Liebert® DataMate™

1.5 - 3 Tons, 50 & 60Hz

User Manual

Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures. Visit https://www.VertivCo.com/en-us/support/ for additional assistance.

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1 IMPORTANT SAFETY INSTRUCTIONS

Save These Instructions

This manual contains important safety instructions that should be followed during the installation and maintenance of the Liebert DataMate. Read this manual thoroughly before attempting to install or operate this unit.

Only properly trained and qualified personnel should move, install or service this equipment.

Adhere to all warnings, cautions and installation, operating and safety instructions on the unit and in this manual. Follow all operating and user instructions.

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Liebert microprocessor does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert control. Follow all national and local codes.

WARNING! Risk of high-speed moving parts. Can cause injury or death. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and verify that all blower wheels have stopped rotating before working in the unit. Do not operate this unit with any or all cabinet panels removed.

WARNING! Risk of explosive discharge from high-pressure refrigerant. Can cause injury and death. This unit contains fluids and gases under high pressure. Relieve pressure before working with piping.

WARNING! Risk of refrigerant system rupture or explosion from overpressurization. Can cause equipment damage, injury or death. If a pressure relief device is not provided with the condenser unit, the system installer must provide and install a discharge pressure relief valve per national and local codes in the high side refrigerant circuit. Do not install a shutoff valve between the compressor and the field-installed relief valve. Do not isolate any refrigerant circuits from overpressurization protection.

CAUTION: Risk of contact with hot surfaces. Can cause injury. The blower motor, humidifiers and reheats are extremely hot during unit operation. Allow sufficient time for them to cool before working within the unit cabinet. Use extreme caution and wear protective gloves and arm protection when working on or near hot discharge lines, humidifiers and reheats.

CAUTION: Risk of sharp edges, splinters and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes and glasses should attempt to move the unit, lift it, remove packaging or prepare the unit for installation.

NOTICE

Risk of clogged or leaking drain lines and leaking water supply and return lines. Can cause equipment and building damage.

This unit requires a water drain connection. Drain lines must be inspected regularly and maintenance must be performed to ensure that drain water runs freely through the drain system and that lines are clear and free of obstructions and in good condition with no visible sign of damage or leaks. This unit may also require an external water supply to operate.

Improper installation, application and service practices can result in water leakage from the unit. Do not mount this unit over equipment or furniture that can be damaged by leaking water. Install a watertight drain pan with a drain connection under the cooling unit and the ceiling mounted water/glycol condenser unit. Route the drain pan to a frequently used maintenance sink so that running water can be observed and reported in a timely manner.

Post a sign to alert people to report water flowing from the secondary drain pan. Vertiv™ recommends installing monitored leak detection equipment for unit drain and supply lines and in the secondary drain pan.

NOTICE

Risk of internal system corrosion and frozen coolant fluid. Can cause equipment damage and major fluid leaks resulting in serious building damage, expensive repair costs and costly system down time.

Cooling coils, heat exchangers and piping systems that are connected to open cooling towers or other open water/glycol systems are at high risk of freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil, piping and heat exchanger corrosion. The water or water/glycol solution must be analyzed by a competent local water treatment specialist before startup to establish the inhibitor and antifreeze solution requirement and at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The complexity of water/glycol solution condition problems and the variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced water treatment specialist and follow a regularly scheduled coolant fluid system maintenance program.

Read and follow individual unit installation instructions for precautions regarding fluid system design, material selection and use of field-provided devices. Liebert systems contain iron and copper alloys that require appropriate corrosion protection. It is important to have the system running with flow through exchangers maintained at initial system fill for 24 to 48 hours depending on size and system configuration.

Water chemistry varies greatly by location, as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components. The chemistry of the water used must be considered, because water from some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The water/coolant fluid must be treated and circulating through the system continuously to prevent the buildup of sediment deposits and or growth of sulfate reducing bacteria.

Proper inhibitor maintenance must be performed in order to prevent corrosion of the system. Consult glycol manufacturer for testing and maintenance of inhibitors.

Commercial ethylene glycol, when pure, is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the water from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

NOTICE

Risk of damage from forklift. Can cause unit damage.

Keep tines of the forklift level and at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

NOTICE

Risk of improper storage. Can cause unit damage.

Keep the Liebert DataMate upright, indoors and protected from dampness, freezing temperatures and contact damage.

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2 MODEL NUMBER NOMENCLATURE—ALL SYSTEMS

Figure 2.1 Model number nomenclature—Evaporator units

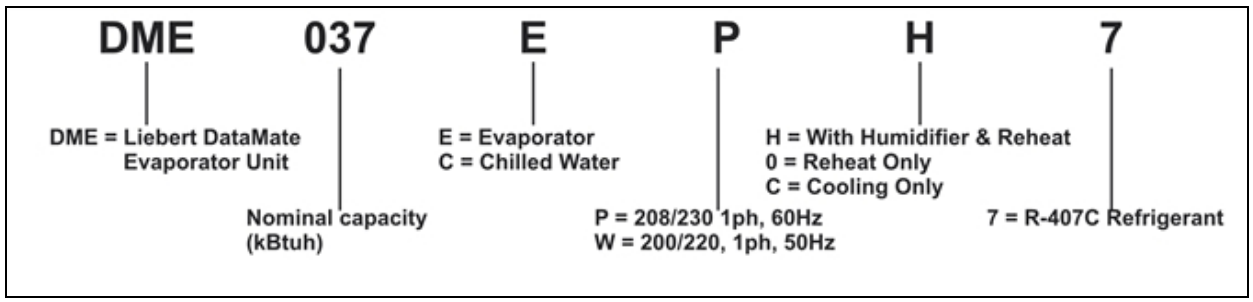


Figure 2.2 Model number nomenclature—Outdoor air-cooled condensing units

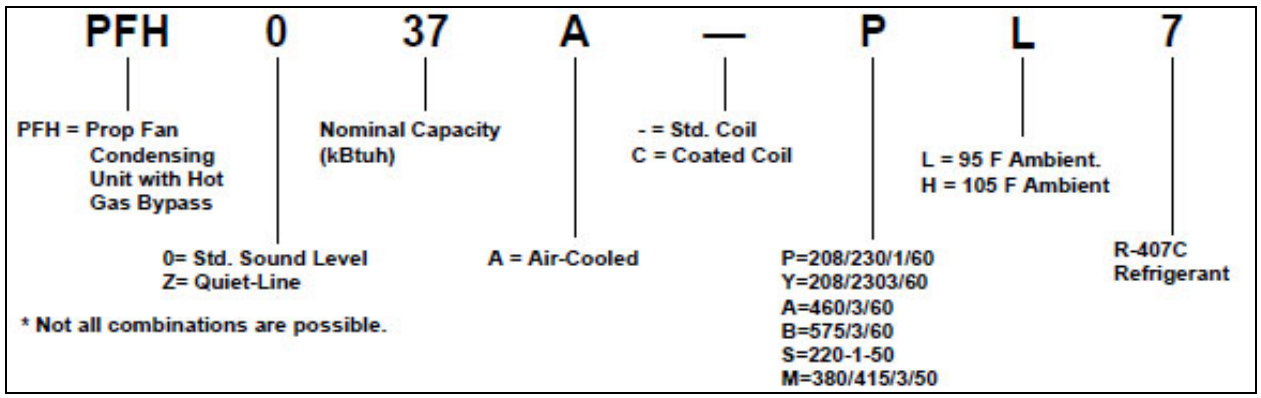


Figure 2.3 Model number nomenclature—Indoor air-cooled condensing units

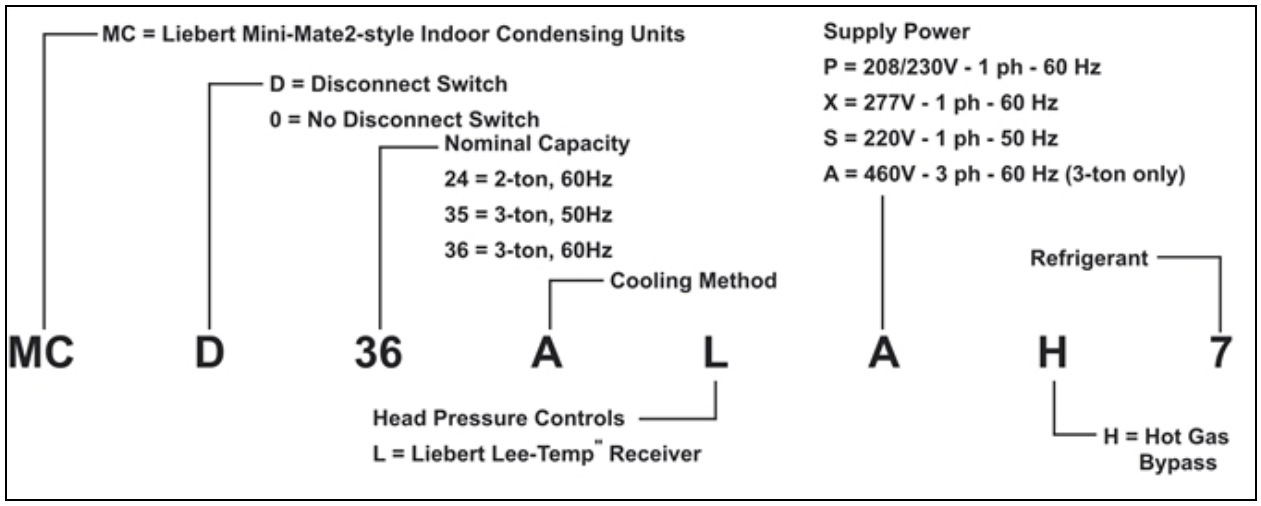


Figure 2.4 Model number nomenclature, close-coupled water/glycol condensing units—60Hz only

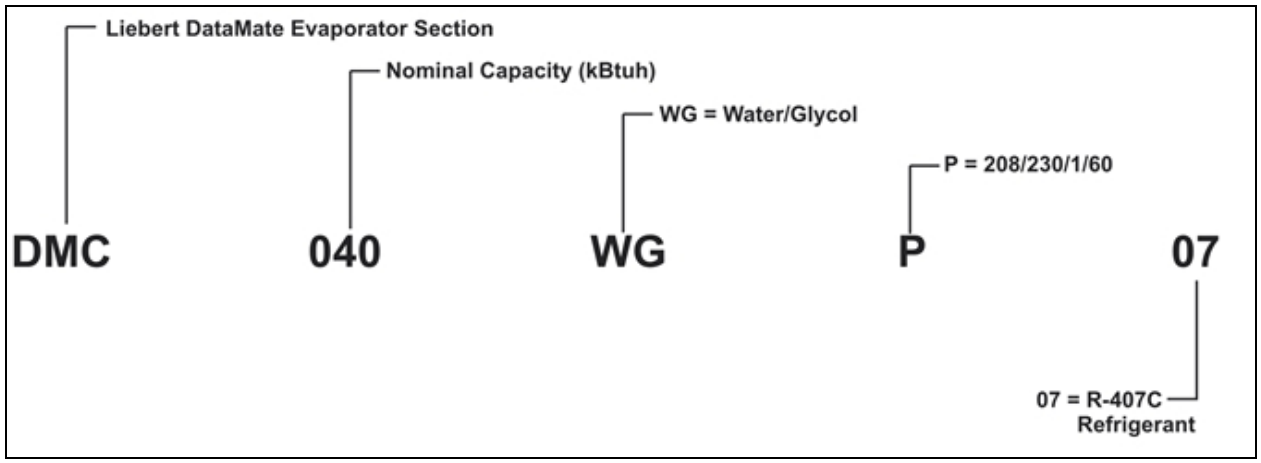


Figure 2.5 Model number nomenclature—Indoor remote water/glycol-cooled condensing units

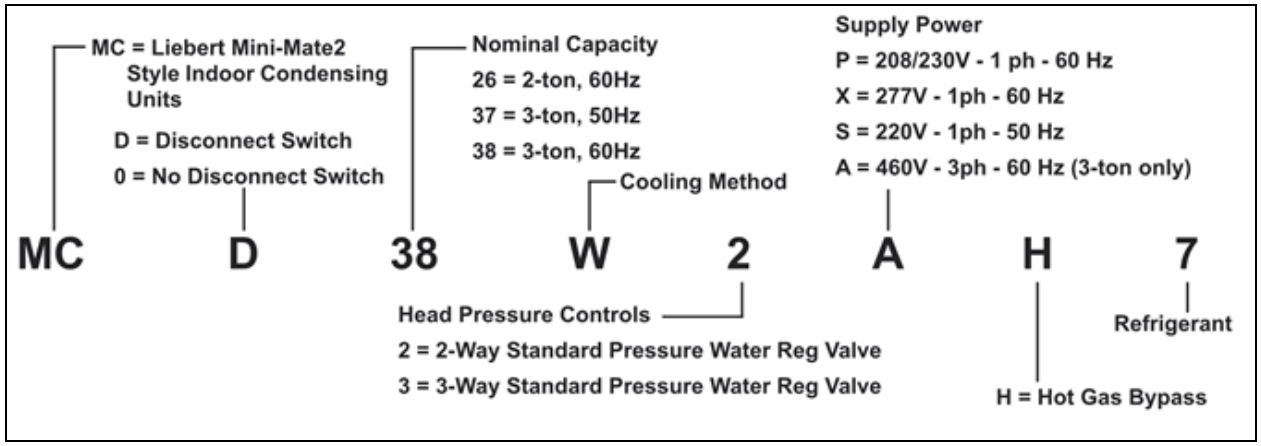
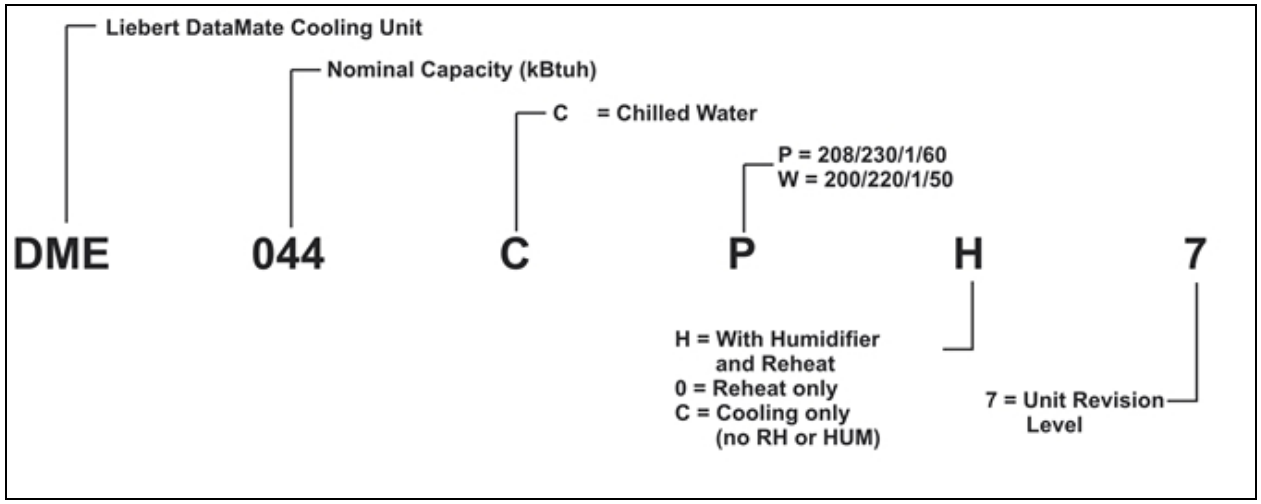


Figure 2.6 Model number nomenclature—Chilled water units



3 INTRODUCTION

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

Installed on the floor or on the wall, Liebert DataMate cooling systems control the cooling, humidity and air distribution required by sensitive electronic equipment. A range of sizes and configurations is available to meet varying sites' needs.

The Liebert DataMate 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 readout.

These features, combined with Vertiv™-quality construction and reliable components, guarantee satisfaction from installation through operation.

Liebert Cooling Systems

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

Easy Installation

The Liebert DataMate is a split-system evaporator combined with a remote air-, water- or glycol-cooled condensing unit or a close-coupled water/glycol-cooled condensing unit or is a self-contained, chilled water unit.

Each split system has thermostat-type wiring to controls and condensing unit. System components are pre-charged with refrigerant using quick-connect fittings and can be easily connected together. Optional pre-charged line sets or sweat adapters for field refrigerant piping are available for remote condensing units.

Easy to Service

The Liebert DataMate is designed for front service access. Routine maintenance and service can be performed quickly and easily. Spare parts are always in Vertiv™ 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, scroll compressor and precise microprocessor control allow the system to operate efficiently.

Space Saving Design

Models available to fit any room without disrupting workstation layout. Requires 5 ft^2 (0.5m^2) or less of floor space or can be mounted on a wall.

Reliable

The Liebert DataMate installed base is a testimony to the system reliability.

Agency Listed

Standard 60Hz units are CSA certified to the harmonized U.S. and Canadian product safety standard, CSA C22.2 No 236/UL 1995 for “Heating and Cooling Equipment” and are marked with the CSA c-us logo.

4 STANDARD FEATURES—1.5- TO 3-TON SYSTEMS

The Liebert DataMate is available as a split system air, water/glycol-cooled unit or self-contained chilled water unit.

4.1 Evaporator Section—Split-Systems

Split-System Evaporator Section includes the evaporator coil, 2-speed centrifugal blower assembly, filter-drier, galvanized steel drain pan, R-407C refrigerant charge, cleanable filters and microprocessor control with wall-mounted display panel. The unit construction is galvanized steel with powder-coated, removable exterior panels. A reversible discharge grille provides the ability to redirect airflow. The evaporator can be floor- or wall-mounted.

4.2 Condensing Unit Section—Remote Split-Systems

4.2.1 Indoor Centrifugal Fan Condensing Units

Indoor Air-Cooled Centrifugal Fan Condensing Units include scroll compressor, factory-mounted disconnect switch, condenser coil, R-407C unit charge, belt-driven centrifugal blower assembly, high-pressure switch, Liebert Lee-Temp™ head pressure control system, hot gas bypass and liquid-line solenoid valve. Unit must be mounted indoors. Condensing unit is designed to use outdoor air with temperatures ranging from -30°F to 95°F (-34°C to 35°C). Available in 2-ton and 3-ton models.

4.2.2 Outdoor Prop Fan Condensing Units

Outdoor Prop Fan Condensing Units include scroll compressor, condenser coil, R-407C unit charge, prop fan, liquid-line solenoid valve, high pressure switch, Liebert Lee-Temp head pressure control and hot gas bypass. Condensing unit is designed for outdoor locations with operating ambients ranging from -30°F to 95°F (-34°C to 35°C).

4.2.3 Indoor Remote Water/Glycol Condensing Units

Indoor Remote Water/Glycol Condensing Units include scroll compressor, R-407C unit charge, factory-mounted disconnect, coaxial condenser, hot gas bypass, high head pressure switch and two-way water regulating valve designed for 150psi (1034.3kPa). Condensing units can be used on either a water or glycol cooling loop. Available in 2- and 3-ton models.

4.3 Condensing Unit Section—Close-Coupled

The Close-Coupled Water/Glycol Condensing Unit is designed to attach to the split-system evaporator to become a single wall- or floor-mounted unit.

Indoor close-coupled water/glycol condensing units include scroll compressor, brazed plate condenser, R-407C refrigerant charge and 2-way water regulating valve. Unit is available in 60Hz models only. Design pressure is 150psi (1034kPa).

4.4 Chilled Water Units

Self-Contained Chilled Water Models include a chilled water coil, a two-way, solenoid open, slow-close (On/Off) spring-return valve, two-speed centrifugal blower assembly, cleanable filters and microprocessor control with wall-mounted display panel. Design pressure is 300psi (2068kPa) with a maximum close-off pressure of 60psig (414kPa).

4.5 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. An eight-key, membrane keypad for setpoint/program control, unit On/Off, fan speed 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, fan speed and alarm conditions.

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

Figure 4.1 Wall-box

4.5.1 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

5 OPTIONAL FACTORY-INSTALLED FEATURES—EVAPORATOR/CHILLED WATER AND CONDENSING UNITS

5.1 Electric Reheat

Electric low watt tubular reheat element with non-corrosive metal sheath provides one stage of non-ionizing reheat to maintain room dry bulb temperature.

5.2 Humidifier/Electric Reheat Package

The humidifier and electric reheat are available as a package for complete humidity control. 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. Maximum humidifier water supply pressure is 150psi (1034kPa).

5.3 Optional Configurations—Prop Fan Condensing Units

Outdoor Prop Fan Condensing Units are also available in the following optional configurations:

- High ambient models for providing catalog capacities at ambient temperatures up to 105°F (40°C): 2- and 3-ton models only.
- Liebert Quiet-Line™ models for low noise level conditions (below 58 dBA) and for providing catalog capacities at ambient temperatures up to 95°F (35°C).
- Condenser coils can be phenolic-coated for extended coil life in coastal areas.

5.4 Optional Configurations—Indoor Remote Water/Glycol Condensing Units

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

- Two-way water regulating valve with 350psi (2413kPa) design pressure
- Three-way water regulating valve with 150psi (1034kPa) design pressure
- Three-way water regulating valve with 350psi (2413kPa) design pressure

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6 SHIP-LOOSE ACCESSORIES—FIELD-INSTALLED

The Condensate Pump is field-mounted internal to the unit and wired to the unit power block or is field-mounted external to the unit with power from unit or external power supply. Pump is complete with integral float switch, discharge check valve, pump, motor assembly and reservoir. A secondary float can be field-wired to shut down the unit upon high condensate level.

The Canister Humidifier Kit can be field-installed to customize cooling only or reheat only units. The kit includes full installation instructions and are designed to be added to the evaporator unit before it is mounted on its wall or floor location.

The 277V Step-Down Transformer is available for units needing 277-1-60 input power; one each for evaporator section and remote condensing section (37.5A max. each). Use one 37.5A transformer for 1-1/2 or 2-ton self-contained water/glycol systems; use 50A transformer for 3-ton self-contained water/glycol systems. Epoxy-encapsulated, transformer is suitable for either indoor or outdoor service.

Pre-Charged Refrigerant Line Set (R-407C) contains an insulated copper suction line and a copper liquid line for interconnection of the indoor and outdoor sections. Available in 15-foot (4.5m) and 30-foot (9m) sections for interconnection of evaporator to remote condensing unit without brazing. Maximum recommended combined line set length is 45 ft.(13.7m).

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

A Remote Temperature and Humidity Sensor package includes sensors in an attractive case with 30 ft. (9 m) 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.

6.1 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 DataMate 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 DataMate. 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® 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® 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 Vertiv™ representative for assistance with a Liebert SiteScan system.

The NIC-ENCL1 and NIC-ENCL2 packages have one or two Liebert IntelliSlot® Web/485 Cards with Adapters, respectively, in one steel enclosure. These are for installation external to the Liebert DataMate. The Liebert IntelliSlot Web/485 Card with Adapter provides communication with Liebert DataMate via SNMP, HTTP, RTU Modbus 485 and BACnet IP. The self-contained NIC-ENCL1 and NIC-ENCL2 kits include an external 120VAC-to-24VAC transformer as a power source. Wiring harnesses are not provided. Power and communication wiring is field-provided.

7 SITE PREPARATION AND INSTALLATION

7.1 Installation Considerations

NOTE: Before installing unit, determine whether any building alterations are required to run piping, wiring and duct work. Carefully follow all unit dimensional drawings and refer to the submittal engineering dimensional drawings of individual units for proper clearances.

The system can be installed in any of several ways. However, the evaporator should always be mounted on a wall in the equipment room. The remote indoor MCD condensing unit can be mounted above the ceiling, underneath a raised floor or in another room and the remote PFH condensing unit can be mounted outside. The DMC condensing unit for the integral water/glycol units is field-attached directly to the evaporator.

7.1.1 System Configurations

Air-cooled models may utilize an indoor centrifugal fan condensing unit if an outdoor location is impractical. The indoor condensing unit may be located near the evaporator to minimize refrigerant piping or near the outside wall to minimize air duct work.

Air-cooled models may also use an outdoor condensing unit, which can be mounted on either the roof or the ground.

Water and glycol-cooled models utilize condensing units that can be located above the ceiling or under a raised floor.

The integral water/glycol model condensing unit attaches directly to the left end of the evaporator and requires no pre-charged refrigerant lines. It must be connected to an electric source and a water or glycol loop.

Table 7.1 System configurations, 60 Hz

Capacity	Evaporator	Condensing Unit			
		Indoor Centrifugal	Outdoor Prop Fan	Remote Water/Glycol	Integral Water/Glycol
1-1/2 tons	DME020E	N/A	PFH020A	N/A	DMC022WG
2 tons	DME027E	MCD24A	PFH027A	MCD26W	DMC029WG
3 tons	DME037E	MCD36A	PFH037A	MCD38W	DMC040WG
	DME044C	Self-Contained Chiller Water			

Table 7.2 System configurations, 50 Hz

Capacity	Evaporator	Condensing Unit		
		Indoor Centrifugal	Outdoor Prop Fan	Remote Water/Glycol
3 tons	DME037E	MCD35A	PFH036A	MCD37W
	DME044C	Self-Contained Chiller Water		

Table 7.3 Application limits, evaporator and chilled-water units*

Input Voltage		Range of Return Air Conditions to Unit	
Minimum	Maximum	Dry Bulb Temp.	Relative Humidity
-5%	+10%	65°F to 85°F (18°C to 29°C)	20% to 80%
*Unit will operate at these conditions but will not control to these extremes.			

