

Liebert Challenger™ 3000

Technical Data Manual - Floor Mounted Systems, Nominal 3 & 5 Ton Systems, Air Cooled, Water/Glycol Cooled, GLYCOOL, Chilled Water, Split Systems, 50 & 60 Hz



PRODUCT NOMENCLATURE



NOTE

Tables i, ii and iii show nomenclature for the complete range of all available product options. Not all combinations are possible. For assistance, contact your local dealer, Liebert representative or call 1-800-543-2778.

Table i Product model information

B	F	042	A	—	A	A	E	I
Challenger 3000	E = Downflow with Econ-O-Coil	Nominal capacity in thousand BTUH	A=Air Cooled		A = 460/60/3	A = Advanced Microprocessor	0 = No Reheat	0 = No Humidifier
	F = Downflow		C= Chilled Water		B = 575/60/3	G = Advanced Microprocessor w/Graphics	E = Electric Reheat	I = Infrared Humidifier
	K = Upflow with Econ-O-Coil		E= Evaporator		C = 208/60/3		H = Hot Water Reheat	S = Steam Generating Humidifier
	U = Upflow		G= GLYCOOL		D = 230/60/3		G = Hot Gas Reheat	
			WG = Water Cooled/Glycol Cooled		2 = 380/60/3		S = SCR Reheat	
					J = 200/50/3			
					H = 230/50/3			
					M = 380/415/50/3			

Table ii Split system configurations

Capacity	Evaporator		Condensing Units		
			Air Cooled Prop Fan Condensing Unit	Air Cooled Centrifugal Condensing Unit	Water/Glycol Condensing Unit
3 Tons	60 Hz (50 Hz)	B*036E (B*035E)	PFH_42A (PFH_41A)	MC_40A (MC_39A)	MC_44W (MC_43W)
5 Tons	60 Hz (50 Hz)	B*060E (B*059E)	PFH_67A (PFH_66A)	MC_65A (MC_64A)	MC_69W (MC_68W)

* F = Downflow U = Upflow

Table iii Self-contained system configurations

Capacity		Indoor Unit	Remote Equipment		System Type
			Air Cooled Condenser	Drycooler/Pump	
3 Ton	60 Hz (50 Hz)	B*042A (B*040A)	CS@083		Air Cooled
	60 Hz (50 Hz)	B*046WG (B*045WG)		DSF069 3/4 HP Pump 1-1/2 HP Pump 50 Hz	Glycol-Cooled or Self-Contained - Water Cooled
	60 Hz (50 Hz)	B*068C (B*072C)			Self-Contained - Chilled Water
5 Ton	60 Hz (50 Hz)	B*067A (B*065A)	CS@083		Air Cooled
	60 Hz (50 Hz)	B*071WG (B*070WG)		DSF109 3/4 HP Pump 60 Hz 1-1/2 HP Pump 50 Hz	Glycol-Cooled or Self-Contained - Water Cooled
	60 Hz (50 Hz)	B#061G (B#058G)		DSO109 1-1/2 HP Pump	GLYCOOL™
	60 Hz (50 Hz)	B*102C (B*101C)			Self-Contained - Chilled Water

* F = Downflow U = Upflow
 # E = Downflow K = Upflow
 @ F = Fan Speed Control L = Lee Temp

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DEDICATED, PRECISE ENVIRONMENTAL CONTROL—ESSENTIAL FOR SENSITIVE ELECTRONICS

For sensitive electronics, environmental control is more than simple cooling. “Comfort” air conditioning systems are designed for the comfort of people and simply cannot provide the kind of environment required by high performance computer or communication equipment.

Temperature Control

The high density heat load in a computer room or other similar application is beyond the capacity of ordinary air conditioning systems.

Sensitive electronics are best maintained in a stable environment of 72°F ±2°F (22.2°C ±1°C). Because computers and communications equipment generate large quantities of heat in small areas, six to 10 times the heat density of normal office space, the air conditioning system must have more than just enough cooling capacity. It must have the precision to react quickly to a drastic change in heat load and prevent wide temperature fluctuations—something a large building system cannot do.

Humidity Control

The electronic equipment must be protected from both internal condensation and static electricity discharges.

Maintaining the correct humidity level in the room is just as important as maintaining proper temperature. When humidity is too high, condensation may form inside electronic equipment and damage it. If humidity is too low, static electricity could disrupt operation or even shut down the electronic system. An ordinary building system cannot normally control the environment within these boundaries.

Air Volume

Computers and other sensitive electronics require greater air volumes than ordinary air conditioning can provide. Typical comfort systems are designed to provide between 300 and 400 CFM (cubic feet per minute), (500–700 CMH) per ton of cooling. Computer systems require between 500 and 600 CFM (850–1020 CMH) per ton. The high density heat load in a relatively small space requires more changes of air than a less dense “comfort” application.

While a normal office space requires only two air changes per hour, a room filled with electronic equipment requires up to 30 changes per hour. Without proper air volume, hot spots and temperature fluctuations could develop within the room. Also, greater air volumes provide the higher sensible heat ratios required by electronic computer equipment.

Air Filtration

A clean environment of properly filtered air is essential. Build-up of dust and fibers attracted by operating electronics can cause faults and impair the operation of electromechanical devices, such as switches and disk drives.

In short, today's electronics need the same precision environmental control that mainframe computers need. The difference is that instead of one large computer room there are several small, often crowded rooms, widely dispersed throughout a building, plant or campus. Conditions and requirements can vary widely.

Year Round Operation

Comfort conditioning systems cannot be relied upon 24 hours per day 365 days per year. They are typically designed to operate 10 hours per day, from spring to autumn. Many “comfort” systems have no provision for winter operation. A precision environmental control system is designed for operation at temperatures down to -30°F (-34.4°C).

Agency Listed

Standard 60 Hz units are UL listed and CSA (NRTL-C) certified. NRTL-C meets both U.S. and Canadian government safety requirements, providing fast, hassle-free inspection and building code approvals. The units are also MEA listed for New York City applications.



PRECISION ENVIRONMENTAL CONTROL FOR INDUSTRIAL, TELECOMMUNICATIONS, MEDICAL AND DATA PROCESSING EQUIPMENT

Data processing power is moving from the specialized environment of the computer room to the office and the factory floor.

At the same time, the applications are growing exponentially. From yesterday's spreadsheets and word processors, micro- to mid-range computers control LANs and WANs, manage complex telecommunications systems, optimize manufacturing processes and facilitate sophisticated testing and laboratory functions.

Computers and sensitive electronics tend to be grouped, often in specialized rooms. This makes operation and service easier, but it also creates the need for precision environmental control—the coordinated management of temperature, humidity and air filtration.

Challenger 3000

Challenger 3000 provides the precision and flexibility required by a broad range of applications.

- Microprocessor-based controls (with a choice of monitoring systems based on your needs) allow you to select temperature and humidity ranges.
- A-frame coil (oriented to airflow) provides a large cooling surface area, and more precise control of temperature and humidity.

Multiple Configurations to Fit a Variety of Spaces

Though electronic equipment rooms share some common protection requirements, their application requirements can vary greatly. The room may or may not have a raised floor or an existing heat rejection loop. Budget and space requirements may limit the options a contractor has.

The Challenger 3000 is available in 10 different configurations, with upflow and downflow air distribution options.

Efficiency in Economic Terms

The Challenger 3000 occupies 7 square feet (.65 square meters) of floor space. It can be located in a corner of the room or against a wall, as all service access is from the front of the unit. With room floor space valued at a premium per square foot, the small footprint of the Challenger 3000 makes economic good sense.

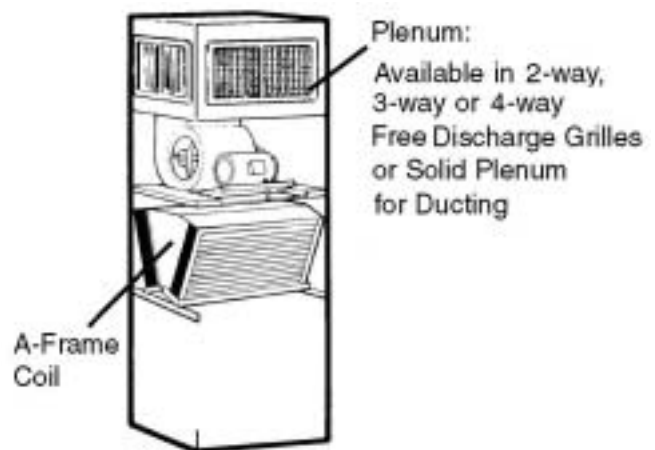
GLYCOOL

GLYCOOL is a patented Liebert process that can significantly reduce energy costs during periods of low outdoor ambient temperatures.

The GLYCOOL system is a normal glycol system with the addition of a second cooling coil in the air handling unit and a three-way valve. During colder months, the glycol solution returning from the outdoor drycooler is routed to the second coil, and becomes the primary source of cooling for the room. At ambient temperatures below 35°F (1.6°C), the cooling capacity is sufficient to handle the total cooling needs of the room. As the compressor is responsible for the majority of the power consumption of the air conditioning unit, a GLYCOOL system can substantially reduce energy costs.

Figure 1 Unit configurations

Chilled Water, Self-Contained System



Water Cooled, Self-Contained System

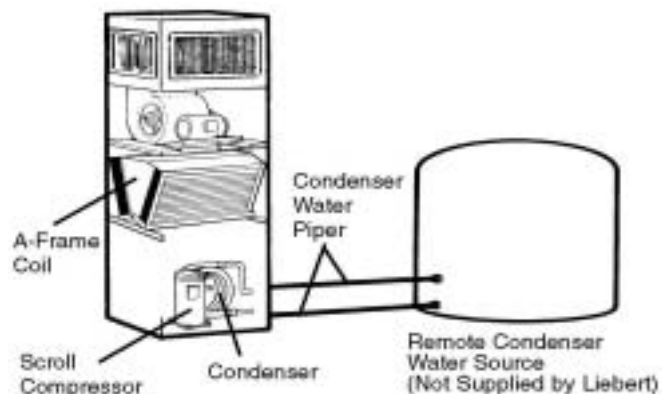
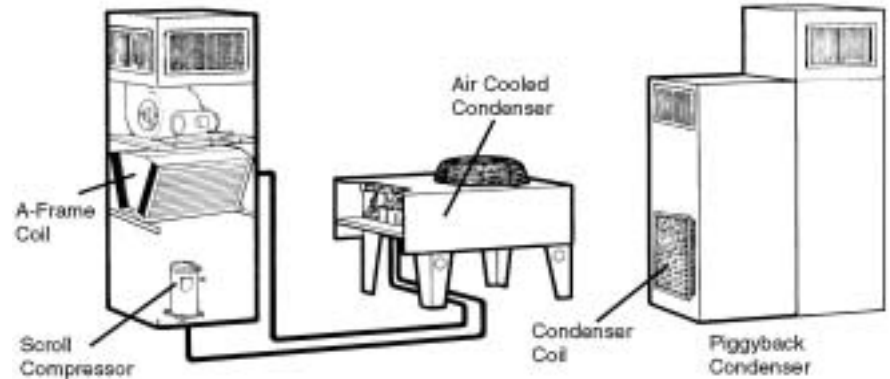
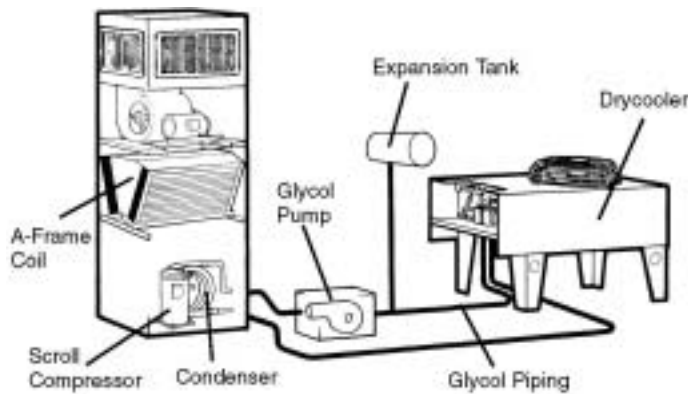


Figure 2 Unit configurations, continued

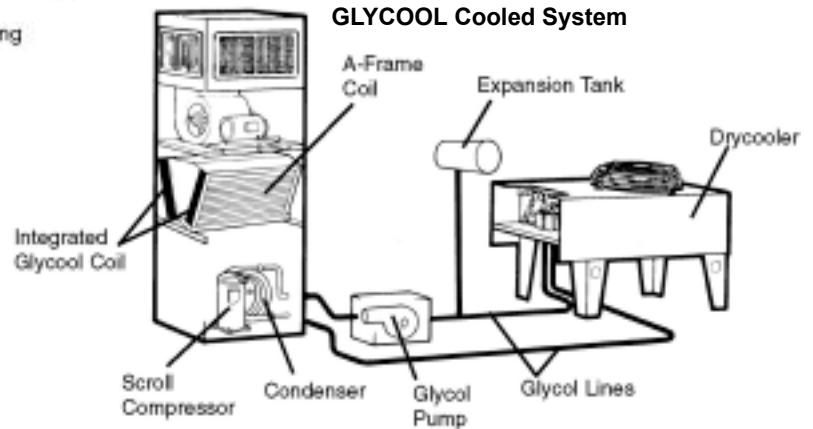
Air Cooled, Self-Contained System With Matching Condensers



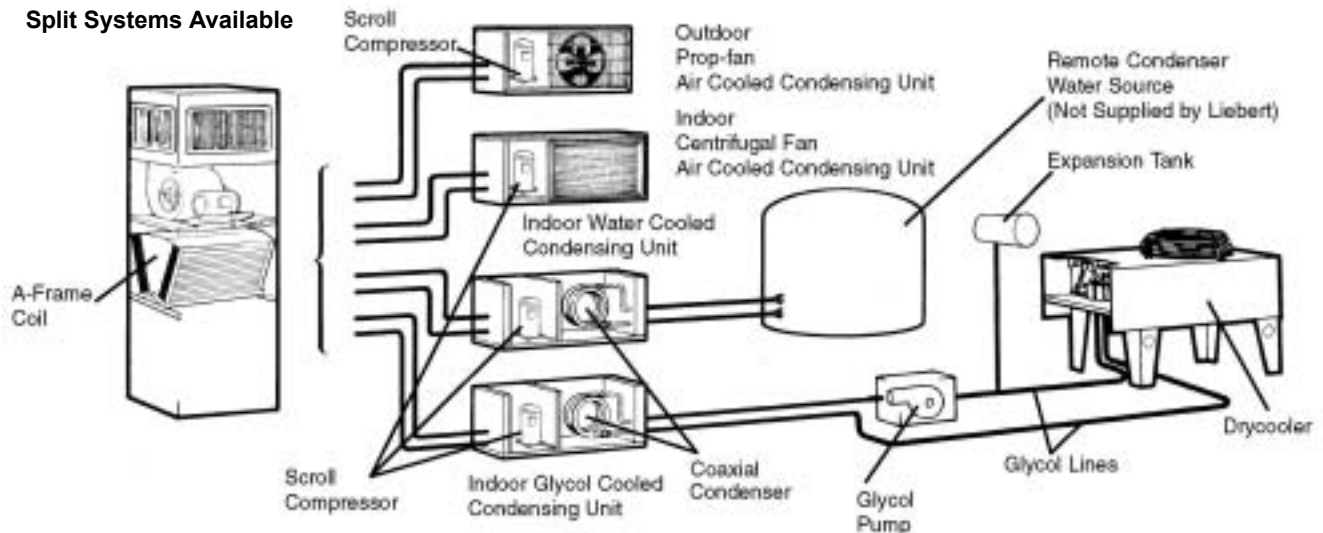
Glycol Cooled, Self-Contained System With Matching Drycooler and Pump



GLYCOOL Cooled System



Split Systems Available



LOCAL MONITORING SYSTEMS

Two levels of microprocessor control systems are available providing precise control and monitoring of the critical space.

The **Advanced Microprocessor** is standard, and the **Advanced Microprocessor with Graphics** is optional. The main control functions are similar for both controls.

Control

The user must enter a three-digit password before making changes.

- Temperature Setpoint 65-85°F (18-29°C)*
- Temperature Sensitivity +1-10°F (0.6-5.6°C)
- Humidity Setpoint 20-80% RH*
- Humidity Sensitivity 1-30% RH
- High Temperature Alarm 35-90°F (2-32°C)
- Low Temperature Alarm 35-90°F (2-32°C)
- High Humidity Alarm 15-85% RH
- Low Humidity Alarm 15-85% RH

* The microprocessor may be set within these ranges; however, the unit may not be able to control to extreme combinations of temperature and humidity.

Control Type

Factory set-up for Intelligent Control which uses “fuzzy logic” and “expert systems” methods. Proportional and Tunable PID are user selectable options.

Internal System Control

- **Compressor short cycle control:** Prevents compressor short-cycling and needless compressor wear.
- **System auto restart:** The auto restart feature will automatically restart the system after a power failure. Time delay is programmable.
- **Sequential Load Activation:** On initial start-up or restart after power failure, each operational load is sequenced to minimize total inrush current.
- **Hot Water / Econ-O-Coil Flush Cycles:** Hot water reheat coils and Econ-O-Coils are periodically flushed to prevent a build-up of contaminants.
- **Temperature/Humidity Sensor Calibration:** The sensors may be calibrated from the front monitor panel to insure that all units in the room are similarly calibrated, assuring greater precision.

Monitoring

- **Normal display:** Includes present room temperature and humidity, active functions (cooling, heating, dehumidifying), and any alarms.
- **Operating status:** Displays each control operation in percent.
- **Read analog inputs function:** Displays the present values of up to four analog inputs.

Diagnostics

- **Input diagnostics:** Reviews inputs to the control system.
- **Control board diagnostics:** Initiates a self-test of the control system.
- **Output diagnostics:** Tests major components by turning them on and off from the control panel. Includes: main fan, compressor, liquid line solenoid valve, hot gas bypass valve, chilled water or chilled GLYCOOL valve, R-5 relay, reheat, hot water reheat valve, humidifier, humidifier make-up valve, and common alarm.

Logging

- **Alarm history log:** The Advanced Microprocessor displays the 10 most recent alarms. The Advanced Microprocessor with Graphics displays the most recent 60 alarms. Both provide a time and date stamp for each event
- **Run time log:** Displays run time and hours for major components (also allows reset of run hours) including compressors, GLYCOOL, fan, humidifier, and reheat.

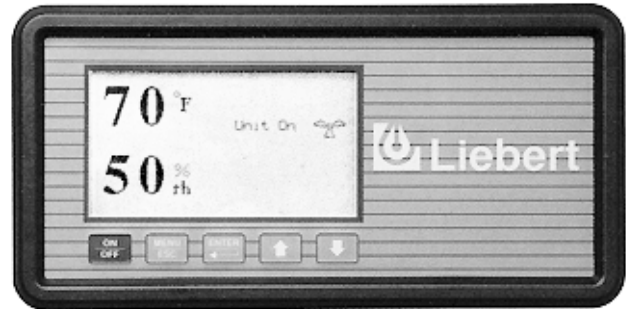
Alarms

- Humidifier problem
- High head pressure
- Change filter
- Loss of air flow
- High temperature
- Low temperature
- High humidity
- Low humidity
- Compressor overload (opt)
- Main fan overload (opt)
- Low suction pressure
- Short cycle
- Loss of power
- Custom alarm (choose up to 4)
 - Water under floor
 - Smoke detected
 - Standby GC pump on
 - Loss of water flow
 - Standby unit on
 - User customized text

Figure 3 Microprocessor control systems



Advanced Microprocessor Control System.
Backlit 4 x 20 Liquid Crystal Display.



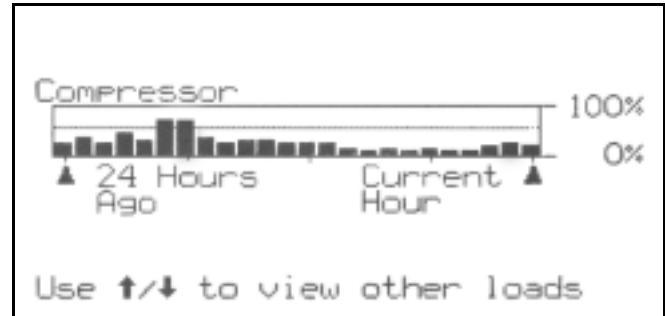
Advanced Microprocessor w/Graphics Control
System—Optional. Backlit 240 x 128 dot matrix
graphics display.

Graphical Displays (Advanced Graphic Control Only)

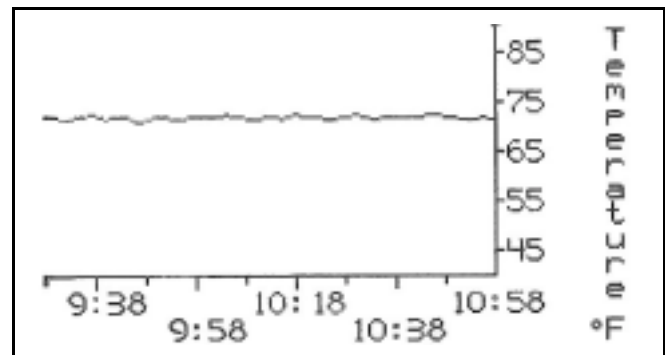
- Individual plots of temperature, humidity and the four analog inputs.
- Bar graph plots of individual component run history by hour.
- Floor plan of optional water detection system layout including on alarm.

Status indication of operating modes with current temperature and humidity.

Figure 4 Optional Views With Advanced Graphics



The runtime screen provides data in either tabular or easy-to-read graphic formats.



Histograms—historical depictions—of temperature or humidity can be displayed on the screen for analysis. This is especially helpful in tracking the environmental factors of an alarm.



STANDARD FEATURES—ALL SYSTEMS

Cabinet and Frame

The frame, 14 gauge, MIG welded tubular and formed steel, provides maximum support while 1" (25.4mm) deep steel panels with 1-1/2 lb. (.68 kg) insulation protect and quiet the system. The front door can be opened for service without shutting off the system. All components are accessible for service/maintenance through the front of the unit.

Liebert enhances the Challenger 3000's resistance to corrosion by applying a black, powder-coat finish to all frame components. Exterior panels are similarly protected with durable powder-coating.

Electrical Panel

The high voltage compartment contains the contactors, transformers and overloads and all other high-voltage components.

Each high voltage component is protected by a separate overcurrent protective device. The entire high voltage panel is enclosed by a safety lock dead front panel. When the front door is opened by operating personnel, the high voltage components remain enclosed for operator safety.

Fan Section

The Challenger 3000 features a quiet, low speed fan assembly with double inlet blower, lifetime lubrication and self-aligning ball bearings. The motor and variable pitch drive are mounted on an adjustable base. The entire blower/ motor assembly is mounted on vibration isolators for smoother operation.

The draw-through design of the fan section provides even air distribution across the coil, controlled air for bypass humidification, elimination of air bypass around the filters and low internal cabinet pressure drop.

Infrared Humidifier

High-intensity quartz lamps over the stainless steel humidifier pan permit clean, particle-free vapor to be added to the air within 5 to 6 seconds of the electronic call from the microprocessor control.

The quartz lamps provide radiant energy that evaporates water in a pure state, without solids.

The Infrared Humidifier is equipped with an automatic water supply system that significantly reduces cleaning maintenance. This system has an adjustable water over-feed to prevent mineral precipitation. A drain valve is provided to easily empty the humidifier pan prior to inspection or servicing. A control valve regulates flow at water pressures between 5 and 150 psig (34.5 and 1034 kPa) and includes a Y-strainer.

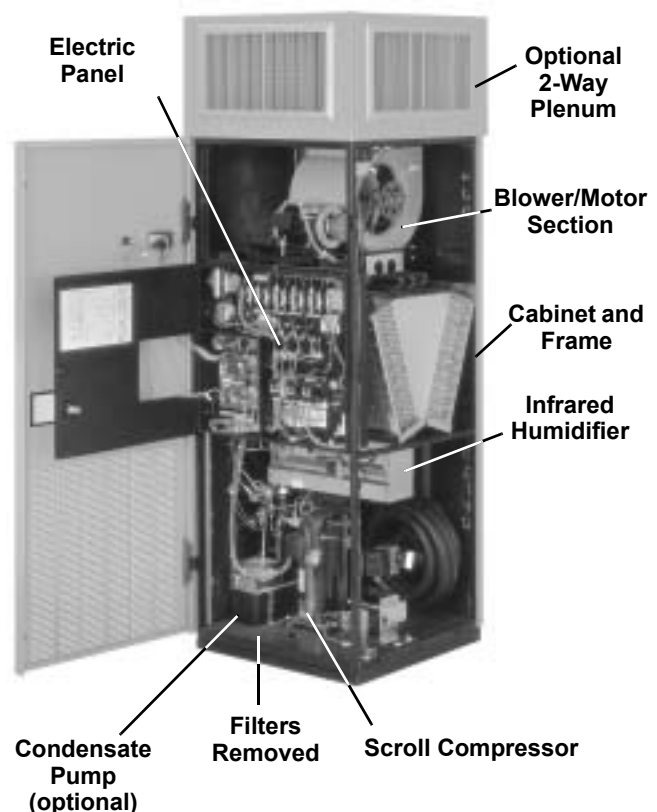
Electric Reheat

The two-stage 304 stainless steel reheat elements are a rigid, fin-tubular design that have extended operation life. The reheat has ample capacity to maintain room dry-bulb conditions during a system call for dehumidification. The two stages give an accurate, controlled response to the requirements of the computer room. The low watt density, electrically enclosed elements are surrounded by the tube and fins, reducing sheath temperatures and eliminating ionization.

Filters

The standard pleated 2" (51mm) filter with an efficiency of 20% (based on ASHRAE 52.1) can be changed quickly and easily through the front of the unit.

Figure 5 Upflow GLYCOOL Challenger 3000 with front return



CHILLED WATER SYSTEM—STANDARD & OPTIONAL FEATURES

Chilled Water System—Standard Features

Cooling Coil

The chilled water cooling coil is designed for closed-loop applications using properly maintained water. It is constructed of copper tubes and aluminum fins. A-frame coils are used on downflow units and V-frame coils are used on upflow units. To ensure quality, the coil is manufactured to the highest standards in the industry.

Modulating Motor

The flow of chilled water through the cooling coil is controlled by an electronic modulating motor. The microprocessor control will activate the motor when a need for cooling or dehumidification exists. The motor will position the valve to precisely match the needs of the conditioned space.

Line Insulation

All chilled water piping within the Challenger 3000 is fully insulated to assure full system capacity and prevent condensation.

Three-Way Control Valve

The fully insulated control valve gives the conditioned space the precise cooling needed by electronic equipment. Its unique design requires no overtravel linkages and never requires adjustment.

