



Heating and Air Conditioning

TECHNICAL GUIDE

SUNLINE 2000™ - BP 180

SUNLINE MAGNUM™ - BP 240

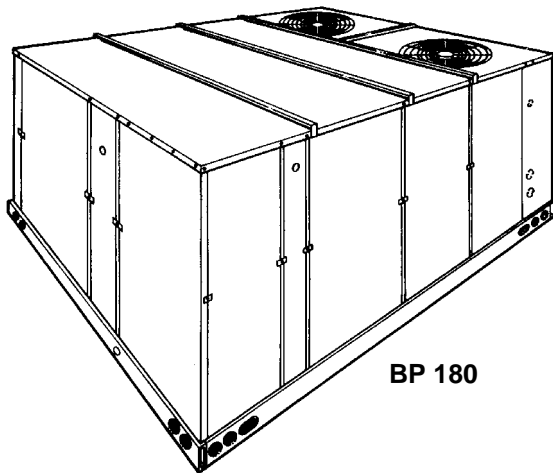
SINGLE PACKAGE HEAT PUMPS

ASHRAE 90.1 COMPLIANT

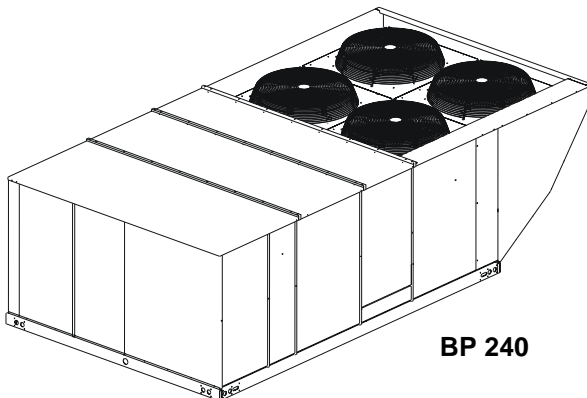
MODEL BP180 and BP240

15 and 20 NOMINAL TONS

9.9 EER (15 TON) and 10.3 EER (20 TON)



BP 180



BP 240

DESCRIPTION

York® Sunline 2000™ BP180 & Sunline Magnum™ BP240 Heat Pumps are convertible single package units. All models have dual refrigerant circuits for efficient part load operation. Although the units are primarily designed for curb mounting on a roof, they can also be slab-mounted at ground level or set on steel beams above a finished roof.

These heat pumps utilize a unique ambient compensated time-temperature defrost system. The defrost module automatically increases the time interval between defrost cycles as the outdoor ambient temperature decreases. This helps to eliminate unnecessary and costly defrosts.

All units include:

- Simplicity® Control Board
- Powder Paint finish that meets ASTM-B-117 1000 hour salt spray standards
- Two-stage cooling provided by dual independent refrigeration circuits with expansion valves, filter-driers, high and low pressure/loss of charge switches and freeze-stats
- Hermetically sealed compressors with crankcase heaters
- Permanently lubricated motors
- Bottom or side air discharge configuration capability (field convertible)
- Belt Drive Blower Motor with standard and high static drive options
- Manufactured under the quality standards of ISO9001
- Twenty-four volt control circuit with compressor lock-out
- Zero-25% fixed air damper with hood
- Copper tube/aluminum fin coils
- Hinged filter access and tool free latched doors
- Hinged tool free blower, blower motor, filters and electrical panel access
- Rigging holes in base rails for lifting
- Single point power connection
- Complete factory package - tested, charged and wired
- Agency approvals on all units

WARRANTY

- Factory Limited Parts Warranty
- One-year parts warranty
- A Five-year parts warranty on the compressor and electric heat elements.



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PRODUCT NOMENCLATURE

15 Ton Sunline 2000 and 20 Ton Sunline Magnum™ Heat Pump Model Number Nomenclature

B P 180 C00 A 2 A AA 1 0 1 2 4 A																																					
Product Category B = HP, Single Pkg., R-22				Product Style A = Style A																																	
Product Identifier P = 10.0-11.0 EER HP				Configuration Options (not required for all units) These four digits will not be assigned until a quote is requested, or an order placed.																																	
Nominal Cooling Capacity 180 = 15 Ton 240 = 20 Ton				<input type="checkbox"/> SS Drain Pan <input type="checkbox"/> CPC Controller, DFS, APS <input type="checkbox"/> Johnson Controller, DFS, APS <input type="checkbox"/> Honeywell Controller, DFS, APS <input type="checkbox"/> Novar Controller, DFS, APS <input type="checkbox"/> Simplicity IntelliComfort Controller <input type="checkbox"/> Simplicity IntelliComfort Controller w/ModLine <input type="checkbox"/> 2" Pleated filters <input type="checkbox"/> 4" Pleated filters <input type="checkbox"/> BAS Ready Economizer (2-10 V.D.C. Actuator without a controller) <input type="checkbox"/> Double Wall Construction <input type="checkbox"/> Any Combination of Additional Options that Don't Have an Option Code Pre-assigned																																	
Heat Type and Nominal Heat Capacity C00 = Cooling Only. No field installed electric heat				Product Generation 1 = First Generation 2 = Second Generation																																	
Electric Heat Options E18 = 18 KW E36 = 36 KW E54 = 54 KW E72 = 72 KW				Additional Options <table border="1"> <thead> <tr> <th>Standard Cabinet</th> <th>Hinged Filter Door & Tool Free Access Cabinet</th> </tr> </thead> <tbody> <tr> <td>AA = None</td> <td>BA = Hinged Filter Door & Tool Free Access Panels</td> </tr> <tr> <td>AB = Phase Monitor</td> <td>BB = Phase Monitor, Hinged Filter Door & Tool Free Access Panels</td> </tr> <tr> <td>AC = Coil Guard</td> <td>BC = Coil Guard, Hinged Filter Door & Tool Free Access Panels</td> </tr> <tr> <td>AD = Dirty Filter Switch</td> <td>BD = Dirty Filter Switch, Hinged Filter Door & Tool Free Access Panels</td> </tr> <tr> <td>AE = Phase Monitor & Coil Guard</td> <td>BE = Phase Monitor & Coil Guard, Hinged Filter Door & Tool Free Access Panels</td> </tr> <tr> <td>AF = Phase Monitor & Dirty Filter Switch</td> <td>BF = Phase Monitor & Dirty Filter Switch, Hinged Filter Door & Tool Free Access Panels</td> </tr> <tr> <td>AG = Coil Guard & Dirty Filter Switch</td> <td>BG = Coil Guard & Dirty Filter Switch, Hinged Filter Door & Tool Free Access Panels</td> </tr> <tr> <td>AH = Phase Monitor, Coil Guard & Dirty Filter Switch</td> <td>BH = Phase Monitor, Coil Guard & Dirty Filter Switch, Hinged Filter Door & Tool Free Access Panels</td> </tr> <tr> <td>RC = Coil Guard & American Flag</td> <td></td> </tr> <tr> <td>TA = Technicoat Condenser Coil</td> <td></td> </tr> <tr> <td>TJ = Technicoat Evaporator Coil</td> <td></td> </tr> <tr> <td>TS = Technicoat Evaporator & Condenser Coils</td> <td></td> </tr> </tbody> </table>								Standard Cabinet	Hinged Filter Door & Tool Free Access Cabinet	AA = None	BA = Hinged Filter Door & Tool Free Access Panels	AB = Phase Monitor	BB = Phase Monitor, Hinged Filter Door & Tool Free Access Panels	AC = Coil Guard	BC = Coil Guard, Hinged Filter Door & Tool Free Access Panels	AD = Dirty Filter Switch	BD = Dirty Filter Switch, Hinged Filter Door & Tool Free Access Panels	AE = Phase Monitor & Coil Guard	BE = Phase Monitor & Coil Guard, Hinged Filter Door & Tool Free Access Panels	AF = Phase Monitor & Dirty Filter Switch	BF = Phase Monitor & Dirty Filter Switch, Hinged Filter Door & Tool Free Access Panels	AG = Coil Guard & Dirty Filter Switch	BG = Coil Guard & Dirty Filter Switch, Hinged Filter Door & Tool Free Access Panels	AH = Phase Monitor, Coil Guard & Dirty Filter Switch	BH = Phase Monitor, Coil Guard & Dirty Filter Switch, Hinged Filter Door & Tool Free Access Panels	RC = Coil Guard & American Flag		TA = Technicoat Condenser Coil		TJ = Technicoat Evaporator Coil		TS = Technicoat Evaporator & Condenser Coils	
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Installation Options A = No Options Installed B = Option 1 C = Option 2 D = Options 1 & 2 E = Option 3 F = Option 4 G = Options 1 & 3 H = Options 1 & 4 J = Options 1, 2 & 3 K = Options 1, 2, & 4 L = Options 1, 3 & 4 M = Options 1, 2, 3, & 4 N = Options 2 & 3 P = Options 2 & 4 Q = Options 2, 3, & 4 R = Options 3 & 4 S = Option 5 T = Options 1 & 5 U = Options 1, 3, & 5 V = Options 1, 4, & 5 W = Options 1, 3, 4, & 5 X = Options 3 & 5 Y = Options 4 & 5 Z = Options 3, 4 & 5																																					
Options 1 = Disconnect 2 = Non-Pwr'd Conv. Outlet 3 = Smoke Detector S.A. 4 = Smoke Detector R.A. 5 = Pwr'd Conv. Outlet																																					
ZZ = If desired option combination is not listed above, ZZ will be assigned and configuration options will be located in digits 15-18.																																					

FEATURES

All models are available with a wide variety of factory-mounted options such as stainless steel heat exchangers, phase monitor, dirty filter switch, and coil guard to make them suitable for almost every application.

All units are self-contained and assembled on full perimeter base rails with holes in the four corners for overhead rigging. Every unit is completely piped, wired, charged and tested at the factory to simplify the field installation and to provide years of dependable operation.

All models (including those with an economizer) are suitable for either bottom or horizontal duct connections. **Models with factory installed power exhaust are suitable for bottom duct connections only.** For bottom duct, you remove the sheet metal panels from the supply and return air openings through the base of the unit. For horizontal duct, you replace the supply and return air panels on the rear of the unit with a side duct flange accessory.

All models are available with these “factory mounted” outdoor air damper options:

- Single enthalpy economizer with or without power exhaust
- BAS-ready economizer with or without power exhaust
- Motorized outdoor air damper
- Barometric Relief Damper

A fixed outdoor air intake assembly will be shipped in the return air compartment of all units ordered without an economizer or motorized outdoor air damper option. The assembly includes a rain hood with a damper that can be set for 10, 15 or 25% outdoor air. With bottom duct connections, the intake damper assembly should be mounted over the opening in the return air panel. With horizontal ductwork, it should be mounted on the return air duct.

All supply air blowers are equipped with a belt drive that can be adjusted to meet the exact requirements of the job. A high static drive option is available for applications with a higher CFM and/or static pressure requirement.

All compressors have internal pressure relief. Every refrigerant circuit includes an expansion valve, a liquid line filter-drier, a discharge line high pressure switch and a suction line with a freeze-stat and low pressure/loss of charge switch to protect all system components.

- **Simplicity® Controls** - Simplicity® control boards have standardized a number of features previously available only as options or by utilizing additional controls.
 - **Low Ambient** - An integrated low-ambient control allows all units to operate in the cooling mode down to 0°F outdoor ambient without additional assistance. Optionally, the control board can be programmed to lockout the compressors when the outdoor air temperature is low or when free cooling is available.
 - **Anti-Short Cycle Protection** - To aid compressor life, an anti-short cycle delay is incorporated into the

standard controls. Compressor reliability is further ensured by programmable minimum run times. For testing, the anti short cycle delay can be temporarily overridden with the push of a button.

- **Fan Delays** - Fan on and fan off delays are fully programmable. Furthermore, the heating and cooling fan delay times are independent of one another. All units are programmed with default values based upon their configuration of cooling and heat.
- **Safety Monitoring** - The control board monitors the high and low-pressure switches, the freeze-stats, the gas valve, if applicable, and the temperature limit switch on gas and electric heat units. The unit control board will alarm on ignition failures, compressor lockouts and repeated limit switch trips.
- **Nuisance Trip Protection and Strikes** - To prevent nuisance trouble calls, the control board uses a “three times, you’re out” philosophy. The high and low-pressure switches and the freeze-stats must trip three times within two hours before the unit control board will lock out the associated compressor.
- **On Board Diagnostics** - Each alarm will energize a trouble light on the thermostat, if so equipped, and flash an alarm code on the control board LED. Each high and low-pressure switch alarm as well as each freeze-stat alarm has its own flash code. The control board saves the five most recent alarms in memory, and these alarms can be reviewed at any time. Alarms and programmed values are retained through the loss of power.

All units have long lasting powder paint cabinets with 1000 hour salt spray test approval under ASTM-B117 procedures.

All models are CSA approved.

- **Warranty** - All models include a one-year limited parts warranty on the complete unit. Compressors and electric heater elements carry a five-year warranty.
- **Electric Heat Operation** - All electric heat models (factory installed only) are wired for a single power source and include a bank of nickel chromium elements mounted at the discharge of the supply air blower to provide a high velocity and uniform distribution of air across the heating elements. Every element is fully protected against excessive current and temperature by fuses and two thermal limit switches.

The power supply wiring can be routed into the control box through a threaded pipe connection in the base pan of the unit or through a knockout in the wiring panel on the front of the unit.

- **BAS Controls** - York’s Sunline™ series units offer factory mounted BAS controls such as Simplicity® Intelli-Comfort™, Novar®, Honeywell, Johnson, and CPC.

FACTORY-INSTALLED OPTIONS

- **SINGLE INPUT ELECTRONIC ENTHALPY ECONOMIZERS** - Includes a slide-in / plug-in damper assembly with fully modulating spring-return motor actuator capable of introducing up to 100% outdoor air with nominal 1% leakage type dampers.

The enthalpy system contains one sensor that monitors the outdoor air and determines when the air is cool enough and dry enough to provide free cooling.

The rainhood is painted to match the basic unit and must be field-assembled before installing.

- **BAS-READY ECONOMIZER** - Includes a slide-in / plug-in damper assembly with fully modulating spring-return motor actuator with zero to 95-degree rotation capable of introducing up to 100% outdoor air with nominal 1% leakage type dampers.

Actuator requires 2-10 VDC input from an external source, such as a field-installed or factory-installed BAS controller. BAS-ready actuators have an adjustable auxiliary end-switch for optional power exhaust control.

For units with Simplicity® Intelli-Comfort™ control, a factory-installed, dry bulb sensor determines if outdoor air temperature is low enough to provide free-cooling operation. (Field-installed humidity sensors for either outdoor air or outdoor & return air streams are available for single enthalpy and differential enthalpy configurations, respectively).

The rainhood is painted to match the basic unit and must be field-assembled before installing.

- **POWER EXHAUST** - Our economizer options are available with power exhaust. Whenever the outdoor air intake dampers are opened for free cooling, the exhaust fan will be energized to prevent the conditioned space from being over-pressurized during economizer operation. BAS-ready economizer actuators have an adjustable auxiliary end-switch to provide a range of damper positions available to energize power exhaust.

The exhaust fan, motor and controls are installed and wired at the factory. The rain hood must be assembled and installed in the field.

The power exhaust option can only be used on bottom duct configurations.

- **MOTORIZED OUTDOOR AIR INTAKE DAMPER** - Includes a slide-in / plug-in damper assembly with a 2-position, spring return motor actuator which opens to a pre-set position whenever the supply air blower is operating and will drive fully closed when the blower unit shuts down.
- **BAROMETRIC RELIEF DAMPER** - This damper option can be used to relieve internal building air pressure on units with an economizer without power exhaust. This accessory includes a rain hood, a bird screen and a fully assembled damper. With bottom duct connections, the

damper should be mounted over the opening in the return air panel. With horizontal ductwork, the accessory should be mounted on the return air duct.

