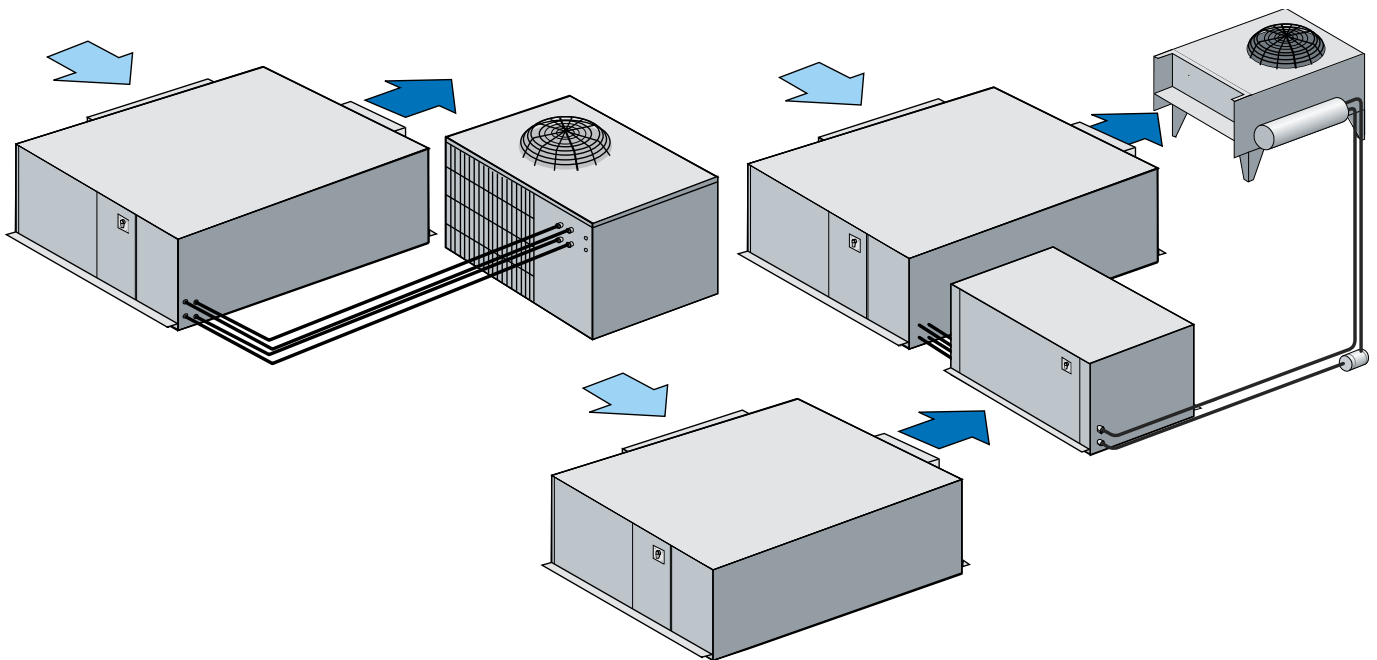


## Liebert® Mini-Mate2™ – 8-Ton (28kW) Capacity

Technical Data Manual—Air, Water, Glycol, GLYCOOL, Chilled Water; 50&60Hz





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## 1.0 INTRODUCTION

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### 1.1 Designed to Match Computer and Electronic Equipment Needs—From Installation to Operation

Installed above the ceiling, the Liebert Mini-Mate2 System controls the cooling, humidity and air distribution required by sensitive electronic equipment. A range of sizes and configurations are available to meet site needs.

The Liebert Mini-Mate2 is also easy to use. Advanced microprocessor technology allows easy, precise control, and menu-driven monitoring keeps you informed of system operation through the LCD read-out. These features, combined with Liebert quality construction and reliable components, guarantee satisfaction from installation through operation.

#### Liebert Precision Cooling

Liebert Precision Cooling systems are designed to control the temperature and humidity required for computers and other sensitive electronic equipment. Liebert Mini-Mate2 provides complete control on an around-the-clock basis, as well as the high sensible heat ratio required by sensitive electronic equipment.

#### Easy Installation

The Liebert Mini-Mate2 is a split-system air, water- or glycol-cooled unit or a self-contained, chilled water unit. Each split system has thermostat-type wiring to the controls and condensing unit.

#### Easy to Service

Low-maintenance components are easily accessed through removable panels. Spare parts are always in Liebert's inventory and available on short notice.

#### Advanced Control Technology

A menu-driven microprocessor control system provides precise temperature and humidity control and accurate alarm setpoints. Using touch sensitive buttons, the wall-mounted monitor/control panel allows you to display temperature and other monitored parameters.

#### High Efficiency

High system efficiency is a result of high sensible heat ratio, two selectable fan speeds and precise microprocessor control.

#### Space Saving Design

All indoor components are installed above the ceiling, so no floor space is required.

#### Reliable

The Liebert Mini-Mate2 family installed base is a testimony to the system's reliability. Components include a rugged compressor, high-efficiency copper tube, aluminum fin evaporator coil and a double inlet, direct drive fan.

#### Agency Listed

Standard 60Hz units are CSA certified to the harmonized U.S. and Canadian product safety standard, CSA C22.2 No 236/UL1995 for "Heating and Cooling Equipment" and are marked with the CSA c-us logo. The units are also MEA listed for New York City applications.



#### Location

When considering installation locations, consider that these units contain water and that water leaks can cause damage to sensitive equipment below. Do not mount these units above sensitive equipment. A field-supplied pan with drain must be supplied beneath cooling units and water/glycol condensers.

Do not install units where normal unit operating sound may disturb the working environment.

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## 2.0 STANDARD FEATURES—8 TON SYSTEMS

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### 2.1 Evaporator Section—Split System

The Liebert Mini-Mate2 systems consist of an evaporator section matched with an outdoor air-cooled condensing unit, indoor air-cooled condensing unit or indoor water/glycol-cooled condensing unit. The system is also available as a self-contained chilled water unit.

Evaporator Unit (for ducting only) includes a dual-circuited evaporator coil, R-407C charge, filter drier, expansion valves, adjustable belt-driven blower assembly, microprocessor control and a stainless steel drain pan. Unit is provided with supply and return air openings for field-supplied ducting. Unit insulation meets ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 & ASTM 1338 standards.

### 2.2 Condensing Unit Section—Split System

#### 2.2.1 Indoor Centrifugal Fan Condensing Units

Indoor Air-Cooled Centrifugal Condensing Units include 3-ton and 5-ton scroll compressors, dual-circuited condenser coil with R-407C refrigerant charge, adjustable belt-driven centrifugal blower assembly, factory-mounted disconnect switch, high pressure switches and built-in Liebert Lee-Temp™ head pressure controls, hot gas bypass, liquid line solenoid valves and receivers for operation down to -30°F (-34°C) ambient. Duct flanges are provided. Condensing unit is rated at 95°F (35°C) ambient air.

#### 2.2.2 Outdoor Prop-Fan Condensing Units

Outdoor Prop-Fan Condensing Units include 3-ton and 5-ton scroll compressors, two condenser coils, propeller fan, high pressure switches, hot gas bypass, Liebert Lee-Temp head pressure controls, liquid line solenoid valves and built-in receivers for operation down to -30°F (-34.4°C) ambient. Condensing unit is rated at 95°F (35°C) ambient air.

#### 2.2.3 Indoor Water/Glycol Condensing Units

Indoor Water/Glycol Condensing Units include 3-ton and 5-ton scroll compressors, coaxial condensers, R-407C refrigerant charge, high head pressure switches, factory-mounted disconnect switch, hot gas bypass and 2-way water/glycol regulating valves. Design pressure is 150psi (1034kPa). Condensing unit can be used on either water or glycol loops.

### 2.3 Chilled Water Units

Chilled Water Units include chilled water coil, 2-way proportional modulating valve, adjustable belt-driven blower assembly and factory mounted disconnect switch. Design pressure is 400psi (2757kPa), 86psi (593kPa) close-off differential. Unit is provided with supply and return air openings for field-supplied ducting. Unit insulation meets ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 & ASTM 1338 standards.

### 2.4 System Controls

System controls include a microprocessor control board mounted in the evaporator/chilled water unit and a wall-mounted interface with a two-line, 16-character liquid crystal display. A seven-key, membrane keypad for setpoint/program control, unit On/Off and alarm silence is below the LCD screen. It provides temperature setpoint and sensitivity adjustment, humidity setpoint and sensitivity adjustment, digital display of temperature, humidity, setpoints, sensitivities and alarm conditions.

The wall-box is field-wired to the microprocessor control using standard four-conductor thermostat wire (field-supplied). The temperature and humidity sensors are in the wall box, which can be installed up to 300 feet (91.4m) from the evaporator unit. The unit-mounted control board also includes common alarm terminals and shutdown terminals. The unit automatically restarts after a power outage.

#### 2.4.1 Three-Stage Cooling

A unique compressor staging system utilizes independent 3-ton and 5-ton circuits to provide better control of room conditions. The unit microprocessor continuously monitors recent cooling operation and selects the most economical cooling stage to satisfy demand.



2.4.2 Other Standard Control Features

- Adjustable auto restart
- 5 day/2 day setback
- Password protection
- Alarm enable/disable
- Self-diagnostics
- Calibrate sensors
- Predictive humidity control
- Common alarm output
- Remote shutdown terminals

Figure 1 Improved load tracking

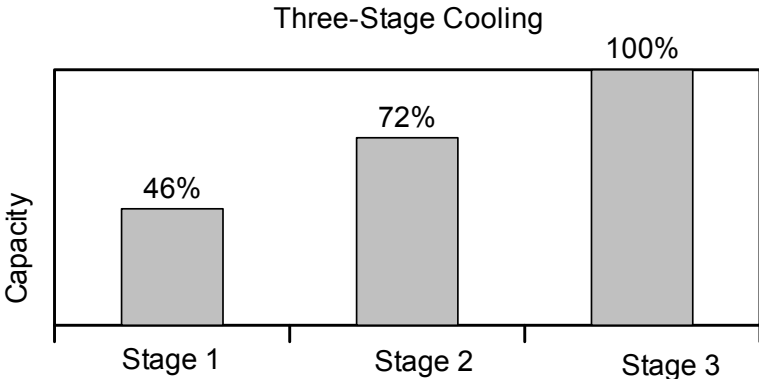


Figure 2 Wall-box



## 3.0 OPTIONAL FACTORY-INSTALLED FEATURES - EVAPORATOR/CHILLED WATER UNITS

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### 3.1 Reheat

**Electric reheat** includes 2-stage, 304/304 stainless steel finned tubular reheat elements for added durability. Also includes high limit safety switch.

**SCR Reheat** provides tight temperature control by rapidly pulsing the 304/304 stainless steel reheat elements in small increments. A solid state relay is factory-installed and wired to the microprocessor control. The compressor is locked on, with the reheat modulated to track the load. Not available on chilled water, GLYCOOL™, free-cooling or 575V units.

**Hot Water Reheat** includes a hot water coil, two-way solenoid valve and Y-strainer. This option is available only on chilled water units; not available with other reheat options.

### 3.2 Humidifier

The **Canister Humidifier** includes a steam generating-type humidifier with automatic flushing circuit, inlet strainer, drain, 1" (25.4mm) air gap on fill line and solenoid valves. Humidifier problem alarm annunciates at the wall-mounted display panel.

**Remote Humidifier Contact** allows the unit's humidity controller to control a humidifier outside the unit. Power to operate the external humidifier does not come from the Liebert Mini-Mate2. Available on units with or without internal humidifier.

### 3.3 Sensors

The **Smoke Sensor** senses return air, shuts down the unit upon sensing smoke and activates visual and audible signals at the wall box. This smoke sensor is not intended to function as or replace any room smoke detection system that may be required by local or national codes.

**High-Temperature Sensor** senses return air temperature and shuts down unit if temperature reaches 125°F (52°C). This device is not meant to replace any fire detection system that may be required by local or national codes.

### 3.4 Switches and Motors

**Filter Clog Switch** senses pressure drop across the filters and activates visual and audible alarms at the wall-box display. The wall-box display annunciates the alarm audibly and flashes a notification upon reaching a customer setpoint.

A **Factory-Installed Non-Fused Disconnect Switch** allows unit to be turned off for maintenance. A disconnect switch is standard for the evaporators, chilled water units and indoor condensing units, but these units may be specified without the switch.

**3hp Blower Motor** is available for high static pressure applications (0.9 to 1.9in [23 to 48mm] w.g.). Standard 2hp motor allows for ESP of 0.5 in (13 mm). Free-cooling or hot water reheat coils reduce the available ESP by 0.3" (8mm). Maximum return air static pressure should not exceed 0.3" (8mm) for drain to work properly.

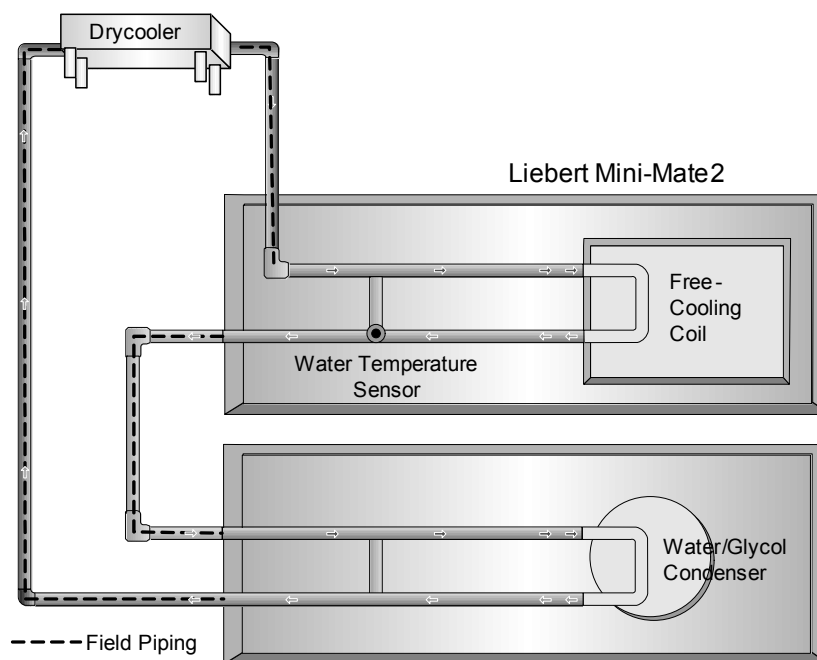
### 3.5 Free-Cooling

**GLYCOOL™ (free-cooling)** coil can be ordered with the evaporator section. This option contains a 3-way modulating valve, fluid temperature sensor and supply/return piping. System includes an adjustable timed flush cycle. Coil is active anytime there is a call for cooling and fluid temperature is 8°F (4.4°C) below room air temperature. The coil can provide the majority of the cooling with DX compressor coil cycled on as needed to complete the cooling requirements.

Air-cooled condensing units can be matched with evaporators using free-cooling coils with chilled water sources to serve as backup cooling. When matched with a water/glycol condensing unit, a three-way water regulating valve is recommended for the condensing unit to simplify piping to the main supply pipes. The coil is designed for closed-loop applications using properly treated and circulated fluid. Not available with SCR reheat options.

Figure 3 Free-cooling option—example

A free-cooling coil allows the system to take advantage of a primary chilled water source or colder water/glycol temperatures available during colder outdoor temperatures. The free-cooling coil is used for cooling whenever fluid temperature is 8°F (4.4°C) or more below room air temperature, reducing the need for compressor operation.

**NOTE**

*If free-cooling is applied to an open water tower, an optional cupro-nickel (CuNi) coil is required to prevent premature corrosion, or a heat exchanger must separate the tower water from the free-cooling loop. The cupro-nickel coil requires an extended lead time.*

### 3.6 Optional Configuration—Prop Fan Condensing Units

**Outdoor Prop Fan Condensing Units** are available with condenser coils that can be phenolic-coated for extended coil life in coastal areas.

### 3.7 Optional Configurations—Water/Glycol Condensing Units

**Indoor Water/Glycol Condensing Units** are available with the following piping options:

- 2-way water regulating valves with 350psi (2413kPa) design pressure.
- 3-way water regulating valves with 150psi (1034kPa) design pressure.
- 3-way water regulating valves with 350psi (2413kPa) design pressure.

### 3.8 Optional Configuration—Chilled Water Units

**Chilled Water units** are available with a 3-way modulating chilled water valve, rated for 400psi (2757kPa) operating pressure. Valve is non-spring return.

## 4.0 SHIP-LOOSE ACCESSORIES—FIELD-INSTALLED

**Filter box kit (for ducted applications)** includes filter box with duct flange connection, one MERV 8 (ASHRAE 52.2) filter (20" x 25" x 4" [508mm x 635mm x 102mm]) and a duct flange for use on the supply air opening of the unit.

The **Condensate Pump** is field-mounted on the outside of the cabinet, wired to the unit power block and is equipped with a discharge check valve. A secondary float is field-wired to shut down the unit upon high condensate level.

**Condensate Pump Mounting Bracket** mounts on the end of the evaporator, easing alignment and installation of the condensate pump.

A **Remote Temperature and Humidity Sensor** package includes sensors in an attractive case with 30 ft. (9m) of cable. Can be wall- or duct-mounted. Remote sensors should be used when the wall box is not located in the space to be conditioned.



### NOTE

*Installing the remote sensors disables the sensors included in the wall box, allowing the wall box to be mounted up to 300 ft (91m) from the Liebert Mini-Mate2 unit.*

**Field-Installed Kits** available for filter clog, smoke sensor, high-temperature sensor, electric reheat and humidifier. The kits include installation instructions and are designed to be added to the evaporator unit before it is installed in the ceiling. Electric reheat kits cannot be installed in units with free-cooling. Humidifier kit cannot be installed on units with SCR reheat.

The **Refrigerant-Line Sweat Adapter Kit** contains four suction line and four liquid line fittings that allow field-supplied refrigerant piping between the evaporator and condensing unit.

**Single-Point Power Kit** contains the necessary electrical components to interconnect the high-voltage sections of a close-coupled evaporator and MCD condensing unit.

## 4.1 Remote Monitoring, Autochangeover and Leak Detection Equipment

The **Liebert RCM4™** is a four-point, normally open, dry contact monitoring panel. One Form-C, dry contact common alarm relay output (rated at 24 VAC, 3 Amp) is provided. Four red LEDs illuminate on the respective alarm and the alarm buzzer is silenced by a front panel switch. The RCM4 requires a 24VAC or 24VDC power source. Power supply is not included.

The **Liebert AC4™ Autochangeover Controller** provides autochangeover and autosequence control for up to four Liebert Mini-Mate2 units within a room. The Liebert AC4 will enable redundant units in an alarm condition, balance usage and test standby units at programmed intervals. Two common alarm relay outputs are available. A built-in LCD and RS-232 port for direct PC/terminal connection provides two options for configuration and monitoring of the product. The Liebert AC4 requires 24VAC input power.

The **Liebert AC8™** is ideal for coordinated control of systems with redundant units. The Liebert AC8 enables redundant devices during an alarm condition, balances usage of devices and tests standby devices at programmable intervals. Supports four zones and can use the 4-20mA temperature sensor (TW420) for temperature staging in each zone. Two programmable output control relays are available for auxiliary control such as humidity lockout. Emergency power operation input provided for device control during an emergency. Two common alarm relay outputs are available. A built-in LCD and RS-232 port for direct PC/terminal connection provides two options for configuration and monitoring of the product.

