



Liebert[®] Xtreme Density

System Design Manual

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit <https://www.vertiv.com/en-us/support/> for additional assistance.

TABLE OF CONTENTS

1 System Description	1
1.1 Generic Piping Layouts	1
1.2 Liebert® XDH—Horizontal Cooling Module	2
1.3 Liebert® XDO—Overhead Cooling Module	3
1.4 Liebert® XDV—Vertical, Above Cabinet Cooling Module	4
1.5 Liebert® XDC—Refrigerant Chiller	4
1.5.1 Liebert® XDC Minimum Load	5
1.6 Liebert® XDP—Pumping Unit	5
1.6.1 Liebert® XDP Minimum Load	5
1.7 Liebert® XD Piping	6
2 Starting a New Equipment Cooling Project	7
2.1 Determining Cooling Equipment Needs	7
2.2 Implementing a Hot Aisle/Cold Aisle Design	7
3 Designing a Liebert® XD Solution	9
3.1 Determine Cooling Requirements and Select Liebert® XD System	9
3.2 Calculate the Heat Load to be Handled by Liebert® XD System	9
3.3 Selecting Liebert® XD Cooling Modules	10
3.4 Configuring a Liebert® XD System	12
3.4.1 Number of Modules Supported by a Liebert® XDP or Liebert® XDC	12
3.4.2 System Connection Configuration	13
3.5 Airflow Requirements for Liebert® XD Solutions	14
3.6 Liebert® XDH Placement	14
3.7 Liebert® XDO Placement	15
3.7.1 Determining Spacing of Liebert® XDOs in an Aisle	15
3.7.2 Determining Vertical Placement of Liebert® XDOs Above the Cold Aisle	16
3.8 Liebert® XDV Module Placement	17
3.9 Liebert® XDP/XDC Placement	19
3.10 Examples of Expansion and Interlaced Connection of Liebert® XD Cooling Modules	19
3.11 Liebert® XD Piping System Design	22
3.12 Liebert® XD Piping Slope	24
3.13 Bypass Flow Controllers (Field Installed)	24
3.14 Piping Details External Field Installed—Shutoff/Isolation Valves	26
3.15 Piping Details—External Field Installed Shutoff/Isolation Valves	26
3.16 Piping Details—Bull Heading Layout	29
3.17 Liebert® XD Refrigerant	29
3.18 Determining Refrigerant Volume	30
3.18.1 Liebert® XDP/XDC Pumped R-134a Circuit Volume	30
3.18.2 Calculating Refrigerant R134a Charge—Example	31

3.19 Chilled Water Piping 32

3.20 Electrical 34

3.21 Temperature/Humidity Sensor Locations 34

3.22 Connecting Liebert® XDP and Liebert® XD Cooling Modules in a CANbus Network 34

 3.22.1 CANbus Cables 35

 3.22.2 CANbus Cable Length in a Network 36

 3.22.3 Remote Sensor Placement Within the CANbus 36

4 Liebert® XD Cooling Modules 39

4.1 Liebert® XDH Standard Features 39

4.2 Optional Features—Liebert® XDH 39

4.3 Connecting High-Voltage Wiring—Liebert® XDH 42

4.4 Connecting Low-Voltage Wiring—Liebert® XDH Smart Modules 43

4.5 Liebert® XDO Standard Features 43

4.6 Optional Features Liebert® XDO 43

4.7 Low-Voltage Wiring—Liebert® XDO Smart Modules 49

4.8 Liebert® XDV Standard Features 50

4.9 Optional Features—Liebert® XDV 50

4.10 High-Voltage Cabling for Liebert® XDV 53

4.11 Low-Voltage Wiring—Liebert® XDV Smart Modules 56

5 Liebert® XDC and Liebert® XDP 57

5.1 Liebert® XDC Standard Features 57

 5.1.1 Liebert® XDC Optional Features 57

5.2 Liebert® XDP Standard Features 69

6 Heat Rejection 77

6.1 Liebert® Lee-Temp Refrigerant Control Air Cooled Condensers 77

 6.1.1 Liebert® Lee-Temp Refrigerant Control Air Cooled Condenser 77

 6.1.2 Standard Features—All Condensers 77

 6.1.3 Condenser Coil 77

 6.1.4 Housing 78

 6.1.5 Propeller Fan 78

 6.1.6 Fan Motor 78

 6.1.7 Electrical Controls 78

6.2 Mechanical Considerations 79

 6.2.1 Dimensions 79

6.3 Heat Rejection Piping 83

 6.3.1 Piping for Direct Expansion (DX) Circuit—R-407C Air Cooled Units 83

6.4 Install Double Discharge Risers 83

 6.4.1 Air Cooled Condenser with Liebert® Lee-Temp “Flooded Condenser” Head Pressure Control System—R-407C (DX) Circuit 92

6.5 Calculating Refrigerant Volume 92

6.6 Liebert® Drycoolers	93
6.6.1 Liebert® Drycooler Fan Cycling Control	93
6.6.2 Pump Controls	93
6.7 Typical System Configurations	93
6.8 Site Considerations	95
6.9 Dimensions and Weights	95
6.10 Mounting the Drycooler	99
6.11 Glycol Piping	99
6.11.1 Piping Guidelines	99
6.11.2 Expansion Tanks, Fluid Relief Valves, Air Management and Other Devices	100
6.12 Electrical Supply	100
6.12.1 Line Voltage Wiring	101
6.12.2 Low Voltage Control Wiring	102
6.13 Filling Instructions	103
6.13.1 Preparing the System for Filling with Glycol	103
6.13.2 Glycol Solutions	104
6.13.3 Filling the System with Glycol	105
6.14 Liebert® Outdoor Control Enclosure	106
6.14.1 Electrical Connections	107
6.14.2 Hazardous Voltage Power Supply Wiring	107
6.14.3 Extra Low Voltage Control Wiring	108
6.14.4 Dual Pump Package Flow Switch	109
6.14.5 Dual Pump Controls Sequence of Operation	109
7 Liebert® iCOM™	111
7.1 Liebert® iCOM™ Display Layout	111
7.2 Cooling Module Overview	113
7.3 Graphical Data Record	114
7.3.1 Liebert® iCOM™ User Menu Icons and Legend	114
7.3.2 Liebert® iCOM™ Service Menu Icons and Legend	115
7.4 Liebert® XDC Alarms Descriptions	115
7.5 Warning Descriptions	118
7.6 Liebert® XDP Alarms	119
7.7 Liebert® XDP Warnings	121
7.8 CANbus Communications	121
7.9 Network Layout Options	122
7.9.1 Remote Temperature/Humidity Sensor Placement and Connection to the CANbus	122
7.9.2 CANbus Maximum Length	125
7.10 CANbus Cables	125
7.11 Connecting the CANbus Network	127
7.11.1 Connection to the Liebert® XDP or XDC	127

7.11.2 Connecting to the Liebert® XDV Smart Modules	128
7.11.3 Connecting to the Liebert® XDH Smart Modules	130
7.11.4 Connecting to the Liebert® XD Smart modules	132
7.12 CANbus Termination	133
7.12.1 Remote Temperature and Humidity Sensors Termination	133
7.12.2 Terminating a Smart Module	133
8 Monitoring	135
9 High Density Module Specifications and Model Number Nomenclature	141
10 XDP and XDC Module Specifications and Model Number Nomenclature	149
Appendices	155
Appendix A: Technical Support and Contacts	155

1 System Description

The Vertiv™ Liebert® XD family of cooling units delivers efficient, sensible cooling to high-heat environments. Liebert® XD systems are designed to cool computer racks and hot zones in a data center or computer room without taking up expensive floor space for cooling components.

The Liebert® XD family includes:

- **Vertiv™ Liebert® XDC**—Vertiv™ Liebert® XD Chiller; cools and pumps refrigerant to cooling modules
- **Vertiv™ Liebert® XDP**—Vertiv™ Liebert® XD Pumping unit; pumps refrigerant to cooling modules
- **Vertiv™ Liebert® XDH**—Vertiv™ Liebert® XD Horizontal row cooler; integrated into hot aisle-cool aisle room layout
- **Vertiv™ Liebert® XDO**—Vertiv™ Liebert® XD Overhead module; suspended from the ceiling structure
- **Vertiv™ Liebert® XDV**—Vertiv™ Liebert® XD Vertical module; mounted on top of the equipment cabinet or suspended from the ceiling structure

Systems combining Liebert® XDO and Liebert® XDV modules can remove more than 20kW (5.7 tons) of heat per cabinet. A system with Liebert® XDH modules can remove more than 30kW (8.5tons) of heat per rack.

For minimum Liebert® XDP and Liebert® XDC load recommendations, see [Liebert® XDP Minimum Load](#) on page 5 , [Liebert® XDC Minimum Load](#) on page 5 , [High Density Module Specifications and Model Number Nomenclature](#) on page 141

The Liebert® XD system also performs at high efficiency rates. Properly spaced cooling modules and the Liebert® XD system's fluid phase change technology, combine to reduce a Liebert® XD system's energy consumption to at least 27 percent less than a traditional cooling system.

The Liebert® XD family maintains this energy efficiency by employing the heat absorption properties of a liquid (pumped refrigerant) through a phase change. Refrigerant is pumped as a liquid, becomes a gas within the heat exchangers of the cooling modules (Liebert® XDH, XDO, and XDV) and then is returned to either the Liebert® XDP or XDC where it condenses to a liquid. This eliminates the compression cycle required by traditional systems. If a leak were to occur, the environmentally friendly refrigerant in the data center would escape as a gas, causing no harm to critical equipment. Because no compressor is used in the pumped refrigerant circuit, no oil is needed.

Liebert® XD cooling modules further increase efficiency with optional control board that reduces fan use when maximum cooling levels are not required. The control board is available on Liebert® XDH, Liebert® XDO, and Liebert® XDV modules.

1.1 Generic Piping Layouts

Liebert® XD systems are available in two configurations—differentiated essentially by the method of heat rejection (see **Figure 1.1** on the next page and **Figure 1.2** on the next page). The Liebert® XDP is a pumping unit connected to a building chilled water system to control and circulate the refrigerant. Liebert® XDPs pump refrigerant to Liebert® XDH, Liebert® XDO, or Liebert® XDV modules, isolate refrigerant circuit from building chilled water supply with an internal heat exchanger and maintains refrigerant temperature above the actual dew point. The Liebert® XDC incorporates the pumping functions with the chiller, which must be connected to a separate heat rejection system. Pumping and refrigerant control are performed by Liebert® XDC.

Figure 1.1 Liebert® XDP Generic Piping Layout

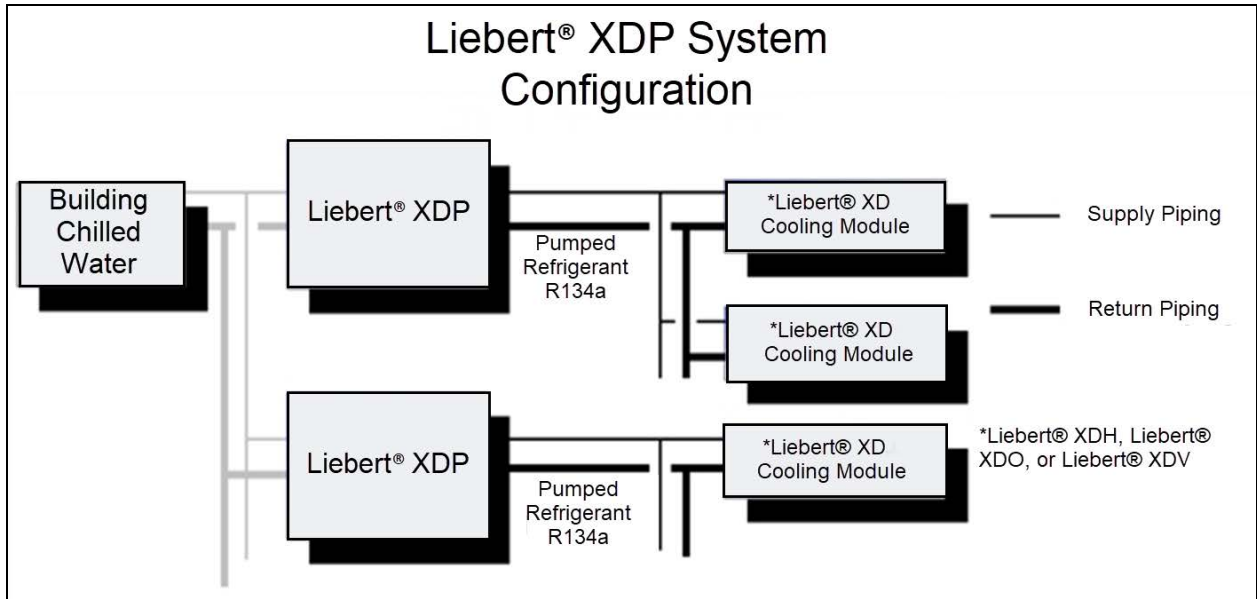
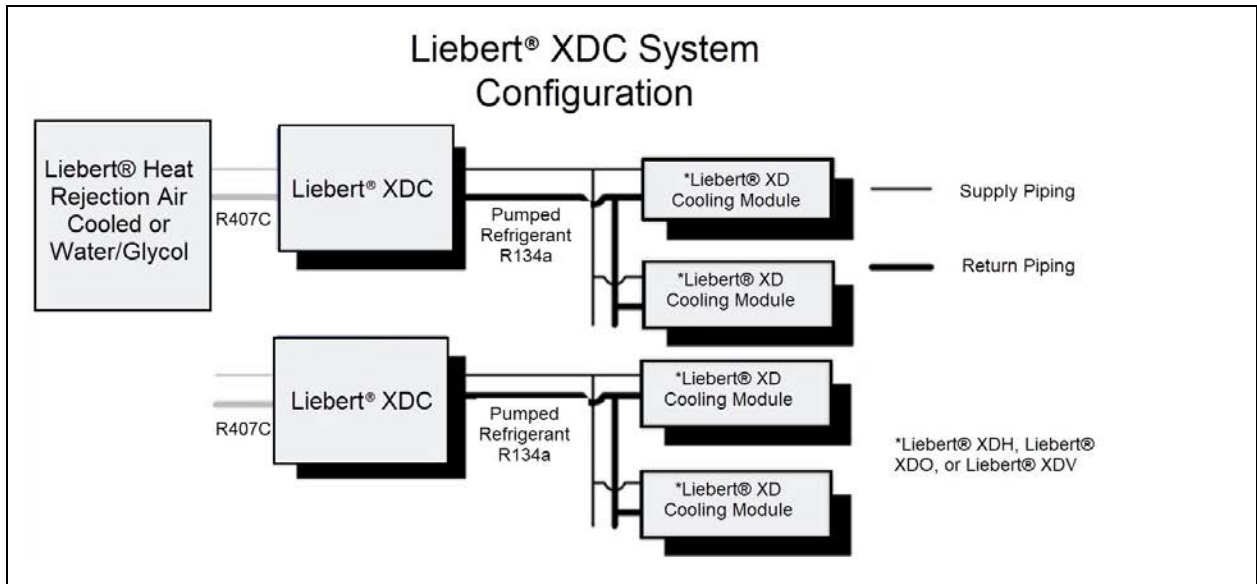


Figure 1.2 Liebert® XDC Generic Piping Layout



1.2 Liebert® XDH—Horizontal Cooling Module

The Liebert® XDH is designed for placement within a row of computer cabinets in the data center in a hot-aisle-cold-aisle arrangement to maximize the Liebert® XDH's cooling. The Liebert® XDH, available in a half-rack width module (12" [305mm]), is intended for use with a Liebert® XD pumped refrigerant cooling system, supplied by either a Liebert® XDP or Liebert® XDC. The module takes in hot air through the rear from the hot aisle, cools the air by air-to-fluid heat exchangers and discharges the air through the front of the module into the cold aisle in a diffuse pattern. The cooling air is then drawn into the enclosures to cool the equipment.

Replaceable front panels on the Liebert® XDH may be customized to match the appearance of various computer manufacturer's equipment, allowing the Liebert® XDH to blend in with adjacent server equipment and enclosures. Unidirectional and bidirectional diffusers are available to direct cooling air for more efficient cooling, depending on the Liebert® XDH's positioning in a row or at the end of a row. Chilled R-134a refrigerant is provided to the Liebert® XDH by a Liebert® XDP or by a Liebert® XDC. The Liebert® XDH has dual refrigeration circuits, one in the upper half of the module and the other in the lower half. This permits increasing and decreasing cooling levels in response to server room conditions. The dual refrigeration circuits permits interlaced connection of two Liebert® XD refrigerant sources to enhance system reliability. The Liebert® XDH may be installed in a Liebert® XD piping system that includes other Liebert® XD cooling modules.

Controls on the front of the Liebert® XDH permit independent operation of the two banks of fans. Dual power connections ensure continued fan operation if one of two electrical sources fails. Optional smart modules allow remote shutdown, fan failure alarms, condensate detection and switching fan per bank On and Off. This saves energy by permitting the module to run with two fans per bank and switching on the middle when the temperature requires all fans for cooling.

The Liebert® XDH is available for hard-piped configurations.

1.3 Liebert® XDO—Overhead Cooling Module

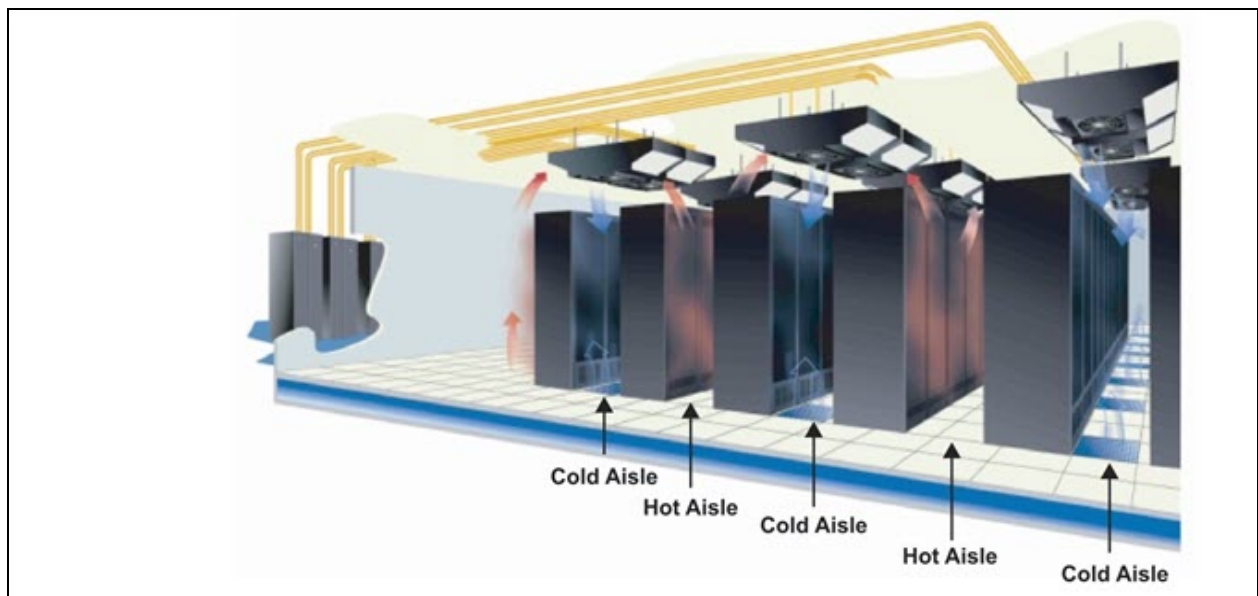
The Liebert® XDO is an overhead cooling system designed for installation above heat-dissipating equipment. A fan draws hot air exhausted from the equipment through two cooling coils and discharges cool air back down to the equipment (see **Figure 1.3** below).

A Liebert® XDO smart module will allow remote monitoring, shutdown, fan failure alarms, condensate detection and automatically cycling the fan ON and OFF as the heat load requires. The Liebert® XDP/Liebert® XDC monitors room conditions and prevents coil condensation by maintaining the temperature of the refrigerant pumped to the Liebert® XDOs above the room dew point.

The Liebert® XDO is available for hard piped configurations.

NOTE: The Liebert® XDO is the most sensitive module to system load. The Liebert® XDO's air intake and the discharge are not separated by a rack. This can lead to the Liebert® XDO pulling in cold air rather than hot air. The Liebert® XDP and Liebert® XDC minimum loads must be met to prevent this from occurring.

Figure 1.3 Suspended Liebert® XDO Modules in Hot Aisle-Cold Aisle Arrangement



1.4 Liebert® XDV—Vertical, Above Cabinet Cooling Module

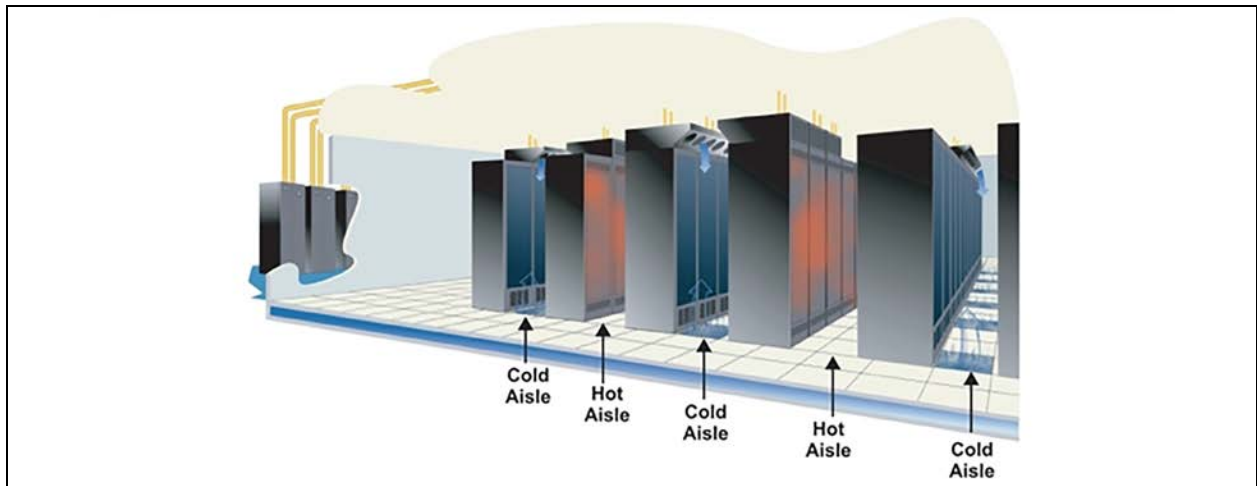
The Liebert® XDV cooling system is designed to be attached to the top of a computer cabinet or rack containing heat-dissipating equipment. Two fans draw hot air exhausted from the equipment or from the hot aisle, pass it through a cooling coil and discharge cool air back down to the cold aisle, where the equipment's air intake is located.

The Liebert® XDV comes from the factory ready to draw heated air through a perforated grille on the back of the module. The Liebert® XDV is easily modified to draw hot air through the bottom of the module, should that cooling method be better suited to your application.

Liebert® XDV smart modules allow remote shutdown, fan failure alarms and automatically switching the second fan ON and OFF. This saves energy by permitting the module to run with one fan and switching on a second fan when the temperature requires both fans for cooling.

The Liebert® XDV is available for hard piped configurations.

Figure 1.4 Top Mounted Liebert® XDV Modules with Hard Piping in Hot Aisle-Cold Aisle Arrangement



1.5 Liebert® XDC—Refrigerant Chiller

The Liebert® XDC is an indoor chiller that connects directly to the Liebert® XD cooling modules and provides refrigerant circulation and control. The Liebert® XDC keeps the refrigerant temperature above the room dew point at the sensors. The Liebert® XDC contains a refrigerant to refrigerant heat exchanger along with two tandem scroll compressor circuits. This allows heat rejection to the outdoor ambient air by using either the air-cooled condensers or water/glycol shell-and-tube condensers much like a standard computer room air conditioning unit. The Liebert® XDC employs two remote sensors (for redundancy) to determine the temperature and humidity in the air and instantly adjusts refrigerant supply temperature to compensate for changing conditions.

The Liebert® XDC uses the Liebert® iCOM™. This advanced control enables the user to monitor essentially all aspects of the Liebert® XD Precision Cooling system, from operating status to maintenance

1.5.1 Liebert® XDC Minimum Load

The Liebert® XDC's minimum recommended operating load is 40% of system nominal capacity. For example, a Liebert® XDC160 60Hz system's minimum load would be 64 kW. Loading below this value can unfavorably affect system operation.

Figure 1.5 Liebert® XD Chiller



1.6 Liebert® XDP—Pumping Unit

The Liebert® XDP isolates the building's chilled water circuit from the pumped refrigerant circuit. The Liebert® XDP circulates refrigerant to Liebert® XD cooling modules while preventing condensation by maintaining the refrigerant's temperature above the room dew point at the sensors. The Liebert® XDP employs two sets (for redundancy) of remote sensors to determine the temperature and humidity in the air and instantly adjusts refrigerant supply temperature to compensate for changing conditions.

The Liebert® XDP uses the Liebert® iCOM™. This advanced control enables the user to monitor essentially all aspects of the Liebert® XD Precision Cooling system, from operating status to maintenance.

1.6.1 Liebert® XDP Minimum Load

The Liebert® XDP's minimum recommended operating load is 30% of system nominal capacity. For example, a Liebert® XDP160 60Hz system's minimum load would be 48 kW. Loading below this value can unfavorably affect system operation.

Figure 1.6 Liebert® XDP



1.7 Liebert® XD Piping

Liebert® XD Piping is prefabricated on site per the direction of the engineer of record and is installed in anticipation of a growing system.

Liebert® XD cooling modules are hard piped to the secondary loop from the XDP .

This unique system allows the room cooling capacity to increase to more than 30kW per rack with no additional disruptive piping installation.

2 Starting a New Equipment Cooling Project

2.1 Determining Cooling Equipment Needs

1.	Is adequate space available for a Liebert® XD installation?	
2.	Is the hot aisle/cold aisle approach being utilized for this room design or can it be utilized in this room design?	
3.	Is redundant cooling equipment required?	
4.	Are there access considerations for all components (possible rigging problems)?	
5.	What heat load growth is anticipated over the next few years?	
6.	How are the cabinets going to be populated (density of heat generation)?	
7.	What monitoring requirements are desired or needed?	
8.	Who will be involved in this project (stakeholders)?	
9.	Is there existing computer room environmental cooling systems for humidity control and filtration?	
10.	Is the vapor barrier sufficient?	
11.	Is a chilled water system available?	
	<ul style="list-style-type: none"> • What is the system's capacity? 	
	<ul style="list-style-type: none"> • What is the system's chilled water supply temperature? 	
	<ul style="list-style-type: none"> • Does the chilled water supply temperature vary during the year or is the temperature constant? 	
12.	How much power is available for cooling equipment?	
13.	What is the maximum distance between the Liebert® XDP/XDC unit and the farthest Liebert® XD cooling module in the proposed layout?	
14.	If an air-cooled Liebert® XDC is used—is an area available for the remote condenser?	
15.	Does the Liebert® XD system refrigerant volume exceed 13 lb/1000ft ³ ? If so, a refrigerant detection and removal equipment may be required. Refer to Liebert® XD Refrigerant on page 29.	

2.2 Implementing a Hot Aisle/Cold Aisle Design

A best practice is to place equipment racks in alternating rows of cold aisles and hot aisles. This is best accomplished when the layout of the file server farm area is being planned. It is more difficult to accomplish when the computer room is already populated with operating hardware.

In the cold aisle, the equipment racks are arranged face-to-face so the cooling air from the computer room cooling unit discharged up through the perforated floor tiles is drawn into the face of the computer hardware and exhausted out the back of the equipment rack into the adjacent hot aisles.

Hot aisles are literally hot because the objective of the alternating cold and hot aisle design is to separate the source of cooling air from hot air discharge, which returns to the computer-room cooling unit. Therefore, no perforated tiles should be placed in the hot aisles. This would mix hot and cold air, lowering the temperature of the air returning to the cooling units, reducing their usable capacity.

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3 Designing a Liebert® XD Solution

Liebert® XD systems are intended for use with precision air conditioning equipment, such as the Liebert® Deluxe System/3 and Liebert® DS. The precision air conditioning equipment is required for the humidification and filtration of the room air.

The Liebert® XD systems provide efficient, highly effective heat removal (sensible cooling only), without providing humidity control. The Liebert® XD control system maintains the refrigerant temperature just above the dew point of the space to prevent condensation. Since the capacity of the system is limited by the dew point in the space, sufficient dehumidification and an adequate vapor barrier must be provided to maintain the dew point at or below the level necessary to achieve the required capacity.

The Liebert® XD system is optimized for hot aisle/cold aisle equipment configurations, an industry best practice for dealing with extremely high heat loads. Room and equipment designs that preclude the hot aisle/cold aisle configuration are often well-suited to cooling with the Liebert® XDR system.

Refer to the technical data manual of either the Liebert® Deluxe System/3 (SL-18100) or the Liebert® DS (SL-18827) for additional installation and application guidelines that apply to all critical space cooling applications.

3.1 Determine Cooling Requirements and Select Liebert® XD System

1. Calculate the total cooling required
2. Determine placement of the Liebert® XD modules
3. Determine required pipe sizes
4. Calculate the refrigerant volume of the Liebert® XD systems
5. Complete design details including, electrical, mounting, piping, etc.

3.2 Calculate the Heat Load to be Handled by Liebert® XD System

When designing a cooling solution using the Liebert® XD system, the initial steps are similar to those required to cool a conventional critical space. The total heat load must be calculated, including sensible and latent cooling requirements. These should be increased by the reserve capacity needed for pull-down situations where the room temperature must be reduced and to provide for unexpected increases in heat load.

NOTE: Reserve capacity is distinct from redundant capacity in that redundant capacity may or may not be available concurrently with normal operating capacity. Reserve capacity is available concurrently with normal operating capacity.

The next step is to determine how much of the required cooling capacity is to be provided by Liebert® Deluxe™ or Liebert® DS units. If the facility is new, typically up to 150W/ft² (1500W/m²) of cooling can be obtained from Liebert precision air conditioning units supplying air through a raised floor. In existing facilities, such factors as raised floor height, under-floor obstructions or other limitations may reduce this to less than 50W/ft² (500W/m²).

Once the total required sensible cooling capacity is known, subtract the sensible cooling portion to be provided by Liebert® Deluxe or Liebert® DS units. This yields the cooling capacity to be provided by the Liebert® XD system. Confirm the minimum heat load for the Liebert® XDP/Liebert® XDC is still present in the data center (48kW and 64kW respectively).

EXAMPLE

For example, a 2000 ft² server room with has 30 racks, 15 racks produce 20kW of heat each and 15 produce 10kW of heat per rack.

1. Calculate the total sensible cooling load.

$$15 \text{ racks} \times 20\text{kW}/\text{rack} = 300\text{kW}$$

$$15 \text{ racks} \times 10\text{kW}/\text{rack} = 150\text{kW}$$

$$300\text{kW} + 150\text{kW} = 450\text{kW}$$

The total room load is 450kW.

2. Check heat density per square foot:

$$450\text{kW}/2000\text{ft}^2 = 0.225\text{kW}/\text{ft}^2 = 225\text{W}/\text{ft}^2$$

3. Determine base cooling requirements:

Typically, perimeter cooling accounts for 2 to 5kW per rack.

$$2\text{kW} \times 30 \text{ racks} = 60\text{kW}$$

Based on 2kW/rack, 60 kW will be handled by the perimeter cooling.

4. Determine Liebert® XD cooling requirements:

$$450\text{kW} - 60\text{kW} = 390\text{kW}$$

Three Vertiv™ Liebert® XDP160s would be needed.

5. Calculate the Vertiv™ Liebert® XDP reserve capacity:

$$390\text{kW}/3 \text{ Vertiv™ Liebert® XDP160s} = 130\text{kW}$$

Each Vertiv™ Liebert® XDP, on average, would bear 130kW of the heat load.

$$130\text{kW} / 160\text{kW} = 81\% \text{ of maximum load}$$

This Liebert® XD solution has 19% reserve capacity.

3.3 Selecting Liebert® XD Cooling Modules

The next step is to select the Liebert® XD cooling modules to be configured into the solution. Liebert® XD modules that use pumped refrigerant can be connected to the same Liebert® XDP/XDC piping circuit. This includes the Liebert® XDH, XDO, and XDV.

Generally, XDO is selected for use in new installations or renovations where the module can be installed on the ceiling or in the overhead space.

The XDV is designed to permit mounting directly on top of an equipment cabinet, for ease of installation in existing facilities. The XDV may also be suspended from overhead, using suitable mounting methods.

The XDH is installed among equipment cabinets and is particularly suited for new installations.

EXAMPLE

Continuing the preceding data center example (in [Calculate the Heat Load to be Handled by Liebert® XD System](#) on page 9) of a server room 2000 ft² with 30 racks (15 producing 20kW of heat per rack and 15 producing 10 kW of heat per rack), the three Liebert® XDPs required can supply coolant to various types of Liebert® XD modules. For instance, the racks with 20kW per rack could be cooled with either Liebert® XDH32 and XDO20. The racks with 10kW per rack could be cooled using the Liebert® XDV10.

1. For the 15 racks with 20kW of heat, the total load is:

$$15 \text{ racks} \times 20\text{kW per rack} = 300\text{kW}$$

The perimeter cooling will address the first 2-5kW per rack:

$$2\text{kW} \times 15 \text{ racks} = 30\text{kW}$$

The Liebert® XD solution would have to remove 270kW for these racks with higher heat load.

$$300\text{kW} - 30\text{kW} = 270\text{kW}$$

Module	Conditions °F (°C)	Capacity at Conditions, kW	Load, kW	Modules Required
Liebert® XDH32	98 (36.6)	30.0	270	9
Liebert® XDO20	98 (36.6)	22.6	270	12

2. For the 15 racks with 10kW of heat each, the total load is:

$$15 \text{ racks} \times 10\text{kW per rack} = 150\text{kW}$$

The base cooling will address the first 2-5kW/rack:

$$2\text{kW} \times 15 \text{ racks} = 30\text{kW}$$

The Liebert® XD solution would have to remove 120kW for these racks with a higher heat load.

$$150\text{kW} - 30\text{kW} = 120\text{kW}$$

Module	Conditions °F (°C)	Capacity at Conditions, kW	Load, kW	Modules Required
Liebert® XDV10	98 (36.6)	10.0	120	12

3. For this data center example, the Liebert® XD solution would consist of:

- 3 Liebert® XDP160s
- 12 Liebert® XDV10s

and any of the following:

- 9 Liebert® XDH32s
- 12 Liebert® XDO20s

3.4 Configuring a Liebert® XD System

3.4.1 Number of Modules Supported by a Liebert® XDP or Liebert® XDC

The numerals designating the model size of a Liebert® XD module may be used to configure a cooling system. For example, a Liebert® XDO32 has a model size of 32 and a Liebert® XDP160 will accommodate cooling modules with a cumulative model size of 160.

Similarly, the minimum number of modules connected to a Liebert® XDP or Liebert® XDC may be calculated using the model size number for the Liebert® XDP or Liebert® XDC and the modules. See **Table 3.1** below .

Table 3.1 Maximum and Minimum Modules Supported by a Liebert® XDP or Liebert® XDC

Cooling Module Type	Liebert® XDC		Liebert® XDP	
	Max	Min	Max	Min
Vertiv™ Liebert® XDH32	5	2	5	2
Vertiv™ Liebert® XDO20	8	4	8	3
Vertiv™ Liebert® XDV8	20	8	20	6
Vertiv™ Liebert® XDV10	16	7	16	5

Different types of Liebert® XD cooling modules may be connected to the same Liebert® XDP or Liebert® XDC as long as the sum of their cooling capacity does not exceed the supporting Liebert® XDP’s or Liebert® XDC’s model size number.

EXAMPLE

Continuing the example in [Selecting Liebert® XD Cooling Modules](#) on page 10 , the Liebert® XD solution in that example consisted of:

- 3 Liebert® XDP160s
- 12 Liebert® XDV10s

and any of the following:

- 9 Liebert® XDH32s
- 12 Liebert® XDO20s

1. Using the Liebert® XDH32 to continue with the example, the Liebert® XD systems could be populated so that the modules were on dedicated Liebert® XDPs.

Table 3.2 Sample Liebert® XD Coolant Supply Loop Connections

Liebert® XD Loop	Liebert® XDH32	Liebert® XDV10	Maximum Loop Load, kW
Liebert® XDP 1	5	0	150
Liebert® XDP 2	4	0	120
Liebert® XDP 3	0	12	120

2. Another possibility would be to mix the Liebert® modules in a manner that allows each Liebert® XDP to have similar loads.

Table 3.3 Sample Liebert® XD Coolant Supply Loop Connections, Balanced Loads

Liebert® XD Loop	Liebert® XDH32	Liebert® XDV10	Applied System Load, kW*
Liebert® XDP 1	3	4	130
Liebert® XDP 2	3	4	130
Liebert® XDP 3	3	4	130

NOTE: An individual Liebert® XDP160 or Liebert® XDC 160 can support up to 160W of total cooling modules. The total flow by the various modules whose individual cooling capacities may vary based on the data center conditions, such as the entering air temperatures or entering refrigerant temperature

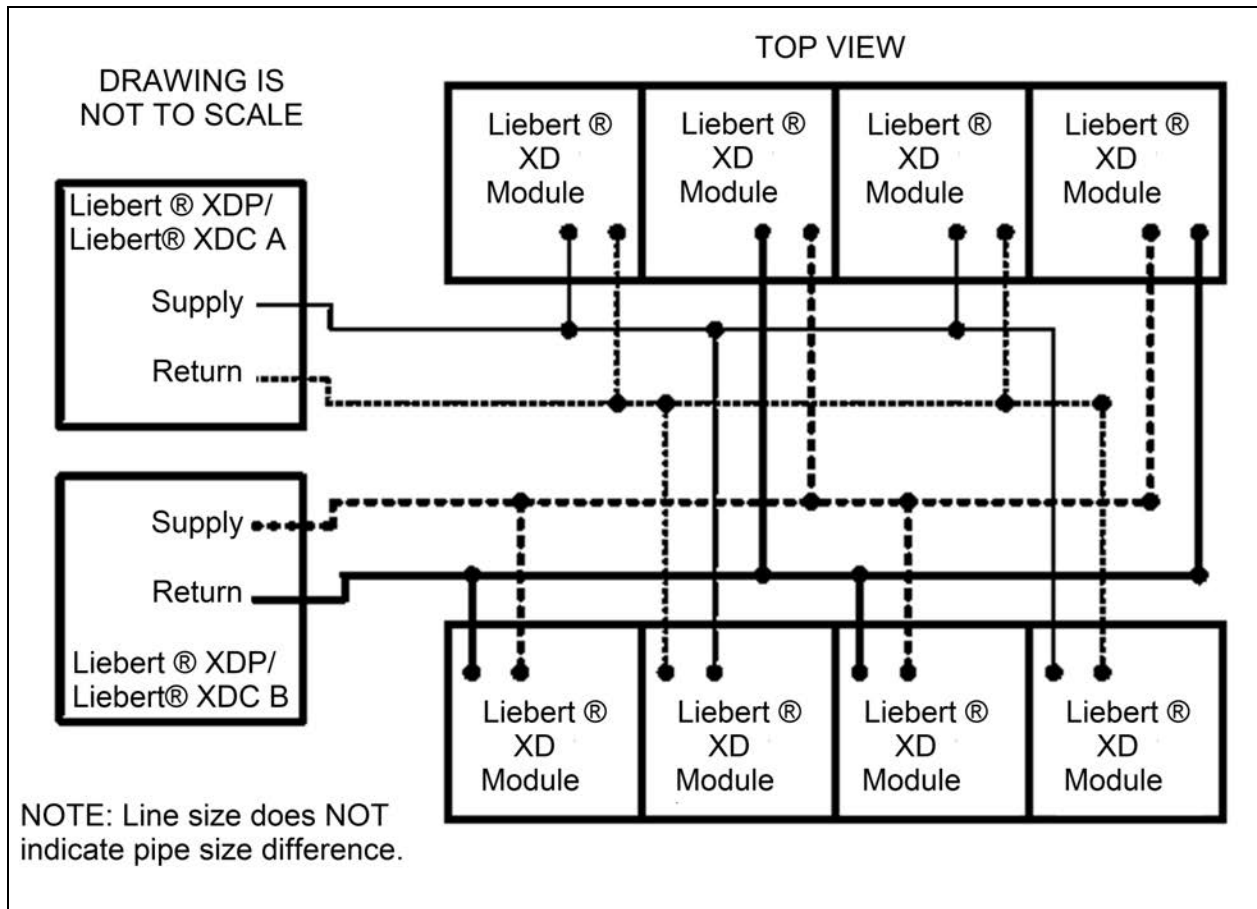
For the Liebert® XD system examples above, additional modules may be added until the 160kW maximum flow limit is reached.

The Liebert® XDP 3 in the example in **Table 3.2** on the previous page, which has a load of 130kW, could accept modules that would remove 30kW—one Liebert® XDH32 and one Liebert® XDV10.

3.4.2 System Connection Configuration

If possible, connect the Liebert® XD modules to Liebert® XDPs or XDCs in an interlaced configuration. In an interlaced configuration, half the cooling modules in an aisle are connected to one Liebert® XDP or Liebert® XDC and the other half in that aisle are connected to another Liebert® XDP or Liebert® XDC. Interlacing the connection piping will keep half the Liebert® XD modules operating and maintain cooling in the conditioned space should one of the Liebert® XDP or Liebert XDC units fail.

Figure 3.1 Typical Liebert® XD Piping—Interlaced Connections



3.5 Airflow Requirements for Liebert® XD Solutions

Computer manufacturers typically specify a temperature change from intake to exhaust (delta T) of 18-27°F (10-15°C) for the air passing through a rack enclosure. The heat generated by electronic equipment combined with the tight quarters of equipment cabinets mean high volumes of air must move through an enclosure to meet this cooling specification.

A Liebert® XD system can supply the cold air to satisfy this cooling demand, but airflow through the enclosure must be adequate to extract the heat from the cabinet. Liebert® XDA units can boost the airflow to levels necessary to protect critical equipment. The Liebert® XDA is particularly suited to the hot aisle/cold aisle arrangement.

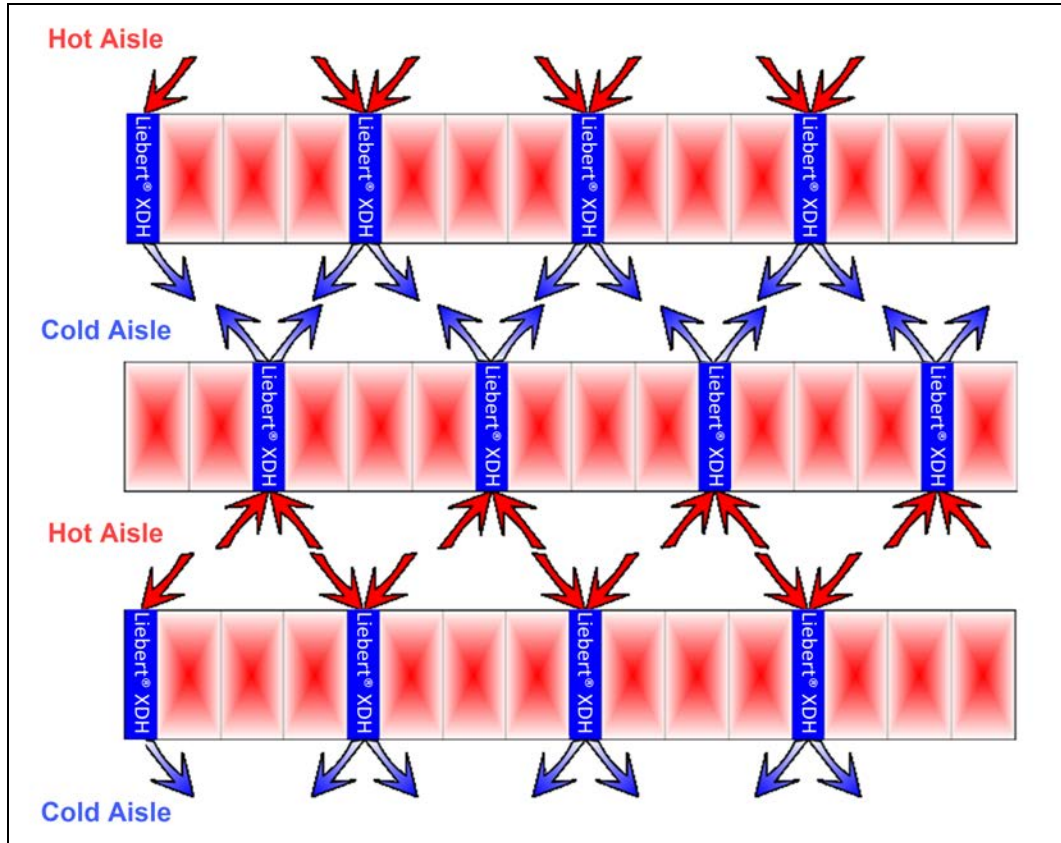
3.6 Liebert® XDH Placement

The free-standing Liebert® XDH cooling module is best placed among the equipment cabinets in a hot aisle-cold aisle arrangement (see **Figure 3.2** on the facing page). The Liebert® XDH draws in air from the hot aisle, cools it and discharges the cooled air into the cold aisle where it is drawn into the equipment cabinets. Even spacing aids in optimizing cooling.

Liebert® XDH modules should be placed among the cabinets that generate the greatest amount of heat. If heat loads are dispersed evenly throughout the room, the Vertiv™ Liebert® XDH modules may be spread out accordingly. Bi-directional air diffusers should be used on Vertiv™ Liebert® XDH modules installed between racks.

If a Liebert® XDH is installed at the end of a row, uni-directional air diffusers should be used on that Liebert® XDH. The uni-directional diffusers can be used for left or right air discharge by removing them from the Liebert® XDH, turning them 180 degrees, then reattaching them to the Liebert® XDH.

Figure 3.2 Liebert® XDH Placement (Top View)



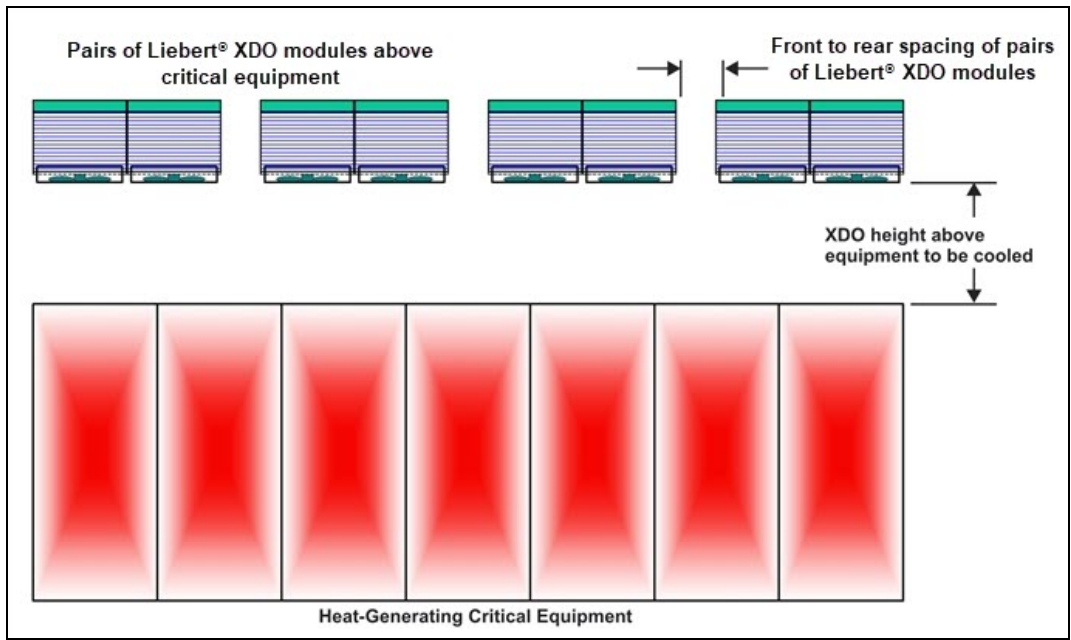
3.7 Liebert® XDO Placement

3.7.1 Determining Spacing of Liebert® XDOs in an Aisle

Liebert® XDO modules should be placed in rows directly above the cold aisles of a room for optimum cooling. Each Liebert® XDO serves an area equal in width to the cold aisle spacing, typically 12 to 16 feet (3.7 to 4.9m). The length of the area served includes any space between Liebert® XDO modules in a row. Depending on the cooling capacity to be achieved, spacing between Liebert® XDO modules in a row may vary from zero to as much as 6 feet (1.8m). When the spacing increases to more than 6 feet (1.8m), overall performance of the system may be negatively affected and gaps in cooling may occur.

Install one Liebert® XDO at the end of each aisle being cooled and to space the remainder between these end modules as shown in **Figure 3.3** on the next page. This layout will block the incursion of hot air around the side of the end cabinets. Allowing space between the Liebert® XDO groups facilitates maintenance by allowing access to the overhead space.

Figure 3.3 Liebert® XDO Spacing—Horizontal (Side View)



3.7.2 Determining Vertical Placement of Liebert® XDOs Above the Cold Aisle

In the maximum density configuration, Vertiv recommends placing the Liebert® XDOs between 18 and 24 inches (457-609mm) above the equipment cabinets. In some cases where the required density is less, the front-to-rear spacing of Liebert® XDOs in a row will be increased. To ensure coverage of the wider spaces between the Liebert® XDO modules, the vertical distance between the cabinets and the Liebert® XDOs should be increased. However, the recommended maximum height of the Liebert® XDO above the cabinets is 30 inches (762mm). See Figure 3.4 below.

