Liebert
Keeping Business In Business

HEAT REMOVAL

MINI-MATE 2

ENGINEERING MANUAL

Ceiling Mounted Systems
Nominal 1 & 1.5 Ton Capacity
Air Cooled
Water/Glycol Cooled
Chilled Water
50 & 60 Hz

EMERSON
Network Power

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Model Number Nomenclature

Air and Water/Glycol Cooled Units MMD12A-PHE00 (example)	
MM	Mini-Mate2
D	0 = No Disconnect
	D = Disconnect
12	12 = 1-ton Unit, 60 Hz (Air)
	11 = 1-ton Unit, 50 Hz (Air)
	18 =1.5-ton Unit, 60 Hz (Air)
	17 =1.5-ton Unit, 50 Hz (Air)
	14 = 1-ton Unit, 60 Hz (Water/Glycol)
	13 = 1-ton Unit, 50 Hz (Water/Glycol)
	20 = 1.5-ton Unit, 60 Hz (Water/Glycol)
	19 = 1.5-ton Unit, 50 Hz (Water/Glycol)
A	A = Air-Cooled System
	W = Water/Glycol System
	F = Air-Cooled System, with Free-Cooling
	G = Water/Glycol with Free-Cooling
-	- = Place Holder (air cooled)
	2 = 2-way reg valve, 150 psi (Water/Glycol Cooled)
	3 = 3-way reg valve, 150 psi (Water/Glycol Cooled)
	D = 2-way reg valve, 350 psi (Water/Glycol Cooled)
	T = 3-way reg valve, 350 psi (Water/Glycol Cooled)
P	P = 208/230-1ph-60 Hz
	X = 277-1ph-60 Hz
	S = 220/240-1-50 Hz
H	0 = No Humidifier
	H = Humidifier
	R = Remote Humidifier Contact
	J = Internal Humidifier and Remote Humidifier Contact
E	0 = No Reheat
	E= Electric Reheat
	H = Hot Water Reheat
	G = Hot Gas Reheat
	S = SCR Reheat
0	0 = No Hot Gas Bypass
	H = Hot Gas Bypass
0	0 = None
	A = Filter Clog
	B = Smoke Detector
	C = Firestat
	D = Filter Clog & Smoke Detector
	E = Filter Clog & Firestat
	F = Smoke Detector & Firestat
	G = Filter Clog, Smoke Detector, & Firestat

Evaporators and Chilled Water Units MMD12E-PHE00 (example)	
MM	Mini-Mate2
D	0 = No Disconnect
	D = Disconnect
12	12 = 1-ton Unit, 60 Hz (Evaporator)
	11= 1-ton Unit, 50 Hz (Evaporator)
	18 =1.5-ton Unit, 60 Hz (Evaporator)
	17 =1.5-ton Unit, 50 Hz (Evaporator)
	23 = 1.5- ton CW Unit, 60 Hz (Chilled Water)
	22 = 1.5-ton CW Unit, 50 Hz (Chilled Water)
E	E = Evaporators
	C = Chilled Water Units
-	- = Place holder (Evaporator)
	2 = 2-way valve (Chilled Water)
	D = High close-off valve (Chilled Water)
P	P = 208/230-1ph-60 Hz
	X = 277-1ph-60 Hz
	S = 220/240-1-50 Hz
H	0 = No Humidifier
	H = Humidifier
	R = Remote Humidifier Contact
	J = Internal Humidifier and Remote Humidifier Contact
E	0 = No Reheat
	E= Electric Reheat
	H = Hot Water Reheat
	S = SCR Reheat
0	0 = Place Holder
0	0 = None
	A = Filter Clog
	B = Smoke Detector
	C = Firestat
	D = Filter Clog & Smoke Detector
	E = Filter Clog & Firestat
	F = Smoke Detector & Firestat
	G = Filter Clog, Smoke Detector, & Firestat

Prop Fan Condensing Units PFC018A-PL0 (example)	
PF	Prop Fan Condensing Unit
C	C = Standard Condensing Unit
	H = Hot Gas Bypass
20A	14A = 1-ton, 60 Hz
	13A = 1-ton, 50 Hz
	20A = 1.5-ton, 60 Hz
	19A = 1.5-ton, 50 Hz
-	- = Standard Coil
	C = Coated Coil
P	P = 208/230V-1ph-60 Hz
	S = 220/240V-1ph-50 Hz
L	L = 95F Ambient, Lee-temp
	H = High Ambient
0	0 = Revision Level

DESIGNED TO MATCH COMPUTER AND ELECTRONIC EQUIPMENT NEEDS — FROM INSTALLATION TO OPERATION

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

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

Computer Matched

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

Easy Installation

Self-contained systems require four (4) wire connection to control wallbox, and all refrigerant piping is factory installed. Each split system has thermostat-type wiring to controls and condensing unit. Pre-charged refrigerant lines are also available to further simplify installation.

Easy to Service

Low maintenance components are easily accessed through removable front panels. Spare parts are in Liebert 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 select and display temperature and other monitored parameters.

High Efficiency

High sensible heat ratio, two selectable fan speeds and precise microprocessor control allow the system to operative efficiently.

Space-Saving Design

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

Reliable

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

Agency Listed

Units are ETL 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.

STANDARD FEATURES — SYSTEMS

The Mini-Mate2 is available as a self-contained system (air cooled, water/glycol-cooled, or chilled water), or as a split system evaporator with outdoor prop-fan condensing unit.

Self-Contained Air-Cooled Unit includes evaporator coil, condenser coil, compressor, filter drier, high head pressure switch, two-speed blower motor, microprocessor control, stainless steel drain pan, and factory installed disconnect switch. MM2CF blower box mounts to the cabinet to provide operation down to -20°F (-29°C) ambient.

Self-Contained Water/Glycol-Cooled Unit includes evaporator coil, coaxial condenser, regulating valve, compressor, filter drier, high head pressure switch, two-speed blower motor, microprocessor control, stainless steel drain pan, and factory installed disconnect switch.

Split System Evaporator includes evaporator coil, filter drier, high head pressure switch, two-speed blower motor, microprocessor control, stainless steel drain pan, and factory installed disconnect switch.

Chilled Water Unit includes chilled water coil, 2-speed blower motor, 2-way slow close (on/off) valve. Design pressure is 300 psi (2068 kPa), with 25 psi (172.3 kPa) close-off differential.

Outdoor Prop-Fan Condensing Unit includes compressor, condenser coil, propeller fan, high pressure switch, Lee-temp head pressure control and built-in receiver for operation down to -30°F (-34.4°C) ambient. Condensing unit is rated for 95°F (35°C) ambient. Hot Gas Bypass, Quietline and High Ambient models also are available.

STANDARD FEATURES — MICROPROCESSOR CONTROL

Microprocessor Control includes a 2-line, 16 character, wall-mounted display which provides temperature setpoint and sensitivity adjustment, humidity setpoint and sensitivity adjustment, digital display of temperature, humidity, setpoints, sensitivities, operating conditions, and alarm conditions.

Wall-mounted Display (wallbox) includes an 8-key membrane keypad for setpoint/program control, unit on/off, high/low fan speed, and alarm silence located below the LCD display. The wallbox is connected to the main control board with four (4) field supplied thermostat-type wires.

The temperature and humidity sensors are located in the wallbox, which can be remote up to 300 feet (91.4 m) from the evaporator unit.

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

Optional Features (Factory Installed)

Electric Reheat includes 304/304 stainless steel finned tubular reheat element for added durability and corrosion resistance. 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 (or the chilled water valve is locked open), with the reheat modulated to track the load.

Hot Water Reheat includes hot water coil, 2-way solenoid valve, and Y-strainer. Note: this option is not available with Free-cooling option or other reheat options.

Hot Gas Reheat can be ordered on self-contained models. This option includes the coil and necessary piping and the control valve. NOTE: This option is not available with Free-cooling or other reheat options.

Canister Humidifier includes steam generating type humidifier with automatic flushing circuit, inlet strainer, drain, air gap on fill line, and solenoid valve. Humidifier problem alarm annunciates wall-mounted display panel.

Remote Humidifier Contact allows the unit's humidity controller to control a humidifier outside the unit. Power to operate the remote humidifier does not come from the Mini-Mate2.

Hot Gas Bypass provides capacity control and reduce compressor cycling. Available on self-contained units or on prop-fan condensing units.

Smoke Detector is factory installed and wired to provide an audible and visual alarm at the wallbox, and shutdown the unit.

Firestat senses the return air temperature and shuts down the unit if temperature reaches 125°F (51.7°C).

Filter Clog Switch activates an audible and visual alarm on the wallbox when filter pressure drop exceeds a pre-set limit.

Disconnect Switch is non-fused, factory installed within the cabinet, and allows the unit to be turned off for maintenance. Disconnect switch is available on self-contained units, evaporators, and chilled water units.

Water/Glycol Cooled Options:

Two-way water regulating valve with 150 psi (1034 kPa) design pressure.

Two-way water regulating valves with 350 psi (2413 kPa) design pressure.

Three-way water regulating valves with 150 psi (1034 kPa) design pressure.

Three-way water regulating valves with 350 psi (2413 kPa) design pressure.

Chilled Water Options:

2-way High Close-Off Chilled Water Valve, rated for 300 psi (2068 kPa) operating pressure, 100 psi (689 kPa) close-off pressure.

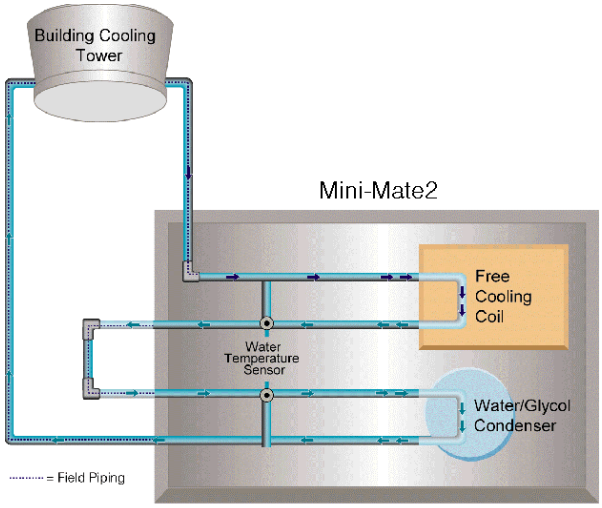
Optional Features — Continued

Free-cooling uses a secondary cooling coil in the air handling unit and a 3-way slow close (on/off) chilled water valve.

When the water (or glycol) solution reaches a preset temperature (usually 45°F (7.2°C)), cooling switches from DX cooling to Free-cooling.

This option is available on air-cooled, water/glycol cooled, and split system evaporators. Free-cooling coil and valve are factory-piped, separate from other water piping.

Note: If Free-cooling is applied to an open water tower, an optional cupro-nickel (Cu-Ni) coil is recommended to prevent premature corrosion.
A cupro-nickel coil requires an extended lead-time. Contact your Liebert representative for pricing and lead-time.



When water temperature goes below 45°F, cooling switches to Free-cooling operation. A separate chilled water source can also be used with Air-Cooled system.

SHIP-LOOSE ACCESSORIES

Pre-Charged Refrigerant Line Set pipes a split-system evaporator to an outdoor condensing unit. Line sets are available in 15-foot (4.5-m) and 30-ft. (9-m) sections, and include an insulated copper suction line and insulated copper liquid line.

Remote Temperature and Humidity Sensors are mounted in an attractive case can be wall or duct mounted, and include a 30-ft. (9-m) section of cable. Remote sensors should be used when the wallbox is not located in the space that is to be conditioned.

Note: Installing the remote sensors disables the sensors that are included in the wallbox.

Supply and Return Grille Kit includes supply and return grilles, 1" x 20" x 20" (25mm x 508mm x 508mm) -20% filter for installation into a 2' x 4' ceiling grid.

Duct Kit includes return air filter box with 1" duct collar, 1" duct collar for supply air, and air block-off plates. Duct kit can be ordered with 4" x 16" x 20" (102mm x 406mm x 508mm) - 20% or 30% filters (based on ASHRAE 52.1)

Duct Collar Kit (no filter) includes 1" supply duct collar, a 1" return collar, and the necessary block-off plates to make the Mini-Mate2 a ducted configuration. Filter box and filter are not included.

Refrigerant Line Sweat Adapter Kit contains two (2) suction lines and two (2) liquid line fittings that allow for field refrigerant piping between the evaporator and condensing unit.

Condensate Pump is field mounted and wired to the outside of the cabinet and is equipped with a check valve. A secondary float is field wired to shut down unit upon high condensate level.

REMOTE MONITORING, AUTOCHANGEOVER, AND LEAK DETECTION EQUIPMENT

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

RCM8CE Eight-Point Remote Dry Contact Monitor is an eight-point, NO or NC (individually selectable), dry contact monitoring panel, that can be used:

- as a stand-alone panel
- to dial out on alarm to a remote location or numeric/alphanumeric pager
- to interface to Liebert SiteScan centralized monitoring systems.

The RCM8CE is equipped with one RS-232 port for a PC/terminal direct connection, and a second RS-232 port for modem communications (modem not included). Eight red LEDs illuminate on alarm, and the alarm buzzer is silenced by a front panel switch. One Form-C, dry-contact common alarm relay (rated at 300 VAC, 6 A) output is provided.

The RCM8CE requires 120 or 230 VAC, 50 or 60 Hz power input, and has an internal Ni-Cad battery rated for one hour of back-up operation.

RCM8DO Eight Point Remote Dry Contact Monitor is an eight-point dry-contact input and eight dry contact output monitoring panel. It is identical to the RCM8CE, but with the addition of eight Normally Open relays (rated at 24 VAC or VDC, 1 A) that will automatically energize upon alarm of each corresponding monitored point.

AC3 Autochangeover Controller provides autochangeover and autosequence control for two or three environmental units. The AC3 has an LCD readout, audible alarm with silence switch, alarm reset, manual override, and manual lead/lag changeover.

A supervised common alarm relay output (rated at 120 VAC, 1 A) is available when controlling two units only. The AC3 can be wall- or flush-mounted, and requires 24 VAC power input.

RAC2-8 Remote Autochangeover Controller monitors and controls up to eight environmental units in four separate zones.

The RAC2-8 has built-in LCD display, audible alarm, silence switch, common alarm relay output, humidity lockout relay, temperature/humidity sensor input, RS-232 port for direct PC/terminal connection, a second RS-232 port for external modem, emergency power operation input, lockout relay output, and emergency power off (EPO) input. It requires a separate 120 VAC (50 or 60 Hz) power input.

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

LT460-K Zone Leak Detection Kits includes one LT460 sensor; a specified length of LT500Y cable; a corresponding number of hold-down clips; and an LT500-ET end terminator.

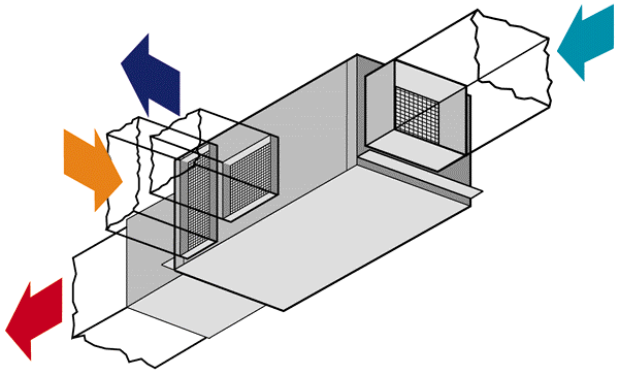
SiteScan is a monitoring solution that gives you decision-making power to effectively manage the equipment critical to your business.

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

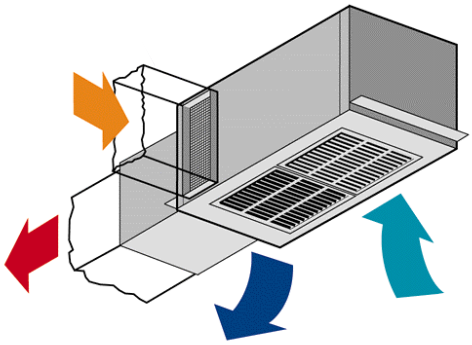
SiteScan is designed with flexibility for both small systems and large, complex systems such as those in computer rooms, telecommunications facilities or industrial process control rooms. Contact your local Liebert representative for assistance with a SiteScan system.

