56.8	-	53.7	53.7	-	50.4	50.4	-	46.8	46.8		
		SHC	-	23.6	30.2	-	22.6	29.2	-	21.5	28.1	-	20.3	26.8	-	19.1	25.5		
	1400 Cfm	EAT (wb)	58	TC	45.6	45.6	51.9	43.8	43.8	49.8	41.9	41.9	47.6	39.7	39.7	45.1	37.3	37.3	42.4
				SHC	39.4	45.6	51.9	37.9	43.8	49.8	36.2	41.9	47.6	34.3	39.7	45.1	32.3	37.3	42.4
62			TC	47.4	47.4	50.5	45.1	45.1	49.3	42.6	42.6	48.0	40.0	40.0	46.5	37.4	37.4	44.2	
			SHC	36.0	43.2	50.5	34.9	42.1	49.3	33.7	40.9	48.0	32.4	39.5	46.5	30.6	37.4	44.2	
67			TC	52.1	52.1	52.1	49.5	49.5	49.5	46.7	46.7	46.7	43.7	43.7	43.7	40.5	40.5	40.5	
			SHC	29.5	36.8	44.0	28.4	35.7	42.9	27.3	34.5	41.8	26.0	33.3	40.5	24.7	32.0	39.2	
72		TC	57.1	57.1	57.1	54.3	54.3	54.3	51.2	51.2	51.2	48.0	48.0	48.0	44.5	44.5	44.5		
		SHC	22.8	30.1	37.4	21.7	29.0	36.3	20.5	27.8	35.1	19.3	26.6	33.9	18.0	25.3	32.6		
76		TC	-	61.4	61.4	-	58.3	58.3	-	55.1	55.1	-	51.6	51.6	-	47.8	47.8		
		SHC	-	24.6	32.2	-	23.5	31.1	-	22.4	29.9	-	21.2	28.7	-	19.9	27.4		
1600 Cfm		EAT (wb)	58	TC	47.7	47.7	54.2	45.8	45.8	52.0	43.7	43.7	49.6	41.3	41.3	47.0	38.8	38.8	44.1
				SHC	41.2	47.7	54.2	39.5	45.8	52.0	37.7	43.7	49.6	35.7	41.3	47.0	33.5	38.8	44.1
	62		TC	48.7	48.7	54.5	46.3	46.3	53.2	43.7	43.7	51.7	41.4	41.4	48.9	38.8	38.8	45.9	
			SHC	38.3	46.4	54.5	37.1	45.2	53.2	35.8	43.7	51.7	33.9	41.4	48.9	31.8	38.8	45.9	
	67		TC	53.3	53.3	53.3	50.6	50.6	50.6	47.7	47.7	47.7	44.6	44.6	44.6	41.2	41.2	42.6	
			SHC	31.0	39.2	47.5	29.9	38.1	46.3	28.7	37.0	45.2	27.5	35.7	43.9	26.2	34.4	42.6	
	72	TC	58.4	58.4	58.4	55.4	55.4	55.4	52.3	52.3	52.3	48.9	48.9	48.9	45.2	45.2	45.2		
		SHC	23.4	31.7	39.9	22.3	30.6	38.8	21.1	29.4	37.6	19.9	28.2	36.4	18.6	26.8	35.1		
	76	TC	-	62.7	62.7	-	59.5	59.5	-	56.1	56.1	-	52.5	52.5	-	48.6	48.6		
		SHC	-	25.5	34.0	-	24.4	32.9	-	23.2	31.7	-	22.0	30.4	-	20.7	29.1		
	1800 Cfm	EAT (wb)	58	TC	49.5	49.5	56.2	47.4	47.4	53.9	45.2	45.2	51.3	42.7	42.7	48.5	40.1	40.1	45.5
				SHC	42.8	49.5	56.2	41.0	47.4	53.9	39.0	45.2	51.3	36.9	42.7	48.5	34.6	40.1	45.5
62			TC	49.8	49.8	58.1	47.5	47.5	56.1	45.2	45.2	53.4	42.8	42.8	50.5	40.1	40.1	47.4	
			SHC	40.4	49.2	58.1	38.8	47.5	56.1	37.0	45.2	53.4	35.0	42.8	50.5	32.8	40.1	47.4	
67			TC	54.3	54.3	54.3	51.5	51.5	51.5	48.5	48.5	48.5	45.3	45.3	47.1	41.8	41.8	45.7	
			SHC	32.5	41.7	50.8	31.4	40.5	49.7	30.2	39.3	48.5	28.9	38.0	47.1	27.5	36.6	45.7	
72		TC	59.4	59.4	59.4	56.3	56.3	56.3	53.1	53.1	53.1	49.6	49.6	49.6	45.8	45.8	45.8		
		SHC	24.0	33.2	42.4	22.9	32.1	41.3	21.7	30.9	40.1	20.4	29.6	38.8	19.1	28.3	37.5		
76		TC	-	63.8	63.8	-	60.5	60.5	-	57.0	57.0	-	53.2	53.2	-	49.2	49.2		
		SHC	-	26.3	35.8	-	25.2	34.6	-	24.0	33.4	-	22.8	32.1	-	21.5	30.8		
2000 Cfm		EAT (wb)	58	TC	51.0	51.0	58.0	48.8	48.8	55.5	46.5	46.5	52.8	43.9	43.9	49.9	41.1	41.1	46.7
				SHC	44.1	51.0	58.0	42.2	48.8	55.5	40.2	46.5	52.8	37.9	43.9	49.9	35.5	41.1	46.7
	62		TC	51.1	51.1	60.4	48.9	48.9	57.8	46.5	46.5	55.0	44.0	44.0	51.9	41.1	41.1	48.6	
			SHC	41.8	51.1	60.4	40.0	48.9	57.8	38.1	46.5	55.0	36.0	44.0	51.9	33.7	41.1	48.6	
	67		TC	55.1	55.1	55.1	52.1	52.1	52.9	49.1	49.1	51.6	45.8	45.8	50.2	42.3	42.3	48.7	
			SHC	33.9	44.0	54.1	32.7	42.8	52.9	31.5	41.5	51.6	30.2	40.2	50.2	28.8	38.8	48.7	
	72	TC	60.3	60.3	60.3	57.1	57.1	57.1	53.7	53.7	53.7	50.1	50.1	50.1	46.3	46.3	46.3		
		SHC	24.5	34.7	44.8	23.4	33.5	43.6	22.2	32.3	42.4	21.0	31.1	41.2	19.6	29.7	39.8		
	76	TC	-	64.6	64.6	-	61.2	61.2	-	57.6	57.6	-	53.8	53.8	-	49.7	49.7		
		SHC	-	27.1	37.5	-	26.0	36.3	-	24.8	35.1	-	23.5	33.8	-	22.2	32.4		

LEGEND:

- Do not operate
- 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

5 TONS

48HC*A06			AMBIENT TEMPERATURE																
			85			95			105			115			125				
			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)				
			75	80	85	75	80	85	75	80	85	75	80	85	75	80	85		
1500 Cfm	EAT (wb)	58	TC	53.4	53.4	60.6	51.3	51.3	58.2	49.0	49.0	55.6	46.5	46.5	52.7	43.7	43.7	49.5	
			SHC	46.3	53.4	60.6	44.5	51.3	58.2	42.5	49.0	55.6	40.3	46.5	52.7	37.9	43.7	49.5	
		62	TC	55.6	55.6	58.2	52.9	52.9	56.9	50.0	50.0	55.5	46.9	46.9	53.9	43.8	43.8	51.6	
			SHC	42.0	50.1	58.2	40.7	48.8	56.9	39.4	47.4	55.5	37.9	45.9	53.9	36.0	43.8	51.6	
		67	TC	60.8	60.8	60.8	57.8	57.8	57.8	54.6	54.6	54.6	51.1	51.1	51.1	47.4	47.4	47.4	
			SHC	34.4	42.6	50.7	33.2	41.3	49.4	31.8	39.9	48.1	30.4	38.5	46.6	28.9	37.0	45.1	
	72	TC	66.6	66.6	66.6	63.2	63.2	63.2	59.7	59.7	59.7	55.9	55.9	55.9	51.8	51.8	51.8		
		SHC	26.7	34.8	43.0	25.4	33.6	41.7	24.1	32.2	40.4	22.6	30.8	38.9	21.1	29.3	37.4		
	76	TC	–	71.4	71.4	–	67.9	67.9	–	64.0	64.0	–	59.9	59.9	–	55.5	55.5		
		SHC	–	28.5	36.7	–	27.2	35.5	–	25.9	34.2	–	24.5	32.7	–	23.0	31.3		
	1750 Cfm	EAT (wb)	58	TC	56.3	56.3	63.8	54.0	54.0	61.2	51.5	51.5	58.3	48.7	48.7	55.2	45.7	45.7	51.8
				SHC	48.8	56.3	63.8	46.8	54.0	61.2	44.6	51.5	58.3	42.2	48.7	55.2	39.6	45.7	51.8
62			TC	57.3	57.3	64.0	54.5	54.5	62.5	51.6	51.6	60.7	48.8	48.8	57.5	45.8	45.8	53.9	
			SHC	45.3	54.7	64.0	44.0	53.3	62.5	42.4	51.6	60.7	40.1	48.8	57.5	37.6	45.8	53.9	
67			TC	62.5	62.5	62.5	59.3	59.3	59.3	55.9	55.9	55.9	52.3	52.3	52.3	48.3	48.3	49.7	
			SHC	36.6	46.0	55.4	35.3	44.7	54.1	33.9	43.3	52.7	32.4	41.8	51.3	30.9	40.3	49.7	
72		TC	68.3	68.3	68.3	64.8	64.8	64.8	61.0	61.0	61.0	57.0	57.0	57.0	52.7	52.7	52.7		
		SHC	27.5	37.0	46.5	26.2	35.7	45.2	24.9	34.4	43.8	23.4	32.9	42.4	21.9	31.4	40.8		
76		TC	–	73.2	73.2	–	69.4	69.4	–	65.4	65.4	–	61.1	61.1	–	56.5	56.5		
		SHC	–	29.7	39.3	–	28.4	38.0	–	27.1	36.7	–	25.6	35.2	–	24.1	33.7		
2000 Cfm		EAT (wb)	58	TC	58.7	58.7	66.5	56.2	56.2	63.7	53.5	53.5	60.6	50.6	50.6	57.3	47.3	47.3	53.7
				SHC	50.9	58.7	66.5	48.7	56.2	63.7	46.4	53.5	60.6	43.8	50.6	57.3	41.0	47.3	53.7
	62		TC	58.8	58.8	69.2	56.3	56.3	66.3	53.6	53.6	63.1	50.6	50.6	59.6	47.4	47.4	55.8	
			SHC	48.3	58.8	69.2	46.3	56.3	66.3	44.0	53.6	63.1	41.6	50.6	59.6	39.0	47.4	55.8	
	67		TC	63.8	63.8	63.8	60.4	60.4	60.4	56.9	56.9	57.3	53.1	53.1	55.8	49.1	49.1	54.1	
			SHC	38.6	49.3	60.1	37.3	48.0	58.7	35.9	46.6	57.3	34.4	45.1	55.8	32.8	43.4	54.1	
	72	TC	69.6	69.6	69.6	65.9	65.9	65.9	62.1	62.1	62.1	57.9	57.9	57.9	53.5	53.5	53.5		
		SHC	28.4	39.1	49.9	27.0	37.8	48.6	25.7	36.4	47.2	24.2	35.0	45.7	22.6	33.4	44.2		
	76	TC	–	74.5	74.5	–	70.6	70.6	–	66.5	66.5	–	62.0	62.0	–	–	–		
		SHC	–	30.8	41.8	–	29.5	40.4	–	28.2	39.0	–	26.7	37.6	–	–	–		
	2250 Cfm	EAT (wb)	58	TC	60.7	60.7	68.8	58.1	58.1	65.8	55.2	55.2	62.6	52.1	52.1	59.1	48.7	48.7	55.2
				SHC	52.6	60.7	68.8	50.3	58.1	65.8	47.9	55.2	62.6	45.2	52.1	59.1	42.2	48.7	55.2
62			TC	60.8	60.8	71.6	58.1	58.1	68.5	55.3	55.3	65.1	52.2	52.2	61.4	48.7	48.7	57.4	
			SHC	50.0	60.8	71.6	47.8	58.1	68.5	45.4	55.3	65.1	42.9	52.2	61.4	40.1	48.7	57.4	
67			TC	64.7	64.7	64.7	61.3	61.3	63.2	57.7	57.7	61.7	53.8	53.8	60.1	49.7	49.7	58.3	
			SHC	40.6	52.6	64.5	39.2	51.2	63.2	37.8	49.7	61.7	36.2	48.2	60.1	34.6	46.5	58.3	
72		TC	70.6	70.6	70.6	66.8	66.8	66.8	62.8	62.8	62.8	58.6	58.6	58.6	54.0	54.0	54.0		
		SHC	29.1	41.2	53.3	27.8	39.9	51.9	26.4	38.4	50.5	24.9	37.0	49.0	23.3	35.4	47.4		
76		TC	–	75.6	75.6	–	71.6	71.6	–	67.3	67.3	–	–	–	–	–	–		
		SHC	–	31.9	44.1	–	30.6	42.8	–	29.2	41.4	–	–	–	–	–	–		
2500 Cfm		EAT (wb)	58	TC	62.5	62.5	70.8	59.7	59.7	67.6	56.7	56.7	64.2	53.4	53.4	60.5	49.9	49.9	56.5
				SHC	54.1	62.5	70.8	51.7	59.7	67.6	49.1	56.7	64.2	46.3	53.4	60.5	43.2	49.9	56.5
	62		TC	62.5	62.5	73.6	59.7	59.7	70.3	56.7	56.7	66.8	53.5	53.5	63.0	49.9	49.9	58.8	
			SHC	51.4	62.5	73.6	49.1	59.7	70.3	46.6	56.7	66.8	43.9	53.5	63.0	41.0	49.9	58.8	
	67		TC	65.5	65.5	68.9	62.0	62.0	67.4	58.3	58.3	65.9	54.4	54.4	64.2	50.2	50.2	62.2	
			SHC	42.5	55.7	68.9	41.1	54.3	67.4	39.6	52.7	65.9	38.0	51.1	64.2	36.3	49.2	62.2	
	72	TC	71.4	71.4	71.4	67.5	67.5	67.5	63.4	63.4	63.4	59.1	59.1	59.1	54.4	54.4	54.4		
		SHC	29.9	43.2	56.5	28.5	41.8	55.2	27.1	40.4	53.7	25.6	38.9	52.2	24.0	37.3	50.6		
	76	TC	–	76.4	76.4	–	72.3	72.3	–	–	–	–	–	–	–	–	–		
		SHC	–	33.0	46.4	–	31.6	45.1	–	–	–	–	–	–	–	–	–		

48HC EnergyX

LEGEND:

- Do not operate
- 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

1-STAGE COOLING

6 TONS

48HC EnergyX

48HC*A07			AMBIENT TEMPERATURE																
			85			95			105			115			125				
			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)				
			75	80	85	75	80	85	75	80	85	75	80	85	75	80	85		
1800 Cfm	EAT (wb)	58	TC	64.1	64.1	72.5	61.8	61.8	69.9	59.2	59.2	67	56.3	56.3	63.7	53.2	53.2	60.2	
			SHC	55.7	64.1	72.5	53.7	61.8	69.9	51.4	59.2	67	48.9	56.3	63.7	46.2	53.2	60.2	
		62	TC	67.9	67.9	68.5	64.9	64.9	67	61.5	61.5	65.3	57.9	57.9	63.5	54	54	61.4	
			SHC	50.2	59.4	68.5	48.8	57.9	67	47.1	56.2	65.3	45.4	54.4	63.5	43.4	52.4	61.4	
		67	TC	74.8	74.8	74.8	71.5	71.5	71.5	67.8	67.8	67.8	63.8	63.8	63.8	59.5	59.5	59.5	
			SHC	41.8	50.9	60.1	40.3	49.5	58.7	38.8	47.9	57.1	37.1	46.2	55.4	35.3	44.4	53.6	
	72	TC	82.2	82.2	82.2	78.7	78.7	78.7	74.7	74.7	74.7	70.4	70.4	70.4	65.6	65.6	65.6		
		SHC	33	42.3	51.6	31.6	40.9	50.2	30.1	39.3	48.6	28.4	37.7	46.9	26.7	35.9	45.1		
	76	TC	–	88.7	88.7	–	84.8	84.8	–	80.6	80.6	–	76	76	–	70.9	70.9		
		SHC	–	35.3	45.2	–	33.9	43.7	–	32.4	42	–	30.7	40.3	–	28.9	38.5		
	2100 Cfm	EAT (wb)	58	TC	67.6	67.6	76.5	65.1	65.1	73.7	62.3	62.3	70.5	59.3	59.3	67.1	55.9	55.9	63.2
				SHC	58.7	67.6	76.5	56.6	65.1	73.7	54.1	62.3	70.5	51.5	59.3	67.1	48.5	55.9	63.2
62			TC	70.1	70.1	74.9	67	67	73.2	63.5	63.5	71.3	59.7	59.7	69.1	56	56	65.8	
			SHC	53.9	64.4	74.9	52.4	62.8	73.2	50.6	61	71.3	48.7	58.9	69.1	46.2	56	65.8	
67			TC	77.1	77.1	77.1	73.6	73.6	73.6	69.7	69.7	69.7	65.5	65.5	65.5	60.9	60.9	60.9	
			SHC	44.2	54.8	65.3	42.7	53.3	63.9	41.2	51.7	62.3	39.4	50	60.5	37.6	48.1	58.6	
72		TC	84.7	84.7	84.7	80.9	80.9	80.9	76.8	76.8	76.8	72.2	72.2	72.2	67.2	67.2	67.2		
		SHC	34.2	44.8	55.5	32.7	43.4	54	31.1	41.8	52.4	29.5	40.1	50.7	27.6	38.2	48.8		
76		TC	–	91.3	91.3	–	87.2	87.2	–	82.7	82.7	–	77.8	77.8	–	72.5	72.5		
		SHC	–	36.7	47.8	–	35.3	46.3	–	33.7	44.7	–	32	43	–	30.2	41.1		
2400 Cfm		EAT (wb)	58	TC	70.6	70.6	79.9	68	68	76.9	65	65	73.5	61.7	61.7	69.8	58.1	58.1	65.8
				SHC	61.3	70.6	79.9	59	68	76.9	56.4	65	73.5	53.6	61.7	69.8	50.5	58.1	65.8
	62		TC	72	72	80.6	68.7	68.7	78.7	65.2	65.2	76.6	61.8	61.8	72.6	58.2	58.2	68.4	
			SHC	57.3	69	80.6	55.6	67.2	78.7	53.7	65.2	76.6	50.9	61.8	72.6	48	58.2	68.4	
	67		TC	78.9	78.9	78.9	75.2	75.2	75.2	71.2	71.2	71.2	66.8	66.8	66.8	62	62	63.4	
			SHC	46.5	58.4	70.3	45	56.9	68.8	43.4	55.3	67.2	41.6	53.5	65.4	39.7	51.6	63.4	
	72	TC	86.6	86.6	86.6	82.7	82.7	82.7	78.3	78.3	78.3	73.6	73.6	73.6	68.4	68.4	68.4		
		SHC	35.2	47.2	59.2	33.7	45.7	57.7	32.1	44.1	56	30.4	42.3	54.3	28.5	40.5	52.4		
	76	TC	–	93.3	93.3	–	89	89	–	84.4	84.4	–	79.3	79.3	–	73.7	73.7		
		SHC	–	38	50.4	–	36.6	48.9	–	35	47.3	–	33.3	45.5	–	31.4	43.6		
	2700 Cfm	EAT (wb)	58	TC	73.2	73.2	82.8	70.4	70.4	79.6	67.3	67.3	76.1	63.8	63.8	72.2	60	60	67.9
				SHC	63.6	73.2	82.8	61.1	70.4	79.6	58.4	67.3	76.1	55.4	63.8	72.2	52.1	60	67.9
62			TC	73.7	73.7	85.5	70.5	70.5	82.8	67.3	67.3	79.1	63.9	63.9	75.1	60.1	60.1	70.6	
			SHC	60.2	72.9	85.5	58.1	70.5	82.8	55.5	67.3	79.1	52.7	63.9	75.1	49.5	60.1	70.6	
67			TC	80.3	80.3	80.3	76.5	76.5	76.5	72.4	72.4	72.4	67.8	67.8	70	62.9	62.9	67.9	
			SHC	48.7	61.9	75.1	47.1	60.4	73.6	45.5	58.7	71.9	43.7	56.8	70	41.7	54.8	67.9	
72		TC	88.2	88.2	88.2	84	84	84	79.6	79.6	79.6	74.6	74.6	74.6	69.3	69.3	69.3		
		SHC	36.1	49.4	62.7	34.6	47.9	61.2	33	46.2	59.5	31.2	44.5	57.7	29.3	42.6	55.8		
76		TC	–	94.9	94.9	–	90.4	90.4	–	85.6	85.6	–	80.4	80.4	–	74.7	74.7		
		SHC	–	39.2	52.9	–	37.7	51.4	–	36.1	49.7	–	34.4	47.9	–	32.5	46		
3000 Cfm		EAT (wb)	58	TC	75.4	75.4	85.3	72.5	72.5	82	69.2	69.2	78.3	65.6	65.6	74.2	61.7	61.7	69.8
				SHC	65.5	75.4	85.3	62.9	72.5	82	60.1	69.2	78.3	57	65.6	74.2	53.5	61.7	69.8
	62		TC	75.5	75.5	88.7	72.5	72.5	85.3	69.3	69.3	81.4	65.7	65.7	77.2	61.7	61.7	72.5	
			SHC	62.2	75.5	88.7	59.8	72.5	85.3	57.1	69.3	81.4	54.1	65.7	77.2	50.9	61.7	72.5	
	67		TC	81.4	81.4	81.4	77.5	77.5	78.1	73.3	73.3	76.4	68.7	68.7	74.4	63.7	63.7	72.2	
			SHC	50.7	65.2	79.7	49.2	63.7	78.1	47.5	61.9	76.4	45.6	60	74.4	43.6	57.9	72.2	
	72	TC	89.4	89.4	89.4	85.2	85.2	85.2	80.5	80.5	80.5	75.5	75.5	75.5	70.1	70.1	70.1		
		SHC	36.9	51.5	66.1	35.4	50	64.6	33.8	48.3	62.9	32	46.5	61.1	30.1	44.6	59.1		
	76	TC	–	96.1	96.1	–	91.6	91.6	–	86.7	86.7	–	81.3	81.3	–	75.5	75.5		
		SHC	–	40.4	55.3	–	38.9	53.8	–	37.2	52.1	–	35.5	50.3	–	33.6	48.3		

LEGEND:

- Do not operate
- 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

7.5 TONS

48HC*D08			AMBIENT TEMPERATURE																
			85			95			105			115			125				
			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)				
			75	80	85	75	80	85	75	80	85	75	80	85	75	80	85		
2250 Cfm	EAT (wb)	58	TC	81	81	91.8	77.9	77.9	88.4	74.7	74.7	84.6	71.1	71.1	80.6	67.3	67.3	76.3	
			SHC	70.2	81	91.8	67.5	77.9	88.4	64.7	74.7	84.6	61.6	71.1	80.6	58.3	67.3	76.3	
		62	TC	85.1	85.1	87.2	81.1	81.1	85.3	76.9	76.9	83.2	72.5	72.5	81	67.8	67.8	78.5	
			SHC	63.3	75.3	87.2	61.4	73.4	85.3	59.5	71.3	83.2	57.3	69.2	81	55	66.7	78.5	
		67	TC	93.3	93.3	93.3	89	89	89	84.3	84.3	84.3	79.4	79.4	79.4	74.1	74.1	74.1	
			SHC	52.3	64.2	76.2	50.4	62.4	74.4	48.4	60.4	72.4	46.4	58.3	70.3	44.2	56.2	68.1	
	72	TC	102.3	102.3	102.3	97.5	97.5	97.5	92.5	92.5	92.5	87.1	87.1	87.1	81.3	81.3	81.3		
		SHC	40.9	53	65	39	51.1	63.1	37.1	49.2	61.2	35.1	47.1	59.1	32.9	44.9	57		
	76	TC	-	110	110	-	104.8	104.8	-	99.4	99.4	-	93.5	93.5	-	87.3	87.3		
		SHC	-	43.7	56.1	-	41.9	54.2	-	39.9	52.2	-	37.9	50.2	-	35.8	48		
	2625 Cfm	EAT (wb)	58	TC	85.4	85.4	96.9	82.1	82.1	93.1	78.6	78.6	89.1	74.7	74.7	84.7	70.5	70.5	80
				SHC	74	85.4	96.9	71.2	82.1	93.1	68.1	78.6	89.1	64.7	74.7	84.7	61.1	70.5	80
62			TC	87.8	87.8	95.7	83.7	83.7	93.6	79.3	79.3	91.3	75	75	87.8	70.6	70.6	83.2	
			SHC	68.2	82	95.7	66.2	79.9	93.6	64.1	77.7	91.3	61.3	74.6	87.8	58	70.6	83.2	
67			TC	96	96	96	91.4	91.4	91.4	86.5	86.5	86.5	81.3	81.3	81.3	75.8	75.8	75.8	
			SHC	55.4	69.3	83.2	53.5	67.4	81.2	51.5	65.4	79.2	49.4	63.2	77.1	47.2	61	74.8	
72		TC	105.2	105.2	105.2	100.1	100.1	100.1	94.8	94.8	94.8	89.1	89.1	89.1	83	83	83		
		SHC	42.3	56.2	70.2	40.4	54.3	68.2	38.4	52.3	66.2	36.3	50.2	64.1	34.1	48	61.9		
76		TC	-	112.9	112.9	-	107.5	107.5	-	101.7	101.7	-	95.6	95.6	-	89.1	89.1		
		SHC	-	45.5	59.8	-	43.6	57.8	-	41.7	55.8	-	39.6	53.7	-	37.4	51.5		
3000 Cfm		EAT (wb)	58	TC	89.2	89.2	101.1	85.6	85.6	97.1	81.8	81.8	92.8	77.7	77.7	88.1	73.2	73.2	83
				SHC	77.3	89.2	101.1	74.2	85.6	97.1	70.9	81.8	92.8	67.3	77.7	88.1	63.5	73.2	83
	62		TC	90.1	90.1	103.5	86.1	86.1	100.3	81.9	81.9	96.5	77.8	77.8	91.6	73.3	73.3	86.4	
			SHC	72.7	88.1	103.5	70.1	85.2	100.3	67.3	81.9	96.5	63.9	77.8	91.6	60.2	73.3	86.4	
	67		TC	98.1	98.1	98.1	93.3	93.3	93.3	88.2	88.2	88.2	82.8	82.8	83.6	77	77	81.3	
			SHC	58.4	74.1	89.9	56.5	72.2	87.9	54.4	70.1	85.8	52.3	67.9	83.6	50	65.6	81.3	
	72	TC	107.3	107.3	107.3	102.1	102.1	102.1	96.5	96.5	96.5	90.6	90.6	90.6	84.3	84.3	84.3		
		SHC	43.5	59.3	75.1	41.6	57.3	73.1	39.5	55.3	71.1	37.4	53.2	69	35.2	50.9	66.7		
	76	TC	-	115.2	115.2	-	109.5	109.5	-	103.5	103.5	-	97.2	97.2	-	90.4	90.4		
		SHC	-	47.2	63.2	-	45.3	61.3	-	43.3	59.3	-	41.2	57.1	-	38.9	54.8		
	3375 Cfm	EAT (wb)	58	TC	92.4	92.4	104.7	88.6	88.6	100.4	84.6	84.6	95.9	80.2	80.2	90.9	75.5	75.5	85.6
				SHC	80	92.4	104.7	76.8	88.6	100.4	73.3	84.6	95.9	69.5	80.2	90.9	65.4	75.5	85.6
62			TC	92.5	92.5	109	88.7	88.7	104.5	84.6	84.6	99.7	80.3	80.3	94.6	75.6	75.6	89	
			SHC	76	92.5	109	72.9	88.7	104.5	69.6	84.6	99.7	66	80.3	94.6	62.1	75.6	89	
67			TC	99.7	99.7	99.7	94.8	94.8	94.8	89.5	89.5	92.2	84	84	89.9	78	78	87.4	
			SHC	61.3	78.8	96.4	59.3	76.8	94.3	57.2	74.7	92.2	55	72.4	89.9	52.6	70	87.4	
72		TC	109	109	109	103.6	103.6	103.6	97.8	97.8	97.8	91.8	91.8	91.8	85.3	85.3	85.3		
		SHC	44.6	62.2	79.9	42.7	60.3	77.9	40.6	58.2	75.8	38.5	56.1	73.6	36.2	53.8	71.3		
76		TC	-	116.9	116.9	-	111.1	111.1	-	104.9	104.9	-	98.4	98.4	-	91.5	91.5		
		SHC	-	48.8	66.6	-	46.8	64.6	-	44.8	62.6	-	42.7	60.4	-	40.4	58.1		
3750 Cfm		EAT (wb)	58	TC	95.1	95.1	107.8	91.2	91.2	103.3	86.9	86.9	98.5	82.3	82.3	93.3	77.4	77.4	87.8
				SHC	82.4	95.1	107.8	79	91.2	103.3	75.3	86.9	98.5	71.3	82.3	93.3	67.1	77.4	87.8
	62		TC	95.2	95.2	112.2	91.2	91.2	107.5	87	87	102.5	82.4	82.4	97.1	77.5	77.5	91.3	
			SHC	78.2	95.2	112.2	75	91.2	107.5	71.5	87	102.5	67.7	82.4	97.1	63.7	77.5	91.3	
	67		TC	101.1	101.1	102.6	96	96	100.5	90.6	90.6	98.3	84.9	84.9	95.9	78.9	78.9	93.2	
			SHC	64	83.3	102.6	62	81.2	100.5	59.8	79.1	98.3	57.6	76.7	95.9	55.1	74.2	93.2	
	72	TC	110.4	110.4	110.4	104.8	104.8	104.8	98.9	98.9	98.9	92.7	92.7	92.7	86.1	86.1	86.1		
		SHC	45.7	65.1	84.5	43.7	63.1	82.5	41.7	61	80.4	39.5	58.8	78.2	37.2	56.5	75.9		
	76	TC	-	118.3	118.3	-	112.4	112.4	-	106	106	-	99.4	99.4	-	92.3	92.3		
		SHC	-	50.3	69.9	-	48.3	67.9	-	46.2	65.8	-	44.1	63.6	-	41.8	61.3		

48HC EnergyX

LEGEND:

- Do not operate
- 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 – COOLING CAPACITIES

2-STAGE COOLING

8.5 TONS

48HC EnergyX

48HC*D09			AMBIENT TEMPERATURE																
			85			95			105			115			125				
			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)				
			75	80	85	75	80	85	75	80	85	75	80	85	75	80	85		
2550 Cfm	EAT (wb)	58	TC	90.5	90.5	102.4	87	87	98.5	83.2	83.2	94.2	79.1	79.1	89.6	74.7	74.7	84.6	
			SHC	78.6	90.5	102.4	75.5	87	98.5	72.2	83.2	94.2	68.7	79.1	89.6	64.8	74.7	84.6	
		62	TC	94.8	94.8	98.1	90.2	90.2	95.8	85.4	85.4	93.4	80.3	80.3	90.8	74.9	74.9	87.8	
			SHC	71.2	84.6	98.1	69.1	82.4	95.8	66.8	80.1	93.4	64.3	77.5	90.8	61.6	74.7	87.8	
		67	TC	104	104	104	99	99	99	93.7	93.7	93.7	88	88	88	81.9	81.9	81.9	
			SHC	58.7	72.2	85.7	56.6	70	83.5	54.3	67.8	81.3	52	65.4	78.9	49.5	62.9	76.4	
	72	TC	114	114	114	108.5	108.5	108.5	102.7	102.7	102.7	96.5	96.5	96.5	89.8	89.8	89.8		
		SHC	45.8	59.3	72.9	43.7	57.2	70.8	41.4	55	68.5	39.1	52.7	66.2	36.7	50.2	63.7		
	76	TC	-	122.4	122.4	-	116.5	116.5	-	110.3	110.3	-	103.7	103.7	-	96.5	96.5		
		SHC	-	48.8	62.8	-	46.7	60.6	-	44.5	58.4	-	42.2	56	-	39.8	53.5		
	2975 Cfm	EAT (wb)	58	TC	95.4	95.4	108	91.6	91.6	103.7	87.5	87.5	99	83.1	83.1	94	78.3	78.3	88.6
				SHC	82.8	95.4	108	79.5	91.6	103.7	75.9	87.5	99	72.1	83.1	94	68	78.3	88.6
62			TC	97.7	97.7	107.4	93	93	104.9	88.1	88.1	102.1	83.2	83.2	97.9	78.4	78.4	92.2	
			SHC	76.7	92	107.4	74.3	89.6	104.9	71.8	86.9	102.1	68.6	83.2	97.9	64.6	78.4	92.2	
67			TC	106.9	106.9	106.9	101.6	101.6	101.6	96	96	96	90.1	90.1	90.1	83.7	83.7	83.9	
			SHC	62.3	77.8	93.4	60.1	75.6	91.2	57.8	73.3	88.9	55.4	70.9	86.5	52.8	68.3	83.9	
72		TC	117	117	117	111.2	111.2	111.2	105.1	105.1	105.1	98.6	98.6	98.6	91.7	91.7	91.7		
		SHC	47.3	62.9	78.6	45.1	60.8	76.4	42.9	58.5	74.1	40.5	56.1	71.7	38	53.6	69.2		
76		TC	-	125.6	125.6	-	119.4	119.4	-	112.8	112.8	-	105.9	105.9	-	98.4	98.4		
		SHC	-	50.8	66.8	-	48.7	64.6	-	46.4	62.3	-	44.1	59.9	-	41.6	57.4		
3400 Cfm		EAT (wb)	58	TC	99.5	99.5	112.7	95.4	95.4	108	91	91	103	86.3	86.3	97.7	81.2	81.2	91.9
				SHC	86.4	99.5	112.7	82.8	95.4	108	79	91	103	74.9	86.3	97.7	70.5	81.2	91.9
	62		TC	100.3	100.3	115.8	95.6	95.6	112.4	91.2	91.2	107.2	86.4	86.4	101.6	81.3	81.3	95.6	
			SHC	81.5	98.6	115.8	78.7	95.6	112.4	75.1	91.2	107.2	71.2	86.4	101.6	67	81.3	95.6	
	67		TC	109.1	109.1	109.1	103.6	103.6	103.6	97.8	97.8	97.8	91.6	91.6	93.7	85	85	90.9	
			SHC	65.6	83.2	100.8	63.4	81	98.6	61	78.6	96.2	58.6	76.1	93.7	55.9	73.4	90.9	
	72	TC	119.3	119.3	119.3	113.3	113.3	113.3	107	107	107	100.3	100.3	100.3	93	93	93		
		SHC	48.7	66.4	84.1	46.5	64.2	81.8	44.2	61.8	79.5	41.8	59.4	77.1	39.2	56.9	74.5		
	76	TC	-	128	128	-	121.5	121.5	-	114.7	114.7	-	107.5	107.5	-	99.8	99.8		
		SHC	-	52.6	70.6	-	50.5	68.4	-	48.2	66.1	-	45.8	63.6	-	43.3	61.1		
	3825 Cfm	EAT (wb)	58	TC	103	103	116.6	98.7	98.7	111.7	94	94	106.4	89	89	100.8	83.6	83.6	94.7
				SHC	89.4	103	116.6	85.6	98.7	111.7	81.6	94	106.4	77.3	89	100.8	72.6	83.6	94.7
62			TC	103.1	103.1	121.3	98.8	98.8	116.1	94.1	94.1	110.7	89.1	89.1	104.8	83.7	83.7	98.4	
			SHC	85	103.1	121.3	81.4	98.8	116.1	77.5	94.1	110.7	73.4	89.1	104.8	69	83.7	98.4	
67			TC	110.9	110.9	110.9	105.2	105.2	105.7	99.2	99.2	103.2	92.9	92.9	100.5	86.1	86.1	97.6	
			SHC	68.8	88.4	108	66.5	86.1	105.7	64.1	83.7	103.2	61.6	81.1	100.5	58.9	78.3	97.6	
72		TC	121.2	121.2	121.2	114.9	114.9	114.9	108.4	108.4	108.4	101.5	101.5	101.5	94.1	94.1	94.1		
		SHC	50	69.7	89.4	47.7	67.4	87.1	45.4	65.1	84.7	43	62.6	82.3	40.4	60	79.6		
76		TC	-	129.8	129.8	-	123.2	123.2	-	116.2	116.2	-	108.8	108.8	-	100.9	100.9		
		SHC	-	54.4	74.3	-	52.2	72.1	-	49.9	69.7	-	47.5	67.3	-	44.9	64.7		
4250 Cfm		EAT (wb)	58	TC	106	106	119.9	101.4	101.4	114.8	96.6	96.6	109.3	91.3	91.3	103.4	85.7	85.7	97
				SHC	92	106	119.9	88	101.4	114.8	83.8	96.6	109.3	79.3	91.3	103.4	74.4	85.7	97
	62		TC	106.1	106.1	124.7	101.5	101.5	119.4	96.6	96.6	113.6	91.4	91.4	107.5	85.7	85.7	100.8	
			SHC	87.4	106.1	124.7	83.6	101.5	119.4	79.6	96.6	113.6	75.3	91.4	107.5	70.6	85.7	100.8	
	67		TC	112.3	112.3	114.9	106.5	106.5	112.5	100.4	100.4	109.9	93.9	93.9	107	87.1	87.1	103.8	
			SHC	71.8	93.4	114.9	69.5	91	112.5	67	88.5	109.9	64.4	85.7	107	61.6	82.7	103.8	
	72	TC	122.6	122.6	122.6	116.2	116.2	116.2	109.5	109.5	109.5	102.5	102.5	102.5	94.9	94.9	94.9		
		SHC	51.2	72.8	94.5	48.9	70.5	92.2	46.6	68.2	89.8	44.1	65.7	87.3	41.5	63.1	84.6		
	76	TC	-	131.3	131.3	-	124.5	124.5	-	117.4	117.4	-	109.8	109.8	-	101.8	101.8		
		SHC	-	56	77.9	-	53.8	75.6	-	51.5	73.3	-	49.1	70.8	-	46.5	68.1		

LEGEND:

- Do not operate
- 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 17 – COOLING CAPACITIES

2-STAGE COOLING

10 TONS

48HC*D12				AMBIENT TEMPERATURE															
				85			95			105			115			125			
				EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)			
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85	
3000 Cfm	EAT (wb)	58	TC	104.3	104.3	118.5	99.5	99.5	113	93.4	93.4	106.1	86.7	86.7	98.6	79.7	79.7	90.6	
			SHC	90.2	104.3	118.5	86	99.5	113	80.6	93.4	106.1	74.9	86.7	98.6	68.8	79.7	90.6	
		62	TC	109.7	109.7	112.4	103.6	103.6	109.5	95.9	95.9	105.9	87.6	87.6	101.2	79.8	79.8	94.4	
			SHC	80.8	96.6	112.4	78	93.8	109.5	74.5	90.2	105.9	70.3	85.7	101.2	65.2	79.8	94.4	
		67	TC	121.5	121.5	121.5	115.4	115.4	115.4	107.8	107.8	107.8	98.7	98.7	98.7	89.1	89.1	89.1	
			SHC	65.2	81	96.9	62.7	78.6	94.5	59.7	75.6	91.5	56.2	72	87.9	52.5	68.3	84.2	
	72	TC	133	133	133	127.1	127.1	127.1	120.5	120.5	120.5	112	112	112	102.1	102.1	102.1		
		SHC	48.7	64.5	80.4	46.5	62.4	78.3	44.1	60	75.9	41.2	57.1	73	37.8	53.7	69.6		
	76	TC	-	140.9	140.9	-	135.1	135.1	-	128.4	128.4	-	121.3	121.3	-	112.5	112.5		
		SHC	-	50.6	67.1	-	48.7	65.2	-	46.6	63.1	-	44.3	60.7	-	41.4	57.7		
	3500 Cfm	EAT (wb)	58	TC	109.9	109.9	124.9	104.9	104.9	119.3	98.7	98.7	112.2	91.6	91.6	104.2	84.2	84.2	95.8
				SHC	94.9	109.9	124.9	90.6	104.9	119.3	85.2	98.7	112.2	79	91.6	104.2	72.6	84.2	95.8
62			TC	112.8	112.8	123.1	106.7	106.7	120	99.5	99.5	115.3	91.7	91.7	108.5	84.3	84.3	99.8	
			SHC	86.8	104.9	123.1	83.9	102	120	80	97.6	115.3	74.9	91.7	108.5	68.8	84.3	99.8	
67			TC	124.2	124.2	124.2	118	118	118	110.3	110.3	110.3	101	101	101	91	91	92.5	
			SHC	68.4	86.7	104.9	66.1	84.3	102.6	63.2	81.5	99.8	59.6	78	96.3	55.9	74.2	92.5	
72		TC	135.2	135.2	135.2	129.1	129.1	129.1	122.4	122.4	122.4	114.2	114.2	114.2	104.2	104.2	104.2		
		SHC	49.2	67.3	85.4	47.1	65.3	83.4	44.8	63	81.2	42	60.4	78.7	38.7	57.1	75.5		
76		TC	-	142.4	142.4	-	136.5	136.5	-	129.6	129.6	-	122.4	122.4	-	114	114		
		SHC	-	51.7	70.9	-	49.7	68.7	-	47.5	66.3	-	45.2	63.8	-	42.6	61.2		
4000 Cfm		EAT (wb)	58	TC	114.3	114.3	130	109.2	109.2	124.2	102.9	102.9	117	95.4	95.4	108.7	87.7	87.7	99.9
				SHC	98.6	114.3	130	94.2	109.2	124.2	88.7	102.9	117	82.2	95.4	108.7	75.5	87.7	99.9
	62		TC	115.3	115.3	132.4	109.6	109.6	128.3	102.9	102.9	121.9	95.5	95.5	113.2	87.8	87.8	104.1	
			SHC	91.9	112.2	132.4	88.7	108.5	128.3	84	102.9	121.9	77.9	95.5	113.2	71.5	87.8	104.1	
	67		TC	125.8	125.8	125.8	119.5	119.5	119.5	111.9	111.9	111.9	102.4	102.4	104.2	92.2	92.2	100.4	
			SHC	71.3	91.8	112.3	69	89.6	110.2	66.2	86.9	107.6	62.8	83.5	104.2	59.1	79.7	100.4	
	72	TC	136.3	136.3	136.3	130.2	130.2	130.2	123.4	123.4	123.4	115.4	115.4	115.4	105.3	105.3	105.3		
		SHC	49.5	69.7	89.8	47.4	67.7	87.9	45.1	65.5	85.9	42.5	63.1	83.7	39.3	60.1	80.9		
	76	TC	-	143.1	143.1	-	137.1	137.1	-	130.1	130.1	-	122.6	122.6	-	114.5	114.5		
		SHC	-	52.2	73.2	-	50.2	71.1	-	48	68.7	-	45.7	66.4	-	43.3	64.1		
	4500 Cfm	EAT (wb)	58	TC	117.5	117.5	133.8	112.4	112.4	127.9	106	106	120.7	98.4	98.4	112.1	90.3	90.3	103
				SHC	101.3	117.5	133.8	96.8	112.4	127.9	91.2	106	120.7	84.6	98.4	112.1	77.7	90.3	103
62			TC	117.6	117.6	139.4	112.5	112.5	133.3	106.1	106.1	125.8	98.5	98.5	116.8	90.4	90.4	107.4	
			SHC	95.9	117.6	139.4	91.6	112.5	133.3	86.4	106.1	125.8	80.1	98.5	116.8	73.5	90.4	107.4	
67			TC	126.6	126.6	126.6	120.2	120.2	120.2	112.8	112.8	114.8	103.2	103.2	111.6	93	93	107.6	
			SHC	73.7	96.4	119.2	71.5	94.3	117.2	68.9	91.8	114.8	65.6	88.6	111.6	61.8	84.7	107.6	
72		TC	136.7	136.7	136.7	130.5	130.5	130.5	123.6	123.6	123.6	115.7	115.7	115.7	105.7	105.7	105.7		
		SHC	49.4	71.6	93.7	47.4	69.7	91.9	45.1	67.5	89.9	42.7	65.4	88.2	39.5	62.6	85.8		
76		TC	-	143.1	143.1	-	137	137	-	129.9	129.9	-	122.4	122.4	-	114.3	114.3		
		SHC	-	52.4	75.1	-	50.5	73.1	-	48.2	70.8	-	46	68.5	-	43.7	66.5		
5000 Cfm		EAT (wb)	58	TC	119.9	119.9	136.7	114.7	114.7	130.7	108.4	108.4	123.6	100.6	100.6	114.8	92.3	92.3	105.4
				SHC	103.2	119.9	136.7	98.6	114.7	130.7	93.2	108.4	123.6	86.4	100.6	114.8	79.2	92.3	105.4
	62		TC	120	120	142.4	114.7	114.7	136.2	108.5	108.5	128.8	100.7	100.7	119.7	92.4	92.4	109.9	
			SHC	97.6	120	142.4	93.3	114.7	136.2	88.1	108.5	128.8	81.7	100.7	119.7	74.9	92.4	109.9	
	67		TC	126.8	126.8	126.8	120.4	120.4	123.6	113.2	113.2	121.3	103.8	103.8	118.4	93.6	93.6	114	
			SHC	75.7	100.6	125.4	73.6	98.6	123.6	71.2	96.2	121.3	68	93.2	118.4	64.2	89.1	114	
	72	TC	136.5	136.5	136.5	130.2	130.2	130.2	123.2	123.2	123.2	115.5	115.5	115.5	105.6	105.6	105.6		
		SHC	49.1	73.1	97	47.1	71.3	95.4	44.9	69.2	93.5	42.5	67.3	92	39.5	64.9	90.2		
	76	TC	-	142.7	142.7	-	136.5	136.5	-	129.4	129.4	-	121.6	121.6	-	113.6	113.6		
		SHC	-	52.2	76.7	-	50.4	74.7	-	48.2	72.4	-	45.9	70.1	-	43.7	68.3		

48HC EnergyX

LEGEND:

- Do not operate
- 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 18 – COOLING CAPACITIES