- **PHENOLIC COATED EVAPORATOR AND CONDENSER COILS** - Special coating process that utilizes Technicoat 10-1" processes. Coating is applied by total immersion of the complete coil for maximum protection.
- **ELECTRIC HEATERS** wired for single point power supply. These nickel chromium heater elements are provided with limit and automatic reset capability to prevent operation at excessive temperatures.
- **FILTER OPTIONS** - Standard units are shipped with 2" throw-away filters installed. 2" pleated and 4" pleated filters are offered as a factory installed option.
- **CONVENIENCE OUTLET** - This 110 volt outlet can be "powered" by the unit with a stepdown transformer or you may order the unit with a "non-powered" convenience outlet that can be wired in the field.
- **DISCONNECT SWITCH** - For gas heat units and cooling units with electric heat, a HACR breaker sized to the unit is provided. For cooling only units, a switch sized to the largest electric heat available for the particular unit is provided. Factory installed option only.
- **BAS - Building Automation System Controls**
Simplicity® Intelli-Comfort™ CONTROL - The York® Simplicity® Intelli-Comfort™ control is factory installed. It includes a supply air sensor, a return air sensor, and an outside air sensor. There are provisions for a field installed dirty filter indicator switch, an air-proving switch, an Outside Air Humidity sensor, a Return Air Humidity sensor, an Inside IAQ sensor, and an Outside Air IAQ sensor. Construction mode operation, 365-day real time clock with 7 day programming plus holiday scheduling is built-in. Two different modes of demand ventilation are achieved through the Intelli-Comfort™ using CO₂ sensors. It uses an inside CO₂ sensor to perform Demand Ventilation. It can also use an Outside CO₂ sensor to perform Differential Demand Ventilation. It uses a Patented Comfort Ventilation algorithm to provide comfortable ventilation air temperature. The patented economizer-loading algorithm will protect the equipment when harsh operating conditions exist. Humidity in the occupied space or return duct can be monitored and controlled via humidity sensors and the on-board connection for hot gas re-heat system. It uses the INTELLI-Start™ algorithm to maximize energy savings by recovering the building from the Unoccupied Setpoints to the Occupied Setpoints just in time for the Occupied Time Period to begin. The Simplicity® Intelli-Comfort™ balances space temperature, ventilation air temperature, CO₂ and humidity for ultimate comfort.
- **Simplicity® Intelli-Comfort™ with ModLINC CONTROL** - The York® Simplicity® Intelli-Comfort™ with ModLINC control is factory installed. It includes all the features of the Intelli-Comfort™ control with an additional control to translate communications from MODBUS to the BACnet MSTP protocol.

- **Novar® BAS CONTROL** - The Novar® ETC-3 building automation system controller is factory installed. Includes supply air sensor, return air sensor, dirty filter indicator switch, and air proving switch.
- **JOHNSON CONTROLS BAS CONTROL** - The Johnson Control YK-UNT-1126 building automation system controller is factory installed. Includes supply air sensor, return air sensor, dirty filter indicator switch, and air proving switch.
- **CPC BAS CONTROL** - The Computer Process Controls Model 810-3060 ARTC Advanced Rooftop building automation system controller is factory installed. Includes supply air sensor, return air sensor, dirty filter indicator switch and air proving switch.
- **HONEYWELL BAS CONTROL** - The Honeywell W7750C building automation system controller is factory installed. Includes air supply sensor, return air sensor, dirty filter indicator switch, and air proving switch.
- **SMOKE DETECTORS** - (supply air & return air) The smoke detectors stop operation of the unit by interrupting power to the control board if smoke is detected within the air compartment.

WARNING

Factory installed smoke detectors in the return air, may be subjected to freezing temperatures during "off" times due to outside air infiltration. These smoke detectors have an operational limit of 32°F to 131°F. Smoke detectors installed in areas that could be outside those limitations will have to be moved to prevent having false alarms.

- **COIL GUARD** - Customers can purchase a coil guard kit to protect the condenser coil from damage. This is not a hail guard kit.
- **STAINLESS STEEL DRAIN PAN** - An optional rust-proof stainless steel drain pan is available to provide years of trouble-free operation in corrosive environments.
- **PHASE MONITORS** - Designed to prevent unit damage. The phase monitor will shut the unit down in an out-of-phase condition.
- **HIGH STATIC DRIVE** - Includes a belt and blower pulley upgrade to enhance blower performance.
- **DIRTY FILTER SWITCH** - This kit includes a differential pressure switch that energizes the fault light on the unit thermostat, indicating that there is an abnormally high pressure drop across the filters. Factory installed option or field installed accessory.
- **HINGED FILTER DOOR/"TOOL FREE" BLOWER AND ACCESS PANELS (not hinged)** - This option allows for easy access and maintenance.

NOTE: Knobs are shipped separately within the unit to prevent shipping damage. These must be field installed for tool free operation.

- **HINGED/"TOOL FREE" BLOWER, BLOWER MOTOR, FILTER AND ELECTRIC ACCESS PANELS** - This option allows for complete hinged and tool free access to the unit's blower, blower motor, filters and electrical panel sections.

FIELD-INSTALLED ACCESSORIES

- **SINGLE INPUT ELECTRONIC ENTHALPY ECONOMIZERS** - Includes a slide-in / plug-in damper assembly with fully modulating spring-return motor actuator capable of introducing up to 100% outdoor air with nominal 1% leakage type dampers.
The enthalpy system contains one sensor that monitors the outdoor air and determines when the air is cool enough and dry enough to provide free cooling.
The rainhood is painted to match the basic unit and must be field-assembled before installing.
- **MOTORIZED OUTDOOR AIR INTAKE DAMPER** - Includes a slide-in / plug-in damper assembly with a 2-position, spring return motor actuator which opens to some pre-set position whenever the supply air blower is operating and will drive fully closed when the blower unit shuts down.
The rain hood is painted to match the basic unit and must be field assembled before installing.
- **ROOF CURBS** - Fourteen-inch high roof curbs provide a water-tight seal between the unit and the finished roof. These full perimeter curbs meet the requirements of the National Roofing Contractors Association (NRCA) and are shipped knocked-down for field assembly.
They're designed to fit inside the base rails of the unit and include both a wood nailing strip and duct hanger supports.
- **SIDE DUCT FLANGES** - One-inch flanges replace the supply and return air panels on the rear of the unit to accommodate horizontal duct connections. These flanges can also be used individually for bottom supply/horizontal return or horizontal supply/bottom return. They cannot be used on units with power exhaust.
- **BAROMETRIC RELIEF DAMPER** - This damper accessory can be used to relieve internal building air pressure on units with an economizer without power exhaust. This accessory includes a rain hood, a bird screen and a fully assembled damper. With bottom duct connections, the damper should be mounted over the opening in the return air panel. With horizontal ductwork, the accessory should be mounted on the return air duct.
- **HIGH STATIC DRIVE** - Includes a belt and blower pulley upgrade to enhance blower performance.
- **ENTHALPY ACCESSORY CONTROL KIT** - This kit contains the required components to convert a single enthalpy economizer to dual enthalpy.
- **BURGLAR BARS** - Mount in the supply and return openings to prevent entry into the duct work.
- **WOOD SKID** - Allows unit to be handled with 90" forks.

- **CO₂ SENSOR** - Senses CO₂ levels and automatically overrides the economizer when levels rise above the present limits.
- **COIL GUARD** - Customers can purchase a coil guard kit to protect the condenser coil from damage. This is not a hail guard kit.
- **PHASE MONITORS** - Designed to prevent unit damage. The phase monitor will shut the unit down in an out-of-phase condition.

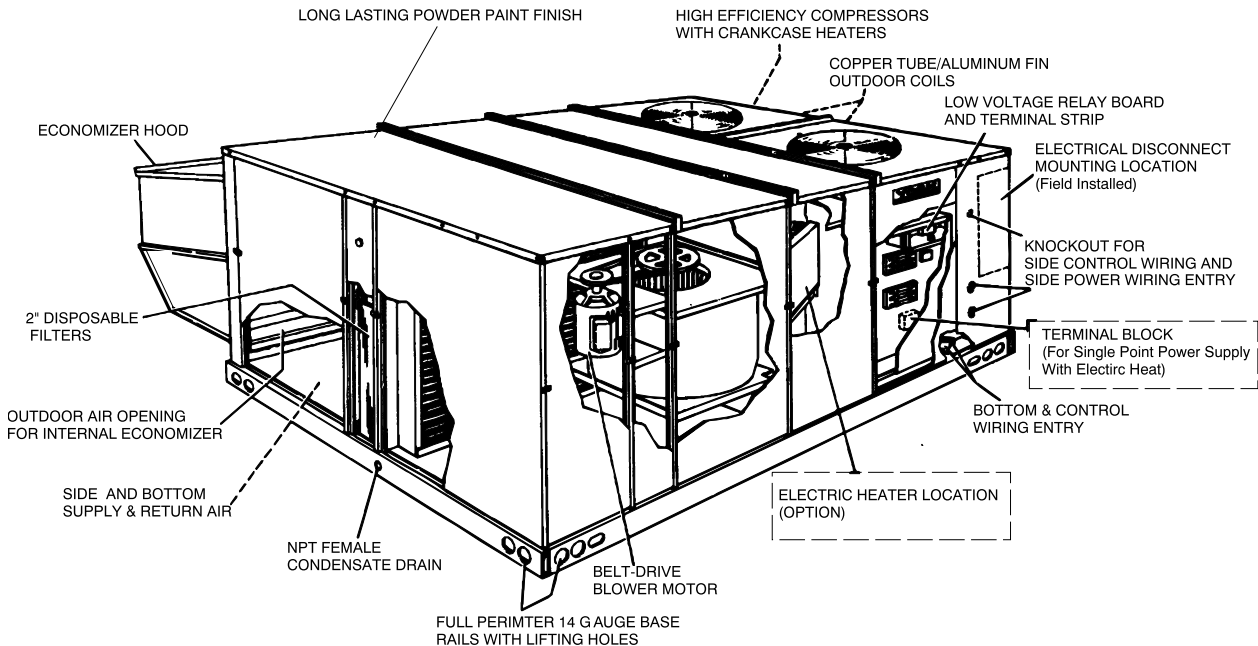


FIGURE 1 - SUNLINE 2000™ BP180 HEAT PUMP

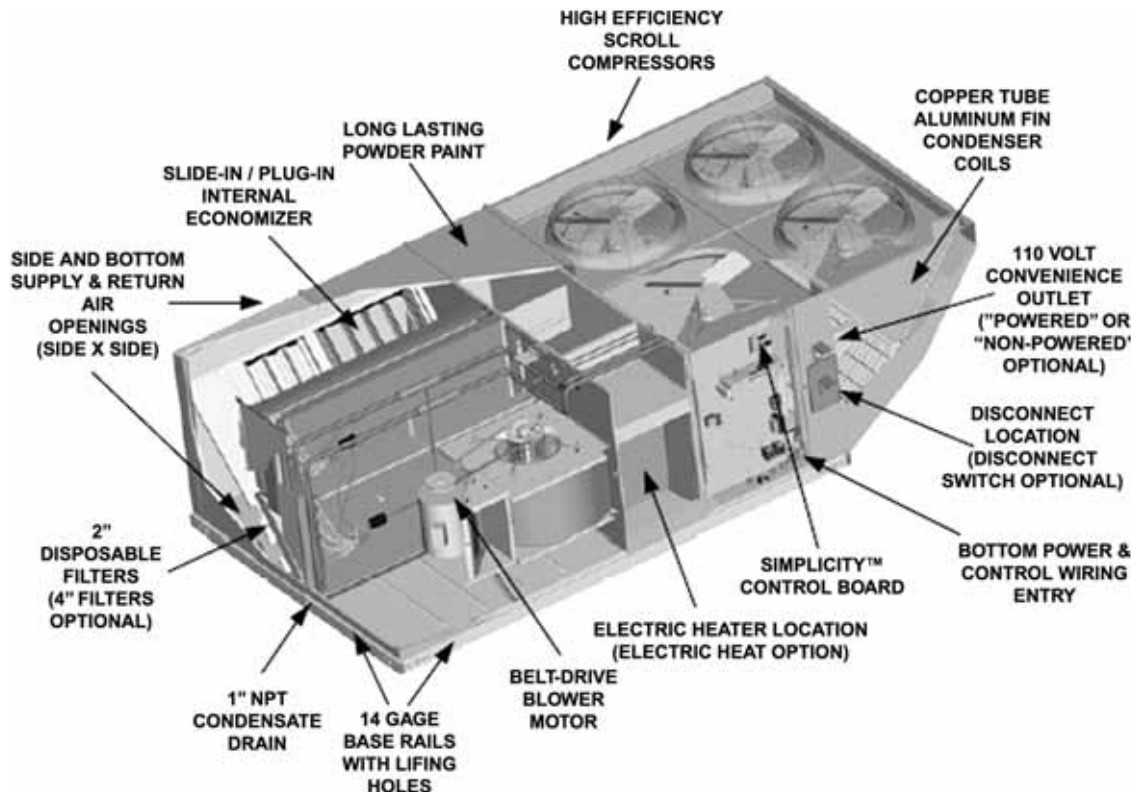


FIGURE 2 - SUNLINE MAGNUM™ BP240 HEAT PUMP

TABLE 1: RATINGS

MODEL	COOLINGCAPACITY ¹ 80//67-95° F			HEATING CAPACITY ¹				ELECTRIC HEAT NOM. CAPACITY ² (KW)
				47° F		17° F		
	MBH	EER	IPLV	MBH	COP	MBH	COP	KW
BP180	164	9.9	9.5	172	3.2	102	2.1	18,36,54,72
BP240	226	10.3	10.2	218	3.4	129	2.1	18,36,54,72

1. Certified in accordance with the Unitary Large Equipment Certification Program which is based on ARI Standard 340/360.
2. Models with electric heat have single point power supply.

EER = Energy Efficiency Ratio at full load - the cooling capacity in BTU's per hour (Btuh) divided by the power input expressed in BTUH per watt (Btuh/watt).

COP = Coefficient of Performance - the total heating capacity provided by the refrigeration system, including circulating fan heat, but excluding supplementary resistance (Btu's per hour) divided by the total electric input (watts) x 3.412.

IPLV = Integrated part load value. The EER of the unit operating on first stage only.

HEAT PUMP WITH ELECTRIC HEAT			
MODEL	MBH	EER	IPLV
BP180E18	164	9.9	9.5
BP180E36	164	9.9	9.5
BP180E54	162	9.8	9.4
BP180E72	160	9.8	9.4
BP240E18	226	10.3	10.2
BP240E36	226	10.3	10.2
BP240E54	223	10.2	10.1
BP240E72	220	10.2	10.1

TABLE 2: SOUND POWER RATING¹

UNIT SIZE	CFM	ESP	BLOWER		SOUND POWER (db 10 ⁻¹² Watts)									SWL dB(A)	dB(A) @ 10Ft. ²
					Octave Band Centerline Frequency (Hz)										
		IWG	RPM	BHP	63	125	250	500	1,000	2,000	4,000	8,000			
BP180	6,000	1.00	1,080	4.60	99	99	89	82	84	77	72	67	89	56	
BP240	8,000	1.00	1,120	6.65	102	102	92	85	87	80	75	70	92	59	

1. These values have been accessed using a model of sound propagation from a point source into the hemispheric/free field. The dBA values provided are to be used for reference only. Calculation of dBA values cover matters of system design and the fan manufacture has no way of knowing the details of each system. This constitutes an expectation to any specification or guarantee requiring a dBA value or sound data in any other form than sound power level ratings.
2. At a distance of 10 feet from the blower.

