Precision Cooling
For *Business-Critical Continuity™*

Liebert® XDF™

User Manual - 14kW Nominal Capacity, 60 Hz

EMERSON
Network Power

TABLE OF CONTENTS

FIGURES

TABLES

SAVE THESE INSTRUCTIONS

This manual contains important instructions that must be closely followed during installation and maintenance of this unit to maintain compliance with agency listings. Read all safety and operating instructions before attempting to operate the Liebert XDF. Adhere to all warnings on the unit and in this manual. Follow all operating and user instructions.

This product is designed for commercial / industrial use only. This product is not intended for use with life support or other U.S. FDA designated “critical” devices. Maximum loads must not exceed those shown on the Liebert XDF’s serial tag.

Install in a clean environment, free from moisture, flammable liquids, gases and corrosive substances. Operate this product in an indoor environment at an ambient temperature between 35°F and 104°F (1.6°C to 40°C). Additionally, units using a remote condenser must be operated at outdoor ambient temperatures: placeholder

- VFD condensers—above 0°F (-18°C)
- Liebert Lee-Temp condensers—above -20°F (-29°C)

This product must be connected to and powered by suitable AC supplies, rated in accordance with the unit’s serial tag. It must be suitably grounded and protected by circuit breakers or fuses.

Power extension cables, if used, must be rated for the load and must not exceed 20 ft. (6.1m) in length.

Liebert recommends using shielded cables for all external communication interfaces.

Ensure that the Liebert XDF has proper ventilation. Never block or insert objects into the ventilation holes or other openings. Maintain a minimum clearance of 36 in. (915mm) in front, behind, on the right side and above the self-contained, air-cooled Liebert XDF for proper airflow and service. The water/glycol-cooled Liebert XDF and the remote air-cooled Liebert XDF require 36 in. (915mm) clearance in front, behind and on the right side. Neither requires overhead clearance.

1.0 GLOSSARY OF SYMBOLS

	**Hazardous Voltage Present**
	**Note following instructions**
	**Consult user manual for additional information**
	**Indicates weight**
	**Indicates ground connection**
	**Indicates alternating current**

2.0 PRODUCT DESCRIPTION

Congratulations on purchasing a Liebert XDF. The Liebert XDF is an integrated equipment cabinet with integral cooling and intelligent control to protect mission-critical enterprise systems from extreme heat. The Liebert XDF provides an organized, secure, controlled environment for your sensitive electronic equipment. The unit is available in a variety of configurations to suit your electronic equipment's environmental requirements.

The Liebert XDF is available in three models:

- **Liebert XDFS**—Self-Contained, Air-Cooled Model
- **Liebert XDFW**—Water/Glycol-Cooled Model
- **Liebert XDFR**—Remote Condenser, Air-Cooled Model

The self-contained, air-cooled Liebert XDFS is intended for installation in open areas. Installation in closed-in areas, such as in a closet, alcove or similar space, requires field-supplied ducting, an external booster fan and sufficient makeup air. Contact your local Emerson Network Power representative before installing the Liebert XDFS in an area that might inhibit heat dissipation.

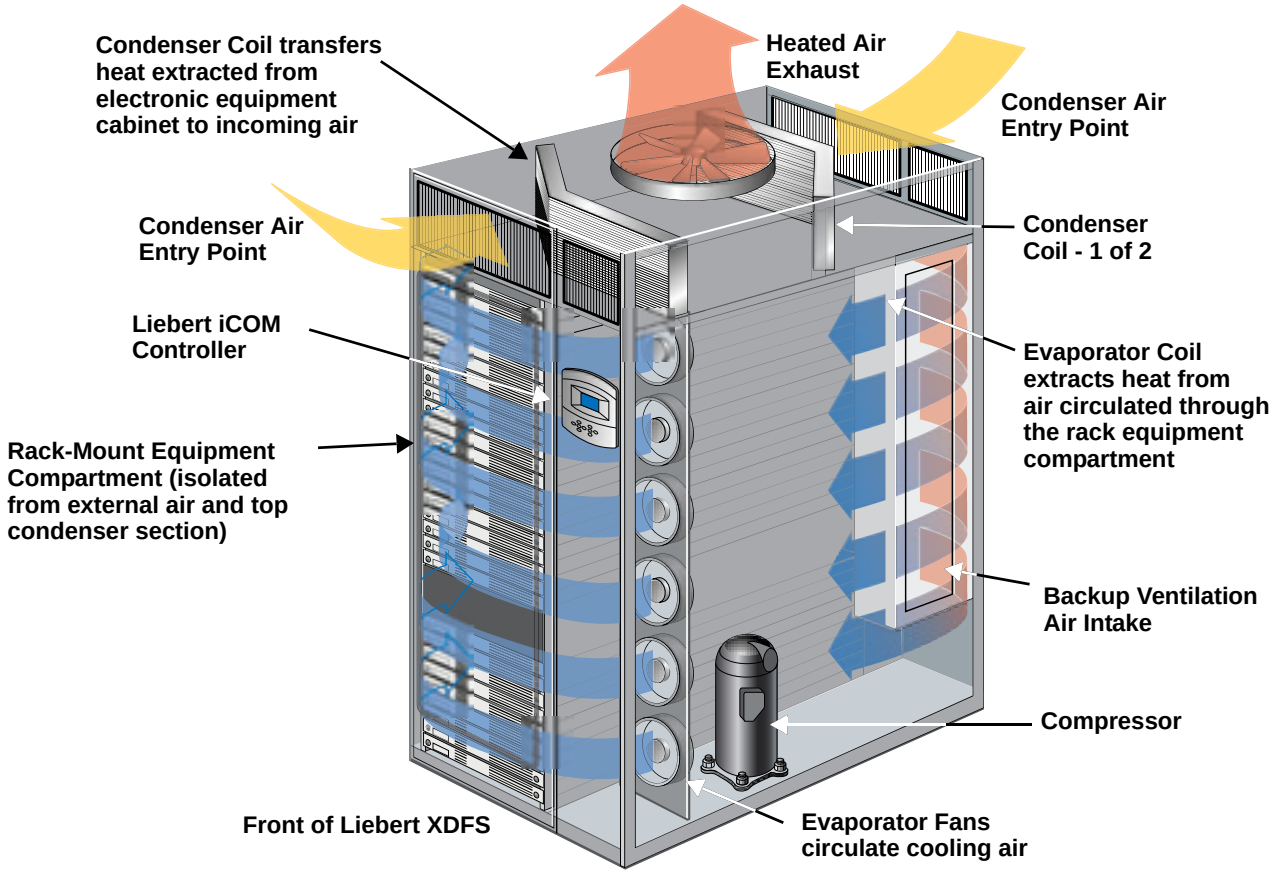
The Liebert XDFW and Liebert XDFR, however may be installed in closed-in areas that meet clearance requirements in the front, rear and right side (see **Figures 8** and **21**). Heat from the Liebert XDFW is carried away by the coolant; heat from the Liebert XDFR is rejected at the condenser, which is installed outdoors.

2.1 Operational Overview—Liebert XDFS, Self-Contained, Air-Cooled Model

The self-contained, air-cooled Liebert XDFS employs a compressorized, direct expansion cooling system rated at 14kW to supply cooling air to rack-mounted equipment. A bank of fans circulates this cooling air through the electronic equipment in the Liebert XDFS (see **Figure 1**). An evaporator coil extracts heat from the circulating air. That heat is transferred to a condenser at the top of the Liebert XDFS and exhausted into the room.

The Liebert XDF's backup ventilation system operates automatically if power fails or if any Liebert XDF cooling system component fails.

Figure 1 Component location, general operational layout of the Liebert XDFS



2.2 Operational Overview - Liebert XDFW, Water/Glycol-Cooled Model

The water/glycol-cooled Liebert XDFW employs a single-stage cooling system rated at 14kW to supply cooling air to the rack-mounted equipment. A bank of fans circulates this cooling air through the electronic equipment in the Liebert XDF (see **Figure 1**).

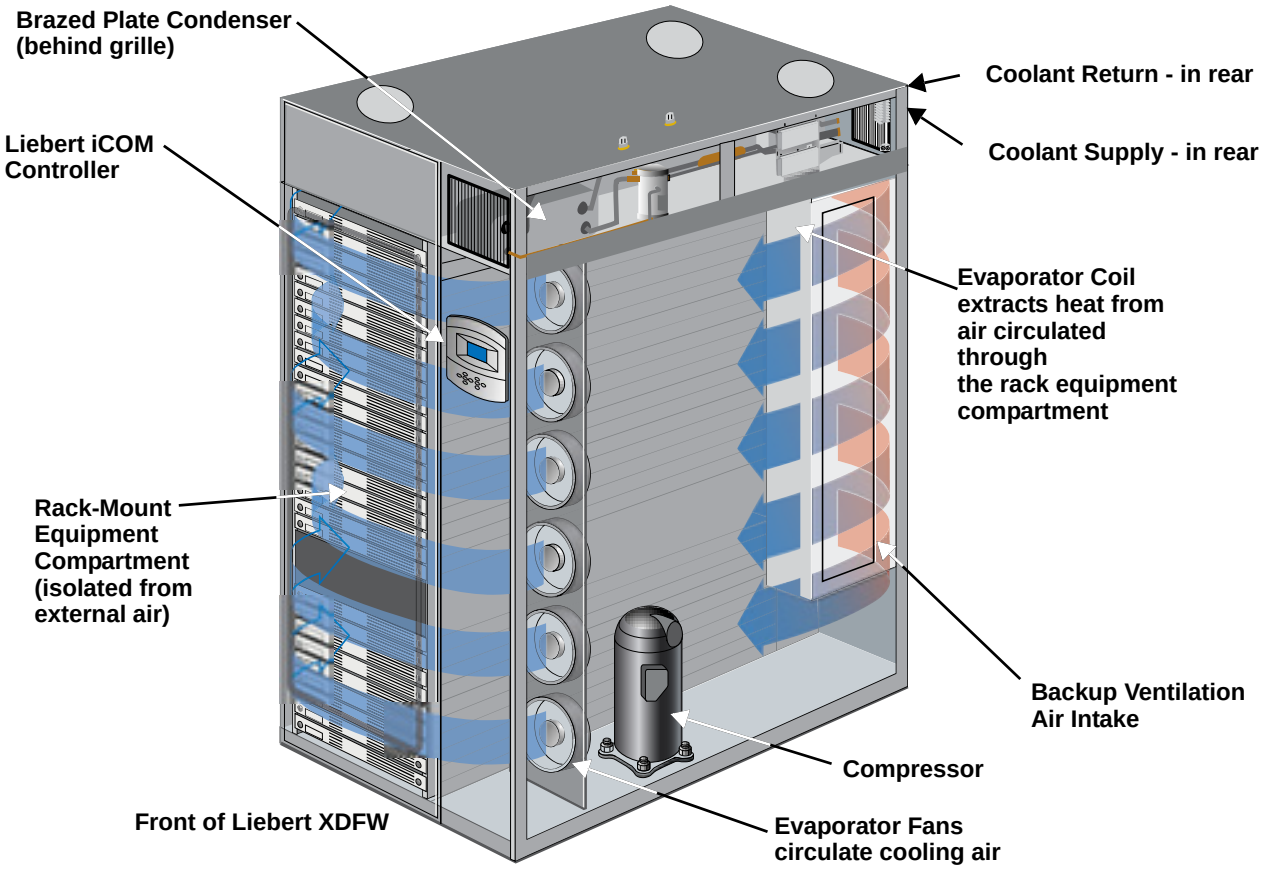
An evaporator coil extracts heat from the circulating air. That heat is transferred to a brazed plate condenser at the top of the Liebert XDF, transferred to the cooling water or glycol solution and is piped out of the unit.

Coolant is piped through the back of the Liebert XDF through supply and return pipes with 1" female NPT connections (refer to **Figure 2** or **Figure 8**).

The Liebert XDF's backup ventilation system operates automatically if power fails or if any Liebert XDF cooling system component fails.

If water is used as the coolant, Liebert recommends employing a closed system connected to an external condensing unit. A closed water supply system protects the Liebert XDF from particles and other contaminants that might reduce cooling efficiency and damage the Liebert XDF.

Figure 2 Component location, general operational layout of the Liebert XDFW



2.3 Operational Overview - Liebert XDFR, Remote Condenser, Air-Cooled Model

The Liebert XDFR remote condenser, air-cooled model employs a single-stage cooling system rated at 14kW to supply cooling air to the rack-mounted equipment. A bank of fans circulates this cooling air through the electronic equipment in the Liebert XDF (see **Figure 1**).

The Liebert XDFR transfers the heat captured by the evaporator coil to a fin-tube condenser outdoors where it dissipates.

The backup ventilation system in each model of the Liebert XDF operates automatically if power fails or if any Liebert XDF cooling system component fails.