2-STAGE COOLING

12.5 TONS

48HC EnergyX

48HC*D14			AMBIENT TEMPERATURE																
			85			95			105			115			125				
			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)			EAT (dB)				
			75	80	85	75	80	85	75	80	85	75	80	85	75	80	85		
3750 Cfm	EAT (wb)	58	TC	131.9	131.9	149.8	127.0	127.0	144.1	121.5	121.5	137.9	115.4	115.4	131.0	108.7	108.7	123.4	
			SHC	114.1	131.9	149.8	109.8	127.0	144.1	105.0	121.5	137.9	99.8	115.4	131.0	94.0	108.7	123.4	
		62	TC	138.0	138.0	143.4	131.7	131.7	140.4	124.7	124.7	136.9	117.1	117.1	133.1	109.4	109.4	127.4	
			SHC	103.4	123.4	143.4	100.4	120.4	140.4	97.1	117.0	136.9	93.4	113.2	133.1	88.8	108.1	127.4	
		67	TC	151.5	151.5	151.5	144.5	144.5	144.5	136.9	136.9	136.9	128.5	128.5	128.5	119.4	119.4	119.4	
			SHC	85.1	105.2	125.3	82.1	102.2	122.3	78.9	99.0	119.0	75.4	95.5	115.5	71.7	91.8	111.8	
	72	TC	166.1	166.1	166.1	158.5	158.5	158.5	150.2	150.2	150.2	141.1	141.1	141.1	131.3	131.3	131.3		
		SHC	66.2	86.5	106.7	63.3	83.6	103.8	60.2	80.4	100.6	56.8	76.9	97.1	53.1	73.3	93.4		
	76	TC	-	178.6	178.6	-	170.5	170.5	-	161.6	161.6	-	151.8	151.8	-	141.3	141.3		
		SHC	-	71.1	91.8	-	68.3	88.9	-	65.2	85.8	-	61.8	82.5	-	58.2	78.7		
	4375 Cfm	EAT (wb)	58	TC	139.2	139.2	158.0	133.8	133.8	151.9	127.9	127.9	145.2	121.3	121.3	137.7	114.1	114.1	129.5
				SHC	120.4	139.2	158.0	115.7	133.8	151.9	110.6	127.9	145.2	104.9	121.3	137.7	98.7	114.1	129.5
62			TC	142.4	142.4	157.6	135.8	135.8	154.1	128.9	128.9	149.2	121.7	121.7	142.9	114.2	114.2	134.8	
			SHC	111.5	134.5	157.6	108.2	131.2	154.1	104.2	126.7	149.2	99.4	121.1	142.9	93.6	114.2	134.8	
67			TC	155.8	155.8	155.8	148.5	148.5	148.5	140.4	140.4	140.4	131.6	131.6	131.6	122.1	122.1	123.0	
			SHC	90.3	113.6	136.8	87.3	110.5	133.8	84.0	107.2	130.5	80.4	103.6	126.8	76.6	99.8	123.0	
72		TC	170.6	170.6	170.6	162.7	162.7	162.7	154.0	154.0	154.0	144.4	144.4	144.4	134.1	134.1	134.1		
		SHC	68.5	91.9	115.3	65.5	88.9	112.3	62.3	85.6	109.0	58.8	82.1	105.4	55.1	78.4	101.7		
76		TC	-	183.3	183.3	-	174.8	174.8	-	165.4	165.4	-	155.2	155.2	-	144.3	144.3		
		SHC	-	74.3	98.3	-	71.3	95.2	-	68.0	91.9	-	64.6	88.3	-	60.9	84.5		
5000 Cfm		EAT (wb)	58	TC	145.3	145.3	164.9	139.5	139.5	158.4	133.2	133.2	151.2	126.2	126.2	143.2	118.5	118.5	134.5
				SHC	125.6	145.3	164.9	120.7	139.5	158.4	115.2	133.2	151.2	109.1	126.2	143.2	102.5	118.5	134.5
	62		TC	146.5	146.5	169.3	140.2	140.2	163.9	133.3	133.3	157.4	126.3	126.3	149.1	118.6	118.6	140.0	
			SHC	118.3	143.8	169.3	114.1	139.0	163.9	109.3	133.3	157.4	103.5	126.3	149.1	97.2	118.6	140.0	
	67		TC	159.1	159.1	159.1	151.5	151.5	151.5	143.1	143.1	143.1	134.0	134.0	137.7	124.2	124.2	133.7	
			SHC	95.2	121.6	148.0	92.2	118.5	144.9	88.8	115.1	141.5	85.1	111.4	137.7	81.3	107.5	133.7	
	72	TC	174.1	174.1	174.1	165.9	165.9	165.9	156.8	156.8	156.8	146.9	146.9	146.9	136.2	136.2	136.2		
		SHC	70.5	97.0	123.5	67.5	94.0	120.5	64.2	90.7	117.1	60.6	87.1	113.5	56.9	83.3	109.6		
	76	TC	-	187.0	187.0	-	178.1	178.1	-	168.3	168.3	-	157.7	157.7	-	146.4	146.4		
		SHC	-	77.0	104.0	-	74.0	100.9	-	70.7	97.5	-	67.2	93.9	-	63.4	90.0		
	5625 Cfm	EAT (wb)	58	TC	150.4	150.4	170.8	144.4	144.4	163.9	137.7	137.7	156.3	130.3	130.3	147.9	122.2	122.2	138.7
				SHC	130.1	150.4	170.8	124.9	144.4	163.9	119.0	137.7	156.3	112.7	130.3	147.9	105.7	122.2	138.7
62			TC	150.7	150.7	177.9	144.5	144.5	170.6	137.8	137.8	162.7	130.4	130.4	153.9	122.3	122.3	144.4	
			SHC	123.5	150.7	177.9	118.4	144.5	170.6	112.9	137.8	162.7	106.8	130.4	153.9	100.2	122.3	144.4	
67			TC	161.7	161.7	161.7	153.9	153.9	155.6	145.3	145.3	152.1	135.9	135.9	148.2	125.9	125.9	143.9	
			SHC	100.0	129.4	158.8	96.8	126.2	155.6	93.4	122.7	152.1	89.7	118.9	148.2	85.6	114.8	143.9	
72		TC	176.9	176.9	176.9	168.3	168.3	168.3	159.0	159.0	159.0	148.8	148.8	148.8	137.9	137.9	137.9		
		SHC	72.3	101.9	131.5	69.3	98.8	128.4	66.0	95.5	125.0	62.4	91.8	121.3	58.6	88.0	117.4		
76		TC	-	189.8	189.8	-	180.6	180.6	-	170.6	170.6	-	159.7	159.7	-	148.1	148.1		
		SHC	-	79.6	109.7	-	76.5	106.5	-	73.2	103.0	-	69.6	99.2	-	65.7	95.1		
6250 Cfm		EAT (wb)	58	TC	154.8	154.8	175.8	148.5	148.5	168.6	141.5	141.5	160.6	133.7	133.7	151.8	125.3	125.3	142.3
				SHC	133.9	154.8	175.8	128.4	148.5	168.6	122.3	141.5	160.6	115.6	133.7	151.8	108.4	125.3	142.3
	62		TC	155.0	155.0	183.0	148.6	148.6	175.5	141.6	141.6	167.2	133.9	133.9	158.0	125.4	125.4	148.1	
			SHC	127.0	155.0	183.0	121.8	148.6	175.5	116.0	141.6	167.2	109.7	133.9	158.0	102.8	125.4	148.1	
	67		TC	163.8	163.8	169.3	155.8	155.8	166.0	147.0	147.0	162.3	137.5	137.5	158.1	127.4	127.4	153.3	
			SHC	104.5	136.9	169.3	101.3	133.6	166.0	97.8	130.0	162.3	93.9	126.0	158.1	89.7	121.5	153.3	
	72	TC	179.1	179.1	179.1	170.3	170.3	170.3	160.8	160.8	160.8	150.3	150.3	150.3	139.2	139.2	139.2		
		SHC	74.1	106.7	139.3	71.0	103.6	136.1	67.7	100.2	132.7	64.1	96.5	128.9	60.2	92.6	124.9		
	76	TC	-	192.1	192.1	-	182.7	182.7	-	172.3	172.3	-	161.2	161.2	-	149.4	149.4		
		SHC	-	82.1	115.1	-	79.0	111.8	-	75.6	108.2	-	71.9	104.3	-	67.9	100.0		

LEGEND:

- Do not operate
- 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

PE PERFORMANCE

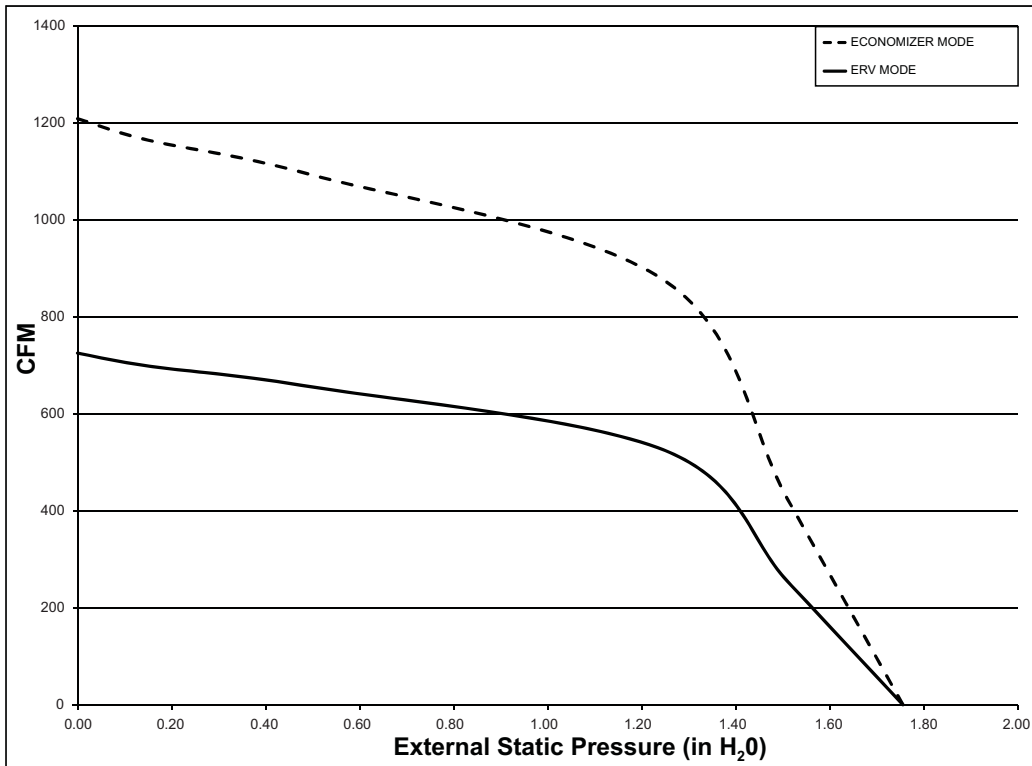


Fig. 16 - 48HC**04

C12206

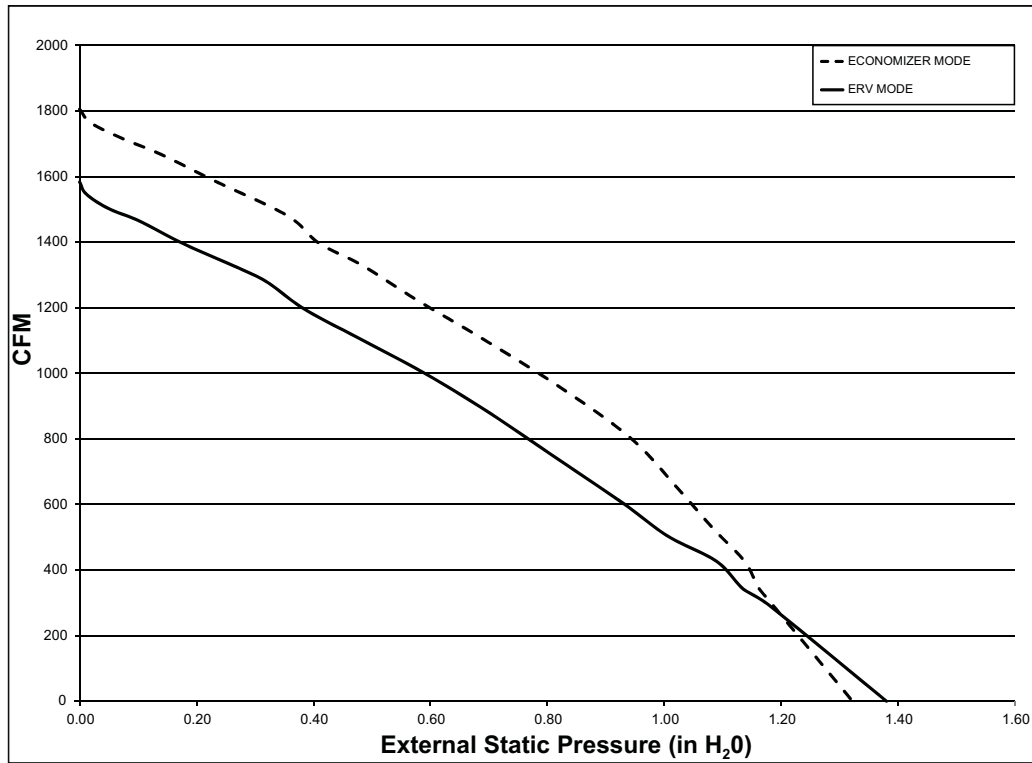


Fig. 17 - 48HC**05 - 06

C12207

48HC EnergyX

PE PERFORMANCE (cont.)

48HC EnergyX

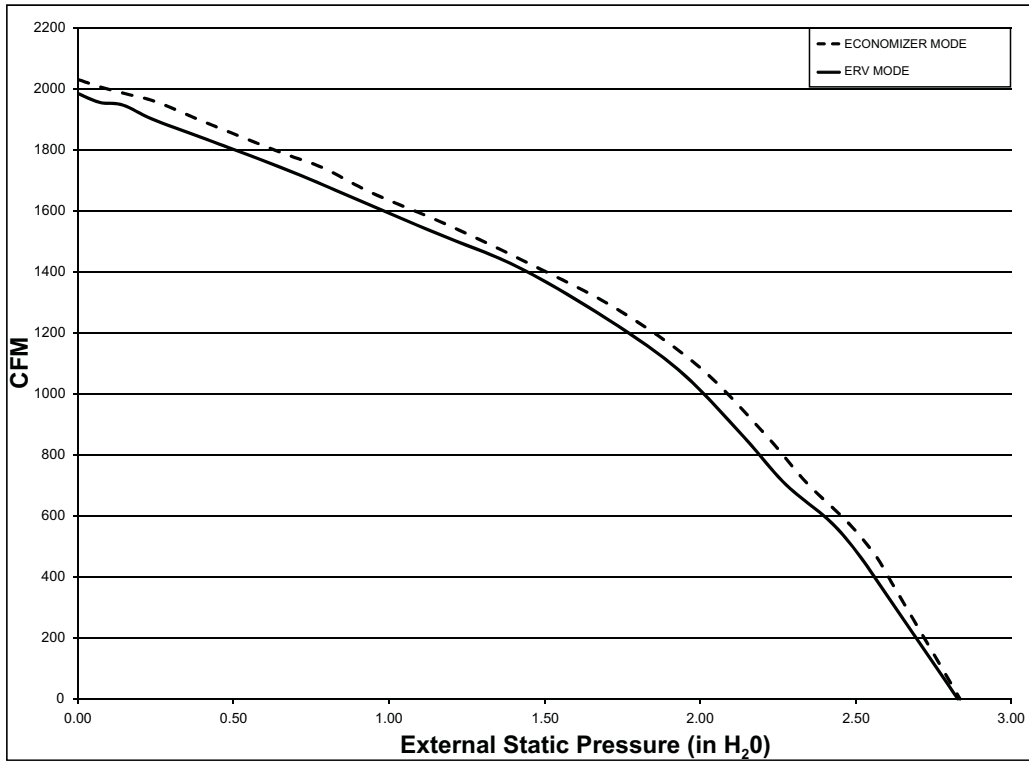


Fig. 18 - 48HC**07

C12208

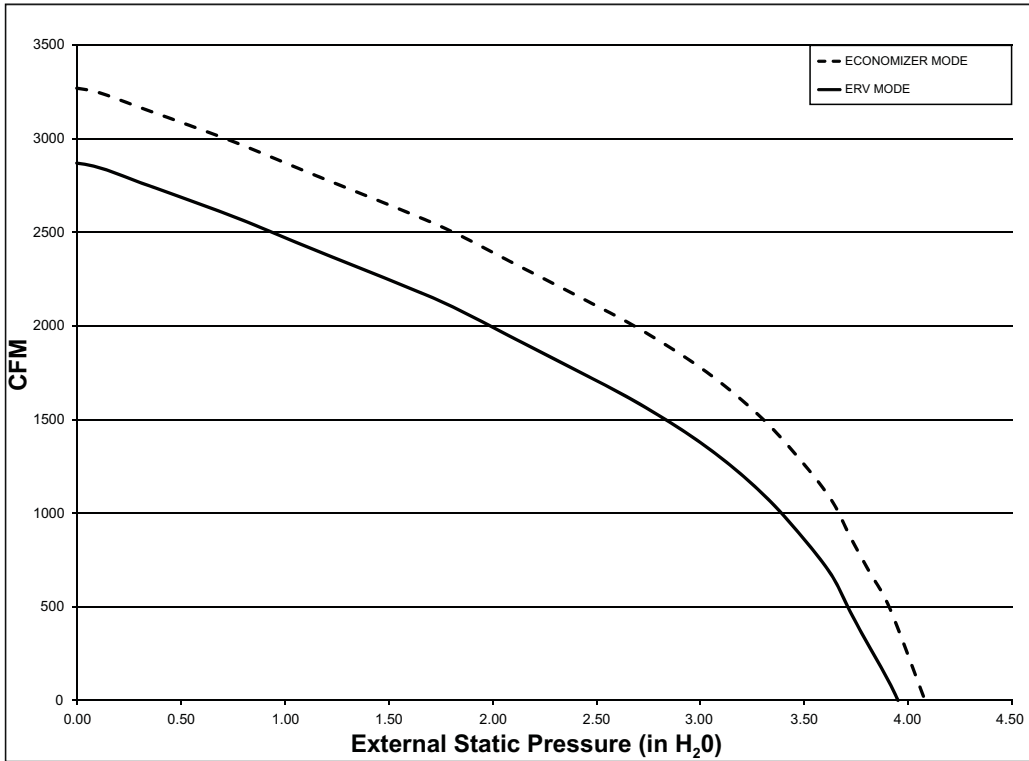


Fig. 19 - 48HC**08 - 12

C12209

PE PERFORMANCE (cont.)

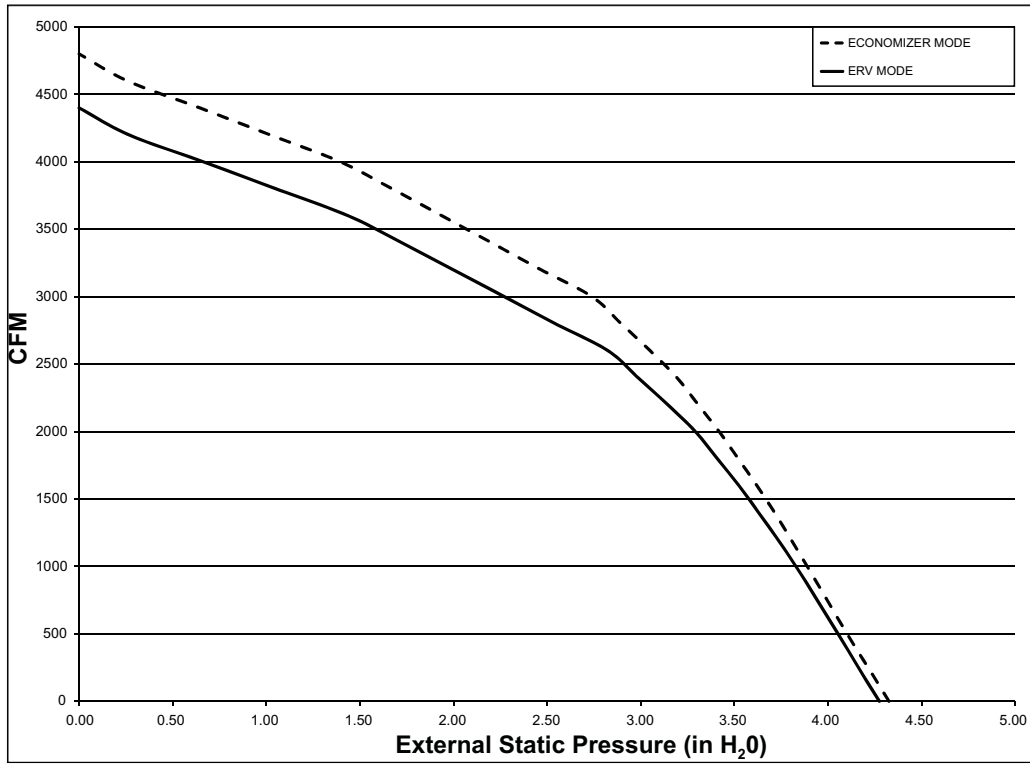


Fig. 20 - 48HC**14

C12210

48HC EnergyX

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. 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, Carrier recommended the lower horsepower option.
5. For information on the electrical properties of Carrier motors, please see the Electrical information section of this book.
6. For more information on the performance limits of Carrier 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.

FAN PERFORMANCE (BELT DRIVE)

Table 19 – 48HC**04

3 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
900	592	0.14	721	0.25	826	0.38	916	0.53	997	0.69
975	616	0.17	744	0.28	847	0.41	936	0.56	1016	0.72
1050	641	0.19	766	0.30	868	0.44	957	0.59	1036	0.76
1125	667	0.22	790	0.33	890	0.47	978	0.63	1056	0.80
1200	693	0.25	813	0.37	913	0.51	999	0.67	1077	0.84
1275	720	0.29	837	0.41	935	0.55	1021	0.71	1098	0.88
1350	747	0.33	862	0.45	958	0.60	1043	0.76	1119	0.94
1425	775	0.37	887	0.50	982	0.65	1066	0.81	1141	0.99
1500	802	0.42	912	0.55	1006	0.70	1088	0.87	1163	1.05

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
900	1070	0.88	1137	1.07	1201	1.29	1260	1.51	1317	1.75
975	1089	0.91	1156	1.11	1219	1.32	1279	1.54	1335	1.78
1050	1108	0.94	1175	1.14	1238	1.36	1297	1.58	1353	1.82
1125	1128	0.98	1195	1.18	1257	1.40	1316	1.62	1372	1.86
1200	1148	1.03	1214	1.23	1276	1.44	1335	1.67	1391	1.91
1275	1169	1.07	1235	1.28	1296	1.50	1354	1.72	1410	1.97
1350	1190	1.13	1255	1.33	1316	1.55	1374	1.78	1429	2.03
1425	1211	1.19	1276	1.39	1337	1.61	1394	1.85	1449	2.09
1500	1232	1.25	1297	1.46	1357	1.68	1415	1.91	1469	2.16

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

Boldface indicates field – supplied drive is required.

Medium static 770–1175 RPM, 1.2 BHP max

High static 1035–1466 RPM, 2.4 BHP max

48HC EnergyX

Table 20 – 48HC**04

3 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
900	582	0.14	715	0.24	825	0.35	921	0.48	1007	0.63
975	606	0.16	735	0.26	843	0.38	938	0.51	1023	0.66
1050	630	0.18	756	0.29	862	0.41	955	0.55	1040	0.70
1125	655	0.21	778	0.32	882	0.45	974	0.58	1057	0.74
1200	681	0.24	800	0.35	902	0.48	992	0.63	1074	0.78
1275	708	0.27	823	0.39	923	0.53	1012	0.67	1093	0.83
1350	735	0.31	847	0.43	945	0.57	1032	0.72	1112	0.88
1425	762	0.35	871	0.48	967	0.62	1053	0.77	1131	0.94
1500	790	0.40	896	0.53	990	0.67	1074	0.83	1151	1.00

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
900	1086	0.79	1159	0.96	1228	1.14	1293	1.33	1354	1.53
975	1101	0.82	1174	0.99	1242	1.18	1306	1.37	1367	1.57
1050	1117	0.86	1189	1.03	1256	1.22	1320	1.41	1381	1.62
1125	1133	0.90	1204	1.08	1271	1.26	1335	1.46	1395	1.67
1200	1150	0.95	1221	1.13	1287	1.31	1350	1.51	1410	1.72
1275	1168	1.00	1237	1.18	1303	1.37	1365	1.57	1425	1.78
1350	1186	1.05	1255	1.24	1320	1.43	1382	1.63	1441	1.84
1425	1204	1.11	1272	1.30	1337	1.49	1398	1.70	1457	1.91
1500	1223	1.18	1291	1.36	1355	1.56	1415	1.77	1473	1.99

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

Boldface indicates field – supplied drive is required.