TABLE 3: COOLING CAPACITIES - BP180 15 TON

AIR ON EVAPORATOR COIL		TEMPERATURE OF AIR ON OUTDOOR COIL																	
		85°F									95 °F								
		TOTAL CAP. MBH	POWER INPUT KW	SENSIBLE CAPACITY, MBH							TOTAL CAP. MBH	POWER INPUT KW	SENSIBLE CAPACITY, MBH						
				ENTERING DRY BULB									ENTERING DRY BULB °F						
CFM	WB °F			86	83	80	77	74	71	68			86	83	80	77	74	71	68
4500	72	182.2	12.33	111.9	99.1	86.3	73.4	60.6	-	-	174.6	13.46	108.0	95.2	82.4	69.5	56.7	-	-
	67	167.3	12.01	140.8	127.9	115.1	102.3	89.4	76.6	63.8	158.9	13.25	136.4	123.6	110.8	97.9	85.1	72.3	59.4
	62	151.1	11.80	151.1	149.6	136.7	123.9	111.1	98.2	85.4	149.7	12.93	149.7	143.9	131.1	118.2	105.4	92.6	79.7
	57	152.4	11.80	152.4	152.4	151.3	138.4	125.6	112.8	100.0	148.6	13.06	148.6	143.9	131.0	118.2	105.4	92.5	79.7
5250	72	189.7	12.39	124.4	109.3	94.1	78.9	63.8	-	-	179.9	13.56	120.2	105.0	89.9	74.7	59.5	-	-
	67	174.3	12.07	155.9	140.7	125.6	110.4	95.2	80.1	64.9	163.8	13.36	151.2	136.0	120.8	105.7	90.5	75.3	60.2
	62	157.3	11.86	157.3	156.6	149.2	134.0	118.8	103.7	88.5	154.2	13.03	154.2	151.3	143.0	127.8	112.6	97.5	82.3
	57	158.7	11.86	158.7	158.7	165.0	149.9	134.7	119.5	104.4	153.1	13.17	153.1	150.7	142.9	127.8	112.6	97.5	82.3
6000	72	197.3	12.45	136.9	119.4	101.9	84.5	67.0	-	-	185.2	13.67	132.3	114.8	97.3	79.8	62.3	-	-
	67	181.2	12.14	171.0	153.5	136.0	118.5	101.0	83.5	66.0	168.6	13.46	165.9	148.4	130.9	113.4	95.9	78.4	60.9
	62	163.6	11.92	163.6	163.6	161.6	144.1	126.6	109.1	91.6	158.7	13.13	158.7	158.7	154.9	137.4	119.9	102.4	84.9
	57	165.0	11.92	165.0	165.0	178.8	161.3	143.8	126.3	108.8	157.6	13.27	157.6	157.6	154.8	137.4	119.9	102.4	84.9
6500	72	199.7	12.49	144.5	125.4	106.2	87.0	67.8	-	-	188.8	13.66	139.8	120.6	101.5	82.3	63.1	-	-
	67	183.4	12.17	178.3	160.8	141.7	122.5	103.3	84.1	64.9	171.9	13.45	170.6	155.6	136.4	117.3	98.1	78.9	59.7
	62	165.6	11.96	165.6	165.6	164.6	145.4	126.2	107.0	87.9	161.9	13.12	161.9	161.9	159.9	140.8	121.6	102.4	83.2
	57	167.1	11.96	167.1	167.1	173.9	154.7	135.6	116.4	97.2	160.7	13.26	160.7	160.7	159.3	140.1	121.0	101.8	82.6
7000	72	202.1	12.53	152.1	131.3	110.4	89.5	68.7	-	-	192.5	13.65	147.3	126.5	105.6	84.7	63.9	-	-
	67	185.6	12.21	185.6	168.2	147.3	126.4	105.6	84.7	63.8	175.2	13.45	175.2	162.9	142.0	121.1	100.3	79.4	58.5
	62	167.6	11.99	167.6	167.6	167.6	146.7	125.9	105.0	84.1	165.0	13.12	165.0	165.0	165.0	144.1	123.3	102.4	81.5
	57	169.1	11.99	169.1	169.1	169.1	148.2	127.3	106.5	85.6	163.8	13.25	163.8	163.8	163.8	142.9	122.1	101.2	80.3

AIR ON EVAPORATOR COIL		TEMPERATURE OF AIR ON OUTDOOR COIL																	
		105°F									115 °F								
		TOTAL CAP. MBH	POWER INPUT KW	SENSIBLE CAPACITY, MBH							TOTAL CAP. MBH	POWER INPUT KW	SENSIBLE CAPACITY, MBH						
				ENTERING DRY BULB									ENTERING DRY BULB °F						
CFM	WB °F			86	83	80	77	74	71	68			86	83	80	77	74	71	68
4500	72	163.0	14.99	104.2	91.3	78.5	65.7	52.8	-	-	151.5	16.53	100.3	87.4	74.6	61.8	49.0	-	-
	67	149.4	14.84	132.6	119.8	106.9	94.1	81.3	68.4	55.6	139.9	16.42	128.8	115.9	103.1	90.3	77.4	64.6	51.8
	62	140.2	14.58	140.2	137.3	124.8	112.0	99.2	86.3	73.5	130.8	16.23	130.8	130.8	118.6	105.8	92.9	80.1	67.3
	57	139.8	14.61	139.8	137.2	124.4	111.6	98.8	85.9	73.1	131.1	16.16	131.1	130.6	117.8	105.0	92.1	79.3	66.5
5250	72	168.5	15.12	116.0	100.8	85.7	70.5	55.3	-	-	157.2	16.68	111.8	96.7	81.5	66.3	51.2	-	-
	67	154.5	14.96	145.4	131.9	116.7	101.6	86.4	71.2	56.1	145.2	16.57	139.6	127.8	112.6	97.4	82.3	67.1	51.9
	62	145.0	14.70	145.0	143.5	136.2	121.1	105.9	90.8	75.6	135.7	16.38	135.7	135.7	129.5	114.4	99.2	84.0	68.9
	57	144.6	14.74	144.6	143.3	135.8	120.6	105.5	90.3	75.1	136.0	16.31	136.0	135.8	128.7	113.5	98.3	83.2	68.0
6000	72	174.0	15.25	127.8	110.4	92.9	75.4	57.9	-	-	162.9	16.83	123.4	105.9	88.4	70.9	53.4	-	-
	67	159.5	15.09	158.2	144.0	126.5	109.0	91.5	74.0	56.5	150.5	16.71	150.5	139.6	122.1	104.6	87.1	69.6	52.1
	62	149.7	14.83	149.7	149.7	147.7	130.2	112.7	95.2	77.7	140.7	16.52	140.7	140.7	140.5	123.0	105.5	88.0	70.5
	57	149.3	14.86	149.3	149.3	147.2	129.7	112.2	94.7	77.2	141.0	16.45	141.0	141.0	139.5	122.0	104.5	87.0	69.5
6500	72	176.4	15.25	135.1	115.9	96.8	77.6	58.4	-	-	163.9	16.85	130.4	111.2	92.0	72.9	53.7	-	-
	67	161.7	15.10	161.0	150.8	131.8	112.6	93.4	74.3	55.1	151.4	16.74	151.4	146.0	127.2	108.0	88.8	69.6	50.5
	62	151.7	14.83	151.7	151.7	150.7	131.5	112.3	93.1	74.0	141.5	16.55	141.5	141.5	141.4	122.2	103.1	83.9	64.7
	57	151.3	14.87	151.3	151.3	150.2	131.0	111.9	92.7	73.5	141.8	16.48	141.8	141.8	141.1	121.9	102.8	83.6	64.4
7000	72	178.7	15.26	142.4	121.5	100.7	79.8	58.9	-	-	164.9	16.87	137.4	116.6	95.7	74.9	54.0	-	-
	67	163.8	15.10	163.8	157.6	137.1	116.3	95.4	74.5	53.7	152.3	16.76	152.3	152.3	132.2	111.4	90.5	69.7	48.8
	62	153.7	14.84	153.7	153.7	153.7	132.8	112.0	91.1	70.2	142.4	16.57	142.4	142.4	142.4	121.5	100.7	79.8	58.9
	57	153.3	14.88	153.3	153.3	153.3	132.4	111.5	90.7	69.8	142.7	16.50	142.7	142.7	142.7	121.9	101.0	80.1	59.3

TABLE 4: COOLING CAPACITIES - BP240 20 TON

AIR ON EVAPORATOR COIL		TEMPERATURE OF AIR ON OUTDOOR COIL																	
		85°F									95 °F								
		TOTAL CAP. ¹ MBH	POWER INPUT ² KW	SENSIBLE CAPACITY ¹ , MBH							TOTAL CAP. ¹ MBH	POWER INPUT ² KW	SENSIBLE CAPACITY ¹ , MBH						
				ENTERING DRY BULB									ENTERING DRY BULB °F						
CFM	WB °F			86	83	80	77	74	71	68			86	83	80	77	74	71	68
6000	72	247.6	16.4	152.9	135.8	118.7	101.6	84.5	-	-	240	17.7	155.7	138.6	121.5	104.4	87.3	-	-
	67	233.9	15.9	196.1	179.0	161.9	144.7	127.6	110.5	93.4	222	17.4	190.3	173.2	156.1	139.0	121.9	104.8	87.7
	62	212.7	15.7	208.0	207.0	189.9	172.8	155.7	138.6	121.5	200	17.0	198.3	191.9	174.8	157.7	140.5	123.4	106.3
	57	208.0	15.5	208.0	207.7	190.6	173.5	156.4	139.3	122.2	198	16.9	198.3	197.9	180.8	163.7	146.6	129.5	112.4
7000	72	256.6	16.5	169.3	149.0	128.8	108.8	88.4	-	-	249	17.8	172.8	152.6	132.3	112.1	91.9	-	-
	67	242.5	16.0	216.1	195.9	175.7	155.5	135.3	115.0	94.8	230	17.5	205.7	190.3	170.1	149.8	129.6	109.4	89.4
	62	220.5	15.8	215.6	215.6	206.1	185.9	165.7	145.5	125.3	208	17.2	205.7	203.6	190.4	170.2	150.0	129.8	109.5
	57	215.6	15.6	215.6	215.5	206.9	186.7	166.5	146.3	126.0	206	17.0	205.7	205.5	197.0	176.8	156.5	136.3	116.1
8000	72	265.7	16.6	185.6	162.3	139.0	115.6	92.3	-	-	258	18.0	189.9	166.5	143.2	119.9	96.6	-	-
	67	251.1	16.1	223.2	212.9	189.5	166.2	142.9	119.6	96.2	239	17.7	215.3	207.4	184.0	160.7	137.4	114.0	90.7
	62	228.3	15.9	223.2	223.2	222.4	199.0	175.7	152.4	129.1	215	17.3	213.2	213.2	206.0	182.7	159.4	136.1	112.7
	57	223.2	15.7	223.2	223.2	223.2	199.9	176.6	153.2	129.9	213	17.2	213.2	213.2	213.2	189.8	166.5	143.2	119.8
8350	72	268.6	16.9	191.2	166.6	142.0	117.4	92.7	-	-	259	18.2	196.5	171.9	147.3	122.6	98.0	-	-
	67	253.8	16.4	225.6	218.3	193.6	169.0	144.4	119.8	95.1	240	17.8	216.1	213.9	189.2	164.6	140.0	115.4	90.7
	62	230.8	16.1	225.6	225.6	227.2	202.6	177.9	153.3	128.7	216	17.5	216.1	216.1	211.4	186.8	162.2	137.6	112.9
	57	225.6	16.0	225.6	225.6	225.6	201.0	176.4	151.7	127.1	214	17.3	213.9	213.9	213.9	189.3	164.6	140.0	115.4
8700	72	271.5	17.1	196.9	170.9	145.0	119.1	93.1	-	-	260	18.4	203.2	177.3	151.3	125.4	99.5	-	-
	67	256.5	16.6	226.0	223.7	197.7	171.8	145.9	119.9	94.0	240	18.0	216.8	216.8	194.5	168.5	142.6	116.7	90.7
	62	233.2	16.4	233.2	233.2	232.0	206.1	180.1	154.2	128.3	217	17.7	216.8	216.8	216.8	190.9	165.0	139.0	113.1
	57	228.0	16.2	228.0	228.0	228.0	202.1	176.2	150.2	124.3	215	17.5	214.7	214.7	214.7	188.7	162.8	136.9	110.9

AIR ON EVAPORATOR COIL		TEMPERATURE OF AIR ON OUTDOOR COIL																	
		105°F									115 °F								
		TOTAL CAP. ¹ MBH	POWER INPUT ² KW	SENSIBLE CAPACITY ¹ , MBH							TOTAL CAP. ¹ MBH	POWER INPUT ² KW	SENSIBLE CAPACITY ¹ , MBH						
				ENTERING DRY BULB									ENTERING DRY BULB °F						
CFM	WB °F			86	83	80	77	74	71	68			86	83	80	77	74	71	68
6000	72	229	19.5	150.5	133.4	116.3	99.2	82.1	-	-	219	21.3	145.4	128.3	111.2	94.1	77.0	-	-
	67	210	19.2	185.4	168.3	151.1	134.0	116.9	99.8	82.7	198	21.1	180.4	163.3	146.2	129.1	112.0	94.9	77.8
	62	190	18.9	189.9	185.7	168.9	151.7	134.6	117.5	100.4	179	20.7	179.5	179.5	162.9	145.8	128.7	111.6	94.5
	57	189	18.7	189.4	189.2	172.3	155.2	138.1	121.0	103.9	180	20.6	180.5	180.5	163.8	146.7	129.6	112.5	95.4
7000	72	237	19.7	167.0	146.8	126.6	106.4	86.2	-	-	226	21.5	161.3	141.1	120.9	100.7	80.4	-	-
	67	217	19.4	196.6	184.7	164.5	144.3	124.1	103.9	83.6	204	21.3	185.4	179.2	159.0	138.8	118.5	98.3	78.1
	62	197	19.0	196.6	194.5	183.8	163.6	143.3	123.1	102.9	185	20.9	185.4	185.4	177.2	156.9	136.7	116.5	96.3
	57	196	18.9	196.1	196.0	187.6	167.3	147.1	126.9	106.7	186	20.8	186.5	186.5	178.1	157.9	137.7	117.5	97.3
8000	72	246	19.8	183.6	160.2	136.9	113.6	90.2	-	-	233	21.7	177.2	153.9	130.6	107.3	83.9	-	-
	67	225	19.5	203.3	201.2	177.9	154.5	131.2	107.9	84.6	211	21.4	191.4	191.4	171.7	148.4	125.1	101.7	78.4
	62	203	19.2	203.3	203.3	198.7	175.4	152.1	128.7	105.4	191	21.1	191.4	191.4	191.4	168.0	144.7	121.4	98.1
	57	203	19.0	202.8	202.8	202.8	179.5	156.1	132.8	109.5	192	20.9	192.4	192.4	192.4	169.1	145.8	122.4	99.1
8350	72	246	20.0	189.6	164.9	140.3	115.7	91.0	-	-	234	21.8	182.6	157.9	133.3	108.7	84.0	-	-
	67	226	19.7	204.0	204.0	182.3	157.6	133.0	108.4	83.8	212	21.6	191.9	191.9	175.3	150.7	126.0	101.4	76.8
	62	204	19.4	204.0	204.0	201.7	177.1	152.4	127.8	103.2	192	21.2	191.9	191.9	191.9	167.3	142.7	118.0	93.4
	57	203	19.2	203.5	203.5	203.5	178.8	154.2	129.6	104.9	193	21.1	193.0	193.0	193.0	168.4	143.7	119.1	94.5
8700	72	247	20.2	195.5	169.6	143.7	117.8	91.8	-	-	235	22.0	187.9	162.0	136.0	110.1	84.2	-	-
	67	226	19.9	204.7	204.7	186.7	160.7	134.8	108.9	82.9	212	21.7	192.5	192.5	178.9	152.9	127.0	101.1	75.2
	62	205	19.5	204.7	204.7	204.7	178.7	152.8	126.9	100.9	192	21.3	192.5	192.5	192.5	166.6	140.6	114.7	88.8
	57	204	19.4	204.1	204.1	204.1	178.2	152.2	126.3	100.4	194	21.2	193.6	193.6	193.6	167.6	141.7	115.8	89.8

TABLE 4: COOLING CAPACITIES - BP240 20 TON (CONTINUED)

AIR ON EVAPORATOR COIL		TEMPERATURE OF AIR ON OUTDOOR COIL								
		125°F								
		TOTAL CAP. ¹ MBH	POWER INPUT ² KW	SENSIBLE CAPACITY ¹ , MBH						
				ENTERING DRY BULB						
CFM	WB °F			86	83	80	77	74	71	68
6000	72	208.0	23.1	140.3	123.1	106.0	88.9	71.8	-	-
	67	185.8	22.9	171.6	158.4	141.3	124.2	107.1	90.0	72.9
	62	169.1	22.6	171.6	169.1	157.0	139.9	122.8	105.7	88.6
	57	171.6	22.5	171.6	171.6	155.4	138.3	121.2	104.1	86.9
7000	72	214.4	23.3	155.6	135.4	115.2	94.9	74.7	-	-
	67	191.4	23.1	176.8	173.6	153.4	133.2	113.0	92.8	72.6
	62	174.2	22.8	176.8	176.8	170.5	150.3	130.1	109.9	89.7
	57	176.8	22.6	176.8	176.8	168.7	148.5	128.3	108.1	87.8
8000	72	220.7	23.5	170.9	147.6	124.3	100.9	77.6	-	-
	67	197.1	23.3	182.1	179.4	165.6	142.2	118.9	95.6	72.3
	62	179.4	23.0	182.1	182.1	179.4	160.7	137.4	114.0	90.7
	57	182.1	22.8	182.1	182.1	179.4	158.7	135.4	112.1	88.8
8350	72	221.3	23.6	175.6	150.9	126.3	101.7	77.1	-	-
	67	197.6	23.4	182.5	182.5	168.3	143.7	119.1	94.4	69.8
	62	179.9	23.1	182.5	182.5	179.9	157.5	132.9	108.3	83.6
	57	182.5	22.9	182.5	182.5	182.5	157.9	133.3	108.6	84.0
8700	72	221.9	23.8	180.2	154.3	128.4	102.4	76.5	-	-
	67	198.1	23.6	183.0	177.0	171.1	145.2	119.2	93.3	67.4
	62	180.3	23.2	183.0	183.0	180.3	154.4	128.4	102.5	76.6
	57	183.0	23.1	183.0	183.0	183.0	157.1	131.1	105.2	79.3

1 The capacities are gross ratings. For Net capacity, deduct the supply air blower motor heat, MBH = 3.415 X Kw. Refer to the appropriate blower performance table for the Kw of the supply air blower motor.