Figure 3 Component location, general operational layout of the Liebert XDFR

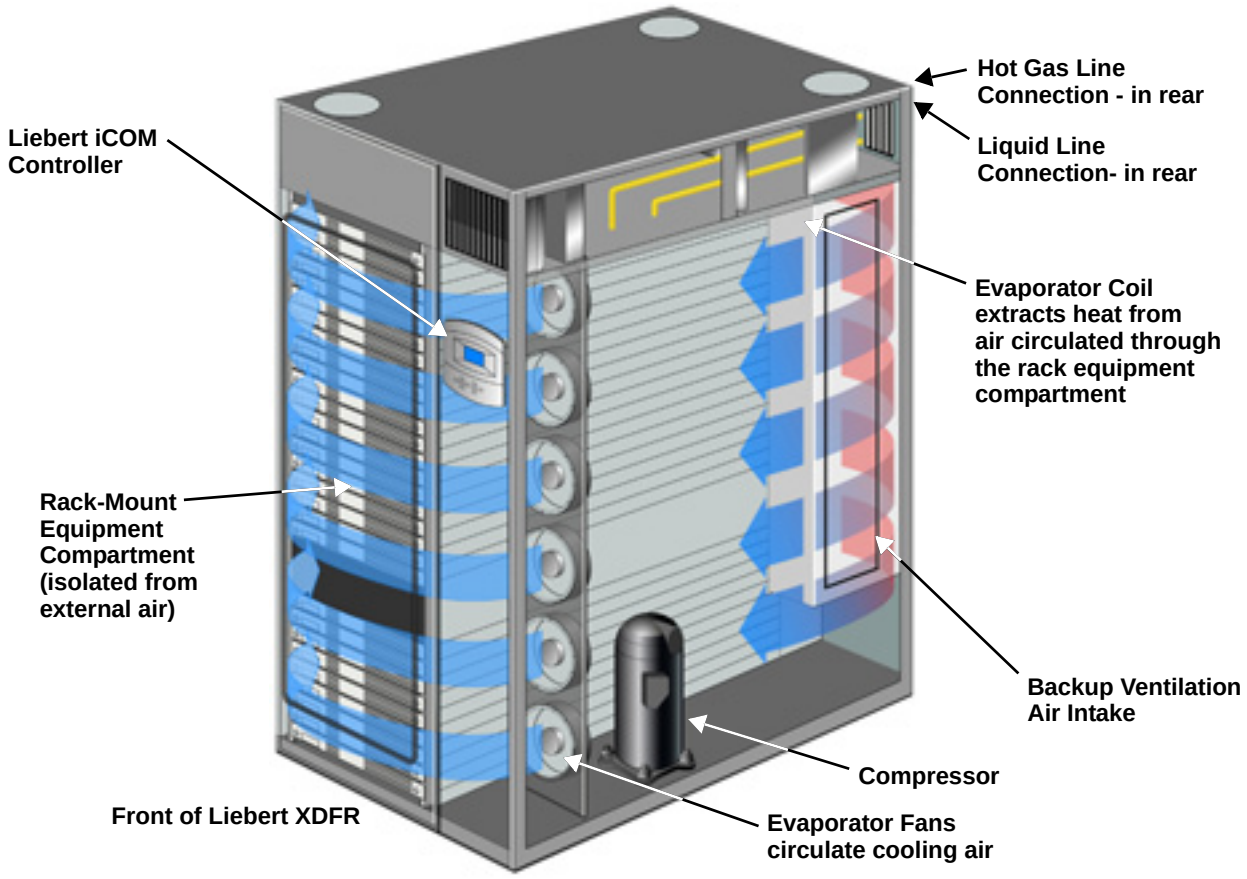


Figure 4 Component location, rear of Liebert XDF

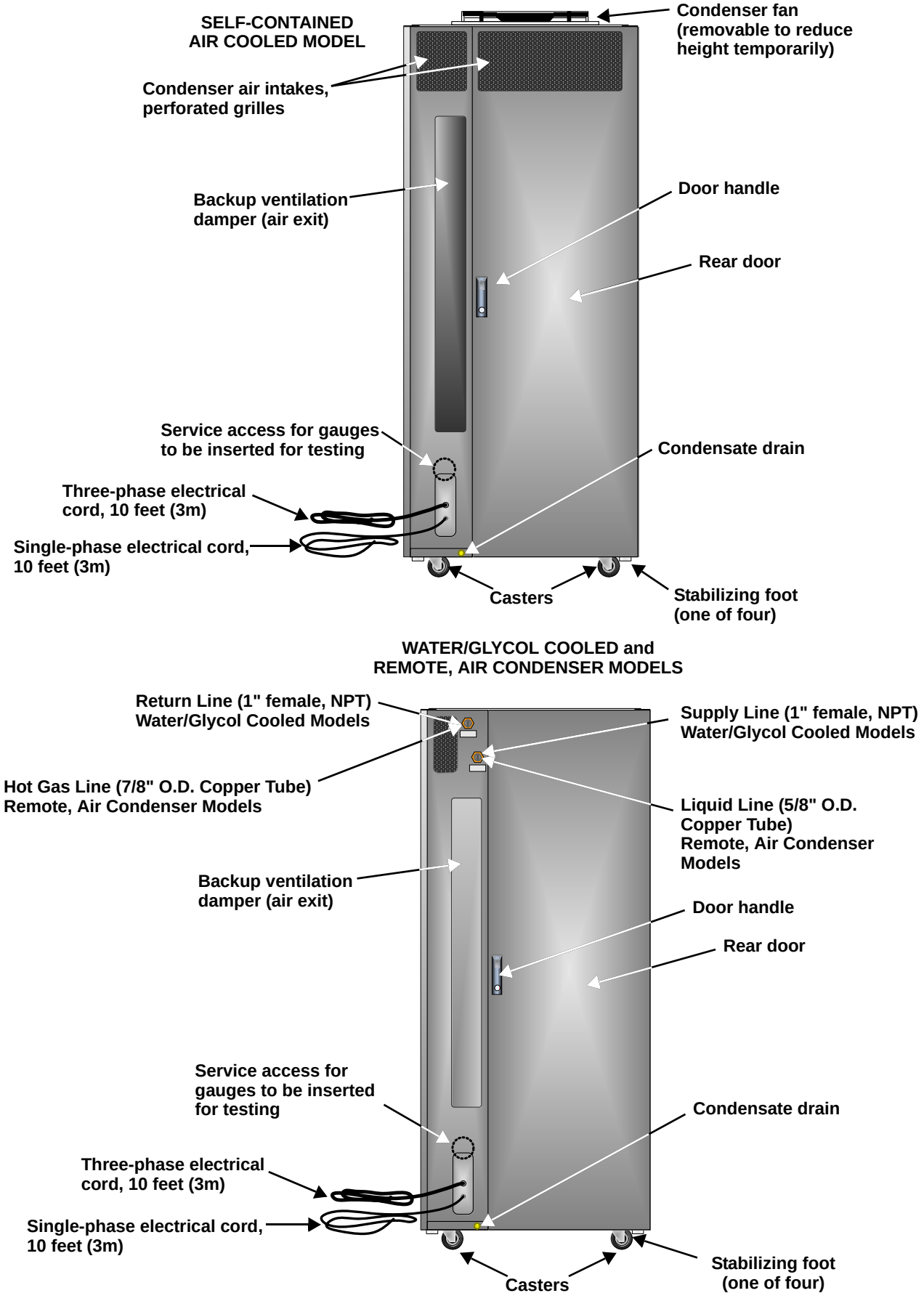


Figure 5 Dimensional data, Liebert XDFS

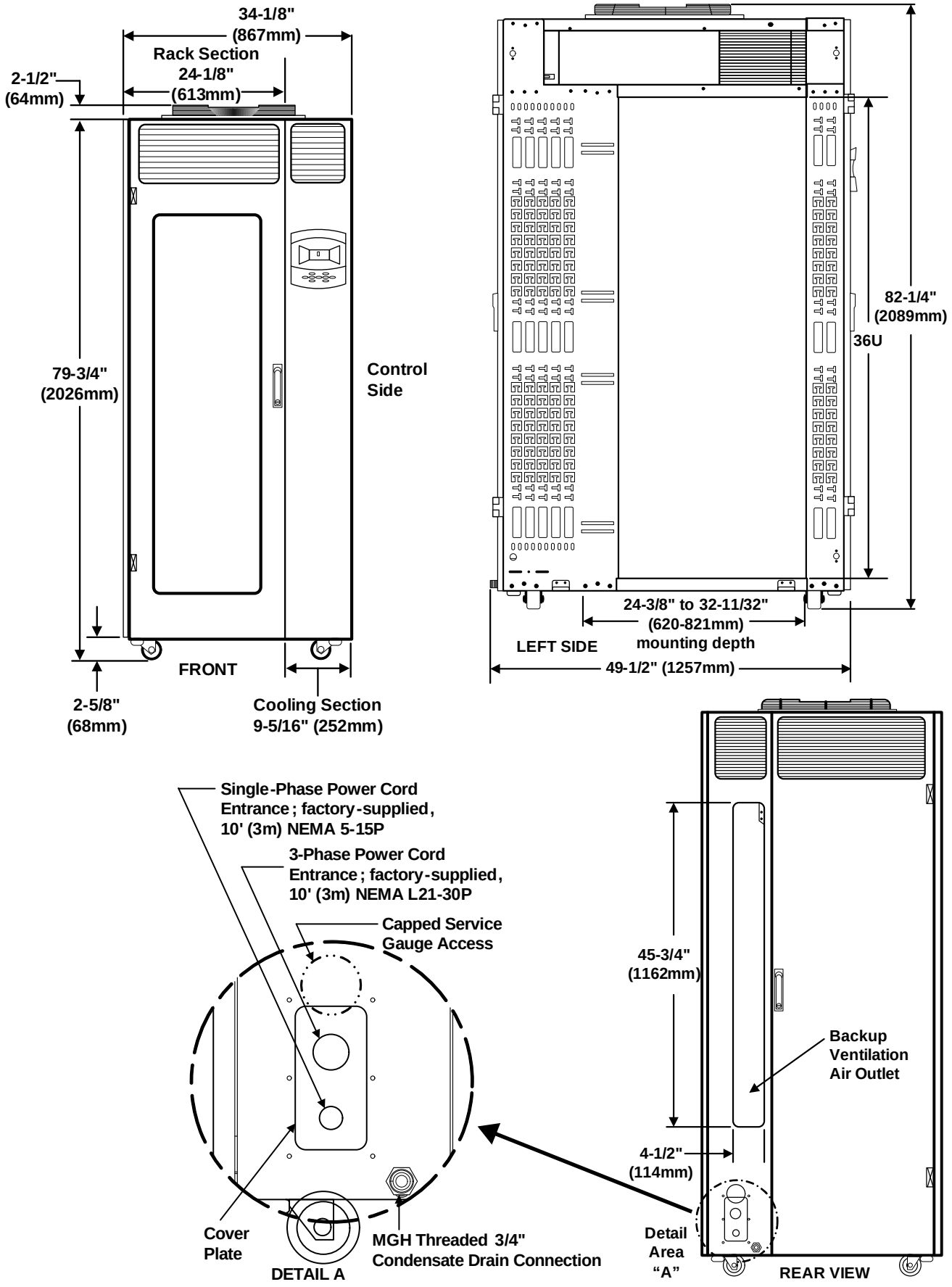


Figure 6 Dimensional data, Liebert XDFW

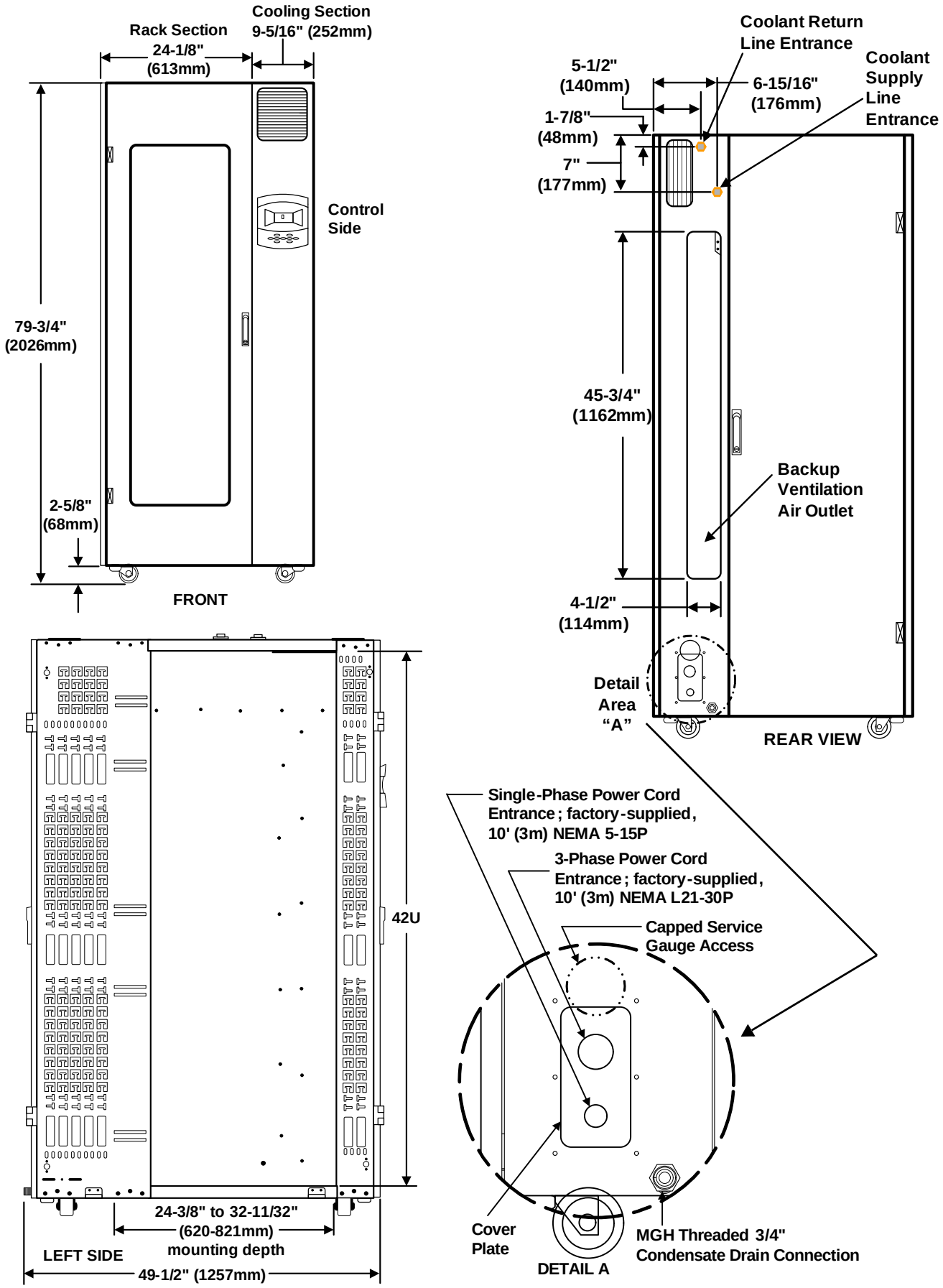


Figure 7 Dimensional data, Liebert XDFR

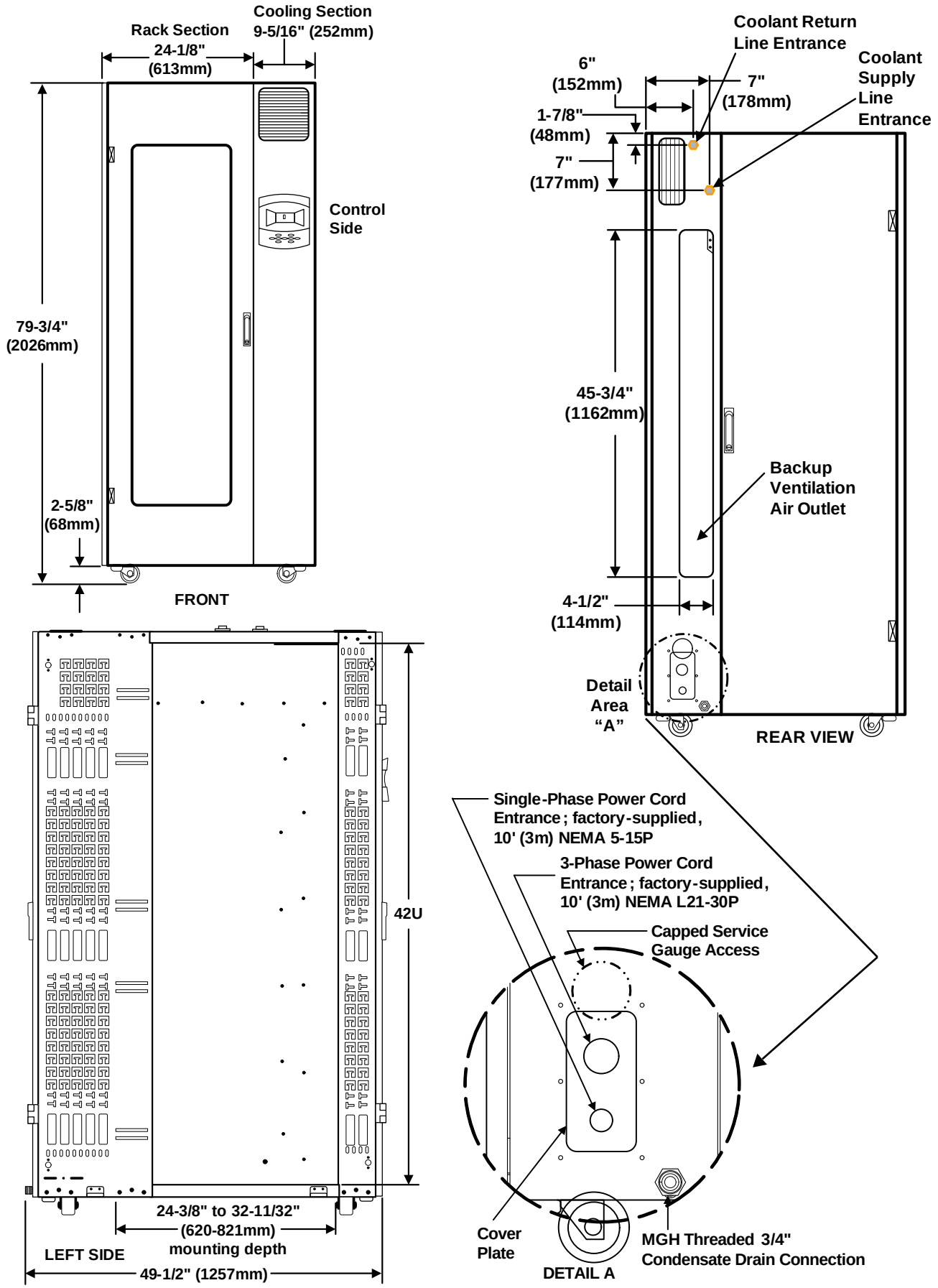
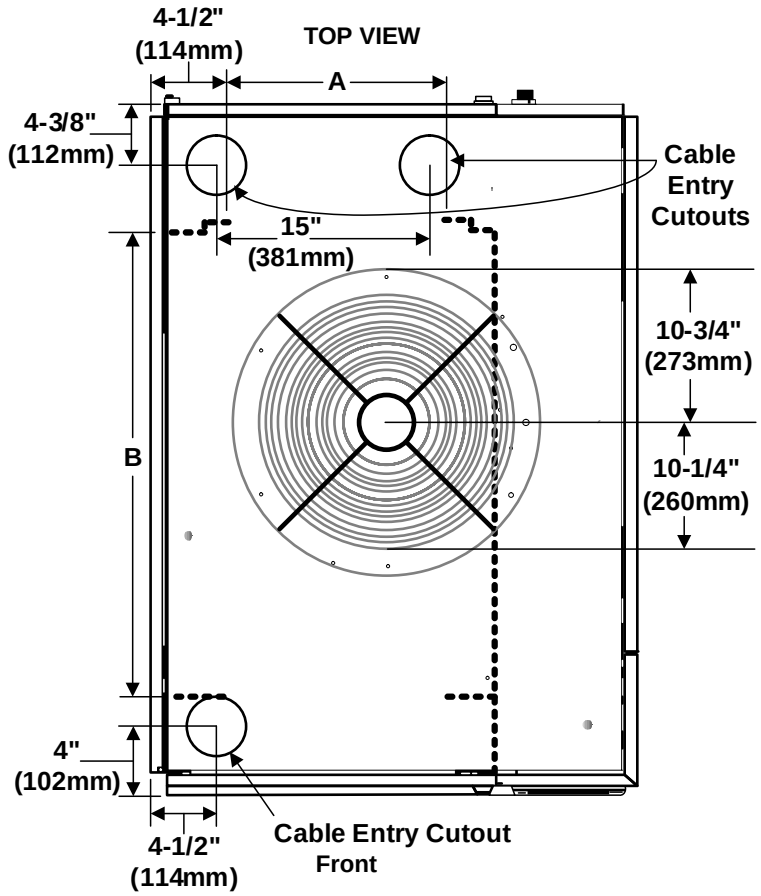
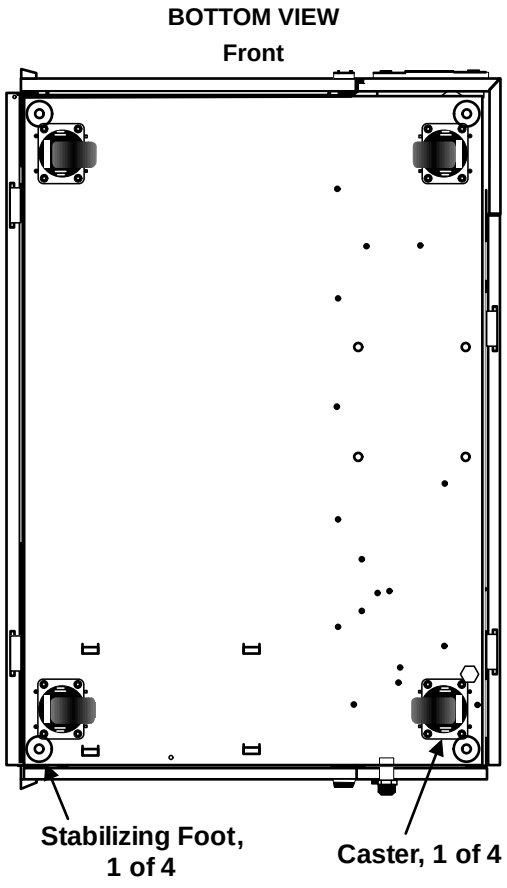


Figure 8 Dimensional data, all models—top, bottom and cable entry cutouts





Self-contained, air-cooled model shown; dimensions for water-cooled and remote, air-cooled units are identical; neither the water-cooled unit nor the remote, air-cooled unit has a condenser fan.

A - Rack-Mount Width
EIA Nominal: 19" (483mm)
Inside Dimension: 17-13/16" (452mm)
B - Adjustable Mounting Depth
Minimum: 24" (620mm)
Maximum: 32-11/32" (821mm)

3.0 LIEBERT XDF COMPONENTS

3.1 Standard Components—All Models

3.1.1 Frame

Height

- Liebert XDFS—82-1/4 inches (2089mm)
- Liebert XDFW—79-3/4 (2026)
- Liebert XDFR—79-3/4 (2026)

Usable Rack Height

- Liebert XDFS—36U (63 inches)
- Liebert XDFW—42U (73-1/2 inches)
- Liebert XDFR—42U (73-1/2 inches)

EIA Rack Width

- All Models—19 inches (483mm)

Each type of the Liebert XDF has a frame consisting of heavy-duty, riveted, 12-gauge steel. Each has fixed front rails and adjustable rear rails with square holes for installing rack-mount equipment. The front and rear vertical frame members accommodate internal mounting rail options and provide space to route and manage cabling.

Cutouts in the top (front and rear) permit customer cable entry (**Figure 8**). All units have casters, stabilizing feet and a grounding lug.

3.1.2 Enclosure

The Liebert XDF is equipped with seals to maintain a separate air volume inside the equipment compartment.

NOTE
Preventing air infiltration into the Liebert XDF will significantly improve overall performance and reduce the amount of condensate generated. Ensure that all cable entrances are sealed and that doors are closed securely. Check to ensure that all panels are properly installed; this is especially important if panels have been removed in the field.

3.1.3 Doors

The front and rear doors are framed from sheet metal and are removable. A multi-point latch with key lock is provided for security. The front door may be either solid sheet metal or have a Plexiglas™ window for viewing installed equipment. The rear door is solid, full-height sheet metal.

3.1.4 Side Panels

Side panels are constructed of sheet metal and use special fasteners to permit removal for maintenance. Insulation is included to provide improved thermal and sound insulation, as well as to prevent condensate formation on the outside of the unit.

3.1.5 Environmental Control

The Liebert XDF supplies cooling air—68°F to 77°F (20-25°C)—to electronic equipment in the rack-mount equipment compartment.

In normal operation, six fans at the right front corner of the Liebert XDF circulate cooling air through the equipment compartment. The laterally circulating air absorbs heat generated by the electronic equipment and transfers the heat to an evaporator coil at the right rear of the Liebert XDF. The heat is removed differently in each type of unit.

Heat Removal—Self-Contained, Air-Cooled Liebert XDFS

Heat removed from the Liebert XDFS cabinet is transferred to condenser coils at the top of the Liebert XDF, in a section separated from the equipment compartment. The condenser fan on top of the self-contained, air-cooled Liebert XDF draws ambient air through the condenser coils and exhausts the heat-laden air into the room.

Heat Removal—Water/Glycol-Cooled Liebert XDFW

The Liebert XDFW transfers the heat captured by the evaporator coil to a brazed plate condenser at the top of the unit, also separate from the equipment compartment. That heat is then carried away by the cooling water or glycol to a condenser or drycooler.

Heat Removal—Remote Condenser, Air-Cooled Liebert XDFR

The Liebert XDFR transfers the heat captured by the evaporator coil to a fin-tube condenser outdoors where it dissipates.

Figure 9 Cooling system components—Liebert XDFS

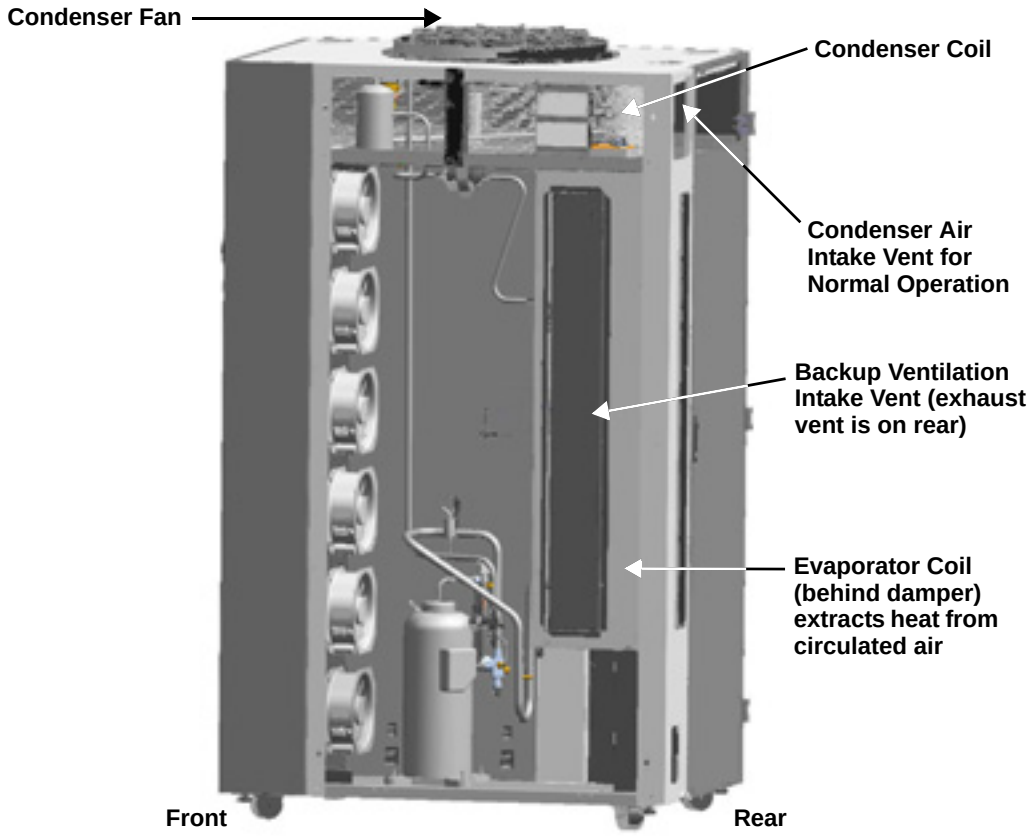


Figure 10 Cooling system components—Liebert XDFW

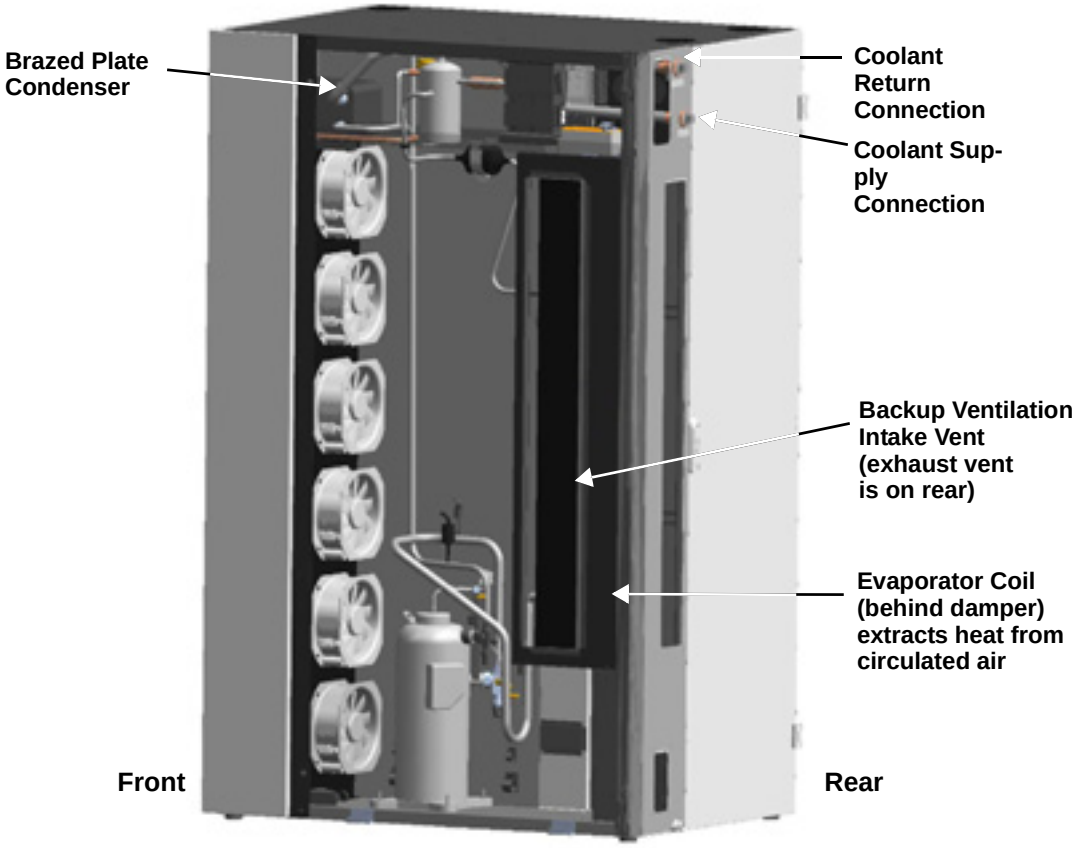
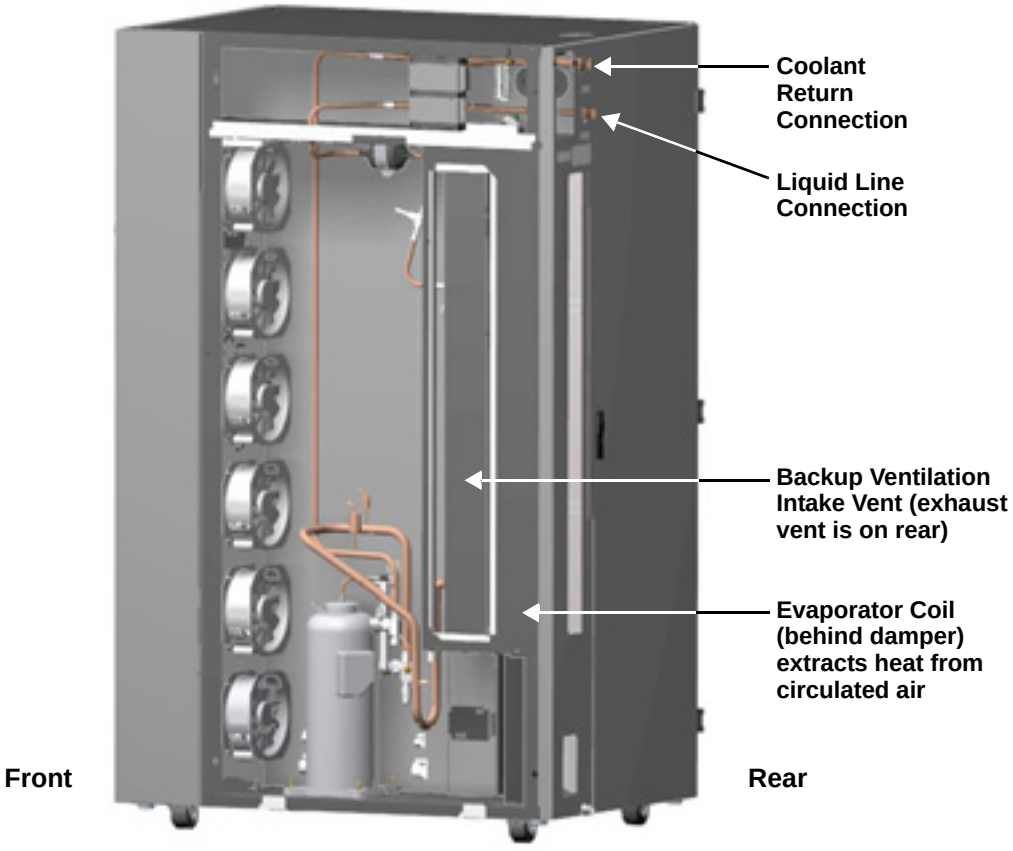


Figure 11 Cooling system components—Liebert XDFR



3.1.6 Control—Liebert iCOM® Controller

Each model of the Liebert XDF is equipped with Liebert's iCOM controller for all programming functions. The menu-driven, 128 x 64 dot matrix graphic display shows the status of the conditioned space, setpoints, alarm status and settings, event histories and the time.

Refer to **11.2 - Liebert iCOM Components and Functions** and **11.3 - Navigating Through the Liebert iCOM Display** for details or call 800-543-2778.

Figure 12 Liebert XDF with Liebert iCOM controller

Liebert iCOM controller

3.2 Coolant Source—Water/Glycol Models

The Liebert XDFW may be connected to either of two types of coolant sources:

- a closed-loop water system (cooling tower)
- a drycooler loop

3.2.1 Closed-Loop Water System

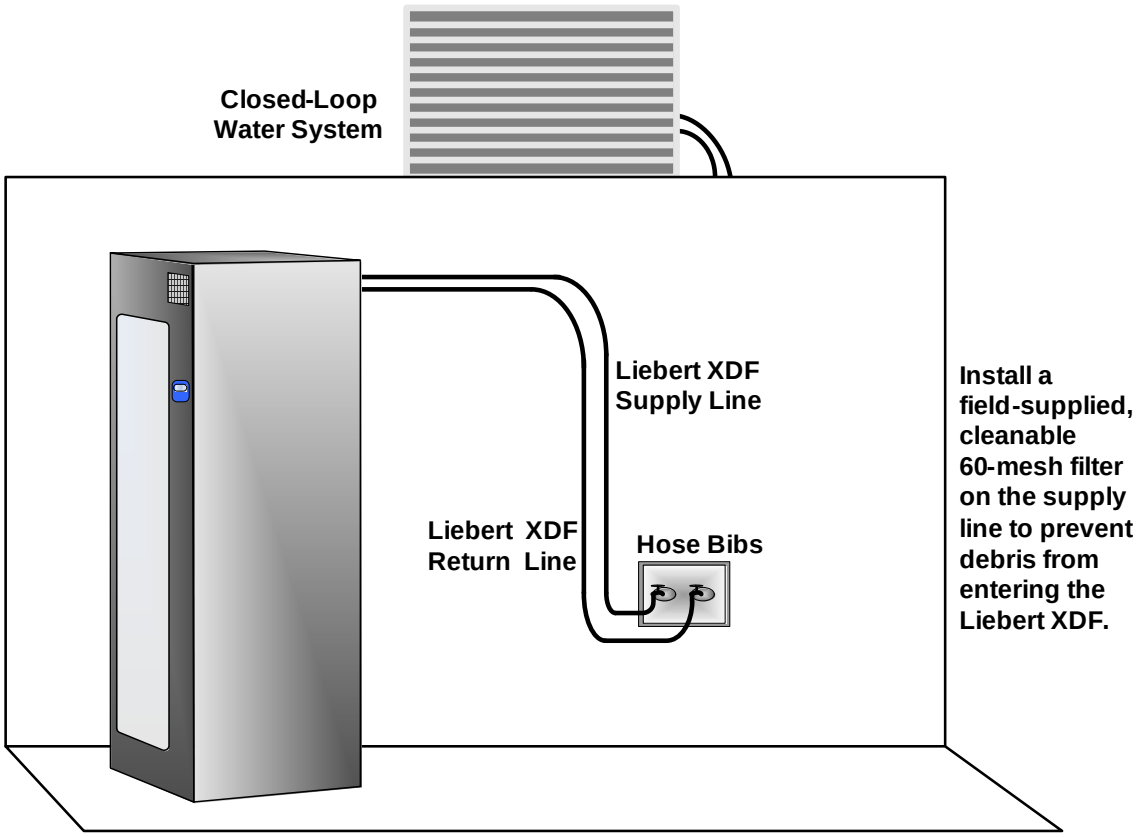
A closed water supply system is required for efficiency and to protect the Liebert XDFW from particles and other contaminants that might obstruct the system's piping.

NOTICE

Risk of dirt and debris contamination. May cause condenser clogging.

Do not install the Liebert XDFW on an open-loop water supply system. Debris carried by the fluid will clog the Liebert XDFW's brazed plate condenser.

Figure 13 Liebert XDFW supplied by closed-loop water system

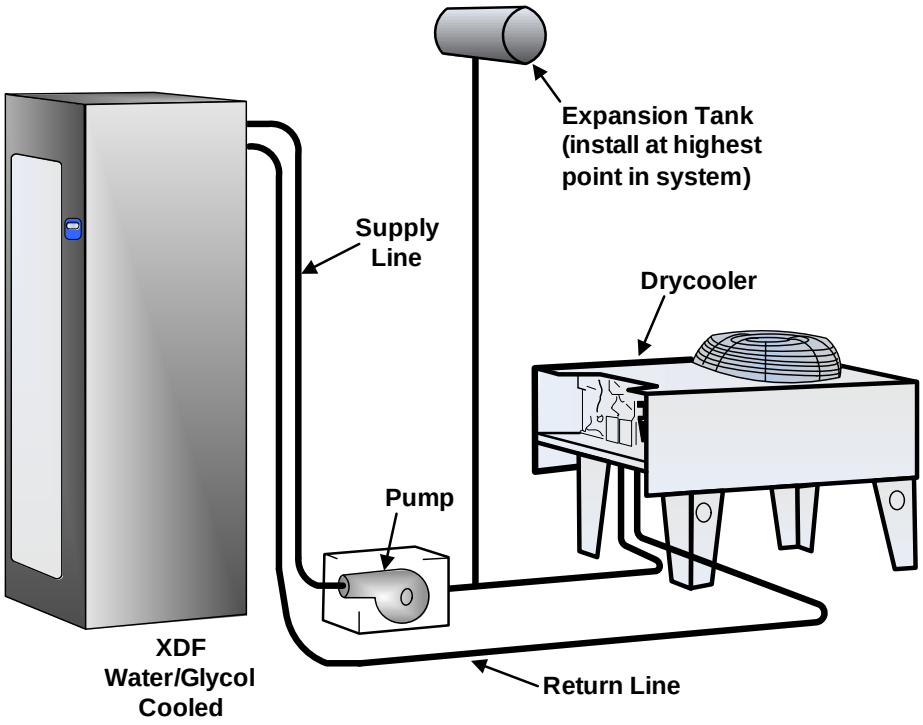


3.2.2 Drycooler Loop

The Liebert XDFW requires an external supply of coolant, either water or glycol, to remove heat extracted from the Liebert XDF.

Contact the factory for drycooler requirements when connecting multiple Liebert XDFW units. For information on setting up a drycooler system, contact your local Emerson representative.

Figure 14 Water/glycol-cooled general arrangement with drycooler as coolant source



3.3 Condenser Loop for the Liebert XDFR

The Liebert XDFR requires connection to an outdoor condenser to remove heat extracted from the cabinet. The Liebert condenser is low-profile, direct-drive propeller fan-type, air-cooled unit suitable for mounting outdoors. It provides for the heat rejection of either one or two separate refrigeration circuits, matching heat rejection capacity varying with the outdoor ambient temperatures and with each corresponding compressor's heat rejection requirements. Constructed with an aluminum cabinet and a copper- tube aluminum fin coil, the unit is quiet and corrosion-resistant. The condenser is quickly and easily installed because all internal wiring is completed at the factory with only external electrical connections to be made at the job site. All electrical connections and controls are enclosed in an integral weatherproof section of the condenser.

3.3.1 Variable Frequency Drive

The VFD condenser control system utilizes a variable frequency drive, inverter duty fan motor operating from 0% to 100% motor RPM based on head pressure, sensed by coolant pressure transducers. VFD, ambient-temperature thermostat(s), motor overload protection and electrical control circuit are factory-wired in the integral control panel. VFD controls the fan adjacent to the connection end of the condenser and remains energized with active compressor operation. The balance of fans on multi-fan units cycle on ambient thermostats. This system provides coolant head pressure control for outdoor ambients as low as 0°F (-18°C).