Chilled Water System—Optional Features

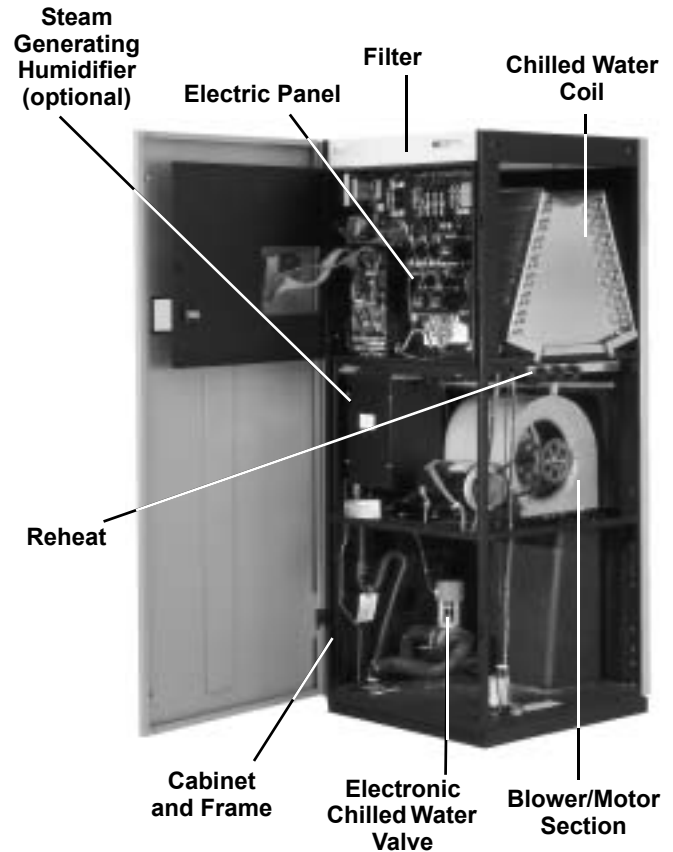
Chilled Water Flow Switch

The flow switch will activate the alarm system and/or shut down the system should the chilled water supply be interrupted. The switch is factory wired and mounted in the chilled water valve compartment.

High Pressure

For special applications, a high pressure, modulating 3-way or 2-way valve can be provided. The valve is designed for 400 psig (2758 kPa) water pressure.

Figure 6 Chilled water Challenger 3000 downflow with top return



REFRIGERATION SYSTEMS

Two versions are available:

1. Self-Contained Systems
2. Split Systems

Self-Contained Systems

These systems feature a scroll compressor and controls, expansion valve, hot gas bypass and evaporator coil in the room unit.

Air Cooled models also include a crankcase heater on the compressor and require field connection to remote air cooled condenser.

Water, Glycol and GLYCOOL models also include a coaxial condenser with field connections required to the water or glycol coolant loop.

Water/Glycol models have 2-way WRV with bypass. GLYCOOL models have 3-way WRV.

Split Systems

These pre-charged systems feature the evaporator coil and expansion valve in the room unit, with the scroll compressor, and the condensing equipment located in one of several different types of condensing units. Pre-charged line sets are available on 3-ton systems.

Refrigeration System Components— Standard Features

Compressor

The heart of the refrigeration system is the compressor.

All self-contained evaporator units and split system condensing units contain a high efficiency, quiet operating scroll compressor. The compressors have internal vibration isolating mountings, pressure safety controls and built-in overload protection.

Evaporator Coil

The evaporator coil is designed for the high sensible heat ratio required by electronic equipment applications. The copper tube, aluminum fin coils are configured as A-frame coils on downflow units and V-frame coils on upflow units for smooth air flow through the unit.

Safety Control

Every Challenger compressor has a high pressure switch with an exclusive manual reset after high pressure cut-out. This prevents cycling the compressor at high pressure, resulting in greater efficiency and longer compressor life.

Expansion Valve

The externally equalized thermostatic expansion valve smoothly controls the flow of refrigerant through the coil and provides precise control of superheat.

AIR COOLED SYSTEM—STANDARD AND OPTIONAL FEATURES

Air Cooled, Self-Contained Systems— Standard Features

Pump Down Control

The compressor pump-down control is accomplished by a liquid-line solenoid valve used in conjunction with a low pressure switch.

Condenser

The Liebert manufactured low profile, direct drive propeller fan type air cooled condenser provides quiet, efficient operation.

It is constructed of aluminum with a copper tube and aluminum fin coil for corrosion resistance. An integral, factory wired and tested control panel reduces installation time.

Fan Speed Control

The winter control system features a variable speed motor and a specially designed solid-state fan speed control transducer.

The transducer senses refrigerant pressure and varies the speed of the fan motor to maintain constant condensing temperature and system capacity. This system permits operation at ambient temperatures as low as -20°F (-29°C).

Air Cooled, Self-Contained Systems— Optional Features

Lee-Temp Winter Control Condenser

The Lee-Temp winter control system's heated receivers permit startup and positive head pressure control at ambient temperatures as low as -30°F (-34.4°C). The Lee-Temp package includes insulated receiver, a pressure relief valve, three-way head pressure control valves, and rotalock valves (see **Figure 7** below).

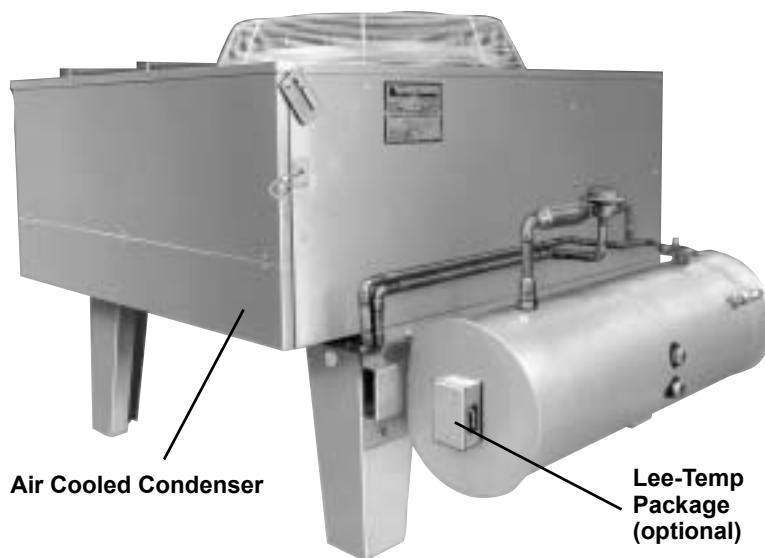
Series PB Condenser

The Series PB condenser converts the Challenger 3000/Lee-Temp system into a self-contained package when an outdoor location is not practical.

Quiet-Line Condensers

Quiet-Line Condensers can help your facility meet the strictest noise codes, and do so at less cost than traditional condensers with acoustical shielding.

Figure 7 Air cooled condenser with Lee-Temp



Air Cooled Split Systems—Standard Features

Centrifugal Fan, Condensing Unit

The centrifugal condensing unit may be connected to the evaporator section by means of pre-charged refrigeration lines (3 ton only). This greatly simplifies installation and keeps installation costs low. The copper-tube, aluminum-fin coil is equipped with low temperature controls to assure year-round operation to -20°F (-29°C). The condensing unit is completely factory wired, charged and tested and is ready for final connections.

The centrifugal fan condensing unit includes scroll compressor, condenser coil, centrifugal blower assembly, high-pressure switch, Lee-Temp head pressure control.

Condensing unit has hot gas bypass standard feature which bypasses hot gas around the compressor directly to the suction side of the compressor to provide capacity control and reduce compressor cycling. System includes liquid injection valve to maintain proper suction superheat.

Unit must be mounted indoors. Duct flanges are provided.

Propeller Fan Condensing Unit

The air cooled condensing unit can be mounted on the roof or a ground level site. The condensing unit housing is manufactured of galvanized steel with a powder coat finish. The copper-tube, aluminum-fin coil is equipped with low temperature controls to assure year-round operation to -30°F (-34.4°C). The condensing unit is completely factory wired, charged and tested and is ready for final connections. (See illustration below)

The standard prop fan condensing unit includes scroll compressor, prop fan, high head pressure switch, hot gas bypass and Lee-temp head pressure control (for operation down to -30°F (-39°C) ambient.)

Figure 8 Outdoor propeller fan condensing unit



Propeller Fan Condensing Unit Options

This unit is available in these optional configurations:

- 105°F (40°C) ambient for high ambient conditions.
- 95°F (35°C) ambient Quiet-Line for low noise level conditions below 58 dBa.

Air Cooled Split Systems—Optional Features

Factory installed non-fused disconnect switch allows unit to be turned off for maintenance. Disconnect switch is available on indoor condensing units only.

Pre-Charged Line Sets

(3 ton only): Consists of one pre-charged liquid line and one pre-charged insulated suction line of soft copper tubing. Each line has one male quick-connect coupling and one female quick-connect coupling with an access valve connection.

Available in 15 ft. (4.6m) and 30 ft. (9.1m) lengths for interconnection of remote located condenser module. Maximum recommended distance between evaporator and condenser modules with pre-charged line sets is 45 ft. (13.7m). For longer runs, use sweat adapter kit.

Refrigerant-Line Sweat Adapter Kit

(3 ton only): Contains two suction and two liquid line compatible fittings that allow field-supplied interconnecting refrigerant lines to be used.

WATER/GLYCOL COOLED SYSTEMS—STANDARD AND OPTIONAL FEATURES

Water/Glycol Self-Contained Systems—Standard Features

Liquid Cooled Condensers

A co-axial condenser provides ample capacity to handle the heat rejection needs of the system while using a minimum of liquid and low total pressure drop.

Regulating Valves

Head pressure operated regulating valves accurately control the condensing temperature and maintain system capacity for various entering liquid flow rates and temperatures. Two-way valves with bypass are standard.

Water/Glycol Cooled, Self-Contained System—Optional Features

Three-way Regulating Valves

Three-way valves provide accurate control of condensing temperature and thus maintain constant system capacity while also keeping the condenser water flow rate constant.

High Pressure

The high pressure option for the condenser circuit consists of a regulating valve and a condenser rated at 350 psig (2413 kPa) water-pressure. This option is required in applications with large static head pressures.

Compressor Crankcase Heater

A compressor crankcase heater is available to prevent the migration of refrigerant to the compressor during off cycles.

Hot Gas Reheat

The hot gas reheat assembly consists of a 3-way directional solenoid operated valve and a hot gas reclaim coil.

Water/Glycol Split System—Standard Features

Water/Glycol Cooled Condensing Units

Factory charged and sealed, the water cooled condensing unit is ready to be installed quickly and easily. The counter-flow coaxial condenser with two-way or three-way regulating valve designed for 150 psi (1034.3 kPa) is matched to the heat rejection requirements of the compressor for a variety of flow rates and fluid temperatures.

Condensing unit has a hot gas bypass standard feature that bypasses hot gas around the compressor directly to the suction side of the compressor to provide capacity control and reduce compressor cycling. System includes liquid injection valve to maintain proper suction superheat.

Water/Glycol Cooled, Split System—Optional Features

High Pressure

The high pressure option for the condenser circuit consists of a 2-way or 3-way water regulating valve and condenser rated at 350 psig (2413 kPa) water pressure. This option is required in applications with large static heads.

Factory Installed Non-Fused Disconnect Switch

Allows unit to be turned off for maintenance. Disconnect switch is available on indoor condensing units only.

Pre-Charged Line Sets—3 Ton Only

Consists of one pre-charged liquid line and one pre-charged insulated suction line of soft copper tubing. Each line has one male quick-connect coupling and one female quick-connect coupling with an access valve connection.

Available in 15 ft. (4.6m) and 30 ft. (9.1m) lengths for interconnection of remote located condenser module. Maximum recommended distance between evaporator and condenser with pre-charged line sets is 45 ft. (13.7m). For longer runs, use sweat adapter kit.

Refrigerant-Line Sweat Adapter Kit

(3 ton only) - contains two suction and two liquid line compatible fittings that allow field-supplied interconnecting refrigerant lines to be used.

Glycol Cooled System—Heat Rejection Devices

Self-Contained and Split Systems

Fan Speed Control Drycooler

The Liebert manufactured Fan Speed Control drycooler is constructed of aluminum and features copper tubes and aluminum fin design. It is low profile, propeller fan type and provides quiet, trouble free heat rejection. The drycooler features a variable speed fan motor and a specially engineered solid state fan speed transducer. The transducer senses the temperature of the leaving glycol and modulates the speed of the fan to maintain proper glycol temperatures. An integral, factory-wired and tested control panel reduces installation time.

Glycol Pump

The glycol system includes a matching centrifugal glycol pump. It is mounted in a vented, weatherproof enclosure.

Optional Equipment—See **page 13**.

GLYCOOL SYSTEMS—STANDARD AND OPTIONAL FEATURES

GLYCOOL (Self-Contained Models Only)

The Liebert GLYCOOL free-cooling system is integrated with a glycol cooled Challenger 3000.

At outdoor temperatures below 35°F (1.6°C), the GLYCOOL coil is capable of providing total system capacity. At outdoor temperatures between 35° and 65°F (1.6° and 18.3°C), the unique modulating valve permits partial cooling of the space by the GLYCOOL coil with the DX system picking up the rest of the load. Above 65°F (18.3°C) the unit functions as a glycol unit and all the cooling is accomplished by the DX system. When cooling is required, the three-way modulating valve and water regulating valve direct glycol (from the heat rejection loop) to the Econ-O-Coil located upstream of the evaporator coil, to the condenser, or to both.

The GLYCOOL system contains all the standard features of a glycol cooled system plus the following.

GLYCOOL System—Standard Features

Comparative Temperature Monitor

A solid-state temperature monitor compares the room air temperature and entering glycol temperature. When air temperature is higher than glycol temperature, the monitor communicates to the microprocessor control that “free-cooling” is available.

GLYCOOL Coil

The GLYCOOL coil is strategically located in the return air stream of the environmental control system. This coil is designed for closed-loop applications using properly treated glycol solutions.

The air is first filtered before entering the coil and then is either precooled or totally cooled before entering the refrigeration coil. The glycol flow to the coil is controlled by a pre-piped modulating three-way valve. When supplied with a 45°F (7.2°C) glycol solution, the coil is sufficiently sized to offer the identical cooling capacity as is obtained during the refrigeration cycle of the compressor.

GLYCOOL Three-Way Control Valve

The GLYCOOL Three-Way Control Valve opens full anytime the temperature of the glycol solution is below room temperature, to take full advantage of all possible free cooling. As the outdoor ambient drops, the three-way control valve modulates the flow to the GLYCOOL coil. It maintains constant temperature in the room and includes operating linkage and electronic motor. Unlike other valves of this nature, there is no over travel linkage or end switches to be adjusted.

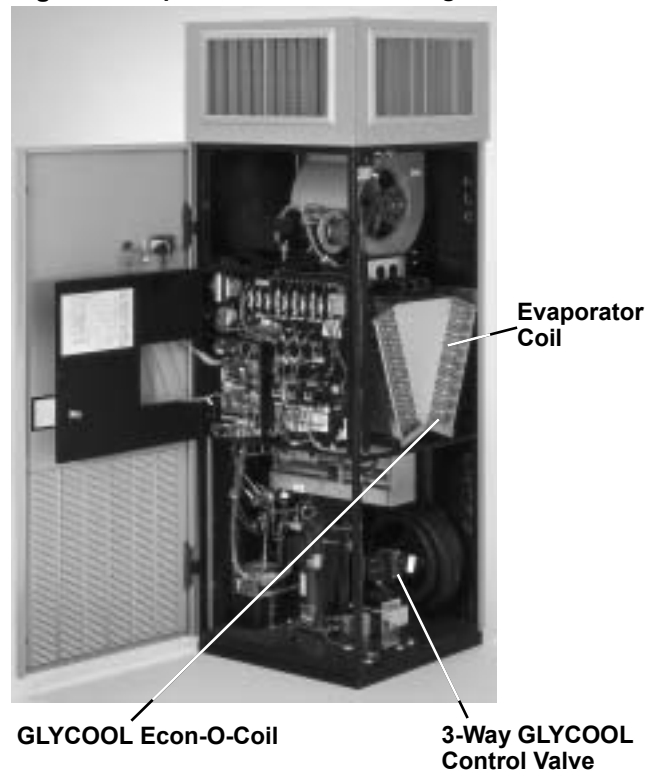
Glycol-Regulating Valve

A head pressure operated glycol regulating valve accurately controls the condensing temperature and system capacity for various entering glycol temperatures. The valve has three-way action.

Drycooler

The Liebert manufactured drycooler is constructed of aluminum with a copper tube aluminum fin coil. The low profile design features multiple direct drive propeller type fans, balanced to the heat rejection load. An integral, factory wired and tested control panel reduces installation time.

Figure 9 Upflow GLYCOOL Challenger 3000



Glycol & GLYCOOL Cooled—Optional Equipment

High Pressure

For high pressure applications, the GLYCOOL system can be equipped with components rated at 300 psig (2069 kPa).

Dual Pump Package

The dual pump package features two full size glycol pumps, each capable of providing sufficient flow for system operation. A flow switch will sense the loss of flow, should the lead pump fail, and automatically command the standby pump to start. The complete system includes dual pump housing, pumps, lead-lag switch and flow switch (for field installation). The dual pump package provides redundancy, protecting against costly downtime in the computer room.

Quiet-Line Drycoolers

Quiet-Line Drycoolers can help your facility meet the strictest noise codes, and do so at less cost than traditional drycoolers with acoustical shielding.

OPTIONAL EQUIPMENT—ALL SYSTEMS

Condensate Pump

The condensate pump, mounted in the bottom of most units, is used for condensate water only.

Complete with sump, motor and pump assembly and automatic control.

Standard model has single float. A dual float condensate pump which includes connections to unit, common alarm, unit shut-down and one customer N/O contact is also available.



Table 1 **Condensate pump capacity**

Voltage	Hz	Capacity		Head Pressure	
		GPH	(l/s)	ft.	(kPa)
200/230	50	50	(189)	10	(30)
208/230	60	50	(189)	17	(51)
380/415	50	200	(757)	26	(78)
460	60	200	(757)	43	(128)

Steam Generating Humidifier

Clean, pure steam is generated in a disposable canister that is complete with supply and drain valves, electronic controls and steam distributor. The humidifier is provided with an automatic flush cycle to lengthen service life. An indicator on the Challenger 3000 monitor panel is activated when the canister should be changed.



Remote Temperature/ Humidity Sensors

The remote temperature/ humidity sensors permit monitoring room conditions from an external source. They are encased in an attractive case and are provided with a plug compatible shielded cable in virtually any length.

Disconnect Switch—Non-Locking

The disconnect operating handle protrudes through the front of the system for easy access. Meets NEC codes.

Disconnect Switch—Locking Type

The locking disconnect switch, mounted in the electrical panel, is connected to the safety lock dead front panel of the system and is interlocked mechanically. In this way the panel can't be opened until the switch is in the off position. And it complies with local codes as well as those of the NEC.



**Disconnect Switch
(Locking & Non-Locking)**

Adjustable Floor Stand

Available in heights from 9" to 24" (228.6 to 609.6mm) in 3" (76.2mm) increments, adjustable +1-1/2" (38.1mm). Allows for installation and connection of the Challenger 3000 prior to installation of the raised floor. A modular, field-installed turning vane can be added to the floor stand.



**NOTE**

Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.

SCR Reheat

This reheat uses stainless steel elements and also includes the necessary sensors and controls to provide variable heat output to help maintain tighter control of room conditions, especially in lightly loaded applications. (Contact factory for available voltages.) Direct expansion units only.

High Efficiency Filter

Four optional filters are available in lieu of standard package. A 4" (102mm) 20%, 30%, 40%-45% or 60%-65% filter may be specified. (Efficiency based on ASHRAE 52.1). 2" (51mm) 20% pre-filters may also be specified.

Heavy Gauge Industrial Panels

These 16 ga. panels include heavy duty gaskets to provide satisfactory system operation when located outside the conditioned space in less-than desirable environments.

High External Static Blowers

These blower/motor packages are available on upflow models where external static pressures are up to 2.0 inches (500 Pa) on 60 Hz units, and up to 1.5 inches (370 Pa) on 50 Hz units. These blowers are rigidly mounted for ducting directly to the blower housing.

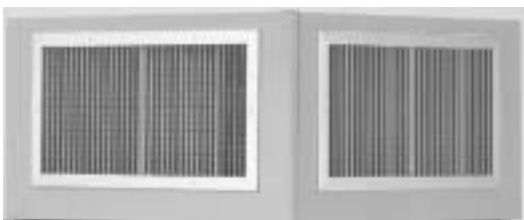
(Consult the factory for specific applications.)

High Efficiency Motors

These motors replace the standard efficiency motors to provide increased energy savings during operation (consult factory for specific efficiencies).

Plenums

Standard height of 18" (457mm) with top duct connection or 2-way, 3-way or 4-way grille discharge styles available.



Plenum With Two-Way Grille

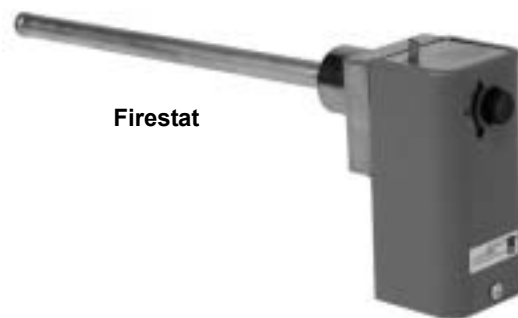
Smoke Detector

The smoke detector senses the return air, shuts down the unit upon detection, and sends visual and audible alarm. Dry contacts are available for a remote customer alarm. This smoke detector is not intended to function as or replace any room smoke detection system that may be required by local or national codes.

Supervised smoke detectors are also available as an option. Consult factory.

Firestat

The firestat senses return air temperature of the system. Upon sensing high temperatures, the environmental control system is shut down. Required by codes in certain areas.



Firestat

Hot Water Reheat

Controlled by a 2-way solenoid valve from the micro-processor control panel, these economical reheats have the capacity to maintain dry bulb conditions when the system is calling for dehumidification. The system is completely pre-piped and includes a control valve and Y-strainer. The reheat coil is constructed of copper tubes and aluminum fins.

COMPREHENSIVE MONITORING SYSTEMS—OPTIONAL

You will find a full range of monitoring and control systems, communications modules designed to interface Liebert equipment with a variety of building management systems, plus stand-alone monitoring, control and leak detection devices.

Enterprise Monitoring Systems

SiteScan Web is a comprehensive critical systems monitoring solution dedicated to ensuring reliability through graphics, event management and data extrapolation. The standard Web interface allows users easy access from anywhere at anytime.

- Single- and multi-site applications.
- Event management and unit control.
- Trend and historical data captures and reporting.
- Full ASHRAE BACnet compatibility.
- Java based.
- Windows 2000 and XP compatible.

SiteLink

- Connectivity to building management systems using Modbus and BACnet.

Site I/O

- Integrates sensors and contacts.

Site TPI

- Integrates non-Liebert equipment.

Network Monitoring Systems

The OpenComms™ family of products leverages one-to-one unit connections and your existing network for a comprehensive monitoring solution for distributed equipment.

OpenComms NIC

- Monitoring option available for Liebert precision air conditioning units.
- Web interface for viewing and control.
- Modbus interface for building management systems.
- SNMP interface for network management systems.

OpenComms Nform

- Centralized monitoring of all Liebert SNMP enabled devices.
- Event and alarm management.
- Adaptable and configurable graphical user interface.
- Integration of third-party SNMP enabled devices through custom Liebert services.
- Windows NT, 2000 and XP compatible.

Stand-Alone Monitoring and Leak Detection Solutions

Autonomous microprocessor controlled modules are available to provide supervision, control and remote notification of Liebert equipment. These stand-alone devices include:

Contact Closure Alarm Panels

- Continuously monitor critical support equipment and instantly notify on alarm condition.

Autochangeover Control Panels

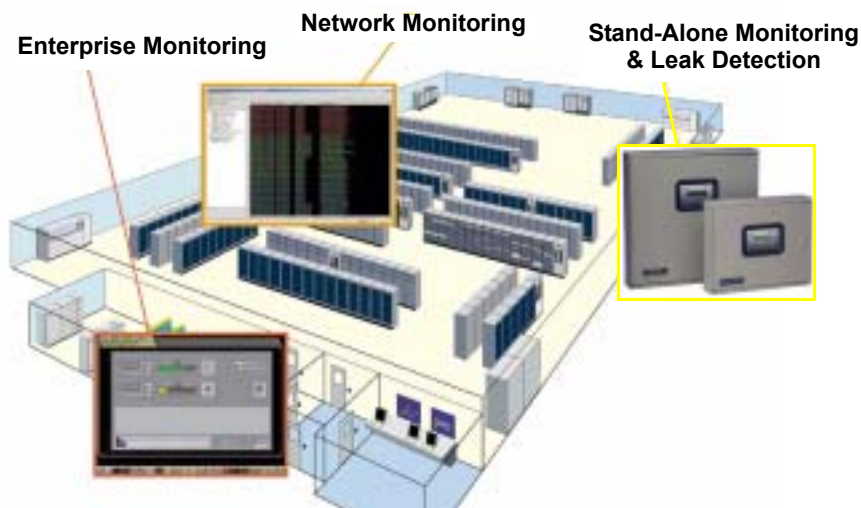
- Sequence the operation of multiple environmental units.

Leak Detection Modules

- Provide quick detection and location of hazardous fluid leaks.

Discrete Output Interface Card

- Straightforward way to tie environmental units to a building management system or alarm panel.



COMPREHENSIVE MONITORING SOLUTIONS—OPTIONAL

SiteScan Web

SiteScan Web is a monitoring solution for critical environments that utilize a facility-view approach. The system enables communications from Liebert environmental and power units—as well as many other pieces of analog or digital equipment to a front end software package that provides monitoring, control and alarm management.

SiteScan monitoring gives you decision making power to effectively manage the equipment that is critical to your business. Designed with flexibility for large, complex systems as well as smaller, single-site facilities, the Liebert SiteScan line of products can provide real-time status and alarms.

SiteLink

The microprocessor-based module provides two-way communication between an existing building management system and up to 12 Liebert units via MOD-Bus or BACnet.

OpenComms Nform

OpenComms Nform centralizes the management of your distributed Liebert network equipment. OpenComms Nform software solution combines full-scale monitoring with the use of the existing network infrastructure—so the cost of dedicated, out-of-band communications cabling is eliminated. It is both scalable and adaptable so it can grow as your systems expand and needs change. OpenComms Nform will monitor any Liebert SNMP device that supports a network interface, such as the OpenComms Web Card and the OpenComms Network Interface Card. Authenticated alarm management and event notification ensures that alarms are detected and acted upon, which allows problems to be quickly resolved.

OpenComms-NIC & OpenComms Web Card

The OpenComms Network Interface Card (OC-NIC) and OpenComms Web Card (OC-Web Card) provide Ethernet connectivity for Liebert equipment. Operating status and alarms are communicated via the network to external systems utilizing industry standard open protocols.

Environmental Discrete Outputs Card

The Environmental Discrete Outputs Card (ENV-DO) provides 16 discrete outputs, corresponding to status and major alarm conditions. These Form-C contact closures provide a straightforward means to connect Liebert Environmental units to Building Management Systems (BMS), I/O or alarm panels.

Remote Contact Monitor (RCM4)

LEDs display customized alarm indication for any dry contact input including alarms for Liebert environmental, power and UPS systems. The RCM4 monitors and displays four dry contact points.

Auto-Changeover Control



**Auto-Changeover -
RAC2-8**

Up to eight environmental units can be automatically and centrally controlled for emergency switching and to balance unit runtime. The AC3 controls two or three units. The RAC2-8 controls two through eight units and has the ability to provide alarm notification to pagers.

Universal Monitor



**Universal Monitor
Large and Small Enclosures**

The Universal Monitor keeps personnel on-site and at remote locations apprised of the status of equipment through local alarming and remote paging services. The panel will interface with anything that closes an electrical contact and any device

with a 4-20mA signal. To improve process efficiency and troubleshooting, the panel tracks data in an alarm log, an event log and a trend log. The Universal Monitor has a local LCD interface and a remote dial-up interface.