Figure 3.4 Liebert® XDO Placement Over Cold Aisle

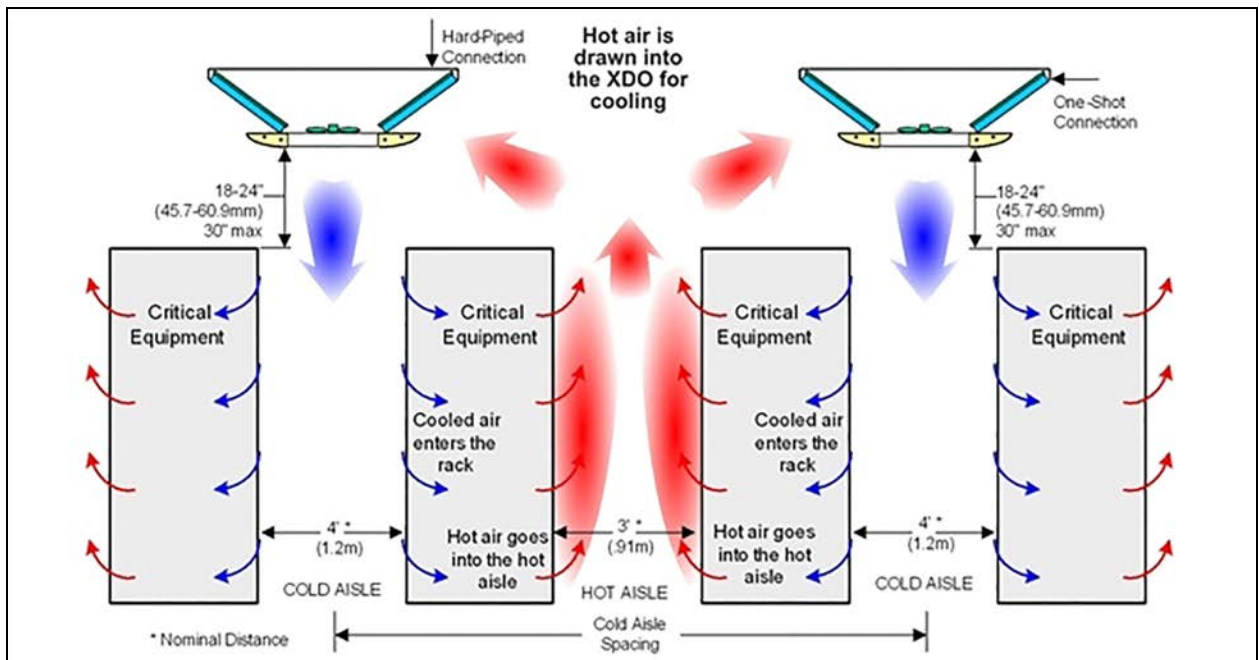


Figure 3.4 on the previous page can be used to determine the correct number and spacing of Liebert® XDOs.

Table 3.4 Calculating Quantity and Spacing of Liebert® XDO Modules (Example Below is Liebert® XDO20)

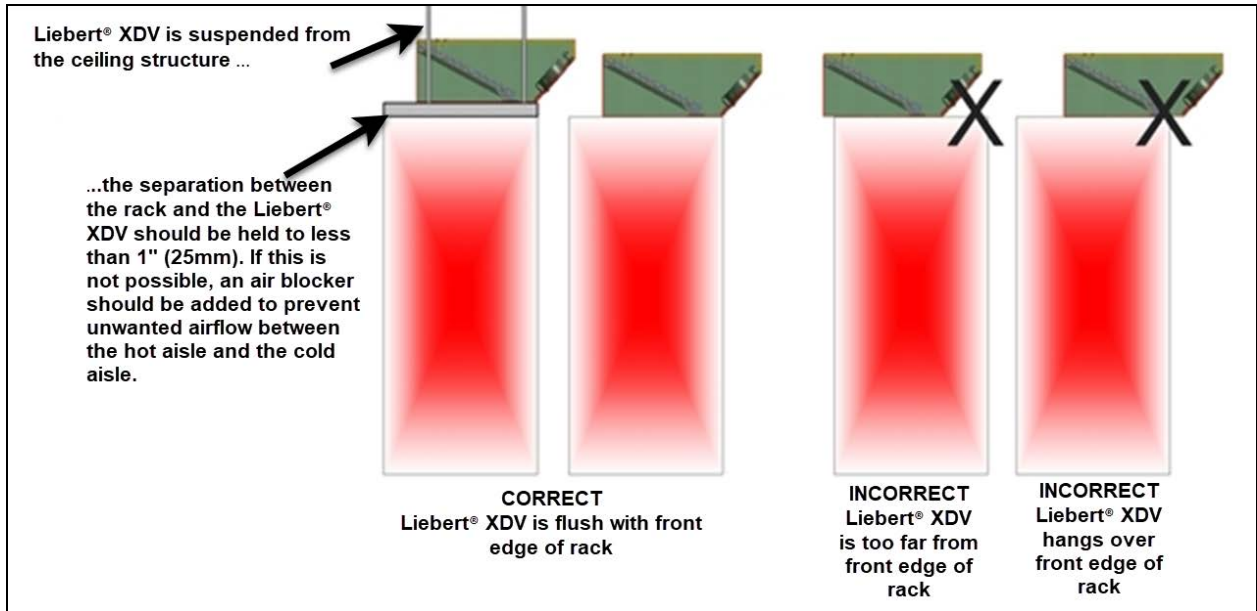
Input Information	Step	Result
Total heat load in the room, kW	A	
Reserve capacity needed (10% to 25% of A is recommended)	B	
	C	Required cooling capacity, kW = A + B
Existing/planned Vertiv™ Liebert Deluxe/Vertiv™ Liebert® DS unit sensible capacity, kW	D	
	E	Required Liebert® XD system cooling capacity, kW = C – D
	F	Number of Liebert® XDO20s required = E ÷ 20, rounded up (60Hz) Number of Liebert® XDO20s required = E ÷ 16, rounded up (50Hz)
	G	Number of Liebert® XDP/XDC units required = F ÷ 8, rounded up (60Hz and 50Hz)
Room area, square feet	H	
	I	Area served by each Liebert® XDO20 = H ÷ F
Spacing of cold aisles, center-to-center, typically 12-16 ft (3.7 to 4.9m)	J	
	K	Spacing between each Liebert® XDO = (I ÷ J) - 2
	L	Required Liebert® XD system cooling density = E x 1000 ÷ H OK if under 640; otherwise, additional cooling is required from Liebert® Deluxe or Liebert® DS units.

3.8 Liebert® XDV Module Placement

Liebert® XDV modules should be placed on top of the cabinets that generate the greatest amount of heat. If heat loads are dispersed evenly throughout the room, the Liebert® XDV modules may be spread out accordingly.

The Liebert® XDV must be placed toward the front of the equipment cabinet, so that its front bottom edge is flush with the front top edge of the cabinet. Placing the module farther back on the top of the cabinet will restrict airflow into the cold aisle. Placing the module too far toward the front of the cabinet will decrease the amount of hot air drawn into the module.

Figure 3.5 Positioning Liebert® XDV on Top of Cabinet



Both of the Liebert® XDV’s power cords should be connected to power sources. If only one power source is available, then only the power cord labeled SECONDARY should be connected to the power source.

Piping for the Liebert® XDV is routed upward to the main return and supply pipes to and from the Liebert® XDP/XDC.

Table 3.5 below may be used to determine the correct number of Liebert® XDV modules.

Table 3.5 Determine Required Number of Liebert® XDV Modules (Example Below is Liebert® XDV10)

Input Information	Step	Results
Total heat load in the room, kW	A	
Reserve capacity needed (10% - 25% of A is recommended)	B	
	C	Required cooling capacity, kW = A + B
Existing/planned Liebert® Deluxe/DS sensible capacity, kW	D	
	E	Required Liebert® XD system cooling capacity, kW = C - D
	F	Number of Liebert® XDV10 modules required = E ÷ 10, rounded up (60Hz) Number of Liebert® XDV10 modules required = E ÷ 8, rounded up (50Hz)
	G	Number of Liebert® XDP/XDC units required = F ÷ 16, rounded up (60Hz and 50Hz)
Room area, square feet	H	
	I	Area served by each Liebert® XDV10 = H ÷ F
	L	Required Liebert® XD system cooling density = E x 1000 ÷ H OK if under 580 for 12-foot cold aisle spacing OK if under 435 for 16-foot cold aisle spacing Otherwise, additional Liebert® Deluxe or Liebert® DS capacity is needed.

3.9 Liebert® XDP/XDC Placement

The Liebert® XDP/XDC may be placed in the critical space or in an adjacent equipment room. The allowable distance between the Liebert® XDP/XDC and its connected cooling modules is determined by the piping design and by the amount of refrigerant required. Refer to [Liebert® XD Refrigerant](#) on page 29 and [Liebert® XD Piping System Design](#) on page 22.

The maximum height of any of the main or connecting piping should be no more than 20 feet (6m) above the top of the Liebert® XDP/XDC unit. Liebert® XDV/XDO modules should be placed as close to the same level as possible. The differences in elevation between the highest and lowest Liebert® XDV or XDO module in a system should be no more than 6 feet (2m).

3.10 Examples of Expansion and Interlaced Connection of Liebert® XD Cooling Modules

Figure 3.6 Liebert® XDV Modules Mounted on Racks Emitting 3kW of Heat, Top View

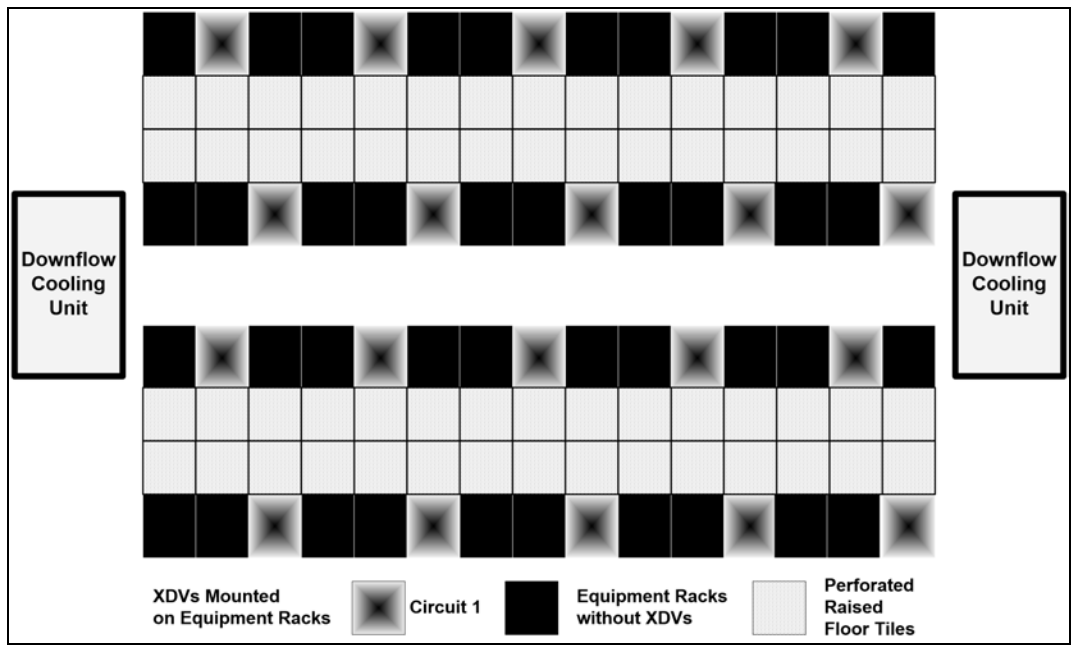


Figure 3.9 Liebert® XDV Modules Mounted on Racks Emitting 16kW of Heat, Top View

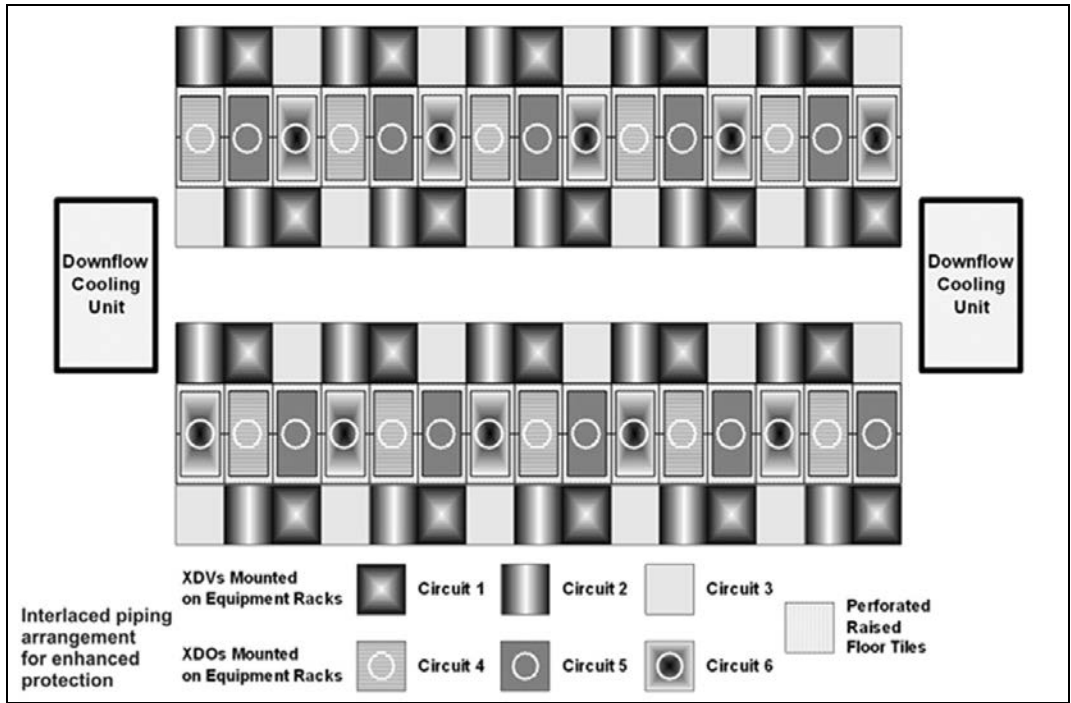


Figure 3.10 Multiple Liebert® XD Modules in an Interlaced System



These methods can increase the redundancy of any Liebert® XD system:

- Hot aisle/cold aisle design

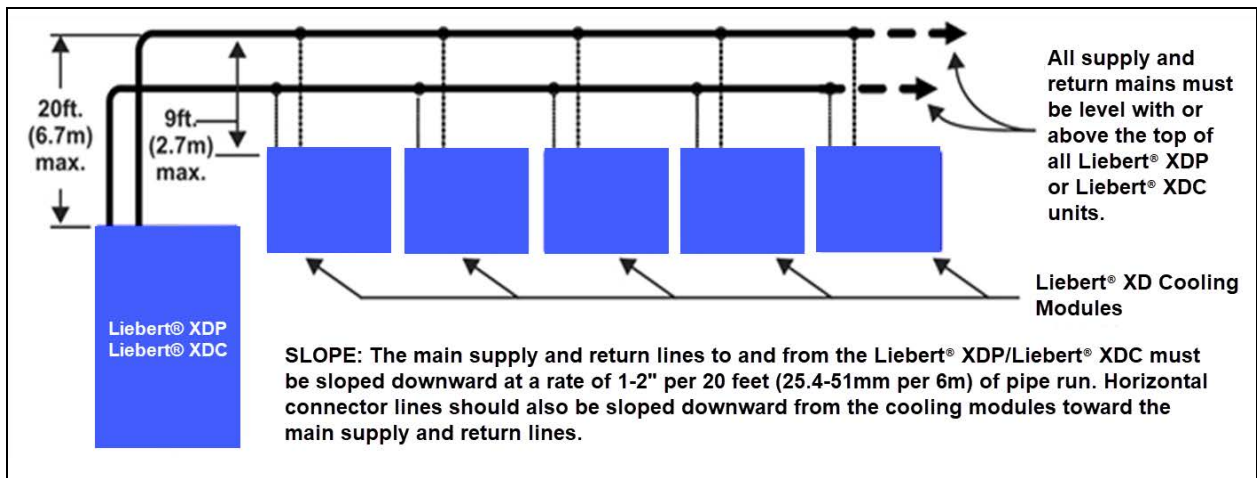
- Interlacing the modules with different Liebert® XDPs or Liebert® XDCs
- Using multiple types of Liebert® XD cooling modules
- Containment methods

3.11 Liebert® XD Piping System Design

All piping must be ASTM (American Society for Testing and Materials) Type ACR copper pipe. The typical maximum operating pressure in the system is 90 psi (620kPa).

Piping for the Liebert® XD system is arranged in a manner similar to piping for a chilled water system. Liebert® XD cooling modules are connected in parallel between the main return and supply pipes going to and from the Liebert® XDP/Liebert® XDC. **Figure 3.11** below represents a typical configuration. **The guidelines provided for pipe size must be strictly followed. Failure to size the main lines and connection lines adequately may result in reduced cooling capacity.** The critical aspects of pipe sizing are related to refrigerant volume and pressure drop. Each must be minimized.

Figure 3.11 Piping for Liebert® XDP/XDC Used With Liebert® XD Cooling Modules



The assembly and connection means used for piping in the Liebert® XD system are similar to that of conventional refrigeration systems. All piping should be installed with high temperature brazed joints. Soft solder is not recommended. The lines being brazed **MUST** be filled with flowing dry nitrogen during brazing to prevent excessive oxidation and scale formation inside the piping. Prevailing good refrigeration practices must be employed for piping supports, leak testing, dehydration and charging. Failure to use good system practices may result in damage to the system. Refer to the ASHRAE refrigeration handbook for general good-practice refrigeration piping.

Follow all guidelines in [Liebert® XD Piping System Design](#) above and [Liebert® XD Piping Slope](#) on page 24 during installation.

Insulate all piping lines to prevent condensation in applications where the dew point approaches the R-134a refrigerant temperature. This might occur where Liebert® XD module piping is above a dropped ceiling or in other areas not measured by sensors connected to the Liebert® XDP or Liebert® XDC.

See **Table 3.6** on the facing page for recommended pipe sizes and **Figure 3.12** on the facing page for piping segment locations.

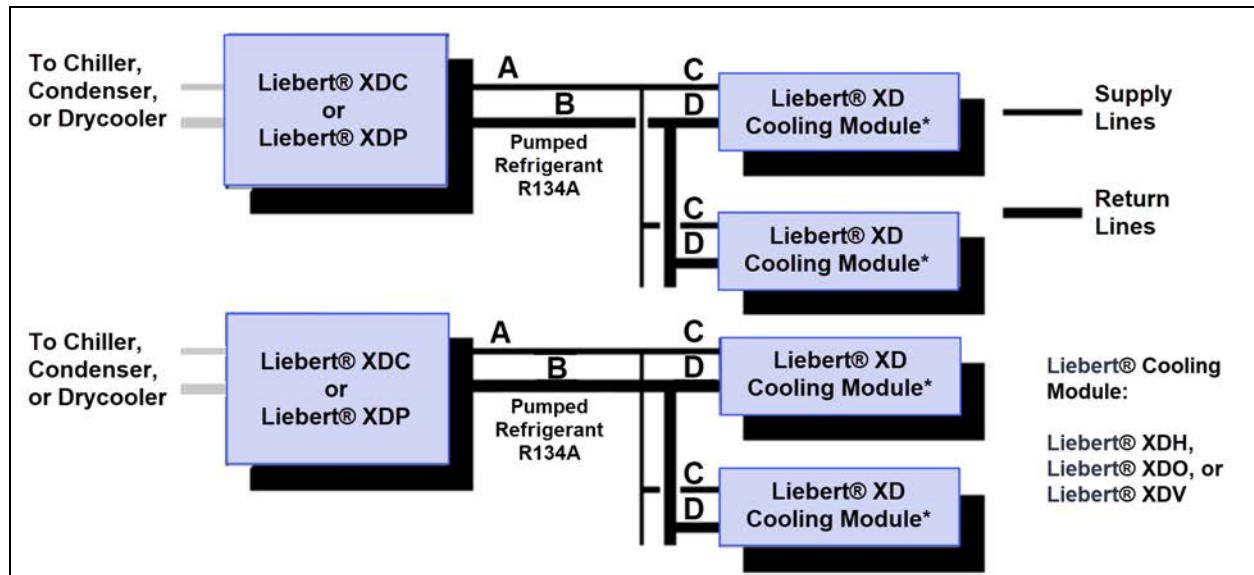
Table 3.6 Supply, Return Pipe Sizes for Refrigerant Loop

Pipe Function	Key to Piping in Generic Piping	Size / Equivalent Pipe Length
Liebert® XDP supply line, from Liebert® XDP supply to farthest Liebert® XD cooling module	A	1-1/8" OD for lengths up to 60 feet
		1-3/8" OD for lengths over 60 but less than 175 feet
Liebert® XDP return line, from farthest Liebert® XD cooling module to Liebert® XDP return	B	2-1/8" OD for lengths up to 60 feet
		2-5/8" OD for lengths over 60 but less than 175 feet
From any model Liebert® XDO/Liebert® XDH to supply line of Vertiv™ Liebert® XDP	C	1/2" OD for lengths up to 10 feet
		7/8" OD for lengths over 10 but less than 25 feet
From any model Liebert® XDO/Liebert® XDH/ to return line of Liebert® XDP	D	7/8" OD for lengths up to 10 feet
		1-1/8" OD for lengths over 10 but less than 25 feet
From any model Liebert® XDV supply to supply line of Liebert® XDP	C	1/2" OD for lengths up to 10 feet
		5/8" OD for lengths over 10 but less than 35 feet
From any model Liebert® XDV return to return line of Liebert® XDP	D	5/8" OD for lengths up to 10 feet
		7/8" OD for lengths over 10 but less than 35 feet

For additional information about piping connections, see the unit’s user manual: Liebert® XDP, 16647; Liebert® XDC, SL-16673; Liebert® XDO, SL-16666; Liebert® XDV, SL-16626; and Liebert® XDH SL-17210.

NOTE: To minimize the amount of refrigerant required, do NOT oversize the piping.

Figure 3.12 Generic Piping Layout



3.12 Liebert® XD Piping Slope

The main supply and return lines to and from the XDP/XDC must be sloped downward toward the XDP/XDC at a rate of 1-2" per 20 feet (25-51mm per 6m) of pipe run. Horizontal connector lines should also be sloped downward from the cooling modules toward the main supply and return lines.

3.13 Bypass Flow Controllers (Field Installed)

To ensure the XDP/XDC pumps operate within the optimum range, some installations require one or more bypass flow controller(s). These devices are added to the field piping, and simulate the flow of additional cooling modules.

Each bypass flow controller should be installed with one shutoff valve to allow the controller to be disabled when cooling modules are added to a Liebert® XD system.

If bypass flow controllers are required, they should be connected between the main supply and the main return lines of the field piping. The connection points to the main supply and return lines should be in a convenient and accessible location between the Liebert® XDP/Liebert® XDC and the first Liebert® XD module in the circuit. See **Figure 3.14** on the facing page and **Figure 3.13** below for piping details of the bypass flow controller.

Refer to **Table 3.7** below to determine the number of bypass flow controllers needed, based on the total nominal cooling capacity of the cooling modules in each Vertiv™ Liebert® XD system.

Table 3.7 Bypass Flow Controllers for Liebert® XDC or Liebert® XDP Based Systems

Cooling Modules - Cumulative Model Size	Required Number of Bypass Flow Controllers	
	Liebert® XDP	Liebert® XDC
48 to 63	3	N/A
64 to 95	2	2
96 to 127	1	1
128 to 160	0	0

Figure 3.13 Bypass Flow Controller Details Dimensions

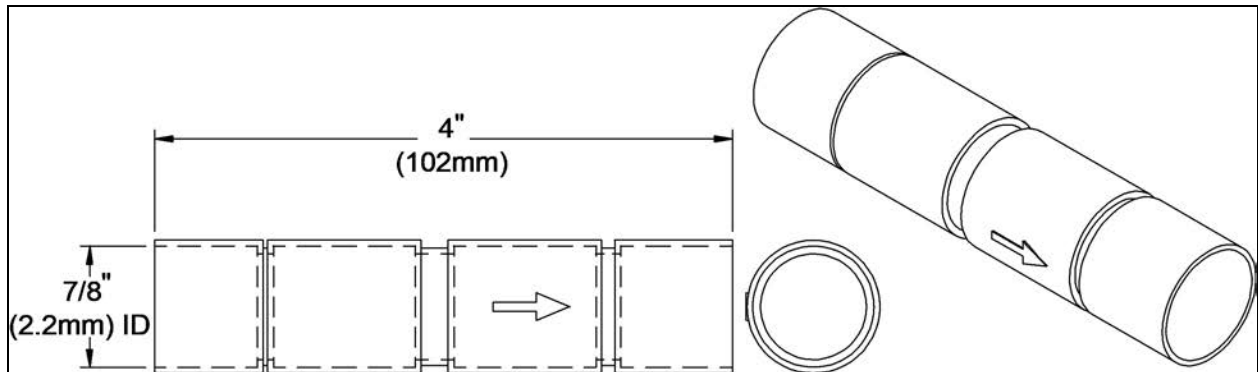


Figure 3.14 Bypass Flow Controller Arrangement

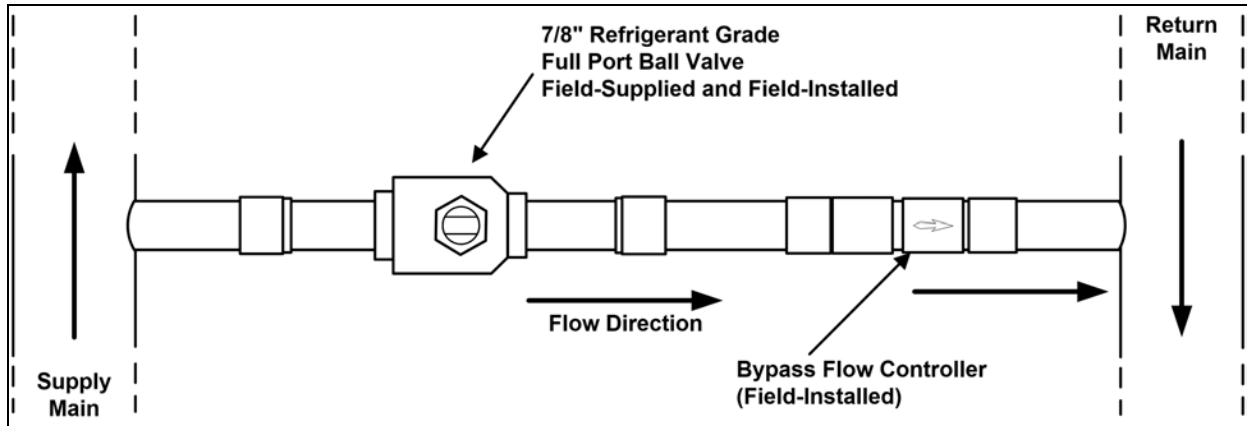
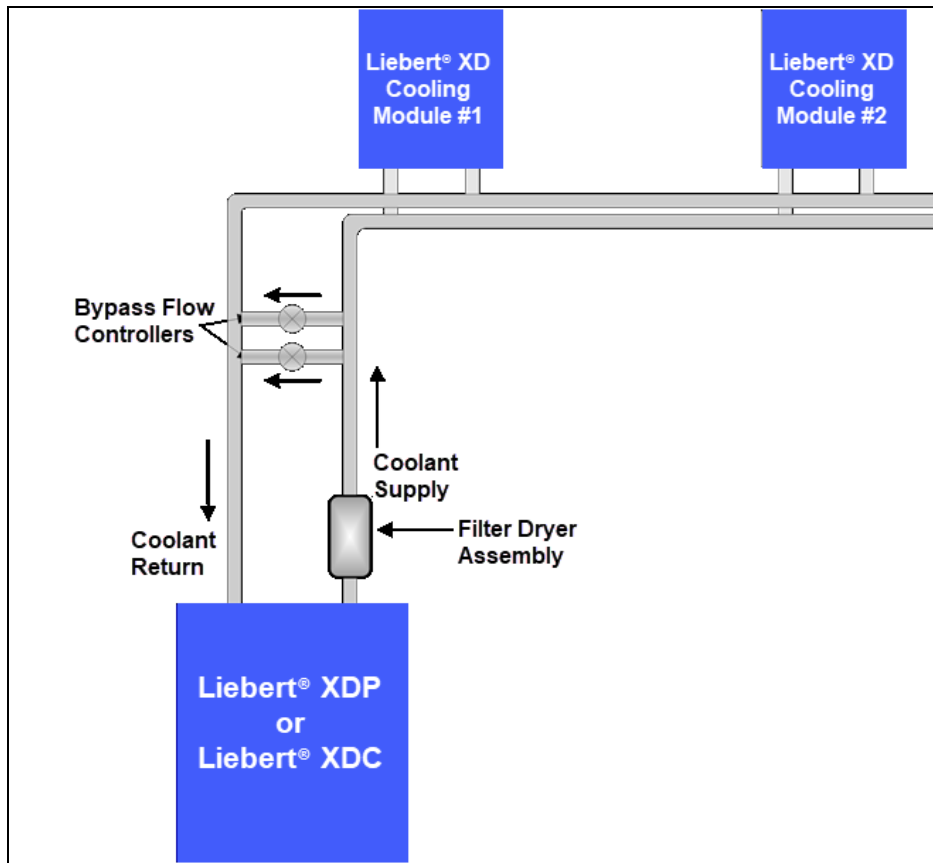


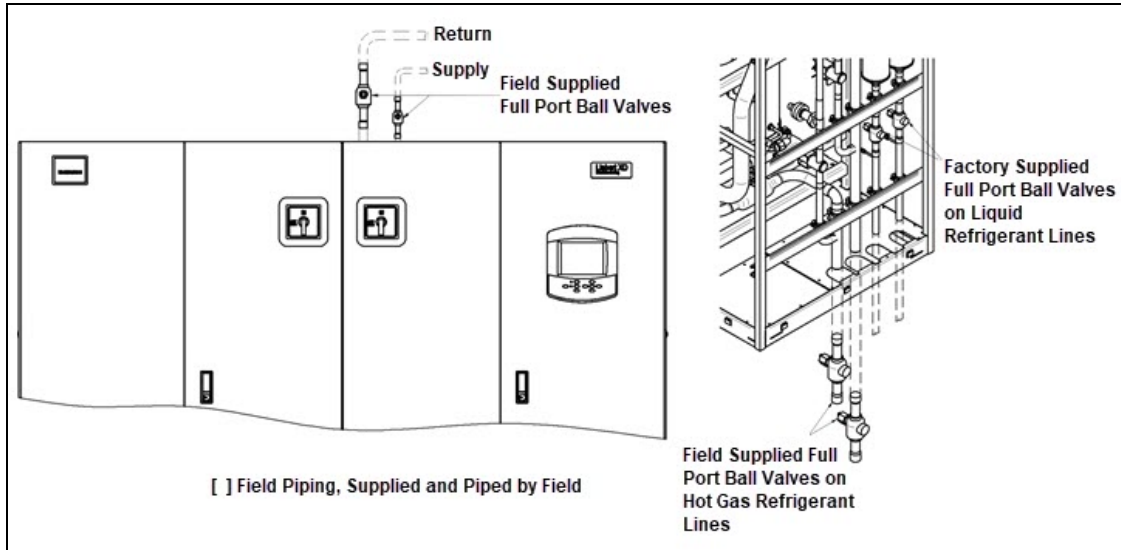
Figure 3.15 Bypass Flow Controller Piping



3.14 Piping Details External Field Installed—Shutoff/Isolation Valves

Isolation valves must be installed on the Liebert® XDC's refrigerant circuit to permit maintenance on the unit (see Figure 3.16 below).

Figure 3.16 General Piping Details--Liebert® XDC



3.15 Piping Details—External Field Installed Shutoff/Isolation Valves

Isolation valves must be installed on the Liebert® XDP's refrigerant circuit to permit maintenance on the unit. See Figure 3.17 below.

Figure 3.17 General Piping Details Liebert® XDP

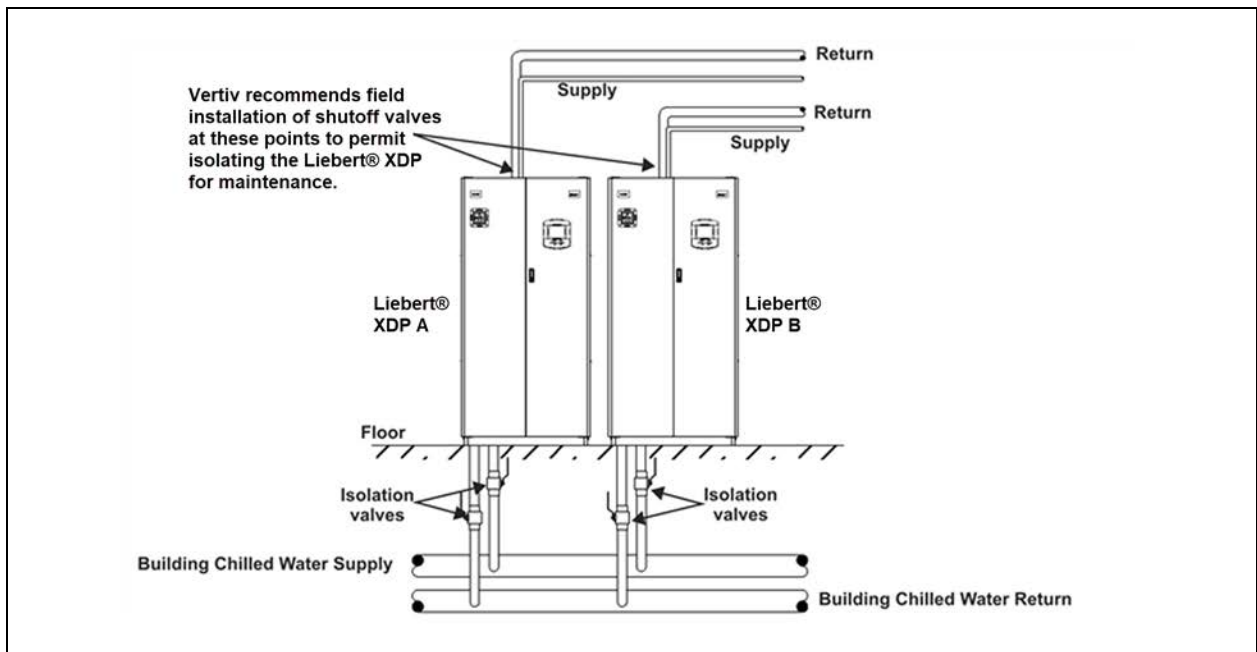


Figure 3.18 External Field Installed Piping—Hard Pipe Connection Diagram XDV and XDH

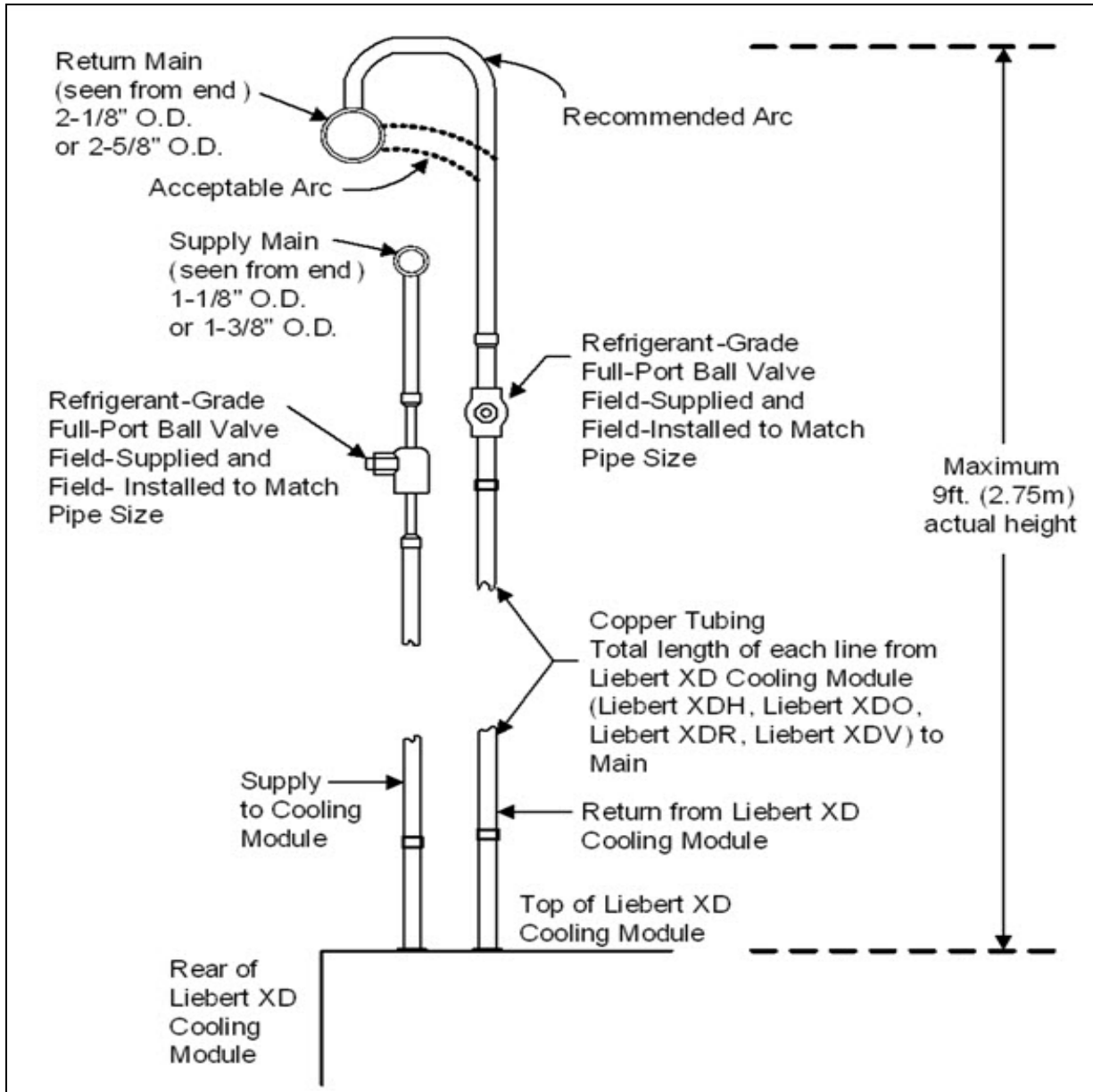
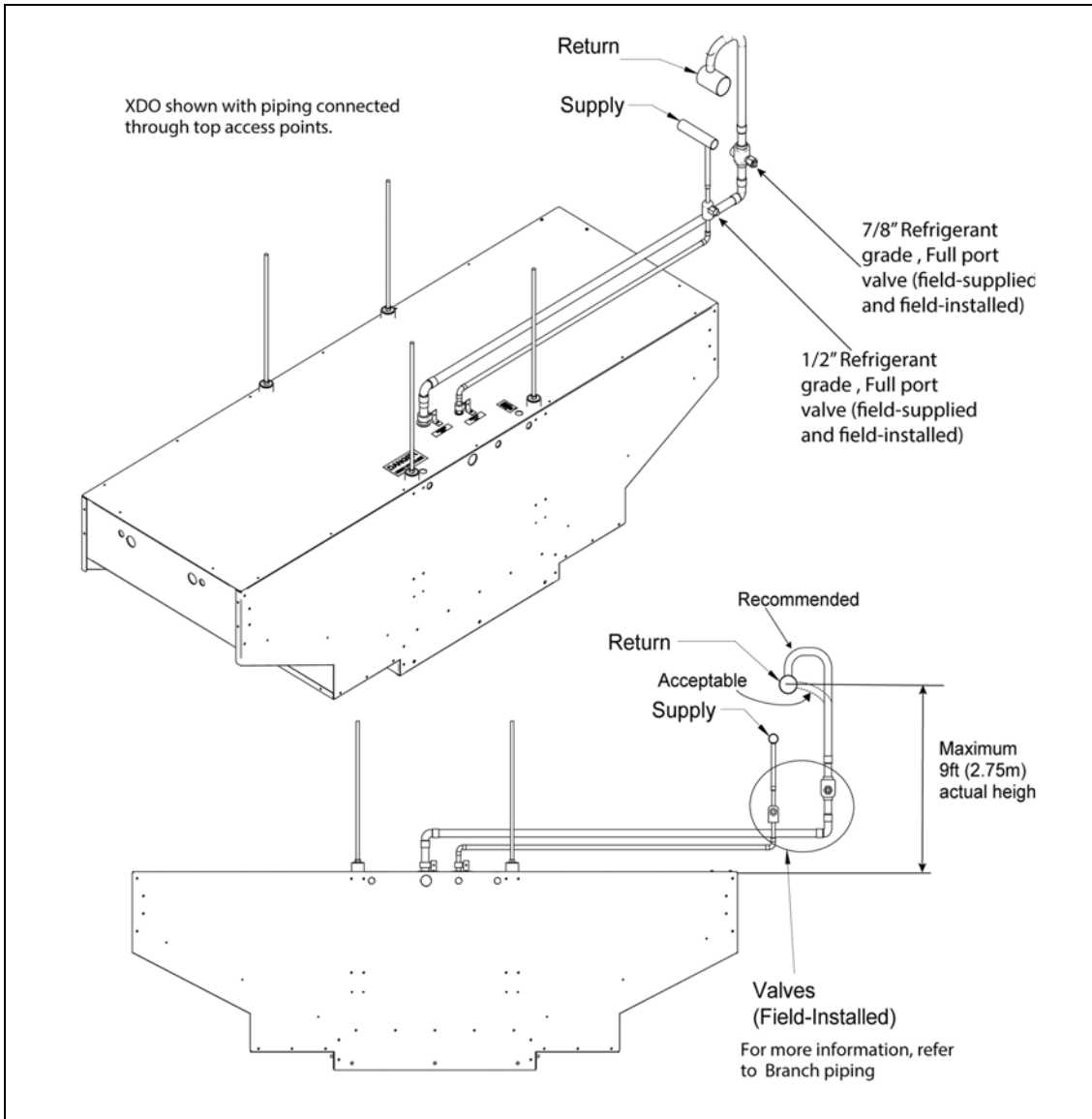


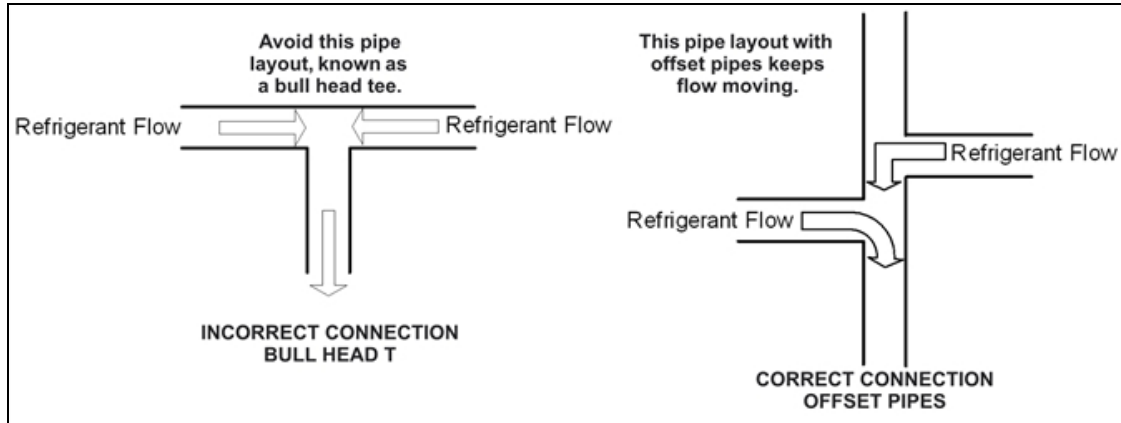
Figure 3.19 External Field Installed Piping—Hard Pipe Connection Diagram for XDO



3.16 Piping Details—Bull Heading Layout

Good piping layout employs offsetting connections to promote easier refrigerant flow, as shown in **Figure 3.20** below. “Bull head T” connections should be avoided.

Figure 3.20 Efficient Piping Layout—Avoid “Bull Head T” Connections



3.17 Liebert® XD Refrigerant

The refrigerant used in the Liebert® XD system is HFC-134a (1,1,1,2-tetrafluoroethane), made by a number of manufacturers. The amount of refrigerant used by the Liebert® XD system may be significantly higher than in typical DX cooling systems.

NOTICE

Risk of improper oil use. Can cause equipment damage.

The Liebert® XD pumped R-134a refrigerant circuits do not use refrigerant oil. Do NOT put oil in the R-134a system.

All the major components of a Liebert® XD system must be installed in a space with a volume of at least 1,000 ft³ (28.3m³) for each 13 pounds of refrigerant in that system from ANSI/ASHRAE Standard 34-2007, *Designation and Safety Classification of Refrigerant*. If the Liebert® XDP/Liebert® XDC is placed in a separate area, such as a machine room, then this area must also meet the volume requirement. Inside the critical space, this includes the space under the raised floor, and the space between the top of the raised floor and the bottom of a suspended ceiling. If the suspended ceiling is all open grates, then this additional space, up to the overhead deck, would also be included.

EXAMPLE

A space is 5,000 square feet, with an 18" raised floor and an 8' 6" suspended ceiling. Liebert® XDOs and a Liebert® XDP are to be placed in this raised-floor area.

The volume of the space is (1.5 + 8.5) x 5,000 or 50,000 cubic feet.

The maximum amount of R-134a refrigerant that can be used in a single Liebert® XDP/Liebert® XDC/Liebert® XD module system within this space is $13 * (50000/1000) = 13 * 50 = 650 \text{ lb}$.

Multiple Liebert® XD systems can be installed in this space, as long as the amount of R-134a refrigerant in any one system does not exceed 650lb. (294.8kg). The maximum amount of refrigerant is 650lb (294.8kg) per Liebert® XD loop.

NOTE: Local codes might permit exceeding the maximum refrigerant limit above if a refrigerant detector and an exhaust system are installed. Installing oxygen sensors may meet some local codes.

3.18 Determining Refrigerant Volume

After the preliminary system design is completed, [System R-134a Charge for a Liebert® XDP/XDC with Any Model Liebert® XDH/XDO/XDV](#) below through [Worksheet to Calculate Refrigerant Charge](#) on the facing page may be used to determine the amount of refrigerant required. Perform the calculation below for each Liebert® XD system being configured.

NOTE: All lengths in System R-134a charge for a Liebert® XDP and XDC with any model Liebert® XDH/XDO/XDV below. System refrigerant charge for the supply and return mains below, R-134a refrigerant charge for hard piped connector lines to and from any model Liebert® XDH /XDO/XDV, are actual pipe lengths, not equivalent pipe lengths.

3.18.1 Liebert® XDP/XDC Pumped R-134a Circuit Volume

This is the refrigerant circuit from the Liebert® XDP/XDC to the Liebert® XD cooling module.

NOTE: All lengths in System R-134a charge for a Liebert® XDP and XDC with any model Liebert® XDH/XDO/XDV below. System refrigerant charge for the supply and return mains below, R-134a refrigerant charge for hard piped connector lines to and from any model Liebert® XDH /XDO/XDV, are actual pipe lengths, not equivalent pipe lengths.

Table 3.8 System R-134a Charge for a Liebert® XDP/XDC with Any Model Liebert® XDH/XDO/XDV

Refrigerant Charge, lb (kg)	Per Liebert® XD Unit (Excludes Connector Lines to and from Liebert® XD Cooling Module)
157 (71.2)	Liebert® XDP/XDC
3.55 (1.61)	Liebert® XDO
2.32 (1.05)	Liebert® XDV
2.66 (1.21)	Liebert® XDH (per circuit)

Table 3.9 System Refrigerant Charge for the Supply and Return Mains

Refrigerant Charge, lb/foot (kg/m)	Supply/Return Main Length and Diameter
0.45 (0.67)	Main supply actual length per 1-1/8" OD copper tubing
0.68 (1.01)	Main supply actual length per 1-3/8" OD copper tubing
0.28 (0.42)	Main return actual length per 2-1/8" OD copper tubing
0.43 (0.64)	Main return actual length per 2-5/8" OD copper tubing

Table 3.10 R-134a Refrigerant Charge for Hard Piped Connector Lines To and From Any Model Liebert® XDH/XDO/ XDV

Refrigerant Charge, lb/foot (kg/m)	Hard-Piped Connector Length and Diameter
0.08 (0.12)	1/2" OD Liebert® XDH/XDO/XDV supply connector actual length
0.13 (0.19)	5/8" OD copper tubing Liebert® XDV supply connector actual length
0.26 (0.39)	7/8" OD Liebert® XDO/XDH supply connector actual length

Table 3.10 R-134a Refrigerant Charge for Hard Piped Connector Lines To and From Any Model Liebert® XDH/XDO/ XDV (continued)

Refrigerant Charge, lb/foot (kg/m)	Hard-Piped Connector Length and Diameter
0.02 (0.03)	5/8" OD copper tubing Liebert® XDV return connector actual length
0.04 (0.06)	7/8" OD copper tubing Liebert® XDV return connector actual length
0.04 (0.06)	7/8" OD copper tubing Liebert® XDH/XDO return connector actual length
0.07 (0.1)	1-1/8" OD copper tubing XDH/XDO return connector actual length

3.18.2 Calculating Refrigerant R134a Charge—Example

Using [System R-134a Charge for a Liebert® XDP/XDC with Any Model Liebert® XDH/XDO/XDV](#) on the previous page, [Table 3.9](#) on the previous page, [Table 3.10](#) on the previous page, calculate the refrigerant charge of the individual sections of your Liebert® XD system. Add the calculated charge amounts to determine the amount of R-134a refrigerant required for one system combining a Liebert® XDP with Liebert® XD cooling modules (Liebert® XDH, Liebert® XDO, and Liebert® XDV). The example below combines one Liebert® XDP with 20 Liebert® XDV8 cooling modules.

Table 3.11 Calculating Refrigerant Charge—Example

Components	Number of Units or Piping Length, feet	Pounds Per Component	Total, lb.
Vertiv™ Liebert® XDP/Vertiv™ Liebert® XDC	1	157	157
Vertiv™ Liebert® XDV8 Cooling Modules	20	2.32	46.4
Supply Main, 1-1/8"	100	0.45	45
Return Main, 2-1/8"	100	0.28	28
Total			276.4

Table 3.12 Worksheet to Calculate Refrigerant Charge

Components	Number of Units or Piping Length	Pounds Per Component	Total
Total			

Verify that the refrigerant volume of the Liebert® XD system with the longest piping length is within the allowable limit. If the allowable limit is exceeded, the Liebert® XDP/XDC should be moved closer to the cooling modules (refer to [Liebert® XD Refrigerant](#) on page 29 for limits and related details). Another way to shorten the total pipe length is to reroute the pipe runs.

3.19 Chilled Water Piping

The Liebert® XDP is offered only with a two-way chilled water control valve. Some applications may require the use of a pressure activated bypass valve to prevent dead-heading of the chilled water pump. This bypass valve must be specified by the engineer responsible for design of the chilled water field piping system.

NOTICE

Risk of particles in chilled water. Can cause equipment damage and reduced cooling.

Failure to install a strainer in the supply line to the Liebert® XDP can result in damage to the unit's heat exchanger.

Install a 20-40 mesh strainer on the chilled water supply to the Liebert® XDP. The strainer is required to prevent particles in the chilled water from entering the heat exchanger of the Liebert® XDP. The maximum distance of the strainer from the Liebert® XDP is 10 feet (3m).