FLEXIBLE CONFIGURATIONS

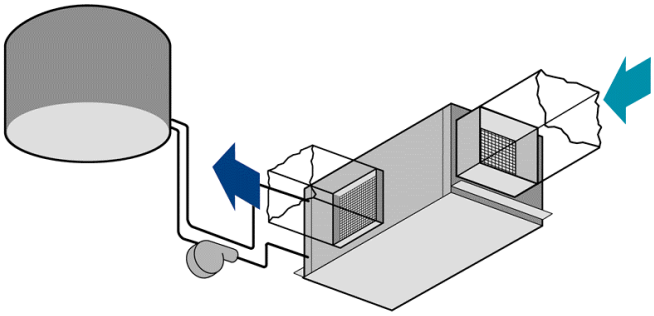
Self-Contained Air-Cooled Ducted



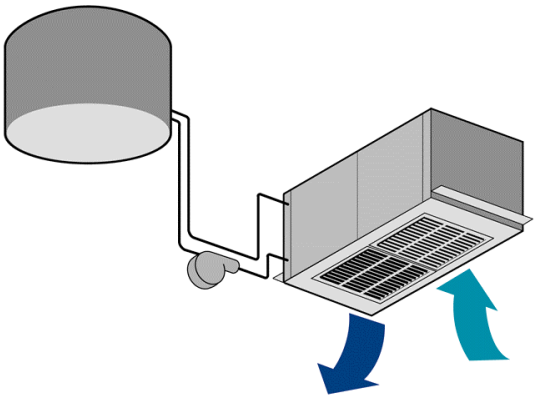
Self-Contained Air-Cooled Grille



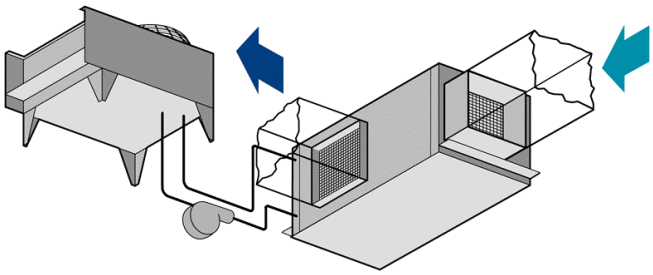
Water-Cooled Ducted



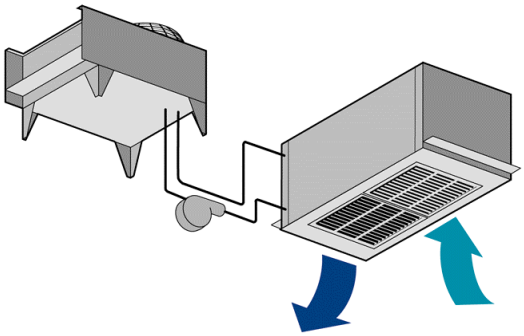
Water-Cooled Grille



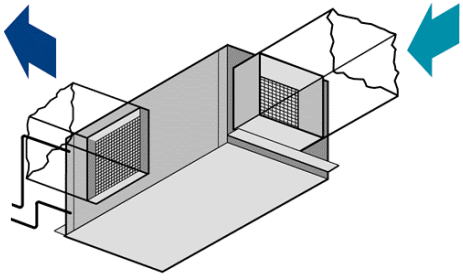
Glycol System Ducted



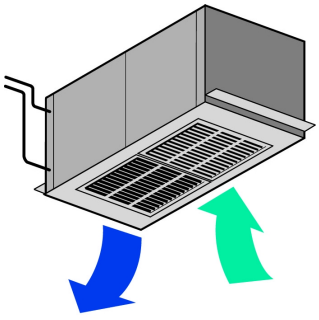
Glycol System Grille



Chilled Water Ducted



Chilled Water Grille



Air-Cooled Data, 60 Hz

Nominal Tons		**1-ton**				**1.5-tons**			
Model Number		**MMD12E**		**MMD12A**		**MMD18E**		**MMD18A**	
Cabinet Type		**Split System**		**Self Contained**		**Split System**		**Self Contained**	
Net Capacity Data - BTUH (kW) High Fan Speed			(metric)		(metric)		(metric)		(metric)
80°F (26.7°C) DB	Total	14100	(4.1)	13300	(3.9)	19800	(5.8)	19300	(5.7)
50% RH	Sensible	11600	(3.4)	11300	(3.3)	15500	(4.5)	15300	(4.5)
75°F (23.9°C) DB	Total	13000	(3.8)	12300	(3.6)	18400	(5.4)	18000	(5.3)
50% RH	Sensible	11200	(3.3)	10900	(3.2)	15000	(4.4)	14900	(4.4)
72°F (22.2°C) DB	Total	12400	(3.6)	11800	(3.5)	17700	(5.2)	17300	(5.1)
50% RH	Sensible	10900	(3.2)	10600	(3.1)	14800	(4.3)	14600	(4.3)
Net Capacity Data - BTUH (kW) Low Fan Speed									
80°F (26.7°C) DB	Total	14000	(4.1)	13300	(3.9)	19300	(5.7)	18800	(5.5)
50% RH	Sensible	10500	(3.1)	10200	(3.0)	13800	(4.0)	13700	(4.0)
75°F (23.9°C) DB	Total	12900	(3.8)	12300	(3.6)	18000	(5.3)	17700	(5.2)
50% RH	Sensible	10100	(3.0)	9900	(2.9)	13500	(4.0)	13400	(3.9)
72°F (22.2°C) DB	Total	12300	(3.6)	11800	(3.5)	17200	(5.0)	16900	(5.0)
50% RH	Sensible	9900	(2.9)	9700	(2.8)	13300	(3.9)	13100	(3.8)
Fan Data - Direct Drive									
High Speed CFM (CMH)		600	(1019)	600	(1019)	750	(1274)	750	(1274)
Low Speed CFM (CMH)		480	(816)	480	(816)	600	(1019)	600	(1019)
External Static Pressure, in (mm)		0.3	(8)	0.3	(8)	0.3	(8)	0.3	(8)
Fan Motor Hp (W)		0.2	(149)	0.2	(149)	0.2	(149)	0.2	(149)
Evaporator Coil - Copper Tube/Aluminum Fin									
Face Area ft^2 (m^2)		2.44	(0.23)	2.44	(0.23)	2.44	(0.23)	2.44	(0.23)
Coil Rows		2		2		3		3	
Max Face Velocity-fpm (m/s)		232	(1.18)	232	(1.18)	291	(1.48)	291	(1.48)
Electric Reheat Data (Includes Fan Motor)									
Capacity - BTUH (kW) @208V		12160	(3.6)	12160	(3.6)	16125	(4.7)	16125	(4.7)
Capacity - BTUH (kW) @240V		14875	(4.4)	14875	(4.4)	19735	(5.8)	19735	(5.8)
Capacity - BTUH (kW) @277V		16285	(4.8)	16285	(4.8)	21520	(6.3)	21520	(6.3)
Hot Water Reheat Data (based on 180°F Water)									
Capacity - BTUH (kW)		40000	(11.7)	40000	(11.7)	47900	(14.0)	47900	(14.0)
Flow Rate - GPM (l/m)		1.5	(5.7)	1.5	(5.7)	2	(7.6)	2	(7.6)
Pressure Drop - ft (kPa)		1	(3.0)	1	(3.0)	1.7	(5.1)	1.7	(5.1)
Hot Gas Reheat Data, based on 103°F return gas temperature									
Capacity - BTUH (kW)		N/A		16200	(4.7)	N/A		18000	(5.3)
Humidifier Data - Steam Generator Type									
Capacity - lbs/hr (kg/hr)		2.5	(1.14)	2.5	(1.14)	2.5	(1.14)	2.5	(1.14)
kW		0.88		0.88		0.88		0.88	
Connection Sizes									
Liquid Line - Coupling Female		3/8”		N/A		3/8”		N/A	
Suction Line - Coupling Female		5/8”		N/A		5/8”		N/A	
Humidifier Supply		1/4”		1/4”		1/4”		1/4”	
Evaporator Drain -FPT		3/4”		3/4”		3/4”		3/4”	
Refrigerant Charge, oz (kg)		3.4	(2)	42	(19)	4	(2)	49	(22)
Operating Weight, lbs (kg)		220	(99.9)	265	(120.3)	225	(102.2)	295	(133.9)
Filter Dimensions, Grille, qty 1, 20" x 20" x 1" (508mm x 508mm x 25mm)									
Filter Dimensions, Ducted, qty 1, 20" x 16" x 1" (508mm x 406 mm x 25 mm)									
PFC Outdoor Condensing Unit: 95°F (35°C) Ambient, Operation to -30°F (-34.4°C) Ambient									
MM2CF Condenser Fan: 95°F (35°C) Ambient, Operation to -20°F Ambient (-28.9°C) Ambient									
Model Number		PFC014A		MM2CF		PFC020A		MM2CF	
Face Area ft^2 (m^2)		4.1	(0.38)	2.25	(0.21)	4.1	(0.38)	2.25	(0.21)
Rows of Coil		2		3		2		3	
Motor Hp (W)		0.20	(149)	0.25	(187)	0.20	(149)	0.25	(187)
CFM (CMH)		2200	(3738)	950	(1614)	2200	(3738)	950	(1614)
External Static Pressure inches wc. (mm)		N/A	N/A	0.5	(13)	N/A	N/A	0.5	(13)
Refrigerant Charge, R-22 oz (kg)		134	(3.8)	N/A	N/A	134	(3.8)	N/A	N/A
Operating Weight, lbs (kg)		200	(91)	63	(29)	200	(91)	63	(29)

Air-Cooled Data, 50 Hz

Nominal Tons		**1-ton**				**1.5-tons**			
Model Number		**MMD11E**		**MMD11A**		**MMD17E**		**MMD17A**	
Cabinet Type		**Split System**		**Self Contained**		**Split System**		**Self Contained**	
Net Capacity Data - BTUH (kW) High Fan Speed			(metric)		(metric)		(metric)		(metric)
80°F (26.7°C) DB	Total	14400	(4.2)	13400	(3.9)	21200	(6.2)	20800	(6.1)
50% RH	Sensible	11700	(3.4)	11300	(3.3)	16000	(4.7)	15900	(4.7)
75°F (23.9°C) DB	Total	13300	(3.9)	12400	(3.6)	19800	(5.8)	19500	(5.7)
50% RH	Sensible	11300	(3.3)	10900	(3.2)	15600	(4.6)	15500	(4.5)
72°F (22.2°C) DB	Total	12700	(3.7)	11900	(3.5)	19000	(5.6)	18700	(5.5)
50% RH	Sensible	11000	(3.2)	10700	(3.1)	15300	(4.5)	15200	(4.5)
Net Capacity Data - BTUH (kW) Low Fan Speed									
80°F (26.7°C) DB	Total	14300	(4.2)	13400	(3.9)	20600	(6.0)	20300	(5.9)
50% RH	Sensible	10600	(3.1)	10200	(3.0)	14400	(4.2)	14200	(4.2)
75°F (23.9°C) DB	Total	13200	(3.9)	12400	(3.6)	19500	(5.7)	18900	(5.5)
50% RH	Sensible	10200	(3.0)	9900	(2.9)	14100	(4.1)	13900	(4.1)
72°F (22.2°C) DB	Total	12600	(3.7)	11900	(3.5)	18400	(5.4)	18200	(5.3)
50% RH	Sensible	10000	(2.9)	9700	(2.8)	13800	(4.0)	13700	(4.0)
Fan Data - Direct Drive									
High Speed CFM (CMH)		600	(1019)	600	(1019)	750	(1274)	750	(1274)
Low Speed CFM (CMH)		480	(816)	480	(816)	600	(1019)	600	(1019)
External Static Pressure, in (mm)		0.3	(8)	0.3	(8)	0.3	(8)	0.3	(8)
Fan Motor Hp (W)		0.2	(149)	0.2	(149)	0.2	(149)	0.2	(149)
Evaporator Coil - Copper Tube/Aluminum Fin									
Face Area ft^2 (m^2)		2.44	(0.23)	2.44	(0.23)	2.44	(0.23)	2.44	(0.23)
Coil Rows		2		2		3		3	
Max Face Velocity-fpm (m/s)		232	(1.18)	232	(1.18)	291	(1.48)	291	(1.48)
Electric Reheat Data (Includes Fan Motor)									
Capacity - BTUH (kW) @240V		14875	(4.4)	14875	(4.4)	19735	(5.8)	19735	(5.8)
Hot Water Reheat Data (based on 180°F Water)									
Capacity - BTUH (kW)		40000	(11.7)	40000	(11.7)	47900	(14.0)	47900	(14.0)
Flow Rate - GPM (l/m)		1.5	(5.7)	1.5	(5.7)	2	(7.6)	2	(7.6)
Pressure Drop - ft (kPa)		1	(3.0)	1	(3.0)	1.7	(5.1)	1.7	(5.1)
Hot Gas Reheat Data, based on 103°F Return Gas Temp									
Capacity - BTUH (kW)		N/A		16200	(4.7)	N/A		18000	(5.3)
Humidifier Data - Steam Generator Type									
Capacity - lbs/hr (kg/hr)		2.5	(1.14)	2.5	(1.14)	2.5	(1.14)	2.5	(1.14)
kW		0.88		0.88		0.88		0.88	
Connection Sizes									
Liquid Line - Coupling Female		3/8"		N/A		3/8”		N/A	
Suction Line - Coupling Female		5/8”		N/A		5/8”		N/A	
Humidifier Supply		1/4”		1/4”		1/4”		1/4	
Evaporator Drain		3/4”		3/4”		3/4”		3/4	
Refrigerant Charge, oz (kg)		3.4	(2)	42	(19)	4	(2)	49	(22)
Operating Weight, lbs(kg)		220	(99.9)	265	(120.3)	225	(102.2)	295	(133.9)
Filter Dimensions, Grille, qty 1, 20" x 20" x 1" (508mm x 508mm x 25mm)									
Filter Dimensions, Ducted, qty 1, 20" x 16" x 1" (508mm x 406 mm x 25 mm)									
PFC Outdoor Condensing Unit: 95°F (35°C) Ambient, Operation to -30°F(-34.4°C) Ambient									
MM2CF Condenser Fan: 95°F (35°C) Ambient, operation to -20°F Ambient (-28.9°C) Ambient									
Model Number		PFC013A		MM2CF		PFC019A		MM2CF	
Face Area ft^2 (m^2)		4.1	(0.38)	2.25	(0.21)	4.1	(0.38)	2.25	(0.21)
Rows of Coil		2		3		2		3	
Motor Hp (W)		0.20	(149)	0.25	(187)	0.20	(149)	0.25	(187)
CFM (CMH)		2200	(3738)	950	(1614)	2200	(3738)	950	(1614)
External Static Pressure inches wc. (mm)		N/A	N/A	0.5	(13)	N/A	N/A	0.5	(13)
Refrigerant Charge, R-22 oz (kg)		134	(3.8)	N/A	N/A	134	(3.8)	N/A	N/A
Operating Weight, lbs (kg)		200	(91)	63	(29)	200	(91)	63	(29)

Water/Glycol Cooled Data, 60 Hz

Nominal Tons		1-ton				1.5-tons			
Model Number		MMD14W				MMD20W			
Cabinet Type		Self-Contained		Self-Contained		Self-Contained		Self-Contained	
System Type		Water Cooled		Glycol Cooled		Water Cooled		Glycol Cooled	
Net Capacity Data - BTUH (kW) High Fan Speed			(metric)		(metric)		(metric)		(metric)
80°F (26.7°C) DB	Total	14100	(4.1)	12200	(3.6)	21300	(6.2)	18900	(5.5)
50% RH	Sensible	11600	(3.4)	10900	(3.2)	15900	(4.7)	15000	(4.4)
75°F (23.9°C) DB	Total	13100	(3.8)	11400	(3.3)	19800	(5.8)	17500	(5.1)
50% RH	Sensible	11200	(3.3)	10500	(3.1)	15500	(4.5)	14500	(4.2)
72°F (22.2°C) DB	Total	12500	(3.7)	10900	(3.2)	18900	(5.5)	16900	(5.0)
50% RH	Sensible	10900	(3.2)	10300	(3.0)	15200	(4.5)	14300	(4.2)
Net Capacity Data - BTUH (kW) Low Fan Speed									
80°F (26.7°C) DB	Total	14000	(4.1)	12300	(3.6)	20600	(6.0)	18500	(5.4)
50% RH	Sensible	10500	(3.1)	9800	(2.9)	14300	(4.2)	13400	(3.9)
75°F (23.9°C) DB	Total	13000	(3.8)	11400	(3.3)	19200	(5.6)	17200	(5.0)
50% RH	Sensible	10100	(3.0)	9500	(2.8)	13900	(4.1)	13100	(3.8)
72°F (22.2°C) DB	Total	12400	(3.6)	10900	(3.2)	18400	(5.4)	16500	(4.8)
50% RH	Sensible	9900	(2.9)	9300	(2.7)	13700	(4.0)	12800	(3.8)
Fan Data - Direct Drive									
High Speed CFM (CMH)		600	(1019)	600	(1019)	750	(1274)	750	(1274)
Low Speed CFM (CMH)		480	(816)	480	(816)	600	(1019)	600	(1019)
External Static Pressure, in (mm)		0.3	(8)	0.3	(8)	0.3	(8)	0.3	(8)
Fan Motor Hp (W)		0.2	(149)	0.2	(149)	0.2	(149)	0.2	(149)
Evaporator Coil - Copper Tube/Aluminum Fin									
Face Area ft^2 (m^2)		2.44	(0.23)	2.44	(0.23)	2.44	(0.23)	2.44	(0.23)
Coil Rows		2		2		3		3	
Max Face Velocity-fpm (m/s)		232	(1.18)	232	(1.18)	291	(1.48)	291	(1.48)
Electric Reheat Data (Includes Fan Motor)									
Capacity - BTUH (kW) @208V		12160	(3.6)	12160	(3.6)	16125	(4.7)	16125	(4.7)
Capacity - BTUH (kW) @230V		14875	(4.4)	14875	(4.4)	19735	(5.8)	19735	(5.8)
Capacity - BTUH (kW) @277V		16285	(4.8)	16285	(4.8)	21520	(6.3)	21520	(6.3)
Hot Water Reheat Data (based on 180°F Water)									
Capacity - BTUH (kW)		40000	(11.7)	40000	(11.7)	47900	(14.0)	47900	(14.0)
Flow Rate - GPM (l/m)		1.5	(5.7)	1.5	(5.7)	2	(7.6)	2	(7.6)
Pressure Drop - ft (kPa)		1	(3.0)	1	(3.0)	1.7	(5.1)	1.7	(5.1)
Hot Gas Reheat Data, based on 103°F return gas temperature									
Capacity - BTUH (kW)		16200	(4.7)	16200	(4.7)	18000	(5.3)	18000	(5.3)
Humidifier Data - Steam Generator Type									
Capacity - lbs/hr (kg/hr)		2.5	(1.14)	2.5	(1.14)	2.5	(1.14)	2.5	(1.14)
kW		0.88		0.88		0.88		0.88	
Connection Sizes									
Water/Glycol Supply and Return, FPT		1/2”		1/2”		1/2”		1/2”	
Humidifier Supply, FPT		1/4”		1/4”		1/4”		1/4”	
Evaporator Drain, FPT		3/4”		3/4”		3/4”		3/4”	
Refrigerant Charge, oz (kg)		3.4	(2)	42	(19)	4	(2)	49	(22)
Operating Weight, lbs(kg)		220	(99.9)	265	(120.3)	225	(102.2)	295	(133.9)
Internal Water/Glycol Volume, gal (L)		0.5	(1.9)	0.5	(1.9)	0.5	(1.9)	0.5	(1.9)
Filter Dimensions, Grille, qty 1, 20" x 20" x 1" (508mm x 508mm x 25mm)									
Filter Dimensions, Ducted, qty 1, 20" x 16" x 1" (508mm x 406 mm x 25 mm)									
Condenser Water Requirements - 85°F EWT (29.4°C)									
THR - BTU/hr (kW) @75/50%		17600	(5.2)	N/A	N/A	25300	(7.4)	N/A	N/A
Flow Rate - GPM (l/m)		1.6	(6.1)	N/A	N/A	3.2	(12.1)	N/A	N/A
Pressure Drop - ft. (kPa)		2.0	(6.0)	N/A	N/A	6.7	(20.0)	N/A	N/A
Condenser Glycol Requirements - 110°F EGT (43.3°C) - 40%									
Flow Rate - GPM (l/m)		N/A	N/A	3.0	(11.4)	N/A	N/A	5.0	(18.9)
Pressure Drop - ft. (kPa)		N/A	N/A	6.6	(20)	N/A	N/A	16.4	(49)