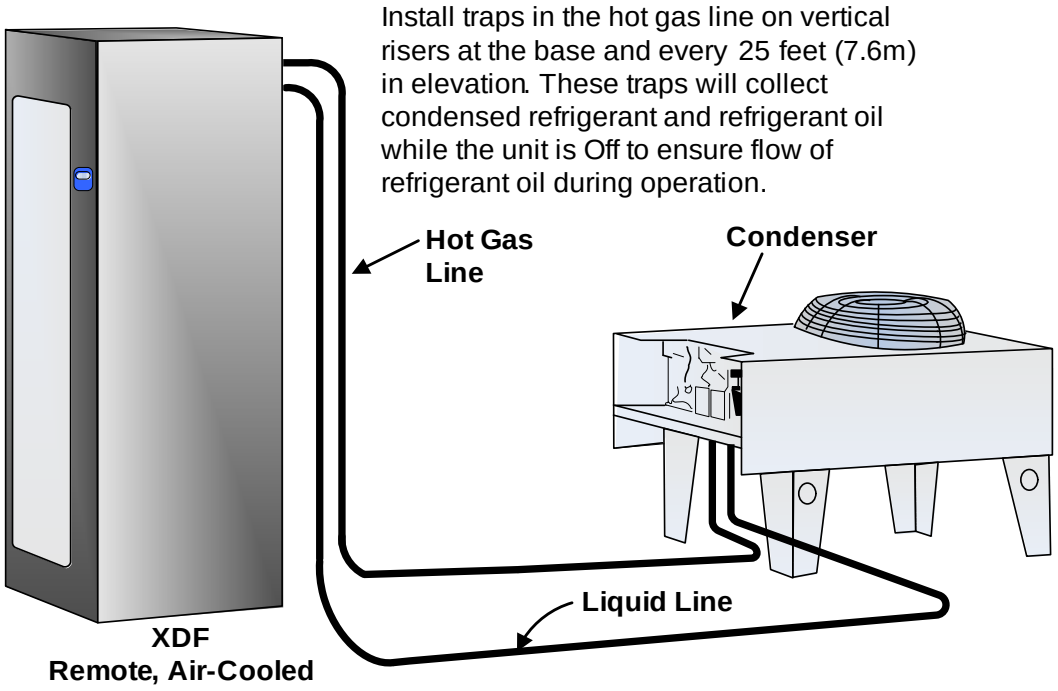
3.3.2 Liebert Lee-Temp™ Coolant Control

The Liebert Lee-Temp head pressure control system is designed to maintain proper operating head pressures in outdoor temperatures down to -20°F (-29°C) with the Liebert XDFR. The condensers utilize head pressure control valves, extra coolant and insulated coolant receivers with heater pads. It works by flooding the condenser coil with liquid coolant to a level that balances the system condensing requirements with the condenser coil surface available to reject the system heat.

During the summer, the system requires the entire condenser coil surface for heat rejection and most of the coolant is stored in a receiver. In the winter, the same amount of heat can be rejected by only a fraction of the coil surface. As head pressure begins to fall, the control valve restricts the flow of liquid coolant exiting from the condenser. This extra liquid coolant reduces the effective condenser surface area available for heat transfer. The head pressure control valve also bypasses hot gas into the receiver to warm the liquid and maintain liquid pressure for proper operation of the expansion valve. Condenser fan controls either cycle the fans based on the ambient temperature or on constantly.

Contact the factory for condenser requirements when connecting multiple Liebert XDFR units. For information on setting up a condenser system, contact your local Emerson representative.

Figure 15 Liebert XDFR general arrangement with condenser as coolant source



3.4 Optional Equipment

3.4.1 General Enclosure Options

- Sealed entrance cable bundle
- Cable tray
- Cable Management Channels
- Cable rings
- Velcro cable management straps
- Fixed shelves, vented, 250lb (113kg) capacity
- Pullout shelves, vented, 130lb (59kg) capacity
- Fixed rails, 150lb (68kg) capacity
- Internal keyboard tray
- Mounting clip nuts and screws 10-32 or M6 thread
- Condensate Pump

3.4.2 Power Options

Liebert MPH Managed Rack PDUs

Power distribution to equipment in your Liebert XDF may be eased with optional Liebert MPH Managed Rack PDUs. These are available in single-phase power option; some units offer remote monitoring and individual receptacle control. For details, see **Table 21 - Liebert MPH—Rack-mount model numbers and specifications** or refer to the Liebert MPH Managed Rack PDU user manual, SL-20827.

Uninterruptible Power Supply

An Uninterruptible Power Supply (UPS) can provide your electronic equipment with surge protection and suppression, as well as voltage and frequency regulation, preventing damage to the hardware. A UPS provides time to perform a controlled shutdown of your operating system, allowing you to save valuable data. Liebert online, double-conversion UPS systems also condition utility power, eliminating damaging power transients.

The following Liebert UPS models are available for installation in the Liebert XDF:

On-Line UPS Systems

- Liebert GXT3 - 500, 700, 1000, 1500, 2000, 2700 and 3000RT120

Line Interactive Systems

- Liebert PS1000, 1440, 2200 and 3000RT3-120

Refer to the UPS user manual for further details.

Figure 16 Optional power equipment, examples

Liebert GXT3U UPS and Additional Battery Cabinet

4.0 UNCRATING THE LIEBERT XDF

4.1 Inspection

Upon arrival of the unit, and before unpacking it, verify that the delivered equipment matches the bill of lading. Examine the packaging for any signs of mishandling or damage. Inspect all items for damage, visible or concealed. Report any damage immediately to the carrier and file a damage claim. Send a copy to Liebert Corporation or to your sales representative.

Packing Material

All material used to package this unit is recyclable. Please save the material for future use or dispose of it appropriately.

4.2 Recommended Setup Equipment

- pallet jack or forklift
- utility knife
- 3/8" ratchet or wrench

4.3 Unloading the Liebert XDF

WARNING

Risk of top-heavy unit falling over. Can cause death, injury and equipment damage.

Read all of the following instructions before attempting to move, lift or remove packaging from the unit.

CAUTION

Risk of sharp edges, splinters and exposed fasteners. Can cause personal injury.

Only trained personnel wearing appropriate safety headgear, gloves, shoes and glasses should attempt to move, lift or remove packaging from the unit or prepare the unit for installation.

CAUTION

Risk of overhead interference. Can damage the unit and structure.

The unit may be too tall to fit through a doorway while on the skid. Measure the unit and doorway heights and refer to the installation plans to verify clearances before moving the unit.

CAUTION

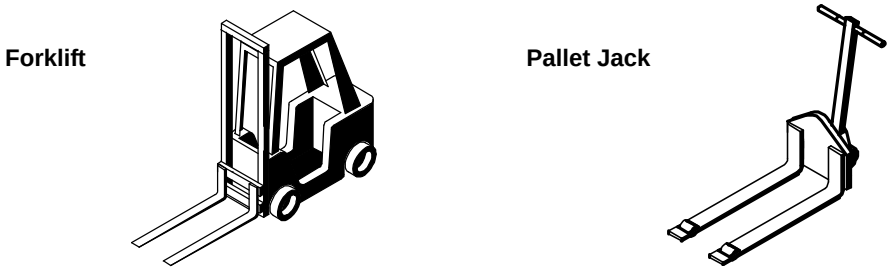
Risk of frozen fluids. Can cause equipment damage.

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

4.3.1 Handling the Unit While It is Packaged

- If possible, transport the Liebert XDF using a forklift or pallet jack. Otherwise use a crane with belts or cables and spreader bars to protect the Liebert XDF's sides from damage.
- If using a forklift or pallet jack, make sure the forks (if adjustable) are spread to the widest distance that fit under the skid. Also, ensure the fork length is suitable for the unit length.
- When moving the packaged Liebert XDF, do not lift it any higher than 6" (152mm) off the ground. Exercise great care if the Liebert XDF must be lifted higher than 6" (152mm); any personnel not directly involved in lifting the Liebert XDF must be at least 20' (5m) from the unit.

Figure 17 Recommended unit handling equipment



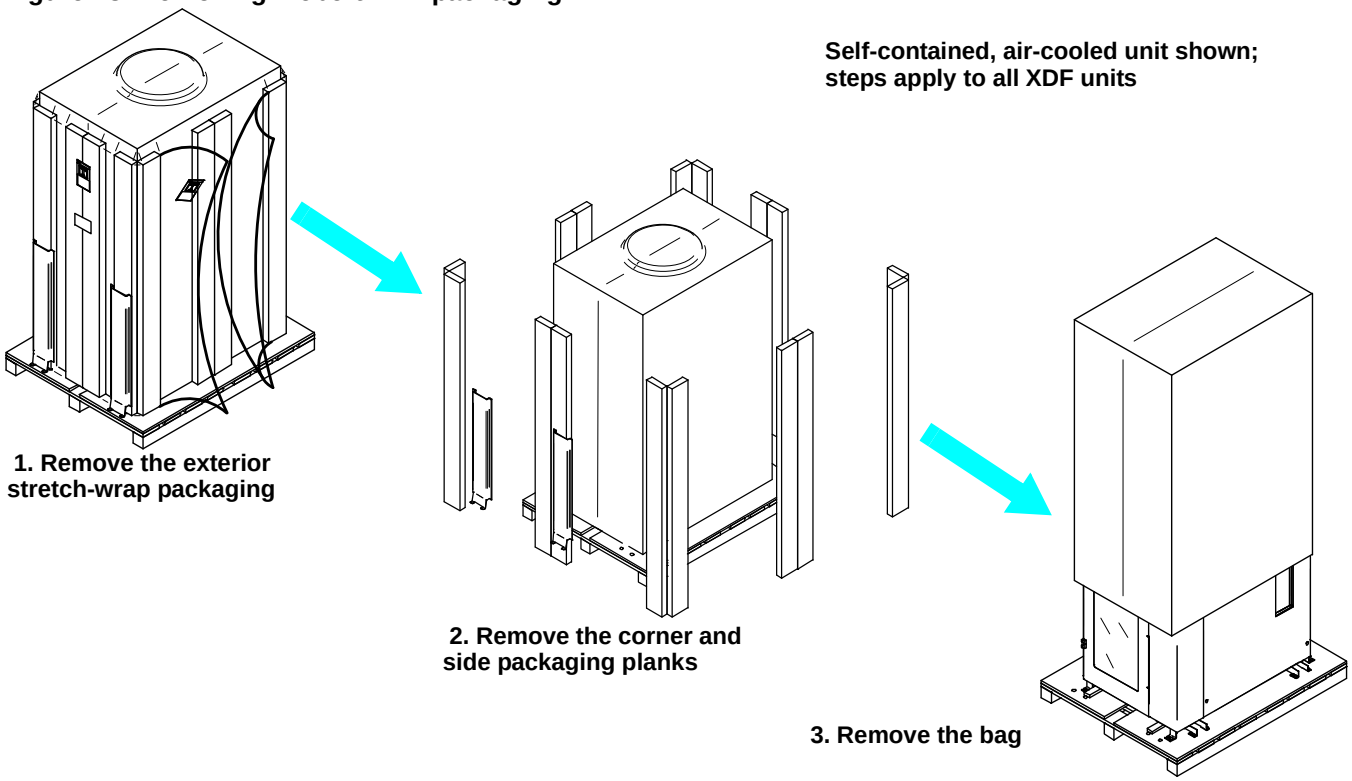
4.3.2 Unpack the Liebert XDF

1. Remove the exterior stretch-wrap packaging material from around the Liebert XDF, exposing the protective corner and side packaging planks (see **Figure 18**).
2. Remove the corner and side packaging planks from the Liebert XDF, exposing the bag over the unit.

   The bag may remain in place to protect the Liebert XDF from dust and scratches or removed for immediate unit installation.

   Ensure the metal ramps stay with the Liebert XDF for removal from the skid.
3. Remove the bag from the Liebert XDF when ready to remove the skid and install the unit.

Figure 18 Removing Liebert XDF packaging



4.3.3 Removing the Liebert XDF from Skid

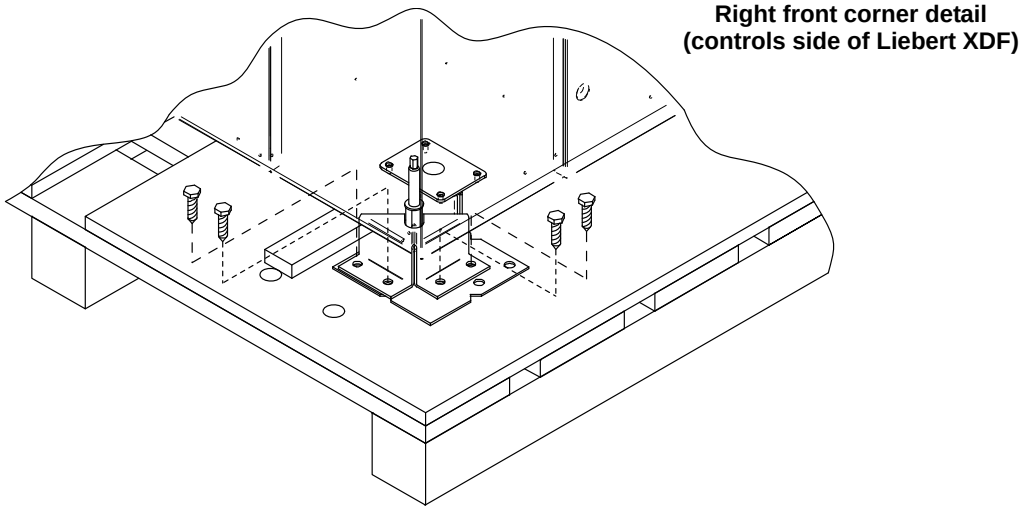
This unit is on casters—to prevent it from rolling, ensure that the skid is on a flat surface before removing the Liebert XDF from the skid.

1. Remove eight lag bolts from the unit tie-down brackets on the controls side of the unit.
2. Remove the four tie-down brackets from the controls side of the unit (see **Figure 19**).
3. Find the ramps that were shipped with the unit.
4. Insert the two tabs on each ramp into the holes on the skid.
5. Remove eight lag bolts from the unit tie-down brackets on the side opposite the controls.
6. Remove the four tie-down brackets from the side opposite the controls.
   Unit weight when empty is 710 lb (322kg). Weight may differ if optional equipment has been installed. Refer to the packing slip for the unit's exact weight.
7. Remove the Liebert XDF by rolling it off of the ramp using an appropriate number of personnel and rigging based on the unit weight (see **Figure 20**).

Once off of the skid, the unit can be rolled to the installation site.

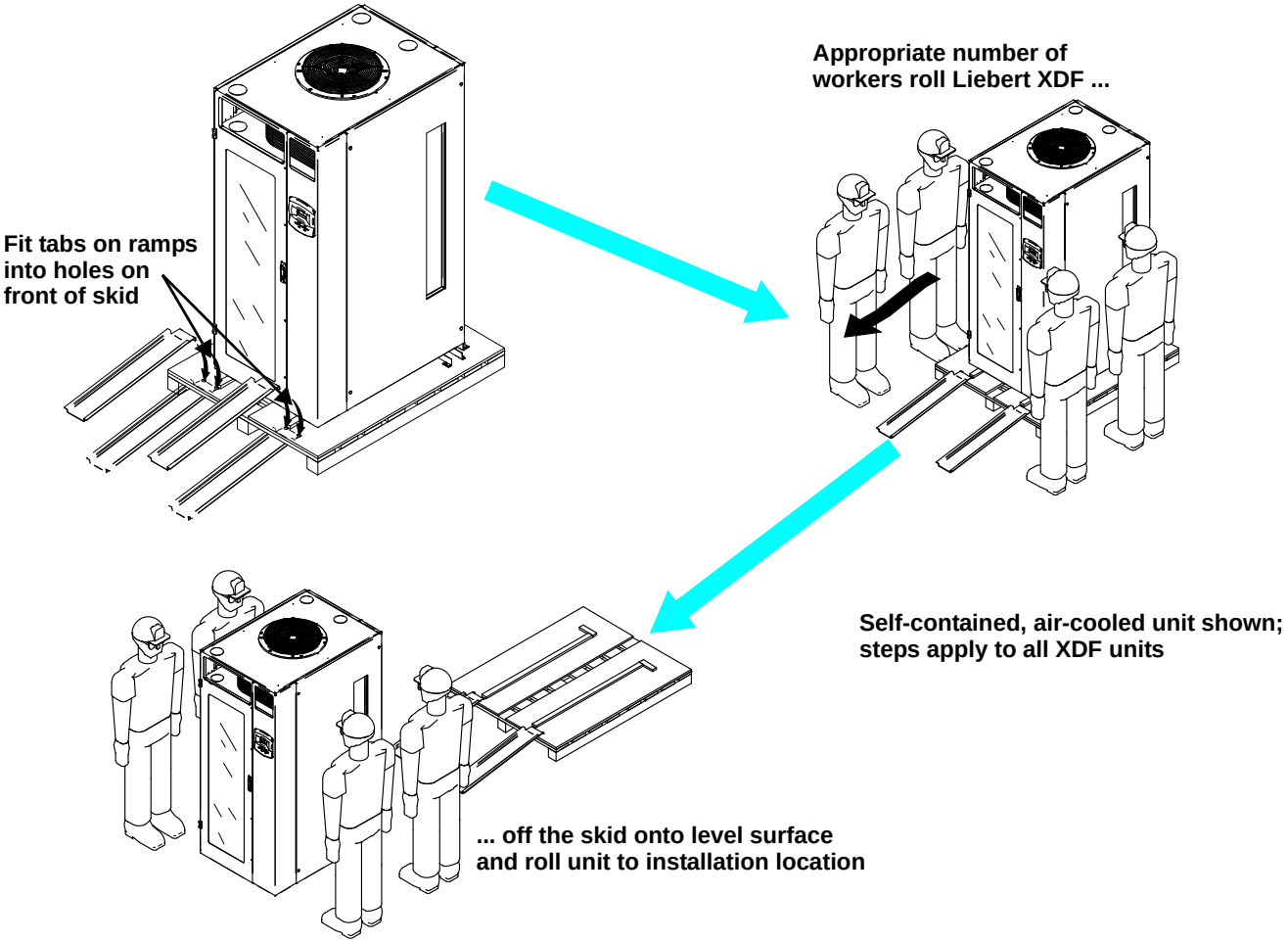
NOTE
If the self-contained, air-cooled Liebert XDF is too tall to pass through a doorway, the condenser fan assembly may be removed, reducing the height by 2-1/2" (64mm).

Figure 19 Remove lag bolts and brackets



Four (4) Lag Bolts and Two Brackets Per Corner

Figure 20 Roll Liebert XDF off the shipping skid



5.0 INSTALLATION

5.1 Liebert XDF Site Preparation

When deciding where to place your Liebert XDF, keep in mind these factors:

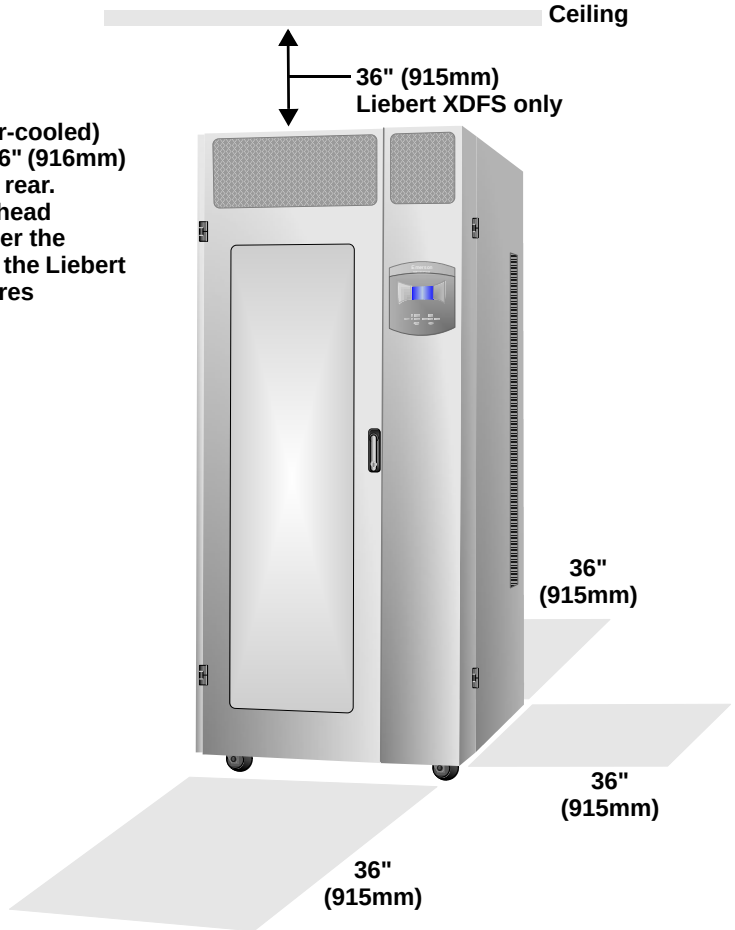
- electricity is required to operate the compressor (208V-3ph-60Hz) and the controls and evaporator fans (120V-1ph-60Hz)
- adequate ventilation and makeup air are necessary for proper equipment operation and protection
- service clearance must be provided
- the Liebert XDF must be on a level surface to ensure proper operation
- condensate must be drained, either by gravity-fed drain or optional condensate pump
- Liebert XDFW (water/glycol-cooled) units require connection to a water or drycooler loop
- Liebert XDFR (remote condenser, air-cooled) models must be installed where piping and control wiring can be run from the indoor Liebert XDFR to an outdoor condenser

The Liebert XDFS (self-contained, air-cooled) is intended for installation in open areas. Field-supplied ducting, an external booster fan and sufficient makeup air are required for installing a self-contained, air-cooled model in closed-in areas, such as in a closet or alcove. Contact your local Emerson representative before installing the Liebert XDF in an area that might inhibit heat dissipation.

Note the dimensions of your Liebert XDF to determine the space required for proper installation and operation. All models of the Liebert XDF require 36 in. (915mm) clearance in the front, back and right side for equipment access and service (see **Figure 21**). The Liebert XDFS also requires overhead clearance of 36 in. (915mm).

Figure 21 Liebert XDF clearances

Liebert XDFS (self-contained, air-cooled) model shown. All units require 36" (916mm) clearance on the side, front and rear. The Liebert XDFS requires overhead clearance of 36" (916mm). Neither the Liebert XDFW (water/glycol) nor the Liebert XDFR (remote, air-cooled) requires overhead clearance.



5.2 Voltage Requirements

All Liebert XDF systems require two input power circuits. Each power cord is 10 feet (3m) long. For the full load amp requirements of each option, refer to **14.1 - Optional Power Systems** or the component's user manual.

5.2.1 Voltage Input Requirements

The first input connection provides power—120V-1ph-60Hz, line-to-neutral—to the controls, evaporator fans and condenser fan. This input's power cord has a NEMA 5-15P plug. This power cord should be connected to a UPS-protected power source.

The second input connection on 60Hz Liebert XDF units provides power—208V-3ph-60Hz, with neutral—to the compressor, optional condensate pump and an alternate connection for the condenser fan. (The alternate connection for the condenser fan permits reducing the load on the UPS-protected power source.) The 208V power cord has a NEMA L21-30P locking plug.

Changing Condenser Fan Power Source—Liebert XDFS

WARNING

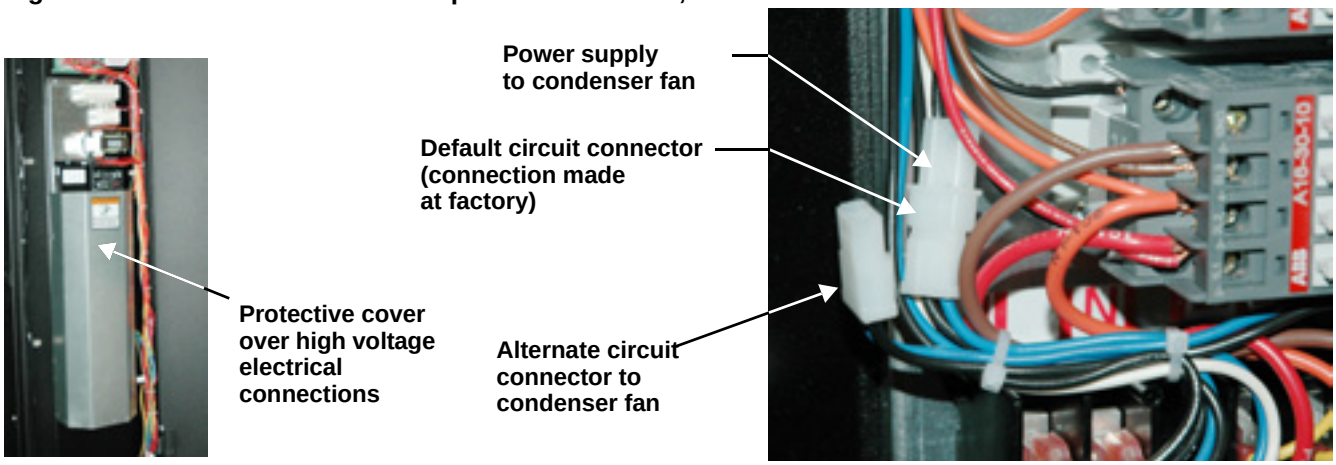
Risk of electric shock. Can cause injury or death.

Disconnect all local and remote electric power before working within and/or installing equipment.

To change the power source for the Liebert XDFS fan connections:

1. Open the front door panel and look for two screws with Torx heads that secure the hinged corner panel. The Torx-head screws are on the front doorjamb.
2. Extract the two screws and swing the panel open.
3. Remove the protective covering over the electrical connections (see **Figure 22**). The cover is secured with two screws.
4. Find the connectors (see **Figure 22**) and pull apart the snap connection made at the factory.
5. Connect the alternate power source connector to the supply that feeds the condenser fan.
6. Reinstall the protective cover over the electrical connections.
7. Close the outer panel and reinsert the two Torx screws.
8. Close the front door.

Figure 22 Alternate condenser fan power connection, Liebert XDFS



5.2.2 Uninterruptible Power Supply—Optional

If your Liebert XDF is equipped with a UPS, it will require connection to a dedicated electrical circuit. Review the UPS's user manual before connecting utility power to the unit.

5.2.3 Liebert MPH Managed Rack PDUs—Optional

Liebert MPH Managed Rack PDUs are available in several power ranges. Consult **Table 21** in **14.0 - Specifications** or the Liebert MPH Managed Rack PDU user manual, SL-20827, for your model's power requirements.

5.2.4 Condensate Drain Connection

The Liebert XDF cooling process removes humidity from the air inside the cabinet. The moisture is collected in a pan and must be removed from the cabinet. The condensate may be fed into a gravity drain or pumped away with an optional, factory-installed condensate pump.