The **Liebert ENV-DO™** interface card provides 16 discrete outputs, corresponding to status and major alarm conditions of Environmental units. The Liebert ENV-DO-ENCL1 packages one Environmental DO interface card in its own steel enclosure and the ENV-DO-ENCL2 packages two Environmental DO interface cards in one enclosure for installation external to the Liebert Mini-Mate2. The self-contained kit includes an external 120VAC-to-24VAC power transformer. Wiring harnesses are not provided. Power and communication wiring is field-provided.

**The Liebert Liqui-tect<sup>®</sup> 410 Point Leak Detection Sensor** detects the presence of conductive liquid using a pair of corrosion-resistant, gold-plated probes mounted in a painted, height-adjustable enclosure. Dual Form-C, dry contact common alarm relays (rated at 24VAC, 3A) signal a leak detected as well as loss of power and cable fault. The Liebert Liqui-tect 410 requires an external 24VAC or 24VDC power source.

**Liebert LT460 Zone Leak Detection Kits** include one LT460 sensor, a specified length of LT500-xxY cable (maximum length is 100 ft [30.5m]) and a corresponding number of hold-down clips. The Liebert LT460 requires an external 24VAC, 0.12A power source, such as EXT-XFMR or XFMR24.

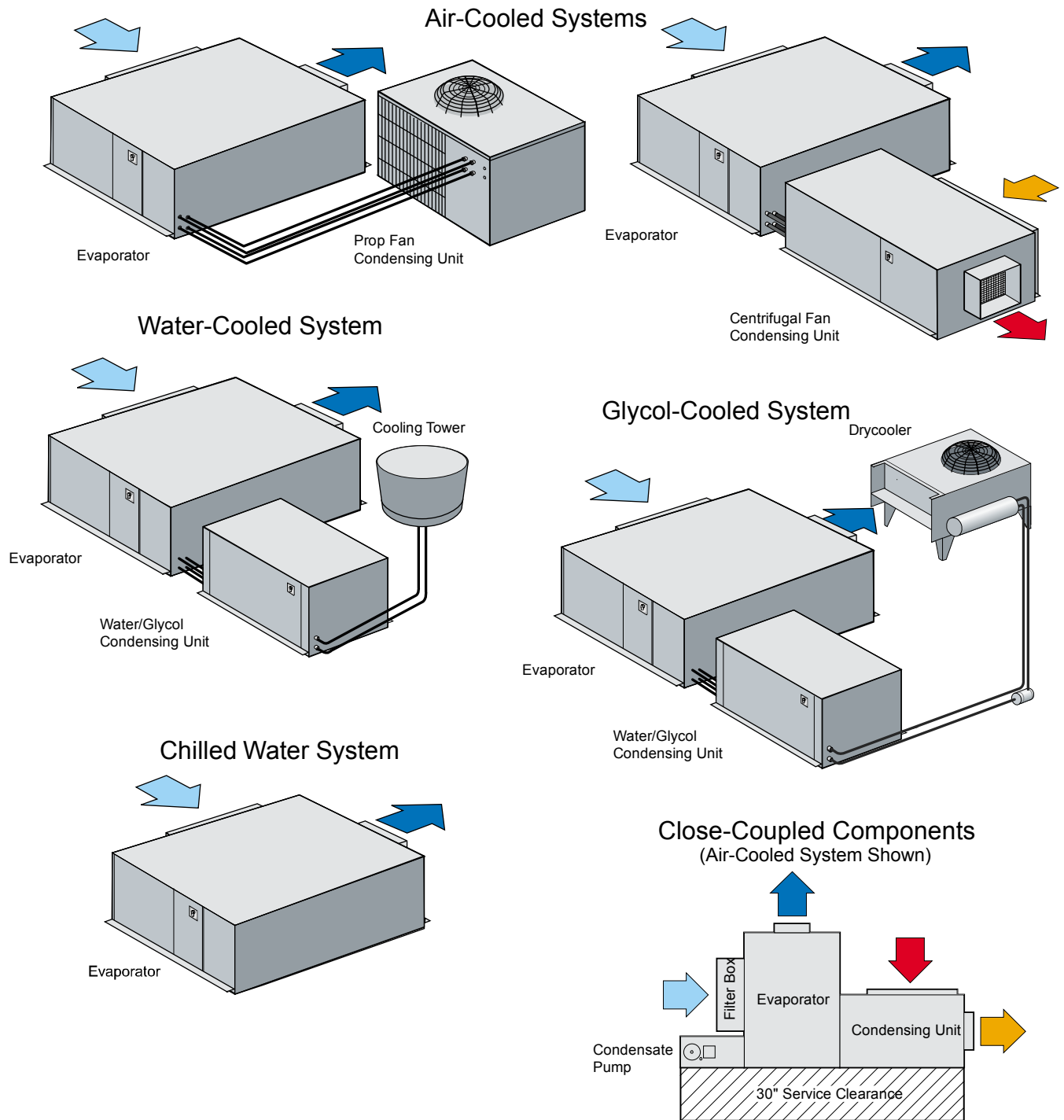
**Liebert SiteScan<sup>®</sup>** is a monitoring solution that gives you decision-making power to effectively manage the equipment critical to your business.

Liebert SiteScan enables communication 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 real-time status and alarms so you can react quickly to changing situations.

Liebert SiteScan is designed with flexibility for both small systems and large, complex systems such as those in computer rooms, telecommunications facilities or industrial process control rooms. Contact your local Emerson representative for assistance with a Liebert SiteScan system.

## 5.0 FLEXIBLE CONFIGURATIONS

Figure 4 Flexible configurations—all systems



## 6.0 AIR-COOLED SYSTEMS—CAPACITIES AND DIMENSIONS

**Table 1 Air-cooled data, 60Hz**

Evaporator Model		MMD96E or MMD96K	
Condensing Unit Type		PFH - Outdoor	MCD - Indoor
<b>DX Evaporator - Net Capacity Data - kW (Btuh)</b>			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	28.4 (96,900)	28.1 (96,000)
	Sensible	27.9 (95,200)	27.8 (94,800)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	27.2 (92,700)	26.9 (91,800)
	Sensible	24.9 (84,900)	24.9 (84,800)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	26.5 (90,400)	26.3 (89,700)
	Sensible	22.8 (77,900)	22.8 (77,700)
<b>Fan Data - Evaporator</b>			
CFM (CMH)		3750 (6371)	
Fan Motor, hp (W)		2.0 (1491)	
External Static Pressure, in. (mm) water gauge		0.5 (13)	
<b>Evaporator Coil - Copper Tube/Aluminum Fin</b>			
Face Area ft. <sup>2</sup> (m <sup>2</sup> )		7.6 (0.71)	
Coil Rows		4	
Max Face Velocity-fpm (m/s)		491 (2.5)	
Unit Refrigerant Charge (5-Ton Circuit), oz. (kg)		7 (0.20)	
Unit Refrigerant Charge (3-Ton Circuit), oz. (kg)		7 (0.20)	
Unit Operating Weight, lb. (kg)		665 (302)	
<b>Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
All Voltages		11.5 (39200)	
<b>SCR Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
All Voltages, except 575-3-60		16.5 (56300)	
<b>Humidifier Data - Steam Generator Type</b>			
Steam capacity, lb./hr (kg/hr)		10 (4.5)	
Electrical Input Power - kW		3.5	
<b>Evaporator Connection Sizes</b>			
Liquid Line Diameter (5-Ton Circuit) - Aeroquip Coupling Size		1/2" - #10 Female	
Suction Line Diameter (5-Ton Circuit) - Aeroquip Coupling Size		1-1/8" - #12 Female	
Liquid line Diameter (3-Ton Circuit) - Aeroquip Coupling Size		3/8" - #6 Female	
Suction Line Diameter (3-Ton Circuit) - Aeroquip Coupling Size		7/8" - #11 Female	
Humidifier Supply		1/4" OD Cu Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
MERV 8 Filter - Nominal Size, qty 2; in. (mm)		4x20x25 (102x508x635)	
<b>Condensing Unit Model Number</b>		<b>PFH096A-_L7</b>	<b>MCD96AL_H7</b>
Condensing Unit Rating Conditions		95°F (35°C) Ambient	
Coil Face Area ft. <sup>2</sup> (m <sup>2</sup> )		21 (1.95)	10.4 (0.97)
Rows of Coil		3	4
CFM (CMH)		6480 (11010)	5000 (8495)
Motor, hp (W)		0.75 (560)	3.0 (2.2)
External Static Pressure, in wg. (mm)		n/a	0.50 (13)
Unit Refrigerant Charge (5-Ton Circuit), oz. (kg)		581 (16.5)	402 (11.4)
Unit Refrigerant Charge (3-Ton Circuit), oz. (kg)		361 (10.2)	210 (6.0)
Unit Operating Weight, lb. (kg)		565 (257)	530 (241)
<b>Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT</b>			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	28.0 (95,600)	
	Sensible	26.8 (91,500)	
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	24.1 (82,200)	
	Sensible	22.5 (76,800)	
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	21.7 (74,100)	
	Sensible	19.9 (67,900)	
Flow Rate - GPM (l/m)		17.6 (66.7)	
Pressure Drop - ft. water (kPa)		9.9 (29.6)	
<b>Free-Cooling Coil - Copper Tube/Aluminum Fin</b>			
Face Area ft. <sup>2</sup> (m <sup>2</sup> )		7.6 (0.7)	
Coil Rows		4	
Max Face Velocity-fpm (m/s)		444 (2.26)	
Internal Fluid Volume - gal (l)		2.6 (9.8)	
Water supply and return connections, in. (mm) OD		1-3/8 (34.9)	

The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45% RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ±5%.

**Table 2 Air-cooled data, 50Hz**

Evaporator Model		MMD95E or MMD95K	
Condensing Unit Type		PFH - Outdoor	MCD - Indoor
<b>DX Evaporator- Net Capacity Data - kW (Btuh)</b>			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	27.9 (95,100)	27.6 (94,200)
	Sensible	27.5 (94,000)	27.3 (93,300)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	26.6 (90,600)	26.3 (89,900)
	Sensible	24.6 (84,100)	24.5 (83,700)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	25.9 (88,400)	25.7 (87,700)
	Sensible	22.7 (77,300)	22.5 (76,900)
<b>Fan Data - Evaporator</b>			
CFM (CMH)		3750 (6371)	
Fan Motor, hp (W)		2.0 (1491)	
External Static Pressure, in. (mm) water gauge		0.5 (13)	
<b>Evaporator Coil - Copper Tube/Aluminum Fin</b>			
Face Area, ft. <sup>2</sup> (m <sup>2</sup> )		7.6 (0.71)	
Coil Rows		4	
Max Face Velocity, fpm (m/s)		491 (2.5)	
Unit Refrigerant Charge (5-Ton Circuit), oz. (kg)		7 (0.20)	
Unit Refrigerant Charge (3-Ton Circuit), oz. (kg)		7 (0.20)	
Unit Operating Weight, lb. (kg)		665 (302)	
<b>Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
All Voltages		10.5 (35900)	
<b>SCR Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
All Voltages, except 575-3-60		15 (51300)	
<b>Humidifier Data - Steam Generator Type</b>			
Steam capacity, lb./hr (kg/hr)		10 (4.5)	
Electrical Input Power, kW		3.5	
<b>Evaporator Connection Sizes</b>			
Liquid Line Diameter (5-Ton Circuit) - Aeroquip Coupling Size		1/2" - #10 Female	
Suction Line Diameter (5-Ton Circuit) - Aeroquip Coupling Size		1-1/8" - #12 Female	
Liquid line Diameter (3-Ton Circuit) - Aeroquip Coupling Size		3/8" - #6 Female	
Suction Line Diameter (3-Ton Circuit) - Aeroquip Coupling Size		7/8" - #11 Female	
Humidifier Supply		1/4" OD Cu Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
MERV 8 Filter - Nominal Size, qty 2; in. (mm)		4x20x25 (102x508x635)	
<b>Condensing Unit Model Number</b>		<b>PFH095A-L7</b>	<b>MCD95AL-H7</b>
Condensing Unit Rating Conditions		95°F (35°C) Ambient	
Coil Face Area, ft. <sup>2</sup> (m <sup>2</sup> )		21 (1.95)	10.4 (0.97)
Rows of Coil		3	4
CFM (CMH)		5400 (9175)	5000 (8495)
Motor, hp (W)		0.75 (560)	3.0 (2.2)
External Static Pressure, in wg. (mm)		n/a	0.50 (13)
Unit Refrigerant Charge (5-Ton Circuit), oz. (kg)		581 (16.5)	402 (11.4)
Unit Refrigerant Charge (3-Ton Circuit), oz. (kg)		361 (10.2)	210 (6.0)
Unit Operating Weight, lb. (kg)		565 (257)	530 (241)
<b>Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT</b>			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	28.0 (95,600)	
	Sensible	26.8 (91,500)	
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	24.1 (82,200)	
	Sensible	22.5 (76,800)	
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	21.7 (74,100)	
	Sensible	19.9 (67,900)	
Flow Rate, GPM (l/m)		17.6 (66.7)	
Pressure Drop, ft. water (kPa)		9.9 (29.6)	
<b>Free-Cooling Coil - Copper Tube/Aluminum Fin</b>			
Face Area ft. <sup>2</sup> (m <sup>2</sup> )		7.6 (0.7)	
Coil Rows		4	
Max Face Velocity, fpm (m/s)		444 (2.26)	
Internal Fluid Volume, gal (l)		2.6 (9.8)	
Water supply and return connections, in. (mm) OD		1-3/8 (34.9)	

The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45% RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ±5%.