Medium static 770–1175 RPM, 1.2 BHP max

High static 1035–1466 RPM, 2.4 BHP max

FAN PERFORMANCE (BELT DRIVE) cont.

Table 21 – 48HC05**

4 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
1200	693	0.25	813	0.37	913	0.51	999	0.67	1077	0.84
1300	729	0.30	846	0.42	943	0.57	1028	0.73	1105	0.90
1400	765	0.35	879	0.48	974	0.63	1058	0.79	1134	0.97
1500	802	0.42	912	0.55	1006	0.70	1088	0.87	1163	1.05
1600	840	0.49	947	0.63	1038	0.78	1119	0.95	1193	1.14
1700	878	0.57	982	0.71	1071	0.87	1151	1.05	1224	1.24
1800	917	0.65	1017	0.81	1105	0.97	1183	1.15	1255	1.35
1900	956	0.75	1053	0.91	1139	1.08	1216	1.27	1287	1.47
2000	995	0.86	1090	1.02	1173	1.20	1249	1.39	1319	1.59

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
1200	1148	1.03	1214	1.23	1276	1.44	1335	1.67	1391	1.91
1300	1176	1.09	1241	1.30	1303	1.51	1361	1.74	1416	1.98
1400	1204	1.17	1269	1.37	1330	1.59	1388	1.82	1442	2.07
1500	1232	1.25	1297	1.46	1357	1.68	1415	1.91	1469	2.16
1600	1262	1.34	1325	1.55	1385	1.78	1442	2.01	1496	2.26
1700	1291	1.44	1354	1.66	1414	1.89	1470	2.12	1524	2.37
1800	1322	1.55	1384	1.77	1443	2.00	1499	2.25	1552	2.50
1900	1352	1.68	1414	1.90	1472	2.13	1528	2.38	1580	2.63
2000	1384	1.81	1445	2.04	1502	2.27	1557	2.52	1609	2.78

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

Boldface indicates field – supplied drive is required.

Medium static 920– 1303 RPM, 1.7 BHP max

High static 1208– 1639 RPM, 2.9 BHP max

Table 22 – 48HC05**

4 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
1200	681	0.24	800	0.35	902	0.48	992	0.63	1074	0.78
1300	717	0.29	831	0.41	930	0.54	1019	0.69	1099	0.85
1400	753	0.34	863	0.46	959	0.60	1046	0.75	1125	0.92
1500	790	0.40	896	0.53	990	0.67	1074	0.83	1151	1.00
1600	828	0.46	930	0.60	1021	0.75	1103	0.91	1179	1.09
1700	866	0.54	964	0.68	1053	0.84	1133	1.01	1207	1.18
1800	905	0.62	1000	0.77	1085	0.94	1164	1.11	1236	1.29
1900	944	0.71	1036	0.87	1119	1.04	1195	1.22	1266	1.41
2000	984	0.82	1072	0.98	1153	1.15	1227	1.34	1297	1.53

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
1200	1150	0.95	1221	1.13	1287	1.31	1350	1.51	1410	1.72
1300	1173	1.02	1243	1.20	1309	1.39	1371	1.59	1430	1.80
1400	1198	1.09	1266	1.28	1331	1.47	1393	1.68	1451	1.89
1500	1223	1.18	1291	1.36	1355	1.56	1415	1.77	1473	1.99
1600	1249	1.27	1316	1.46	1379	1.66	1439	1.87	1496	2.09
1700	1277	1.37	1342	1.57	1404	1.77	1463	1.99	1520	2.21
1800	1305	1.48	1369	1.68	1430	1.89	1489	2.11	1545	2.34
1900	1333	1.60	1397	1.81	1457	2.02	1514	2.25	1570	2.48
2000	1363	1.73	1425	1.94	1484	2.16	1541	2.39	1596	2.63

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

Boldface indicates field – supplied drive is required.

Medium static 920– 1303 RPM, 1.7 BHP max

High static 1208– 1639 RPM, 2.9 BHP max

48HC EnergyX

FAN PERFORMANCE (BELT DRIVE) cont.

Table 23 – 48HC**06

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
1500	847	0.41	966	0.55	1067	0.68	1158	0.81	1240	0.93
1625	896	0.50	1010	0.65	1109	0.79	1198	0.93	1278	1.07
1750	947	0.59	1056	0.76	1152	0.92	1238	1.07	1318	1.22
1875	998	0.70	1103	0.88	1196	1.05	1280	1.22	1358	1.38
2000	1049	0.82	1151	1.02	1241	1.20	1323	1.38	1399	1.56
2125	1102	0.96	1199	1.17	1287	1.37	1367	1.56	1441	1.75
2250	1154	1.11	1248	1.33	1333	1.55	1411	1.75	1484	1.96
2375	1208	1.28	1298	1.52	1381	1.74	1457	1.96	1528	2.18
2500	1261	1.47	1349	1.72	1429	1.96	1503	2.19	1572	2.42

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
1500	1316	1.05	1387	1.17	1454	1.28	1517	1.39	1578	1.50
1625	1353	1.20	1423	1.33	1489	1.46	1552	1.58	1611	1.70
1750	1391	1.36	1460	1.51	1525	1.65	1587	1.78	1646	1.91
1875	1430	1.54	1498	1.70	1562	1.85	1623	2.00	1681	2.14
2000	1470	1.73	1537	1.90	1600	2.06	1660	2.23	1718	2.38
2125	1511	1.93	1576	2.12	1639	2.29	1698	2.47	1755	2.64
2250	1552	2.15	1617	2.35	1678	2.54	1737	2.73	1793	2.92
2375	1595	2.39	1658	2.60	1718	2.80	1776	3.01	-	-
2500	1638	2.64	1700	2.87	1760	3.08	-	-	-	-

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

Boldface indicates field – supplied drive is required.

Medium static 1035– 1466 RPM, 2.4 BHP max

High static 1303 – 1687 RPM, 2.9 BHP max

Table 24 – 48HC**06

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
1500	798	0.41	906	0.55	1002	0.71	1088	0.87	1167	1.05
1625	845	0.50	949	0.65	1041	0.81	1125	0.98	1202	1.17
1750	893	0.60	993	0.76	1081	0.93	1163	1.11	1238	1.30
1875	942	0.71	1037	0.88	1123	1.06	1202	1.25	1275	1.44
2000	992	0.84	1083	1.02	1166	1.21	1242	1.40	1313	1.61
2125	1043	0.98	1129	1.17	1209	1.37	1283	1.57	1353	1.79
2250	1093	1.14	1177	1.34	1254	1.55	1325	1.76	1393	1.98
2375	1145	1.32	1225	1.53	1299	1.74	1369	1.97	1434	2.20
2500	1196	1.51	1273	1.73	1345	1.96	1413	2.19	1477	2.43

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
1500	1241	1.23	1310	1.42	1375	1.63	1438	1.84	1497	2.06
1625	1274	1.36	1342	1.56	1406	1.77	1467	1.98	1526	2.21
1750	1308	1.50	1375	1.70	1438	1.92	1498	2.14	1555	2.37
1875	1344	1.65	1409	1.86	1471	2.09	1530	2.32	1586	2.55
2000	1380	1.82	1444	2.04	1505	2.27	1563	2.51	1619	2.75
2125	1418	2.01	1481	2.24	1540	2.47	1597	2.72	1652	2.97
2250	1457	2.21	1518	2.45	1576	2.69	1632	2.94	1686	3.20
2375	1497	2.43	1556	2.68	1614	2.93	1669	3.19	-	-
2500	1538	2.68	1596	2.93	1652	3.19	-	-	-	-

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

Boldface indicates field – supplied drive is required.

Medium static 1035– 1466 RPM, 2.4 BHP max

High static 1303 – 1687 RPM, 2.9 BHP max

48HC EnergyX

FAN PERFORMANCE (BELT DRIVE) cont.

Table 25 – 48HC**07

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
1800	449	0.34	539	0.53	615	0.75	681	0.99	742	1.26
1950	470	0.40	557	0.60	631	0.83	696	1.08	756	1.35
2100	491	0.47	576	0.68	648	0.91	712	1.17	771	1.45
2250	513	0.54	595	0.76	665	1.01	728	1.27	786	1.56
2400	536	0.63	615	0.86	684	1.11	745	1.39	802	1.68
2550	558	0.72	635	0.97	702	1.23	763	1.51	818	1.81
2700	582	0.83	656	1.08	721	1.35	781	1.65	835	1.95
2850	605	0.94	677	1.21	741	1.49	799	1.79	853	2.11
3000	629	1.07	699	1.35	761	1.64	818	1.95	871	2.28

48HC EnergyX

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
1800	797	1.54	848	1.84	896	2.16	942	2.49	985	2.84
1950	810	1.64	861	1.94	909	2.26	954	2.60	997	2.96
2100	824	1.74	875	2.06	922	2.38	967	2.73	1009	3.09
2250	839	1.86	889	2.18	935	2.52	980	2.87	1022	3.23
2400	854	1.99	903	2.32	950	2.66	993	3.02	1035	3.39
2550	870	2.13	918	2.46	964	2.81	1008	3.18	1049	3.55
2700	886	2.28	934	2.62	979	2.98	1022	3.35	1063	3.74
2850	903	2.44	950	2.79	995	3.16	1037	3.54	1078	3.93
3000	920	2.62	966	2.98	1010	3.35	1052	3.74	1093	4.14

NOTE: For more information, see General Fan Performance Notes.
Boldface indicates field-supplied drive is required.

Standard static 489 – 747 RPM, 1.7 BHP max
 Medium static 733 – 949 RPM, 2.9 BHP max
 High static 909 – 1102 RPM, 4.7 BHP max

Table 26 – 48HC**07

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
1800	441	0.33	533	0.51	611	0.72	681	0.96	745	1.23
1950	462	0.38	550	0.58	626	0.80	694	1.04	757	1.31
2100	483	0.45	567	0.65	641	0.88	708	1.13	769	1.40
2250	505	0.52	586	0.73	657	0.97	722	1.22	782	1.50
2400	528	0.60	605	0.82	674	1.07	738	1.33	796	1.62
2550	550	0.69	625	0.92	692	1.17	754	1.45	811	1.74
2700	574	0.80	645	1.03	710	1.29	770	1.57	826	1.88
2850	597	0.91	666	1.16	729	1.43	788	1.71	843	2.02
3000	621	1.03	688	1.29	749	1.57	806	1.87	859	2.18

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
1800	804	1.51	860	1.82	912	2.15	961	2.49	1008	2.85
1950	815	1.60	869	1.91	920	2.24	969	2.59	1016	2.96
2100	826	1.70	880	2.01	930	2.35	978	2.70	1024	3.07
2250	838	1.81	891	2.12	941	2.46	988	2.82	1033	3.19
2400	851	1.92	903	2.25	952	2.59	999	2.95	1043	3.33
2550	865	2.05	916	2.38	964	2.73	1010	3.10	1054	3.48
2700	879	2.19	929	2.53	976	2.88	1022	3.25	1066	3.64
2850	894	2.35	943	2.69	990	3.05	1035	3.43	1078	3.82
3000	910	2.51	958	2.86	1004	3.23	1048	3.61	1090	4.01

NOTE: For more information, see General Fan Performance Notes.
Boldface indicates field-supplied drive is required.

Standard static 489 – 747 RPM, 1.7 BHP max
 Medium static 733 – 949 RPM, 2.9 BHP max
 High static 909 – 1102 RPM, 4.7 BHP max

FAN PERFORMANCE (BELT DRIVE) cont.

Table 27 – 48HC08**

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
2250	505	0.39	595	0.54	676	0.69	750	0.86	819	1.03
2438	532	0.47	617	0.63	694	0.79	766	0.97	833	1.15
2625	559	0.56	640	0.73	714	0.90	783	1.08	848	1.28
2813	588	0.67	664	0.84	735	1.03	801	1.22	864	1.42
3000	616	0.79	689	0.97	757	1.16	821	1.36	882	1.57
3188	646	0.92	715	1.11	780	1.31	842	1.52	901	1.74
3375	675	1.06	742	1.27	804	1.48	864	1.70	920	1.93
3563	705	1.23	769	1.44	829	1.66	886	1.89	941	2.13
3750	736	1.41	797	1.63	855	1.86	910	2.10	963	2.35

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
2250	884	1.21	945	1.40	1003	1.60	1059	1.80	1112	2.01
2438	896	1.34	955	1.54	1012	1.74	1066	1.95	1118	2.17
2625	909	1.47	967	1.68	1022	1.89	1075	2.11	1126	2.34
2813	923	1.62	980	1.84	1034	2.06	1086	2.29	1136	2.52
3000	939	1.79	994	2.01	1047	2.24	1098	2.47	1147	2.71
3188	956	1.97	1010	2.20	1061	2.43	1111	2.68	1159	2.93
3375	975	2.16	1027	2.40	1077	2.65	1125	2.90	1172	3.15
3563	994	2.37	1044	2.62	1093	2.87	1141	3.13	1186	3.40
3750	1014	2.60	1063	2.86	1111	3.12	1157	3.39	1202	3.66

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

- Standard static 518 – 733 RPM, 1.7 BHP max
- Medium static 690 – 936 RPM, 2.4 BHP max
- High static 838 – 1084 RPM, 3.7 BHP max

48HC EnergyX

Table 28 – 48HC08**

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
2250	482	0.36	577	0.51	659	0.66	732	0.82	799	0.98
2438	505	0.43	597	0.59	676	0.75	748	0.92	813	1.09
2625	529	0.51	617	0.68	694	0.85	764	1.03	827	1.22
2813	554	0.60	638	0.78	713	0.97	781	1.16	843	1.35
3000	579	0.70	660	0.89	732	1.09	799	1.29	860	1.50
3188	604	0.81	683	1.02	753	1.23	817	1.44	877	1.65
3375	630	0.94	706	1.15	774	1.37	836	1.60	895	1.82
3563	657	1.08	729	1.31	795	1.54	856	1.77	913	2.01
3750	683	1.23	753	1.47	817	1.71	877	1.96	933	2.21

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
2250	860	1.14	917	1.31	971	1.48	1022	1.66	1071	1.84
2438	873	1.27	929	1.45	983	1.63	1033	1.81	1081	2.00
2625	887	1.40	942	1.59	995	1.78	1045	1.98	1092	2.18
2813	901	1.55	956	1.75	1008	1.95	1057	2.15	1104	2.36
3000	917	1.70	970	1.91	1021	2.13	1070	2.34	1117	2.56
3188	933	1.87	986	2.09	1036	2.32	1084	2.54	1130	2.77
3375	950	2.05	1002	2.29	1051	2.52	1098	2.76	1144	3.00
3563	967	2.25	1018	2.49	1067	2.74	1113	2.99	1158	3.24
3750	985	2.46	1035	2.71	1083	2.97	1129	3.23	1173	3.49

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

- Standard static 518 – 733 RPM, 1.7 BHP max
- Medium static 690 – 936 RPM, 2.4 BHP max
- High static 838 – 1084 RPM, 3.7 BHP max

FAN PERFORMANCE (BELT DRIVE) cont.

Table 29 – 48HC09**

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
2250	505	0.39	595	0.54	676	0.69	750	0.86	819	1.03
2438	532	0.47	617	0.63	694	0.79	766	0.97	833	1.15
2625	559	0.56	640	0.73	714	0.90	783	1.08	848	1.28
2813	588	0.67	664	0.84	735	1.03	801	1.22	864	1.42
3000	616	0.79	689	0.97	757	1.16	821	1.36	882	1.57
3188	646	0.92	715	1.11	780	1.31	842	1.52	901	1.74
3375	675	1.06	742	1.27	804	1.48	864	1.70	920	1.93
3563	705	1.23	769	1.44	829	1.66	886	1.89	941	2.13
3750	736	1.41	797	1.63	855	1.86	910	2.10	963	2.35

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
2250	884	1.21	945	1.40	1003	1.60	1059	1.80	1112	2.01
2438	896	1.34	955	1.54	1012	1.74	1066	1.95	1118	2.17
2625	909	1.47	967	1.68	1022	1.89	1075	2.11	1126	2.34
2813	923	1.62	980	1.84	1034	2.06	1086	2.29	1136	2.52
3000	939	1.79	994	2.01	1047	2.24	1098	2.47	1147	2.71
3188	956	1.97	1010	2.20	1061	2.43	1111	2.68	1159	2.93
3375	975	2.16	1027	2.40	1077	2.65	1125	2.90	1172	3.15
3563	994	2.37	1044	2.62	1093	2.87	1141	3.13	1186	3.40
3750	1014	2.60	1063	2.86	1111	3.12	1157	3.39	1202	3.66

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

- Standard static 518 – 733 RPM, 1.7 BHP max
- Medium static 690 – 936 RPM, 2.4 BHP max
- High static 838 – 1084 RPM, 3.7 BHP max

Table 30 – 48HC09**

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
2250	520	0.47	609	0.64	687	0.81	757	0.99	821	1.16
2438	547	0.57	633	0.75	708	0.94	776	1.12	839	1.31
2625	575	0.68	657	0.88	730	1.07	796	1.27	857	1.48
2813	604	0.81	683	1.02	753	1.23	817	1.44	877	1.65
3000	634	0.95	709	1.17	777	1.40	839	1.62	897	1.85
3188	664	1.11	736	1.35	801	1.58	862	1.82	919	2.06
3375	694	1.29	763	1.54	826	1.79	885	2.04	941	2.29
3563	725	1.49	791	1.75	852	2.01	909	2.28	963	2.54
3750	756	1.71	819	1.98	879	2.26	934	2.53	987	2.81

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
2250	881	1.35	937	1.53	990	1.72	1040	1.91	1088	2.11
2438	897	1.51	952	1.70	1004	1.90	1054	2.11	1101	2.31
2625	915	1.68	968	1.89	1020	2.10	1068	2.32	1115	2.53
2813	933	1.87	986	2.09	1036	2.32	1084	2.54	1130	2.77
3000	952	2.08	1004	2.31	1053	2.55	1100	2.79	1145	3.03
3188	972	2.30	1023	2.55	1071	2.80	1118	3.05	1162	3.30
3375	993	2.55	1043	2.81	1090	3.07	1136	3.33	1179	3.59
3563	1014	2.81	1063	3.08	1110	3.36	1154	3.63	1198	3.91
3750	1037	3.09	1084	3.38	1130	3.66	1174	3.95	1216	4.24

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

- Standard static 518 – 733 RPM, 1.7 BHP max
- Medium static 690 – 936 RPM, 2.4 BHP max
- High static 838 – 1084 RPM, 3.7 BHP max

48HC EnergyX

FAN PERFORMANCE (BELT DRIVE) cont.

Table 31 – 48HC12**

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
3000	616	0.79	689	0.97	757	1.16	821	1.36	882	1.57
3250	655	0.96	724	1.16	788	1.37	849	1.58	907	1.80
3500	695	1.17	760	1.38	821	1.60	879	1.83	934	2.06
3750	736	1.41	797	1.63	855	1.86	910	2.10	963	2.35
4000	777	1.68	834	1.91	889	2.16	942	2.41	993	2.67
4250	818	1.98	873	2.23	925	2.49	976	2.75	1025	3.02
4500	860	2.32	912	2.58	962	2.85	1010	3.13	1057	3.41
4750	902	2.69	951	2.97	999	3.26	1046	3.55	1091	3.84
5000	944	3.11	991	3.40	1037	3.70	1082	4.00	1125	4.31

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
3000	939	1.79	994	2.01	1047	2.24	1098	2.47	1147	2.71
3250	962	2.03	1015	2.26	1066	2.50	1115	2.75	1163	3.00
3500	987	2.30	1038	2.54	1088	2.80	1135	3.05	1181	3.32
3750	1014	2.60	1063	2.86	1111	3.12	1157	3.39	1202	3.66
4000	1042	2.93	1090	3.20	1136	3.48	1180	3.76	1224	4.04
4250	1072	3.30	1118	3.58	1162	3.87	1205	4.16	1247	4.46
4500	1103	3.70	1147	4.00	1190	4.29	1232	4.60	-	-
4750	1135	4.14	1177	4.45	-	-	-	-	-	-
5000	1167	4.63	-	-	-	-	-	-	-	-

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

- Standard static 591 – 838 RPM, 2.4 BHP max
- Medium static 838 – 1084 RPM, 3.7 BHP max
- High static 1022 – 1240 RPM, 4.9 BHP max

48HC EnergyX

Table 32 – 48HC12**

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
3000	579	0.70	660	0.89	732	1.09	799	1.29	860	1.50
3250	613	0.85	690	1.06	760	1.27	823	1.49	883	1.71
3500	648	1.03	721	1.25	788	1.48	850	1.71	907	1.95
3750	683	1.23	753	1.47	817	1.71	877	1.96	933	2.21
4000	719	1.45	786	1.71	848	1.97	905	2.23	959	2.50
4250	756	1.71	819	1.98	879	2.26	934	2.53	987	2.81
4500	792	1.99	853	2.28	910	2.57	964	2.87	1015	3.16
4750	830	2.31	888	2.62	943	2.92	995	3.23	1044	3.54
5000	867	2.66	923	2.98	976	3.30	1026	3.63	1074	3.95

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
3000	917	1.70	970	1.91	1021	2.13	1070	2.34	1117	2.56
3250	938	1.93	991	2.16	1041	2.38	1089	2.61	1134	2.85
3500	961	2.18	1013	2.42	1062	2.66	1108	2.91	1153	3.15
3750	985	2.46	1035	2.71	1083	2.97	1129	3.23	1173	3.49
4000	1011	2.76	1059	3.03	1106	3.30	1151	3.58	1194	3.85
4250	1037	3.09	1084	3.38	1130	3.66	1174	3.95	1216	4.24
4500	1064	3.46	1110	3.76	1155	4.06	1198	4.36	1239	4.66
4750	1091	3.85	1137	4.16	1180	4.48	-	-	-	-
5000	1120	4.28	1164	4.61	-	-	-	-	-	-

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

- Standard static 591 – 838 RPM, 2.4 BHP max
- Medium static 838 – 1084 RPM, 3.7 BHP max
- High static 1022 – 1240 RPM, 4.9 BHP max

FAN PERFORMANCE (BELT DRIVE) cont.