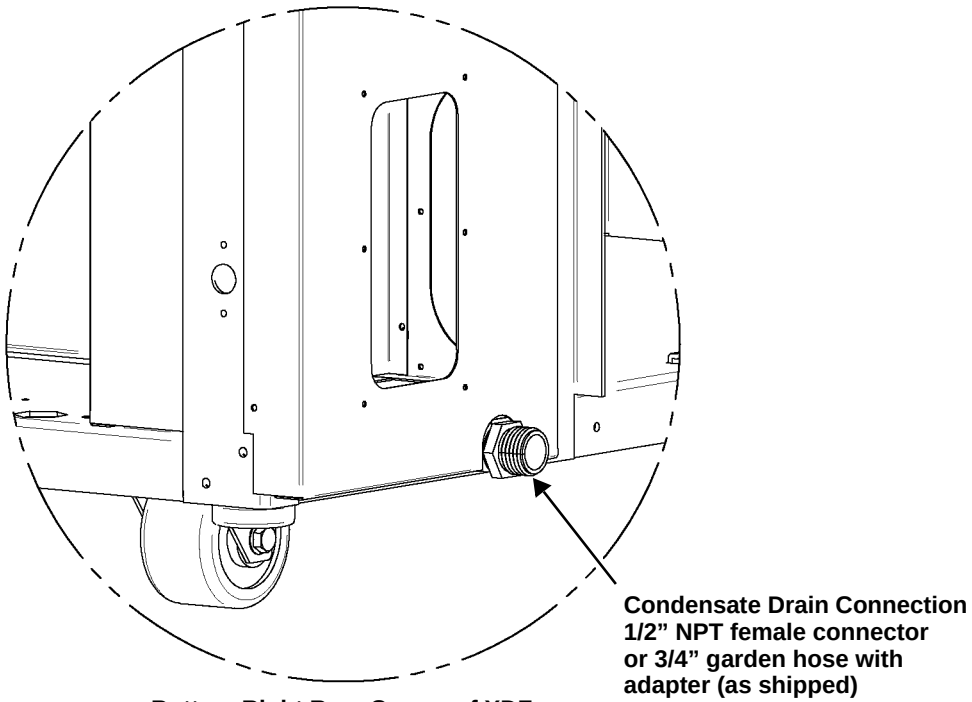
The gravity-fed drain line must be pitched a minimum of 1/8" per foot (11mm per meter).

Table 1 Optional condensate pump performance

Model	Maximum Head, feet (m)
60Hz	18 (5.49)
50Hz	14 (4.27)

The standard Liebert XDF condensate drain is a 1/2" NPT female pipe connector. A factory-supplied adapter permits connecting a 3/4" hose, the same size as a standard garden hose. The adapter is shipped with the cabinet (see **Figure 23**).

Figure 23 Condensate drain connection and adapter



5.3 Equipment Layout

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect all local and remote electric power before working within and/or installing equipment.

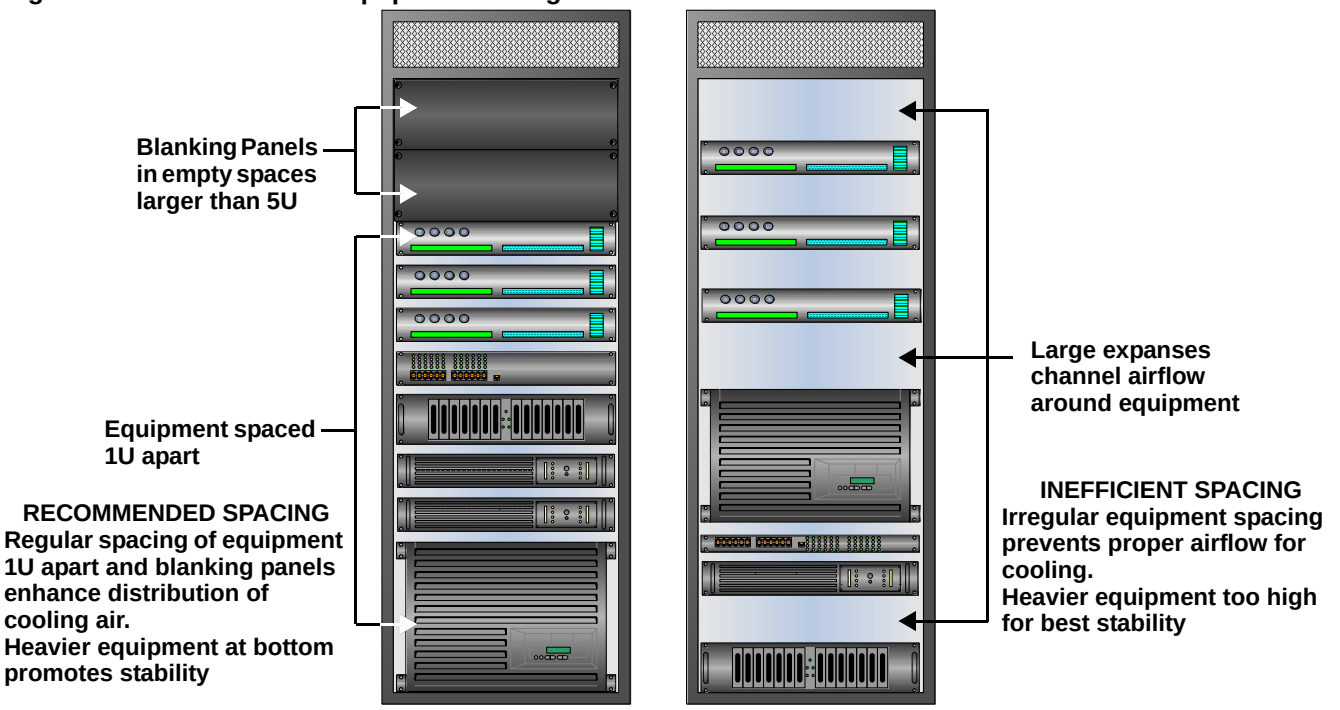
Before installing or rearranging equipment, ensure the equipment and the UPS are switched Off. Ensure that all electrical sources are disconnected.

The lateral, circular flow of cooling air permits arranging equipment as required for stability if the Liebert XDF is filled or nearly filled with equipment. Install heavier equipment first, placing it in the lower racks of the Liebert XDF. This keeps the Liebert XDF from having a high center of gravity, which could make it easier to tip over (see **Figure 24**).

The Liebert XDF may be filled to capacity as long as the maximum heat load of 14kW is not exceeded. If the Liebert XDF will not be filled with equipment, install the equipment to include a 1U space above and below each unit. Again, install heavier equipment first, placing it in the bottom racks.

After all equipment has been installed, any remaining spaces larger than 5U at the top of the Liebert XDF should be closed with optional blanking panels. (Panels are available in 1U, 2U, 3U, 4U, 5U and 10U.) This arrangement prevents large, open expanses in the equipment compartment that would reduce cooling efficiency by channeling airflow around the electronic gear.

Figure 24 Recommended equipment arrangement



CAUTION

Risk of top-heavy unit falling over. Can cause death, injury and equipment damage.

Read all of the following instructions before attempting to move, lift or remove packaging from the unit.

NOTE

All electrical receptacles and sockets in the vicinity of where the Liebert XDF will be used must be ground/earth type.

5.4 Frame and Enclosure Configurations

5.4.1 Internal Mounting Rails

The Liebert XDF can accommodate rack-mounted or free-standing computer and network equipment. The unit features 19-inch (483mm) rear-mount rack rails. These internal mounting rails are designed in accordance with the EIA 310D rack standard. The rails are adjustable for equipment of different sizes.

Liebert offers these optional mounting hardware kits: fixed shelf, fixed rails, pullout shelf, 19-inch (483mm) rack rail adapters and keyboard trays. Each kit includes installation hardware.

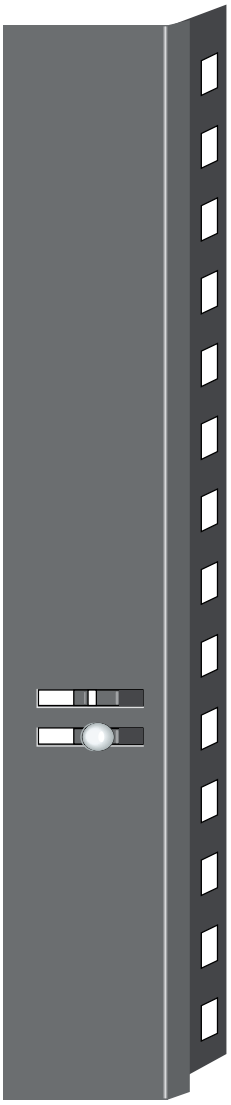
5.4.2 Rear-Mount Rails—Position

The Liebert XDF's front rails are fixed into position, while rear-mount rails are secured by carriage bolts that pass through horizontal slots in the frame. These slots permit you to change the front-to-rear distance between the rails as your application requires.

To position the rails:

1. Determine the proper location of the rails.
2. Loosen the bolts securing a rail to the frame.
3. Move the rail to the desired position (be sure to get the rail square).
4. Tighten the bolts securing the rails to the frame.
5. Repeat for the other rail.
6. Install your rack-mounted equipment or the shelves to hold your free-standing equipment.

NOTE
Before installing any electrical equipment, make sure that the equipment is switched Off.



Detail of Rack Rail

5.5 Mounting Hardware

Optional mounting clip nuts and screws are available for mounting equipment to the mounting rails. Clip nuts are metal clips with captive nuts that fit over vertical rack rail holes, allowing individual placement of the mounting hardware. Each clip nut and screw package includes 10 clip nuts (Type 10/32 or M6 threads) and screws.

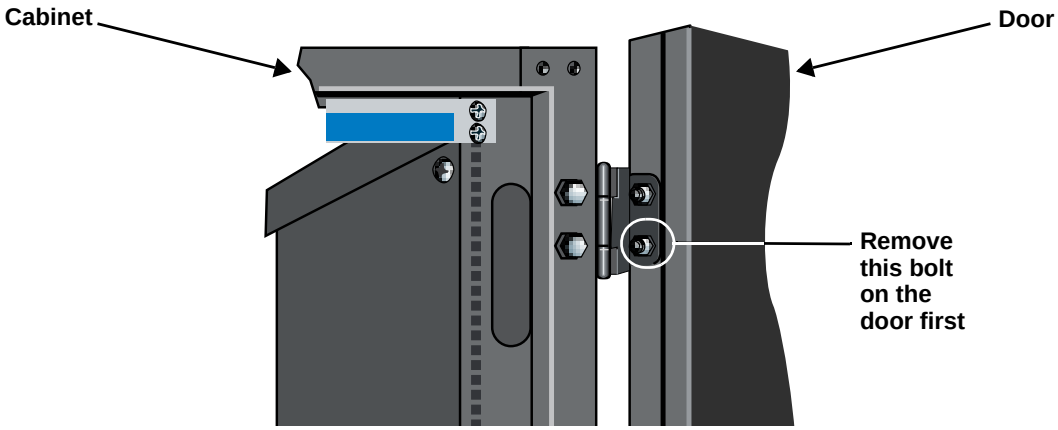
5.6 Door—Remove

The Liebert XDF's doors are removable for convenience when installing equipment.

5.6.1 Remove the Door

1. Remove the bolts securing the lower half of each two-piece hinge to the door.
2. Remove the lower half of each hinge.
3. Lift the door straight up until the pins clear the hinges.
4. Set the door in a safe place.

Figure 25 Removing Liebert XDF door



5.6.2 Quick Door Removal

For minimum-security installations that also require frequent and fast removal of the door, the lower half of the hinge assembly may be permanently removed. This allows for quick removal of an open door by lifting the door straight up until the pins clear the hinge mount.

5.7 Side Panels—Remove and Replace

Liebert XDF side panels are simple to remove and replace, making it easier to install equipment and to service the Liebert XDF. Panel removal also improves access for equipment maintenance and replacement.

5.7.1 Remove the Left Panel

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect all local and remote electric power before working within and/or installing equipment.

To remove the left panel from the Liebert XDF:

1. The left panel is secured with two internal security quarter-turn fasteners and four panel retainers. Open the doors and locate the internal security quarter-turn fasteners on the left side panel. The security fasteners are at the top front and top rear corners of the panel.
2. Using the factory-supplied T-handle Allen wrench, turn the internal security fasteners counterclockwise 90 degrees.
3. Locate the four panel retainers on the outside of the left Liebert XDF panel. One retainer is in each corner of the panel.
4. Using the factory-supplied T-handle Allen wrench, turn the panel retainers counterclockwise 90 degrees.

CAUTION

Risk of heavy panel falling off. Can cause injury and/or equipment damage.

Support the panel when removing it. Unlocking the security fasteners and removing the panel retainers will allow unsupported panel to fall.

5. Lift the panel off the lip at the bottom of the Liebert XDF and set it in a safe location.

5.7.2 Remove the Right Panel

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect all local and remote electric power before working within and/or installing equipment.

To remove the right panel from the Liebert XDF:

1. Locate the four panel retainers on the outside of the right Liebert XDF panel. One retainer is in each corner of the panel.
2. Using the factory-supplied T-handle Allen wrench, turn the panel retainers counterclockwise 90 degrees.

CAUTION

Risk of heavy panel falling off. Can cause injury and/or equipment damage.

Support the panel when removing it. Unlocking the security fasteners and removing the panel retainers will allow unsupported panel to fall.

3. Lift the panel off the lip at the bottom of the Liebert XDF and set it in a safe location.

5.7.3 Replace a Panel

1. Set the panel on the lip at the bottom of the Liebert XDF frame.
2. Using the factory-supplied T-handle Allen wrench, turn each of the four panel retainers clockwise 90 degrees.
3. **Left panel only**: Using the factory-supplied T-handle Allen wrench, turn the internal security fasteners clockwise 90 degrees.

6.0 DRYCOOLER AND PIPING INSTALLATION—LIEBERT XDFW

Equipment damage and personal injury can result from improper piping installation, leak checking, fluid chemistry and fluid maintenance.

- Follow local piping codes, safety codes and Liebert unit installation and maintenance instructions.
- Qualified personnel must install and inspect system piping.
- Contact a local water consultant regarding water quality, corrosion protection and freeze protection requirements.

CAUTION

Risk of dirt and debris contamination. May cause condenser clogging.

Do not install a Liebert XDFW on an open-loop water supply system. Debris carried by the fluid will clog the unit's brazed plate condenser.

CAUTION

Risk of piping stress. Can cause leaks and equipment damage.

To help prevent piping failures, supply and return lines must be supported so that their weight does not bear on the Liebert XDFW's piping, on the drycooler or on the pumps.

6.1 Drycooler Installation—Water/Glycol-Cooled Model

For details on installing the drycooler, refer to the drycooler's installation manual or contact your local Emerson Network Power representative. The manual was shipped with the unit and is available at the Liebert Web site: **www.liebert.com**

6.2 Piping for Liebert XDFW

The Liebert XDFW's supply and return fittings are on the upper portion of the rear of the unit (see **Figure 8**). The 1-1/8" diameter pipes have one-inch female NPT fittings. The pipes are capped at the factory. Piping connections to the Liebert XDFW should be done by properly trained and qualified personnel. All work must be done in compliance with all national and local regulations.

6.2.1 Closed Loop Water System

Where water will be used as a coolant medium, Liebert recommends use of a closed-loop water system with a cooling tower or similar heat dissipation method. For flow rates for the Liebert XDFW, see **Table 2**.

Table 2 Water supply flow rates

Entering Water Temp. (EWT), °F (C)	Saturated Cond. Temp. (SCT), °F (C)	Flow Rate GPM (l/s)	Pressure Drop ft (kPa)
65 (18)	105 (41)	15.0 (.95)	4.6 (13.8)
75 (24)	105 (41)	15.0 (.95)	4.6 (13.8)
85 (29)	110 (43)	15.0 (.95)	4.6 (13.8)

Values are based on 95°F (35°C) ambient, 77°F (25°C) discharge air, 10°F (5°C) temperature rise on the heat transfer media.

6.2.2 Expansion Tanks, Fluid Relief Valves and Other Devices

An expansion tank must be provided for expansion and contraction of the fluid due to temperature change in this closed system. Vents are required at system high points to vent trapped air when filling the system. A relief valve is also necessary.

Depending on the complexity of the system, various other devices may be specified. Pressure gauges, flow switches, automatic air separator, tempering valves, standby pumps, sensors for electrical controls and flow switches are just a few of these devices.

Manual shutoff valves should be installed on the supply and return lines. In addition, multiple pump packages require a check valve at the discharge of each pump to prevent back-flow through the standby pump(s). These check valves permit isolating units for routine maintenance or in an emergency.

Liebert also recommends installing these items in the system:

- cleanable, 60-mesh filters—These filters will trap the particles in the coolant supply line and extend the service life of the water-cooled condenser.
- floor drains with wet traps or a leak-detection system, such as Liebert's Liqui-tect™
- hose bibs at the lowest point of the system to facilitate filling
- relief valve—to protect against burst water pipes

6.2.3 Corrosion Protection

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.

Contact a local water consultant regarding water quality, corrosion and freeze protection requirements. 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 may contain corrosive elements that reduce the effectiveness of the inhibited formulation.

Surface waters that are classified as soft and are low in chloride and sulfate ion content (less than 100 parts per million each) should be used. Proper inhibitor maintenance must be performed 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 mixed with corrosion inhibitors. For further details on corrosion prevention, see **6.3.1 - Glycol Solutions**.

Idle fluid allows the collection of sediment and that prevents the formation of a protective oxide layer on the inside of tubes. Keep the unit switched On and the system pump operating.

6.2.4 Freeze Protection—Coolant Type and Insulation

Glycol solutions should be considered for use as a coolant to protect the coil against freezing and corrosion from water.

CAUTION

Risk of frozen fluid. Can cause piping rupture and equipment damage.

When the field piping or unit can be exposed to freezing temperatures, charge the system with the proper percentage of glycol and water for the coldest design ambient to prevent freezing.

CAUTION

Risk of frozen fluid. Can cause piping rupture and equipment damage.

Immediately after using water for leak testing or system cleaning, charge the tested system with the proper percentage of glycol and water for your coldest design ambient. Complete system drain-down cannot be ensured and damage to the system could result from freezing of residual water.

The minimum coolant temperature to be supplied to the Liebert XDF will determine whether the supply and return lines require insulation to prevent condensation.

6.3 Drycooler Loop System

6.3.1 Glycol Solutions

The percentage of glycol to water must be determined by using the lowest design outdoor temperature in which the system is operating. **Table 3** indicates the solution freeze point at several concentration levels of ethylene glycol. Propylene glycol concentrations should be 1% higher than the ethylene glycol table values to find the freeze point. For example, 41% propylene glycol freezes at -10°F (-12°C).

Table 3 Ethylene glycol concentrations

% Glycol by Volume	0 *	10	20	30	40	50
Freezing Point °F (°C)	32 (0)	25 (-3.9)	16 (-8.9)	5 (-15.0)	-10 (-23.3)	-32 (-35.5)
Apparent Specific Gravity @ 50°F (10°C)	1	1.014	1.028	1.042	1.057	1.071

* A minimal amount of glycol should be considered for inhibitive coil protection.

The user must determine whether the planned use of glycol complies with national, state and local regulations.

CAUTION

Risk of material reaction. Can cause piping damage.

Galvanized pipe must not be used in or with systems or units that contain glycol. Phosphates in the inhibitor can react with zinc in the galvanized pipe, precipitating an insoluble material that can foul the system.

NOTE

When mishandled, glycol products pose a threat to the environment. Before using any glycol products, review the latest Material Safety Data Sheets and ensure that you can use the product safely. For Material Safety Data Sheets and other product safety information, contact the nearest supplier.

Glycol manufacturers request that the customer read, understand and comply with the information on the product packaging and in the current Material Safety Data Sheets. Make this information available to anyone responsible for operation, maintenance and repair of the drycooler and related equipment.

Typical inhibited formula ethylene glycol and propylene glycol manufacturers and suppliers are Union Carbide (Ucartherm) or Dow Chemical (Dowtherm SR-1, Dowfrost). These glycols are supplied with corrosion inhibitors and do not contain a silicone anti-leak formula. Do not use glycols with silicone anti-leak additives because they reduce cooling performance. Commercial ethylene glycol, when pure, is generally less corrosive to the common metals of construction than water itself. Aqueous solutions of these glycols, however, assume the corrosivity of the water from which they are prepared and may become increasingly corrosive with use if not mixed with corrosion inhibitors.

NOTE

Automotive antifreeze is unacceptable and must NOT be used.

Table 4 Glycol supply flow rates

Glycol Type	Entering Coolant Temperature, (ECT) °F (°C)	Saturated Cond. Temperature (SCT),°F (°C)	Flow Rate GPM (l/s)	Pressure Drop, ft (kPa)
Ethylene (40%)	115 (46)	135°F (57°C)	15.0 (.95)	11.6 (34.6)
Propylene (40%)	115 (46)	135°F (57°C)	15.0 (.95)	18.5 (55.4)

Table assumes 95°F ambient, 77°F discharge air, 10°F temperature rise on the heat transfer media.

Table 5 Drycooler selection

Ambient Temperature, °F (°C)	Drycooler Model	Glycol Pump hp	Standard Pump Model 1-Phase (57 ft @ 15GPM)	High Head Pump Model 3-Phase (70 ft @ 15GPM)
95 (35.0)	D** 092A	3/4	P13-0030	P02-0340
105 (40.6)	D** 174A	3/4	P13-0030	P02-0340
110 (43.3)	D** 225A 16	3/4	P13-0030	P02-0340

6.4 Filling the Liebert XDFW with Coolant

6.4.1 Preparing the System for Filling

It is important to remove any dirt, oil or metal filings that may contaminate the cooling system piping in order to prevent contamination of the coolant and fouling of the drycooler piping (IF USED). The system should be flushed thoroughly using a mild cleaning solution or high-quality water and then completely drained before charging with coolant.

Cleaning new systems is just as important as cleaning old ones. New systems might be coated with oil or a protective film; dirt and scale are also common. Any residual contaminants could adversely affect the heat transfer stability and performance of your system. In many cases, in both old and new systems, special cleaners are needed to remove scale, rust and hydrocarbon foulants from pipes, manifolds and passages. Clean heat transfer surfaces are important in maintaining the integrity of the cooling system. For more information on cleaners and degreasers, contact your sales representative.

Calculate the internal volume of the system as closely as possible. See **Table 6** and **Table 3** for unit volumes.

6.4.2 Liebert XDFW Coolant Capacity

The water/glycol-cooled Liebert XDF's coolant capacity is 0.56 of a gallon (2.1 liters). In closed systems, additional coolant will be required for the piping. Refer to **Table 6** for required amounts for various piping sizes.

Table 6 Volume in standard Type "L" copper piping

Diameter (in.)		Volume	
Outside	Inside	Gal/Ft	L/M
1/2	0.123	0.008	0.01
5/8	0.555	0.012	0.15
3/4	0.666	0.018	0.22
7/8	0.785	0.025	0.31
1-1/8	1.025	0.043	0.53

6.4.3 Filling the Liebert XDFW with Water or Glycol

When filling the Liebert XDF with either water or glycol, keep air to a minimum. Air in glycol turns to foam and is difficult and time-consuming to remove. (Anti-foam additives are available and may be considered.)

1. Open all operating systems to the loop.
2. With the top vent(s) open, fill the system from the bottom of the loop. This will allow the coolant to push the air out of the top of the system, minimizing trapped air.
3. Fill to approximately 80% of calculated capacity.

   Fill slowly from this point, checking fluid levels until the system is full.

NOTE

For glycol solution preparation and periodic testing, follow manufacturer's recommendations. Do not mix products of different manufacturers.

7.0 CONDENSER INSTALLATION FOR AIR-COOLED UNITS WITH REMOTE CONDENSER

7.1 Remote Condenser Installation—XDFR

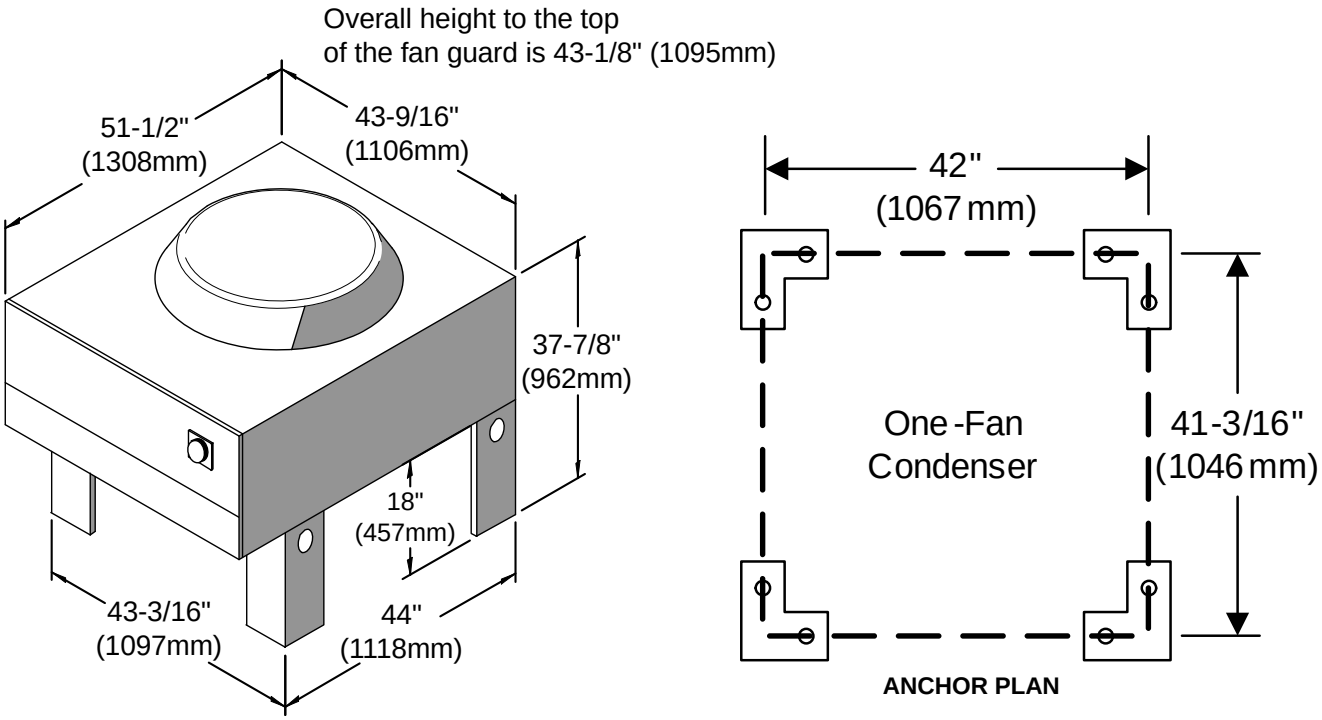
For details on installing the condenser, refer to the condenser's installation manual or contact your local Emerson Network Power representative. The manual was shipped with the unit and is available at the Liebert Web site: **www.liebert.com**

7.2 Condenser Location

The air-cooled condenser should be located for maximum security and maintenance accessibility. Avoid ground level sites with public access or areas that contribute to heavy snow or ice accumulations. Utilize centrifugal condensers whenever interior building locations must by used. To assure adequate air supply, it is recommended that condensers be located in a clean air area, away from loose dirt and foreign matter that may clog the coil. In addition, condensers should not be located in the vicinity of steam, hot air or fume exhausts. Also, condensers should be located no closer than 3 feet (1 meter) from a wall, obstruction or adjacent unit.

Install condensers in a level position to assure proper coolant flow and oil return. For roof installation, mount condensers on steel supports in accordance with local codes. To minimize sound and vibration transmission, mount steel supports across load bearing walls. For ground installation, a concrete pad will provide adequate support. Condenser legs have mounting holes for securing the condenser to the steel supports or concrete pad.

Figure 26 Condenser planning dimensional data—One-fan units



See Figure 27 for typical condenser footprint dimensions.