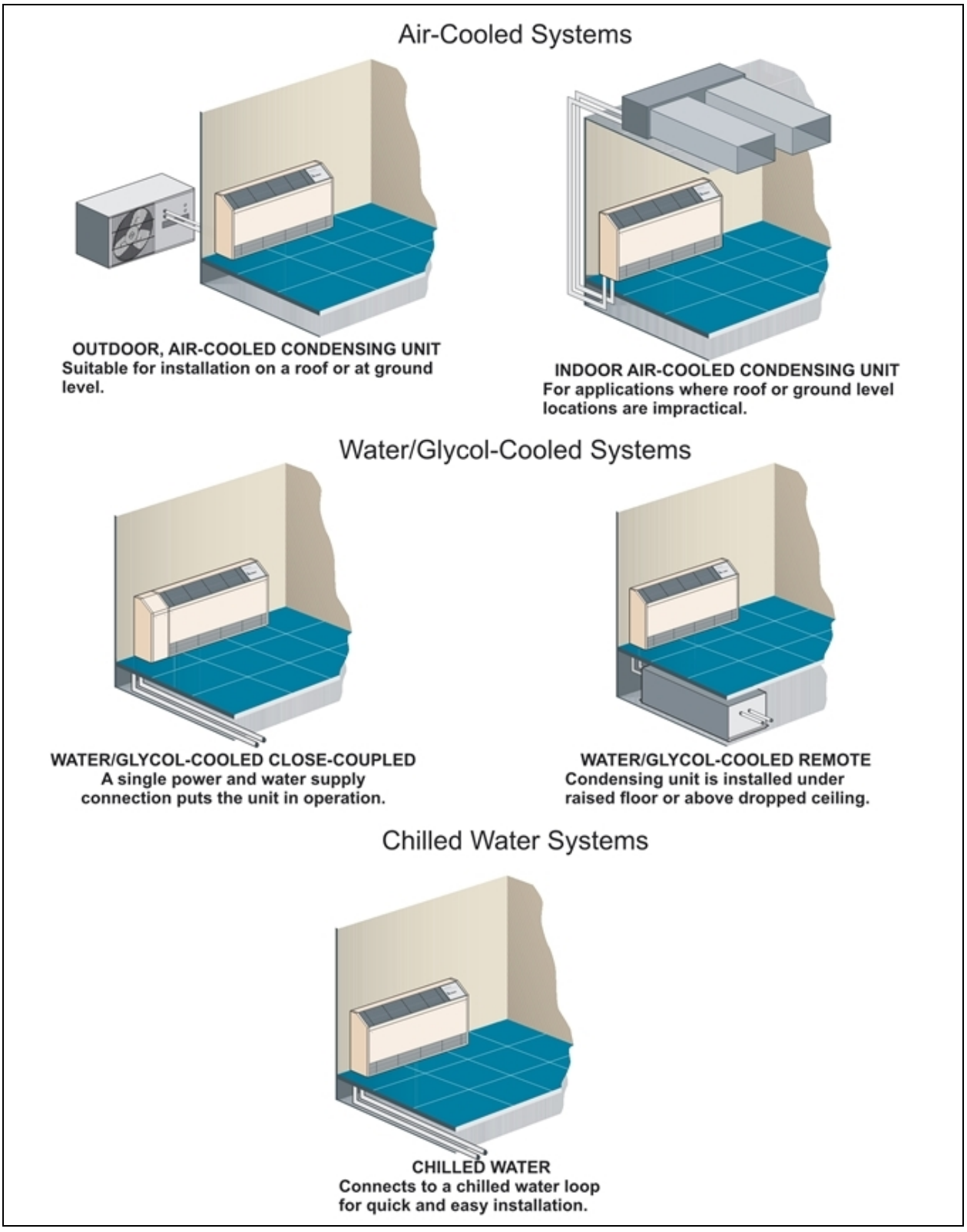
Table 7.4 Application limits, indoor and outdoor air-cooled condensing units

Input Voltage		Condensing Units	Entering Dry Bulb Air Temperature	
Minimum	Maximum		Minimum	Maximum
-5%	+10%	Outdoor Prop Fan Condensing Unit	-30°F (-34°C)	115°F (46°C) standard unit* 125°F (52°C) high ambient unit*
		Indoor Air-Cooled Condensing Unit		115°F (46°C)*
*Unit capacity ratings are stated for 95°F (35°C) for standard units and 105°F (41°C) for high ambient PFH units only. Exceeding these rating points by 20°F (11°C) will result in lower cooling capacities, but will not damage the equipment.				

Table 7.5 Application limits, indoor water/glycol-cooled condensing units

Input Voltage		Entering Fluid Temperature	
Min	Max	Min	Max
-5%	+10%	65°F (18.3°C) *	115°F (46°C)
*Operation below 65°F (18°C) may result in reduced valve life and fluid noise.			

Figure 7.1 Flexible configurations—All systems



7.1.2 Room Preparation

The room should be well insulated and must have a sealed vapor barrier. The vapor barrier in the ceiling and walls can be a polyethylene type film. Paint on concrete walls or floors should be vapor resistant.

NOTE: The single most important requirement for maintaining environmental control in the conditioned room is the vapor barrier.

Outside or fresh air should be kept to a minimum. Outside air adds to the heating, cooling, humidifying and dehumidifying loads of the site. It is recommended that outside air be kept below 5% of the total air circulated in the computer room. Doors should be properly sealed to minimize leaks and should not contain grilles.

7.1.3 Location Considerations

NOTICE

Risk of leaking water. Can cause equipment and building damage.

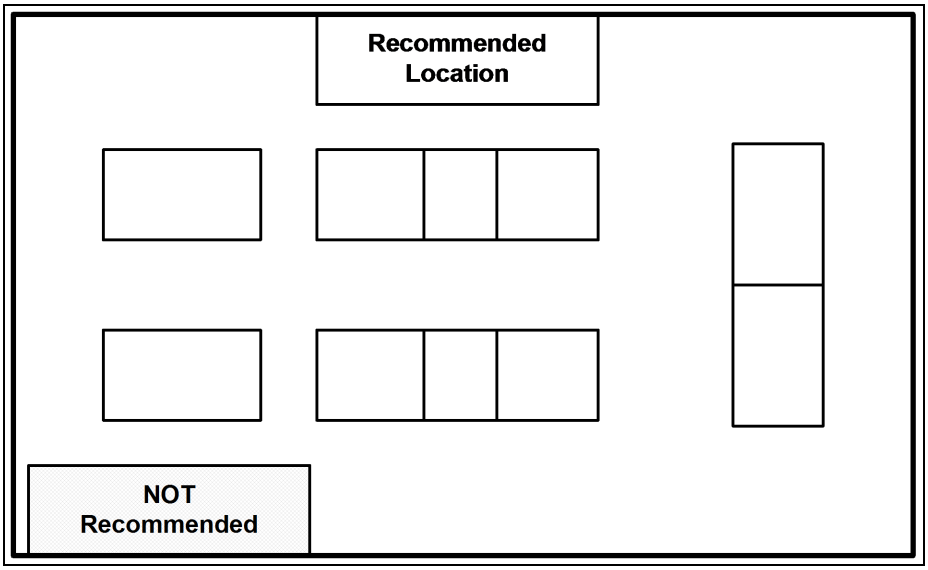
Improper installation, application and service practices can result in water leakage from the unit. Do not mount this unit over equipment or furniture that can be damaged by leaking water. Install a watertight drain pan with a drain connection under the cooling unit and the ceiling mounted water/glycol condenser unit. Route the drain pan to a frequently used maintenance sink so that running water can be observed and reported in a timely manner.

Post a sign to alert people to report water flowing from the secondary drain pan. Vertiv™ recommends installing monitored leak detection equipment for the unit, the condensate drain lines, water/coolant fluid supply and return lines and in the secondary drain pan. Check drain lines periodically for leaks, sediment buildup, obstructions, kinks and/or

NOTE: Do not mount units in areas where normal unit operating sound may disturb the working environment.

Try to locate the evaporator in an unobstructed floor space to facilitate service. Avoid locations in confined areas that affect the air flow pattern and result in short cooling cycles, downdrafts and air noise. Avoid locating the unit in an alcove or at the extreme end of a long, narrow room. Avoid installing multiple units close to each other. This can result in crossing air patterns, uneven loads and competing operating modes. Do not attach additional devices (such as smoke detectors, etc.) to the cabinet that will interfere with routine maintenance or service.

Figure 7.2 Proper room location



7.2 Application Weights

NOTE: Follow all unit dimensional drawings carefully. determine whether any building alterations are required to run piping, wiring and duct work. Also refer to the submittal engineering dimensional drawings of individual units for clearances.

Table 7.6 Evaporator and condensing unit net weights

Model Number		lb (kg)
60Hz	50Hz	
Evaporator Section		
DME020E	—	230 (104)
DME027E	—	330 (150)
DME037E	DME037E	365 (166
DME044C	DME044C	365 (166)
Outdoor, Propeller Fan Condensing Unit		
PFH020A	—	200 (91)
PFH027A	—	200 (91)
PFH037A	PFH036A	241 (109)
Indoor, Centrifugal Fan Condensing Unit		
MCD24A	—	230 (104)
MCD36A	MCD35A	240 (109)
Water/Glycol-Cooled Condensing Unit		
MCD26W	—	175 (79)
MCD38W	MCD37W	220 (100)
Close-Coupled Water/Glycol Condensing Unit		
DMC022WG	—	170 (77)
DMC029WG	—	170 (77)
DMC040WG	—	170 (77)

7.3 Equipment Inspection (Upon Receipt)

When the Liebert DataMate arrives, inspect all items for any visible damage. Do not accept a damaged unit from the shipper!

If possible, do not uncrate equipment until it is close to its final location. All required assemblies are banded and shipped in corrugated containers. If you discover any damage when you uncrate the unit, report it to the shipper and to your Liebert supplier immediately.

7.4 Installation—Evaporator or Chilled Water Unit

Unlatch the front cabinet door and remove the screws that secure the cabinet to the chassis. Lift off the cabinet. Eight keyholes (0.50 in. head, 0.22 in. slot) are provided on the back of the unit for mounting on the wall. The unit must be level.

WARNING! Risk of unit falling off of the wall. Can cause building and equipment damage and serious injury. Vertiv™ recommends that the installer have a licensed professional structural engineer evaluate the wall to determine whether the unit can be safely mounted on the wall and what type and size of fasteners are required to support the weight of the unit during all phases of operation. See **Figure 7.4 on page 30 for unit mounting holes and Table 7.6 on the previous page for unit weights. Note that some vibration may occur during start, stop and operation cycles. The wall may need to be reinforced to support the maximum load of the unit.**

Figure 7.3 Unit, floor cutout dimensional data

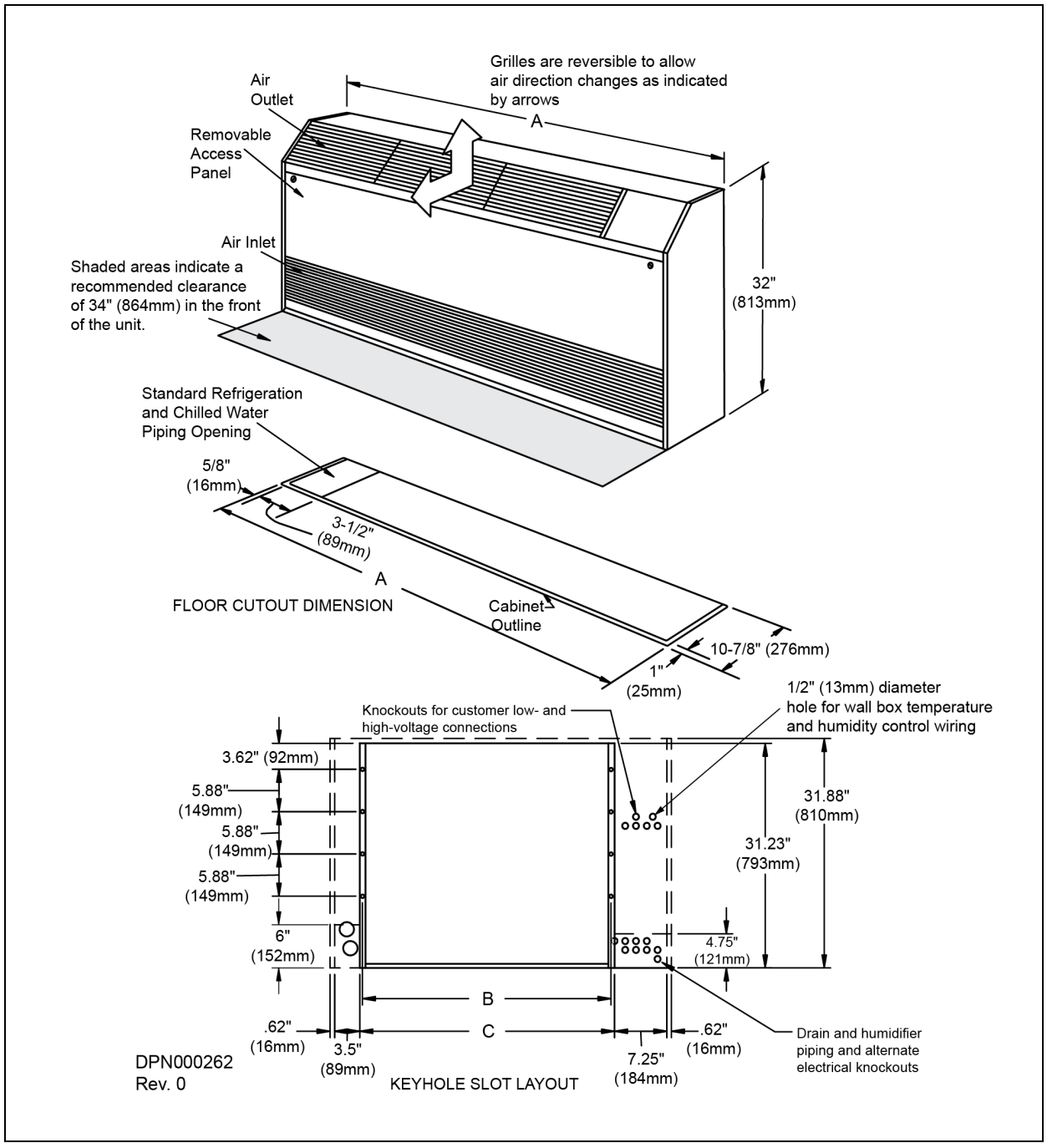


Table 7.7 Fan/coil and chilled water module dimensional data

Dimensional Data, In. (mm)				
MODEL	A	B	C	Shipping weight lb. (kg)
DME020E	46-1/2 (1181)	33-3/4 (857)	34-7/16 (874)	230 (104)
DME027E	64-1/8 (1628)	51-1/2 (1308)	52-3/16 (1325)	330 (150)
DME037E	64-1/8 (1628)	51-1/2 (1308)	52-3/16 (1325)	365 (165)
DME044C	64-1/8 (1628)	51-1/2 (1308)	52-3/16 (1325)	365 (165)
Source: DPN000262, Rev. 0				

7.4.1 Piping Connections and Cooling Requirements

The following pipe connections are required (refer to Figure 7.4 on the next page):

- A drain line from the evaporator coil drain pan
- A drain line from the optional humidifier (if applicable)
- A drain line from the optional condensate pump (if required for this installation) (Refer to Figure 7.8 on page 41)
- A water supply line to the optional humidifier (if applicable)
- Connections between the evaporator unit and the condensing unit and, if water/glycol-based, the appropriate heat rejection loop (cooling tower water, city water, or closed loop glycol system) (if applicable).
- Connections between the chilled water unit and the chilled water loop (if applicable).

NOTE: During startup, inspect for leaks at all piping connections.

Figure 7.4 Evaporator piping connections

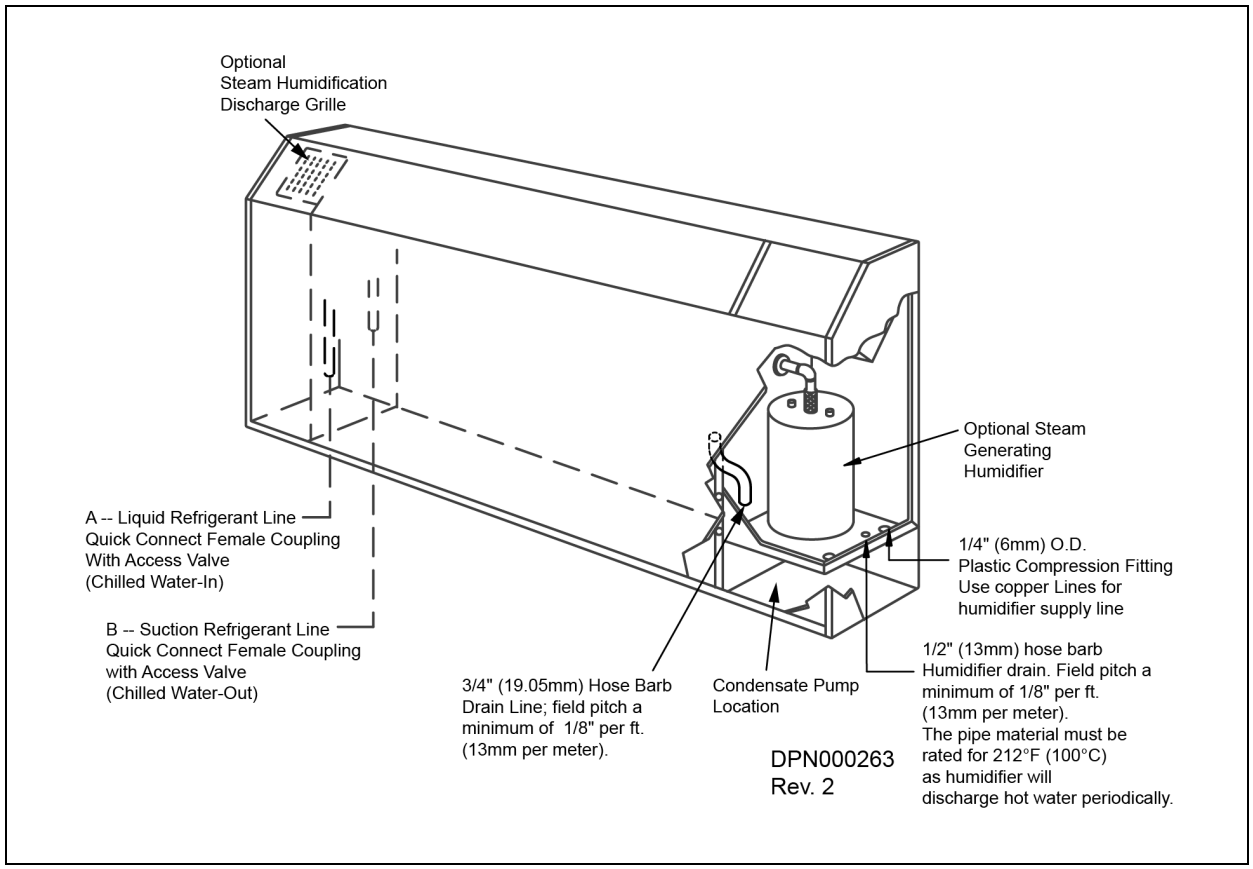
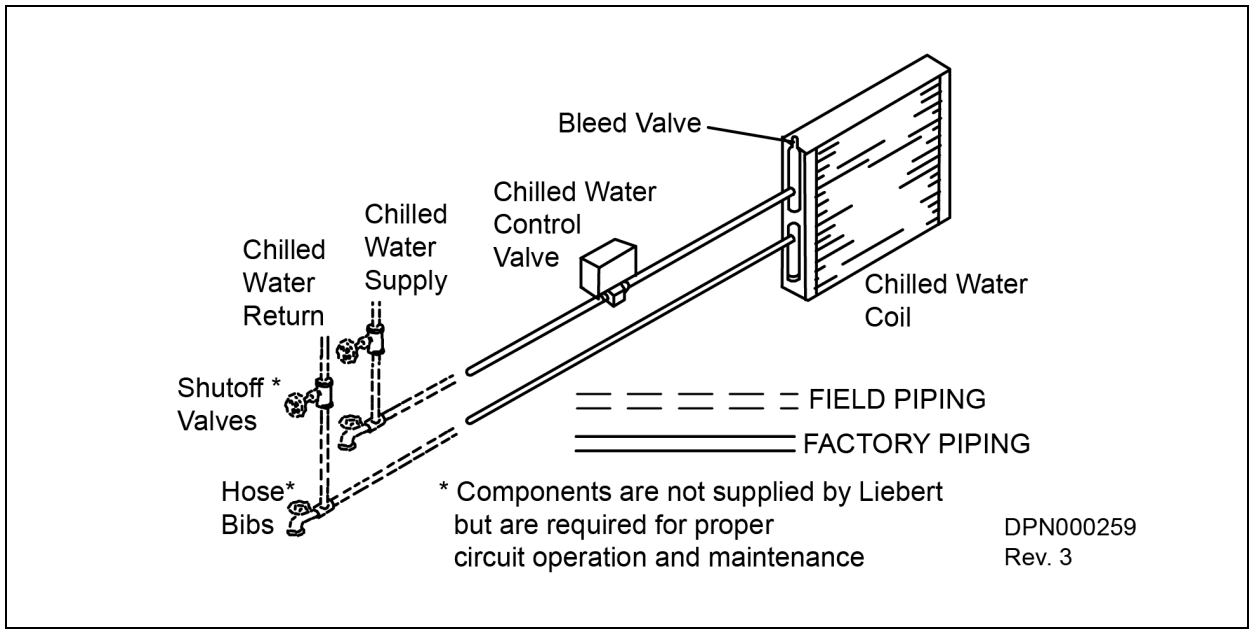


Table 7.8 Unit piping outlet connection sizes - pipe size, coupling number and torque

Model #	Size OD Cu Liquid Line A	Coupling	Torque lb-ft (Nm)	Size OD Cu Suction Line B	Coupling	Torque lb-ft (Nm)
Evaporator Units						
DME020E	3/8"	#6	10-12 (14-16)	1/2"	#11	35-45 (47-61)
DME027E	3/8"	#6		7/8"	#11	
DME037E	3/8"	#6		7/8"	#11	
Chilled Water Units						
Model #	Water Inlet			Water Outlet		
DME044C	7/8" (22.2mm) OD Cu	N/A	N/A	7/8" (22.2mm) OD Cu	N/A	N/A

Figure 7.5 General arrangement drawing, chilled water



Evaporator Coil Drain Line

A 3/4 in. (19mm) OD hose barb connection is provided for the evaporator coil condensate drain. The drain line must be located so it will not be exposed to freezing temperatures. The drain line should be the full size of the drain connection. Pitch the drain line per local and national codes.

NOTE: The drain line must be trapped outside the unit.

Humidifier Drain Line

Units supplied with the optional humidifier have a 1/2 in. (13mm) hose barb connection to drain the steam generating humidifier canister. The drain line should be the full size of the drain connection. Pitch the drain line per local and national codes.

NOTE: The drain line must be trapped outside the unit. This line may contain boiling water. Use copper or other suitable material for the drain line.

Humidifier Water Supply Line

Units supplied with the optional humidifier package have a 1/4 in. (6.4mm) tube compression fitting connection for water inlet. Supply pressure range is 10 to 150psig (69 to 1034kPag). Required flow rate is 1 gpm (3.8 lpm). A shutoff valve should be installed in this line to isolate the humidifier for maintenance.

Loop Connections

Chilled Water Piping—Install manual service shutoff valves at the supply and return lines of each unit. This will provide for routine service or emergency isolation of the unit.

The ambient conditions and the minimum water temperature to be supplied from the chiller will determine whether supply and return lines should be insulated. Insulating them will prevent condensation of the water supply and return lines to the unit.

The minimum recommended water temperature is 42°F. Design pressure is 300psig (2068kPag) with a maximum close-off pressure of 60psig (414kPa). Connections are 7/8 in (22.2mm) OD copper for supply and return lines.

Water/Glycol Piping—Manual service shutoff valves should be installed at the supply and return line to each unit to enable routine service and/or emergency isolation of the unit. When the condensing fluid quality is poor, Vertiv™ recommends installing #16-20 mesh filters that can be easily replaced or cleaned in the supply line. These filters extend the service life of the condenser.

The maximum fluid pressure is 150psig (1034kPag). For applications above this pressure, consult the factory.

The water/glycol-cooled systems will operate in conjunction with a cooling tower, city water or drycooler.

Refrigerant (R-407C) Loop

All split systems require two refrigerant lines (an insulated copper suction line and a copper liquid line) between the evaporator and the condensing unit.

The refrigerant lines can be piped by:

- installing an optional sweat adapter kit and hard piping between the two units
- installing optional pre-charged line sets (maximum combined length of 45' [13.7m])
- close-coupling the units using the quick connects (see Figure 7.30 on page 65)

WARNING! Risk of explosive discharge from high-pressure refrigerant. Can cause injury or death. This unit contains fluids and gases under high pressure. Relieve pressure before working with piping.

All refrigeration piping should be installed with high-temperature brazed joints. Prevailing good refrigeration practices should be employed for piping supports, leak testing, evacuation, dehydration and charging of the refrigeration circuits. The refrigeration piping should be isolated from the building with vibration-isolating supports. To prevent tube damage when sealing openings in walls and to reduce vibration transmission, use a soft, flexible material to pack around the tubes.

NOTICE

Risk of twisted or kinked piping. Can cause flow restriction or leaks.

Handle the pre-charged lines with care so they do not get kinked or damaged. Use tube benders and make all bends before making connections to either end. Coil any excess tubing in a horizontal plane with the slope of the tubing toward the condensing unit.

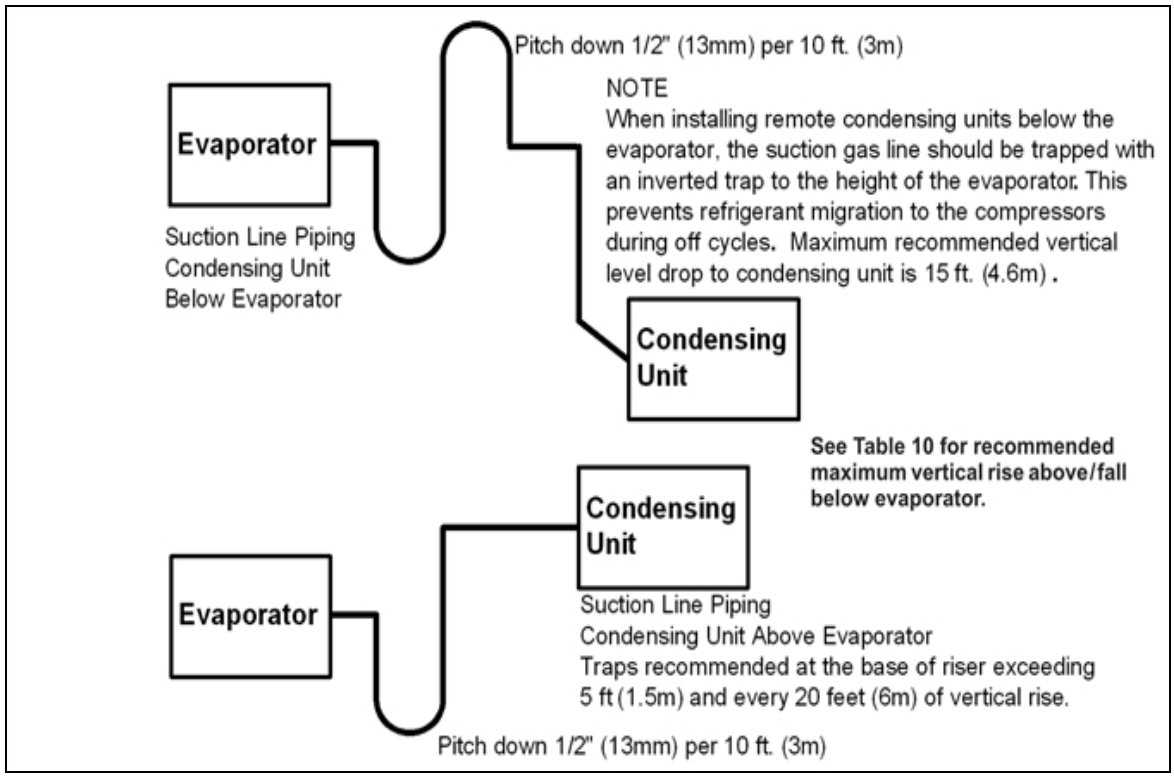
Field-Fabricated Piping

All field-fabricated refrigeration piping should use copper pipe with high-temperature brazed joints. A brazing alloy with a minimum temperature of 1350°F (732°C), such as Sil-Fos. Avoid soft solders such as 50/50 or 95/5.