Leak Detection



**Zone Leak
Detection**



**Area Leak
Detection**

Zone detectors with cable or single point detectors provide fast and accurate indication of water in your critical space.

These systems communicate with your unit or with a separate monitoring system. Area water detection cable with distance measurement and monitoring protects your entire room. This system quickly and accurately calculates and displays the location of water on the cable, allowing you to promptly find and correct a leak.

Temperature and Humidity Recorder

A seven-day temperature and humidity recorder permits close examination of computer room environment condition and can be used as a permanent record of the environmental control system's operation efficiency. The system includes pens, 100 recording charts; two bottles of recording ink (1 red ink and 1 blue ink).



AIR COOLED DATA—60 Hz

Table 2 Challenger 3000 air cooled data—60 Hz

System Type	BU = Upflow BF = Downflow		Self-Contained		Split Systems							
					w/Outdoor Prop-Fan Condensing Unit				w/Indoor Centrifugal Condensing Unit			
Indoor Unit	BF/BU 042A	BF/BU 067A	BF/BU 036E	BF/BU 060E	BF/BU 036E	BF/BU 060E	BF/BU 036E	BF/BU 060E	BF/BU 036E	BF/BU 060E	BF/BU 036E	BF/BU 060E
* Net Capacity Data - Standard Air Volume	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H	kW
80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) 50% RH												
Total	41,800	12.2	64,700	19.0	40,900	12.0	62,600	18.3	41,500	12.2	63,800	18.7
Sensible	34,400	10.1	53,800	15.8	34,100	10.0	53,000	15.5	38,500	11.3	53,400	15.6
75°F DB, 62.5°F WB (23.9°C DB, 16.9°C WB) 50% RH												
Total	38,900	11.4	60,500	17.7	38,200	11.2	58,300	17.1	40,100	11.7	59,600	17.5
Sensible	33,300	9.8	52,100	15.3	33,000	9.7	51,300	15.0	40,100	11.7	51,800	15.2
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH												
Total	37,900	11.1	60,400	17.7	38,700	11.3	58,500	17.1	40,100	11.7	59,600	17.5
Sensible	35,700	10.5	60,400	17.7	38,700	11.3	58,500	17.1	40,100	11.7	59,600	17.5
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH												
Total	37,300	10.9	58,100	17.0	36,700	10.8	55,900	16.4	38,800	11.4	57,200	16.8
Sensible	32,600	9.6	51,100	15.0	32,400	9.5	50,200	14.7	38,800	11.4	50,700	14.9
72°F DB, 58.6°F WB (22.2°C DB, 14.8°C WB) 45% RH												
Total	37,900	11.1	58,300	17.1	37,300	10.9	56,400	16.5	38,800	11.4	57,500	16.8
Sensible	37,900	11.1	58,300	17.1	37,300	10.9	56,400	16.5	38,800	11.4	57,500	16.8
* Net Capacity Data - Optional Air Volume												
80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) 50% RH												
Total	42,400	12.4	64,000	18.8	41,500	12.2	61,800	18.1	41,100	12.0	63,000	18.5
Sensible	38,800	11.4	54,700	16.0	38,500	11.3	53,900	15.8	38,400	11.3	54,400	15.9
75°F DB, 62.5°F WB (23.9°C DB, 16.9°C WB) 50% RH												
Total	40,900	12.0	59,700	17.5	40,100	11.7	57,700	16.9	39,800	11.7	58,800	17.2
Sensible	40,900	12.0	52,900	15.5	40,100	11.7	52,100	15.3	39,800	11.7	52,600	15.4
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH												
Total	40,900	12.0	60,100	17.6	40,100	11.7	58,200	17.1	39,800	11.7	59,300	17.4
Sensible	40,900	12.0	60,100	17.6	40,100	11.7	58,200	17.1	39,800	11.7	59,300	17.4
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH												
Total	39,400	11.5	57,300	16.8	38,800	11.4	55,100	16.1	38,400	11.3	56,400	16.5
Sensible	39,400	11.5	51,800	15.2	38,800	11.4	50,900	14.9	38,400	11.3	51,500	15.1
72°F DB, 58.6°F WB (22.2°C DB, 14.8°C WB) 45% RH												
Total	39,400	11.5	57,900	17.0	38,800	11.4	56,000	16.4	38,400	11.3	57,100	16.7
Sensible	39,400	11.5	57,900	17.0	38,800	11.4	56,000	16.4	38,400	11.3	57,100	16.7
Fan Data (Blower A12x9AT)**												
Std Air CFM (CMH)	1800 (3060)	2800 (4760)	1800 (3060)	2800 (4760)	1800 (3060)	2800 (4760)	1800 (3060)	2800 (4760)	1800 (3060)	2800 (4760)	1800 (3060)	2800 (4760)
Std Fan Motor HP (kW)	3/4 (.56)	1-1/2 (1.1)	3/4 (.56)	1-1/2 (1.1)	3/4 (.56)	1-1/2 (1.1)	3/4 (.56)	1-1/2 (1.1)	3/4 (.56)	1-1/2 (1.1)	3/4 (.56)	1-1/2 (1.1)
Opt Air CFM (CMH)	2300 (3910)	3000 (5100)	2300 (3910)	3000 (5100)	2300 (3910)	3000 (5100)	2300 (3910)	3000 (5100)	2300 (3910)	3000 (5100)	2300 (3910)	3000 (5100)
Opt Fan Motor HP (kW)	1 (.75)	2 (1.5)	1 (.75)	2 (1.5)	1 (.75)	2 (1.5)	1 (.75)	2 (1.5)	1 (.75)	2 (1.5)	1 (.75)	2 (1.5)
Ext Static in. WG (Pa)	.3 (75)	.3 (75)	.3 (75)	.3 (75)	.3 (75)	.3 (75)	.3 (75)	.3 (75)	.3 (75)	.3 (75)	.3 (75)	.3 (75)
Evaporator Coil (BF: A-Frame; BU: V-FRAME)												
Face Area, ft. ² (m ²)	6.67 (.62)	6.67 (.62)	6.67 (.62)	6.67 (.62)	6.67 (.62)	6.67 (.62)	6.67 (.62)	6.67 (.62)	6.67 (.62)	6.67 (.62)	6.67 (.62)	6.67 (.62)
Rows	3	4	3	4	3	4	3	4	3	4	3	4
Face Velocity - FPM (m/s)	255 (1.3)	405 (2.1)	255 (1.3)	405 (2.1)	255 (1.3)	405 (2.1)	255 (1.3)	405 (2.1)	255 (1.3)	405 (2.1)	255 (1.3)	405 (2.1)
Electric Reheat 2 Stage (Stainless Steel, Fin Tubular) - Standard												
Capacity - BTU/H (kW) (includes motor heat)	33,400 (9)	56,200 (15)	33,400 (9)	56,200 (15)	33,400 (9)	56,200 (15)	33,400 (9)	56,200 (15)	33,400 (9)	56,200 (15)	33,400 (9)	56,200 (15)
Hot Water Reheat 180°F (82.2°C) E.W.T., 60°F (15.5°C) E.A.T. - Optional (Includes standard air volume & optional fan motor HP)												
Capacity - BTU/H (kW) (includes motor heat)	82,019 (24.1)	102,112 (29.9)	82,019 (24.1)	102,112 (29.9)	82,019 (24.1)	102,112 (29.9)	82,019 (24.1)	102,112 (29.9)	82,019 (24.1)	102,112 (29.9)	82,019 (24.1)	102,112 (29.9)
Flow Rate - GPM (l/s)	5.0 (.32)	5.0 (.32)	5.0 (.32)	5.0 (.32)	5.0 (.32)	5.0 (.32)	5.0 (.32)	5.0 (.32)	5.0 (.32)	5.0 (.32)	5.0 (.32)	5.0 (.32)
Pressure drop, ft (kPa)	19.1 (57.1)	19.2 (57.4)	19.1 (57.1)	19.2 (57.4)	19.1 (57.1)	19.2 (57.4)	19.1 (57.1)	19.2 (57.4)	19.1 (57.1)	19.2 (57.4)	19.1 (57.1)	19.2 (57.4)

* The net capacity data has fan motor heat factored in for all ratings and the entering air condition of 72°F (22.2°C) & 50% RH is the standard rating for ASHRAE 127-2001.

** NOTE: Data rated with 2" 20% ASHRAE filter. Some options or combinations of options may result in reduced airflow. Consult factory for recommendations.

Table 2 Challenger 3000 air cooled data—60 Hz (continued)

System Type	BU = Upflow BF = Downflow	Self-Contained		Split Systems			
				w/Outdoor Prop-Fan Condensing Unit		w/Indoor Centrifugal Condensing Unit	
Indoor Unit		BF/BU 042A	BF/BU 067A	BF/BU 036E	BF/BU 060E	BF/BU 036E	BF/BU 060E
Infrared Humidifier - Standard							
Capacity - lbs/hr (kg/hr)		11 (5)	11 (5)	11 (5)	11 (5)	11 (5)	11 (5)
kW		4.8	4.8	4.8	4.8	4.8	4.8
Steam Generating Humidifier - Optional							
Capacity - lbs/hr (kg/hr)		11 (5)	11 (5)	11 (5)	11 (5)	11 (5)	11 (5)
kW		3.9	3.9	3.9	3.9	3.9	3.9
Filter Section - Efficiencies per ASHRAE 52.1 - Disposable Type							
20% Eff. available in 2" (51mm) - Standard, or Optional 4" (102mm) Depths other Optional 4" (102mm) Eff. are: 30%, 40-45%, 60-65%							
Nominal Size - inches		28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5
Nominal Size - mm		724 x 749	724 x 749	724 x 749	724 x 749	724 x 749	724 x 749
Effective Surface Area, ft ² (m ²)		24.1 (2.2)	24.1 (2.2)	24.1 (2.2)	24.1 (2.2)	24.1 (2.2)	24.1 (2.2)
Connection Sizes Challenger 3000 Unit							
Liquid Line		3/8 OD CU	1/2 OD CU	5/8 - 18 Female #6 QC	1/2 OD CU	5/8 - 18 Female #6 QC	1/2 OD CU
Hot Gas Line		5/8 OD CU	7/8 OD CU	N/A	N/A	N/A	N/A
Suction Line		N/A	N/A	1-1/8 - 12 Female #11 QC	1-1/8 OD CU	1-1/8 - 12 Female #11 QC	1-1/8 OD CU
Humidifier Supply Line		1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU
Condensate Drain Line		3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT
Condenser Air 95°F (35°C) Ambient							
Model		CS_083	CS_083	PFH_42A	PFH_67A	MC_40A	MC_65A
Motor HP (kW)		3/4 (.56)	3/4 (.56)	1/5 (.15)	1/2 (.37)	1 (.75)	2 (1.5)
Face Area, ft ² (m ²)		11.1 (1.03)	11.1 (1.03)	7.7 (0.72)	10.5 (0.98)	4.6 (0.43)	7.3 (0.68)
Rows		2	2	2	3	3	4
Ext. Static in. WG (Pa)		N/A	N/A	N/A	N/A	0.5 (125)	0.5 (125)
CFM (CMH)		6650 (11298)	6650 (11298)	3000 (5097)	4200 (7136)	2000 (3398)	3500 (5947)
Liquid Line Connection		5/8 OD CU	5/8 OD CU	5/8 - 18 Male #6 QC	1/2 OD CU	5/8 - 18 Male #6 QC	1/2 OD CU
Hot Gas Connection		7/8 OD CU	7/8 OD CU	N/A	N/A	N/A	N/A
Suction Line Connection		N/A	N/A	1-1/8 - 12 Male #11 QC	1-1/8 OD CU	1-1/8 - 12 Male #11 QC	1-1/8 OD CU

AIR COOLED DATA—50 Hz

Table 3 Air cooled data—50 Hz

System Type	BF = Downflow BU = Upflow	Self-Contained				Split Systems							
						w/Outdoor Prop-Fan Condensing Unit				w/Indoor Centrifugal Condensing Unit			
Indoor Unit		BF/BU 040A		BF/BU 065A		BF/BU 035E		BF/BU 059E		BF/BU 035E		BF/BU 059E	
* Net Capacity Data - Standard Air Volume		kW	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H
26.7°C DB, 19.4°C WB (80°F DB, 67°F WB) 50% RH													
Total		12.4	42,400	18.3	62,600	11.8	40,200	18.1	61,700	11.6	39,700	18.3	62,400
Sensible		10.0	34,200	14.9	51,000	9.8	33,400	14.9	50,700	9.7	33,200	14.9	50,900
23.9°C DB, 16.9°C WB (75°F DB, 62.5°F WB) 50% RH													
Total		11.6	39,500	17.1	58,400	11.0	37,500	16.6	56,700	10.8	36,900	17.0	58,100
Sensible		9.7	33,100	14.5	49,400	9.5	32,300	14.3	48,700	9.4	32,100	14.4	49,300
23.9°C DB, 16.1°C WB (75°F DB, 61°F WB) 45% RH													
Total		11.3	38,500	16.7	57,000	11.1	38,000	16.6	56,600	11.0	37,400	16.6	56,700
Sensible		10.4	35,600	15.6	53,100	11.1	38,000	16.6	56,600	11.0	37,400	15.5	53,000
22.2°C DB, 15.5°C WB (72°F DB, 60°F WB) 50% RH													
Total		11.1	37,800	16.4	56,000	10.5	35,900	15.8	53,900	10.3	35,200	16.3	55,700
Sensible		9.5	32,500	14.2	48,400	9.3	31,700	13.9	47,500	9.2	31,400	14.2	48,300
22.2°C DB, 14.8°C WB (72°F DB, 58.6°F WB) 45% RH													
Total		10.8	36,900	16.4	56,000	10.7	36,600	15.9	54,200	10.5	36,000	16.3	55,700
Sensible		10.2	34,800	16.4	56,000	10.7	36,600	15.9	54,200	10.5	36,000	16.3	55,700
* Net Capacity Data - Optional Air Volume													
26.7°C DB, 19.4°C WB (80°F DB, 67°F WB) 50% RH													
Total		N/A	N/A	18.2	62,000	N/A	N/A	17.9	61,200	N/A	N/A	18.1	61,700
Sensible		N/A	N/A	15.2	52,000	N/A	N/A	15.1	51,700	N/A	N/A	15.2	51,900
23.9°C DB, 16.9°C WB (75°F DB, 62.5°F WB) 50% RH													
Total		N/A	N/A	16.9	57,700	N/A	N/A	16.4	56,100	N/A	N/A	16.8	57,400
Sensible		N/A	N/A	14.7	50,300	N/A	N/A	14.5	49,600	N/A	N/A	14.7	50,200
23.9°C DB, 16.1°C WB (75°F DB, 61°F WB) 45% RH													
Total		N/A	N/A	17.0	57,900	N/A	N/A	16.6	56,500	N/A	N/A	16.9	57,600
Sensible		N/A	N/A	17.0	57,900	N/A	N/A	16.6	56,500	N/A	N/A	16.9	57,600
22.2°C DB, 15.5°C WB (72°F DB, 60°F WB) 50% RH													
Total		N/A	N/A	16.2	55,300	N/A	N/A	15.6	53,300	N/A	N/A	16.1	55,000
Sensible		N/A	N/A	14.4	49,200	N/A	N/A	14.2	48,400	N/A	N/A	14.4	49,100
22.2°C DB, 14.8°C WB (72°F DB, 58.6°F WB) 45% RH													
Total		N/A	N/A	16.3	55,700	N/A	N/A	15.9	54,100	N/A	N/A	16.3	55,500
Sensible		N/A	N/A	16.3	55,700	N/A	N/A	15.9	54,100	N/A	N/A	16.3	55,500
Fan Data (Blower A12x9AT)**													
Std Air CMH (CFM)		3060 (1800)		4420 (2600)		3060 (1800)		4420 (2600)		3060 (1800)		4420 (2600)	
Std Fan Motor kW (HP)		.75 (1)		1.1 (1-1/2)		.75 (1)		1.1 (1-1/2)		.75 (1)		1.1 (1-1/2)	
Opt Air CMH (CFM)		N/A		4760 (2800)		N/A		4760 (2800)		N/A		4760 (2800)	
Opt Fan Motor kW (HP)		N/A		1.5 (2)		N/A		1.5 (2)		N/A		1.5 (2)	
Ext Static Pa (in. WG)		75 (.3)		75 (.3)		75 (.3)		75 (.3)		75 (.3)		75 (.3)	
Evaporator Coil (BF: A-Frame; BU: V-FRAME)													
Face Area m ² (ft ²)		.62 (6.67)		.62 (6.67)		.62 (6.67)		.62 (6.67)		.62 (6.67)		.62 (6.67)	
Rows		3		4		3		4		3		4	
Face Velocity - m/s (FPM)		1.3 (255)		1.9 (375)		1.3 (255)		1.9 (375)		1.3 (255)		1.9 (375)	
Electric Reheat 2 Stage (Stainless Steel, Fin Tubular) - Standard													
Capacity-kW (BTU/H), includes motor heat		9 (34,100)		15 (56,200)		9 (34,100)		15 (56,200)		9 (34,100)		15 (56,200)	
Hot Water Reheat 82.2°C (180°F) E.W.T., 15.5°C (60°F) E.A.T. - Optional (Includes standard air volume & optional fan motor HP)													
Capacity-kW (BTU/H), includes motor heat		24.1 (82,019)		29.4 (100,539)		24.1 (82,019)		29.4 (100,539)		24.1 (82,019)		29.4 (100,539)	
Flow Rate - l/s (GPM)		.32 (5.0)		.32 (5.0)		.32 (5.0)		.32 (5.0)		.32 (5.0)		.32 (5.0)	
Pressure drop - kPa (ft.)		57.1 (19.1)		57.4 (19.2)		57.1 (19.1)		57.4 (19.2)		57.1 (19.1)		57.4 (19.2)	

* The net capacity data has fan motor heat factored in for all ratings and the entering air condition of 22.2°C (72°F) & 50% RH is the standard rating for ASHRAE 127-2001.

** NOTE: Data rated with 2" 20% ASHRAE filter. Some options or combinations of options may result in reduced airflow. Consult factory for recommendations.

Table 3 Air cooled data—50 Hz (continued)

System Type BF = Downflow BU = Upflow	Self-Contained		Split Systems			
			w/Outdoor Prop-Fan Condensing Unit		w/Indoor Centrifugal Condensing Unit	
Indoor Unit	BF/BU 040A	BF/BU 065A	BF/BU 035E	BF/BU 059E	BF/BU 035E	BF/BU 059E
Infrared Humidifier - Standard						
Capacity - kg/hr (lbs/hr)	5 (11)	5 (11)	5 (11)	5 (11)	5 (11)	5 (11)
kW	4.8	4.8	4.8	4.8	4.8	4.8
Steam Generating Humidifier - Optional						
Capacity - kg/hr (lbs/hr)	5 (11)	5 (11)	5 (11)	5 (11)	5 (11)	5 (11)
kW	3.9	3.9	3.9	3.9	3.9	3.9
Filter Section - Efficiencies per ASHRAE 52.1 - Disposable Type						
20% Eff. available in 51mm (2") - Standard, or Optional 102mm (4") Depths other Optional 102mm (4") Eff. are: 30%, 40-45%, 60-65%						
Nominal Size - mm	724 x 749	724 x 749	724 x 749	724 x 749	724 x 749	724 x 749
Nominal Size - inches	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5
Effective Surface Area - m ² (ft ²)	2.2 (24.1)	2.2 (24.1)	2.2 (24.1)	2.2 (24.1)	2.2 (24.1)	2.2 (24.1)
Connection Sizes Challenger 3000 Unit						
Liquid Line	3/8 OD CU	1/2 OD CU	5/8 - 18 Female #6 QC	1/2 OD CU	5/8 - 18 Female #6 QC	1/2 OD CU
Hot Gas Line	5/8 OD CU	7/8 OD CU	N/A	N/A	N/A	N/A
Suction Line	N/A	N/A	1-1/8 -12 Female #11 QC	1-1/8 OD CU	1-1/8 -12 Female #11 QC	1-1/8 OD CU
Humidifier Supply Line	1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU
Condensate Drain Line	3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT
Condenser Air 35°C (95°F) Ambient						
Model	CS_083	CS_083	PFH_41A	PFH_66A	MC_39A	MC_64A
Motor kW (HP)	.56 (3/4)	.56 (3/4)	.15 (1/5)	.37 (1/2)	.75 (1)	1.5 (2)
Face Area m ² (ft ²)	1.03 (11.1)	1.03 (11.1)	0.72 (7.7)	0.98 (10.5)	0.43 (4.6)	0.68 (7.3)
Rows	2	2	2	3	3	4
Ext. Static Pa (in. WG)	N/A	N/A	N/A	N/A	125 (0.5)	125 (0.5)
CMH (CFM)	9429 (5550)	9429 (5550)	4248 (2500)	6116 (3600)	2800 (1650)	5947 (3500)
Liquid Line Connection	5/8 OD CU	5/8 OD CU	5/8 - 18 Male #6 QC	1/2 OD CU	5/8 - 18 Male #6 QC	1/2 OD CU
Hot Gas Connection	7/8 OD CU	7/8 OD CU	N/A	N/A	N/A	N/A
Suction Line Connection	N/A	N/A	1-1/8 - 12 Male #11 QC	1-1/8 OD CU	1-1/8 - 12 Male #11 QC	1-1/8 OD CU

WATER COOLED DATA—60 Hz

Table 4 Water cooled data—60 Hz

System Type	BF = Downflow BU = Upflow		Self-Contained				Split Systems			
Indoor Unit	BF/BU 046WG		BF/BU 071WG		BF/BU 036E		BF/BU 060E			
* Net Capacity Data - Standard Air Volume	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H	kW		
80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) 50% RH										
Total	43,200	12.7	69,900	20.5	42,400	12.4	67,600	19.8		
Sensible	34,900	10.2	55,700	16.3	34,600	10.1	54,900	16.1		
75°F DB, 62.5°F WB (23.9°C DB, 16.9°C WB) 50% RH										
Total	40,100	11.7	65,200	19.1	39,300	11.5	63,100	18.5		
Sensible	33,800	9.9	54,000	15.8	33,400	9.8	53,200	15.6		
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH										
Total	39,000	11.4	63,600	18.6	38,200	11.2	61,500	18.0		
Sensible	36,200	10.6	58,000	17.0	35,900	10.5	57,100	16.7		
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH										
Total	38,300	11.2	62,500	18.3	37,500	11.0	60,500	17.7		
Sensible	33,100	9.7	53,000	15.5	32,700	9.6	52,100	15.3		
72°F DB, 58.6°F WB (22.2°C DB, 14.8°C WB) 45% RH										
Total	37,400	11.0	61,100	17.9	38,200	11.2	59,200	17.3		
Sensible	35,300	10.3	56,700	16.6	38,200	11.2	55,900	16.4		
* Net Capacity Data - Optional Air Volume										
80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) 50% RH										
Total	44,000	12.9	69,200	20.3	43,100	12.6	67,100	19.7		
Sensible	39,400	11.5	56,600	16.6	39,100	11.5	55,800	16.3		
75°F DB, 62.5°F WB (23.9°C DB, 16.9°C WB) 50% RH										
Total	40,900	12.0	64,600	18.9	40,000	11.7	62,500	18.3		
Sensible	38,000	11.1	54,900	16.1	37,600	11.0	54,000	15.8		
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH										
Total	42,200	12.4	62,900	18.4	41,400	12.1	62,500	18.3		
Sensible	42,200	12.4	59,000	17.3	41,400	12.1	62,500	18.3		
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH										
Total	40,600	11.9	61,800	18.1	39,800	11.7	59,800	17.5		
Sensible	40,600	11.9	53,700	15.7	39,800	11.7	52,900	15.5		
72°F DB, 58.6°F WB (22.2°C DB, 14.8°C WB) 45% RH										
Total	40,600	11.9	61,900	18.1	39,800	11.7	60,100	17.6		
Sensible	40,600	11.9	61,900	18.1	39,800	11.7	60,100	17.6		
Fan Data (Blower A12x9AT)**										
Std Air CFM (CMH)	1800 (3060)		2800 (4760)		1800 (3060)		2800 (4760)			
Std Fan Motor HP (kW)	3/4 (.56)		1-1/2 (1.1)		3/4 (.56)		1-1/2 (1.1)			
OptAir CFM (CMH)	2300 (3910)		3000 (5100)		2300 (3910)		3000 (5100)			
Opt Fan Motor HP (kW)	1 (.75)		2 (1.5)		1 (.75)		2 (1.5)			
Ext Static in. WG (Pa)	.3 (75)		.3 (75)		.3 (75)		.3 (75)			
Evaporator Coil (BF: A-Frame; BU: V-Frame)										
Face Area, ft. ² (m ²)	6.67 (.62)		6.67 (.62)		6.67 (.62)		6.67 (.62)			
Rows	3		4		3		4			
Face Velocity - FPM (m/s)	255 (1.3)		405 (2.1)		255 (1.3)		405 (2.1)			
Electric Reheat 2 Stage (Stainless Steel, Fin Tubular) - Standard										
Capacity - BTU/H (kW) (includes motor heat)	33,400 (9)		56,200 (15)		33,400 (9)		56,200 (15)			
Hot Water Reheat 180°F (82.2°C) E.W.T., 60°F (15.5°C) E.A.T. - Optional (Includes standard air volume & optional fan motor HP)										
Capacity - BTU/H (kW) (includes motor heat)	82,019 (24.1)		102,112 (29.9)		82,019 (24.1)		102,112 (29.9)			
Flow Rate - GPM (l/s)	5.0 (.32)		5.0 (.32)		5.0 (.32)		5.0 (.32)			
Pressure drop, ft (kPa)	19.1 (57.1)		19.2 (57.4)		19.1 (57.1)		19.2 (57.4)			
Hot Gas Reheat - Optional (Includes standard air volume & optional fan motor)										
Capacity - BTU/H (kW) (includes motor heat)	42,600 (12.5)		54,900 (16.1)		42,600 (12.5)		54,900 (16.1)			

* The net capacity data has fan motor heat factored in for all ratings and the entering air condition of 72°F (22.2°C) & 50% RH is the standard rating for ASHRAE 127-2001.

** NOTE: Data rated with 2" 20% ASHRAE filter. Some options or combinations of options may result in reduced airflow. Consult factory for recommendations.