Water/Glycol Cooled Data, 50 Hz

Nominal Tons		**1-ton**				**1.5-tons**			
Model Number		**MMD13W**				**MMD19W**			
Cabinet Type		**Self-Contained**				**Self-Contained**			
System Type		**Water Cooled**		**Glycol Cooled**		**Water Cooled**		**Glycol Cooled**	
Net Capacity Data - BTUH (kW) High Fan Speed			(metric)		(metric)		(metric)		(metric)
80°F (26.7°C) DB	Total	14100	(4.1)	12500	(3.7)	23200	(6.8)	20400	(6.0)
50% RH	Sensible	11600	(3.4)	11000	(3.2)	16700	(4.9)	15600	(4.6)
75°F (23.9°C) DB	Total	13000	(3.8)	11600	(3.4)	21500	(6.3)	19000	(5.6)
50% RH	Sensible	11200	(3.3)	10600	(3.1)	16200	(4.7)	15200	(4.5)
72°F (22.2°C) DB	Total	12400	(3.6)	11100	(3.3)	20600	(6.0)	18200	(5.3)
50% RH	Sensible	10900	(3.2)	10300	(3.0)	15900	(4.7)	14900	(4.4)
Net Capacity Data - BTUH (kW) Low Fan Speed									
80°F (26.7°C) DB	Total	14000	(4.1)	12500	(3.7)	22500	(6.6)	19900	(5.8)
50% RH	Sensible	10400	(3.0)	9900	(2.9)	15000	(4.4)	14000	(4.1)
75°F (23.9°C) DB	Total	12900	(3.8)	11600	(3.4)	20800	(6.1)	18500	(5.4)
50% RH	Sensible	10100	(3.0)	9600	(2.8)	14600	(4.3)	13600	(4.0)
72°F (22.2°C) DB	Total	12300	(3.6)	11100	(3.3)	19900	(5.8)	17800	(5.2)
50% RH	Sensible	9900	(2.9)	9400	(2.8)	14400	(4.2)	13400	(3.9)
Fan Data - Direct Drive									
High Speed CFM (CMH)		600	(1019)	600	(1019)	750	(1274)	750	(1274)
Low Speed CFM (CMH)		480	(816)	480	(816)	600	(1019)	600	(1019)
External Static Pressure, in (mm)		0.3	(8)	0.3	(8)	0.3	(8)	0.3	(8)
Fan Motor Hp (W)		0.2	(149)	0.2	(149)	0.2	(149)	0.2	(149)
Evaporator Coil - Copper Tube/Aluminum Fin									
Face Area ft^2 (m^2)		2.44	(0.23)	2.44	(0.23)	2.44	(0.23)	2.44	(0.23)
Coil Rows		2		2		3		3	
Max Face Velocity-fpm (m/s)		232	(1.18)	232	(1.18)	291	(1.48)	291	(1.48)
Electric Reheat Data, Includes Fan Motor									
Capacity - BTUH (kW) @240V		14875	(4.4)	14875	(4.4)	19735	(5.8)	19735	(5.8)
Hot Water Reheat Data, based on 180°F water									
Capacity - BTUH (kW)		40000	(11.7)	40000	(11.7)	47900	(14.0)	47900	(14.0)
Flow Rate - GPM (l/m)		1.5	(5.7)	1.5	(5.7)	2	(7.6)	2	(7.6)
Pressure Drop - ft (kPa)		1	(3.0)	1	(3.0)	1.7	(5.1)	1.7	(5.1)
Hot Gas Reheat Data, based on 103°F return gas temperature									
Capacity - BTUH (kW)		16200	(4.7)	16200	(4.7)	18000	(5.3)	18000	(5.3)
Humidifier Data - Steam Generator Type									
Capacity - lbs/hr (kg/hr)		2.5	(1.14)	2.5	(1.14)	2.5	(1.14)	2.5	(1.14)
kW		0.88		0.88		0.88		0.88	
Connection Sizes									
Water/Glycol Supply, NPT Female		1/2”		1/2”		1/2”		1/2”	
Water/Glycol Return, NPT Female		1/2”		1/2”		1/2”		1/2”	
Humidifier Supply		1/4”		1/4”		1/4”		1/4”	
Evaporator Drain		3/4”		3/4”		3/4”		3/4”	
Refrigerant Charge, oz (kg)		3.4	(2)	42	(19)	4	(2)	49	(22)
Operating Weight, lbs(kg)		220	(99.9)	265	(120.3)	225	(102.2)	295	(133.9)
Internal Water/Glycol Volume, gal (L)		0.5	(1.9)	0.5	(1.9)	0.5	(1.9)	0.5	(1.9)
Filter Dimensions, Grille, qty 1, 20" x 20" x 1" (508mm x 508mm x 25mm)									
Filter Dimensions, Ducted, qty 1, 20" x 16" x 1" (508mm x 406 mm x 25 mm)									
Condenser Water Requirements - 85°F EWT (29.4°C)									
THR - BTU/hr (kW) @75/50%		17600	(5.2)	N/A	N/A	25300	(7.4)	N/A	N/A
Flow Rate - GPM (l/m)		1.6	(6.1)	N/A	N/A	3.2	(12.1)	N/A	N/A
Pressure Drop - ft. (kPa)		2.0	(6.0)	N/A	N/A	6.7	(20.0)	N/A	N/A
Condenser Glycol Requirements - 110°F EGT (43.3°C) - 40%									
Flow Rate - GPM (l/m)		N/A	N/A	3.0	(11.4)	N/A	N/A	5.0	(18.9)
Pressure Drop - psi (kPa)		N/A	N/A	6.6	(20)	N/A	N/A	16.4	(49)

Chilled Water System Data, 60 Hz

Model Number		MMD23C	
Nominal Tons		**1.5-ton**	
Cabinet Type		**Self-Contained**	
Capacity Data - BTUH (kW) High Fan Speed			(metric)
80°F (26.7°C) DB	Total	21600	(6.3)
50% RH	Sensible	17300	(5.1)
Flow Rate - GPM (l/m)		4.3	(16.3)
Pressure Drop - PSI (kPa)		8.0	(54.9)
75°F (23.9°C) DB	Total	15700	(4.6)
50% RH	Sensible	14900	(4.4)
Flow Rate - GPM (l/m)		3.1	(11.7)
Pressure Drop - PSI (kPa)		4.2	(29.2)
72°F (22.2°C) DB	Total	13100	(3.8)
50% RH	Sensible	13000	(3.8)
Flow Rate - GPM (l/m)		2.6	(9.8)
Pressure Drop - PSI (kPa)		3.1	(21.2)
Capacity Data - BTUH (kW) Low Fan Speed			
80°F (26.7°C) DB	Total	18600	(5.4)
50% RH	Sensible	14500	(4.2)
Flow Rate - GPM (l/m)		3.7	(14.0)
Pressure Drop - PSI (kPa)		5.9	(40.9)
75°F (23.9°C) DB	Total	13400	(3.9)
50% RH	Sensible	12400	(3.6)
Flow Rate - GPM (l/m)		2.7	(10.2)
Pressure Drop - PSI (kPa)		3.2	(22.1)
72°F (22.2°C) DB	Total	11200	(3.3)
50% RH	Sensible	11100	(3.3)
Flow Rate - GPM (l/m)		2.2	(8.3)
Pressure Drop - PSI (kPa)		2.3	(15.5)
Fan Data - Direct Drive			
High Speed CFM (CMH)		750	(1274)
Low Speed CFM (CMH)		600	(1019)
External Static Pressure, in. (mm)		0.3	(8)
Fan Motor Hp (W)		0.2	(0.15)
Evaporator Coil - Copper Tube/Aluminum Fin			
Face Area ft^2 (m^2)		2.44	(0.23)
Coil Rows		2	
Max Face Velocity-fpm (m/s)		293	(1.49)
Electric Reheat Data (Includes Fan Motor)			
Capacity - BTUH (kW) @208V		12160	(3.6)
Capacity - BTUH (kW) @240V		14875	(4.4)
Capacity - BTUH (kW) @277V		16285	(4.8)
Hot Water Reheat Data (based on 180°F Water)			
Capacity - BTUH (kW)		40000	(11.7)
Flow Rate - GPM (l/m)		1.5	(5.7)
Pressure Drop - ft (kPa)		1.0	(3.0)
Humidifier Data - Steam Generator Type			
Capacity - lbs/hr (kg/hr)		2.5	(1.14)
kW		0.88	
Connection Sizes			
Chilled Water Supply and Return, FPT		1/2"	
Humidifier Supply, FPT		1/4"	
Evaporator Drain, FPT		3/4”	
Operating Weight, lbs (kg)		220	(99.9)
Filter Dimensions, Grille, qty 1, 20" x 20" x 1" (508mm x 508mm x 25mm)			
Filter Dimensions, Ducted, qty 1, 20" x 16" x 1" (508mm x 406 mm x 25 mm)			

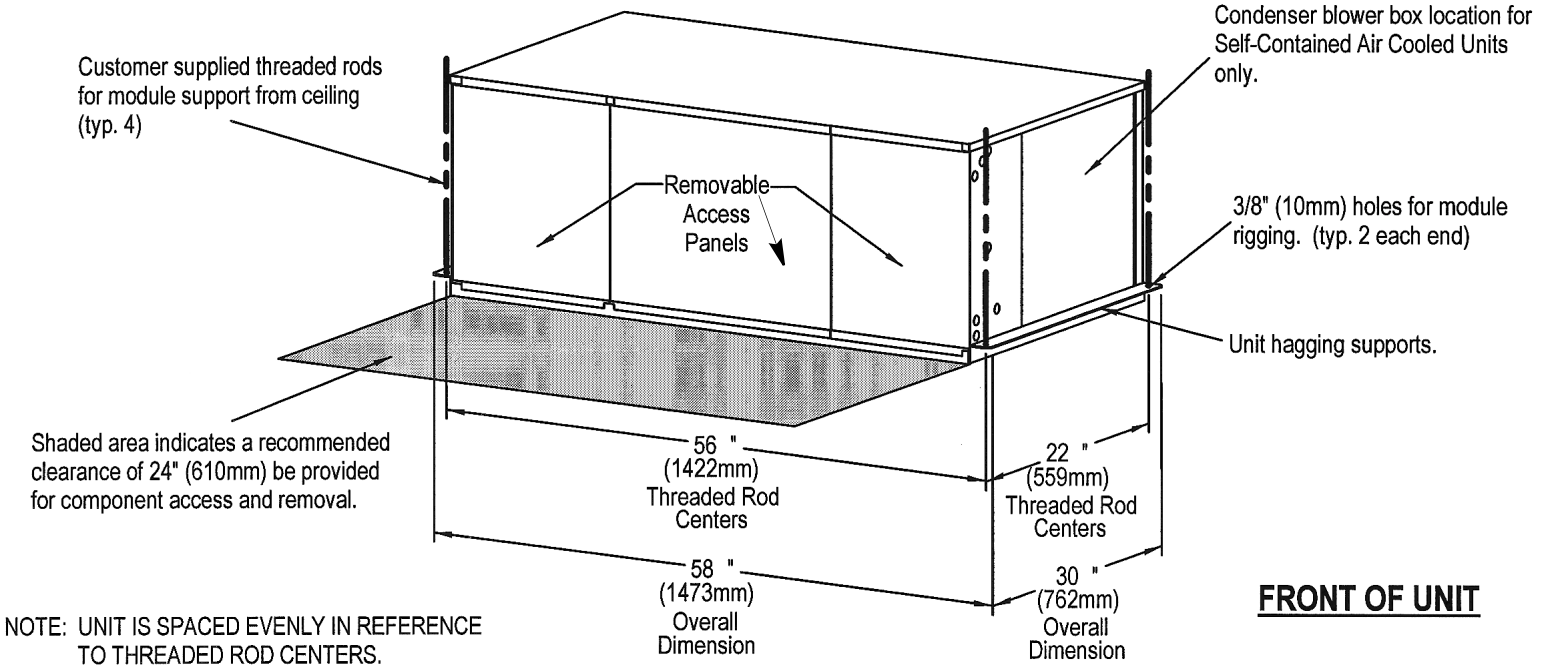
Capacity Correction Factors (based on 10°F water rise)				
	72°F/50%		75°F/50%	
EWT	TCC	SCC	TCC	SCC
42°F	1.31	1.21	1.18	1.09
43°F	1.22	1.16	1.12	1.06
44°F	1.07	1.07	1.05	1.03
45°F	1.00	1.00	1.00	1.00
46°F	0.93	0.93	0.92	0.96
47°F	0.86	0.86	0.84	0.91
48°F	0.79	0.79	0.75	0.83
49°F	0.71	0.71	0.70	0.78