Figure 3.21 Piping Access Points

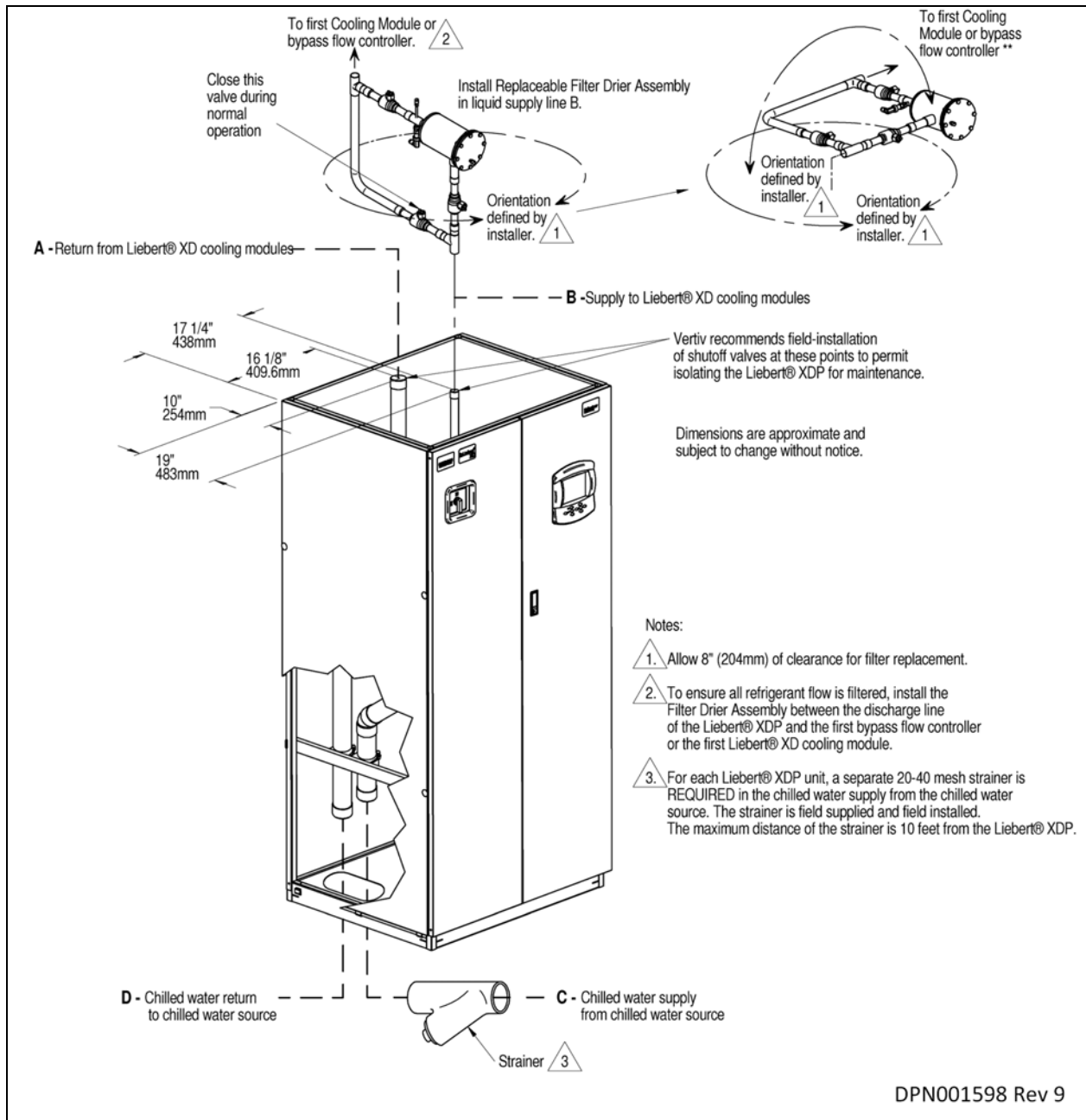


Table 3.13 Unit Piping Outlet Connection Sizes, Inches, OD Cu

Model	Pipe Connection Point			
	A	B	C	D
50/60 Hz				
XDP160	2-1/8	1-1/8	2-5/8	2-5/8

Chilled water connections to the Liebert® XDP are near the bottom of the unit. Refer to the Liebert® XDP User Manual (SL-16644) for further information. Piping is routed downward from the unit to chilled water piping under the raised floor. Connections are made using standard practices for copper chilled water piping. Field-supplied Victaulic® connections may be used to simplify installation in existing facilities. Refer to [High Density Module Specifications and Model Number Nomenclature](#) on page 141 for additional information.

3.20 Electrical

Make all wiring and electrical connections in accordance with local and national codes. Refer to the applicable table in [High Density Module Specifications and Model Number Nomenclature](#) on page 141 regarding wire size and circuit protection requirements. Refer to electrical schematic when making connections.

3.21 Temperature/Humidity Sensor Locations

The display panel sensor and Liebert® iCOM™ sensor (shipped loose) must always be installed in the conditioned space. The display panel sensor and Liebert® iCOM™ sensor may be mounted on the Liebert® XDC/XDP's front door if the unit is located in the area that it conditions.

The remote temperature/humidity sensor for the Liebert® XDP and XDC should be installed in the higher-temperature portion of the cold aisle where the Liebert® XD modules are located. Alternatively, it can be placed on the return air side of the primary air mover, such as a Liebert® DS, in the room if it represents the conditions where all the Liebert® XD cooling modules are located. It should not be installed where ambient air might cause false readings, for example, near unsealed doors, windows and similar areas.

3.22 Connecting Liebert® XDP and Liebert® XD Cooling Modules in a CANbus Network

A Controller Area Network (CAN) is a specialized internal communication network. It allows the Liebert® XDP and the Liebert® XD smart modules to communicate without a host computer. Networking a Liebert® XDP with smart modules enables the smart modules to be controlled and monitored from the Liebert® XDP.

The Liebert® XD smart modules CANbus is to be networked only to the Liebert® XDP that is supplying coolant to the smart modules.

Figure 3.22 Liebert® XD System with CANbus



3.2.2.1 CANbus Cables

The Liebert® XDP may be connected to smart modules with CANbus cables. The shielded cable consists of three pairs of twisted wires with a six-pin RJ-12 connector.

Figure 3.23 CANbus Cable Wiring

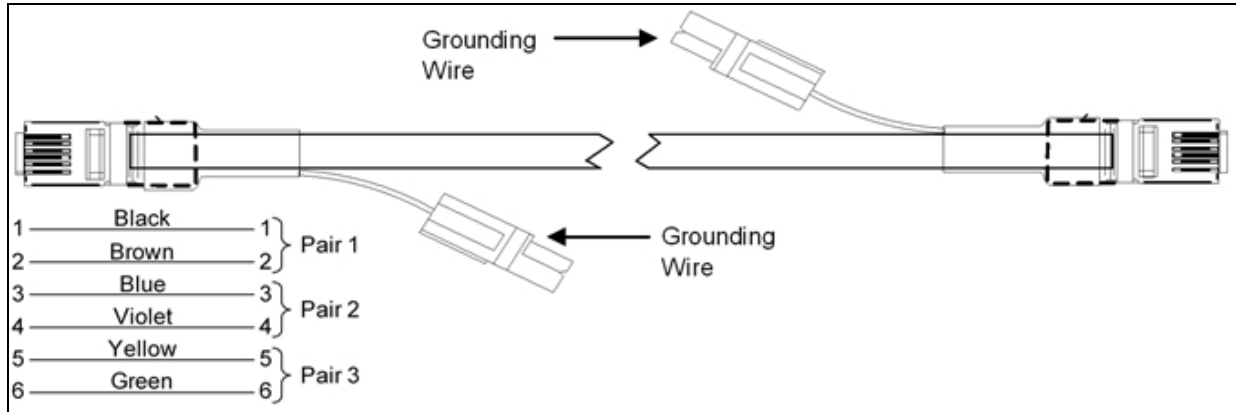


Table 3.14 CANbus Cable Part Numbers

Length ft (m)	Part #
3 ft (0.9m)	300157G10
6 ft (1.8m)	300157G1
10 ft (3.0m)	300157G2
15 ft (4.6m)	300157G11
20ft (6.1m)	300157G3
30ft (9.1m)	300157G4
60 ft (18.3m)	300157G5
90 ft (27.4m)	300157G6
120 ft (36.6m)	300157G7
150 ft (45.7m)	300157G8

Plan wiring runs for U2U communication when designing the layout of the conditioned space. In addition to following general good wiring practices, take these precautions:

- Keep control and communication cables away from power cables to prevent electromagnetic interference.
- Do not bend cables to less than four times the diameter of the cable.
- Do not deform cables when securing them in bundles or when hanging them.
- Keep cables away from devices that can introduce noise into them, such as machines, fluorescent lights and electronics.
- Avoid stretching cables; tension when pulling cables should not exceed 25 pounds (11kg) of pulling tension.
- Do not secure cables with any method that might damage them. Use approved hangers, such as those for telephone wire or RG-6 coaxial cable, available at most hardware stores.

3.22.2 CANbus Cable Length in a Network

The maximum total length of cable that can be used in a CANbus network differs by the type of Liebert® XD cooling module as shown in **Table 3.15** below .

Table 3.15 Allowable Total CAN Cable Length

Module	Allowable Total CAN Cable Length, ft (m)
Liebert® XDV8	580 (177)
Liebert® XDV10	580 (177)
Liebert® XDO20	590 (180)
Liebert® XDH32	585 (178)

*The internal CANbus cable within the Liebert® XD module and the remote sensors has been accounted for.

Figure 3.24 Single Daisy Chain of Liebert® XDO Smart Modules in CANbus Network

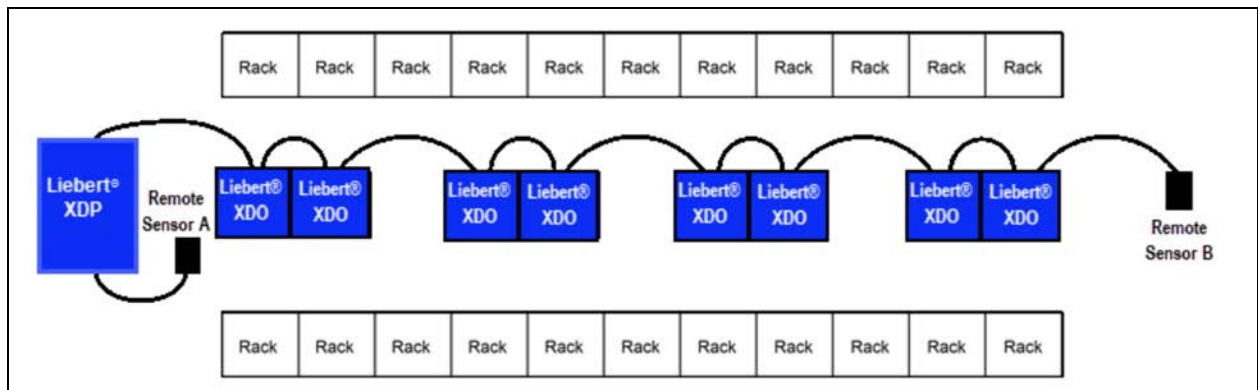


Table 3.16 Cumulative Cable Length

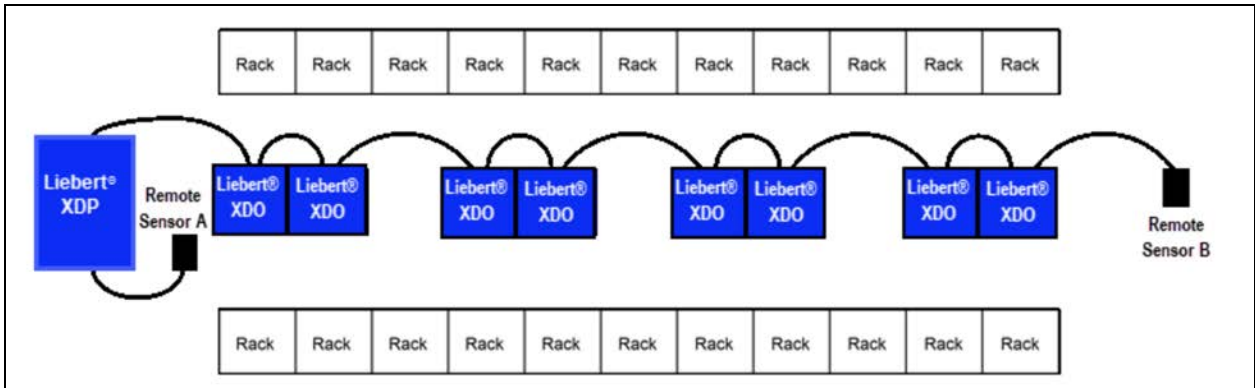
Cable Segments	Length of Each ft. (m)	Cumulative Length ft. (m)
14	6 (1.8)	84 (25.6)
1	20 (6)	20 (6)
1	30 (9.1)	30 (9.1)
Combined cable length		134 (40.8)

The cumulative length of cable used in the example in **Figure 3.24** above is 134 ft. (40.8m), far shorter than the maximum allowable cable run of 580 ft. (177m) for Liebert® XDV10 modules.

3.22.3 Remote Sensor Placement Within the CANbus

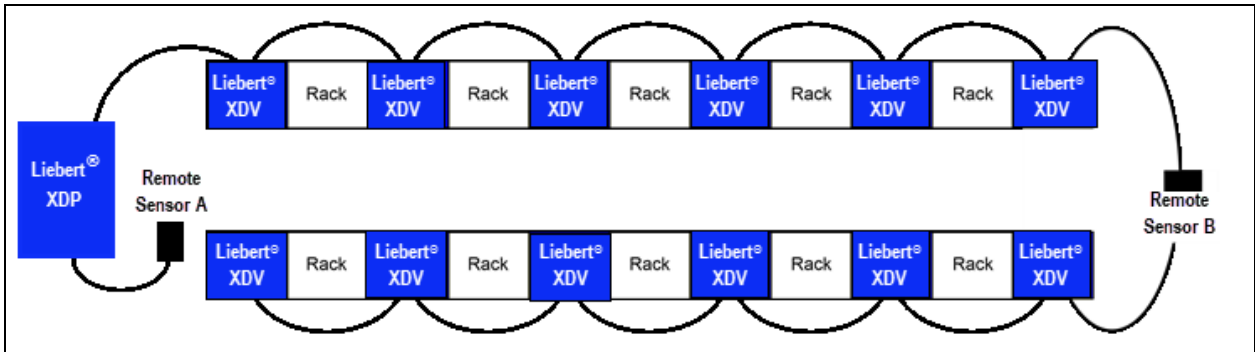
Two remote sensors are shipped with the Liebert® XDP. One shielded CANbus cable is provided with each sensor. Sensor A is to be connected to the directly the Liebert® XDP. Sensor B is to be connected to the CANbus within the smart module chain. This can be at the end of the chain as shown in **Figure 3.25** on the facing page . For proper placement within the room, see [Temperature/Humidity Sensor Locations](#) on page 34 .

Figure 3.25 Sensor at the End of Daisy Chain of Liebert® XDO Smart Modules in CANbus Network



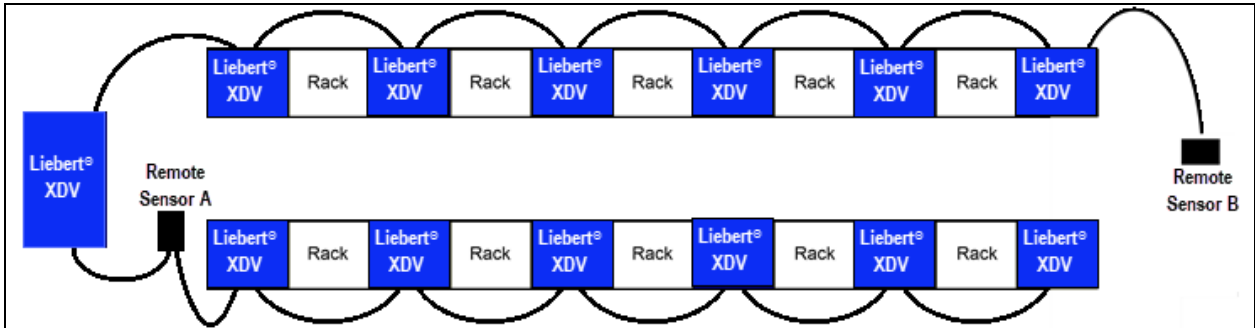
Sensor B can be placed in the middle of the daisy chain as shown in Figure 3.26 below ; however, the additional cable length must be subtracted from the allowable length.

Figure 3.26 Sensor Within the Daisy Chain of Liebert® XDV Smart Modules in CANbus Network



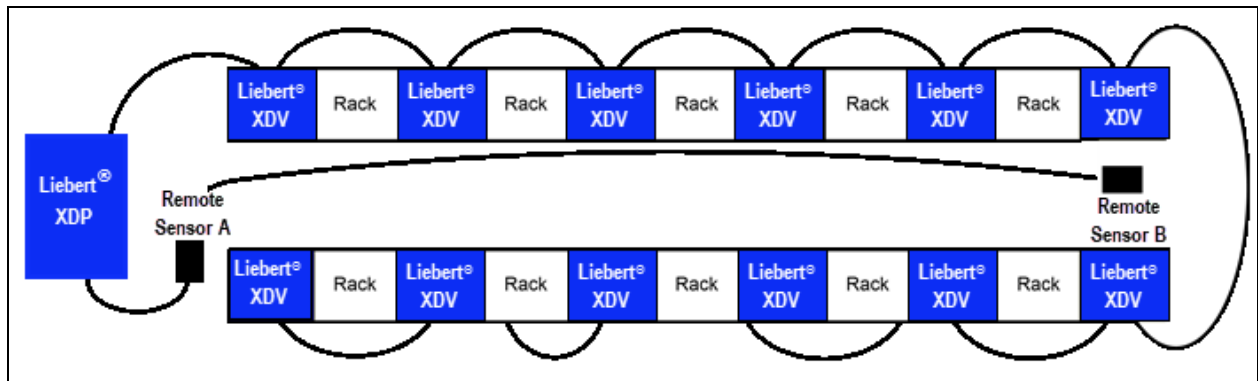
The modules can also be split into two chains as shown in Figure 3.27 below .

Figure 3.27 Dual Daisy Chain of Liebert® XDV Smart Modules in CANbus Network



The sensors can also be isolated in an independent daisy chain, see Figure 3.28 on the next page .

Figure 3.28 Independent Smart Module and Sensor Daisy Chains in CANbus Network



4 Liebert® XD Cooling Modules

4.1 Liebert® XDH Standard Features

- **Smart Module**—Smart modules will allow remote shutdown, fan failure alarms and automatically switching the second fan bank ON and OFF. The controls save energy by permitting the module to turn one fan in each fan bank OFF based on the supply and return temperature. Liebert® XD smart modules are able to provide alarm conditions such as fan failure or condensate detection at the Liebert® XDP display via CANbus communication. For electrical connection details, refer to the Liebert® XDH user manual, SL-17210, available on the Vertiv web site: www.Vertiv.com.
- **Dual Refrigeration Circuits**—Each Liebert® XDH has two refrigeration circuits, one in the upper half of the module and one in the lower half. Dual refrigeration circuits permit altering cooling levels in response to server room conditions. The dual refrigeration circuits permits interlaced connection of two refrigerant sources to enhance system reliability.
- **Dual Power Cords and Power Inlets**—The Liebert® XDH is supplied with two detachable power cords 10 ft (3m) long that attach to two IEC power inlets on the rear of the module. Each power cord has a NEMA 5-15P (IEC 320-C14) plug at the opposite end. The dual power cords allow the module to be powered by two separate power sources. If the secondary power cord is connected to a UPS, the Liebert® XDH's fans will continue to operate if utility power fails.
- **Top Piping Access**—The XDH has supply and return piping access on the top of each module. Supply piping connection is 1/2" OD copper pipe, and return piping connection is 7/8" OD copper.
- **Corner Stabilizers**—A stabilizer in each corner permits rolling the XDH with greater ease and less chance of tipping.
- **Air Diffusers**—Two diffusers, one on the upper half of the module and one on the lower half, enhance flow of cooling air. Uni-directional and bi-directional diffusers are available.

4.2 Optional Features—Liebert® XDH

- **Tie-Down Bracket**—An optional tie-down bracket may be installed on the Liebert® XDH to secure it in the row. The bracket keeps space between the Liebert® XDH and adjacent equipment constant, preventing vibration.

Figure 4.1 Liebert® XDH Dimensions

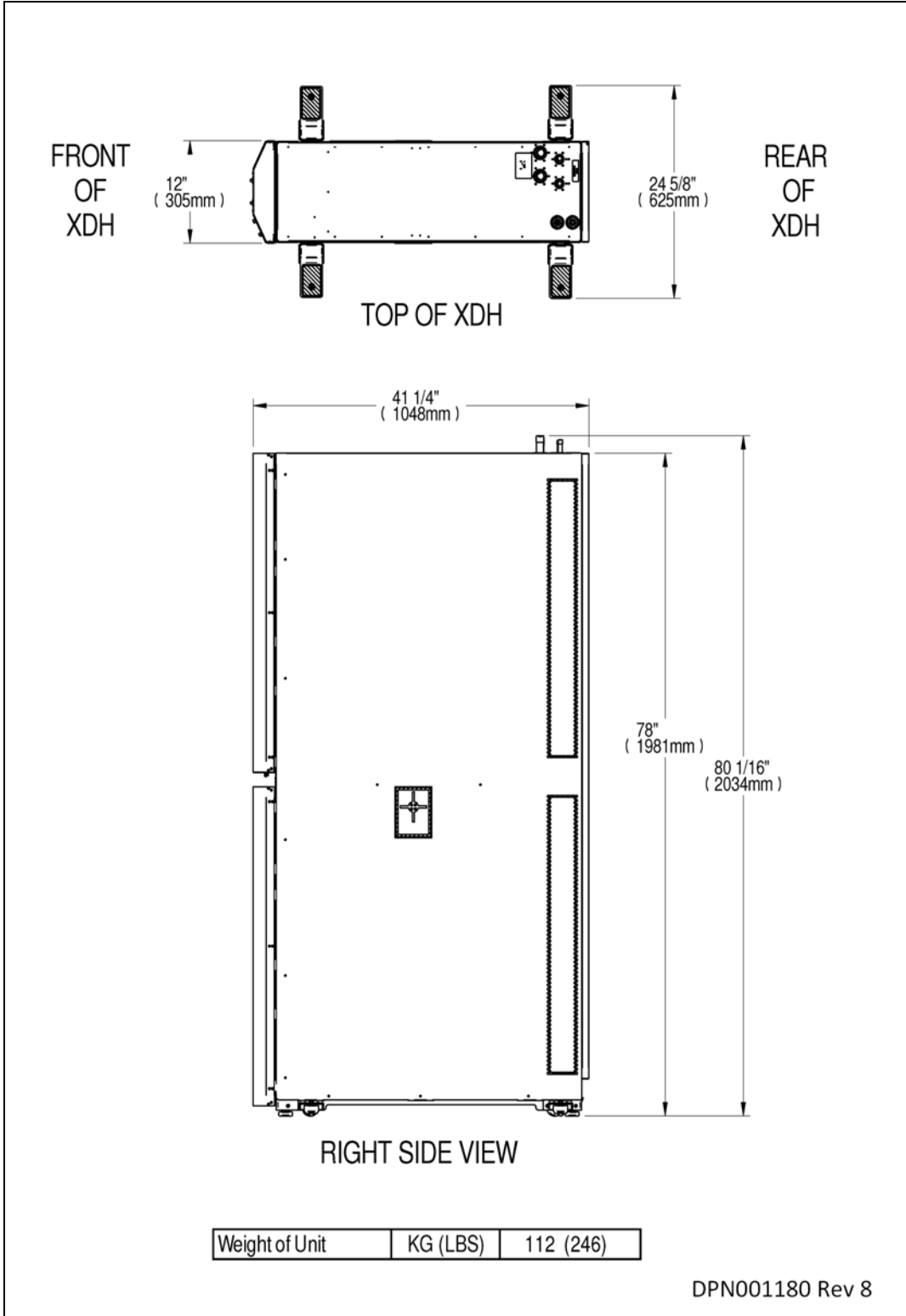
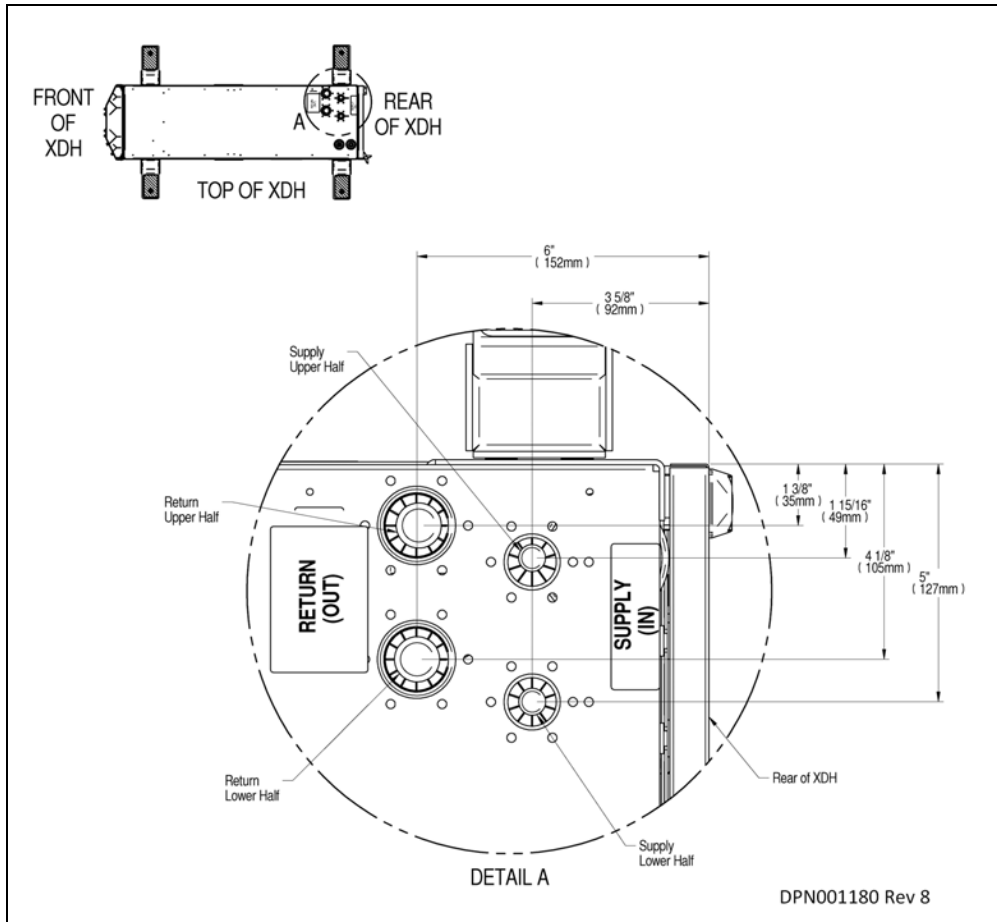


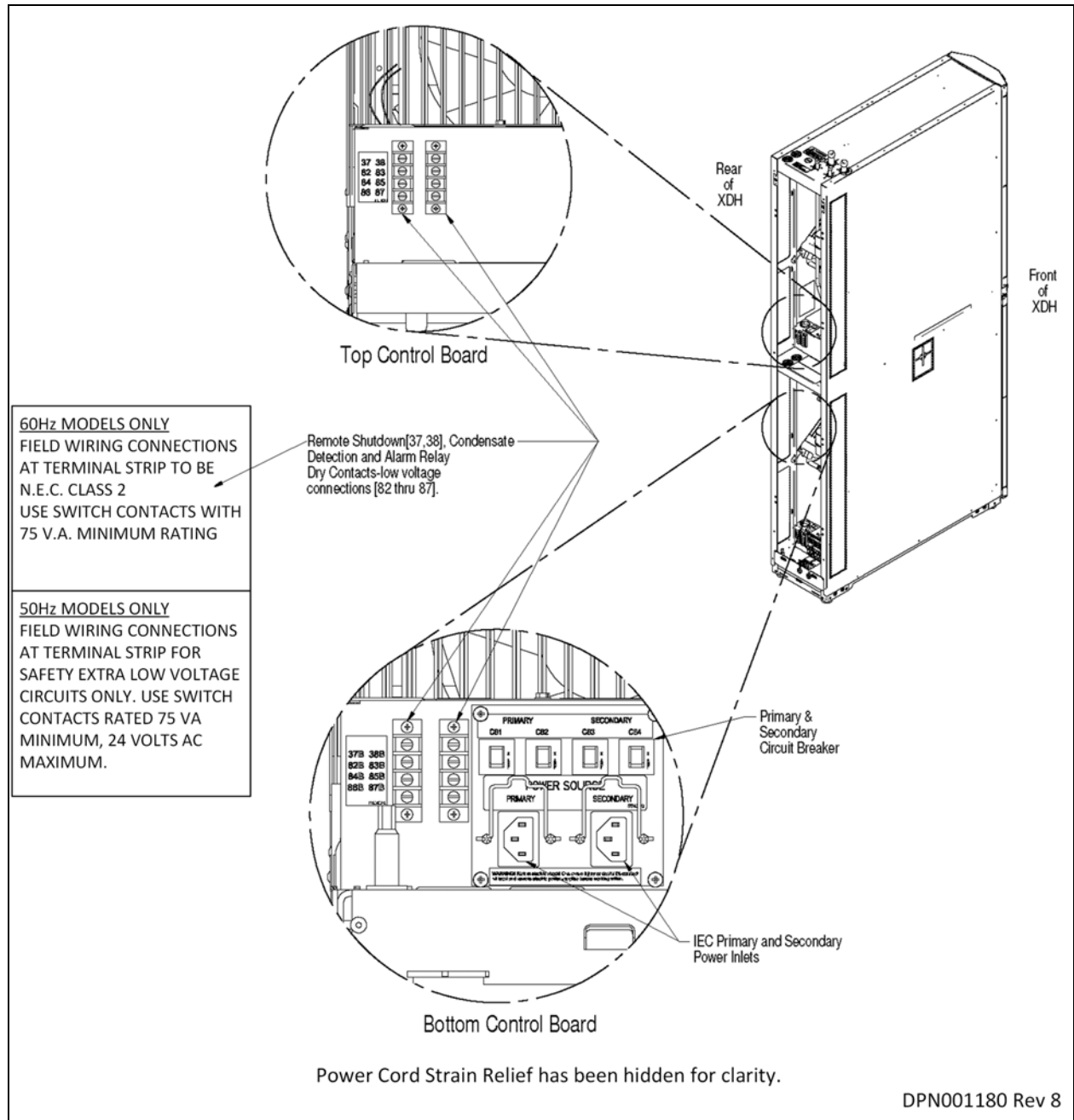
Figure 4.2 Supply and Return Piping Connections—Liebert® XDH



4.3 Connecting High-Voltage Wiring—Liebert® XDH

The Liebert® XDH requires single-phase power for normal operation. The module ships with two power cords, each 10 feet (3m) long with NEMA 5-15 plugs, which connect to common, three-prong outlets. See **Figure 4.3** below

Figure 4.3 Basic Liebert® XDH Electrical Connections



4.4 Connecting Low-Voltage Wiring—Liebert® XDH Smart Modules

Low-voltage connections are available only on the Liebert® XD smart module. The low-voltage connections for Liebert® XDH smart modules are in the rear of the modules. There are two connection locations, one for the lower bank of fans and one for the upper bank of fans. The power connections are shown in 4.3 on the previous page ; the communication ports are on the rear left side of the Liebert® XDH.

These dry contacts can be connected to a monitoring unit, such as Liebert® SiteScan™. Make connections on these modules according to site-specific drawings. The module must be installed in accordance with national and local wiring regulations.

Terminal block connections 37, 38 and 82 through 87 can be connected to a monitoring unit, such as Liebert® SiteScan™. The remote shutdown, condensate detection alarm, and fan failure alarms operate independently of each other.

- Contacts 37 and 38 are for remote shutdown.
- Contacts terminals 82, 83 and 84 are activated by the condensate detection alarm.
 - T82 is used for normally open contact closure requirements.
 - T83 is common.
 - T84 is used when normally closed contact closure is required.
- Contacts terminals 85, 86 and 87 are activated by the fan failure alarm.
 - T85 is for normally open contact closure requirements.
 - T86 is common.
 - T87 is used when normally closed contact closure is required. The condensate detection alarm and the fan failure alarm operate independently of each other.
- P66 and P67 are CAN bus ports.

4.5 Liebert® XDO Standard Features

- **Smart Modules**—The Liebert® XDO is available with an optional factory-installed control board. A Liebert® XDO smart module will allow remote monitoring, shutdown, fan failure alarms, condensate detection and automatically cycling the fan On and Off as the heat load requires. Liebert® XD smart modules are able to provide alarm conditions such as fan failure or condensate detection at the Liebert® XDP display via CANbus communication.
- **Micro Channel Heat Exchanger**—Liebert® XDO module includes two all-aluminum micro channel heat exchangers.
- **Fan**—Air is drawn in the sides of the module through the heat exchangers and is discharged by the fan to the area below—The Liebert® XDO fan tray hinges down to allow access to replace or service all electrical components.
- **Internal Mounting**—The Liebert® XDO module is typically suspended from the overhead building structure by inserting field-supplied threaded rods into the internal mounting brackets.

4.6 Optional Features Liebert® XDO

- **Refrigerant Pre-Charge**—The Liebert® XDO can be precharged with refrigerant. The module will have the one-shot fittings and be pressurized. The one-shot Liebert® XD Flex Piping will also be precharged with refrigerant.
- **External Mounting Brackets**—The Liebert® XDO module can be suspended by external mounting brackets that are attached to the front and rear panels of the module. The external mounting brackets are optional ship-loose items.

- Lighting Fixture**—Field-installable lighting fixtures are available in two voltages, 120V and 277V. The lighting fixture may be attached to the bottom of the light panel to the left and right of the fan. Each fixture consists of housing, reflector, ballast and diffuser. Fixtures are compatible with standard 48" fluorescent bulbs. Bulbs are not included.

Figure 4.4 Dimensional Data—Liebert® XDO Hard Piped Modules

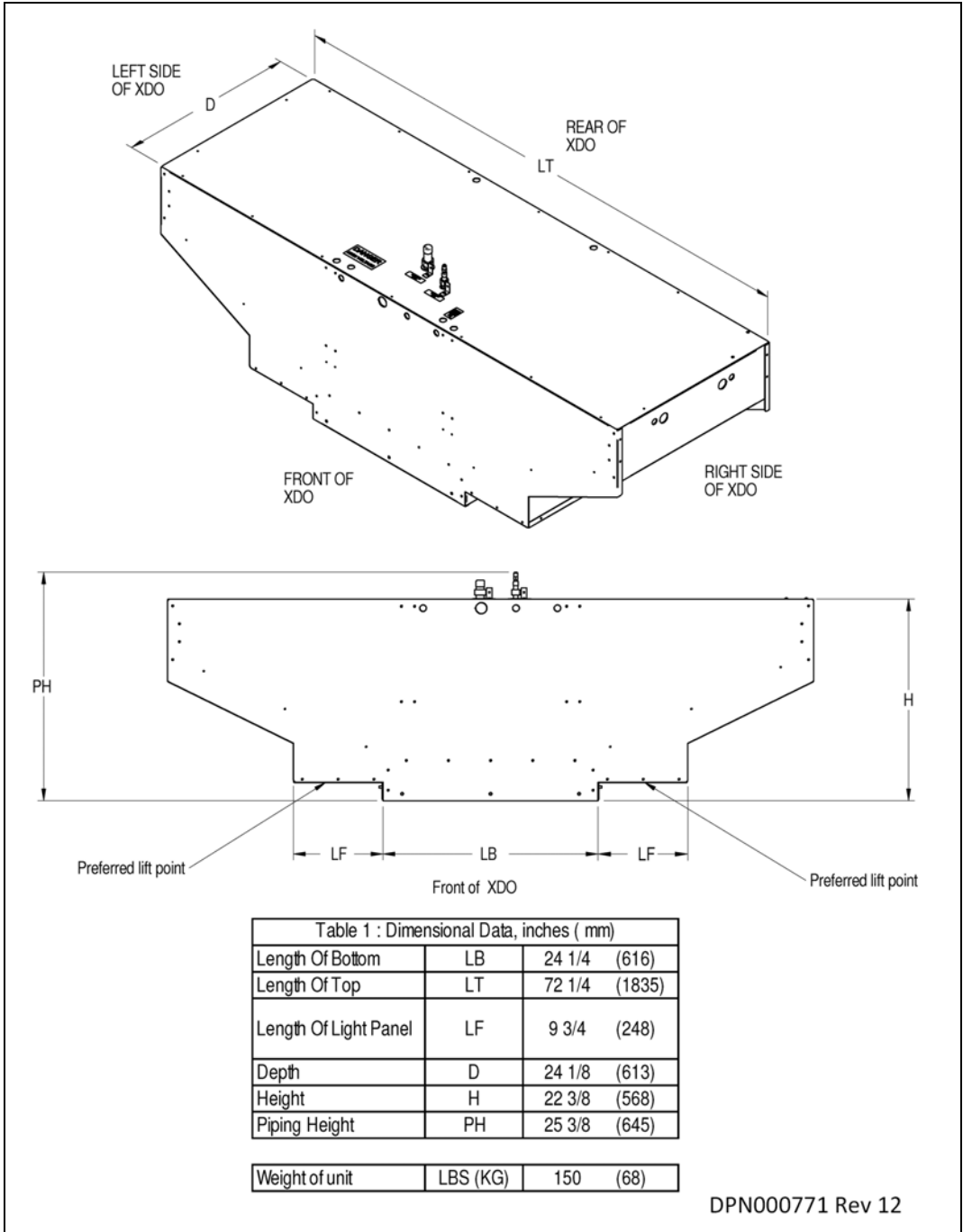


Figure 4.5 Dimensional Data—Liebert® XDO with Pre-Charged Option

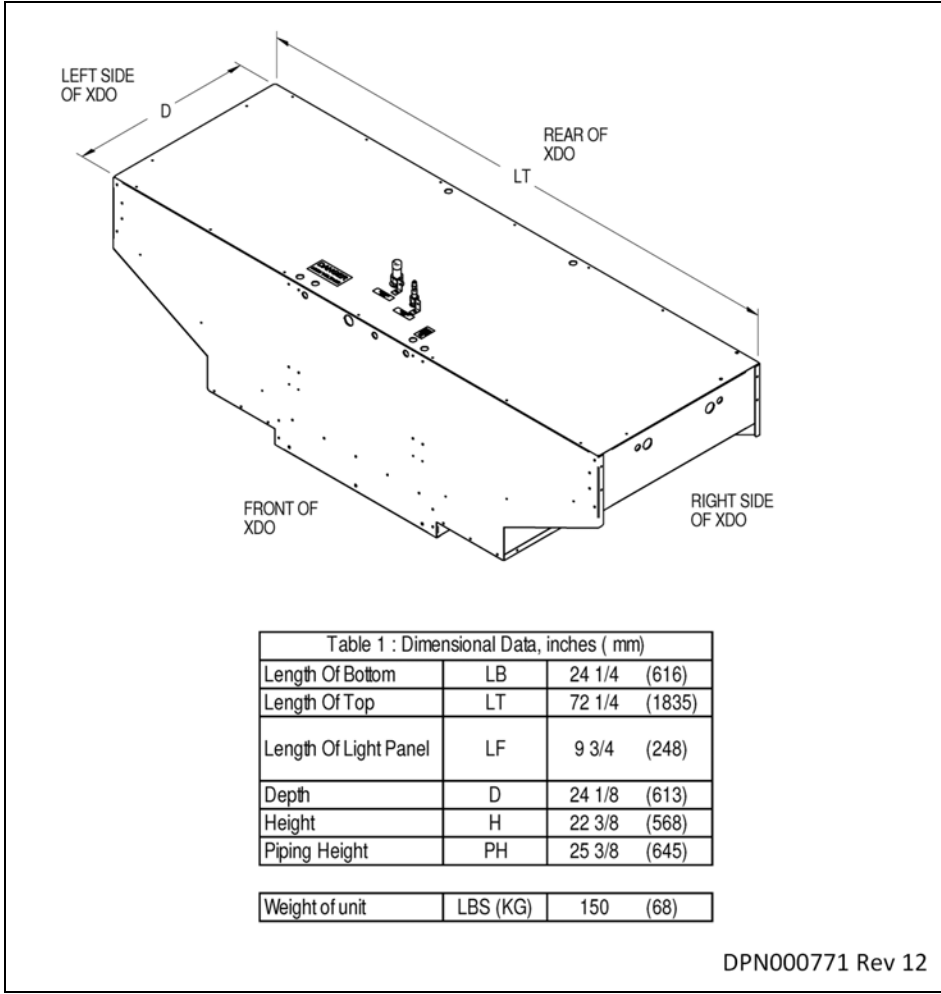


Figure 4.6 Liebert® XDO Internal Mounting Location

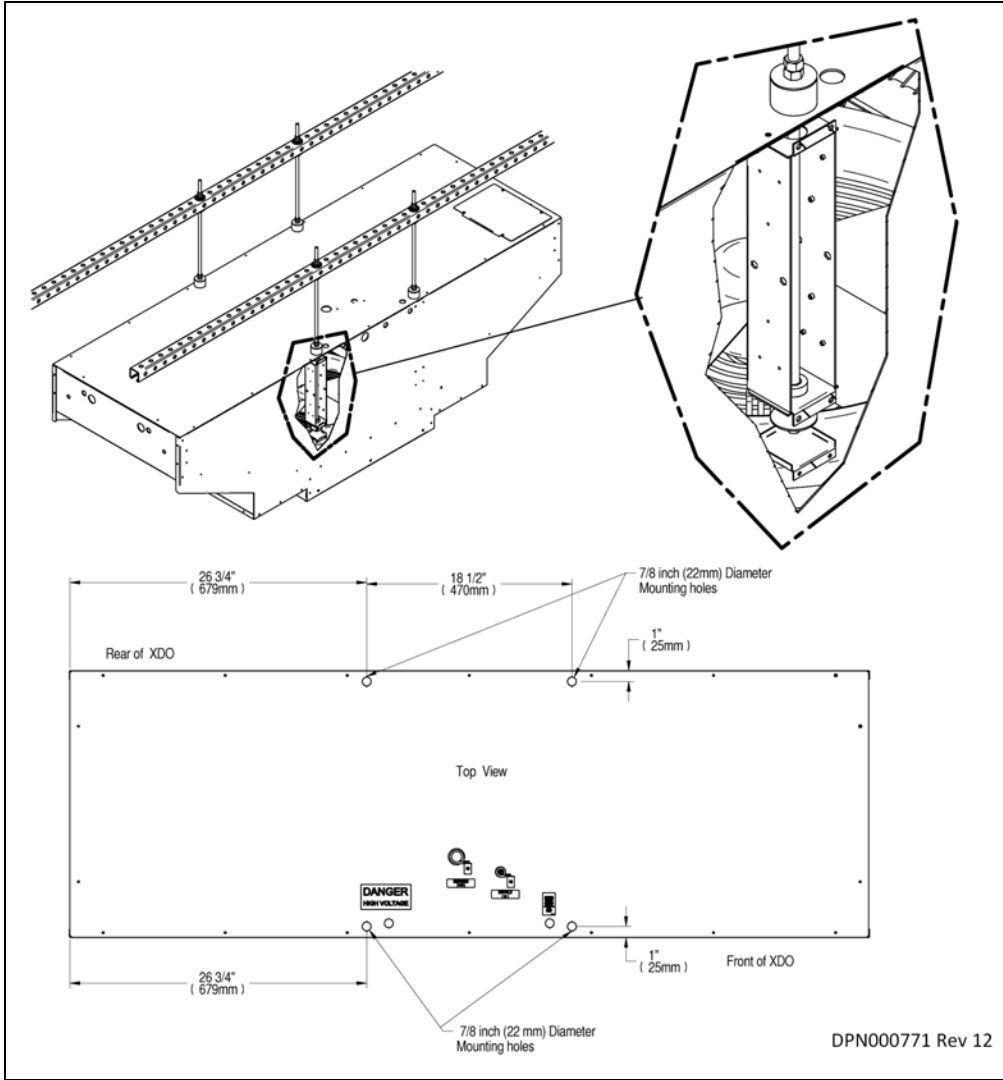


Figure 4.7 Top and Front Electrical Access Points and Terminal Block—Standard Liebert® XDO Modules.

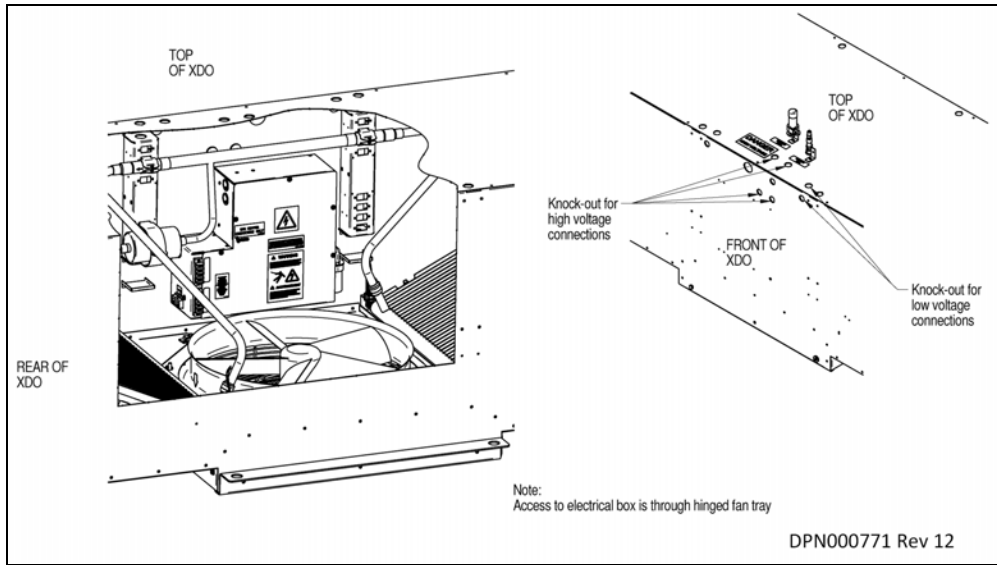


Figure 4.8 High Voltage Connections and Terminal Locations Liebert® XDO Modules

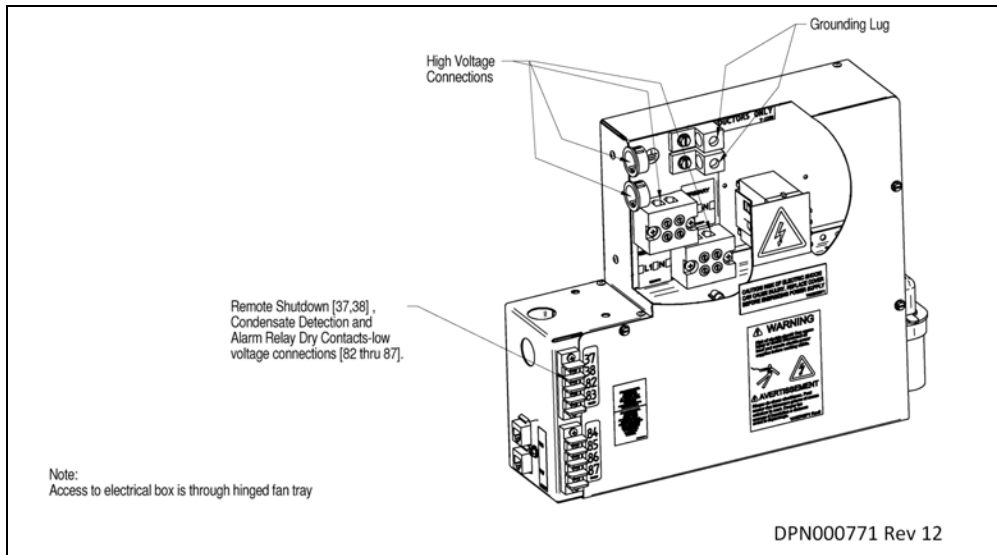


Figure 4.9 Top and Front Electrical Access Points—Liebert® XDO Smart Modules

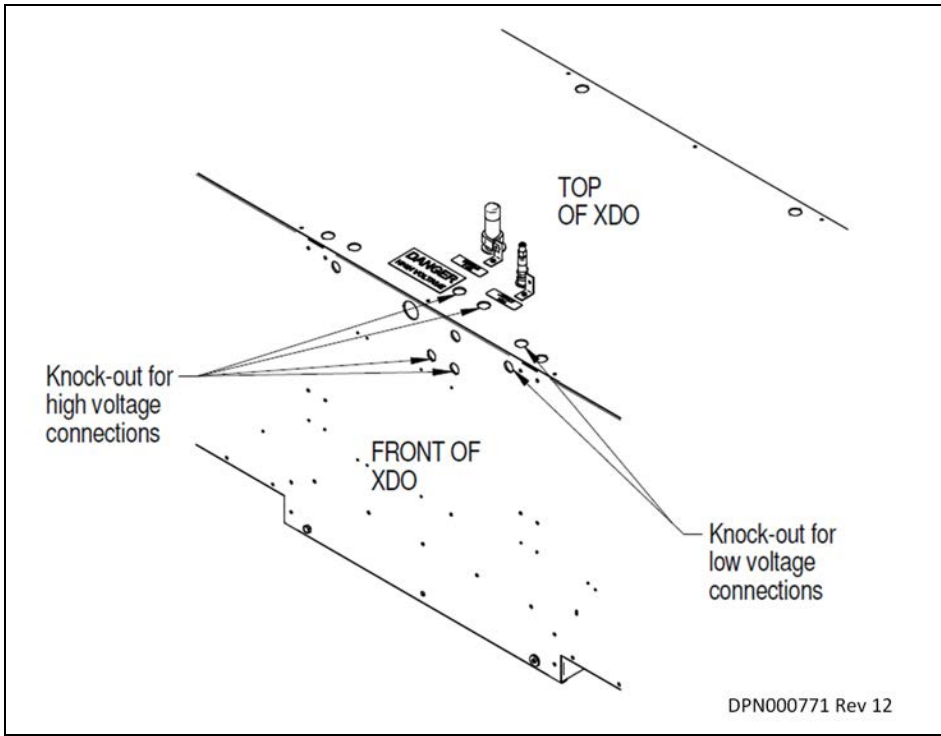
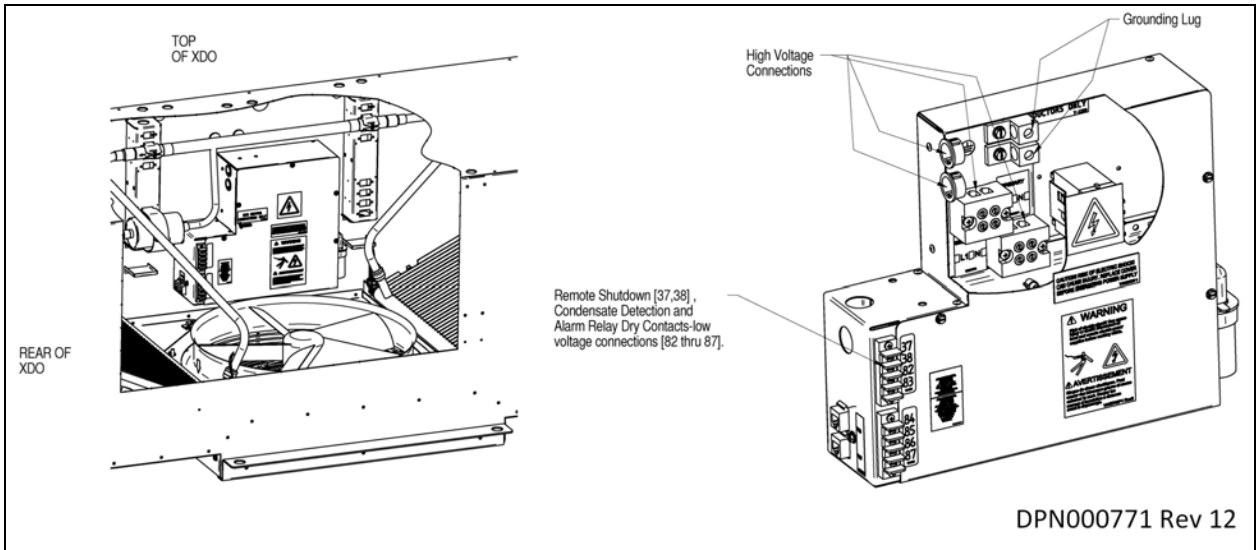


Figure 4.10 High Voltage Terminal Block Connection Locations—Liebert® XDO Smart Modules



4.7 Low-Voltage Wiring—Liebert® XDO Smart Modules

Low-voltage connections to the Liebert® XDO are available only on smart modules.