Figure 27 Typical condenser footprint—dimensions

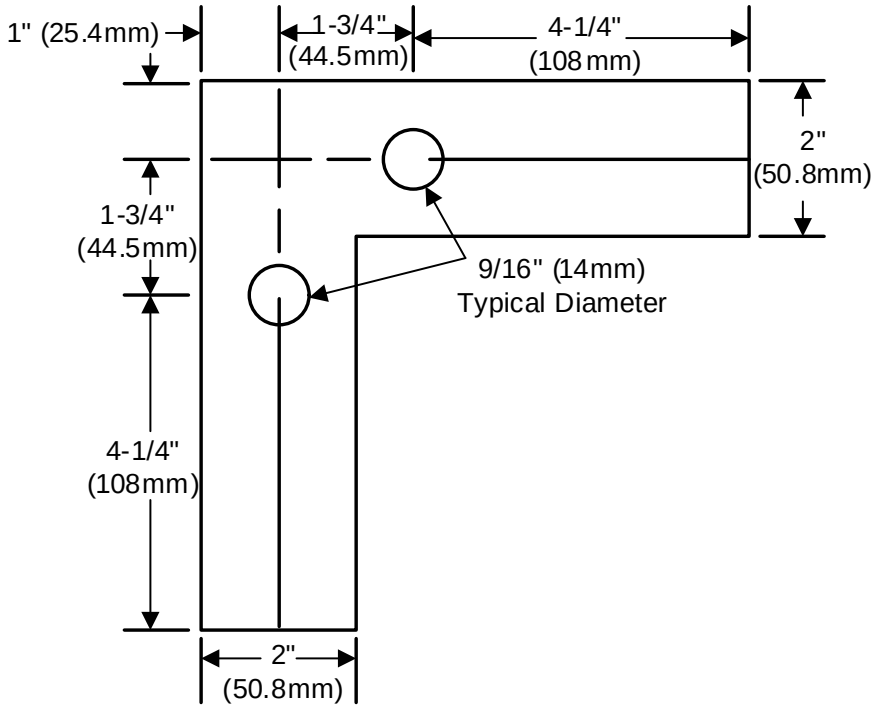


Figure 28 Piping connection locations for 1-fan VFD control condensers

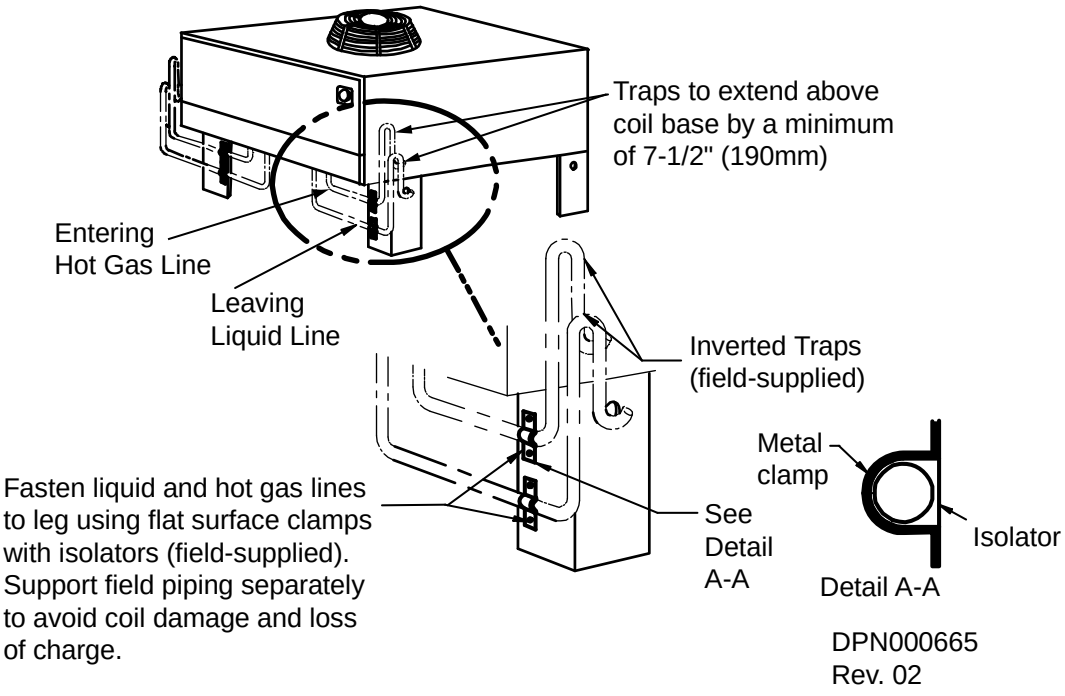
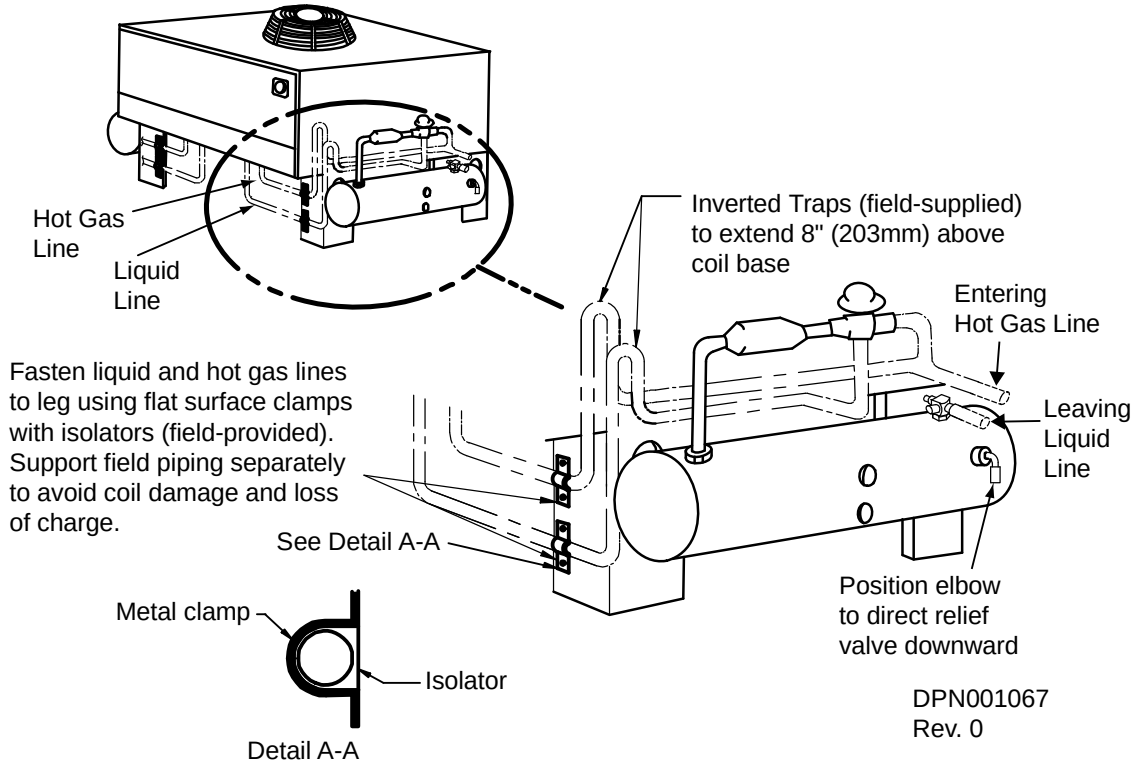


Figure 29 Piping connections for 1-fan Liebert Lee-Temp condensers



7.3 Electrical Connections

Refer to equipment nameplate regarding wire size and circuit protection requirements. Refer to electrical schematic when making connections. Make all wiring and electrical connection in accordance with local and national codes.

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect all local and remote electric power before working within the unit. Use a voltmeter to make sure power is turned Off before making any electrical connections.

7.3.1 Line Voltage

Line voltage electrical service is required for all air-cooled condensers at the location of the condenser. This power supply does not have to be the same voltage as the indoor unit. This separate power source may be 208, 230, 460, or 575 V, 60 Hz; or 200, 230, or 380/415 V, 50 Hz. The disconnect switch may be factory-supplied and mounted in the electrical panel or field-supplied and mounted per local and national codes.

7.3.2 Low Voltage

A control interlock between the condenser and the indoor unit is required and is connected between 70 and 71 in the handy box of the indoor unit and the electric panel of the air-cooled condenser. NEC Class 1 wiring is required. The recommended wire sizing for control wiring runs up to 150 ft (45m) is 16AWG for 60Hz.

7.3.3 Liebert Lee-Temp/Flood Back Head Pressure Control Condensers

Liebert Lee-Temp condensers require a separate power supply for the heated receivers. This power supply is connected to the electrical connection box on the end of the receiver.

7.4 Coolant Piping

All refrigeration piping should be installed with high temperature brazed joints. Prevailing good refrigeration practices should be employed for piping supports, leak testing, dehydration and charging of the refrigeration circuits. For the Liebert XDFR, the coolant piping should be installed to minimize the amount of line set outdoors to limit the coolant's exposure to cooler outdoor conditions that might inhibit the suction pressure.

Unit refrigeration components and piping are shipped from the factory with a nitrogen holding charge.

NOTE

The refrigeration piping should be isolated from the building by the use of vibration isolating supports.

NOTE

Piping, including inverted trap(s), must be routed to allow unobstructed access to the panel per the NEC.

NOTE

When installing field piping, care must be taken to protect all coolant lines from the atmosphere, especially when using coolants with POE oils. Do not allow the piping to stand open to air for more than 15 minutes. Units designed for R407C have a compressor that contains POE oil that is very hygroscopic; that is, it quickly absorbs water from the air. The longer the compressor piping is left open to air, the harder it will be to fully evacuate. If left open too long, the POE oil may need to be replaced before achieving the required vacuum level.

NOTE

Keep the evaporator unit and condenser closed with their factory charge of dry nitrogen while all field piping is installed. Keep the field piping clean and dry during installation, and do not allow it to stand open to the atmosphere. When all the field interconnecting piping is in place, vent the condenser dry nitrogen charge and connect to the field piping. Finally, vent the evaporator unit dry nitrogen charge and make its piping connections last.

Follow all proper brazing practices including a dry nitrogen purge to maintain system cleanliness.

Traps should be installed in the hot gas line on vertical risers at the base and every 25 feet (7.6 meters) in elevation. These traps will collect condensed coolant and coolant oil during the Off cycle of the unit and ensure flow of coolant oil during operation.

NOTICE

Risk of inadequate compressor oil. Can cause equipment damage.

Compressor oil must be added when the coolant lengths exceed 150ft (45m) for a Liebert XDFR with a VFD condenser and 50ft (15m) for a XDFR for a Liebert Lee-temp condenser. Failure to do so will result in damage to the compressor. Two ounces (59ml) of oil must be added for every 10lb (4.5kg) over 40lb (18kg) of coolant charge.

Factory approval is required whenever:

- an R407C system condenser must be installed below the level of the cooling coil
- the total rise of the coolant piping exceeds 40 ft.

Total discharge line pressure drop must not exceed 10 PSIG (69 kPa).

Consult your local Liebert representative when considering installations outside these guidelines.

Table 7 Equivalent lengths (feet) for various pipe fittings

Copper Pipe O.D. in.	90 Degree Elbow Copper	90 Degree Elbow Cast	45 Degree Elbow	Tee	Gate Valve	Globe Valve	Angle Valve
1/2	0.8	1.3	0.4	2.5	0.26	7.0	4.0
5/8	0.9	1.4	0.5	2.5	0.28	9.5	5.0
3/4	1.0	1.5	0.6	2.5	0.3	12.0	6.5
7/8	1.45	1.8	0.8	3.6	0.36	17.2	9.5
1-1/8	1.85	2.2	1.0	4.6	0.48	22.5	12.0
1-3/8	2.4	2.9	1.3	6.4	0.65	32.0	16.0
1-5/8	2.9	3.5	1.6	7.2	0.72	36.0	19.5

Coolant trap = 4 times equivalent length of pipe per this table.

Table 8 Indoor unit R407C charge, approximate

Model	R407C Charge, lb (kg)
XDFR141	2 (0.9)

Table 9 Line charges - R407C per 100 ft (30 m) of Type “L” copper tube

O.D.	R407C	
	Liquid Line lb (kg)	Hot Gas Line lb (kg)
5/8"	11.0 (4.6)	2.2 (0.9)
7/8"	23.0 (9.6)	4.5 (1.9)

Table 10 Condenser R407C

Model	R407C	
	Approximate Charge, lb (kg)	
	VFD	Lee-Temp*
083	5 (2.27)	26 (11.8)

* Charge includes the receiver charge.

Table 11 Condenser connection sizes

Condenser Model	Number of Fans	Number of Circuits	Connection Size, OD, In.		Net Weight lb (kg)
			Hot Gas	Liquid	
TCSV083 CSL083	1	1	7/8	7/8	295 (134)

7.5 VFD Systems

The VFD condenser utilizes a variable frequency drive, inverter duty fan motor operating from 0% to 100% motor RPM based on head pressure, sensed by coolant pressure transducers. VFD, ambient-temperature thermostat(s), motor overload protection and electrical control circuit are factory-wired in the integral control panel. VFD controls the fan adjacent to the connection end of the condenser and remains energized with active compressor operation. The balance of fans on multi-fan units cycle on ambient thermostats. This system provides coolant head pressure control for outdoor ambients as low as 0°F (-18°C). The Liebert Lee-Temp condenser must be used for temperatures lower than 0°F (-18°C).

7.5.1 Materials Supplied with Condenser

- Built-in, wired condenser control box
- Air-cooled condenser
- Piping access cover to be reinstalled when piping is complete
- Bolts (four per leg) 3/8" x 5/8"
- Terminal block for two-wire, 24-volt interlock connection between unit and condenser
- Condenser legs, four on one-fan models

7.5.2 Dehydration/Leak Test and Charging Procedures for VFD Condenser

NOTICE

Risk of improper handling of coolant. Can result in enviornmental degradation and violation of regulations.

All local codes for handling coolant must be followed.

NOTE

R407C uses a POE (polyol ester) lubricant. The R407C coolant must be introduced and charged from the cylinder only as a liquid.

NOTE

When installing field piping, care must be taken to protect all coolant lines from the atmosphere, especially when using coolants with POE oils. Do not allow the piping to stand open to air for more than 15 minutes. Units designed for R407C have a compressor which contains POE oil that is very hygroscopic; that is, it quickly absorbs water from the air. The longer the compressor piping is left open to air, the harder it will be to fully evacuate. If left open too long, the POE oil may need to be replaced before achieving the required vacuum level.

Dehydration/Leak Test

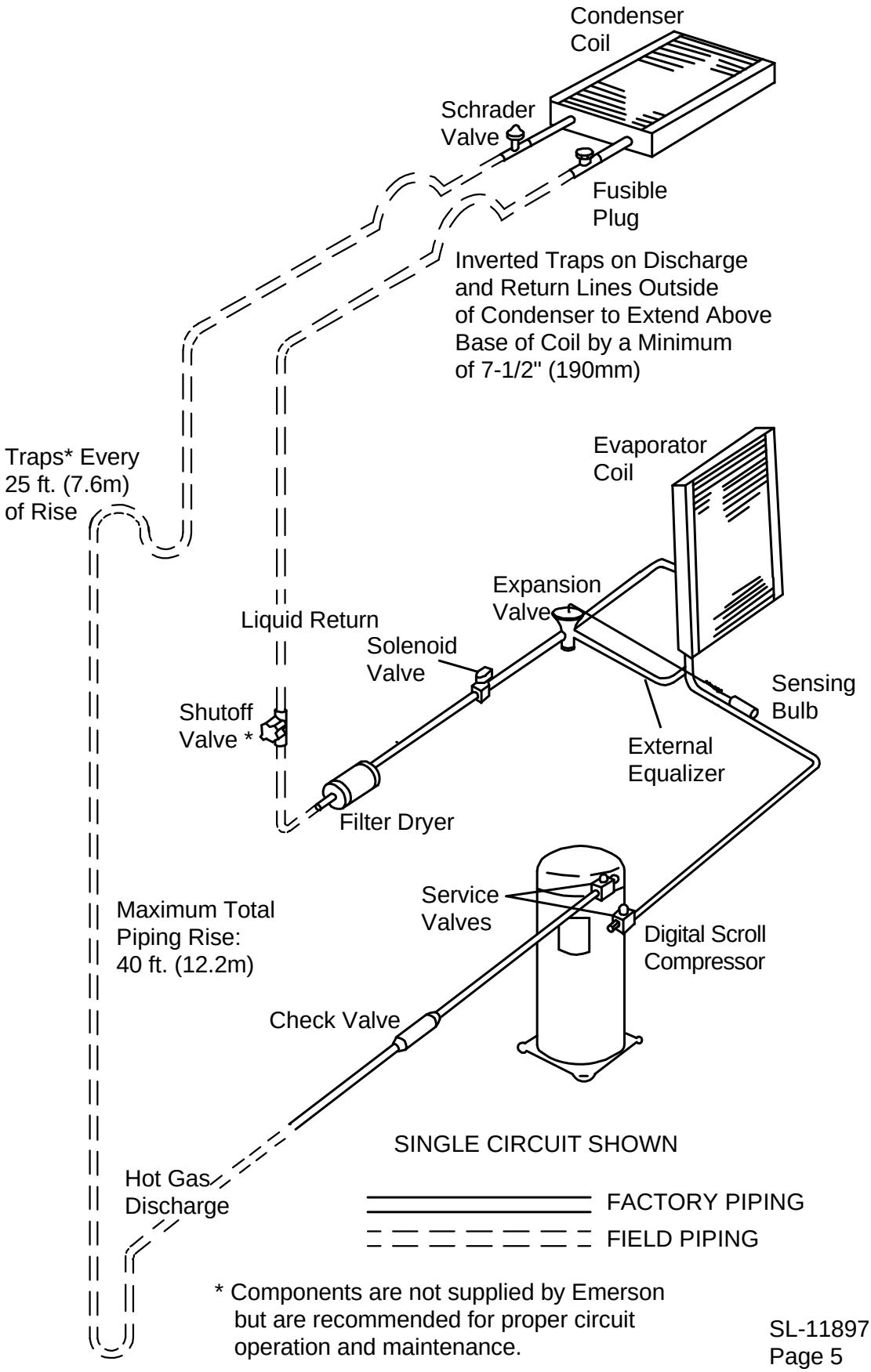
1. Disconnect all power to the Liebert XDFR. Lock out and tag out all input power connections.

NOTE

*The Liebert XDFR uses a 208VAC liquid line solenoid valve. These instructions allow the system to be evacuated, pressure-checked and charged without having to power the solenoid. To do this, a jumper hose (see **Step 2**) is to be used to access the piping between the discharge line check valve and liquid line solenoid valve.*

2. Connect a jumper hose from the Schrader port on the suction line to the Schrader port on the compressor discharge rotalock.
3. Connect the low-side coolant gauge to the compressor suction rotalock.
4. Connect the high side coolant gauge to the liquid line coupling located just outside of the Liebert XDFR's rear panel.
5. Pressurize the system circuits to 150 PSIG (1034 kPa) with dry nitrogen and a trace of coolant.
6. Check the system for leaks with leak finder.
7. After completing the leak tests, release the test pressure (per local code) and pull a deep vacuum on the system.
8. Wait four hours, then check the pressure readings.
   a. If the pressure readings have not changed, break the vacuum with dry nitrogen.
   b. Pull another vacuum to 250 microns or less.
   c. Wait two hours, then recheck the pressure.
   d. If the pressure is unchanged, the system is ready for charging as detailed in **7.5.3 - Charging**.

Figure 30 Air-cooled VFD control, general arrangement



7.5.3 Charging

1. Disconnect all power to the Liebert XDFR. Lock out and tag out all input power connections.
2. Ensure that all operational components are clear of debris.
3. Remove the jumper hose installed in **7.5.2 - Dehydration/Leak Test and Charging Procedures for VFD Condenser**.
4. Remove the high-side hose and place it on the Schrader port of the compressor discharge rotalock.
5. Remove the low-side coolant hose and place it on the liquid line coolant coupling.
6. Connect the coolant gauge charging hose to the drum of coolant.
7. Calculate the amount of charge for the system. Refer to the unit, condenser and coolant line charge (see **Tables 8**, **9** and **10**).
8. Place a heater blanket on the R407C cylinder and weigh in the calculated amount of charge.

7.6 Liebert Lee-Temp/Flood Back Head Pressure Control Systems

The Liebert Lee-Temp system consists of a modulating type head pressure control valve and insulated receiver with heater pad are required if the system will operate in temperatures as cold as -20°F (-29°C).

7.6.1 Piping

NOTICE

Improper protection of the check valve during soldering or brazing may damage the component, necessitating replacement by the user.

A factory-supplied Liebert Lee-Temp Piping assembly must be field-installed on the condenser. During soldering or brazing near the check valve on the Liebert Lee-Temp Piping Assembly, the internal parts must be protected by wrapping the valve with a damp cloth to keep the valve temperature below 250°F (121°C).

7.6.2 Materials Supplied with Condenser

- Built-in pre-wired condenser control box
- Air-cooled condenser
- Piping access cover to be reinstalled when piping is complete
- Bolts (four per leg) 3/8" x 5/8"
- Terminal block for two-wire 24V interlock connection between the unit and the condenser
- Condenser legs: four on one-fan models
- Lee-Temp system:
  - Insulated storage receiver
  - Head pressure control valve with integral check valve
  - Adapter assembly
  - Rotalock valve
  - Pressure relief valve
  - Liquid level sight glass
  - Check valve
- Bolts - six per receiver, 3/8" x 1"

NOTE

Liebert Lee-Temp heater pad requires a separate, continuous electrical source of either 115 VAC or 200/208/230 VAC.

7.6.3 Dehydration/Leak Test and Charging Procedures for Liebert Lee-Temp Control Type Condenser

NOTICE

Risk of improper handling of coolant. Can result in enviornmental degradation and violation of regulations.

All local codes for handling coolant must be followed.

NOTE

R407C uses a POE (polyol ester) lubricant. The R407C coolant must be introduced and charged from the cylinder only as a liquid.

NOTE

When installing field piping, care must be taken to protect all coolant lines from the atmosphere, especially when using coolants with POE oils. Do not allow the piping to stand open to air for more than 15 minutes. Units designed for R407C have a compressor which contains POE oil that is very hygroscopic; that is, it quickly absorbs water from the air. The longer the compressor piping is left open to air, the harder it will be to fully evacuate. If left open too long, the POE oil may need to be replaced before achieving the required vacuum level.

Dehydration/Leak Test

1. Disconnect all power to the Liebert XDFR. Lock out and tag out all input power connections.

NOTE

*The Liebert XDFR uses a 208VAC liquid line solenoid valve. These instructions allow the system to be evacuated, pressure-checked and charged without having to power the solenoid. To do this, a jumper hose (see **Step 2**) is to be used to access the piping between the discharge line check valve and the liquid line solenoid valve.*

2. Connect a jumper hose from the Schrader port on the suction line to the Schrader port on the compressor discharge rotalock.
3. Connect the low-side coolant gauge to the compressor suction rotalock.
4. Connect the high-side coolant gauge to the liquid line coolant coupling located just outside of the Liebert XDFR's rear panel.
5. At the condenser, attach a jumper hose from the rotalock valve on the outlet of the receiver to the Schrader port on the liquid header of the condenser.
6. Front-seat the receiver rotalock valve approximately two turns.
7. Pressurize the system circuit to 150 PSIG (1034 kPa) by using dry nitrogen with a trace of coolant.
8. Check the system for leaks with leak finder.
9. After completing the leak tests, release the test pressure (per local code) and pull a deep vacuum on the system.
10. Wait four hours and check the pressure readings.
    a. If the pressure readings have not changed, break the vacuum with dry nitrogen.
    b. Pull another vacuum to 250 microns or less.
    c. Wait two hours and recheck the pressure.
    d. If the pressure is unchanged, the system is ready for charging as detailed in **7.6.4 - Charging**.

7.6.4 Charging

1. Disconnect all power to the Liebert XDFR. Lock out and tag out all input power connections.
2. Ensure that all operational components are clear of debris.
3. Remove the jumper hose installed in **7.6.3 - Dehydration/Leak Test and Charging Procedures for Liebert Lee-Temp Control Type Condenser**.
4. Remove the high-side hose and place it on the Schrader port of the compressor discharge rotalock.
5. Remove the low-side coolant hose and place it on the liquid line coolant coupling.
6. At the condenser, remove the jumper hose between the receiver rotalock valve and the liquid line Schrader port.
7. Connect the coolant gauge charging hose to the drum of coolant.
8. Calculate the amount of charge for the system. Refer to the unit, condenser and coolant line charge (see **Tables 8**, **9** and **10**).
9. Place a heater blanket on the R407C cylinder and weigh in the calculated amount of charge.

Liebert Lee-Temp Receiver Coolant Level

On the receiver at the condenser are two coolant-level sight glasses. Coolant level will vary with outside temperature. Check coolant level after the unit has been on for at least 15 minutes.

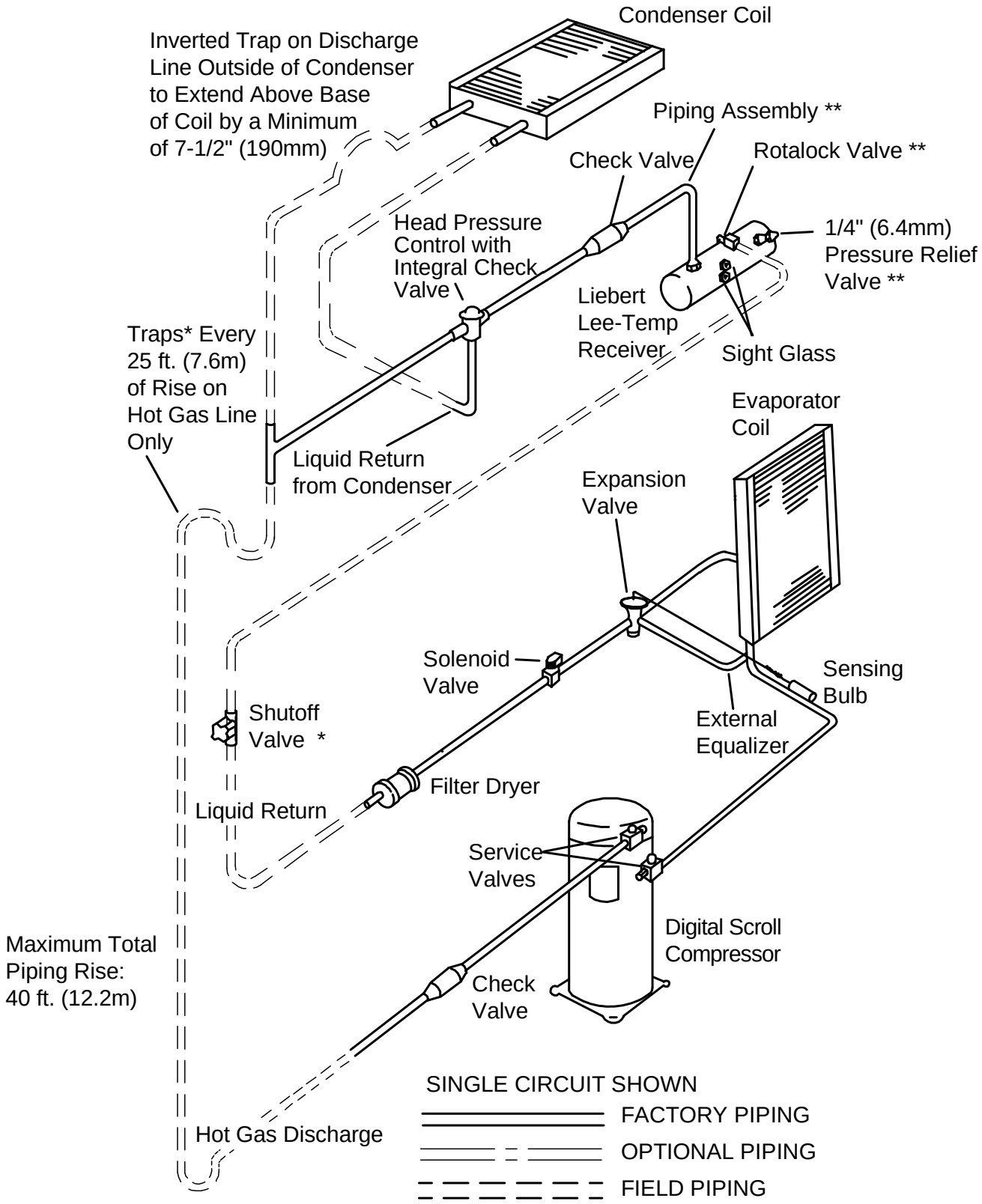
Sight Glass Levels

40°F (4.5°C) and lower—bottom sight glass is 3/4 full

40 to 60°F (4.5 to 15.5°C)—bottom sight glass is full

60°F (15.5°C) and higher—top sight glass is 3/4 full.