1. Use sweat adapter kit matched to the Liebert DataMate and outdoor condensing unit refrigerant connection sizes.
2. Measure pipe runs and calculate pipe size and equivalent feet of suction and liquid lines per Table 7.9 on the next page and Table 7.13 on page 36.
3. Use a flow of dry nitrogen through the piping during brazing to prevent formation of copper oxide scale inside the piping. Copper oxide forms when copper is heated in the presence of air. POE oil will dissolve these oxides from inside the copper pipes and deposit them throughout the system, clogging filter driers and affecting other system components. A pure dry nitrogen flow of 1-3 ft3/min (0.5-1.5 l/s) inside the pipe during brazing is sufficient to displace the air. Control the flow with a metering device.
4. Pressurize and leak-test the completed lines at approximately 150psig (1034kPa) pressure.
5. Evacuate each line twice to 500 microns. Break the vacuum each time with clean, dry nitrogen.
6. Evacuate the lines a third time to 500 microns.
7. See Quick Connect Fittings on page 37 for the proper procedure to connect lines to each unit of the split system.
8. Add refrigerant (R-407C) to the completed system as calculated per Table 7.12 on page 35 for both liquid and suction line sizes used.

When installing remote condensing units above the evaporator, the suction gas line should be trapped at the evaporator. This trap will retain refrigerant oil during the Off cycle. When the unit starts, oil in the trap is carried up the vertical riser and returns to the compressor (see Figure 7.6 on the next page).

Figure 7.6 Refrigerant piping diagram



NOTE: When installing remote condensing units below the evaporator, the suction gas line should be trapped with an inverted trap the height of the evaporator. This prevents refrigerant migration to the compressor during off cycles.

Table 7.9 Recommended refrigerant line sizes

Equivalent Length, ft (m)	1.5-Ton		2-Ton		3-Ton	
	Suction	Liquid	Suction	Liquid	Suction	Liquid
50 (15.2	5/8"	3/8"	7/8"	3/8"	7/8"	3/8"
100 (30.5)	7/8"	3/8"	7/8"	1/2"	1-1/8"[2]	1/2"
150 (45.7)	7/8"	1/2"	7/8"	1/2"	1-1/8"[2]	1/2"

1. Suction line and liquid line sizing based on < 3 psi pressure drop in each and horizontal suction line refrigerant velocities >700FPM (3.6m/s).
2. Suction sizes should be reduced one pipe size for vertical riser sections to maintain suction line velocity > 1000FPM (5.1m/s) for proper oil return.

Table 7.10 Pipe length and condenser elevation relative to evaporator

Nominal System Size Tons	Max. Equiv. Pipe Length ft. (m)	Maximum PFH Level Above Evaporator, ft. (m)	Maximum PFH Level Below Evaporator, ft. (m)
1.5 and 2	150 (45)	40 (12)	15 (4.6)
3	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 20 ft. (6m) and/or condensing unit installation is more than 15 ft. (4.6m) below the evaporator. Contact Vertiv™ Application Engineering for assistance.			

Table 7.11 Refrigerant charge in Liebert pre-charged R-407C line sets

Line Size, in.	Length, ft. (m)	Charge R-407C, oz (kg)
3/8 liquid	15 (4.5)	5 (0.14)
	30 (9)	10 (0.28)
5/8 or 7/8 suction	15 (4.5)	5 (0.14)
	30 (9)	10 (0.28)

Table 7.12 Line charges - refrigerant per 100 ft. (30m) of Type L copper tube

Line Size, OD, in.	R-407C, lb/100 ft. (kg/30m)	
	Liquid Line	Suction Line
3/8	3.6 (1.6)	—
1/2	6.7 (3.1)	—
5/8	10.8 (4.9)	0.3 (0.1)
3/4	16.1 (7.3)	0.4 (0.2)
7/8	22.3 (10.2)	0.5 (0.3)
1-1/8	—	0.9 (0.4)
1-3/8	—	1.4 (0.7)

Table 7.13 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							

Refrigerant Charge Requirements

Total R-407C refrigerant charge will be required only if units are evacuated during installation or maintenance. During operation, refer to pressures in on page 93.

Total Refrigerant = Units and Lines

Table 7.14 Refrigerant charge

60 Hz	50 Hz	Charge R-407C, oz (kg)
DME020E	—	4 (0.11)
DME027E	—	5 (0.14)
DME037E	DME037E	6.5 (0.18)
MC*24AL_H7	—	134 (3.80)
MC*36AL_H7	MC*35AL_H7	213 (6.04)
MC*26W__H7	—	41 (1.16)
MC*38W__H7	MC*37W__H7	54 (1.54)
DMC022WG	—	47 (1.33
DMC029WG	—	59 (1.67
DMC040WG	—	61 (1.72)
PFH020A-_L7	—	134 (3.80)
PFH027A-_L7	—	134 (3.80)
PFH027A-_H7	—	213 (6.04)
PFHZ27A-_L7	—	213 (6.04)
PFH037A-_L7	PFH036A-_L7	213 (6.04)
PFH037A-_H7	PFH036A-_H7	426 (12.08)
PFHZ37A-_L7	PFHZ36A-_L7	426 (12.08)

Quick Connect Fittings

NOTE: When hard piping is used, complete all piping and evacuate the lines before connecting quick connects.

Be especially careful when connecting the quick connect fittings. Read through the following steps before making the connections.

1. Remove protector caps and plugs.
2. Carefully wipe coupling seats and threaded surfaces with a clean cloth.
3. Lubricate the male diaphragm and synthetic rubber seal with refrigerant oil.
4. Thread the coupling halves together by hand to ensure that the threads mate properly.
5. Tighten the coupling body hex nut and union nut with the proper size wrench until the coupling bodies "bottom out" or until a definite resistance is felt.
6. Using a marker or pen, make a line lengthwise from the coupling union nut to the bulkhead.
7. Tighten the nuts an additional quarter-turn; the misalignment of the lines shows how much the coupling has been tightened. This final quarter-turn is necessary to ensure that the joint will not leak. Refer to Table 7.15 below for torque requirements.

Table 7.15 Torque values

Coupling Size	lb-ft (Nm)
— #6	10-12 (14-16)
— #11	35-45 (47-61)

7.4.2 Electrical Connections

WARNING! Arc flash and electric shock hazard. Can cause injury and death. Open all local and remote electric power disconnect switches, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Liebert microprocessor does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert control. Follow all national and local codes.

Each unit is shipped from the factory with all internal wiring completed. Refer to electrical schematic when making connections. Electrical connections to be made at the installation site are:

- Power supply to the evaporator unit
- Power supply to the condensing unit
- Control wiring between the evaporator unit and the condensing unit
- Power and control wiring (factory supplied) to the condensate pump (if applicable)
- Control wiring between wall box remote controls and the evaporator unit

Power Connections

All power and control wiring and ground connections must be in accordance with the National Electrical Code and local codes. Refer to unit serial tag for wire size and circuit protection requirements.

WARNING! Risk of loose electrical wiring connections. Can cause overheating of wire, smoke and fire resulting in building and equipment damage, activation of fire suppression systems, dispatching of emergency fire and rescue equipment and personnel, serious injury or death. Use copper wiring only. Verify that all connections are tight.

Make sure that voltage supplied matches the voltage specified on the unit name plate. A power disconnect switch is required to isolate the unit for maintenance. Route the supply power to the disconnect switch and then to the unit. Route the conduit through the hole provided in the cabinet. Connect earth ground to lug provided near terminal board.

NOTE: When an Integral Water/Glycol Cooled condensing unit is being used, the line voltage supply is connected to the condensing unit. The evaporator is powered from the condensing unit using a factory-supplied interconnecting cable.

Transformer Taps

The power terminal connections are labeled L1 and L2. **The input transformer connection must be changed for 208VAC applications.** Refer to the electrical schematic.

Control Connections

A field-supplied, shielded four-wire control connection (24VAC) is required between the evaporator and the condensing unit. Control wiring must be installed in accordance with the National Electrical Code (NEC) Class 1 circuit. Connect the shield wire to earth (ground) at the Liebert equipment.

NOTICE

Risk of degraded control. Can cause operation problems.

Low-voltage wiring and connections should be kept separate and shielded from high-voltage lines or loads such as light ballasts. High-voltage wiring and loads can induce interference in control wiring.

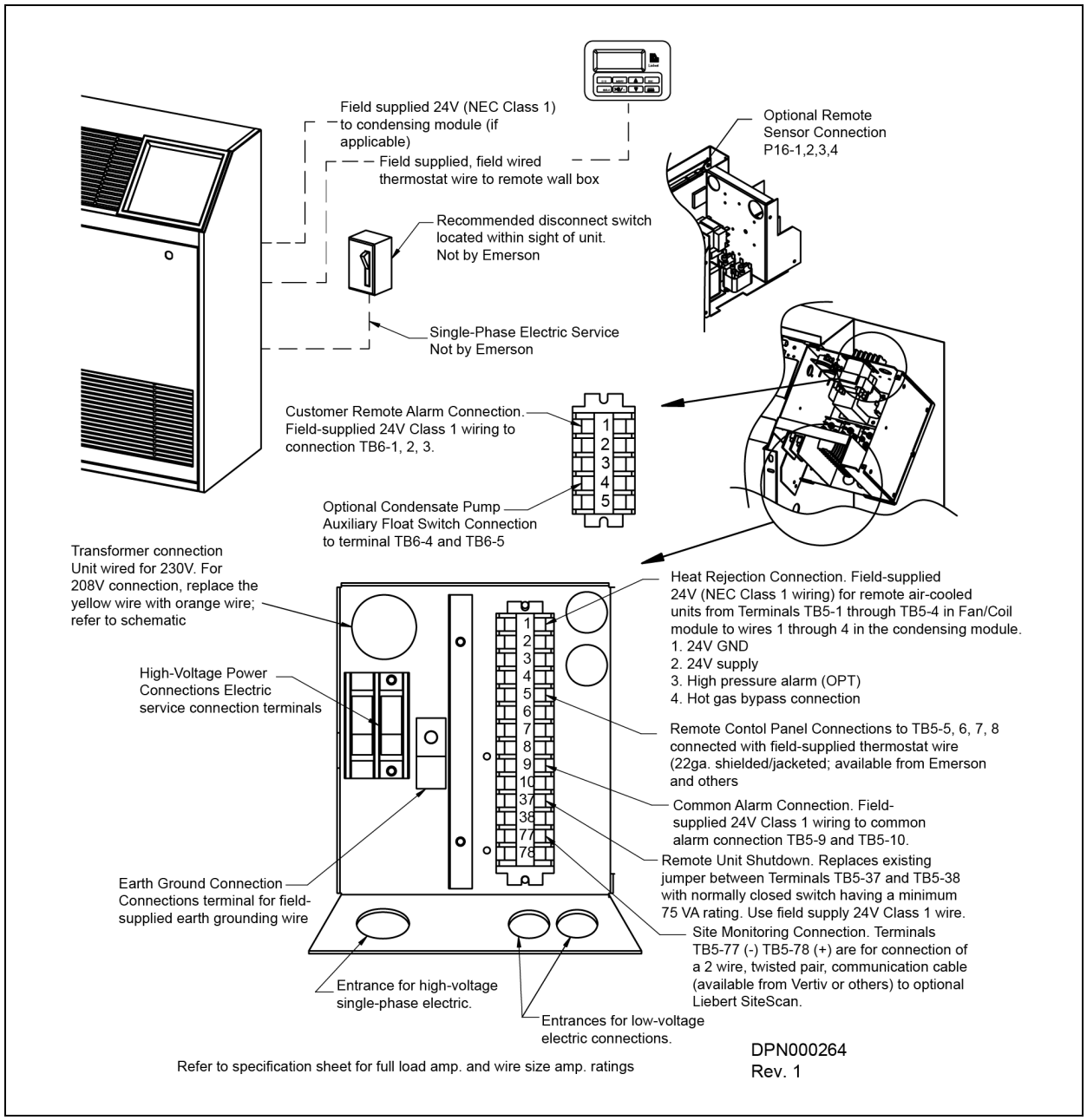
Glycol-cooled units also require a two-wire control connection to the drycooler and pump. A Class 1 circuit is required for water/glycol units.

Control wiring between the evaporator and the condensing unit must not allow a voltage drop in the line of more than 1 volt (16 gauge minimum for 75 feet). **Do not connect additional electrical devices to the control circuit.** The circuit breaker contained in the transformer housing is sized only for the factory-supplied control system.

Additional control wiring will be required if your system includes other optional monitoring and control devices.

Four wire (thermostat-type) must be connected between the evaporator control board and the wall box. See Figure 7.7 on the facing page.

Figure 7.7 Evaporator unit electrical connections



7.4.3 Condensate Pump Installation

WARNING! Risk of electric shock. Can cause injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is Off before working within the electric connection enclosures. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Liebert microprocessor does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert control. Follow all national and local codes.

A condensate pump is required when the evaporator is installed below the level of the gravity-fed drain line. Components include the pump, check valve, sump, level sensor and controls. The pump is automatically controlled by the water level in the sump.

Install the condensate pump inside the evaporator housing on the right side. The pump kit includes all necessary fittings and complete instructions.

Disconnect power and remove the evaporator housing.

The following piping connections are required:

- Unit drain pan
- Unit humidifier drain (if present)
- Pump output to customer drain line

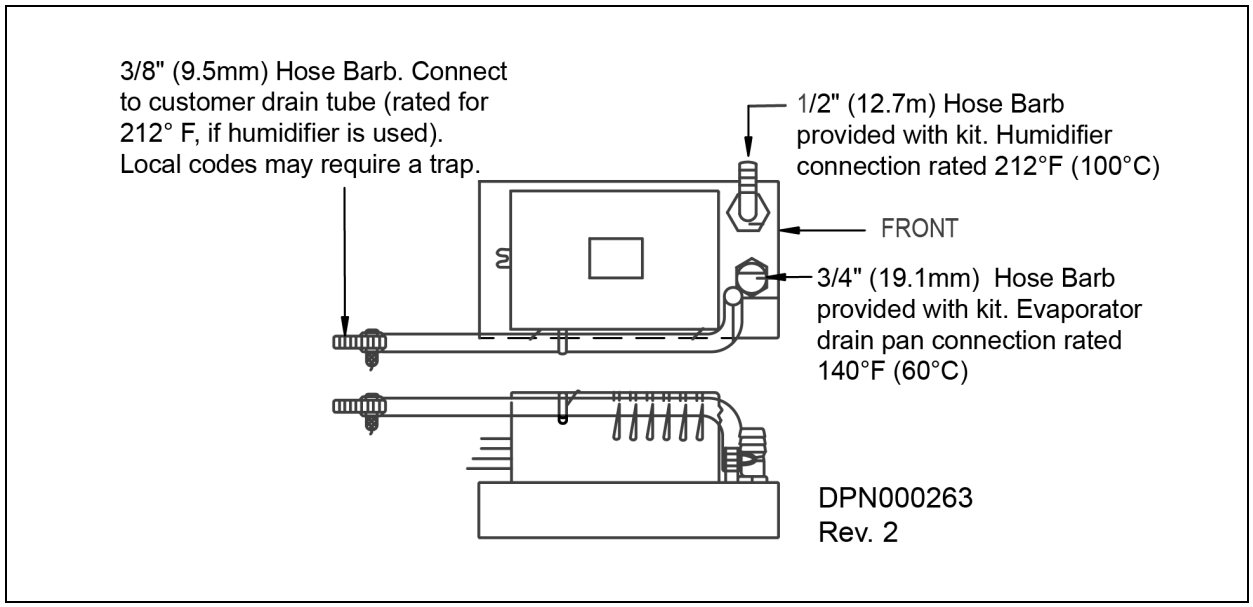
A wiring harness is provided for the condensate pump. The following electrical connections are required:

- Line voltage (yellow wires)
- Control voltage (red wires)
- Ground connection (green wire)

Tighten all connections. Apply power and check pump operation before replacing the evaporator housing. Inspect for leaks. Replace evaporator housing.

Schedule periodic inspections of the piping connections. The pump sump should be cleaned as often as the evaporator air filter. Monthly cleaning is recommended.

Figure 7.8 Optional condensate pump (field installed)



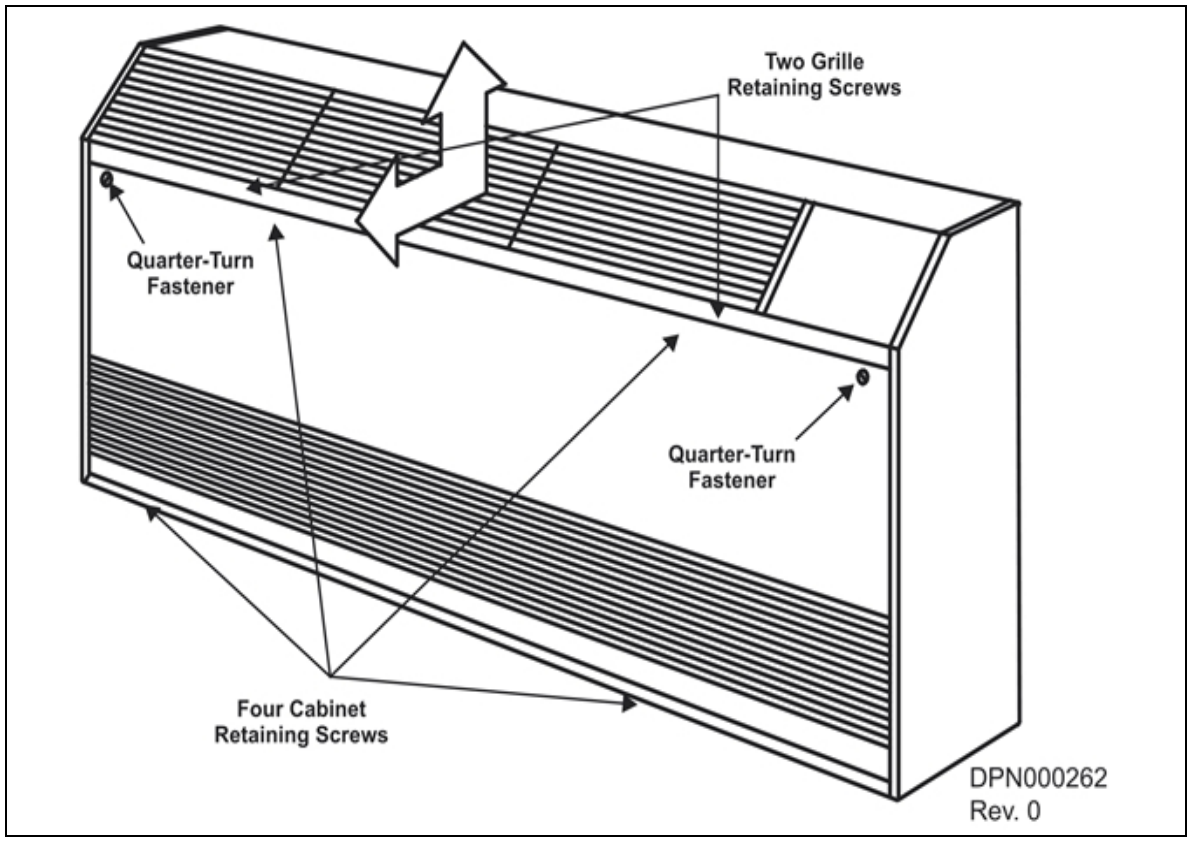
7.4.4 Changing Air Flow Direction

The air discharge grille on the evaporator can be placed in one of three different positions: vertical, horizontal or 45°.

To change the air flow direction:

1. Remove the front panel using quarter turn fasteners.
2. Remove the cabinet by removing the four retaining screws. Lift off the cabinet.
3. Remove the left end panel.
4. Remove the grille by sliding it to the left end of the unit.
5. The grille can be inverted or rotated to select the desired air discharge direction.
6. After the desired air flow direction has been set, reverse steps 1 through 4 above.

Figure 7.9 Removing the front panel and cover



7.5 Outdoor Air-Cooled Condensing Unit Installation

7.5.1 Location Considerations

NOTE: Follow all national and local building, electrical and plumbing codes.

To ensure a satisfactory air supply, locate air-cooled propeller fan condensing units in an environment providing clear air, away from loose dirt and foreign matter that may clog the coil. Condensing units must not be located in the vicinity of steam, hot air, or fume exhausts, or closer than 18 inches from a wall, obstruction, or adjacent unit. Avoid areas where heavy snow will accumulate at air inlet and discharge locations.

The condensing unit should be located for maximum security and maintenance accessibility. Avoid ground-level sites with public access. Refer to Table 7.10 on page 35 for maximum refrigerant line lengths.

Install a solid base, capable of supporting the weight of the condensing unit. The base should be at least 2 inches higher than the surrounding grade and 2 inches larger than the dimensions of the condensing unit base. For snowy areas, a base of sufficient height to clear snow accumulation must be installed.

Figure 7.10 Cabinet and floor planning dimensional data, outdoor condensing unit

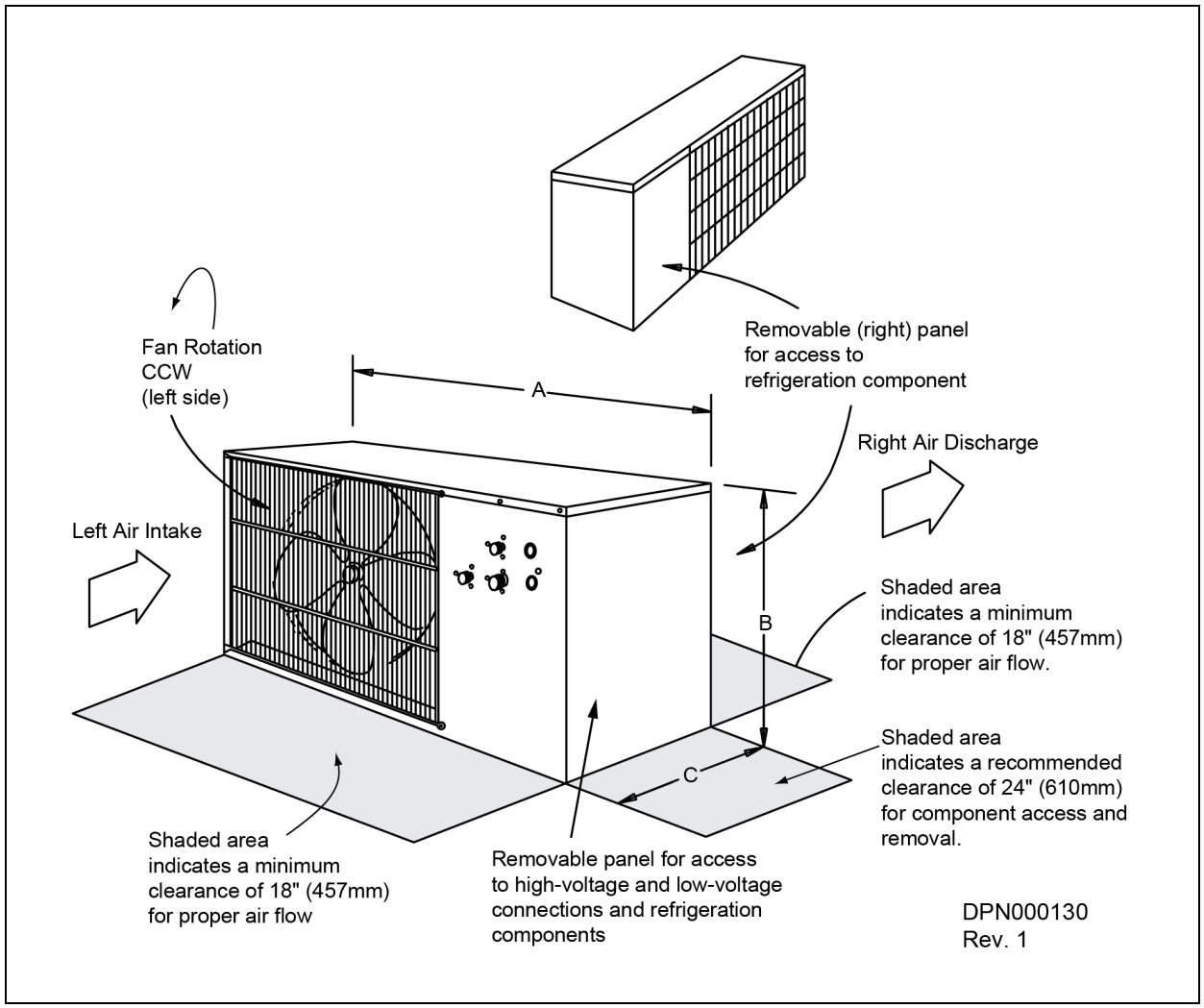


Table 7.16 Propeller fan, air-cooled condensing unit dimensions, inches (mm)

Model Numbers		Dimensional Data, inches (mm)			Module Net Weight, lb (kg)
60Hz	50Hz	A	B	C	
PFH020A-L	—	40 (1016)	23-1/2 (597)	18 (457)	200 (91)
PFH027A-L	—				
PFH027A-H	—	48 (1219)	31 (787)	18 (457)	241 (109)
PFHZ27A-L	—				
PFH037A-L	PFH036A-L				
PFH037A-H	PFH036A-H	53 (1343)	36 1/4 (918)	18 (457)	351 (159)
PFHZ37A-L	PFHZ36A-L				
Source: DPN000130, Rev. 1					

7.5.2 Piping Connections

Two refrigerant lines are required to connect the outdoor condensing unit to the Liebert DataMate. The bottom connection is for the insulated copper suction line. The top connection is for the copper liquid line. Details are given in Piping Connections and Cooling Requirements on page 29.

7.5.3 Electrical Connections

WARNING! Arc flash and electric shock hazard. Can cause injury and death. Open all local and remote electric power supplies, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Liebert microprocessor does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert control. Follow all national and local codes.

Power Connections

The outdoor condensing unit requires its own power source and earth ground, with a disconnect switch (field-supplied) to isolate the unit for maintenance. Voltage supplied must agree with the voltage specified on the unit nameplate. An optional transformer is available for 277VAC, single-phase applications.

WARNING! Risk of loose electrical wiring connections. Can cause overheating of wire, smoke and fire resulting in building and equipment damage, activation of fire suppression systems, dispatching of emergency fire and rescue equipment and personnel, serious injury or death. Use copper wiring only. Verify that all connections are tight.

Control Connections

A field-supplied, shielded, four-wire (24VAC) control connection is required between the condensing unit and the evaporator.