Figure 5 General arrangement, split systems, air-cooled fan coil

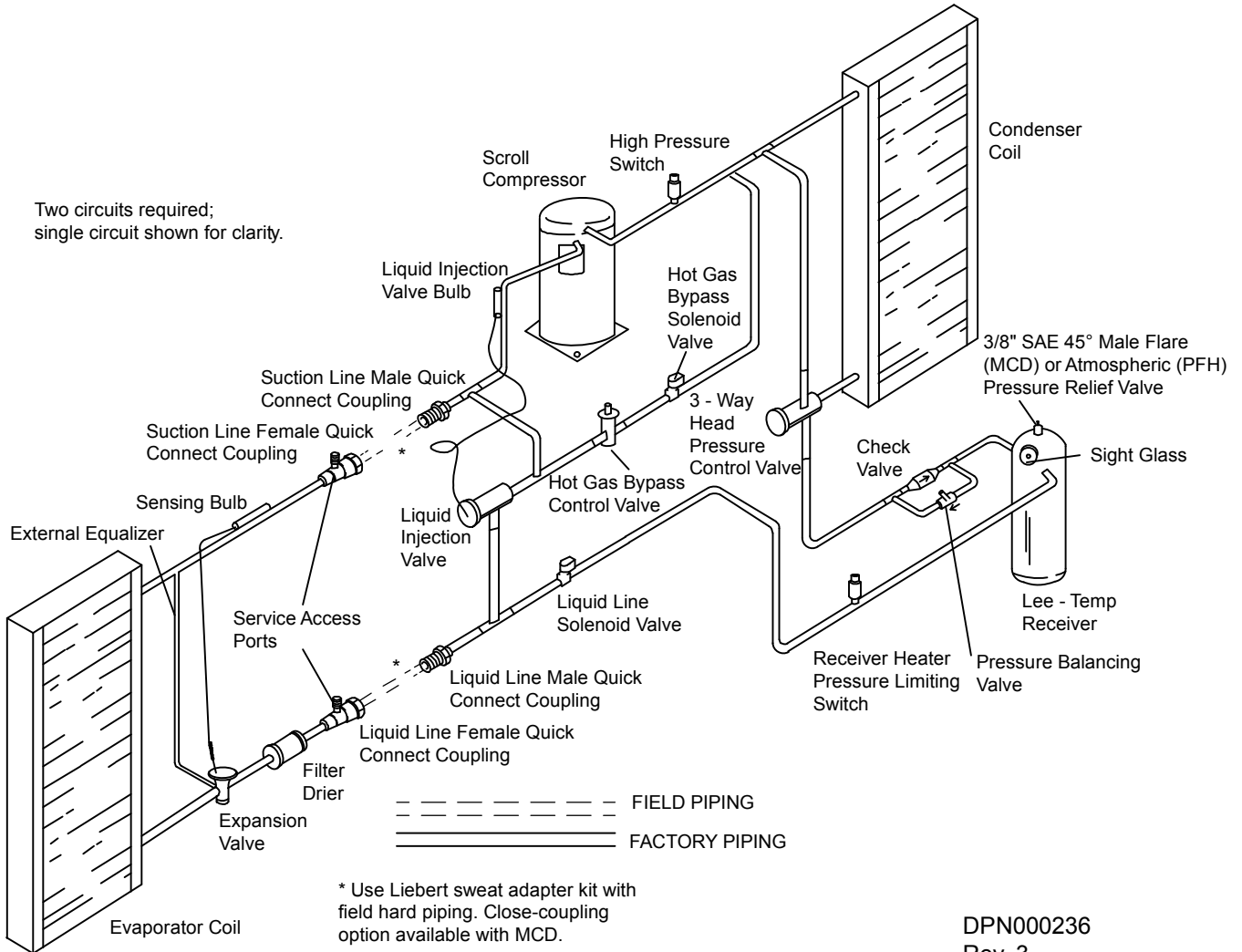


Figure 6 Free-cooling arrangement, air-cooled units

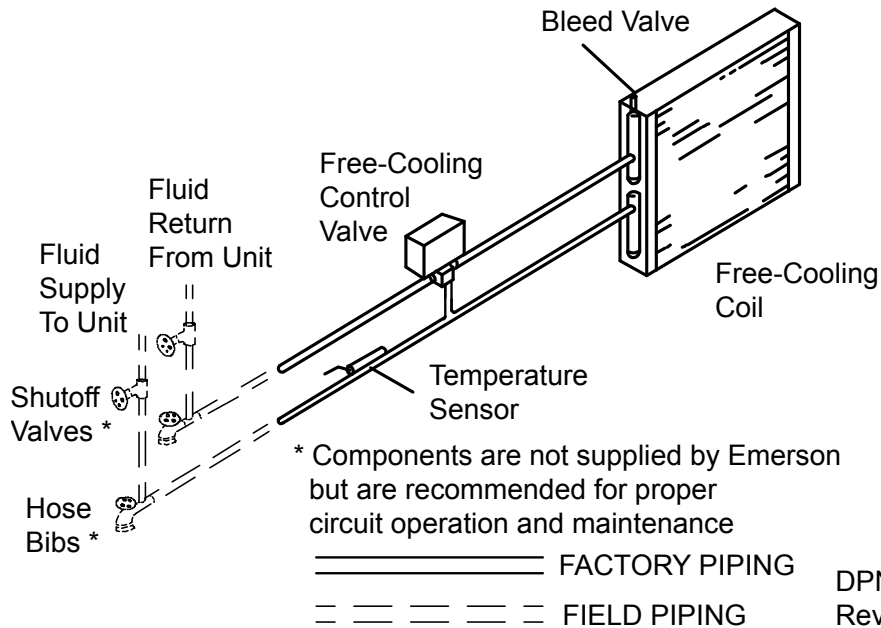


Figure 7 Dimensions, evaporator module

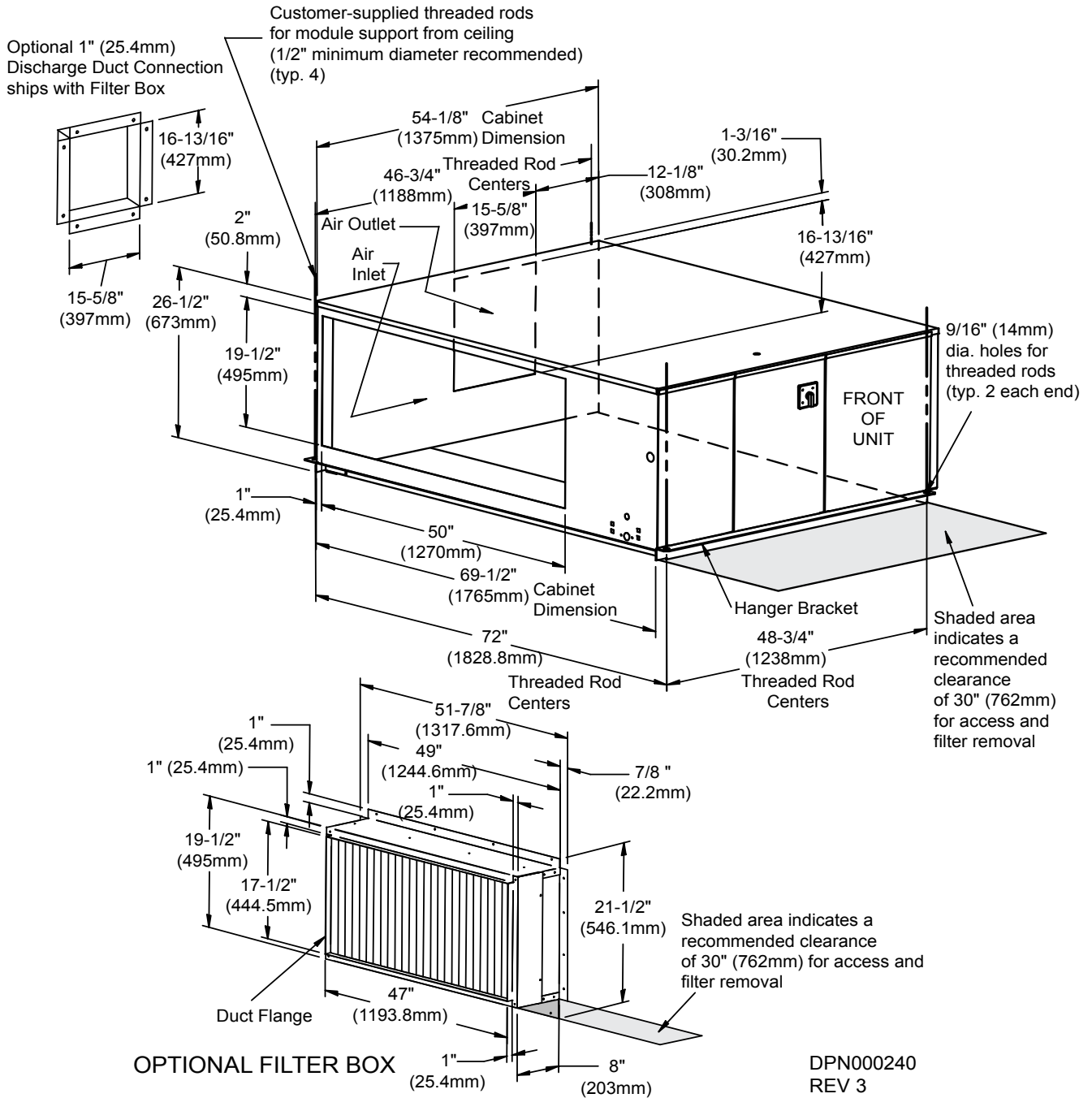
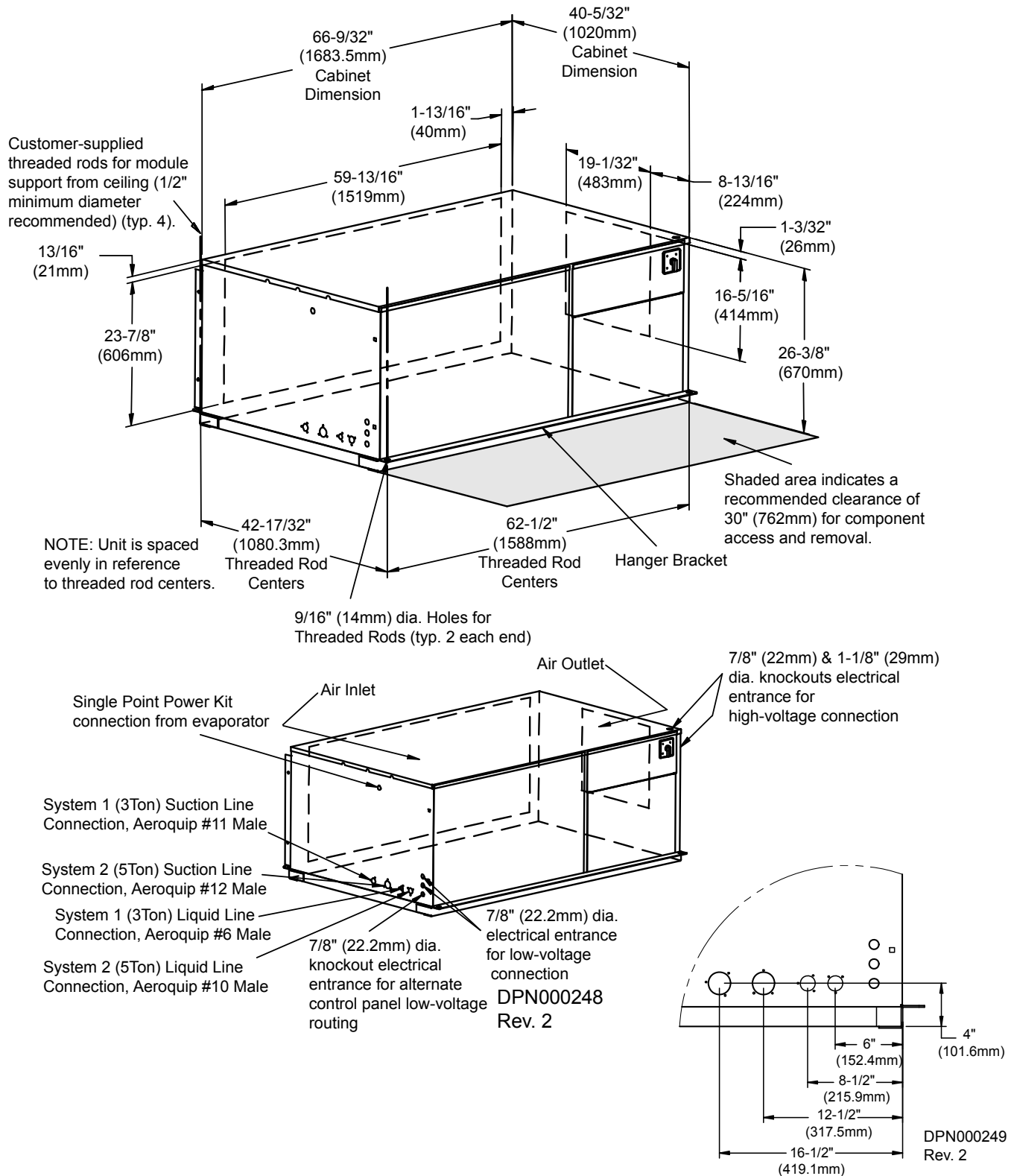


Table 3 Evaporator module weights

Model #		Weight, lb (kg)
60Hz	50Hz	
MM*96E	MM*95E	665 (302)
MM*96K	MM*95K	705 (320)

**Figure 8** Dimensions—indoor air-cooled condensing unit



**Table 4** Indoor condensing unit weights

Model #		Weight, lb (kg)
60Hz	50Hz	
MC*96A	MC*95A	530 (240)

Source: DPN000248, Rev. 2

Figure 9 Cabinet and floor planning dimensions, Prop Fan Condensing modules

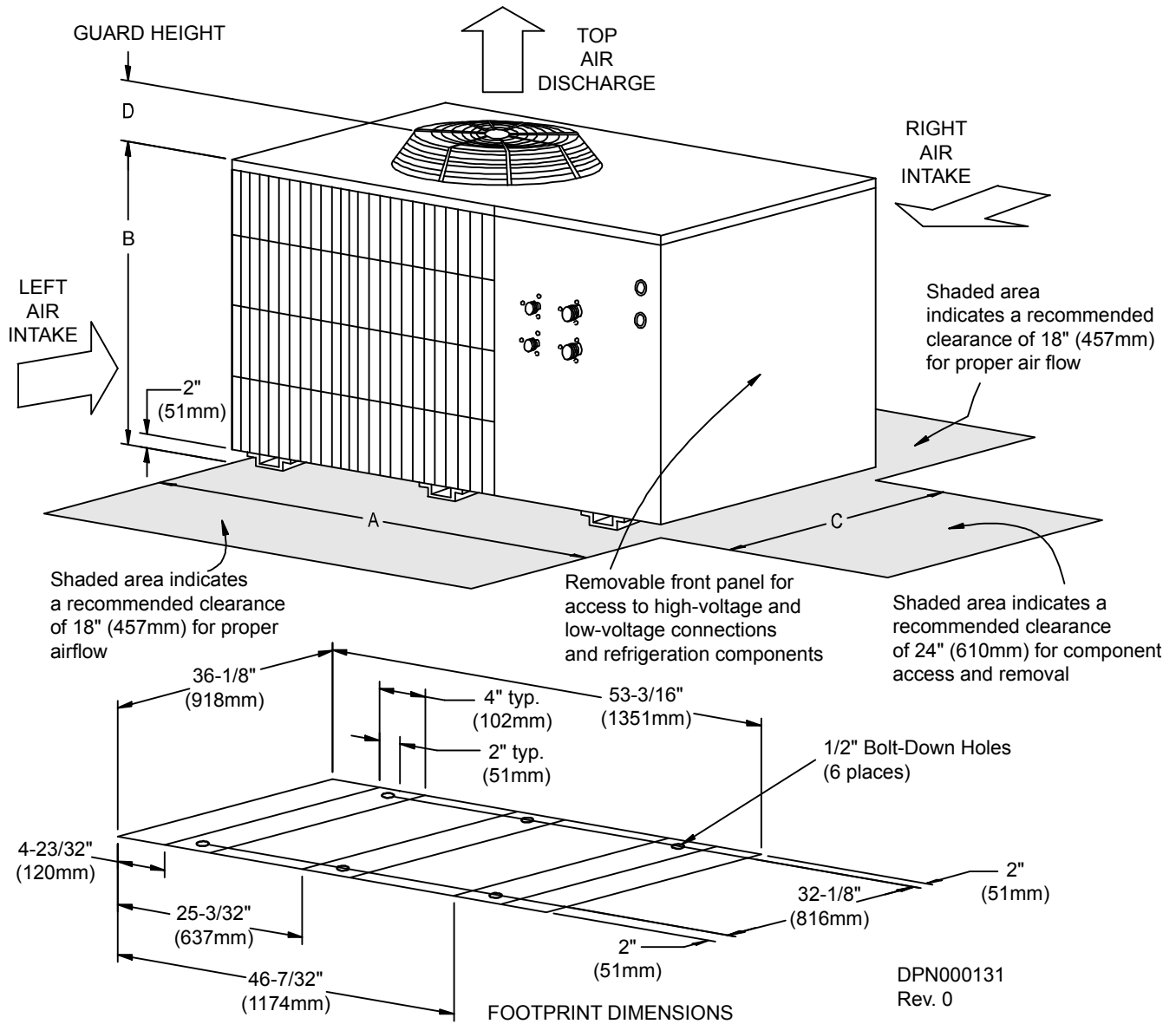


Table 5 Dimensions and weight, Prop Fan Condensing modules

Model #		Dimensions, in (mm)				Net Weight lb (kg)
60Hz	50Hz	A	B	C	D	
PFH096A-L	PFH095A-L	53 (1343)	36-1/4 (918)	38-1/2 (978)	5-1/2 (140)	570 (259)

Source: DPN000131, Rev. 0

## 7.0 WATER/GLYCOL-COOLED SYSTEMS—CAPACITIES AND DIMENSIONS

**Table 6 Water/glycol data, 60Hz**

Evaporator Model		MMD96E or MMD96K	
Condensing Unit Fluid		Water-Cooled	Glycol-Cooled
<b>DX Evaporator- Net Capacity Data - kW (Btuh)</b>			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	31.1 (106,000)	27.0 (92,000)
	Sensible	29.6 (101,000)	26.8 (91,600)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	29.9 (102,000)	25.6 (87,500)
	Sensible	26.2 (89,400)	24.2 (82,400)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	29.2 (99,800)	24.9 (85,100)
	Sensible	24.2 (82,600)	22.2 (75,600)
<b>Fan Data - Evaporator</b>			
CFM (CMH)		3750 (6371)	
Fan Motor HP (W)		2.0 (1491)	
External Static Pressure, in. (mm) water gauge		0.5 (13)	
<b>Evaporator Coil - Copper Tube/Aluminum Fin</b>			
Face Area ft. <sup>2</sup> (m <sup>2</sup> )		7.6 (0.71)	
Coil Rows		4	
Max Face Velocity, fpm (m/s)		491 (2.5)	
Unit Refrigerant Charge (5-Ton Circuit), oz. (kg)		7 (0.20)	
Unit Refrigerant Charge (3-Ton Circuit), oz. (kg)		7 (0.20)	
Unit Operating Weight, lb. (kg)		665 (302)	
<b>Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
All Voltages		11.5 (39200)	
<b>SCR Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
All Voltages, except 575-3-60		16.5 (56300)	
<b>Humidifier Data - Steam Generator Type</b>			
Steam capacity, lb./hr (kg/hr)		10 (4.5)	
Electrical Input Power, kW		3.5	
<b>Evaporator Connection Sizes</b>			
Liquid Line Diameter (5-Ton Circuit) - Aeroquip Coupling Size		1/2" - #10 Female	
Suction Line Diameter (5-Ton Circuit) - Aeroquip Coupling Size		1-1/8" - #12 Female	
Liquid line Diameter (3-Ton Circuit) - Aeroquip Coupling Size		3/8" - #6 Female	
Suction Line Diameter (3-Ton Circuit) - Aeroquip Coupling Size		7/8" - #11 Female	
Humidifier Supply		1/4" OD Cu Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
MERV 8 Filter - Nominal Size, qty 2; in. (mm)		4x20x25 (102x508x635)	
<b>Condensing Unit Model Number</b>		<b>MCD98W_AH7</b>	
Condenser Fluid Requirements		85°F (29.4°C) EWT	110°F (43.3°C) EGT - 40% PG
THR - kW (Btuh) @ 75F/45%RH		38.4 (131,000)	36.6 (125,000)
Flow Rate, GPM (l/m)		22.7 (86.0)	32.6 (123.6)
Pressure Drop, ft. of H2O (kPa)		19.2 (57.4)	45.8 (136.9)
Water-Cooled Condensing Temperature		105°F (40.6°C)	N/A
Unit Volume, Gal (l)		4.0 (15.1)	
Unit Refrigerant Charge (5-Ton Circuit), oz. (kg)		94 (2.7)	
Unit Refrigerant Charge (3-Ton Circuit), oz. (kg)		54 (1.5)	
Connection Sizes, in. (mm) OD		1-3/8 (34.9)	
Unit Operating Weight, lb. (kg)		470 (213)	
<b>Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT</b>			
Entering Fluid Conditions		45°F (29.4°C) EWT	45°F EGT - 40% PG
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	28.0 (95,600)	20.8 (71,000)
	Sensible	26.8 (91,500)	20.8 (71,000)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	24.1 (82,200)	17.6 (60,100)
	Sensible	22.5 (76,800)	17.6 (60,100)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	21.7 (74,100)	15.7 (53,500)
	Sensible	19.9 (67,900)	15.7 (53,500)
Flow Rate - GPM (l/m)		17.6 (66.7)	32.6 (123.6)
Pressure Drop - ft. water (kPa)		9.9 (29.6)	47.3 (141.4)
<b>Free-Cooling Coil - Copper Tube/Aluminum Fin</b>			
Face Area, ft. <sup>2</sup> (m <sup>2</sup> )		7.6 (0.7)	
Coil Rows		4	
Max Face Velocity, fpm (m/s)		444 (2.26)	
Internal Fluid Volume - gal (l)		2.6 (9.8)	
Water supply and return connections, in. (mm) OD		1-3/8 (34.9)	

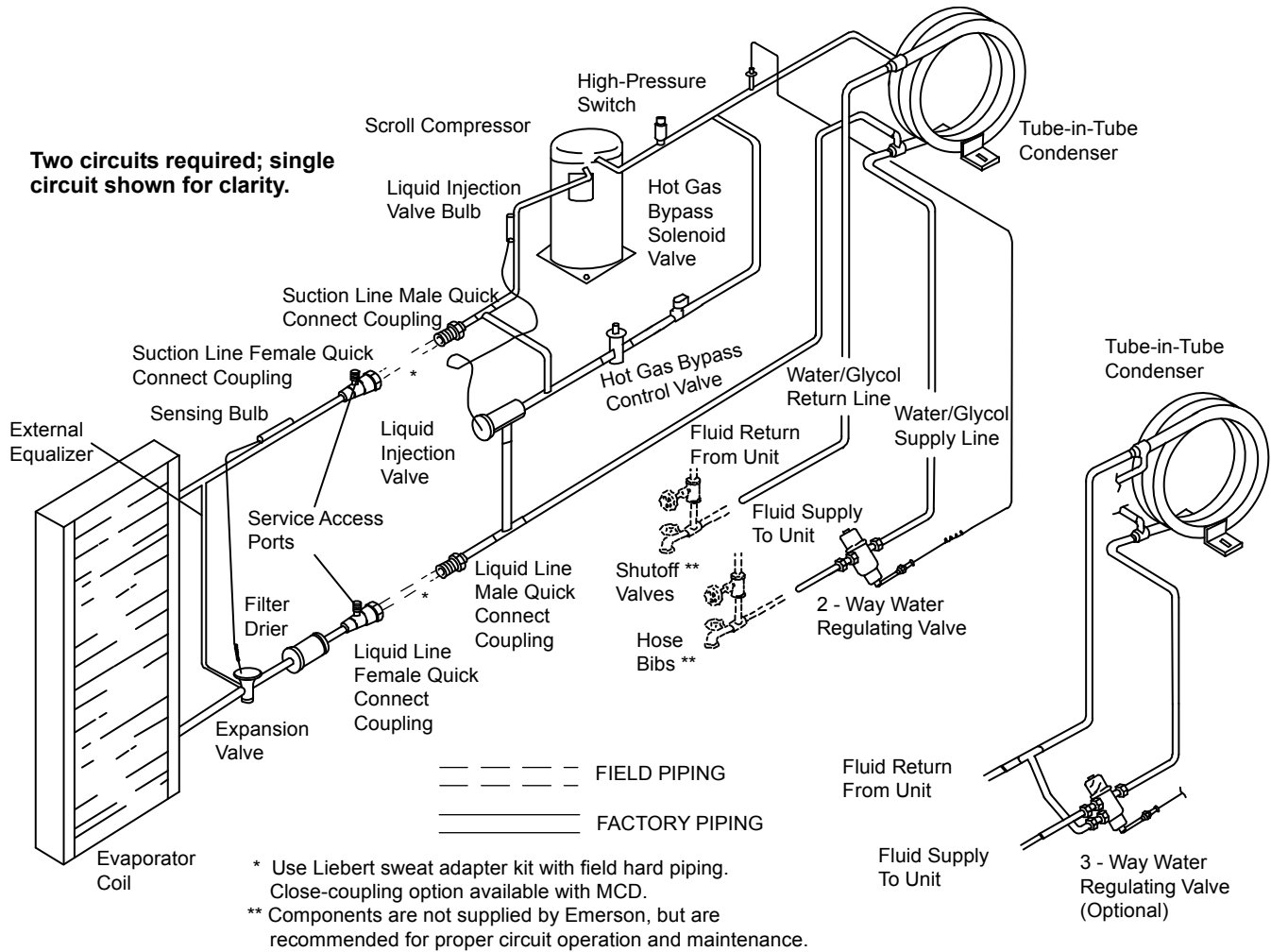
The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45% RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ±5%.