Figure 31 Air-cooled, Liebert Lee-Temp general arrangement



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

** Components supplied by Emerson; must be field-installed.

SL-10061 PG. 4
SL-10071 PG. 4

8.0 ELECTRICAL CONNECTIONS

Power is supplied to the Liebert XDF through two factory-connected power cords (120V and 208V). For more information, refer to **5.2.1 - Voltage Input Requirements**

Additional electrical connections required for operation depend on the equipment installed in the Liebert XDF and remote communications desired.

The Liebert XDF has slots for two communication cards, such as Liebert's Intellislot card, and two alarm/warning hardwire connections. These connections are at the top left corner of the self-contained, air-cooled Liebert XDF, inside the area housing the condenser coil (see **Figure 32**). For details, see **11.1 - Environmental Control**. Water-cooled Liebert XDF units have the connections on the top of the unit, near the middle of the compartment (see **Figure 33**).

Alarm and warning contacts may be connected to monitoring equipment, such as Liebert's Universal Monitor and SiteLink equipment, as well as to building management systems. Consult the monitoring equipment's user manual for details.

Figure 32 Customer electrical connections and cable entry points—self-contained, air-cooled units

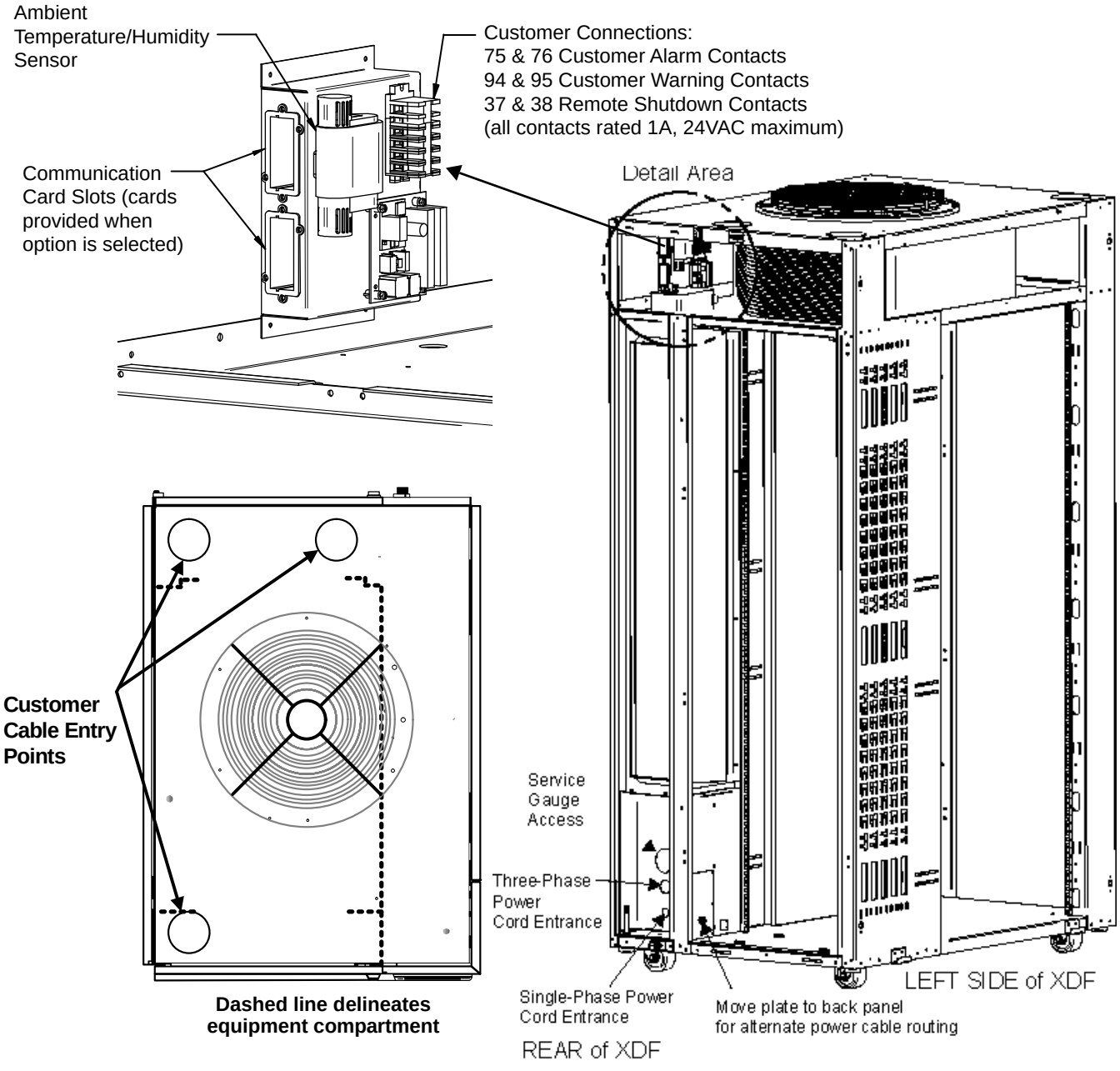
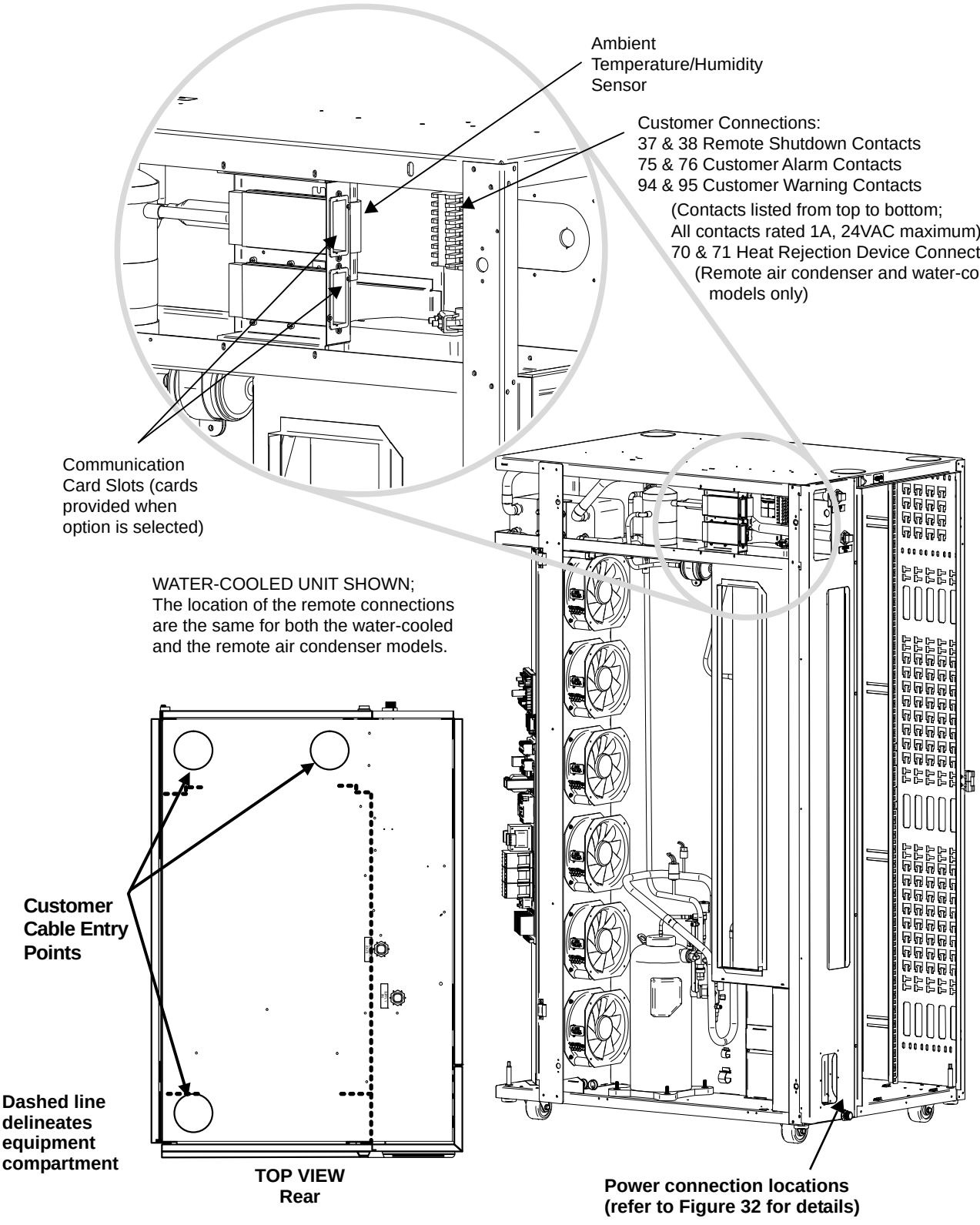


Figure 33 Customer electrical connections and cable entry points—water/glycol-cooled units and remote, air-cooled units



8.1 Utility Power Supply

The Liebert XDF's 120V and 208V input power cords are stored for shipment in a compartment at the bottom left of the rear of the Liebert XDF. The 10 feet (3m) cords may be routed to power outlets on the floor or wall.

If the power connections are overhead, the cables may be routed inside the unit and out the top. Liebert recommends pulling the cables across the floor of the rack-mounted equipment compartment and up the right rear side. This permits securing cables to the cable management cutouts along the inside of the Liebert XDF.

WARNING

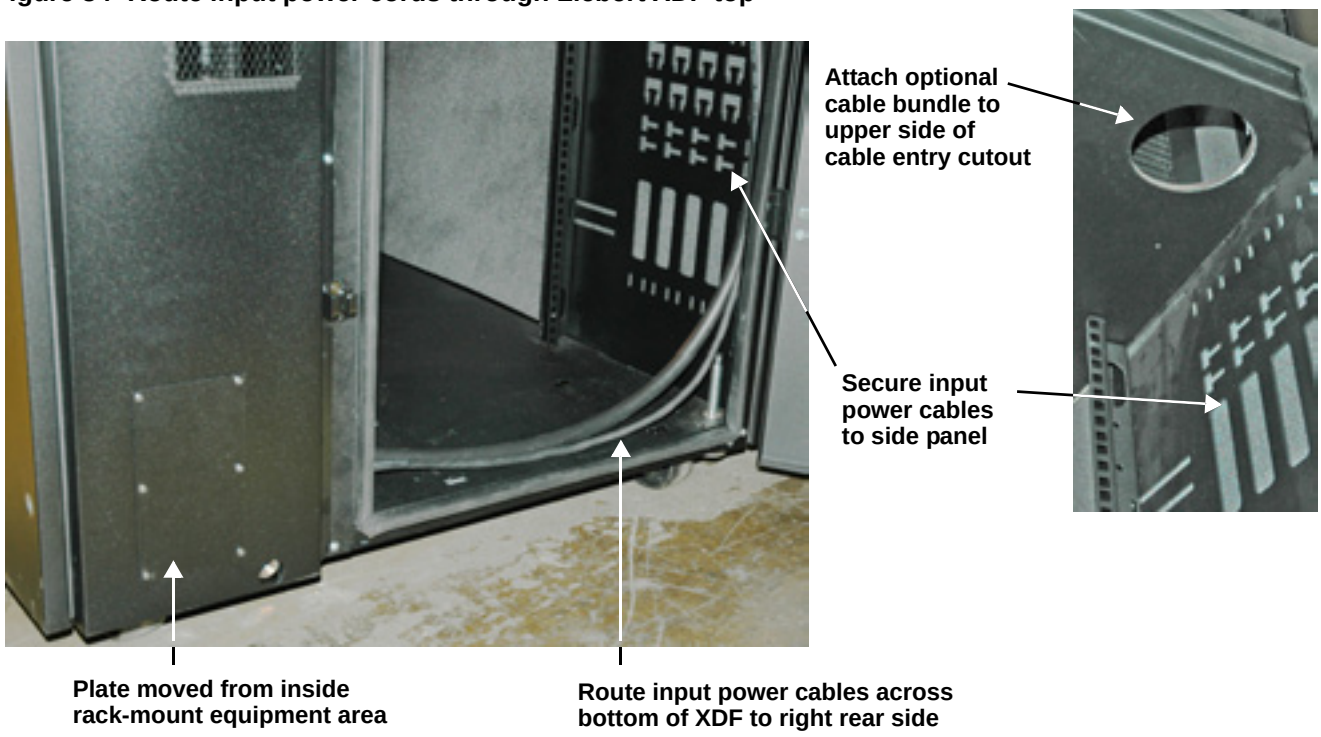
Before beginning any work inside the Liebert XDF, disconnect all power inputs to the Liebert XDF and installed equipment.

8.1.1 Route Input Power Cables Through the Liebert XDF's Top

To route the factory-supplied input power cables inside the unit and out the top:

1. Open the rear door, revealing the back of the rack-mount equipment compartment.
2. Remove the six Phillips screws securing the small metal plate at the bottom left (inside the rack-mount equipment compartment; see **Figures 32** and **34**).
3. Remove the cable entry snap bushing at the top right side of the rack-mount equipment compartment to access the condenser coil compartment.
4. Remove the cable entry snap bushing from the top of the Liebert XDF.
5. Attach an optional cable bundle to the top of the panel that separates the rack-mount equipment compartment from the condenser compartment.
6. Feed the input power cords through the opening at the bottom of the Liebert XDF and route them through the optional cable bundle and out the top (see **Figure 34**).
7. Secure the cable bundle seal around the input power cords.
8. Secure the input power cables to the side of the Liebert XDF with optional Velcro ties or cable rings.
9. Install the small plate removed in **Step 2** on the back of the Liebert XDF just above the condensate drain (see **Figure 34**).
10. Connect the input power cables to appropriate utility supplies.

Figure 34 Route input power cords through Liebert XDF top



9.0 CABLE MANAGEMENT OPTIONS

The Liebert XDF is able to host many of the components of the Foundation cable management products. These optional items deliver a flexible solution to rack-enclosure cable problems by utilizing a patent pending platform to provide adaptive equipment and cabling support. Cable and equipment mounting options are available to meet changing requirements.

9.1 Cable Management Considerations

When designing the equipment layout in the Liebert XDF, consider how cables must be run for each configuration and how cable runs affect cooling, access and operational factors. Separate power and communication cables to reduce electromagnetic interference.

Good cable management contributes to:

- Effective airflow for cooling
- Easier cable identification
- Improved access
- Reduced electromagnetic interference
- Proper bend radii, particularly for fiber optic cables
- Adequate support for large cables and heavy cable bundles

Several Foundation options are designed to facilitate structured cable management. These are described in **9.4 - Optional Cable Management Channel**.

NOTE

When installing cables, leave enough slack for the unit to be rolled forward or sideways.

Do not block or restrict cooling system discharge or return airflow.

Do not defeat the ground/earth connections between the utility/mains outlet and the Liebert XDF.

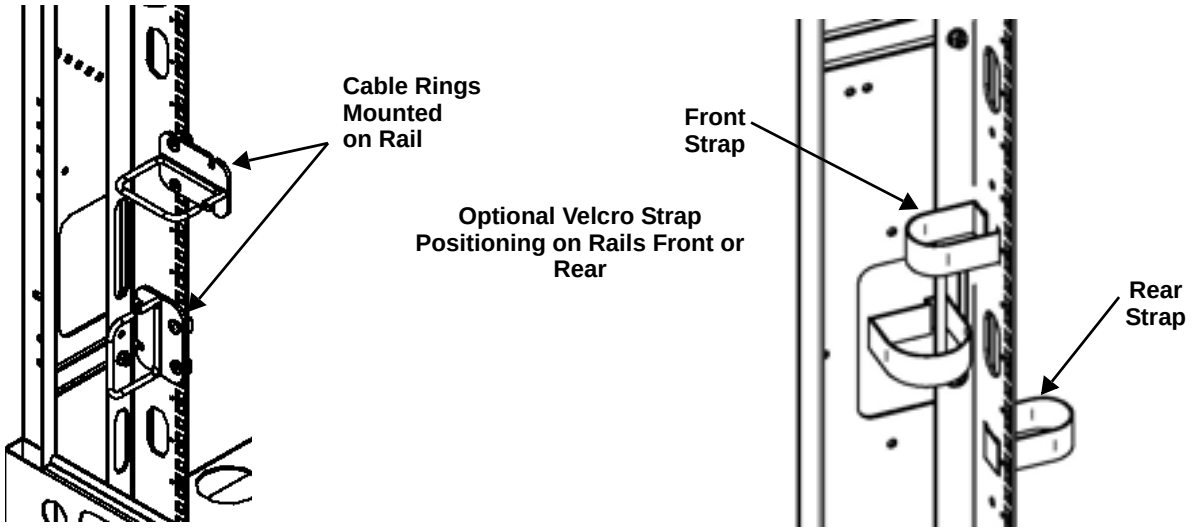
9.2 Cable Management

Once your equipment has been installed, you are ready to connect cables for power and communication. Before making any connections, check the equipment to ensure that all power switches are in the Off position.

Numerous cable entrances and management provisions are built into the Liebert XDF to ease cable installation.

Optional cable rings and Velcro straps, along with some components for routing cables, can be used with the Liebert XDF. These help not only to keep your cables organized but also separate power and communications cables, reducing electromagnetic interference. A wide area is provided on the left rear side of the frame to mount cable rings, Velcro straps and cable trays. This location contributes to cooling efficiency by keeping equipment cables out of the cooling air pattern (see **Figure 37**).

Figure 35 Cable rings, Velcro straps on Liebert XDF rails



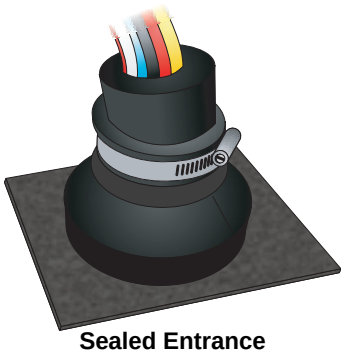
9.3 Cable Access

9.3.1 Top Cover and Back

Optional sealed entrance cable bundles (cone-shaped seals and clamps) permit use of the round openings on the top of the Liebert XDF for cable entry.

To bring cable through these holes:

1. Replace the plug with a sealed entrance cable bundle.
2. Pull the cable through the bundle.
3. The cable bundle can be trimmed to accommodate various quantities of cables.
4. Use the clamp to secure the bundle around the cables.



Sealed Entrance Cable Bundle

9.4 Optional Cable Management Channel

The optional Foundation Cable Management Channel (CMC) combines with other optional items to permit the user to route cables in an organized, efficient manner.

CMCs are available in 1U, 2U and 3U sizes and are adjustable for side-to-side or front-to-rear orientations.

Refer to **Figures 37** and **38** for various cable management configurations and options.

Figure 36 Cable Management Channel lengths

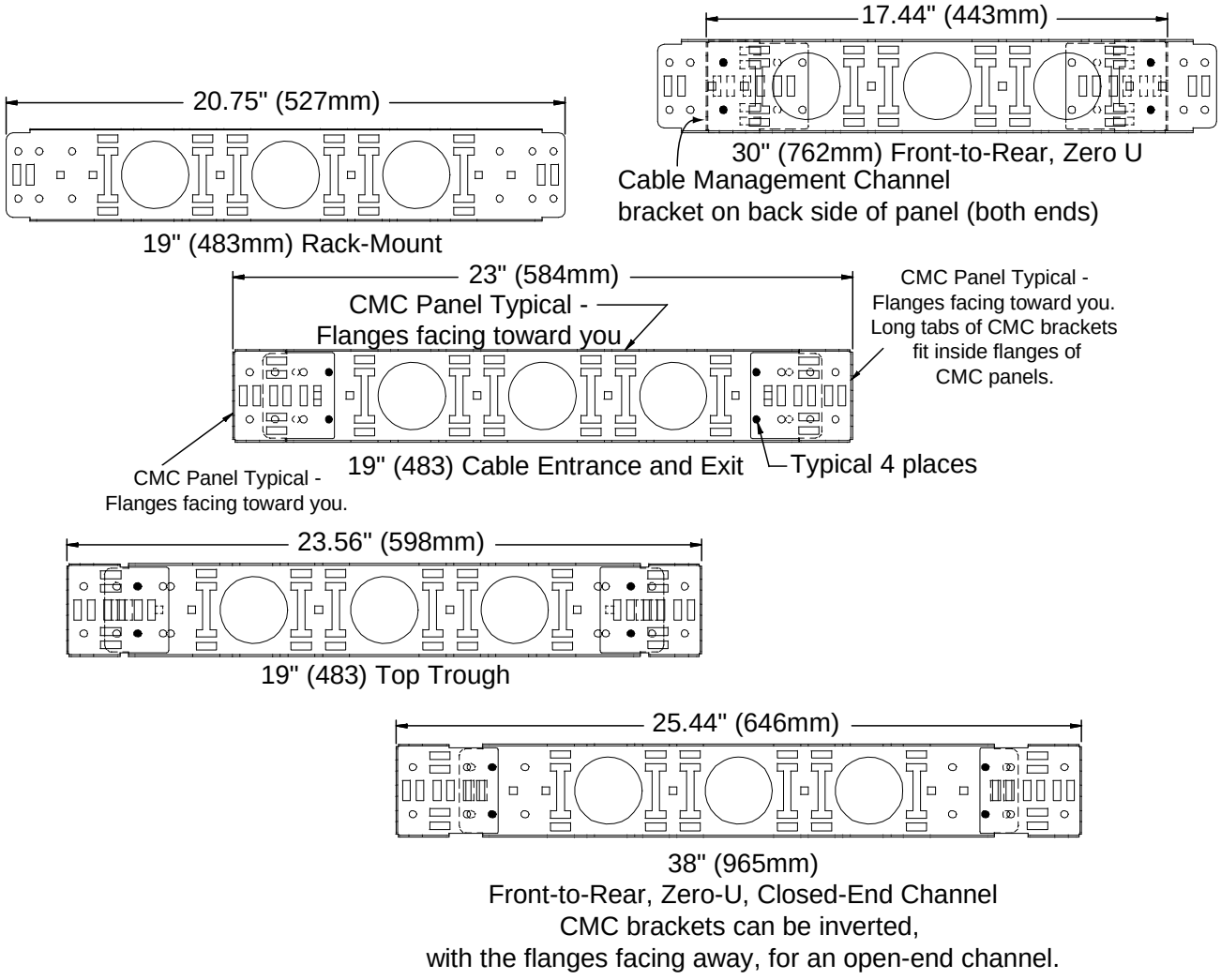


Figure 37 Cable management mounting locations and options: Velcro cable straps, cable spools

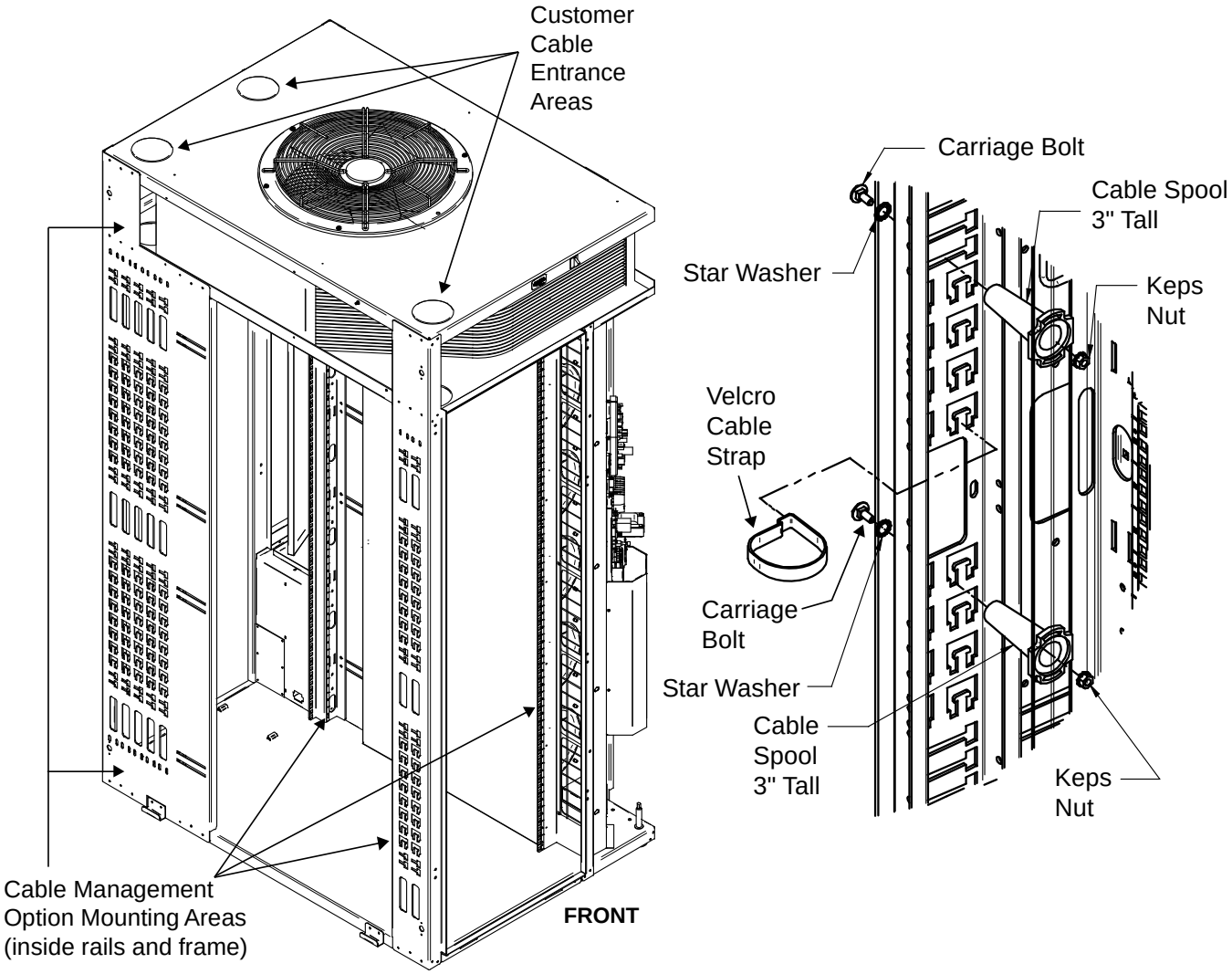
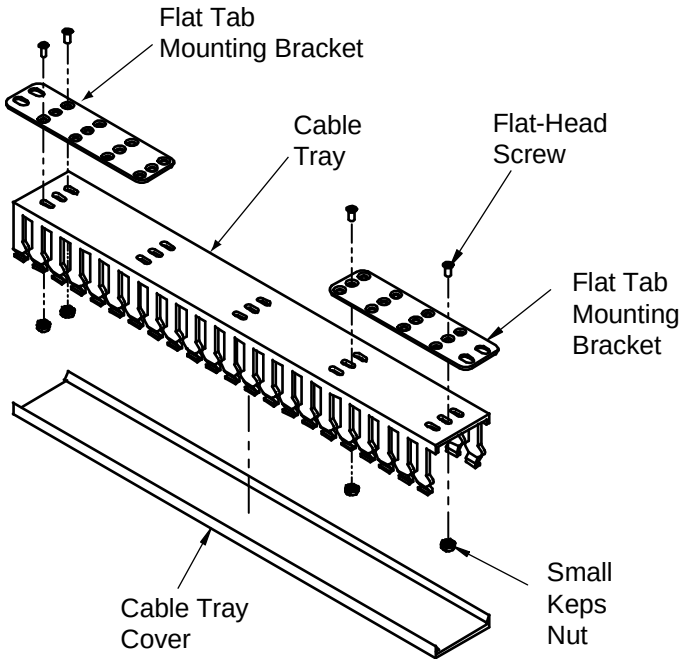


Figure 38 Cable management accessories: Cable Tray



10.0 STARTUP

Before plugging in your electronic equipment, make sure that all power switches are in the Off position.