Connect the shield wire to earth (ground) at the Liebert equipment. Refer to Figure 7.10 on the previous page and Figure 7.11 on the facing page the electrical schematic.

NOTICE

Risk of degraded control. Can cause poor operation problems.

Low-voltage wiring and connections should be kept separate and shielded from high-voltage lines or loads such as light ballasts. High-voltage wiring and loads can induce interference in control wiring.

Figure 7.11 Piping and electrical connections, horizontal air discharge units

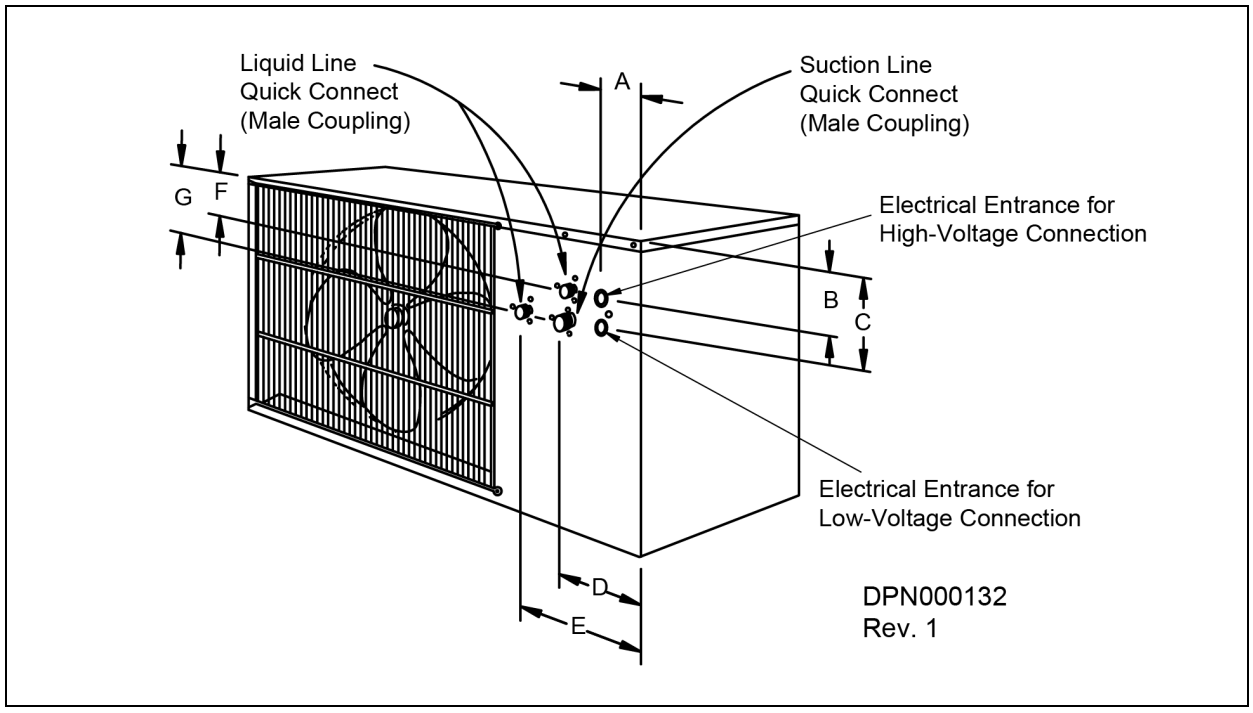


Table 7.17 Electrical and piping connections, horizontal air discharge

Model Numbers		Electrical Connections, in (mm)			Piping Connections, in. (mm)			
60Hz	50Hz	A	B	C	D	E	F	G
PFH020A-L	—	2-1/4 (57)	5-1/4 (133)	7-3/4 (197)	8-3/4 (222)	—	5 (127)	7-1/4 (184)
PFH027A-L	—							
PFH027A-H	—							
PFHZ27A-L	—	2 (51)	5-3/4 (146)	8-1/2 (216)	4-3/4 (121)	6-3/4 (171)	—	8-1/2 (216)
PFH037A-L	PFH036A-L							
PFH037A-H	PFH036A-H							
PFHZ37A-L	PFHZ36A-L	2 (51)	6 (152)	8-1/2 (216)	4-3/4 (121)	7-3/4 (197)	—	8-1/2 (216)
Source: DPN000132, Rev. 1								

7.6 Installing Ceiling Condensing Units

WARNING! Risk of ceiling collapse and heavy unit falling. Can cause building and equipment damage, serious injury or death. Verify that the supporting roof structure is capable of supporting the weight of the unit(s) and the accessories. (see Application Weights on page 26.) Verify that the top ends of the threaded suspension rods are securely anchored and that all nuts are tight.

Indoor MCD condensing units are usually mounted above the ceiling. They must be securely mounted to the roof structure. The ceiling and ceiling supports of existing buildings may require reinforcements. Be sure to follow all applicable national and local codes. Use field-supplied threaded suspension rods and 3/8-16 factory hardware kit.

Recommended clearance between ceiling grids and building structural members is the unit height plus 3 in (76mm).

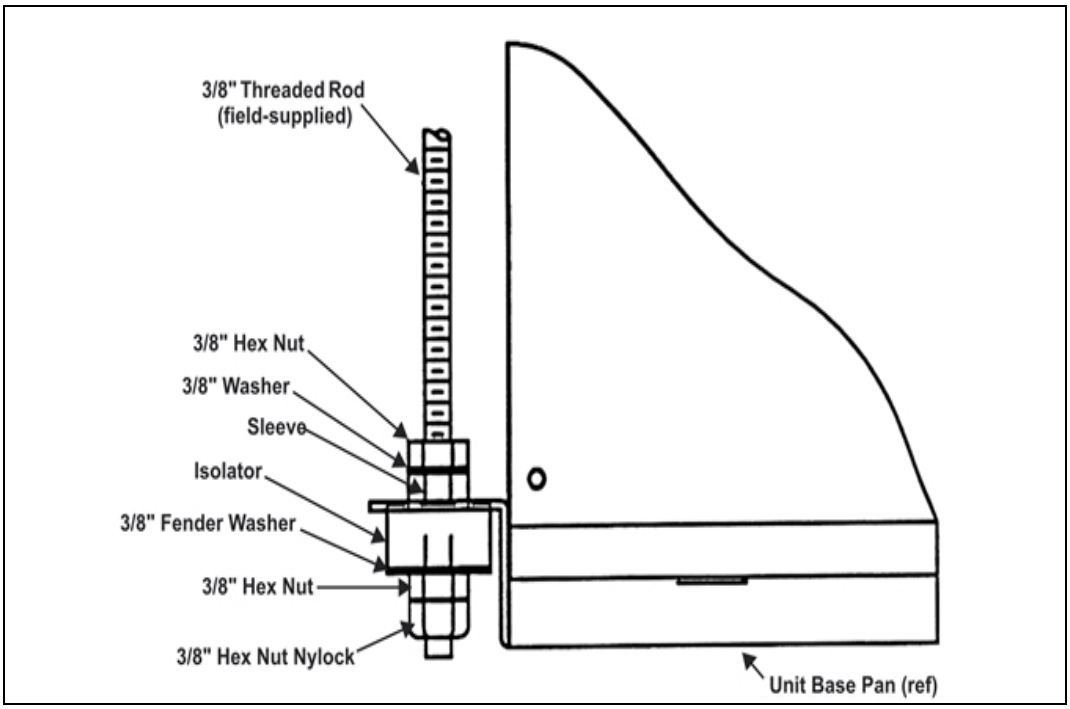
Install the four field-supplied rods by suspending them from suitable building structural members. Locate the rods so that they will align with the four mounting holes in the flanges that are part of the unit base.

Using a suitable lifting device that is rated for the weight of the unit (see Application Weights on page 26), raise the unit and pass the threaded rods through the four mounting holes in the flanges that are part of the unit base.

Attach the threaded rods to the unit flanges using the supplied hardware. (See Figure 7.12 on the facing page for the arrangement). The rubber grommets provide vibration isolation.

1. First, use the plain nuts to hold unit in place. Adjust these nuts so that the weight of the unit is supported evenly by the four rods, does not rest on the ceiling grid, and to ensure the unit is level.
2. Second, use the shake-proof nuts to “jam” the plain nuts.

Figure 7.12 Threaded rod and hardware kit installation



7.7 Indoor Air-Cooled Ceiling-Mount Condensing Unit Installation

7.7.1 Location Considerations

The centrifugal fan air-cooled condensing unit is suitable for indoor installation only. The unit may be located above the dropped ceiling or any remote indoor area using the hangers and hardware provided.

To mount the unit in the ceiling, refer to Installing Ceiling Condensing Units on the previous page.

7.7.2 Piping Connections

Details for refrigerant (R-407C) loop piping are in Piping Connections and Cooling Requirements on page 29.

7.7.3 Electrical Connections

WARNING! Arc flash and electric shock hazard. Can cause injury and death. Open all local and remote electric power supplies, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Liebert microprocessor does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert control. Follow all national and local codes.

Power Connections

The centrifugal condensing unit requires its own power source and earth ground, with a disconnect switch (field supplied) to isolate the unit for maintenance. Voltage supplied must agree with the voltage specified on the unit nameplate.

Control Connections

A field-supplied shielded four-wire control connection is required from the evaporator unit to the condensing unit.

Connect the shield wire to earth (ground) at the Liebert equipment. Refer to Figure 7.15 on page 51 and the electrical schematic.

NOTICE

Risk of degraded control. Can cause operation problems.

Low-voltage wiring and connections should be kept separate and shielded from high-voltage lines or loads such as light ballasts. High-voltage wiring and loads can induce interference in control wiring.

7.7.4 Ducting

The total external static pressure for the inlet and outlet ducts, including grille, must not exceed 0.5 inches of water. Hood intake dimensions should be the same as the condensing unit duct dimensions.

If the condensing unit draws air from the outside of the building, rain hoods must be installed. In addition, install a triple layer bird screen over rain hood openings to eliminate the possibility of insects, birds, water and debris from entering the unit.

Use flexible ductwork or nonflammable cloth collars to attach ductwork to the unit and to control vibration transmission to the building. Attach the ductwork to the unit using the flanges provided. Locate the unit and ductwork so that the discharge air does not short circuit to the return air inlet.

Avoid directing the hot exhaust air toward adjacent doors or windows.

Normal operating sound may be objectionable if the condensing unit is placed directly over quiet work areas. Ductwork that runs through a conditioned space or is exposed to areas where condensation may occur must be insulated. Whenever possible, ductwork should be suspended using flexible hangers. Ductwork should not be fastened directly to the building structure. In applications where the ceiling plenum is used as the heat rejection domain, the discharge air must be directed away from the condensing unit air inlet and a screen must be added to the end of the discharge duct to protect service personnel.

For multiple unit installations, space the units so that the hot condensing unit exhaust air is not directed toward the air inlet of an adjacent unit.

Table 7.18 Air flow – CFM (CMH) at 0.50 inches of water gauge external static pressure

2 Ton	3 Ton
1,000 (1699)	1430 (2490)

Figure 7.13 General arrangement drawing, air-cooled

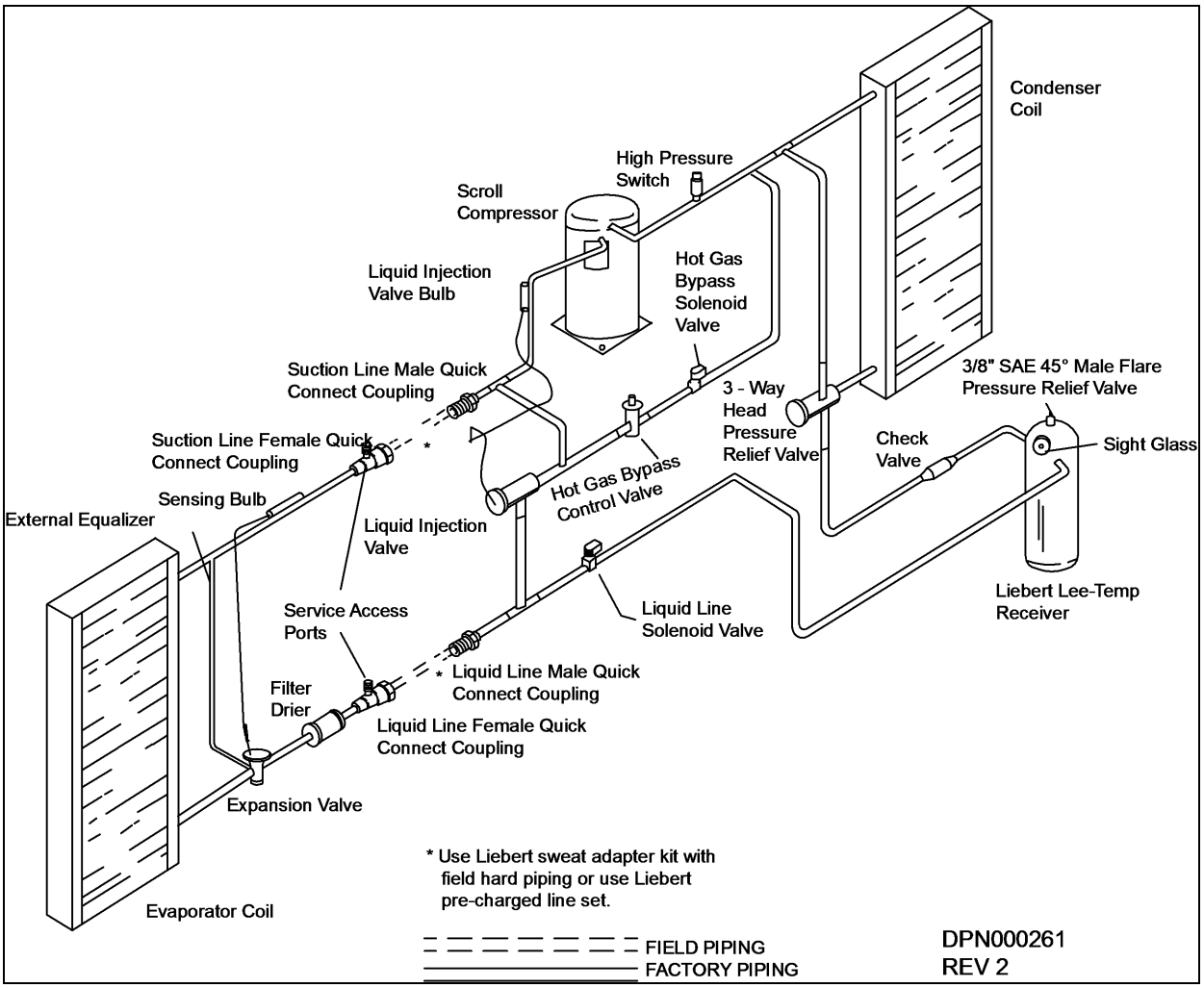


Figure 7.14 Indoor air-cooled condensing unit dimensions and pipe connections (2 and 3 ton)

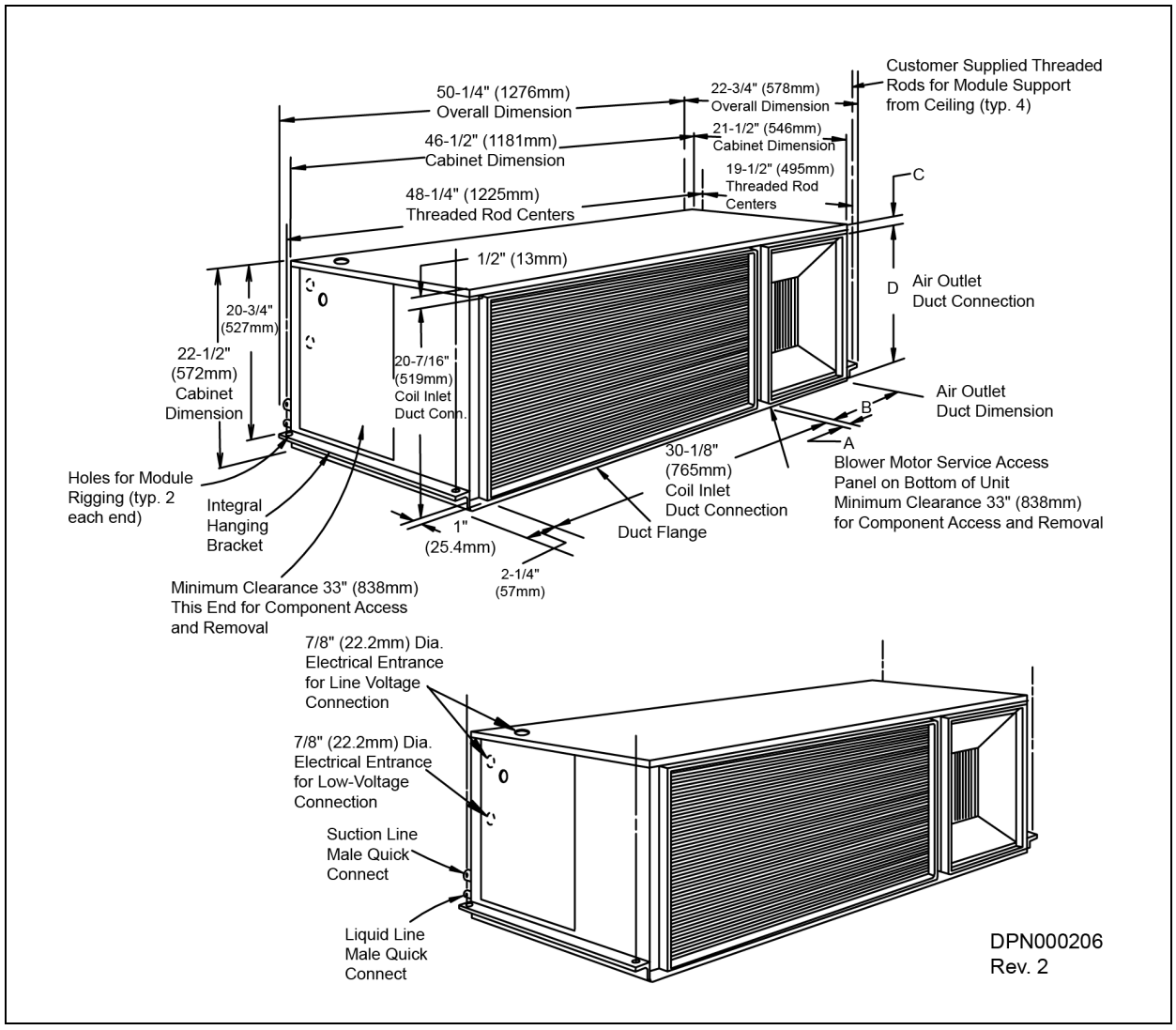
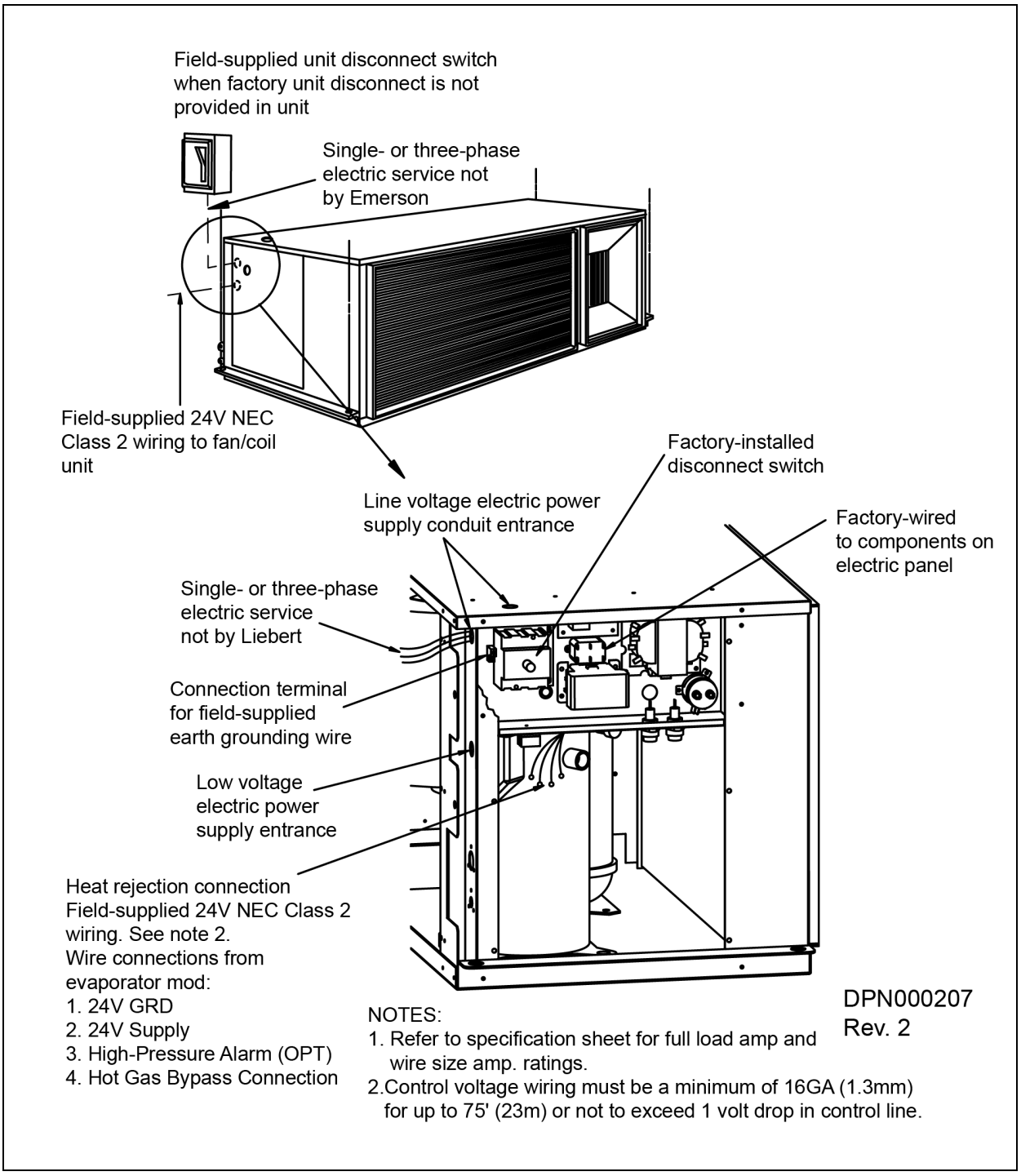


Table 7.19 Remote centrifugal fan, air-cooled condensing, weight and dimensions

Model	Weight lb (kg)	Dimensions, in (mm)			
		A	B	C	D
MC*24A	230 (104)	1-7/16 (37)	11-7/16 (290)	1/2 (13)	20-7/16(519)
MC*35A	240 (109)				
MC*36A	240 (109)				
Source: DPN000206, Rev. 2					

Figure 7.15 Indoor air-cooled condensing unit electrical connections (2 and 3 ton)



7.8 Water/Glycol-Cooled Ceiling-Mount Condensing Unit Installation

7.8.1 Location Considerations

Water/glycol-cooled MCD condensing units are suitable for indoor installation only and may be located above a dropped ceiling or any remote indoor area using the hangers and hardware provided.

To mount the MCD condensing unit in the ceiling, refer to Installing Ceiling Condensing Units on page 46.

NOTICE

Risk of internal system corrosion and frozen coolant fluid. Can cause equipment damage and major fluid leaks resulting in serious building damage, expensive repair costs and costly system down time.

Cooling coils, heat exchangers and piping systems that are connected to open cooling towers or other open water/glycol systems are at high risk of freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil, piping and heat exchanger corrosion. The water or water/glycol solution must be analyzed by a competent local water treatment specialist before startup to establish the inhibitor and antifreeze solution requirement and at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The complexity of water/glycol solution condition problems and the variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced water treatment specialist and follow a regularly scheduled coolant fluid system maintenance program.

Read and follow individual unit installation instructions for precautions regarding fluid system design, material selection and use of field-provided devices. Liebert systems contain iron and copper alloys that require appropriate corrosion protection. It is important to have the system running with flow through exchangers maintained at initial system fill for 24 to 48 hours depending on size and system configuration.

Water chemistry varies greatly by location, as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components. The chemistry of the water used must be considered, because water from some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The water/coolant fluid must be treated and circulating through the system continuously to prevent the buildup of sediment deposits and or growth of sulfate reducing bacteria.

Proper inhibitor maintenance must be performed in order to prevent corrosion of the system. Consult glycol manufacturer for testing and maintenance of inhibitors.

Commercial ethylene glycol, when pure, is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the water from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

7.8.2 Piping Connections

Piping Considerations

Do not use galvanized pipe in glycol systems. Manual service shutoff valves should be installed at the supply and return line to each unit. This enables routine service and/or emergency isolation of the unit. When the condensing unit fluid quality is poor, filters (that can be easily replaced or cleaned, with 16-20 mesh screen) should be placed in the supply line. These filters extend the service life of the condensing units.

Condensing fluid connections are 7/8" (22.2mm) OD copper. Details for refrigerant (R-407C) loop piping are in Piping Connections and Cooling Requirements on page 29.

Condensing Unit Fluid Requirements

The maximum fluid pressure is 150psig (1034kPag). For applications above this pressure, consult the factory.

The water-cooled system will operate in conjunction with either a cooling tower or city water. Glycol cooled systems will operate in conjunction with a cooling tower, city water or drycooler. Automotive antifreeze must not be used in glycol systems. Prepare glycol solution using customary practices.

Regulating Valve

Water/glycol-cooled units include a coolant flow regulating valve which may require adjustment.

Attach refrigeration gauges to the compressor discharge and suction lines. Raise the head pressure by turning the adjusting screw clockwise. Allow enough time between adjustments for the system to stabilize. Refer to recommended operating pressures in Piping Connections and Cooling Requirements on page 29.

When the refrigeration system has been off for approximately 10 to 15 minutes, the coolant flow should stop. If the coolant continues to flow, the valve is improperly adjusted (head pressure too low).

Flush the valve by inserting a screwdriver or similar tool under the two sides of the main spring and lifting. This will open the valve seat and flush out any dirt particles,

7.8.3 Electrical Connections

WARNING! Arc flash and electric shock hazard. Can cause injury and death. Open all local and remote electric power supplies, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Liebert microprocessor does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert control. Follow all national and local codes.

WARNING! Risk of loose electrical wiring connections. Can cause overheating of wire, smoke and fire resulting in building and equipment damage, activation of fire suppression systems, dispatching of emergency fire and rescue equipment and personnel, serious injury or death. Use copper wiring only. Verify that all connections are tight.

Power Connections

The condensing unit requires its own power source and earth ground, with a disconnect switch (field supplied) to isolate the unit for maintenance. Voltage supplied must agree with the voltage specified on the unit nameplate.

Control Connections

A field-supplied shielded four-wire (24VAC) control connection is required from the evaporator unit to the condensing unit.

Connect the shield wire to earth (ground) at the Liebert equipment. Avoid running the low voltage connections near high voltage lines or loads such as light ballasts. Refer to Figure 7.17 on page 57 and the electrical schematic.