**Table 7 Water/glycol data, 50Hz**

Evaporator Model		MMD95E or MMD95K	
Condensing Unit Fluid		Water-Cooled	Glycol-Cooled
<b>DX Evaporator- Net Capacity Data - kW (Btuh)</b>			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	30.5 (104,000)	26.5 (90,300)
	Sensible	29.2 (99,600)	26.4 (90,100)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	29.3 (100,000)	25.1 (85,600)
	Sensible	25.9 (88,500)	23.9 (81,500)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	28.7 (98,000)	24.4 (83,200)
	Sensible	23.9 (81,600)	21.9 (74,800)
<b>Fan Data - Evaporator</b>			
CFM (CMH)		3750 (6371)	
Fan Motor HP (W)		2.0 (1491)	
External Static Pressure, in. (mm) water gauge		0.5 (13)	
<b>Evaporator Coil - Copper Tube/Aluminum Fin</b>			
Face Area ft. <sup>2</sup> (m <sup>2</sup> )		7.6 (0.71)	
Coil Rows		4	
Max Face Velocity-fpm (m/s)		491 (2.5)	
Unit Refrigerant Charge (5-Ton Circuit), oz. (kg)		7 (0.20)	
Unit Refrigerant Charge (3-Ton Circuit), oz. (kg)		7 (0.20)	
Unit Operating Weight, lb. (kg)		665 (302)	
<b>Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
All Voltages		10.5 (35900)	
<b>SCR Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
All Voltages, except 575-3-60		15 (51300)	
<b>Humidifier Data - Steam Generator Type</b>			
Steam capacity, lb./hr (kg/hr)		10 (4.5)	
Electrical Input Power, kW		3.5	
<b>Evaporator Connection Sizes</b>			
Liquid Line Diameter (5-Ton Circuit) - Aeroquip Coupling Size		1/2" - #10 Female	
Suction Line Diameter (5-Ton Circuit) - Aeroquip Coupling Size		1-1/8" - #12 Female	
Liquid line Diameter (3-Ton Circuit) - Aeroquip Coupling Size		3/8" - #6 Female	
Suction Line Diameter (3-Ton Circuit) - Aeroquip Coupling Size		7/8" - #11 Female	
Humidifier Supply		1/4" OD Cu Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
MERV 8 Filter - Nominal Size, qty 2; in. (mm)		4x20x25 (102x508x635)	
<b>Condensing Unit Model Number</b>		<b>MCD97W_AH7</b>	
Condenser Fluid Requirements		85°F (29.4°C) EWT	110°F (43.3°C) EGT - 40% PG
THR - kW (Btuh) @ 75F/45%RH		37.5 (128,000)	35.8 (122,000)
Flow Rate, GPM (l/m)		28.3 (107.3)	32.8 (124.3)
Pressure Drop, ft. of H2O (kPa)		19 (56.8)	46.4 (138.7)
Water-Cooled Condensing Temperature		105°F (40.6°C)	N/A
Unit Volume, Gal (l)		4.0 (15.1)	
Unit Refrigerant Charge (5-Ton Circuit), oz. (kg)		94 (2.7)	
Unit Refrigerant Charge (3-Ton Circuit), oz. (kg)		54 (1.5)	
Connection Sizes, in. (mm) OD		1-3/8 (34.9)	
Unit Operating Weight, lb. (kg)		470 (213)	
<b>Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT</b>			
Entering Fluid Conditions		45°F (29.4°C) EWT	45°F EGT - 40% PG
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	28.0 (95,600)	20.9 (71,200)
	Sensible	26.8 (91,500)	20.9 (71,200)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	24.1 (82,200)	17.6 (60,200)
	Sensible	22.5 (76,800)	17.6 (60,200)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	21.7 (74,100)	15.7 (53,600)
	Sensible	19.9 (67,900)	15.7 (53,600)
Flow Rate, GPM (l/m)		17.6 (66.7)	32.8 (124.3)
Pressure Drop, ft. water (kPa)		9.9 (29.6)	47.8 (142.9)
<b>Free-Cooling Coil - Copper Tube/Aluminum Fin</b>			
Face Area, ft. <sup>2</sup> (m <sup>2</sup> )		7.6 (0.7)	
Coil Rows		4	
Max Face Velocity, fpm (m/s)		444 (2.26)	
Internal Fluid Volume, gal (l)		2.6 (9.8)	
Water supply and return connections, in. (mm) OD		1-3/8 (34.9)	

The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45% RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ±5%.

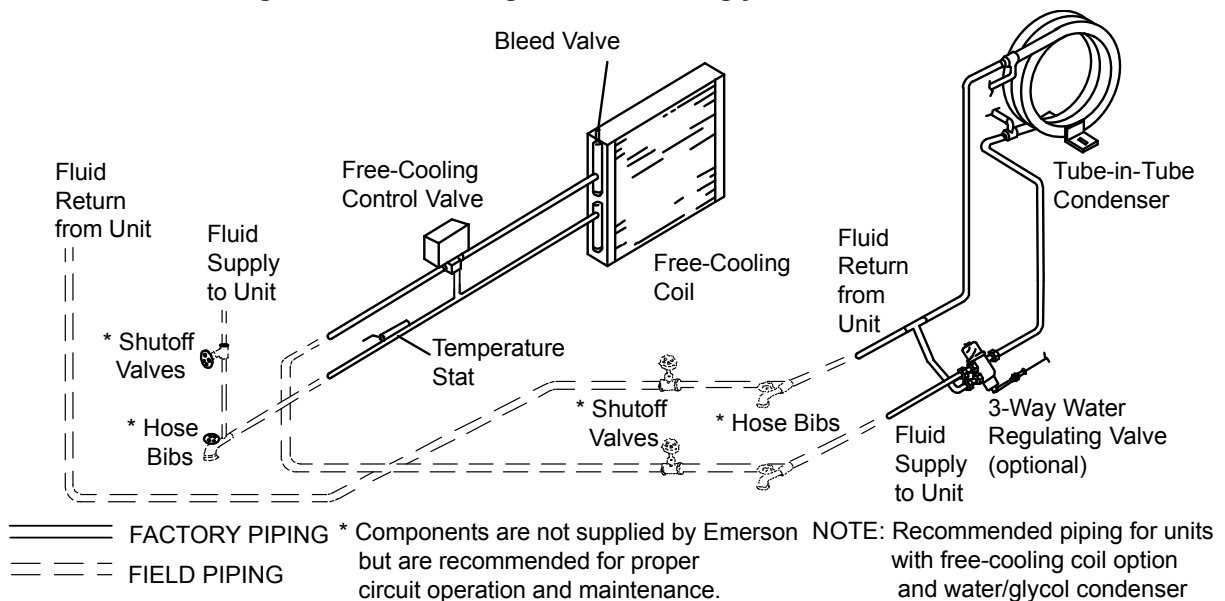
Figure 10 General arrangement, split systems, water/glycol units



DPN000235  
Rev. 1

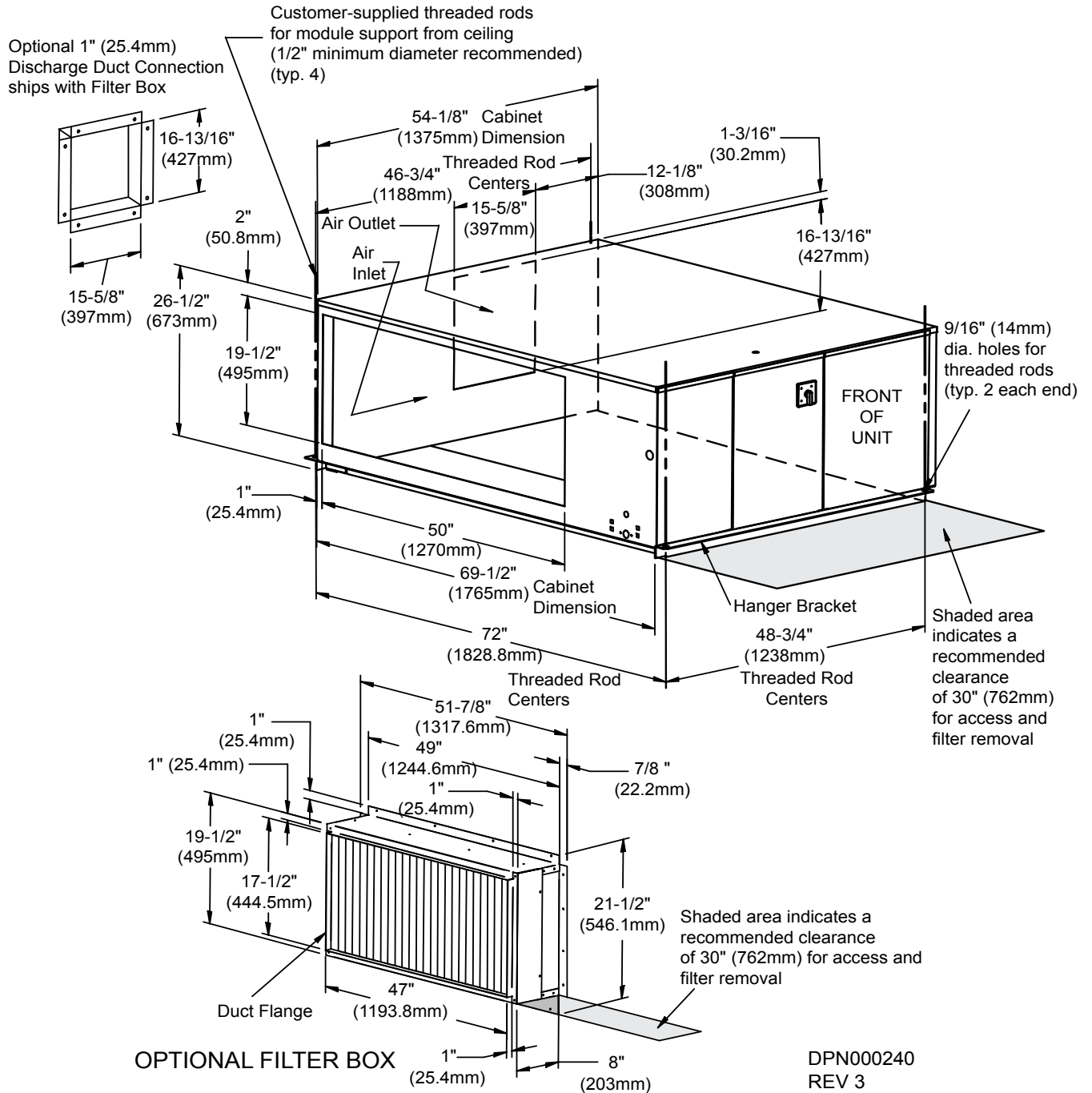
Note: Condenser water circuits are headered together to form one (1) supply connection and one (1) return connection.

Figure 11 General arrangement, free-cooling coil with water/glycol units



DPN000241  
Rev. 2

**Figure 12 Dimensions, evaporator module**



**Table 8 Evaporator module weights**

Model #		Weight lb (kg)
60Hz	50Hz	
MM*96E	MM*95E	665 (302)
MM*96K	MM*95K	705 (320)

Source: DPN000240, Rev. 3



Figure 13 Dimensions—Water/glycol condensing unit

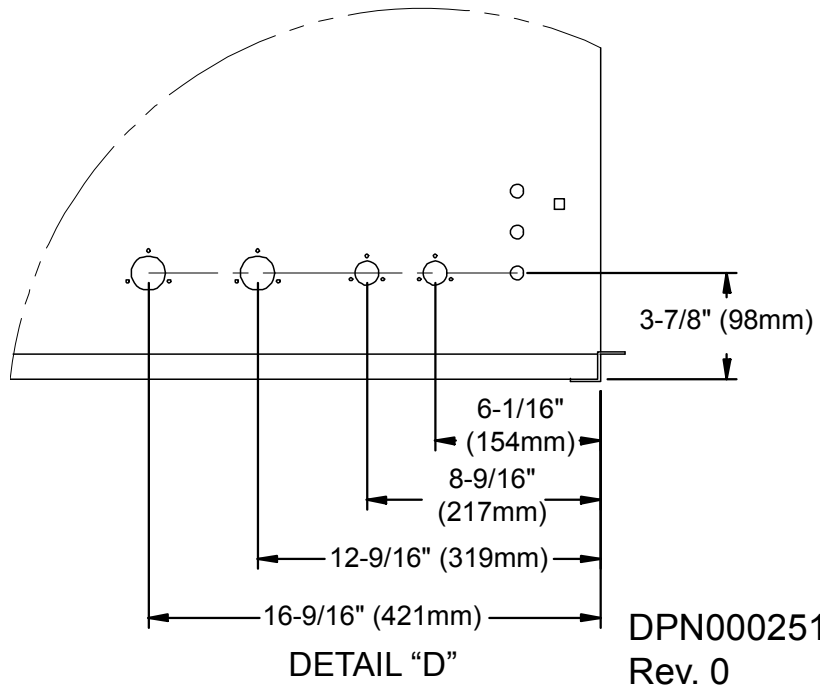
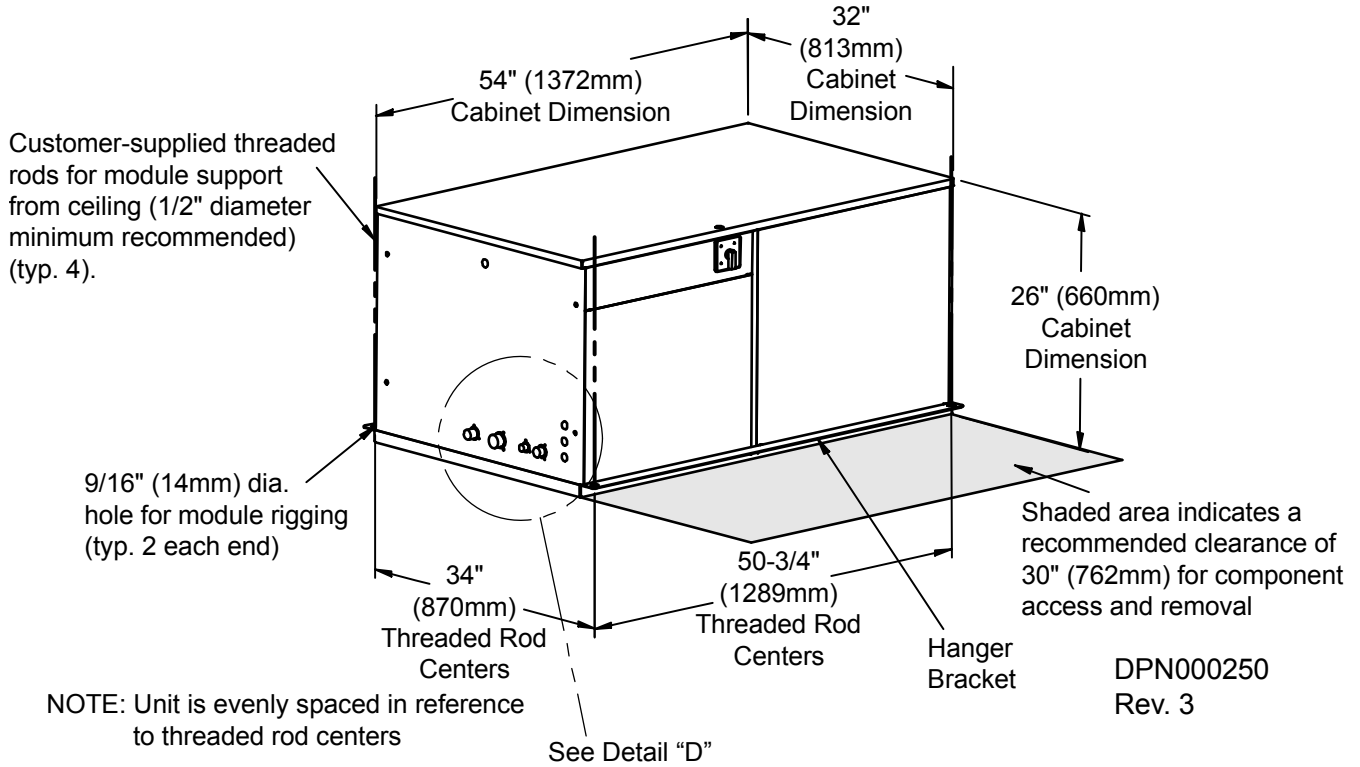
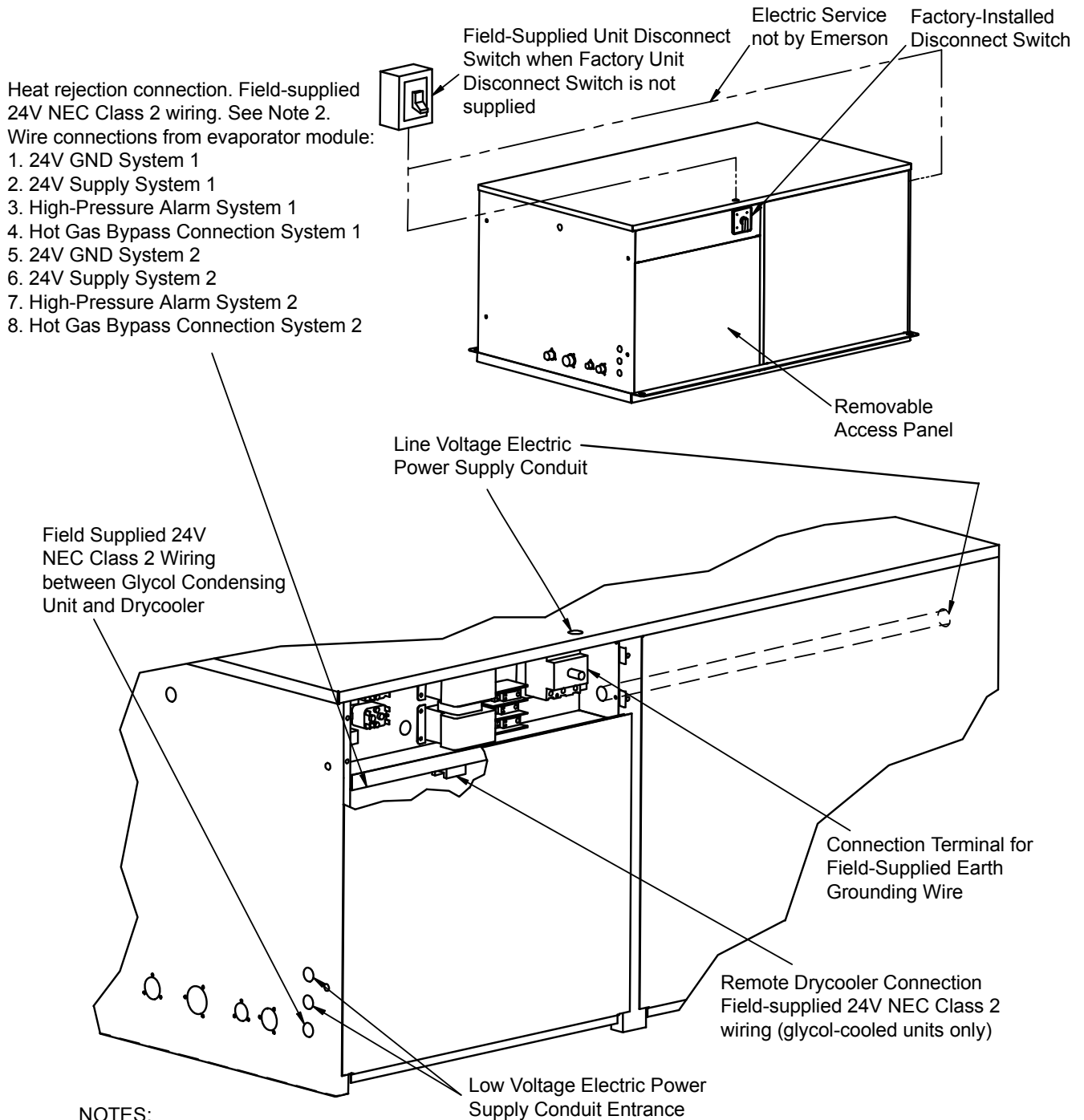


Table 9 Water/glycol condensing unit

Model #		Weight lb (kg)
60Hz	50Hz	
MC*98W	MC*97W	470 (213)

Source: DPN000250, Rev. 3

Figure 14 Electrical field connections indoor water/glycol condensing unit



NOTES:

1. Refer to specification sheet for full load amp and wire size amp ratings.
2. Control voltage wiring must be a minimum of 16G A (1.3mm) for up to 75' (23m) or not to exceed 1 volt drop in control line.