- Be certain there are no obstructions, wire bundles, manuals, trash, etc., in front of or on either side of the Liebert XDF. Make sure all doors are shut and sealed properly.
- Plug the Liebert XDF's 120V power cord into a dedicated utility circuit.
- Plug the Liebert XDF's 208V power cord into a dedicated utility circuit.

10.1 Liebert XDF Startup Inspection Checklist

10.1.1 Site Conditions

___ 1. Confirm at least 36 in. (915mm) clearance in front of the Liebert XDF, on the right side and behind the unit. No left-side clearance required.

___ 2. Confirm at least 36 in. (915mm) clearance above the unit (self-contained, air-cooled units only; water/glycol units do not require clearance above).

___ 3. Confirm site ventilation provisions:

- ___ Sufficient ambient space to dissipate heat rejected by the Liebert XDF (self-contained, air-cooled units).
- ___ Ambient temperature range is 35°F to 104°F (1.6 to 40°C).

___ 4. Ensure that the Liebert XDF is level.

___ 5. Confirm condensate drain tube is connected to a drain and will drain properly.

___ 6. Secure all electrical connections inside the Liebert XDF.

___ 7. Confirm that the dedicated circuits for the Liebert XDF's compressor and fans are separate from the circuit for the UPS (not same duplex).

- ___ Liebert XDF requires a 120V/60Hz/15A, single-phase, 2-wire plus ground circuit.
- ___ Record the fan working input voltage 120VAC (±10%): _____
- ___ Liebert XDF requires a 208V/60Hz/30A, three-phase, 4-wire plus ground circuit.
- ___ Record the compressor working input voltage 208VAC (±10%): _____
- ___ Check UPS (if provided) nameplate for input electrical requirements.

___ 8. Examine the positioning of equipment inside the cabinet.

- ___ Prevent short cycling of airflow - no spaces larger than 1U between electronic devices.
- ___ Spaces larger than 5U at top of rack are covered with blanking panels.
- ___ Heaviest equipment installed near the bottom of the cabinet.

___ 9. Check cabinet seals—No gaps, loose cables, air leaks:

- ___ Door gaskets intact / free of damage. Close front and rear doors and confirm no visible seal violations.
- ___ Side panels and the frame have uniform sealing.
- ___ Cable entrance points are sealed.

___ 10. Determine whether the UPS, if one is installed in the Liebert XDF, has fully charged batteries.

NOTE

The UPS's batteries may require recharging before it can fully supply your equipment's power needs for the rated time if utility power fails.

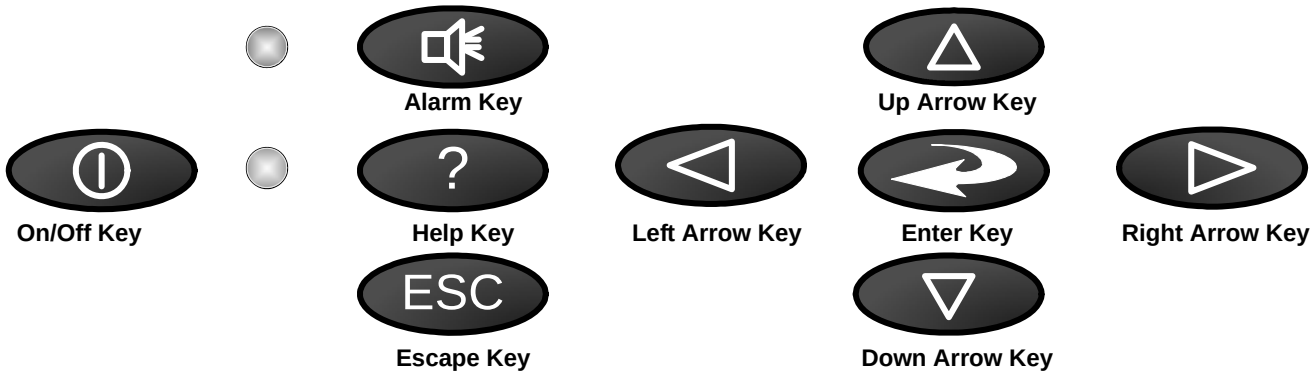
To charge the UPS batteries before using the unit, you can apply power to the UPS module while installing equipment or making adjustments.

Refer to the UPS manual for preparation for startup, details of UPS operation and the meaning of LED indicators.

10.2 Starting the Liebert XDF

The Liebert XDF is started, stopped and controlled with Liebert's iCOM controller. **Figure 39** shows the Liebert iCOM keypad.

Figure 39 Liebert iCOM controller keys



To start the Liebert XDF:

1. Press the On/Off key on the Liebert iCOM controller.
2. Confirm internal airflow: Inside enclosure, (evaporator fan discharge).
3. Confirm cooling air begins circulating.
4. Power up the UPS (if provided).
5. Close the Liebert XDF's doors, if open.

NOTE
Control requires 30-60 seconds to boot up after the 120V power is supplied.

10.2.1 Evaporator Fan Operation

The evaporator fans will turn On whenever the unit control is active (powered).

10.2.2 Condenser Fan Operation

Normal Operation—The condenser fan will turn On whenever the unit is running and the compressor is On.

Backup Ventilation—The condenser fan will be On or Off when the backup ventilation is open, depending on the Condenser Fan Ventilation setpoint. See **11.8 - Backup Ventilation System** for additional information.

NOTE
Only an Emerson-authorized representative can change the Condenser Fan Ventilation setpoint.

11.0 OPERATION

The Liebert XDF is intended for operation with its doors closed and latched. This increases efficiency and keeps out dust and humidity.

With the doors closed, the Liebert XDF will achieve full capacity in ambient conditions up to 95°F (35°C) and 40 percent relative humidity. The Liebert XDF's cooling efficiency is reduced if it is operated in higher ambient temperatures and humidity. The reduction varies according to the heat load from the installed equipment and the external temperature and humidity.

The Liebert XDF may be operated for short periods with its doors open. Refer to **Figure 11.7 - Operation With the Door Open**.

11.1 Environmental Control

The Liebert XDF's cooling functions are controlled by Liebert's iCOM control module. This section describes the Liebert iCOM's basic functions, such as start-up and navigation. For further details on setting up and using your Liebert iCOM, refer to **11.2 - Liebert iCOM Components and Functions** and **11.3 - Navigating Through the Liebert iCOM Display** or call 800-543-2778.

NOTE

The Liebert iCOM installed on the Liebert XDF is programmed for single-unit control. It does not have the capability of communicating with other Liebert iCOM units. Disregard portions of the Liebert iCOM manual that refer to multiple unit operations.

The menu-driven Liebert iCOM display is used for programming each cooling function. The screen shows the status of the conditioned space, setpoints, alarm status and settings, event histories and the current time.

Remote Communications—Building Management Systems, Liebert SiteScan

The Liebert iCOM controller on the Liebert XDF may be remotely accessed with Liebert's SiteScan® systems, Modbus or with SNMP.

Each Liebert XDF is equipped with Intellislot bays for use with optional communication cards:

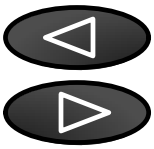
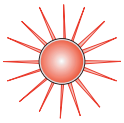
- Liebert IntelliSlot® 485—enables the Liebert XDF to communicate via Modbus or BACnet protocols to Liebert's SiteScan or third-party building management systems
- Liebert IntelliSlot Web—enables the Liebert XDF to communicate via SNMP

11.2 Liebert iCOM Components and Functions

The Liebert iCOM controller layout is shown in **Figure 40**.

Figure 40 Liebert iCOM display components

Table 12 Keyboard icons and functions

Icon	Key Name	Function
	On/Off Key	Controls the operational state of the cooling unit.
	Alarm Key	Silences an alarm.
	Help Key	Accesses integrated help menus.
	ESCape Key	Returns to the previous display view.
	Enter Key	Confirms all selections and selects icons or text.
	Increase Key (Up Arrow)	Moves upward in a menu or increases the value of a selected parameter.
	Decrease Key (Down Arrow)	Moves downward in a menu or reduces the value of a selected parameter.
	Left and Right Arrow Keys	Navigates through text and sections of the display.
	Upper LED	Blinking Red—Active, unacknowledged alarm exists
		Solid Red—Active, acknowledged alarm exists
	Lower LED	Amber—Power is available to the unit, unit is NOT operating
		Green—Power is available to the unit, unit is operating

11.3 Navigating Through the Liebert iCOM Display

Liebert iCOM displays icons and text for monitoring and controlling your Liebert cooling unit. The Liebert iCOM's default screen may be either graphical or simple (no bar graphs).

Figure 41 Liebert iCOM graphical display default screen components

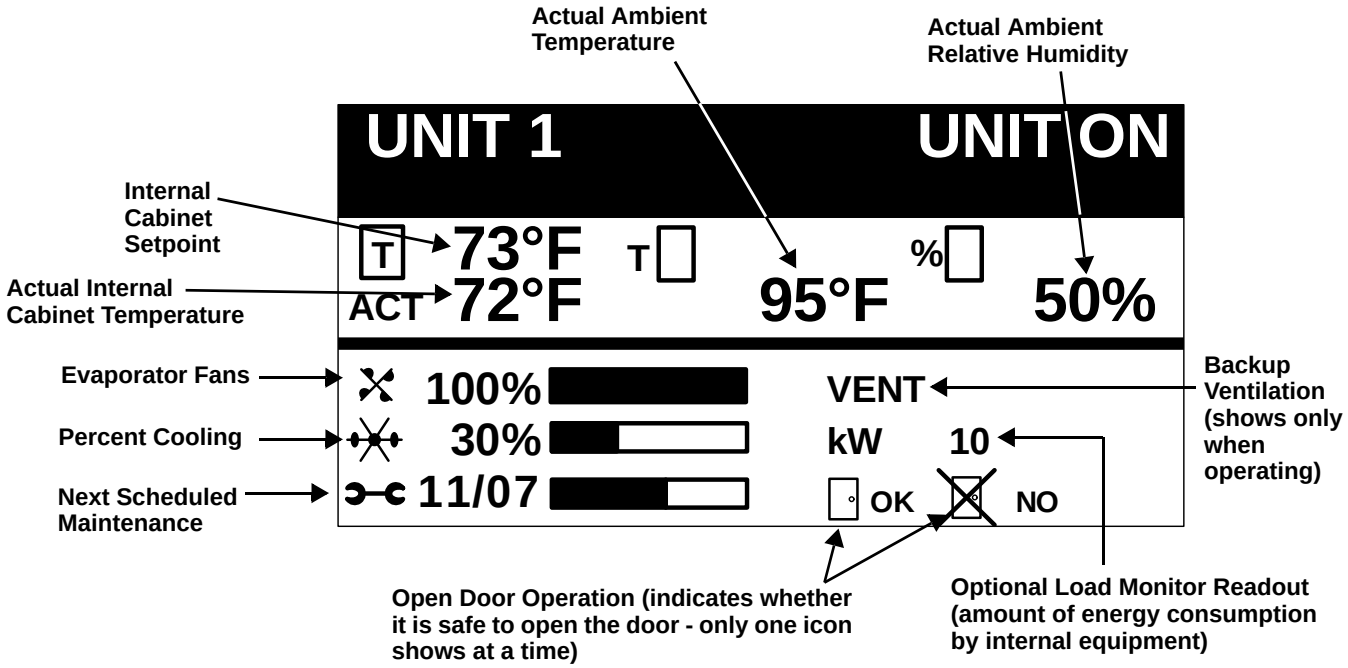
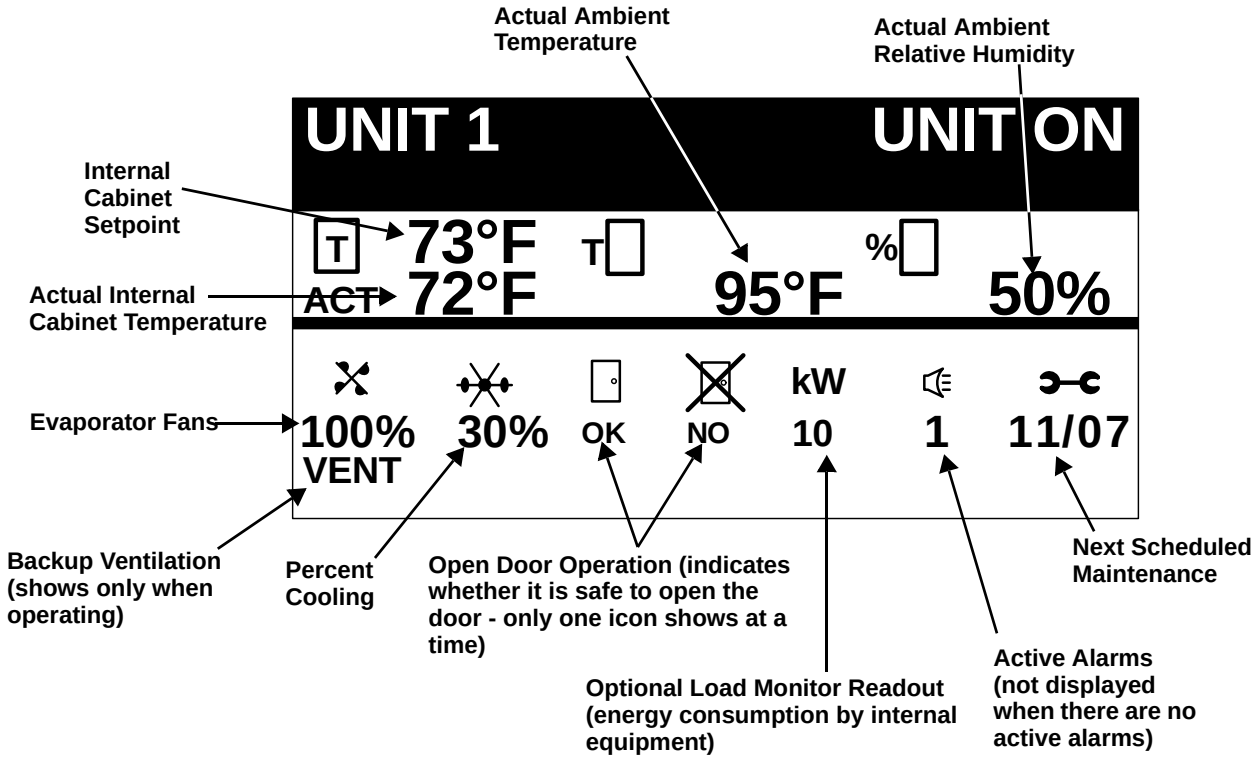


Figure 42 Liebert iCOM simple display default screen components



11.3.1 Accessing Menus and Settings

Viewing Data

No password is required to view data or settings.

To view data:

1. From the default screen, press the **Enter** key to view the opening page of the six-page user menu (see **Figure 43**).
2. Press **Enter** again to highlight the password line.
3. Use the **Down** arrow to scroll to the icon for the data you wish to view.
4. Once that icon is highlighted, press **Enter** again to display the data.
   If there are lines above or below what is shown on the screen, small arrows in the top right corner and bottom right corner will be displayed (see **Figure 44**).
5. Press **Enter** to select the first line of data.
6. Use the **Up** and **Down** arrow keys to scroll to the desired data point.
7. Press **ESC** to move back to higher level menus.

Figure 43 Liebert iCOM user menu, Page 1 of 6

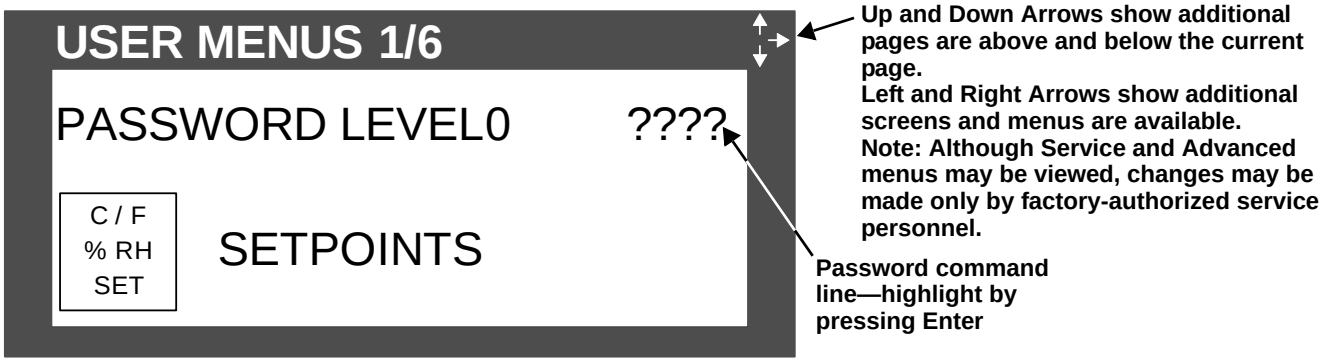
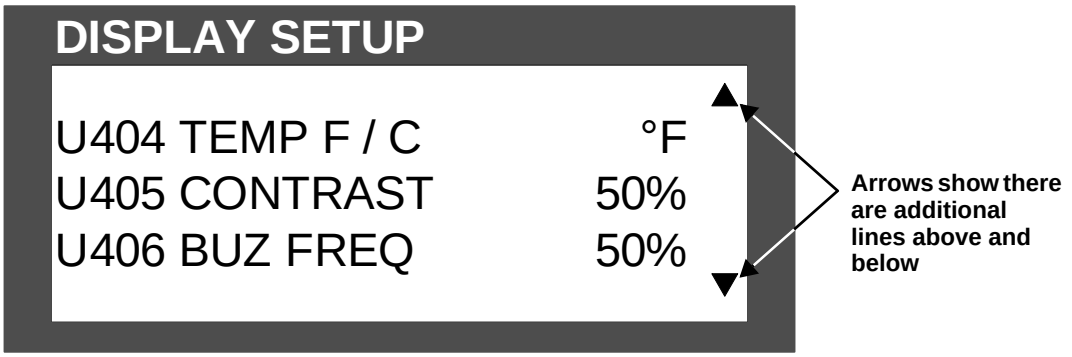


Figure 44 Accessing additional menu lines



11.3.2 Entering the Password

1. From the default screen, press the **Enter** key to access the opening page of the six-page user menu (see **Figure 43**).
2. Press **Enter** to highlight the Password command line.
3. With the password line highlighted, press **Enter** to highlight the first digit in the password; enter the password, 1490.
4. Use the **Up** and **Down** arrow keys to select a numeral for the first digit of the password.
5. Move to the next digit of the password with the **Right** arrow key.
6. Select the numerals for all four digits with the same process.
7. After all four digits of the password have been entered, press the **Enter** key.

NOTE

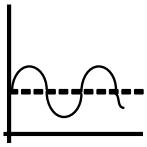
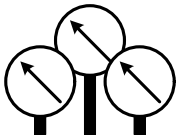
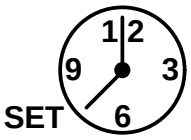
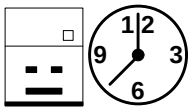
Do not press the ESC key or the Liebert iCOM will move to the previous screen and the password must be re-entered before changes may be made.

11.4 Changing Operational Settings

Changes to the Liebert XDF's operation settings in the **Set Alarms** and **Setpoints** menus require a password.

1. From the default screen, press the **Enter** key to view the opening page of the six-page user menu.
2. Press **Enter** again to highlight the password line.
3. Enter the password (for help, see **11.3.2 - Entering the Password**)
4. After entering the password, use the **Up** and **Down** arrow keys to scroll to the icon containing the operational setting to be changed.
5. Press **Enter** to display the data for that icon.
6. Press **Enter** to highlight the first line of commands.
7. Use the **Up** and **Down** arrow keys to scroll to the command line to be changed.
8. Press **Enter** to highlight the setting.
9. Change the setting by using the **Up** and **Down** arrow keys.
10. Press **Enter** to accept the change. (The setting will no longer be highlighted.)
11. Press **ESC** to deselect the command line. (The command line will no longer be highlighted.)
12. Press **ESC** again to move to previous screens.

Table 13 User menu icons

Icon	Name	Description
°C / °F % RH SET	Setpoints	View and change internal cabinet temperature setpoint (humidity setpoint inactive on Liebert XDF)
EVENT LOG	Event Log	Contains last 400 events
	Graphic Data Record	Displays temperature and humidity graphs
SET ALARMS	Set Alarms	Allows enable, disable and settings for alarms
	Sensor Data	Shows readings of sensors
	Display Setup	Change settings for display: language, time, simple or graphic display
1234h	Total Run Hours	Records the run time of all components and allows setting of limits on run time
	Sleep Mode	Allows setback settings for non-peak operation
	Service Contacts	Contains key contact information for local service, including names and phone numbers

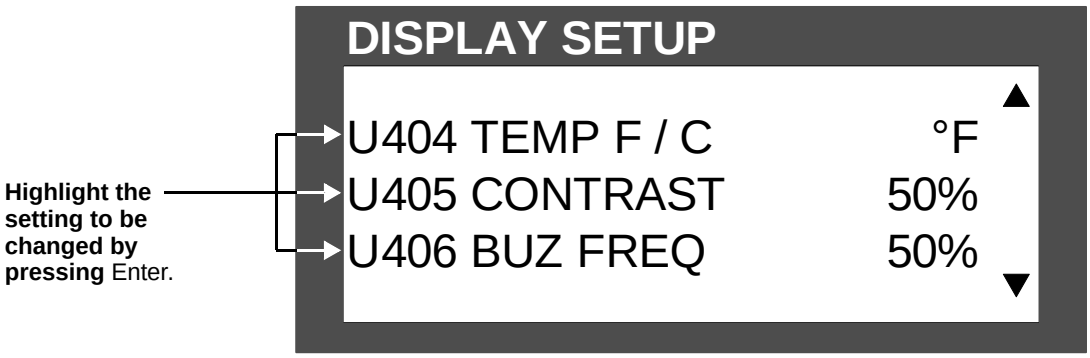
11.5 Changing Liebert iCOM's Display Settings

No password is required to change the way Liebert iCOM displays data. The Display Setup submenus control how such data as temperature, date and time is shown.

To change the display settings:

1. From the default screen, press the **Enter** key (see **Figure 39**) to access the user menu.
2. Press the **Enter** key again to highlight the password command line.
3. Use the **Up** and **Down** arrow keys to navigate to the Display Setup icon.
4. Press the **Enter** key again to access the Display Setup submenu (see **Figure 45**).
5. Press the **Enter** key to select the first command.
   Either change that setting or navigate to another setting with the **Up** and **Down** arrow keys.
6. Once the desired command line is highlighted, press the **Enter** key to access that parameter's display setting options.
7. Use the **Up** and **Down** arrow keys to make changes.
8. Press the **Enter** key to accept the changes.
9. Press the **ESC** key twice to return to Liebert iCOM's user menu.

Figure 45 Display setup screen



11.6 Changing the Liebert XDF's Default Operating Temperature

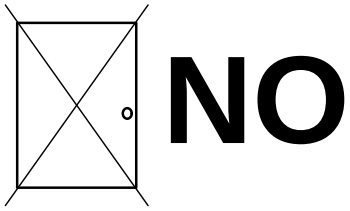
The Liebert XDF's internal temperature is set at the factory at 72°F (22°C). This setpoint is adjustable from 65°F to 80°F (18-27°C). To change this setpoint:

1. From the default screen, press the Enter key (see **Figure 39**) to access the user menu.
2. Press **Enter** a second time to select and highlight the Password line.
3. Enter the password (see **11.3.2 - Entering the Password**).
4. Use the **Down** arrow key highlight the Setpoints icon.
5. Press the **Enter** key to enter the setpoints submenu.
6. Press the **Enter** key to highlight TEMP SET command line.
7. Press **Enter** again to access the setpoint adjustment.
8. Use the **Up** and **Down** arrow keys to select the desired setpoint.
9. Press the **Enter** key to accept the selected setpoint.
10. Press the **ESC** key twice to return to the Liebert iCOM's user menu.

For further details about the Liebert iCOM controller, see **11.2 - Liebert iCOM Components and Functions** and **11.3 - Navigating Through the Liebert iCOM Display**. For more complete information about the Liebert iCOM controller, call 800-543-2778.

11.7 Operation With the Door Open

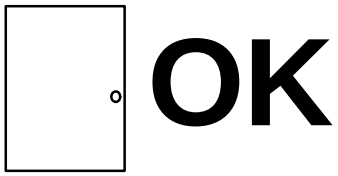
If the external ambient dew point exceeds the Liebert XDF's internal temperature, the Liebert iCOM control will flash a warning that condensation may form inside the enclosure if a door is opened. The warning is an icon of a door with an "X" on top of it. The word **NO** appears beside the icon.



If a warning is flashing, the Liebert XDF's doors may be opened safely while the unit is operating by following these steps:

1. From the default screen, press the **Enter** key (see **Figure 39**) to access the user menu.
2. Press **Enter** a second time to select and highlight the Password line.
3. Use the **Down** arrow to scroll to the Setpoints icon.
4. Press the **Enter** key again to access the Setpoints submenu.
5. Press **Enter** again to highlight the first command line.
6. Using the **Down** arrow key to highlight the DOOR OP command line.
7. Hit the **Enter** key to highlight the setting adjustment.
8. Use the **Up** and **Down** arrow keys to change the status to **YES**.
9. Press **Enter** to accept the change.
10. Hit the **ESC** key four times to return to the default screen.
11. The Liebert iCOM control will begin reducing cooling until the Liebert XDF's internal temperature is high enough that condensation will not occur if the door is opened.
12. Once the internal temperature reaches this point, the "Door Open Wait Timer" starts counting down.

    The Liebert XDF may be opened without internal condensation when the default screen removes the "X" from the door icon and the word **OK** appears beside the icon.



The Liebert XDF will keep the temperature at the level required for opening the door for two minutes. If a door is not opened within two minutes, the Liebert XDF will return to the normal operating point.