Figure 7.16 Water- and glycol-cooled ceiling-mount condensing units: Dimensions and pipe connections (2 and 3 ton)

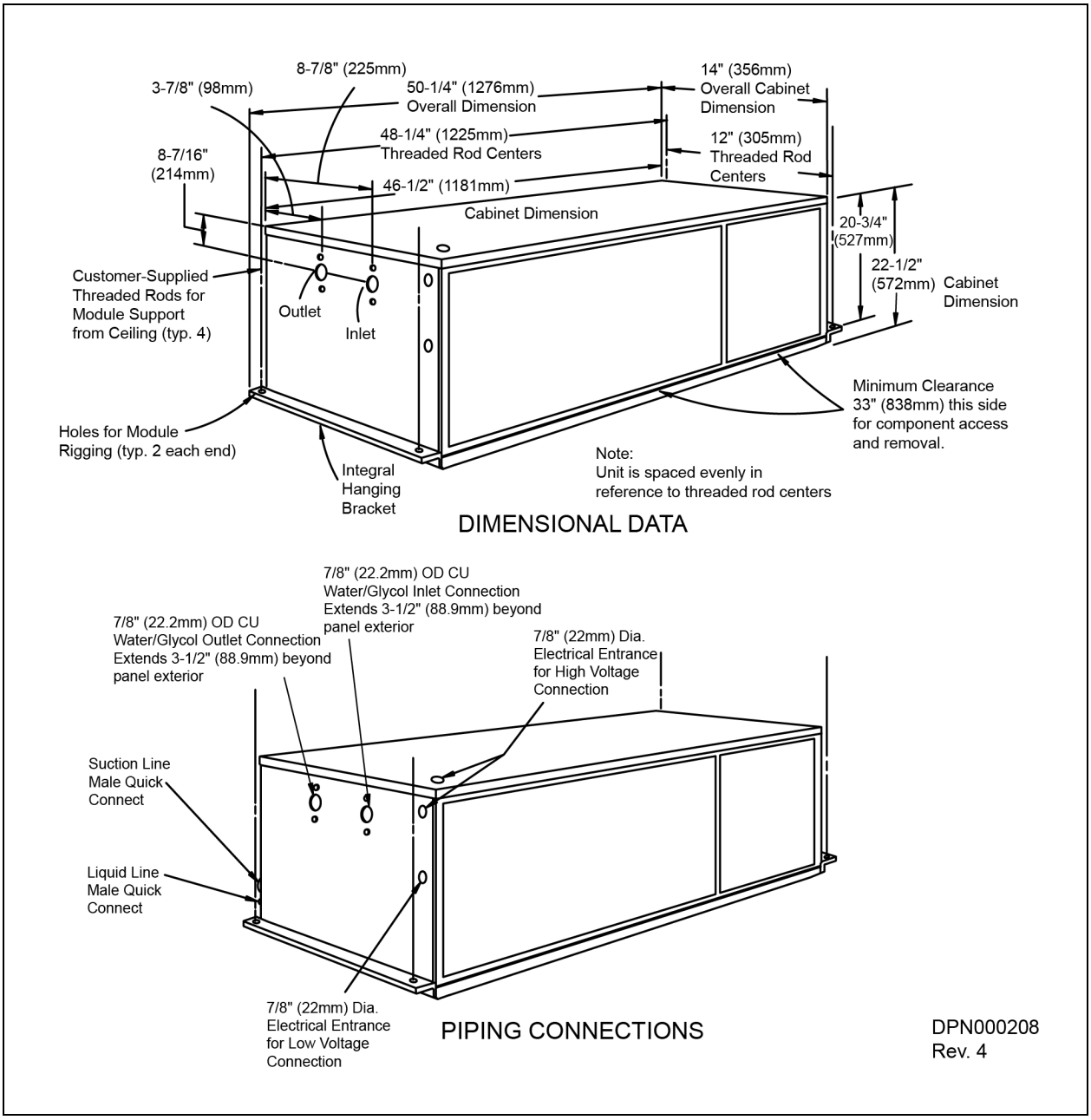


Table 7.20 Net weights, 2- and 3-ton units

Model #		Weight
60Hz	50Hz	lb. (kg)
MC*26W	NA	175 (79)
MC*38W	MC*37W	220 (100)

Figure 7.17 Water- and glycol-cooled ceiling-mount condensing units: electrical connections (2 and 3 ton)

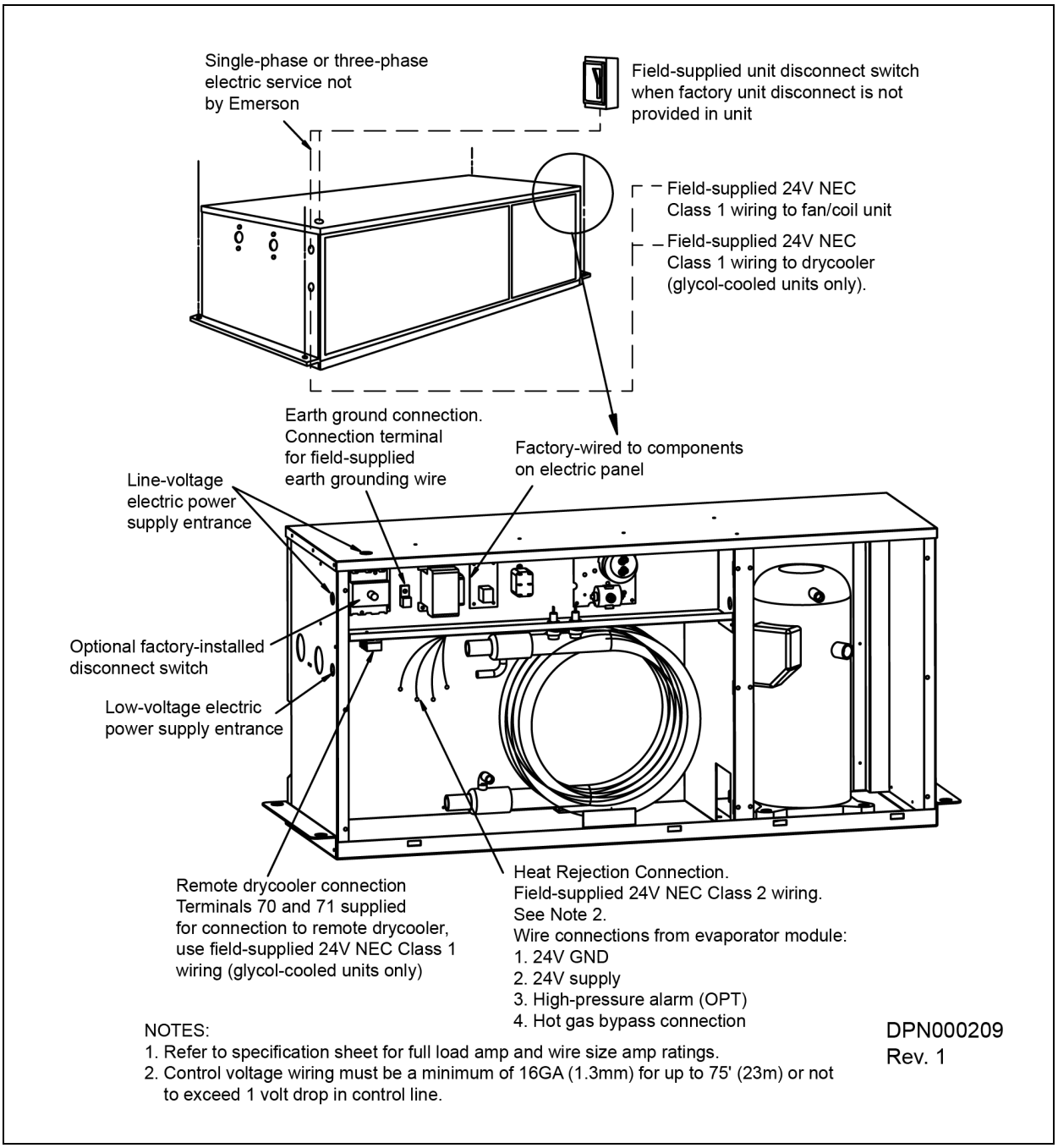
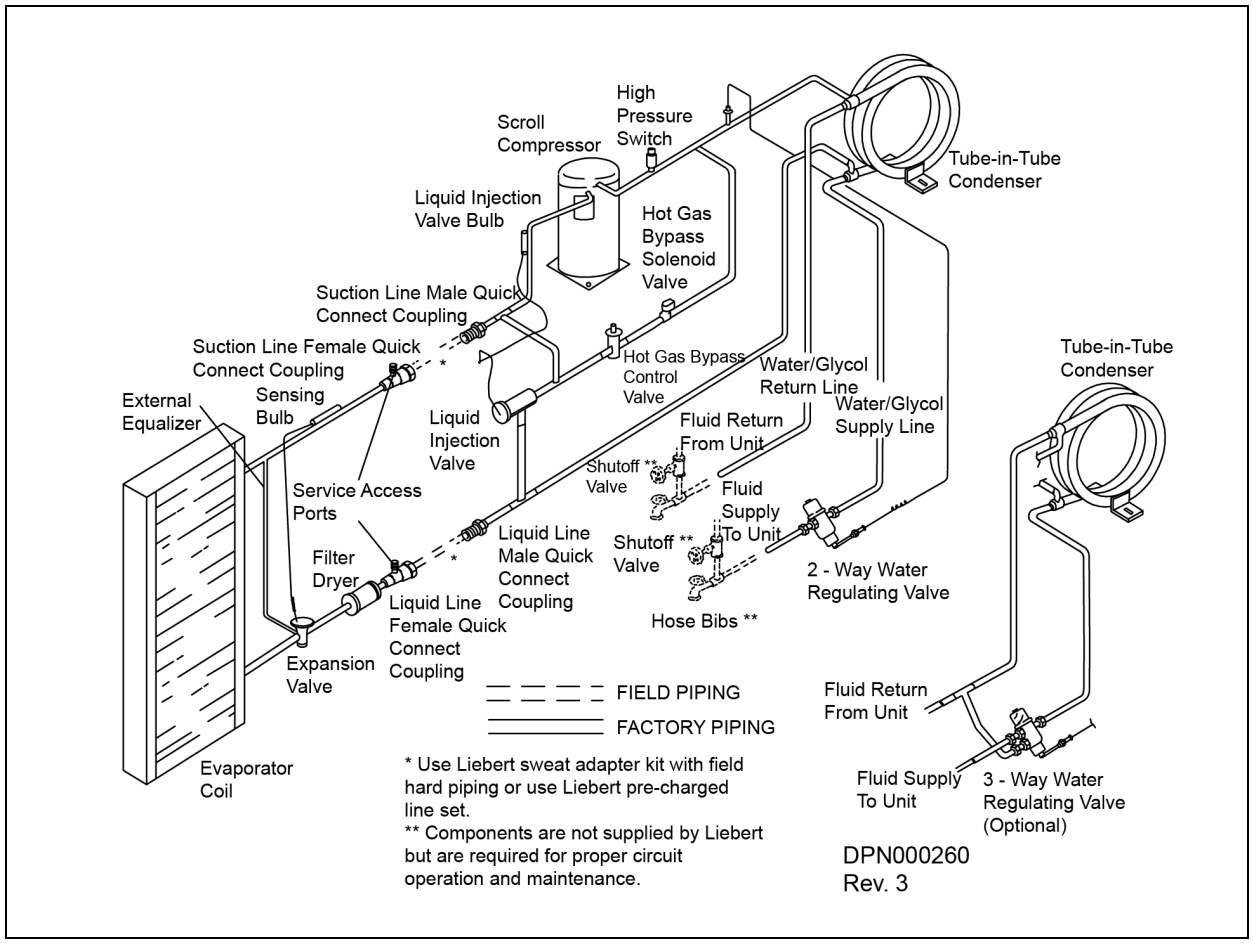


Figure 7.18 General arrangement drawing, water/glycol-cooled



7.9 Integral Water/Glycol-Cooled Condensing Unit Installation

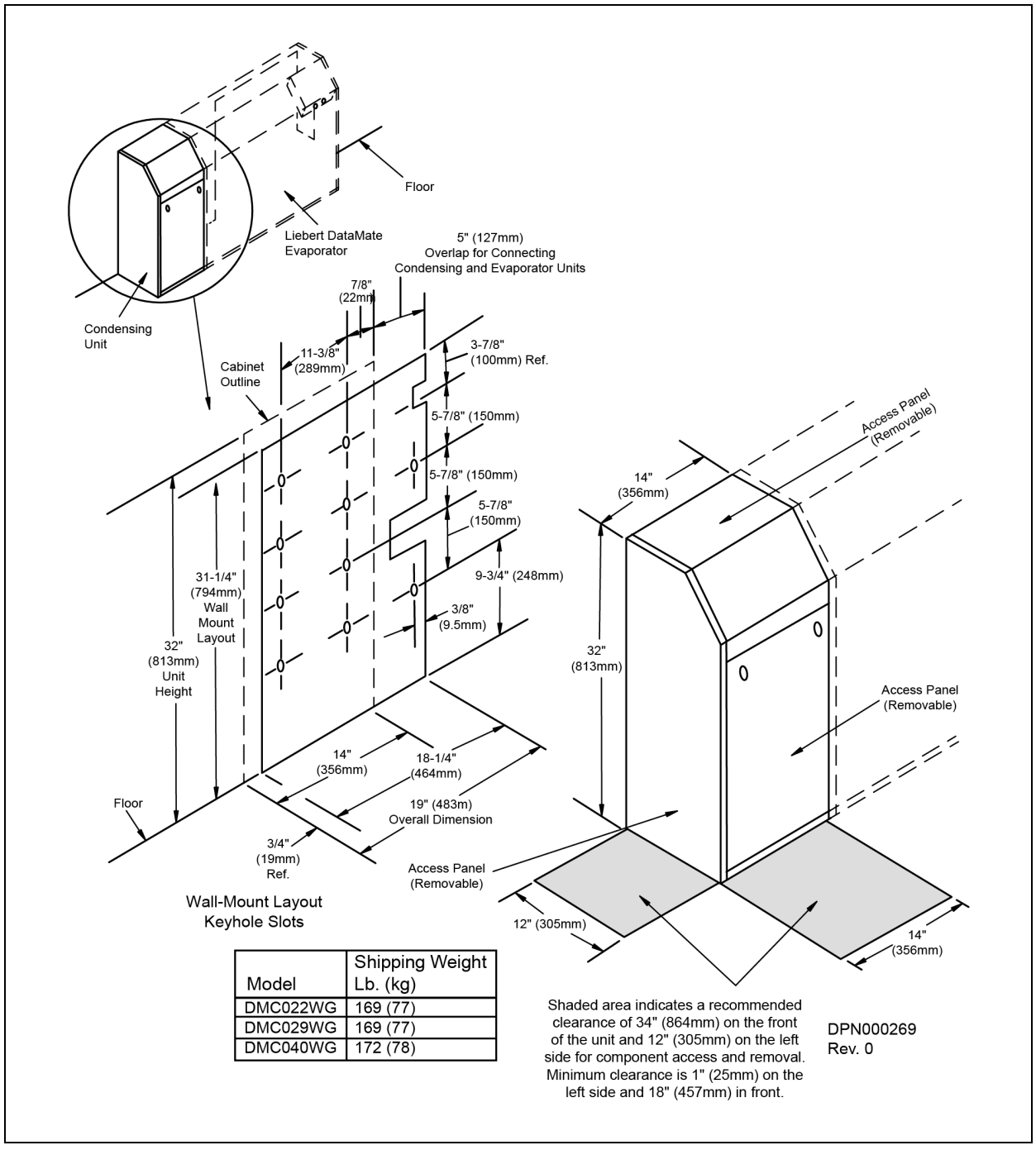
WARNING! Risk of electric shock. Can cause injury or death. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure. Some internal components require and receive power even during the Unit Off mode of the Liebert control. Follow all national and local codes.

CAUTION: Risk of sharp edges and heavy parts. Can cause injury. Use only properly trained and qualified HVAC installation personnel to install this unit. Wear gloves to prevent injury to hands. Wear safety glasses to prevent injury to eyes.

7.9.1 Location Considerations

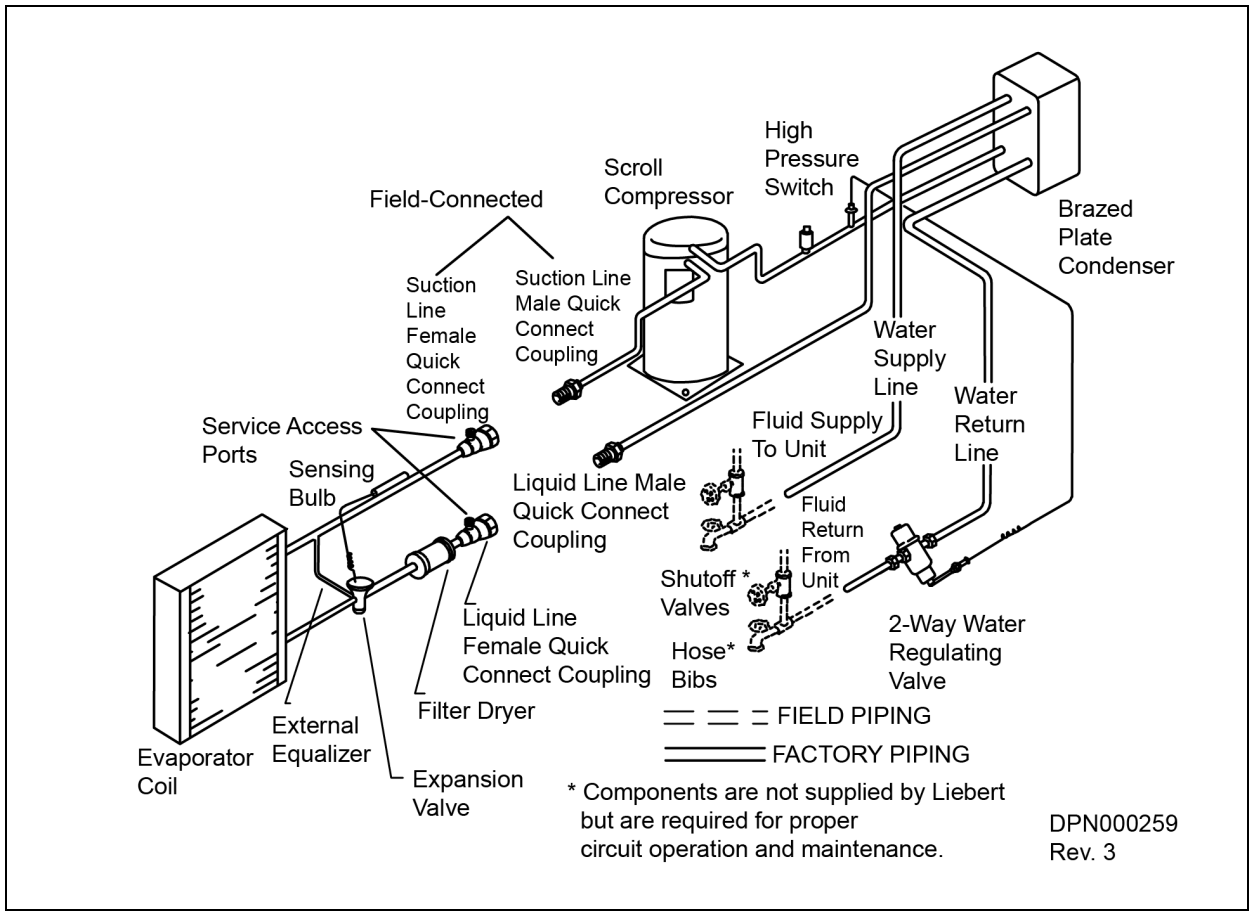
The integral water/glycol condensing unit is suitable for indoor installation only. The unit is designed to be attached to the left side of the evaporator chassis.

Figure 7.19 Integral water/glycol unit dimensions



Model	Shipping Weight Lb. (kg)
DMC022WG	169 (77)
DMC029WG	169 (77)
DMC040WG	172 (78)

Figure 7.20 General arrangement, water/glycol systems, close-coupled condensing unit



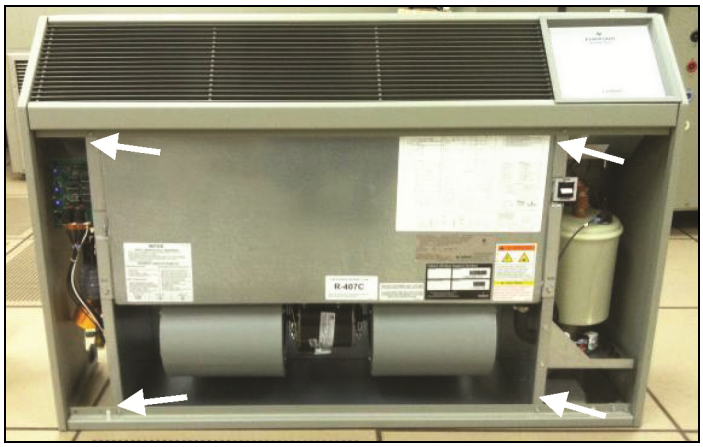
7.9.2 DMC Condensing Unit Attachment to DME Evaporator

1. The Liebert DataMate evaporator (DME) and Liebert DataMate condensing unit (DMC) should be joined away from the wall so there is access to the rear of the unit.
2. Remove front access cover from DME evaporator.

Figure 7.21 Remove DME evaporator front access cover

3. Remove four screws from DME evaporator front.

Figure 7.22 Screw location, evaporator front



4. Remove evaporator panel assembly by lifting up and towards unit front.

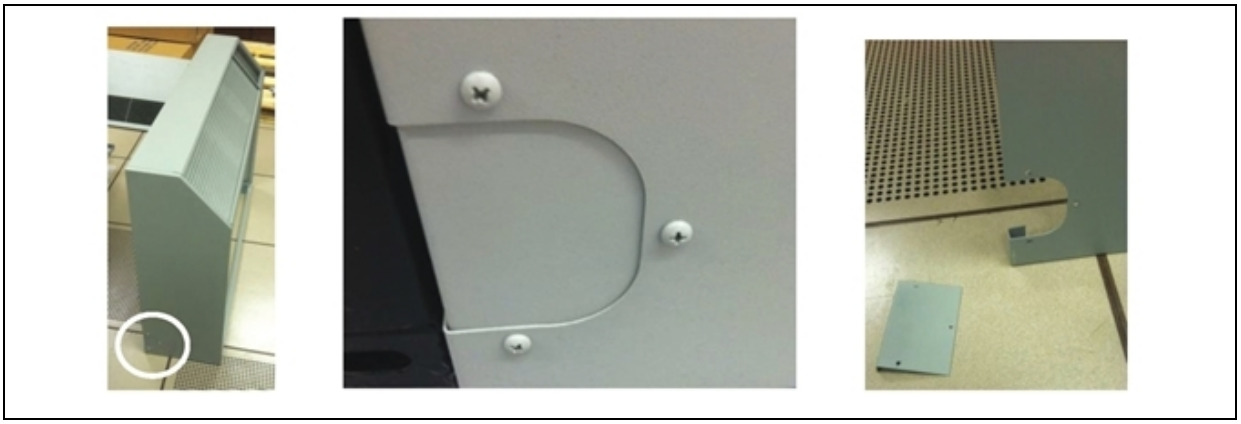
Figure 7.23 Remove evaporator panel assembly

5. Remove left chassis extension from DME by removing all six screws. Two are located at bottom as indicated by arrows. Four are on the backside of the unit. This piece is not used with the Liebert DataMate water/glycol condensing unit and can be recycled.

Figure 7.24 Remove left chassis extension

6. Remove panel cutout cover from left side of DME evaporator panel assembly. This piece is not used with the Liebert DataMate water/glycol condensing unit and can be recycled.

Figure 7.25 Remove the panel cutout cover from the DME evaporator panel



7. Remove the bottom left support bracket from the DME evaporator panel assembly and recycle it.

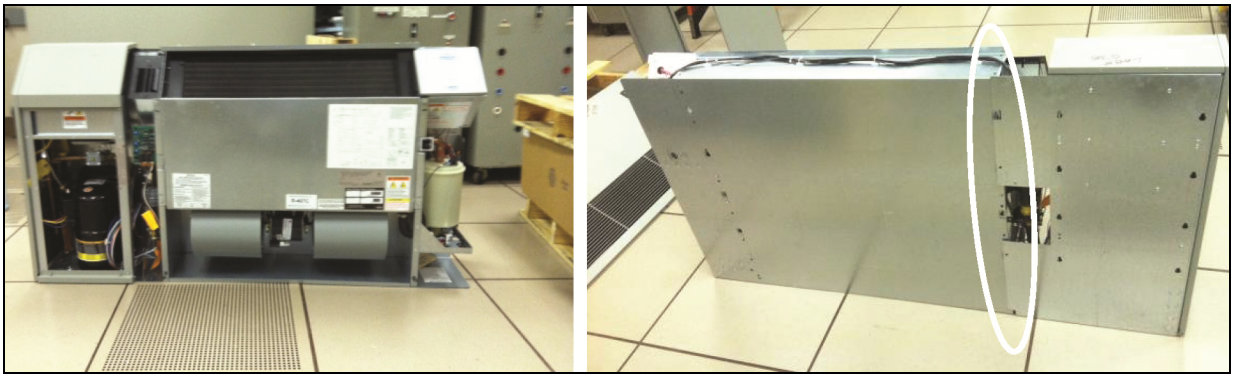
Figure 7.26 Remove bottom left support bracket from DME evaporator panel

8. Remove front access cover from DMC condensing unit.

Figure 7.27 Remove front access cover from condensing unit

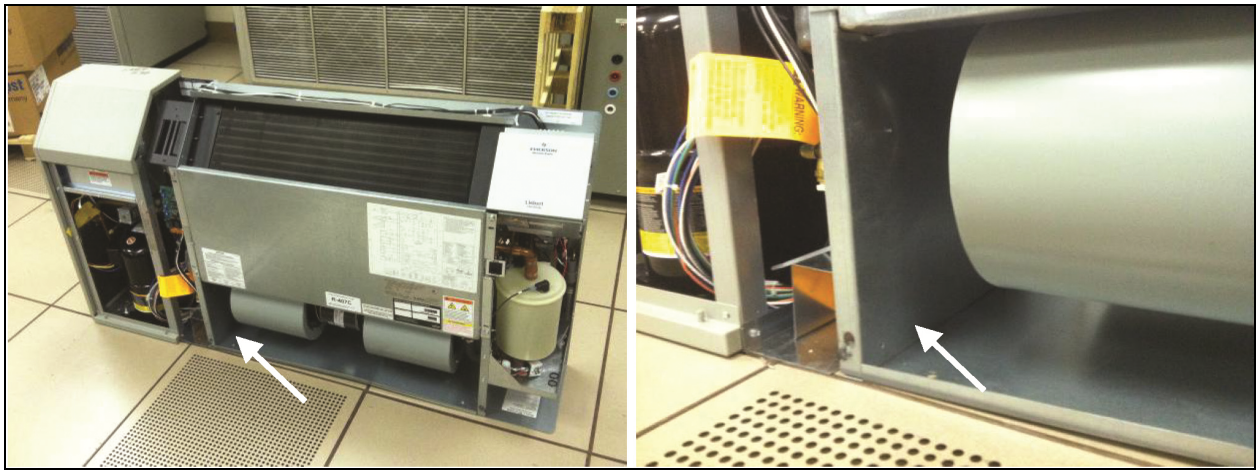
9. Join the DMC condensing unit to the DME evaporator. Place four screws left over from step 5 in the rear of the units to join both chassis together.