Chilled Water System Data, 50 Hz

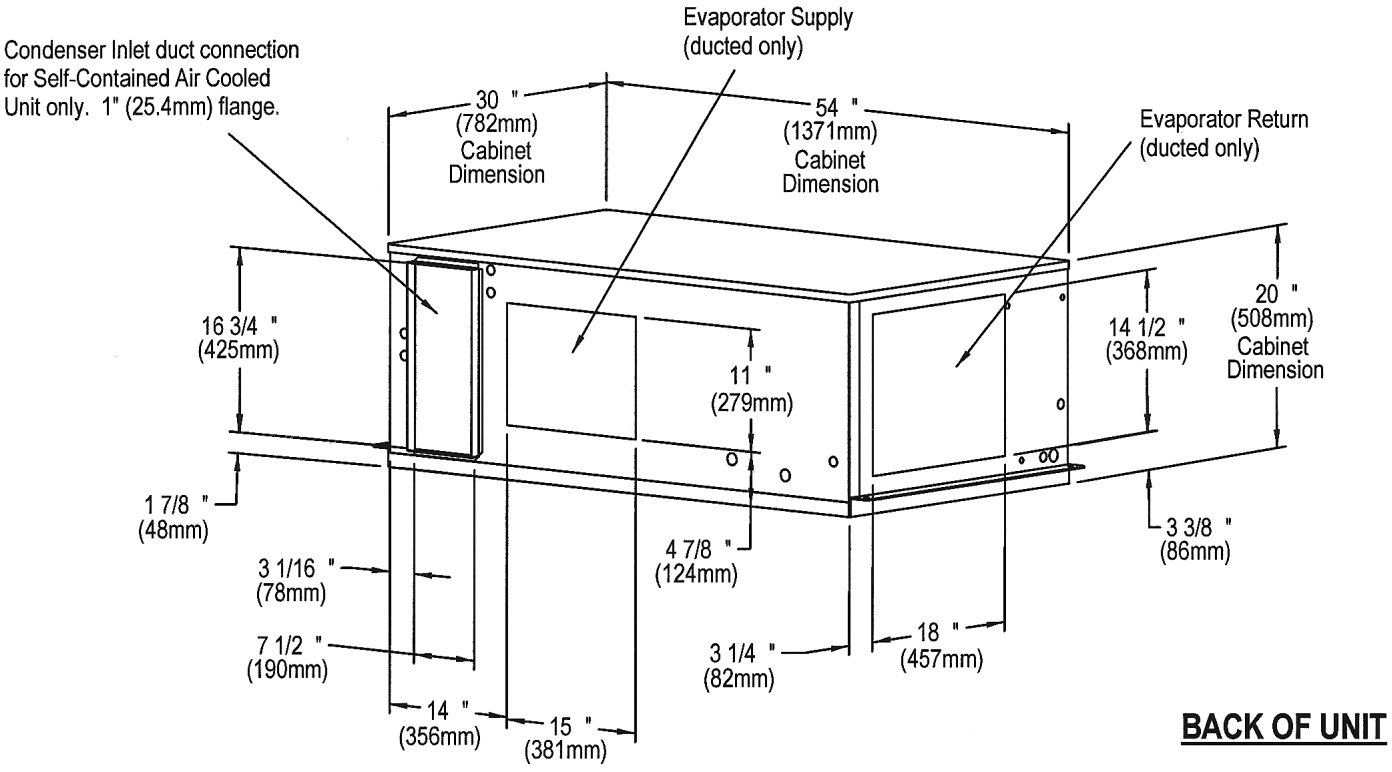
Model Number		MMD22C	
Nominal Tons		**1.5-ton**	
Cabinet Type		**Self-Contained**	
Capacity Data - BTUH (kW) High Fan Speed			(metric)
80°F (26.7°C) DB	Total	21600	(6.3)
50% RH	Sensible	17300	(5.1)
Flow Rate - GPM (l/m)		4.3	(16.3)
Pressure Drop - PSI (kPa)		8.0	(54.9)
75°F (23.9°C) DB	Total	15700	(4.6)
50% RH	Sensible	14900	(4.4)
Flow Rate - GPM (l/m)		3.1	(11.7)
Pressure Drop - PSI (kPa)		4.2	(29.2)
72°F (22.2°C) DB	Total	13100	(3.8)
50% RH	Sensible	13000	(3.8)
Flow Rate - GPM (l/m)		2.6	(9.8)
Pressure Drop - PSI (kPa)		3.1	(21.2)
Capacity Data - BTUH (kW) Low Fan Speed			
80°F (26.7°C) DB	Total	18600	(5.4)
50% RH	Sensible	14500	(4.2)
Flow Rate - GPM (l/m)		3.7	(14.0)
Pressure Drop - PSI (kPa)		5.9	(40.9)
75°F (23.9°C) DB	Total	13400	(3.9)
50% RH	Sensible	12400	(3.6)
Flow Rate - GPM (l/m)		2.7	(10.2)
Pressure Drop - PSI (kPa)		3.2	(22.1)
72°F (22.2°C) DB	Total	11200	(3.3)
50% RH	Sensible	11100	(3.3)
Flow Rate - GPM (l/m)		2.2	(8.3)
Pressure Drop - PSI (kPa)		2.3	(15.5)
Fan Data - Direct Drive			
High Speed CFM (CMH)		750	(1274)
Low Speed CFM (CMH)		600	(1019)
External Static Pressure, in. (mm)		0.3	(8)
Fan Motor Hp (W)		0.2	(0.15)
Evaporator Coil - Copper Tube/Aluminum Fin			
Face Area ft^2 (m^2)		2.44	(0.23)
Coil Rows		2	
Max Face Velocity-fpm (m/s)		293	(1.49)
Electric Reheat Data (Includes Fan Motor)			
Capacity - BTUH (kW) @240V		14875	(4.4)
Hot Water Reheat Data (based on 180°F Water)			
Capacity - BTUH (kW)		40000	(11.7)
Flow Rate - GPM (l/m)		1.5	(5.7)
Pressure Drop - ft (kPa)		1.0	(3.0)
Humidifier Data - Steam Generator Type			
Capacity - lbs/hr (kg/hr)		2.5	(1.14)
kW		0.88	
Connection Sizes			
Chilled Water Supply, NPT Female		1/2”	
Chilled Water Return, NPT Female		1/2”	
Humidifier Supply		1/4”	
Evaporator Drain		3/4”	
Operating Weight, lbs (kg)		220	(99.9)
Filter Dimensions, Grille, qty 1, 20" x 20" x 1" (508mm x 508mm x 25mm)			
Filter Dimensions, Ducted, qty 1, 20" x 16" x 1" (508mm x 406 mm x 25 mm)			

Capacity Correction Factors (based on 10° F water rise)				
	72°F/50%		75°F/50%	
EWT	TCC	SCC	TCC	SCC
42°F	1.31	1.21	1.18	1.09
43°F	1.22	1.16	1.12	1.06
44°F	1.07	1.07	1.05	1.03
45°F	1.00	1.00	1.00	1.00
46°F	0.93	0.93	0.92	0.96
47°F	0.86	0.86	0.84	0.91
48°F	0.79	0.79	0.75	0.83
49°F	0.71	0.71	0.70	0.78

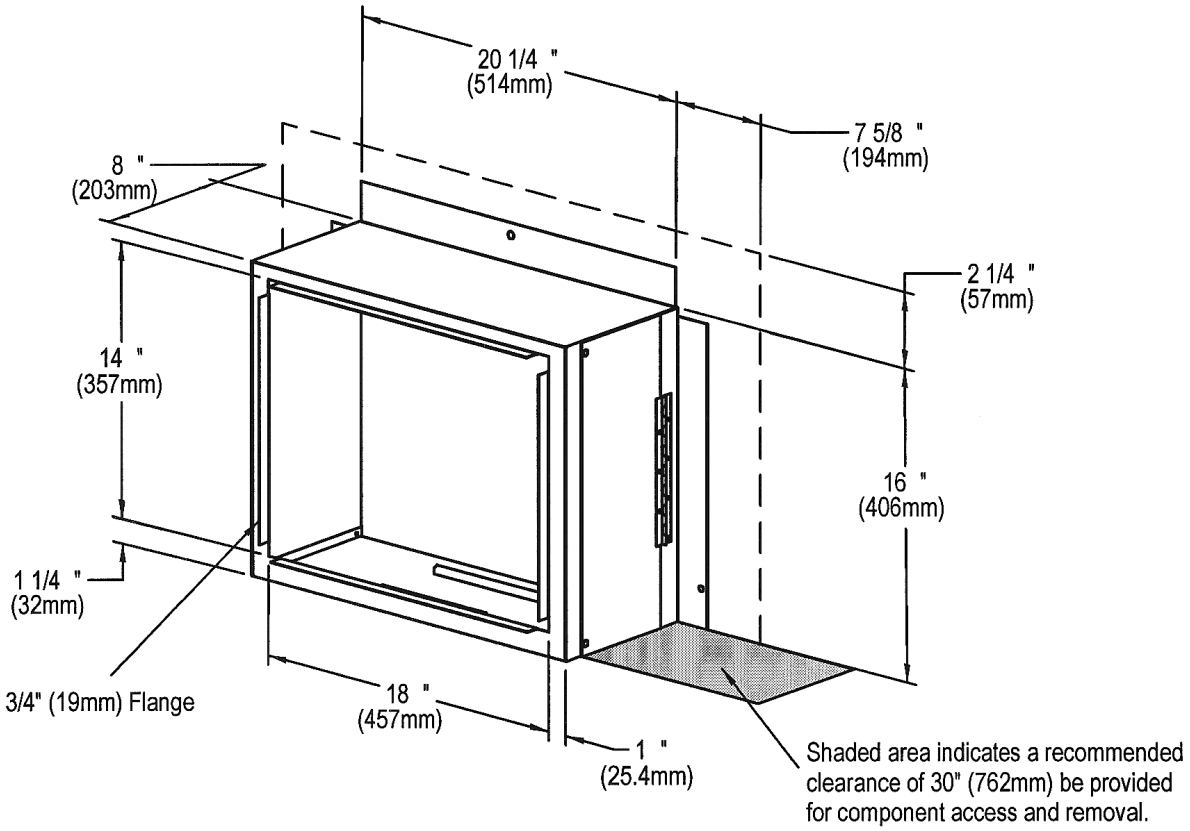
DIMENSIONAL DATA
AIR, WATER, GLYCOL AND CHILLED WATER
1- AND 1.5-TON MINI-MATE2



NOTE: UNIT IS SPACED EVENLY IN REFERENCE TO THREADED ROD CENTERS.

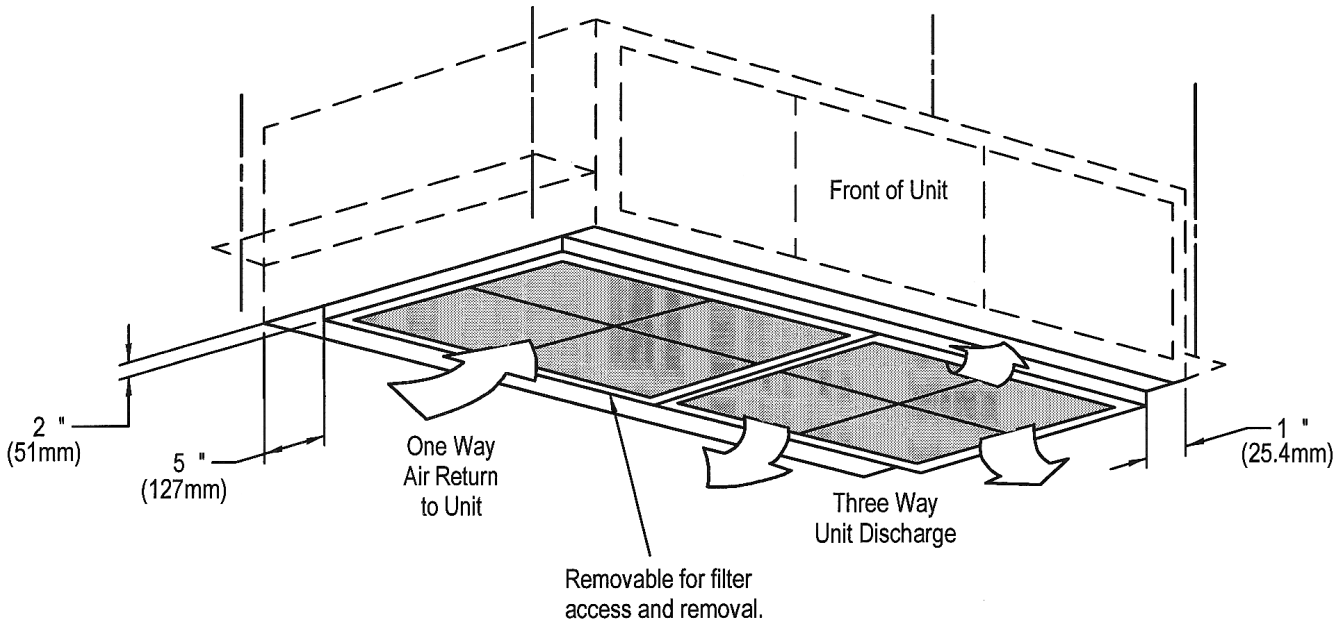


FILTER BOX AND GRILLE DIMENSIONAL DATA 1- AND 1.5-TON MINI-MATE2

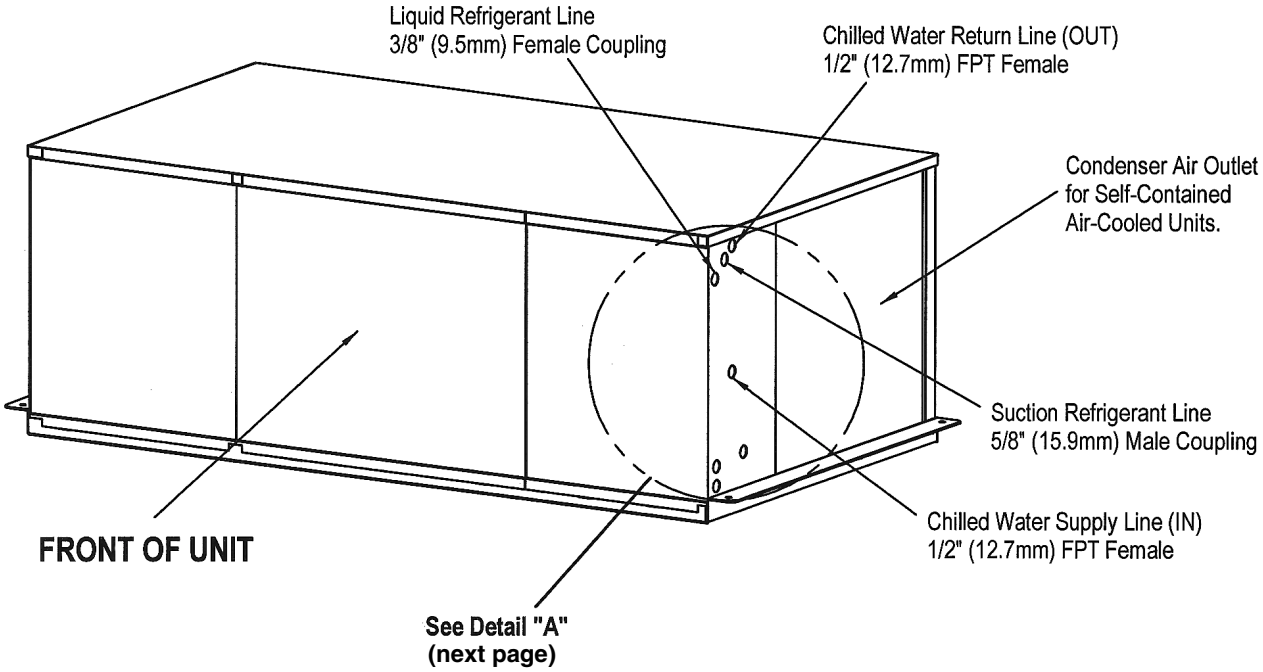


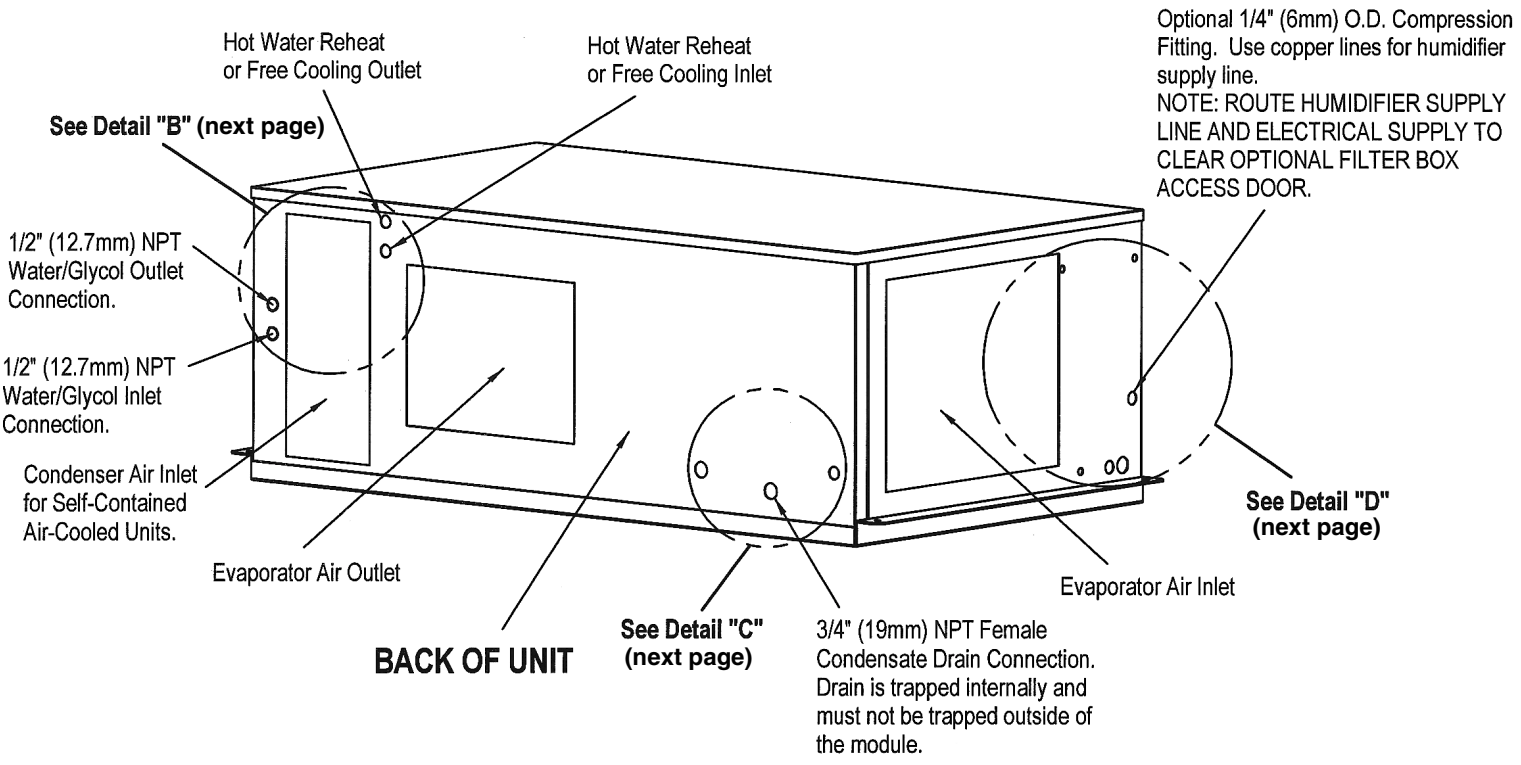
(OPTIONAL) FILTER BOX DIMENSIONAL DATA

NOTE: Drawing below is not to scale.