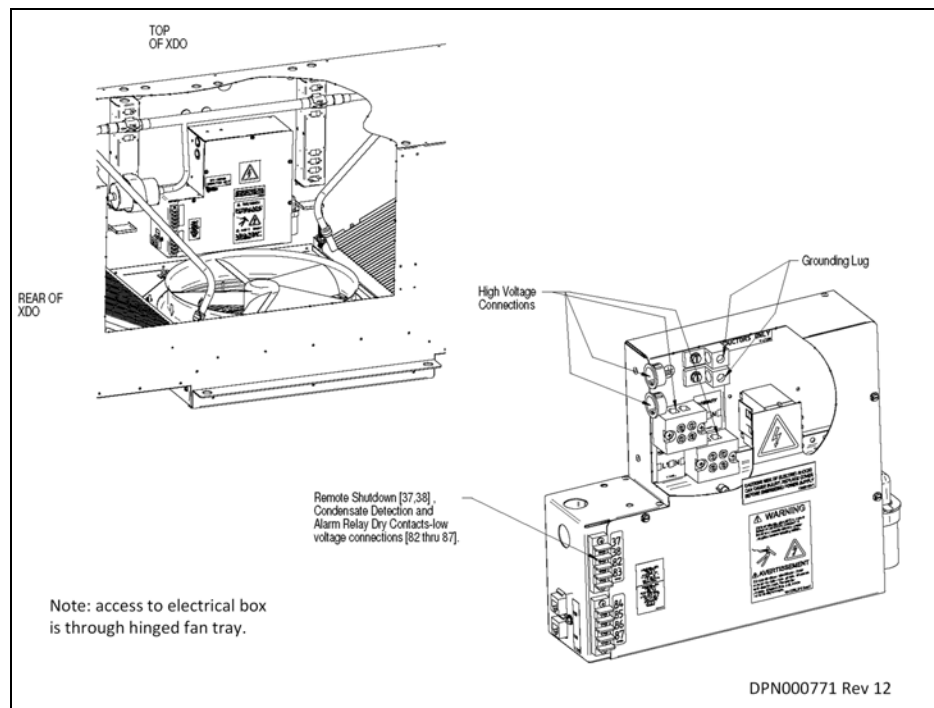
Viewing the Liebert® XDO from the front or from above, the low-voltage terminal block is on the right side of the module (see **Figure 4.11** below). Make low-voltage connections on these modules according to site-specific drawings. The module must be installed in accordance with national and local wiring regulations.

For Liebert® XDO smart modules, the low-voltage connections are on the electric box inside the Liebert® XDO. Knockouts for the low-voltage connections are on the front of the Liebert® XDO, near the top (see **Figure 4.11** below).

Terminal block connections 37, 38 and 82 through 87 can be connected to a monitoring unit, such as Liebert® SiteScan™. The remote shutdown, condensate detection alarm and fan failure alarms operate independently of each other.

- Contacts 37 and 38 are for remote shutdown.
- Contacts terminals 82, 83 and 84 are activated by the condensate detection alarm.
 - T82 is used for normally open contact closure requirements.
 - T83 is common.
 - T84 is used when normally closed contact closure is required.
- Contacts terminals 85, 86 and 87 are activated by the fan failure alarm.
 - T85 is for normally open contact closure requirements.
 - T86 is common.
 - T87 is used when normally closed contact closure is required. The condensate detection alarm and the fan failure alarm operate independently of each other.
- P66 and P67 are CAN bus ports.

Figure 4.11 Low-Voltage Wiring—Liebert® XDO Smart Modules



4.8 Liebert® XDV Standard Features

- **Smart Module**— Liebert® XDV smart modules allow remote shutdown, fan failure alarms and automatically switching the second fan On and Off. This saves energy by permitting the module to run with one fan and switching on a second fan when the temperature requires both fans for cooling. Liebert® XD smart modules are able to provide alarm conditions such as fan failure or condensate detection at the Liebert® XDP display via CANbus communication. For electrical connection details, refer to the Liebert® XDV user manual, SL-16626, available on the Vertiv web site: www.Vertiv.com.
- **Micro Channel Heat Exchanger**—The Liebert® XDV module includes one all-aluminum micro channel heat exchanger.
- **Dual IEC Power Cords and Power Inlets**—The Liebert® 115V, 60Hz XDV module is supplied with two detachable, 10 ft (3m) power cords that attach to two IEC power inlets in the rear of the module. Each power cord has a NEMA 5-15P (IEC 320-C14) plug at the opposite end. The Liebert® 230V, 60/50 Hz Liebert® XDV module is supplied with two non-detachable 10 ft (3m) power cords. This feature allows the module to be powered by two separate power sources.
- **Dual Air Inlets**—The Liebert® XDV module can be configured to allow air to enter from the rear grille or the bottom of the module.
- **Dual Fans**—Airflow is provided by two fans on the front of the module.
- **Dual Switches**—Controls on the front of the module permit the use of one fan or both fans.
- **Liebert Foundation Mounting**—Two 1/4-20 cage nuts on the underside of module allow direct attachment to any Liebert Foundation cabinet; bolts provided with Liebert® XDV module.
- **Mounting Clips for Non-Liebert Cabinets**—The Liebert® XDV module is supplied with mounting clips that allow attachment to a non-Liebert cabinet (some drilling may be required).

4.9 Optional Features—Liebert® XDV

- **External Mounting Brackets**—The Liebert® XDV can be suspended from the overhead building structure. The external mounting brackets are ship-loose items.

Figure 4.12 Liebert® XDV Dimensions

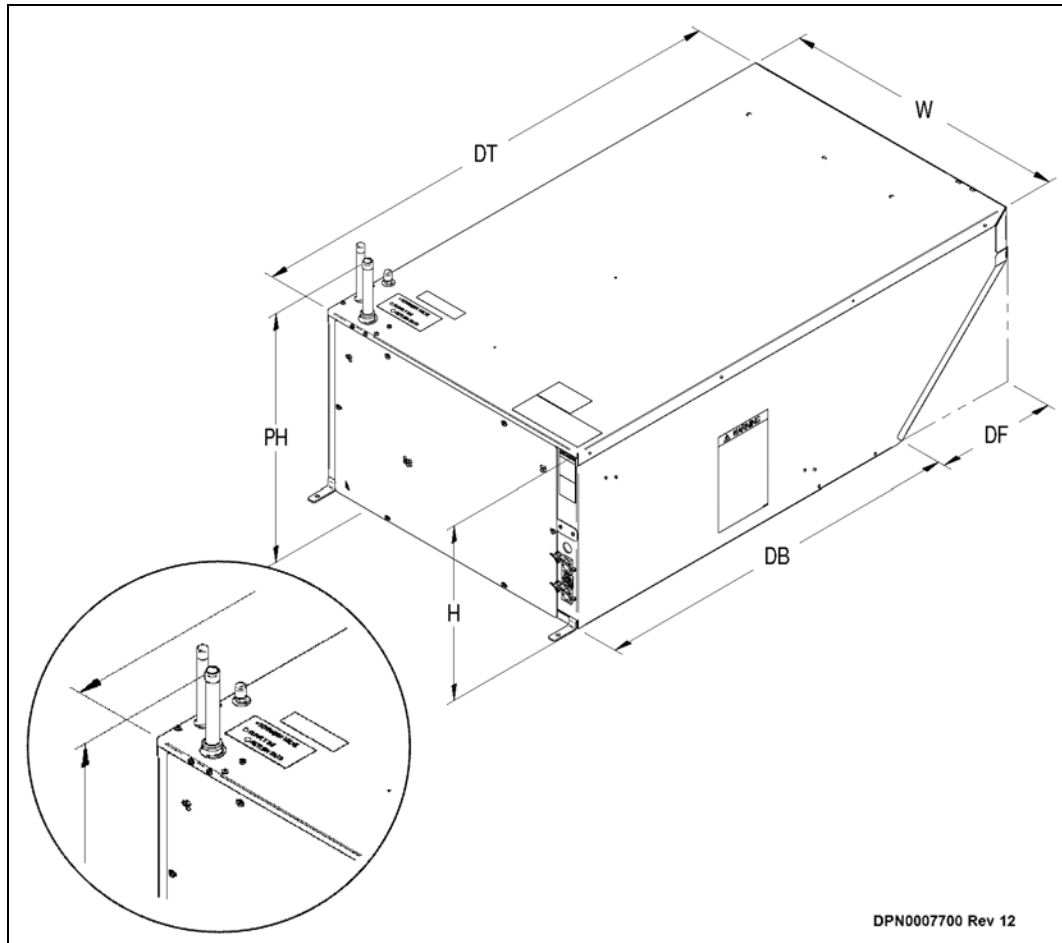


Table 4.1 Dimensional Data

Illustration Key	Dimension	Measurement, in. (mm)
DT	Depth Top	39-1/2 (1003)
DB	Depth Bottom	29-5/8 (752)
W	Width	22-7/8 (581)
H	Height	14 (356)
PH	Piping Height	18-5/8
DF	Depth Front	9-8/8 (251)
Weight of Unit		77lbs (35 kg)

Figure 4.13 Suspending Single Liebert® XDV from Unistruts

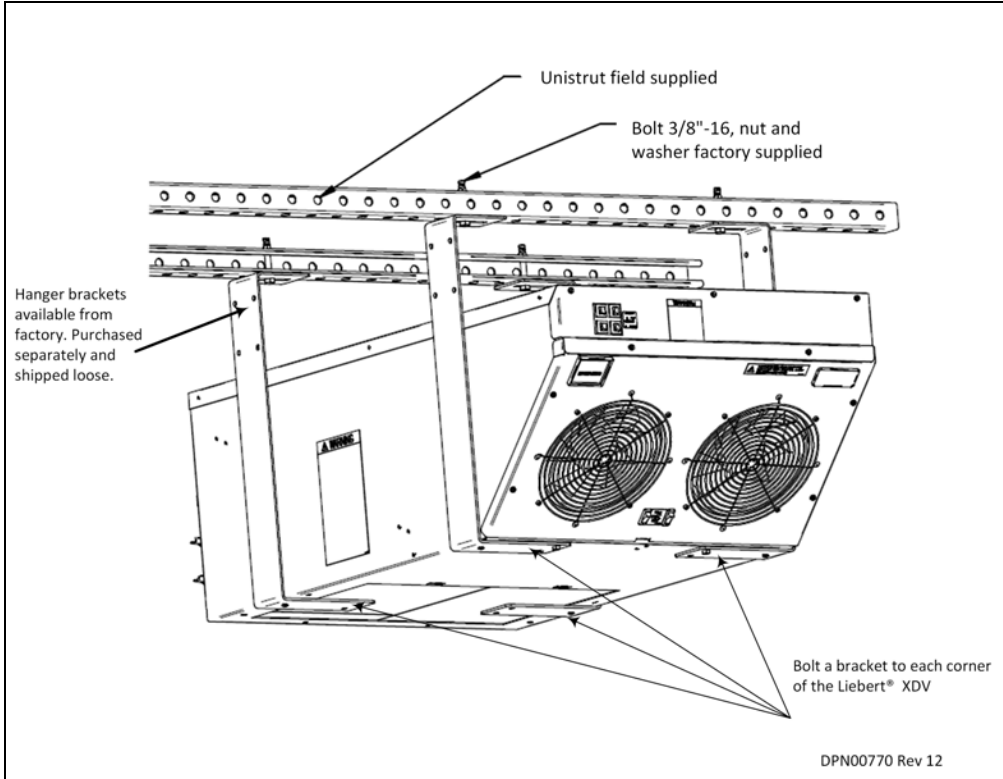


Figure 4.14 Suspending Single Liebert® XDV From the Roof Structure

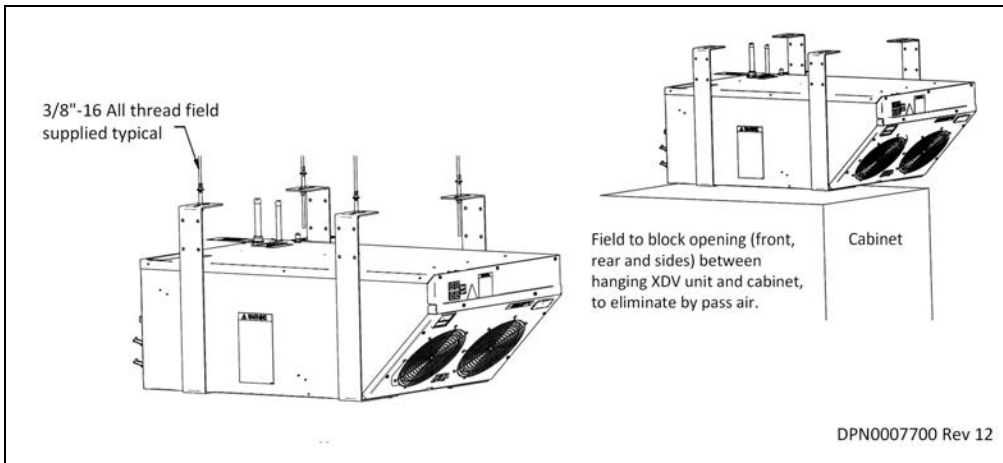
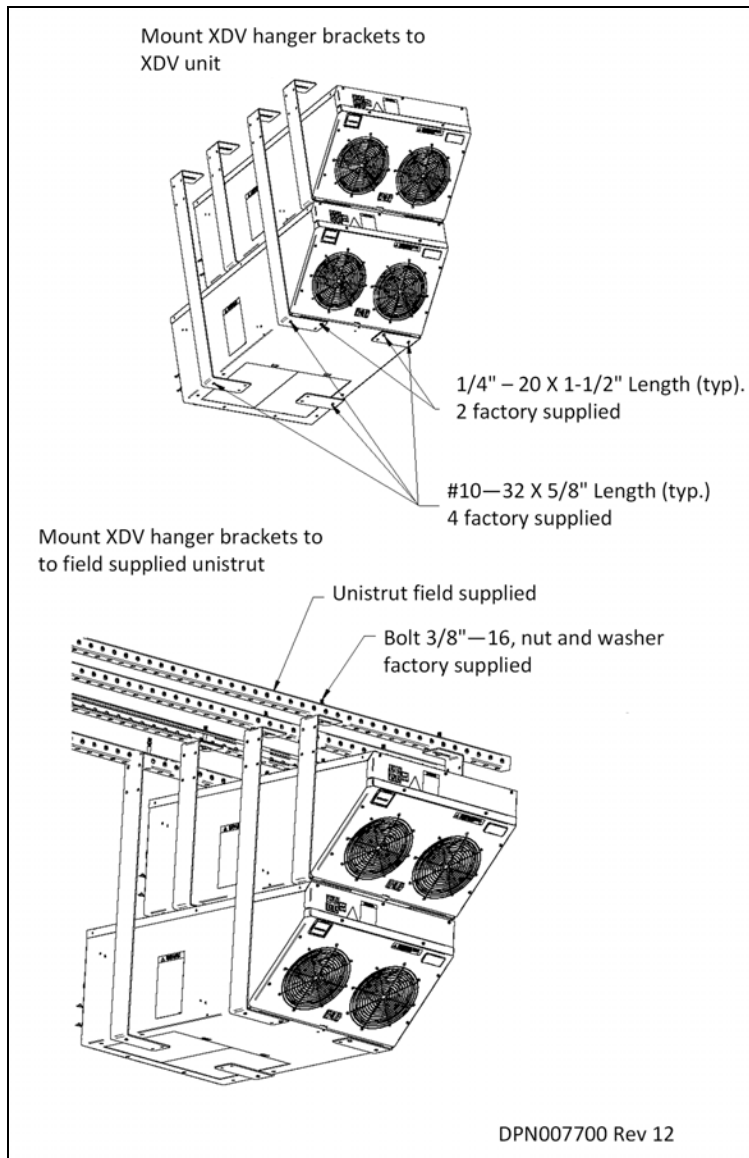


Figure 4.15 Alternate Mounting Methods—Mounting Multiple Liebert® XDV Modules



4.10 High-Voltage Cabling for Liebert® XDV

The Liebert® XDV ships with two IEC input power cords. IEC power cords connect to receptacles on the Liebert® XDV and to power sources. See [4.10](#) above and [Figure 4.17](#) on page 55.

Figure 4.16 Electrical Connections for CSA-Approved Liebert® XDV

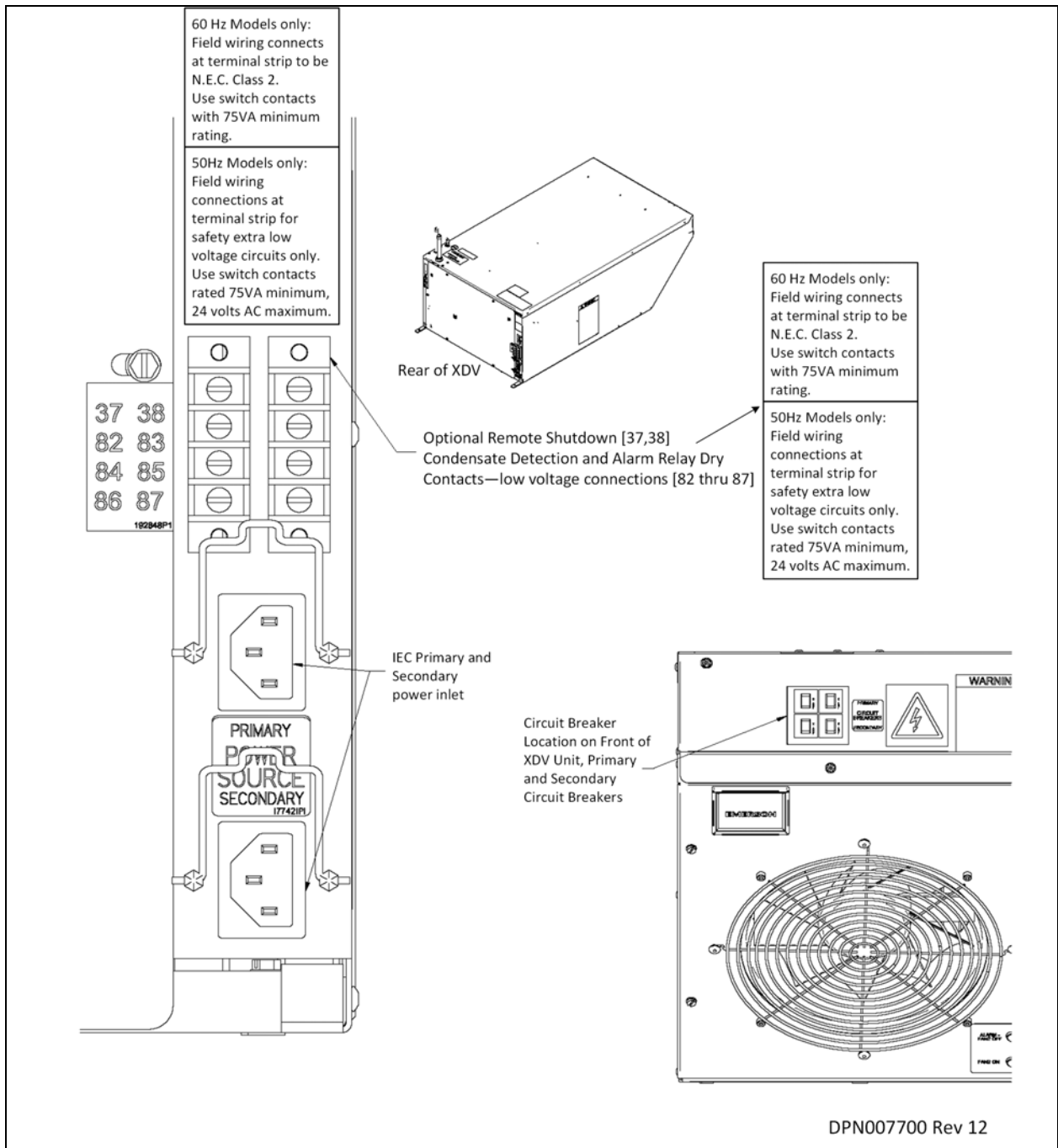
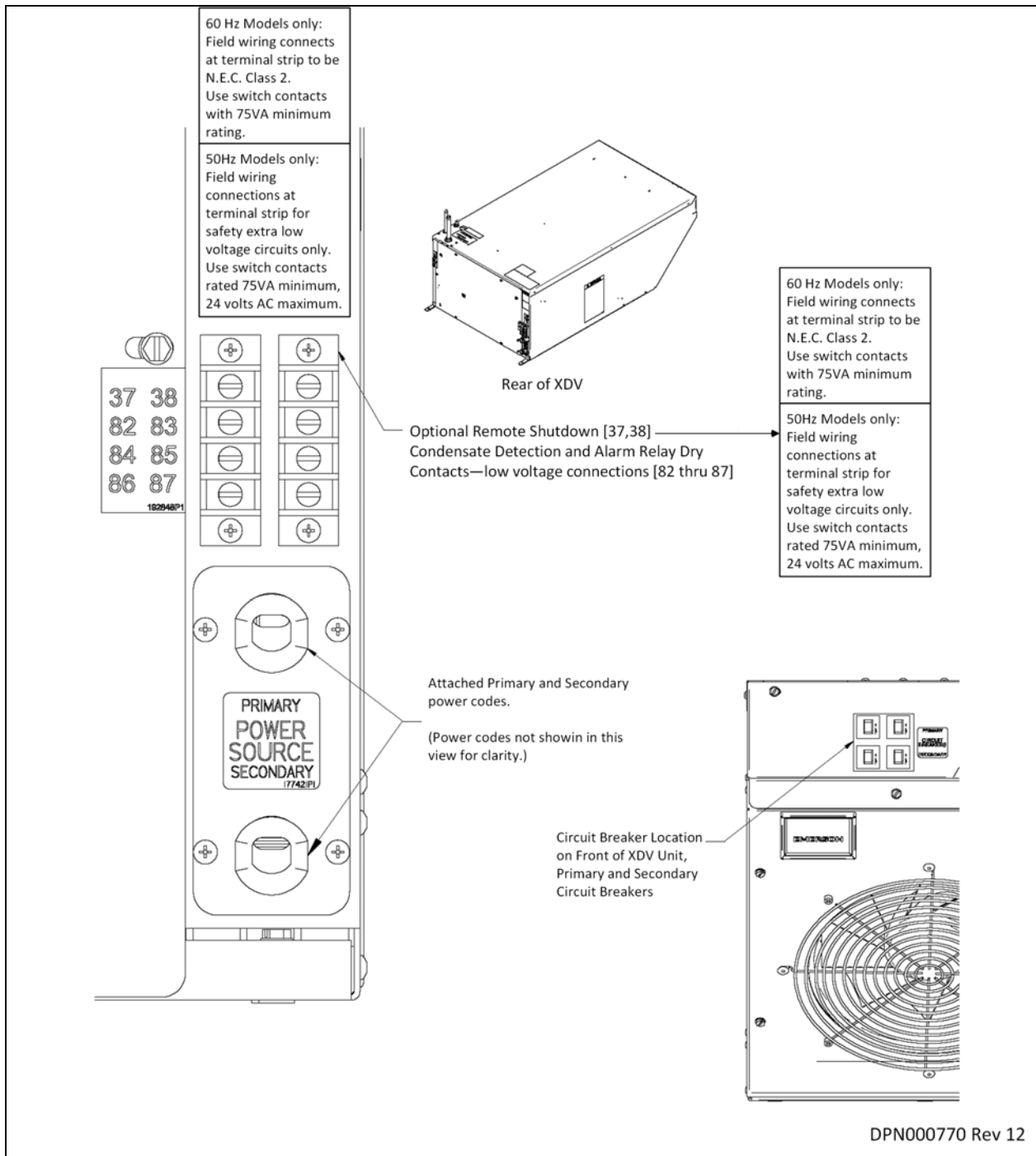


Figure 4.17 Electrical Connections for CE-Approved Liebert® XDV Modules



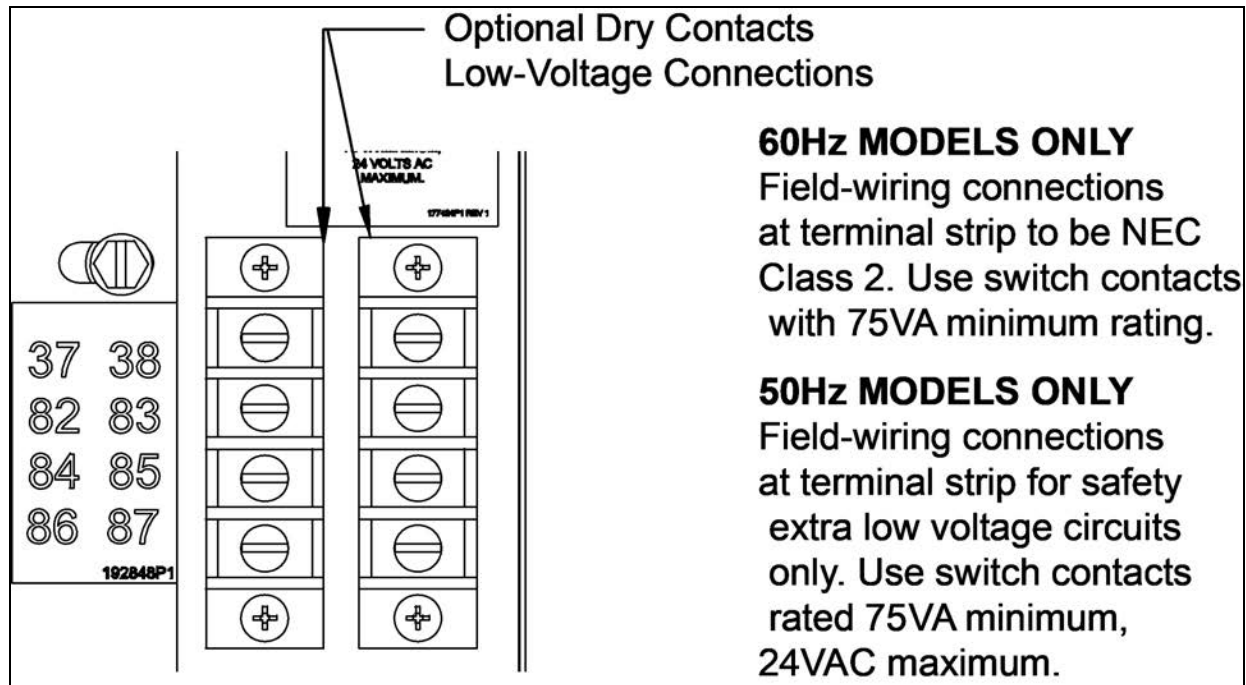
4.11 Low-Voltage Wiring—Liebert® XDV Smart Modules

The low-voltage connections for Liebert® XDV smart modules are on the rear right side of the modules. The power connections are shown in **Figure 4.18** below and the dry contacts can be connected to a monitoring module, such as Liebert® SiteScan™. Make low-voltage connections on these modules according to site-specific drawings. The module must be installed in accordance with national and local wiring regulations.

Terminal block connections 37, 38 and 82 through 87 can be connected to a monitoring unit, such as SiteScan™. The remote shutdown, condensate detection alarm and fan failure alarms operate independently of each other.

- Contacts 37 and 38 are for remote shutdown.
- Contacts terminals 82, 83 and 84 are activated by the condensate detection alarm.
 - T82 is used for normally open contact closure requirements.
 - T83 is common.
 - T84 is used when normally closed contact closure is required.
- Contacts terminals 85, 86 and 87 are activated by the fan failure alarm.
 - T85 is for normally open contact closure requirements.
 - T86 is common.
 - T87 is used when normally closed contact closure is required. The condensate detection alarm and the fan failure alarm operate independently of each other.
- P66 and P67 are CAN bus ports.

Figure 4.18 Low-Voltage Connections for Liebert® XDV Smart Modules



5 Liebert® XDC and Liebert® XDP

5.1 Liebert® XDC Standard Features

- **Compressors**—Scroll with a suction gas cooled motor, vibration isolators, thermal overloads, manual reset high-pressure switch and pump down low-pressure switch.
- **Refrigeration System**—Dual refrigeration circuits each including liquid line filter dryers, refrigerant sight glass with moisture indicator, electronic control valve, adjustable externally equalized expansion valves and liquid line solenoid valves.
- **Heat Exchanger**—Brazed plate design with interwoven circuiting constructed of stainless steel plates, copper brazed.
- **Pumps**—Centrifugal type, end suction, canned rotor design.
- **Liebert® iCOM™**—The Liebert® iCOM™ offers the highest capabilities in unit control, communication and monitoring of Liebert Precision Cooling units. The Liebert® iCOM™ is a factory-installed assembly. Operating conditions and status are indicated on the unit display, which is mounted either on the unit or on the wall, depending on application details (see the Liebert® XDC User Manual, SL-16674, available at www.Vertiv.com). The control system also monitors unit operation and activates an alarm when any of the specified factory preset conditions are exceeded. The unit includes two temperature-humidity sensors to aid in effective cooling.
- **Liebert® Lee-Temp Refrigerant Control Air-Cooled Condenser**—The Liebert® Lee-Temp head pressure control system is designed to maintain proper operating head pressures in outdoor temperatures down to -30°F (-34.4°C). The condensers utilize head pressure control valves, extra refrigerant and insulated refrigerant receivers with heater pads. It works by flooding the condenser coil with liquid refrigerant 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 refrigerant 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 refrigerant exiting from the condenser. This extra liquid refrigerant 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 are either fan cycling on ambient temperature or constant on.

5.1.1 Liebert® XDC Optional Features

- **Water/Glycol Condensers**—A water/glycol floor stand condenser option is available for heat rejection requirements. The water/glycol floor stand can be installed beneath the Liebert® XDC or nearby.

Figure 5.1 Dimensional Data

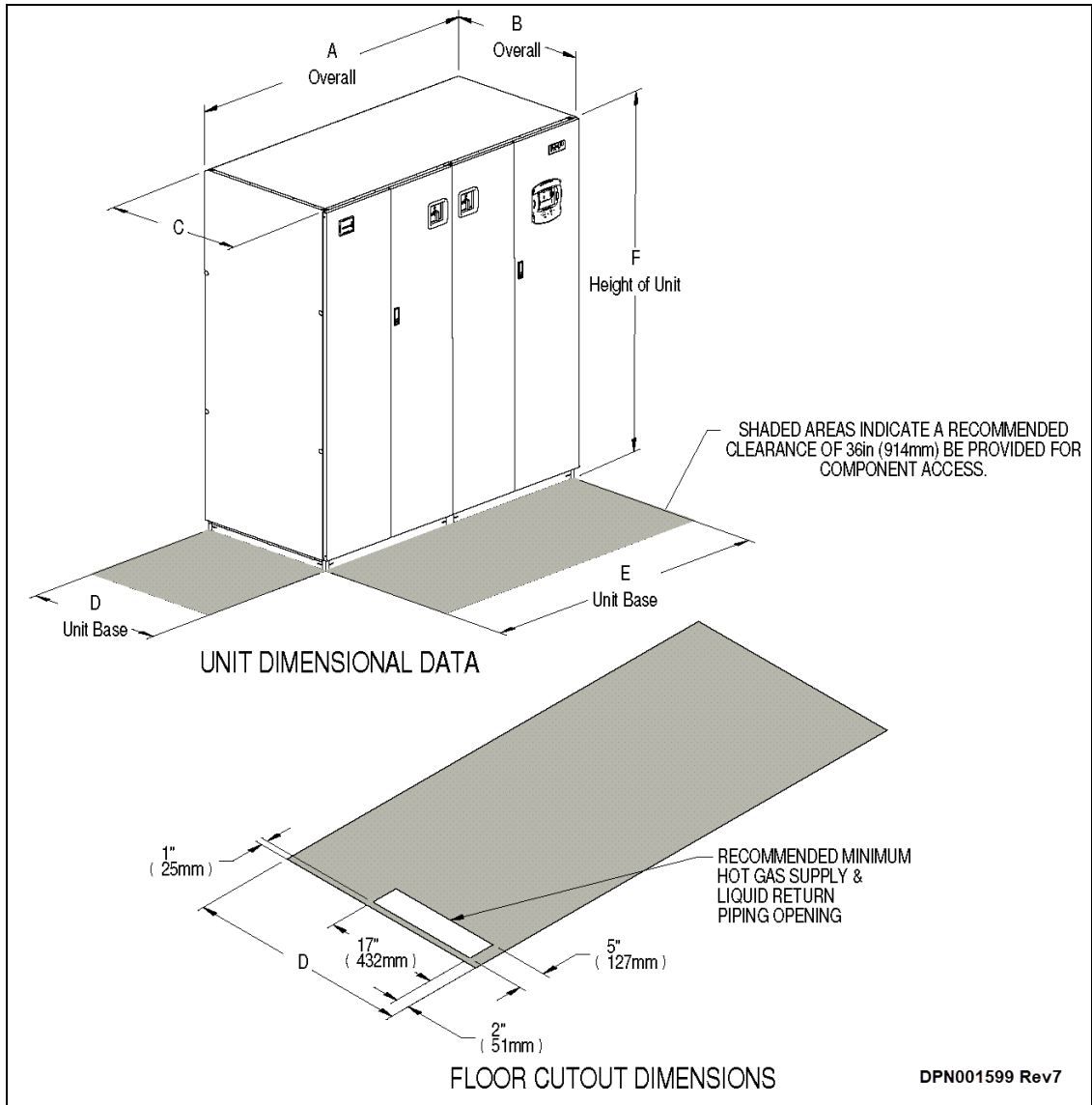


Table 5.1 Liebert® XDC Dimensions, Weight

Air-Cooled Model	Dimensional Data, inches (mm)						Shipping Weight lb. (kg)	
	A	B *	C	D	E	F	Domestic	Export
50/60Hz								
XDC160	74 (1880)	34 (864)	33-1/8 (841)	33 (838)	72 (1829)	78 (1981)	1975 (896)	2109 (957)

*Dimension does not include the bezel of the disconnect switch or iCOM display.

Figure 5.2 Piping Locations

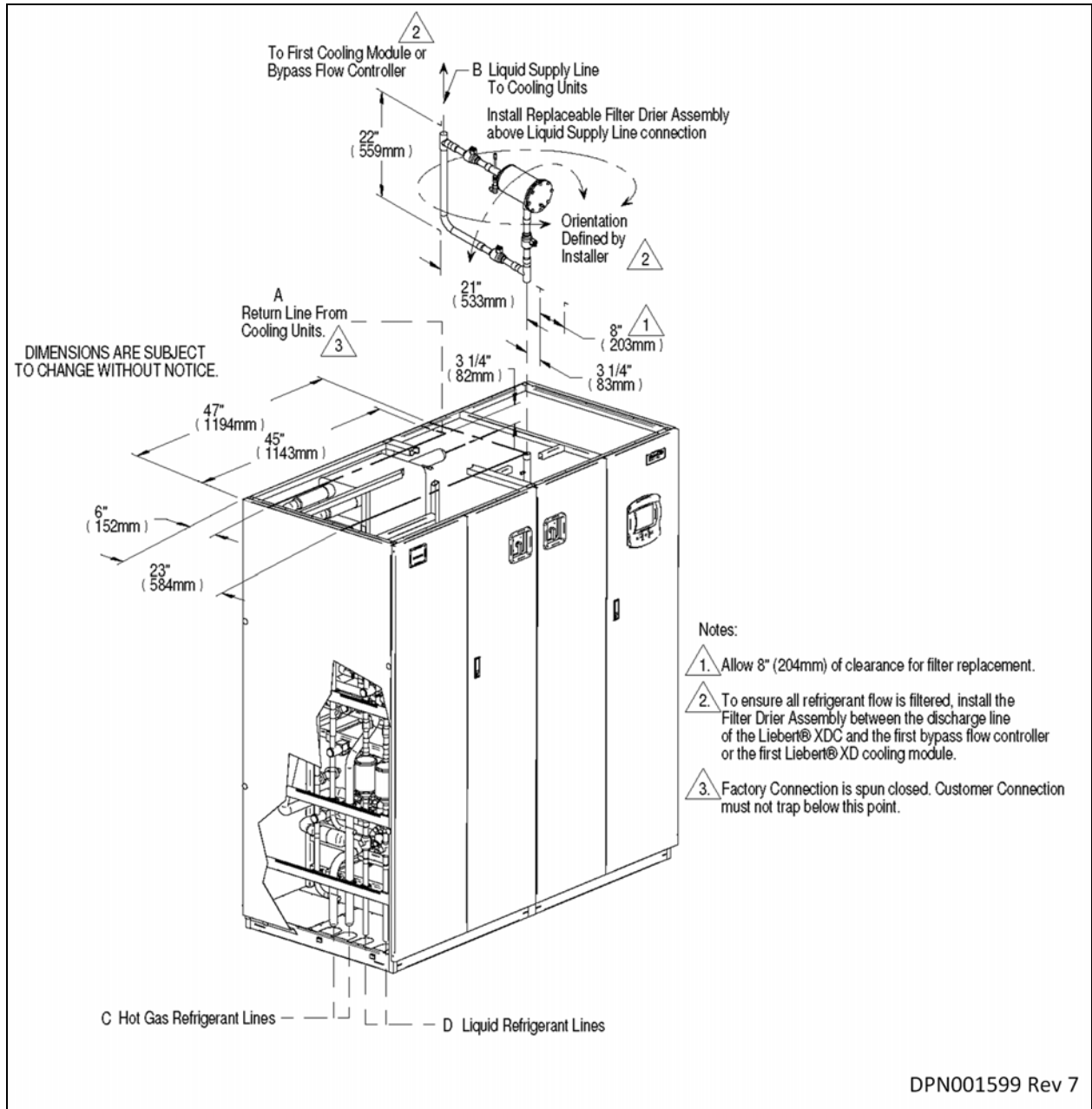


Table 5.2 Liebert® XDC Piping Connection Sizes

50/60Hz	Piping Outlet Connection Sizes, OD Cu, inches			
	A	B	C	D
XDC160	2-1/8	1-1/8	1-3/8	7/8

Source: DPN001599

Figure 5.3 Positioning a Water/Glycol Liebert® XDC for Placement on a Floor Stand

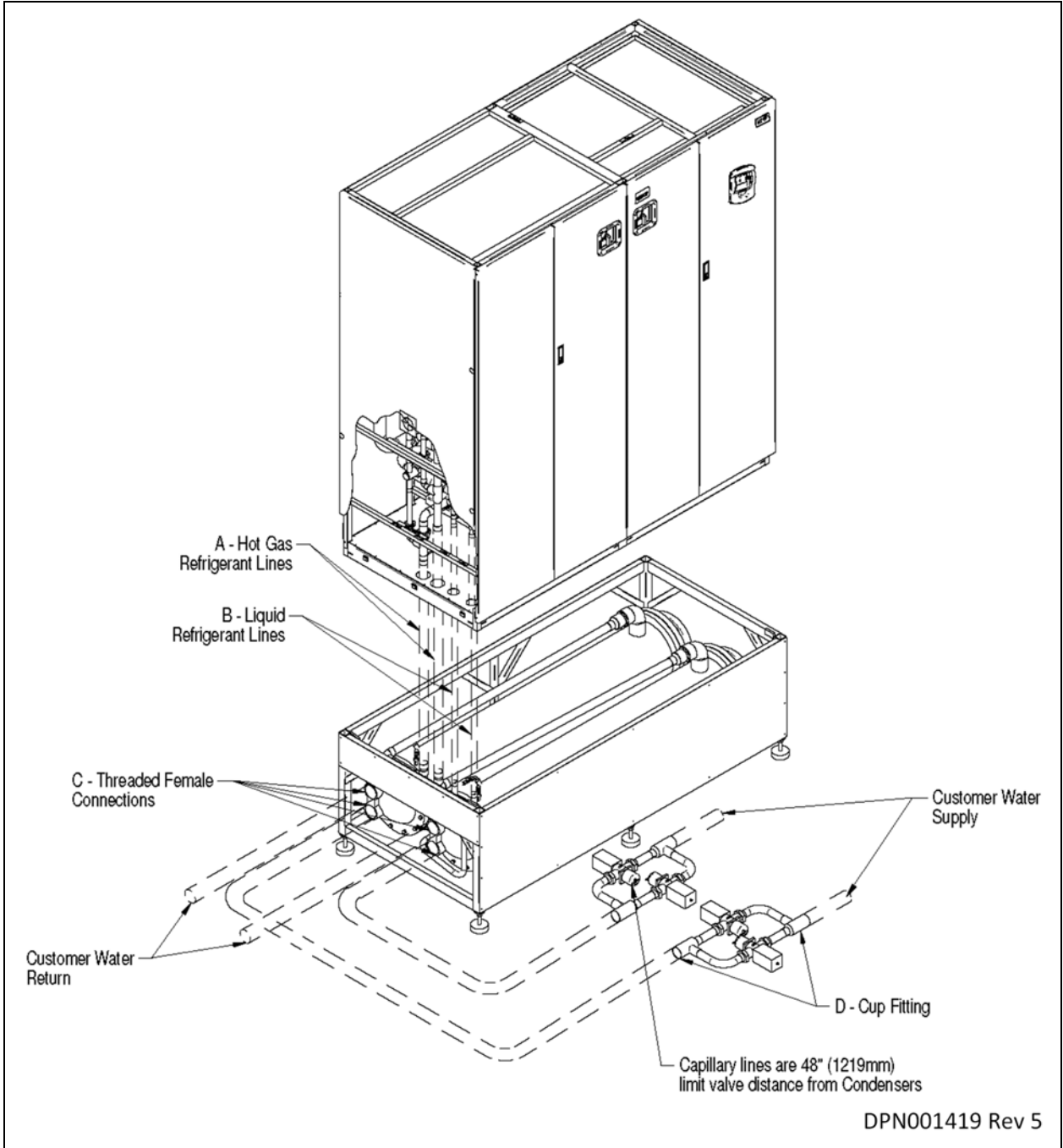


Table 5.3 Liebert® XDC Water/Glycol Piping Connection Sizes

Water Cooled Model 50/60 Hz	Piping Outlet Connection Sizes, OD Cu, inches			
	A	B	C*	D**
XDC160	1-3/8	7/8	2-1/2	2-1/8 or 2-5/8

*Threaded Female Connection
 **2-1/8" for 1" WRV, 2-5/8" for 1-1/4" WRV

Figure 5.4 Piping Locations—Floor Stand and Valve Assembly

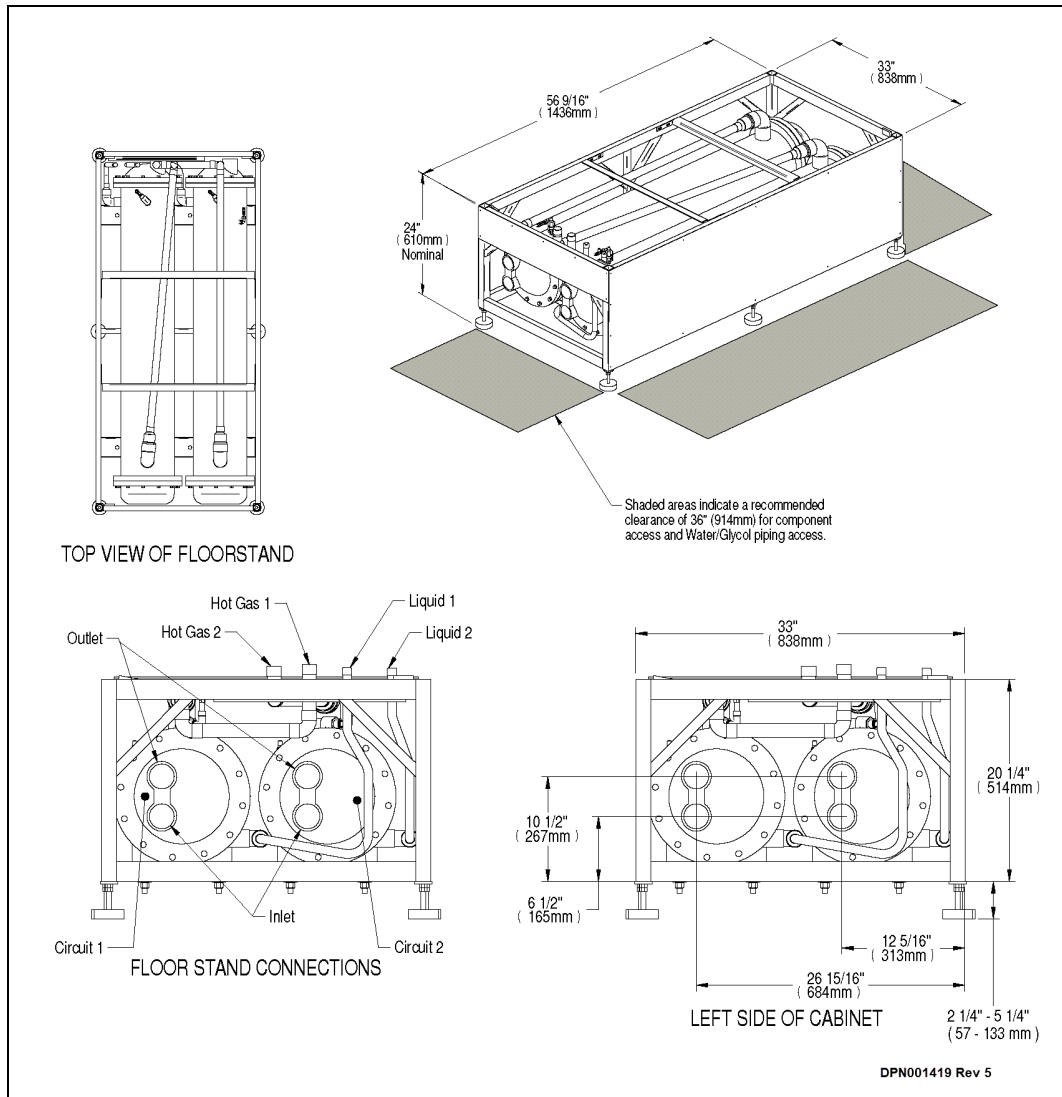


Figure 5.5 Front View of Liebert® XDC and Electrical Enclosures

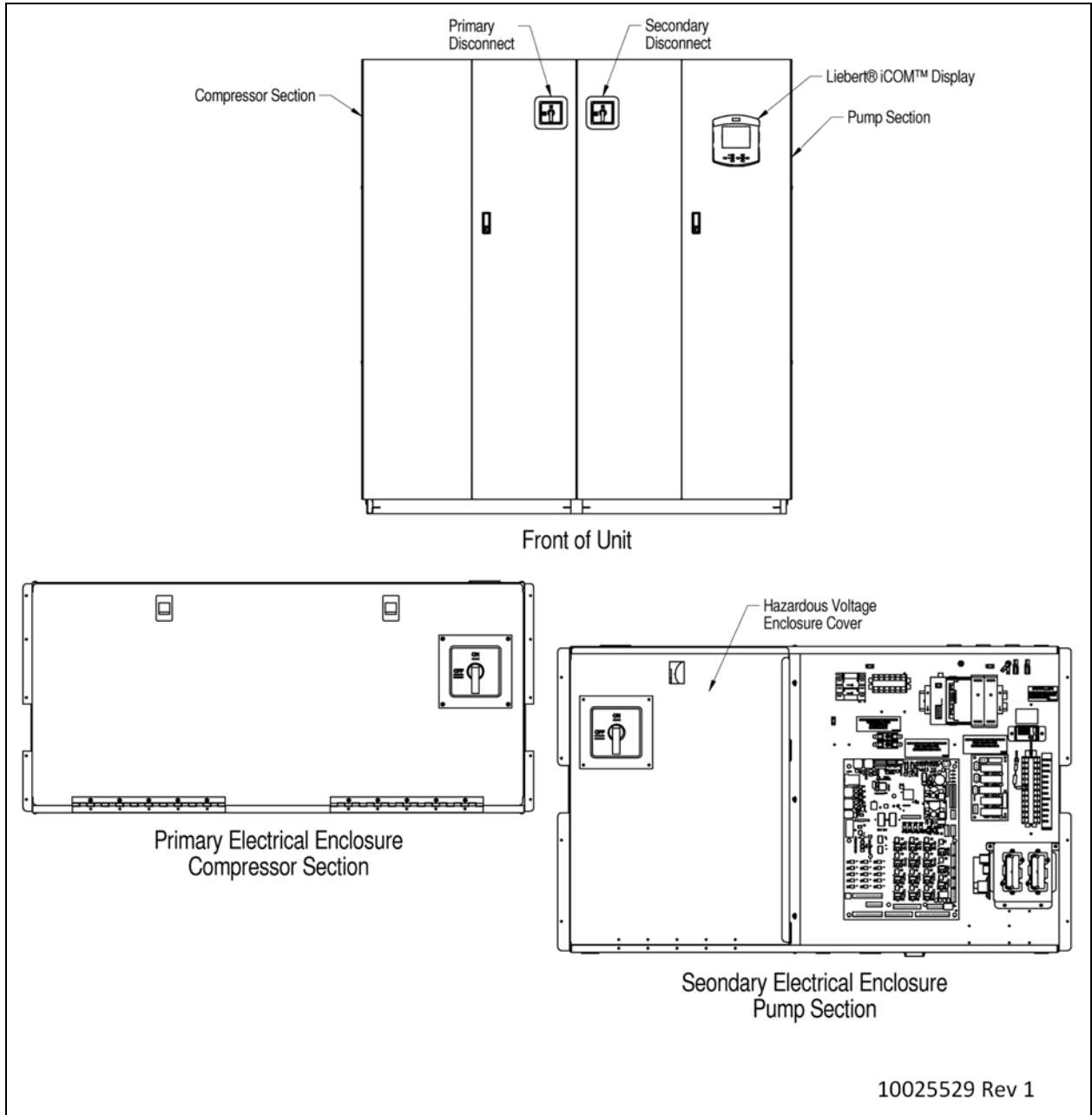


Figure 5.6 Liebert® XDC Electrical Enclosure Knockout Locations for Field Wiring

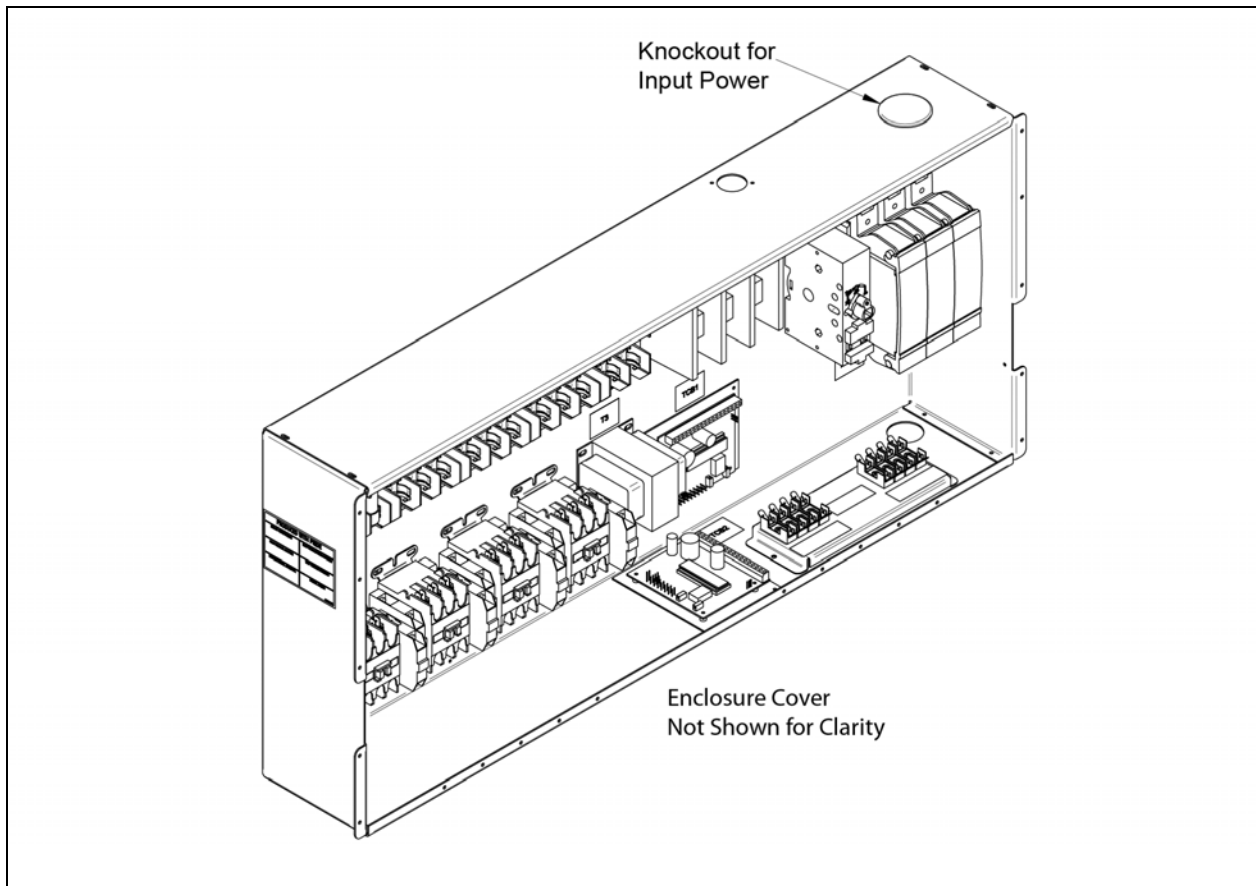


Figure 5.7 Liebert® XDC High-Voltage Connections—Primary Disconnect Switch, 60Hz Models