Figure 7.28 Join the DMC condensing unit to the DME evaporator



10. Place remaining two screws toward the bottom of unit chassis. These screws should go through the clearance holes in the evaporator blower section and grab the bite holes in the condensing unit.

Figure 7.29 Insert screws through blower section into the condensing unit

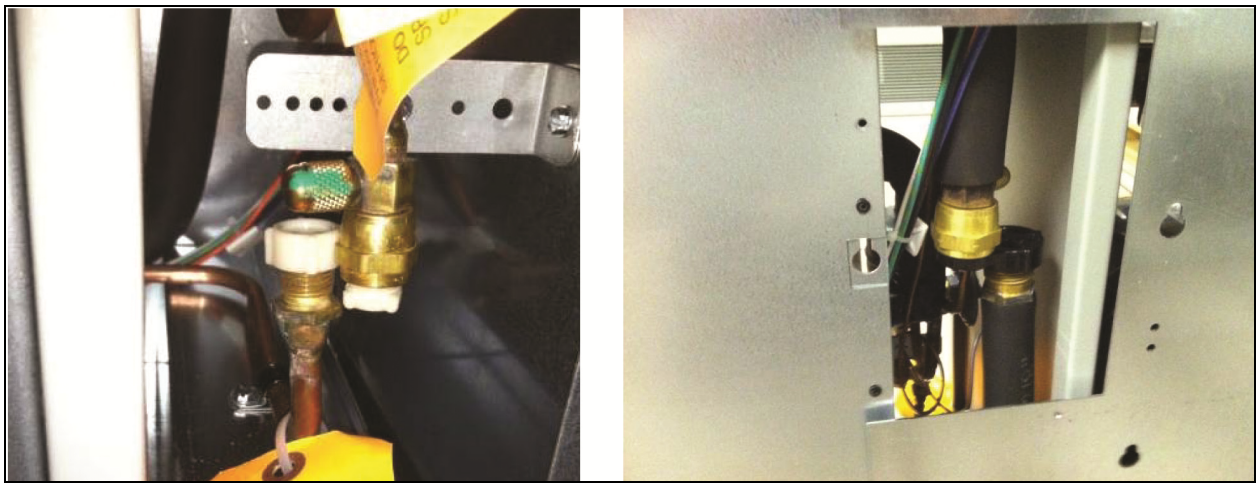


7.9.3 Refrigerant Circuit Connections

1. Connect liquid lines through access in front of unit and suction line through rear of unit. Loosen or remove the piping brackets/clamps as necessary to connect the lines. Follow quick-connect instructions below when making connections.

CAUTION: Risk of explosion from high pressure refrigerant. Cutting pressurized lines can cause serious injury. Do not cut the refrigerant lines.

Figure 7.30 Connect the liquid lines and the suction lines



2. Remove protector caps and plugs.
    a. Carefully wipe coupling seats and threaded surfaces with a clean cloth.
    b. Lubricate the male diaphragm and synthetic rubber seal with refrigerant oil.
    c. Thread the coupling halves together by hand to ensure that the threads mate properly.
    d. Tighten the coupling body hex nut and union nut with the proper sized wrench until the coupling bodies bottom-out or until a definite resistance is felt.
    e. Use a marker or pen to make a line lengthwise from the coupling union nut to the bulkhead.
    f. Tighten the nuts an additional quarter of a turn, using the marking to determine the amount. This additional tightening is necessary to ensure that the joint does not leak.

       If a torque wrench is used, torque the nuts to the values in Table 7.21 below.

Table 7.21 Torque values

Coupling Size	lb-ft (Nm)
— #6	10-12 (14-16)
— #11	35-45 (47-61)

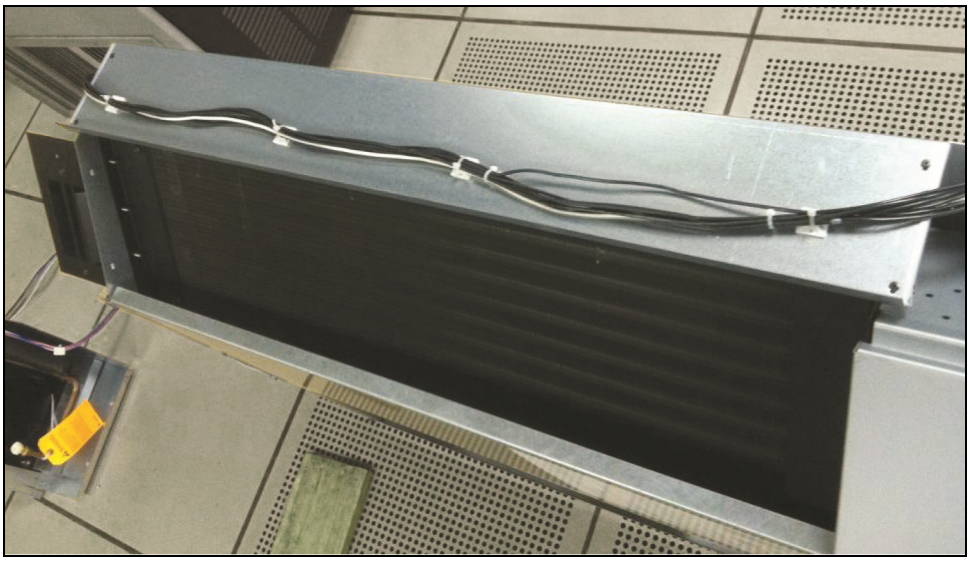
7.9.4 Unit-to-Unit Electrical Connections

When the DMC is used with the DME, the evaporator is powered from the condensing unit. The DMC unit is shipped with a power/control wire harness to connect the two units.

WARNING! Arc flash and electric shock hazard. Can cause injury or death. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure. Some internal components require and receive power even during the Unit Off mode of the Liebert control. Follow all national and local codes.

1. Route wires from DMC condensing unit along top portion of DME evaporator as shown in Figure 7.31 below.

Figure 7.31 Power/control wire harness routing



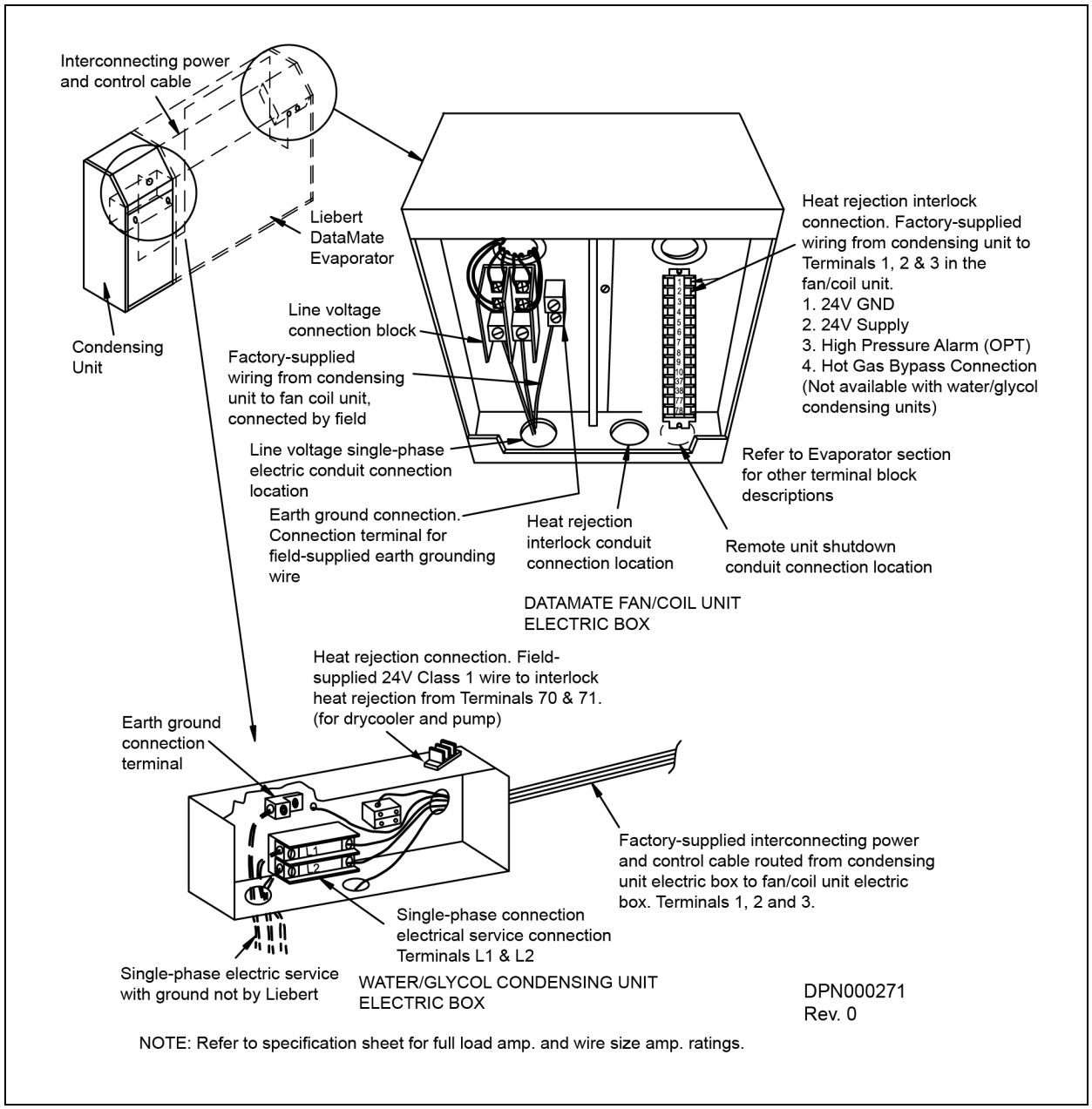
Electrical Connections

1. Connect electrical power and control wires as shown in Figure 7.32 on the next page and electrical schematics provided.

Heat Rejection Connections

The integral condensing unit must be connected to the drycooler if it is used in a glycol loop. Terminals are provided in the condensing unit's electric box for Class 1 wiring to the heat rejection equipment.

Figure 7.32 Integral water/glycol condensing unit connections



7.9.5 Final Unit Placement and Installation Steps

1. Support the DME evaporator and DMC condensing units while connecting the units to the wall using the provided keyhole slots and appropriate field-supplied fasteners.
2. Make heat rejection fluid connections to the DMC. Manual service shutoff valves are required at the supply and return water /glycol line to each unit. This enables routine service and/or emergency isolation of the unit. Vertiv™ recommends that 16-20 mesh filters (that can be easily replaced or cleaned) be placed in the supply line when the condensing unit fluid quality is poor. These filters extend the service life of the condensing unit.

Connection Sizes OD Copper

DMC022WG	5/8"
DMC029WG/DMC040WG	7/8"

Condensing Unit Fluid Requirements

The maximum fluid pressure is 150psig (1034kPag). For applications above this pressure, consult the factory.

The system will operate in conjunction with either a cooling tower, city water or drycooler.

Regulating Valve

Refer to Piping Connections on page 53 for a description of the regulating valve and instructions for adjustment.

1. If the integral condensing unit is used in a glycol loop, it must be connected to the drycooler. Terminals are provided on the condensing unit's electric box for Class 1 wiring to the heat rejection equipment. See Figure 7.32 on the previous page.

WARNING! Arc flash and electric shock hazard. Can cause injury and death. Open all local and remote electric power supplies, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Liebert microprocessor does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert control. Follow all national and local codes.

2. Connect single-phase supply power wires to the power block of DMC condensing unit.
3. Install the DME evaporator panel assembly, securing it with four screws.

Figure 7.33 Install DME evaporator panel assembly

4. Install the DME and DMC front access covers, securing each with quarter-turn fasteners.

Figure 7.34 Install DME and DMC front access covers

8 CHECKLIST FOR COMPLETING INSTALLATION

1. Proper clearances for service access have been maintained around the equipment.
2. Equipment is level and mounting fasteners are tight.
3. Piping completed to refrigerant or coolant loop (if required). Refrigerant charge added (if required).
4. Condensate pump installed (if required).
5. Drain line connected and checked for leaks (correct as required).
6. Water supply line connected to humidifier (if required).
7. All piping connections are tight and checked for leaks (correct as required).
8. Safety pan installed under water/glycol-cooled condensing units.
9. Ducting completed if required.
10. Line voltage to power wiring matches equipment nameplate.
11. Power wiring connections completed to disconnect switch, evaporator and condensing unit, including earth ground.
12. Control panel DIP switches set based on customer requirements.
13. Power line circuit breakers or fuses have proper ratings for equipment installed.
14. Control wire to condensing unit is shielded.
15. Connections completed to evaporator and condensing unit, including control wire, shield wire connected to earth (ground) at Liebert equipment.
16. All wiring connections are tight.
17. Foreign materials have been removed from in and around all equipment installed (shipping materials, construction materials, tools, etc.).
18. Fans and blowers rotate freely without unusual noise.
19. Inspect all piping connections for leaks during initial operation.\
20. Drain pan is installed under cooling and ceiling-mounted condensing unit.
21. Monitored water detection system is installed for the unit, water supply/return lines and condensate drain line.

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9 MICROPROCESSOR CONTROL

The Microprocessor Control for the Liebert DataMate features an easy to-use, menu-driven liquid crystal display. The menus, control features and circuit board details are described in this section. Detailed information concerning controls (System Performance Microprocessor Controls on page 85) and alarms (Alarms on page 87) are provided.

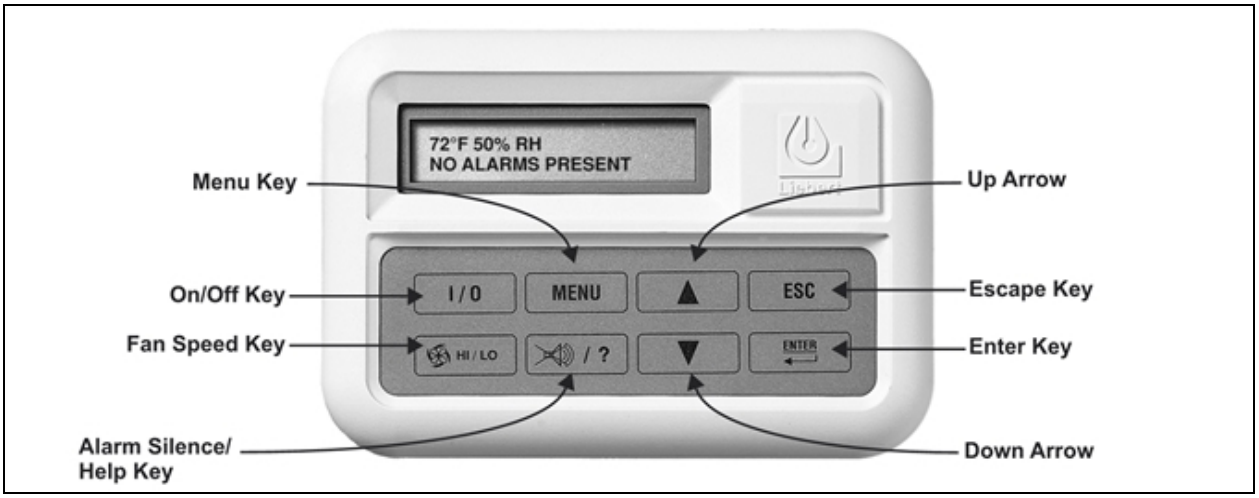
9.1 Feature Overview

To turn the unit ON, press the ON/OFF (I/O) key after power is applied. To turn the unit OFF, press the ON/OFF (I/O) key before power is disconnected.

The following control keys may be used to move through the menus, as prompted on the LCD:

- On/Off (I/O): Turns unit on or off (top far left).
- Menu: Enables user to access the program menu to change control parameters, alarms, setback schedule, etc. (top near left).
- Up Arrow: Increases the value of displayed parameter while in a set mode (setpoints, time, etc.) (Arrow-top near right).
- Fan Speed (HI/LO): Changes the fan speed between high and low fan speed on direct-drive blower models; not available on high-static belt-driven motor (bottom far left, when present).
- Escape (ESC): Allows user to move back to a previous menu (top far right).
- Alarm Silence/? (Help): If an alarm is present, pressing this key will silence he alarm. If this key is pressed when no alarms are present, help text will appear (bottom near left).
- Down Arrow: Decreases the value of displayed parameter while in a set mode (bottom near right).
- Enter (ENTER): After setting a control point, press Enter to store the information in the microprocessor (bottom far right).

Figure 9.1 Control key locations—all-mounted display box



Active alarms appear on the LCD and sound an audible beeper. To silence an alarm, press the Alarm Silence/Help key as prompted on the display.

Setpoints, DIP switch settings and other selections were made during factory testing of your unit and are based upon typical operating experience. (Other default selections were made according to options included with your unit). MAKE ADJUSTMENTS TO THE FACTORY DEFAULT SELECTIONS ONLY IF THEY DO NOT MEET YOUR SPECIFICATIONS.

Allowable ranges are displayed by pressing the help key. A password will be required (if enabled) to change setpoints, time delays, etc.

The display normally shown includes the present room temperature, humidity, active status functions (cooling, heating, dehumidifying, humidifying), normal fan speed/low fan speed and active alarms. The Status Display may also be selected from the Main Menu.

9.2 Main Menu <Menu>

Press the MENU key to display the Main Menu. The menu selections (in the following order) include:

SETPOINTS	CALIBRATE SENSORS
STATUS	ALARM ENABLE
ACTIVE ALARMS	ALARM TIME DELAY
TIME	COMMON ALARM ENABLE
DATE	CUSTOM ALARMS
SETBACK	CUSTOM TEXT
SETUP OPERATION	DIAGNOSTICS
SETPOINT PASSWORD	END OF MENU
SETUP PASSWORD	

Use the Up/Down arrow to scroll through the selections. When ready to select a particular function press Enter.

9.3 Setpoints

Setpoints and system setup parameters are kept in nonvolatile memory. Selecting SETPOINTS from the Main Menu will display the following selections:

- TEMPERATURE SETPOINT
- TEMPERATURE SENSITIVITY
- HUMIDITY SETPOINT
- HUMIDITY SENSITIVITY
- HIGH TEMPERATURE ALARM
- LOW TEMPERATURE ALARM
- HIGH HUMIDITY ALARM
- LOW HUMIDITY ALARM

Scroll through this submenu by using the Up/Down arrow, then press Enter to select a particular function. To change a particular value, press Enter and use the Up/Down arrows to change the value. When the value has been changed press Enter to store the value. For example to change the temperature setpoint from the main status display.

1. Press the Menu key to display the main menu.
2. Scroll to “SETPOINTS” using the Up/Down arrow key. Press the Enter key.
3. Scroll to “TEMP SETPOINT” using the Up/Down arrow key. Press the Enter key.
4. Use the Up/Down arrow to change the value. Press the Enter key.

Table 9.1 View default setpoints and allowable ranges

Setpoint	Default	Range
Temperature Setpoint	72°F	40-90°F (5-32°C)
Temperature Sensitivity	2.0°F	1-9.9°F (0.6-5.6°C)
Humidity Setpoint	50%	20-80% RH
Humidity Sensitivity	5%	1-30% RH
High Temperature Alarm	80°F	35-95°F (2-35°C)
Low Temperature Alarm	65°F	35-95°F (2-35°C)
High Humidity Alarm	60%	15-85% RH
Low Humidity Alarm	40%	15-84% RH

9.4 Status

The operator can monitor the percentage heating, cooling, dehumidifying and humidifying status of the unit by selecting the “STATUS” sub-menu.

9.5 Active Alarms

The operator can monitor the alarms status by selecting “ALARMS” which will display a “No Alarm Present” or “Alarm XX of YY” alert and description. If more than one alarm is activated, use the Up/Down Arrow to scroll through the alarms list. (“XX” reference is the number of the alarm shown, while the “YY” reference is the total number of alarms activated).

9.6 Time

The controller clock must be set to allow for the setback control. The clock uses the 24-hour system (i.e., 12 midnight is displayed as 24:00). To change the time, press Enter to select the function, then use the Up/Down arrow to change the first character, press Enter to store, then press the Up/Down arrow to change the section character, press Enter to store, etc. THERE IS A BATTERY BACKUP FOR THE DATE AND TIME FEATURES.

9.7 Date

The controller date must be set to allow for the setback control. To change the date press “Enter,” then use the Up/Down arrow to change the first character, press Enter to store, press the up/down button to change the second character, etc.

9.8 Setback

The microprocessor can be programmed for night and weekend setback. Two (2) events can be programmed per day for a five-day workweek and two (2) events can be programmed for a two-day weekend. Table 9.2 below can be used to devise a setback plan.

Table 9.2 Microprocessor night and weekend setback

Event	Weekend	Weekday
Time 1		
Temperature 1		
Sensitivity 1		
Humidity 1		
Humidity Sensitivity 1		
Time 2		
Temperature 2		
Sensitivity 2		
Humidity 2		
Humidity Sensitivity 2		

9.9 Setup Operation

Selecting Setpoint/Setup from the Main Menu will display the following selections:

- RESTART TIME DELAY
- C/F DEGREES
- HUMIDITY CONTROL METHOD

Use the Up/Down Arrow to scroll through the submenu. Press Enter to select a particular function.

9.9.1 Restart Time Delay

This function delays unit restart after main power is restored to the unit. If several systems are operating, the time delays should be set to different values to cause a sequential start. Delay can be set from 0.1 to 9.9 minutes (6 to 594 seconds). Setting the value to zero (0) will prevent unit restart when power is restored. In this case, the unit must be restarted manually by pressing the “ON/OFF” button on the keypad.

9.9.2 C/F Degrees

The control may be selected to show readings and setpoints in either degrees Fahrenheit (°F) or Celsius (°C). To change the value use Enter to select this function, then use the Up/Down Arrow to change the value. Press Enter to store the value.

9.9.3 Humidity Control Method

The operator may select either relative (direct) or absolute (predictive) humidity control. If “relative” is selected, the RH control is taken directly from the RH sensor. If “absolute” is selected, the RH control is automatically adjusted whenever return air temperature deviates from the desired temperature setpoint (i.e., predictive humidity control). The LCD will indicate percentage relative humidity for both methods of control. If the “absolute” feature is selected, the adjusted humidity reading will also be shown. When utilizing the predictive humidity control feature, the humidity level is automatically adjusted ~2% RH for each degree difference between the return air temperature and the temperature setpoint.

Unnecessary dehumidification can result when overcooling occurs during a dehumidification cycle. This is due to a higher than normal RH reading caused by overcooling the room (about 2% RH for each degree of overcooling). This drop in temperature extends the dehumidification cycle. Later, when the dehumidification ends and the temperature rises to the setpoint, the RH reading falls. The final RH reading will then be lower than actually desired. If the temperature drop was significant enough, the percentage RH could be low enough to activate the humidifier.

If the absolute humidity control is selected, over-dehumidification may be avoided. When overcooling occurs (i.e., causing an increase in the RH reading) the humidity control program estimates what the RH will be when the dehumidification cycle ends and temperature returns to the setpoint. This allows the dehumidification cycle to end at the proper time. The predictive humidity control can greatly reduce energy consumption by minimizing compressor/reheat operation. Use the Up/Down Arrow key to select the desired humidity control method.

Table 9.3 Setup functions, default values and allowable ranges

Function	Default	Range
Restart Time Delay	0.1 minute	0 to 9.9 min (0 = manual restart)
C/F Degrees	°F	°C or °F
Humidity Control	Rel	Relative or Absolute

9.10 Change Passwords

The display will prompt the operator to enter a three digit password when attempting to make changes. The system includes two (2) passwords: one for setpoints and one for setup. The system allows the password to be changed by first entering the default password set at the factory (1-2-3) for setpoints and (3-2-1) for setup. The password function provides system security, so that only authorized personnel are allowed to make changes to the system. (If unauthorized changes are being made, the passwords may be compromised and new ones should be selected). The password function can be disabled by setting DIP switch 8 in the wall box to ON, then resetting power to the unit.

9.11 Calibrate Sensors

The temperature and humidity sensor can be calibrated by selecting the CALIBRATE SENSORS menu item. The temperature sensor can be calibrated ±5°F (2.8°C), while the humidity sensor can be calibrated ±10% RH. When calibrating the humidity sensor, the value shown will always be % RH, even though absolute humidity control may be selected. If absolute humidity control is selected, the Normal Status Display will display the adjusted reading. This reading may not agree with the relative humidity reading displayed while in calibration.

If the sensors are subject to frequent wide temperature and humidity swings, it may be necessary to shorten the cycling by increasing the sensor time delay. If the sensors are located too close to the air discharge, they will likely experience rapid swings in measurement. Another method in reducing compressor cycling is to increase the temperature and/or humidity sensitivity.

9.12 Alarm Enable

Each alarm can be disabled or enabled. Use the Up/Down Arrow to select a particular alarm, press Enter to select either enable or disable. Then press Enter again to store the change. When the alarm is disabled it will NOT report to either the wall box beeper or the common alarm relay.

NOTE: The high water alarm will automatically shut the unit off, even if the alarm is disabled.

9.13 Alarm Time Delay

Each individual alarm can be programmed with a time delay, causing the unit to delay a specified amount of time (0-255 seconds) before recognizing the alarm. See Table 9.4 below for the default times. The alarm condition must be present for the full amount of the time delay before the alarm will sound. If the alarm condition is diverted prematurely, the alarm will not be recognized and the time delay time will automatically reset.

NOTE: For software alarms such as loss of power and short cycle, the time delay should be left at the factory default of 0.

Table 9.4 Alarm default time delays

Alarm	Default Time Delay (seconds)
Humidifier Problem	2
High Head Pressure	2
Custom Alarm #1	0
Custom Alarm #2	6
High Temperature	30
Low Temperature	30
High Humidity	30
Low Humidity	30
Short Cycle	0
Loss of Power	0

9.14 Common Alarm Enable

Each individual alarm can be selected to activate/deactivate the common alarm relay. If the energize common alarm function is set to YES, the relay is energized immediately as the alarm is annunciated and de-energized when the alarm condition is diverted after the alarm has been recognized. If the alarm is completely DISABLED, the alarm has no effect on the common alarm relay. Use the Up/Down arrows to scroll to a particular alarm, press the Enter button to select it, then press the Enter button again to select Yes or No.