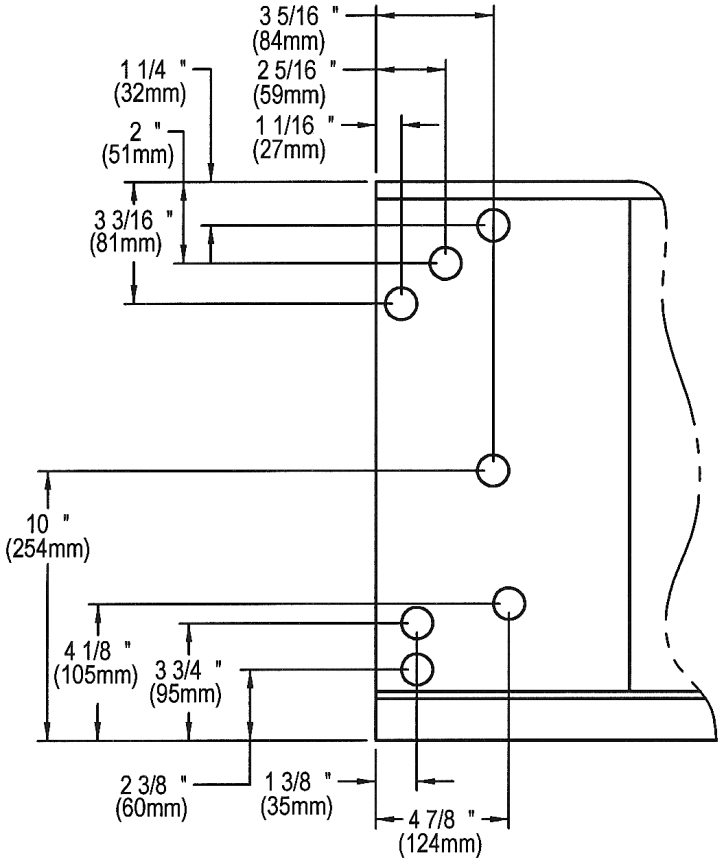


PIPING CONNECTION DATA
AIR, WATER, GLYCOL & CHILLED WATER
1- AND 1.5-TON MINI-MATE2

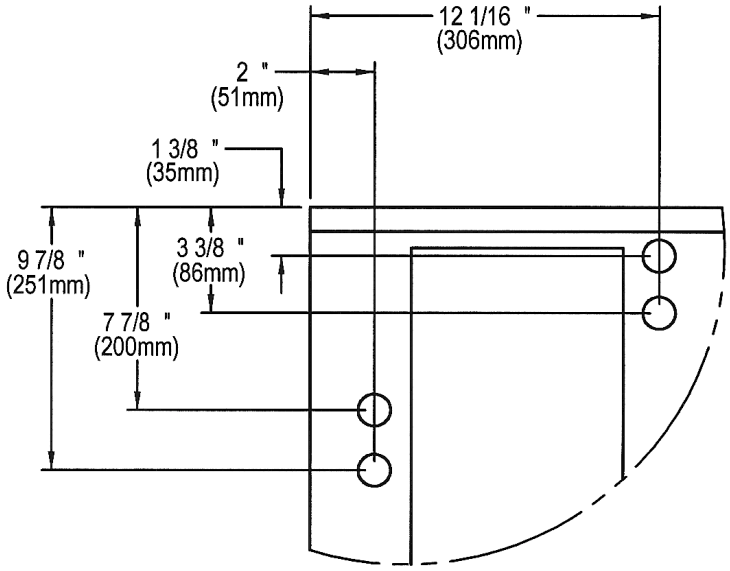




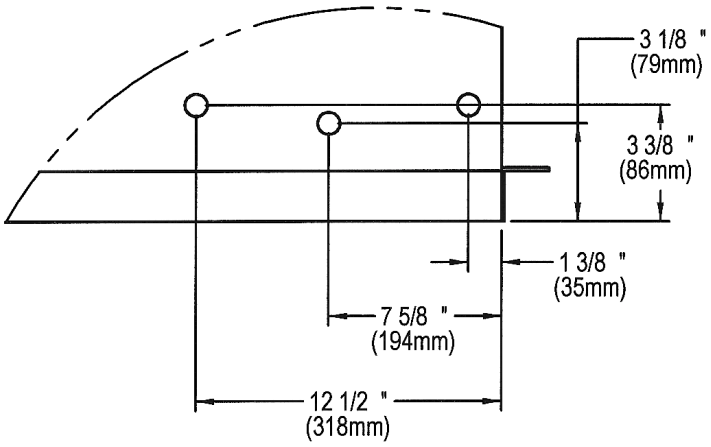
1- AND 1.5-TON MINI-MATE2
PIPING CONNECTION LOCATIONS
AIR, WATER, GLYCOL & CHILLED WATER



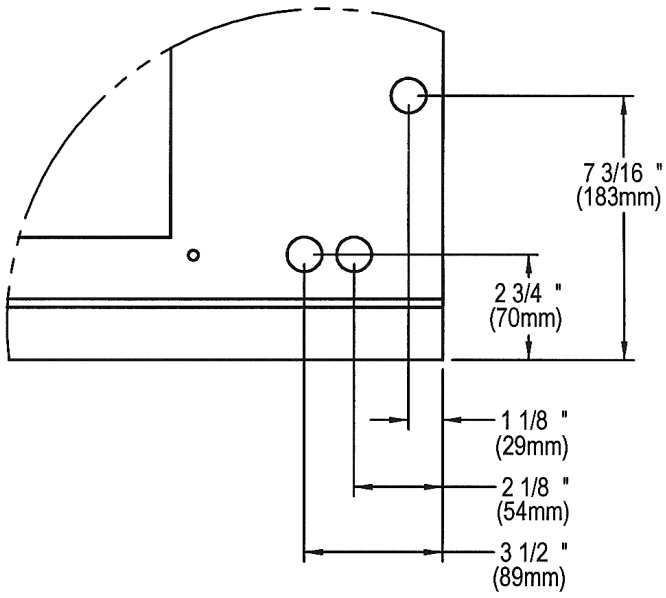
DETAIL "A"



DETAIL "B"

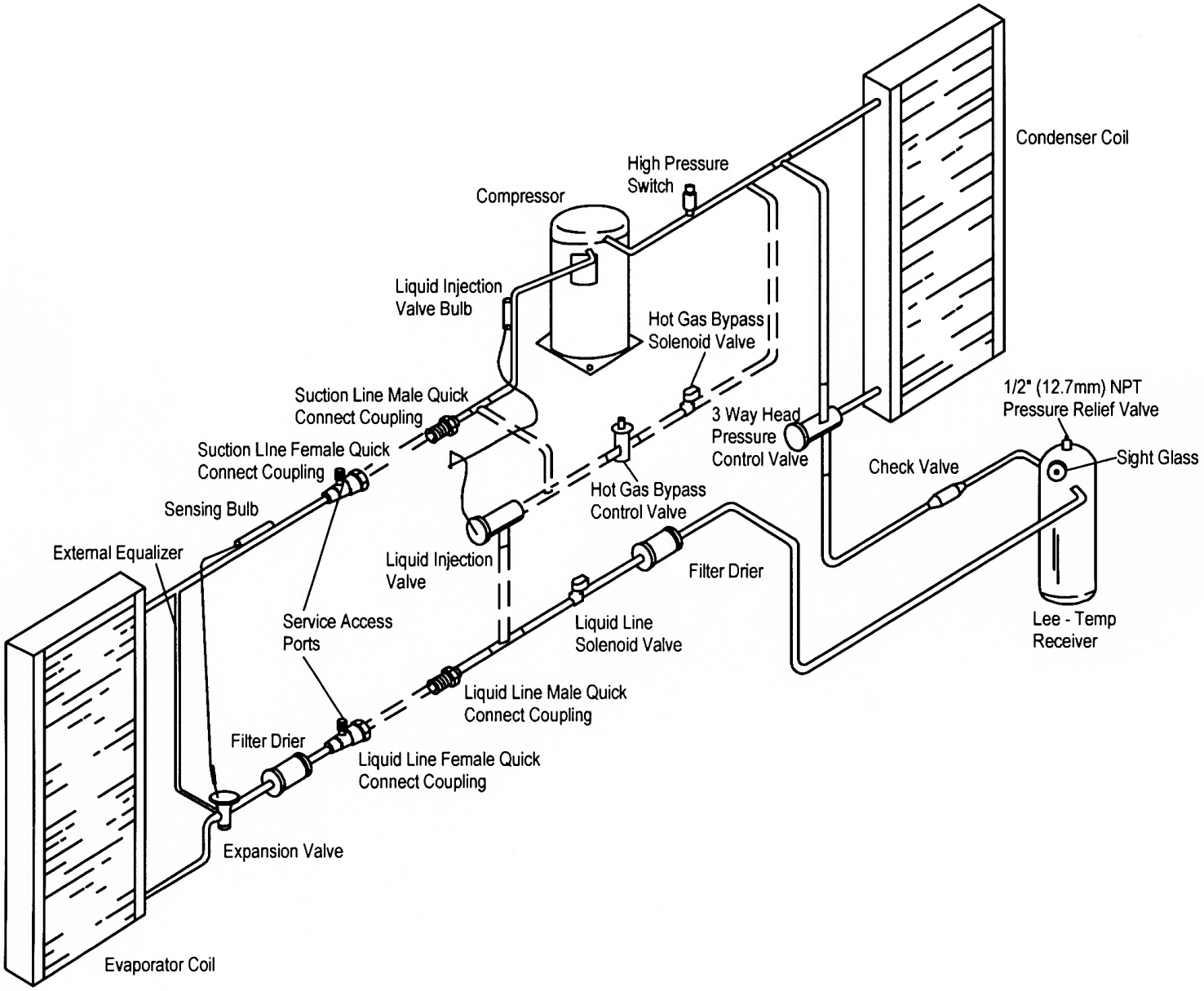


DETAIL "C"



DETAIL "D"

SPLIT SYSTEMS WITH OUTDOOR AIR-COOLED CONDENSING UNIT
GENERAL ARRANGEMENT DIAGRAM
1- AND 1.5-TON MINI-MATE2

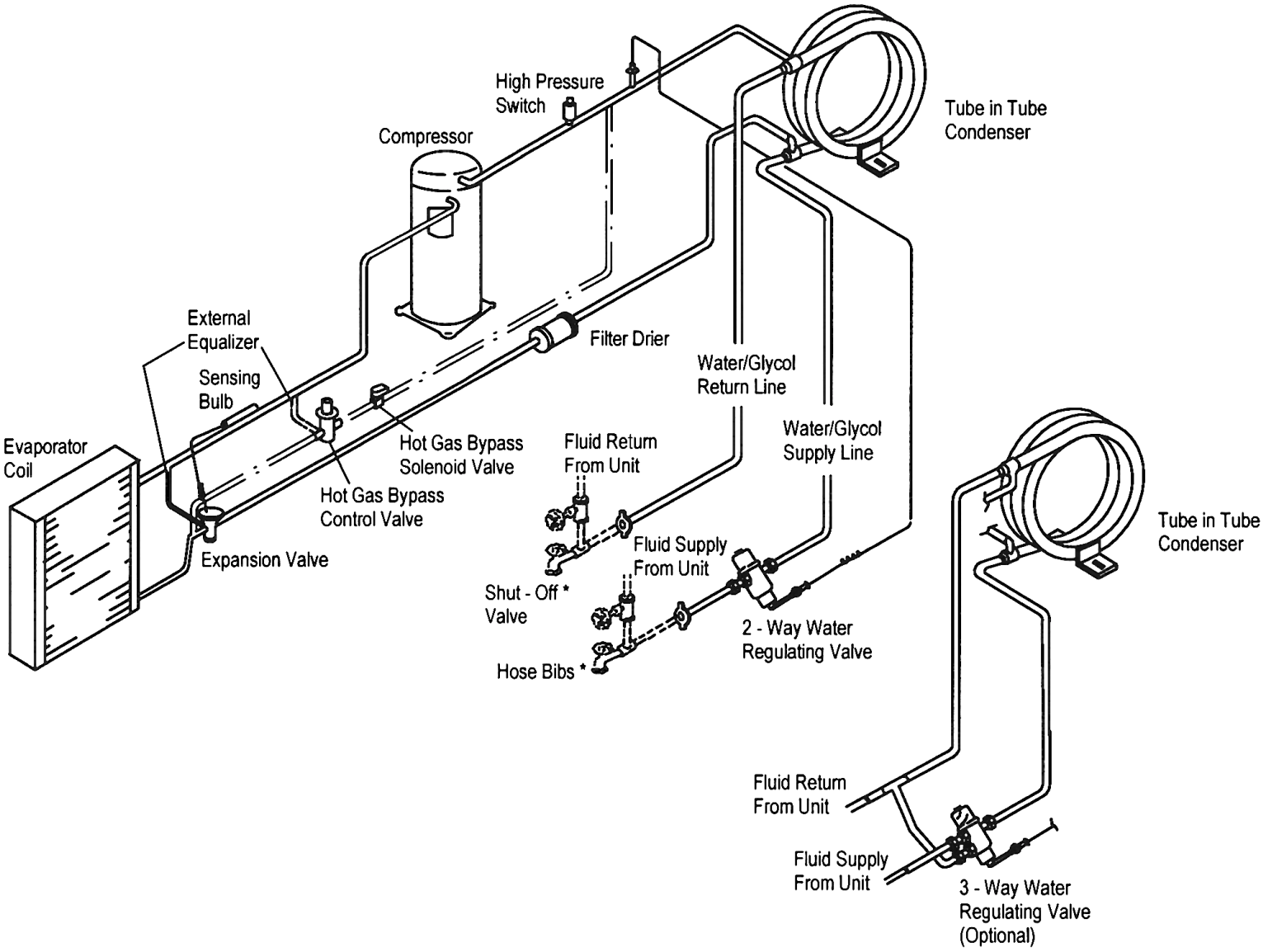


OPTIONAL PIPING

FACTORY PIPING

* Field piping refers to the use of hard piping using sweat adapter kit or precharged line set.

SELF-CONTAINED WATER/GLYCOL SYSTEM
GENERAL ARRANGEMENT DIAGRAM
1- AND 1.5-TON MINI-MATE2



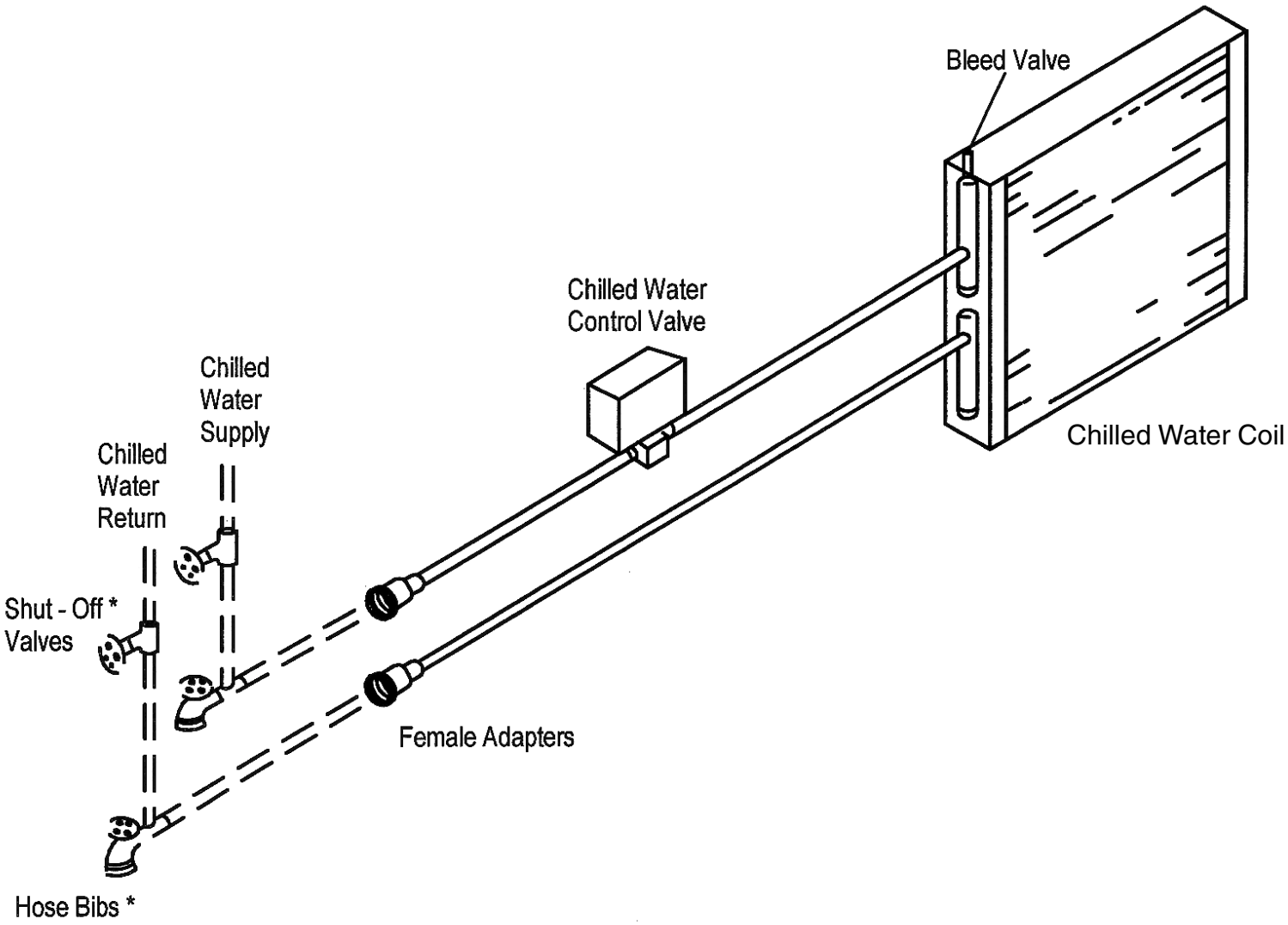
OPTIONAL PIPING

FIELD PIPING

FACTORY PIPING

* Components are not supplied by Liebert but are recommended for proper circuit operation and maintenance.