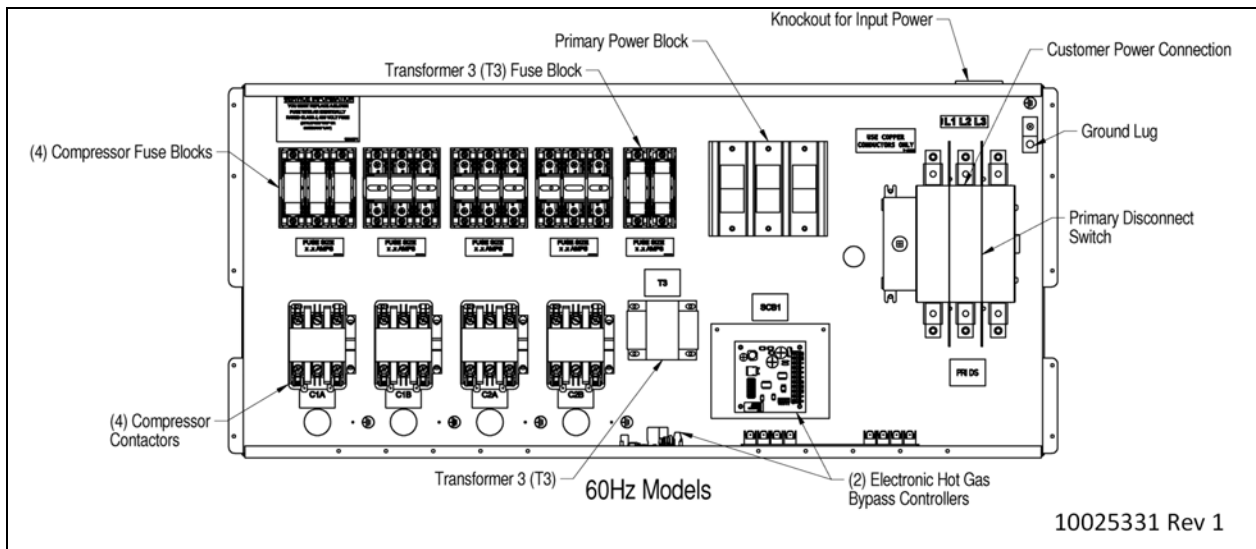


Figure 5.8 Liebert® XDC High-Voltage Connections—Primary Disconnect Switch, 50Hz Models

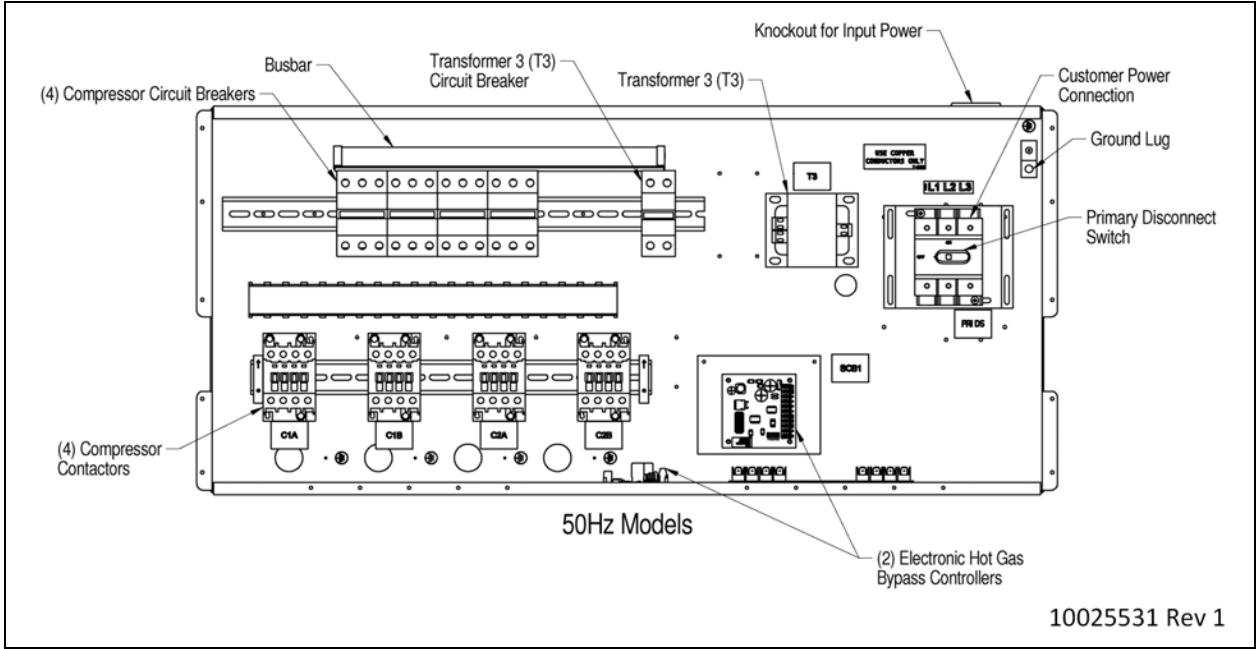


Figure 5.9 Liebert® XDC High-Voltage Connections—Secondary Disconnect Switch, 60Hz Models

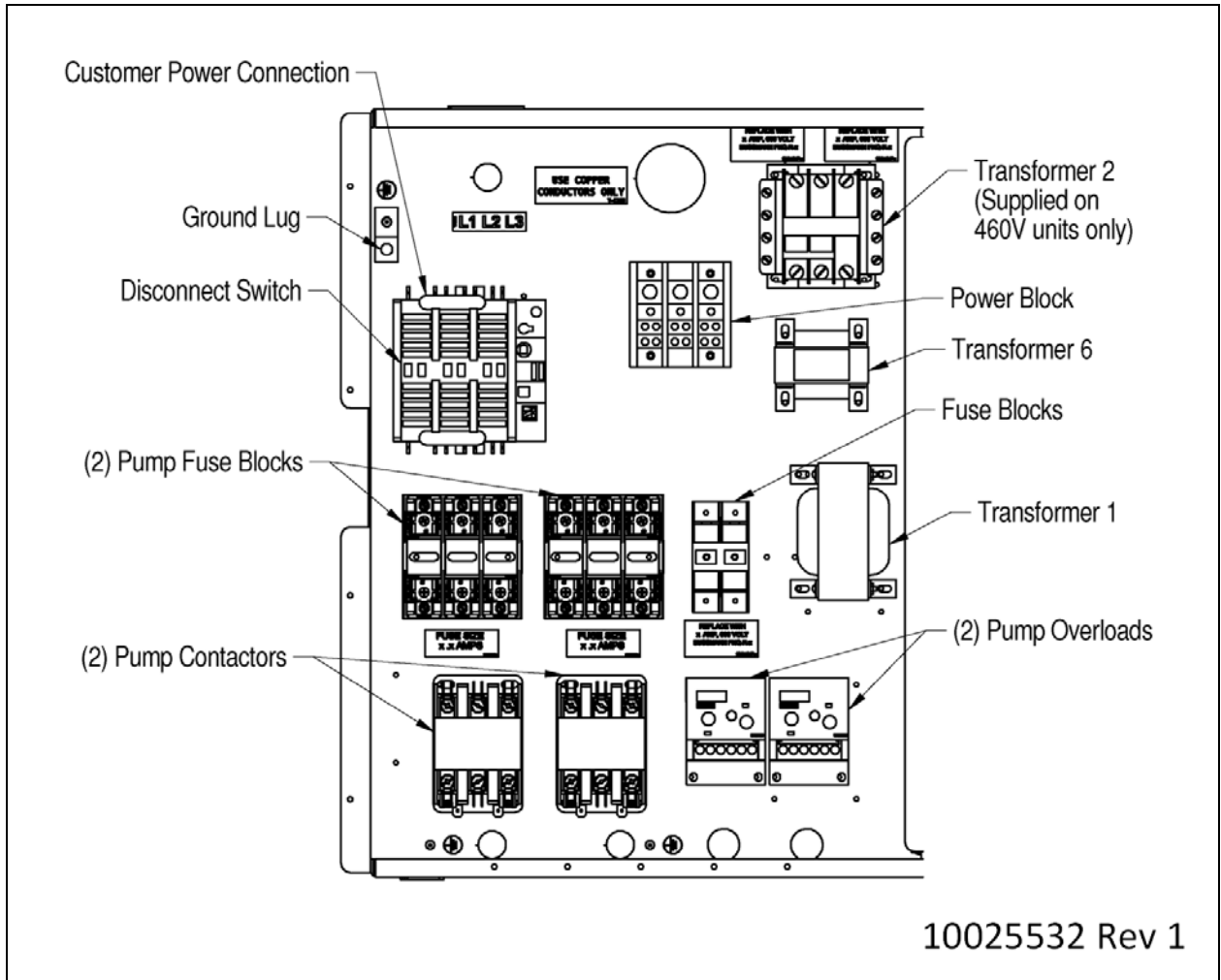


Figure 5.10 Liebert® XDC High-Voltage Connections—Secondary Disconnect Switch, 50Hz Models

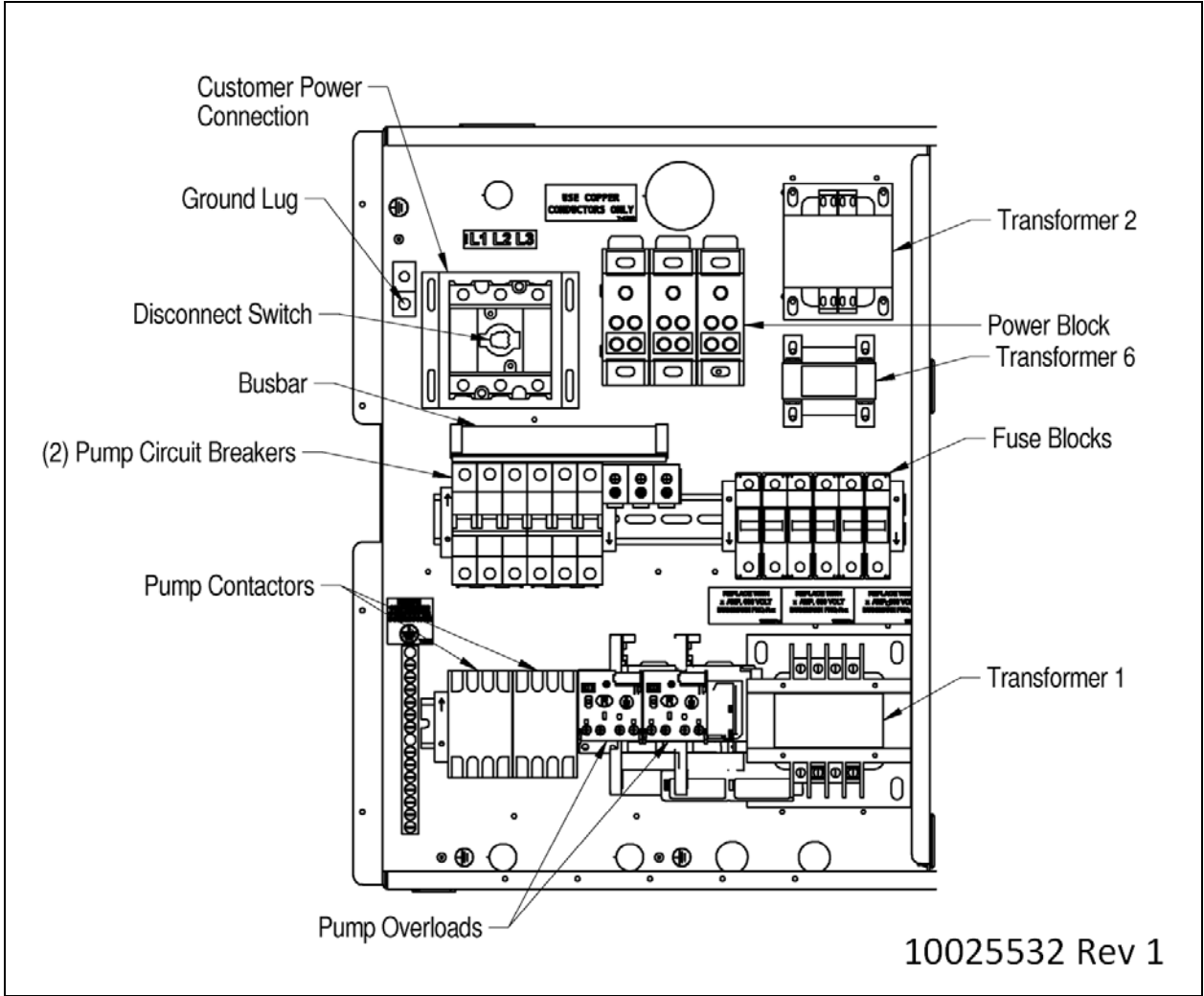


Figure 5.11 Liebert® XDC Heat Rejection Electrical Connection Points

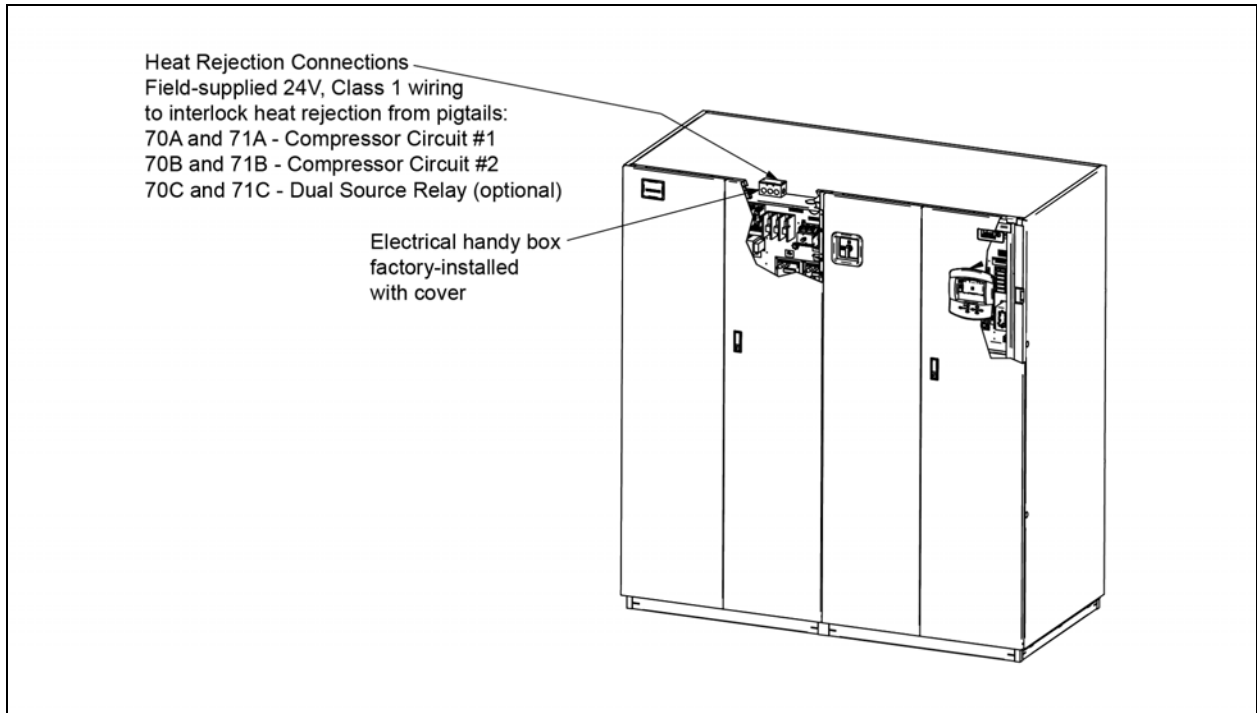


Figure 5.12 Liebert® XDC Electrical Enclosure Knockout Locations for Extra Low-Voltage Connections

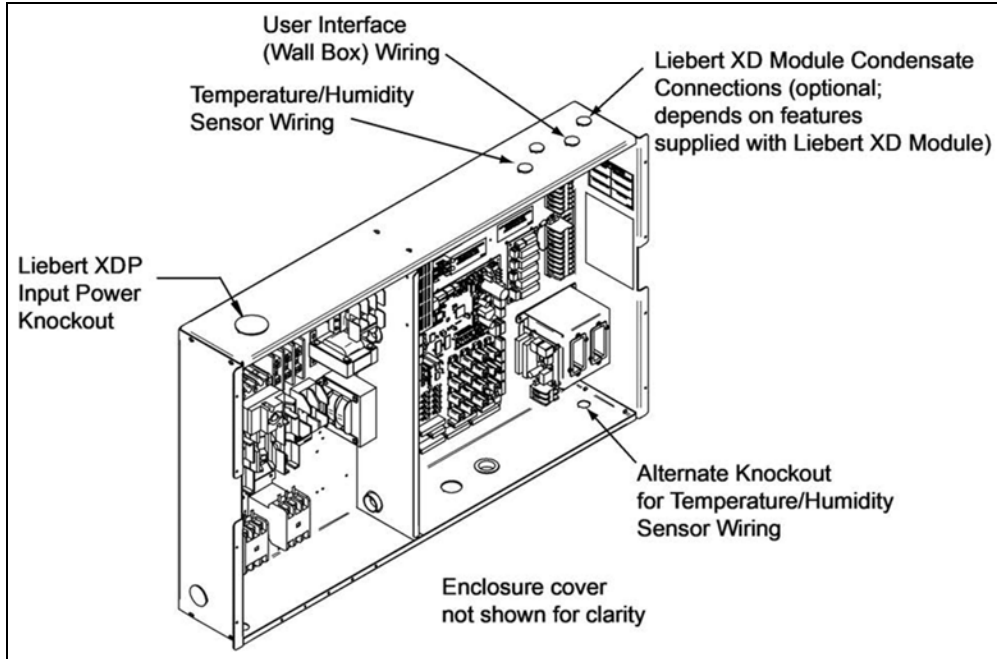
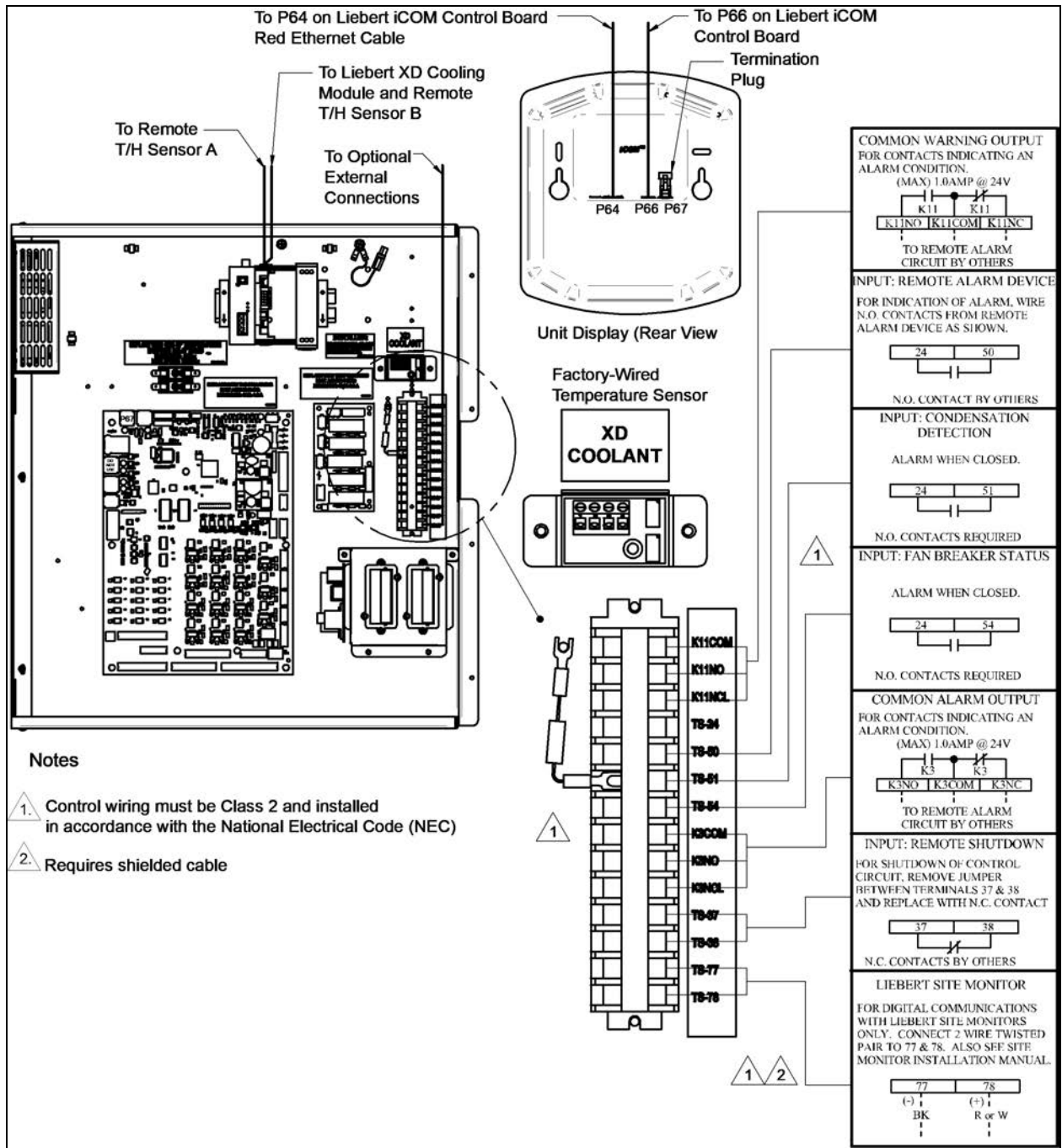


Figure 5.13 Liebert® XDC Extra Low-Voltage Field Connection Points



5.2 Liebert® XDP Standard Features

- **Heat Exchanger**—Braze plate design with interwoven circuiting constructed of stainless steel plates, copper brazed.
- **Pumps**—Centrifugal type, end suction, internally cooled, canned rotor design.
- **Cabinet and Frame**—Custom powder painted steel panels. A hinged control access panel opens to a second front panel, which is a protected enclosure for all high-voltage components. Frame is constructed of 14 gauge heliarc welded tubular steel and painted using an auto-deposition coating system.
- **Liebert® iCOM™**—The Liebert® iCOM™ offers the highest capabilities in control, communication and monitoring of Liebert Precision Cooling units. The Liebert® iCOM™ is a factory-installed assembly. Operating conditions and status are indicated on the display, which is mounted either on the Liebert® XDP or on the wall, depending on application details (see user manual, SL-16644). The control system also monitors unit operation and activates an alarm when any of the specified factory preset conditions are exceeded.

The Liebert® XDP with Liebert® iCOM™ includes two temperature-humidity sensors to aid in effective cooling.

- **CANbus Communication**—The Liebert® XDP is able to communicate with XD smart modules over CANbus. This allows the status of the modules to be viewed from the Liebert® XDP iCOM® display. The Liebert® XDP is also able to send remote shutdown signals to the smart modules. Liebert® XD smart modules are able to provide alarm conditions such as fan failure or condensate detection at the Liebert® XDP display.

Figure 5.14 Liebert® XDP Dimensions

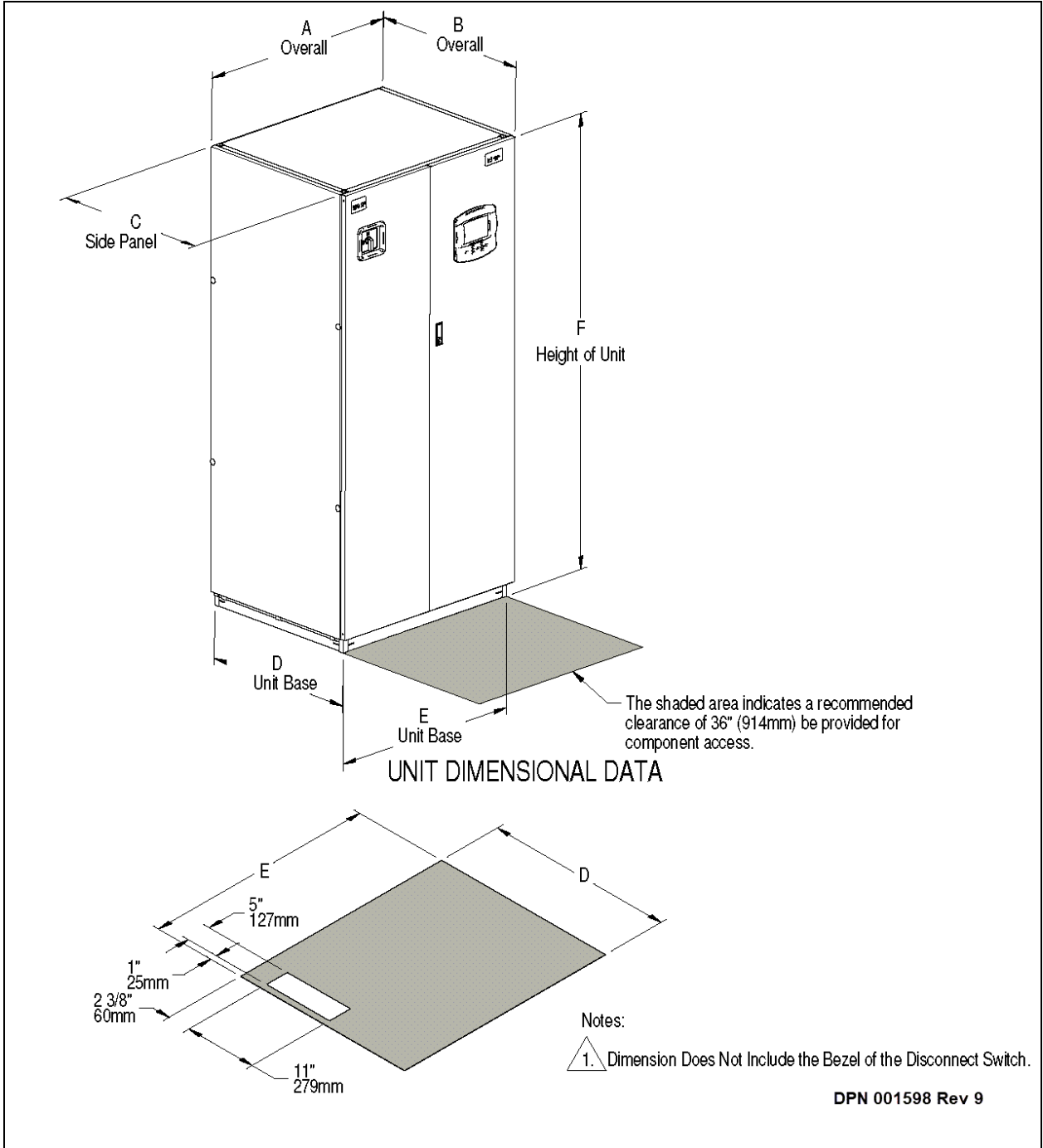


Table 5.4 Liebert® XDP Dimensions

Model	Dimensional Data inches (mm)					Shipping Weight, lb (kg)	
	A	B *	C	D	E	Domestic	Export
Liebert® XDP160	38 (965)	34 (864)	33-1/8 (841)	33 (838)	36 (914)	990 (449)	1067 (484)

* The dimension does not include the bezel of the disconnect switch.

Figure 5.15 Liebert® XDP Piping Access Points and External Features

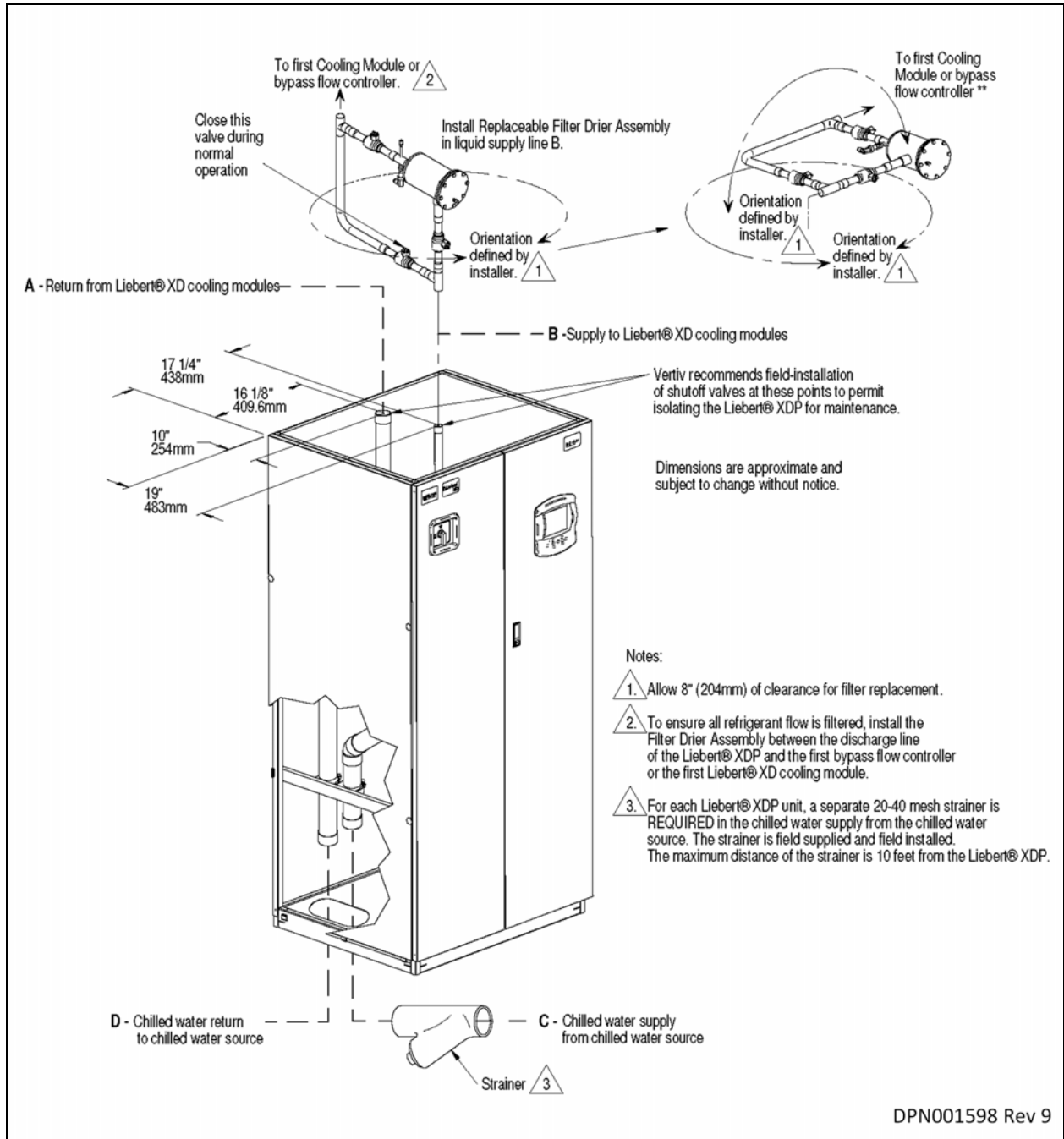


Table 5.5 Unit Piping Outlet Connection Sizes, Inches, OD Cu

Model	Pipe Connection Point			
	A	B	C	D
Liebert® XDP160	2-1/8	1-1/8	2-5/8	2-5/8

Figure 5.16 Front View of Liebert® XDP and Electrical Enclosure

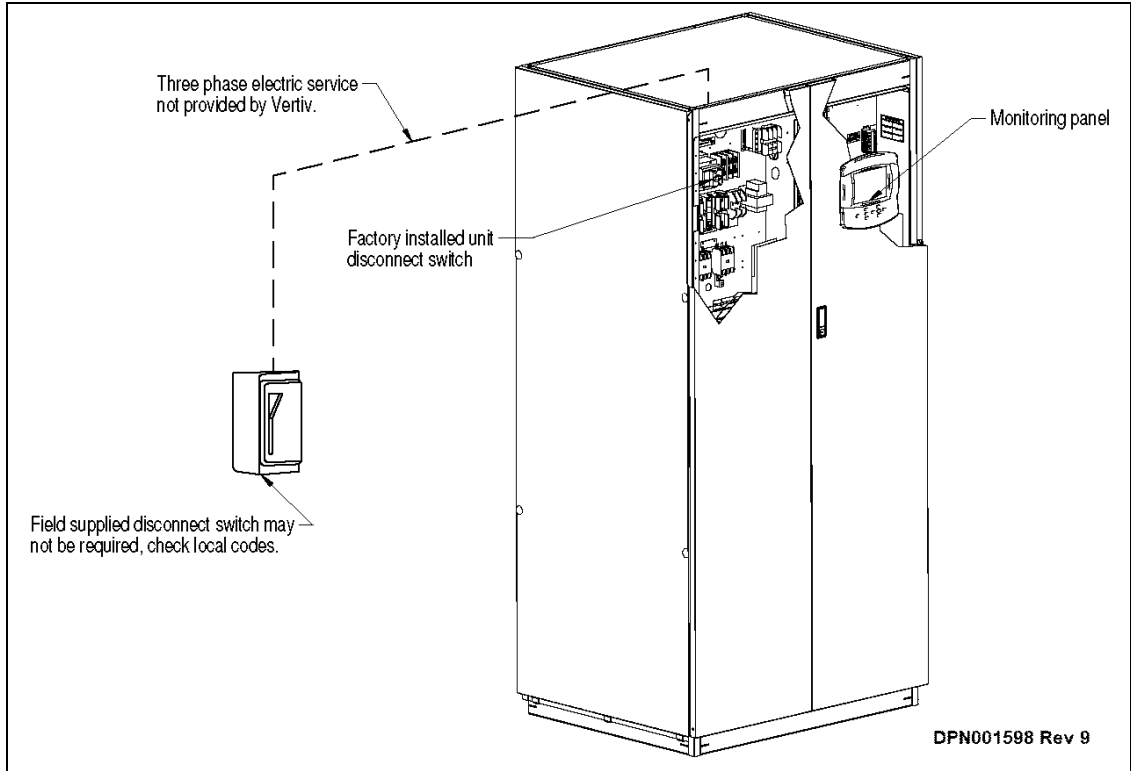


Figure 5.17 Liebert® XDP Electrical Enclosure Knockout Location for Hazardous Voltage Wiring

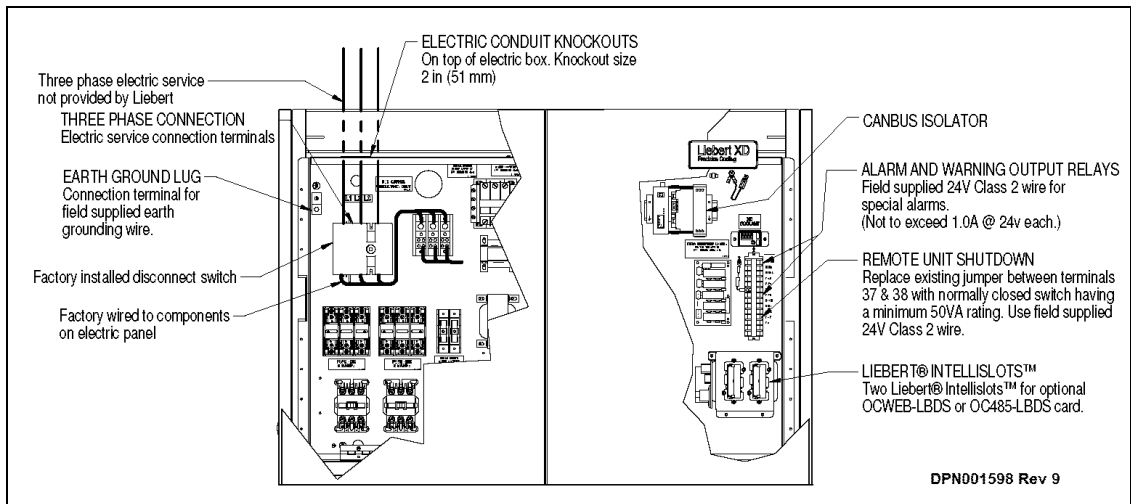


Figure 5.18 Liebert® XDP Electrical Enclosure Knockout Locations for Field Wiring

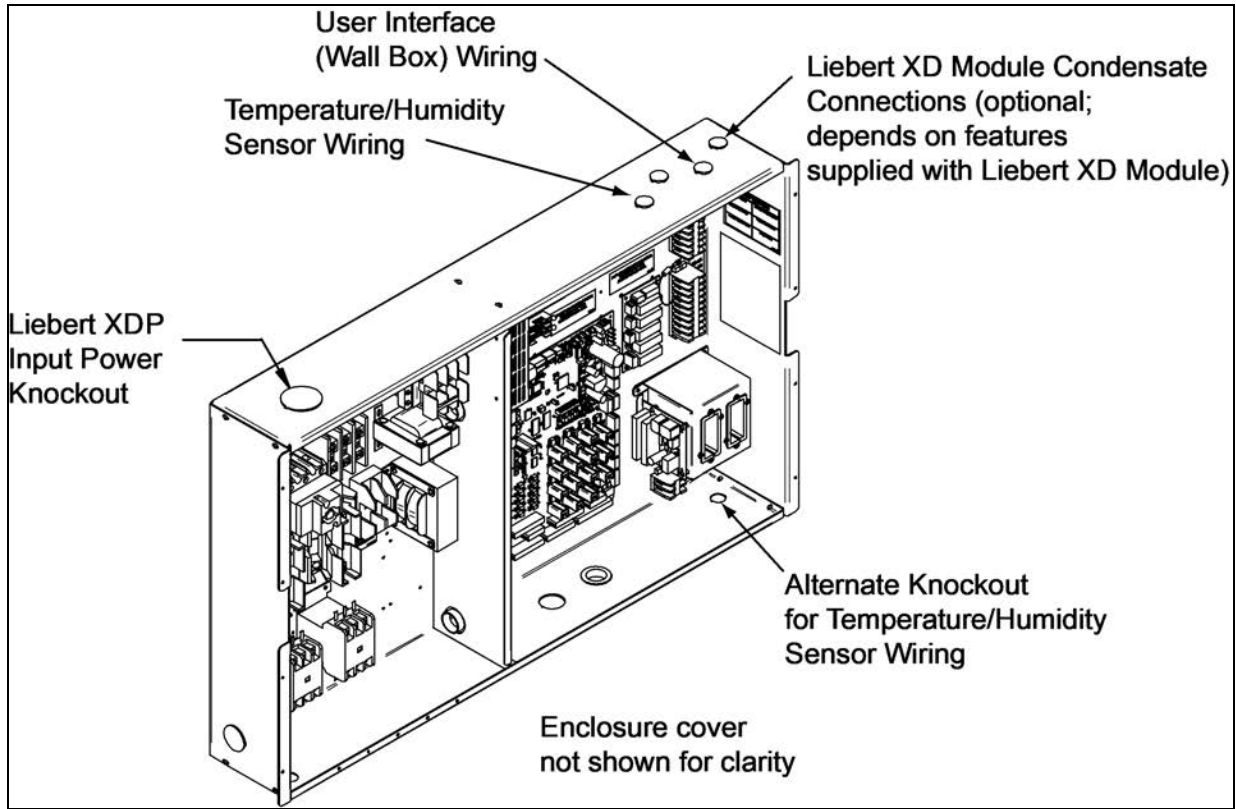


Figure 5.19 Liebert® XDP High-Voltage Connections—60Hz

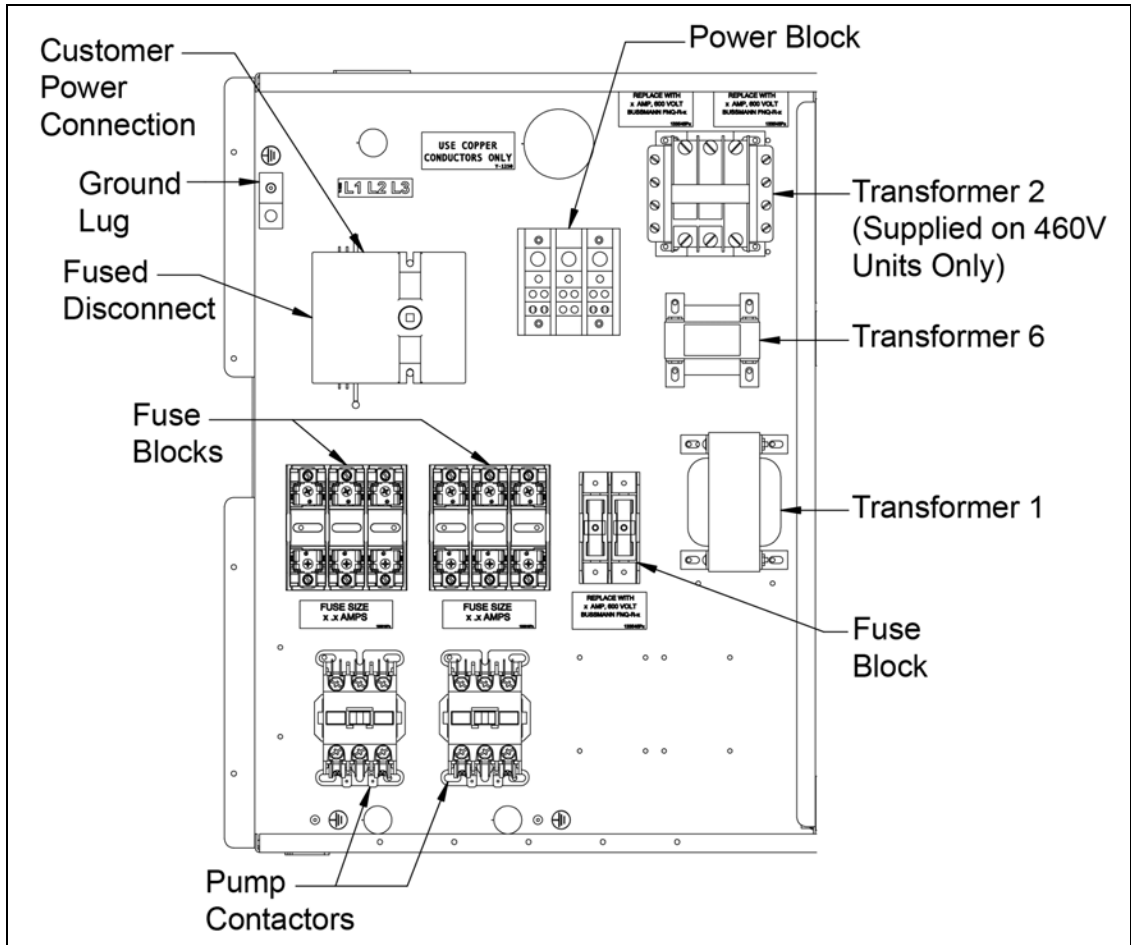
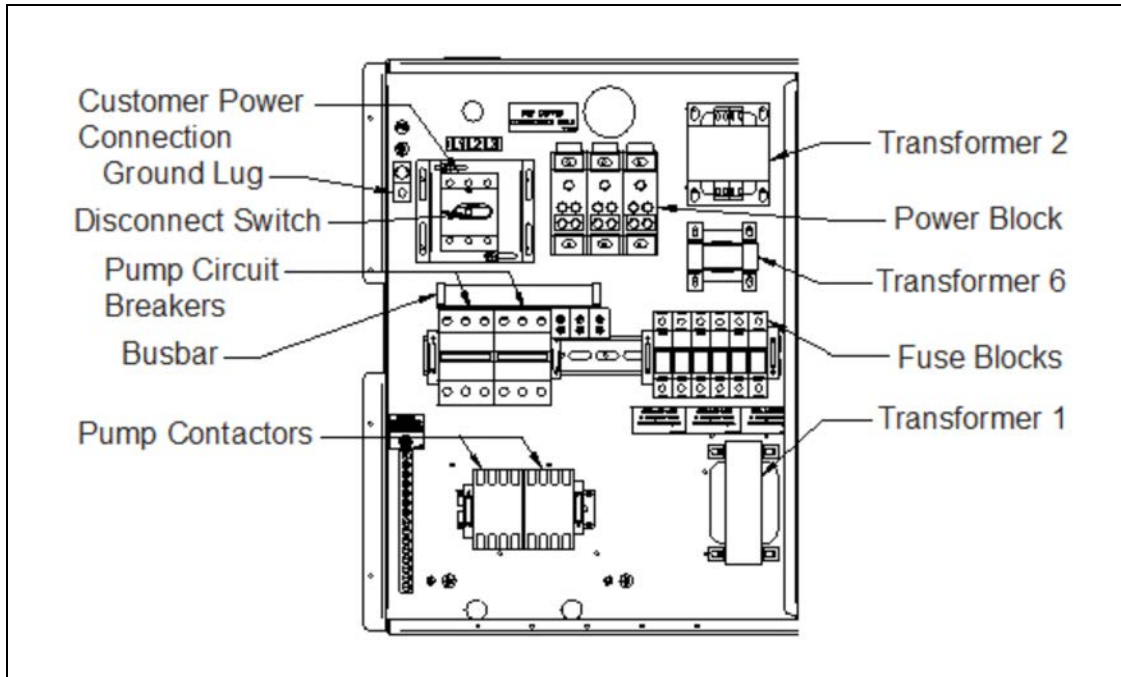


Figure 5.20 Liebert® XDP High-Voltage Connections—50Hz



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6 Heat Rejection

6.1 Liebert® Lee-Temp Refrigerant Control Air Cooled Condensers

The Liebert® XDC requires two air cooled condensers per unit. Each condenser requires one receiver.

6.1.1 Liebert® Lee-Temp Refrigerant Control Air Cooled Condenser

The Liebert® Lee-Temp head pressure control system is designed to maintain proper operating head pressures in outdoor temperatures down to -30°F (-34.4°C). The condensers utilize head pressure control valves, extra refrigerant and insulated refrigerant receivers with heater pads. It works by flooding the condenser coil with liquid refrigerant 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 refrigerant 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 refrigerant exiting from the condenser. This extra liquid refrigerant 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 are either fan cycling on ambient temperature or constant on.