Table 33 – 48HC14**

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
3438	431	0.59	504	0.81	574	1.08	643	1.40	706	1.74
3750	456	0.71	524	0.95	589	1.22	653	1.54	715	1.90
4063	481	0.86	546	1.11	606	1.39	666	1.71	725	2.07
4375	507	1.03	569	1.30	626	1.59	681	1.91	736	2.27
4688	533	1.22	593	1.51	647	1.81	698	2.13	750	2.49
5000	560	1.44	617	1.74	669	2.05	718	2.39	766	2.75
5313	587	1.68	642	2.00	691	2.33	738	2.67	784	3.04
5625	614	1.95	667	2.29	715	2.63	760	2.99	804	3.36
5938	642	2.25	692	2.60	739	2.97	782	3.34	824	3.72
6250	670	2.58	718	2.95	763	3.33	805	3.72	846	4.11

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
3438	763	2.10	815	2.46	862	2.82	905	3.18	946	3.55
3750	772	2.28	825	2.66	873	3.05	918	3.45	959	3.84
4063	781	2.46	834	2.87	883	3.29	929	3.71	971	4.14
4375	790	2.66	843	3.09	892	3.53	938	3.98	982	4.43
4688	801	2.89	852	3.32	901	3.78	947	4.25	991	4.73
5000	814	3.15	863	3.58	910	4.04	956	4.53	999	5.03
5313	830	3.44	875	3.87	920	4.33	965	4.83	1008	5.34
5625	847	3.77	890	4.20	933	4.66	975	5.15	1017	5.67
5938	865	4.13	906	4.56	947	5.03	987	5.52	1028	6.04
6250	885	4.53	924	4.97	962	5.43	1001	5.92	-	-

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

Standard static 440 – 609 RPM, 2.9 BHP max

Medium static 609 – 778 RPM, 3.7 BHP max

High static 776 – 955 RPM, 6.1 BHP max

Table 34 – 48HC14**

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
3438	421	0.57	493	0.78	561	1.02	627	1.30	688	1.62
3750	445	0.69	512	0.91	576	1.17	638	1.45	697	1.77
4063	470	0.84	533	1.07	593	1.33	651	1.62	707	1.94
4375	496	1.00	555	1.25	612	1.52	666	1.82	720	2.14
4688	522	1.19	579	1.46	632	1.74	683	2.04	734	2.37
5000	549	1.41	602	1.68	653	1.98	702	2.29	750	2.62
5313	576	1.64	627	1.94	675	2.24	721	2.57	767	2.91
5625	603	1.91	652	2.22	698	2.54	742	2.87	786	3.23
5938	630	2.20	677	2.53	721	2.87	764	3.21	805	3.57
6250	657	2.53	702	2.87	745	3.22	786	3.58	826	3.96

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
3438	746	1.96	799	2.32	849	2.70	896	3.09	940	3.50
3750	753	2.12	806	2.48	856	2.88	903	3.28	947	3.70
4063	761	2.29	813	2.67	862	3.07	909	3.48	953	3.92
4375	771	2.50	821	2.88	869	3.28	916	3.70	960	4.15
4688	783	2.73	831	3.11	878	3.52	923	3.95	966	4.40
5000	797	2.99	843	3.37	888	3.78	931	4.22	974	4.67
5313	812	3.28	856	3.67	899	4.08	941	4.52	983	4.98
5625	828	3.60	870	3.99	912	4.41	953	4.85	993	5.31
5938	846	3.95	886	4.36	926	4.78	965	5.22	1004	5.69
6250	865	4.35	904	4.75	942	5.18	979	5.63	-	-

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

Standard static 440 – 609 RPM, 2.9 BHP max

Medium static 609 – 778 RPM, 3.7 BHP max

High static 776 – 955 RPM, 6.1 BHP max

48HC EnergyX

FAN PERFORMANCE (cont.)

X13 MULTI-SPEED/TORQUE MOTOR

Table 35 – 48HC*A04 Vertical Unit-Direct Drive

Speed (Torque) Tap	CFM	ESP	BHP
1	900	0.30	0.19
	975	0.17	0.17
	1050	0.06	0.16
	1125	-	-
	1200	-	-
	1275	-	-
	1350	-	-
	1425	-	-
	1500	-	-
2	900	0.48	0.25
	975	0.34	0.23
	1050	0.20	0.22
	1125	0.07	0.20
	1200	-	-
	1275	-	-
	1350	-	-
	1425	-	-
	1500	-	-
3	900	0.84	0.38
	975	0.69	0.36
	1050	0.53	0.33
	1125	0.38	0.32
	1200	0.24	0.31
	1275	0.10	0.31
	1350	-	-
	1425	-	-
	1500	-	-
4	900	0.99	0.43
	975	0.88	0.43
	1050	0.75	0.43
	1125	0.61	0.43
	1200	0.47	0.42
	1275	0.33	0.40
	1350	0.19	0.38
	1425	-	-
	1500	-	-
5	900	1.10	0.47
	975	1.02	0.49
	1050	0.75	0.51
	1125	0.61	0.54
	1200	0.81	0.56
	1275	0.74	0.58
	1350	0.67	0.61
	1425	0.60	0.63
	1500	0.52	0.66

Table 36 – 48HC*A04 Horizontal Unit-Direct Drive

Speed (Torque) Tap	CFM	ESP	BHP
1	900	0.45	0.23
	975	0.33	0.22
	1050	0.22	0.20
	1125	0.12	0.19
	1200	0.05	0.17
	1275	-	-
	1350	-	-
	1425	-	-
	1500	-	-
2	900	0.66	0.30
	975	0.52	0.28
	1050	0.39	0.27
	1125	0.27	0.26
	1200	0.16	0.24
	1275	0.05	0.23
	1350	-	-
	1425	-	-
	1500	-	-
3	900	1.01	0.43
	975	0.88	0.41
	1050	0.73	0.39
	1125	0.59	0.38
	1200	0.46	0.36
	1275	0.33	0.36
	1350	0.21	0.33
	1425	0.09	0.31
	1500	-	-
4	900	1.13	0.46
	975	1.03	0.46
	1050	0.92	0.46
	1125	0.81	0.46
	1200	0.69	0.46
	1275	0.57	0.45
	1350	0.44	0.44
	1425	0.31	0.42
	1500	0.18	0.40
5	900	1.20	0.49
	975	1.14	0.51
	1050	0.92	0.53
	1125	0.81	0.55
	1200	0.95	0.57
	1275	0.90	0.60
	1350	0.84	0.62
	1425	0.78	0.65
	1500	0.72	0.68

48HC EnergyX

FAN PERFORMANCE (cont.)

X13 MULTI-SPEED/TORQUE MOTOR (cont.)

Table 37 – 48HC*A05 Vertical Unit-Direct Drive

Speed (Torque) Tap	CFM	ESP	BHP
1	1200	0.38	0.30
	1300	0.24	0.28
	1400	0.12	0.27
	1500	0.01	0.26
	1600	–	–
	1700	–	–
	1800	–	–
	1900	–	–
	2000	–	–
2	1200	0.49	0.34
	1300	0.34	0.32
	1400	0.20	0.31
	1500	0.05	0.29
	1600	–	–
	1700	–	–
	1800	–	–
	1900	–	–
	2000	–	–
3	1200	0.87	0.56
	1300	0.74	0.57
	1400	0.60	0.59
	1500	0.44	0.56
	1600	0.29	0.50
	1700	0.14	0.47
	1800	0.02	0.46
	1900	–	–
	2000	–	–
4	1200	0.93	0.57
	1300	0.83	0.60
	1400	0.72	0.63
	1500	0.60	0.63
	1600	0.48	0.62
	1700	0.35	0.62
	1800	0.21	0.61
	1900	0.06	0.58
	2000	–	–
5	1200	0.97	0.58
	1300	0.89	0.61
	1400	0.72	0.65
	1500	0.60	0.68
	1600	0.64	0.72
	1700	0.55	0.75
	1800	0.46	0.79
	1900	0.35	0.82
	2000	0.25	0.86

Table 38 – 48HC*A05 Horizontal Unit-Direct Drive

Speed (Torque) Tap	CFM	ESP	BHP
1	1200	0.49	0.35
	1300	0.34	0.33
	1400	0.20	0.31
	1500	0.06	0.29
	1600	–	–
	1700	–	–
	1800	–	–
	1900	–	–
	2000	–	–
	2	1200	0.60
1300		0.45	0.38
1400		0.30	0.36
1500		0.16	0.34
1600		0.01	0.32
1700		–	–
1800		–	–
1900		–	–
2000		–	–
3		1200	0.94
	1300	0.83	0.61
	1400	0.71	0.63
	1500	0.59	0.61
	1600	0.46	0.59
	1700	0.33	0.56
	1800	0.19	0.53
	1900	0.07	0.49
	2000	–	–
	4	1200	0.98
1300		0.89	0.62
1400		0.81	0.65
1500		0.72	0.66
1600		0.62	0.67
1700		0.52	0.68
1800		0.40	0.68
1900		0.27	0.66
2000		0.12	0.61
5		1200	1.02
	1300	0.95	0.63
	1400	0.81	0.67
	1500	0.72	0.70
	1600	0.74	0.74
	1700	0.67	0.78
	1800	0.59	0.82
	1900	0.51	0.86
	2000	0.42	0.89

48HC EnergyX

FAN PERFORMANCE (cont.)

X13 MULTI-SPEED/TORQUE MOTOR (cont.)

Table 39 – 48HC*A06 Vertical Unit-Direct Drive

Speed (Torque) Tap	CFM	ESP	BHP
1	1500	0.27	0.45
	1625	0.08	0.43
	1750	-	-
	1875	-	-
	2000	-	-
	2125	-	-
	2250	-	-
	2375	-	-
	2500	-	-
2	1500	0.48	0.57
	1625	0.26	0.55
	1750	0.08	0.53
	1875	-	-
	2000	-	-
	2125	-	-
	2250	-	-
	2375	-	-
	2500	-	-
3	1500	0.91	0.82
	1625	0.72	0.82
	1750	0.52	0.81
	1875	0.31	0.78
	2000	0.11	0.77
	2125	-	-
	2250	-	-
	2375	-	-
	2500	-	-
4	1500	0.98	0.85
	1625	0.82	0.89
	1750	0.66	0.92
	1875	0.50	0.90
	2000	0.32	0.92
	2125	0.13	0.86
	2250	-	-
	2375	-	-
	2500	-	-
5	1500	1.00	-
	1625	0.86	0.91
	1750	0.66	0.95
	1875	0.50	0.98
	2000	0.41	1.01
	2125	0.25	0.88
	2250	0.06	1.01
	2375	-	-
	2500	-	-

Table 40 – 48HC*A06 Horizontal Unit-Direct Drive

Speed (Torque) Tap	CFM	ESP	BHP
1	1500	0.40	0.50
	1625	0.20	0.48
	1750	0.04	0.45
	1875	-	-
	2000	-	-
	2125	-	-
	2250	-	-
	2375	-	-
	2500	-	-
2	1500	0.62	0.62
	1625	0.39	0.60
	1750	0.19	0.57
	1875	0.03	0.53
	2000	-	-
	2125	-	-
	2250	-	-
	2375	-	-
	2500	-	-
3	1500	1.04	0.87
	1625	0.87	0.88
	1750	0.68	0.88
	1875	0.48	0.84
	2000	0.28	0.84
	2125	0.07	0.84
	2250	-	-
	2375	-	-
	2500	-	-
4	1500	1.10	0.90
	1625	0.96	0.94
	1750	0.81	0.98
	1875	0.65	0.95
	2000	0.47	1.00
	2125	0.27	0.94
	2250	0.05	0.96
	2375	-	-
	2500	-	-
5	1500	1.12	0.92
	1625	1.00	0.96
	1750	0.81	1.00
	1875	0.65	1.04
	2000	0.56	1.08
	2125	0.39	0.95
	2250	0.19	1.09
	2375	-	-
	2500	-	-

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FAN PERFORMANCE (cont.)

Table 41 – PULLEY ADJUSTMENT

UNIT		Motor/Drive Combo	Motor Pulley turns open										
			0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
04	3 Phase	Standard Static	854	825	795	766	736	707	678	648	619	589	560
		Medium Static	1175	1135	1094	1054	1013	973	932	892	851	811	770
		High Static	1466	1423	1380	1337	1294	1251	1207	1164	1121	1078	1035
05	3 Phase	Standard Static	854	825	795	766	736	707	678	648	619	589	560
		Medium Static	1303	1265	1226	1188	1150	1112	1073	1035	997	958	920
		High Static	1639	1596	1553	1510	1467	1424	1380	1337	1294	1251	1208
06	3 Phase	Standard Static	1175	1135	1094	1054	1013	973	932	892	851	811	770
		Medium Static	1466	1423	1380	1337	1294	1251	1207	1164	1121	1078	1035
		High Static	1687	1649	1610	1572	1533	1495	1457	1418	1380	1341	1303
07	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
08	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
09	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
12	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
14	3 Phase	Standard Static	609	592	575	558	541	525	508	491	474	457	440
		Medium Static	778	761	744	727	710	694	677	660	643	626	609
		High Static	955	973	951	929	907	886	864	842	820	798	776

■ – Factory settings

48HC EnergyX

ELECTRICAL DATA (cont.)

Table 42 – 48HC**04

V-Ph-Hz	UNIT VOLTAGE RANGE		COMP 1		OFM (ea)		IFM			COMBUSTION FAN MOTOR FLA	ERV Motors				ERV TOTAL FLA		
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA		Exhaust		Supply			Wheel	
											QTY	FLA (ea)	QTY	FLA (ea)			QTY
208-3-60	187	253	10.4	73	190	1.0	DD-STD	78%	7.4	0.48	1	3.89	1	1.44	1	0.3	5.6
					190	1.0	STD	67%	4.9								
					190	1.0	MED	67%	4.9								
					190	1.0	HIGH	69%	5.2								
230-3-60	187	253	10.4	73	190	1.0	DD-STD	78%	7.4	0.48	1	3.89	1	1.44	1	0.3	5.6
					190	1.0	STD	67%	4.9								
					190	1.0	MED	67%	4.9								
					190	1.0	HIGH	69%	5.2								
460-3-60	414	506	5.8	38	190	0.5	DD-STD	78%	4.0	0.25	1	1.76	1	1.44	1	0.3	3.5
					190	0.5	STD	73%	2.1								
					190	0.5	MED	73%	2.1								
					190	0.5	HIGH	69%	2.6								
575-3-60	518	633	3.8	37	190	0.5	DD-STD	78%	4.0	0.24	1	3.52	1	1.44	1	0.3	5.3
					190	0.5	STD	73%	1.9								
					190	0.5	MED	73%	1.9								
					190	0.5	HIGH	78%	2.0								

Table 43 – 48HC**05

V-Ph-Hz	UNIT VOLTAGE RANGE		COMP 1		OFM (ea)		IFM			COMBUSTION FAN MOTOR FLA	ERV Motors				ERV TOTAL FLA		
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA		Exhaust		Supply			Wheel	
											QTY	FLA (ea)	QTY	FLA (ea)			QTY
208-3-60	187	253	13.7	83	325	1.4	DD-STD	78%	7.4	0.48	1	3.89	1	3.89	1	0.3	8.1
					325	1.4	STD	67%	4.9								
					325	1.4	MED	75%	5.2								
					325	1.4	HIGH	79%	7.5								
230-3-60	187	253	13.7	83	325	1.4	DD-STD	78%	7.4	0.48	1	3.89	1	3.89	1	0.3	8.1
					325	1.4	STD	67%	4.9								
					325	1.4	MED	75%	5.2								
					325	1.4	HIGH	79%	7.5								
460-3-60	414	506	6.2	41	325	0.9	DD-STD	78%	4.0	0.25	1	1.76	1	1.76	1	0.3	3.8
					325	0.9	STD	73%	2.1								
					325	0.9	MED	75%	2.6								
					325	0.9	HIGH	79%	3.4								
575-3-60	518	633	4.8	33	325	0.9	DD-STD	78%	4.0	0.24	1	1.76	1	1.76	1	0.3	3.8
					325	0.9	STD	73%	1.9								
					325	0.9	MED	72%	1.6								
					325	0.9	HIGH	77%	2.8								

ELECTRICAL DATA (cont.)

Table 44 – 48HC**06

V-Ph-Hz	UNIT VOLTAGE RANGE		COMP 1		OFM (ea)		IFM			COMBUSTION FAN MOTOR FLA	ERV Motors				ERV TOTAL FLA		
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA		Exhaust		Supply			Wheel	
											QTY	FLA (ea)	QTY	FLA (ea)		QTY	FLA (ea)
208-3-60	187	253	15.9	110	325	1.4	DD-STD	78%	7.4	0.48	1	3.89	1	3.89	1	0.3	8.1
					325	1.4	STD	67%	4.9								
					325	1.4	MED	69%	5.2								
					325	1.4	HIGH	79%	7.5								
230-3-60	187	253	15.9	110	325	1.4	DD-STD	78%	7.4	0.48	1	3.89	1	3.89	1	0.3	8.1
					325	1.4	STD	67%	4.9								
					325	1.4	MED	69%	5.2								
					325	1.4	HIGH	79%	7.5								
460-3-60	414	506	7.0	52	325	0.9	DD-STD	78%	4.0	0.25	1	1.76	1	1.76	1	0.3	3.8
					325	0.9	STD	73%	2.1								
					325	0.9	MED	69%	2.6								
					325	0.9	HIGH	79%	3.4								
575-3-60	518	633	5.1	40	325	0.9	DD-STD	78%	4.0	0.24	1	1.76	1	1.76	1	0.3	3.8
					325	0.9	STD	73%	1.9								
					325	0.9	MED	78%	2.0								
					325	0.9	HIGH	77%	2.8								

Table 45 – 48HC**07

V-Ph-Hz	UNIT VOLTAGE RANGE		COMP 1		OFM (ea)		IFM			COMBUSTION FAN MOTOR FLA	ERV Motors*				ERV TOTAL FLA		
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA		Exhaust		Supply			Wheel	
											QTY	FLA (ea)	QTY	FLA (ea)		QTY	FLA (ea)
208-3-60	187	253	19.0	123	325	1.5	STD	75%	5.2	0.48	1	3.89	1	3.89	1	0.3	8.1
					325	1.5	MED	79%	7.5								
					325	1.5	HIGH	81%	15								
					325	1.5	STD	75%	5.2								
230-3-60	187	253	19.0	123	325	1.5	MED	79%	7.5	0.48	1	3.89	1	3.89	1	0.3	8.1
					325	1.5	HIGH	81%	15								
					325	0.8	STD	75%	2.6								
					325	0.8	MED	79%	3.4								
460-3-60	414	506	9.7	62	325	0.8	HIGH	81%	7.4	0.25	1	1.76	1	1.76	1	0.3	3.8
					325	0.6	STD	73%	1.2								
					325	0.6	MED	77%	2.8								
					325	0.6	HIGH	81%	5.6								
575-3-60	518	633	7.4	50	325	0.6	STD	73%	1.2	0.24	1	1.76	1	1.76	1	0.3	3.8
					325	0.6	MED	77%	2.8								
					325	0.6	HIGH	81%	5.6								
					325	0.6	STD	73%	1.2								

* On 575v units, the ERV motors are 230v or 460v.

ELECTRICAL DATA (cont.)

Table 46 – 48HC**08

V-Ph-Hz	UNIT VOLTAGE RANGE		COMP 1		COMP 2		OFM (ea)		IFM			COMBUSTION FAN MOTOR FLA	ERV Motors*				ERV TOTAL FLA		
	MIN	MAX	RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA		QTY	FLA (ea)	QTY	FLA (ea)		QTY	FLA (ea)
208-3-60	187	253	13.6	83	13.6	83	325	1.5	STD	75%	5.2	0.48	1	7.78	1	3.89	1	0.3	
							325			69%									5.2
							325			81%									10
230-3-60	187	253	13.6	83	13.6	83	325	1.5	STD	75%	5.2	0.48	1	7.78	1	3.89	1	0.3	
							325			69%									5.2
							325			81%									10
460-3-60	414	506	6.1	41	6.1	41	325	0.8	STD	75%	2.6	0.25	1	3.39	1	1.76	1	0.3	
							325			69%									2.6
							325			81%									4.4
575-3-60	518	633	4.2	33	4.2	33	325	0.6	STD	73%	1.2	0.24	1	3.39	1	1.76	1	0.3	
							325			78%									2
							325			77%									2.8

* On 575v units, the ERV motors are 230v or 460v.

Table 47 – 48HC**09

V-Ph-Hz	UNIT VOLTAGE RANGE		COMP 1		COMP 2		OFM (ea)		IFM			COMBUSTION FAN MOTOR FLA	ERV Motors*				ERV TOTAL FLA		
	MIN	MAX	RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA		QTY	FLA (ea)	QTY	FLA (ea)		QTY	FLA (ea)
208-3-60	187	253	13.7	83	13.7	83	325	1.5	STD	75%	5.2	0.48	1	7.78	1	3.89	1	0.3	
							325			69%									5.2
							325			81%									10
230-3-60	187	253	13.7	83	13.7	83	325	1.5	STD	75%	5.2	0.48	1	7.78	1	3.89	1	0.3	
							325			69%									5.2
							325			81%									10
460-3-60	414	506	6.2	41	6.2	41	325	0.8	STD	75%	2.6	0.25	1	3.39	1	1.76	1	0.3	
							325			69%									2.6
							325			81%									4.4
575-3-60	518	633	4.8	33	4.8	33	325	0.6	STD	73%	1.2	0.24	1	3.39	1	1.76	1	0.3	
							325			78%									2
							325			77%									2.8

* On 575v units, the ERV motors are 230v or 460v.

ELECTRICAL DATA (cont.)

Table 48 – 48HC12**

V-Ph-Hz	UNIT VOLTAGE RANGE		COMP 1		COMP 2		OFM (ea)		IFM			COMBUSTION FAN MOTOR FLA	ERV Motors*				ERV TOTAL FLA	
	MIN	MAX	RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA		QTY	FLA (ea)	QTY	FLA (ea)		QTY
208-3-60	187	253	15.9	110	15.9	110	1070	6.2	STD	69%	5.2	0.48	1	7.78	1	3.89	1	0.3
							1070	6.2	MED	81%	10							
							1070	6.2	HIGH	81%	15							
230-3-60	187	253	15.9	110	15.9	110	1070	6.2	STD	69%	5.2	0.48	1	7.78	1	3.89	1	0.3
							1070	6.2	MED	81%	10							
							1070	6.2	HIGH	81%	15							
460-3-60	414	506	7.7	52	7.7	52	1070	3.1	STD	69%	2.6	0.25	1	3.39	1	1.76	1	0.3
							1070	3.1	MED	81%	4.4							
							1070	3.1	HIGH	81%	7.4							
575-3-60	518	633	5.7	39	5.7	39	1070	2.5	STD	78%	2	0.24	1	3.39	1	1.76	1	0.3
							1070	2.5	MED	77%	2.8							
							1070	2.5	HIGH	81%	5.6							

* On 575v units, the ERV motors are 230v or 460v.

Table 49 – 48HC14**

V-Ph-Hz	UNIT VOLTAGE RANGE		COMP 1		COMP 2		OFM (ea)		IFM			COMBUSTION FAN MOTOR FLA	ERV Motors*				ERV TOTAL FLA	
	MIN	MAX	RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA		QTY	FLA (ea)	QTY	FLA (ea)		QTY
208-3-60	187	253	19.0	123	19.0	123	280	1.5	STD	79%	7.5	0.48	1	7.78	1	7.78	1	0.6
							280	1.5	MED	81%	10							
							280	1.5	HIGH	90%	20.4							
230-3-60	187	253	19.0	123	19.0	123	280	1.5	STD	79%	7.5	0.48	1	7.78	1	7.78	1	0.6
							280	1.5	MED	81%	10							
							280	1.5	HIGH	90%	20.4							
460-3-60	414	506	9.7	62	9.7	62	280	0.8	STD	79%	3.4	0.25	1	3.39	1	3.39	1	0.25
							280	0.8	MED	81%	4.4							
							280	0.8	HIGH	90%	10.2							
575-3-60	518	633	7.4	50	7.4	50	280	0.7	STD	77%	2.8	0.24	1	3.39	1	3.39	1	0.25
							280	0.7	MED	77%	2.8							
							280	0.7	HIGH	94%	9							

* On 575v units, the ERV motors are 230v or 460v.

ELECTRICAL DATA (cont.)