SELF-CONTAINED CHILLED-WATER SYSTEM
GENERAL ARRANGEMENT DIAGRAM
1- AND 1.5-TON MINI-MATE2

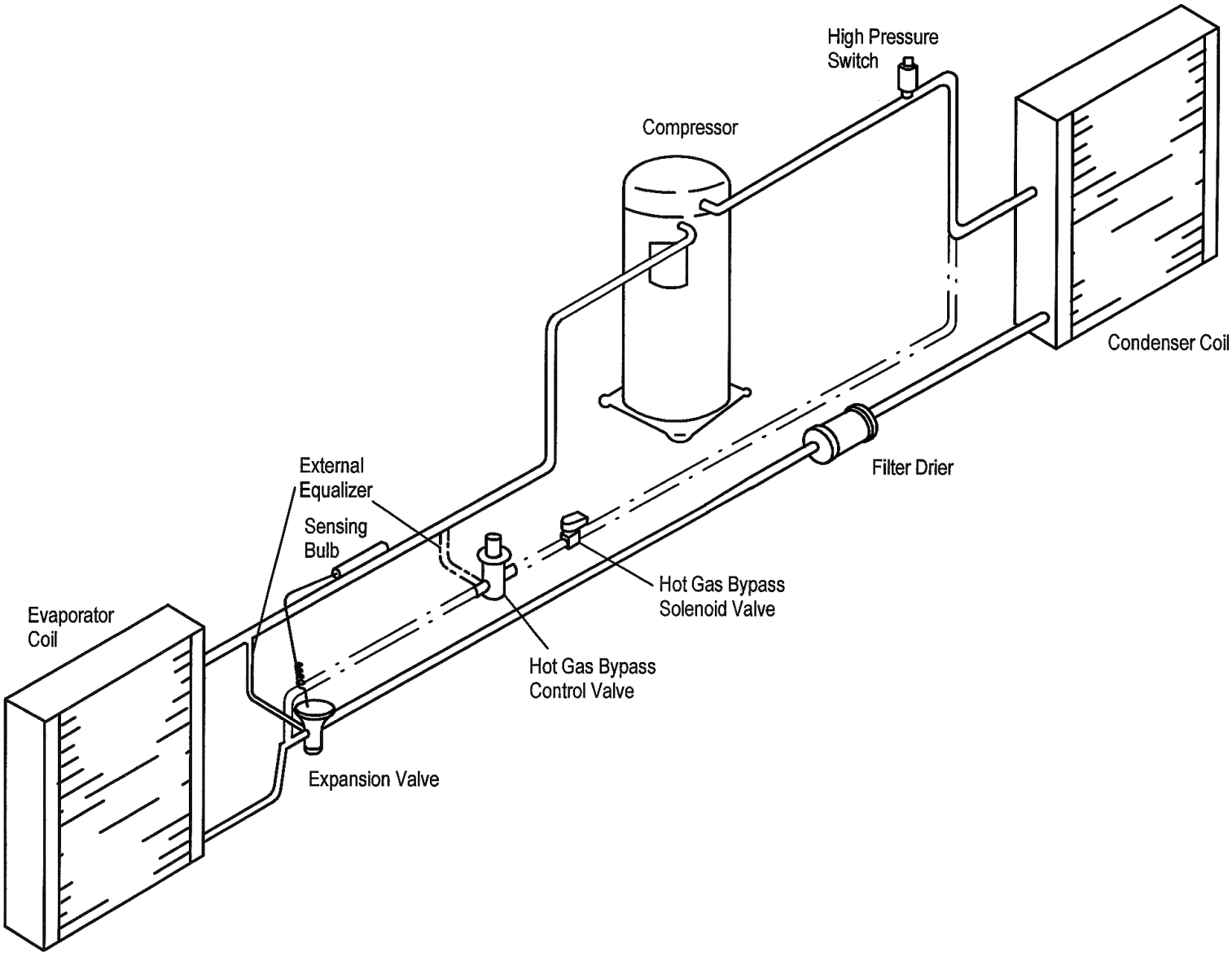


FIELD PIPING

FACTORY PIPING

*** Components not supplied by Liebert, but are recommended for proper circuit operation and maintenance.**

SELF-CONTAINED AIR-COOLED SYSTEM
GENERAL ARRANGEMENT DIAGRAM
1- AND 1.5-TON MINI-MATE2

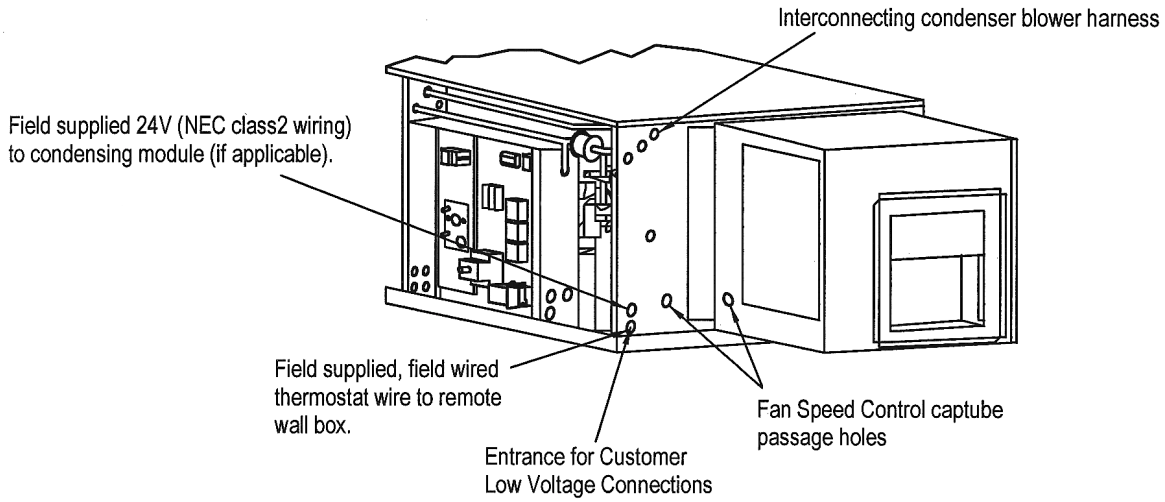


OPTIONAL PIPING

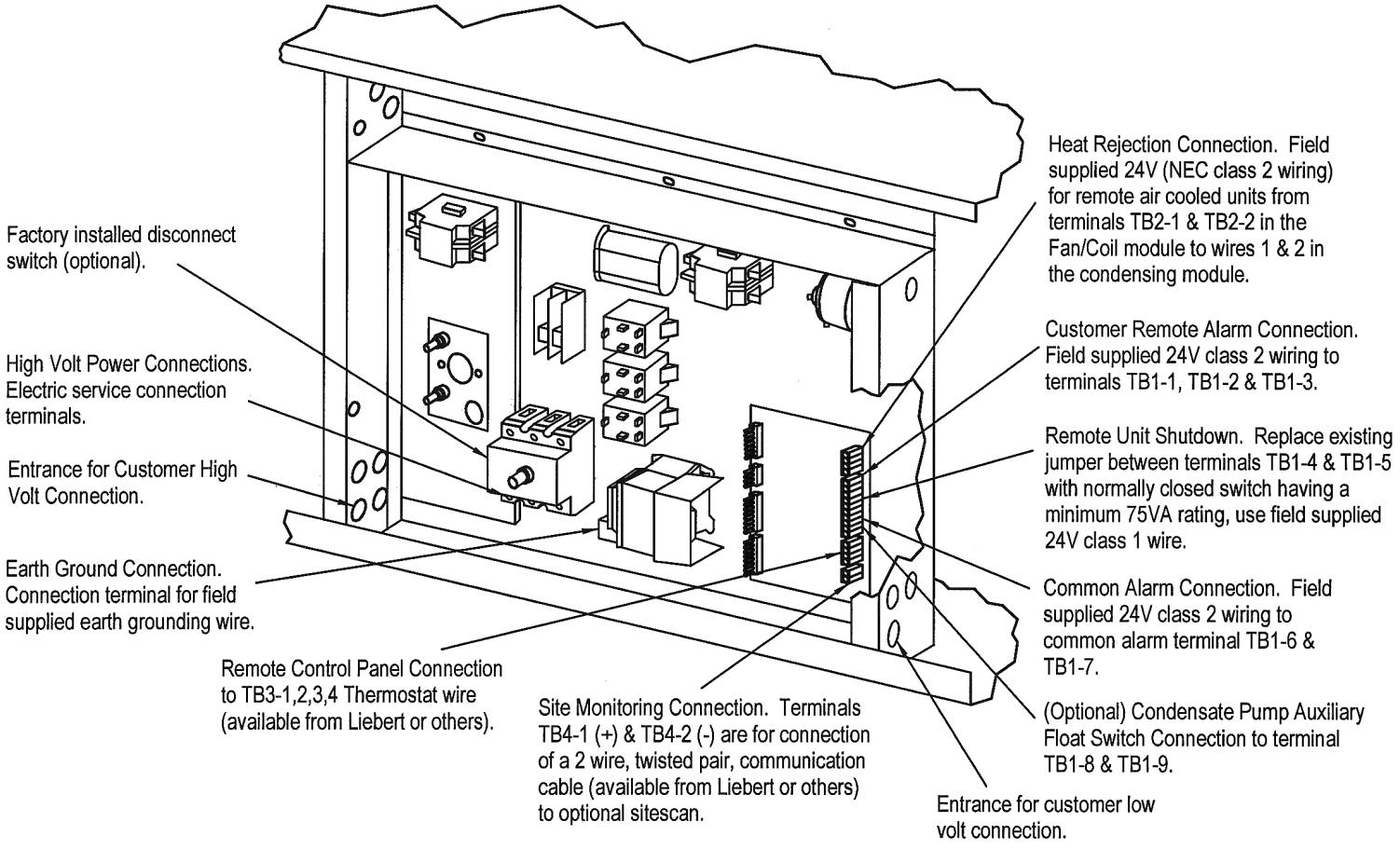
FACTORY PIPING

* Components are not supplied by Liebert but are recommended for proper circuit operation and maintenance.

ELECTRICAL FIELD CONNECTIONS
AIR, WATER, GLYCOL AND CHILLED WATER
1- AND 1.5-TON MINI-MATE2

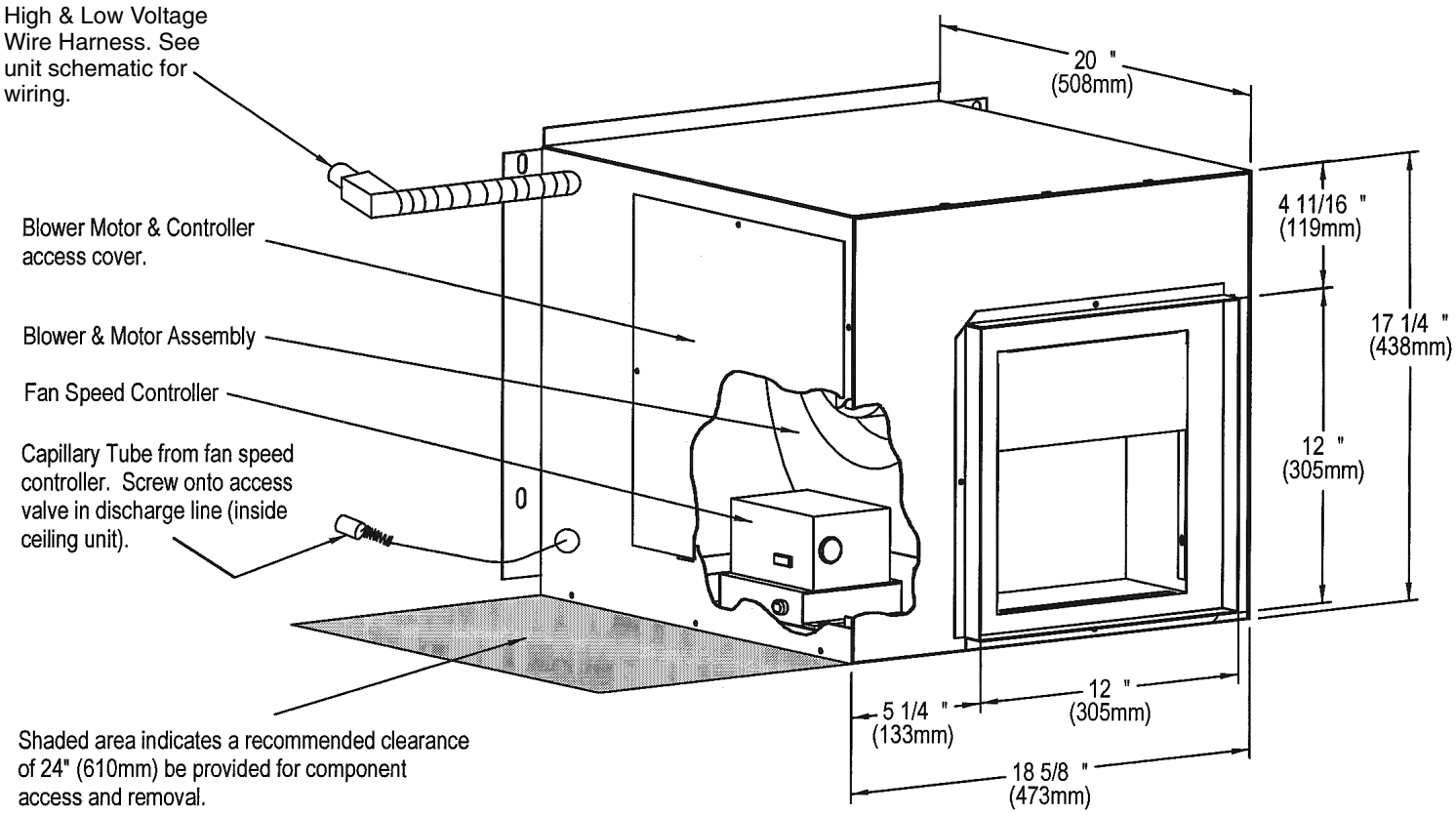


RIGHT END

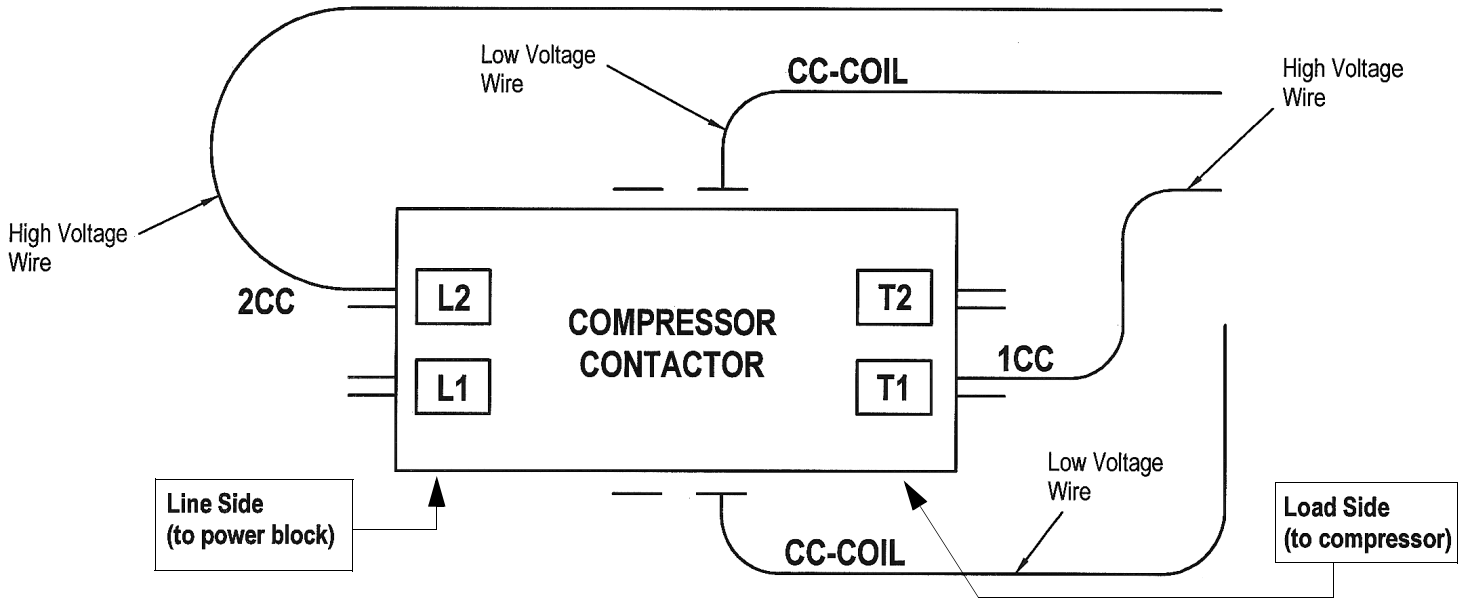


NOTE: Refer to specification sheet for full load amp and wire size amp ratings.