Table 4 Water cooled data—60 Hz (continued)

System Type	BF = Downflow BU = Upflow	Self-Contained		Split Systems	
		BF/BU 046WG	BF/BU 071WG	BF/BU 036E	BF/BU 060E
Indoor Unit					
Infrared Humidifier - Standard					
Capacity - lbs/hr (kg/hr)		11 (5)	11 (5)	11 (5)	11 (5)
kW		4.8	4.8	4.8	4.8
Steam Generating Humidifier - Optional					
Capacity - lbs/hr (kg/hr)		11 (5)	11 (5)	11 (5)	11 (5)
kW		3.9	3.9	3.9	3.9
Filter Section - Efficiencies per ASHRAE 52.1 - Disposable Type					
20% Eff. available in 2" (51mm) - Standard, or Optional 4" (102mm) Depths other Optional 4" (102mm) Eff. are: 30%, 40-45%, 60-65%					
Nominal Size - inches		28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5
Nominal Size - mm		724 x 749	724 x 749	724 x 749	724 x 749
Effective Surface Area, ft ² (m ²)		24.1 (2.2)	24.1 (2.2)	24.1 (2.2)	24.1 (2.2)
Water Regulating Valve ¹					
Size - In		3/4	1	3/4	1
Water Requirements (Coaxial Condenser)		-	-	MC_44W	MC_69W
THR - BTU/H (kW) @ 75°F (22.2°C), 50% RH		51,000 (14.9)	82,000 (24.0)	50,500 (14.8)	81100 (23.8)
65°F (18.3°C) EWT - 105°F (40.6°C) Cond Temp					
Flow Rate GPM (l/s)		2.0 (.13)	5.5 (.35)	2.0 (.13)	5.4 (.34)
Pressure Drop ft (kPa)		0.7 (2.1)	2.0 (6.0)	0.8 (2.4)	2.7 (8.1)
75°F (23.9°C) EWT - 105°F (40.6°C) Cond Temp					
Flow Rate GPM (l/s)		3.8 (.24)	7.8 (.49)	3.7 (.24)	7.6 (.48)
Pressure Drop ft (kPa)		1.9 (5.7)	3.8 (11.3)	2.3 (6.9)	5.1 (15.2)
85°F (29.4°C) EWT - 110°F (43.3°C) Cond Temp					
Flow Rate GPM (l/s)		5.4 (.34)	10.1 (.64)	5.3 (.33)	9.7 (.61)
Pressure Drop ft (kPa)		3.5 (10.4)	5.9 (17.6)	4.4 (13.1)	8.1 (24.2)
Connection Sizes Challenger 3000 Unit					
Condenser Supply		7/8 OD CU	1-1/8 OD CU	-	-
Condenser Return		7/8 OD CU	1-1/8 OD CU	-	-
Liquid Line		-	-	5/8 - 18 Female #6 QC	1/2 OD CU
Suction Line		-	-	1-1/8 - 12 Female #11 QC	1-1/8 OD CU
Humidifier Supply Line		1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU
Condensate Drain Line		3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT
Connection Sizes Condensing Unit					
Condenser Supply		-	-	7/8 OD CU	1-1/8 OD CU
Condenser Return		-	-	7/8 OD CU	1-1/8 OD CU
Liquid Line		-	-	5/8 - 18 Male #6 QC	1/2 OD CU
Suction Line		-	-	1-1/8 - 12 Male #11 QC	1-1/8 OD CU

¹) Self-contained unit pressure drops based on 2-way valve with bypass. Split system unit pressure drops based on 2- or 3-way valve.

WATER COOLED DATA—50 Hz

Table 5 Water cooled data—50 Hz

System Type	BF = Downflow BU = Upflow	Self-Contained				Split Systems			
Indoor Unit		BF/BU 045WG		BF/BU 070WG		BF/BU 035E		BF/BU 059E	
* Net Capacity Data - Standard Air Volume		kW	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H
26.7°C DB, 19.4°C WB (80°F DB, 67°F WB) 50% RH									
Total		13.0	44,300	20.0	68,400	12.4	42,300	19.4	66,100
Sensible		10.2	34,900	15.6	53,100	10.0	34,200	15.3	52,300
23.9°C DB, 16.9°C WB (75°F DB, 62.5°F WB) 50% RH									
Total		12.1	41,200	18.6	63,500	11.4	38,900	18.0	61,400
Sensible		9.9	33,800	15.1	51,500	9.6	32,900	14.8	50,600
23.9°C DB, 16.1°C WB (75°F DB, 61°F WB) 45% RH									
Total		11.7	40,000	18.1	61,800	11.0	37,700	17.5	59,800
Sensible		10.6	36,200	16.1	55,100	10.3	35,300	15.9	54,300
22.2°C DB, 15.5°C WB (72°F DB, 60°F WB) 50% RH									
Total		11.5	39,300	17.8	60,700	10.8	37,000	17.2	58,700
Sensible		9.7	33,100	14.8	50,400	9.4	32,100	14.5	49,600
22.2°C DB, 14.8°C WB (72°F DB, 58.6°F WB) 45% RH									
Total		11.2	38,300	17.3	59,200	11.0	37,700	16.8	57,400
Sensible		10.4	35,400	15.8	53,900	11.0	37,700	15.6	53,100
* Net Capacity Data - Optional Air Volume									
26.7°C DB, 19.4°C WB (80°F DB, 67°F WB) 50% RH									
Total		N/A	N/A	19.8	67,700	N/A	N/A	19.2	65,400
Sensible		N/A	N/A	15.9	54,100	N/A	N/A	15.6	53,200
23.9°C DB, 16.9°C WB (75°F DB, 62.5°F WB) 50% RH									
Total		N/A	N/A	18.4	62,900	N/A	N/A	17.8	60,800
Sensible		N/A	N/A	15.4	52,400	N/A	N/A	15.1	51,500
23.9°C DB, 16.1°C WB (75°F DB, 61°F WB) 45% RH									
Total		N/A	N/A	17.9	61,200	N/A	N/A	17.3	59,200
Sensible		N/A	N/A	16.5	56,200	N/A	N/A	16.2	55,400
22.2°C DB, 15.5°C WB (72°F DB, 60°F WB) 50% RH									
Total		N/A	N/A	17.6	60,100	N/A	N/A	17.0	58,100
Sensible		N/A	N/A	15.0	51,200	N/A	N/A	14.8	50,400
22.2°C DB, 14.8°C WB (72°F DB, 58.6°F WB) 45% RH									
Total		N/A	N/A	17.2	58,700	N/A	N/A	17.1	58,200
Sensible		N/A	N/A	16.1	55,000	N/A	N/A	17.1	58,200
Fan Data (Blower A12x9AT)**									
Std Air CMH (CFM)		3060 (1800)		4420 (2600)		3060 (1800)		4420 (2600)	
Std Fan Motor kW (HP)		.75 (1)		1.1 (1-1/2)		.75 (1)		1.1 (1-1/2)	
OptAir CMH (CFM)		N/A		4760 (2800)		N/A		4760 (2800)	
Opt Fan Motor kW (HP)		N/A		1.5 (2)		N/A		1.5 (2)	
Ext Static Pa (in. WG)		75 (.3)		75 (.3)		75 (.3)		75 (.3)	
Evaporator Coil (BF: A-Frame; BU: V-Frame)									
Face Area m ² (ft ²)		.62 (6.67)		.62 (6.67)		.62 (6.67)		.62 (6.67)	
Rows		3		4		3		4	
Face Velocity - m/s (FPM)		1.3 (255)		1.9 (375)		1.3 (255)		1.9 (375)	
Electric Reheat 2 Stage (Stainless Steel, Fin Tubular) - Standard									
Capacity - kW (BTU/H) (includes motor heat)		9 (34,100)		15 (56,200)		9 (34,100)		15 (56,200)	
Hot Water Reheat 82.2°C (180°F) E.W.T., 15.5°C (60°F) E.A.T. - Optional (Includes standard air volume & optional fan motor HP)									
Capacity - kW (BTU/H) (includes motor heat)		24.1 (82,019)		29.4 (100,539)		24.1 (82,019)		29.4 (100,539)	
Flow Rate - l/s (GPM)		.32 (5.0)		.32 (5.0)		.32 (5.0)		.32 (5.0)	
Pressure drop - kPa (ft.)		57.1 (19.1)		57.4 (19.2)		57.1 (19.1)		57.4 (19.2)	
Hot Gas Reheat - Optional (Includes standard air volume & optional fan motor)									
Capacity - kW (BTU/H) (includes motor heat)		12.5 (42,600)		15.0 (51,300)		12.5 (42,600)		15.0 (51,300)	

* The net capacity data has fan motor heat factored in for all ratings and the entering air condition of 22.2°C (72°F) & 50% RH is the standard rating for ASHRAE 127-2001.

** NOTE: Data rated with 2" 20% ASHRAE filter. Some options or combinations of options may result in reduced airflow. Consult factory for recommendations.

Table 5 Water cooled data—50 Hz (continued)

System Type	BF = Downflow BU = Upflow	Self-Contained		Split Systems	
Indoor Unit		BF/BU 045WG	BF/BU 070WG	BF/BU 035E	BF/BU 059E
Infrared Humidifier - Standard					
Capacity - kg/hr (lbs/hr)		5 (11)	5 (11)	5 (11)	5 (11)
kW		4.8	4.8	4.8	4.8
Steam Generating Humidifier - Optional					
Capacity - kg/hr (lbs/hr)		5 (11)	5 (11)	5 (11)	5 (11)
kW		3.9	3.9	3.9	3.9
Filter Section - Efficiencies per ASHRAE 52.1 - Disposable Type					
20% Eff. available in 51mm (2") - Standard, or Optional 102mm (4") Depths other Optional 102mm (4") Eff. are: 30%, 40-45%, 60-65%					
Nominal Size - mm		724 x 749	724 x 749	724 x 749	724 x 749
Nominal Size - inches		28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5
Effective Surface Area - m ² (ft ²)		2.2 (24.1)	2.2 (24.1)	2.2 (24.1)	2.2 (24.1)
Water Regulating Valve ¹					
Size - In		3/4	1	3/4	1
Water Requirements (Coaxial Condenser)				MC_43W	MC_68W
THR - kW (BTU/H) @ 22.2°C (75°F), 50% RH		15.4 (52,400)	23.8 (81,200)	15.0 (51100)	23.2 (79,200)
18.3°C (65°F) EWT - 40.6°C (105°F) Cond Temp					
Flow Rate l/s (GPM)		.14 (2.2)	.34 (5.4)	.13 (2.0)	.33 (5.2)
Pressure Drop kPa (ft)		2.4 (0.8)	5.7 (1.9)	2.4 (0.8)	7.8 (2.6)
23.9°F (75°F) EWT - 40.6°C (105°F) Cond Temp					
Flow Rate l/s (GPM)		.25 (4.0)	.48 (7.6)	.24 (3.8)	.47 (7.4)
Pressure Drop kPa (ft)		6.3 (2.1)	10.7 (3.6)	7.2 (2.4)	14.3 (4.8)
29.4°C (85°F) EWT - 43.3°C (110°F) Cond Temp					
Flow Rate l/s (GPM)		.36 (5.7)	.61 (9.7)	.34 (5.4)	.59 (9.4)
Pressure Drop kPa (ft)		11.3 (3.8)	16.7 (5.6)	13.7 (4.6)	22.7 (7.6)
Connection Sizes Challenger 3000 Unit					
Condenser Supply		7/8 OD CU	1-1/8 OD CU	-	-
Condenser Return		7/8 OD CU	1-1/8 OD CU	-	-
Liquid Line		-	-	5/8 - 18 Female #6 QC	1/2 OD CU
Suction Line		-	-	1-1/8 - 12 Female #11 QC	1-1/8 OD CU
Humidifier Supply Line		1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU
Condensate Drain Line		3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT
Connection Sizes Condensing Unit					
Condenser Supply		-	-	7/8 OD CU	1-1/8 OD CU
Condenser Return		-	-	7/8 OD CU	1-1/8 OD CU
Liquid Line		-	-	5/8 - 18 Male #6 QC	1/2 OD CU
Suction Line		-	-	1-1/8 - 12 Male #11 QC	1-1/8 OD CU

¹) Self-contained unit pressure drops based on 2-way valve with bypass. Split system unit pressure drops based on 2- or 3-way valve.

GLYCOL COOLED/GLYCOOL DATA—60 Hz

Table 6 Glycol Cooled/GLYCOOL Data—60 Hz

System Type BF or BE = Downflow BU or BK = Upflow	Glycol Cooled								GLYCOOL	
	Self-Contained				Split Systems				Self-Contained	
Indoor Unit	BF/BU 046WG		BF/BU 071WG		BF/BU 036E		BF/BU 060E		BE/BK 061G	
* Net Capacity Data - Standard Air Volume	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H	kW
80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) 50% RH										
Total	38,200	11.2	62,300	18.3	37,900	11.1	60,900	17.8	59,300	17.4
Sensible	33,100	9.7	52,900	15.5	33,000	9.7	52,400	15.4	51,000	14.9
75°F DB, 62.5°F WB (23.9°C DB, 16.9°C WB) 50% RH										
Total	35,800	10.5	58,300	17.1	35,400	10.4	57,100	16.7	55,400	16.2
Sensible	32,000	9.4	51,300	15.0	31,900	9.3	50,800	14.9	49,300	14.4
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH										
Total	36,500	10.7	58,500	17.1	36,100	10.6	57,300	16.8	54,500	16.0
Sensible	36,500	10.7	58,500	17.1	36,100	10.6	57,300	16.8	54,500	16.0
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH										
Total	34,300	10.0	56,000	16.4	33,900	9.9	54,700	16.0	53,100	15.6
Sensible	31,400	9.2	50,200	14.7	31,200	9.1	49,700	14.6	48,300	14.2
72°F DB, 58.6°F WB (22.2°C DB, 14.8°C WB) 45% RH										
Total	35,200	10.3	56,500	16.6	34,800	10.2	55,300	16.2	52,500	15.4
Sensible	35,200	10.3	56,500	16.6	34,800	10.2	55,300	16.2	52,500	15.4
* Net Capacity Data - Optional Air Volume										
80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) 50% RH										
Total	40,100	11.7	61,600	18.0	39,900	11.7	60,100	17.6	N/A	N/A
Sensible	40,100	11.7	53,800	15.8	39,900	11.7	53,300	15.6	N/A	N/A
75°F DB, 62.5°F WB (23.9°C DB, 16.9°C WB) 50% RH										
Total	37,700	11.0	57,600	16.9	37,400	11.0	56,200	16.5	N/A	N/A
Sensible	37,700	11.0	52,100	15.3	37,400	11.0	51,600	15.1	N/A	N/A
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH										
Total	37,700	11.0	58,100	17.0	37,400	11.0	56,900	16.7	N/A	N/A
Sensible	37,700	11.0	58,100	17.0	37,400	11.0	56,900	16.7	N/A	N/A
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH										
Total	36,300	10.6	55,200	16.2	35,900	10.5	53,900	15.8	N/A	N/A
Sensible	36,300	10.6	50,900	14.9	35,900	10.5	50,400	14.8	N/A	N/A
72°F DB, 58.6°F WB (22.2°C DB, 14.8°C WB) 45% RH										
Total	36,300	10.6	56,000	16.4	35,900	10.5	54,900	16.1	N/A	N/A
Sensible	36,300	10.6	56,000	16.4	35,900	10.5	54,900	16.1	N/A	N/A
GLYCOOL Coil Sensible Capacity										
75°F DB, 62.5°F WB (23.9°C DB, 16.9°C WB) 45°F (10°C) EGT									42,100	12.3
Fan Data (Blower A12x9AT)**										
Std Air CFM (CMH)	1800 (3060)		2800 (4760)		1800 (3060)		2800 (4760)		2800 (4760)	
Std Fan Motor HP (kW)	3/4 (.56)		1-1/2 (1.1)		3/4 (.56)		1-1/2 (1.1)		2 (1.5)	
Opt Air CFM (CMH)	2300 (3910)		3000 (5100)		2300 (3910)		3000 (5100)		N/A	
Opt Fan Motor HP (kW)	1 (.75)		2 (1.5)		1 (.75)		2 (1.5)		N/A	
Ext Static in. WG (Pa)	.3 (75)		.3 (75)		.3 (75)		.3 (75)		.3 (75)	
Evaporator Coil (BF: A-Frame; BU: V-FRAME)										
Face Area, ft² (m²)	6.67 (.62)		6.67 (.62)		6.67 (.62)		6.67 (.62)		6.67 (.62)	
Rows	3		4		3		4		4	
Face Velocity - FPM (m/s)	255 (1.3)		405 (2.1)		255 (1.3)		405 (2.1)		405 (2.1)	
Electric Reheat 2 Stage (Stainless Steel, Fin Tubular) - Standard										
Capacity - BTU/H (kW) (includes motor heat)	33,400 (9)		56,200 (15)		33,400 (9)		56,200 (15)		57,700 (15)	
Hot Water Reheat 180°F (82.2°C) E.W.T., 60°F (15.5°C) E.A.T. - Optional (Includes standard air volume & optional fan motor HP)										
Capacity - BTU/H (kW) (includes motor heat)	82,019 (24.1)		102,112 (29.9)		82,019 (24.1)		102,112 (29.9)		N/A	
Flow Rate - GPM (l/s)	5.0 (.32)		5.0 (.32)		5.0 (.32)		5.0 (.32)		N/A	
Pressure drop, ft (kPa)	19.1 (57.1)		19.2 (57.4)		19.1 (57.1)		19.2 (57.4)		N/A	
Hot Gas Reheat - Optional (Includes standard air volume & optional fan motor)										
Capacity - BTU/H (kW) (includes motor heat)	42,600 (12.5)		54,900 (16.1)		42,600 (12.5)		54,900 (16.1)		N/A	

* The net capacity data has fan motor heat factored in for all ratings and the entering air condition of 72°F (22.2°C) & 50% RH is the standard rating for ASHRAE 127-1988.

All above data is based on 40% ethylene glycol solution.

** NOTE: Data rated with 2" 20% ASHRAE filter. Some options or combinations of options may result in reduced airflow. Consult factory for recommendations.

Table 6 Glycol Cooled/GLYCOOL Data—60 Hz (continued)

System Type BF or BE = Downflow BU or BK = Upflow	Glycol Cooled				GLYCOOL
	Self-Contained		Split Systems		Self-Contained
Indoor Unit	BF/BU 046WG	BF/BU 071WG	BF/BU 036E	BF/BU 060E	BE/BK 061G
Infrared Humidifier - Standard					
Capacity - lbs/hr (kg/hr)	11 (5)	11 (5)	11 (5)	11 (5)	11 (5)
kW	4.8	4.8	4.8	4.8	4.8
Steam Generating Humidifier - Optional					
Capacity - lbs/hr (kg/hr)	11 (5)	11 (5)	11 (5)	11 (5)	11 (5)
kW	3.9	3.9	3.9	3.9	3.9
Filter Section - Efficiencies per ASHRAE 52.1 - Disposable Type					
20% Eff. available in 2" (51mm) - Standard, or Optional 4" (102mm) Depths other Optional 4" (102mm) Eff. are: 30%, 40-45%, 60-65%					
Nominal Size - inches	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5
Nominal Size - mm	724 x 749	724 x 749	724 x 749	724 x 749	724 x 749
Effective Surface Area, ft ² (m ²)	24.1 (2.2)	24.1 (2.2)	24.1 (2.2)	24.1 (2.2)	24.1 (2.2)
Glycol Regulating Valve					
Size - In	3/4	1	3/4	1	1
Econo-Valve					
Size - In	-	-	-	-	1
Cv	-	-	-	-	13.9
System Data*					
			MC_44WG	MC_69WG	
Flow Rate GPM (l/s)	10 (.63)	17.5 (1.1)	11.3 (.71)	20 (1.3)	17.5 (1.1)
Unit Volume Gallons (l)	1.2 (4.5)	2.0 (7.5)	1.2 (4.5)	2.0 (7.5)	4.0 (15.0)
Pressure Drop, ft (kPa)	14.2 (42.4)	18.9 (56.4)	22.5 (66.8)	37.5 (111.9)	51.1 (152.5)
Drycooler 95°F (35°C) Ambient*					
Model Number	DSF069-3PH	DSF109-3PH	DSF069-3PH	DSF109-3PH	DSO109-3PH
Volume Gallons (Liters)	2.4 (9.0)	4.9 (18.4)	2.4 (9.0)	4.9 (18.4)	4.9 (18.4)
Pressure Drop, ft (kPa)	2.6 (7.8)	2.3 (6.9)	3.3 (9.8)	2.4 (7.2)	2.3 (6.9)
Fan HP (kW)	3/4 (.56)	3/4 (.56)	3/4 (.56)	3/4 (.56)	3/4 (.56)
Expansion Tank Capacity - Gal (l)	8.8 (33.1)	8.8 (33.1)	8.8 (33.1)	8.8 (33.1)	8.8 (33.1)
Glycol Pump HP - 3 phase (kW)	3/4 (.56)	3/4 (.56)	3/4 (.56)	3/4 (.56)	1.5 (1.1)
Head, ft (kPa)	72 (214.8)	69 (205.9)	72 (214.8)	69 (205.9)	88 (262.6)
Drycooler Connections FPT	1-1/4	2	1-1/4	2	2
Connection Sizes Challenger 3000 Unit					
Condenser Supply	7/8 OD CU	1-1/8 OD CU	-	-	1-1/8 OD CU
Condenser Return	7/8 OD CU	1-1/8 OD CU	-	-	1-1/8 OD CU
Liquid Line	-	-	5/8 - 18 Female #6 QC	1/2 OD CU	-
Suction Line	-	-	1-1/8 - 12 Female #11 QC	1-1/8 OD CU	-
Humidifier Supply Line	1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU
Condensate Drain Line	3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT
Connection Sizes Condensing Unit					
Condenser Supply	-	-	7/8 OD CU	1-1/8 OD CU	-
Condenser Return	-	-	7/8 OD CU	1-1/8 OD CU	-
Liquid Line	-	-	5/8 - 18 Male #6 QC	1/2 OD CU	-
Suction Line	-	-	1-1/8 - 12 Male #11 QC	1-1/8 OD CU	-

* All above data is based on 40% ethylene glycol solution.

GLYCOL COOLED/GLYCOOL DATA—50 Hz

System Type BF or BE = Downflow BU or BK = Upflow	Glycol Cooled								GLYCOOL	
	Self-Contained				Split Systems				Self-Contained	
Indoor Unit	BF/BU 045WG		BF/BU 070WG		BF/BU 035E		BF/BU 059E		BE/BK 058G	
* Net Capacity Data - Standard Air Volume	kW	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H	kW	BTU/H
26.7°C DB, 19.4°C WB (80°F DB, 67°F WB) 50% RH										
Total	11.3	38,400	17.7	60,400	10.9	37,200	17.3	59,000	16.8	57,400
Sensible	9.6	32,800	14.7	50,200	9.5	32,300	14.6	49,700	14.1	48,100
23.9°C DB, 16.9°C WB (75°F DB, 62.5°F WB) 50% RH										
Total	10.5	36,000	16.5	56,400	10.1	34,500	16.1	55,100	15.7	53,500
Sensible	9.3	31,800	14.2	48,600	9.1	31,200	14.1	48,100	13.7	46,600
23.9°C DB, 16.1°C WB (75°F DB, 61°F WB) 45% RH										
Total	10.7	36,600	16.5	56,300	10.3	35,300	16.2	55,200	15.3	52,200
Sensible	10.7	36,600	16.5	56,300	10.3	35,300	16.2	55,200	15.3	52,200
22.2°C DB, 15.5°C WB (72°F DB, 60°F WB) 50% RH										
Total	10.1	34,500	15.9	54,100	9.6	32,900	15.5	52,800	15.0	51,300
Sensible	9.1	31,100	13.9	47,600	8.9	30,400	13.8	47,100	13.4	45,600
22.2°C DB, 14.8°C WB (72°F DB, 58.6°F WB) 45% RH										
Total	10.3	35,300	15.9	54,300	9.9	33,900	15.6	53,200	14.7	50,300
Sensible	10.3	35,300	15.9	54,300	9.9	33,900	15.6	53,200	14.7	50,300
* Net Capacity Data - Optional Air Volume										
26.7°C DB, 19.4°C WB (80°F DB, 67°F WB) 50% RH										
Total	N/A	N/A	17.5	59,700	N/A	N/A	17.1	58,300	N/A	N/A
Sensible	N/A	N/A	15.0	51,200	N/A	N/A	14.9	50,700	N/A	N/A
23.9°C DB, 16.9°C WB (75°F DB, 62.5°F WB) 50% RH										
Total	N/A	N/A	16.3	55,600	N/A	N/A	15.9	54,400	N/A	N/A
Sensible	N/A	N/A	14.5	49,500	N/A	N/A	14.4	49,000	N/A	N/A
23.9°C DB, 16.1°C WB (75°F DB, 61°F WB) 45% RH										
Total	N/A	N/A	16.4	56,100	N/A	N/A	16.1	54,900	N/A	N/A
Sensible	N/A	N/A	16.4	56,100	N/A	N/A	16.1	54,900	N/A	N/A
22.2°C DB, 15.5°C WB (72°F DB, 60°F WB) 50% RH										
Total	N/A	N/A	15.6	53,300	N/A	N/A	15.3	52,100	N/A	N/A
Sensible	N/A	N/A	14.2	48,400	N/A	N/A	14.0	47,900	N/A	N/A
22.2°C DB, 14.8°C WB (72°F DB, 58.6°F WB) 45% RH										
Total	N/A	N/A	15.8	54,000	N/A	N/A	15.5	52,900	N/A	N/A
Sensible	N/A	N/A	15.8	54,000	N/A	N/A	15.5	52,900	N/A	N/A
GLYCOOL Coil Sensible Capacity										
23.9°C DB, 16.9°C WB (75°F DB, 62.5°C WB) 10°C (45°F) EGT									40,700	11.9
Fan Data (Blower A12x9AT)**										
Std Air CMH (CFM)	3060 (1800)		4420 (2600)		3060 (1800)		4420 (2600)		4420 (2600)	
Std Fan Motor kW (HP)	.75 (1)		1.1 (1-1/2)		.75 (1)		1.1 (1-1/2)		1.5 (2)	
Opt Air CMH (CFM)	N/A		4760 (2800)		N/A		4760 (2800)		N/A	
Opt Fan Motor kW (HP)	N/A		1.5 (2)		N/A		1.5 (2)		N/A	
Ext Static Pa (in. WG)	75 (.3)		75 (.3)		75 (.3)		75 (.3)		75 (.3)	
Evaporator Coil (BF: A-Frame; BU: V-Frame)										
Face Area m ² (ft ²)	.62 (6.67)		.62 (6.67)		.62 (6.67)		.62 (6.67)		.62 (6.67)	
Rows	3		4		3		4		4	
Face Velocity - m/s (FPM)	1.3 (255)		1.9 (375)		1.3 (255)		1.9 (375)		1.9 (375)	
Electric Reheat 2 Stage (Stainless Steel, Fin Tubular) - Standard										
Capacity - kW (BTU/H) (includes motor heat)	9 (34,100)		15 (56,200)		9 (34,100)		15 (56,200)		15 (56,200)	
Hot Water Reheat 82.2°C (180°F) E.W.T., 15.5°C (60°F) E.A.T. - Optional (Includes standard air volume & optional fan motor HP)										
Capacity - kW (BTU/H) (includes motor heat)	24.1 (82,019)		29.4 (100,539)		24.1 (82,019)		29.4 (100,539)		N/A	
Flow Rate - l/s (GPM)	.32 (5.0)		.32 (5.0)		.32 (5.0)		.32 (5.0)		N/A	
Pressure drop - kPa (ft.)	57.1 (19.1)		57.4 (19.2)		57.1 (19.1)		57.4 (19.2)		N/A	
Hot Gas Reheat - Optional (Includes standard air volume & optional fan motor)										
Capacity - kW (BTU/H) (includes motor heat)	12.5 (42,600)		15.0 (51,300)		12.5 (42,600)		15.0 (51,300)		N/A	

* The net capacity data has fan motor heat factored in for all ratings and the entering air condition of 22.2°C (72°F) & 50% RH is the standard rating for ASHRAE 127-2001.

All above data is based on 40% ethylene glycol solution.

** NOTE: Data rated with 2" 20% ASHRAE filter. Some options or combinations of options may result in reduced airflow. Consult factory for recommendations.