9.15 Custom Alarms

The custom alarm messages can be selected from a list of standard alarm messages, or the operator may write his/her own message. A MAXIMUM OF TWO (2) ALARM MESSAGES CAN BE CUSTOMIZED. The two custom alarm messages will initially display the previously programmed message but can be changed.

The text for custom alarms can be changed at any time by selecting “CUSTOM ALARMS”. To change the text for a custom alarm, select the alarm you would like to change, 1 or 2. Using the Up/Down Arrows, step through the list of five standard alarm messages (listed below) and two custom alarms. Select the alarm message desired and store it by pressing Enter.

9.15.1 Standard Custom Alarm Messages

- WATER FLOW LOSS
- LOSS OF AIR FLOW
- HUMIDIFIER PROBLEM
- FILTER CLOG

9.16 Custom Text

To modify the two custom alarm messages select “CUSTOM TXT”. Then select “CUS TXT #1” or “CUS TXT #2”. Text can be up to 20 characters in length and can be either a blank space or any of the following alphanumeric characters and symbols:

- A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z
- #,%,*,-
- 0,1,2,3,4,5,6,7,8 or 9

Use the Up/Down Arrows to select a character, then press Enter. The cursor will move to the next space where you may once again use the Up/Down Arrows to select another character, etc.

LCD Contrast

The level of contrast due to the viewing angle of the Liquid Crystal Display (LCD) can be adjusted using a potentiometer screw, inside the wall box next to the display.

Nonvolatile Memory

All critical information is stored in nonvolatile memory. Setpoints and setup parameters are kept inside the microcontroller in EEPROM.

Equipment Options Switches

Equipment options are selected and enabled using DIP switches 1 through 7. These are on the control board near TB1. These switches are factory-set and should not require any user changes. The setting and function of the switches can be individually read on the LCD.

NOTE: In order to update the DIP switch settings, power must be cycled Off, then On, from the unit disconnect switch.

Table 9.5 Equipment switch settings (unit control board)

Switch	OFF Position	ON Position
1	Compressor	Chill Water
2	Not Used—Must remain in OFF position	
3	Not Used—Must remain in OFF position	
4	Not Used—Must remain in OFF position	
5	Enable Reheat	Disable Reheat
6	Enable Humidifier	Disable Humidifier
7	Enable Dehumidifier	Disable Dehumidifier
8	Not Used—Must remain in OFF position	

Table 9.6 Switch settings (wall box board)

Switch	OFF Position	ON Position
1	Disable Beeper	Enable Beeper
2	Not Used—Must remain in OFF position	
3	Not Used—Must remain in OFF position	
4	Not Used—Must remain in OFF position	
5	Not Used—Must remain in OFF position	
6	Not Used—Must remain in OFF position	
7	Disable Setback	Enable Setback
8	Enable Password	Disable Password

9.17 Run Diagnostics (Available on Rev 1.001.0 and Higher)

By selecting Run Diagnostics, maintenance personnel can check system inputs, outputs and conduct a test of the microcontroller circuit board from the wall box control. A review of the system inputs and the microcontroller test can be done without interrupting normal operation.

Show Inputs

With the unit on and the fan running, the input states may be displayed for the following devices:

High Water Alarm: Normally off unless High Water Alarm is active.

- High Head Pressure Alarm: Normally Off unless High head Pressure alarm is active.
- Custom alarm #1: Normally Off unless this special customer selectable alarm is active.
- Custom alarm #2: Normally Off unless this special customer selectable alarm is active.
- Power: Normally On unless unit is turned Off through the wall box, or any of these optional devices: high water alarm or remote shutdown

Test Outputs

When this feature is selected, the unit is effectively turned Off. When stepping from one load to the next, the previous load is automatically turned Off. The loads can also be toggled on/ off by selecting “ENTER”. Once turned on, the output will remain on for five minutes unless toggled off or the test outputs function is exited by selecting “MENU/ESC” (Compressor is limited to 15 seconds on to prevent damage.)

NOTICE

Risk of overheating the compressor during the Test Outputs mode. Can cause compressor damage.

Testing the compressor output for more than a few seconds can damage the compressor. Do not operate the unit in the Test Outputs mode any longer than is necessary for troubleshooting.

NOTICE

Risk of extended unit operation in the Test Outputs mode for troubleshooting. Can cause damage to unit.

DO NOT operate unit in the Test Outputs mode any longer than is necessary for troubleshooting

The outputs are:

- Normal Fan: Normal speed fan contactor
- Low Speed Fan: Low speed fan contactor
- Humidifier: Humidifier contactor
- Cool: Compressor contactor
- HGBP: Hot gas bypass valve
- Reheat: Reheat contactor
- Common Alarm: Common alarm relay

NOTE: Fan turned on with all loads.

Test Control Board

By selecting this function, the microcontroller will perform a self test lasting approximately 10 seconds. When the test is complete, the display will show the ROM checksum, ROM part number and firmware vision number.

Figure 9.2 Control menu

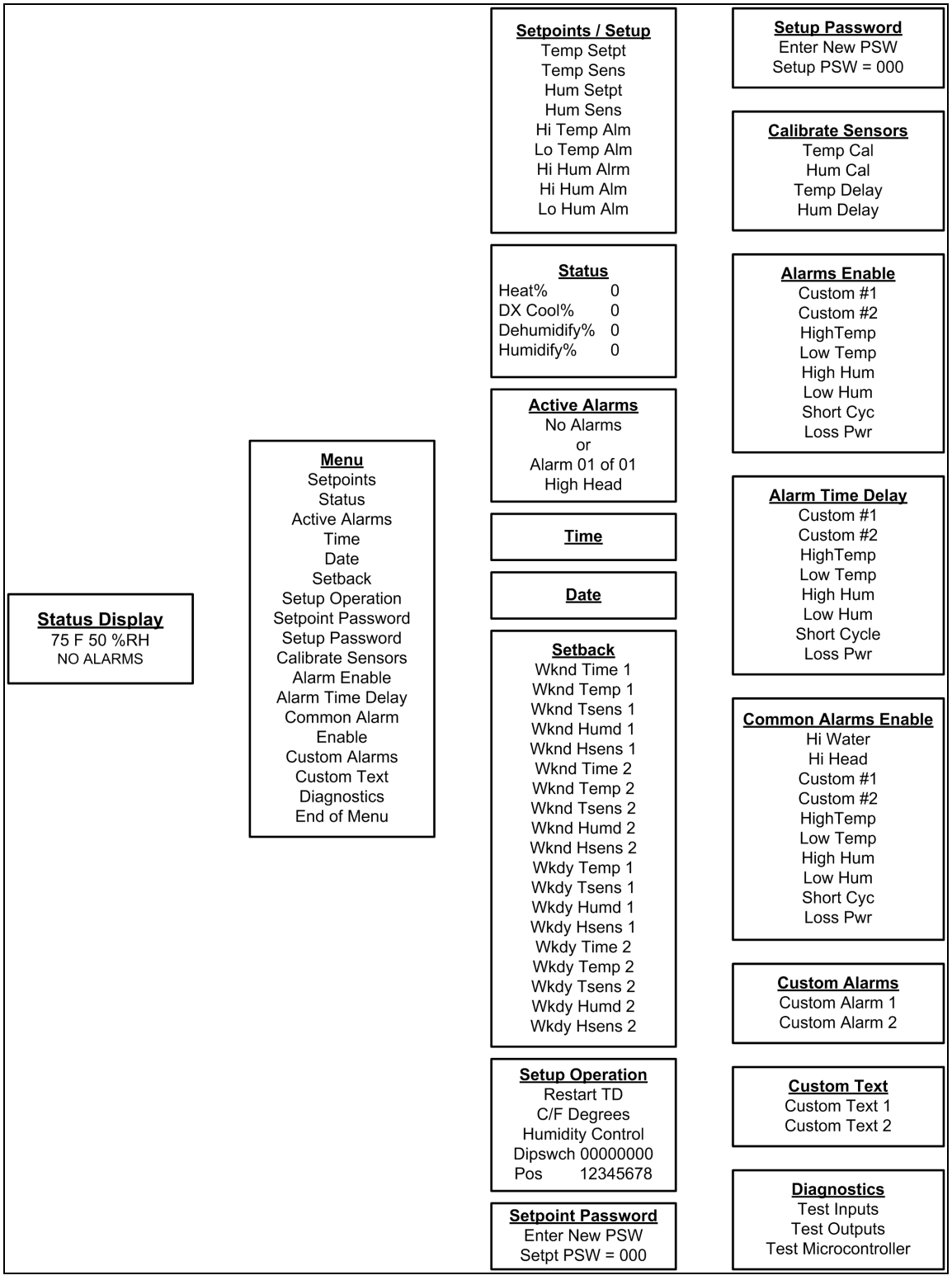
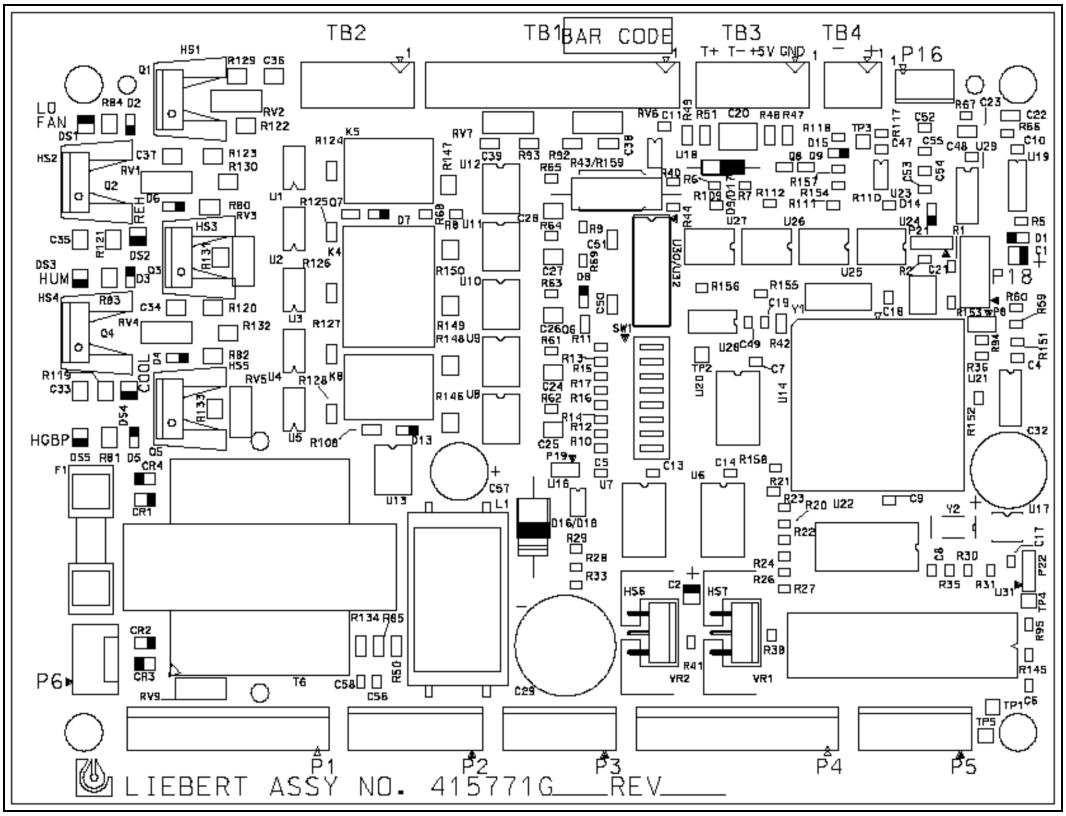
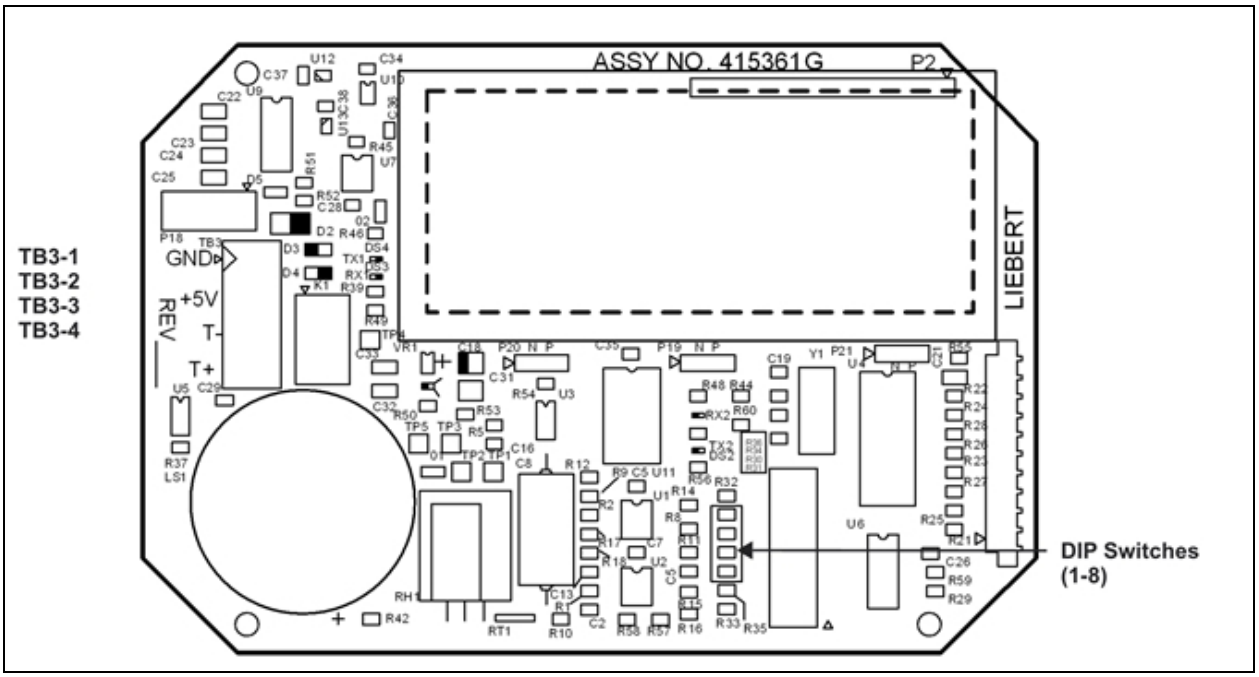


Figure 9.3 Control board (inside evaporator)



TB2-4	Hot Gas Bypass		TB1-3	Customer Alarm Connection #2
TB2-3	High Head Alarm Connection		TB1-2	Customer Alarm Connection # 1
TB2-2	Heat Rejection		TB1-1	Customer Alarm Connection (Common)
TB2-1	Heat Rejection		TB3-4	Connection to TB3 Pin 4 of wall box
TB1-9	Condensate Pump Aux Alarm		TB3-3	Connection to TB3 Pin 3 of wall box
TB1-8	Condensate Pump Aux Alarm		TB3-2	Connection to TB3 Pin 2 wall box
TB1-7	Common Alarm Connection		TB3-1	Connection to TB3 Pin 1 of wall box
TB1-6	Common Alarm Connection		TB4-2	Site Monitoring Connection (-)
TB1-5	Remote Shutdown		TB4-1	Site Monitoring Connection (+)
TB1-4	Remote Shutdown		P16	Remote Sensor Connection

Figure 9.4 Wall box board



10 SYSTEM PERFORMANCE MICROPROCESSOR CONTROLS

This section provides a detailed description of how the Liebert DataMate responds to operator inputs and room conditions.

10.1 Temperature Control

10.1.1 Cooling/Heating Required

The temperature control program for the microprocessor is based on a calculated percentage requirement for cooling/heating.

10.1.2 Cooling Operation (Cooling, Compressorized Direct Expansion and Chilled Water)

Cooling is ACTIVATED when the temperature control calculates a requirement for cooling of 100%. It is DEACTIVATED when the cooling requirement drops below 50%. The optional hot gas bypass is energized when a call for cooling occurs, unless there is also a call for dehumidification.

Table 10.1 Cooling and dehumidification load response of hot gas bypass

Situation	Response
Cooling only	ON
Dehumidification only	OFF
Cooling with Dehumidification	OFF

10.1.3 Heating Operation—Electric Heat

The reheat stage is ACTIVATED when the temperature control calculates a requirement of 100%. Conversely, the reheat is DEACTIVATED when the heat requirement is 50% less than the activation point.

10.2 Humidity Control

10.2.1 Dehumidification/Humidification Required

The humidity control is based on a calculated percentage requirement for dehumidification or humidification (i.e., the difference between the return air humidity and the humidity setpoint). As the return air humidity rises above the humidity setpoint, the percent dehumidification required increases proportionally from 0% to 100% over a humidity band equal to the humidity sensitivity setting. The converse is true for percent humidification requirement.

10.2.2 Dehumidification Operation, Compressorized Direct Expansion (DX) Systems

Dehumidification with the standard configuration is accomplished by operating the compressor without the hot gas bypass active. On cooling units with direct drive motors, the fan will operate at low speed unless the cooling requirement reaches 100%. At that point, the low speed fan is disabled (unless manually overridden by the user) until the cooling requirement decreases to 0%. Dehumidification will also be disabled if the heating requirement exceeds 125%. It will be re-enabled when the heating requirement reaches 50%.

10.2.3 Humidification Operation

The canister humidifier is activated when the humidity control calculates a requirement of 100% humidification, and it is deactivated when the humidification requirement falls below 50%.

10.3 Load Control Features

The control system monitors the compressor and prevents it from turning on within a 3-minute period of being off. If this on-off-on cycle occurs too often (e.g., 10 times in a one-hour period), a Short Cycle Alarm will occur.

10.3.1 Communication

The control system uses a two-wire, RS-422 channel to communicate with Liebert Site Products via a proprietary protocol. A converter board (ECA2) is available to allow communications with a “dumb” terminal or a computer using RS-232 channel. More details are provided in the Site Products and ECA2 user manual.

The communications channel provides both monitoring and control options, including:

- TEMPERATURE/HUMIDITY: Current temperature and humidity readings.
- STATUS (%): Cooling/heating and humidify/dehumidify operating status.
- PRESENT ALARMS: Alarms currently activated.
- SETPOINTS:
  - Temperature Setpoint
  - Temperature Sensitivity
  - Humidity Setpoint
  - Humidity Sensitivity
  - High Temperature Alarm
  - Low Temperature Alarm
  - High Humidity Alarm
  - Low Humidity Alarm
- ON/OFF STATUS
- SILENCE ALARM

11 ALARMS

The microprocessor control system will audibly and visually signal all ENABLED Alarms (including two (2) custom alarms). These special alarms can be chosen from the optional alarm list and/ or can have their own fully custom text. The custom alarm inputs are contact closures wired from terminal TB1-1 through a normally open contact to either TB1-2 (alarm 1) or TB1-3 (alarm 2). The alarms can be enabled/disabled (refer to Microprocessor Control on page 73) and a time delay of 0-255 seconds can be set. The alarms can also be programmed to either sound the alarm and activate the common alarm relay OR to sound the alarm only.

When a new alarm occurs, it is displayed on the screen and the audible alarm is activated. (If communicating with a Liebert Site Product, the alarm is also transmitted). The message “PRESS ALARM SILENCE” will prompt the operator to silence the alarm. After the alarm is silenced, the display will return to the Normal Status Display. Alarms can be reviewed by selecting the “ACTIVE ALARMS” feature. The alarms can also be silenced through communications with a Liebert Site Products Unit.

Many alarms will reset automatically when the alarm condition is no longer represented and only after it has been acknowledged by being “Silenced.” The exceptions are:

1. Software alarms (i.e., Loss of Power and Short Cycle) will reset automatically 30 seconds after being silenced or acknowledged; and
2. Specific alarms monitoring overload or high pressure switches may require a manual reset depending upon the model.

11.1 Standard Alarms: Definitions and Troubleshooting

The following list provides a definition and troubleshooting suggestions for each type of alarm. Refer to Troubleshooting on page 107 for additional details. If you need further assistance, contact your Vertiv™ representative. THE CUSTOMER MUST SPECIFY ALARM(S) AT THE TIME OF ORDER. OTHER DEVICES AND WIRING MAY BE REQUIRED AT THE FACTORY FOR SOME OF THE ALARMS.

11.1.1 Custom Alarms

Custom alarm(s) messages are programmed at the LCD. The message displayed may be included in a list of provided alarms or it may be customized text (for up to 2 alarms). IF CUSTOMIZED TEXT IS USED, MAINTENANCE PERSONNEL SHOULD BE INFORMED OF THE ALARM FUNCTION AND THE REQUIRED ACTION.

11.1.2 High Head Pressure

Compressor head pressure is monitored with a pressure-sensor switch. (One SPDT pressure switch is used) for the compressor in the unit.

If head pressure exceeds 400 psig (2785 kPa), the switch opens the compressor contactor and sends an input signal to the control. The high head pressure condition is acknowledged by pressing the alarm silence button on the wall box, which will clear the alarm if the high head pressure condition no longer exists. If the compressor is off for 1 hour, the control goes into a special cold start mode. In the cold start mode on a call for cooling or dehumidification, the liquid line solenoid valve (LLSV) is energized. If the high pressure switch does NOT trip within 10 seconds, the control returns to normal operation of monitoring the high head pressure switch for three occurrences in a 12 hour period. It is a rolling timer and after the third high head alarm occurs and is acknowledged by the user, it will lock off the compressor.

If while in the cold start mode, the high head pressure switch DOES trip within 10 seconds of the activation of the LLSV, the control does not annunciate the alarm. The control will turn off the LLSV and delay 10 seconds. The control will permit this occurrence two more times or a total of 3 times. If on the fourth try, the high head pressure switch trips within 10 seconds, the control will annunciate the alarm, turn off the LLSV, wait for the user to acknowledge the alarm and hold the compressor off for 3 minutes, the length of the normal short cycle control. The control will permit this occurrence three times. On the third occurrence, the control will lock the compressor off until the control power is reset.

Air-Cooled Systems

Check for power shut off to the condensing unit, condenser fans not working, defective head pressure control valves, closed service valves, dirty condenser coils or crimped lines. Also, make sure that when the compressor contactor is energized, the side switch on the contactor closes to energize the control circuit on the condensing unit.

Water/Glycol Systems

Check water regulating valves. Verify water/glycol flow (i.e., pumps operating and service valves open). Confirm that the water tower or drycooler is operating and that the coolant temperature entering the condenser is at or below design conditions. Confirm that AUX relay (Terminals 70 and 71) close during cooling to turn on the drycooler.

11.1.3 Humidity Level

The humidity level alarm may be activated under the following conditions:

- High: The room return air humidity exceeds the pre-set high humidity alarm set point. Check DIP switch to verify that the unit is set up for dehumidification.
- Low: The room return air humidity decreases to the high humidity alarm set point. Check DIP switch and installed equipment to verify that the unit is set up for humidification.
- High and Low Humidity (simultaneously): The simultaneous display of two alarms results in loss of the humidity input signal. DASHES WILL BE DISPLAYED IN THE HUMIDITY READING DISPLAY Under these conditions, the control system deactivates both humidification and dehumidification. Check for a disconnected cable or failed sensor.

11.1.4 Temperature

The temperature level alarm may be activated under the following conditions:

- High: The room return air temperature increases to the high temperature alarm set point. Check for proper set point value. Verify that the room heat load is less than the unit's rated capacity. Make sure cooling components are operating (compressor or valves).
- Low: The room return air temperature decreases to the low temperature alarm set point. Check for proper set point value. Make sure all heating components are operating (e.g., contactors, reheats, etc.). Are reheats drawing the proper current (refer to amp rating on nameplate).
- High and Low (simultaneously): The simultaneous display of these two alarms results in loss of the temperature input signal (or the humidity is out of sensor range: 15 to 85% RH). Dashes will be displayed for the temperature reading. The control system will initiate 100% cooling. Check for a disconnected cable or a failed sensor.

11.1.5 Humidifier Problem Alarm

The Humidifier Problem Alarm will sound and display a message if any of the following humidifier conditions occur: overcurrent detection; fill system fault or end of cylinder life.

Check fault indicator LED on the humidifier control board:

- Constant LED on = Overcurrent
- 1 second LED Flash = Fill System
- 1/2 second LED Flash = Replace Tank

11.1.6 Loss of Power

The Loss of Power Alarm will activate (after power is restored to the unit) if the unit has lost power or the disconnect switch was incorrectly turned off before the unit On/Off switch was pressed. A Liebert remote monitoring unit (optional) will immediately indicate loss of power.

11.1.7 Short Cycle

A Short Cycle alarm will occur if a compressor system has exceeded 10 cooling start attempts in a one-hour period. This can be caused by low refrigerant level or if the room cooling load is small compared to unit capacity. Check for leaks, crimped lines and defective components. If the room load is low, increase the temperature sensitivity to reduce cycle.

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12 SYSTEM TESTING AND MAINTENANCE

This section describes system testing, maintenance and replacement procedures. Use copies of the Maintenance Inspection Checklist to record preventive maintenance inspections.

WARNING! Arc flash and electric shock hazard. Can cause injury and death. Open all local and remote electric power supplies, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric connnection enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. The Liebert microprocessor does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert control. Follow all national and local codes.

12.1 System Testing

12.1.1 Environmental Control Functions

The performance of all control circuits can be tested by changing the setpoints, which activates each of the main functions.

12.1.2 Cooling

To test the cooling function, set the setpoint to a temperature of 10°F (5°C) below room temperature. A call for cooling should register and prompt the equipment to begin cooling cycle. (Disregard any temperature alarms.) Upon completion of testing, return setpoint to the desired temperature.

12.1.3 Heating

Reheat may be tested by setting the setpoint 10°F (5°C) above room temperature. A call for heating should register and prompt the equipment to begin heating cycle. (Disregard any temperature alarms). Upon completion of testing, return the setpoint to the desired temperature.

12.1.4 Humidification

To check humidification, set the humidity setpoint at RH 10% above the room humidity reading. After a short delay, the canister will fill with water and steam will be produced. Upon completion of testing, return the humidity setpoint to the desired humidity.

12.1.5 Dehumidification

The dehumidification performance can be tested by setting the humidity setpoint at RH 10% below room relative humidity. The compressor should turn on. Upon completion of testing, return humidity setpoint to the desired humidity.

12.1.6 Remote Shutdown

A connection point is provided for remote shutdown devices supplied by the customer. This terminal strip is located in the electric panel. (Terminals 37 and 38 are fitted with a jumper when no remote shutdown device is installed).

12.2 Maintenance

12.2.1 Electric Panel

The electric panel should be inspected on a semiannual basis for any loose electrical connections.

12.2.2 Filters

Filters are usually the most neglected item in an environmental control system. In order to maintain efficient operation, they should be checked monthly and cleaned or changed as required. ALWAYS TURN POWER OFF BEFORE REPLACING FILTERS.

The washable filter is located behind the access door on the lower front of the fan coil unit.