2 These ratings include condenser fan motor and compressor motor power but not the supply air blower motor power.

TABLE 5: HEATING CAPACITIES - 15 TON

CFM	Return Air °F	CAP & KW	OUTDOOR AIR TEMPERATURE °F (72% RH)							
			-10	0	10	20	30	40	50	60
4500	55	MBH	42	64	85	107	128	150	171	192
		KW	9.1	9.6	10.1	10.6	11.1	11.7	12.2	12.7
	70	MBH	38	60	81	102	124	145	167	188
		KW	11.0	11.5	12.0	12.5	13.1	13.6	14.1	14.6
	80	MBH	42	63	85	106	128	149	171	192
		KW	13.4	13.9	14.5	15.0	15.5	16.0	16.5	17.0
5250	55	MBH	44	66	87	109	130	151	173	194
		KW	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0
	70	MBH	40	62	83	104	126	147	169	190
		KW	10.4	10.9	11.4	12.0	12.5	13.0	13.5	14.0
	80	MBH	43	64	85	107	128	150	171	193
		KW	12.4	13.0	13.5	14.0	14.5	15.0	15.5	16.0
6000	55	MBH	46	67	89	110	132	153	175	196
		KW	7.8	8.3	8.8	9.4	9.9	10.4	10.9	11.4
	70	MBH	42	64	85	106	128	149	171	192
		KW	9.8	10.3	10.9	11.4	11.9	12.4	12.9	13.4
	80	MBH	43	65	86	108	129	150	172	193
		KW	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.1
7200	55	MBH	47	68	90	111	133	154	176	197
		KW	7.7	8.2	8.7	9.2	9.7	10.2	10.8	11.3
	70	MBH	43	64	86	107	129	150	172	193
		KW	9.6	10.2	10.7	11.2	11.7	12.2	12.7	13.2
	80	MBH	45	67	88	110	131	153	174	196
		KW	11.7	12.2	12.7	13.2	13.7	14.2	14.8	15.3
7500	55	MBH	48	69	91	112	134	155	177	198
		KW	7.5	8.1	8.6	9.1	9.6	10.1	10.6	11.1
	70	MBH	44	65	87	108	130	151	172	194
		KW	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0
	80	MBH	48	69	90	112	133	155	176	198
		KW	11.9	12.4	12.9	13.4	13.9	14.4	15.0	15.5

THE MBH AND KW VALUES DO NOT INCLUDE THE SUPPLY AIR BLOWER MOTOR.
 FOR NET CAPACITY, ADD THE SUPPLY AIR BLOWER MOTOR HEAT (MBH = 3.415 x KW)

TABLE 6: HEATING CAPACITIES - 20 TON

CFM	Return Air °F	CAP & KW	OUTDOOR AIR TEMPERATURE °F (72% RH)							
			-10	0	10	20	30	40	50	60
6000	55	MBH	37	65	94	123	151	180	209	237
		KW	11.1	11.7	12.2	12.8	13.3	13.9	14.4	15.0
	70	MBH	33	61	90	119	147	176	204.7	233
		KW	13.0	13.5	14.1	14.6	15.2	15.7	16.3	16.8
	80	MBH	26	55	84	112	141	170	198	227
		KW	14.5	15.0	15.6	16.1	16.7	17.2	17.8	18.3
7000	55	MBH	43	72	100	129	158	186	215	244
		KW	10.7	11.3	11.8	12.4	12.9	13.5	14.0	14.6
	70	MBH	39	67	96	125	153	182	211	239
		KW	12.5	13.1	13.6	14.2	14.7	15.3	15.8	16.4
	80	MBH	32	61	90	118	147	176	204	233
		KW	14.0	14.5	15.1	15.6	16.2	16.7	17.3	17.8
7750	55	MBH	48	76	105	134	162	191	220	248
		KW	10.4	11.0	11.5	12.1	12.6	13.2	13.7	14.3
	70	MBH	43	72	101	129	158	187	215	244
		KW	12.2	12.7	13.3	13.8	14.4	14.9	15.5	16.0
	80	MBH	37	65	94	123	152	180	209	238
		KW	13.6	14.2	14.7	15.3	15.8	16.4	16.9	17.5
8000	55	MBH	43	72	101	129	158	187	215	244
		KW	10.5	11.0	11.6	12.1	12.7	13.2	13.8	14.3
	70	MBH	39	68	96	125	154	182	211	240
		KW	12.3	12.8	13.4	13.9	14.5	15.0	15.6	16.1
	80	MBH	33	61	90	119	147	176	205	233
		KW	13.8	14.3	14.9	15.4	16.0	16.5	17.1	17.6
8300	55	MBH	39	68	97	125	154	183	212	240
		KW	10.5	11.1	11.6	12.2	12.7	13.3	13.8	14.4
	70	MBH	35	64	93	122	150	179	208	236
		KW	12.4	13.0	13.5	14.1	14.6	15.1	15.7	16.2
	80	MBH	29	58	87	115	144	173	201	230
		KW	13.9	14.5	15.0	15.6	16.1	16.7	17.2	17.8

THE MBH AND KW VALUES DO NOT INCLUDE THE SUPPLY AIR BLOWER MOTOR.
 FOR NET CAPACITY, ADD THE SUPPLY AIR BLOWER MOTOR HEAT (MBH = 3.415 x KW)

CFM, STATIC PRESSURE, AND POWER - ALTITUDE AND TEMPERATURE CORRECTIONS

The information below should be used to assist in application of product when being applied at altitudes at or exceeding 1000 feet above sea level.

The air flow rates listed in the standard blower performance tables are based on standard air at sea level. As the altitude or temperature increases, the density of air decreases. In

order to use the indoor blower tables for high altitude applications, certain corrections are necessary.

A centrifugal fan is a "constant volume" device. This means that, if the rpm remains constant, the CFM delivered is the same regardless of the density of the air. However, since the air at high altitude is less dense, less static pressure will be generated and less power will be required than a similar application at sea level. Air density correction factors are shown in Table 7 and Figure 3.

TABLE 7: ALTITUDE CORRECTION FACTORS

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

The examples below will assist in determining the airflow performance of the product at altitude.

Example 1: What are the corrected CFM, static pressure, and BHP at an elevation of 5,000 ft. if the blower performance data is 6,000 CFM, 1.5 IWC and 4.0 BHP?

Solution: At an elevation of 5,000 ft. the indoor blower will still deliver 6,000 CFM if the rpm is unchanged. However, Table 7 must be used to determine the static pressure and BHP. Since no temperature data is given, we will assume an air temperature of 70°F. Table 7 shows the correction factor to be 0.832.

$$\text{Corrected static pressure} = 1.5 \times 0.832 = 1.248 \text{ IWC}$$

$$\text{Corrected BHP} = 4.0 \times 0.832 = 3.328$$

Example 2: A system, located at 5,000 feet of elevation, is to deliver 6,000 CFM at a static pressure of 1.5". Use the unit

blower tables to select the blower speed and the BHP requirement.

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

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

$$\text{Sea level static pressure} = 1.5 / .832 = 1.80"$$

Enter the blower table at 6000 sCFM and static pressure of 1.8". The rpm listed will be the same rpm needed at 5,000 ft.

Suppose that the corresponding BHP listed in the table is 3.2. This value must be corrected for elevation.

$$\text{BHP at 5,000 ft.} = 3.2 \times .832 = 2.66$$

Altitude/Temperature Conversion Factor

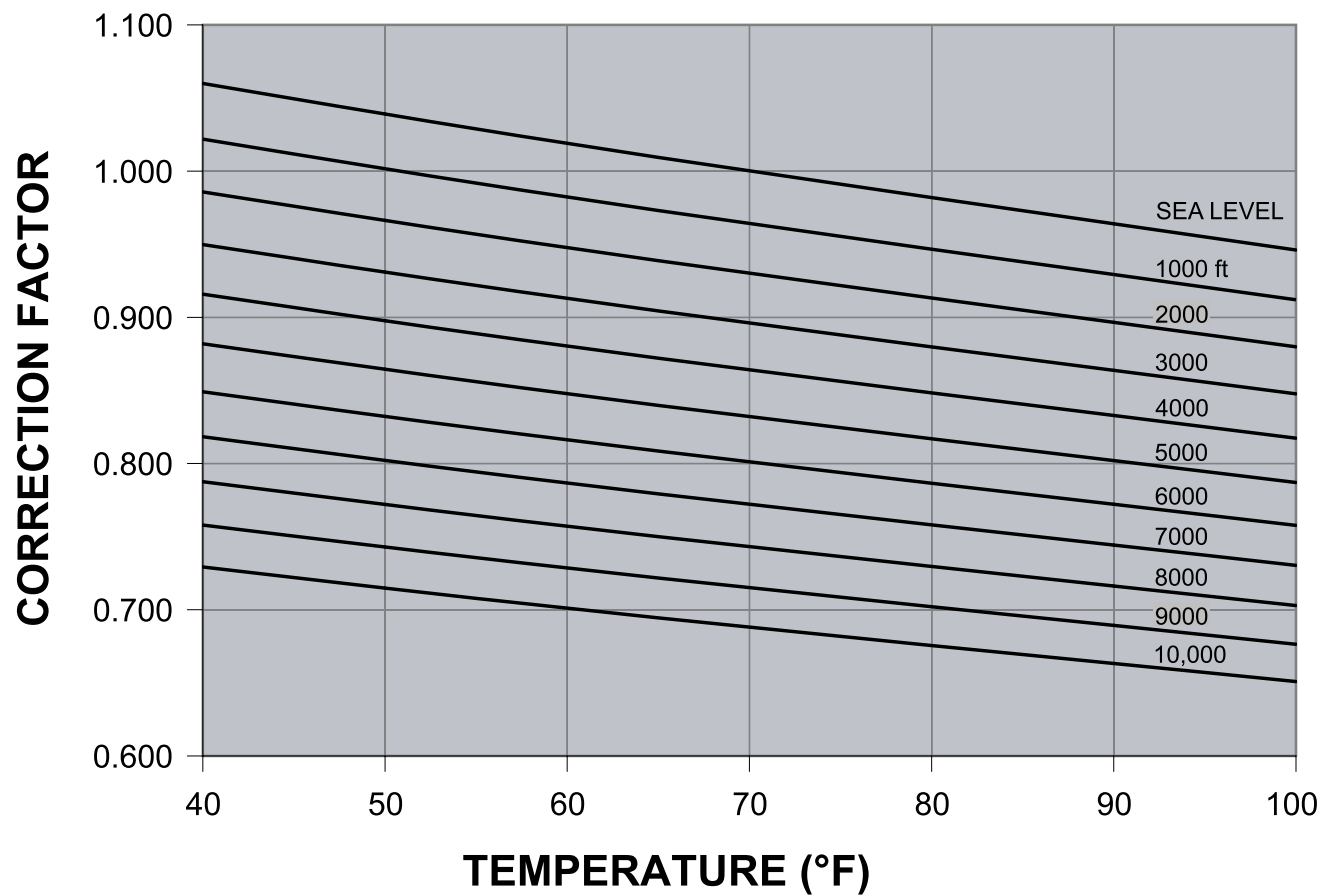


FIGURE 3 - ALTITUDE/TEMPERATURE CONVERSION FACTOR

**TABLE 8: BLOWER PERFORMANCE 15 TON SUPPLY AIR
BOTTOM DUCT CONNECTIONS**

Blower Speed (RPM)	Motor Pulley (Turns Open)*	CFM														
		4500			5250			6000			6750			7200		
		ESP	BHP	KW	ESP	BHP	KW	ESP	BHP	KW	ESP	BHP	KW	ESP	BHP	KW
208 VOLT AND STANDARD DRIVE																
850	6.0	0.9	2.4	2.2	0.7	3.0	2.7	0.5	3.2	2.9	-	-	-	-	-	-
870	5.5	1.0	2.5	2.3	0.8	3.1	2.8	0.6	3.5	3.1	0.2	4.1	3.7	-	-	-
915	4.5	1.1	2.6	2.4	0.9	3.4	3.0	0.7	3.7	3.3	0.3	4.4	3.9	0.2	4.5	4.0
965	3.5	1.2	2.9	2.6	1.0	3.6	3.2	0.8	4.0	3.6	0.5	4.7	4.2	0.4	4.9	4.4
980	3.0	1.3	3.0	2.7	1.1	3.7	3.3	0.9	4.1	3.7	0.6	4.8	4.3	0.5	5.1	4.6
1010	2.0	1.4	3.1	2.8	1.2	3.8	3.4	1.0	4.2	3.8	0.7	5.0	4.5	0.6	5.4	4.8
1040	1.0	1.5	3.2	2.9	1.3	3.9	3.5	1.1	4.5	4.0	0.9	5.2	4.7	0.7	5.7	5.1
208 VOLT AND HIGH STATIC DRIVE																
965	6.0	1.2	2.9	2.6	1.0	3.6	3.2	0.8	4.0	3.6	0.5	4.7	4.2	0.4	5.0	4.4
980	5.5	1.3	3.0	2.7	1.1	3.7	3.3	0.9	4.1	3.7	0.6	4.8	4.3	0.5	5.1	4.6
1025	4.5	1.5	3.2	2.9	1.3	3.9	3.5	1.1	4.5	4.0	0.8	5.1	4.6	0.7	5.6	5.0
1065	3.5	1.6	3.4	3.0	1.4	4.0	3.6	1.2	4.7	4.2	1.0	5.5	4.9	-	-	-
1095	3.0	1.7	3.5	3.1	1.5	4.2	3.8	1.3	4.9	4.4	1.2	5.7	5.1	-	-	-
1130	2.0	1.9	3.7	3.3	1.7	4.5	4.0	1.5	5.1	4.6	-	-	-	-	-	-
1170	1.0	2.1	3.9	3.5	2.0	4.7	4.2	1.8	5.5	4.9	-	-	-	-	-	-
208/460/575 VOLT AND STANDARD DRIVE																
70	6.0**	1.0	2.4	2.2	0.8	3.1	2.8	0.6	3.5	3.1	0.2	4.1	3.7	-	-	-
915	5.0	1.1	2.6	2.4	0.9	3.3	3.0	0.7	3.7	3.3	0.3	4.4	3.9	0.2	4.5	4.0
965	4.0	1.2	2.9	2.6	1.0	3.6	3.2	0.8	4.0	3.6	0.5	4.7	4.2	0.4	5.0	4.4
980	3.5	1.3	3.0	2.7	1.1	3.7	3.3	0.9	4.1	3.7	0.6	4.8	4.3	0.5	5.1	4.6
1040	2.0	1.5	3.2	2.9	1.3	3.9	3.5	1.1	4.5	4.0	0.9	5.3	4.7	0.7	5.7	5.1
1065	1.0	1.6	3.3	3.0	1.4	4.0	3.6	1.2	4.7	4.2	1.0	5.5	4.9	-	-	-
208/460/575 VOLT AND HIGH STATIC DRIVE																
980	6.0	1.3	2.9	2.6	1.1	3.7	3.3	0.9	4.1	3.7	0.6	4.8	4.3	0.5	5.1	4.6
1040	4.5	1.5	3.2	2.9	1.3	3.9	3.5	1.1	4.5	4.0	0.9	5.3	4.7	0.7	5.7	5.1
1065	4.0	1.6	3.4	3.0	1.4	4.0	3.6	1.2	4.7	4.2	1.0	5.5	4.9	-	-	-
1095	3.5	1.7	3.5	3.1	1.5	4.2	3.8	1.3	4.9	4.4	1.2	5.7	5.1	-	-	-
1130	2.5	1.9	3.7	3.3	1.7	4.5	4.0	1.5	5.1	4.6	-	-	-	-	-	-
1170	1.5	2.1	3.9	3.5	2.0	4.7	4.2	1.8	5.5	4.9	-	-	-	-	-	-
1190	1.0	2.2	4.0	3.6	2.1	4.8	4.3	2.0	5.7	5.1	-	-	-	-	-	-

NOTES:

- Blower performance includes fixed outdoor air, 2" T/A filters, a dry indoor coil and no electric heat.
- Refer to page 18 for additional static resistances.