WITH ERY

Table 50 – 48HC*A04 SINGLE STAGE COOLING

MCA/MOCP

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.						w/ PWRD C.O.					
		w/ERV w/o Economizer			w/ERV w/Economizer			w/ERV w/o Economizer			w/ERV w/Economizer		
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA
208/ 230-3-60	DD-STD	27	30	28 88	27	30	28 88	32	40	34 93	32	40	34 93
	STD	25	30	25 93	25	30	25 93	30	35	31 98	30	35	31 98
	MED	25	30	25 93	25	30	25 93	30	35	31 98	30	35	31 98
	HIGH	25	30	26 111	25	30	26 111	30	40	31 116	30	40	31 116
460-3-60	DD-STD	16	20	16 47	16	20	16 47	18	20	18 49	18	20	18 49
	STD	14	15	14 49	14	15	14 49	16	20	16 51	16	20	16 51
	MED	14	15	14 49	14	15	14 49	16	20	16 51	16	20	16 51
	HIGH	14	20	14 58	14	20	14 58	17	20	17 60	17	20	17 60
575-3-60	DD-STD	15	20	16 47	15	20	16 47	17	20	18 49	17	20	18 49
	STD	13	15	13 48	13	15	13 48	15	20	15 50	15	20	15 50
	MED	13	15	13 48	13	15	13 48	15	20	15 50	15	20	15 50
	HIGH	13	15	13 54	13	15	13 54	15	20	15 56	15	20	15 56

Table 51 – 48HC*A05 SINGLE STAGE COOLING

MCA/MOCP

WITH ERY

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.						w/ PWRD C.O.					
		w/ERV w/o Economizer			w/ERV w/Economizer			w/ERV w/o Economizer			w/ERV w/Economizer		
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA
208/ 230-3-60	DD-STD	34	45	35 101	34	45	35 101	39	50	41 106	39	50	41 106
	STD	32	45	32 106	32	45	32 106	37	50	38 111	37	50	38 111
	MED	32	45	33 113	32	45	33 113	37	50	38 118	37	50	38 118
	HIGH	35	45	35 150	35	45	35 150	39	50	41 155	39	50	41 155
460-3-60	DD-STD	17	20	17 51	17	20	17 51	19	25	20 53	19	25	20 53
	STD	15	20	15 53	15	20	15 53	17	20	18 55	17	20	18 55
	MED	16	20	16 56	16	20	16 56	18	20	18 58	18	20	18 58
	HIGH	16	20	16 75	16	20	16 75	19	20	19 77	19	20	19 77
575-3-60	DD-STD	15	20	16 43	15	20	16 43	17	20	18 45	17	20	18 45
	STD	13	15	13 44	13	15	13 44	15	20	15 46	15	20	15 46
	MED	13	15	13 46	13	15	13 46	14	20	15 48	14	20	15 48
	HIGH	14	15	14 61	14	15	14 61	16	20	16 63	16	20	16 63

ELECTRICAL DATA (cont.)

Table 52 – 48HC*A06 SINGLE STAGE COOLING

MCA/MOCP

WITH ERV

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	
208/ 230-3-60	DD-STD	37	50	38	128	37	50	38	128	42	50	43	133	42	50	43	133
	STD	35	50	35	133	35	50	35	133	40	50	40	138	40	50	40	138
	MED	35	50	35	151	35	50	35	151	40	50	41	156	40	50	41	156
460-3-60	HIGH	37	50	38	177	37	50	38	177	42	50	43	182	42	50	43	182
	DD-STD	18	20	18	62	18	20	18	62	20	25	21	64	20	25	21	64
	STD	16	20	16	64	16	20	16	64	18	20	18	66	18	20	18	66
575-3-60	MED	17	20	16	73	17	20	16	73	19	25	19	75	19	25	19	75
	HIGH	17	20	17	86	17	20	17	86	20	25	20	88	20	25	20	88
	DD-STD	16	20	16	50	16	20	16	50	17	20	18	52	17	20	18	52
575-3-60	STD	13	15	13	51	13	15	13	51	15	20	15	53	15	20	15	53
	MED	14	15	14	57	14	15	14	57	15	20	16	59	15	20	16	59
	HIGH	14	20	15	68	14	20	15	68	16	20	16	70	16	20	16	70

Table 53 – 48HC*A07 SINGLE STAGE COOLING

MCA/MOCP

WITH ERV

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	
208/ 230-3-60	STD	40	50	41	156	40	50	41	156	45	60	46	161	45	60	46	161
	MED	43	60	43	193	43	60	43	193	48	60	49	198	48	60	49	198
	HIGH	50	60	52	219	50	60	52	219	55	60	57	224	55	60	57	224
460-3-60	STD	21	25	20	79	21	25	20	79	23	30	23	81	23	30	23	81
	MED	21	30	21	98	21	30	21	98	24	30	24	100	24	30	24	100
	HIGH	25	30	26	111	25	30	26	111	28	30	28	113	28	30	28	113
575-3-60	STD	16	20	16	65	16	20	16	65	18	20	18	67	18	20	18	67
	MED	18	20	18	80	18	20	18	80	19	25	19	82	19	25	19	82
	HIGH	20	25	21	94	20	25	21	94	22	25	23	96	22	25	23	96

ELECTRICAL DATA (cont.)

WITH ERV

Table 54 – 48HC*D08 TWO STAGE COOLING

MCA/MOCP

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.						w/ PWRD C.O.					
		w/ERV w/o Economizer			w/ERV w/Economizer			w/ERV w/o Economizer			w/ERV w/Economizer		
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA
208/ 230-3-60	STD	51	60	54 203	51	60	54 203	56	60	60 208	56	60	60 208
	MED	51	60	54 214	51	60	54 214	56	60	60 219	56	60	60 219
	HIGH	56	60	60 257	56	60	60 257	61	70	66 262	61	70	66 262
460-3-60	STD	24	25	25 101	24	25	25 101	26	30	28 103	26	30	28 103
	MED	24	25	25 107	24	25	25 107	26	30	28 109	26	30	28 109
	HIGH	26	30	27 129	26	30	27 129	28	30	30 131	28	30	30 131
575-3-60	STD	18	20	19 83	18	20	19 83	19	20	21 85	19	20	21 85
	MED	19	20	20 87	19	20	20 87	20	25	22 89	20	25	22 89
	HIGH	19	20	21 98	19	20	21 98	21	25	22 100	21	25	22 100

Table 55 – 48HC*D09 TWO STAGE COOLING

MCA/MOCP

WITH ERV

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.						w/ PWRD C.O.					
		w/ERV w/o Economizer			w/ERV w/Economizer			w/ERV w/o Economizer			w/ERV w/Economizer		
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA
208/ 230-3-60	STD	51	60	55 203	51	60	55 203	56	60	60 208	56	60	60 208
	MED	51	60	55 214	51	60	55 214	56	60	60 219	56	60	60 219
	HIGH	56	60	60 257	56	60	60 257	61	70	66 262	61	70	66 262
460-3-60	STD	24	30	25 101	24	30	25 101	26	30	28 103	26	30	28 103
	MED	24	30	25 107	24	30	25 107	26	30	28 109	26	30	28 109
	HIGH	26	30	27 129	26	30	27 129	28	30	30 131	28	30	30 131
575-3-60	STD	19	20	20 83	19	20	20 83	21	25	22 85	21	25	22 85
	MED	20	25	21 87	20	25	21 87	22	25	23 89	22	25	23 89
	HIGH	21	25	22 98	21	25	22 98	22	25	24 100	22	25	24 100

ELECTRICAL DATA (cont.)

Table 56 – 48HC*D12 TWO STAGE COOLING

MCA/MOCP

w/ PWRD C.O.

WITH ERV

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	
208/ 230-3-60	STD	60	70	63 294	60	70	63 294	64	70	69 299	64	70	69 299	64	70	69 299	
	MED	64	70	69 337	64	70	69 337	69	80	74 342	69	80	74 342	69	80	74 342	
	HIGH	69	80	75 346	69	80	75 346	74	80	80 351	74	80	80 351	74	80	80 351	
460-3-60	STD	29	35	31 141	29	35	31 141	31	35	33 143	31	35	33 143	31	35	33 143	
	MED	31	35	33 163	31	35	33 163	33	40	35 165	33	40	35 165	33	40	35 165	
	HIGH	34	40	36 167	34	40	36 167	36	40	39 169	36	40	39 169	36	40	39 169	
575-3-60	STD	23	25	25 111	23	25	25 111	25	30	27 113	25	30	27 113	25	30	27 113	
	MED	24	30	25 122	24	30	25 122	26	30	27 124	26	30	27 124	26	30	27 124	
	HIGH	27	30	29 136	27	30	29 136	29	30	31 138	29	30	31 138	29	30	31 138	

Table 57 – 48HC*D14 TWO STAGE COOLING

MCA/MOCP

w/ PWRD C.O.

WITH ERV

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	
208/ 230-3-60	STD	71	80	76 330	71	80	76 330	76	80	76 330	76	90	82 335	76	90	82 335	
	MED	74	80	79 347	74	80	79 347	79	90	84 352	79	90	84 352	79	90	84 352	
	HIGH	85	100	91 366	85	100	91 366	89	100	96 371	89	100	96 371	89	100	96 371	
460-3-60	STD	35	40	37 165	35	40	37 165	37	45	40 167	37	45	40 167	37	45	40 167	
	MED	36	45	38 174	36	45	38 174	38	45	41 176	38	45	41 176	38	45	41 176	
	HIGH	42	50	45 183	42	50	45 183	44	50	47 185	44	50	47 185	44	50	47 185	
575-3-60	STD	29	35	31 135	29	35	31 135	31	35	33 137	31	35	33 137	31	35	33 137	
	MED	29	35	31 135	29	35	31 135	31	35	33 137	31	35	33 137	31	35	33 137	
	HIGH	36	40	38 147	36	40	38 147	37	45	40 149	37	45	40 149	37	45	40 149	

ELECTRICAL DATA (cont.)

Table 58 – 48HC*A04 SINGLE STAGE COOLING

MCA/MOCP

WITH ERV AND HACR BREAKER

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA	
208/ 230-3-60	DD-STD	27	30	28	88	27	30	28	88	32	30	25	93	32	40	34	93
	STD	25	30	25	93	25	30	25	93	30	30	25	93	30	35	31	98
	MED	25	30	25	93	25	30	25	93	30	30	25	93	30	35	31	98
	HIGH	25	30	26	111	25	30	26	111	30	40	31	116	30	40	31	116
460-3-60	DD-STD	16	20	16	47	16	20	16	47	18	20	18	49	18	20	18	49
	STD	14	15	14	49	14	15	14	49	16	20	16	51	16	20	16	51
	MED	14	15	14	49	14	15	14	49	16	20	16	51	16	20	16	51
	HIGH	14	20	14	58	14	20	14	58	17	20	17	60	17	20	17	60
575-3-60	DD-STD	15	20	16	47	15	20	16	47	17	20	18	49	17	20	18	49
	STD	13	15	13	48	13	15	13	48	15	20	15	50	15	20	15	50
	MED	13	15	13	48	13	15	13	48	15	20	15	50	15	20	15	50
	HIGH	13	15	13	54	13	15	13	54	15	20	15	56	15	20	15	56

Table 59 – 48HC*A05 SINGLE STAGE COOLING

MCA/MOCP

WITH ERV AND HACR BREAKER

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA	
208/ 230-3-60	DD-STD	34	45	35	101	34	45	35	101	39	45	35	101	39	50	41	106
	STD	32	45	32	106	32	45	32	106	37	45	38	111	37	50	38	111
	MED	32	45	33	113	32	45	33	113	37	45	38	118	37	50	38	118
	HIGH	35	45	35	150	35	45	35	150	39	45	41	155	39	50	41	155
460-3-60	DD-STD	17	20	17	51	17	20	17	51	19	20	19	53	19	25	20	53
	STD	15	20	15	53	15	20	15	53	17	20	18	55	17	20	18	55
	MED	16	20	16	56	16	20	16	56	18	20	18	58	18	20	18	58
	HIGH	16	20	16	75	16	20	16	75	19	20	19	77	19	20	19	77
575-3-60	DD-STD	15	20	16	43	15	20	16	43	17	20	18	45	17	20	18	45
	STD	13	15	13	44	13	15	13	44	15	20	15	46	15	20	15	46
	MED	13	15	13	46	13	15	13	46	14	20	15	48	14	20	15	48
	HIGH	14	15	14	61	14	15	14	61	16	20	16	63	16	20	16	63

ELECTRICAL DATA (cont.)

Table 60 – 48HC*A06 SINGLE STAGE COOLING

MCA/MOCP

WITH ERV AND HACR BREAKER

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA	
208/ 230-3-60	DD-STD	37	50	38	128	37	50	38	128	42	50	43	133	42	50	43	133
	STD	35	50	35	133	35	50	35	133	40	50	40	138	40	50	40	138
	MED	35	50	35	151	35	50	35	151	40	50	41	156	40	50	41	156
460-3-60	HIGH	37	50	38	177	37	50	38	177	42	50	43	182	42	50	43	182
	DD-STD	18	20	18	62	18	20	18	62	20	25	21	64	20	25	21	64
	STD	16	20	16	64	16	20	16	64	18	20	18	66	18	20	18	66
575-3-60	MED	17	20	16	73	17	20	16	73	19	25	19	75	19	25	19	75
	HIGH	17	20	17	86	17	20	17	86	20	25	20	88	20	25	20	88
	DD-STD	16	20	16	50	16	20	16	50	17	20	18	52	17	20	18	52
575-3-60	STD	13	15	13	51	13	15	13	51	15	20	15	53	15	20	15	53
	MED	14	15	14	57	14	15	14	57	15	20	16	59	15	20	16	59
	HIGH	14	20	15	68	14	20	15	68	16	20	16	70	16	20	16	70

Table 61 – 48HC*A07 SINGLE STAGE COOLING

MCA/MOCP

WITH ERV AND HACR BREAKER

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA		MCA	HACR BRKR	DISC. SIZE FLA LRA	
208/ 230-3-60	STD	40	50	41	156	40	50	41	156	45	60	46	161	45	60	46	161
	MED	43	60	43	193	43	60	43	193	48	60	49	198	48	60	49	198
	HIGH	50	60	52	219	50	60	52	219	55	60	57	224	55	60	57	224
460-3-60	STD	21	25	20	79	21	25	20	79	23	30	23	81	23	30	23	81
	MED	21	30	21	98	21	30	21	98	24	30	24	100	24	30	24	100
	HIGH	25	30	26	111	25	30	26	111	28	30	28	113	28	30	28	113
575-3-60	STD	16	20	16	65	16	20	16	65	18	20	18	67	18	20	18	67
	MED	18	20	18	80	18	20	18	80	19	25	19	82	19	25	19	82
	HIGH	20	25	21	94	20	25	21	94	22	25	23	96	22	25	23	96

ELECTRICAL DATA (cont.)

Table 62 – 48HC*D08 TWO STAGE COOLING

MCA/MOCP

WITH ERV AND HACR BREAKER
w/ PWRD C.O.

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA
208/ 230-3-60	STD	51	60	54	203	51	60	54	203	56	60	60	208	56	60	60	208
	MED	51	60	54	214	51	60	54	214	56	60	60	219	56	60	60	219
	HIGH	56	60	60	257	56	60	60	257	61	70	70	262	61	70	70	262
460-3-60	STD	24	25	25	101	24	25	25	101	24	25	25	103	26	30	30	103
	MED	24	25	25	107	24	25	25	107	26	30	28	109	26	30	28	109
	HIGH	26	30	27	129	26	30	27	129	28	30	30	131	28	30	30	131
575-3-60	STD	18	20	19	83	18	20	19	83	19	20	19	85	19	25	25	85
	MED	19	20	20	87	19	20	20	87	20	25	22	89	20	25	22	89
	HIGH	19	20	21	98	19	20	21	98	21	25	22	100	21	25	22	100

Table 63 – 48HC*D9 TWO STAGE COOLING

MCA/MOCP

WITH ERV AND HACR BREAKER
w/ PWRD C.O.

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA
208/ 230-3-60	STD	51	60	55	203	51	60	55	203	56	60	60	208	56	60	60	208
	MED	51	60	55	214	51	60	55	214	56	60	60	219	56	60	60	219
	HIGH	56	60	60	257	56	60	60	257	61	70	70	262	61	70	70	262
460-3-60	STD	24	30	25	101	24	30	25	101	24	30	25	103	26	30	30	103
	MED	24	30	25	107	24	30	25	107	26	30	28	109	26	30	28	109
	HIGH	26	30	27	129	26	30	27	129	28	30	30	131	28	30	30	131
575-3-60	STD	19	20	20	83	19	20	20	83	21	25	21	85	21	25	22	85
	MED	20	25	21	87	20	25	21	87	22	25	23	89	22	25	23	89
	HIGH	21	25	22	98	21	25	22	98	22	25	24	100	22	25	24	100

ELECTRICAL DATA (cont.)

Table 64 – 48HC*D12 TWO STAGE COOLING

MCA/MOCP

**WITH ERV AND HACR BREAKER
w/ PWRD C.O.**

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA
208/ 230-3-60	STD	60	70	63	294	60	70	63	294	64	70	69	299	64	70	69	299
	MED	64	70	69	337	64	70	69	337	69	80	74	342	69	80	74	342
	HIGH	69	80	75	346	69	80	75	346	74	80	80	351	74	80	80	351
460-3-60	STD	29	35	31	141	29	35	31	141	31	35	33	143	31	35	33	143
	MED	31	35	33	163	31	35	33	163	33	40	35	165	33	40	35	165
	HIGH	34	40	36	167	34	40	36	167	36	40	39	169	36	40	39	169
575-3-60	STD	23	25	25	111	23	25	25	111	25	25	27	113	25	30	27	113
	MED	24	30	25	122	24	30	25	122	26	30	27	124	26	30	27	124
	HIGH	27	30	29	136	27	30	29	136	29	30	31	138	29	30	31	138

Table 65 – 48HC*D14 TWO STAGE COOLING

MCA/MOCP

**WITH ERV AND HACR BREAKER
w/ PWRD C.O.**

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA
208/ 230-3-60	STD	71	80	76	330	71	80	76	330	76	80	82	335	76	90	82	335
	MED	74	80	79	347	74	80	79	347	79	80	84	352	79	90	84	352
	HIGH	85	100	91	366	85	100	91	366	89	100	96	371	89	100	96	371
460-3-60	STD	35	40	37	165	35	40	37	165	37	40	40	167	37	45	40	167
	MED	36	45	38	174	36	45	38	174	38	45	41	176	38	45	41	176
	HIGH	42	50	45	183	42	50	45	183	44	50	47	185	44	50	47	185
575-3-60	STD	29	35	31	135	29	35	31	135	31	35	33	137	31	35	33	137
	MED	29	35	31	135	29	35	31	135	31	35	33	137	31	35	33	137
	HIGH	36	40	38	147	36	40	38	147	37	45	40	149	37	45	40	149

ELECTRICAL DATA (cont.)

Table 66 – 48HC*D08 TWO STAGE COOLING & TWO SPEED INDOOR FAN MOTOR

MCA/MOCP
WITH ERV

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.																				
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer								
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA						
208/ 230-3-60	STD	52/52	60/60	55/55 207	52/52	60/60	55/55 207	57/56	60/60	57/56 211	57/56	60/60	55/55 207	57/56	60/60	57/56 211	58/58	70/70	62/62 216	58/58	70/70	62/62 216
	MED	53/53	60/60	57/56 211	53/53	60/60	57/56 211	57/56	60/60	57/56 211	57/56	60/60	57/56 211	57/56	60/60	57/56 211	58/58	70/70	62/62 216	58/58	70/70	62/62 216
	HIGH	57/56	60/60	61/60 261	57/56	60/60	61/60 261	61/60	60/60	61/60 261	61/60	60/60	61/60 261	61/60	60/60	61/60 261	62/61	70/70	66/65 266	62/61	70/70	66/65 266
460-3-60	STD	24	30	25 103	24	30	25 103	24	30	25 103	24	30	25 103	26	30	28 105	26	30	28 105	26	30	28 105
	MED	25	30	27 106	25	30	27 106	25	30	27 106	25	30	27 106	27	30	29 108	27	30	29 108	27	30	29 108
	HIGH	26	30	28 131	26	30	28 131	26	30	28 131	26	30	28 131	28	30	30 133	28	30	30 133	28	30	30 133
575-3-60	STD	19	20	21 85	19	20	21 85	19	20	21 85	19	20	21 85	21	25	22 87	21	25	22 87	21	25	22 87
	MED	20	25	21 89	20	25	21 89	20	25	21 89	20	25	21 89	22	25	23 91	22	25	23 91	22	25	23 91
	HIGH	21	25	22 98	21	25	22 98	21	25	22 98	21	25	22 98	23	25	24 100	23	25	24 100	23	25	24 100

Table 67 – 48HC*D09 TWO STAGE COOLING & TWO SPEED INDOOR FAN MOTOR

MCA/MOCP
WITH ERV

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.																				
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer								
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA						
208/ 230-3-60	STD	52/52	60/60	55/55 207	52/52	60/60	55/55 207	57/56	60/60	57/56 211	57/56	60/60	55/55 207	57/56	60/60	57/56 211	58/58	70/70	62/62 216	58/58	70/70	62/62 216
	MED	53/53	60/60	57/56 211	53/53	60/60	57/56 211	57/56	60/60	57/56 211	57/56	60/60	57/56 211	58/58	70/70	62/62 216	58/58	70/70	62/62 216	58/58	70/70	62/62 216
	HIGH	57/56	70/60	61/60 261	57/56	70/60	61/60 261	61/60	60/60	61/60 261	61/60	60/60	61/60 261	62/61	70/70	67/66 266	62/61	70/70	67/66 266	62/61	70/70	67/66 266
460-3-60	STD	24	30	26 103	24	30	26 103	24	30	26 103	24	30	26 103	27	30	28 105	27	30	28 105	27	30	28 105
	MED	25	30	27 106	25	30	27 106	25	30	27 106	25	30	27 106	27	30	29 108	27	30	29 108	27	30	29 108
	HIGH	26	30	28 131	26	30	28 131	26	30	28 131	26	30	28 131	29	30	31 133	29	30	31 133	29	30	31 133
575-3-60	STD	21	25	22 85	21	25	22 85	21	25	22 85	21	25	22 85	22	25	24 87	22	25	24 87	22	25	24 87
	MED	21	25	23 89	21	25	23 89	21	25	23 89	21	25	23 89	23	25	25 91	23	25	25 91	23	25	25 91
	HIGH	22	25	24 98	22	25	24 98	22	25	24 98	22	25	24 98	24	25	26 100	24	25	26 100	24	25	26 100

ELECTRICAL DATA (cont.)

Table 68 – 48HC*D12 TWO STAGE COOLING & TWO SPEED INDOOR FAN MOTOR

**MCA/MOCP
WITH ERV**

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.													
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ PWRD C.O.					
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA		
208/ 230-3-60	STD	61/61	70/70	66/65 291	61/61	70/70	66/65 291	66/66	80/80	71/71	296	66/66	80/80	71/71	296
	MED	65/64	80/70	70/69 341	65/64	80/70	70/69 341	70/69	80/80	75/74	346	70/69	80/80	75/74	346
	HIGH	68/67	80/80	73/72 352	68/67	80/80	73/72 352	73/72	80/80	79/78	357	73/72	80/80	79/78	357
460-3-60	STD	30	35	32 140	30	35	32 140	32	35	34	142	32	35	34	142
	MED	31	35	33 165	31	35	33 165	33	40	36	167	33	40	36	167
	HIGH	33	35	35 170	33	35	35 170	35	40	37	172	35	40	37	172
575-3-60	STD	25	30	26 113	25	30	26 113	26	30	28	115	26	30	28	115
	MED	26	30	27 122	26	30	27 122	27	30	29	124	27	30	29	124
	HIGH	28	30	29 136	28	30	29 136	29	35	31	138	29	35	31	138

Table 69 – 48HC*D14 TWO STAGE COOLING & TWO SPEED INDOOR FAN MOTOR

**MCA/MOCP
WITH ERV**

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.													
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ PWRD C.O.					
		MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA	MCA	FUSE or HACR BRKR	DISC. SIZE FLA LRA		
208/ 230-3-60	STD	72/72	80/80	77/76 327	72/72	80/80	77/76 327	77/76	80/90	83/82	332	77/76	80/90	83/82	332
	MED	75/74	80/80	80/79 351	75/74	80/80	80/79 351	79/78	90/90	85/84	356	79/78	90/90	85/84	356
	HIGH	85	100	91 366	85	100	91 366	89	100	96	371	89	100	96	371
460-3-60	STD	36	40	38 164	36	40	38 164	38	45	40	166	38	45	40	166
	MED	37	45	39 176	37	45	39 176	39	45	41	178	39	45	41	178
	HIGH	42	50	45 183	42	50	45 183	44	50	47	185	44	50	47	185
575-3-60	STD	31	35	33 135	31	35	33 135	32	35	35	137	32	35	35	137
	MED	31	35	33 135	31	35	33 135	32	35	35	137	32	35	35	137
	HIGH	36	40	38 147	36	40	38 147	37	45	40	149	37	45	40	149

ELECTRICAL DATA (cont.)