6.1.2 Standard Features—All Condensers

Table 6.1 Receivers and Head Pressure Kits for Liebert® Lee-Temp Condensers

Outdoor Ambient°F (°C)	Condenser Model 50/60Hz	Condenser Qty	Receiver Part #	Receiver Qty	Head Pressure Kit	Head Pressure Kit Qty
-30 to 100 (-34 to 38)	DCSL415	2	185010G2 ¹ /G4 ²	2	179711G1	2
-30 to 105 (-34 to 41)	DCSL616	2	179713G1/G2 ²	1	179711G2	2
35 to 105 (2 to 41)	DCSL616	2	181610G2 ¹ /G4 ²	2	179711G1	2
¹ 120V heater ² 230V heater						

Liebert condensers consist of condenser coil(s), housing, propeller fan(s) direct driven by individual fan motor(s), electrical controls and mounting legs. Liebert air cooled condensers provide positive refrigerant head pressure control to the Precision Cooling indoor unit by adjusting heat rejection capacity. Various methods are employed to match indoor unit type, minimum outdoor design ambient and maximum sound requirements.

6.1.3 Condenser Coil

Liebert manufactured coils are constructed of copper tubes in a staggered tube pattern. Tubes are expanded into continuous, corrugated aluminum fins. The fins have full depth fin collars completely covering the copper tubes, which are connected to heavy wall Type “L” headers. Inlet coil connector tubes pass through relieved holes in the tube sheet for maximum resistance to piping strain and vibration. Coils are either single circuit or dual circuit, depending on the application. The hot gas and liquid lines are spun shut at the factory and include a factory-installed Schrader valve. Coils are factory leak tested at a minimum of 300 psig (2068 kPa gauge), dehydrated, then filled and sealed with a nitrogen holding charge for shipment.

6.1.4 Housing

The condenser housing is fabricated from bright aluminum sheet and divided into individual fan sections by full width baffles. Structural support members, including coil support frame, motor and drive support, are galvanized steel for strength and corrosion resistance. Aluminum legs are provided for mounting unit for vertical discharge and have rigging holes for hoisting the unit into position. The unit's electrical panel is inside an integral NEMA 3R weatherproof section of the housing.

6.1.5 Propeller Fan

Aluminum propeller fan blades are secured to a corrosion protected steel hub. Fan guards are heavy gauge, close meshed steel wire with corrosion resistant PVC finish rated to pass a 675-hour salt spray test. Fans are secured to the fan motor shaft by a keyed hub and dual setscrews. Fan diameter is 26" (660mm) or less. The fans are factory-balanced and run before shipment.

6.1.6 Fan Motor

The condenser fan motor is a continuous air over design equipped with rain shield and permanently sealed bearing. Die-formed, galvanized steel supports are used for rigid mounting of the motor.

6.1.7 Electrical Controls

Electrical controls, overload protection devices and service connection terminals are factory-wired inside the integral electrical panel section of the housing. A locking disconnect switch is factory-mounted and wired to the electrical panel and controlled via an externally mounted locking door handle. An indoor unit interlock circuit enables condenser operation whenever indoor unit compressors are active. Only supply wiring and indoor unit interlock wiring are required at condenser installation.

6.2 Mechanical Considerations

6.2.1 Dimensions

Figure 6.1 Condenser Planning Dimensional Data—Four Fan Unit Lee-Temp DCSL415

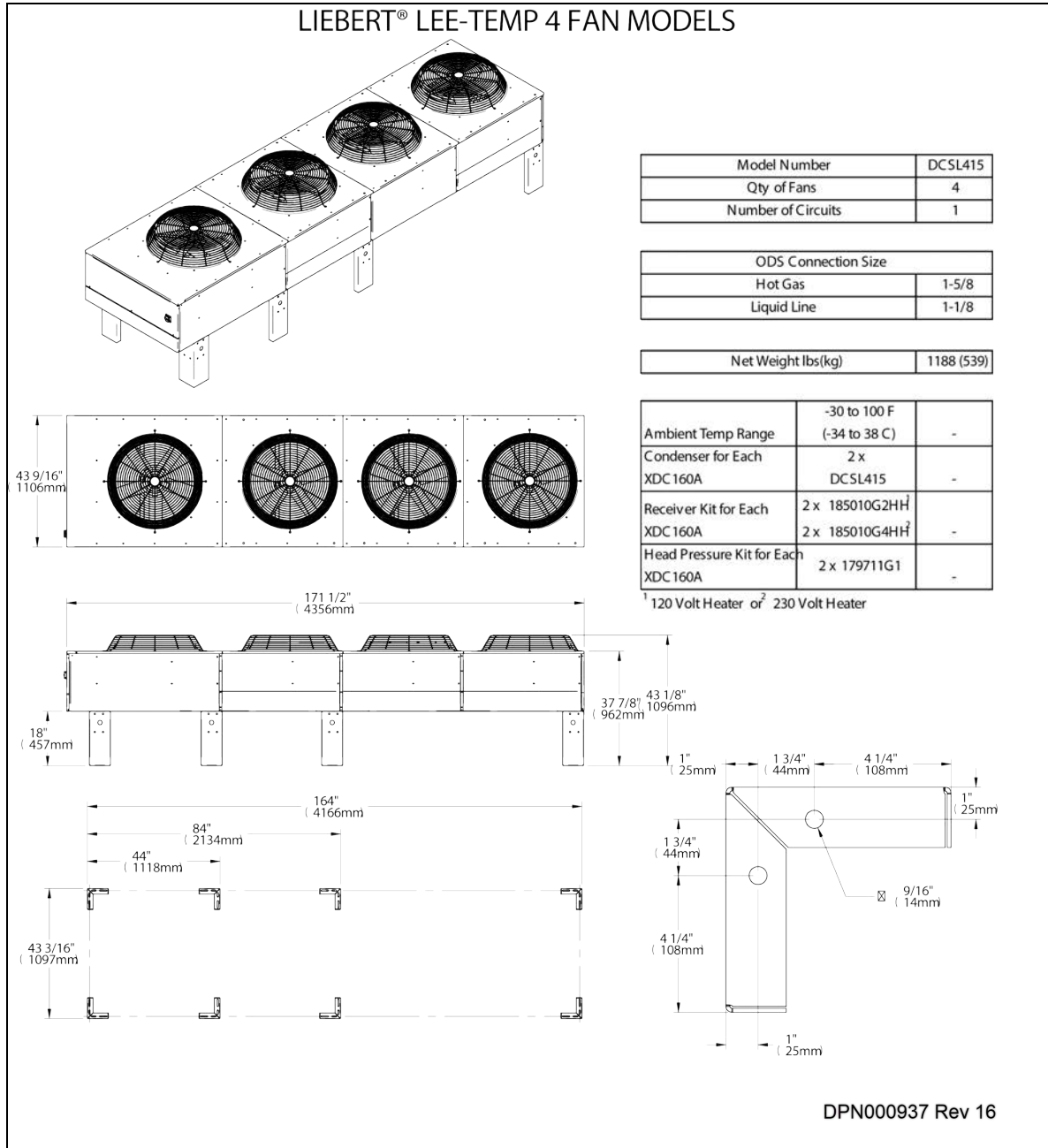


Figure 6.2 Condenser Planning Dimensional Data—Six Fan Units Lee-Temp DC SL616 High Ambient (Single Circuit Shown)

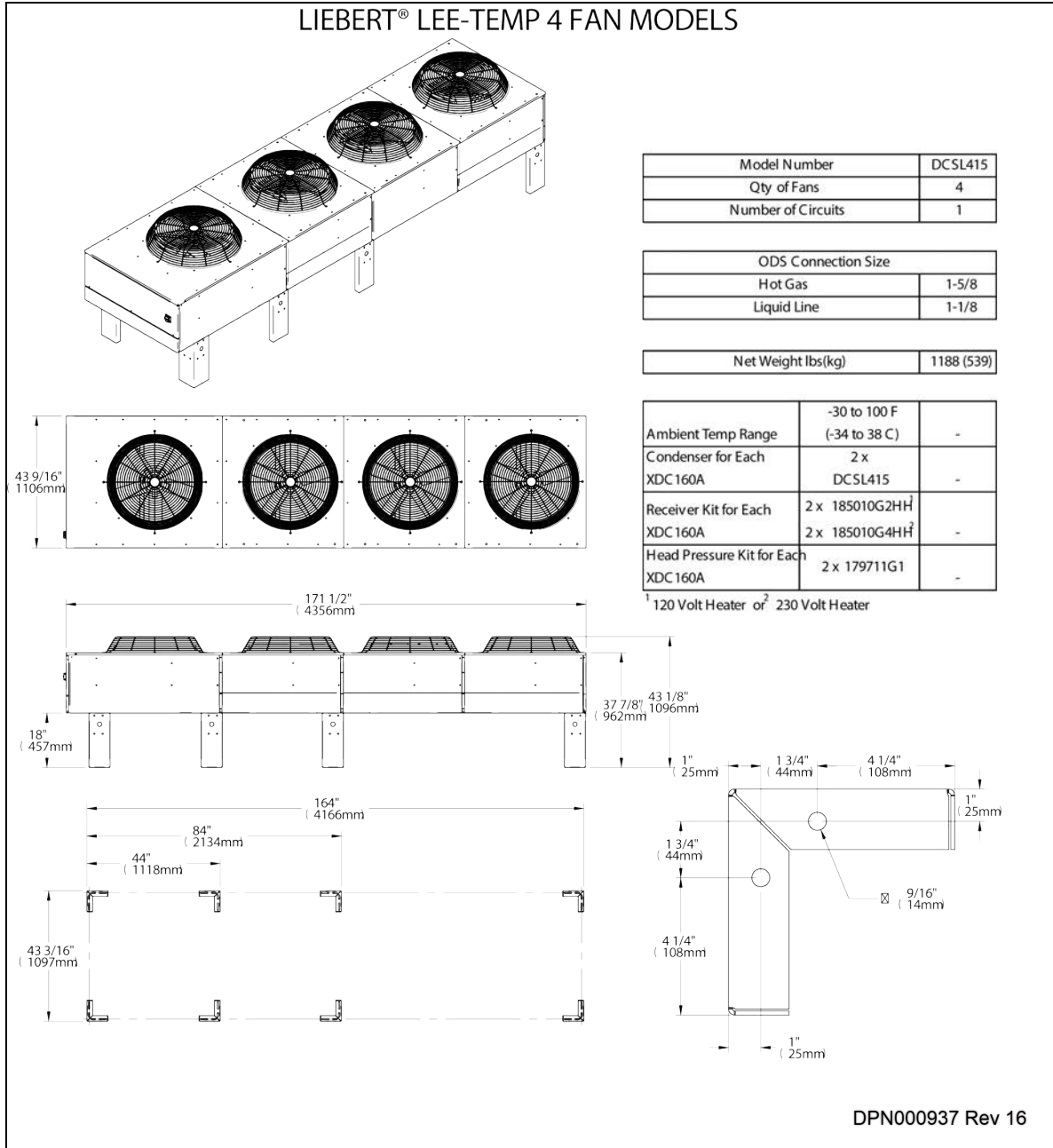


Figure 6.3 .Condenser Planning Dimensional Data—Six Fan Units Lee-Temp DCSL616 High Ambient (Single Circuit Shown)

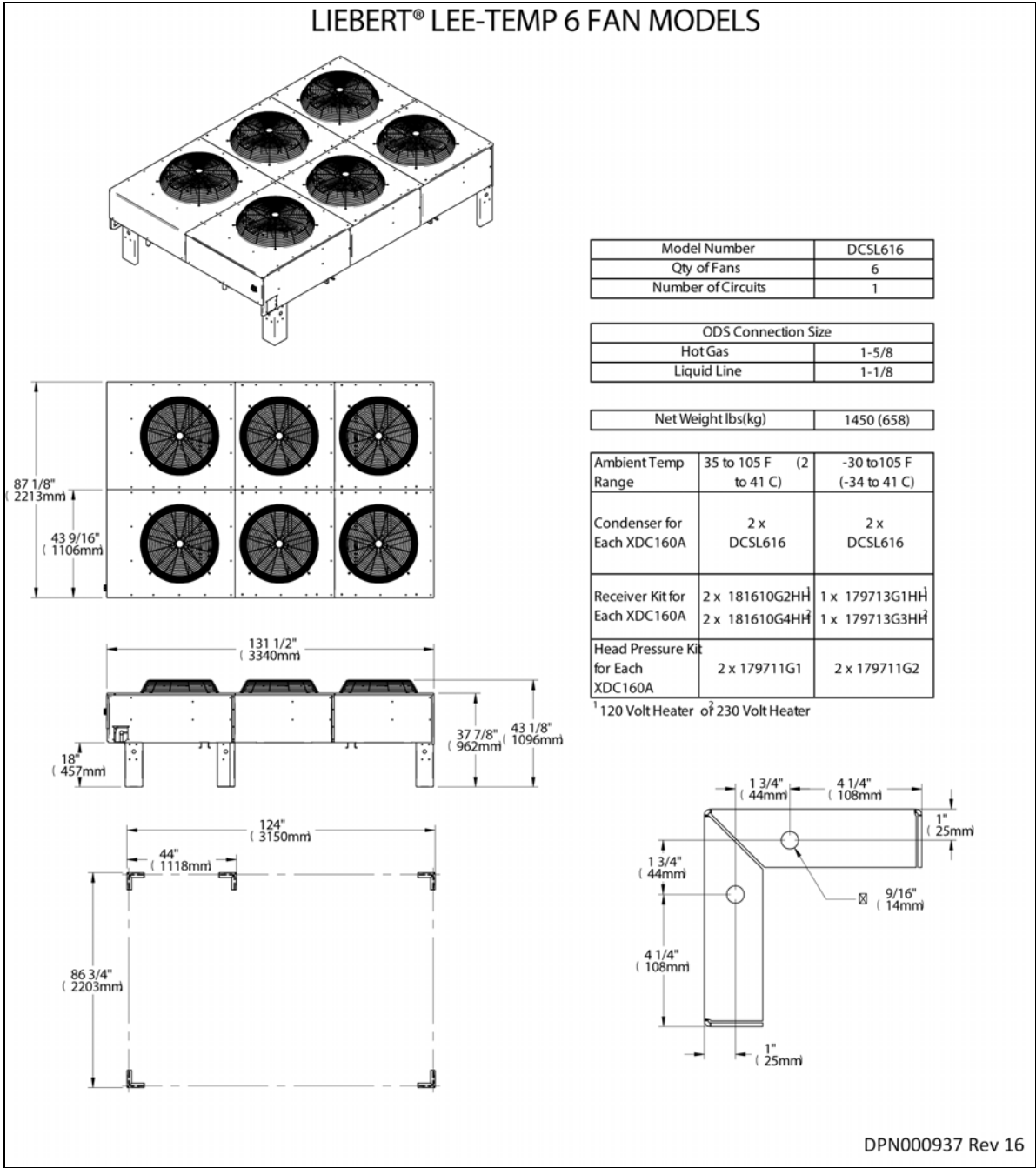


Table 6.2 Condenser Weights and Connections

Outdoor Ambient °F (°C)	Model 50/60Hz	Number of Fans	Connection Size, OD, In.		Net Weight lb (kg)	Receiver Part #	Receivers per Condenser	Net Weight lb (kg)
			Hot Gas	Liquid				
-30 to 100 (-34 to 38)	DCSL415	4	1-3/8	1-1/8	840 (381)	185010G2 ¹ /G4 ²	1	260 (118)
-30 to 105 (-34 to 41)	DCSL616	6	(2) 1-5/8	(2) 1-1/8	1380 (626)	179713G1/G2 ²	1	424 (192)
35 to 105 (-34 to 41)	DCSL616	6	(2) 1-5/8	(2) 1-1/8	1380 (626)	181610G2 ¹ /G4 ²	1	200 (91)
¹ 120V ² 230V								

Table 6.3 60Hz Electrical Condenser Data—Liebert® Lee-Temp Controlled/Fan Cycling

Model #	083, 104, 28K			165, 205, 60K			251, 308, 90K			415, 510			616			830, 1010				
# of Fans	1			2			3			4			6			8				
Input Voltage	ph	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	
208/230	3	3.5	4.4	15	7.0	7.9	15	10.5	11.4	15	14.0	14.9	20	21.0	21.9	25	28.0	28.9	35	
460		1.7	2.1	15	3.4	3.8	15	5.1	5.5	15	6.8	7.2	15	10.2	10.6	15	13.6	14.0	20	
575		1.4	1.8	15	2.8	3.2	15	4.2	4.6	15	5.6	6.0	15	8.4	8.8	15	11.2	11.6	15	
FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device																				

Table 6.4 50 Hz Condenser Full Load

Amp Value

Condenser Control Type		Liebert® Lee Temp Controlled/ Fan Cycling	
Model #	# of Fans	Input Voltage - Phase	
		200/230-3	380/415-3
415	4	14.0	6.8
616	6	21.0	10.2

Table 6.5 Liebert® Lee-Temp Receiver Electrical Data, 50Hz and 60Hz

Rated Voltage - Single Phase	120			200/208/230		
Watts/Receiver	150	300	450	150	300	450
Full Load Amps	1.4	2.8	4.2	0.7	1.4	2.1
Wire Size Amps	1.8	3.5	5.3	0.9	1.8	2.7
Maximum Overcurrent Protection Device, Amps	15	15	15	15	15	15

The Liebert® Lee-Temp receiver requires a separate power feed for heaters. The condenser is not designed to supply power to the receiver.

6.3 Heat Rejection Piping

6.3.1 Piping for Direct Expansion (DX) Circuit—R-407C Air Cooled Units

Risk of refrigerant system explosion or rupture from overpressurization. Can cause equipment damage, injury or death.



WARNING! Installer must install a 400 psig pressure relief valve in each of the two R-407C refrigerant circuits of the Liebert® XDC system. Do not install shutoff valves between the compressors and the pressure relief valves.

6.4 Install Double Discharge Risers

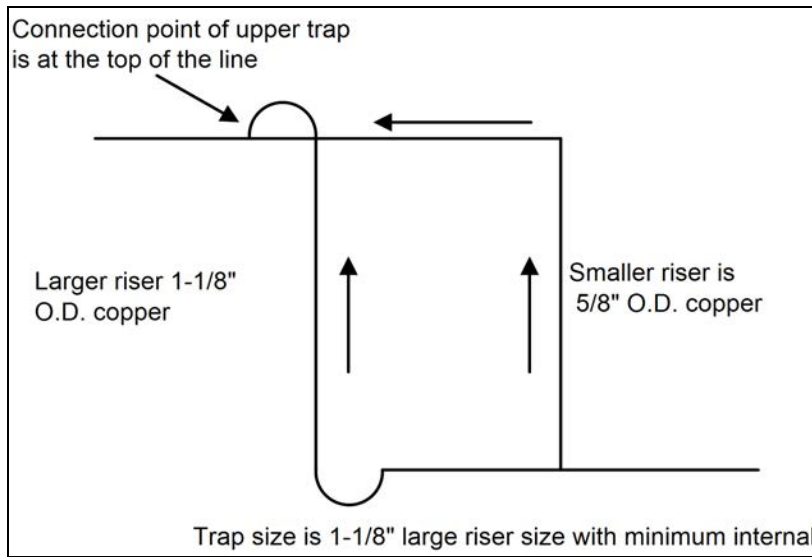
For air-cooled systems, double discharge risers must be installed in the hot gas lines that have vertical heights of 15 feet (4.6m) or more (see **Figure 6.4** on the next page). This will allow proper oil return to the compressors when the system is running at low loads. A double riser system is constructed of a large diameter riser with a trap at the base and a riser with a smaller diameter in parallel.

At full-load operation, the refrigerant vapor flows up both risers at velocities that are adequate to carry the oil. At low loads, refrigerant vapor velocities are lower and the trap at the bottom of the riser becomes filled with oil. When this happens, refrigerant flows up only the smaller riser.

The trap at the top of the riser must be tied into the top of the line to prevent oil from filling the larger riser. For each double riser used, the maximum height of the riser must not exceed 15 feet (4.6m). Multiple risers must be installed in series as the height of the hot gas line increases. Total maximum height of the hot gas line must not exceed 60 feet (18.3m).

Horizontal discharge lines should be pitched downward in the direction of flow to aid in oil drainage with downward pitch of at least 1/2 inch in 10 feet (13mm in 3m).

Figure 6.4 Double Discharge Riser Layout



Contact your local Liebert representative for factory approval whenever a refrigerant piping run exceeds 200 feet (60m) equivalent length or when condensers must be installed below the level of the cooling coil.

For Air Cooled Liebert® Lee-Temp Flood Back Head Pressure Control Units Only



WARNING! Risk of explosive discharge from high-pressure refrigerant. Can cause injury or death.

This unit contains fluids and/or gases under high pressure.

Relieve pressure before working with piping.

NOTICE

Risk of refrigerant contamination. Can cause equipment damage and operational problems.

Refrigerant R-407C is a blend of three components and must be introduced and charged from the cylinder only as a liquid.

Refrigerant R-407C uses a POE (polyolester) lubricant. Do not open the compressor unit piping to the atmosphere for more than 15 minutes. The compressors contain POE oil that is very hygroscopic; it quickly absorbs water from the atmosphere. The longer the compressor piping is open to the atmosphere, 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.

POE oils also have a property that makes them act as a solvent in a refrigeration system. Maintaining system cleanliness is extremely important because the oil will tend to bring any foreign matter back to the compressor. Refer to the ASHRAE refrigeration handbook for general good-practice refrigeration piping.

Table 6.6 Receivers and Head Pressure Kits for Liebert® Lee-Temp Condensers

Outdoor Ambient °F (°C)	Condenser Model 50/60Hz	Condenser Qty	Receiver Part #	Receiver Qty	Head Pressure Kit	Head Pressure Kit Qty
-30 to 100 (-34 to 38)	DCL415	2	185010G2 ¹ /G4 ²	2	179711G1	2
-30 to 105 (-34 to 41)	DCL616	2	179713G1 ¹ /G2 ²	1	179711G2	2
35 to 105 (2 to 41)	DCL616	2	181610G2 ¹ /G4 ²	2	179711G1	2
¹ 120V heater ² 230V heater						

Figure 6.5 Installation Data—Liebert® Lee-Temp, One Circuit, Four Fan Model

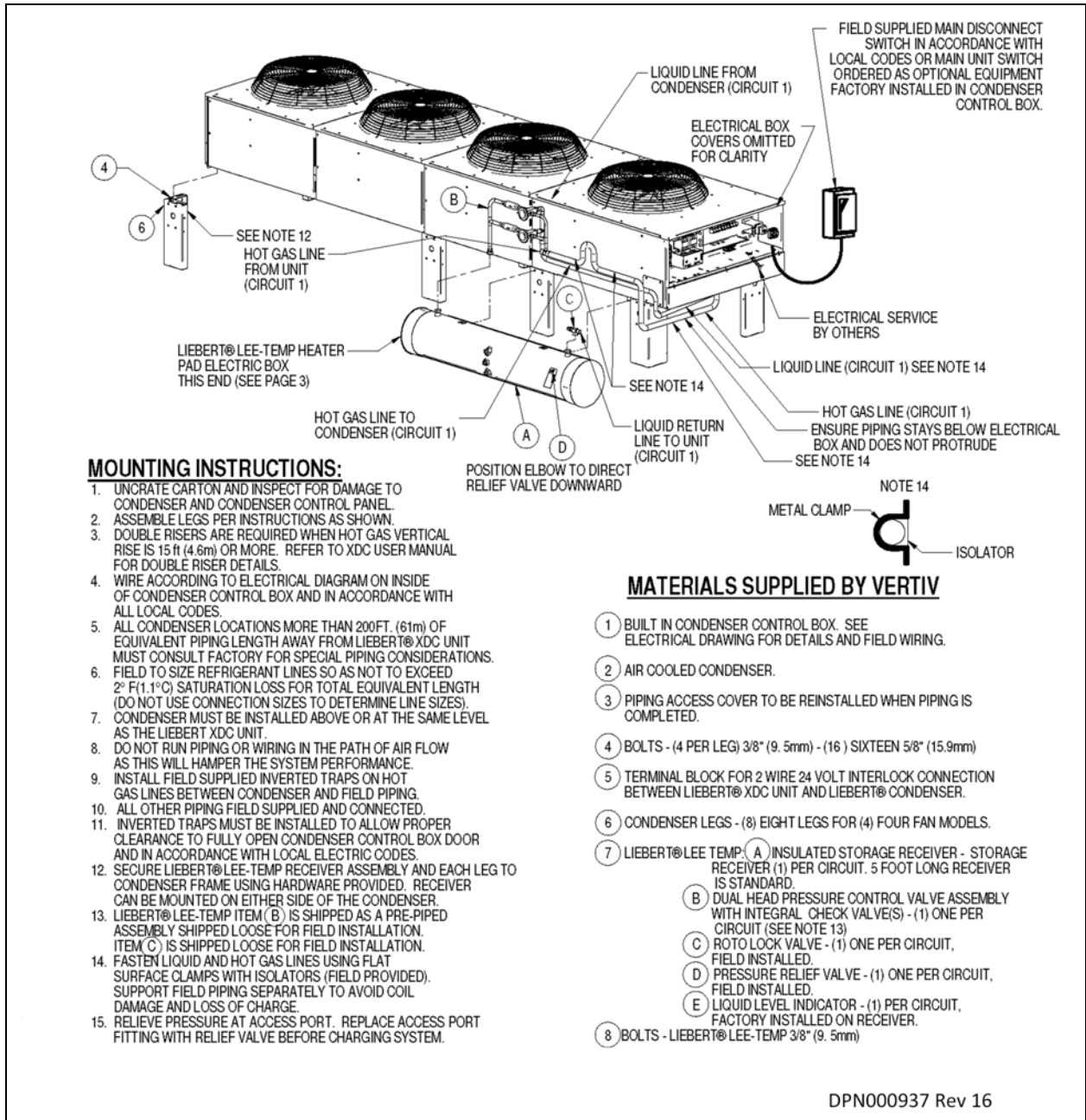


Figure 6.6 Installation Data—Liebert® Lee-Temp, One Circuit, High Ambient Six Fan Model

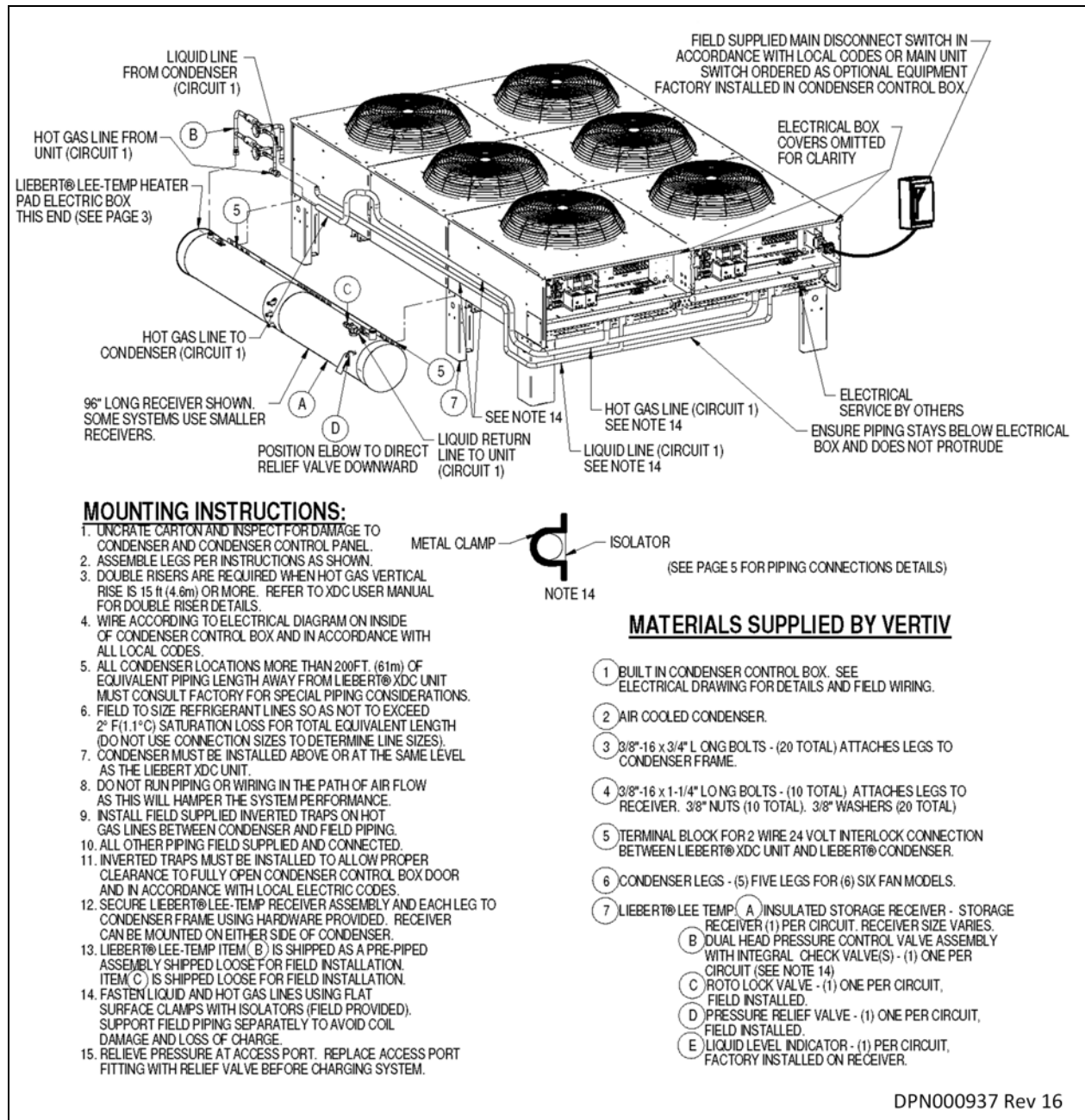


Figure 6.7 Liebert® XDC Piping Schematic and Liebert® Lee-Temp Heater Pad Wiring

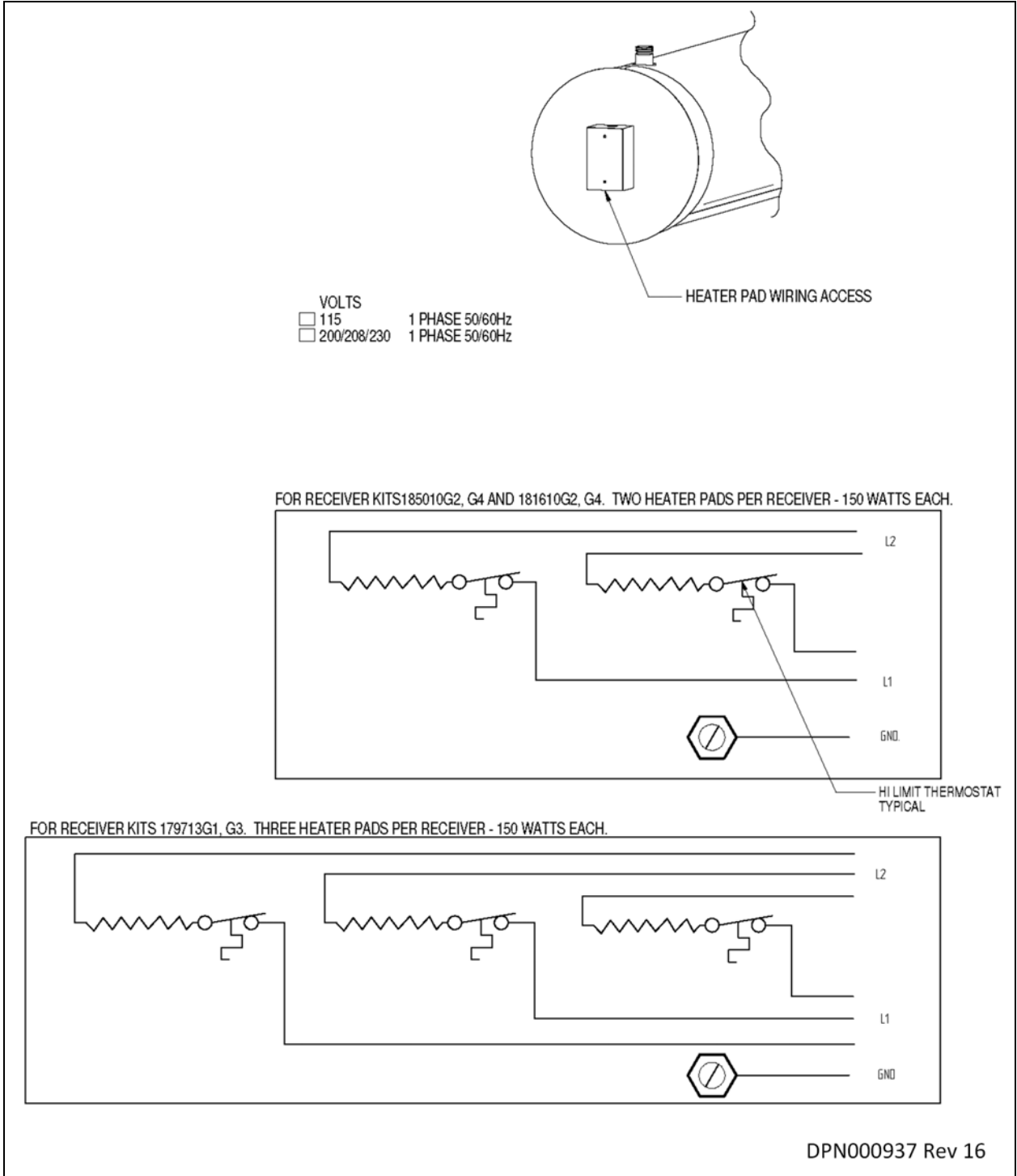


Figure 6.8 General Arrangement Air Cooled Liebert® XDC Liebert® Lee-Temp Control

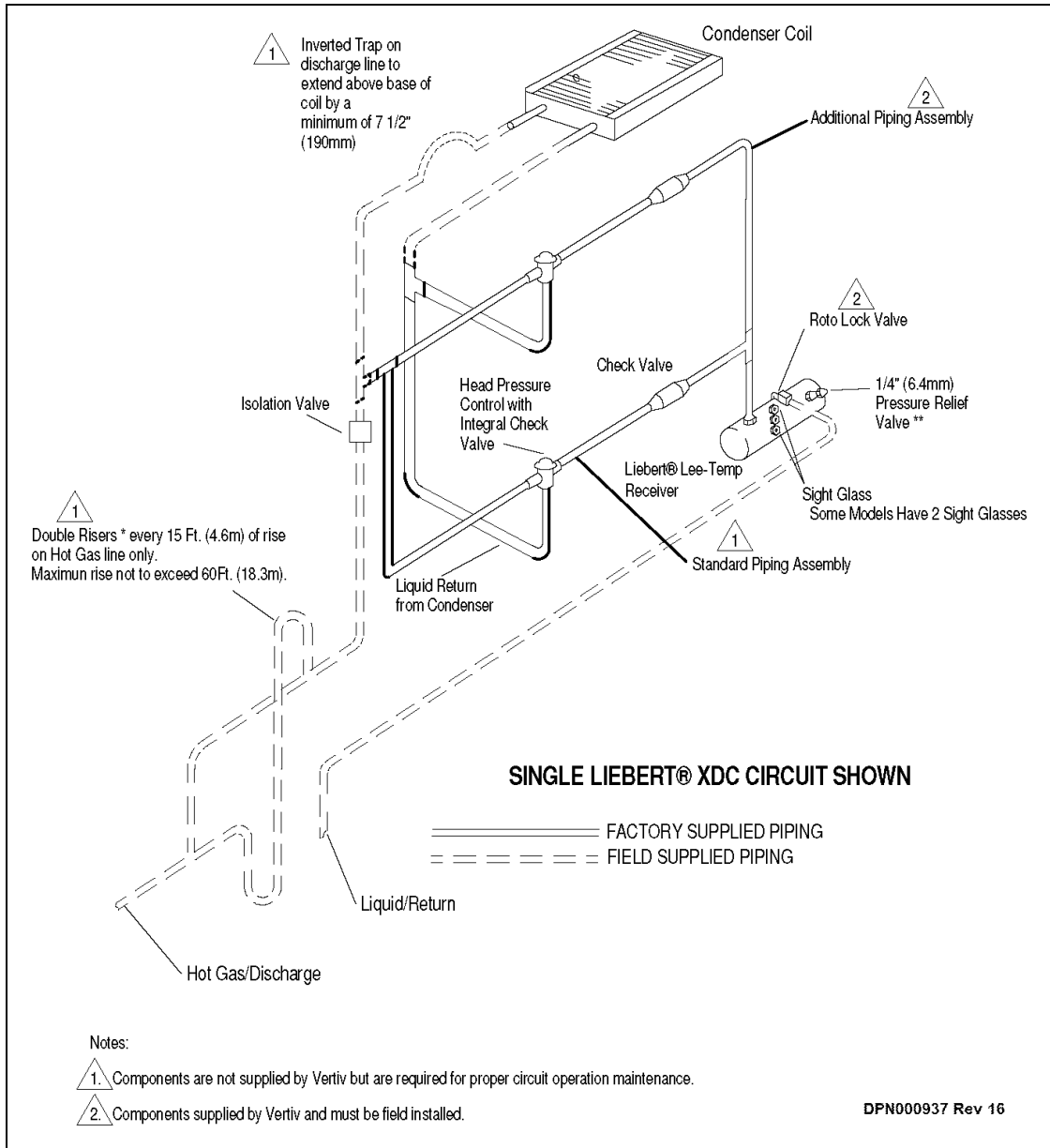


Table 6.7 Recommended Refrigerant Line Sizes, DX R-407C, OD Copper

Liebert® XDC 160		
Equivalent Length, ft., (m)	*Hot Gas Line, in.	Liquid Line, in.
50 (15)	1-1/8	7/8
100 (30)	1-1/8	1-1/8
150 (45)	1-3/8	1-1/8

Table 6.7 Recommended Refrigerant Line Sizes, DX R-407C, OD Copper (continued)

Liebert® XDC 160		
Equivalent Length, ft., (m)	*Hot Gas Line, in.	Liquid Line, in.
200 (60)	1-3/8	1-1/8

* Double risers are required when hot gas vertical rise is 15ft. (4.6m) or more.
Source: DPN000937, Rev 16

Figure 6.9 DCSL616 Piping Connections—Two Refrigerant Circuits Connected for Parallel Flow

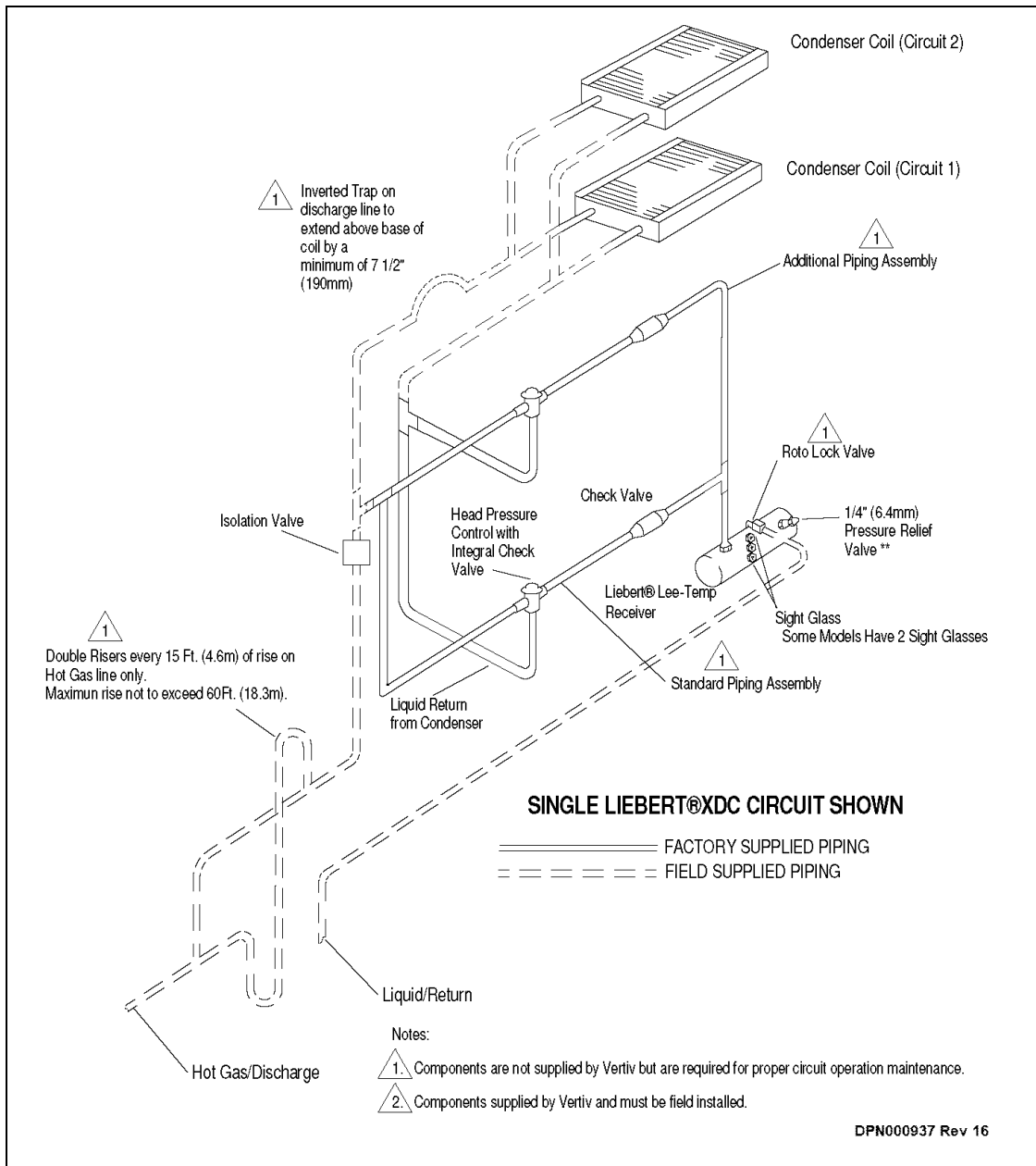


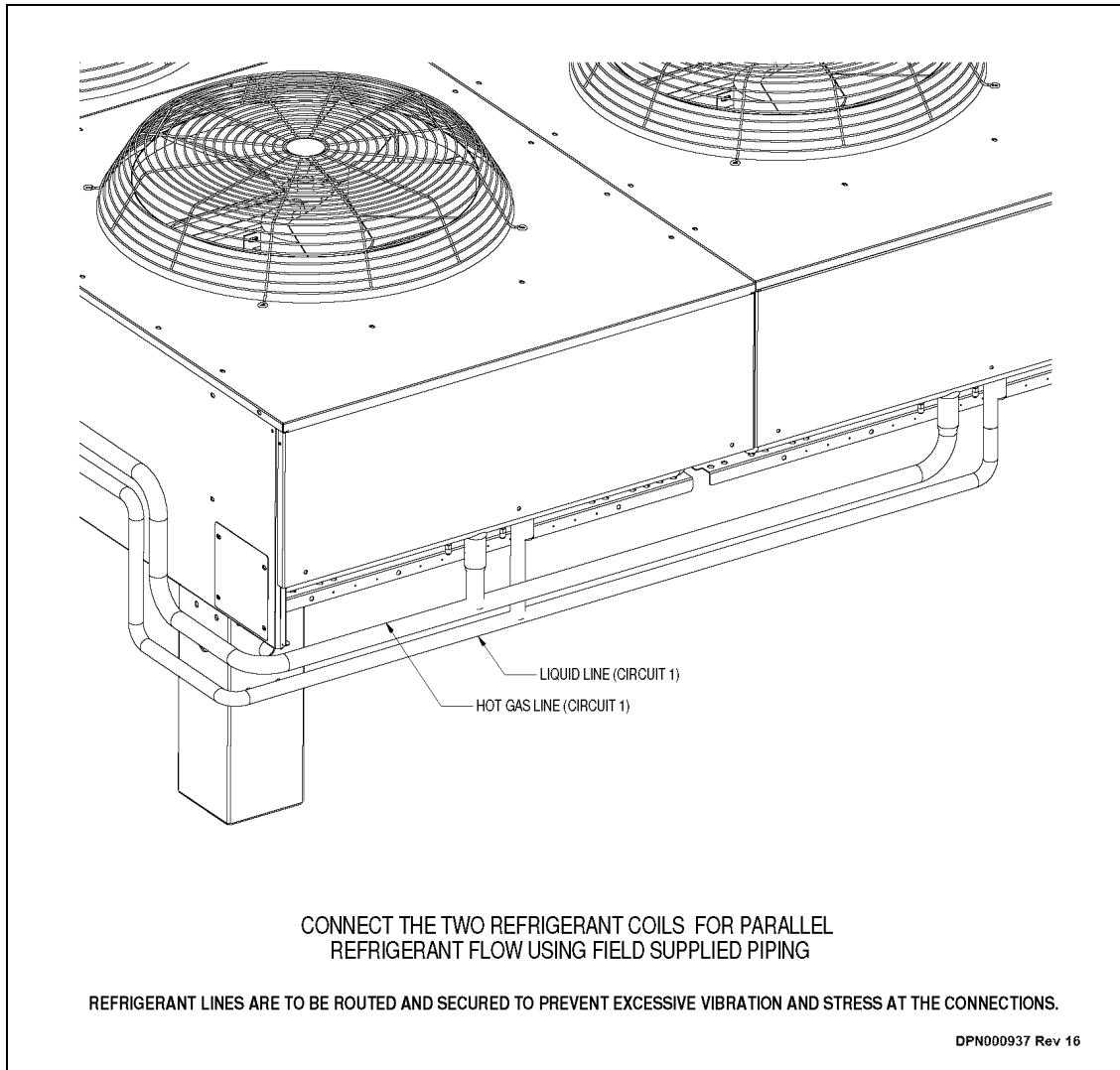
Table 6.8 Recommended Refrigerant Line Sizes for DCSL616

Liebert® XDC 160		
Equivalent Length, ft., (m)	*Hot Gas Line, in.	Liquid Line, in.
50 (15)	1-1/8	7/8
100 (30)	1-1/8	1-1/8
150 (45)	1-3/8	1-1/8
200 (60)	1-3/8	1-1/8

* Double risers are required when hot gas vertical rise is 15 feet or more.

Source: DPN000937, Rev. 16

Figure 6.10 DCSL616 Piping Connections—Two Refrigerant Circuits Connected for Parallel Refrigerant Flow



6.4.1 Air Cooled Condenser with Liebert® Lee-Temp “Flooded Condenser” Head Pressure Control System—R-407C (DX) Circuit

The Liebert® Lee-Temp system consists of a modulating type head pressure control valves and insulated receivers with heater pads to ensure operation at ambient temperatures as low as -30°F (-34.4°C).

6.5 Calculating Refrigerant Volume

Using **Table 6.9** below, [Outdoor Air Condenser Charge—R-407C](#) below and [Air Cooled Systems Liquid Line Charge—R-407C Refrigerant per 100ft \(30m\) of Type ACR Copper Tube](#) below or [Indoor Water/Glycol Cooled Module—R-407C Refrigerant Charge](#) on the facing page, calculate the refrigerant charge of the individual sections of the heat rejection system. Add the calculated charge amounts to determine the amount of R-407C refrigerant required for one system.

Table 6.9 Indoor Unit Refrigerant Charge—R-407C

Model 50/60 Hz	Charge/Circuit, lb. (kg)
Liebert® XDC160	17.5 (8.0)

Table 6.10 Outdoor Air Condenser Charge—R-407C

Outdoor Ambient, °F (°C)	Model 50/60 Hz	Receiver Part #	Charge / Circuit, lb. (kg)
-30 to 100 (-34 to 38)	DCSL415	185010G2 for 120V below/G42 for 230V below	200 (91)
-30 to 105 (-34 to 41)	DCSL616	179713G1 for 120V below/1797G2 for 230V below	254 (115)
35 to 105 (2 to 41)	DCSL616	181610G2 for 120V below/181610G4 for 230 below	164 (75)
120V			
230V			

Table 6.11 Air Cooled Systems Liquid Line Charge—R-407C Refrigerant per 100ft (30m) of Type ACR Copper Tube

O.D., inches	Liquid Line, lb. (kg)	Hot Gas Line, lb. (kg)
3/8	3.7 (1.7)	-
1/2	6.9 (3.1)	-
5/8	11.0 (5.0)	2.2 (1.0)
3/4	15.7 (7.1)	3.1 (1.4)
7/8	23.0 (10.4)	4.5 (2.0)
1-1/8	39.3 (17.8)	7.8 (3.5)
1-3/8	59.8 (27.1)	11.8 (5.4)
1-5/8	—	16.7 (7.6)

Table 6.12 Indoor Water/Glycol Cooled Module—R-407C Refrigerant Charge

Model 60 Hz	Charge / Circuit, lb. (kg)
Liebert® XDC 160	30.0 (13.2) per circuit

6.6 Liebert® Drycoolers

The Liebert® Drycooler is a low profile, direct drive propeller fan type air cooled unit. Constructed with an aluminum cabinet and a copper tube aluminum fin coil, the unit is quiet and corrosion resistant. All electrical connections and controls are enclosed in an integral NEMA 3R rated electrical panel section of the Drycooler.

6.6.1 Liebert® Drycooler Fan Cycling Control

Available on all sizes of standard sound and Quiet-Line Drycoolers. A thermostatic control cycles the fan on a single fan Drycooler in response to leaving fluid temperatures. Two or more thermostats are employed on drycoolers with two or more fans to cycle fans or groups of fans in response to leaving fluid temperatures. The thermostat setpoints are listed on the factory-supplied schematic. They typically range from 35 to 45°F (2 to 7°C) for GLYCOOL applications and 65 to 75°F (18 to 24°C) for glycol applications.

6.6.2 Pump Controls

Controls for pump(s) up to 7.5hp are built into the same integral electric panel as the drycooler fan controls. Pump fuses, overload heaters and flow switch (dual pump control models) are included with the Liebert pump packages or must be field-supplied for field-supplied pumps.

Dual pump option—Provides controls for primary and standby pump. The flow switch senses loss of flow and switches to the standby pump for continuous system operation in the event of a pump failure. An internal switch allows manual selection of the lead/lag pump.