ESP - External Static Pressure available for the supply and return air duct system. All internal unit resistances have been deducted from the total static pressure of the blower.

* Do **NOT** close the pulley below 1 turn open.

** Factory setting.

TABLE 9: BLOWER PERFORMANCE 20 TON SUPPLY AIR**BOTTOM DUCT CONNECTIONS**

BLOWER SPEED, (RPM)	MOTOR PULLEY (TURNS OPEN)*	CFM														
		6000			7000			8000			9000			9400		
		ESP	BHP	KW	ESP	BHP	KW	ESP	BHP	KW	ESP	BHP	KW	ESP	BHP	KW
208 VOLT AND STANDARD DRIVE																
870	6.0**	0.3	2.1	1.8	-	-	-	-	-	-	-	-	-	-	-	-
900	5.0	0.7	3.2	2.7	0.4	3.5	2.9	0.1	3.8	3.2	-	-	-	-	-	-
930	4.0	1.0	4.1	3.4	0.8	4.5	3.8	0.5	4.9	4.1	-	-	-	-	-	-
950	3.0	1.2	4.6	3.9	1.0	5.1	4.3	0.7	5.5	4.6	0.3	5.9	5.0	-	-	-
980	2.0	1.5	5.3	4.5	1.3	5.8	4.9	1.1	6.3	5.3	0.6	6.9	5.8	0.1	7.3	6.1
1015	1.0	1.8	5.9	5.0	1.6	6.5	5.5	1.4	7.0	5.9	0.9	7.7	6.5	0.5	8.2	6.9
208 VOLT AND HIGH STATIC DRIVE																
950	6.0	1.2	4.6	3.9	1.0	5.1	4.3	0.7	5.5	4.6	0.3	5.9	5.0	-	-	-
980	5.0	1.5	5.3	4.5	1.3	5.8	4.9	1.1	6.3	5.3	0.6	6.9	5.8	0.1	7.3	6.1
1010	4.0	1.7	5.8	4.9	1.6	6.3	5.3	1.4	6.9	5.8	0.9	7.5	6.3	0.4	7.9	6.7
1020	3.5	1.8	6.1	5.1	1.7	6.5	5.5	1.5	7.1	6.0	1.0	7.8	6.6	0.5	8.3	7.0
1035	3.0	1.9	6.2	5.2	1.8	6.8	5.7	1.6	7.4	6.2	1.1	8.1	6.8	0.6	8.6	7.3
1050	2.5	2.0	6.4	5.4	1.9	7.0	5.9	1.7	7.6	6.4	1.2	8.3	7.0	-	-	-
1075	2.0	2.2	6.6	5.5	2.0	7.2	6.0	1.8	7.8	6.6	1.4	8.6	7.2	-	-	-
1100	1.0	2.3	6.7	5.6	2.1	7.3	6.1	2.0	7.9	6.7	-	-	-	-	-	-
230/460/575 VOLT AND STANDARD DRIVE																
870	6.0**	0.3	2.1	1.8	-	-	-	-	-	-	-	-	-	-	-	-
900	5.0	0.7	3.2	2.7	0.4	3.5	2.9	0.1	3.8	3.2	-	-	-	-	-	-
930	4.0	1.0	4.1	3.4	0.8	4.5	3.8	0.5	4.9	4.1	-	-	-	-	-	-
950	3.5	1.2	4.6	3.9	1.0	5.1	4.3	0.7	5.5	4.6	0.3	5.9	5.0	-	-	-
980	2.5	1.5	5.3	4.5	1.3	5.8	4.9	1.1	6.3	5.3	0.6	6.9	5.8	0.1	7.3	6.1
1015	1.5	1.8	5.9	5.0	1.6	6.5	5.5	1.4	7.0	5.9	0.9	7.7	6.5	0.5	8.2	6.9
1025	1.0	1.9	6.1	5.1	1.7	6.6	5.6	1.5	7.3	6.1	1.0	7.9	6.7	0.6	8.6	7.3
230/460/575 VOLT AND HIGH STATIC DRIVE																
950	6.0	1.2	4.6	3.9	1.0	5.1	4.3	0.7	5.5	4.6	0.3	5.9	5.0	-	-	-
980	5.0	1.5	5.3	4.5	1.3	5.8	4.9	1.1	6.3	5.3	0.6	6.9	5.8	0.1	7.3	6.1
1015	4.0	1.8	5.9	5.0	1.6	6.5	5.5	1.4	7.0	5.9	0.9	7.7	6.5	0.5	8.2	6.9
1035	3.5	1.9	6.2	5.2	1.8	6.8	5.7	1.6	7.4	6.2	1.0	8.1	6.8	0.6	8.6	7.3
1050	3.0	2.0	6.4	5.4	1.9	7.0	5.9	1.7	7.6	6.4	1.2	8.3	7.0	-	-	-
1080	2.0	2.2	6.6	5.5	2.0	7.2	6.0	1.8	7.8	6.6	1.4	8.6	7.2	-	-	-
1100	1.5	2.3	6.7	5.6	2.1	7.3	6.1	2.0	7.9	6.7	-	-	-	-	-	-
1120	1.0	2.4	6.8	5.7	2.2	7.4	6.2	2.1	8.1	6.8	-	-	-	-	-	-

NOTES:

- Blower performance includes fixed outdoor air, 2" T/A filters, a dry indoor coil and no electric heat.
- Refer to page 18 for additional static resistances.

ESP - External Static Pressure available for the supply and return air duct system. All internal unit resistances have been deducted from the total static pressure of the blower.

* Do **NOT** close the pulley below 1 turn open.

** Factory setting.

TABLE 10: BLOWER MOTOR AND DRIVE DATA

MODEL SIZE	DRIVE	BLOWER RANGE (RPM)	MOTOR ¹			ADJUSTABLE MOTOR PULLEY				FIXED BLOWER PULLEY				BELT (NOTCHED)		
			HP	FRAME	EFF. (%)	DESIG-NATION	OUTSIDE DIA. (IN.)	PITCH DIA. (IN.)	BORE (IN.)	DESIG-NATION	OUTSIDE DIA. (IN.)	PITCH DIA. (IN.)	BORE (IN.)	DESIG-NATION	PITCH LENGTH (IN.)	QTY.
15 TON	Standard	850/1065	5	184 T	83	1VP56	5.35	4.3-5.3 ²	1-1/8	BK90	8.75	8.4	1	BX70	71.8	1
	High Static	965/1190								BK80	7.75	7.4	1	BX80	69.8	1
20 TON	Standard	870/1025	7.5	213 T	89	1VP68	6.75	5.5-6.5 ²	1-3/8	BK120	11.75	11.4	1-3/16	BX83	84.8	1
	High Static	950/1120								BK110	10.75	10.4	1-3/16	BX81	82.8	1

1. All motors have a nominal speed of 1800 RPM, a 1.15 service factor and a solid base. They can operate to the limit of their service factor because they are located in the moving air, upstream of any heating device.
2. Do NOT close this pulley below 1 turn open.

TABLE 11: STATIC RESISTANCES¹

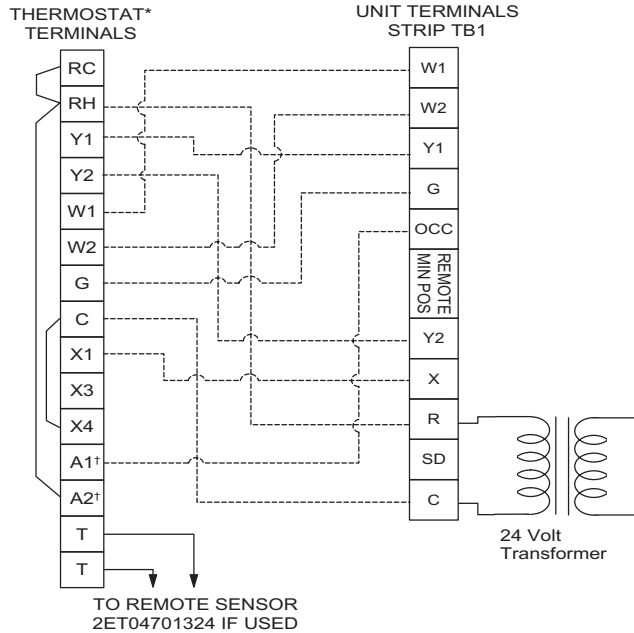
DESCRIPTION		RESISTANCE, IWG					
		CFM					
		15 TON			20 TON		
		4500	6000	7200	6000	8000	9400
WET INDOOR COIL		0.1	0.1	0.1	0.1	0.1	0.1
ELECTRIC HEAT OPTIONS	18 KW	0.1	0.1	0.1	0.1	0.1	0.1
	36 KW	0.1	0.2	0.3	0.1	0.2	0.3
	54 KW	0.2	0.3	0.4	0.2	0.3	0.4
	72 KW	0.2	0.4	0.6	0.2	0.4	0.6
ECONOMIZER OPTION		0.1	0.1	0.1	0.1	0.1	0.1
HORIZONTAL DUCT CONNECTIONS ²		0.1	0.2	0.3	0.2	0.3	0.5

1. Deduct these resistance values from the available external static pressures shown in the respective Blower Performance Table (See Note 2 for exception.)
2. Since the resistance to air flow will be less for horizontal duct connections than for bottom duct connections, add these pressures to the ESP values on the respective unit's blower performance table.

TABLE 12: POWER EXHAUST PERFORMANCE

MOTOR ² SPEED	STATIC RESISTANCE OF RETURN DUCTWORK, IWG									
	0.2		0.3		0.4		0.5		0.6	
	CFM	KW	CFM	KW	CFM	KW	CFM	KW	CFM	KW
HIGH ¹	5250	0.83	4500	0.85	4200	0.88	3750	0.93	3000	0.99
MEDIUM	4900	0.77	3900	0.79	3500	0.82	2900	0.85	-	-
LOW	4400	0.72	3700	0.74	3000	0.78	-	-	-	-

1. Factory Setting.
2. Power Exhaust motor is a 3/4 HP, PSC type with sleeve bearings, a 48 frame and inherent protection.



* Electronic programmable Thermostat 2ET0770010024 (includes subbase).

† Terminals A1 and A2 provide a relay output to close the outdoor economizer dampers when the thermostat switches to the set-back position.

FIGURE 4 - ELECTRONIC THERMOSTAT FIELD WIRING

NOTE: This unit does NOT REQUIRE a heat pump thermostat. It is designed to work with a standard two-stage cool, two-stage heat thermostat; however, the thermostat must provide a "G" signal when there is a call for "W1".

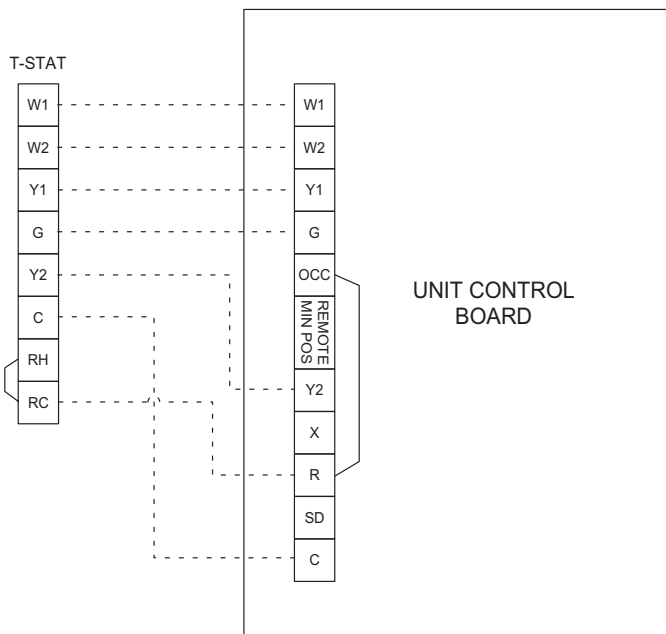


FIGURE 5 - FIELD WIRING 24 VOLT THERMOSTAT

CAUTION

The thermostat must provide a "G" signal when there is a call for "W1." The unit control board will energize the indoor blower when the compressors are energized; however, if the thermostat calls for "W2" during the anti-short-cycle delay, the electric heat (when installed) will be energized immediately upon the call for "W2."

CAUTION

The thermostat must provide a "G" signal when there is a call for "W1." The unit control board will energize the indoor blower when the compressors are energized; however, if the thermostat calls for "W2" during the anti-short-cycle delay, the electric heat (when installed) will be energized immediately upon the call for "W2."

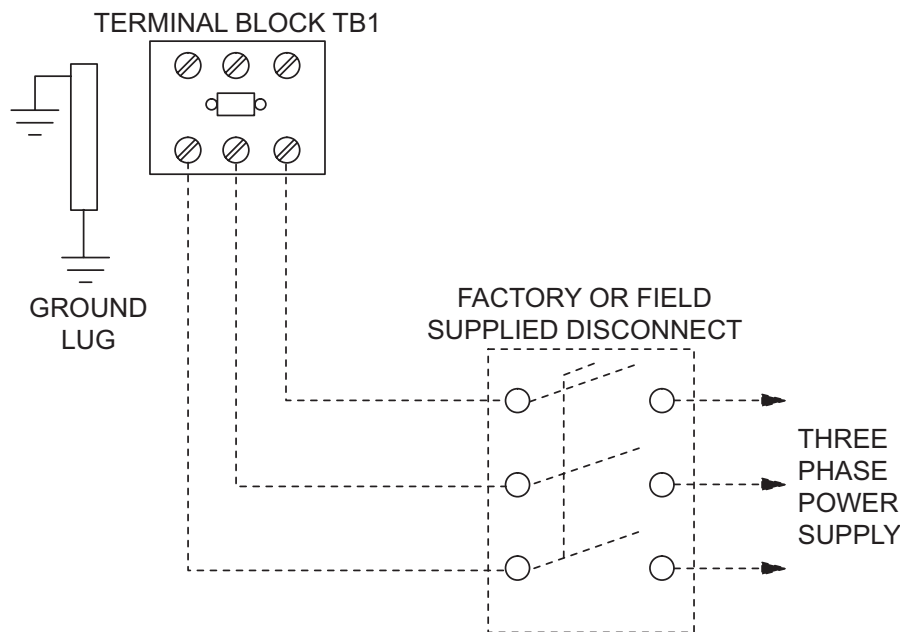


FIGURE 6 - FIELD WIRING DISCONNECT

TABLE 13: VOLTAGE LIMITATIONS

POWER SUPPLY	VOLTAGE	
	MIN.	MAX.
208/230-3-60	187	253
460-3-60	414	506
575-3-60	518	630

TABLE 14: ELECTRICAL DATA -WITHOUT POWERED CONVENIENCE OUTLET

MODEL (TON- NAGE)	VOLTAGE	COMPRESSORS		OD FAN MOTORS FLA EACH	ID BLOWER MOTOR FLA	CONV OUTLET AMPS	HEATER OPTION				MIN. CIRCUIT AMPACITY (AMPS)	MAX. FUSE/ BRKR ¹ SIZE (AMPS)
		RLA EACH	LRA EACH				MODEL	KW ²	STAGES	AMPS		
BP180 (15)	208	21.8	184	4.5	15.4	0.0	-	0.0	-	-	73.5	90
							E18	13.5	1	37.5	120.3	125
							E36	27.0	2	75.1	120.3	125
							E54	40.6	2	112.6	160.1	175
							E72	54.1	2	150.1	169.4	200
	230	21.8	184	4.3	14.4	0.0	-	0.0	-	-	72.1	90
							E18	18.0	1	43.3	126.1	150
							E36	36.0	2	86.6	126.3	150
							E54	54.0	2	129.9	147.9	175
							E72	72.0	2	173.2	191.2	225
	460	11.0	90	2.2	7.2	0.0	-	0.0	-	-	36.4	45
							E18	18.0	1	21.7	63.4	70
							E36	36.0	2	43.3	63.4	70
							E54	54.0	2	65.0	74.0	90
							E72	72.0	2	86.6	95.6	110
	575	9.3	73	1.7	5.9	0.0	-	0.0	-	-	30.2	35
							E18	18.0	1	17.3	51.9	60
							E36	36.0	2	34.6	51.9	60
							E54	54.0	2	52.0	59.3	70
							E72	72.0	2	69.3	76.7	90
BP240 (20)	208	33.6	225	3.7	20.0	0.0	-	0.0	-	-	110.4	125
							E18	13.5	1	37.5	157.2	175
							E36	27.0	2	74.9	157.2	175
							E54	40.6	2	112.7	165.9	175
							E72	54.1	2	150.2	204.1	225
	230	33.6	225	3.7	20.0	0.0	-	0.0	-	-	110.4	125
							E18	18.0	1	43.3	164.5	175
							E36	36.0	2	86.6	164.5	175
							E54	54.0	2	129.9	164.5	175
							E72	72.0	2	173.2	218.7	225
	460	17.3	114	1.9	10.0	0.0	-	0.0	-	-	56.5	70
							E18	18.0	1	21.7	83.6	90
							E36	36.0	2	43.3	83.6	90
							E54	54.0	2	65.0	83.6	90
							E72	72.0	2	86.6	110.7	125
	575	13.5	80	1.5	8.2	0.0	-	0.0	-	-	44.6	50
							E18	18.0	1	17.3	66.2	70
							E36	36.0	2	34.6	66.2	70
							E54	54.0	2	52.0	66.2	70
							E72	72.0	2	69.3	87.9	90

Note 1: Maximum HACR breaker of the same amp size is acceptable.