If a door is opened, the Liebert XDF will remain in "Open Door Operation" status until all doors are closed. After all doors are closed, a two-minute delay is initiated before the unit returns to its normal operating setpoint. If a door is opened again within the two-minute delay, the timer is reset and will restart when the door is closed.

NOTE

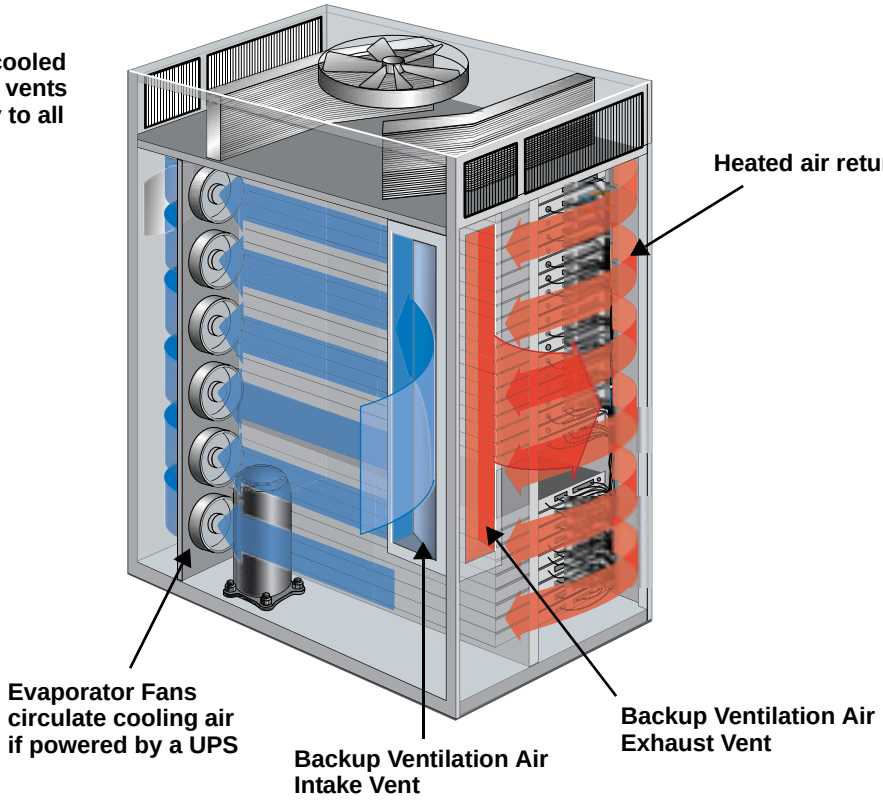
The high cabinet temperature alarm is disabled for the period of time that Open Door Operation is set to YES.*)*

11.8 Backup Ventilation System

The Liebert XDF is equipped with a backup ventilation system that circulates ambient air through the Liebert XDF should any component of the cooling system fail or if power is lost. Any alarm that triggers opening the backup ventilation, does so only after the cabinet temperature exceeds the ambient temperature.

If powered by a UPS, evaporator fans circulate ambient air until the Liebert XDF returns to normal operation.

Figure 46 Airflow pattern, backup ventilation operation



11.9 Liebert XDF Compressor

The Liebert iCOM automatically adjusts the cooling capacity of the digital scroll compressor depending on the heat load in the cabinet.

Sensors near the evaporator fans monitor the cooling airflow and send the data to the Liebert iCOM. These sensors have setpoints that may be adjusted with the Liebert iCOM control unit to raise or lower the internal cabinet temperature. For information on changing the setpoints, refer to **11.6 - Changing the Liebert XDF's Default Operating Temperature** or call 800-543-2778.

If the supply air temperature drops below the setpoint, Liebert iCOM reduces the compressor's cooling output accordingly. The evaporator fans will continue to circulate internal cabinet air throughout the enclosure.

11.10 Uninterruptible Power Supply

The Liebert XDF may be supplied with any of several Liebert UPS units or with no UPS. For integrated/matched models, the UPS and the equipment installed in the Liebert XDF are sized with matched capacities. A larger UPS, with more battery time, can be obtained, but the connected electronics load should not exceed the Liebert XDF's cooling capacity.

For Liebert XDF units equipped with a UPS, refer to the UPS manual for UPS operation and specifications.

12.0 ALARMS AND WARNINGS

12.1 General Alarm Information

Whenever there is an alarm or a warning, the display will automatically move to the active alarms screen. Some alarms will reset automatically and the Liebert XDF will return to normal operation if the conditions causing the alarm are corrected. Alarms that reset automatically will continue to sound a buzzer and display a flashing red light to notify the user that an alarm has occurred. If the conditions causing the alarm no longer exist, the light and buzzer can be stopped by pressing the alarm key on the keypad.

This section describes the conditions that cause alarms and the alarm reset procedures.

12.2 Alarms

High Head Pressure Alarm

The compressor will turn Off immediately after the high head pressure switch closes.

High Head Pressure at Startup—If a high pressure condition occurs during the first 10 minutes of operation, the compressor will be turned Off for 10 seconds then will start again (assuming the high pressure is alleviated) with no alarm indication. This can occur three times within the first 10 minutes of operation. If a high head pressure situation occurs a fourth time, the compressor will be locked Off. If the compressor is locked Off, call your local Emerson representative.

High Head Pressure During Normal Operation—If the compressor goes into a high head pressure condition after the first 10 minutes of operation, the compressor will turn Off and an alarm will be activated. If the pressure falls and the high head pressure switch opens, the alarm will reset automatically and the compressor will restart after three minutes. The flashing red light and buzzer remain active until acknowledged by pressing the alarm key once. If the compressor goes into a high head pressure condition three times in a rolling 12-hour period, the compressor will be locked Off. If the compressor is locked Off, call your local Emerson sales representative.

Low Pressure Alarm

Table 14 Coolant pressure settings, psi (kPa)

Low-Pressure Cut Out	Low-Pressure Cut In	High-Pressure Cut Out
35 (241.3)	60 (413.7)	425 (2930.3)

The low-pressure switch is ignored for a period of time after a cold start of the compressor.

NOTE

The period the low-pressure switch is ignored can be programmed between 0 and 5 minutes by an authorized Emerson service associate. The default is 3 minutes.

If the low-pressure switch opens for less than 5 seconds after the period of time the switch is ignored, the compressor will continue to run. If the low-pressure switch opens for more than 5 seconds but less than 15 seconds, an alarm will be activated and the low-pressure counter will increment to 1. The compressor will continue to run, but the flashing red light and audible alarm will remain active until acknowledged.

The low-pressure alarm has a 12-hour rolling timer. If the low-pressure counter increments to 3 within a rolling 12-hour period, the compressor will be locked Off. The compressor will be allowed to come back On only if either power is removed from the control or if the low-pressure counter is reset to 0 by an authorized Emerson service associate.

If the low-pressure switch opens for more than 15 seconds, an alarm will be activated and the compressor will be locked Off. The compressor will be allowed to come back On only if either the power is removed from the control or if the low-pressure counter is reset to 0 by an authorized Emerson service associate.

Loss of Compressor Power

A Loss of Compressor Power alarm will be active if the compressor circuit loses power. The compressor will restart automatically if power is restored. The flashing red light and buzzer remain active until acknowledged by pressing the alarm key once.

Digital Scroll High Temperature Protection

The digital scroll compressor has a built-in head temperature sensor. If the value reaches 268ºF (131ºC), the digital scroll high temperature alarm will be activated and the compressor will be shut down for 30 minutes. If the sensor falls below its reset temperature during the 30 minute shutdown, the alarm will reset automatically and the compressor will restart at the conclusion of the shutdown period. The flashing red light and buzzer remain active until they are acknowledged by pressing the alarm key.

If the compressor is turned Off five times in a rolling 4-hour period due to a high scroll temperature, the compressor will be locked Off. If the compressor is locked Off, call your local Emerson sales representative.

High Cabinet Temperature Alarm

The user can set the high cabinet temperature alarm setpoint under the Set Alarms option in the user menu. The default setpoint is 90ºF (27.2ºC). If the cabinet temperature exceeds the setpoint, this alarm becomes active.

If the user desires to change the high cabinet temperature alarm setpoint, Emerson recommends setting it at least 10ºF (5.5°C) higher than the internal cabinet temperature setpoint.

NOTE

If the compressor is On when the cabinet reaches the high cabinet alarm setpoint, the control will attempt to bring the cabinet temperature down by running the digital scroll compressor at 100% capacity. The control will monitor the cooling inside the cabinet and determine if sufficient cooling is taking place. If sufficient cooling is occurring, the compressor will continue to run and there will be no alarm as long as the unit is capable of bringing the cabinet temperature down to the cabinet temperature setpoint. If the cooling rate is insufficient, the high cabinet temperature alarm will be activated. The compressor will continue to run as long as the cabinet temperature is below the ambient temperature. If the cabinet temperature exceeds the ambient temperature, the compressor will be locked Off and the backup ventilation will open. The compressor will remain locked Off until the alarm is reset.

The alarm can be reset only if the high temperature condition is resolved and the main power is reset or the high cabinet temperature counter is reset by an Emerson service associate.

If the compressor is turned Off due to Loss of Compressor Power, Digital Scroll High Temperature, or High Head Pressure and the cabinet temperature subsequently exceeds the high cabinet temperature alarm setpoint, the high cabinet temperature alarm will be activated. If the original reason that the compressor is Off is fixed, the following sequence occurs:

- The control will permit the compressor to run at 100% capacity for 20 seconds and check to see if sufficient cooling is occurring inside the cabinet.
- If the control determines that sufficient cooling is occurring, the compressor will continue to run and the control will continue monitoring the cabinet cooling progress. Once the cabinet temperature drops to 2ºF (1.2ºC) above the cabinet setpoint, the high cabinet temperature alarm will reset automatically and normal operation will resume.
- If the control determines that sufficient cooling is not taking place and the cabinet temperature exceeds the ambient temperature, the compressor will be locked Off and the backup ventilation will open.

NOTE

The audible alarm and flashing red light will remain active until the user presses the alarm key on the control panel.

Compressor Start Counter

Any time the compressor starts, a counter will increment by 1. One hour after a compressor-start event, the counter will decrement by 1. If the counter exceeds the maximum allowable value within a rolling one-hour period, the compressor will be locked Off and the Liebert iCOM will display the alarm *Compressor(s) Lockout*.

NOTE

The allowable number of compressor starts can be changed in the service menu between 6 and 20 by an authorized Emerson service associate. The default is 15. If the compressor is locked Off, the only way to reset the alarm is to remove power from the control (the counter is not stored).

WARNING

If the compressor-start counter reaches 6, a *Compressor Short Cycle* warning will be shown on the unit display, the unit will sound an audible alarm and display a flashing red light.

Sensor Failure Alarm

Four sensors measure the internal cabinet temperature. If all four sensors fail, the display will read *Cabinet Sensor Fail*, the red light will flash and the buzzer will sound. A backup sensor will take over and the unit will continue to run. If this occurs, contact your authorized Emerson representative.

If the backup sensor fails, the display will read *Cabinet H-Sensor Fail*, the red light will flash and the buzzer will sound. At this point, the compressor will be locked Off and the backup ventilation will be activated. If this occurs, contact your authorized Emerson representative.

12.2.1 Backup Ventilation

The Liebert XDF is equipped with backup ventilation that will open when outside air must be brought in for cooling. In normal operating mode *Compressor On*, the backup ventilation will be closed. In an emergency situation *Compressor Off* or if insufficient cooling is taking place, the backup ventilation will be opened if the cabinet temperature exceeds the ambient temperature. In certain situations, if the problem is fixed, the control will close the backup ventilation again and normal operation will resume.

Five events that can lead to activation of backup ventilation are:

- High Head Pressure
- Low Suction Pressure
- Loss of Compressor Power
- High Cabinet Temperature
- Digital Scroll High Temperature

High Head Pressure

If the compressor has been turned Off because of High Head Pressure, the backup ventilation will open if the cabinet temperature rises to or above the ambient temperature. The backup ventilation will close if the High Head Pressure is resolved, as long as the compressor has not been locked Off by High Head lockout. See **High Head Pressure Alarm on page 62**.

Low Suction Pressure

If the compressor has been turned Off due to Low Suction Pressure, the backup ventilation will open if the cabinet temperature rises to or above the ambient temperature. The backup ventilation will close if the Low Pressure is resolved, as long as the compressor has not been locked Off by Low Pressure lockout. See **Low Pressure Alarm on page 62**.

Loss of Compressor Power

If the compressor has been turned Off due to Loss of Compressor Power, the backup ventilation will open if the cabinet temperature rises to or above the ambient temperature. The backup ventilation will close if compressor power is restored.

High Cabinet Temperature

If the cabinet temperature exceeds the High Cabinet Temperature alarm setpoint, the control will run the compressor at 100% capacity and monitor cooling as described in **High Cabinet Temperature Alarm on page 63**. If sufficient cooling is not taking place and the internal cabinet temperature exceeds the ambient temperature, the compressor will be turned Off and the backup ventilation will open. If the cabinet temperature exceeds the high cabinet temperature alarm setpoint but the cabinet temperature is below the ambient temperature, cooling will remain On and the backup ventilation will remain closed as long as the cabinet temperature remains below the ambient temperature.

Digital Scroll High Temperature

If the compressor is turned Off due to Digital Scroll High Temperature, the backup ventilation will open if the cabinet temperature rises to or above the ambient temperature. The backup ventilation will close after 30 minutes if the scroll temperature drops below the trip point and cooling resumes, as long as the compressor has not been locked Off by Digital Scroll High Temperature Lockout. See **Digital Scroll High Temperature Protection on page 63**.

Sensor Failure

If the compressor has been turned Off due to Sensor Failure, the backup ventilation will open if the cabinet temperature rises to or above the ambient temperature. If a Cabinet Sensor Failure occurs, contact your authorized Emerson representative.

12.3 Warnings

Front Door Ajar—This warning is active if the front door is opened without following the procedure in **11.7 - Operation With the Door Open**. The red light will flash and the buzzer will sound until acknowledged or the door is closed.

Rear Door Ajar—This warning is active if the rear door is opened without following the procedure in **11.7 - Operation With the Door Open**. The red light will flash and the buzzer will sound until acknowledged or the door is closed.

High Condensate Level—This warning is active if condensate is detected at the condensate switch. The red light will flash and the buzzer will sound until acknowledged or the condensation is no longer detected by the condensate switch.

Low Cabinet Temperature—The minimum cabinet temperature is user-settable under the Set Alarms menu in the user menu. The default setpoint is 64°F (17.8°C). If the cabinet temperature drops below the setpoint for more than 2 minutes, the red light will flash and a buzzer will be activated. If the cabinet temperature rises above the setpoint, the warning will reset automatically.

NOTE

A history of the last 400 alarms and warnings will be archived under the Event Log menu of the user menu.

13.0 MAINTENANCE

Table 15 Troubleshooting

Problem	Cause	Solution
Liebert XDF system not cooling	No Power	Confirm unit is plugged in and the building breaker has not tripped.
	Clogged condenser coil	Clean coil. See **13.1 - Periodic Maintenance**.
	Coolant loss	Verify leak. If coolant system needs repaired, contact Liebert Technical Support at 800-543-2378.
Fans blowing warm air	Airflow is blocked at the intake or exhaust.	Remove airflow obstructions from the front and rear of the enclosure. Ensure the cabinet has at least 36" (915mm) front, rear and overhead clearance. (Water/glycol and remote condenser models do not require overhead clearance.) Open Liebert XDF's doors and let compressor cool. Plug in Liebert XDF and verify compressor is energized.
	Compressor trips on thermal overload	Open Liebert XDF doors and let compressor cool. Plug in Liebert XDF and verify compressor is energized.
	Faulty Compressor	Contact Liebert Technical Support at 800-543-2378.
Water leaking from inside the cabinet	Cabinet not level or internal drain line clogged	Ensure that the enclosure rests on a level surface. The cabinet must be level to ensure proper operation. Verify condensate drain is attached to drain and the drain line has the proper pitch (see **5.2.4 - Condensate Drain Connection**).
Excessive vibration or noise	Defective motor in blower or shipping damage	Contact Liebert Technical Support at 800-543-2378.
Cabinet is excessively hot	Electronic equipment not positioned for optimum cabinet airflow	Rearrange the equipment as illustrated in **5.3 - Equipment Layout**.
	Compressor is overloaded	Verify the UPS load does not exceed Liebert XDF's capacity. If no UPS, verify equipment load does not exceed the Liebert XDF's rating.
	Heat not rejected from room	Verify that Liebert XDF is in room with air circulation and heat rejected from unit is sufficiently removed.
	Liebert XDF system not cooling	Confirm unit is plugged in and the building breaker has not tripped. Check setpoints on Liebert iCOM controller.
	Cabinet not sealed	Check cable entry points, and verify doors and side panels are closed. Reposition wires to prevent air leak, or fix or replace damaged gaskets.
Audible alarm and cabinet is excessively hot	Liebert iCOM control module has detected an abnormal condition	Silence alarm on the Liebert iCOM module. See solutions for "Liebert XDF system not cooling," "Fans blowing warm air" and "Cabinet is excessively hot causes" to determine course of action.
Unit goes Off on low suction pressure during startup	Low ambient temperature	Change winter start kit time to 5 minutes (default setting is 3 minutes).

13.1 Periodic Maintenance

13.1.1 Maintaining the Self-Contained, Air-Cooled Liebert XDF

The Liebert XDF requires very little maintenance. The Liebert XDFS's condenser coil must be inspected periodically to determine the necessary cleaning interval based on conditions at the installation site. Depending on site conditions, the coil may require cleaning as often as twice a month or as seldom as twice per year. If the coil becomes dirty and clogged, it should be vacuumed with a soft bristle brush or cleaned with compressed air.

13.1.2 Maintaining the Liebert XDF with Remote Condenser

For information on maintaining the remote condenser, refer to the unit's user manual, SL-10066, available at the Liebert Web site: **www.liebert.com**

14.0 SPECIFICATIONS

Figure 47 Liebert XDF model numbers

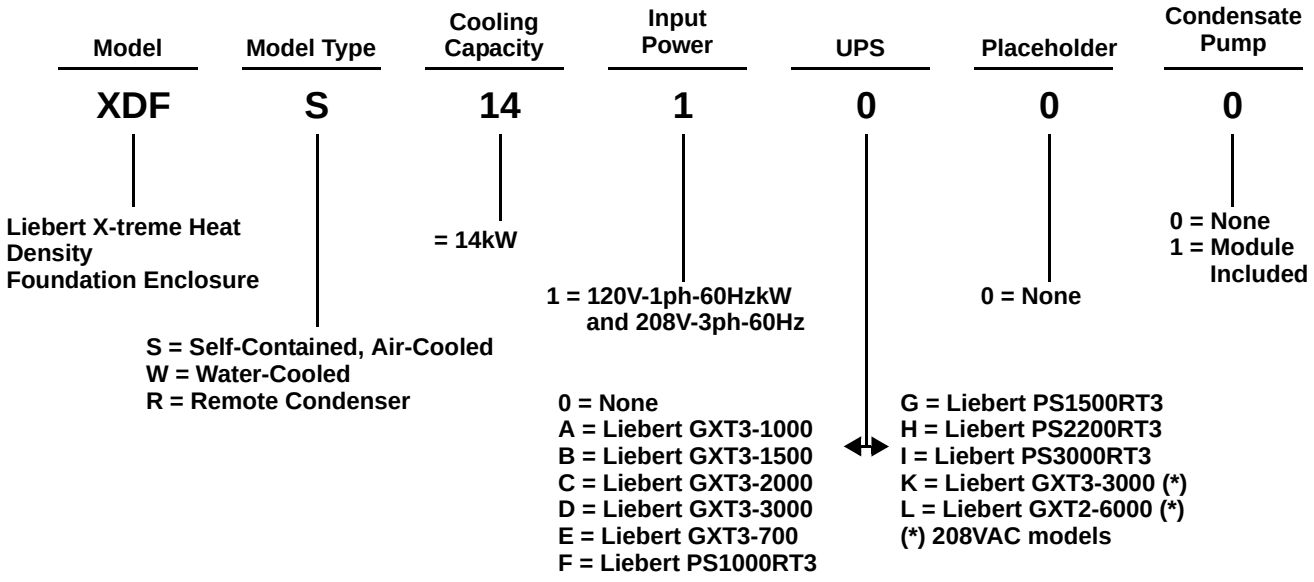


Table 16 Physical specifications

Dimensions	XDFS141 Self- Contained, Air-Cooled Units	XDFW141 Water/Glycol-Cooled Units	XDFR141 Remote Condenser Air-Cooled Units
Height, in. (mm)			
Overall	82-1/4 (2089)	79-3/4 (2026)	
Cabinet Only	79-3/4 (2026)	79-3/4 (2026)	
Fan Guard	2-1/2 (57)	N/A	
Equipment Rack Area	36U	42U	
Width, in. (mm)			
Overall	34-1/8 (867)		
EIA Nominal	19 (483)		
Inside Dimension	17-13/16 (452)		
Depth, in. (mm)			
Overall	49-1/2 (1257)		
Mounting Depth, adjustable, minimum	24-3/8 (620)		
Mounting Depth, adjustable, maximum	32-11/32 (821)		
Weight, lb. (kg)			
Cabinet Only	710 (322)	668 (303)	
Equipment Capacity	1200 (544)		
Sound Power Level, dBA	86	79	79

Table 17 Electrical specifications

Electrical Data	Self- Contained, Air-cooled Units	Water/Glycol Cooled Units	Remote Condenser Air-Cooled Units
Control & Fan Supply			
Voltage	120		
Ph	1	1	1
Hz	60	60	
Unit FLA	8.3	5.0	
Max Fuse or Circuit Breaker Amps	15	15	
Min. Supply Circuit Ampacity	9.2	5.2	
Receptacle required	NEMA 5-15R		
Compressor Supply			
Voltage	208	208	
Ph	3	3	
Hz	60	60	
Unit FLA	20	16.7	
Max. Fuse or Circuit Breaker Amps	35	35	
Min. Supply Circuit Ampacity	23.9	20.6	
Receptacle Required	NEMA L21-30R		
Condensate Pump Amps, Optional	1	1	1

Table 18 Total heat rejection—Liebert XDFS only

Rating Point, Ambient °F (°C)	Supply Air Temperature, °F (°C)	Load, kW	Total Heat Rejection, kW
95 (35)	77 (25)	14.1	20

Table 19 Liebert XDFR condenser dimensions

Condenser Model	Number of Fans	Domestic Packaging			Export Packaging		
		Weight lb (kg)	Dimensions LxWxH, in. (mm)	Volume ft^3 (m^3)	Weight lb (kg)	Dimensions LxWxH, in. (mm)	Volume ft^3 (m^3)
TCSV083 CSL083	1	330 (150)	59x30x51 (1500x760x1300)	52 (1.4)	415 (188)	60x31x52 (1520x790x1320)	56 (1.5

14.1 Optional Power Systems

Table 20 UPS performance data

Model Number	VA / Watts	Height	Input Power (1 ph)		
		In (mm) U	Volts	OPD	(A) Plug
Liebert GXT3-700RT120	700 / 490	3.5 (89) 2	120	15	NEMA 5-15P
Liebert GXT3-1000RT120	1000 / 700	3.5 (89) 2	120	15	NEMA 5-15P
Liebert GXT3-1500RT120	1500 / 1050	3.5 (89) 2	120	15	NEMA 5-15P
Liebert GXT3-2000RT120	2000 / 1400	3.5 (89) 2	120	20	NEMA 5-20P
Liebert GXT3-3000RT120	3000 / 2100	3.5 (89) 2	120	30	NEMA L5-30P
Liebert GXT3-3000RT208	3000/2700W	3.5 (89) 3	280	20	NEMA L6-20P
Liebert GXT2-6000RT-208	6000 / 4200	7 (178) 4	208/120	30	NEMA L14-30P or Hard-Wired
Liebert PS1000RT3-120	1000 / 750	3.5 (89) 2	120	15	NEMA 5-15P
Liebert PS1500RT3-120	1440 / 1080	3.5 (89) 2	120	15	NEMA 5-15P
Liebert PS2200RT3-120	2200 / 1650	3.5 (89) 2	120	15	NEMA L5-30P
Liebert PS3000RT3-120	3000 / 2250	3.5 (89) 2	120	15	NEMA L5-30P

14.2 Optional Managed Power - Liebert MPH Managed Rack PDUs, Horizontal-Mount

Liebert MPH Managed Rack PDUs are available in 19" rack-mount form. See **Table 21** for specifications.

Table 21 Liebert MPH—Rack-mount model numbers and specifications

	Input						Output
Part Number	Voltage	Rated Amps	Maximum Continuous Amps	kW	Phase	Plug	Receptacle/Socket Configuration
Monitoring Level - Basic							
MPH-NBR09NXXF30	208-240	30	24	4.9	1	NEMA L6-30	(9) IEC-C13
MPH-NBR09NXXE30	208-240	20	16	3.3	1	NEMA L6-20	(9) IEC-C13
MPH-NBR09AXXD30	120	30	24	2.8	1	NEMA L5-30	(9) NEMA 5-20R T-Slot
MPH-NBR09AXXC30	120	20	16	1.9	1	NEMA L5-20	(9) NEMA 5-20R T-Slot
Monitoring Level - Controlled							
MPH-NCR09NXXF30	208-240	30	24	4.9	1	NEMA L6-30	(9) IEC-C13
MPH-NCR09NXXE30	208-240	20	16	3.3	1	NEMA L6-20	(9) IEC-C13
MPH-NCR09AXXD30	120	30	24	2.8	1	NEMA L5-30	(9) NEMA 5-20R T-Slot
MPH-NCR09AXXC30	120	20	16	1.9	1	NEMA L5-20	(9) NEMA 5-20R T-Slot

Ensuring The High Availability
Of Mission-Critical Data And Applications.

Emerson Network Power, the global leader in enabling business-critical continuity, ensures network resiliency and adaptability through a family of technologies—including Liebert power and cooling technologies—that protect and support business-critical systems. Liebert solutions employ an adaptive architecture that responds to changes in criticality, density and capacity. Enterprises benefit from greater IT system availability, operational flexibility and reduced capital equipment and operating costs.

Technical Support / Service
Web Site
www.liebert.com
Monitoring
liebert.monitoring@emerson.com
800-222-5877
Outside North America: +00800 1155 4499
Single-Phase UPS & Server Cabinets
liebert.upstech@emerson.com
800-222-5877
Outside North America: +00800 1155 4499
Three-Phase UPS & Power Systems
800-543-2378
Outside North America: 614-841-6598
Environmental Systems
800-543-2778
Outside the United States: 614-888-0246

Locations
United States
1050 Dearborn Drive
P.O. Box 29186
Columbus, OH 43229
Europe
Via Leonardo Da Vinci 8
Zona Industriale Tognana
35028 Piove Di Sacco (PD) Italy
+39 049 9719 111
Fax: +39 049 5841 257
Asia
29/F, The Orient Square Building
F. Ortigas Jr. Road, Ortigas Center
Pasig City 1605
Philippines
+63 2 687 6615
Fax: +63 2 730 9572

SL-17010_REV5_03-10

Emerson Network Power.
The global leader in enabling *Business-Critical Continuity*™

- AC Power
- Connectivity
- DC Power
- Embedded Computing
- Embedded Power
- Infrastructure Management & Monitoring
- Outside Plant
- Power Switching & Controls
- **Precision Cooling**

EmersonNetworkPower.com

- Racks & Integrated Cabinets
- Services
- Surge Protection