DPN000252  
Rev. 2

## 8.0 CHILLED WATER SYSTEMS—CAPACITIES AND DIMENSIONS

**Table 10 Chilled water data, 50 & 60Hz**

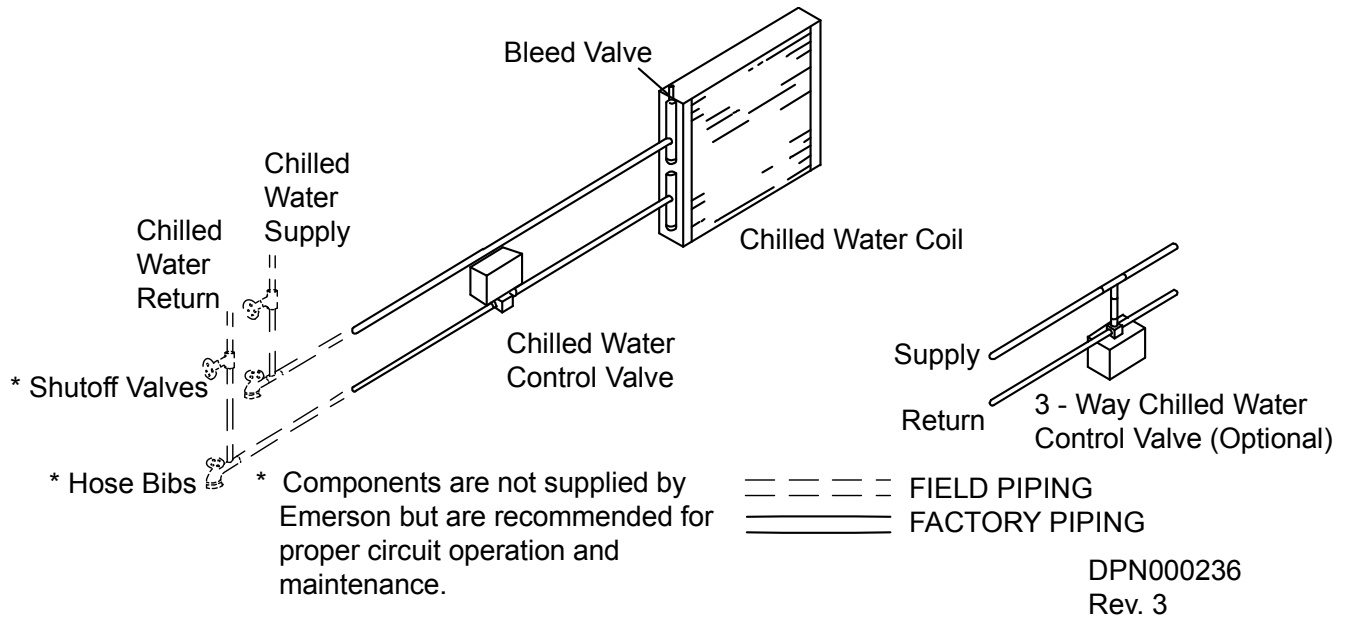
CW Model, 50 & 60 Hz		MMD8TC
<b>Net Capacity Data - kW (Btuh) based on 45°F (7.2°C) EWT &amp; 10°F (5.6°C) temperature rise</b>		
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	29.8 (101,800)
	Sensible	27.9 (95,100)
Flow Rate, GPM (l/m)		21.4 (81.1)
Pressure Drop, ft. water (kPa)		14.7 (44.0)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	24.0 (82,000)
	Sensible	22.5 (76,700)
Flow Rate, GPM (l/m)		17.6 (66.7)
Pressure Drop, ft. water (kPa)		10.1 (30.2)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	20.5 (69,900)
	Sensible	19.1 (65,300)
Flow Rate, GPM (l/m)		15.1 (57.2)
Pressure Drop, ft. water (kPa)		7.5 (22.4)
<b>Fan Data - Evaporator</b>		
CFM (CMH)		3750 (6371)
Fan Motor, hp (kW)		2 (1.5)
External Static Pressure, in. (mm) water gauge		0.5 (13)
<b>CW Coil - Copper Tube/Aluminum Fin</b>		
Face Area, ft. <sup>2</sup> (m <sup>2</sup> )		7.6 (0.7)
Coil Rows		4
Max Face Velocity, fpm (m/s)		491 (2.5)
<b>Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>		
Input Voltage-208/230/460/575-3-60		11.5 (39,110)
Input Voltage-380-3-50		10.5 (35,780)
Input Voltage-400-3-50		11.5 (39,110)
<b>Hot Water Reheat Coil - Copper Tube/Aluminum Fin</b>		
Capacity (with fan motor heat) using 180°F (82°C) EWT, kW (Btuh)		32.5 (110,800)
Flow Rate, GPM (l/m)		3.0 (11.4)
Pressure Drop, ft. water (kPa)		1.2 (3.6)
Face Area, ft. <sup>2</sup> (m <sup>2</sup> )		7.6 (0.7)
Coil Rows		1
HWRH supply and return connections, in. (mm) OD		7/8 (22.2)
<b>Humidifier Data - Steam Generator Type</b>		
Steam capacity, lb./hr (kg/hr)		10 (4.5)
Electrical Input Power, kW		3.5
<b>Unit Connection Sizes</b>		
CW supply and return connections, in. (mm) OD		1-3/8 (34.9)
Humidifier Supply		1/4" OD Cu Compression Fitting
Evaporator/Condensate Drain		3/4" NPT-Female
Unit Internal Fluid Volume, gal (l)		2.6 (9.8)
MERV 8 Filter - Nominal Size, qty 2; in. (mm)		4x20x25 (102x508x635)
Unit Operating Weight		665 (302)
Unit Valve Type		Modulating, Non-Spring Return
Valve Size		1"
Valve Cv		11.6
Max. Static Operating Pressure, psi (kPa)		400 (2758)
Close-Off Pressure, psi (kPa)		86 (592)

The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45% RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ±5%.

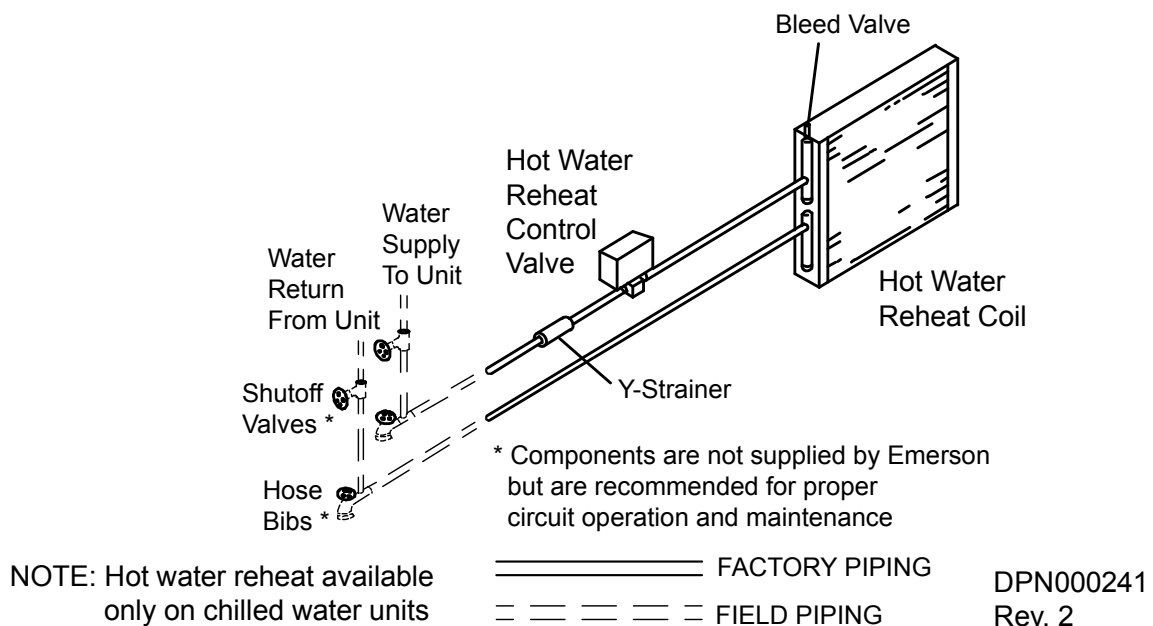
**Table 11 Capacity correction factors, based on 10°F (5.6°C) water rise**

EWT	72°F (22.2°C) 50%RH		75°F (23.9°C) 45%RH	
	TCC	SCC	TCC	SCC
42°F (5.6°C)	1.27	1.14	1.24	1.12
43°F (6.1°C)	1.18	1.09	1.16	1.08
44°F (6.7°C)	1.08	1.05	1.07	1.04
45°F (7.2°C)	1.00	1.00	1.00	1.00
46°F (7.8°C)	0.93	0.95	0.94	0.96
47°F (8.3°C)	0.85	0.91	0.87	0.93
48°F (8.9°C)	0.80	0.85	0.82	0.88
49°F (9.4°C)	0.74	0.79	0.77	0.83

**Figure 15 General arrangement, chilled water unit**



**Figure 16 Hot water reheat, chilled water units**





## 9.0 ELECTRICAL DATA

**Table 13 Split system evaporator or chilled water electrical data**

Standard 2.0hp Motor	60 Hz				50 Hz
	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-50
Base Evaporator Model #	MM*96E	MM*96E	MM*96E	MM*96E	MM*95E
Base Chilled Water Model #	MM*8TC	MM*8TC	MM*8TC	MM*8TC	MM*8TC
<b>Cooling Only</b>					
FLA	6.3	6.3	3.1	2.7	3.7
WSA	7.9	7.9	3.9	3.4	N/A
OPD	15	15	15	15	N/A
<b>with Electric Reheat</b>					
FLA	34.1	31.4	15.7	12.7	18.1
WSA	42.6	39.3	19.6	15.9	N/A
OPD	45	40	20	20	N/A
<b>with SCR Reheat</b>					
FLA	47.9	44.0	21.9	N/A	25.4
WSA	59.9	55.0	27.4	N/A	N/A
OPD	60	60	30	N/A	N/A
<b>with Humidifier</b>					
FLA	18.1	16.9	8.4	7.0	9.8
WSA	22.6	21.1	10.5	8.8	N/A
OPD	25	25	15	15	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	45.9	42.0	21.0	17.0	24.2
WSA	57.4	52.5	26.3	21.3	N/A
OPD	60	60	30	25	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	59.7	54.6	27.2	N/A	31.5
WSA	74.6	68.3	34.0	N/A	N/A
OPD	80	70	35	N/A	N/A
Optional 3.0hp Motor	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-50
Base Evaporator Model #	MM*96E	MM*96E	MM*96E	MM*96E	MM*95E
Base Chilled Water Model #	MM*8TC	MM*8TC	MM*8TC	MM*8TC	MM*8TC
<b>Cooling Only</b>					
FLA	9.7	9.0	4.5	3.6	4.8
WSA	12.1	11.3	5.6	4.5	N/A
OPD	20	20	15	15	N/A
<b>with Electric Reheat</b>					
FLA	37.5	34.1	17.1	13.6	19.2
WSA	46.9	42.6	21.4	17.0	N/A
OPD	50	45	25	20	N/A
<b>with SCR Reheat</b>					
FLA	51.3	46.7	23.3	N/A	26.5
WSA	64.1	58.4	29.1	N/A	N/A
OPD	70	60	30	N/A	N/A
<b>with Humidifier</b>					
FLA	21.5	19.6	9.8	7.9	10.9
WSA	26.9	24.5	12.3	9.9	N/A
OPD	30	30	15	15	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	49.3	44.7	22.4	17.9	25.3
WSA	61.6	55.9	28.0	22.4	N/A
OPD	70	60	30	25	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	63.1	57.3	28.6	N/A	32.6
WSA	78.9	71.6	35.8	N/A	N/A
OPD	80	80	40	N/A	N/A

\* = Specify "D" for disconnect, "0" for no disconnect

1. FLA = Full Load Amps, WSA = Wire Size Amps, OPD = Maximum Overcurrent Protection Device

2. Use MM\*96E/MM\*95E electrical data for MM\*8TC chilled water units.

3. For Hot Water Reheat (available on MM\*8TC units only), use appropriate "Cooling Only" or "with humidifier" categories.

4. For MM\*96K/MM\*95K electrical data, use appropriate MM\*96E/MM\*95E data (except SCR reheat is not available with freecooling option)

5. SCR Reheat not available on MM\*96K, MM\*95K, or MM\*8TC.

**Table 14 Indoor condensing unit electrical data**

	60Hz			50Hz
	MC*96A	MC*96A	MC*96A	MC*95A
	208/230-3-60	460-3-60	575-3-60	380/415-3-50
<b>Air-Cooled</b>				
FLA	41.8	20.2	15.7	23.4
WSA	47	22.7	17.6	N/A
OPD	60	30	20	N/A
<b>Water/Glycol-Cooled</b>	60 Hz			50 Hz
	MC*98W	MC*98W	MC*98W	MC*97W
	208/230-3-60	460-3-60	575-3-60	380/415-3-50
FLA	32.1	15.7	12.1	18.6
WSA	37.3	18.2	14	N/A
OPD	50	25	20	N/A

\* = Specify "D" for disconnect, "0" for no disconnect

**Table 15 Outdoor Prop Fan Condensing Units electrical data**

	60Hz			50Hz
	PFH096A	PFH096A	PFH096A	PFH095A
	208/230-3-60	460-3-60	575-3-60	380/415-3-50
<b>Air-Cooled</b>				
FLA	35.6	17.4	13.5	20.3
WSA	40.8	19.9	15.4	N/A
OPD	60	25	20	N/A

FLA = Full Load Amps, WSA = Wire Size Amps,  
OPD = Maximum Overcurrent Protection Device

**Table 16 Single point power kit—electrical data, air-cooled system with close-coupled indoor condensing units**

Standard 2.0 hp motor	60 Hz				50 Hz
	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-50
Base Evaporator Model Number	MM*96E	MM*96E	MM*96E	MM*96E	MM*95E
Base Condensing Unit Model Number	MC*96A	MC*96A	MC*96A	MC*96A	MC*95A
<b>Cooling Only</b>					
FLA	48.1	48.1	23.3	18.4	27.1
WSA	53.3	53.3	25.8	20.3	N/A
OPD	70	70	35	25	N/A
<b>with Electric Reheat</b>					
FLA	75.9	73.2	35.9	28.4	41.5
WSA	88	84.7	41.6	32.8	N/A
OPD	100	90	45	35	N/A
<b>with SCR Reheat</b>					
FLA	89.7	85.8	42.1	N/A	48.8
WSA	105.3	100.4	49.3	N/A	N/A
OPD	110	110	50	N/A	N/A
<b>with Humidifier</b>					
FLA	59.9	58.7	28.6	22.7	33.2
WSA	65.1	63.9	31.1	24.6	N/A
OPD	80	80	40	30	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	75.9	73.2	35.9	28.4	41.5
WSA	88.0	84.7	41.6	32.8	N/A
OPD	100	90	45	35	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	101.5	96.4	47.4	N/A	54.9
WSA	117.1	111.0	54.6	N/A	N/A
OPD	125	125	60	N/A	N/A
<b>Optional 3.0hp Motor</b>					
	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-50
Base Evaporator Model Number	MM*96E	MM*96E	MM*96E	MM*96E	MM*95E
Base Condensing Unit Model #	MC*96A	MC*96A	MC*96A	MC*96A	MC*95A
<b>Cooling Only</b>					
FLA	51.5	50.8	24.7	19.3	28.2
WSA	56.7	56.0	27.2	21.2	N/A
OPD	70	70	35	25	N/A
<b>with Electric Reheat</b>					
FLA	79.3	75.9	37.3	29.3	42.6
WSA	91.4	87.4	43.0	33.7	N/A
OPD	100	100	45	35	N/A
<b>with SCR Reheat</b>					
FLA	93.1	88.5	43.5	N/A	49.9
WSA	108.7	103.1	50.7	N/A	N/A
OPD	110	110	60	N/A	N/A
<b>with Humidifier</b>					
FLA	63.3	61.4	30.0	23.6	34.3
WSA	68.5	66.6	32.5	25.5	N/A
OPD	80	80	40	30	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	79.3	75.9	37.3	29.3	42.6
WSA	91.4	87.4	43.0	33.7	N/A
OPD	100	100	45	35	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	104.9	99.1	48.8	N/A	56.0
WSA	120.5	113.7	56.0	N/A	N/A
OPD	125	125	60	N/A	N/A

\* = Specify "D" for disconnect, "0" for no disconnect

Notes:

1. FLA = Full Load Amps, WSA = Wire Size Amps, OPD = Maximum Overcurrent Protection Device
2. For MM\*96K/MM\*95K electrical data, use appropriate MM\*96E/MM\*95E data (except SCR reheat is not available with free-cooling option).