System Type BF or BE = Downflow BU or BK = Upflow	Glycol Cooled				GLYCOOL
	Self-Contained		Split Systems		Self-Contained
Indoor Unit	BF/BU 045WG	BF/BU 070WG	BF/BU 035E	BF/BU 059E	BE/BK 058G
Infrared Humidifier - Standard					
Capacity - kg/hr (lbs/hr)	5 (11)	5 (11)	5 (11)	5 (11)	5 (11)
kW	4.8	4.8	4.8	4.8	4.8
Steam Generating Humidifier - Optional					
Capacity - kg/hr (lbs/hr)	5 (11)	5 (11)	5 (11)	5 (11)	5 (11)
kW	3.9	3.9	3.9	3.9	3.9
Filter Section - Efficiencies per ASHRAE 52.1 - Disposable Type					
20% Eff. available in 51mm (2") - Standard, or Optional 102mm (4") Depths other Optional 102mm (4") Eff. are: 30%, 40-45%, 60-65%					
Nominal Size - mm	724 x 749	724 x 749	724 x 749	724 x 749	724 x 749
Nominal Size - inches	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5	28.5 x 29.5
Effective Surface Area - m ² (ft ²)	2.2 (24.1)	2.2 (24.1)	2.2 (24.1)	2.2 (24.1)	2.2 (24.1)
Glycol Regulating Valve					
Size - In	3/4	1	3/4	1	1
Econo-Valve					
Size - In	-	-	-	-	1
Cv	-	-	-	-	13.9
System Data*					
Flow Rate L/S (GPM)	.63 (10)	1.1 (17.5)	MC_43WG .71 (11.3)	MC_68WG 1.3 (20)	1.1 (17.5)
Unit Volume Liters (Gallons)	4.5 (1.2)	7.5 (2.0)	4.5 (1.2)	7.5 (2.0)	15.0 (4.0)
Pressure Drop kPa (ft.)	42.4 (14.2)	56.4 (18.9)	66.8 (22.4)	111.9 (37.5)	152.5 (51.1)
Drycooler 35°C (95°F) Ambient*					
Model Number	DSF069-3PH	DSF109-3PH	DSF069-3PH	DSF109-3PH	DSO109-3PH
Volume Liters (Gallons)	9.0 (2.4)	18.4 (4.9)	9.0 (2.4)	18.4 (4.9)	18.4 (4.9)
Pressure Drop kPa (ft.)	8.7 (2.9)	6.9 (2.3)	10.7 (3.6)	8.7 (2.9)	6.9 (2.3)
Fan kW (HP)	.56 (3/4)	.56 (3/4)	.56 (3/4)	.56 (3/4)	.56 (3/4)
Expansion Tank Capacity Liters (Gallons)	33.1 (8.8)	33.1 (8.8)	33.1 (8.8)	33.1 (8.8)	33.1 (8.8)
Glycol Pump kW - 3 phase (HP)	1.1 (1.5)	1.1 (1.5)	1.1 (1.5)	1.1 (1.5)	1.1 (1.5)
Head kPa (ft.)	268.6 (90.0)	262.6 (88.0)	268.6 (90.0)	262.6 (88.0)	262.6 (88.0)
Pump Suction & Discharge FPT	1-1/4 & 3/4	1-1/4 & 3/4	1-1/4 & 3/4	1-1/4 & 3/4	1-1/4 & 3/4
Drycooler Connections FPT	1-1/4	2	1-1/4	2	2
Connection Sizes Challenger 3000 Unit					
Condenser Supply	7/8 OD CU	1-1/8 OD CU	-	-	1-1/8 OD CU
Condenser Return	7/8 OD CU	1-1/8 OD CU	-	-	1-1/8 OD CU
Liquid Line	-	-	5/8 - 18 Female #6 QC	1/2 OD CU	-
Suction Line	-	-	1-1/8 - 12 Female #11 QC	1-1/8 OD CU	-
Humidifier Supply Line	1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU	1/4 OD CU
Condensate Drain Line	3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT	3/4 FPT
Connection Sizes Condensing Unit					
Condenser Supply	-	7/8 OD CU	1-1/8 OD CU	-	-
Condenser Return	-	7/8 OD CU	1-1/8 OD CU	-	-
Liquid Line	-	5/8 - 18 Male #6 QC	1/2 OD CU	-	-
Suction Line	-	1-1/8 - 12 Male #11 QC	1-1/8 OD CU	-	-

* All above data is based on 40% ethylene glycol solution.

CHILLED WATER DATA—60 Hz

Capacity Data BTU/H (kW) @ 45°F (7.2°C) EWT * Net Capacity Data - Standard Air Volume

Indoor Unit BF = Downflow BU = Upflow	BF/BU 068C	BF/BU 102C
80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) 50% RH		
Total BTU/H (kW)	56,800 (16.6)	98,100 (28.7)
Sensible BTU/H (kW)	4,300 (1.3)	71,500 (20.9)
Flow Rate GPM (L/S)	11.5 (0.7)	19.7 (1.2)
Pressure Drop ft (kPa)	7.1 (21.2)	22.1 (65.9)
75°F DB, 62.5°F WB (23.9°C DB, 16.9°C WB) 50% RH		
Total BTU/H (kW)	41,300 (12.1)	72,900 (21.4)
Sensible BTU/H (kW)	36,300 (10.6)	61,000 (17.9)
Flow Rate GPM (L/S)	8.6 (0.5)	14.7 (0.9)
Pressure Drop ft (kPa)	4.1 (12.2)	12.8 (38.2)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH		
Total BTU/H (kW)	40,100 (11.7)	68,200 (20.0)
Sensible BTU/H (kW)	38,200 (11.2)	63,100 (18.5)
Flow Rate GPM (L/S)	8.6 (0.5)	13.3 (0.8)
Pressure Drop ft (kPa)	4.1 (12.2)	10.6 (31.6)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH		
Total BTU/H (kW)	33,700 (9.9)	59,900 (17.6)
Sensible BTU/H (kW)	32,000 (9.4)	54,400 (15.9)
Flow Rate GPM (L/S)	7.0 (0.4)	12.0 (0.8)
Pressure Drop ft (kPa)	2.8 (8.4)	8.8 (26.3)
72°F DB, 58.6°F WB (22.2°C DB, 14.8°C WB) 45% RH		
Total BTU/H (kW)	32,100 (9.4)	56,200 (16.5)
Sensible BTU/H (kW)	32,100 (9.4)	55,300 (16.2)
Flow Rate GPM (L/S)	6.6 (0.4)	11.1 (0.7)
Pressure Drop ft (kPa)	2.5 (7.5)	7.6 (22.7)
*Net Capacity - Optional Air Volume		
80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) 50% RH		
Total BTU/H (kW)	68,500 (20.1)	102,300 (30.0)
Sensible BTU/H (kW)	53,100 (15.6)	74,800 (21.9)
Flow Rate GPM (L/S)	14.0 (0.9)	20.9 (1.3)
Pressure Drop ft (kPa)	10.3 (30.7)	24.6 (73.4)
75°F DB, 62.5°F WB (23.9°C DB, 16.9°C WB) 50% RH		
Total BTU/H (kW)	48,100 (14.1)	75,900 (22.2)
Sensible BTU/H (kW)	43,700 (12.8)	63,700 (18.7)
Flow Rate GPM (L/S)	9.5 (0.6)	15.5 (1.0)
Pressure Drop ft (kPa)	4.9 (14.6)	14.1 (42.1)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH		
Total BTU/H (kW)	47,300 (13.9)	71,200 (20.9)
Sensible BTU/H (kW)	45,800 (13.4)	66,100 (19.4)
Flow Rate GPM (L/S)	9.3 (0.6)	14.1 (0.9)
Pressure Drop ft (kPa)	4.9 (14.6)	11.8 (35.2)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH		
Total BTU/H (kW)	40,800 (12.0)	62,300 (18.3)
Sensible BTU/H (kW)	39,200 (11.5)	56,800 (16.6)
Flow Rate GPM (L/S)	8.5 (0.5)	12.7 (0.8)
Pressure Drop ft (kPa)	4.0 (12.0)	9.8 (29.4)
72°F DB, 58.6°F WB (22.2°C DB, 14.8°C WB) 45% RH		
Total BTU/H (kW)	39,200 (11.5)	58,500 (17.1)
Sensible BTU/H (kW)	39,200 (11.5)	57,700 (16.9)
Flow Rate GPM (L/S)	8.1 (0.5)	11.7 (0.7)
Pressure Drop ft (kPa)	3.7 (11.1)	8.4 (25.5)

* The net capacity data has fan motor heat factored in for all ratings and the entering air condition of 72°F (22.2°C), 50% RH is the standard rating condition for ASHRAE 127-2001.

Indoor Unit BF = Downflow BU = Upflow	BF/BU 068C	BF/BU 102C
Fan Data (Blower A12x9AT) **		
Std Air CFM (CMH)	1800 (3060)	2800 (4760)
Std Fan Motor HP (kW)	3/4 (.56)	1-1/2 (1.1)
Opt Air CFM (CMH)	2300 (3910)	3000 (5100)
Opt Fan Motor HP (kW)	1 (.75)	2 (1.5)
Ext Static in. WG (Pa)	.3 (75)	.3 (75)
Chilled Water Coil (BF: A-Frame; BU: V-Frame)		
Face Area, ft ² (m ²)	6.67 (.62)	6.67 (.62)
Rows	3	4
Face Velocity - FPM (m/s)	255 (1.3)	405 (2.1)
Electric Reheat 2 Stage (Stainless Steel, Fin Tubular) - Standard		
Capacity - BTU/H (kW) (includes motor heat)	33,400 (9)	56,200 (15)
Hot Water Reheat 180°F (82.2°C) E.W.T., 60°F (15.5°C) E.A.T. Optional (Includes standard air volume & optional fan motor HP)		
Capacity - BTU/H (kW) (includes motor heat)	82,019 (24.1)	102,112 (29.9)
Flow Rate - GPM (l/s)	5.0 (0.32)	5.0 (0.32)
Pressure drop, ft (kPa)	19.1 (57.1)	19.2 (57.4)
Infrared Humidifier - Standard		
Capacity - lbs/hr (kg/hr)	11 (5)	11 (5)
kW	4.8	4.8
Steam Generating Humidifier - Optional		
Capacity - lbs/hr (kg/hr)	11 (5)	11 (5)
kW	3.9	3.9
Filter Section - Efficiencies per ASHRAE 52.1 - Disposable Type		
20% Eff. available in 2" (51mm) - Standard, or Optional 4" (102mm) Depths; other Optional 4" (102mm) Eff. are: 30%, 40-45%, 60-65%		
Nominal Size - inches	28.5 x 29.5	28.5 x 29.5
Nominal Size - mm	724 x 749	724 x 749
Effective Surface Area, ft ² (m ²)	24.1 (2.2)	24.1 (2.2)
Connection Sizes Challenger 3000 Unit		
CW Supply	1-1/8 OD CU	1-1/8 OD CU
CW Return	1-1/8 OD CU	1-1/8 OD CU
Humidifier Supply	1/4 OD CU	1/4 OD CU
Condensate Drain	3/4 FPT	3/4 FPT
Control Valve		
Maximum design water pressure 150 psi (1034.3 kPa)		
Valve Actuator	Modulating	Modulating
Sensors	Proportional	Proportional
Valve Body	3-Way	3-Way
Valve Size - inches	1	1
Cv	11.6	11.6
2-Way Valve (Optional)		
Close Off Pressure - PSI (kPa)	86 (593)	86 (593)

** NOTE: Data rated with 2" 20% ASHRAE filter. Some options or combinations of options may result in reduced airflow. Consult factory for recommendations.

CHILLED WATER DATA—50 Hz

Capacity Data kW (BTU/H) @ 7.2°C (45°F) EWT
*** Net Capacity Data - Standard Air Volume**

Indoor Unit BF = Downflow BU = Upflow	BF/BU 072C	BF/BU 101C
26.7°C DB, 19.4°C WB (80°F DB, 67°F WB) 50% RH		
Total kW (BTU/H)	16.6 (56,800)	27.5 (94,000)
Sensible kW (BTU/H)	12.6 (43,000)	19.8 (67,500)
Flow Rate L/S (GPM)	0.7 (11.5)	1.2 (19.7)
Pressure Drop kPa (ft)	21.2 (7.1)	65.9 (22.1)
23.9°C DB, 16.9°C WB (75°F DB, 62.5°F WB) 50% RH		
Total kW (BTU/H)	12.1 (41,300)	20.4 (69,700)
Sensible kW (BTU/H)	10.6 (36,300)	16.8 (57,500)
Flow Rate L/S (GPM)	0.5 (8.6)	0.9 (14.7)
Pressure Drop kPa (ft)	12.2 (4.1)	38.2 (12.8)
23.9°C DB, 16.1°C WB (75°F DB, 61°F WB) 45% RH		
Total kW (BTU/H)	11.3 (38,500)	19.0 (64,800)
Sensible kW (BTU/H)	10.9 (37,100)	17.4 (59,500)
Flow Rate L/S (GPM)	0.5 (7.6)	0.8 (13.3)
Pressure Drop kPa (ft)	9.8 (3.3)	31.6 (10.6)
22.2°C DB, 15.5°C WB (72°F DB, 60°F WB) 50% RH		
Total kW (BTU/H)	9.9 (33,700)	16.7 (57,100)
Sensible kW (BTU/H)	9.4 (32,000)	15.1 (51,400)
Flow Rate L/S (GPM)	0.4 (7.0)	0.8 (12.0)
Pressure Drop kPa (ft)	8.4 (2.8)	26.3 (8.8)
22.2°C DB, 14.8°C WB (72°F DB, 58.6°F WB) 45% RH		
Total kW (BTU/H)	9.4 (32,100)	15.7 (53,500)
Sensible kW (BTU/H)	9.4 (32,100)	15.4 (52,400)
Flow Rate L/S (GPM)	0.4 (6.6)	0.7 (11.1)
Pressure Drop kPa (ft)	7.5 (2.5)	22.7 (7.6)
*Net Capacity - Optional Air Volume		
26.7°C DB, 19.4°C WB (80°F DB, 67°F WB) 50% RH		
Total kW (BTU/H)	N/A	28.8 (98,300)
Sensible kW (BTU/H)	N/A	20.8 (70,900)
Flow Rate L/S (GPM)	N/A	1.3 (20.9)
Pressure Drop kPa (ft)	N/A	73.4 (24.6)
23.9°C DB, 16.9°C WB (75°F DB, 62.5°F WB) 50% RH		
Total kW (BTU/H)	N/A	21.3 (72,800)
Sensible kW (BTU/H)	N/A	17.7 (60,300)
Flow Rate L/S (GPM)	N/A	1.0 (15.5)
Pressure Drop kPa (ft)	N/A	42.1 (14.1)
23.9°C DB, 16.1°C WB (75°F DB, 61°F WB) 45% RH		
Total kW (BTU/H)	N/A	19.9 (67,900)
Sensible kW (BTU/H)	N/A	18.3 (62,500)
Flow Rate L/S (GPM)	N/A	0.9 (14.1)
Pressure Drop kPa (ft)	N/A	35.2 (11.8)
22.2°C DB, 15.5°C WB (72°F DB, 60°F WB) 50% RH		
Total kW (BTU/H)	N/A	17.5 (59,600)
Sensible kW (BTU/H)	N/A	15.8 (53,800)
Flow Rate L/S (GPM)	N/A	0.8 (12.7)
Pressure Drop kPa (ft)	N/A	29.2 (9.8)
22.2°C DB, 14.8°C WB (72°F DB, 58.6°F WB) 45% RH		
Total kW (BTU/H)	N/A	16.3 (55,800)
Sensible kW (BTU/H)	N/A	16.1 (54,800)
Flow Rate L/S (GPM)	N/A	0.7 (11.7)
Pressure Drop kPa (ft)	N/A	25.1 (8.4)

* The net capacity data has fan motor heat factored in for all ratings and the entering air condition of 22.2°C (72°F), 50% RH is the standard rating condition for ASHRAE 127-2001.

Indoor Unit BF = Downflow BU = Upflow	BF/BU 072C	BF/BU 101C
Fan Data (Blower A12x9AT) **		
Std Air CMH (CFM)	3060 (1800)	4420 (2600)
Std Fan Motor kW (HP)	.75 (1)	1.1 (1-1/2)
Opt Air CMH (CFM)	N/A	4760 (2800)
Opt Fan Motor kW (HP)	N/A	1.5 (2)
Ext Static Pa (in. WG)	75 (.3)	75 (.3)
Chilled Water Coil (BF: A-Frame; BU: V-Frame)		
Face Area m ² (ft ²)	.62 (6.67)	.62 (6.67)
Rows	3	4
Face Velocity - m/s (FPM)	1.3 (255)	1.9 (375)
Electric Reheat 2 Stage (Stainless Steel, Fin Tubular) - Standard		
Capacity - kW (BTU/H) (includes motor heat)	9 (34,100)	15 (56,200)
Hot Water Reheat 82.2°C (180°F) E.W.T., 15.5°C (60°F) E.A.T. - Optional (Includes standard air volume & optional fan motor HP)		
Capacity - BTU/H (kW) (includes motor heat)	24.1 (82,019)	29.4 (100,539)
Flow Rate - l/s (GPM)	0.32 (5.0)	0.32 (5.0)
Pressure drop - kPa (ft.)	57.1 (19.1)	57.4 (19.2)
Infrared Humidifier - Standard		
Capacity - kg/hr (lbs/hr)	5 (11)	5 (11)
kW	4.8	4.8
Steam Generating Humidifier - Optional		
Capacity - kg/hr (lbs/hr)	5 (11)	5 (11)
kW	3.9	3.9
Filter Section - Efficiencies per ASHRAE 52.1 - Disposable Type		
20% Eff. available in 51mm (2") - Standard, or Optional 102mm (4") Depths; other Optional 102mm (4") Eff. are: 30%, 40-45%, 60-65%		
Nominal Size - mm	28.5 x 29.5	28.5 x 29.5
Nominal Size - inches	724 x 749	724 x 749
Effective Surface Area - m ² (ft ²)	2.2 (24.1)	2.2 (24.1)
Connection Sizes Challenger 3000 Unit		
CW Supply	1-1/8 OD CU	1-1/8 OD CU
CW Return	1-1/8 OD CU	1-1/8 OD CU
Humidifier Supply	1/4 OD CU	1/4 OD CU
Condensate Drain	3/4 FPT	3/4 FPT
Control Valve		
Maximum design water pressure 1034.4 kPa (150 PSI)		
Valve Actuator	Modulating	Modulating
Sensors	Proportional	Proportional
Valve Body	3-WAY	3-WAY
Valve Size - inches	1	1
Cv	11.6	11.6
2-Way Valve (Optional)		
Close Off Pressure - kPa (PSI)	593 (86)	593 (86)

** NOTE: Data rated with 2" 20% ASHRAE filter. Some options or combinations of options may result in reduced airflow. Consult factory for recommendations.

DIMENSIONAL DRAWINGS

Figure 10 Cabinet and floor planning dimensional data—Upflow (BU/BK) models

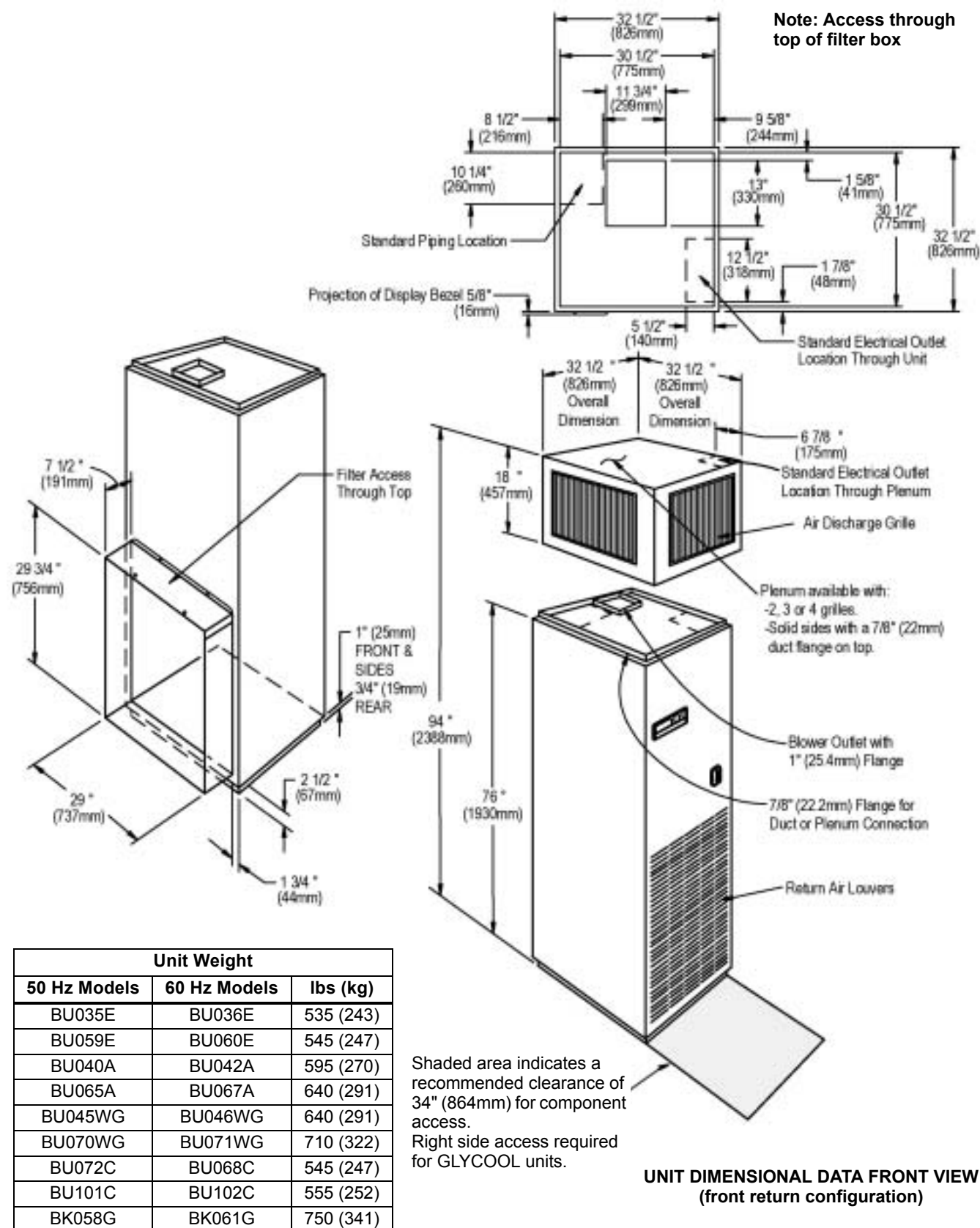
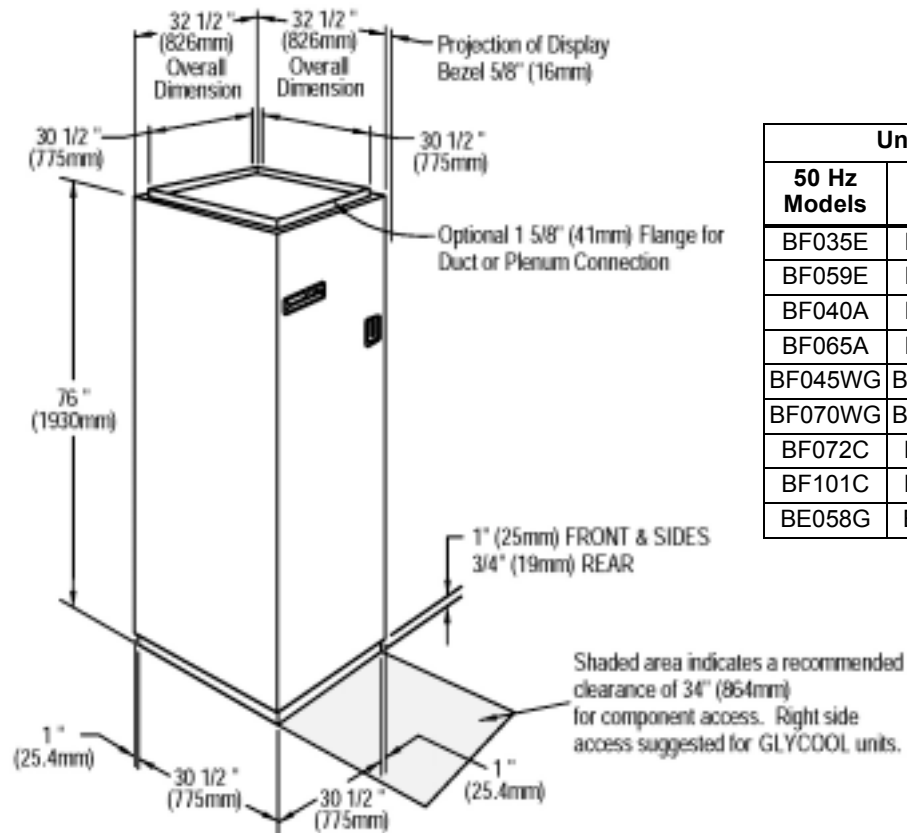
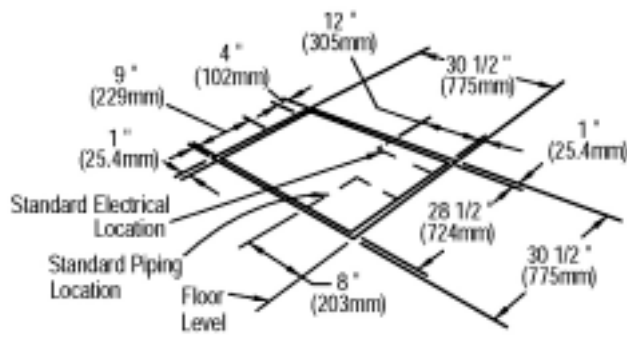


Figure 11 Cabinet and floor planning dimensional data—Downflow (BF/BE) models

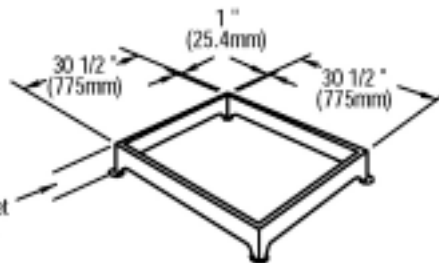


UNIT DIMENSIONAL DATA

Unit Weight		
50 Hz Models	60 Hz Models	lbs (kg)
BF035E	BF036E	535 (243)
BF059E	BF060E	545 (247)
BF040A	BF042A	595 (270)
BF065A	BF067A	640 (291)
BF045WG	BF046WG	640 (291)
BF070WG	BF071WG	710 (322)
BF072C	BF068C	545 (247)
BF101C	BF102C	555 (252)
BE058G	BE061G	750 (341)



FLOOR CUTOUT DIMENSIONS



See Specification Sheet for Floor Stand Height Ordered.