Table 70 – 48HC*D08 TWO STAGE COOLING & TWO SPEED INDOOR FAN MOTOR

MCA/MOCP
WITH ERV AND HACR BREAKER

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.																							
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer											
		MCA	HACR BRKR	DISC. SIZE FLA LRA	DISC. SIZE FLA LRA	MCA	HACR BRKR	DISC. SIZE FLA LRA	DISC. SIZE FLA LRA	MCA	HACR BRKR	DISC. SIZE FLA LRA	DISC. SIZE FLA LRA	MCA	HACR BRKR	DISC. SIZE FLA LRA	DISC. SIZE FLA LRA								
208/ 230-3-60	STD	52/52	60/60	55/55	207	52/52	60/60	55/55	207	57/57	60/60	61/60	211	57/57	60/60	66/65	266	57/57	60/60	61/60	212	57/57	60/60	61/60	212
	MED	53/53	60/60	57/56	211	53/53	60/60	57/56	211	58/58	60/60	61/60	211	58/58	60/60	66/65	266	58/58	60/60	61/60	216	58/58	60/60	61/60	216
	HIGH	57/57	60/60	61/60	261	57/57	60/60	61/60	261	62/62	60/60	61/60	261	62/62	60/60	66/65	266	62/62	60/60	61/60	266	62/62	60/60	61/60	266
460-3-60	STD	24	30	25	103	24	30	25	103	26	30	25	103	26	30	28	105	26	30	28	105	26	30	28	105
	MED	25	30	27	106	25	30	27	106	27	30	27	106	27	30	29	108	27	30	29	108	27	30	29	108
	HIGH	26	30	28	131	26	30	28	131	28	30	28	131	28	30	30	133	28	30	30	133	28	30	30	133
575-3-60	STD	19	20	21	85	19	20	21	85	21	20	21	85	21	25	22	87	21	25	22	87	21	25	22	87
	MED	20	25	21	89	20	25	21	89	22	25	21	89	22	25	23	91	22	25	23	91	22	25	23	91
	HIGH	21	25	22	98	21	25	22	98	23	25	22	98	23	25	24	100	23	25	24	100	23	25	24	100

Table 71 – 48HC*D09 TWO STAGE COOLING & TWO SPEED INDOOR FAN MOTOR

MCA/MOCP
WITH ERV AND HACR BREAKER

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.																							
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer											
		MCA	HACR BRKR	DISC. SIZE FLA LRA	DISC. SIZE FLA LRA	MCA	HACR BRKR	DISC. SIZE FLA LRA	DISC. SIZE FLA LRA	MCA	HACR BRKR	DISC. SIZE FLA LRA	DISC. SIZE FLA LRA	MCA	HACR BRKR	DISC. SIZE FLA LRA	DISC. SIZE FLA LRA								
208/ 230-3-60	STD	52/52	60/60	55/55	207	52/52	60/60	55/55	207	57/57	60/60	61/60	211	57/57	60/60	67/66	266	57/57	60/60	61/61	212	57/57	60/60	61/61	212
	MED	53/53	60/60	57/57	211	53/53	60/60	57/57	211	58/58	60/60	61/60	211	58/58	60/60	67/66	266	58/58	60/60	61/61	216	58/58	60/60	61/61	216
	HIGH	57/57	60/60	61/60	261	57/57	60/60	61/60	261	62/62	60/60	61/60	261	62/62	60/60	67/66	266	62/62	60/60	61/61	266	62/62	60/60	61/61	266
460-3-60	STD	24	30	26	103	24	30	26	103	27	30	26	103	27	30	28	105	27	30	28	105	27	30	28	105
	MED	25	30	27	106	25	30	27	106	27	30	27	106	27	30	29	108	27	30	29	108	27	30	29	108
	HIGH	26	30	28	131	26	30	28	131	29	30	28	131	29	30	31	133	29	30	31	133	29	30	31	133
575-3-60	STD	21	25	22	85	21	25	22	85	22	25	22	85	22	25	24	87	22	25	24	87	22	25	24	87
	MED	21	25	23	89	21	25	23	89	23	25	23	89	23	25	25	91	23	25	25	91	23	25	25	91
	HIGH	22	25	24	98	22	25	24	98	24	25	24	98	24	25	26	100	24	25	26	100	24	25	26	100

ELECTRICAL DATA (cont.)

Table 72 – 48HC*D12 TWO STAGE COOLING & TWO SPEED INDOOR FAN MOTOR

MCA/MOCP
WITH ERV AND HACR BREAKER

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA
208/ 230-3-60	STD	61/61	70/70	66/65	291	61/61	70/70	66/65	291	66/66	80/80	71/71	296	66/66	80/80	71/71	296
	MED	65/65	80/80	70/69	341	65/65	80/80	70/69	341	70/70	80/80	75/74	346	70/70	80/80	75/74	346
	HIGH	68/68	80/80	73/72	352	68/68	80/80	73/72	352	73/73	80/80	79/78	357	73/73	80/80	79/78	357
460-3-60	STD	30	35	32	140	30	35	32	140	32	35	34	142	32	35	34	142
	MED	31	35	33	165	31	35	33	165	33	40	36	167	33	40	36	167
	HIGH	33	35	35	170	33	35	35	170	35	40	37	172	35	40	37	172
575-3-60	STD	25	30	26	113	25	30	26	113	26	30	28	115	26	30	28	115
	MED	26	30	27	122	26	30	27	122	27	30	29	124	27	30	29	124
	HIGH	28	30	29	136	28	30	29	136	29	35	31	138	29	35	31	138

Table 73 – 48HC*D14 TWO STAGE COOLING & TWO SPEED INDOOR FAN MOTOR

MCA/MOCP
WITH ERV AND HACR BREAKER

NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.															
		w/ERV w/o Economizer				w/ERV w/Economizer				w/ERV w/o Economizer				w/ERV w/Economizer			
		MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA	MCA	HACR BRKR	DISC. SIZE FLA	LRA
208/ 230-3-60	STD	72/72	80/80	77/76	327	72/72	80/80	77/76	327	77/77	90/90	83/82	332	77/77	90/90	83/82	332
	MED	75/75	80/80	80/79	351	75/75	80/80	80/79	351	79/79	90/90	85/84	356	79/79	90/90	85/84	356
	HIGH	85	100	91	366	85	100	91	366	89	100	96	371	89	100	96	371
460-3-60	STD	36	40	38	164	36	40	38	164	38	45	40	166	38	45	40	166
	MED	37	45	39	176	37	45	39	176	39	45	41	178	39	45	41	178
	HIGH	42	50	45	183	42	50	45	183	44	50	47	185	44	50	47	185
575-3-60	STD	31	35	33	135	31	35	33	135	32	35	35	137	32	35	35	137
	MED	31	35	33	135	31	35	33	135	32	35	35	137	32	35	35	137
	HIGH	36	40	38	147	36	40	38	147	37	45	40	149	37	45	40	149

SEQUENCE OF OPERATION

CONTROLS

The EnergyX Energy Recovery Ventilator (ERV) module is controlled by a digital controller located inside the EnergyX chassis. It communicates with the WeatherMaster ComfortLink controller via a UPC translator module which connects to the WeatherMaster rooftop unit's ComfortLink controller via a LEN cable. All controller settings and configuration are input via the ComfortLink scrolling marquee display.

All control points, including outdoor airflow, exhaust airflow and CO₂ setpoints are configured via the ComfortLink scrolling marquee interface. (Note: CO₂ sensor requires a factory installed economizer.)

The EnergyX energy recovery unit pre-conditions the outdoor air before it mixes with the return air and enters the rooftop unit evaporator coil. As a result, the EnergyX operation is mostly independent of the rooftop unit operation except to allow the space conditioning needs to be met without RTU compressor operation or RTU heat operation for a significantly wider range of ambient temperatures (than a unit without an energy recovery module). This is achieved either by the pre-conditioning of the EnergyX wheel or the economizer (if equipped). The EnergyX will pre-condition the outside air in the cooling and heating modes of operation.

For more information regarding controller operation, see the EnergyX controls, Start-Up, Operations, and Troubleshooting supplement manual.

General

The sequence below describes the sequence of operation for a WeatherMaster unit with ComfortLink controls and an EnergyX. For more information regarding controller operation, see the EnergyX Start-Up, Operations, and Troubleshooting supplement manual.

The EnergyX module will not activate unless the RTU fan is on. The EnergyX default condition is to remain off in the unoccupied mode, however, this can be over-ridden via the control setpoints.

Cooling Operation

When the ComfortLink controller recognizes that the conditioned zone requires cooling (via the space temperature sensor or space thermostat) the EnergyX module is activated. The EnergyX control module follows the sequence of operation logic as listed below.

Step 1 — Economizer Operation

First, the EnergyX module checks if the outside air is suitable for free cooling via the outside air enthalpy sensor. If the outside air is suitable for free cooling and the unit has an economizer, the EnergyX will operate in "ventilation mode" where the wheel will remain off but

the ERV economizer will modulate in free-cooling. If the unit is in Unoccupied mode, then the unit will not operate in economizer mode and will proceed to Step 2.

Step 2 — Wheel Operation

If the outside air is not suitable for free cooling, then the EnergyX will operate in either cooling or heating mode as called for by the rooftop unit ComfortLink controller.

NOTE: If the unit is in Unoccupied mode, the default configuration is that the EnergyX module will not operate. This can be over-ridden by an adjustable setpoint in the ERV controller.

Cooling Operation

If the outside air is not suitable for free cooling then the EnergyX wheel will activate and the supply fan will activate per the CFM setpoint.

Modulating EnergyX Units Only - If a CO₂ sensor is used (connected to the RTU ComfortLink controller) the supply fan will modulate between the DCV minimum and DCV maximum setpoints. The exhaust fan will modulate to follow the supply fan operation per the Exhaust CFM-offset value. If the economizer opens more than 5%, the wheel utilizes a "stop-jog" operation to periodically rotate the wheel and minimize potential dirt build-up and excess wear on one section of the wheel. (Note: CO₂ sensor requires a factory installed economizer).

Heating Operation

When the ComfortLink controller sees that the space requires heating via the space temperature sensor or when the thermostat or calls for heating, the EnergyX module is activated. The ERV wheel will rotate and the supply fan will activate per the CFM setpoint. Modulating EnergyX Units Only - If a CO₂ sensor is used (connected to the RTU ComfortLink controller) the supply fan will modulate between the DCV minimum and DCV maximum setpoints. The exhaust fan will modulate to follow the supply fan operation per the Exhaust CFM-offset value, via the Economizer Control Board (ECB).

Supply and Exhaust Air Frost Control Operation

When the factory installed frost protection option is used, the EnergyX module will sense pressure differential across the energy recovery cassette. The supply blower will be shut-off if the pressure differential across the energy recovery cassette exceeds the adjustable setpoint value. The blower will remain off for 5 minutes. The exhaust blower and wheel will remain on, in order to remove any frost build-up on the wheel.

SEQUENCE OF OPERATION (cont.)

EnergyX Wheel Maintenance and Blower Indicator Operation

When the optional factory installed wheel maintenance indicator is used, a proxy sensor monitors the EnergyX wheel and sends a corresponding alarm signal when appropriate. Pressure switches are used to detect and activate the unit alarm when blowers are not running.

EnergyX Filter Maintenance Indicator Operation

When the optional factory installed filter maintenance indicator is used, a factory-installed differential pressure switch measures pressure drop across the outside air filter and activates a field-supplied dry contact indicator when the pressure differential exceeds the adjustable switch setpoint. EnergyX operation is not interrupted.

APPLICATION DATA

Energy Recovery

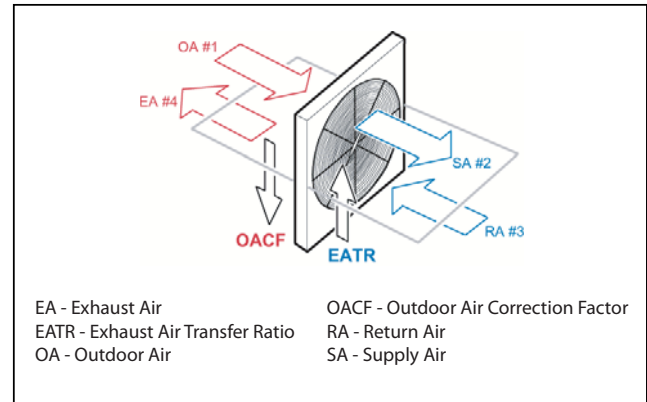
Energy recovery devices such as the EnergyX typically result in substantial energy savings over other outdoor air devices. Specifically, the EnergyX adds sensible and latent capacity as well as additional stages of cooling and heating operation to the Rooftop Unit. Due to the EnergyX's significantly lower input watts than the corresponding RTU compressor(s), proper control strategies for this device maximize its operation to reduce the run time of the RTU compressor(s). This results in a much higher system efficiency than can typically be achieved by using a rooftop unit of the same total capacity.

The EnergyX with its modulating airflow capability allows a designer to increase the amount of outside air significantly more than normal with the following benefits:

- Reduced rooftop unit sizing - The more air that passes through the energy recovery device reduces the load (and potential unit size) on the rooftop unit's compressors and heating system
- Higher system cooling and heating efficiencies - Since the EnergyX uses the power of 'rotary enthalpy transfer' as opposed to mechanical compression conditioning of the ventilation air resulting in a much higher operating efficiency (RER) of the energy recovery unit and system Combined Efficiency Factor (CEF). The higher the airflow through the EnergyX, the higher the system efficiency (CEF) value. Since the EnergyX also conditions ventilation air in the heating mode, the necessary amount and/or operation of the rooftop unit heat system is reduced.
- Better part-load conditioning – as the EnergyX is able to modulate its airflow, the ability to match the changing zone part-load capacity (in cooling and in heating) is greatly increased.

- Higher air change rates – Larger amounts of ventilation air allows the zone air to be flushed out more often. This can contribute significantly to reduced sickness and more productive operating environments.

All ventilated spaces are good candidates for energy recovery systems. The applications that benefit most are those that require a large amount of outside air for a space that has a low internal load. This is true because most outside air loads are latent which requires a larger rooftop unit to accommodate both internal and ventilation loads. Advantages of the ERV unit include the ability to reduce the size of the rooftop unit, provide better humidity levels and provide a stable, tempered space.



C11485

Fig. 22 - Air-to-Air Energy Recover Ventilation - Airflow Convention

Examples of ERV applications are classrooms, churches, conference rooms, game rooms, auditoriums, movie theaters, day care centers, nursing homes, funeral homes, dormitories, and clinics. Retrofits of existing systems to handle outside air without modifying the rooftop unit are excellent applications. Other examples are bars, restaurants, casino/game rooms, barber/beauty shops, bingo halls, locker rooms, recreational facilities and health clubs. Animal shelters such as veterinary clinics and kennels have been very successful implementations. Retail spaces and manufacturing facilities are also good applications.

If the outside air requirement is greater than 10% of a rooftop unit's supply air rating the EnergyX unit should be considered to enhance the comfort of the occupants and reduce the tonnage of the rooftop unit. Carrier's Packaged RTU Builder selection software program offers a quick, simple look at the advantages and payback of the EnergyX system.

SEQUENCE OF OPERATION (cont.)

ASHRAE 62.1 Air Classification Requirements

The EnergyX allows for easy compliance with the current ASHRAE Standard 62.1 Air Classification Requirements. Pollutant transfer via Desiccant is a ‘non issue’ since by virtue of the ASHRAE “classes of air” the main determinant is EATR or cross transfer of air by leakage from exhaust to supply. Since the EATR is an AHRI Certified measurement of an AHRI certified wheel device, the user can be assured of meeting the air dilution requirements of ASHRAE 62.1 and therefore the air classification requirements.

Industrial Applications are by definition those that are Class 4 air (or worse). Most wheel manufacturers do not encourage application of wheels to these types of applications. When required, many wheel manufacturers make specialty wheels with specific mechanical purge construction for industrial applications, that can be used to field-replace the factory provided wheels. Contact the applicable wheel manufacture for specific application details.

Choosing the proper airflow is essential. Unit selection guidance for the EnergyX is in definite contrast to typical unit sizing and selections. Typical unit sizing methods are to select the energy recovery device per the desired amount of outdoor air and then calculate the total capacity of the resulting energy recovery unit. This capacity is then subtracted from the desired total capacity for the conditioned zone. The remaining value is the necessary capacity of the rooftop unit. By conventional cooling & heating capacity guidance, the effort is to reduce the amount of outside (ventilation air) as much as possible since this additional ventilation air results in increased load on the rooftop unit compressor and heating sections.

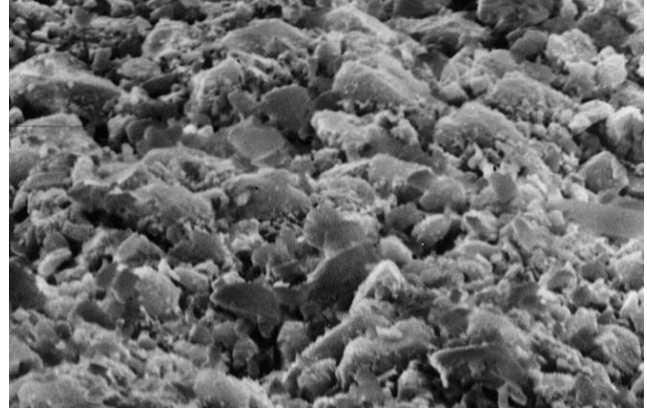
Note that all units can be used in applications that require more or less airflow than the published CFM operating range as long as the airflow range is within the capabilities of the EnergyX fan system. This option can be used for high-static applications. Although performance is optimized at equal exhaust and supply airflow rates, the selection program and the EnergyX unit can be used with unequal airflow amounts. The unit must be sized for the largest airflow amount. The smaller airflow used cannot be less than 50% of the larger airflow in the published range.

Energy recovery wheels

Carrier’s EnergyX energy recovery wheels consist of a welded stainless steel hub, spoke and rim assembly, which is independent of the heat transfer matrix. The heat transfer matrix is contained in patented energy transfer segments, removable from the wheel without requiring tools. The energy wheel uses a unique parallel plate geometry and polymer film substrate to provide an optimized heat exchanger design. The polymer film construction is not subject to corrosion in coastal locations or swimming pool areas.

Silica gel technology

The EnergyX energy recovery wheels use the desiccant material known as silica gel, which is a highly porous solid adsorbent material that structurally resembles a rigid sponge. It has a very large internal surface composed of myriad microscopic cavities and a vast system of capillary channels that provide pathways connecting the internal microscopic cavities to the outside surface of the sponge. Silica gel enthalpy wheels transfer water by rotating between two air streams of different vapor pressures. The vapor pressure differential drives molecules into/from these cavities to transfer moisture from the more humid airstream to the drier airstream.



C11484

Fig. 23 - Microscopic Image of Silica Gel

Adsorption: silica gel vs. molecular sieve

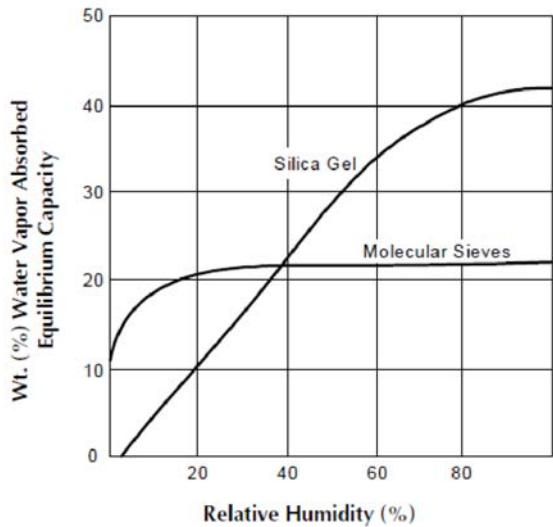
The graph below shows the effect of Relative Humidity on Desiccant Capacity characteristic curve for adsorption of water on silica gel. It shows the percent weight adsorbed versus relative humidity of the airstream in contact with the silica gel. The amount of water adsorbed rises linearly with increasing relative humidity (RH) until RH reaches near 60%. It then plateaus at above 40% adsorbed as relative humidity approaches 100%. For contrast, the curve for molecular sieves rises rapidly to plateau at about 20% absorbed at 20% RH.

The Effect of Relative Humidity on Desiccant Capacity graph explains the following application considerations:

- Molecular sieves are preferred for regenerated applications such as desiccant cooling and dehumidification systems that must reduce the processed air streams to very low relative humidities.
- Silica gel has superior characteristics for recovering space conditioning energy from exhaust air and handling high relative humidity outside conditions.

SEQUENCE OF OPERATION (cont.)

The transfer of water by adsorption/desorption is not dependent on temperature. Therefore, the silica gel enthalpy wheel works to reduce latent load at difficult part-load conditions.



C11487

Fig. 24 - Effect of Relative Humidity on Desiccant Capacity

Fungal growth and moisture transfer

Carrier EnergyX units have silica gel-based desiccant wheels. The water molecules are individually transferred by desorption/adsorption to and from the silica gel surfaces. Water is present on the wheel in a molecular layer only, and condensation does not occur. Therefore, Carrier's energy recovery wheels experience dry moisture transfer; there is no bulk liquid water present that could support fungal growth. Water transfer to and from the wheel's desiccant surfaces occurs in the vapor phase; there are no wet surfaces and liquid water does not enter the airstream. Silica gel is also highly selective for water, based on the strong preference of the gel surface for the dipolar water molecule over other compounds.

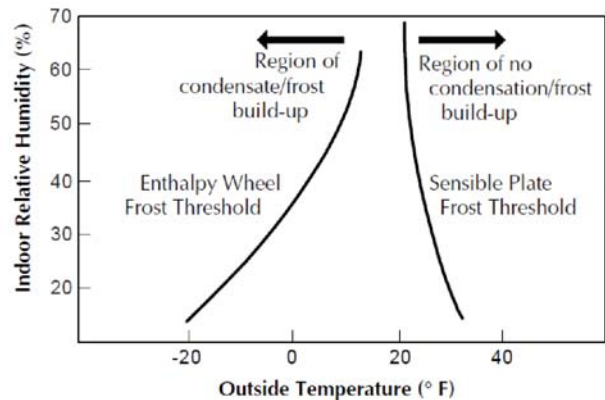
Frost control requirements

Energy recovery systems require frost protection or a means of defrosting in climates that experience severe winter conditions. Frost formation results in a reduction and eventual blockage of airflow through the energy wheel.

Frost formation causes reduced airflow through the heat exchanger. Without frost control, energy recovery and airflow may be significantly reduced. The frost threshold temperature is the point at which frost begins to accumulate on heat exchanger surfaces. It is a function of both outside temperature and indoor relative humidity.

The Frost Threshold Comparison figures compares the frost threshold of a plate-type sensible heat exchanger with that of an enthalpy wheel. Note that frost forms at temperatures between 22°F and 30°F in a plate-type heat exchanger, frost threshold temperatures for enthalpy wheels are generally 20 to 30 degrees lower,

approximately 0°F to 20°F. This is because the enthalpy wheel removes water from the exhaust airstream, effectively lowering the exhaust's dew point. The water removed is subsequently picked up through desorption by the entering outdoor air. Depending on the indoor relative humidity in areas where winter outside temperatures are between -5°F and 22°F, enthalpy wheel based recovery systems have a significant advantage over sensible plate type units because there is no additional cost for frost control. Even in cold areas, in most cases, enthalpy wheel based systems for schools and office buildings can be designed without frost control because most of the frosting hours are at night when the building is unoccupied. Consult bin data, such as that provided by ASHRAE, to qualify daytime applications in cold climates for frost-free operation.