Note 2: Only 18kW of the 36 or 54kW, or only 36kW of the 72kW electric heat can be simultaneously energized with the mechanical heating. The full heater kW operates only if both compressors are locked out.

TABLE 15: ELECTRICAL DATA -WITH POWERED CONVENIENCE OUTLET

MODEL (TON- NAGE)	VOLTAGE	COMPRESSORS		OD FAN MOTORS FLA EACH	ID BLOWER MOTOR FLA	CONV OUTLET AMPS	HEATER OPTION				MIN. CIRCUIT AMPACITY (AMPS)	MAX. FUSE/ BRKR ¹ SIZE (AMPS)
		RLA EACH	LRA EACH				MODEL	KW ²	STAGES	AMPS		
BP180 (15)	208	21.8	184	4.5	15.4	10.0	-	0.0	-	-	83.5	100
							E18	13.5	1	37.5	130.3	150
							E36	27.0	2	75.1	130.3	150
							E54	40.6	2	112.6	172.6	175
							E72	54.1	2	150.1	181.9	200
	230	21.8	184	4.3	14.4	10.0	-	0.0	-	-	82.1	100
							E18	18.0	1	43.3	136.2	150
							E36	36.0	2	86.6	138.8	150
							E54	54.0	2	129.9	160.4	175
							E72	72.0	2	173.2	203.7	225
	460	11.0	90	2.2	7.2	5.0	-	0.0	-	-	41.4	50
							E18	18.0	1	21.7	68.4	70
							E36	36.0	2	43.3	69.4	70
							E54	54.0	2	65.0	80.2	90
							E72	72.0	2	86.6	101.9	110
	575	9.3	73	1.7	5.9	4.0	-	0.0	-	-	34.2	40
							E18	18.0	1	17.3	55.8	60
							E36	36.0	2	34.6	55.9	60
							E54	54.0	2	52.0	64.3	70
							E72	72.0	2	69.3	81.7	90
BP240 (20)	208	33.6	225	3.7	20.0	10.0	-	0.0	-	-	120.4	150
							E18	13.5	1	37.5	167.2	175
							E36	27.0	2	74.9	167.2	175
							E54	40.6	2	112.7	178.4	200
							E72	54.1	2	150.2	214.1	225
	230	33.6	225	3.7	20.0	10.0	-	0.0	-	-	120.4	150
							E18	18.0	1	43.3	174.5	175
							E36	36.0	2	86.6	174.5	175
							E54	54.0	2	129.9	174.5	175
							E72	72.0	2	173.2	228.7	250
	460	17.3	114	1.9	10.0	5.0	-	0.0	-	-	61.5	70
							E18	18.0	1	21.7	88.6	100
							E36	36.0	2	43.3	88.6	100
							E54	54.0	2	65.0	88.6	100
							E72	72.0	2	86.6	115.7	125
	575	13.5	80	1.5	8.2	4.0	-	0.0	-	-	48.6	60
							E18	18.0	1	17.3	70.2	80
							E36	36.0	2	34.6	70.2	80
							E54	54.0	2	52.0	70.2	80
							E72	72.0	2	69.3	91.9	100

Note 1: Maximum HACR breaker of the same amp size is acceptable.

Note 2: Only 18kW of the 36 or 54kW, or only 36kW of the 72kW electric heat can be simultaneously energized with the mechanical heating. The full heater kW operates only if both compressors are locked out.

TABLE 16: ELECTRIC HEAT CORRECTION FACTORS

NOMINAL VOLTAGE	VOLTAGE	KW CAP. MULTIPLIER
208	208	1.00
240	230	0.92
480	460	0.92
600	575	0.92

TABLE 17: PHYSICAL DATA

MODEL			BP180	BP240
SUPPLY AIR BLOWER	CENTRIFUGAL BLOWER (Dia. x Wd. in.)		15 x 15	18 x 15
	FAN MOTOR HP		5	7.5
INDOOR COIL	ROWS DEEP		4	4
	FINS PER INCH		13	15
	FACE AREA (Sq. Ft.)		15.5	25
OUTDOOR FAN	QUANTITY		2	4
	PROPELLER DIA. (in.)	(Each)	30	30
	FAN MOTOR HP	(Each)	1.25	3/4
	NOM. CFM TOTAL	(Each)	6500	5000
OUTDOOR COIL	ROWS DEEP		3	2
	FINS PER INCH		15	20
	FACE AREA (Sq. Ft.)		36.0	63.8
COMPRESSOR (Qty. Per Unit)	SCROLL		2	2
AIR FILTERS	QUANTITY PER UNIT	(18" X 24" X 2")	5	-
		(12" X 24" X 2")	-	12
	TOTAL FACE AREA (sq. ft.)		15.0	24
CHARGE	REFRIGERANT 22 (lbs./oz.)	SYSTEM NO. 1	22/8	29/0
		SYSTEM NO. 2	22/8	29/0

TABLE 18: OPERATING WEIGHTS (LBS.)

MODEL			BP180	BP240
Basic Unit	BP (Heat Pump)		1900	2640
Options	Economizer		160	
	Economizer with Power Exhaust		245	
	Motorized Damper		150	
	Electric Heater	18 KW	25	
		36 KW	30	
		54 KW	35	
		72 KW	40	
Accessories	Roof Curb		175	185
	Barometric Damper		45	45
	Wood Skid		200	220

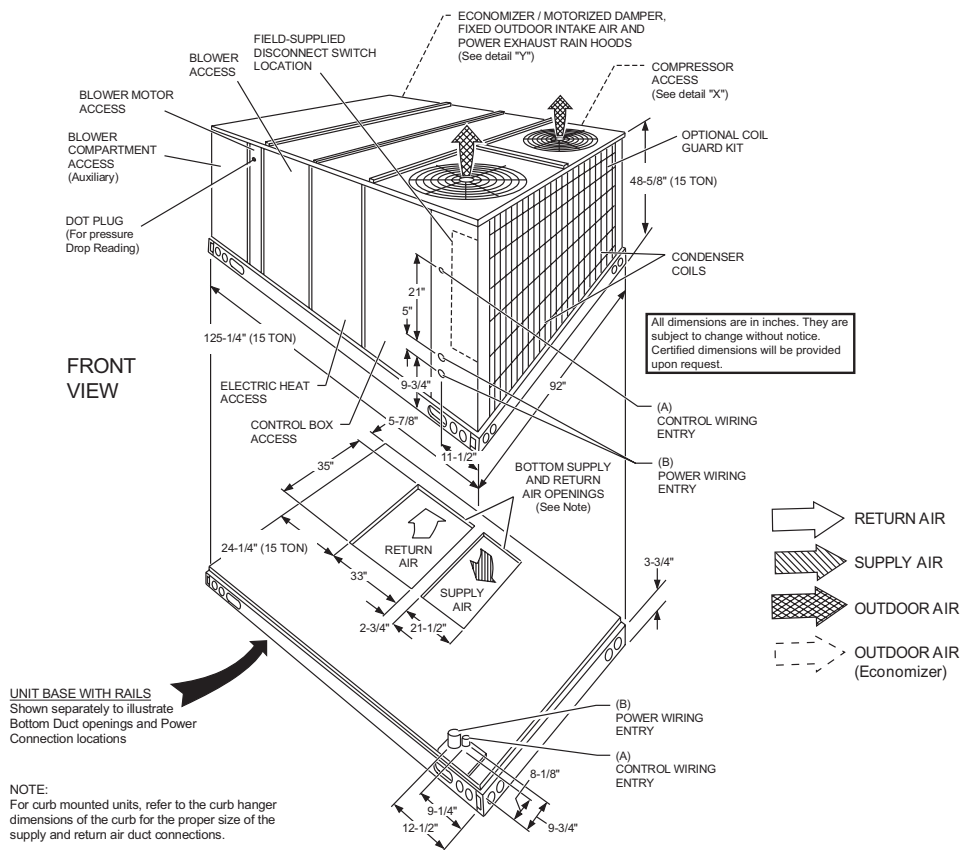


FIGURE 7 - UNIT DIMENSIONS - 15 TON

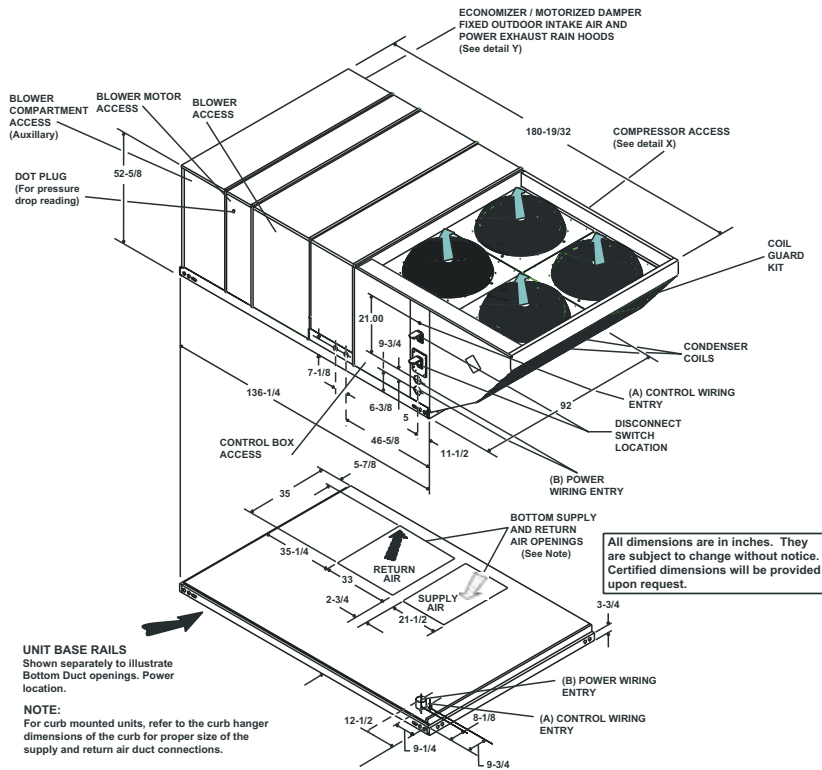


FIGURE 8 - UNIT DIMENSIONS - 20 TON

TABLE 19: MINIMUM CLEARANCES

LOCATION	CLEARANCE
Front	36"
Back	24" (Less Economizer) 49" (With Economizer)
Left Side (Filter Access)	24" (Less Economizer) 36" (With Economizer) ¹
Right Side (Cond. Coil)	36"
Below Unit ²	0"
Above Unit ³	72" With 36" Maximum Horizontal Overhang (For Condenser Air Discharge)

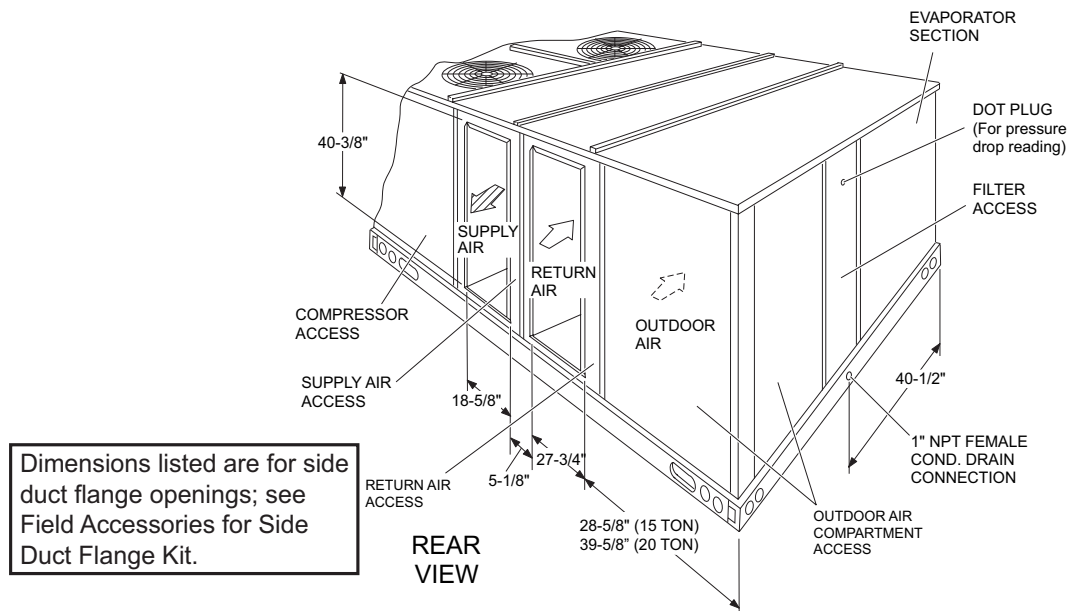
1. If economizer is factory installed, the unassembled rainhood must be removed from its side along position in front of evaporator coil, or in the outdoor air compartment, prior to final installation.

2. Units (applicable in U.S.A. only) may be installed on combustible floors made from wood or class A, B or C roof covering material.
3. Units must be installed outdoors. Overhanging structures or shrubs should not obstruct outdoor air discharge outlet.

NOTE: Units and ductwork are approved for zero clearance to combustible materials when equipped with electric heaters.

TABLE 20: UTILITIES ENTRY DATA

HOLE	OPENING SIZE (DIA.)	USED FOR	
A	1-1/8" KO	Control Wiring	Front
	3/4" NPS (Fem.)		Bottom
B	3-5/8" KO	Power Wiring	Front
	3" NPS (Fem.)		Bottom

**FIGURE 9 - REAR VIEW DIMENSIONS (15 & 20 TON)**

NOTE: Units are shipped with the bottom duct openings covered. An accessory flange kit is available for connecting side ducts.

For bottom duct applications:

1. Remove the side panels from the supply and return air compartments to gain access to the bottom supply and return air duct covers.
2. Remove and discard the bottom duct covers. Duct openings are closed with sheet metal covers except when the unit includes a power exhaust option. The covering consists of a heavy black paper composition.
3. Replace the side supply and return air compartment panels.

For side duct applications:

1. Replace the side panels on the supply and return air compartments with the side duct flange accessory kit panels.
2. Connect ductwork to the flanges on those panels.