12.2.3 Direct Drive Blower Package

Monthly inspection of the blower package includes: motors, motor mounts and impellers.

Fan Impellers and Motor Bearings

Fan impellers should be thoroughly inspected and any debris removed. Check to see if they are tightly mounted on the fan shaft and do not rub against the fan housing during rotation. Although the motor bearings are permanently sealed and self-lubricating and do NOT need lubricated, they should be inspected monthly for signs of wear.

Air Distribution

Since all unit models are designed for constant volume air delivery, any unusual restrictions within the air circuit must be avoided.

12.2.4 Refrigeration System

Each month the components of the refrigeration system should be inspected for proper function and signs of wear. Since in most cases evidence of malfunction is present prior to component failure, periodic inspections can be a major factor in the prevention of most system failures. Refrigerant lines must be properly supported and not allowed to vibrate against ceilings, floors or the unit frame. Inspect all refrigerant lines every six months for signs of wear and proper support. Inspect the capillary and equalizer lines from the expansion valve.

Suction Pressure

Suction pressure will vary with load conditions. Suction pressure normally ranges from 58psi to 75psi (405kPa to 517kPa).

Discharge Pressure

The discharge pressure will vary greatly with load and ambient conditions (Table 11.1 below). The high-pressure switch will shutdown the compressor at its cut-out setting.

Table 11.1 Typical discharge pressure

System Design	Discharge Pressure, psig (kPa)
Air-Cooled	200-300 (1380-2070)
Water-Cooled 65 to 85°F water (18 to 29.4°C)	200-250 (1380-1725)
Glycol-Cooled	250-350 (1725-2415)
High-Pressure Cut-Out	400 (2760)

Thermostatic Expansion Valve

The thermostatic expansion valve keeps the evaporator supplied with enough refrigerant to satisfy load conditions. Proper valve operation can be determined by measuring superheat level. If too little refrigerant is being fed to the evaporator, then the superheat will be high. Conversely, if too much refrigerant is being supplied, then the superheat will be low. The correct superheat setting is between 10 and 15°F (5.6 and 8.3°C).

Air-Cooled Condensing Units

Restricted airflow through the condenser coil will reduce the operating efficiency of the unit. Additionally, it can result in high compressor head pressure and loss of cooling. Using compressed air or commercial coil cleaner, clean the condenser coil of all debris that will inhibit airflow. In winter, do not permit snow to accumulate around the side or underneath the condenser. At the same time check for bent or damaged coil fins and repair as necessary. Check all refrigerant lines and capillaries for vibration and support as necessary. Carefully inspect all refrigerant lines for signs of oil leaks.

Water/Glycol Condensing Unit Condensers

The ceiling-mounted water or glycol-cooled module has a coaxial condenser consisting of an exterior steel tube and an interior copper tube. The DMC close-coupled water/glycol-cooled module has a brazed plate condenser coil.If the water supply is clean, condensers do not normally require maintenance or replacement. Should your system begin to operate at high head pressure with reduced capacity and all other causes have been eliminated, the condenser may be obstructed or fouled and should be replaced.

Regulating Valves

The water regulating valve automatically regulate the amount of fluid necessary to remove the heat from the refrigeration system, permitting more fluid to flow when load conditions are high and less fluid to flow when load conditions are low. The valve consists of a brass body, balance spring, valve seat, valve disc holders, capillary tube to discharge pressure and adjusting screw.

The water regulating valve is designed to begin opening at 180psi (1240kPa) and be fully opened at 240psi (1655kPa). The valve is factory set and should not need adjustment. There is a significant difference in the way standard pressure and high-pressure valves are adjusted. Consult Liebert Service.

Glycol Solution Maintenance

It is difficult to establish a specific schedule of inhibitor maintenance since the rate of inhibitor depletion depends upon local water conditions. Analysis of water samples at time of installation and every six (6) months should help to establish a pattern of depletion. A visual inspection of the solution and filter residue is often helpful in judging whether or not active corrosion is occurring. The complexity of problems caused by water requires expert advice from a water treatment specialist plus a regular maintenance program schedule. It is important to note that improper use of water treatment chemicals can cause severe problems.

Proper inhibitor maintenance must be performed in order to prevent corrosion of the glycol system. Consult your glycol manufacturer for proper testing and maintenance procedures. Do not mix products from different manufacturers.

Hot Gas Bypass

Operation

When applying hot gas bypass with split system condensing units, bypassing discharge gas to the compressor suction line offers more flexibility than conventional hot gas bypass to the evaporator unit. DMC condensing units do not contain hot gas bypass.

The hot gas bypass valve is installed between the compressor discharge piping and suction piping, bypassing the condenser and evaporator coils. The discharge gas mixes with the suction gas, raising the suction temperature and pressure and decreasing the mass flow through the evaporator. The higher suction temperatures could cause compressor overheating, therefore a separate liquid quenching valve is provided to mix refrigerant from the system liquid line with the discharge gas before mixing with the suction gas entering the compressor.

During normal operation, when the evaporator is under full load the hot gas bypass equalizer pressure will remain high enough to keep the valve port closed. If the evaporator load decreases, the evaporator temperature and pressure will drop. When the suction pressure reduces below the hot gas bypass valve setting the hot gas bypass valve opens diverting some of the refrigerant flow back to the compressor suction. The liquid quenching valve bulb senses this increased superheat and opens, allowing liquid refrigerant to mix with the discharge gas, desuperheating it.

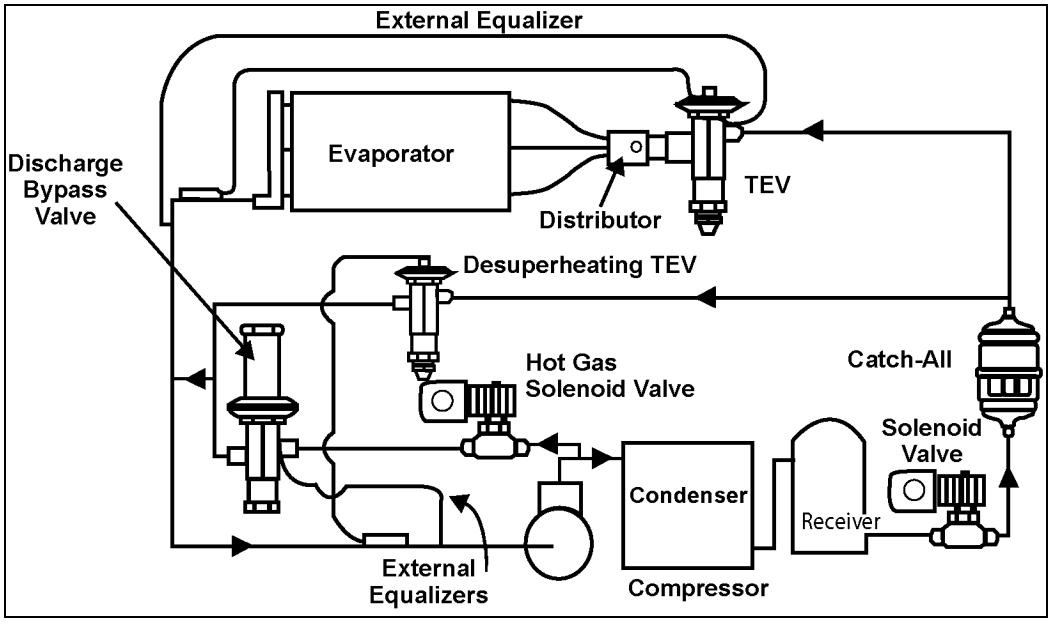
Proper mixing of the three refrigerant paths ensures stable operation and system performance. The liquid quenching valve bulb must be located downstream of all these connections to control superheat at the compressor inlet. Superheat settings for the liquid quenching valve are chosen to maintain consistency with the system expansion valve. During hot gas bypass operation higher superheats, 25-40°F (14-22°C), may be observed at the compressor. The liquid quenching valve is internally equalized and superheat is not adjustable.

Adjustment

1. Install the suction and discharge pressure gauge.
2. Adjust temperature setpoint to call for cooling so that the refrigeration compressor will run continuously.
3. Remove the TOP adjusting nut from the valve.
4. Insert an Allen wrench in the brass hole at top of valve in adjusting port and turn CLOCKWISE if a higher evaporator temperature is required. Adjust no more than 1/4 turn at a time. Let the system stabilize for 15 minutes before determining if additional adjustment is necessary.

5. After obtaining the suction pressure required, reinstall cap tightly making sure there are no leaks.
6. Let the evaporator operate for approximately 10 to 15 minutes to make sure the suction pressure is within the range desired.
7. There may be a fluctuation of approximately 3 to 6psig (21 to 41kPa) on the evaporator due to the differential on the hot gas bypass.
8. Return temperature setpoint to the desired setting.

Figure 11.1 Hot gas bypass



Replacement Procedures

Compressor Replacement—Infrequently, a fault in the motor insulation may result in a motor burnout (if system is properly installed, motor burnout rarely occurs). Primarily this type of failure is due to mechanical or lubrication problems, where the burnout is a secondary consequence.

Early detection can prevent a large percentage of the problems that can cause compressor failures. Periodic maintenance inspections by alert service personnel (i.e., identification of abnormal operation) can be a major factor in reducing maintenance costs. It is easier and more cost-effective to implement the necessary preventative steps that ensure proper system operation; rather than ignore a problem until it results in compressor failure and costly replacement. When troubleshooting a compressor problem, check all electrical components for proper operation:

WARNING! Risk of explosive discharge from high-pressure refrigerant. Can cause injury or death. This unit contains fluids and gases under high pressure. Relieve pressure before working with the refrigerant piping.

CAUTION: Risk of contacting caustic substances. Can cause injury. Avoid touching or contacting the gas and oils with exposed skin. Severe burns will result. Wear protective clothing, safety goggles and long rubber gloves when handling contaminated parts.

- Check all fuses and circuit breakers.
- Check pressure switch operation.
- If a compressor failure has occurred, determine whether its cause is an electrical or mechanical problem.

NOTE: System contains refrigerant. Recover refrigerant per national, state and local codes before maintenance.

Mechanical Failure—If you have determined that a mechanical failure has occurred, the compressor must be replaced. If a burnout occurs, correct the problem and clean the system. It is important to note that successive burnouts OF THE SAME SYSTEM are usually caused by improper cleaning. If a severe burnout has occurred, the oil will be black and acidic.

Electrical Failure—In the event of an electrical failure and subsequent burnout of the refrigeration compressor motor, proper procedures must be followed to thoroughly remove any acids that would cause a future failure. There are two kits that can be used with a complete compressor burnout - Sporlan System Cleaner and Alco Dri-Kleener. Follow the manufacturer's procedure. DAMAGE TO A REPLACEMENT COMPRESSOR DUE TO IMPROPER SYSTEM CLEANING CONSTITUTES ABUSE UNDER THE TERMS OF THE WARRANTY, THEREBY VOIDING THE WARRANTY.

Replacement compressors are available from your Liebert supplier and will be shipped to the job site in a reusable crate (as required by the service contractor). If the compressor is under warranty, it must be returned to Liebert in order to receive proper warranty credit. It should be returned in the same container the replacement was shipped in. The possible cause(s) or condition(s) of the damage should be legibly recorded on the provided return tag.

Proper procedures to remove and replace the failed compressor are:

1. Disconnect power
2. Attach suction and discharge gauges to access fittings.

3. Recover refrigerant using standard recovery procedures and equipment.

NOTE: Release of refrigerant to the atmosphere is harmful to the environment and unlawful. Refrigerant must be recycled or discarded in accordance with federal, state and local regulations.

4. Remove failed compressor.
5. Install replacement compressor and make all connections. Pressurize and leak test the system at approximately 150psig (1034kPag) pressure.
6. Follow manufacturer's instructions for cleanout kits.
7. Evacuate the system twice to 1500 microns and the third time to 500 microns. Break the vacuum each time with clean, dry refrigerant to 2psig (13.8kPa).
8. Charge the system with refrigerant (R-407C) based on requirements of the evaporator, condensing unit and lines. Refer to the installation manual or the unit nameplate.
9. Apply power and operate the system. Check for proper operation. Refer to Table 11.1 on page 93 for discharge pressure.

12.2.5 Humidifier

WARNING! Risk of extremely hot surfaces. Can cause injury. Do not attempt to replace parts until the humidifier has cooled down to a temperature that is safe for human contact. Wear safety goggles, thermally insulated gloves and arm protection when working on the humidifier.

The optional humidifier system consists of a water canister with an internal set of electrodes that generate the steam used for humidification. The steam is introduced into the air through a copper discharge tube in the coil bypass section.

The humidifier Run/Drain switch is located near the humidifier canister. This switch should be in the Run position when the humidifier is in normal operation and in the Drain position when a manual drain sequence is required.

The humidifier is designed to operate with water systems having 10 to 150psig (69 to 1034kPag) water pressure. Steam generating capacity is 3 lb/hr (1.3kg/hr).

Humidifier Operation

1. During start-up, when the controller calls for humidification, the fill valve opens and water enters the canister. When the water level reaches the electrodes, current flows and heats the water. The canister fills until the amperage reaches the setpoint and the fill valve closes. As the water warms, its conductivity increases and the current rises. If the amperage reaches 115% of the setpoint, the drain valve opens momentarily. This reduces electrode contact with the water and lowers the current to 100%. Boiling soon commences and the canister operates normally.
2. Normal operation is controlled by a time cycle which is factory set at 60 seconds. At the end of each cycle, the fill valve opens to replenish the water boiled off so a “steady state” is maintained.
3. If the conductivity of the water is low, the fill valve will remain open. Before the amperage reaches setpoint, the water level may reach the overflow tube and drain. Boiling should commence in time. As water is boiled off, the mineral concentration in the canister increases. The humidifier eventually reaches full output and goes into normal operation. Refer to Humidifier Circuit Board Adjustments on the next page for the “%” pot.

4. During canister operation, the mineral concentration increases and water boils off rapidly. The current decreases quickly because water contacts less electrode surface. When the current decreases to the low threshold point before the end of the time cycle, the drain valve opens. The mineral laden water drains out and is replaced with fresh water. This lowers the mineral concentration and returns the canister to “steady state” operation and prolongs canister life. The frequency of drains depends on water conductivity.
5. The electrode surface will eventually become coated with a layer of insulating material, which causes a drop in current flow. The water level in the canister will slowly rise exposing new electrode surface to the water to maintain normal output. Eventually, the steady state water level will reach the overflow tube and continuously drain water out of the canister. Steam capacity will decline. At this point, all of the electrode surface has been used up and the canister should be replaced.

NOTE: When the unit stays in humidification mode and no longer produces steam, the humidifier canister needs to be replaced.

6. If the mineral concentration is too high, arcing can occur. If the electrodes start to arc, turn off the humidifier immediately and replace the canister.

See Replacing the Humidifier Canister on the facing page for instructions for replacing the canister.

Humidifier Circuit Board Adjustments

WARNING! Risk of electric shock. Can cause injury or death. Open all local and remote electric power disconnect switches before working on the humidifier printed circuit board. Circuit board adjustment should be performed by properly trained and qualified personnel only. Hazardous voltages are present in the equipment. Use extreme caution. Power may be disconnected while making adjustments.

Humidifier operation is governed by the humidifier control board. This board is located on the left side of the evaporator unit. Three potentiometers are mounted on the board. These pots can be used to adjust for extreme water conductivity conditions and capacity.

The “%” pot controls the amperage at which the drain will energize. This adjustment is factory set at 70%, which indicates that the unit will drain when the amperage decreases to 70% of the setpoint. The% value should be increased for highly conductive water and decreased for less conductive water. If a change of three to four percent in either direction does not resume normal operation, consult Customer Service and Support.

The pot marked “cap adj” controls humidifier capacity. It is factory set at 65%. Adjustment may be required if more humidification is needed.

NOTE: If condensation occurs on the discharge grille, reduce humidifier capacity.

The pot marked “sec” controls the duration of the drain cycle. This adjustment is factory set at 60 seconds. Consult Customer Service and Support before adjusting either of these two pots.

Replacing the Humidifier Canister

The proper procedure to replace the humidifier canister is:

1. Turn off the humidifier by lowering the humidity setpoint below the ambient humidity level. Record the original setpoint.
2. Turn unit off at wallbox.
3. Place the RUN/DRAIN switch in the DRAIN position to drain the water from the canister.
4. Return the RUN/DRAIN switch to the RUN position after the canister has drained.
5. Turn OFF the power at the main unit.
6. Remove the cover from the humidifier cabinet.
7. Locate the power wires to the steam canister. They are connected to the canister with 1/4" quick connects. Make note of the wiring configuration before removing any wires. Refer to schematic on unit. Slide the rubber boot back to expose the connections. Remove the three (3) power wires and the canister full wire. Do not loosen the screws that secure the electrodes.

WARNING! Risk of extremely hot surfaces. Can cause injury. Do not attempt to replace parts until the humidifier has cooled to a temperature that is safe for human contact. Wear safety goggles, thermally insulated gloves and arm protection when working on the humidifier.

8. Loosen the steam outlet hose clamps and slide the steam hose away from the canister fitting.
9. Remove the canister.
10. Reverse previous steps to reassemble humidifier, paying special attention to the following:
    - sealing the O-ring on the canister
    - making sure the steam outlet hose is connected without leaks
    - connecting the power wire correctly
    - returning the run/drain switch to the “run” position
    - checking to make sure no leaks are present

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13 MAINTENANCE WORKSHEET

Source: DPN002953, Rev. 0

Inspection Date		Job Name
Indoor Unit Model #		Indoor Unit Serial #
Condenser/Drycooler Model	#	Condenser/Drycooler Serial #
Room Temperature/Humidity	° / %	Ambient Temperature, F°(°C)

Good maintenance practices are essential to minimizing operation cost and maximizing product life. Read and follow all applicable maintenance checks listed below. At a minimum, these checks should be performed semiannually. However, maintenance intervals may need to be more frequent based on site-specific conditions. Review the unit user manual for further information on unit operation. Vertiv™ recommends the use of trained and authorized service personnel, extended service contracts and factory-certified replacement parts. Contact your local Vertiv™ representative for more details.

Check All That Apply

EVAPORATOR / FILTERS

1. Check/replace filters
2. Grille area unrestricted
3. Wipe section clean
4. Coil clean
5. Clean condensate pan
6. Clean trap in condensate drain
7. Drain connection/lines open, leak free and in good condition
8. Check/test filter clog switch operation (if equipped)
9. Check/test condensate drain pan float switch operation (if equipped)

BLOWER SECTION

1. Blower wheels free of debris
2. Check belt tension and condition (replace if needed)
3. Check sheave/pulley (replace if worn)
4. Check motor mount

5. Motor #1 Amp Draw	L1	L2	L3

6. Compare to nameplate amps

REHEAT (If Equipped)

1. Inspect elements
2. Check/retorque wire connections (inside reheat box)

3. Reheat amp draw	#1	# 2	#3
	(L1 and L2 on Single-Phase Units)		

STEAM GENERATING HUMIDIFIER (If Equipped)

1. Check drain valve/drain lines/trap for clogs
2. Check water fill valve and all hoses for leaks
3. Check condition of steam hose
4. Clean strainer
5. Replace humidifier bottle if necessary
6. Check operation of humidifier

7. Humidifier amp draw	L1	L2	L3
	(L1 and L2 on Single-Phase Units)		

CONDENSATE PUMP (If Equipped)

1. Check for debris in sump.
2. Check operation of float(s) (Free Movement)
3. Check/clean discharge check valve
4. Drain connection/lines for leaks, open and free of debris, damage and corrosion

OVERFLOW DRAIN PAN (Ducted Units - If Equipped)

1. Drain Connection and Lines Open and Free of Debris
2. Drain line empties into a maintenance sink or condensate pump.
3. Water detection device/system installed and monitored - Check operation (if installed)

ELECTRICAL PANEL

1. Check fuses
2. Check contactors for pitting
3. Check/retorque wire connections

CONTROLS

1. Check/verify control operation (sequence)
2. Check Economizer operation (Liebert InteleCool2)
3. Check/test changeover device(s) (if equipped)
4. Check/test water detection device(s) (if equipped)

REFRIGERATION PIPING

1. Check refrigerant lines (clamps secure/no rubbing/leaks)
2. Check for moisture (sight glass)
3. Check for restriction/temperature drop across filter driers

COMPRESSOR SECTION

1. Check oil level
2. Check for oil leaks
3. Check compressor mounts (springs/bushings)
4. Cap tubes (not rubbing)
5. Check/re-torque wire connections (inside compressor box)
6. Compressor operation (vibration/noise)
7. Check crankcase heater fuses/operation (if equipped)
8. Check condenser fan cycling (Liebert InteleCool2)
9. Check for refrigerant leaks

10. Suction pressure			
11. Discharge pressure			
12. Superheat			
13. High pressure cut-out			
14. Compressor amp draw	L1	L2	L3
	(L1 and L2 on Single-Phase Units)		

WATER-COOLED CONDENSERS (if equipped)

1. Check water regulating valve operation
2. Verify water flow/continuous flow is maintained
3. Cap tubes (not rubbing)
4. Check for water/glycol leaks

5. Entering water temp	°	leaving water temp	°

AIR COOLED CONDENSING UNIT (if equipped)

1. Condenser coil clean
2. Motor mount tight
3. Bearings in good condition
4. Refrigerant lines properly supported

5. Motor amp draw	L1	L2	L3°
	(L1 and L2 on Single-Phase Units)		

NOTES

Name
Signature
Company
Make copies for your records. Compare readings / information to previous maintenance worksheet To locate your local Vertiv™ representative for Liebert-engineered parts, go to the Liebert Web site: http://www.VertivCo.com/en-us/support/ or call 1-800-543-2778.

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14 TROUBLESHOOTING

Table 13.1 Troubleshooting

Symptom	Possible Cause	Check Or Remedy
Unit will not start	No power to unit	Check voltage at input terminal block.
	Control voltage circuit breaker (at transformer) open	Locate short and reset circuit breaker.
	Float switch relay has closed due to high water in the condensate pump sump.	Check drain and line as well as for failed pump. Access through left panel. Power must be cycled at the disconnect to reset.
	Jumper not in place	Check terminal 37 and 38 for jumper or N/C contact. Check pins P39-1 and P39-2 for jumper or N/C firestat contact.
No cooling	"Cooling" is not displayed at the control panel.	Adjust TEMP control setpoint and sensitivity to require cooling.
	Short cycle prevention control	Control software delays compressor 3 minutes cooling, from stop to start
	Compressor contactor not pulling in.	Check for 24VAC ± 2VAC at terminals TB5-1 and TB5-2. If voltage, check contactor.
	Compressor high head pressure	See below for cause.
	Plugged filter/dryer.	Replace filter/dryer.
	Low refrigerant charge.	Check pressure gauges. At low ambient temperatures, proper refrigerant charge is very important on units with Liebert Lee-Temp™ receivers.
Compressor high head pressure	Insufficient air flow across condenser coil	Remove debris from coil and air inlets.
	Water/Glycol-Cooled only: No fluid flowing through condenser.	Check fluid supply to regulating valve. Adjust valve if necessary.
	Condenser fan not operating	Check fan operation.
	Condensing unit control wires running with or near high-voltage lines or loads such as light ballasts.	Run shielded control wiring, connecting the shield wire to earth (ground) at the Liebert equipment. Reroute control wiring.

Table 13.1 Troubleshooting (continued)

Symptom	Possible Cause	Check Or Remedy
Humidifier does not operate	DIP switch not set to enable humidifier option	See DIP switch settings.
	"HUMIDIFY" not displayed at control panel	Increase humidity control setpoint and sensitivity to require humidification.
	Defective board	Check voltage at P3-1 and P3-2 on interface board for 24VAC ± 2VAC. If no voltage, check wiring and/or replace board. Check wiring from control panel to humidifier circuit board.
	Failed humidity sensor	Humidity display will indicate dashes. Check wiring from temperature/humidity board to the control board and from the wall box to the control board. Replace wallbox or temperature/humidity circuit board (if remote).
	No water flow	Make sure switch is in Run position. Check humidifier water supply (including filter screen) and check nylon overflow line if canister is full.
	Canister fill rate is not keeping up with the steam output	Check fill valve screen opening and capillary tube for obstructions. Check water supply pressure (minimum 10psig).
Reheat will not operate	DIP switch not set to enable reheat option	See DIP switch settings.
	"HEAT" not displayed at the control panel	Increase temperature setpoint to require heating.
	Reheat safety open, defective reheat contact or defective board	Check voltage at P2-1 or P2-2 to P34-10 on control board for 24VAC ± 2VAC. If voltage, check reheat contactor and reheat safety. If no voltage, check wiring and/or replace board.
	Element is burned out	Turn off power. Check element continuity with Ohm meter.
Cooling cycle too short	Sensor response delay too short	Increase sensor response delay. See Calibrate Sensors on page 78.
Display freezes and control pads do not respond	Static discharge	During period of low humidity, static electricity can cause the control program to freeze or display incorrect information. Although this is unlikely, the control can be reset by cycling power from the disconnect switch.
Condensate pump does not operate	Open or short circuit in wiring	Find open or short circuit and repair power to pump.
Continuous cooling	Failed temperature sensor	Temperature display will indicate dashes. Check wiring from temperature/humidity board (remote sensors) to the control board or from control board to wallbox. Replace temperature/humidity circuit board (remote sensors) or wallbox.

Table 13.1 Troubleshooting (continued)

Symptom	Possible Cause	Check Or Remedy
Continuous Heating Dehumidification Humidification	Shorted wiring or failed control board	Check wiring and/or replace control board.
No fan operation at low speed when selected at control panel	Open wiring or failed interface board	Verify “LOW FAN” is displayed at the control panel. Check for 24VAC ± 2VAC at terminals P1-6 and P1-7. If no voltage, check wiring and/or replace interface board.
No fan operation at low speed during dehumidification	Temperature is more than 2°F above the HIGH TEMP setpoint	Verify with display. COOL requirement overrides DEHUMIDIFY.
Display	Incorrect wiring	Review section Electrical Connections on page 37. Verify VDC between 5 and 6 volts at TB-3 Pin 1 (ground) and TB-3 Pin 2 of the control board and wall box. If the transmit lines (TB-3 Pins 3 and 4) are not connected, only the power LED will be lit. It will flash once every 10-12 seconds. If T- is connected but not T+, TX1 will flash about every 2-3 seconds, and the power LED will flash once every 10-12 seconds. If T+ and T- are reversed, the power LED and RX1 Will be lit and flash every 10-12 seconds. NOTE: Erratic operation of the unit could occur. If no LED is lit, there is no power or the +5VDC polarity is reversed. If any of these conditions occur, remove power from the evaporator using the disconnect switch, and correct the wiring from the control board to the wall box. NOTE: It may take up to 20 seconds for the display to appear on the wall box LCD after power is applied.

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VertivCo.com | Vertiv Headquarters, 1050 Dearborn Drive, Columbus, OH, 43085, USA

SL-11040_REV5_10-17/590-1697-501A