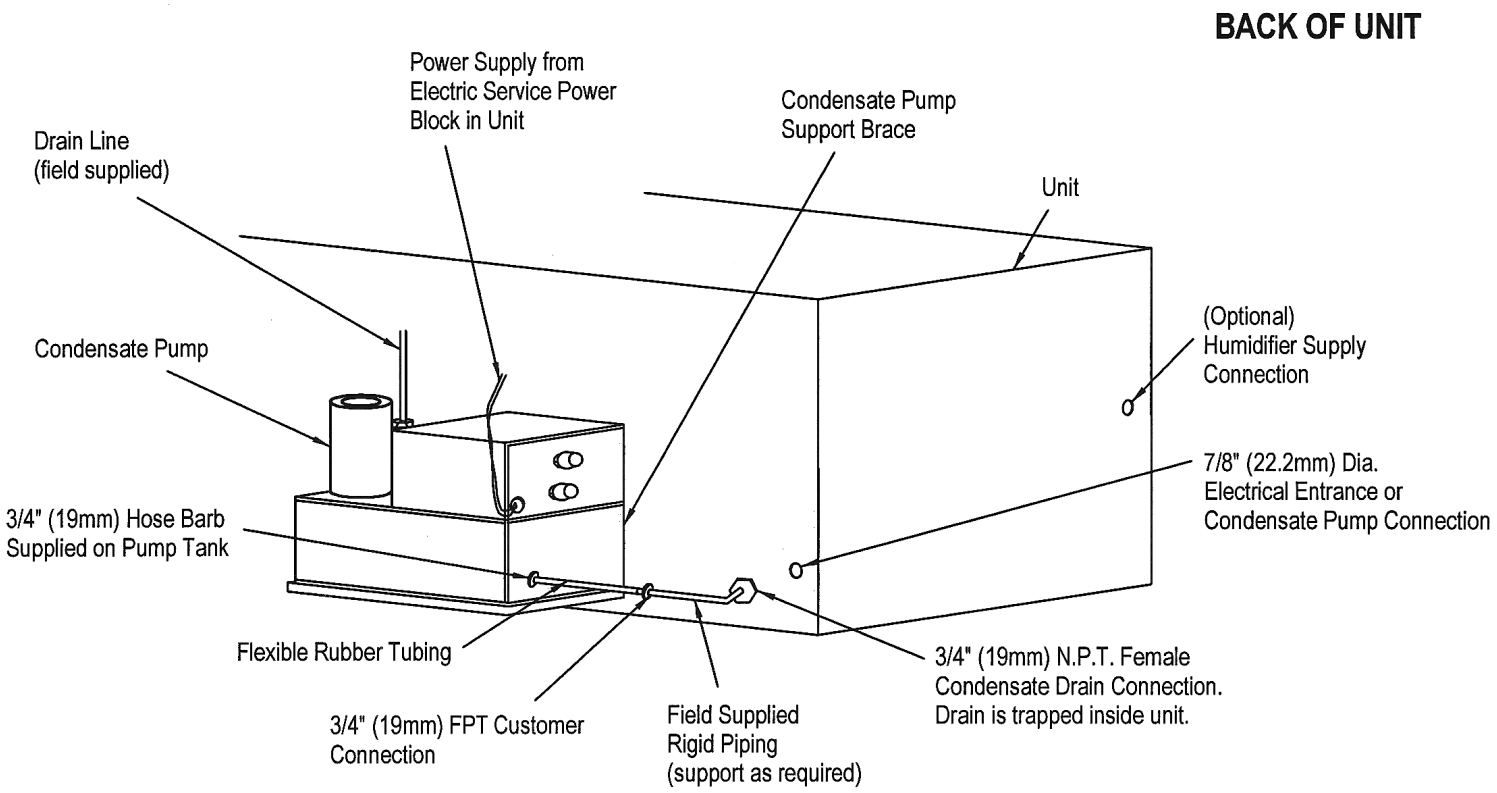
DIMENSIONS & ELECTRICAL FIELD CONNECTIONS
MM2CF CONDENSER FAN MODULE
1- AND 1.5-TON MINI-MATE2



WIRING CONNECTIONS INSIDE CEILING UNIT ELECTRIC BOX



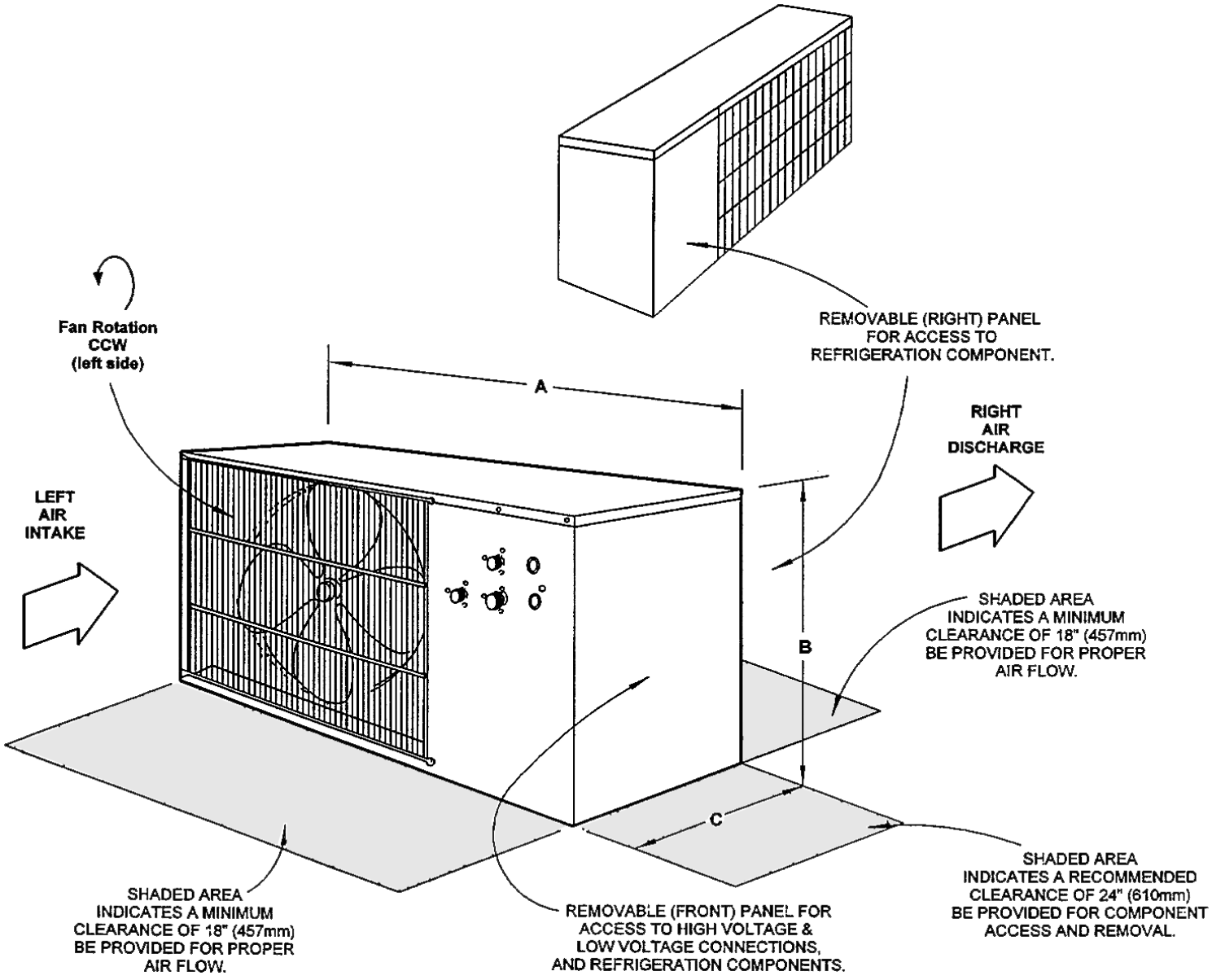
CONDENSATE PUMP CONNECTION
(OPTIONAL FIELD INSTALLED)
1- AND 1.5-TON MINI-MATE2



NOTE:
3/4" (19mm) Flexible Rubber Tubing Assembly (supply with pump kit) must be installed on pump end of rigid piping (support as required).

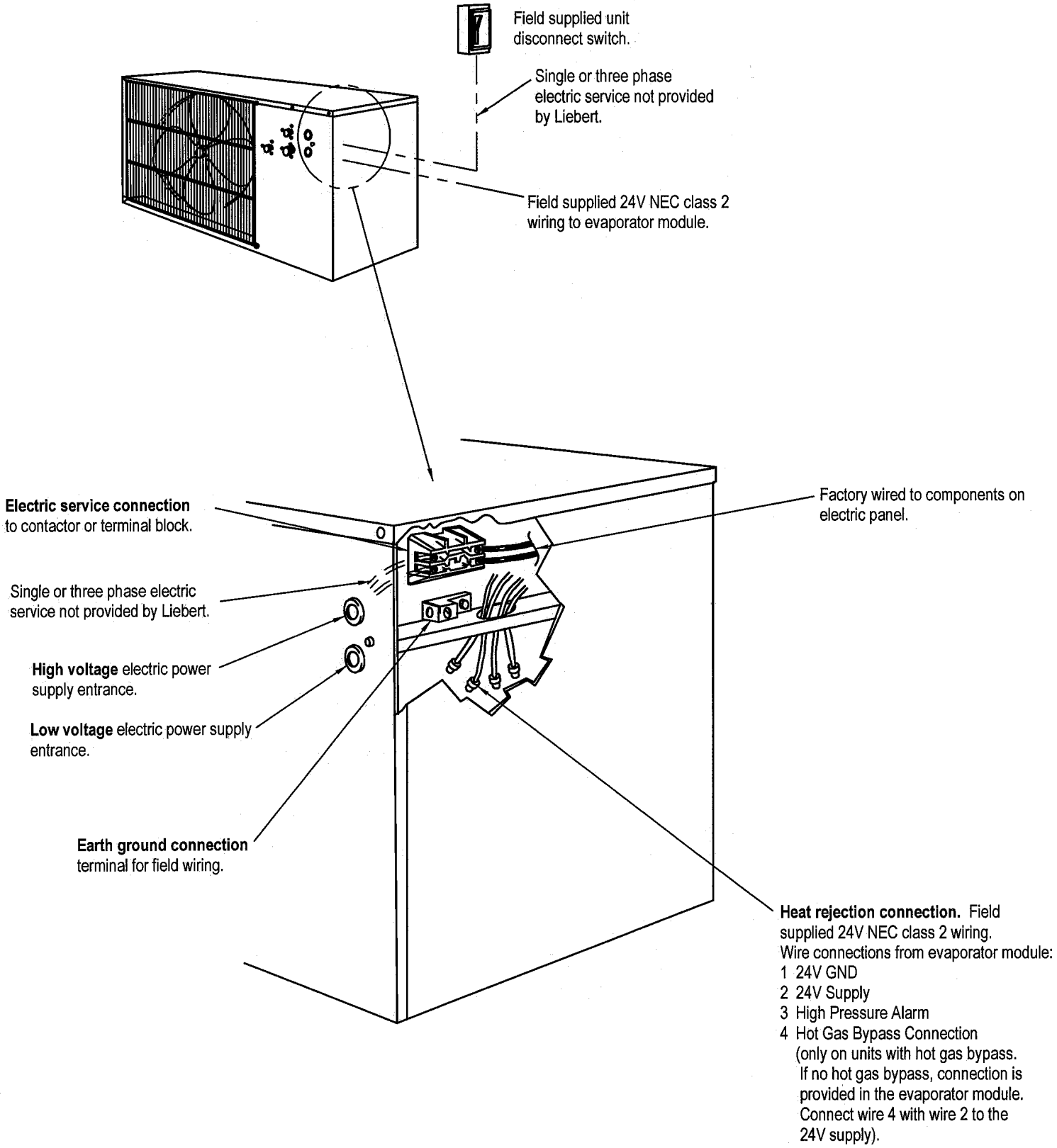
(OPTIONAL FIELD INSTALLED) CONDENSATE PUMP

DIMENSIONAL DATA
1- AND 1.5-TON PROP FAN
CONDENSING UNIT



Model Numbers		Dimensional Data In. (mm)			Module Weight lbs (kg) net
60 Hz	50 Hz	A	B	C	
PFC014A-L	PFC013A-L	40 (1016)	23-1/2 (597)	18 (457)	200 (91)
PFH014A-L					
PFC020A-L	PFC019A-L				
PFH020A-L					

ELECTRICAL FIELD CONNECTIONS
1- AND 1.5-TON PROP FAN
CONDENSING UNIT



NOTE: Refer to specification sheet for full load amp and wire size amp ratings

Self-Contained Air-Cooled System Electrical Data

Base Model Number	208/230V, 1ph, 60 Hz		277V, 1ph, 60 Hz		220/240V, 1ph, 50 Hz	
	MM*12A	MM*18A	MM*12A	MM*18A	MM*11A	MM*17A
Cooling Only						
FLA	8.7	12.8	7.5	12.9	8.9	13.0
WSA	10.0	15.1	8.7	15.4	10.3	15.4
OPD	15	20	15	25	N/A	N/A
with Electric Reheat						
FLA	27.5	37.8	23.8	29.2	27.7	38.0
WSA	33.5	46.4	29.0	35.8	33.8	46.7
OPD	35	50	30	40	N/A	N/A
with SCR Reheat						
FLA	27.5	37.8	23.8	29.2	27.7	38.0
WSA	33.5	46.4	29.0	35.8	33.8	46.7
OPD	35	50	30	40	N/A	N/A
with Humidifier						
FLA	13.5	17.6	11.1	16.5	13.5	17.6
WSA	14.8	19.9	12.3	19.0	14.9	20.0
OPD	20	25	15	25	N/A	N/A
with Electric Reheat and Humidifier						
FLA	27.5	37.8	23.8	29.2	27.7	38.0
WSA	33.5	46.4	29.0	35.8	33.8	46.7
OPD	35	50	30	40	N/A	N/A
with SCR Reheat and Humidifier						
FLA	32.3	42.6	27.4	32.8	32.3	42.6
WSA	38.3	51.2	32.6	39.4	38.4	51.3
OPD	40	60	35	45	N/A	N/A

1. Electrical values are not impacted by Hot Water Reheat, Hot Gas Reheat, and Free-cooling options
2. FLA = Full Load Amps, WSA = Wire Size Amps, OPD = Maximum Overcurrent Protection Device
3. * = specify "D" for disconnect, “0” for no disconnect.
4. Self-contained air-cooled units include MM2CF blower box.

Self-Contained Water/Glycol Cooled System Electrical Data

Base Model Number	208/230V, 1ph, 60 Hz		277V, 1ph, 60 Hz		220/240V, 1ph, 50 Hz	
	MM*14W	MM*20W	MM*14W	MM*20W	MM*13W	MM*19W
Cooling Only						
FLA	6.6	10.7	6.0	11.4	6.9	11.0
WSA	7.9	13.0	7.2	13.9	8.3	13.4
OPD	15	20	15	20	N/A	N/A
With Electric Reheat						
FLA	25.4	35.7	22.3	27.7	25.7	36.0
WSA	31.4	44.3	27.5	34.3	31.8	44.7
OPD	35	45	30	40	N/A	N/A
With SCR Reheat						
FLA	25.4	35.7	22.3	27.7	25.7	36.0
WSA	31.4	44.3	27.5	34.3	31.8	44.7
OPD	35	45	30	40	N/A	N/A
With Humidifier						
FLA	11.4	15.5	9.6	15.0	11.5	15.6
WSA	12.7	17.8	10.8	17.5	12.9	18.0
OPD	15	25	15	25	N/A	N/A
With Electric Reheat And Humidifier						
FLA	25.4	35.7	22.3	27.7	25.7	36.0
WSA	31.4	44.3	27.5	34.3	31.8	44.7
OPD	35	45	30	40	N/A	N/A
With SCR Reheat And Humidifier						
FLA	30.2	40.5	25.9	31.1	30.3	40.6
WSA	36.2	49.1	31.1	37.9	36.4	49.3
OPD	40	50	35	40	N/A	N/A

1. Electrical values are not impacted by hot water reheat, hot gas reheat, and Free-cooling options.
2. FLA = Full Load Amps, WSA = Wire Size Amps, OPD = Maximum Overcurrent Protection Device
3. * = specify “D” for disconnect, “0” for no disconnect.

Split-System Evaporator or Chilled Water Electrical Data

Base Evaporator Model Number	208/230V, 1ph, 60 Hz			277V, 1ph, 60 Hz			220/240V, 1ph, 50 Hz		
	MM*12E	MM*18E	MM*23C	MM*12E	MM*18E	MM*23C	MM*11E	MM*17E	MM*22C
Cooling Only									
FLA	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
WSA	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
OPD	15	15	15	15	15	15	N/A	N/A	N/A
With Electric Reheat									
FLA	20.2	26.4	26.4	17.7	17.7	17.7	20.2	26.4	26.4
WSA	25.3	33.0	33.0	22.1	22.1	22.1	25.3	33.0	33.0
OPD	30	35	35	25	25	25	N/A	N/A	N/A
With SCR Reheat									
FLA	20.2	26.4	26.4	17.7	17.7	17.7	20.2	26.4	26.4
WSA	25.3	33.0	33.0	22.1	22.1	22.1	25.3	33.0	33.0
OPD	30	35	35	25	25	25	N/A	N/A	N/A
With Humidifier									
FLA	6.2	6.2	6.2	5.0	5.0	5.0	6.0	6.0	6.0
WSA	7.8	7.8	7.8	6.3	6.3	6.3	7.5	7.5	7.5
OPD	15	15	15	15	15	15	N/A	N/A	N/A
With Electric Reheat and Humidifier									
FLA	25.0	31.2	31.2	21.3	21.3	21.3	24.8	31.0	31.0
WSA	31.3	39.0	39.0	26.6	26.6	26.6	31.0	38.8	38.8
OPD	35	40	40	30	30	30	N/A	N/A	N/A
With SCR Reheat and Humidifier									
FLA	25.0	31.2	31.2	21.3	21.3	21.3	24.8	31.0	31.0
WSA	31.3	39.0	39.0	26.6	26.6	26.6	31.0	38.8	38.8
OPD	35	40	40	30	30	30	N/A	N/A	N/A

1. Electrical values are not impacted by Hot Water Reheat, Hot Gas Reheat, and Free-cooling options
2. FLA = Full Load Amps, WSA = Wire Size Amps, OPD = Maximum Overcurrent Protection Device.
3. * = specify “D” for disconnect, “0” for no disconnect.