6.7 Typical System Configurations

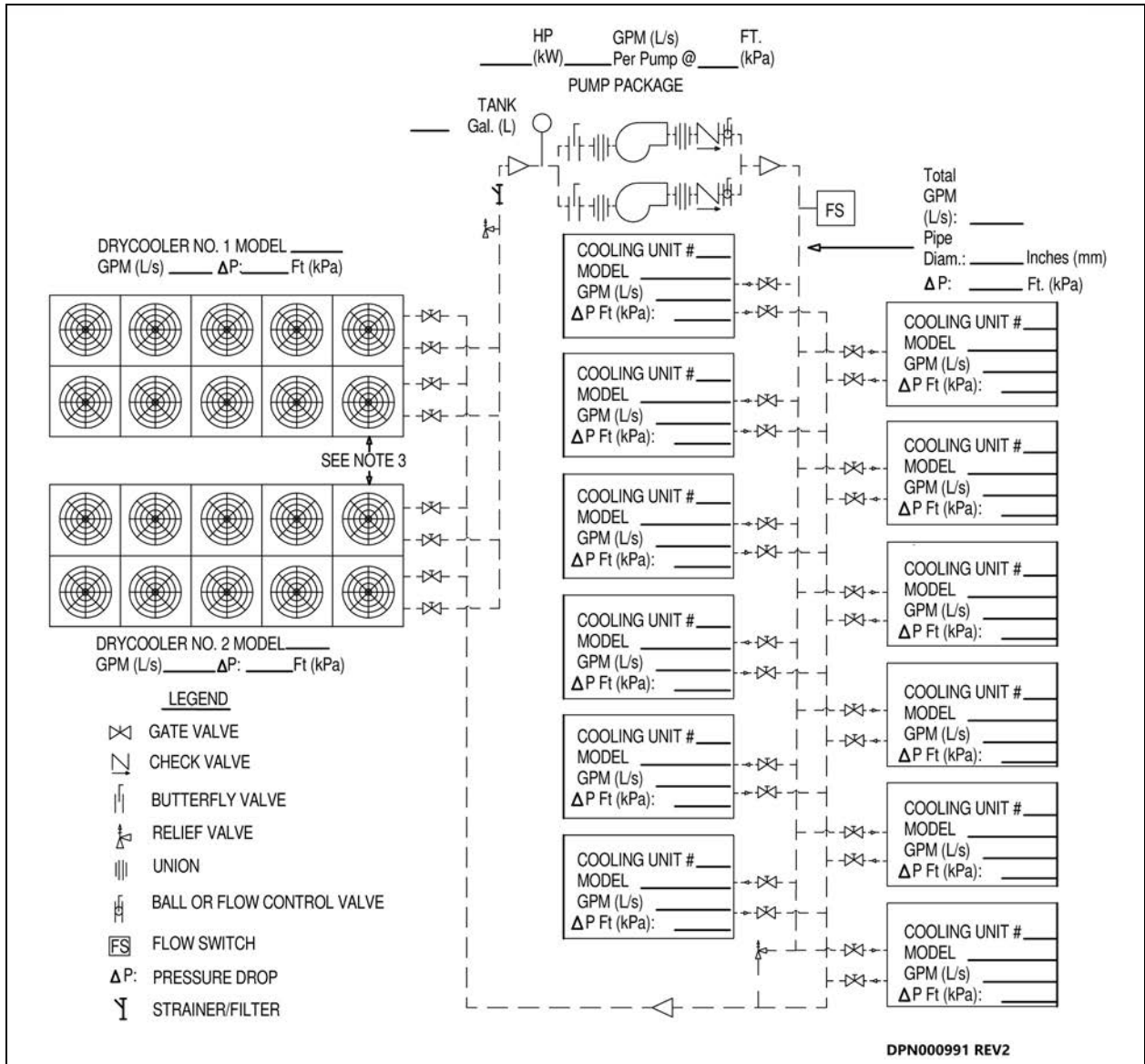
The standard glycol cooled precision air conditioning system includes these major components:

- Indoor air conditioning unit with heat exchangers (refrigerant/glycol)
- Glycol regulating valve
- Outdoor air cooled drycooler
- Glycol pump(s)
- Expansion/compression tank
- Pump controls
- Interconnection piping
- Unit interlock control wiring

Figure 6.11 on the next page shows a typical configuration of multiple indoor units and multiple outdoor drycoolers using a dual pump package and on a common piping loop.

Additional field-supplied components, such as valves, expansion tank, strainers and flow or pressure switches are also shown in **Figure 6.11** below. These components are necessary and should be included when designing a system with one indoor and one outdoor unit on a piping loop or a system using multiple indoor and outdoor units on a common piping loop. Larger systems may also benefit from an air separator (not shown). Refer to SL-10080, available at www.Vertiv.com for further details on required components.

Figure 6.11 Typical Piping Arrangement for Liebert® XDC and Two DDNT880A



6.8 Site Considerations

The drycoolers and pumps should be installed in a location offering maximum security and access for maintenance.

Avoid ground level sites with public access and areas that contribute to heavy snow or ice accumulations. Drycoolers must not be installed in a pit where discharge air is likely to be recirculated through the drycooler or installed where objects restrict the air inlet free area. Also, the drycoolers should be located no closer than 3 feet (1m) from a wall, obstruction, or adjacent unit (see **Figure 6.12** on the next page.)

The drycooler must be installed on a level surface to ensure proper glycol flow, venting, and drainage.

For roof installation, mount the drycooler on suitable curbs or other supports in accordance with local codes.

Allow adequate space for pump packages, expansion/compression tanks, piping, and additional field supplied devices.

When mounting pump packages, mount on level surface or suitable curbs that will allow cooling ventilation air to enter from underneath the pump package frame and exit through the louvers.

6.9 Dimensions and Weights

Table 6.13 Standard Drycooler Net Weights, Shipping Weights, Dimensions, and Volume (Approximate)

Model	No. of Fans	Net Weight lb (kg)	Domestic Packaging			Export Packaging		
			Packaged Weight lb (kg)	Dimensions L x W x H in (cm)	Volume ft ³ (m ³)	Packaged Weight lb (kg)	Dimensions L x W x H in (cm)	Volume ft ³ (m ³)
*D**880	8	2330 (1058)	2730 (1239)	184 x 37 x 97	382	3230 (1446)	185 x 38 x 97	395
*D**940		2430 (1103)	2910 (1321)	(467 x 94 x 246)	(10.8)	3410 (1548)	(470 x 97 x 246)	(112)

Figure 6.12 Drycooler Planning Dimensional Data—Eight Fan Units

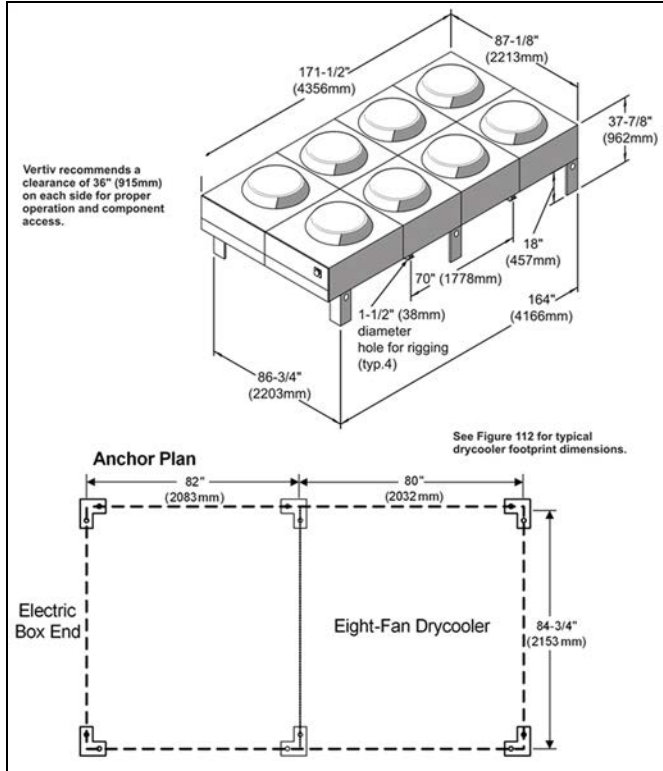


Figure 6.13 Typical Drycooler Footprint—Dimensions

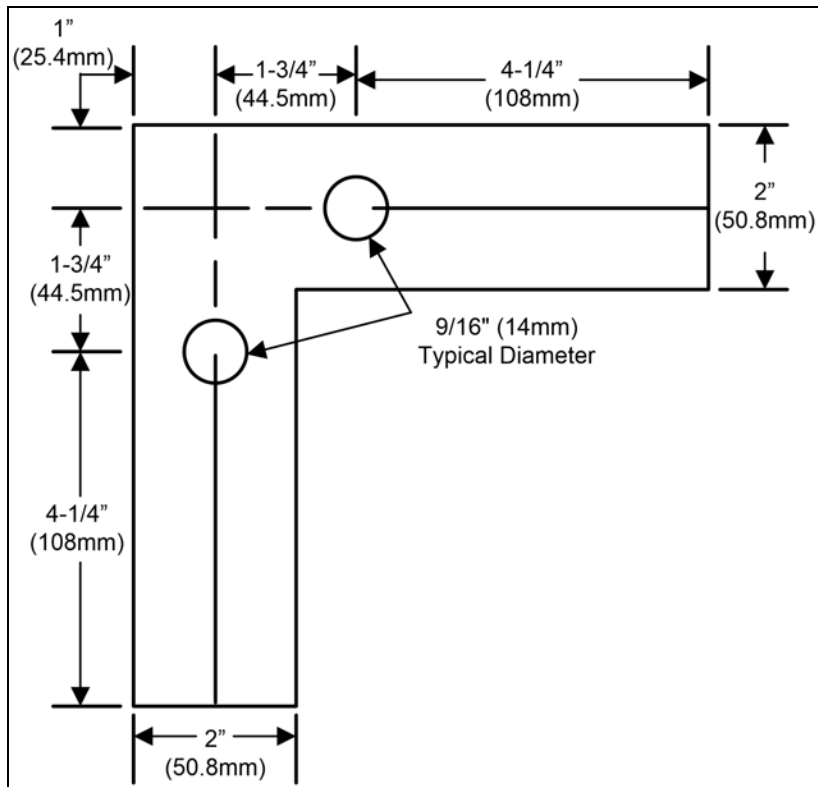


Figure 6.14 Piping Connections for 8 Fan Drycoolers

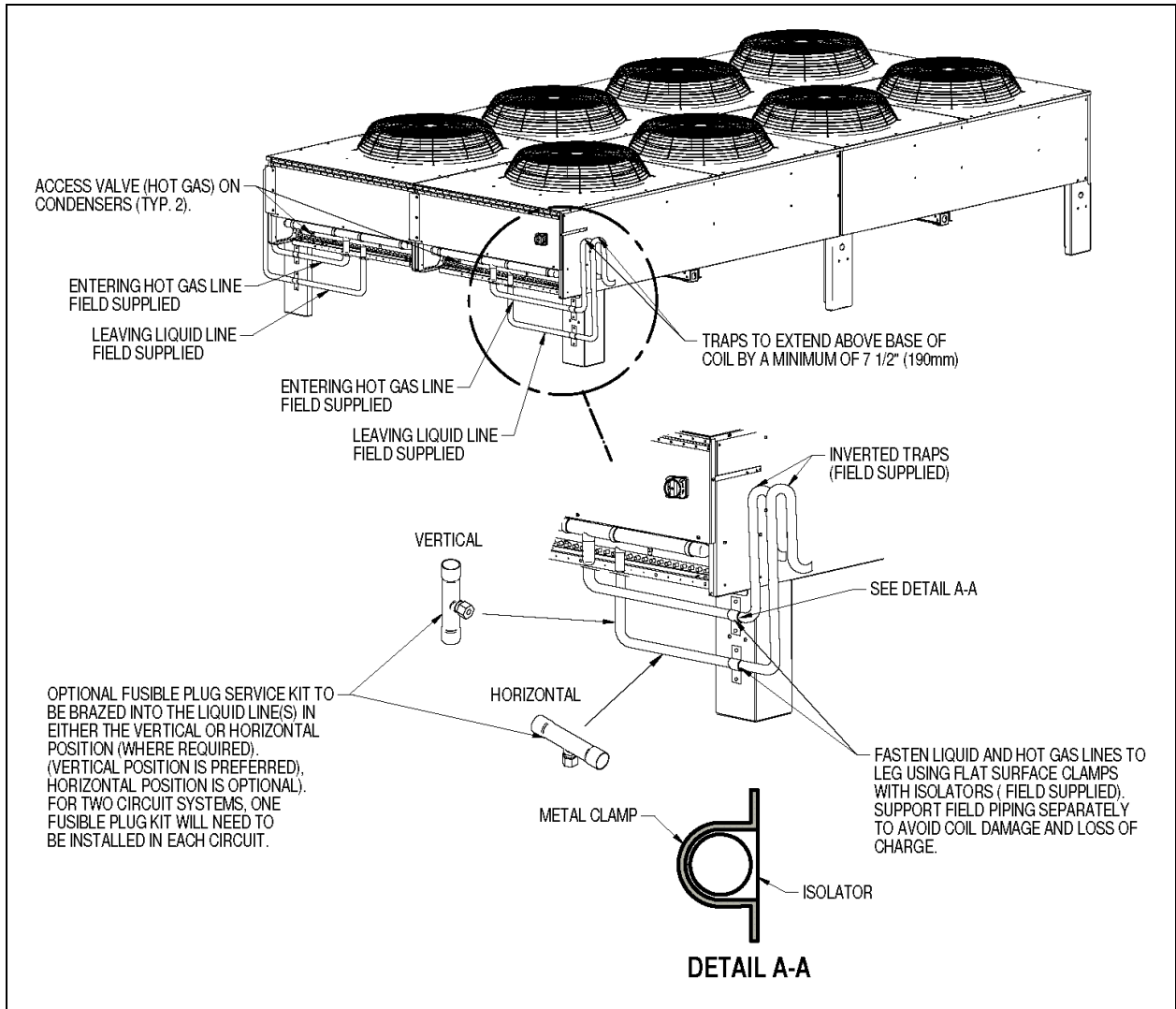


Table 6.14 Standard Drycooler Piping Connection Sizes and Internal Volume

Drycooler Model #	No. of Internal Coil Circuits	No. of Fans	Internal Volume, gal. (L)	No. of Inlets/Outlets	Inlet & Outlet Connection Size	
					OD Copper, in.	ID Sweat, in.
880	80*	8	44.0 (166.5)	4/4	—	2-1/8
940	96*	8	52.0 (196.8)	4/4	—	2-1/8

* Standard Circuiting

6.10 Mounting the Drycooler

The drycooler must be installed so that it is level within 1/2" (13mm) to ensure proper glycol flow, venting and drainage. For roof installation, mount the drycooler on suitable curbs or other supports; follow all local and national codes. Secure the legs to the mounting surface using a field-supplied 1/2" (13mm) diameter bolt in each of the two 9/16" (14mm) holes in each leg. See **Figure 6.12** on page 96 for anchor dimensions.

6.11 Glycol Piping



CAUTION: Risk of explosive discharge of high pressure gas and flying projectiles. Can cause building and/or piping damage and personal injury.

Units are shipped from the factory with a pressurized dry nitrogen holding charge. Carefully relieve the pressure before cutting into the piping system.

NOTICE

Risk of excessive coolant fluid pressure, improper piping material, and unsupported piping. Can cause piping rupture, coolant fluid leaks and building and/or equipment damage.

To avoid the possibility of burst pipes, the system installer must supply and install a relief valve in the system. Galvanized pipe must not be used in glycol systems. To help prevent piping failures, supply and return lines must be supported such that their weight does not bear on the piping of the unit or pumps.

6.11.1 Piping Guidelines

Piping between the drycooler, the pump and the indoor unit is required to complete the system and is to be provided and installed by the system installer. All fluid piping must comply with local codes. Properly sized pipes will help reduce pumping power and operating costs.

Pipe material choices are typically copper, plastic or steel/black iron. Consult glycol and pipe manufacturing literature for compatibility and sizing assistance. Galvanized piping should not be used. Any copper piping installed should be "L" or "K" refrigerant grade copper.

See **Figure 6.11** on page 94 for a typical piping diagram, depicting multiple indoor units, multiple drycoolers and dual pumps. Single indoor unit/pump/drycooler systems are also possible.

Drycooler supply and return connections vary in size and number. Refer to **Table 6.14** on the previous page. Vertiv recommends installing manual service shutoff valves at the supply and return connections of each drycooler and indoor cooling unit. The shutoff valves permit isolating equipment for routine maintenance and for repairs.

Multiple pump packages require a check valve at the discharge of each pump to prevent back-flow through the standby pump(s). To extend the service life of the drycooler and the system's pumps, install filters/strainers in the supply line to the pumps. These filters should have a 16-20 mesh screen and be a type that can be easily replaced or cleaned.

Installing hose bibs at the lowest point of the system will facilitate filling.

Keep piping runs as straight as possible; avoid unnecessary bends and minimize additional fittings.

Allow for pipe expansion from warm fluids. Piping should be isolated from the building with vibration-isolating supports. Use soft, flexible material to seal between pipes and wall openings to prevent pipe damage.

Consideration of the minimum glycol temperature to be supplied from the drycooler and the pipe routing will determine if the glycol supply and return lines should be insulated. Insulation will prevent condensation on the glycol lines in low ambient conditions.

Completed piping system should provide maximum leak-prevention. Welded or high-temperature soldered joints should be used where possible. Threaded pipe joints, if needed, can be made with tightly drawn Teflon™ tape.

Clean and prepare all pipe connections before joining. Be careful not to allow solder/joining debris to get inside the lines during the connection process.

6.11.2 Expansion Tanks, Fluid Relief Valves, Air Management 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 fluid pressure relief valve is also a necessary piping component.

All systems must have an air management system to ensure proper component operation and system performance. There are several methods that can be used to manage the air within a closed loop hydronic system. Depending on the method chosen, the system may include one or more of the following ancillary components: tank-steel (expansion, compression, diaphragm or bladder), air separator and air vent.

Consult your local engineer to determine which method will be used and where these components must be installed.

Depending on the complexity of the system, various other devices may be specified—refer to site-specific drawings. Some of the devices that may be required are: pressure gauges, flow switches, automatic air separator, tempering valves, standby pumps and sensors for electrical controls.

NOTICE

Risk of frozen coolant fluid. Can cause piping rupture, coolant fluid leaks and building damage.

Immediately following the use of 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.

6.12 Electrical Supply

Line voltage electrical service is required for all models. Refer to equipment nameplate regarding wire size and circuit protection requirements. Electrical service must conform to national and local electrical codes. Refer to electrical schematic when making connections.

Each unit is shipped from the factory with all internal unit wiring completed.



WARNING! Risk of electric shock. Can cause injury or death.

Disconnect all local and remote electrical power supplies before working within the electrical enclosure.

The line side of the disconnect remains energized when the disconnect is Off.

Use a voltmeter to verify that the electrical power is Off before performing any electrical and/or mechanical service and/or maintenance operations.



WARNING! Risk of high speed moving parts. Can cause injury or death.

The fan(s) blades can start to rotate unexpectedly when the power is On. Disconnect all local and remote electrical power supplies before working within the fan compartment.

Use a voltmeter to verify that the electrical power is Off before performing any electrical and/or mechanical service and/or maintenance operations.

Each unit is shipped from the factory with all internal unit wiring completed. Refer to the electrical schematic supplied with the drycooler when making line voltage supply, low voltage indoor unit interlock and any low voltage alarm connections. All wiring must be done in accordance with all applicable local, state and national electrical codes.

For electrical characteristics, refer to **Table 6.15** below .

6.12.1 Line Voltage Wiring



WARNING! Risk of electrical fire and short circuit. Can cause property damage, injury or death.

Select and install the electrical supply wire and overcurrent protection device(s) according to the specifications on the unit nameplate(s), per the instructions in this manual and according to the applicable national, state and local code requirements. Use copper conductors only. Make sure all electrical connections are tight. Unit-specific wiring diagrams are provided on each unit.

Drycooler rated voltage should be verified with available power supply upon receipt of unit but before installation. Refer to the unit electrical schematic and serial tag for specific electrical requirements. All wiring must be done in accordance with all applicable local, state and national electrical codes.

Line voltage electrical service is required for all drycoolers at the location of the drycooler. If the drycooler contains pump controls, the pump package voltage must match the drycooler voltage. See the unit's serial tag for specific electrical requirements of the drycooler and any pump package. A unit disconnect is standard on drycoolers with internal pump controls and optional on all other drycoolers. Site disconnect(s) may also be required per local code to isolate the drycooler/pumps for maintenance. Route the supply power to the site disconnect switch and then to the drycooler. Route the conduit through the hole provided in the cabinet. Connect earth ground to lug provided near terminal board.

Table 6.15 60Hz Electrical Values Eight Fan Drycoolers without Pump Controls, Standard

Models

	Voltage	Phase	FLA	WSA	OPD
880, 940	208/230	3	28.0	28.9	35
	460	3	13.6	14.0	20
	575	3	11.2	11.6	15

Values are calculated per UL 1995. OPD values may be adjusted higher than calculations to compensate for maximum anticipated application temperatures.

Table 6.16 60Hz Pump FLA Values

Pump hp	Input Power, Volts	
	208	460
10	30.8	14.0

Values based on NEC handbook values for 3-phase motors.

6.12.2 Low Voltage Control Wiring

NOTICE

Risk of control malfunction. Can cause improper unit operation.

Make sure that all low voltage electrical wiring has been performed per the schematic diagram provided and that all low voltage wiring connections are tight.

A control interlock between the drycooler and the indoor cooling units is required. Field-supplied copper wire is required for connection between like-numbered Terminals 70 & 71 on both units for remote On/Off control of the drycooler, synchronized with the indoor unit. Wiring must be sized and selected for insulation class per NEC and other local codes. The recommended control circuit wire (24VAC) size is 16AWG for lengths up to 150ft. (45m). Contact the factory for assistance with longer wiring runs.

Table 6.17 Minimum Recommended Control Circuit Wire Size, AWG, 60 Hz Models

Control Wire Run, ft (m)	Drycooler Types With Pump Controls													
	DSF	DDF	DSO						DDO					
	Number of Fans													
	1	1	1	2	3	4	6	8	1	2	3	4	6	8
0-25 (0-7.6)	16	16	16	16	16	16	16	16	16	16	16	16	16	16
26-50 (7.9-15.2)	16	16	16	16	16	16	16	14	16	14	14	14	14	14
51-75 (15.5-22.8)	16	16	16	16	16	16	14	14	14	14	14	12	14	14
76-100 (23.2-30.4)	16	16	16	16	16	16	12	12	12	12	12	12	12	12
101-125 (30.8-38.1)	16	14	16	16	14	14	12	12	12	10	10	10	10	10
126-150 (38.4-45.7)	16	14	16	14	14	14	10	12	10	10	10	10	10	10
Control Wire Run, ft (m)	Drycooler Types Without Pump Controls													
	(D)DNL		(D)DNT											
	Number of Fans													
	1-4	6 & 8	1	2	3	4	6	8						
0-25 (0-7.6)	16	16	16	16	16	16	16	16						
26-50 (7.9-15.2)	16	16	16	16	16	16	16	16						
51-75 (15.5-22.8)	16	16	16	16	16	16	16	14						
76-100 (23.2-30.4)	16	16	16	16	16	16	16	12						
101-125 (30.8-38.1)	16	16	16	16	16	16	14	12						
126-150 (38.4-45.7)	16	16	16	16	16	14	14	10						

Data based on 16 AWG min. wire size, 0.4 Amp per contactor, 1 to 1.5 Volt maximum drop & 104 °F (40 °C) average ambient temperature

Table 6.18 Minimum Recommended Control Circuit Wire Size, mm2, 50Hz Models

Control Wire Run, m (ft)	Drycooler Types With Pump Controls													
	DSF	DDF	DSO						DDO					
	Number of Fans													
	1	1	1	2	3	4	6	8	1	2	3	4	6	8
0-7.6 (0-25)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.0	1.5	1.5	1.5	1.5	1.5
7.9-15.2 (26-50)	1.0	1.0	1.0	1.0	1.0	1.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
15.5-22.8 (51-75)	1.0	1.5	1.0	1.5	1.5	1.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
23.2-30.4 (76-100)	1.0	2.5	1.0	1.5	2.5	2.5	4.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0
30.8-38.1 (101-125)	1.5	2.5	1.5	2.5	2.5	2.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
38.4-45.7 (126-150)	1.5	4.0	1.5	2.5	4.0	4.0	6.0	6.0	6.0	6.0	6.0	10.0	6.0	6.0
Control Wire Run, m (ft)	Drycooler Types Without Pump Controls													
	(D)DNL		(D)DNT											
	Number of Fans													
	1-4	6 & 8	1	2	3	4	6	8						
0-7.6 (0-25)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0						
7.9-15.2 (26-50)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.5						
15.5-22.8 (51-75)	1.0	1.0	1.0	1.0	1.0	1.5	1.5	4.0						
23.2-30.4 (76-100)	1.0	1.0	1.0	1.0	1.0	1.5	2.5	4.0						
30.8-38.1 (101-125)	1.0	1.5	1.0	1.5	1.5	2.5	2.5	6.0						
38.4-45.7 (126-150)	1.0	1.5	1.0	1.5	1.5	2.5	4.0	6.0						

Table based on 1.0 mm2 min. wire size, 0.5 Amp per contactor, 1 to 1.5 Volt maximum drop & 40 °C (104 °F) average ambient temperature

6.13 Filling Instructions

6.13.1 Preparing the System for Filling with Glycol

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 fresh glycol solution and fouling of the drycooler piping. The system should be flushed thoroughly using a mild cleaning solution or high-quality water and then completely drained before charging with glycol. Cleaning new systems is just as important as cleaning old ones. New systems can 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 heating/cooling system. For more information on cleaners and degreasers, contact your sales representative. Follow the manufacturer’s instructions when using these products.

Calculate the internal volume of the system as closely as possible. The drycooler volumes are shown in **Table 6.14** on page 98. Use **Table 6.20** on page 105 for field-installed piping volumes. Indoor unit volumes are found in their user manuals.

6.13.2 Glycol Solutions

NOTE: Glycol solutions should be considered for the protection of the coil. When glycol solutions are not used, damage can occur either from freezing or from corrosion from water.

When considering the use of any glycol products in a particular application, you should review the latest Material Safety Data Sheets and ensure that the use you intend can be accomplished safely. For Material Safety Data Sheets and other product safety information, contact the supplier nearest you. Before handling any other products mentioned in the text, you should obtain available product safety information and take necessary steps to ensure safety of use.

NOTICE

Risk of mishandled glycol products. Can cause environmental damage.

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. 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.

No chemical should be used as or in a food, drug, medical device, or cosmetic, or in a product or process in which it may contact a food, drug, medical device, or cosmetic until the user has determined the suitability and legality of the use. Since government regulations and use conditions are subject to change, it is the user's responsibility to determine that this information is appropriate and suitable under current, applicable laws and regulations.

NOTICE

Risk of using the wrong type of glycol. Can cause piping damage, coolant fluid leaks, and substantial building damage.

Automotive antifreeze is unacceptable and must NOT be used.

Typical inhibited formula ethylene glycol and propylene glycol manufacturers and suppliers are Union Carbide (Ucartherm) and Dow Chemical (Dowtherm SR-1, Dowfrost). These glycols are supplied with corrosion inhibitors and do not contain a silicone anti-leak formula. Commercial ethylene glycol and propylene glycol, when pure, are 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 when not properly inhibited.

There are two basic types of additives:

- Corrosion inhibitors and
- Environmental stabilizers

The corrosion inhibitors function by forming a surface barrier that protects the metals from attack. Environmental stabilizers, while not corrosion inhibitors in the strictest sense of the word, decrease corrosion by stabilizing or favorably altering the overall environment. An alkaline buffer, such as borax, is a simple example of an environmental stabilizer, since its prime purpose is to maintain an alkaline condition (pH above 7).

The percentage of glycol to water must be determined by using the lowest design outdoor temperature in which the system is operating. **Table 6.19** on the facing page indicates the solution volume of inhibited glycol required to provide freeze protection at various ambient temperatures.

Table 6.19 Glycol Concentrations for Freeze Protection by Ambient Temperatures

Coolant Type	Temperature, °F (°C)							
	20 (-7)	10 (-12)	0 (-18)	-10 (-23)	-20 (-29)	-30 (-34)	-40 (-40)	-50 (-46)
Propylene Glycol % by Volume	18 *	29*	36	42	46	50	54	57
Ethylene Glycol % by Volume	17 *	26*	35	41	46	50	55	59

Based on Dowfrost™ (PG) and Dowtherm™ SR-1 (EG) product literature.

* Inhibitor levels should be adjusted to properly protect the system if solution concentrations are less than 30%.

NOTICE

Risk of corrosive dilution water. Can cause piping system damage, coolant fluid leaks and substantial building damage.

The quality of water used for dilution must be considered because water may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Surface water that is classified as soft (low in chloride and sulfate ion content—less than 100 ppm each) should be used.

6.13.3 Filling the System with Glycol

Installation of hose bibs at the lowest point of the system is recommended.

When filling a glycol system 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.)

Open all operating systems to the loop. With the top vent(s) open, fill the system from the bottom of the loop. This will allow the glycol to push the air out of the top of the system, minimizing trapped air. Fill to approximately 80% of calculated capacity. Fill slowly from this point, checking fluid levels until full.

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

Table 6.20 Volume in Standard Type "L" Copper Piping

Diameter (in.)		Volume	
Outside	Inside	gal/ft	l/m
1-3/8	1.265	0.065	0.811
1-5/8	1.505	0.092	1.15
2-1/8	1.985	0.161	2.00
2-5/8	2.465	0.248	3.08
3-1/8	2.945	0.354	4.40
3-5/8	3.425	0.479	5.95
4-1/8	3.905	0.622	7.73

6.14 Liebert® Outdoor Control Enclosure

The Liebert® Outdoor Control Enclosure is designed to be used with a Liebert condenser or drycooler to control one or more pump and/or fan motors. The enclosure is rated NEMA 3R when installed as shown in **Figure 6.15** below .

Figure 6.15 Liebert® Outdoor Control Enclosure Installed



Figure 6.16 Flow Rate, 10 hp, 3500 rpm Pump Package, Model # 9A31258G3 in Aluminum Enclosure

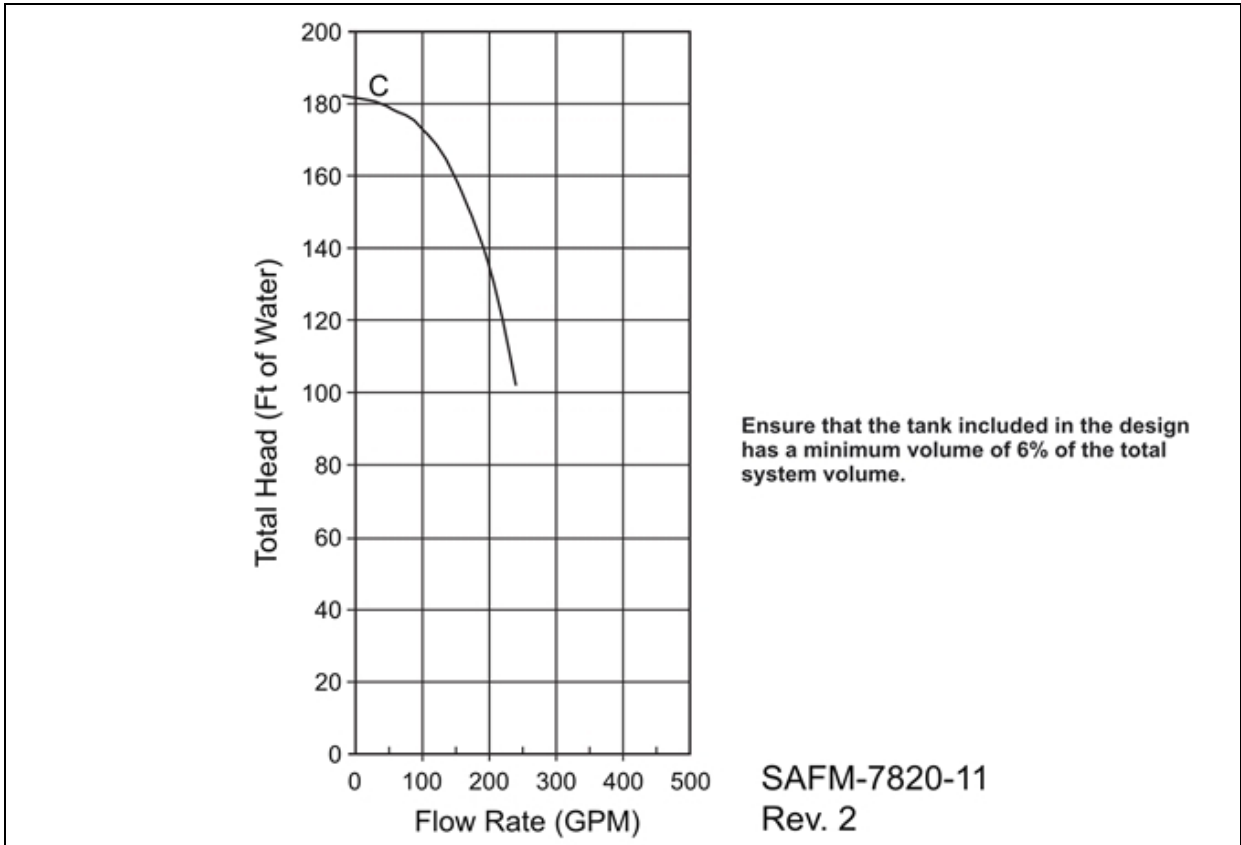


Table 6.21 Liebert® Outdoor Control Enclosure Specifications

Model	HP	Size	Impeller	Connections		FLA	Cabinet Size- in (mm)		
				Discharge	Suction		Length	Width	Height
D10ANTS1317	10	2 x 15 x 7	6.44	15 FPT	20 FPT	14	413 (1049)	324 (822)	19.9 (506)
D10ANTS1317						30.8			

6.14.1 Electrical Connections



WARNING! Risk of electric shock. Can cause injury or death. Disconnect all local and remote power supplies before working within.

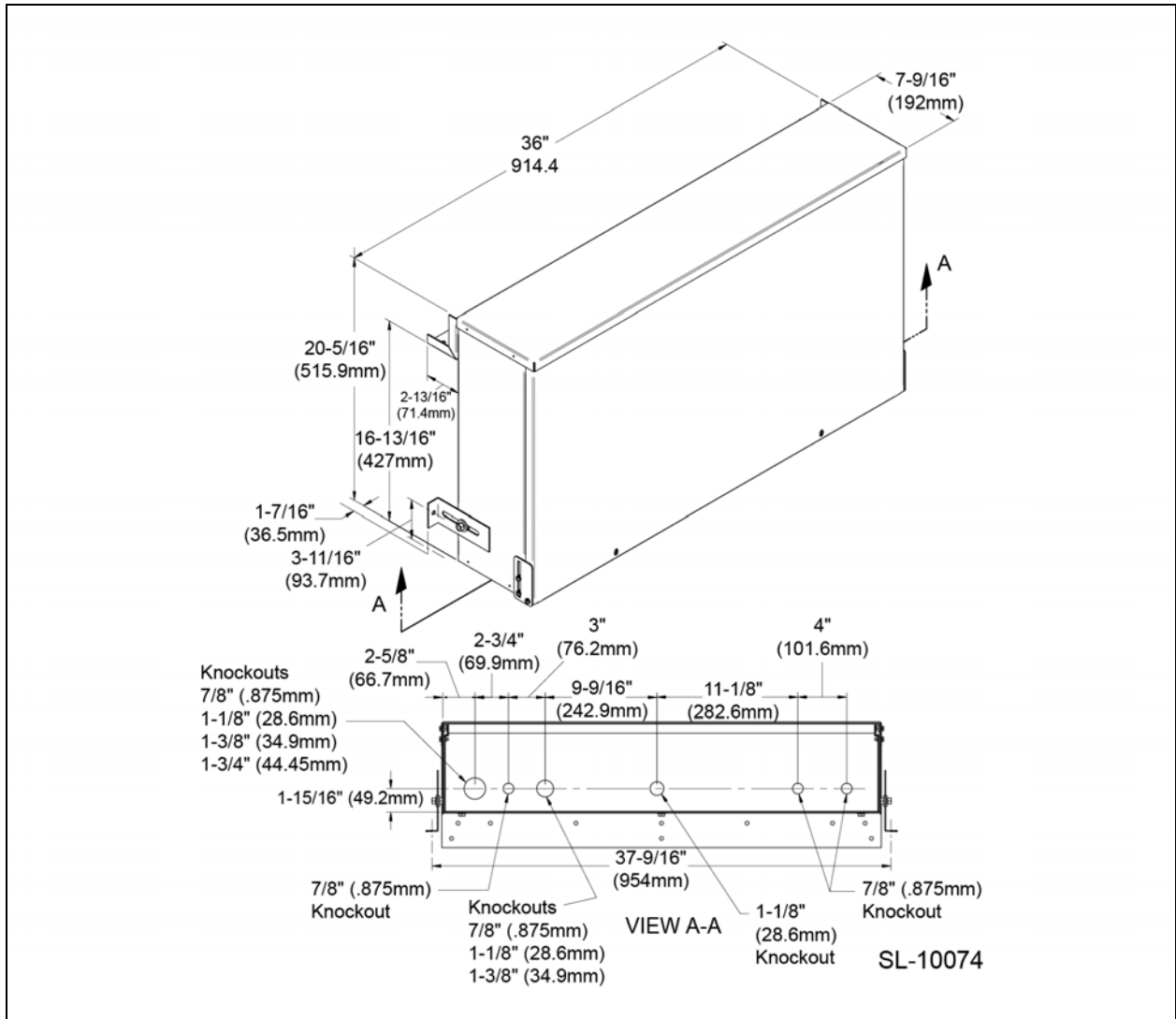
6.14.2 Hazardous Voltage Power Supply Wiring

Wire per national and local electrical codes.

Hazardous voltage electrical service is required at the location of the control enclosure. Use the knockouts provided at the bottom of the enclosure. This power supply does not have to be the same voltage as the Liebert indoor unit. This separate power source may be 110V, 208V, 230V, 460V or 575V, single phase or three phase, 60Hz; or it may be 200V, 230V, 380V or 415V, single phase or three phase, 50Hz as appropriate.

Install a field-supplied disconnect as required per local and national codes.

Figure 6.17 Dimensions and Knockout Sizes, 36-inch Models



6.14.3 Extra Low Voltage Control Wiring

Control interlock between the control enclosure and the indoor unit(s) or other source(s) is required. Multiple indoor units may be connected in parallel if the controlled pumps will feed them all.

- Extra low voltage, non-safety control wiring must be a minimum of 16 GA. (1.665 mm²) for up to 75 feet (22.9m), or not to exceed 1V drop in the control line.
- Install extra low voltage control wiring (24V) from Terminals 70 & 71 on the wire raceway in the compressor compartment of the indoor unit to Terminals 70 & 71 of the control enclosure.
- Extra low voltage control wiring should also be installed between Terminals 24 and 50 from the control enclosure to the indoor cooling unit's common alarm or other alarm location for loss-of-flow indication.
- Install extra low voltage control wiring between the auxiliary terminals on the control panel to Terminals 70 and 71 on the drycooler.
- The flow switch wiring should be connected to Terminals 77 and 74.
- Provide line voltage to power block(s) in control enclosure as shown in the electrical schematic.

- Install optional field-supplied disconnect if desired.
- Run three phase line voltage from the control box to each individual pump motor.

6.14.4 Dual Pump Package Flow Switch

Mount the flow switch in a section of coolant supply/return piping where there is a straight run of at least five pipe diameters on each side of the flow switch.

- The switch should be mounted so the terminals or wire leads are easily accessible for wiring.
- Mount the flow switch in a standard 1" x 1" x 1" tee for one inch pipe installation. Use a reducing tee for larger sizes of pipe to keep the flow switch near the pipe and to provide adequate paddle length in the flow stream.
- Screw the flow switch in position so the flat part of the paddle is at a right angle to the flow. The arrow on the side of the case must point in the direction of the flow.
- The flow switch must be mounted in a horizontal pipeline.

6.14.5 Dual Pump Controls Sequence of Operation

On a call for cooling, the compressor contactor and/or the Liebert® Econ-O-Coil relay in the Liebert unit is energized. The relay and contactor are in the Liebert indoor evaporator section. Each compressor contactor has a side switch wired in parallel with the Liebert® Econ-O-Coil relay and is responsible for closure of the low-voltage pump control circuit.

This low voltage circuit has a series of contactors, relays, selector switch and a flow switch. This circuit controls the start of the pumps and provides contact closure to interlock the drycooler(s) control circuit. Once the circuit is closed, 24V is passed to the pumps control circuit and the auxiliary relays are energized, closing the drycooler(s) control circuit.

Pump P1 is factory-set to be the primary pump (Selector Switch 1-2). Voltage then passes through the normally closed contacts of the R2 relay (standby pump relay), through the current overloads and to the #1 pump contactor. At this point, the #1 pump and appropriate drycoolers are running.

When the pump establishes flow, it opens the system flow switch. The pump has approximately 10 seconds to establish full flow. If it does, the system will run in this state until the call for cooling is satisfied and the circuit drops out. If this pump cannot establish flow or if it has been running and fails, the flow switch will close and energize an adjustable relay, typically set for 10 seconds.

Once this relay times out, it energizes the R2 switch over relay. This relay will drop out the voltage to the #1 pump contactor and energize the #2 pump contactor. Along with the R2 relay the AL relay (alarm relay) will energize. This will provide a set of closed contacts for remote indication of the switch-over situation.

Once the problem with the lead pump is repaired, the controls must be reset. To reset the control box, turn OFF the main power to the control box and then restore the main power to the control box. Pump P1 then becomes the primary pump again.

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7 Liebert® iCOM™

Figure 7.1 Liebert® iCOM™ Display—Liebert® XDC and XDP



7.1 Liebert® iCOM™ Display Layout

The Liebert® iCOM™ displays icons and text for monitoring and controlling your Liebert cooling unit. **Figure 7.2** on the next page and **Figure 7.3** on the next page shows the Liebert® iCOM™ home screen for the Liebert® XDC and XDP.

Figure 7.2 Liebert® iCOM™ Default Home Screen for Liebert® XDC

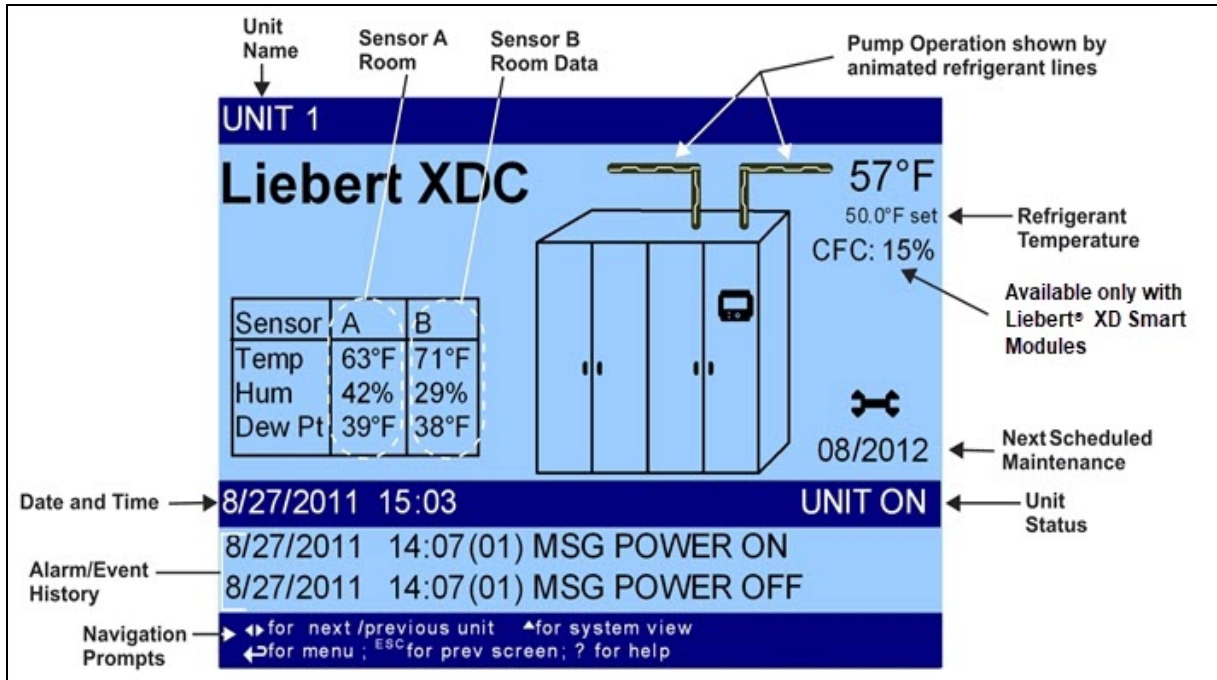
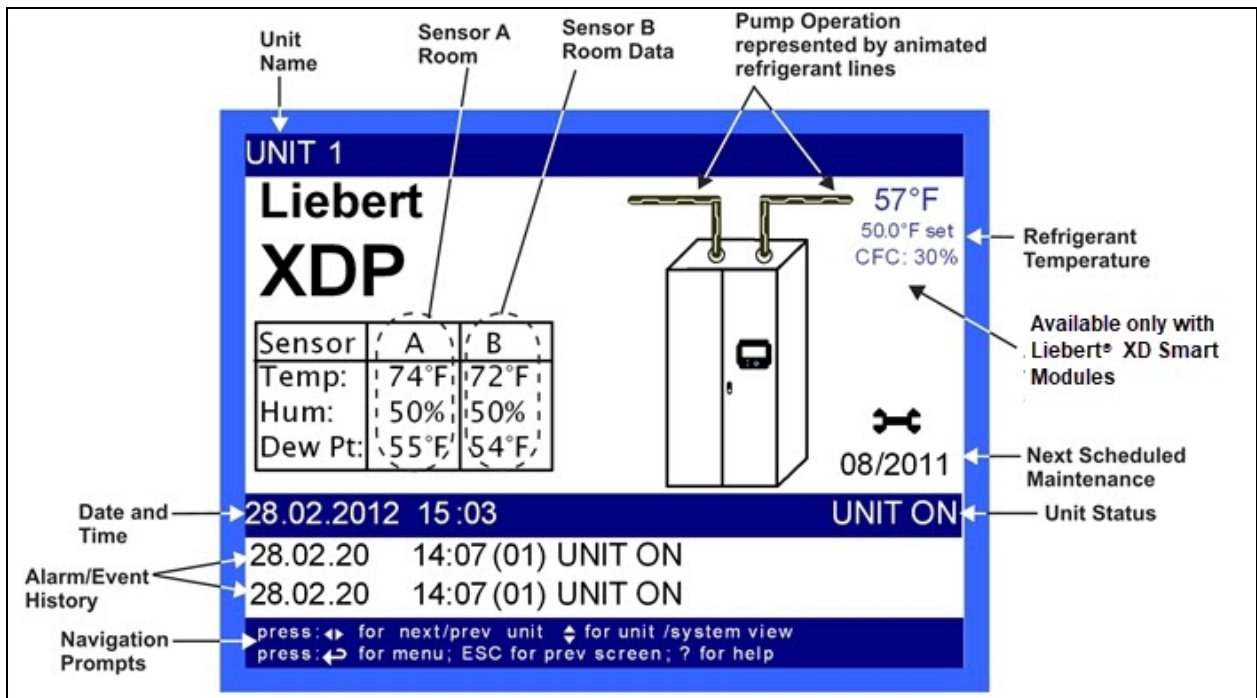


Figure 7.3 Liebert® iCOM™ Default Home Screen for Liebert® XDP



7.2 Cooling Module Overview

The Liebert® iCOM™ will display an overview of all connected cooling modules. It does not display a system view, which would include units other than the cooling modules. See **Figure 7.4** below. The Liebert® iCOM™ will also display smart module parameters. See **Figure 7.5** on the next page.

Figure 7.4 Cooling Module Overview

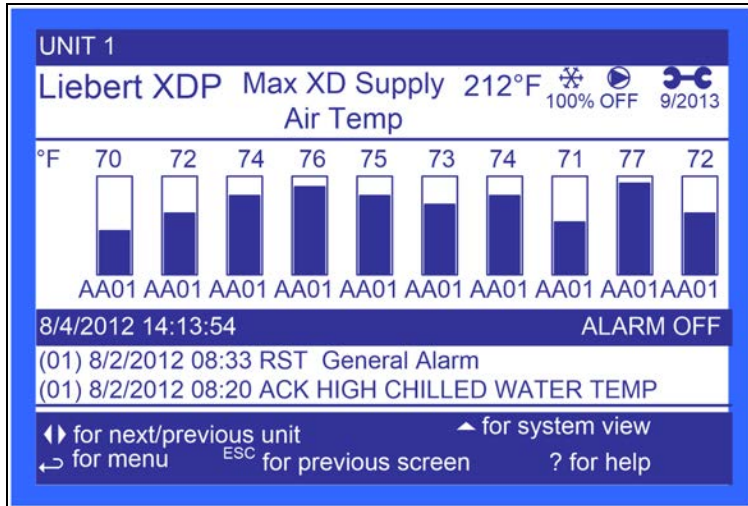
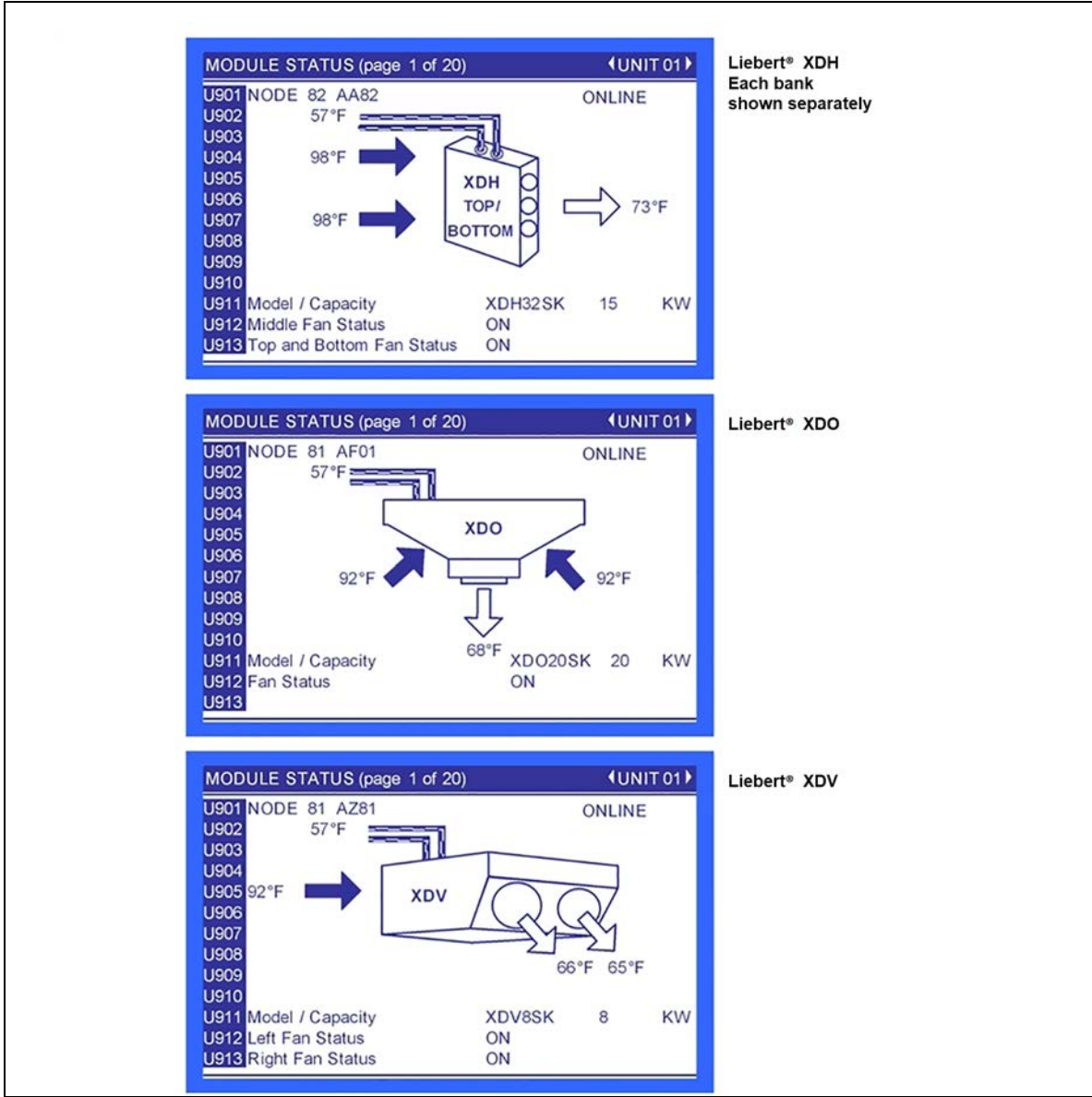


Figure 7.5 Smart Module Parameters—Liebert® XDH, XDO, XDV



7.3 Graphical Data Record

The Graphical Data Record charts the average temperature from Sensors A and B, the average dew point from Sensors A and B, the supply refrigerant temperature and the supply refrigerant control point.