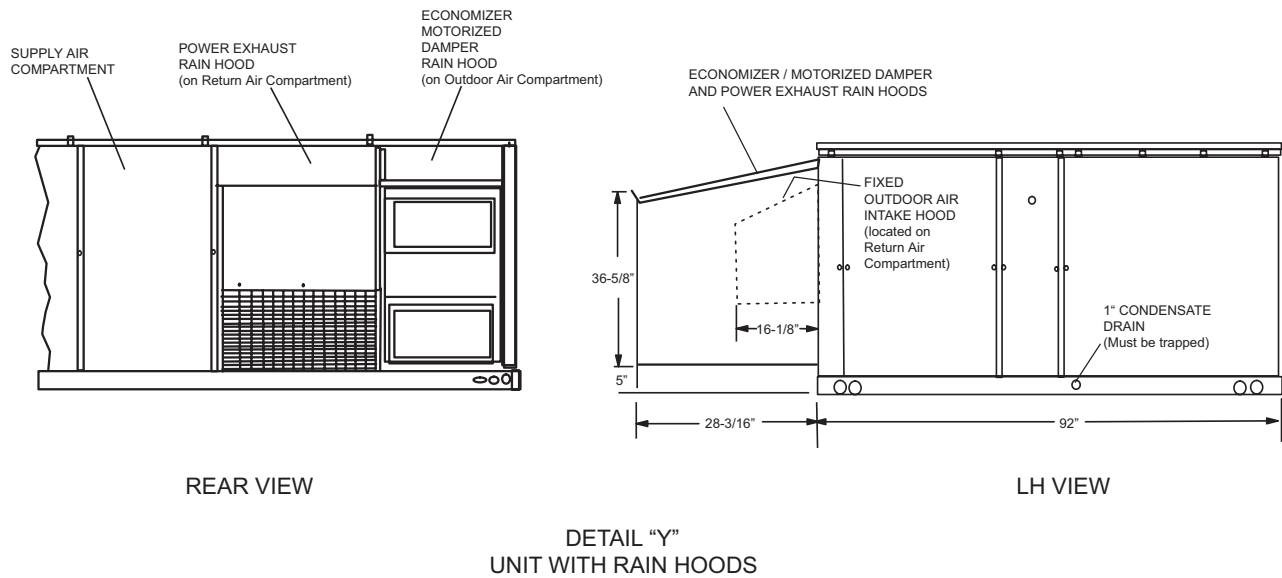


FIGURE 10 - UNIT DIMENSIONS BP180 AND 240 (RAINHOOD)

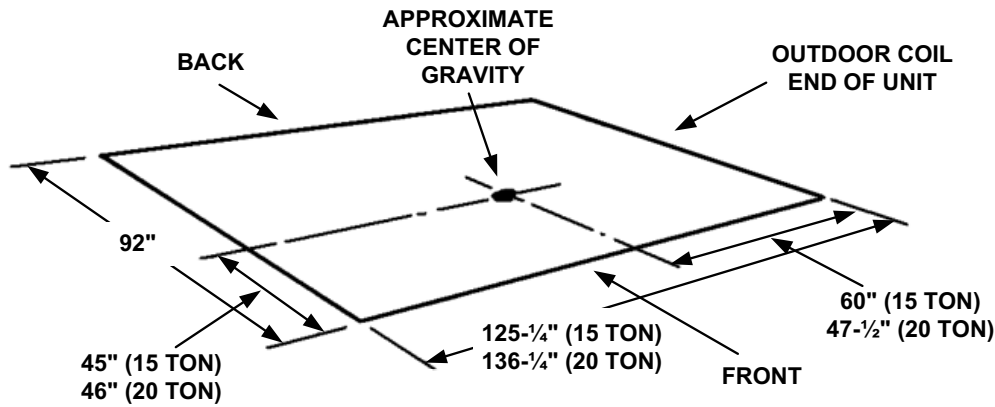


FIGURE 11 - CENTER OF GRAVITY

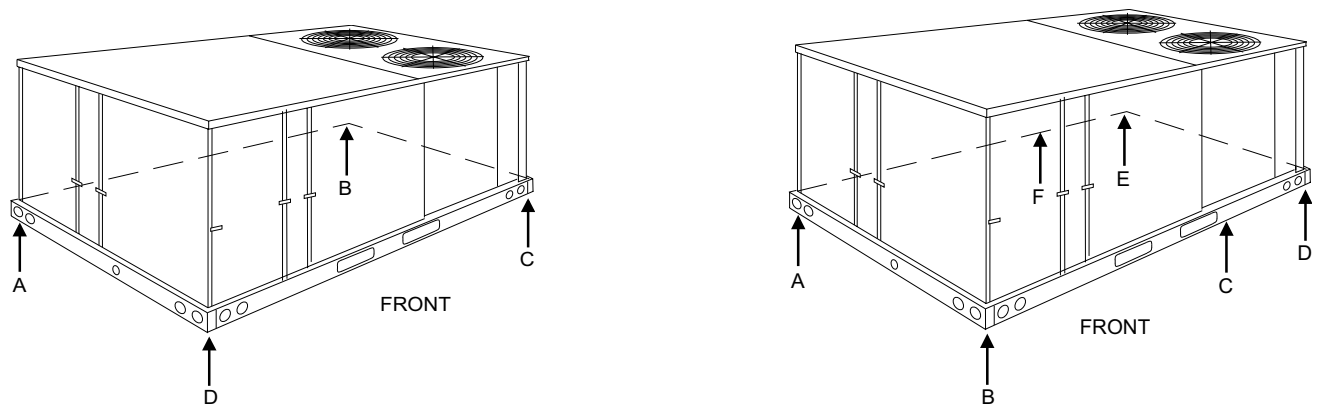


FIGURE 12 - FOUR AND SIX POINT LOADS - 15 TON

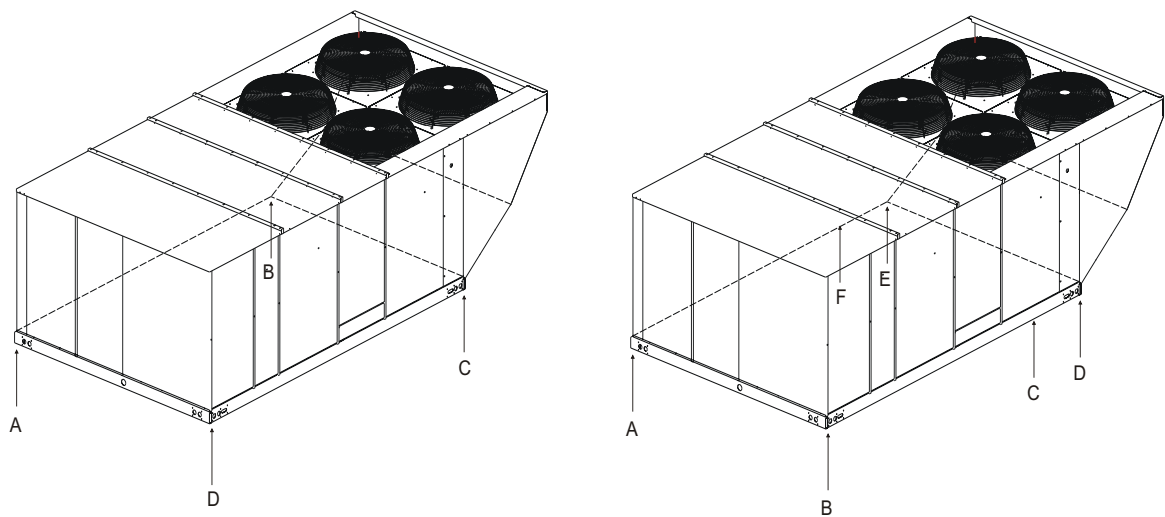


FIGURE 13 - FOUR AND SIX POINT LOADS - 20 TON

TABLE 21: FOUR AND SIX POINT LOADS

UNIT	4 - POINT LOADS (LBS)				
	TOTAL	A	B	C	D
180	2190	513	510	558	559
240	2840	495	925	925	495

NOTE: These weights are with economizer and 72 kW electric heat.

UNIT	6 - POINT LOADS (LBS)						
	TOTAL	A	B	C	D	E	F
180	2190	342	358	357	372	356	341
240	2840	330	330	473	617	617	473

NOTE: These weights are with economizer and 72 kW electric heat.

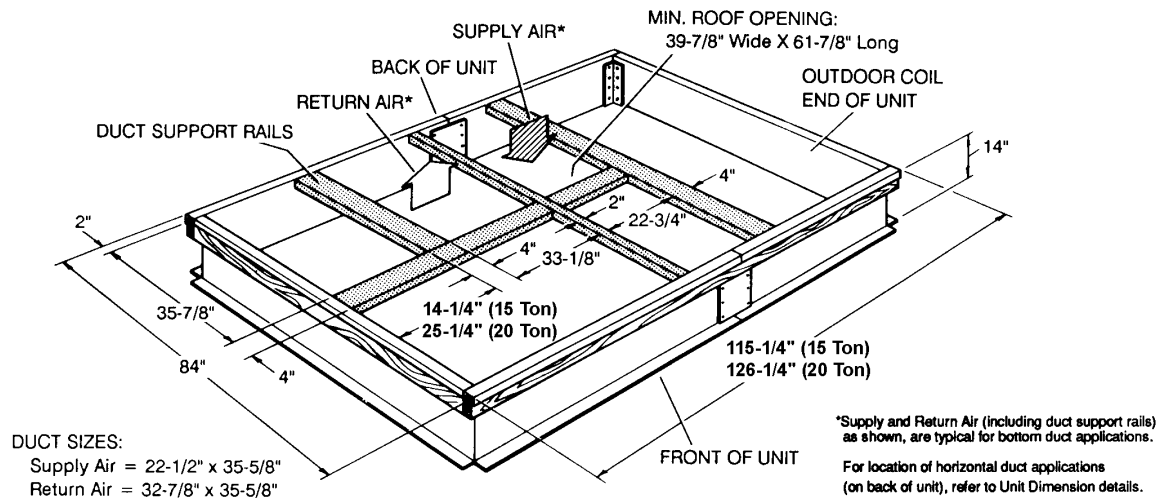


FIGURE 14 - ROOF CURB DIMENSIONS - 15 & 20 TON

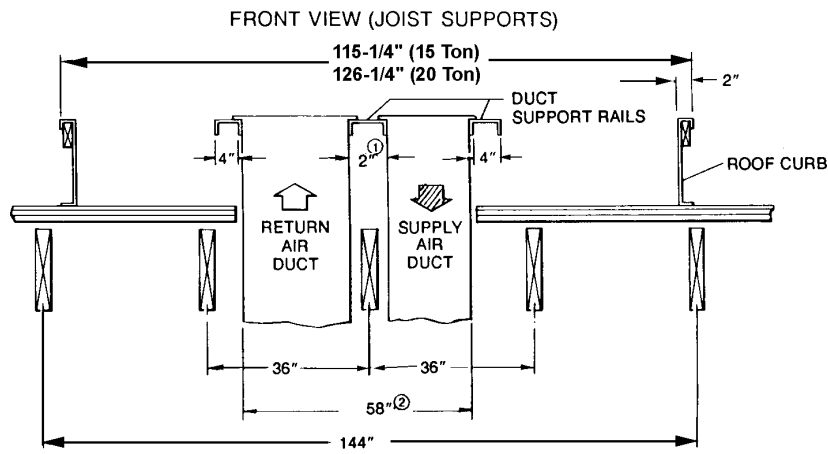


FIGURE 15 - ROOF CURB BENEFITS

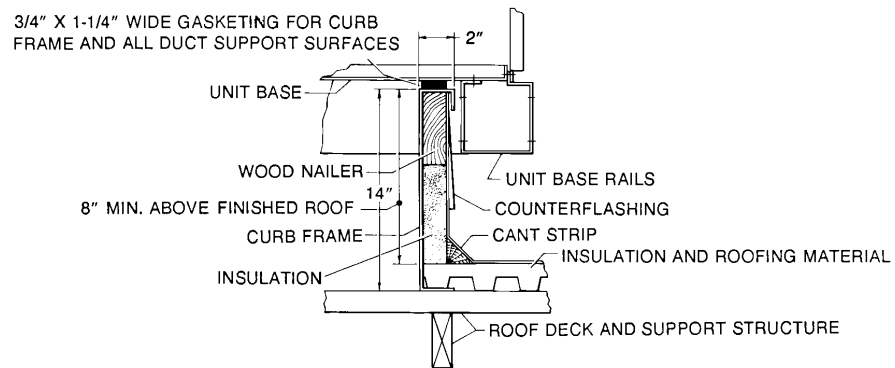


FIGURE 16 - UNIT AND CURB APPLICATIONS

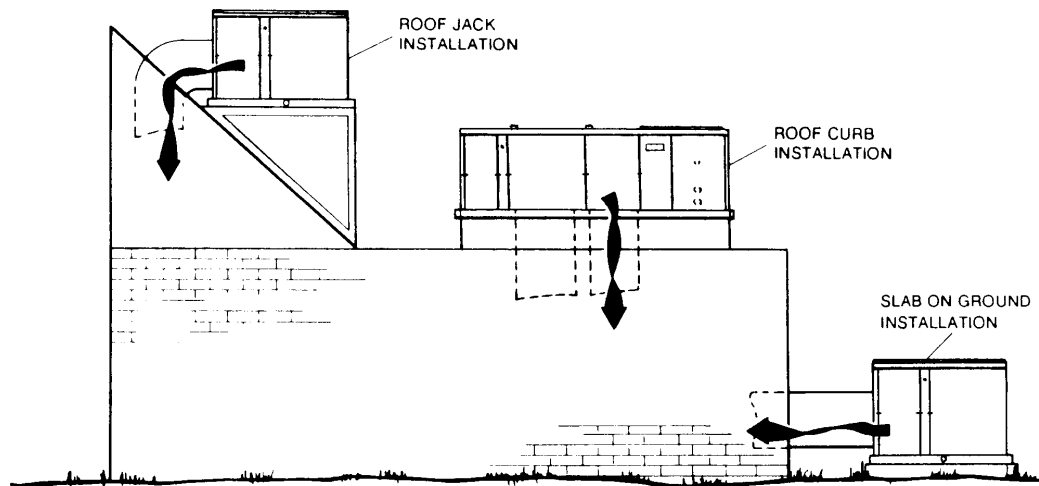


FIGURE 17 - TYPICAL APPLICATIONS - 15 TON

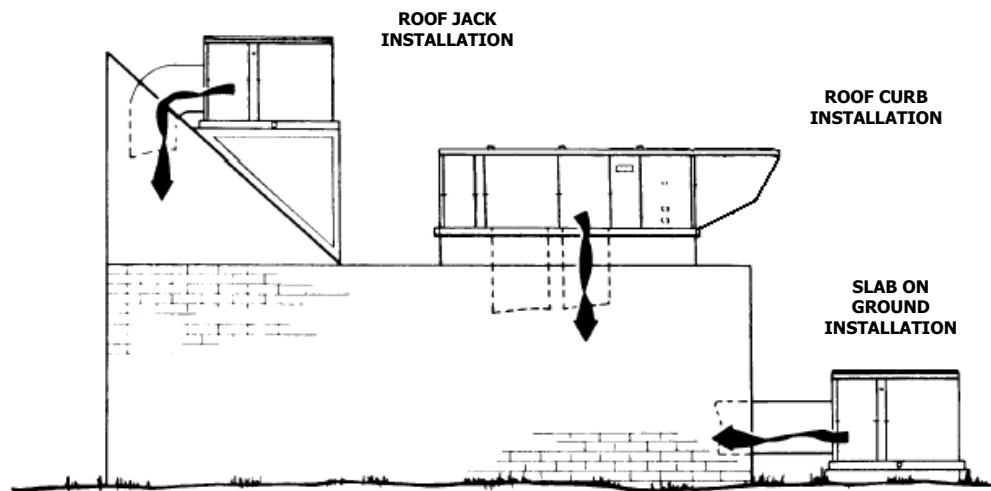


FIGURE 18 - TYPICAL UNIT APPLICATIONS - 20 TON

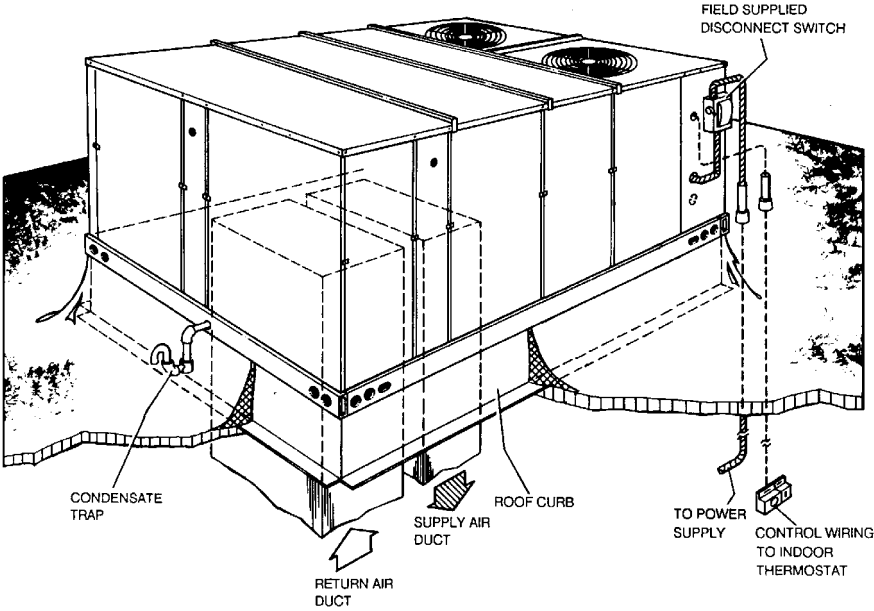


FIGURE 19 - TYPICAL ROOF-TOP INSTALLATION (15 TON SHOWN)