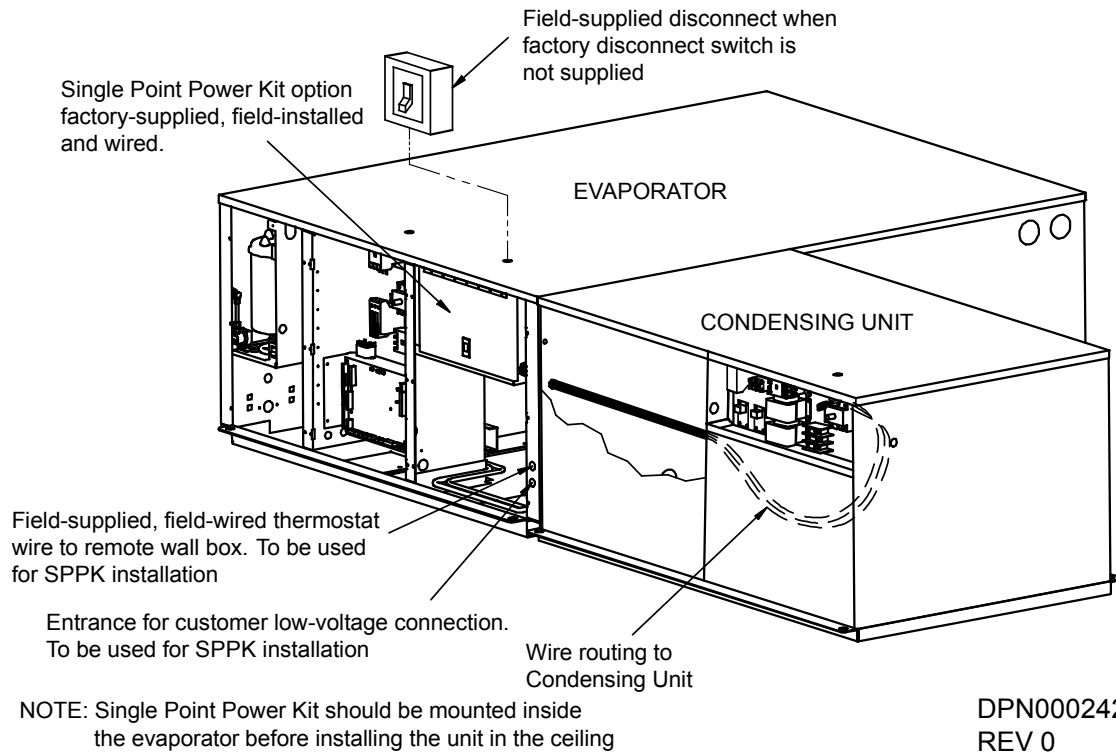
**Table 17 Single point power kit—electrical data, water/glycol-cooled system evaporators with close-coupled indoor condensing units**

Standard 2.0 hp motor	60Hz				50Hz
	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-60
Base Evaporator Model #	MM*96E	MM*96E	MM*96E	MM*96E	MM*95E
Base Condensing Unit Model #	MC*98W	MC*98W	MC*98W	MC*98W	MC*97W
<b>Cooling Only</b>					
FLA	38.4	38.4	18.8	14.8	22.3
WSA	43.6	43.6	21.3	16.7	N/A
OPD	60	60	30	20	N/A
<b>with Electric Reheat</b>					
FLA	66.2	63.5	31.4	24.8	36.7
WSA	78.3	75.0	37.1	29.2	N/A
OPD	90	80	40	30	N/A
<b>with SCR Reheat</b>					
FLA	80.0	76.1	37.6	N/A	44
WSA	95.6	90.7	44.8	N/A	N/A
OPD	100	100	50	N/A	N/A
<b>with Humidifier</b>					
FLA	50.2	49.0	24.1	19.1	28.4
WSA	55.4	54.2	26.6	21.0	N/A
OPD	70	70	35	25	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	66.2	63.5	31.4	24.8	36.7
WSA	78.3	75.0	37.1	29.2	N/A
OPD	90	80	40	30	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	91.8	86.7	42.9	N/A	50.1
WSA	107.4	101.3	50.1	N/A	N/A
OPD	110	110	60	N/A	N/A
<b>Optional 3.0hp Motor</b>	<b>208-3-60</b>	<b>230-3-60</b>	<b>460-3-60</b>	<b>575-3-60</b>	<b>380/415-3-60</b>
Base Evaporator Model #	MM*96E	MM*96E	MM*96E	MM*96E	MM*95E
Base Condensing Unit Model #	MC*98W	MC*98W	MC*98W	MC*98W	MC*97W
<b>Cooling Only</b>					
FLA	41.8	41.1	20.2	15.7	23.4
WSA	47.0	46.3	22.7	17.6	N/A
OPD	60	60	30	20	N/A
<b>with Electric Reheat</b>					
FLA	69.6	66.2	32.8	25.7	37.8
WSA	81.7	77.7	38.5	30.1	N/A
OPD	90	90	45	35	N/A
<b>with SCR Reheat</b>					
FLA	83.4	78.8	39.0	N/A	45.1
WSA	99.0	93.4	46.2	N/A	N/A
OPD	100	100	50	N/A	N/A
<b>with Humidifier</b>					
FLA	53.6	51.7	25.5	20.0	29.5
WSA	58.8	56.9	28.0	21.9	N/A
OPD	70	70	35	25	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	69.6	66.2	32.8	25.7	37.8
WSA	81.7	77.7	38.5	30.1	N/A
OPD	90	90	45	35	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	95.2	89.4	44.3	N/A	51.2
WSA	110.8	104.0	51.5	N/A	N/A
OPD	125	110	60	N/A	N/A

\* = Specify "D" for disconnect, "0" for no disconnect

1. FLA = Full Load Amps, WSA = Wire Size Amps, OPD = Maximum Overcurrent Protection Device
2. For MM\*96K/MM\*95K electrical data, use appropriate MM\*96E/MM\*95E data (except SCR reheat is not available with free-cooling option).

**Figure 18 Single point power kit connections—Air-cooled systems**



**Figure 19 Single point power kit connections—Water/glycol-cooled systems**

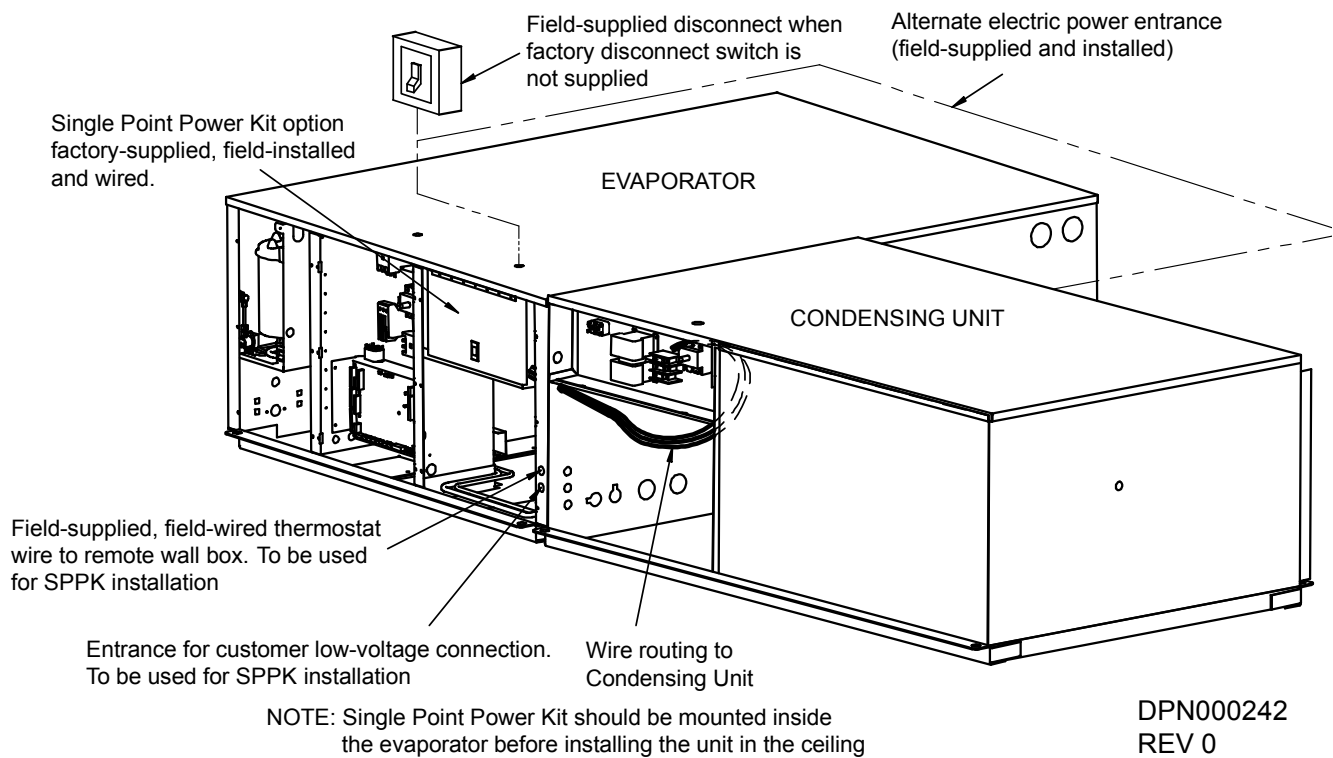
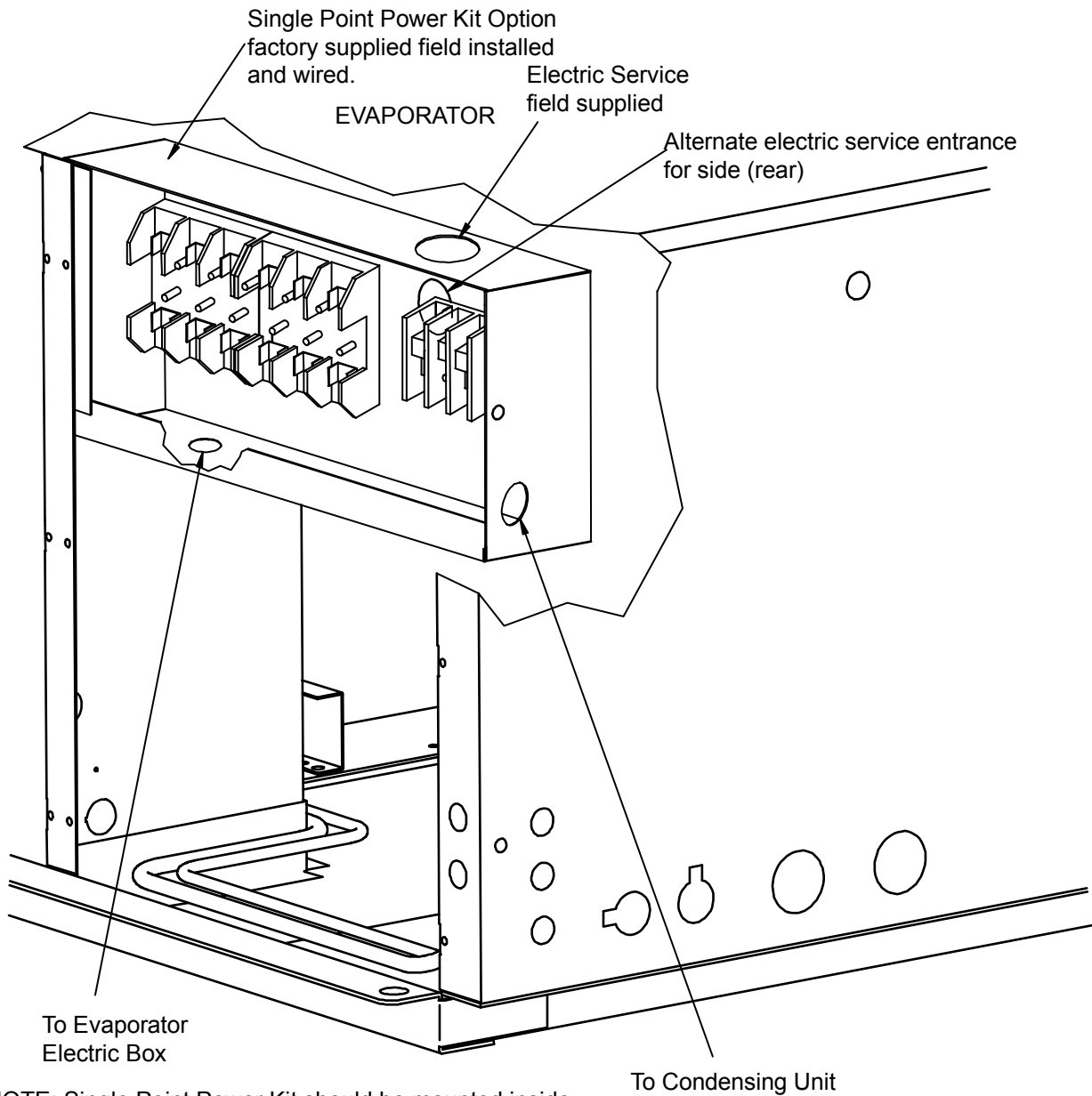


Figure 20 Single point power kit electrical connections



NOTE: Single Point Power Kit should be mounted inside the evaporator before installing the unit in the ceiling

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## 10.0 REFRIGERANT PIPING

**Table 18 Unit refrigerant charge**

Model #		R-407C, oz (kg)	
60Hz	50Hz	3-Ton Circuit	5-Ton Circuit
MM*96E	MM*95E	7 (0.20)	7 (0.20)
MM*96K	MM*95K	7 (0.20)	7 (0.20)
MC*96A	MC*95A	210 (6.0)	402 (11.4)
PFH096A	PFH095A	361 (10.2)	51 (16.5)
MC*98W	MC*97W	54 (1.5)	94 (2.7)

All evaporator units and condensing units are fully factory-charged with refrigerant. If field-supplied refrigerant piping is installed, refrigerant charge must be added; refer to **Table 21** to determine the additional charge.

**Table 19 Recommended refrigerant line sizes**

Equivalent Length, ft (m)	3 Ton		5 Ton	
	Suction	Liquid	Suction	Liquid
50 (15.2)	7/8"	1/2"	1-1/8"	1/2"
100 (30.5)	7/8"	1/2"	1-1/8"	5/8"
150 (45.7)	1-1/8"	5/8"	1-3/8"	5/8"

**Table 20 Pipe length and condenser elevation relative to evaporator**

Nominal System Size, Tons	Max. Equiv. Pipe Length, ft. (m)	Max. PFH Level Above Evaporator, ft. (m)	Max. PFH Level Below Evaporator, ft. (m)
8	150 (45)	50 (15)	15 (4.6)

Maximum recommended total equivalent pipe length is 150 ft (46m). Suction and liquid lines may require additional specialty items when vertical lines exceed 20ft. (6m) and/or condensing unit installation is more than 15 ft. (4.6m) below the evaporator. Contact Emerson Application Engineering for assistance.

**Table 21 Line charges - refrigerant per 100 ft. (30m) of Type L copper tube**

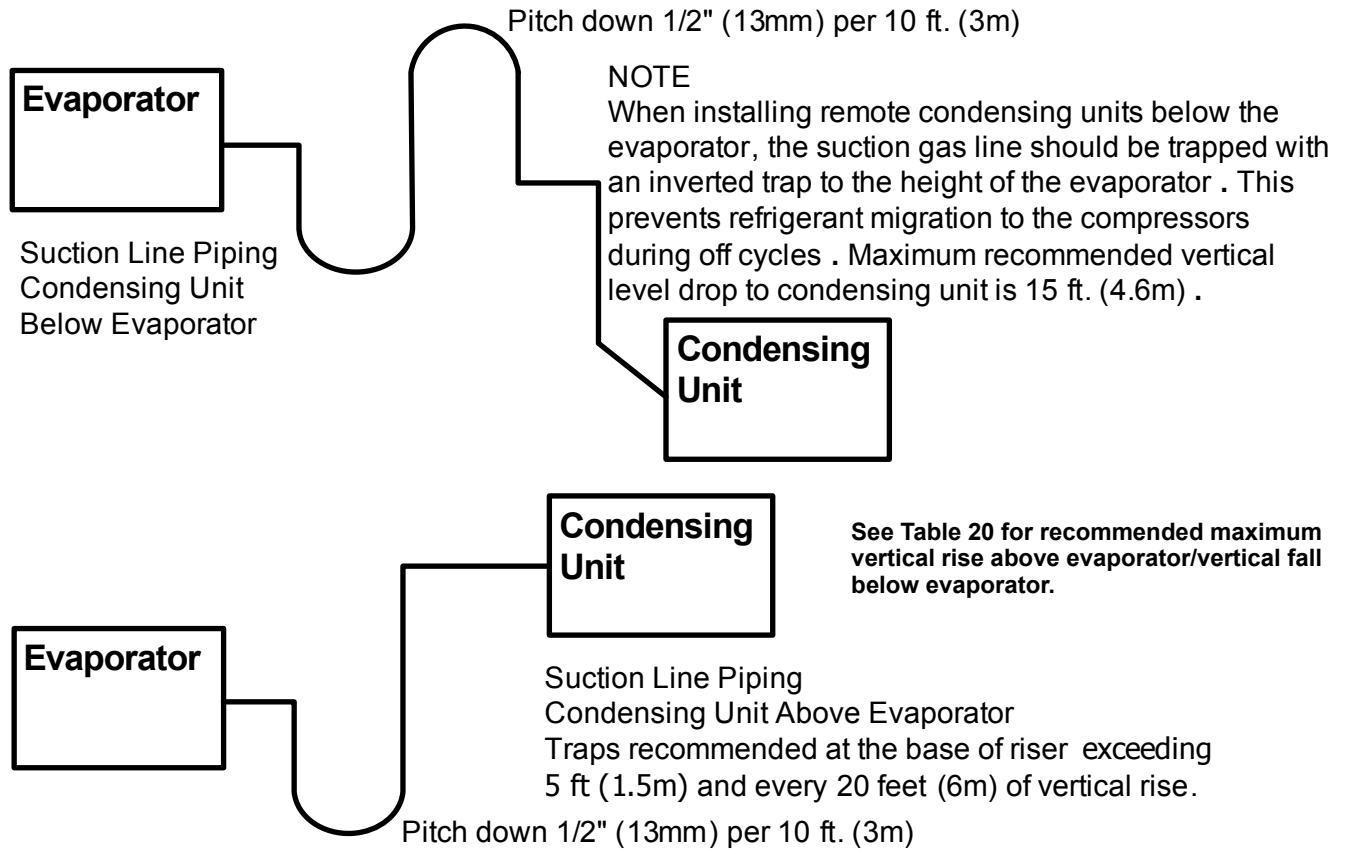
Line Size, O.D., in.	R-407C, lb/100 ft. (kg/30m)	
	Liquid Line	Suction Line
3/8	3.7 (1.7)	—
1/2	6.9 (3.1)	—
5/8	11.0 (5.0)	0.4 (0.2)
3/4	15.7 (7.1)	0.6 (0.3)
7/8	23.0 (10.4)	1.0 (0.4)
1-1/8	—	1.7 (0.7)
1-3/8	—	2.7 (1.1)

**Table 22 Equivalent lengths for various pipe fittings, ft (m)**

Copper Pipe OD, in.	90 Degree Elbow Copper	90 Degree Elbow Cast	45 Degree Elbow	Tee	Gate Valve	Globe Valve	Angle Valve
1/2	0.8 (0.24)	1.3 (0.39)	0.4 (0.12)	2.5 (0.76)	0.26 (0.07)	7.0 (2.13)	4.0 (1.21)
5/8	0.9 (0.27)	1.4 (0.42)	0.5 (0.15)	2.5 (0.76)	0.28 (0.08)	9.5 (2.89)	5.0 (1.52)
3/4	1.0 (0.3)	1.5 (0.45)	0.6 (0.18)	2.5 (0.76)	0.3 (0.09)	12.0 (3.65)	6.5 (1.98)
7/8	1.45 (0.44)	1.8 (0.54)	0.8 (0.24)	3.6 (1.09)	0.36 (0.1)	17.2 (5.24)	9.5 (2.89)
1-1/8	1.85 (0.56)	2.2 (0.67)	1.0 (0.3)	4.6 (1.4)	0.48 (0.14)	22.5 (6.85)	12.0 (3.65)
1-3/8	2.4 (0.73)	2.9 (0.88)	1.3 (0.39)	6.4 (1.95)	0.65 (0.19)	32.0 (9.75)	16.0 (4.87)
1-5/8	2.9 (0.88)	3.5 (1.06)	1.6 (0.48)	7.2 (2.19)	0.72 (0.21)	36.0 (10.97)	19.5 (5.94)