OPTIONAL FLOOR STAND DIMENSIONAL DATA

Figure 12 Cabinet and floor planning dimensional data—3-ton centrifugal fan condensing unit

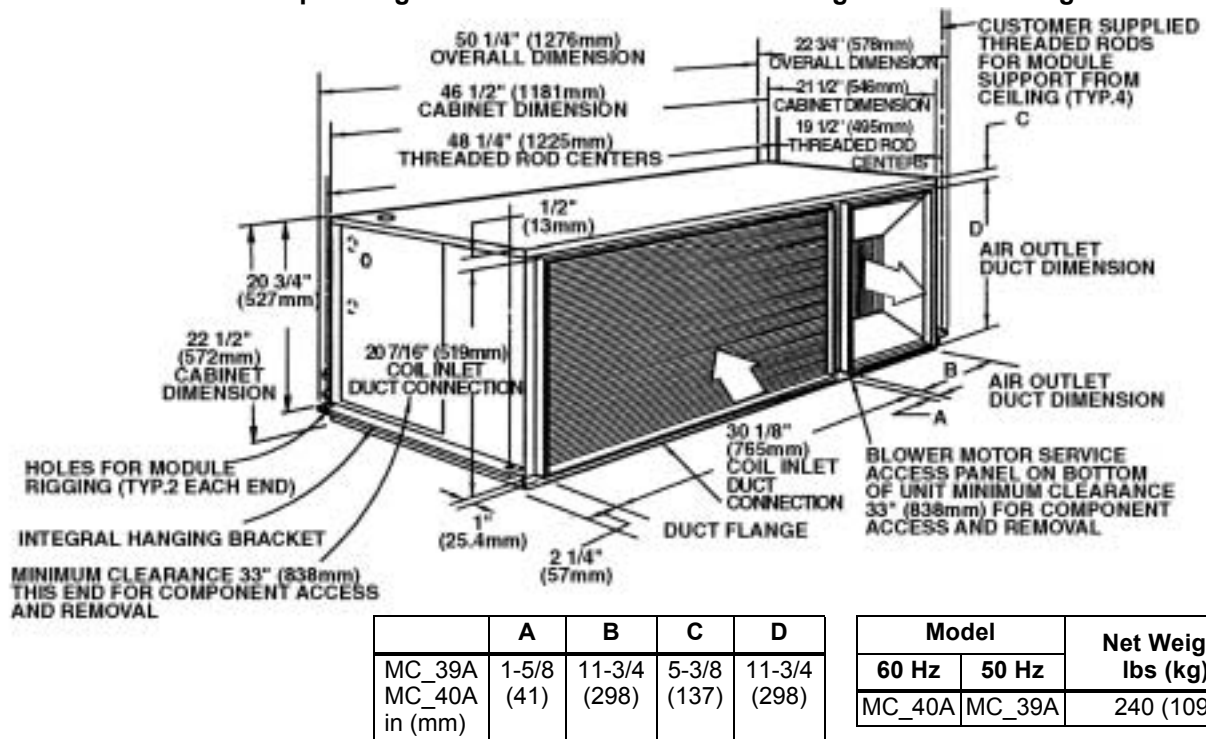


Figure 13 Cabinet and floor planning dimensional data—Split system—5-ton centrifugal fan condensing unit

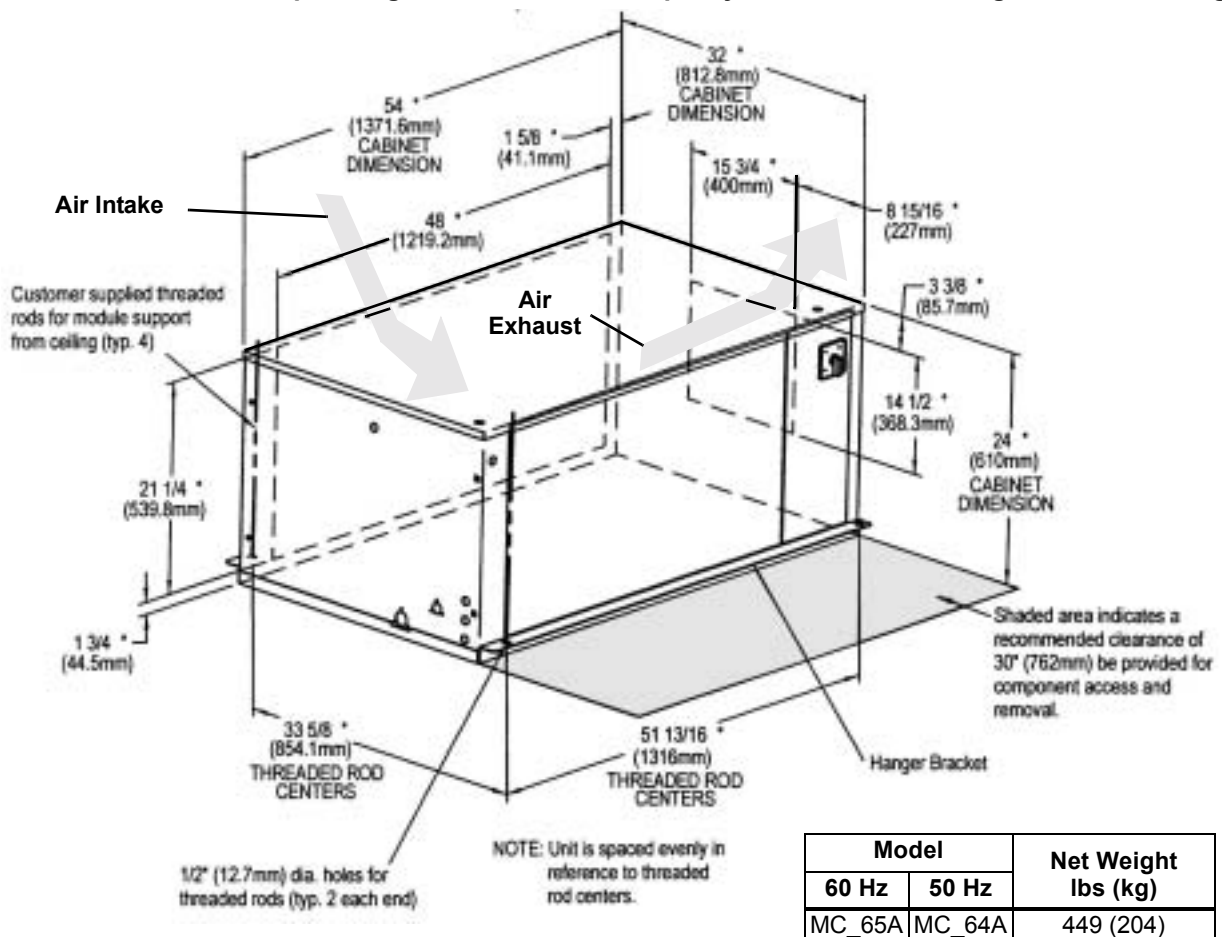
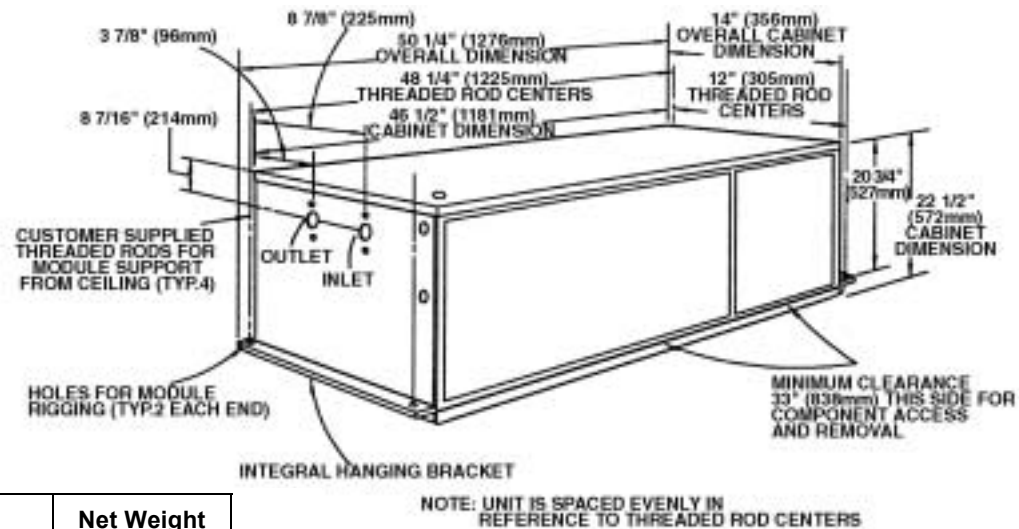
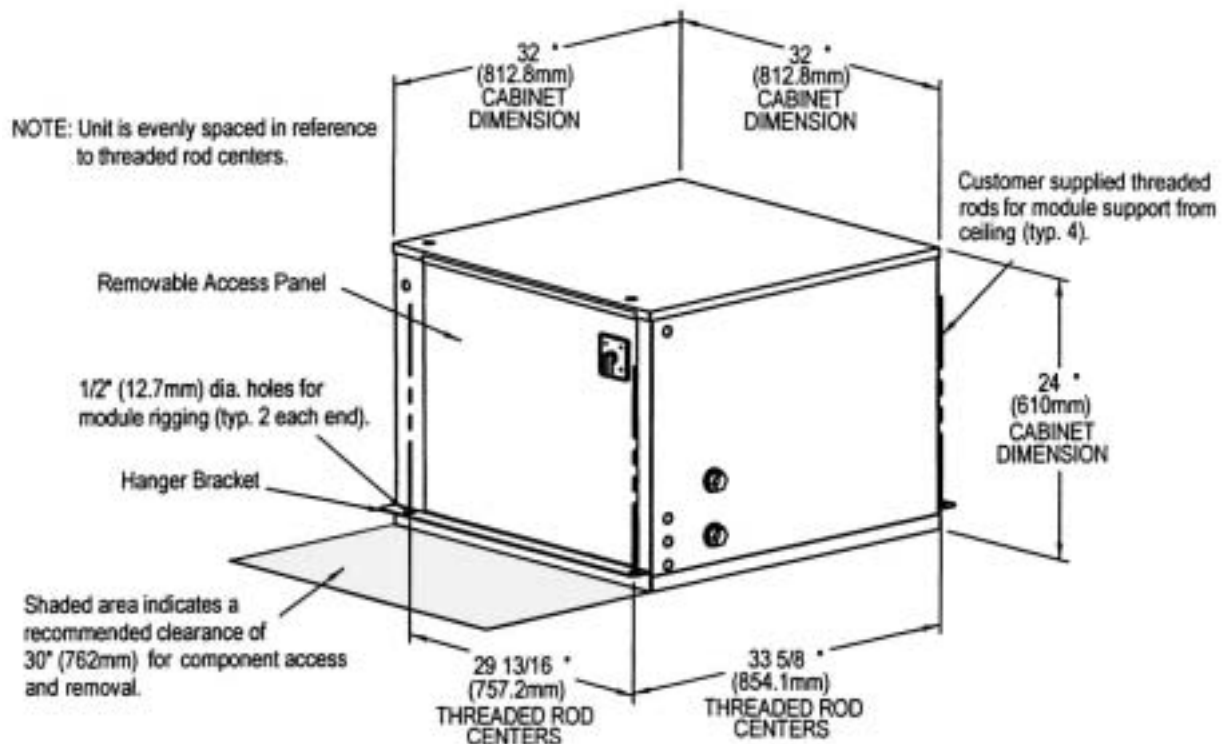


Figure 14 Cabinet and floor planning dimensional data—Split system—3-ton water/glycol cooled condensing unit



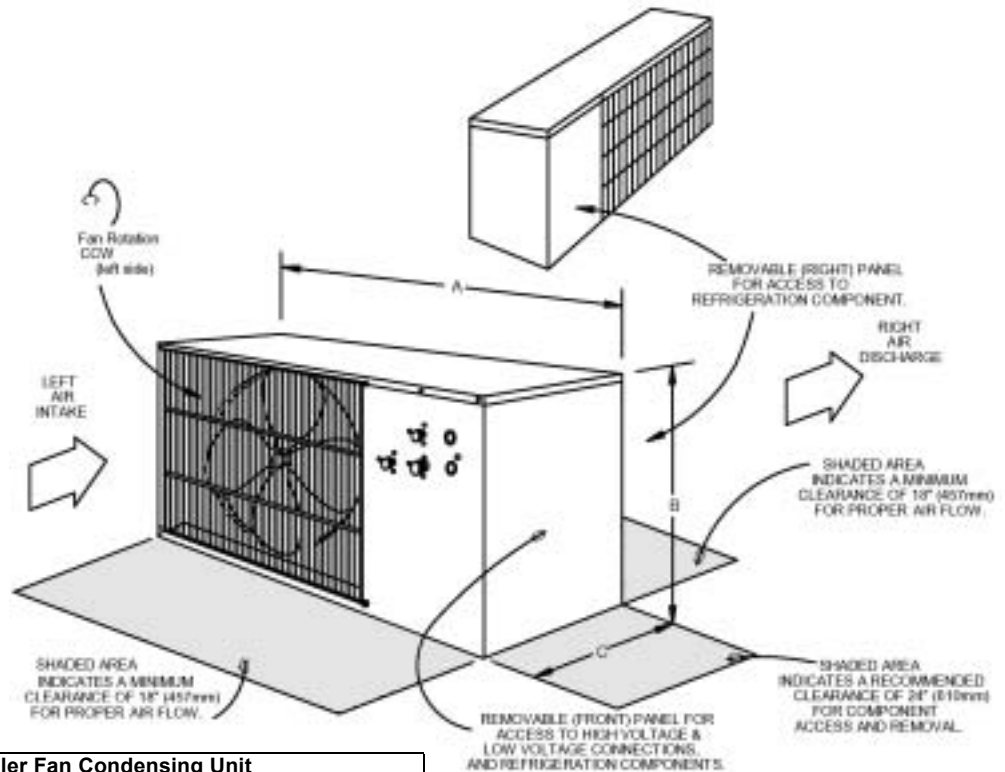
Model		Net Weight lbs (kg)
60 Hz	50 Hz	
MC_44W	MC_43W	190 (86)

Figure 15 Cabinet and floor planning dimensional data—Split system—5-ton water/glycol cooled condensing unit



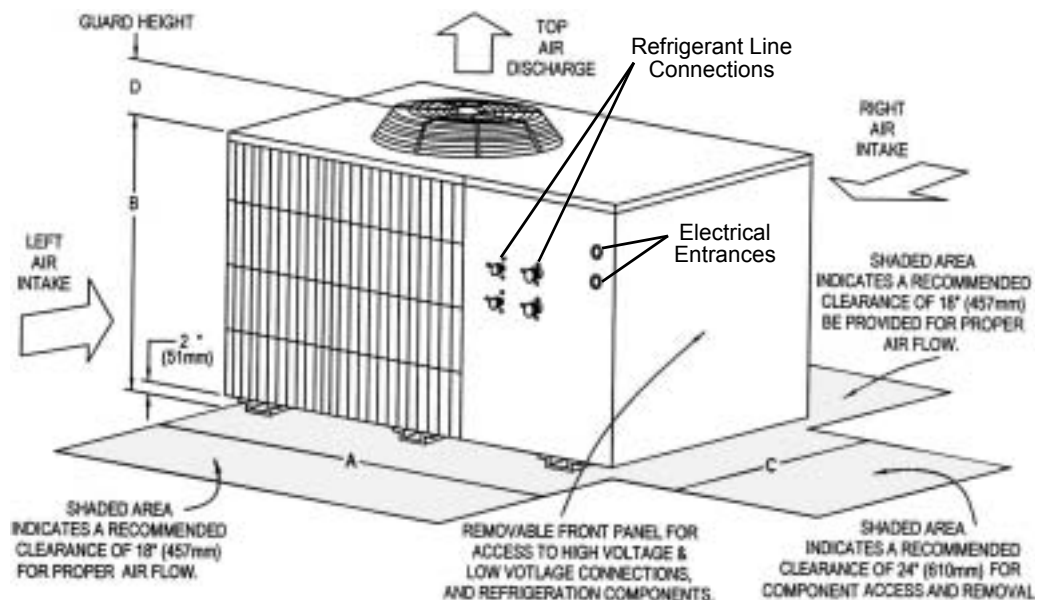
Model		Net Weight lbs (kg)
60 Hz	50 Hz	
MC_69W	MC_68W	282 (128)

Figure 16 Cabinet and floor planning dimensional data—Split System—Propeller fan condensing unit



Outdoor Propeller Fan Condensing Unit					
Model		Width (A)	Depth (C)	Height (B)	Net Weight
60 Hz	50 Hz	Dimensions - Inches (mm)			lbs (kg)
PFH042A-_L	PFH041A-_L	48 (1219)	18 (457)	31 (787)	241 (109)
PFH042A-_H	PFH041A-_H	53 (1343)	18 (457)	36-1/4 (918)	351 (159)
PFFZ42A-_L	PFFZ41A-_L	53 (1343)	18 (457)	36-1/4 (918)	351 (159)
PFH067A-_L	PFH066A-_L	53 (1343)	18 (457)	36-1/4 (918)	351 (159)

Figure 17 Cabinet and floor planning dimensional data—Propeller fan condensing modules—Vertical air discharge



Model Numbers		Dimensional Data in. (mm)				Module Weight
60 HZ	50 HZ	A	B	C	D	lbs (kg) net.
PFH067A-_H	PFH066A-_H	53	36-1/4	38-1/2	5-1/2	488
PFFZ67A-_H	PFFZ66A-_L	(1343)	(918)	(978)	(140)	(222)

Figure 18 Cabinet and floor planning dimensional data—Self-contained system—Air cooled condenser or drycooler

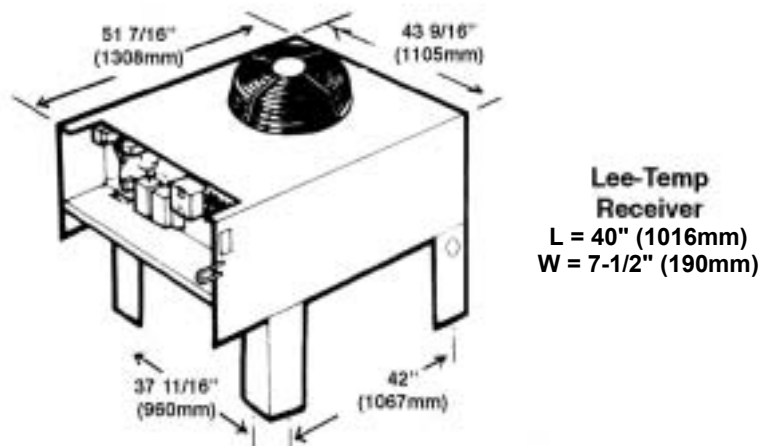
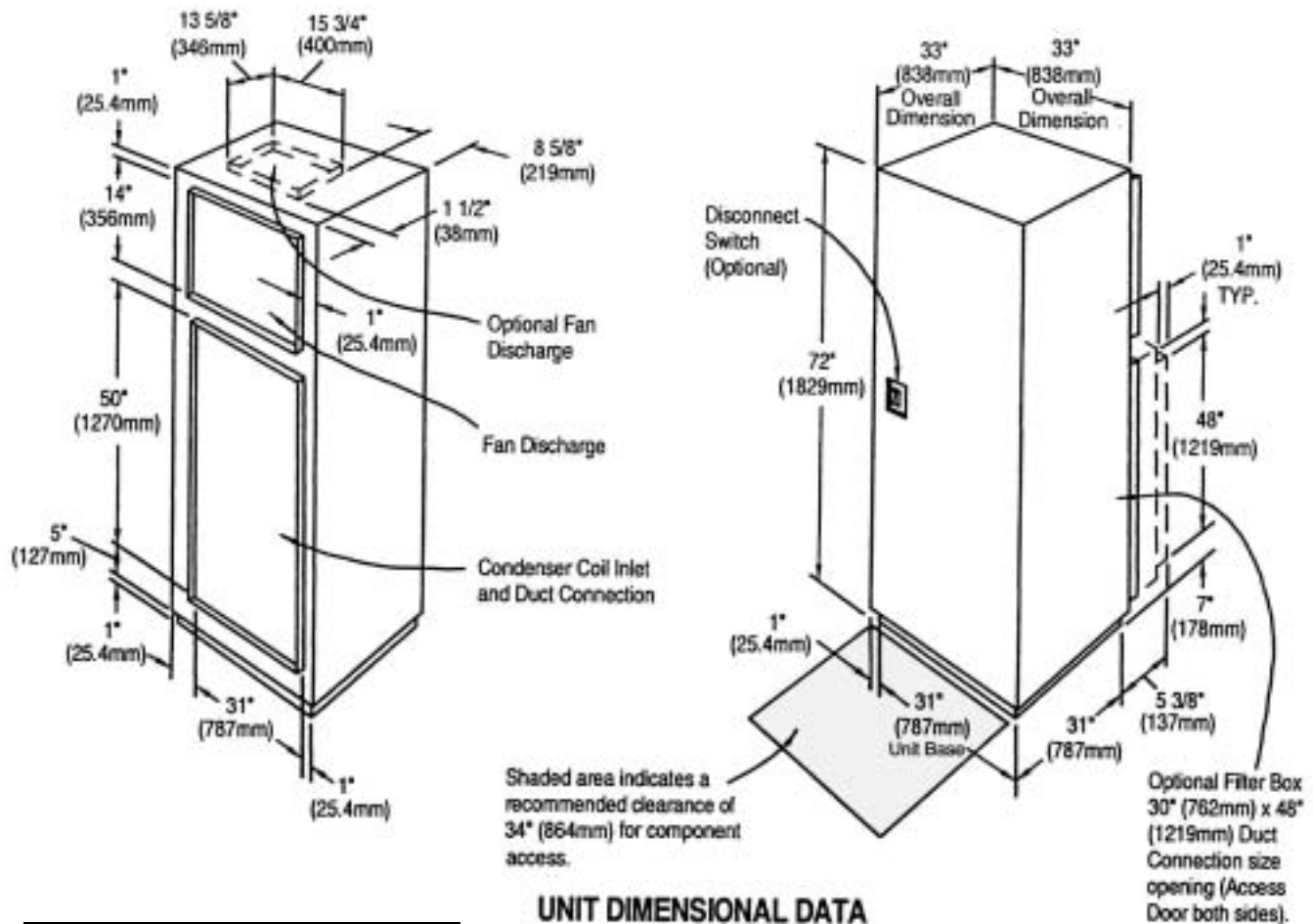


Figure 19 Cabinet and floor planning dimensional data—Piggyback condenser



MODEL	WEIGHT
PB-224A; PB-280A; PB-332A; PB-378A	540 lb (240 kg)

ELECTRICAL DATA—60 Hz

Table 7 Challenger 3000 electrical data—60 Hz¹

Model Type	Self-Contained								Split System Evaporator or Chilled Water							
	3 Ton B*042A, 046WG				5 Ton B*067A, 071WG, 061G				3 Ton B*036E, 068C				5 Ton B*060E, 102C			
Voltage	All Voltages Are 3 Phase Unless Noted Otherwise															
	208	230	460	575	208	230	460	575	208	230	460	575	208	230	460	575
With Electric Reheat & Humidifier (Infrared or Steam Generating) (Note: See Table 8 for units w/SCR reheats. ²)																
Motor	.75 HP (.56 kW)				1.5 HP (1.1 kW)				.75 HP (.56 kW)				1.5 HP (1.1 kW)			
FLA	42.0	40.3	19.6	17.5	68.0	65.0	32.3	24.6	41.4	37.5	19.0	17.5	60.6	55.4	28.1	24.6
WSA	51.8	49.7	24.2	21.9	83.6	80.0	39.7	30.8	51.8	46.9	23.8	21.9	75.8	69.3	35.1	30.8
OPD	50	50	25	20	90	90	40	30	60	50	25	25	80	70	40	35
Motor	1.0 HP (.75 kW)				2.0 HP (1.5 kW)				1.0 HP (.75 kW)				2.0 HP (1.5 kW)			
FLA	42.9	41.1	20.0	17.8	69.8	66.6	33.1	25.2	42.3	38.3	19.4	17.8	62.4	57.0	28.9	25.2
WSA	52.9	50.5	24.6	22.3	85.4	81.6	40.5	31.5	52.9	47.9	24.3	22.3	78.0	71.3	36.1	31.5
OPD	60	50	25	20	90	90	45	30	60	50	25	25	80	80	40	35
Motor	1.5 HP (1.1 kW)				3.0 HP (2.2 kW)				1.5 HP (1.1 kW)				3.0 HP (2.2 kW)			
FLA	44.6	42.7	20.8	18.5	72.9	69.4	34.5	26.4	44.0	39.9	20.2	18.5	65.5	59.8	30.3	26.4
WSA	55.0	52.1	25.4	23.1	88.5	84.4	41.9	33.0	55.0	49.9	25.3	23.1	81.9	74.8	37.9	33.0
OPD	60	60	25	20	90	90	45	35	60	50	30	25	90	80	40	35
Humidifier Only (Infrared or Steam Generating)																
Motor	.75 HP (.56 kW)				1.5 HP (1.1 kW)				.75 HP (.56 kW)				1.5 HP (1.1 kW)			
FLA	30.3	27.8	13.6	13.9	39.7	37.0	18.4	16.9	16.4	13.9	7.2	8.5	19.0	16.3	8.4	9.5
WSA	33.8	31.3	15.2	15.3	44.9	42.2	20.9	18.8	20.5	17.4	9.0	10.6	23.8	20.4	10.5	11.9
OPD	45	45	20	20	60	60	30	25	25	15	15	15	25	20	15	15
Motor	1.0 HP (.75 kW)				2.0 HP (1.5 kW)				1.0 HP (.75 kW)				2.0 HP (1.5 kW)			
FLA	31.2	28.6	14.0	14.2	41.5	38.6	19.2	17.5	17.3	14.7	7.6	8.8	20.8	17.9	9.2	10.1
WSA	34.7	32.1	15.6	15.6	46.7	43.8	21.7	19.4	21.6	18.4	9.5	11.0	26.0	22.4	11.5	12.6
OPD	45	45	20	20	60	60	30	25	20	15	15	15	30	25	15	15
Motor	1.5 HP (1.1 kW)				3.0 HP (2.2 kW)				1.5 HP (1.1 kW)				3.0 HP (2.2 kW)			
FLA	32.9	30.2	14.8	14.9	44.6	41.4	20.6	18.7	19.0	16.3	8.4	9.5	23.9	20.7	10.6	11.3
WSA	36.4	33.7	16.4	16.3	49.8	46.6	23.1	20.6	23.8	20.4	10.5	11.9	29.9	25.9	13.3	14.1
OPD	50	45	20	20	70	60	30	25	25	20	15	15	35	30	15	15
Electric Reheat Only (Note: See Table 8 for Self-contained units w/SCR reheats. ²)																
Motor	.75 HP (.56 kW)				1.5 HP (1.1 kW)				.75 HP (.56 kW)				1.5 HP (1.1 kW)			
FLA	42.0	40.3	19.6	15.5	68.0	65.0	32.3	24.6	28.1	26.4	13.2	10.1	47.3	44.3	22.3	17.2
WSA	51.7	49.7	24.2	19.1	83.6	80.0	39.7	30.2	35.1	33.0	16.5	12.6	59.1	55.4	27.9	21.5
OPD	50	50	25	20	90	90	40	30	40	35	20	15	60	60	30	25
Motor	1.0 HP (.75 kW)				2.0 HP (1.5 kW)				1.0 HP (.75 kW)				2.0 HP (1.5 kW)			
FLA	42.9	41.1	20.0	15.8	69.8	66.6	33.1	25.2	29.0	27.2	13.6	10.4	49.1	45.9	23.1	17.8
WSA	52.6	50.5	24.6	19.4	85.4	81.6	40.5	30.8	36.3	34.0	17.0	13.0	61.4	57.4	28.9	22.3
OPD	60	50	25	20	90	90	45	30	40	35	20	15	70	60	30	25
Motor	1.5 HP (1.1 kW)				3.0 HP (2.2 kW)				1.5 HP (1.1 kW)				3.0 HP (2.2 kW)			
FLA	44.6	42.7	20.8	16.5	72.9	69.4	34.5	26.4	30.7	28.8	14.4	11.1	52.2	48.7	24.5	19.0
WSA	54.3	52.1	25.4	20.1	88.5	84.4	41.9	32.0	38.4	36.0	18.0	13.9	65.3	60.9	30.6	23.8
OPD	60	60	25	20	90	90	45	35	40	40	20	15	60	70	35	20
Without Electric Reheat & Humidifier																
Motor	.75 HP (.56 kW)				1.5 HP (1.1 kW)				.75 HP (.56 kW)				1.5 HP (1.1 kW)			
FLA	17.0	16.7	7.8	6.5	26.4	25.9	12.6	9.5	3.1	2.8	1.4	1.1	5.7	5.2	2.6	2.1
WSA	20.5	20.2	9.4	7.9	31.6	31.1	15.1	11.4	3.9	3.5	1.8	1.4	7.1	6.5	3.3	2.6
OPD	30	30	15	15	50	50	25	15	15	15	15	15	15	15	15	15
Motor	1.0 HP (.75 kW)				2.0 HP (1.5 kW)				1.0 HP (.75 kW)				2.0 HP (1.5 kW)			
FLA	17.9	17.5	8.2	6.8	28.2	27.5	13.4	10.1	4.0	3.6	1.8	1.4	7.5	6.8	3.4	2.7
WSA	21.4	21.0	9.8	8.2	33.4	32.7	15.9	12.0	5.0	4.5	2.3	1.8	9.4	8.5	4.3	3.4
OPD	35	30	15	15	50	50	25	15	15	15	15	15	15	15	15	15
Motor	1.5 HP (1.1 kW)				3.0 HP (2.2 kW)				1.5 HP (1.1 kW)				3.0 HP (2.2 kW)			
FLA	19.6	19.1	9.0	7.5	31.3	30.3	14.8	11.3	5.7	5.2	2.6	2.1	10.6	9.6	4.8	3.9
WSA	23.1	22.6	10.6	8.9	36.5	35.5	17.3	13.2	7.1	6.5	3.3	2.6	13.3	12.0	6.0	4.9
OPD	35	35	15	15	50	50	25	20	15	15	15	15	20	20	15	15

1. Contact factory for 380-3-60 data.

2. For Split System Evaporators with SCR reheat, use the values above.

The above values were calculated per UL Standard 1995.