Outdoor Prop Fan Condensing Unit Electrical Data

Model	60 Hz		50 Hz	
	PFC014A	PFC020A	PFC013A	PFC019A
Voltage	208/230-1-60	208/230-1-60	200/240-1-50	200/240-1-50
FLA	8.5	11.4	8.2	10.9
WSA	10.6	13.9	9.9	13.3
OPD	15	20	N/A	N/A

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

Recommended Refrigerant Line Sizes

Equivalent Feet	Circuit	Liquid Line	Suction Line
50 feet		3/8" O.D.	5/8" O.D.
100 feet		3/8" O.D.	7/8" O.D.
150 feet		3/8" O.D.	7/8" O.D.

Line Charges, R-22, lbs/100 ft

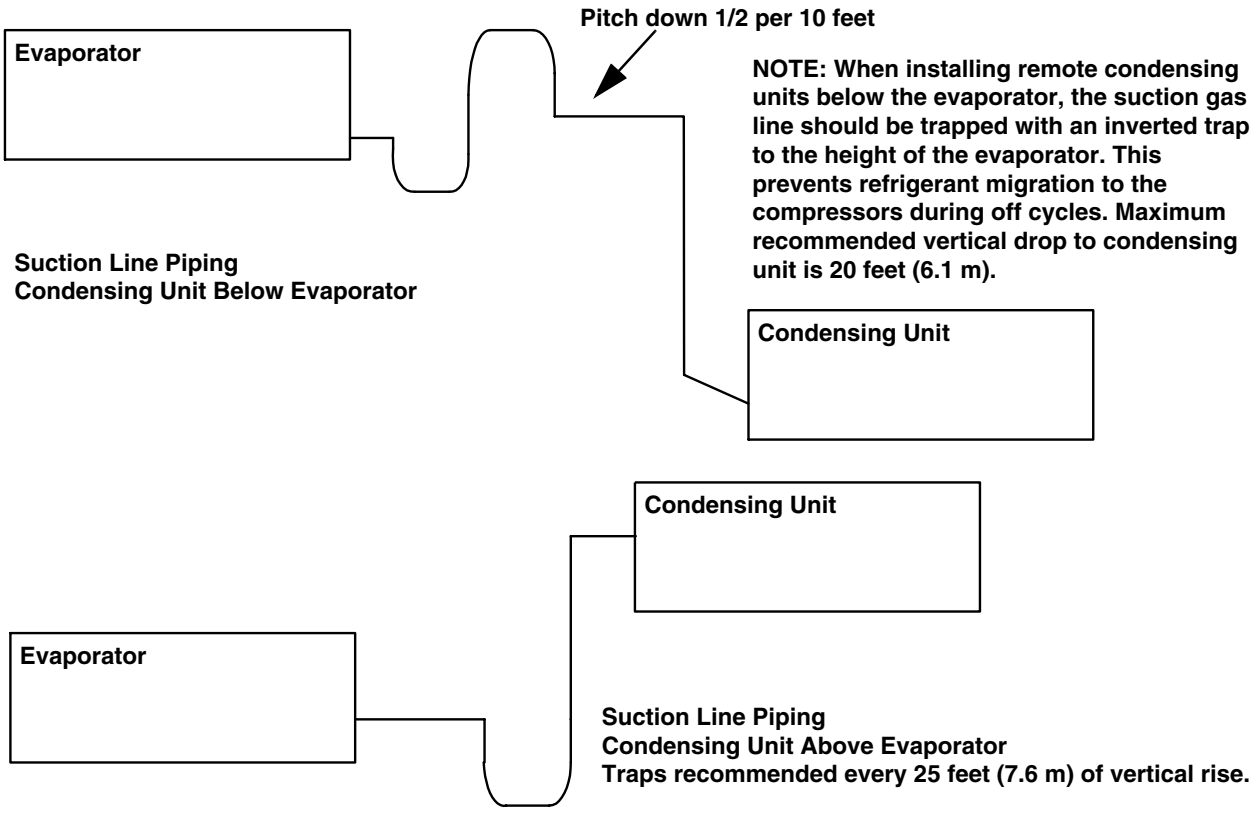
O.D.	Liquid Line	Suction Line
3/8"	3.9	0.1
1/2	7.3	0.2
5/8"	11.7	0.3
7/8"	24.4	0.7
1-1/8"	41.6	1.2
1-3/8"	N/A	1.9

Consult your Liebert representative for longer line lengths.

Evaporator and Condensing Units are pre-charged with R-22 refrigerant.

Use table above (**Line Charges, R-22, lbs/100 ft**) to determine charge to be added to refrigerant lines.

Suction Line Piping



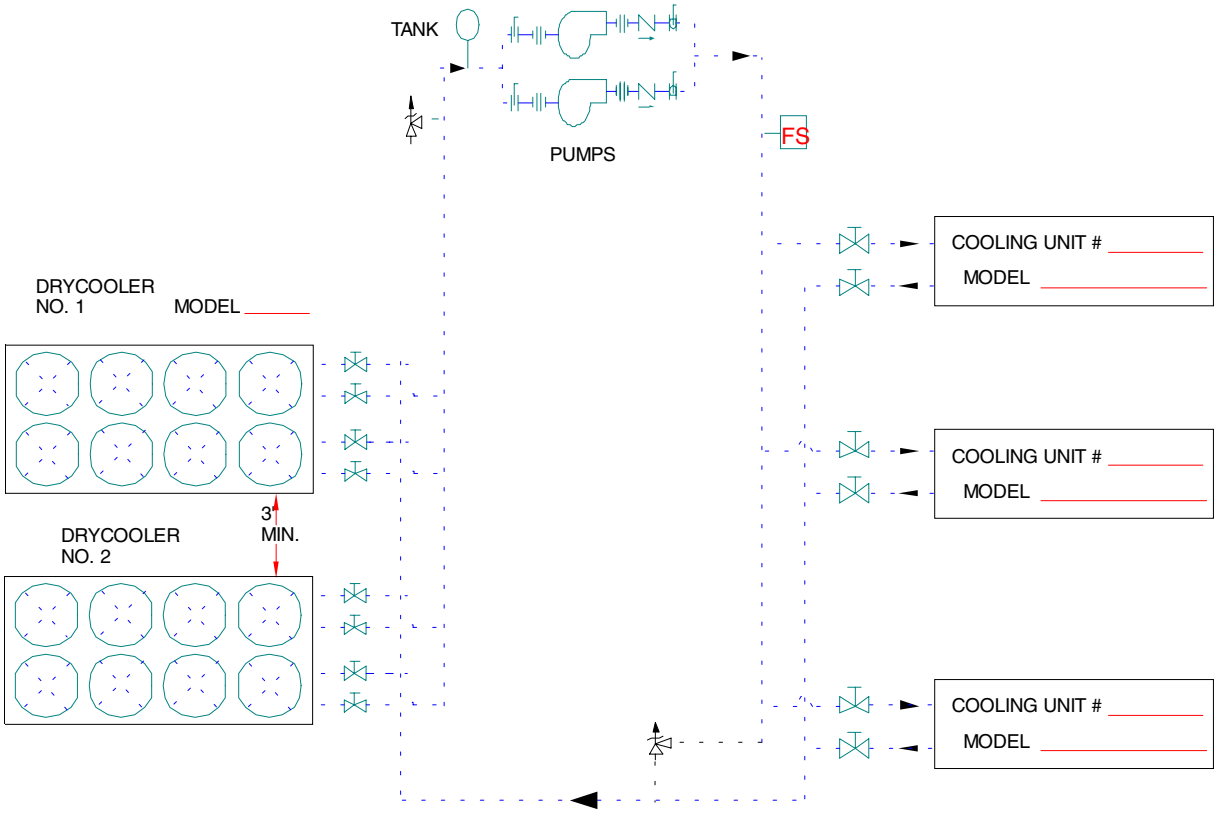
Outdoor Drycooler

Quantity	GPM	Ambient Temperature					
		95°F (35°C)		100°F (38°C)		105°F (40.6°C)	
		Model	PD-ft	Model	PD-ft	Model	PD-ft
1	5	D**033	3.0	D**033	3.0	D**069-4	5.3
2	10	D**069-4	17.0	D**069-6	8.4	D**139-8	4.4
3	15	D**092-6	16.6	D**109-8	10.1	D**197	2.5
4	20	D**109-8	16.8	D**174	3.4	D**225-16	5.4

Indoor Piggyback Drycooler

Quantity	GPM	Ambient Temperature					
		95°F (35°C)		100°F (38°C)		105°F (40.6°C)	
		Model	PD-ft	Model	PD-ft	Model	PD-ft
1	5	N/A	--	N/A	--	N/A	--
2	10	N/A	--	N/A	--	N/A	--
3	15	PD*102	2.7		PD*102	N/A	--

HEAT REJECTION LOOP



GUIDE SPECIFICATIONS FOR MINI-MATE2 1-TON OR 1.5-TON SYSTEMS

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 listing according to UL 1995.

The system model number shall be _____.

1.2 DESIGN REQUIREMENTS

The environmental control system shall be a Liebert Mini-Mate2 factory assembled unit. It shall be specifically designed for above-dropped-ceiling installation and serviceable from one side and bottom of the system.

Each system shall be capable of delivering ____CFM (____ CMH) at high fan speed to the air supply grille. The circulating-air fan shall be two speed for precise dehumidification control. The fan motor shall be 1/5 Hp (149 W).

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 with _____ 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, "Hi-Pot" Test (two times rated voltage plus 1000 volts, per UL 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 Cabinet and Frame Construction

The cabinet and chassis shall be constructed of heavy gauge galvanized steel and designed for easy installation and service access from one side and bottom of unit only (water cooled units require end access). Mounting holes shall be factory attached to the cabinet.

2.1.2 Air Distribution

The air distribution system shall be constructed with a direct-drive fan assembly equipped with double-inlet blower, self-aligning ball bearings, and lifetime lubrication. Fan motor shall be permanent-split capacitor, high efficiency type, equipped with two speeds for air flow modulation. Dehumidification shall utilize the lower fan speed. Air delivery shall be minimum ____ CFM (____ CMH) at high fan speed. For ducted applications air delivery shall be ____ CFM (____ CMH) at ____" external static pressure.

Supply and return grille (option)

A factory supplied supply and return grille kit shall be provided for supply and return air delivery through a 2' x 4' ceiling grid.

Filter box and duct kit (option)

A return air filter box shall be provided with hinged filter access, and 1" duct flange. A 1" duct flange shall also be provided for air discharge. Filters shall be _____% efficiency based on ASHRAE Dust Weight Arrestance Test.

2.1.3 Filters

The filters shall be rated not less than 20% efficiency based on ASHRAE Dust Weight Arrestance Test. They shall be removable without shutting down the system.

2.1.4 Microprocessor Control (Standard)

The control system shall be microprocessor based. The wall-mounted control enclosure shall include a 2-line by 16 character LCD display providing continuous display of operating status and alarm condition. An 8-key membrane keypad for setpoint/program control, unit on/off, and fan speed shall be located below the display.

A. Monitoring

The LCD display shall provide on/off indication, fan speed 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.

B. Control parameters

- Temperature Setpoint 65-85°F (18 to 29°C)
- Temperature Sensitivity 1° to 5°F (1° to 3°C)
- Humidity Setpoint 20-80% RH
- Humidity Sensitivity 1 to 10% RH

C. Unit controls

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. Common Alarm and Remote On/Off

A common alarm relay shall be provided to interface alarms with a remote alarm device. Two (2) terminals are also provided for remote on/off control. Individual alarms shall be "enabled" or "disabled" from reporting to the common alarm.

3. Setback Control

The control shall be programmable on a daily basis or on a 5 day/2 day program schedule. It shall be capable of accepting 2 programs per day.

4. Temperature Calibration

The control shall include the capabilities to calibrate the temperature and humidity sensors and adjust the sensor response delay time from 1 to 90 seconds. The control shall be capable of displaying temperature values in Fahrenheit or Celsius.

5. 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.

D. Alarms

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
- Loss of Power
- Compressor Short Cycle

2. Custom Alarms (2x)

- Humidifier Problem
- Filter Clog
- Water Detected
- Smoke Detected

User-customized text can be entered for the two (2) custom alarms.

3. Alarm Controls

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.

4. Audible Alarm

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

5. Common Alarm

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

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.

E. Communications

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

2.1.5 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 remote wallbox. The humidifier shall have a capacity of _____ lbs./hr. (kg/h). An LED light on the humidifier assembly shall indicate over-current detection, fill system fault, and end of cylinder life conditions.

2.1.6 Electric Reheat (Optional

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 an NRTL approved safety switch to protect the system from overheating. The capacity of the reheat coils shall be _____ BTU/HR (kW), with input power of _____ kW, controlled in one stage.

2.1.7 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 two-way solenoid valve and cleanable Y-strainer.

2.1.8 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), with input power of _____ kW.

2.1.9 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).

2.1.10 Disconnect Switch, Non-Locking Type (Optional)

The non-automatic molded case circuit interrupter shall be mounted in the high voltage section of the electrical panel. The switch shall be accessible with the door closed.

2.1.11 Remote Sensors (Optional)

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.

2.1.12 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.

2.1.13 Smoke Detector (Optional)

The smoke detector shall immediately shut down the environmental control system and activate the alarm system when activated. The smoke detector shall be mounted in the electrical panel with the sensing element in the return air compartment.

2.1.14 Condensate Pump (Optional)

The condensate pump shall have the capacity of ___ GPH (___ l/h) at ___ ft. head (___ kPa). It shall be complete with integral float switch, pump, motor assembly, and reservoir.

2.1.15 Free-Cooling/Dual Cooling Source

A Free-cooling coil shall be integral to the evaporator section, 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) entering glycol solution temperature. 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.

2.1.16 Remote Humidifier Contact

The control system shall provide a contact closure to control a remote optional humidifier.

2.2 Direct Expansion System Components

2.2.1 Direct Expansion Coil

The evaporator coil shall have 2.4 sq.ft. (0.23 sq.m) face area, __ rows deep. It shall 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.

2.2.2 Refrigeration System

The refrigeration system shall consist of a scroll (rotary hermetic on 1-ton) compressor with vibration isolating grommets, high pressure safety switch, and externally equalized expansion valve.

A. Air-cooled self-contained systems

Air-Cooled Condenser

The condenser coil shall be constructed of copper tubes and aluminum fins and a direct-drive centrifugal fan. No piping, brazing, dehydration or charging shall be required. Condenser electrical connection to the cooling chassis shall be by a factory wired plug. Fan shall be sized to provide full rated cooling capacity at 95°F (35°C) entering air from plenum space. The system shall be provided with a fan speed control system to permit operation at -20°F (-28.9°C) ambient temperature.

B. Water- or glycol-cooled self-contained systems

1. 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. Water Regulating Valve

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

3. Design Pressure

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

2.3 Direct Expansion Split Systems

2.3.1 Direct Expansion Coil

The evaporator coil shall have _____ sq.ft. (sq. m) face area, _____ rows deep. It shall 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.

2.3.2 Refrigeration System

The refrigeration system shall consist of an evaporator, externally equalized expansion valve, and filter drier.

2.3.3 Propeller Fan Condensing Unit

The condenser coil shall be constructed of copper tubes and aluminum fins with a direct-drive propeller-type fan. All components shall be factory assembled, charged with refrigerant, sealed, and be capable of being connected to the evaporator section using pre-charged refrigerant line sets. No piping, brazing, dehydration, or charging shall be required. Condenser shall be designed for 95°F (35°C) ambient and be capable of operation to -30°F (-34.4°C).

2.4 Chilled Water System Components

2.4.1 Chilled Water Control

The control valve shall be the motorized slow-acting two-position type to reduce water hammer. Design pressure shall be 300 psig (2067 kPa), and a maximum close-off pressure of 25 psi (172 kPa).

2.4.2 Chilled Water Coil

The cooling coil shall have a minimum of 2.4 sq.ft. (0.23 sq.m) face area, 2 rows deep. It shall be constructed of copper tubes and aluminum fins and have a maximum face velocity of 325 ft. per minute (1.65 m/s) at 780 CFM (1325 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.

2.5 Optional Equipment - All Systems

2.5.1 Liebert SiteScan® Site Monitoring System

A Liebert SiteScan Site Monitoring System Model _____ shall be provided for remote monitoring of the Mini-Mate2 unit and monitoring of other Liebert support equipment. The 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.

2.5.2 Liebert Site Monitoring or Control Systems

Provide indicated quantities of the following:

- _____ Leak Detection System(s) Model _____
- _____ Remote Monitor(s)
- Model _____
- _____ Auto-changeover Control(s)
- Model _____

2.6 Optional Equipment - Individual Systems

2.6.1 Refrigerant Line Sets

Pre-charged refrigerant line sets shall be provided by Liebert in proper lengths for application. Line set length shall be _____ feet (m). Pre-charged refrigerant line sets shall be provided in [15 foot (4.5 m) or 30 foot (9 m)].

2.6.2 Refrigerant Line Sweat Adapter Kit

The refrigerant line sweat adapter kit contains two (2) suction lines and two (2) liquid line fittings that allow for field refrigerant piping between the evaporator and condensing unit.

3.0 INSTALLATION

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.

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

Liebert
Keeping Business In Business

HEAT REMOVAL

MINI-MATE 2

ENGINEERING MANUAL

The Company Behind the Products

With over a million installations around the globe, Liebert is the world leader in computer protection systems. Since its founding in 1965, Liebert has developed a complete range of support and protection systems for sensitive electronics:

- Environmental systems—close-control air conditioning from 1 to 60 tons
- Power conditioning and UPS with power ranges from 300 VA to more than 1000 kVA
- Integrated systems that provide both environmental and power protection in a single, flexible package
- Monitoring and control—from systems of any size or location, on-site or remote
- Service and support through more than 100 service centers around the world and a 24/7 Customer Response Center

While every precaution has been taken to ensure the accuracy and completeness of this literature, Liebert Corporation assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions.

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