C11486

Fig. 25 - Frost Threshold comparison

The Frost Thresholds Temperatures table below lists typical frost threshold temperatures for Carrier's EnergyX energy recovery wheels over a wide range of indoor-air temperatures and relative humidity. Frost control is not required until outdoor air temperatures are below the threshold.

INDOOR AIR RH (%)	INDOOR AIR DRY BULB TEMPERATURE			
	70 F	72 F	75 F	80 F
20	-14	-13	-11	-8
30	-3	-2	-1	3
40	5	7	9	11
50	12	13	15	18
60	18	19	21	26

In regions where winter temperatures are extreme, Carrier's energy recovery wheels can be used effectively with the Frost Protection Factory Installed Option (FIOP).

NOTE: Refer to ASHRAE for bin data in cold climates where the threat of wheel frosting is frequent. Consult this information to ensure appropriate preheat techniques are used during occupied times.

48HC EnergyX

SEQUENCE OF OPERATION (cont.)

Frost prevention for frost control is required in extremely cold climates to preserve performance and assure the continuous supply of outdoor air. Enthalpy wheel frost control strategies take advantage of inherently low frosting thresholds. This results in minimized energy use and maximized design load reductions. In regions that experience extreme winter conditions, the Frost Protection FIOP allows the exhaust fan to operate below the frost threshold temperature; however, a temperature sensor would disable the supply fan when the outdoor-air temperatures reach the frost control setpoint. The outdoor-air temperature sensor is located in the outdoor air intake of the ERV section. To avoid depressurization of the space, fresh air dampers may be required as part of the building's ventilation system.

Economizers

As promulgated by ASHRAE, economizers reduce operating expenses and compressor run time by providing a source of free cooling and a means of ventilation to match changing application needs. When properly designed (per ASHRAE standards), the economizer will control the amount of outdoor air allowed into the building and is integrated with the operation of the compressors. Carrier economizers are properly designed and allow free cooling to occur when the outdoor air is suitable depending upon the control strategy chosen.

It has also been proven (by multiple independent sources) that using a Demand Control Ventilation (CO₂) strategy will result in considerable energy savings over a constant outdoor air volume strategy. This is because air to be brought in at a fixed rate has no variability as the outside air conditions change. Modulating EnergyX systems with DCV control allows the outside ventilation air to be reduced to the minimum building ventilation requirements as required by the actual occupancy load, which in turn reduces the load on the unit compressors or heating system.

It is recommended that an economizer option always be used with the EnergyX. This allows for true free cooling operation when the outside air conditions allow for it.

Wheel Cleaning

The EnergyX includes a 5 year wheel warranty as a standard product feature. Wheels are self cleaning from dry dust and dirt due to laminar airflow through the wheel. If volatile organic compounds (VOC's) are present, wheels need to be 'deep' cleaned just like evaporator coils must be in order to maintain latent recovery performance. Since it is easier and less risky to clean a wheel outside of the HVAC unit than within, EnergyX unit construction allows for easy wheel segment removal.

It is recommended that a different wheel segment be cleaned each time the unit air filters are changed in order to ensure periodic entire wheel cleaning. Wheel cleaning can be done simply and easily by hand. Proper wheel cleaning does not remove wheel desiccant. See the EnergyX Controls & Troubleshooting Supplement Instructions for additional wheel cleaning and service information.

EXHAUST FAN PERFORMANCE

Many applications that utilize energy recovery incorporate ducted return/exhaust air paths. In these applications, it is important to consider the duct pressure of the return/exhaust just as a designer would consider the effects of the supply duct static pressure on the airflow of the rooftop unit itself.

EnergyX Modulating Volume 3-12.5 ton Units – The exhaust fan in the Modulating Volume EnergyX unit will assist the rooftop unit fan in pulling air through the exhaust/return duct. These exhaust fans are backwards curved impeller designs which are capable of significant more static pressure operation than typical forward curved fan designs. The following exhaust fan performance curves are provided for additional guidance when considering return/exhaust duct design.

NOTE: If application designs require two separate ducts (one for exhaust air, one for return air) contact your Carrier Sales Engineer for additional guidance prior to specification or ordering.

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.

GUIDE SPECIFICATIONS - 48HC**04-14 WITH ENERGYX®

Note about this specification:

This specification is in the “Masterformat” as published by the Construction Specification Institute. Please feel free to copy this specification directly into your building spec.

Gas Heat/Electric Cooling Packaged Rooftop

HVAC Guide Specifications

Size Range: 3 to 12.5 Nominal Tons



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

23 07 16	HVAC Equipment Insulation
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- | | |
|----------------|---|
| 23 07 16.13 | Decentralized, Rooftop Units: |
| 23 07 16.13.A. | Evaporator fan compartment: |
| 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. | Gas heat compartment: |
| 1. | Aluminum foil-faced fiberglass insulation shall be used. |
| 2. | Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation. |

23 09 13	Instrumentation and Control Devices for HVAC
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- | | |
|----------------|---|
| 23 09 13.23 | Sensors and Transmitters |
| 23 09 13.23.A. | Thermostats |
| 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. |

23 09 23	Direct-digital Control system for HVAC
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- | | |
|----------------|--|
| 23 09 23.13 | Decentralized, Rooftop Units: |
| 23 09 23.13.A. | ComfortLink Unit Controls shall contain: |
| 1. | Four button detailed English scrolling marquee display. |
| 2. | CCN (Carrier Comfort Network) capable. |
| 3. | Unit control with standard suction pressure transducers and condensing temperature thermistors. |
| 4. | Shall provide a 5°F temperature difference between cooling and heating set points to meet ASHRAE 90.1 Energy Standard. |
| 5. | Shall provide and display a current alarm list and an alarm history list. |
| 6. | Service run test capability. |
| 7. | Shall accept input from a CO ₂ sensor (both indoor and outdoor). |
| 8. | Configurable alarm light shall be provided which activates when certain types of alarms occur. |

9. Compressor minimum run time (3 minutes) and minimum off time (5 minutes) are provided.
10. Service diagnostic mode.
11. Economizer control (optional).
12. Control multi capacity stages
13. Unit shall be complete with self-contained low voltage control circuit.
14. Unit shall have 0°F low ambient cooling operation.

23 09 33 Electric and Electronic Control System for HVAC

23 09 33.13 Decentralized, Rooftop Units:

23 09 33.13.A. General:

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, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.
4. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor. See heat exchanger section of this specification.
5. Unit shall include a minimum of one 8-pin screw terminal connection board for connection of control wiring.

23 09 33.23.B. Safeties:

1. Compressor over-temperature, over-current. High internal pressure differential.
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.
5. Heating section shall be provided with the following minimum protections:
 - a. High-temperature limit switches.
 - b. Induced draft motor speed sensor.
 - c. Flame rollout switch.
 - d. Flame proving controls.

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, disposable 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 (48HC**04-14)

23 81 19.13.A. General

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully 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 sound, Puron® 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 minimum efficiency requirements.
2. 3-phase units are Energy Star certified.
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, and shall be manufactured in a facility registered by ISO 9001.
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.
15. High Efficient Motors listed shall meet section 313 of the Energy Independence and Security Act of 2007 (EISA 2007).

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.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 125°F (52°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 down to 35°F (2°C), ambient outdoor temperatures. Accessory low ambient kits shall be available if operation below 35°F (2°C), is required. See below for head pressure control package or winter start kit.
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 airflow on all models. No special kit required on 04-12 models. Supply duct kit required for 14 size model only.
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 / 16°C): 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 gas 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 4 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 an internally sloped condensate drain pan made of a non-corrosive material.
 - b. Shall comply with ASHRAE Standard 62.
 - c. Shall use a 3/4-in. -14 NPT drain connection, possible either through the bottom or side of the drain pan. Connection shall be made per manufacturer's recommendations.
 7. Top panel:
 - a. Shall be a single piece top panel on 04 thru 12 sizes, two piece on 14 size.
 8. Gas Connections:
 - a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit (horizontal plane).
 - b. Thru-the-base capability
 - (1.) Standard unit shall have a thru-the-base gas-line location using a raised, embossed portion of the unit basepan.
 - (2.) Optional, factory-approved, water-tight connection method must be used for thru-the-base gas connections.
 - (3.) No basepan penetration, other than those authorized by the manufacturer, is permitted.
 9. 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.
 10. 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 a molded composite handles.
 - d. Handles shall be UV modified, composite. They shall be 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. Gas Heat
1. General
 - a. Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.
 - b. Shall incorporate a direct-spark ignition system and redundant main gas valve.
 - c. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.
 2. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor.
 - a. IGC board shall notify users of fault using an LED (light-emitting diode).
 - b. The LED shall be visible without removing the control box access panel.

- c. IGC board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high temperature limit switch.
 - d. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high temperature limit switch. Fault indication shall be made using an LED.
3. Standard Heat Exchanger construction
 - a. Heat exchanger shall be of the tubular-section type constructed of a minimum of 20-gauge steel coated with a nominal 1.2 mil aluminum-silicone alloy for corrosion resistance.
 - b. Burners shall be of the in-shot type constructed of aluminum-coated steel.
 - c. Burners shall incorporate orifices for rated heat output up to 2000 ft (610m) elevation. Additional accessory kits may be required for applications above 2000 ft (610m) elevation, depending on local gas supply conditions.
 - d. Each heat exchanger tube shall contain multiple dimples for increased heating effectiveness.
 4. Optional Stainless Steel Heat Exchanger construction
 - a. Use energy saving, direct-spark ignition system.
 - b. Use a redundant main gas valve.
 - c. Burners shall be of the in-shot type constructed of aluminum-coated steel.
 - d. All gas piping shall enter the unit cabinet at a single location on side of unit (horizontal plane).
 - e. The optional stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20-gauge type 409 stainless steel.
 - f. Type 409 stainless steel shall be used in heat exchanger tubes and vestibule plate.
 - g. Complete stainless steel heat exchanger allows for greater application flexibility.
 5. Optional Low NO_x Heat Exchanger construction
 - a. Low NO_x reduction shall be provided to reduce nitrous oxide emissions to meet California's Air Quality Management District (SCAQMD) low-NO_x emissions requirement of 40 nanograms per joule or less.
 - b. Primary tubes and vestibule plates on low NO_x units shall be 409 stainless steel. Other components shall be aluminized steel.
 6. Induced draft combustion motor and blower
 - a. Shall be a direct-drive, single inlet, forward-curved centrifugal type.
 - b. Shall be made from steel with a corrosion-resistant finish.
 - c. Shall have permanently lubricated sealed bearings.
 - d. Shall have inherent thermal overload protection.
 - e. Shall have an automatic reset feature.

23 81 19.13.J. Coils

1. Standard Aluminum Fin/Copper Tube Coils:
 - 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 Pre-coated aluminum-fin condenser coils (3-phase models only):
 - a. Shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments.
 - b. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube.
 - c. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.
3. Optional Copper-fin evaporator and condenser coils (3-phase 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.
4. Optional E-coated aluminum-fin evaporator and condenser coils (3-phase models only) :
 - a. Shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins.
 - b. Coating process shall ensure complete coil encapsulation of tubes, fins and headers.

- c. Color shall be high gloss black with gloss per ASTM D523-89.
 - d. Uniform dry film thickness from 0.8 to 1.2 mil on all surface areas including fin edges.
 - e. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93.
 - f. Impact resistance shall be up to 160 in.-lb (ASTM D2794-93).
 - g. Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92).
 - h. Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90.
5. Optional E-coated aluminum-fin, aluminum tube condenser coils:
- a. Shall have a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers.
 - b. Coating process shall ensure complete coil encapsulation, including all exposed fin edges.
 - c. E-coat thickness of 0.8 to 1.2 mil with top coat having a uniform dry film thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided.
 - d. Shall have superior hardness characteristics of 2H per ASTM D3363-00 and cross-hatch adhesion of 4B-5B per ASTM D3359-02.
 - e. Shall have superior impact resistance with no cracking, chipping or peeling per NSF/ANSI 51-2002 Method 10.2.

23 81 19.13.K. Refrigerant Components

1. Refrigerant circuit shall include the following control, safety, and maintenance features:
 - a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
 - b. Refrigerant filter drier - Solid core design.
 - 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 fully hermetic, scroll compressor for each independent refrigeration circuit.
 - b. Models shall be available with single compressor/single stage cooling designs on 04 – 07 sizes models, and 2 compressor/2-stage cooling models on 08 – 14 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-ampere 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. Electric Drive (Direct Drive) X13 – 5 Speed/Torque Evaporator Fan:
- a. Multi-speed motor with easy quick adjustment settings.
 - b. Blower fan shall be double-inlet type with forward-curved blades.
 - c. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.
 - d. Standard on all 04-06 3-phase models with optional belt drive.
3. 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.
 - e. Standard on all 07-14 size models. Optional on all 04-06 3-phase models.
- 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 04 to 12 models and shaft-up on 14 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. EnergyX and Economizer

a. System Description

One-piece EnergyX (Energy Recovery Ventilation) unit is an electrically controlled ventilation air pre-conditioner utilizing an ARI 1060 certified Energy Recovery Cassette to reduce the cooling and heating loads placed on the primary HVAC unit by untreated outdoor air. Building exhaust air shall be introduced to the EnergyX unit through ductwork. Unit shall be designed as a factory-installed option to be used with WeatherMaster 48HC units for use in vertical return applications only.

b. Quality Assurance

- (1.) Unit shall be designed in accordance with UL Standard 1995
- (2.) Energy Recovery unit shall be ETL tested and certified.
- (3.) Rooftop unit and Energy Recovery unit shall be ETL certified as one single system.
- (4.) Roof curb or curb extension shall be designed to conform to NRCA Standards.
- (5.) Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- (6.) Unit casing shall be capable of withstanding ASTM No. 141 (Method 6061) 500-hour salt spray test.
- (7.) Unit shall contain ARI 1060 certified Energy Recovery Cassette.
- (8.) Unit shall leakage rates shall be capable of meeting ASHRAE Standard 62.1 requirements for use of class-2 exhaust with class-1 ventilation air.

2. Products

a. Equipment (Standard)

(1.) General

The EnergyX unit shall be a factory assembled, single piece unit. Contained within the unit enclosure shall be all factory wiring with a single, pre-determined point of power input and a single point of 24-volt control wiring.

b. Unit Cabinet

- (1.) Unit cabinet shall be constructed of galvanized steel coated with a pre-painted baked enamel finish.
- (2.) All models shall have hoods installed over outside air intake and exhaust openings. Outside air hood shall have aluminum water entrainment filters.
- (3.) All models have 1-in., 2 pound density fiberglass insulation.
- (4.) Hinged access doors with compression latches shall be provided on all units for access to fans and filters. Hinged doors shall be provided with at least one handle capable of being locked.
- (5.) Exhaust air stream shall have back-draft dampers to prevent air penetration during off cycles.

- (6.) Holes shall be provided in the base rails for rigging shackles to facilitate overhead rigging.
- c. Blowers
 - (1.) Blowers shall be direct drive with variable speed motors.
 - (2.) Blower wheel shall be made of steel with a corrosion resistant finish. It shall be dynamically balanced, double-inlet type with backward-curved blades.
 - (3.) Blower shall be mounted on neoprene vibration isolation pads.
 - (4.) Motor shall be high efficiency and have thermal overload protection.
- d. Filter Section
 - (1.) Standard filter section shall accept commercially available, 2-in. pleated filter(s).
- e. Controls and Safeties
 - (1.) The EnergyX unit shall operate in conjunction with rooftop unit fan.
- f. Electrical Requirements
 - (1.) All unit power wiring shall enter unit cabinet at a single location.
- g. Energy Recovery Cassette
 - (1.) The energy recovery media shall have a minimum of 70% effectiveness at nominal unit airflow.
 - (2.) Energy wheel performance shall be ARI Standard 1060 Certified and bear the ARI Certified Product Seal.
 - (3.) The energy recovery cassette shall be an UL Recognized component for electrical and fire safety.
 - (4.) The wheel shall be coated with silica gel desiccant, permanently bonded without the use of binders or adhesives.
 - (5.) Coated wheels shall be washable with detergent or alkaline coil cleaner and water.
 - (6.) The silica gel shall not dissolve or deliquesce in the presence of water or high humidity.
 - (7.) The substrate shall be made of a lightweight polymer and shall not degrade or require additional coatings for application in coastal environments.
 - (8.) The wheel polymer layers shall be wound continuously with one flat and one structured layer in an ideal parallel plate geometry providing laminar flow and minimum pressure drop.
 - (9.) The polymer layers shall be captured in a stainless steel wheel frame or aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix.
 - (10.) Energy recovery wheels greater than 19 inches in diameter shall be provided with removable wheel segments.
 - (11.) Wheel frame shall be a welded hub, spoke and rim assembly of stainless, plated, and or coated steel and shall be self supporting without the wheel segments in place.
 - (12.) Wheel segments shall be removable without the use of tools to facilitate maintenance and cleaning.
 - (13.) Wheel rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks.
 - (14.) Wheel bearings shall provide an L-10 life of 400,000 hours.
 - (15.) Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.
- 3. Special Features (Options and Accessories)
 - a. Supply and exhaust air frost control option
 - (1.) Factory-installed frost protection module shall sense pressure differential across the energy recovery cassette.
 - (2.) Supply blower shall be shut-off if the pressure differential across the energy recovery cassette exceeds an adjustable set point. Blower shall remain off for an adjustable time period.
 - (3.) Exhaust blower and wheel shall remain in operation in order to remove any frost build-up on the wheel.
 - b. EnergyX maintenance indicator package
 - (1.) A factory-installed switch shall monitor EnergyX blowers and wheel motor amp draw and send a signal to field-supplied 24-v indicator upon amperage surge that maintenance required.
 - c. Filter maintenance indicator
 - (1.) A factory-installed differential pressure switch shall measure pressure drop across the outside air filter and activate a field-supplied 24-v indicator when airflow is restricted. It shall not interrupt EnergyX operation. Switch set point shall be adjustable.
 - d. EnergyX free cooling with enthalpy and stop/jog control
 - (1.) An enthalpy sensor shall prevent the wheel from rotating if the outside air conditions are acceptable for free cooling. Both exhaust and supply blowers will remain on.

- (2.) Stop-Jog-Control shall energize the wheel periodically during the free cooling operation of the EnergyX to prevent dirt build-up on the wheel.
- e. Economizer Option
 - (1.) The economizer shall be integrated in the energy recovery module and shall allow air to bypass the energy recovery wheel for free cooling and fail safe operation. Tilting wheel mechanisms shall not be allowed.
 - (2.) The economizer damper shall be motorized with factory installed, 24-volt Belimo actuator.
 - (3.) The EnergyX shall be capable of using the economizer in a free cooling operation.
 - (4.) The economizer shall utilize enthalpy sensor controls when in the economizer mode.
- f. CO₂ Sensor
 - (1.) The modulating airflow energy recovery unit shall be capable of incorporating a CO₂ sensor for use with Demand Control Ventilation.
 - (2.) The CO₂ sensor shall connect to the base rooftop unit's digital controller.
 - (3.) The modulating airflow energy recovery unit shall use at a minimum, a high & low CFM airflow set point when a CO₂ sensor is used.
- g. Roof Curb Extension (HC04-14 sizes with EnergyX) Accessory for use with EnergyX units
 - (1.) The energy recovery module shall use the standard rooftop unit rooftop curb.
 - (2.) Rooftop extensions, support rails or other devices that come in contact with the roof surface to support the energy recovery module shall not be allowed.
 - (3.) A horizontal adapter curb shall be used to convert vertical return air applications into horizontal return air applications. The supply airflow shall be convertible via the base rooftop unit operation and restrictions.
- 4. Staged Air Volume System (SAV) for 2-stage cooling models only:
 - a. Evaporator fan motor:
 - (1.) Shall have permanently lubricated bearings.
 - (2.) Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating.
 - (3.) Shall be Variable Frequency duty and 2-speed control.
 - (4.) Shall contain motor shaft grounding ring to prevent electrical bearing fluting damage by safely diverting harmful shaft voltages and bearing currents to ground.
- 5. Variable Frequency Drive (VFD). Only available on 2-speed indoor fan motor option (SAV):
 - a. Shall be installed inside the unit cabinet, mounted, wired and tested.
 - b. Shall contain Electromagnetic Interference (EMI) frequency protection.
 - c. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.
 - d. Self diagnostics with fault and power code LED indicator. Field accessory Display Kit available for further diagnostics and special setup applications.
 - e. RS485 capability standard.
 - f. Electronic thermal overload protection.
 - g. 5% swinging chokes for harmonic reduction and improved power factor.
 - h. All printed circuit boards shall be conformal coated.
- 6. 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).
- 7. Propane Conversion Kit
 - a. Package shall contain all the necessary hardware and instructions to convert a standard natural gas unit for use with liquefied propane, up to 2000 ft (610m) elevation.
 - b. Additional accessory kits may be required for applications above 2000 ft (610m) elevation.
- 8. Flue Shield (04-12 models only)
 - a. Flue shield shall provide protection from the hot sides of the gas flue hood.
- 9. Condenser Coil Hail Guard Assembly (Factory installed option on 3-phase models. Field installed on all 3 phase models):
 - a. Shall protect against damage from hail.
 - b. Shall be of louvered style.

10. 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.
11. HACR Breaker
 - a. These manual reset devices provide overload and short circuit protection for the unit. Factory wired and mounted with the units, with access cover to help provide environmental protection.
On 575V applications, HACR breaker can only be used with WYE power distribution systems. Use on Delta power distribution systems is prohibited.
12. Convenience Outlet:
 - a. Powered convenience outlet (3-phase models only).
 - (1.) Outlet shall be powered from main line power to the rooftop unit.
 - (2.) Outlet shall be powered from line side or load side of disconnect by installing contractor, as required by code. If outlet is powered from load side of disconnect, unit electrical ratings shall be UL certified and rated for additional outlet amperage.
 - (3.) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
 - (4.) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - (5.) Voltage required to operate convenience outlet shall be provided by a factory-installed step-down transformer.
 - (6.) Outlet shall be accessible from outside the unit.
 - (7.) Outlet shall include a field-installed "Wet in Use" cover.
 - b. Non-Powered convenience outlet.
 - (1.) Outlet shall be powered from a separate 115/120v power source.
 - (2.) A transformer shall not be included.
 - (3.) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
 - (4.) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - (5.) Outlet shall be accessible from outside the unit.
 - (6.) Outlet shall include a field-installed "Wet in Use" cover.
13. Flue Discharge Deflector (04-12 models only):
 - a. Flue discharge deflector shall direct unit exhaust vertically instead of horizontally.
 - b. Deflector shall be defined as a "natural draft" device by the National Fuel and Gas (NFG) code.
14. Thru-the-Base Connectors:
 - a. Kits shall provide connectors to permit gas and electrical connections to be brought to the unit through the unit basepan.
 - b. Minimum of four connection locations per unit.
15. 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.
16. High Altitude Gas Conversion Kit:
 - a. Package shall contain all the necessary hardware and instructions to convert a standard natural gas unit to operate from 2000-7000 ft (610 to 2134m) elevation with natural gas or from 0-7000 ft (90-2134m) elevation with liquefied propane.
17. 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.
18. 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.

19. Indoor Air Quality (CO₂) 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 set-point shall have adjustment capability.
20. Smoke detectors (factory-installed only) RA detector on 08-14 models 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
21. 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).
22. Hinged Access Panels
 - a. Shall provide easy access through integrated quarter turn latches.
 - b. Shall be on major panels of – filter, control box, fan motor and compressor
23. Display Kit for Variable Frequency Drive
 - a. Kit allows the ability to access the VFD controller programs to provide special setup capabilities and diagnostics.
 - b. Kit contains display module, mounting bracket and communication cable.
 - c. Display Kit can be permanently installed in the unit or used on any SAV system VFD controller as needed.