FLA= Full Load Amps (Input Amps); WSA= Wire Size Amps (Minimum Supply Circuit Ampacity); OPD= Maximum Overcurrent Protective Device Size RLA= Rated Load Amps; LRA= Locked Rotor Amps

* F= Downflow; U= Upflow; E= Downflow with Econ-O-Coil; K= Upflow with Econ-O-Coil

Table 8 Self-contained with SCR reheat *

Model	3 Ton				5 Ton			
Voltage (3, 60 Hz)	208	230	460	575	208	230	460	575
Electric Reheat & Humidifier (Infrared or Steam Generating)								
Motor	.75 HP (.56 kW)				1.5 HP (1.1 kW)			
FLA	55.3	51.4	25.4	N/A	81.3	76.1	38.1	N/A
WSA	65.0	60.8	30.0	N/A	96.9	91.1	45.5	N/A
OPD	70	60	30	N/A	100	100	50	N/A
Motor	1.0 HP (.75 kW)				2.0 HP (1.5 kW)			
FLA	56.2	52.2	25.8	N/A	83.1	77.7	38.9	N/A
WSA	65.9	61.6	30.4	N/A	98.7	92.7	46.3	N/A
OPD	70	60	30	N/A	100	100	50	N/A
Motor	1.5 HP (1.1 kW)				3.0 HP (2.2 kW)			
FLA	57.9	53.8	26.6	N/A	86.2	80.5	40.3	N/A
WSA	67.6	63.2	31.2	N/A	101.8	95.5	47.7	N/A
OPD	70	70	30	N/A	110	100	50	N/A
Electric Reheat Only								
Motor	.75 HP (.56 kW)				1.5 HP (1.1 kW)			
FLA	42.0	40.3	19.6	N/A	68.0	65.0	32.3	N/A
WSA	51.7	49.7	24.2	N/A	83.6	80.0	39.7	N/A
OPD	50	50	25	N/A	90	90	40	N/A
Motor	1.0 HP (.75 kW)				2.0 HP (1.5 kW)			
FLA	42.9	41.1	20.0	N/A	69.8	66.6	33.1	N/A
WSA	52.6	50.5	24.6	N/A	85.4	81.6	40.5	N/A
OPD	60	50	25	N/A	90	90	45	N/A
Motor	1.5 HP (1.1 kW)				3.0 HP (2.2 kW)			
FLA	44.6	42.7	20.8	N/A	72.9	69.4	34.5	N/A
WSA	54.3	52.1	25.4	N/A	88.5	84.4	41.9	N/A
OPD	60	60	25	N/A	90	90	45	N/A

Note: Compressor is locked on. Heater is same size as standard.

* Contact factory for 380-3-60 data.

Table 9 Scroll compressor and main fan (for comparison purposes only) *

Model	3 Ton				5 Ton			
Voltage (3, 60 Hz)	208	230	460	575	208	230	460	575
Scroll Compressor								
RLA	13.9	13.9	6.4	5.4	20.7	20.7	10.0	7.4
LRA	88.0	88.0	44.0	34.0	128.0	128.0	63.0	49.0
Main Fan								
Motor	.75 HP (.56 kW)				1.5 HP (1.1 kW)			
RLA	3.1	2.8	1.4	1.1	5.7	5.2	2.6	2.1
LRA	19.0	16.8	8.4	6.6	35.9	31.2	15.6	12.6
Motor	1.0 HP (.75 kW)				2.0 HP (1.5 kW)			
RLA	4.0	3.6	1.8	1.4	7.5	6.8	3.4	2.7
LRA	24.8	21.6	10.8	8.4	46.9	40.8	20.4	16.2
Motor	1.5 HP (1.1 kW)				3.0 HP (2.2 kW)			
RLA	5.7	5.2	2.6	2.1	10.6	9.6	4.8	3.9
LRA	35.9	31.2	15.6	12.6	66.0	58.0	26.8	23.4

* Contact factory for 380-3-60 data.

Table 10 Outdoor condensing units

Electrical Data 60 Hz 95°F (35°C) Ambient			
Voltage	Model	PFH042A-_L	PFH067A-_L
208/230-3-60	FLA	15.3	24.1
	WSA	18.8	29.3
	OPD	30.0	45.0
380-3-60	FLA	N/A	12.4
	WSA	N/A	15.1
	OPD	N/A	25.0
460-3-60	FLA	7.1	11.7
	WSA	8.7	14.2
	OPD	15.0	20.0
575-3-60	FLA	6.6	9.1
	WSA	8.0	11.1
	OPD	15.0	15.0
Electrical Data 60 Hz 105°F (40°C) Ambient			
Voltage	Model	PFH042A-_H	PFH067A-_H
208/230-3-60	FLA	17.3	24.2
	WSA	20.8	29.4
	OPD	30.0	50.0
380-3-60	FLA	N/A	12.4
	WSA	N/A	15.1
	OPD	N/A	25.0
460-3-60	FLA	8.1	11.7
	WSA	9.7	14.2
	OPD	15.0	20.0
575-3-60	FLA	6.6	9.3
	WSA	8.0	11.3
	OPD	15.0	15.0
Electrical Data 60 Hz Quiet-Line 95°F (35°C)			
Voltage	Model	PFH242A-_L	PFH267A-_L
208/230-3-60	FLA	14.8	21.1
	WSA	18.3	25.9
	OPD	30.0	45.0
380-3-60	FLA	N/A	12.5
	WSA	N/A	15.2
	OPD	N/A	25.0
460-3-60	FLA	6.9	10.9
	WSA	8.5	13.4
	OPD	15.0	20.0
575-3-60	FLA	5.9	8.8
	WSA	7.3	10.8
	OPD	15.0	15.0

Table 11 Indoor condensing units, air cooled *

Electrical Data 60 Hz 95°F (35°C) Ambient			
Voltage	Model	MC_40A	MC_65A
208/230-3-60	FLA	20.5	26.5
	WSA	24.0	31.7
	OPD	35.0	50.0
460-3-60	FLA	9.7	12.9
	WSA	11.3	15.4
	OPD	15.0	25.0
575-3-60	FLA	N/A	9.7
	WSA	N/A	11.6
	OPD	N/A	15.0

* Contact factory for 380-3-60 data.

Table 12 Indoor condensing units, water cooled *

Voltage	Model	MC_44W	MC_69W
208/230-3-60	FLA	13.9	20.7
	WSA	17.4	25.9
	OPD	30.0	45.0
460-3-60	FLA	6.4	10.0
	WSA	8.0	12.5
	OPD	15.0	20.0
575-3-60	FLA	n/a	7.4
	WSA	n/a	9.3
	OPD	n/a	15.0

* Contact factory for 380-3-60 data.

Table 13 Fan speed control condensers *

95°F (35°C) Ambient (1 Phase - 60 Hz)				
CSF083/CSF104				
Voltage	208	230	460	575
FLA	4.8	4.8	2.5	1.9
WSA	6.0	6.0	3.1	2.4
OPD	15.0	15.0	15.0	15.0

* Contact factory for 380-3-60 data.

Table 14 Lee-Temp condensers *

95°F (35°C) Ambient (3 Phase - 60 Hz)				
CSL083/CSL104				
Voltage	208	230	460	575
FLA	4.8	4.8	2.5	1.4
WSA	6.0	6.0	3.1	1.8
OPD	15.0	15.0	15.0	15.0

* Contact factory for 380-3-60 data.

Table 15 Lee-Temp receiver heater pads for use w/CSL condensers

Volts	120	230
Watts/Pad	150	150
FLA	1.25	0.65
WSA	1.6	0.8
OPD	15	15

Separate electrical source required for continuous operation of single phase heater pads for Lee-Temp.

Table 16 Drycooler & pump package - 95°F (35°C) ambient *

Tonnage	3 Ton			5 Ton		
Voltage	208/230	460	575	208/230	460	575
Glycol	Drycooler & Pump					
DSF Model	069	069	069	109	109	109
Pump Hp	3/4	3/4	3/4	3/4	3/4	3/4
FLA	7.0	3.3	2.7	7.0	3.3	2.7
WSA	7.9	3.7	3.1	7.9	3.7	3.1
OPD	15	15.0	15.0	15	15.0	15.0
GLYCOOL	Drycooler & Pump					
DSO Model	-	-	-	109	109	109
Pump Hp	-	-	-	1-1/2	1-1/2	1-1/2
FLA	-	-	-	10.1	4.7	3.8
WSA	-	-	-	11.8	5.5	4.4
OPD	-	-	-	15	15	15

1. Pump and drycooler powered from same 3 phase feeder.

* Contact factory for 380-3-60 data.

Table 17 Drycooler only - 95°F (35°C) ambient *

Tonnage	3 Ton			5 Ton		
Voltage	208/230	460	575	208/230	460	575
Glycol	Drycooler					
DSF Model	069	069	069	109	109	109
FLA	4.8	2.4	1.9	4.8	2.4	1.9
GLYCOOL	Drycooler					
DSO Model	-	-	-	109	109	109
FLA	-	-	-	4.0	2.0	1.4

* Contact factory for 380-3-60 data.

Table 18 Pumps *

HP	Voltage (3 Phase - 60 Hz)				
		208	230	460	575
3/4	FLA	3.5	3.2	1.6	1.3
1-1/2	FLA	6.6	6	3	2.4

* Contact factory for 380-3-60 data.

ELECTRICAL DATA—50 Hz

Table 19 Challenger 3000 electrical data—50 Hz

Model Type	Self-Contained						Split System Evaporator or Chilled Water					
	3 Ton B*040A, 045WG			5 Ton B*065A, 070WG, 058G			3 Ton B*035E, 072C			5 Ton B*059E, 101C		
	3 Phase, 50 Hz											
Voltage	200	230	380/415	200	230	380/415	200	230	380/415	200	230	380/415
With Electric Reheat & Humidifier (Infrared or Steam Generating) (Note: See Table 20 for units w/SCR reheats. ¹)												
Motor	N/A			1.1 kW (1.5 HP)			N/A			1.1 kW (1.5 HP)		
FLA	N/A	N/A	N/A	66.0	64.4	34.4	N/A	N/A	N/A	58.1	54.8	30.8
Motor	.75 kW (1.0 HP)			1.5 kW (2.0 HP)			.75 kW (1.0 HP)			1.5 kW (2.0 HP)		
FLA	42.7	41.8	23.1	67.7	65.9	35.2	40.5	37.9	21.3	59.8	56.3	31.6
Motor	1.1 kW (1.5 HP)			2.2 kW (3.0 HP)			1.1 kW (1.5 HP)			2.2 kW (3.0 HP)		
FLA	44.3	43.2	23.9	70.8	68.6	36.8	42.1	39.3	22.1	62.9	59.0	33.2
Humidifier Only (Infrared or Steam Generating)												
Motor	N/A			1.1 kW (1.5 HP)			N/A			1.1 kW (1.5 HP)		
FLA	N/A	N/A	N/A	38.8	36.4	19.1	N/A	N/A	N/A	18.1	15.7	9.1
Motor	.75 kW (1.0 HP)			1.5 kW (2.0 HP)			.75 kW (1.0 HP)			1.5 kW (2.0 HP)		
FLA	31.5	29.3	16.5	40.5	37.9	19.9	16.5	14.3	8.3	19.8	17.2	9.9
Motor	1.1 kW (1.5 HP)			2.2 kW (3.0 HP)			1.1 kW (1.5 HP)			2.2 kW (3.0 HP)		
FLA	33.1	30.7	17.3	43.6	40.6	21.5	18.1	15.7	9.1	22.9	19.9	11.5
Electric Reheat Only (Note: See Table 20 for units w/SCR reheats. ¹)												
Motor	N/A			1.1 kW (1.5 HP)			N/A			1.1 kW (1.5 HP)		
FLA	N/A	N/A	N/A	66.0	64.4	34.4	N/A	N/A	N/A	45.3	43.7	24.4
Motor	.75 kW (1.0 HP)			1.5 kW (2.0 HP)			.75 kW (1.0 HP)			1.5 kW (2.0 HP)		
FLA	42.7	41.8	23.1	67.7	65.9	35.2	27.7	26.8	14.9	47.0	45.2	25.2
Motor	1.1 kW (1.5 HP)			2.2 kW (3.0 HP)			1.1 kW (1.5 HP)			2.2 kW (3.0 HP)		
FLA	44.3	43.2	23.9	70.8	68.6	36.8	29.3	28.2	15.7	50.1	47.9	26.8
Without Electric Reheat & Humidifier												
Motor	N/A			1.1 kW (1.5 HP)			N/A			1.1 kW (1.5 HP)		
FLA	N/A	N/A	N/A	26.0	25.3	12.7	N/A	N/A	N/A	5.3	4.6	2.7
Motor	.75 kW (1.0 HP)			1.5 kW (2.0 HP)			.75 kW (1.0 HP)			1.5 kW (2.0 HP)		
FLA	18.7	18.2	10.1	27.7	26.8	13.5	3.7	3.2	1.9	7.0	6.1	3.5
Motor	1.1 kW (1.5 HP)			2.2 kW (3.0 HP)			1.1 kW (1.5 HP)			2.2 kW (3.0 HP)		
FLA	20.3	19.6	10.9	30.8	29.5	15.1	5.3	4.6	2.7	10.1	8.8	5.1

1. For Split System Evaporators with SCR reheat, use the values above.

FLA = Full Load Amps (Input Amps)

RLA = Rated Load Amps

LRA = Locked Rotor Amps

* F = Downflow

U = Upflow

E = Downflow with Econ-O-Coil

K = Upflow with Econ-O-Coil

Table 20 Self-contained with SCR reheat

Model	3 Ton			5 Ton		
Voltage (3, 50 Hz)	200	230	380/415	200	230	380/415
Electric Reheat & Humidifier (Infrared or Steam Generating)						
Motor	N/A			1.1 kW (1.5 HP)		
FLA	N/A	N/A	N/A	78.8	75.5	40.8
Motor	.75 kW (1.0 HP)			1.5 kW (2.0 HP)		
FLA	55.5	52.9	29.5	80.5	77.0	41.6
Motor	1.1 kW (1.5 HP)			2.2 kW (3.0 HP)		
FLA	57.1	54.3	30.3	83.6	79.7	43.2
Electric Reheat Only						
Motor	N/A			1.1 kW (1.5 HP)		
FLA	N/A	N/A	N/A	66.0	64.4	34.4
Motor	.75 kW (1.0 HP)			1.5 kW (2.0 HP)		
FLA	42.7	41.8	23.1	67.7	65.9	35.2
Motor	1.1 kW (1.5 HP)			2.2 kW (3.0 HP)		
FLA	44.3	43.2	23.9	70.8	68.6	36.8

Note: Compressor is locked on. Heater is same size as standard.

Table 21 Scroll compressor and main fan (for comparison purposes only)

Model	3 Ton			5 Ton		
Voltage (3, 50 Hz)	200	230	380/415	200	230	380/415
Scroll Compressor						
RLA	15.0	15.0	8.2	20.7	20.7	10.0
LRA	120.0	132.0	51.5	156.0	172.0	74.0
Main Fan						
Motor	N/A			1.1 kW (1.5 HP)		
RLA	N/A	N/A	N/A	5.3	4.6	2.7
LRA	N/A	N/A	N/A	35.8	31.2	17.9
Motor	.75 kW (1.0 HP)			1.5 kW (2.0 HP)		
RLA	3.7	3.2	1.9	7.0	6.1	3.5
LRA	19.2	16.7	9.6	50.6	44.0	25.3
Motor	1.1 kW (1.5 HP)			2.2 kW (3.0 HP)		
RLA	5.7	5.2	2.6	10.1	8.8	5.1
LRA	35.9	31.2	15.6	58.5	51.0	29.3

Table 22 Outdoor condensing units

Electrical Data 50 Hz 35°C (95°F) Ambient			
Voltage	Model	PFH041A-_L	PFH066A-_L
200/230-3-50	FLA	16.3	24.1
380/415-3-50	FLA	8.8	13.2
Electrical Data 50 Hz 40°C (105°F) Ambient			
Voltage	Model	PFH041A-_H	PFH066A-_H
200/230-3-50	FLA	18.4	24.2
380/415-3-50	FLA	9.9	13.2
Electrical Data 50 Hz Quiet-Line 35°C (95°F)			
Voltage	Model	PFHZ41A-_L	PFHZ66A-_L
200/230-3-50	FLA	15.9	22.5
380/415-3-50	FLA	8.7	12.4

Table 23 Indoor condensing units air cooled

Electrical Data 50 Hz 35°C (95°F) Ambient			
Voltage	Model	MC_39A	MC_64A
380/415-3-50	FLA	10.4	13.7

1. Consult factory for 200/230 volts.

Table 24 Indoor condensing units water cooled

Voltage	Model	MC_43W	MC_68W
380/415-3-50	FLA	7.5	10.0

1. Consult factory for 200/230 volts.

Table 25 Fan speed control condensers

35°C (95°F) Ambient (1 Phase - 50 Hz)			
CSF083/CSF104			
Voltage	200	230	380/415
FLA	4.0	4.0	2.0

Table 26 Lee-Temp condensers

35°C (95°F) Ambient (3 Phase - 50 Hz)			
CSL083/CSF104			
Voltage	200	230	380/415
FLA	4.0	4.0	1.8

Table 27 Lee-Temp receiver heater pads; for use w/CSL condensers

Volts	230
Watts/Pad	150
Amps	0.68

Separate electrical source required for continuous operation of single phase heater pads for Lee-Temp.

Table 28 Drycooler & pump package - 35°C (95°F) ambient

Tonnage	3 Ton			5 Ton		
Voltage	200	230	380/415	200	230	380/415
Glycol Drycooler & Pump						
DSF Model	069	069	069	109	109	109
Pump Hp	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2
FLA	9.6	9.6	4.6	9.6	9.6	4.6
GLYCOOL Drycooler & Pump						
DSO Model	-	-	-	109	109	109
Pump Hp	-	-	-	1-1/2	1-1/2	1-1/2
FLA	-	-	-	9.6	9.6	4.6

1. Pump and drycooler powered from same 3 phase feeder.

Table 29 Drycooler only - 35°C (95°F) ambient

Tonnage	3 Ton			5 Ton		
Voltage	200	230	380/415	200	230	380/415
Glycol Drycooler & Pump						
DSF Model	069	069	069	109	109	109
FLA	4.0	4.0	1.8	4.0	4.0	1.8
GLYCOOL Drycooler & Pump						
DSO Model	-	-	-	109	109	109
FLA	-	-	-	4.0	4.0	1.8

1. Drycooler powered from same 3 phase feeder as pumps.

Table 30 Pumps

	Voltage (3 Phase - 50 Hz)			
HP		200	230	380/415
1-1/2	FLA	5.6	5.6	2.8

GUIDE SPECIFICATIONS—NOMINAL 3 OR 5 TON ENVIRONMENTAL CONTROL SYSTEM

1.0 GENERAL

1.1 Summary

These specifications describe requirements for an environmental control system. The system shall be designed to maintain temperature and relative humidity conditions within the room. The manufacturer shall design and furnish all equipment to be fully compatible with heat dissipation requirements of the site.

1.2 Design Requirements

The environmental control system shall be a Liebert Challenger 3000 factory assembled unit. Standard 60 Hz units shall be UL listed and CSA (NRTL-C) certified. It shall be specifically designed for service from the front of the unit. The system shall be designed for draw-through air arrangement to insure even air distribution to the entire face area of the coil.

Each system shall be capable of handling ____ CFM (CMH) at ____ inches (mm) of water external static pressure with (down discharge air flow) (up discharge air flow with front return or up discharge air flow with rear return) pattern. It shall have a total cooling capacity of ____ BTU/HR (kW), sensible cooling capacity of ____ BTU/HR (kW), based on the entering air condition of °F (°C) dry bulb, and ____ °F (°C) wet bulb. These units are to be supplied with ____ Volt, ____ phase, ____ Hz power supply. The humidifier shall have a capacity of ____ lbs/hr (kg/h). Reheat shall have a capacity of ____ BTU/HR (kW). The main fan shall be ____ HP (kW).

1.3 Submittals

Submittals shall be provided with the proposal and shall include: Single-Line Diagrams; Dimensional, Electrical, and Capacity data; Piping and Electrical Connection Drawings.

2.0 PRODUCT

2.1 All Systems

2.1.1 Cabinet and Frame Construction

The frame shall be constructed of MIG welded tubular and formed steel. All frame components shall be finished in a black, powder-coat finish to protect against corrosion. The exterior panels shall be (20 gauge)/(18 gauge) steel and shall be powder coated with ____ color paint. The panels shall be insulated with a minimum 1 in. (25.4mm), 1-1/2 lbs. (0.68 kg) density fiber insulation. Front and side panels shall have captive, 1/4 turn fasteners.

The cabinet shall be designed so that all components are serviceable and removable from the front of the unit.

2.1.2 Fan and Motor Section

The fan shall be the centrifugal type, double width, double inlet. The shaft shall be heavy duty steel with self-aligning ball bearings with minimum life span of 100,000 hours.

The fan motor shall be 1750 RPM and mounted on an adjustable base. The drive package shall be sized for 200% of the fan motor horsepower, and equipped with an adjustable motor pulley. The fan/motor assembly shall be mounted on (vibration isolators) (solid base). The fan shall be located to draw air over the coil to ensure even air distribution and maximum coil performance.

High Efficiency Motor (Optional)

The fan motor shall be a ____ HP (kW) high efficiency motor with a full load efficiency of ____ %.

2.1.3 Filter

The filter shall be ____ inches (mm) thick and rated not less than ____ % (20%, 30%, 40-45%, 60-65%) efficiency based on ASHRAE 52.1.

Prefilter (Optional)

The prefilter shall be 2 in. (50.8mm) thick with an efficiency of 20% based on ASHRAE 52.1.

2.1.4 Advanced Microprocessor Control (Standard)

The Advanced control processor shall be microprocessor based with a front monitor LCD display panel and control keys for user inputs. The controls shall be menu driven with on-screen prompts for easy user operation. The system shall allow user review and programming of temperature and humidity set-points, alarm parameters, and setup selections including choice of control type. A password shall be required to make system changes. For all user selections, the range of acceptable input (temperature, humidity, or time delay) shall be displayed on the monitor screen. The system shall provide monitoring of room conditions, operational status in % of each function, component run times, date and time, and four analog inputs from sensors provided by others.

Control

The control system shall allow programming of the following room conditions:

Temperature Setpoint 65 to 85°F (18-29°C)

Temperature Sensitivity +1 to +9.9°F (0.6 to 5.6°C) in 0.1° increments

Humidity Setpoint 20 to 80% RH

Humidity Sensitivity +1 to +30% RH

All setpoints shall be adjustable from the individual unit front monitor panel. The microprocessor can be set within these ranges, however, the unit may not be able to control to extreme combinations of temperature and humidity.

Temperature and Humidity Sensors shall be capable of being calibrated using the front monitor panel controls to coordinate with other temperature and humidity sensors in the room.

Predictive Humidity Control

The microprocessor shall calculate the moisture content in the room and prevent unnecessary humidification and dehumidification cycles by responding to changes in dew point temperature.

Compressor Short-Cycle Control

The control system shall include a program to prevent compressor short-cycling.

System Auto-Restart

For start-up after power failure, the system shall provide automatic restart with a programmable (up to 9.9 minutes in 6-second increments) time delay. Programming can be performed either at the unit or from the central site monitoring system.

Sequential Load Activation

During start-up, or after power failure, the microprocessor shall sequence operational load activation to minimize inrush current. Systems allowing multiple loads to start simultaneously are unacceptable.

Chilled Water/Hot Water/Econ-O-Coil Flush Cycles

Chilled water, hot water, and Econ-O-Cool coils (if unit is so equipped) shall be automatically flushed to prevent the buildup of contaminants. Systems without this feature shall include the necessary devices to bypass fluid into the coil on a programmed basis.

Front Monitor Display Panel

The microprocessor shall provide a front monitor LCD backlit display panel with 4 rows of 20 characters with adjustable contrast. This display (along with five front mounted control keys) shall be the only operator interface required to obtain all available system information such as room conditions, operational status, alarms, control and alarm set-points, and all user selections including alarm delays, sensor calibration, DIP switch selections, and diagnostics. All indicators shall be in language form. No symbols or codes shall be acceptable.

Alarms

The microprocessor shall activate an audible and visual alarm in event of any of the following conditions:

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- Short Cycle
- Compressor Overload (Optional)
- Main Fan Overload (Optional)
- Humidifier Problem
- High Head Pressure
- Change Filter
- Loss of Air Flow
- Low Suction Pressure
- Loss of Power
- Custom Alarm (#1 to #4)

Custom alarms are four customer accessible alarm inputs to be indicated on the front panel. Custom alarms can be identified with prepared (programmed) alarm labels for the following frequently used inputs:

- Water Under Floor
- Smoke Detected
- Standby GC Pump On
- Loss of Water Flow
- Standby Unit On

User customized text can be entered for two of the four custom alarms. Each alarm (unit and custom) can be separately enabled or disabled, selected to activate the common alarm, and programmed for a time delay of 0 to 255 seconds.

Audible Alarm

The audible alarm shall annunciate any alarm that is enabled by the operator.