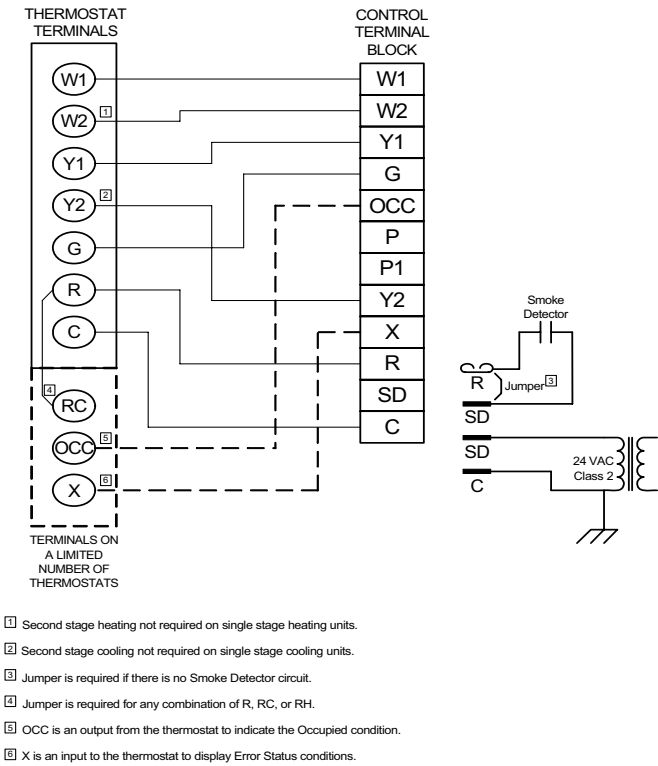


FIGURE 20 - Simplicity® CONTROL WIRING DIAGRAM

GUIDE SPECIFICATIONS

GENERAL

Units shall be manufactured by York International Unitary Products Group in an ISO 9001 certified facility.

York's Sunline 2000™ and Sunline Magnum™ units are convertible single package units. All models have dual independent refrigerant circuits for efficient part load operation and maximum comfort control. Although the units are primarily designed for curb mounting on a roof, they can also be slab-mounted at ground level or set on steel beams above a finished roof. Cooling only, cooling with gas heat and cooling with electric heat models are available with a wide variety of factory-mounted options and field-installed accessories to make them suitable for almost every application. All units are self-contained and assembled on full perimeter base rails with holes in the four corners for overhead rigging. Every unit is completely piped, wired, charged and tested at the factory to simplify the field installation and to provide years of dependable operation. All models (including those with an economizer) are suitable for either bottom or horizontal duct connections. Models with power exhaust are suitable for bottom duct connections only. For bottom duct, remove the sheet metal panels from the supply and return air openings through the base of the unit. For horizontal duct, replace the supply and return air panels on the rear of the unit with a side duct flange accessory. All supply air blowers are equipped with a belt drive that can be adjusted to meet the exact requirements of the job.

Each unit shall have 2 condenser fan motors. A high static drive option is available for applications with a higher CFM and/or static pressure requirement. All compressors include crankcase heat and internal pressure relief. Every refrigerant circuit includes an expansion valve, a liquid line filter-drier, a discharge line high pressure switch and a suction line with a freestat and low pressure/loss of charge switch. The unit control circuit includes a 75 VA transformer, a 24-volt circuit breaker and a relay board with two compressor lockout circuits, a terminal strip for thermostat wiring, plus an additional set of pin connectors to simplify the interface of additional field controls. All units have long lasting powder paint cabinets with 1000 hour salt spray test approval under ASTM-B117 procedures. All models are CSA approved. All models include a 1-year limited warranty on the complete unit. Compressors and electric heater elements carry an additional 4-year warranty. Aluminumized steel tubular heat exchangers carry an additional 9-year warranty.

DESCRIPTION

Units shall be factory-assembled, single packaged, BP180, 240 Optional Electric Heat, designed for outdoor mounted installation. These units shall have minimum EER ratings of 9.8 (15 ton) and 10.2 (20 ton).

They shall have built-in field convertible duct connections for down discharge supply/return or horizontal discharge supply/return, and be available with factory installed options or field

installed accessories. The units shall be factory wired, piped, charged with R-22 refrigerant and factory tested prior to shipment. All unit wiring shall be both numbered and color coded. All units shall be manufactured in a facility certified to ISO 9001 standards and the cooling performance shall be rated in accordance with DOE and ARI test procedures. Units shall be CGA listed, classified to ANSI Z21.47 standards, UL 1995/ CAN/CSA No. 236-M90 conditions.

UNIT CABINET

Unit cabinet shall be constructed of G90 galvanized steel, with exterior surfaces coated with a non-chalking, powdered paint finish, certified at 1000 hour salt spray test per ASTM-B117 standards. Indoor blower section shall be insulated with a minimum 1/2" thick insulation, coated on the airside. Aluminum foil faced insulation shall be used in the furnace compartment and be fastened with ridged fasteners to prevent insulation from entering the air stream. Cabinet panels shall be "large" size, easily removable for servicing and maintenance. Full perimeter base rails shall be provided to assure reliable transit of equipment, overhead rigging and proper sealing on roof curb applications. Disposable 2" filters shall be furnished and be accessible through a removable access door, sealed airtight. Units filter track shall be designed to accommodate either 2" or 4" filters. Fan performance measuring ports shall be provided on the outside of the cabinet to allow accurate air measurements of evaporator fan performance without removing panels or creating air by-pass of the coils. Condensate pan shall be internally sloped and conform to ASHRAE 62-89 self-draining standards. Condensate connection shall be a minimum of 1" I.D. female and be a ridged mount connection. Unit shall incorporate a fixed outdoor air damper with an outdoor air intake opening covered with a bird screen and a rain hood painted to match the exterior of the unit.

INDOOR (EVAPORATOR) FAN ASSEMBLY

Fan shall be a belt drive assembly and include an adjustable-pitch motor pulley. Job site selected (B.H.P.) brake horsepower shall not exceed the motors nameplate horsepower rating, plus the service factor. Units shall be designed not to operate above service factor. Fan wheel shall be double-inlet type with forward-curved blades, dynamically balanced to operate smoothly throughout the entire range of operation. Airflow design shall be constant air volume.

OUTDOOR (CONDENSER) FAN ASSEMBLY

The outdoor fans shall be of the direct-driven propeller type, discharge air vertically, have aluminum blades riveted to corrosion resistant steel spider brackets and shall be dynamically balanced for smooth operation. The 2 outdoor fan motors (15 ton) and 4 outdoor fan motors (20 ton) shall be totally enclosed with permanently lubricated bearings, internally protected against overload conditions and staged independently.

REFRIGERANT COMPONENTS

Compressors:

- a. Shall be internally protected with internal high-pressure relief and over temperature protection.
- b. Shall have internal spring isolation and sound muffling to minimize vibration and noise, and be externally isolated on a dedicated, independent mounting.

Coils:

- a. Evaporator and condenser coils shall have aluminum plate fins mechanically bonded to seamless internally enhanced copper tubes with all joints brazed. Special Phenolic coating shall be available as a factory option.
- b. Evaporator and Condenser coils shall be of the direct expansion, draw-thru, design.

Refrigerant Circuit and Refrigerant Safety Components shall include:

- a. Balance-port thermostatic expansion valve with independent circuit feed system.
- b. Filter drier/strainer to eliminate any moisture or foreign matter.
- c. Accessible service gage connections on both suction and discharge lines to charge, evacuate, and measure refrigerant pressure during any necessary servicing or troubleshooting, without losing charge.
- d. The refrigeration system shall provide at least 15° F of sub-cooling at design conditions.
- e. All models shall have two independent circuits.

UNIT CONTROLS

- a. Unit shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-volt transformer side.
- b. Unit shall incorporate a lockout circuit which provides reset capability at the space thermostat or base unit, should any of the following standard safety devices trip and shut off compressor.
 - 1. High-pressure switch.
 - 2. Freeze-protection thermostat, evaporator coil. If any of the above safety devices trip, a LED (light-emitting diode) indicator shall flash a diagnostic code that indicates which safety switch has tripped.
- d. Unit shall incorporate "AUTO RESET" compressor over temperature, over current protection.
- e. Unit shall operate with conventional thermostat designs and have a low voltage terminal strip for easy hook-up.

- f. Unit control board shall have on-board diagnostics and fault code display.
- g. Standard controls shall include anti-short cycle and low voltage protection, and permit cooling operation down to 0 °F.
- h. Control board shall monitor each refrigerant safety switch independently.
- i. Control board shall retain last 5 fault codes in non volatile memory, which will not be lost in the event of a power loss.

ELECTRIC HEATING (BP180, BP240 MODELS)

Nickel chromium electric heating elements shall be provided as required by the application with 1 or 2 stage control, as required, from 13.5 KW to 72 KW capacities. The heating section shall have a primary limit control(s) and automatic reset to prevent the heating element system from operating at an excessive temperature. Units with Electric Heating shall be wired for a single point power supply with branch circuit fusing (where required).

UNIT OPERATING CHARACTERISTICS

Unit shall be capable of starting and running at 125° F outdoor temperature, exceeding maximum load criteria of ARI Standard 340/360. The compressor, with standard controls, shall be capable of operation down to 0° F outdoor temperature.

ELECTRICAL REQUIREMENTS

All unit power wiring shall enter unit cabinet at a single factory provided location and be capable of side or bottom entry, to minimize roof penetrations and avoid unit field modifications. Separate side and bottom openings shall be provided for the control wiring.

STANDARD LIMITED WARRANTIES

- Compressor 5 Years
- Electric Heat Element 5 Years
- Other Parts 1 Year

OPTIONAL OUTDOOR AIR (Shall be made available by either/or):

- **ELECTRONIC ENTHALPY AUTOMATIC ECONOMIZER** - Outdoor and return air dampers that are interlocked and positioned by a fully-modulating, spring-return damper actuator. The maximum leakage rate for the outdoor air intake dampers shall not exceed 2% when dampers are fully closed and operating against a pressure differential of 0.5 IWG. A unit-mounted potentiometer shall be provided to adjust the outdoor and return air damper assembly to take in CFM of outdoor air to meet the minimum ventilation requirement

of the conditioned space during normal operation. During economizer operation, a mixed-air temperature control shall modulate the outdoor and return air damper assembly to prevent the supply air temperature from dropping below 55°F. Changeover from compressor to economizer operation shall be provided by an integral electronic enthalpy control that feeds input into the basic module. The outdoor intake opening shall be covered with a rain hood that matches the exterior of the unit. Water eliminator/filters shall be provided. Simultaneous economizer/compressor operation is also possible. Dampers shall fully close on power loss.

- **BAS-READY ECONOMIZER** - Outdoor and return air dampers that are interlocked and positioned by a fully-modulating, spring return damper actuator. The maximum leakage rate for the outdoor air intake dampers shall not exceed 2% when dampers are fully closed and operating against a pressure differential of 0.5 IWG.

For units with Simplicity® Intelli-Comfort™ control, free-cooling shall be available while the outdoor dry bulb temperature (OAT) remains below a programmable set-point of the controller. Field-installed humidity sensors for either outdoor air or outdoor & return air streams are available to provide free-cooling based on single-enthalpy or dual-enthalpy configurations, respectively. If free-cooling is available, a call for cooling shall modulate the economizer in order to maintain a supply air temperature (SAT) programmable set-point. With the use of a field-installed indoor air quality sensor, the controller shall provide Demand Ventilation by modulating the economizer dampers to allow more outside airflow upon detection of elevated indoor CO2 concentrations above a programmable set-point. With an additional field-installed outdoor air quality sensor, Differential Demand Ventilation shall be provided.

The outdoor intake opening shall be covered with a rain hood that matches the exterior of the unit. Water eliminator/filters shall be provided.

Simultaneous economizer/compressor operation is also possible. Dampers shall fully close on power loss.

- **MOTORIZED OUTDOOR AIR DAMPERS** - Outdoor and return air dampers that are interlocked and positioned by a 2-position, spring-return damper actuator. The maximum leakage rate for the outdoor air intake dampers shall not exceed 2% when dampers are fully closed and operating against a pressure differential of 0.5 IWG. A unit-mounted potentiometer shall be provided to adjust the outdoor and return air damper assembly to take in the design CFM of outdoor air to meet the ventilation requirements of the conditioned space during normal operation. Whenever the indoor fan motor is energized, the dampers open up to one of two pre-selected positions - regardless of the outdoor air enthalpy. Dampers return to the fully closed position when the indoor fan motor is de-energized. Dampers shall fully close on power loss.

OTHER PRE-ENGINEERED ACCESSORIES AVAILABLE

- **ROOF CURB** - 14" high, full perimeter curb with wood nailer (shipped knocked-down).
- **100% BAROMETRIC RELIEF DAMPER** - Contains a rain hood, air inlet screen, exhaust damper and mounting hardware. Used to relieve internal air pressure through the unit.
- **BURGLAR BARS** - Designed to work with above roof curbs, depending on unit model. Fits duct openings of curb supply and return air openings.
- **SIDE DUCT FLANGE** - Supply and return air duct flanges for side duct applications. Do not use on units with power exhaust.
- **HIGH STATIC DRIVE** - Includes blower pulley and belt for higher CFM and/or static pressure requirements.
- **WOOD SKID** - Allows unit to be handled with 90" forks.
- **COIL GUARD KIT** - Guard for cooling coil.

OTHER FACTORY INSTALLED OPTIONS

- **POWER EXHAUST OPTION** - To work in conjunction with economizers.
- **TECHNICOAT PHENOLIC COATED CONDENSER AND EVAPORATOR COIL**
- **ELECTRONIC SINGLE ENTHALPY ECONOMIZER**
- **DIRTY FILTER SWITCH**
- **PHASE MONITOR**
- **COIL GUARD**
- **POWERED GFI CONVENIENCE OUTLET**
- **NON-POWERED GFI CONVENIENCE OUTLET**
- **BAS CONTROLS** (Simplicity® Intelli-Comfort™, CPC, JOHNSON, HONEYWELL, NOVAR®)
- **BAS READY ECONOMIZER** (2-10 V.D.C. Actuator without a controller)
- **HINGED FILTER DOOR ACCESS AND TOOL FREE ACCESS PANELS**
- **HINGED TOOL FREE BLOWER, BLOWER MOTOR, FILTER AND ELECTRICAL ACCESS PANELS**
- **HIGH STATIC DRIVE**
- **2" THROW AWAY FILTERS**
- **4" PLEATED FILTERS**
- **DISCONNECT SWITCH**
- **SUPPLY AIR SMOKE DETECTOR**
- **RETURN AIR SMOKE DETECTOR**
- **STAINLESS STEEL DRAIN PAN**

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