Refrigerant trap = Four times equivalent length of pipe per this table

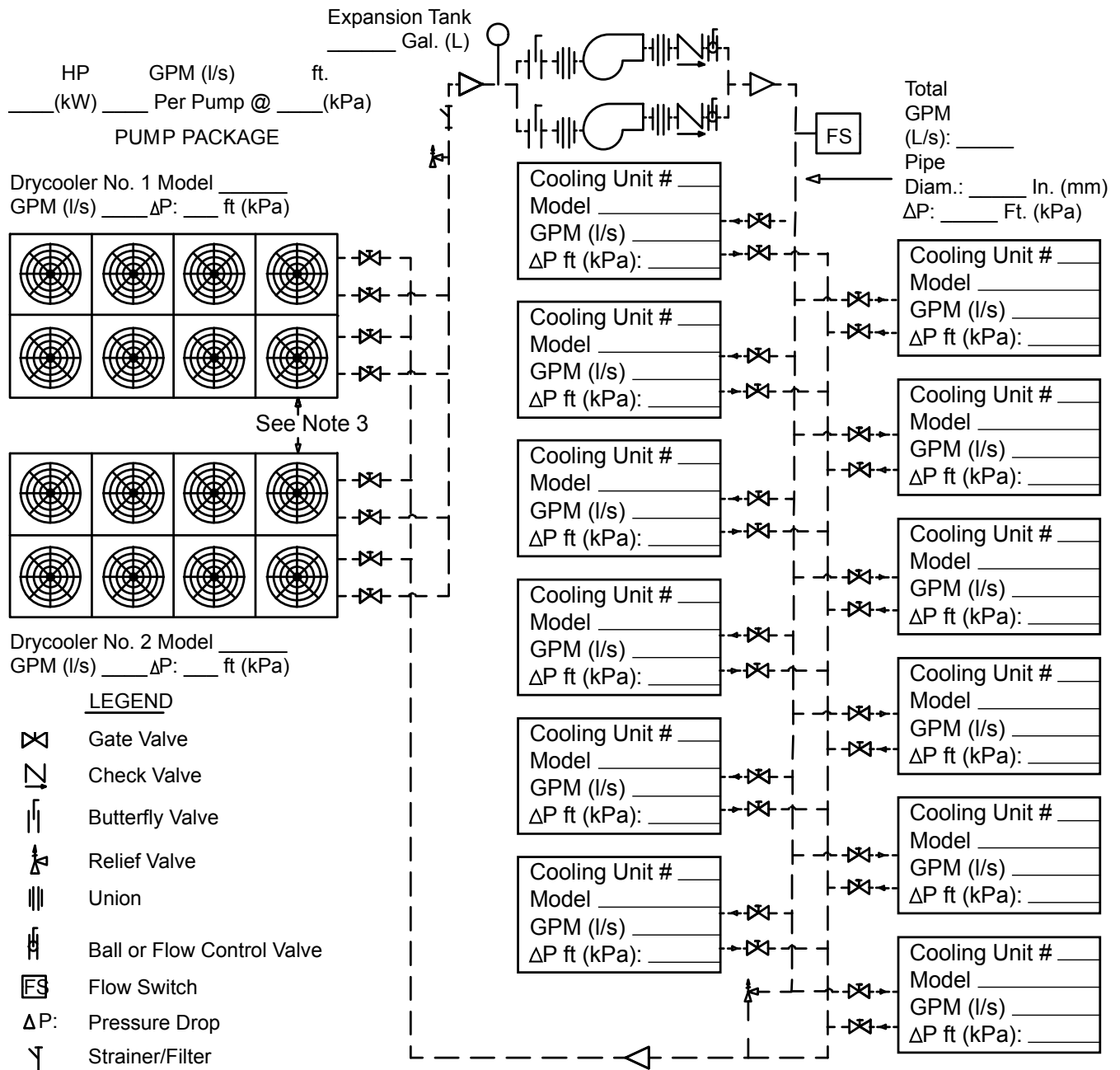
Figure 21 Refrigerant piping diagram



# 11.0 GLYCOL LOOP

Contact Emerson Application Engineering for assistance in choosing correct drycooler models. Refer to **Figure 22**.

**Figure 22 Heat rejection loop, multiple drycoolers and multiple indoor units**



**Notes:**

1. Pressure and temperature gauges (or ports for same) are recommended to monitor component pressure drops and performance.
2. Flow measuring devices, drain and balancing valves to be supplied by others and located as required.
3. See product literature for installation guidelines and clearance dimensions.
4. Drawing shows dual pump package. Alternate pump packages with more pumps may be considered; consult supplier

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## 12.0 MODEL NUMBER NOMENCLATURE—ALL SYSTEMS

Figure 23 Model number nomenclature—Evaporator Units

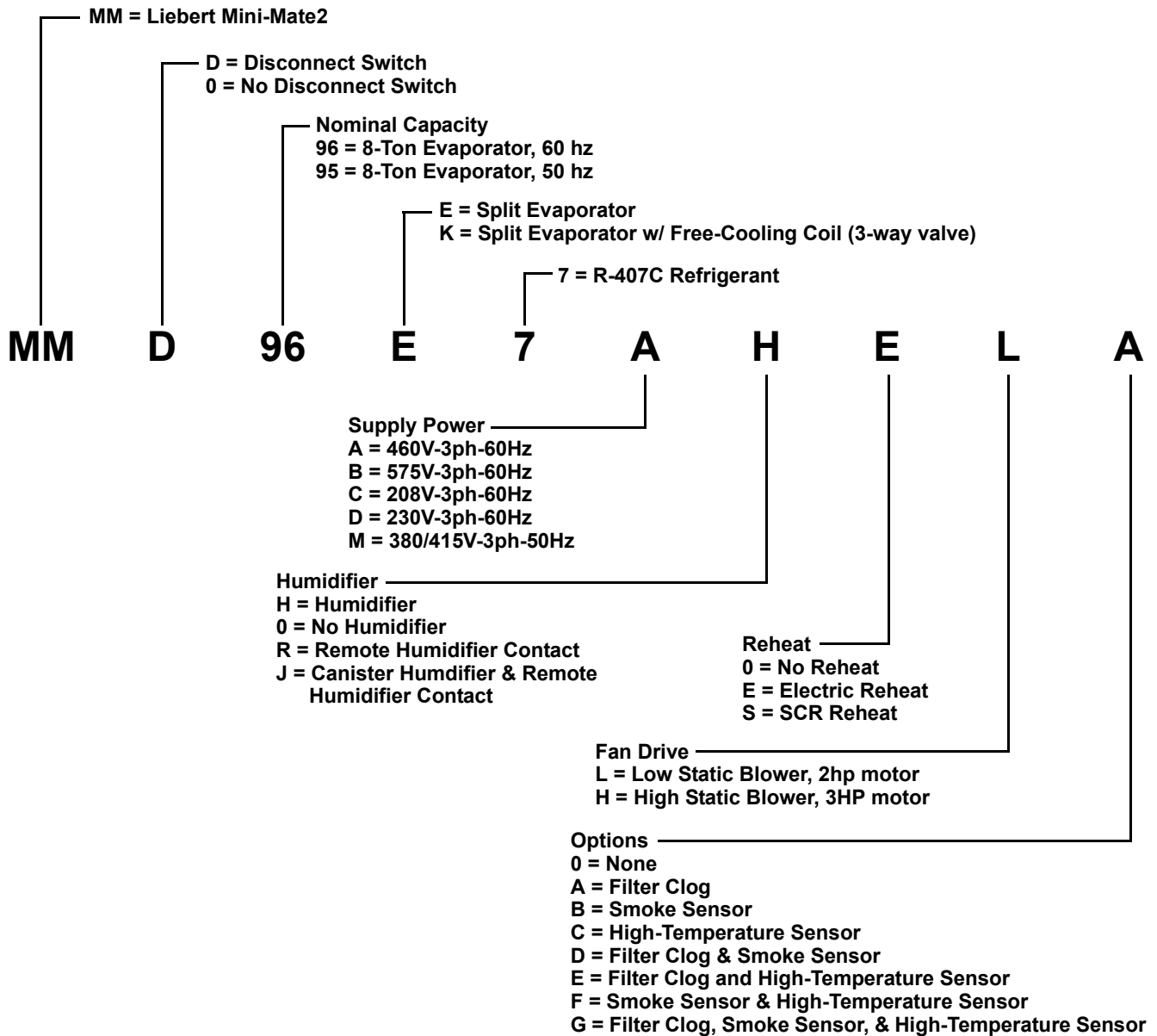


Figure 24 Model number nomenclature—Air-cooled indoor condensing units

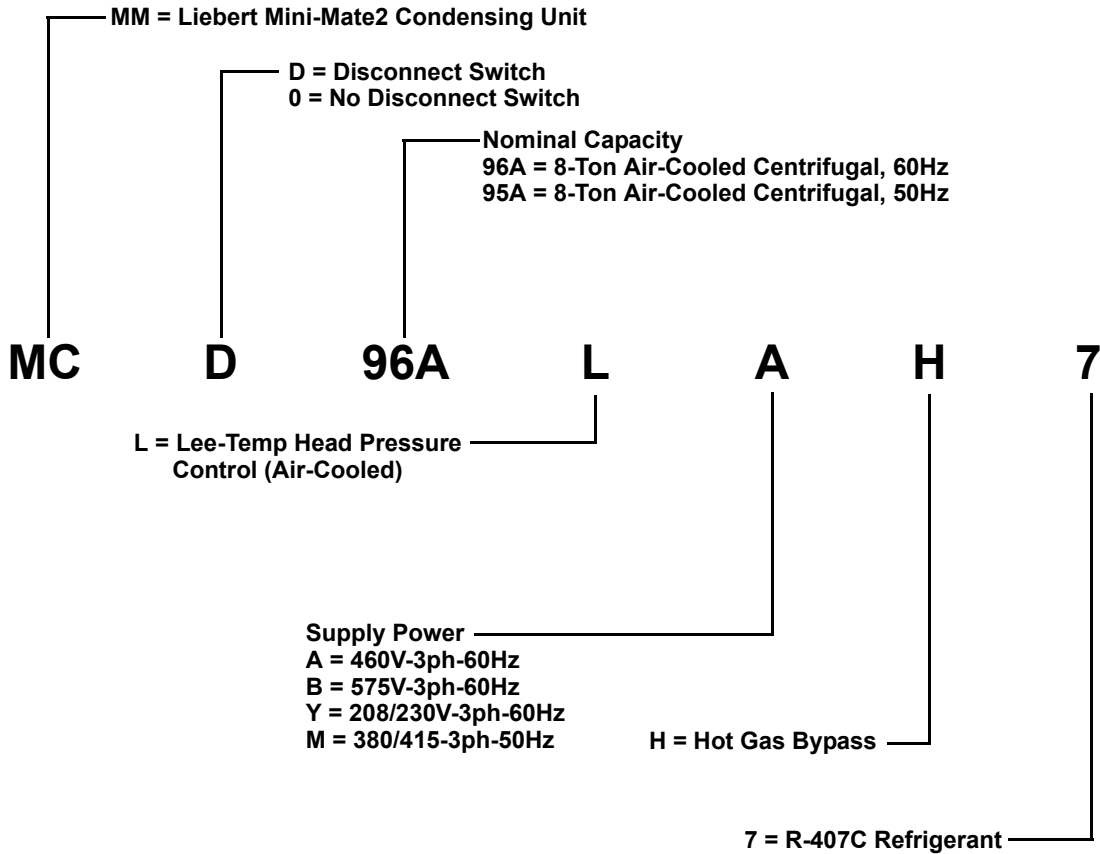


Figure 25 Air-cooled systems—Outdoor prop fan condensing units

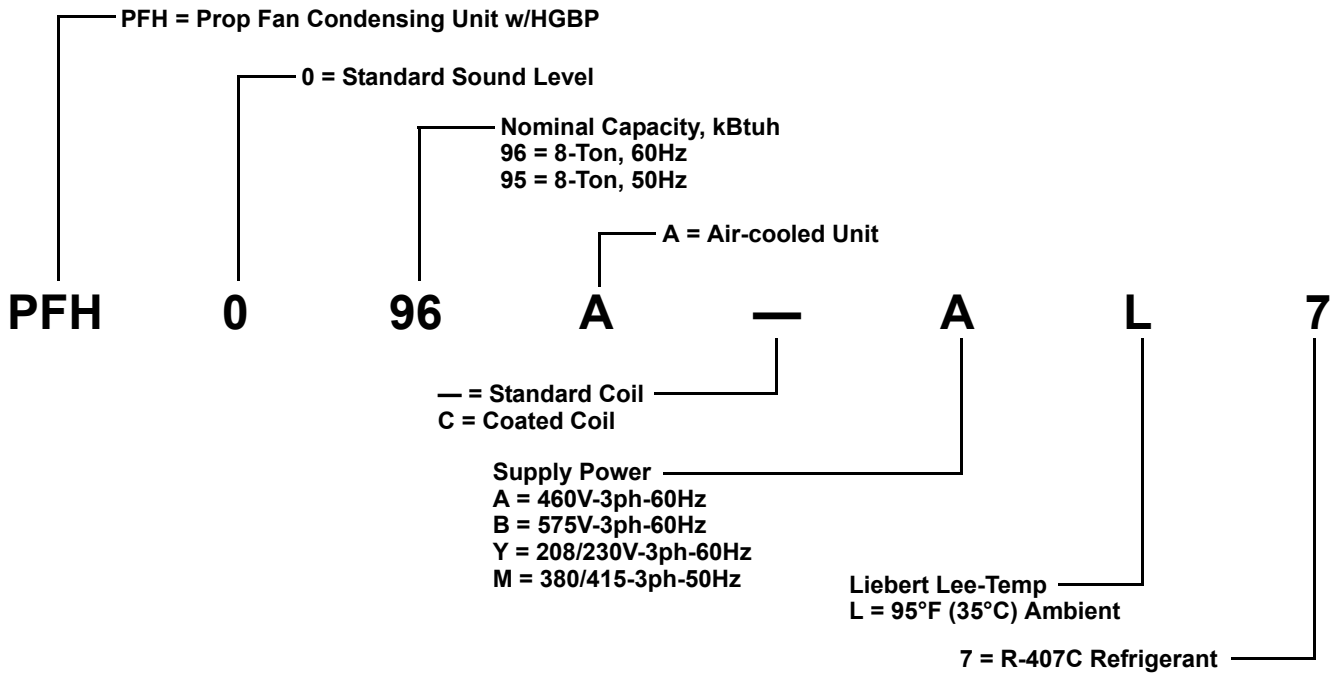




Figure 26 Water/glycol-cooled systems—indoor condensing units

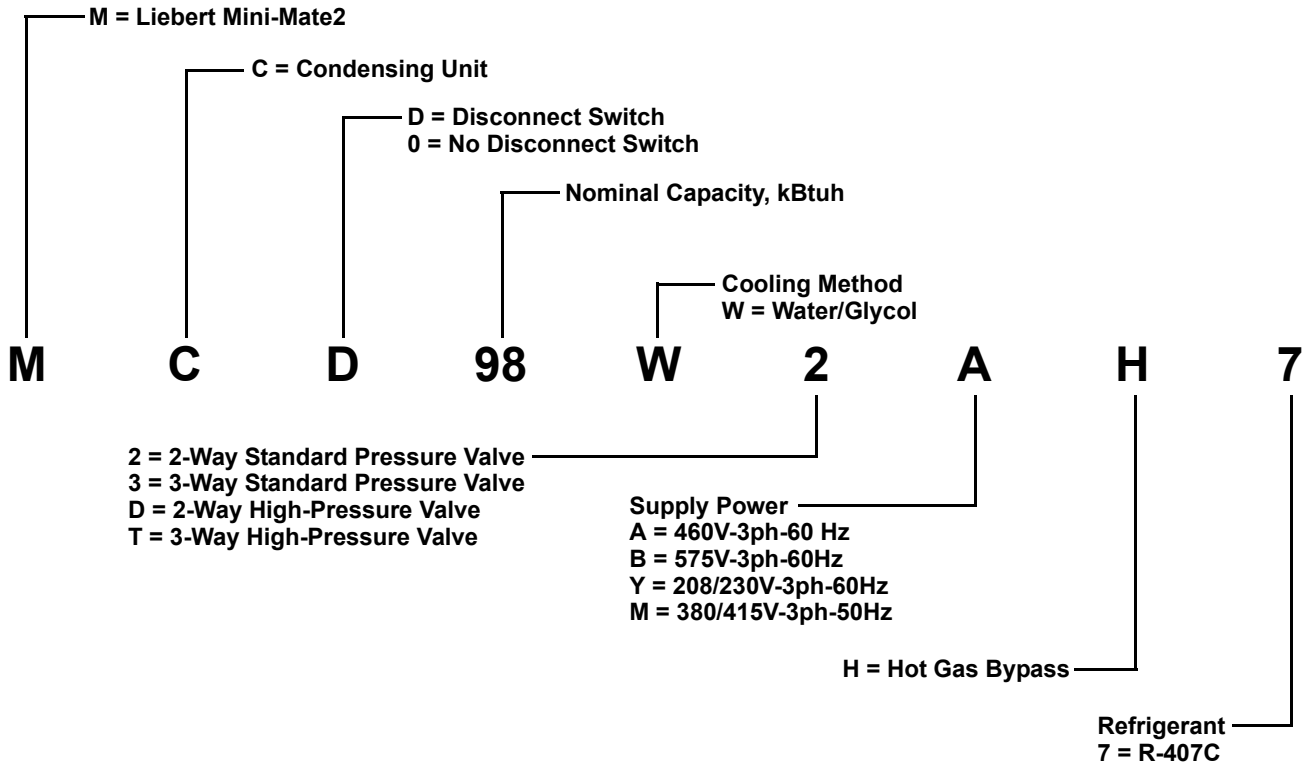
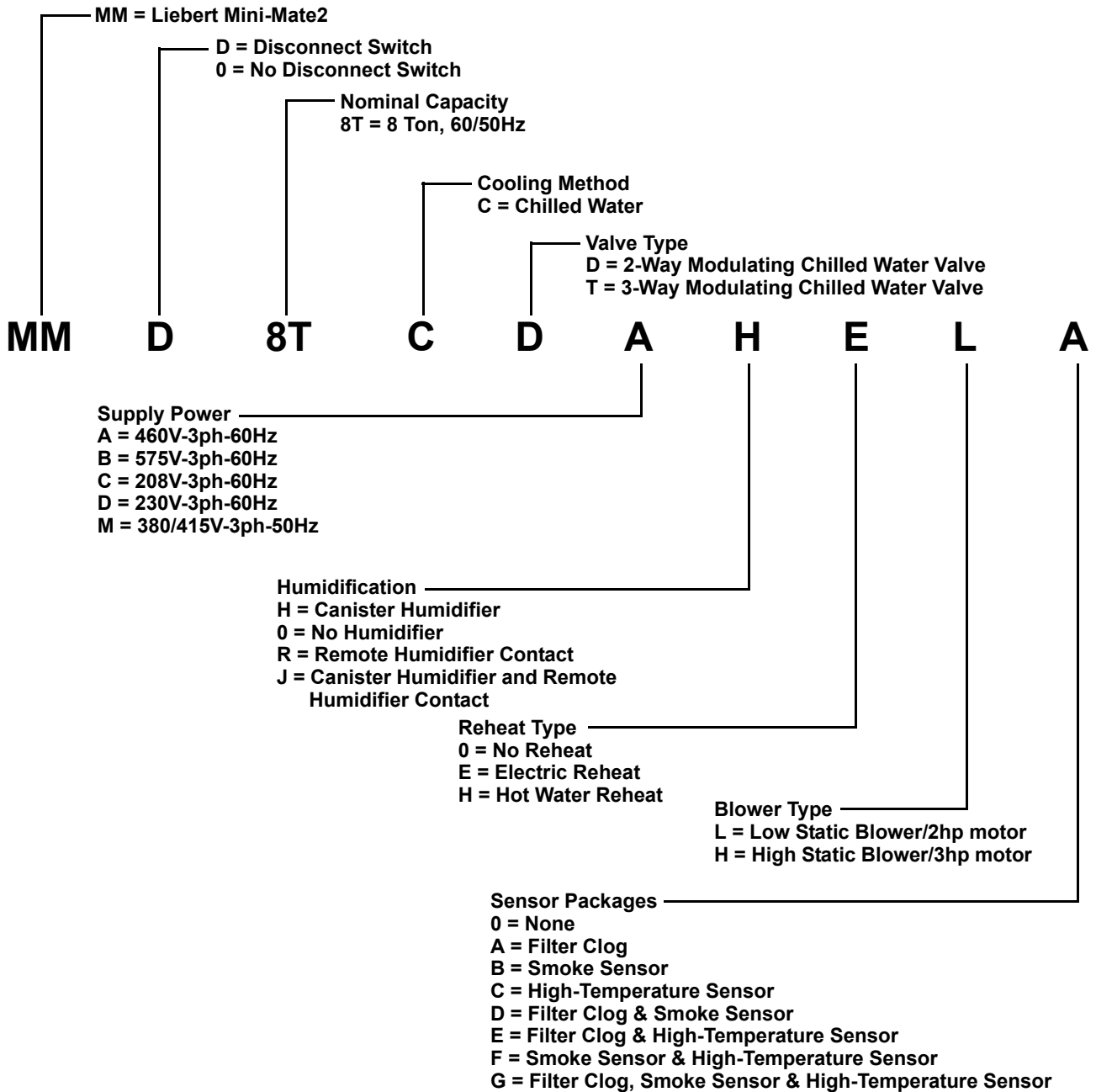


Figure 27 Model number nomenclature—Chilled water units



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## GUIDE SPECIFICATIONS FOR LIEBERT MINI-MATE2 - 8-TON

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### 1.0 General

#### 1.1 Summary

These specifications describe requirements for an environmental control system. The system shall be designed to control temperature and relative humidity conditions within the room.