Common Alarm

A programmable common alarm shall be provided to interface user selected alarms with a remote alarm device.

Remote Monitoring

All alarms shall be communicated to the Liebert monitoring system with the following information: date and time of occurrence, unit number, and present temperature and humidity.

Analog Inputs

The system shall include four customer accessible analog inputs for sensors provided by others. The analog inputs shall accept a 4 to 20 mA signal. The user shall be able to change the input to 0 to 5 VDC or 0 to 10 VDC if desired. The gains for each analog input shall be programmable from the front panel. The analog inputs shall be able to be monitored from the front panel.

Diagnostics

The control system and electronic circuitry shall be provided with self-diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as on or off at the front monitor panel. Control outputs shall be able to be turned on or off from the front monitor panel without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.

Data Collection

The control system shall maintain accumulative operating hours of compressor, reheat, humidifier, fan motor, and Econ-O-Coil. The ten most recent alarms shall also be retained.

Communications

The microprocessor shall be compatible with all Liebert remote monitoring and control devices.

2.1.5 Advanced Microprocessor Control with Graphics (Optional)

The optional Advanced control processor shall be microprocessor based with a front monitor dot matrix display panel and control keys for user inputs. The controls shall be menu driven with on-screen prompts for easy user operation. The system shall allow user review and programming of temperature and humidity setpoints, alarm parameters, and setup selections including choice of control type. A password shall be required to make system changes. For all user selections, the range of acceptable input (temperature, humidity, or time delay) shall be displayed on the monitor screen. The system shall provide monitoring of room conditions, operational status in % of each function, component run times, date and time, and four analog inputs from sensors provided by others.

Control

The control system shall allow programming of the following room conditions:

- Temperature Setpoint 65 to 85°F (18-29°C)
- Temperature Sensitivity +1 to +9.9°F (0.6 to 5.6°C) in 0.1° increments
- Humidity Setpoint 20 to 80% RH
- Humidity Sensitivity +1 to +30% RH

All setpoints shall be adjustable from the individual unit front monitor panel.

Temperature and Humidity Sensors shall be capable of being calibrated using the front monitor panel controls to coordinate with other temperature and humidity sensors in the room.

Predictive Humidity Control

The microprocessor shall calculate the moisture content in the room and prevent unnecessary humidification and dehumidification cycles by responding to changes in dew point temperature.

Compressor Short-Cycle Control

The control system shall include a program to prevent compressor short-cycling.

System Auto-Restart

For start-up after power failure, the system shall provide automatic restart with a programmable (up to 9.9 minutes in 6-second increments) time delay. Programming can be performed either at the unit or from the central site monitoring system.

Sequential Load Activation

During start-up, or after power failure, the microprocessor shall sequence operational load activation to minimize inrush current. Systems allowing multiple loads to start simultaneously are unacceptable.

Chilled Water/Hot Water/Econ-O-Coil Flush Cycles

Chilled water, hot water, and Econ-O-Cool coils shall be automatically flushed to prevent the buildup of contaminants. Systems without this feature shall include the necessary devices to bypass fluid into the coil on a programmed basis.

Front Monitor Display Panel

The microprocessor shall provide a front monitor 240 x 120 dot matrix display panel with adjustable back-lighting. This display (along with five front mounted control keys) shall be the only operator interface required to obtain all available system information such as room conditions, operational status, graphical data, alarms, control and alarm setpoints, and all user selections including alarm delays, sensor calibration, DIP switch selections, and diagnostics. All indicators shall be in language form. No symbols or codes shall be acceptable.

Alarms

The microprocessor shall activate an audible and visual alarm in event of any of the following conditions:

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- Short Cycle
- Compressor Overload (Optional)
- Main Fan Overload (Optional)
- Humidifier Problem
- High Head Pressure
- Change Filter
- Loss of Air Flow
- Low Suction Pressure
- Loss of Power
- Custom Alarm (#1 to #4)

Custom alarms are four customer accessible alarm inputs to be indicated on the front panel. Custom alarms can be identified with prepared (programmed) alarm labels for the following frequently used inputs:

- Water Under Floor
- Smoke Detected
- Standby GC Pump On
- Loss of Water Flow
- Standby Unit On

User-customized text can be entered for all four custom alarms. Each alarm (unit and custom) can be separately enabled or disabled, selected to activate the common alarm, and programmed for a time delay of 0 to 255 seconds.

Audible Alarm

The audible alarm shall annunciate any alarm that is enabled by the operator.

Common Alarm

A programmable common alarm shall be provided to interface user selected alarms with a remote alarm device.

Remote Monitoring

All alarms shall be communicated to the Liebert site monitoring system with the following information: date and time of occurrence, unit number, and present temperature and humidity.

Analog Inputs

The system shall include four customer accessible analog inputs for sensors provided by others. The analog inputs shall accept a 4 to 20 mA signal. The user shall be able to change the input to 0 to 5 VDC or 0 to 10 VDC if desired. The gains for each analog input shall be programmable from the front panel. The analog inputs shall be able to be monitored from the front panel.

Diagnostics

The control system and electronic circuitry shall be provided with self-diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as on or off at the front monitor panel.

Control outputs shall be able to be turned on or off from the front monitor panel without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.

Data Collection

The control system shall maintain accumulative operating hours of compressor, reheat, humidifier, fan motor, Econ-O-Coil, and heat rejection. The sixty most recent alarms shall also be retained.

Graphing

The control shall display the following graphical data:

- Temperature, humidity, analog inputs
- Component operating status by hour
- Operating status

Communications

The microprocessor shall be compatible with all Liebert remote monitoring and control devices.

2.1.6 Infrared Humidifier (Standard)

The humidifier shall be of the infrared type consisting of high intensity quartz lamps mounted above and out of the water supply. The evaporator pan shall be stainless steel and arranged to be serviceable without disconnecting water supply lines, drain lines or electrical connections. The complete humidifier section shall be pre-piped ready for final connection. The infrared humidification system shall use bypass air to prevent over-humidification of the controlled space. The auto flush system shall automati-

cally flush deposits from the humidifier pan. The system shall be field adjustable to change the cycle time to suit local water conditions. The humidifier shall have a capacity of ____ lbs/hr (kg/h).

2.1.7 Steam Generating Humidifier (Optional)

The environmental control system shall be equipped with a steam generating humidifier that is controlled by the microprocessor control system. It shall be complete with disposable canister, all supply and drain valves, steam distributor, and electronic controls. The need to change canister shall be annunciated on the microprocessor control panel. The humidifier shall have a capacity of ____ lbs/hr (kg/h).

2.1.8 Electric Reheat (Standard)

The low-watt density, 304/304, stainless steel, finned-tubular electric reheat coils shall be capable of maintaining room dry bulb conditions when the system is calling for dehumidification. The reheat section shall include UL approved safety switches to protect the system from overheating. The capacity of the reheat coils shall be ____ BTU/HR (kW), ____ kW, controlled in ____ stage(s).

2.1.9 Hot Water Reheat (Optional)

The hot water reheat coil shall have copper tubes and aluminum fins with a capacity of ____ BTU/HR (kW) when supplied with ____ °F (°C) entering water temperature at ____ GPM (l/s) flow rate. Maximum pressure drop shall be ____ PSI (kPa). The control system shall be factory pre-piped with a 2-way motorized control valve and cleanable Y-strainer.

2.1.10 SCR Electric Reheat (Optional)

The SCR (Silicon Controlled Rectifier) controller shall proportionally control the stainless steel reheats to maintain the selected room temperature. The rapid cycling made possible by the SCR controller provides precise temperature control, and the more constant element temperature improves heater life. The capacity of the reheat coils shall be ____ BTU/HR (kW).

2.1.11 Floor Stand (Optional)

The floor stand shall be constructed of a heliarc-welded tubular steel frame. The floor stand shall be coated using an autodeposition process to protect against corrosion. The floor stand shall have adjustable legs with vibration isolation pads. The floor stand shall be: 9 in. (23cm), 12 in. (30cm), 15 in. (38cm), 18 in. (46cm), 21 in. (53cm), 24 in. (61cm) high.

2.1.12 Turning Vane (Optional)

The turning vane shall be designed to mount in the factory supplied floor stand and direct air either to the front or rear of the unit.

2.1.13 Plenum (Optional)

The unit shall be supplied with a (2 way) (3 way) (4 way) (ducted) air discharge plenum. The plenum shall be 18 in. (457mm) high, insulated and powder painted the same color as the room unit.

2.1.14 Disconnect Switch, Non-Locking Type (Optional)

The manual disconnect switch shall be mounted in the high voltage section of the electrical panel. The switch shall be accessible with the door closed.

2.1.15 Disconnect Switch, Locking Type (Optional)

The manual disconnect switch shall be mounted in the high voltage section of the electrical panel. The switch shall be accessible from the outside of the unit with the door closed, and prevent access to the high voltage electrical components until switched to the "OFF" position.

2.1.16 Remote Sensors (Optional)

The unit shall be supplied with remote temperature and humidity sensors. The sensors shall be connected to the unit by a 30 ft. (9m), 60 ft. (18m), 90 ft. (27m), 120 ft. (36m), 150 ft. (45m) shielded cable.

2.1.17 Firestat (Optional)

The firestat shall immediately shut down the system when high temperatures are detected. The firestat shall be mounted in the electrical panel with the sensing element in the return air.

2.1.18 Smoke Detector (Optional)

The smoke detector senses the return air, shuts down the unit upon detection, and sends visual and audible alarm. Dry contacts are available for a remote customer alarm. This smoke detector is not intended to function as or replace any room smoke detection system that may be required by local or national codes.

2.1.19 Condensate Pump (Optional)

The condensate pump shall have the capacity of ____ GPH (l/h) at ____ ft. (m) head @ ____ V - ____ Hz. It shall be complete with (single) (dual) integral float switch, pump, motor assembly, and reservoir.

2.2 Direct Expansion Self-Contained Systems

Direct Expansion Coil

The evaporator coil shall have ____ sq.ft. (sq. m) face area, ____ rows deep. It shall be configured as (A) (V) frame and be constructed of copper tubes and aluminum fins and have a maximum face velocity of ____ ft. per minute (m/s) at ____ CFM (CMH). The coil shall be provided with a stainless steel drain pan.

Refrigeration System

The refrigeration system shall consist of a high efficiency scroll compressor, hot gas bypass, pressure safety switches, externally equalized expansion

valve, filter drier, refrigerant sight glass and moisture indicator.

2.2.1 Air Cooled Self-Contained Systems

Pump Down Control

A liquid line solenoid valve shall be provided for pump down control.

Crankcase Heater

A crankcase heater shall be provided for additional system protection from refrigerant migration during off cycles.

Propeller Fan Condenser (Standard)

The Liebert manufactured air cooled condenser shall be the low profile, slow speed, direct-drive, propeller-fan type. The condenser shall be constructed of aluminum and contain a copper tube, aluminum fin coil with an integral electric control panel. The system shall be designed for ____ °F (°C) ambient. The air cooled condenser shall have a ____ Volt, ____ phase, ____ Hz power supply.

Fan Speed Control (FSC) Head Pressure Control (Standard)

The winter control system for the air cooled condenser shall be Liebert Fan Speed Control (FSC). The variable speed motor shall turn on at 10% of the supply voltage and modulate in response to head pressure to a full speed of 1050 RPM. It shall be designed with ball bearings, permanent lubrication, and internal overload protection.

The control system shall be complete with transducers, thermostats and electrical control circuit, factory prewired and tested in an integral control panel. The transducer shall automatically sense the head pressure of the compressor and control the variable speed fan on the air cooled condenser to properly maintain the head pressure.

The fan speed control system shall provide positive start-up and operation in ambient temperature as low as -20°F (-29°C). Included with the fan speed control system shall be a solid state winter start kit as an integral feature of the electronic control panel.

Lee-Temp Head Pressure Control (Optional)

The winter control system for the air cooled condenser shall be "Lee-Temp." The Lee-Temp system shall allow startup and positive head pressure control with ambient temperatures as low as -30°F (-34.4°C). The Lee-Temp package shall include: insulated receiver, pressure relief valve for each circuit, head pressure three-way control valve, and rotalock valve for isolating the refrigerant charge. The Lee-Temp receiver shall be factory insulated and mounted ready for the field connection to the air cooled condenser. The Lee-Temp heater shall be (150) (300) ____ Watt and require a separate power supply of (115) (230) ____ Volt, single phase, ____ Hz.

Piggyback Condenser (Optional)

The system shall be supplied with a piggyback condenser (PB). The condenser shall be constructed of steel with frame coated using the autophoretic® process, and panels powder coated to protect against corrosion. The coil shall be copper tube with aluminum fins. The heavy duty fan shall be the centrifugal type, double width, double inlet. The 1750 RPM (1450 RPM @ 50 Hz) fan motor shall be mounted on an adjustable base, and equipped with an adjustable motor pulley. A Liebert Lee-Temp head pressure control system shall be integral with the unit. The system shall be designed for -30°F (-34.4°C) ambient. The air cooled condenser shall have a _____ Volt, 3 phase, _____ Hz power supply.

Centrifugal Fan Condenser (Optional)

The system shall be supplied with a centrifugal fan condenser (LCC). The condenser shall be constructed of galvanized steel with a copper tube, aluminum fin coil. The heavy duty fan shall be the centrifugal type, double width, double inlet. The 1750 RPM (1450 RPM @ 50 Hz) fan motor shall be mounted on an adjustable base, and equipped with an adjustable motor pulley. A Liebert Lee-Temp head pressure control system shall be field piped to the unit. Electrical controls shall be in a rain-tight enclosure.

The system shall be designed for _____ °F (°C) ambient. The air cooled condenser shall have a _____ Volt, 3 phase, _____ Hz power supply.

2.2.2 Water or Glycol Cooled Self-Contained Systems

Indoor Unit Condenser

The water/glycol system shall be equipped with a coaxial condenser having a total pressure drop of _____ ft. of water (kPa) and a flow rate of _____ GPM (l/s) with _____ °F (°C) entering water/glycol temperature.

2-Way Water Regulating Valve with Bypass (Standard)

The condenser circuit shall be pre-piped with a head-pressure actuated 2-way regulating valve with bypass.

3-Way Water Regulating Valve (Optional)

The condenser circuit shall be pre-piped with a head pressure actuated 3-way regulating valve.

Design Pressure

The condenser water/glycol circuit shall be designed for a pressure of [(150 PSI (1034 kPa)) (350 PSI (2413 kPa))].

Crankcase Heater (Optional)

A crankcase heater is provided to prevent the migration of refrigerant to the compressor during off cycles.

Hot Gas Reheat (Optional)

The complete hot gas reheat system shall include a copper tube, aluminum fin coil, three-way solenoid valve, and refrigerant check valve. The capacity of the coil shall be _____ BTU/HR (kW).

Outdoor Unit

Propeller Fan Drycooler (Standard)

The Liebert manufactured drycooler shall be the low profile, slow speed, direct drive propeller fan type. The drycooler shall be constructed of aluminum and contain a copper tube aluminum fin coil with an integral electric control panel. The drycooler shall be designed for _____ °F (°C) ambient.

Centrifugal Fan Drycooler (Optional)

The system shall be supplied with a centrifugal fan drycooler (LCD). The drycooler shall be constructed of galvanized steel with a copper tube, aluminum fin coil. The heavy duty fan shall be the centrifugal type, double width, double inlet. The 1750 RPM (1450 RPM @ 50 Hz) fan motor shall be mounted on an adjustable base, and equipped with an adjustable motor pulley. A 3-way control valve and thermostat shall maintain the desired fluid temperature. Electrical controls shall be in a rain-tight enclosure. The system shall be designed for _____ °F (°C) ambient. The drycooler shall have a _____ Volt, 3 phase, _____ Hz power supply.

Single Glycol Pump Package (Standard)

This system shall be provided with a centrifugal pump mounted in a weatherproof and vented enclosure. The pump shall be rated for _____ GPM (l/s) at _____ ft. of head (kPa), and operate on _____ Volt, 3 phase, _____ Hz.

Dual Glycol Pump Package (Optional)

The dual pump package shall include pumps, enclosure, and field mounted flow switch. The pumps shall be wired to the drycooler control box which includes a lead/lag switch for the pumps. The standby pump shall automatically start upon failure of the lead pump. Each pump shall be rated _____ for GPM (l/s) at _____ feet of head (kPa).

2.2.3 GLYCOOL Self-Contained Systems

GLYCOOL Coil

The GLYCOOL coil shall be constructed of copper tubes and aluminum fins and be located upstream of the evaporator coil. The GLYCOOL coil shall be designed for closed-loop applications using properly treated glycol solutions. The coil shall be rated at _____ BTU/HR (kW) sensible cooling capacity with a 45°F (7.2°C) entering glycol solution temperature. The GLYCOOL coil shall require _____ GPM (l/s) and the total unit pressure drop shall not exceed _____ feet of water (kPa) when in the free cooling mode.

3-Way GLYCOOL Valve

The GLYCOOL coil shall be equipped with a fully proportional 3-way control valve. This motorized control valve shall control the amount of flow to the GLYCOOL coil and maintain constant temperature and relative humidity.

Glycol Condenser

The glycol system shall be equipped with a coaxial condenser having a total pressure drop of _____ feet of water (kPa) and a flow rate of _____ GPM (l/s), with _____ °F (°C) entering 40% ethylene glycol temperature.

3-Way Water Regulating Valve

The condenser circuit shall be pre-piped with a head pressure actuated 3-way water regulating valve.

Design Pressure

The GLYCOOL coil/condenser circuit shall be designed for a pressure of [(150 PSI (1034 kPa)) (300 PSI (2069 kPa))].

Comparator Circuit

The system shall be equipped with a microprocessor-controlled comparator sensor that permits free-cooling operation whenever entering glycol temperature is below return-air temperature.

Propeller Fan Drycooler (Standard)

The Liebert manufactured drycooler shall be the low profile, slow speed, direct drive propeller fan type. The drycooler shall be constructed of aluminum and contain a copper tube aluminum fin coil with an integral electric control panel. The drycooler shall be designed for _____ °F (°C) ambient.

Centrifugal Fan Drycooler (Optional)

The system shall be supplied with a centrifugal fan drycooler (LCD). The drycooler shall be constructed of galvanized steel with a copper tube, aluminum fin coil. The heavy duty fan shall be the centrifugal type, double width, double inlet. The 1750 RPM (1450 RPM @ 50 Hz) fan motor shall be mounted on an adjustable base, and equipped with an adjustable motor pulley. A 3-way control valve and thermostat shall maintain the desired fluid temperature. Electrical controls shall be in a rain tight enclosure. The system shall be designed for _____ °F (°C) ambient. The drycooler shall have a _____ Volt, 3 phase, _____ Hz power supply.

Single Glycol Pump Package (Standard)

This system shall be provided with a centrifugal pump mounted in a weatherproof and vented enclosure. The pump shall be rated for _____ GPM (l/s) at _____ ft. of head (kPa), and operate on _____ Volt, 3 phase, _____ Hz.

Dual Glycol Pump Package (Optional)

The dual pump package shall include pumps, enclosure, and field mounted flow switch. The pumps shall be wired to the drycooler control box which includes a lead/lag switch for the pumps. The standby pump shall automatically start upon failure of the lead pump. Each pump shall be rated for _____ GPM (l/s) at _____ feet of head (kPa).

2.3 Direct Expansion Split Systems

Direct Expansion Coil

The evaporator coil shall have _____ sq.ft. (sq. m) face area, _____ rows deep. It shall be configured as (A) (V) frame and be constructed of copper tubes and aluminum fins and have a maximum face velocity of _____ ft. per minute (m/s) at _____ CFM (CMH). The coil shall be provided with a stainless steel drain pan.

Refrigeration System

The refrigeration system shall consist of a rugged scroll compressor, pressure safety switches, externally equalized expansion valve, filter dryer, and a refrigerant sight glass and moisture indicator.

Refrigerant Line Sets (Optional)

Pre-charged refrigerant line sets shall be provided by Liebert in proper lengths for application. Line set length shall be _____ feet (m).

Centrifugal Fan Condensing Unit

The condenser coil shall be constructed of copper tubes and aluminum fins. The condensing unit shall be factory assembled, charged with refrigerant and sealed.

Components shall include scroll compressor, high-pressure switch, Lee-temp refrigerant receiver, head pressure control valve, and liquid line solenoid valve.

The condensing unit shall be designed for 95°F (35°C) ambient and be capable of operation to -20°F (-29°C) ambient.

A hot gas bypass circuit shall be provided to reduce compressor cycling and improve operation under low load conditions.

The condenser fan shall be designed for _____ CFM (CMH) at _____ inches (mm) external static pressure.

(Optional) Disconnect

Factory installed non-fused disconnect switch allows unit to be turned off for maintenance.

3-Ton Models

The condensing module shall be capable of being connected to the evaporator section using pre-charged refrigerant line sets. No brazing, dehydration, or charging shall be required. The fan/motor assembly shall be direct drive.

5-Ton Models

The fan/motor assembly shall be belt drive. Condensing unit must be hard piped with the evaporator. Sweat adapters are shipped loose with all 5 ton evaporators for use on the 5 ton condensing units.

Propeller Fan Condensing Unit

The condenser coil shall be constructed of copper tubes and aluminum fins with a direct drive propeller type fan and shall include a scroll compressor, high pressure switch, Lee-temp receiver, head pressure control valve, and liquid line solenoid valve. All components shall be factory assembled, charged with refrigerant and sealed. No brazing, dehydration, or charging shall be required. Condensing unit shall be designed for 95°F (35°C) ambient and be capable of operation to -30°F (-34.4°C).

A hot gas bypass circuit shall be provided to reduce compressor cycling and improve operation under low load conditions.

(Optional) Quiet-Line Models

The condensing unit shall be designed to operate at a sound level less than 58 dBA.

(Optional) High Ambient Models

The outdoor condensing unit shall be designed for design ambient operation of 105°F (40.6°C).

3-Ton Models

The condensing module shall be capable of being connected to the evaporator section using pre-charged refrigerant line sets. No brazing, dehydration, or charging shall be required.

5-Ton Models

Condensing unit must be hard piped with the evaporator. Sweat adapters are shipped loose with all 5 ton evaporators for use on the 5 ton condensing units.

2.3.1 Water or Glycol Cooled Split Systems

Water or Glycol Cooled Condensing Unit

The water/glycol condensing unit shall be equipped with a coaxial condenser having a total system pressure drop of ____ ft. of water (kPa) and a flow rate of ____ GPM (l/s) with ____ °F (°C) entering water/glycol temperature.

Components shall include scroll compressor and high-pressure switch. The condensing unit shall be factory charged with R-22 refrigerant.

The condenser circuit shall be pre-piped with a [(2-way) (3-way)] regulating valve which is head-pressure actuated.

The condenser water/glycol circuit shall be designed for a static operating pressure of [(150 PSI (1034 kPa)) (350 PSI (2413 kPa))].

A hot gas bypass circuit shall be provided to reduce compressor cycling and improve operation under low load conditions.

(Optional) Disconnect

Factory installed non-fused disconnect switch allows unit to be turned off for maintenance.

3-Ton Models

The condensing module shall be capable of being connected to the evaporator section using pre-charged refrigerant line sets. No piping, brazing, dehydration, or charging shall be required.

5-Ton Models

Condensing unit must be hard piped with the evaporator. Sweat adapters are shipped loose with all 5 ton evaporators for use on the 5 ton condensing units.

Propeller Fan Drycooler (Standard)

The Liebert manufactured drycooler shall be the low profile, slow speed, direct drive propeller fan type. The drycooler shall be constructed of aluminum and contain a copper tube aluminum fin coil with an integral electric control panel. The drycooler shall be designed for ____ °F (°C) ambient.

Centrifugal Fan Drycooler (Optional)

The system shall be supplied with a centrifugal fan drycooler (LCD). The drycooler shall be constructed of galvanized steel with a copper tube, aluminum fin coil. The heavy duty fan shall be the centrifugal type, double width, double inlet. The 1750 RPM (1450 RPM @ 50 Hz) fan motor shall be mounted on an adjustable base, and equipped with an adjustable motor pulley. A 3-way control valve and thermostat shall maintain the desired fluid temperature. Electrical controls shall be in a rain tight enclosure. The system shall be designed for ____ °F (°C) ambient. The drycooler shall have a ____ Volt, 3 phase, ____ Hz power supply.

Single Glycol Pump Package (Standard)

This system shall be provided with a centrifugal pump mounted in a weatherproof and vented enclosure. The pump shall be rated for GPM (l/s) at ____ ft. of head (kPa), and operate on ____ Volt, 3 phase, ____ Hz.

Dual Glycol Pump Package (Optional)

The dual pump package shall include pumps, enclosure, and field mounted flow switch. The pumps shall be wired to the drycooler control box which includes a lead/lag switch for the pumps. The standby pump shall automatically start upon failure of the lead pump. Each pump shall be rated for ____ GPM (l/s) at ____ feet of head (kPa).

2.4 Chilled Water Self-Contained Systems Chilled Water Coil

The cooling coil shall have a minimum of ____ sq. ft. (sq. m) face area, ____ rows deep. The coil shall be controlled by a modulating control valve. The chilled water coil shall be designed for closed-loop applications using properly maintained water. It shall be configured as an (A) (V) frame and be constructed of copper tubes and aluminum fins and have a maximum face velocity of ____ ft. per minute (m/s) at ____ CFM (CMH). The water circuit shall be designed to distribute water into the entire coil face area. The coil shall be supplied with ____ °F (°C) entering water temperature, with a ____ °F (°C) temperature rise. The coil shall be supplied with ____ GPM (m/s) of chilled water and the pressure drop shall not exceed ____ PSI (kPa). The coil assembly shall be mounted in a stainless steel condensate drain pan.

3-Way Chilled Water Valve (Standard)

The water circuit shall include a 3-way modulating valve. The microprocessor control shall position the valve in response to room conditions. Cooling capacity will be controlled by bypassing chilled water around the coil.

2-Way Chilled Water Valve (Optional)

The water circuit shall include a 2-way modulating valve. The microprocessor control shall position the valve in response to room conditions. The minimum close-off pressure of the valve/actuator assembly shall be ____ PSI (kPa).

Design Pressure

The chilled water circuit shall be designed for a pressure of [(150 PSI (1034 kPa)) (400 PSI (2758 kPa))].

Flow Switch (Optional)

The flow switch shall activate the alarm system should the chilled water supply be interrupted. The switch shall be factory mounted and wired.

2.5 Comprehensive Monitoring Solutions

(For detailed Guide Specifications on these products, refer to information posted at www.liebert.com)

SiteScan Web System

SiteLink Module

OpenComms Nform

OpenComms NIC & Web Card (OC-NIC & OC-Web Card)

Environmental Discrete Outputs Card (ENV-DO)

Remote Contact Monitor

- RCM4

Autochangeover Controllers

- AC3
- RAC2-8

Universal Monitor

Leak Detection

- Direct Read Module
- Zone Sensor
- Spot Sensor

3.0 EXECUTION

3.1 Installation of Environmental Control Units

3.1.1 General

Install environmental control units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

3.1.2 Electrical Wiring

Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's electrical connection diagram submittal to electrical contractor.

3.1.3 Piping Connections

Install and connect devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's piping connection diagram submittal to piping contractor.

3.1.4 Supply and Drain Water Piping

Connect water supply and drains to air conditioning unit. Provide pitch and trap as manufacturer's instructions and local codes require.

3.2 Field Quality Control

Start up environmental control units in accordance with manufacturer's start up instructions. Test controls and demonstrate compliance with requirements.

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