The manufacturer shall design and furnish all equipment in the quantities and configurations shown on the project drawings.

System shall be supplied with CSA Certification to the harmonized U.S. and Canadian product safety standard CSA C22.2 No 236/UL 1995 for "Heating and Cooling Equipment" and marked with the CSA c-us logo (60 Hz only).

The system model numbers shall be: Evaporator \_\_\_\_\_ Condensing Unit  
\_\_\_\_\_

#### 1.2 Design Requirements

The environmental control system shall be a Liebert Mini-Mate2 factory assembled unit. On direct expansion models, the refrigeration system shall be split, with the compressor located in a remote or attached (close-coupled) condensing unit.

The evaporator section shall be designed for ceiling installation. Condensing units shall be designed for either outdoor or ceiling installation.

The system shall have a total cooling capacity of \_\_\_\_\_ BTU/hr (kW), and a sensible cooling capacity of \_\_\_\_\_ BTU/hr (kW), based on the entering air condition of \_\_\_\_\_°F (°C) dry bulb, and \_\_\_\_\_°F (°C) wet bulb.

The unit is to be supplied for operation on a \_\_\_\_\_ volt, \_\_\_\_\_ phase, \_\_\_\_\_ Hz power supply.

#### 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.

#### 1.4 Quality Assurance

The specified system shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, "HiPot" Test (two times rated voltage plus 1000 volts, per NRTL agency requirements) and Metering Calibration Tests. The system shall be designed and manufactured according to world class quality standards. The manufacturer shall be ISO 9001 certified.

## **2.0 Product**

### **2.1 Standard Features/All Systems**

#### **2.1.1 Evaporator Cabinet Construction**

The cabinet and chassis shall be constructed of heavy gauge galvanized steel and shall be serviceable from one side only. Mounting brackets shall be factory-attached to the cabinet. Internal cabinet insulation shall meet ASHRAE 62.1 requirements for Mold Growth, Humidity and Erosion, tested per UL 181 and ASTM 1338 standards.

#### **2.1.2 Air Distribution**

The fan shall be the belt-drive, centrifugal type, double width, double inlet. The shaft shall be heavy-duty steel with self-aligning ball bearings with minimum life of 100,000 hours. The fan motor shall be 1750 rpm (1450 rpm @ 50hz) and mounted on an adjustable base. The drive package shall be equipped with an adjustable motor pulley. The fan/motor assembly shall be mounted on vibration isolators.

The evaporator system shall be capable of delivering \_\_\_\_ CFM (CMH) at \_\_\_\_ inches (mm) of external static pressure.

The fan motor shall be \_\_\_\_ HP (W).

System shall be suitable for ducted air distribution.

#### **2.1.3 Microprocessor Control**

The control system shall be microprocessor-based, factory-wired into the system cabinet and tested prior to shipment. The wall-mounted control enclosure shall include a 2-line by 16-character liquid crystal display (LCD) providing continuous display of operating status and alarm condition which is wired into the control board using 4-conductor field-supplied wire. A 7-key membrane keypad for setpoint/program control and unit On/Off shall be located below the display. The control shall be capable of displaying values in °F or °C. The microprocessor shall provide three stages of cooling for direct expansion units by cycling the 3-ton compressor, 5-ton compressor and then both compressors. The microprocessor shall determine the optimal stage to run based on historical run data.

The microprocessor shall adjust the modulating chilled water valve on chilled water units. Temperature and humidity sensors shall be located in the wall box, which shall be capable of being located up to 300 ft (91.4m) from the evaporator unit.

##### **2.1.3.1 Monitoring**

The LCD shall provide an On/Off indication, operating mode indication (cooling, heating, humidifying, dehumidifying) and current day, time, temperature and humidity (if applicable) indication. The monitoring system shall be capable of relaying unit operating parameters and alarms to the Liebert SiteScan® monitoring system.

##### **2.1.3.2 Control Setpoint Parameters**

- Temp. Setpoint 65-85°F (18-29°C)
- Temp. Sensitivity 1-9.9 °F (1-5°C)
- Humidity Setpoint 20-80% RH
- Humidity Sensitivity 1-30% RH

##### **2.1.3.3 Unit Controls**

###### **2.1.3.3.1 Compressor Short-Cycle Control**

The control system shall prevent compressor short-cycling by a 3-minute timer from compressor stop to the next start.

###### **2.1.3.3.2 Common Alarm and Remote On/Off**

A common alarm relay shall provide a contact closure to a remote alarm device. Two (2) terminals shall also be provided for remote On/Off control. Individual alarms shall be “enabled” or “disabled” from reporting to the common alarm.

### **2.1.3.3.3 Setback Control**

The control shall be user-configurable to use a manual setpoint control or a programmable, time-based setback control. The setback control will be based on a 5 day/2 day programmed weekly schedule with capability of accepting 2 events per program day.

### **2.1.3.3.4 Temperature Calibration**

The control shall include the capabilities to calibrate the temperature and humidity sensors and adjust the sensor response delay time from 10 to 90 seconds. The control shall be capable of displaying temperature values in °F or °C.

### **2.1.3.3.5 System Auto Restart**

For startup 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 wall-mounted controller or from the central, site-monitoring system.

## **2.1.4 Alarms**

### **2.1.4.1 Unit Alarm**

The control system shall monitor unit operation and activate an audible and visual alarm in the event of the following factory preset alarm conditions:

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- High Water Alarm - Lockout Unit Operation
- High Head Pressure #1 and #2
- Loss of Power
- Compressor Short Cycle #1 and #2
- Humidifier Problem
- Filter Clog

### **2.1.4.2 Custom Alarms (3x)**

- Smoke Detected
- Standby Unit On
- Water Flow Loss
- Standby GC Pump
- Custom 1
- Custom 2
- Custom 3

User-customized text can be entered for the three (3) custom alarms.

### **2.1.4.3 Alarm Controls**

Each alarm (unit and custom) shall be individually enabled or disabled (except for high head pressure and high water in condensate pan) and can be programmed for a time delay of 0 to 255 seconds of continuous alarm condition to be recognized as an alarm. Each alarm can also be enabled or disabled to activate the common alarm (except high head pressure and high water in condensate pan).

### **2.1.4.4 Audible Alarm**

The audible alarm shall annunciate at the LCD wall box any alarm that is enabled by the operator.

### **2.1.4.5 Common Alarm**

A programmable common alarm shall be provided to interface user selected alarms with a remote alarm device. Alarms shall be enabled or disabled from reporting to the common alarm.

#### **2.1.4.6 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.

### **2.2 Direct Expansion System Evaporator Components**

#### **2.2.1 Direct Expansion Coil**

The evaporator section shall include evaporator coil, thermostatic expansion valve and filter driers.

The evaporator coil shall have two circuits, minimum 7.6 sq.ft. (0.71 sq.m) face area, 4 rows deep, constructed of copper tubes and aluminum fins, and have a maximum face velocity of \_\_\_ ft. per minute (m/s) at \_\_\_ CFM (CMH). Externally equalized thermostatic expansion valves shall control refrigerant flow. The evaporator unit shall be factory-charged with R-407C refrigerant and sealed.

The coil shall be provided with a stainless steel drain pan, with an internally trapped drain line. The evaporator drain pan shall include a factory-installed float switch to shut down the evaporator upon high water condition.

### **2.2 Chilled Water System Components**

#### **2.2.1 Chilled Water Control Valve**

A (2-way) (3-way) modulating, non-spring return valve shall be controlled by the microprocessor to position the valve in response to room conditions. Water-side design pressure shall be 400 psig (2757 kPa) static pressure, with a maximum close-off pressure of \_\_\_ psi (kPa).

#### **2.2.2 Chilled Water Coil**

The cooling coil shall have a minimum 7.6 sq.ft. (0.71 sq.m) face area, 4 rows deep, 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 supplied with 45°F (7.2°C) entering water temperature. The coil shall be supplied with \_\_\_ GPM (l/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 with internally trapped drain line. The evaporator drain pan shall include a factory-installed float switch to shutdown the evaporator upon high water condition.

### **2.3 Indoor Air-Cooled Centrifugal Fan Condensing Unit**

The condensing unit coil shall have a minimum 9.2 sq.ft. (0.85 sq.m) face area, 4 rows deep, constructed of copper tubes and aluminum fins. Components shall include 3-ton scroll compressor, 5-ton scroll compressor, high-pressure switches, Lee-temp refrigerant receivers, head pressure control valves, and liquid line solenoid valves. No internal piping, brazing, dehydration, or charging shall be required. The condensing unit shall be factory charged with R-407C refrigerant and sealed. The condensing unit can be mounted directly to the evaporator or can be mounted remote to the evaporator.

The condensing unit shall be designed for 95°F (35°C) ambient and be capable of operation to -30°F (-34.4°C) inlet air temperature. Hot gas bypass shall be provided on both circuits to reduce compressor cycling and optimize performance under low load conditions.

The fan motor assembly shall be belt-drive. The condenser fan shall be centrifugal type, double inlet, heavy-duty steel shaft, with self-aligning bearings. The fan motor shall operate at 1750 rpm, shall be equipped with adjustable motor pulley, and shall be mounted on an adjustable base. The fan and motor assembly shall be mounted on vibration isolators.

The condenser fan shall be designed for \_\_\_ CFM (CMH) at \_\_\_" (mm) external static pressure

## 2.3 Outdoor Air-Cooled Prop 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 3-ton scroll compressor, 5-ton scroll compressor, high-pressure switches, Liebert Lee-Temp refrigerant receivers, head pressure control valves and liquid line solenoid valves. All components shall be factory-assembled, charged with R-407C refrigerant and sealed. No internal piping, 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).

Hot gas bypass shall be provided for each circuit to reduce compressor cycling and optimize performance under low load conditions.

(Option) The coils shall be phenolic-coated for extended coil life in coastal areas.

## 2.3 Water/Glycol-Cooled Condensing Unit

The water/glycol condensing unit shall include a 3-ton scroll compressor, 5-ton scroll compressor, high-pressure switches, coaxial condenser, water-regulating valve, hot gas bypass system and liquid line solenoid valve. A hot gas bypass circuit shall be provided for each circuit to reduce compressor cycling and optimize performance under low-load conditions. All components shall be factory-assembled, charged with R-407C refrigerant and sealed. No internal piping, brazing dehydration or charging shall be required.

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.

The coaxial condenser shall have 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.

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 (1034kPa)) (350 PSI (2413 kPa))].

## 2.4 Factory-Installed Options

### 2.4.1 Steam Generating Humidifier

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, 1" (25.4 mm) air gap on fill line, inlet strainer, steam distributor and electronic controls. The need to change canister shall be annunciated on the microprocessor wall box control panel. The humidifier shall have a capacity of 4.5 lb/hr (10 kg/h). An LED light on the humidifier assembly shall indicate cylinder full, overcurrent detection, fill system fault and end of cylinder life conditions.

### 2.4.2 Electric Reheat

The electric reheat shall be low-watt density, 304/304 stainless steel, finned-tubular and shall be capable of maintaining room dry bulb conditions when the system is calling for dehumidification. The reheat section shall include an agency-approved safety switch to protect the system from overheating. The capacity of the reheat coils shall be \_\_\_\_\_ BTU/HR (kW), with unit input voltage of \_\_\_\_\_ V, controlled in two stages.

### 2.4.3 Hot Water Reheat

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-prepiped with a 2-way solenoid valve and cleanable Y-strainer. The hot water reheat coil shall only be available on chilled water units.

#### 2.4.4 SCR Electric Reheat

The electric reheat shall be low-watt density, 304/304 stainless steel, finned-tubular and shall be capable of maintaining room dry bulb conditions when the system is calling for dehumidification. The reheat section shall include an agency-approved safety switch to protect the system from overheating.

The SCR (Silicon Controlled Rectifier) controller shall proportionally control the reheat elements 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 unit microprocessor control shall operate the SCR controller, while cooling is locked on. The capacity of the reheat coils shall be \_\_\_\_\_ BTU/HR (kW), unit input voltage of \_\_\_\_\_ V. Not available on chilled water or free-cooling units.

#### 2.4.5 Disconnect Switch, Non-Locking

The non-automatic, non-locking, molded case circuit interrupter shall be factory mounted in the high-voltage section of the electrical panel. The switch handle shall be accessible from the unit front and mounted on:

- \_\_\_\_\_ the evaporator/chilled water unit
- \_\_\_\_\_ the indoor air-cooled centrifugal condensing unit
- \_\_\_\_\_ the water/glycol-cooled condensing unit.

#### 2.4.6 High-Temperature Sensor

The high-temperature sensor shall immediately shut down the system when high temperatures (125°F, 51.7°C) are detected. The high-temperature sensor shall be mounted with the sensing element in the return air.

#### 2.4.7 Smoke Sensor

The smoke sensor shall immediately shut down the environmental control system and activate the alarm system when activated. The sensing element shall be located in the return air compartment. This smoke sensor shall not function or replace any room smoke detection system that may be required by local or national codes.

#### 2.4.8 Filter Clog Switch

The filter clog switch senses pressure drop across the filters and shall annunciate the wall-box display upon exceeding the adjustable setpoint.

#### 2.4.9 GLYCOOL™ (Free-Cooling)/Dual Cooling Coil

A secondary free-cooling coil shall be integral to the evaporator cabinet, and shall be constructed of copper tubes and aluminum fins. The coil shall be rated at \_\_\_\_\_ BTU/HR (kW) sensible cooling capacity with a 45°F (22°C), \_\_\_% glycol solution. The 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. Free-cooling shall be activated when the inlet coolant temperature is low enough to provide cooling, and shall include factory piped three-way valves.

Coil is designed for closed-loop applications using properly treated and circulated fluid. An optional CuNi coil or a field-supplied heat exchanger system is required to prevent premature corrosion if applied to open water tower loop. Not available with SCR reheat.

### 2.5 Ship-Loose Accessories

#### 2.5.1 Remote Sensors

The unit shall be supplied with remote temperature and humidity sensors. The sensors shall be connected to the unit by a \_\_\_\_\_ ft. (m) shielded cable.

#### 2.5.2 Air Filter Box

The evaporator section shall be supplied with an air filter box for use with ducted installations. Two (2) filters shall be included 4" x 20" x 25" (102 mm x 508mm x 635mm) each, deep-pleated type, with a MERV 8 rating, based on ASHRAE 52.2.



### 2.5.3 Condensate Pump

The condensate pump shall have the capacity of \_\_\_\_ GPH (\_\_\_\_ l/h) at \_\_\_\_ ft. head (\_\_\_\_ kPa). It shall be complete with integral float switch, discharge check valve, pump, motor assembly and reservoir. A secondary float switch shall be provided to permit field wiring to the unit control to shut down the evaporator upon a high water level condition.

### 2.5.4 Condensate Pump Bracket

A condensate pump bracket shall be provided to mount condensate pump to the end of the unit and allow easy alignment and installation of the condensate pump.

### 2.5.5 Refrigerant Line Sweat Adapter Kit

Provide a sweat adapter kit to permit field brazing of refrigerant line connections.

### 2.5.6 Single Point Power Kit

A Single Point Power Kit shall be provided for a close-coupled system to allow a single electrical feed to supply power to both the evaporator and indoor close-coupled (attached) condensing unit.

### 2.5.7 Liebert Local Monitoring Systems, Autochangeover and Leak Detection

Provide indicated quantities of the following:

- \_\_\_\_ Leak Detection System(s) Model \_\_\_\_\_
- \_\_\_\_ Remote Monitor(s) Model \_\_\_\_\_
- \_\_\_\_ Auto Changeover Control(s) Model \_\_\_\_\_

### 2.5.8 Liebert SiteScan Site Monitoring System

A Liebert SiteScan Site Monitoring System Model \_\_\_\_\_ shall be provided for remote monitoring of the Liebert Mini-Mate2 unit and monitoring of other Liebert support equipment. The Liebert SiteScan shall have the capability to monitor and change (at the user direction) the temperature and humidity setpoints and sensitivities of each unit. The printer shall provide the user with chronological alarm information. It shall also be capable of being programmed to print out environmental conditions or operating modes at each unit.

### 2.5.9 Drycooler

The Liebert drycooler shall be a low-profile, direct-drive propeller fan-type air-cooled unit. The drycooler shall be constructed with an aluminum cabinet and a copper-tube aluminum fin coil, and multiple direct drive fans. All electrical connections and controls shall be enclosed in an integral electric control panel. Weatherproof section of the drycooler the unit is quiet and corrosion resistant.

The drycooler shall be designed for \_\_\_\_°F (°C) ambient.

### 2.5.10 Glycol Pump Package

The system shall include a centrifugal pump mounted in a weatherproof and vented enclosure. The pump shall be rated for \_\_\_\_ gpm (l/s) at \_\_\_\_ ft. (kPa) of head, and operate on \_\_\_\_ volt, \_\_\_\_ phase, \_\_\_\_ Hz.

## 3.0 Execution

### 3.1 Installation of Air Conditioning Unit

#### 3.1.1 General

Install air conditioning unit in accordance with manufacturer's installation instructions. Install unit plumb and level, firmly anchored in location 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. Install and wire per local and national codes.

### **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. Unit drain shall be trapped internally and shall not be trapped externally.

### **3.1.5 Field-Supplied Pan**

A field-supplied pan with drain shall be installed beneath cooling units and water/glycol condensing units.

## **3.2 Field Quality Control**

Startup air conditioning unit in accordance with manufacturer's startup instructions. Test controls and demonstrate compliance with requirements.



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