The temperature scales can be changed to expand or compress the data.

The time scale also can be altered to any of several selectable values.

7.3.1 Liebert® iCOM™ User Menu Icons and Legend

User menus report general cooling unit operations and status. User Menu screens employ a coding that begins in “U” and is followed by parameters and information, such as settings.











Table 7.1 Liebert® iCOM™ User Menu icons

Setpoints View and change operational setpoints 	Spare Parts List Contains spare parts available on site 	Event Log Lists last 400 events and alarms View Only 	Graphic Data Record  Displays average temperature from Sensors A and B, the average dew point from Sensors A and B, the supply refrigerant temperature and the supply refrigerant control point graphs; Data is View Only; Display scale is adjustable	View Network Shows status of all connected units; View Only 	Set Alarms Allows user to change settings for alarms 
Sensor Data Shows readings of sensors; View Only 	Active Alarms Lists all current alarms; View Only 	Display Setup Change settings for display; language and time 	Total Run Hours  Records the run time of all components and allows setting of limits on run time; View Only	XDIO Displays readings for the individual smart modules; View Only 	Service Contacts Contains key contact information for service 

7.3.2 Liebert® iCOM™ Service Menu Icons and Legend

Service menus allow customized settings for site operations. Service Menu screens employ a coding that begins in “S” and is followed by parameters and information, such as settings.

Table 7.2 Liebert® iCOM™ Service Menu icons

Setpoint View and change operational setpoints 	UNIT DIARY  Shows all program changes and maintenance performed.	Maintenance/Wellness Settings  Shows all maintenance records, calculates next maintenance date	Diagnostics/Service Mode  Enter Diagnostics/Service Mode for troubleshooting and repair	Set Alarms Change settings for alarms 
Sensor Calibration/Setup Setup and calibrate sensors for site 	Network  Setup or alter network setting.	Options Setup  Enter specific settings for various options	SMART MODULE  Setup of alarms and events. Set temperature limits for supply and return sensors. Label smart modules, view firmware version.	Service Contacts Contains key contact information for service 

7.4 Liebert® XDC Alarms Descriptions

NOTE: Alarms must be acknowledged before they can be reset. To acknowledge or silence an alarm, press the ALARM key one time. This will silence the alarm; the red LED will remain illuminated until the alarm is reset.

- **CALL SERVICE**—Activated when Customer Input 1 is configured for **Call Service** and 24VAC is applied to the input. This alarm is reset when the 24VAC is removed.
- **COMP 1A HIGH PRESSURE**—Activated when the control senses a high head pressure signal from Compressor 1A. This alarm will reset when the main power is cycled or the HP 1A Alarm Code variable in the Service Diagnostics menu is reset to 0.
- **COMP 1B HIGH PRESSURE**—Activated when the control senses a high head pressure signal from Compressor 1B. This alarm will reset when the main power is cycled or the HP 1B Alarm Code variable in the Service Diagnostics menu is reset to 0.
- **COMP 2A HIGH PRESSURE**—Activated when the control senses a high head pressure signal from Compressor 2A. This alarm will reset when the control power is cycled or the HP 2A Alarm Code variable in the Service Diagnostics menu is reset to 0.

- **COMP 2B HIGH PRESSURE**—Activated when the control senses a high head pressure signal from Compressor 2B by the control. This alarm will reset when the main power is cycled or the HP 2B Alarm Code variable in the Service Diagnostics menu is reset to 0.
- **COMP 1A SHORT CYCLE**—Activated when Compressor 1A turns On, Off, then back On, 10 times within 1 hour. The alarm will reset itself when the control turns Compressor 1A On, then Off fewer than 10 times within 1 hour of operating time for 1.5 hours.
- **COMP 1B SHORT CYCLE**—Activated when Compressor 1B turns On, Off, then back On, 10 times within 1 hour. The alarm will reset itself when the control turns Compressor 1B On, then Off fewer than 10 times within 1 hour of operating time for 1.5 hours.
- **COMP 2A SHORT CYCLE**—Activated when Compressor 2A turns On, Off, then back On, five times within 10 minutes or 10 times within 1 hour. The alarm will reset itself when the control turns Compressor 2A On, then Off fewer than 10 times within 1 hour of operating time for 1.5 hours.
- **COMP 2B SHORT CYCLE**—Activated when Compressor 2B turns On, Off, then back On, five times within 10 minutes or 10 times within 1 hour. The alarm will reset itself when the control turns Compressor 2B On, then Off fewer than 10 times within 1 hour of operating time for 1.5 hours.
- **COMPRESSOR(S) LOCKOUT**—Activated when Customer Input 1 is configured for **Comp Lock PD** and 24VAC is applied to the input. This alarm is reset when the 24VAC is removed.
- **CONDENSATION DETECTED** (optional)—Activated when water is detected at a cooling module. A 24VAC signal is applied to the condensation input on the control board using a twisted pair of wires or the alarm is sent via CANbus communication. When this alarm is active, the control will raise its refrigerant control point by 4°F (2.2°C). This alarm will reset when the alarms is acknowledged and the signal stops being sent from CANbus or condensation input. The alarm can also be reset by cycling the power. The main power must be cycled to remove the 4°F (2.2°C) offset.
- **CUSTOMER INPUT 1**—Activated when a 24VAC signal is applied to the customer alarm input on the control board. This alarm will reset when the 24VAC signal stops being sent from the customer alarm input. WATER UNDER FLOOR, SMOKE DETECTED, CALL SERVICE and COMP LOCK PD are possible designations for this alarm; they are set with the Unit Code.
- **FAN FAILURE** (optional)—Activated when a 24VAC signal is applied to the fan failure input on the control board using a twisted pair of wires or the alarm is sent via CANbus communication. This alarm will reset when the alarms is acknowledged and the signal stops being sent from CANbus or fan failure input. The alarm can also be reset by cycling the power.
- **HIGH DEW POINT**—Activates when the calculated dew point at either Sensor A or B exceeds the user-specified alarm setpoint. The alarm will reset when the calculated room dew point from both Sensor A and Sensor B is 2°F (1.1°C) below the setpoint and the alarm has been acknowledged.
- **HIGH REFRIGERANT TEMP**—Activated when the refrigerant temperature sensor reads the refrigerant temperature above the user-specified alarm setpoint. This alarm will reset when the reading from the refrigerant temperature sensor drops 2°F (1.1°C) below the user-specified setpoint and the alarm has been acknowledged.
- **HIGH TEMP SENSOR A**—Activated when the reading from Sensor A is above the user-specified alarm setpoint. The alarm will reset when the reading from Sensor A drops 2°F (1.1°C) below the setpoint and the alarm has been acknowledged.
- **HIGH TEMP SENSOR B**—Activated when the reading from Sensor B is above the user-specified alarm setpoint. The alarm will reset when the reading from Sensor B drops 2°F (1.1°C) below the setpoint and the alarm has been acknowledged.
- **LOSS OF FLOW PUMP 1**—Activated when Pump 1 is commanded to run and the differential pressure switch does not sense differential pressure (set at 6 psi; 41kPa; 0.41 bars). After attempting to start Pump 1 three times, the Liebert® XDC will automatically switch to the other pump to establish flow. This alarm will reset when flow has been established on Pump 1 and the alarm has been acknowledged.

- **LOSS OF FLOW PUMP 2**—Activated when Pump 2 is commanded to run and the differential pressure switch does not sense differential pressure (set at 6 psi; 41kPa; 0.41 bars). After attempting to start Pump 2 three times, the Liebert® XDC will automatically switch to the other pump to establish flow. This alarm will reset when flow has been established on Pump 2 and the alarm has been acknowledged.
- **LOW MEMORY**—Activated when the control board is low in memory resources. This alarm rests automatically as soon as memory consumption falls below the threshold.
- **LOW REFRIGERANT TEMP**—Activated when the supply refrigerant temperature sensor temperature reading drops below the higher of the two calculated dew points, assuming that neither Sensor A or Sensor B has a sensor failure alarm. This alarm will reset when the refrigerant temperature sensor reads the refrigerant temperature above both of the two calculated dew points and the alarm has been acknowledged. This alarm can lock the unit Off. If this occurs, the main power must be cycled, or the Low Refrig Temp Alarm Code in the Service Diagnostics menu must be reset to 0.
- **LOW TEMP SENSOR A**—Activates when the reading from Sensor A drops below the user-specified alarm setpoint. The alarm will reset when the reading from Sensor A rises 2°F (1.1°C) above the setpoint and the alarm has been acknowledged.
- **LOW TEMP SENSOR B**—Activates when the reading from Sensor B drops below the user-specified alarm setpoint. The alarm will reset when the reading from Sensor B rises 2°F (1.1°C) above the setpoint and the alarm has been acknowledged.
- **NODEX CONDENSATION DETEC**—Activated when condensation is detected on a smart module at CAN node ID X, where X is a value ranging from 81 to 100. This alarm resets when condensate is no longer detected. The main power must be cycled off to remove the 4°F (2.2°C) offset value.
- **NODEX FAN FAILURE**—Activated when a fan failure occurs on a smart module at CAN node ID X, where X is a value ranging from 81 to 100. The alarm will rest when the fan returns to normal operation.
- **NODEX LOCAL SHUT DOWN**—Activated when a smart module at CAN node ID X, where X is a value ranging from 81 to 100, has been shut down by an external signal. This alarm will reset when the remote shutdown input is deactivated.
- **NODEX RETURN AIR TEMPLIMIT**—Activated when the return air temperature (entering air temperature to the module) exceeds the user-specified return air temperature range on a smart module at CAN node ID X, where X is a value ranging from 81 to 100. This alarm will reset when the return air temperature return to with the user-specified range.
- **NODEX SENSOR FAILURE**—Activated when a smart module at CAN node ID X, where X is a value ranging from 81 to 100, stops receiving a signal from one or more of its supply air, return air, or refrigerant temperature sensors. This alarm will reset when signals are detected from the module's sensors.
- **NODEX SUPPLY AIR TEMPLIMIT**—Activated when the supply air temperature (temperature of the air leaving the module) exceeds the user-specified supply air temperature range on a smart module at CAN node ID X, where X is a value ranging from 81 to 100. This alarm will reset when the return air temperature return to with the user-specified range.
- **PUMP SHORT CYCLE**—Activated when the Liebert® XDC is trying to establish flow (differential pressure) and is unable to do so. The Liebert® XDC will attempt three times to establish flow on a pump before trying the other pump. The control will keep cycling three times on one pump, then three times on the other pump until it is able to establish flow (differential pressure). If this cycling occurs for 30 minutes and the Liebert® XDC still does not establish flow, a PUMP SHORT CYCLE alarm will be present. This alarm will shut down the Liebert® XDC. To reset this alarm, the main power must be cycled.
- **RAM/BATTERY FAIL**—Activated when the RAM backup battery or the RAM itself has failed. This requires a hardware replacement.
- **SENSOR A FAILURE**—Activated when the controls no longer senses a signal from Sensor A. This alarm will reset when the signal is returned and the alarms has been acknowledged.

- **SENSOR B FAILURE**— Activated when the controls no longer senses a signal from Sensor B. This alarm will reset when the signal is returned and the alarm has been acknowledged.
- **SMOKE DETECTED**—Activated when the Customer Input 1 is configured for “Smoke” and 24VAC is applied to the input. This alarm is reset when the 24VAC is removed.

NOTE: This is not a room smoke detector and is not intended to replace external smoke detectors.

- **SUPPLY REFRIGERANT SENSOR FAILURE**—Activated when the control no longer senses a signal from the supply refrigerant sensor. This alarm will reset when the signal is returned.
- **TANDEM BANK 1 LP**—Activated when the low-pressure switch for Tandem Compressor Bank 1 doesn't send the proper signal during normal operation, or during pump down. This alarm will reset when the main power is cycled or the Tandem Bank 1 LP Code variable in the Service Diagnostics menu is reset to 0.
- **TANDEM BANK 2 LP**—Activated when the low-pressure switch for Tandem Compressor Bank 2 doesn't send the proper signal during normal operation, or during pump-down. This alarm will reset when the main power is cycled or the Tandem Bank 2 LP Code variable in the Service Diagnostics menu is reset to 0.
- **TANDEM BANK 1 PD**—Activated when Tandem Compressor Bank 1 suction pressure cannot be pumped down below the threshold during compressor shutdown. This alarm will reset when the main power is cycled or the Tandem Bank 1 PD Alarm Code variable in the Service Diagnostics menu is reset to 0.
- **TANDEM BANK 2 PD**—Activated when Tandem Compressor Bank 2 suction pressure cannot be pumped down below the threshold during compressor shutdown. This alarm will reset when the main power is cycled or the Tandem Bank 2 PD Alarm Code variable in the Service Diagnostics menu is reset to 0.
- **UNIT CODE MISSING**—Activated when a valid unit code has not been entered and saved. To reset, enter valid unit code, save and execute.
- **WATER UNDER FLOOR**—Activated when Customer Input 1 is configured for **Water Alarm** and 24VAC is applied to the input. This alarm is reset when the 24VAC is removed.

7.5 Warning Descriptions

COMPRESSOR 1A HRS EXCEED—Activated when the Compressor 1A Actual Hours exceeds the user-specified limit. To reset, Actual Hours must be reset to 0.

COMPRESSOR 1B HRS EXCEED—Activated when the Compressor 1B Actual Hours exceeds the user-specified limit. To reset, Actual Hours must be reset to 0.

COMPRESSOR 2A HRS EXCEED—Activated when the Compressor 2A Actual Hours exceeds the user-specified limit. To reset, Actual Hours must be reset to 0.

COMPRESSOR 2B HRS EXCEED—Activated when the Compressor 2B Actual Hours exceeds the user-specified limit. To reset, Actual Hours must be reset to 0.

PUMP 1 HRS EXCEED—Activated when the Pump 1 Actual Hours exceeds the user-specified limit. To reset, Actual Hours must be reset to 0.

PUMP 2 HRS EXCEED—Activated when the Pump 2 Actual Hours exceeds the user-specified limit. To reset, Actual Hours must be reset to 0.

LOSS OF POWER—Activated when the unit is On and operational and 24VAC power to the control is lost. This alarm will be emitted when power is restored to the control. The Liebert® XDC will restart at a user-defined time delay after power is restored. Once activated, the alarm will remain activated for 30 minutes.

7.6 Liebert® XDP Alarms

NOTE: Alarms must be acknowledged before they can be reset. To acknowledge or silence an alarm, press the ALARM key one time. This will silence the alarm; the red LED will remain illuminated until the alarm is reset.

CALL SERVICE—Activated when Customer Input 1 is configured for **Call Service** and 24VAC is applied to the input. This alarm is reset when the 24VAC is removed.

CONDENSATION DETECTED (optional)—Activated when water is detected at a cooling module. A 24VAC signal is applied to the condensation input on the control board using a pair of twisted wires or the alarm is sent via CANbus communication. When this alarm is active, the control will raise its refrigerant control point by 4°F (2.2°C). This alarm will reset when the alarms is acknowledged and the signal stops being sent from CANbus or condensation input. The alarm can also be reset by cycling the power. The main power must be cycled to remove the 4°F (2.2°C) offset.

CONTROL VALVE FAILURE—Activated when the chilled water control valve has been commanded to open or close by the control and no change is detected by the valve position signal. The alarm is reset when the main power is cycled.

CUSTOMER INPUT 1—Activated when a 24VAC signal is applied to the customer alarm input on the control board. This alarm will reset when the 24VAC signal stops being sent from the customer alarm input. WATER UNDER FLOOR, SMOKE DETECTED, CALL SERVICE, and COMP LOCK PD are possible designations for this alarm; they are set with the Unit Code.

FAN FAILURE (optional)—Activated when a 24VAC signal is applied to the fan failure input on the control board using a twisted pair of wires or the alarm is sent via CANbus communication. This alarm will reset when the alarms is acknowledged and the signal stops being sent from CANbus or fan failure input. The alarm can also be reset by cycling the power.

HIGH CW TEMP—Activated when the Supply CW sensor reads the chilled water temperature above the user-specified alarm setpoint. This alarm will reset when the reading from the refrigerant temperature sensor drops 5°F (2.8°C) below the user-specified setpoint and the alarm has been acknowledged.

HIGH DEW POINT—Activates when the calculated dew point at either Sensor A or B exceeds the user-specified alarm setpoint. The alarm will reset when the calculated room dew point from both Sensor A and Sensor B is 2°F (1.1°C) below the setpoint and the alarm has been acknowledged.

HIGH REFRIGERANT TEMP—Activated when the refrigerant temperature sensor reads the refrigerant temperature above the user-specified alarm setpoint. This alarm will reset when the reading from the refrigerant temperature sensor drops 2°F (1.1°C) below the user-specified setpoint and the alarm has been acknowledged.

HIGH TEMP SENSOR A—Activated when the reading from Sensor A is above the user-specified alarm setpoint. The alarm will reset when the reading from Sensor A drops 2°F (1.1°C) below the setpoint and the alarm has been acknowledged.

HIGH TEMP SENSOR B—Activated when the reading from Sensor A is above the user-specified alarm setpoint. The alarm will reset when the reading from Sensor A drops 2°F (1.1°C) below the setpoint and the alarm has been acknowledged.

LOSS OF FLOW PUMP 1—Activated when Pump 1 is commanded to run and the differential pressure switch does not sense differential pressure (set at 6 psi; 41kPa; 0.41 bars). After attempting to start Pump 1 three times, the Liebert® XDP will automatically switch to the other pump to establish flow. This alarm will reset when flow has been established on Pump 1 and the alarm has been acknowledged.

LOSS OF FLOW PUMP 2—Activated when Pump 2 is commanded to run and the differential pressure switch does not sense differential pressure (set at 6 psi; 41kPa; 0.41 bars). After attempting to start Pump 2 three times, the Liebert® XDP will automatically switch to the other pump to establish flow. This alarm will reset when flow has been established on Pump 2 and the alarm has been acknowledged.

LOW MEMORY—Activated when the control board is low in memory resources. This alarm rests automatically as soon as memory consumption falls below the threshold.

LOW REFRIGERANT TEMP—Activated when the supply refrigerant temperature sensor temperature reading drops below the higher of the two calculated dew points, assuming that neither Sensor A or Sensor B has a sensor failure alarm. This alarm will reset when the refrigerant temperature sensor reads the refrigerant temperature above both of the two calculated dew points and the alarm has been acknowledged. This alarm can lock the unit Off. If this occurs, the main power must be cycled, or the Low Refrig Temp Alarm Code in the Service Diagnostics menu must be reset to 0.

LOW TEMP SENSOR A—Activated when the reading from Sensor A drops below the user-specified alarm setpoint. The alarm will reset when the reading from Sensor A rises 2°F (1.1°C) above the setpoint and the alarm has been acknowledged.

LOW TEMP SENSOR B—Activated when the reading from Sensor B drops below the user-specified alarm setpoint. The alarm will reset when the reading from Sensor B rises 2°F (1.1°C) above the setpoint and the alarm has been acknowledged.

NODEX CONDENSATION DETEC—Activated when condensation is detected on a smart module at CAN node ID X, where X is a value ranging from 81 to 100. This alarm resets when condensate is no longer detected. The main power must be cycled off to remove the 4°F (2.2°C) offset value.

NODEX FAN FAILURE—Activated when a fan failure occurs on a smart module at CAN node ID X, where X is a value ranging from 81 to 100. The alarm will reset when the fan returns to normal operation.

NODEX LOCAL SHUT DOWN—Activated when a smart module at CAN node ID X, where X is a value ranging from 81 to 100, has been shut down by an external signal. This alarm will reset when the remote shutdown input is deactivated.

NODEX RETURN AIR TEMPLIMIT—Activated when the return air temperature (entering air temperature to the module) exceeds the user-specified return air temperature range on a smart module at CAN node ID X, where X is a value ranging from 81 to 100. This alarm will reset when the return air temperature returns to within the user-specified range.

NODEX SENSOR FAILURE—Activated when a smart module at CAN node ID X, where X is a value ranging from 81 to 100, stops receiving a signal from one or more of its supply air, return air, or refrigerant temperature sensors. This alarm will reset when signals are detected from the module's sensors.

NODEX SUPPLY AIR TEMPLIMIT—Activated when the supply air temperature (temperature of the air leaving the module) exceeds the user-specified supply air temperature range on a smart module at CAN node ID X, where X is a value ranging from 81 to 100. This alarm will reset when the return air temperature returns to within the user-specified range.

PUMP SHORT CYCLE—Activated when the Liebert® XDP is trying to establish flow (differential pressure) and is unable to do so. The Liebert® XDP will attempt three times to establish flow on a pump before trying the other pump. The control will keep cycling three times on one pump, then three times on the other pump until it is able to establish flow (differential pressure). If this cycling occurs for 30 minutes and the Liebert® XDP still does not establish flow, a PUMP SHORT CYCLE alarm will be present. This alarm will shut down the Liebert® XDP. To reset this alarm, the main power must be cycled.

RAM/BATTERY FAIL—Activated when the RAM backup battery or the RAM itself has failed. This requires a hardware replacement.

SENSOR A FAILURE—Activated when the controls no longer sense a signal from Sensor A. This alarm will reset when the signal is returned and the alarm has been acknowledged.

SENSOR B FAILURE—Activated when the controls no longer sense a signal from Sensor B. This alarm will reset when the signal is returned and the alarm has been acknowledged.

SMOKE DETECTED—Activated when the Customer Input 1 is configured for **Smoke** and 24VAC is applied to the input. This alarm is reset when the 24VAC is removed.

NOTE: This is not a room smoke detector and is not intended to replace external smoke detectors.

SUPPLY CW SENSOR FAILURE—Activated when the control no longer senses a signal from the Supply CW sensor. This alarm will reset when the signal is returned.

SUPPLY REFRIGERANT SENSOR FAILURE—Activated when the control no longer senses a signal from the supply refrigerant sensor. This alarm will reset when the signal is returned.

UNIT CODE MISSING—Activated when a valid unit code has not been entered and saved. To reset, enter valid unit code, save and execute.

WATER UNDER FLOOR—Activated when Customer Input 1 is configured for **Water Alarm** and 24VAC is applied to the input. This alarm is reset when the 24VAC is removed.

7.7 Liebert® XDP Warnings

LOSS OF POWER—Activated when the unit is On and operational and 24VAC power to the control is lost. This alarm will be emitted when power is restored to the control. The Liebert® XDP will restart at a user-defined time delay after power is restored. Once activated, the alarm will remain activated for 30 minutes.

PUMP 1 HRS EXCEED—Activated when the Pump 1 Actual Hours exceeds the user-specified limit. To reset, Actual Hours must be reset to 0.

PUMP 2 HRS EXCEED—Activated when the Pump 2 Actual Hours exceeds the user-specified limit. To reset, Actual Hours must be reset to 0.

7.8 CANbus Communications

A Controller Area Network (CAN) is a specialized internal communication network. It allows a Liebert® XDP, XDC, and XD Smart Modules to communicate without a host computer. Networking the Liebert® XDP or XDC to Smart Modules enables the Smart Modules to be controlled and monitored from the Liebert® XDP or XDC.

Figure 7.6 below shows a typical Liebert® XD system in a CANbus network. Liebert® XD Smart Modules should be connected to the Liebert® XDP or Liebert® XDC that supplies the modules with refrigerant.

Figure 7.6 Liebert® XD System with CANbus



NOTE: Only six Liebert® XDV10S* are shown. A maximum of one of the following can be connected together in a single CANbus:

- 16 Liebert® XDV10S
- 20 Liebert® XDV8S
- 5 single circuited Liebert® XDH32S
- 8 Liebert® XDO20S

Plan wiring runs for unit-to-module (U2M) communication when designing the layout of the conditioned space. In addition to general good wiring practices, take into account:

- Keep control and communication cables away from power cables to prevent electromagnetic interference.
- Do not bend cables to less than four times the diameter of the cable.
- Do not deform cables when securing in bundles or when hanging them.
- Keep cables away from devices that can introduce noise into them, such as machines, fluorescent lights, and electronics.
- Avoid stretching cables-tension when pulling cables should not exceed 25 pounds (11kg).
- Do not secure cables with any method that might damage them; use approved hangers, such as those used for telephone wire and RG-6 coaxial wire; available at most hardware stores.
- Do not run cables through conduit. Cables should be treated the same as any other data cable.

Running CANbus cables through conduit will increase the total length required.

7.9 Network Layout Options

The Liebert® XDP and Liebert® XDC have two CANbus ports each (P2 and P4) on the CAN Isolator in the low voltage side of the electrical box (see **Figure 7.11** on page 127 and [P2 and P4 Locations on the CAN Isolator](#) on page 128). This allows for two chains of the network to be created to minimize the total network length.

7.9.1 Remote Temperature/Humidity Sensor Placement and Connection to the CANbus

The Liebert® XDP and Liebert® XDC are shipped with two remote temperature/humidity sensors. One sensor should be placed closer to the Liebert® XDP or Liebert® XDC; the other should be placed in the warmest part of the cold aisle or in the return air stream of a computer room air conditioning unit, such as as the Liebert® DS or Liebert® CW.

One shielded CANbus cable is provided with each sensor.

The remote sensors can be placed at the end of a chain or in the middle of a daisy chain as shown.

Refer to **Figure 7.7** on the facing page and **Figure 7.8** on page 124 for examples of acceptable network layouts.

Figure 7.7 Modules on a Single Chain

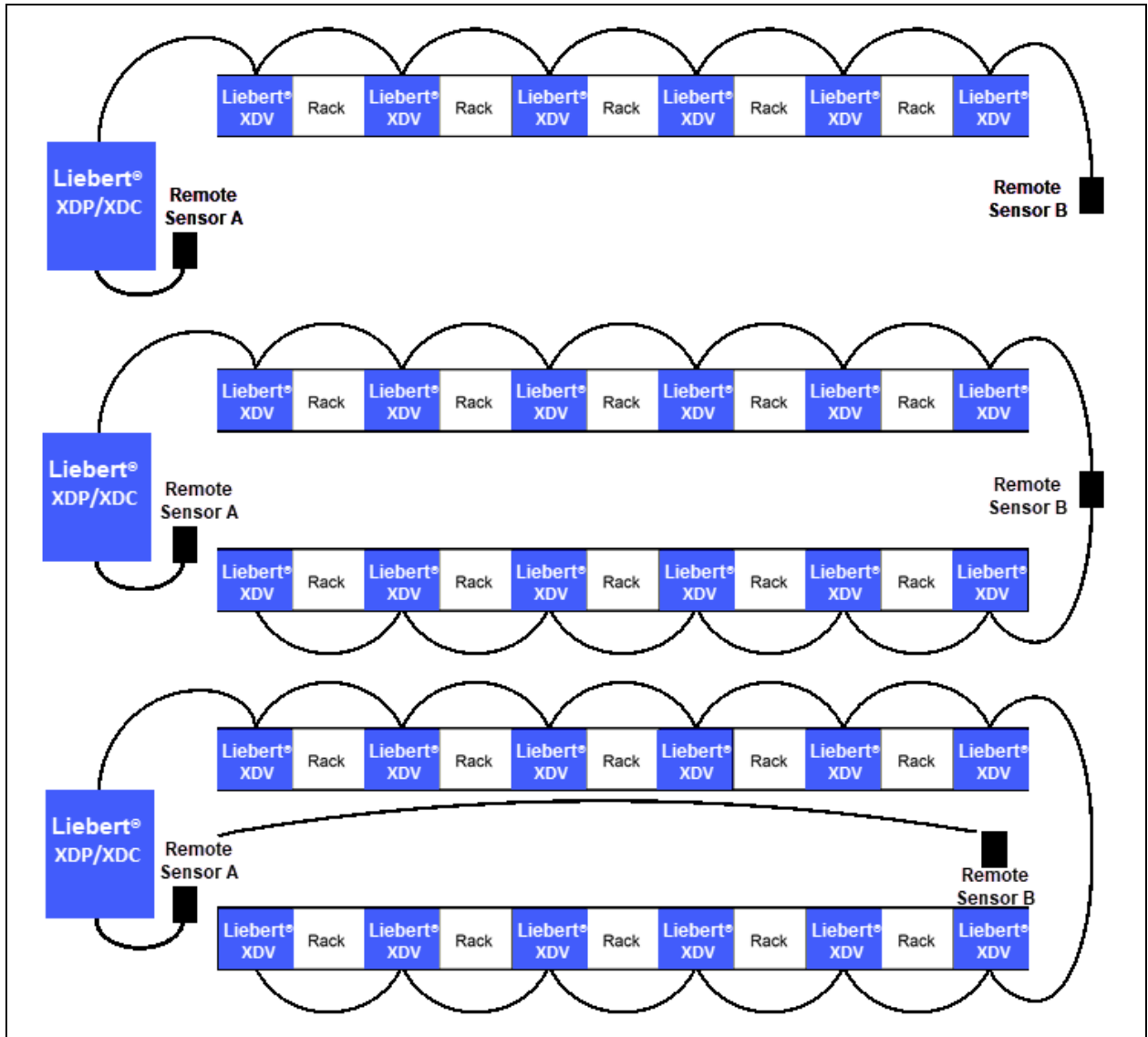
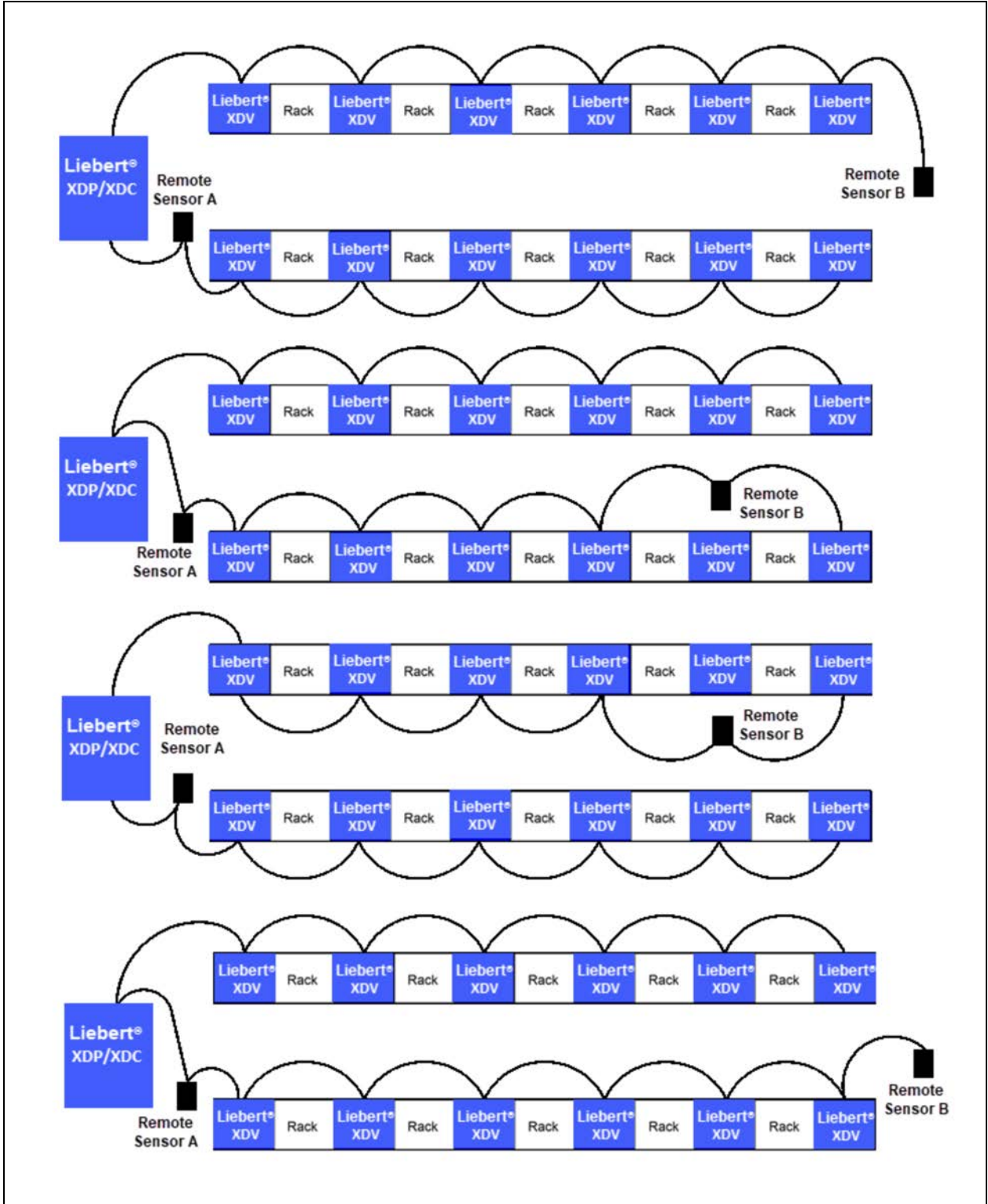


Figure 7.8 Modules on Two Chains



7.9.2 CANbus Maximum Length

The CANbus network (the sum of the two CANbus chains) has a maximum length limitation.

- If the Liebert® XDP or Liebert® XDC with iCOM does not have a CAN Isolator, the maximum distance is 150 ft. (46m) total network without measuring the final device voltage. The 150 ft. (46m) total must also include the remote temperature and humidity sensor cable lengths.
- If the Liebert® XDP or Liebert® XDC contains a CAN Isolator, the maximum distance is 300 ft. (91m). To exceed this length, the final device voltage must be measured.

7.10 CANbus Cables

The Liebert® XDP may be connected to the Smart Modules with a CANbus cable. The shielded cable consists of three pairs of twisted wires with a 6-pin RJ12 connector.

NOTICE

Risk of improper wiring. Can cause equipment damage.

Mismatching wire pins at the RJ12 connection will damage the CAN device. Extreme caution should be taken when making cables.

Figure 7.9 CANbus Cable

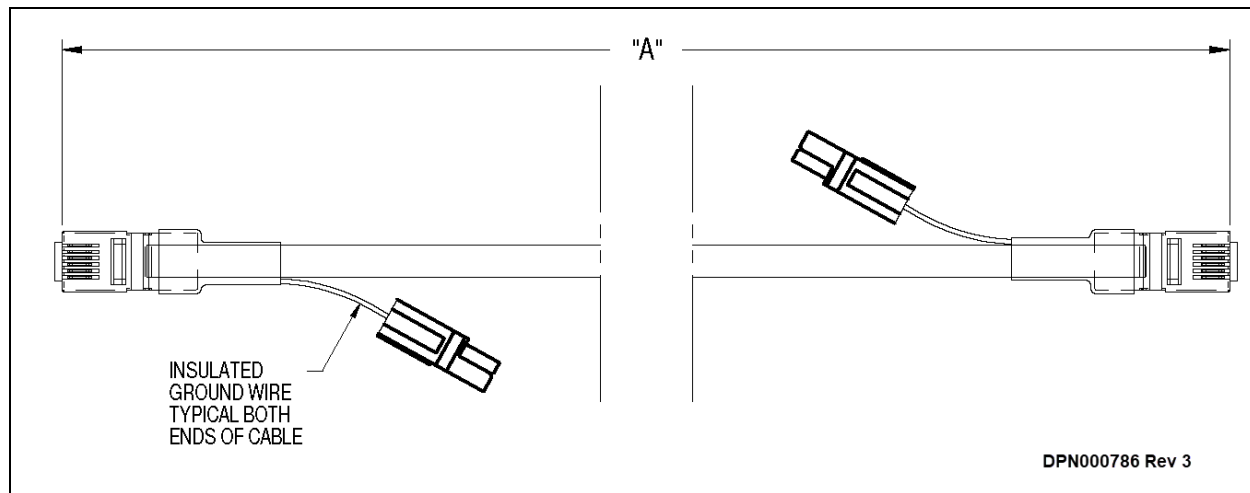


Table 7.3 CANbus Cable Lengths and Part Numbers

Liebert Part #	Dimension A ft. (m)
300157G1	6 (1.8)
300157G2	10 (3)
300157G3	20 (6)
300157G4	30 (9.1)
300157G5	60 (18.3)
300157G6	90 (27.4)

Table 7.3 CANbus Cable Lengths and Part Numbers (continued)

Liebert Part #	Dimension A ft. (m)
300157G7	120 (36.6)
300157G8	150 (45.7)
300157G9	6.25 (1.9)
300157G10	3 (0.9)
300157G11	15 (4.6)
300157G13	40 (12.2)
300157G14	50 (15.2)
300157G15	70 (21.3)
300157G16	80 (24.4)
300157G17	100 (30.5)
300157G18	110 (33.5)

Figure 7.10 CANbus Cable Plug

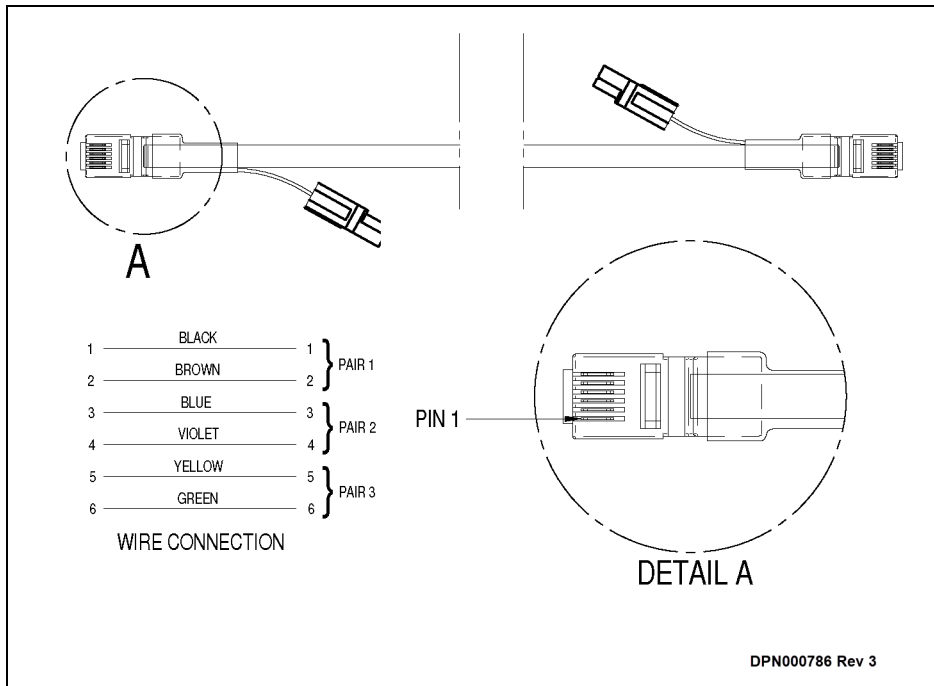


Table 7.4 Color Code Chart

Pair Number	Pair Color	
1	Black	Brown
2	Blue	Violet
3	Yellow	Green

7.11 Connecting the CANbus Network

7.11.1 Connection to the Liebert® XDP or XDC

The Liebert® XDP and XDC have two CANbus ports each (P2 and P4) on the CAN Isolator in the low voltage side of the electrical box (see **Figure 7.11** below and **Figure 7.12** on the next page). This allows for two chains of the network to be created to minimize the total network length.

Figure 7.11 CAN Isolator Location Within the Liebert® XDP/XDC

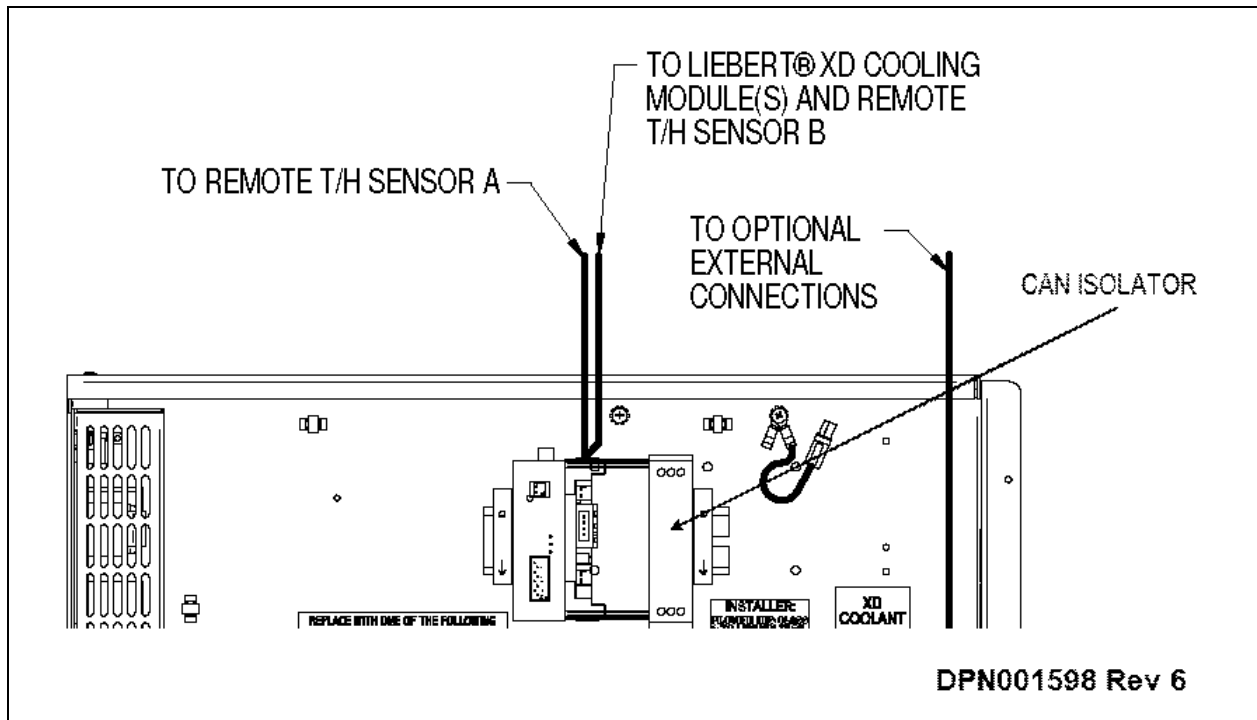
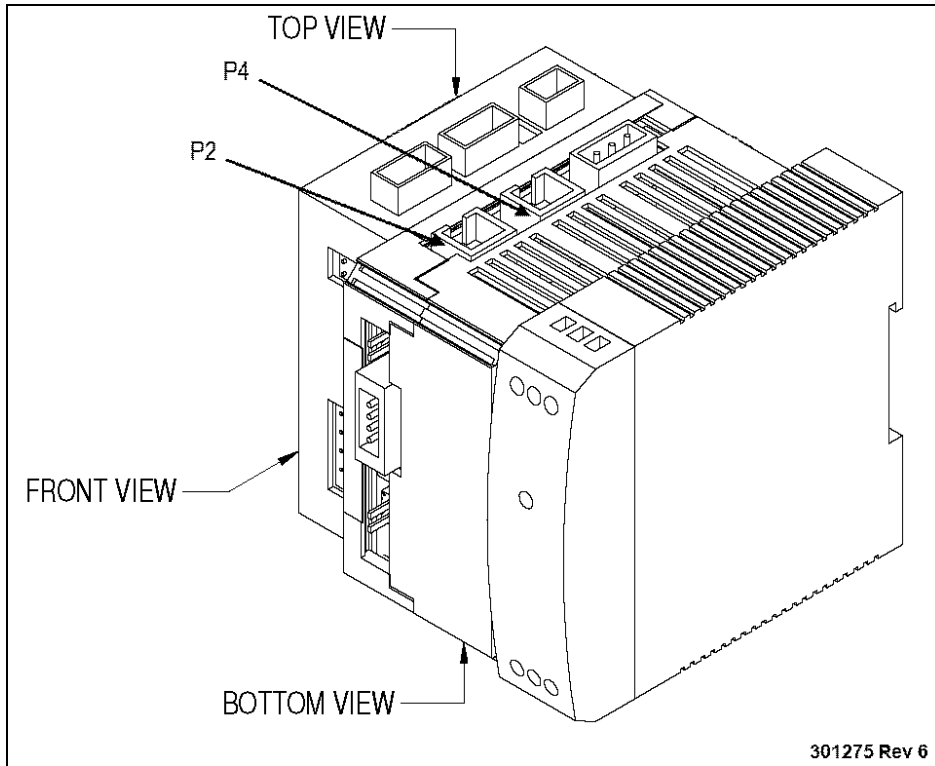


Figure 7.12 P2 and P4 Locations on the CAN Isolator

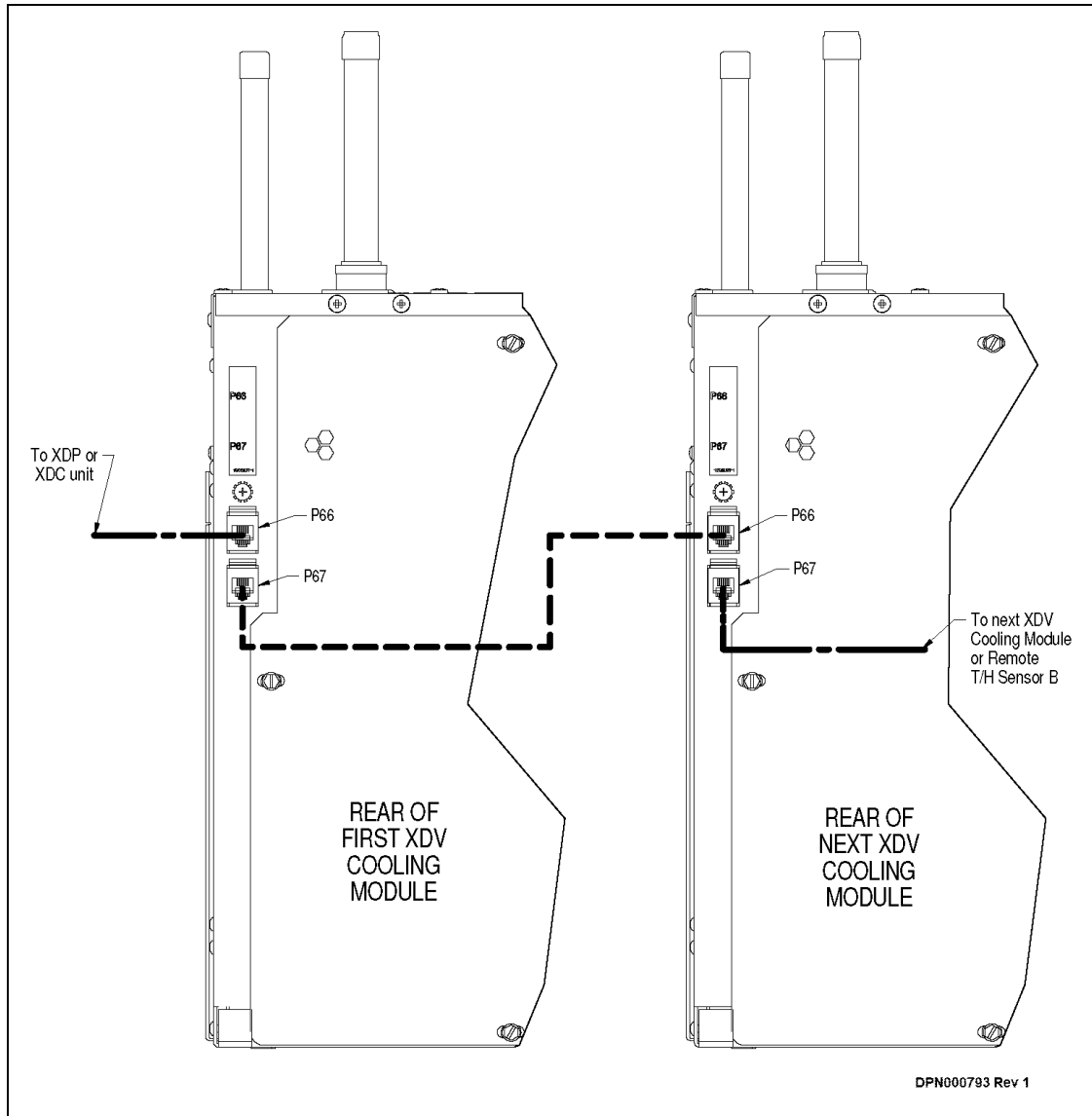


7.11.2 Connecting to the Liebert® XDV Smart Modules

Liebert® XDV CANbus Port Locations

The CANbus ports on the Liebert® XDV are on the rear of the unit. The cable from the Liebert® XDP or XDC side will be connected to port P66. The leaving cable will be connected to port P67. See **Figure 7.13** on the facing page .

Figure 7.13 Liebert® XDV Smart Module CANbus Port Locations

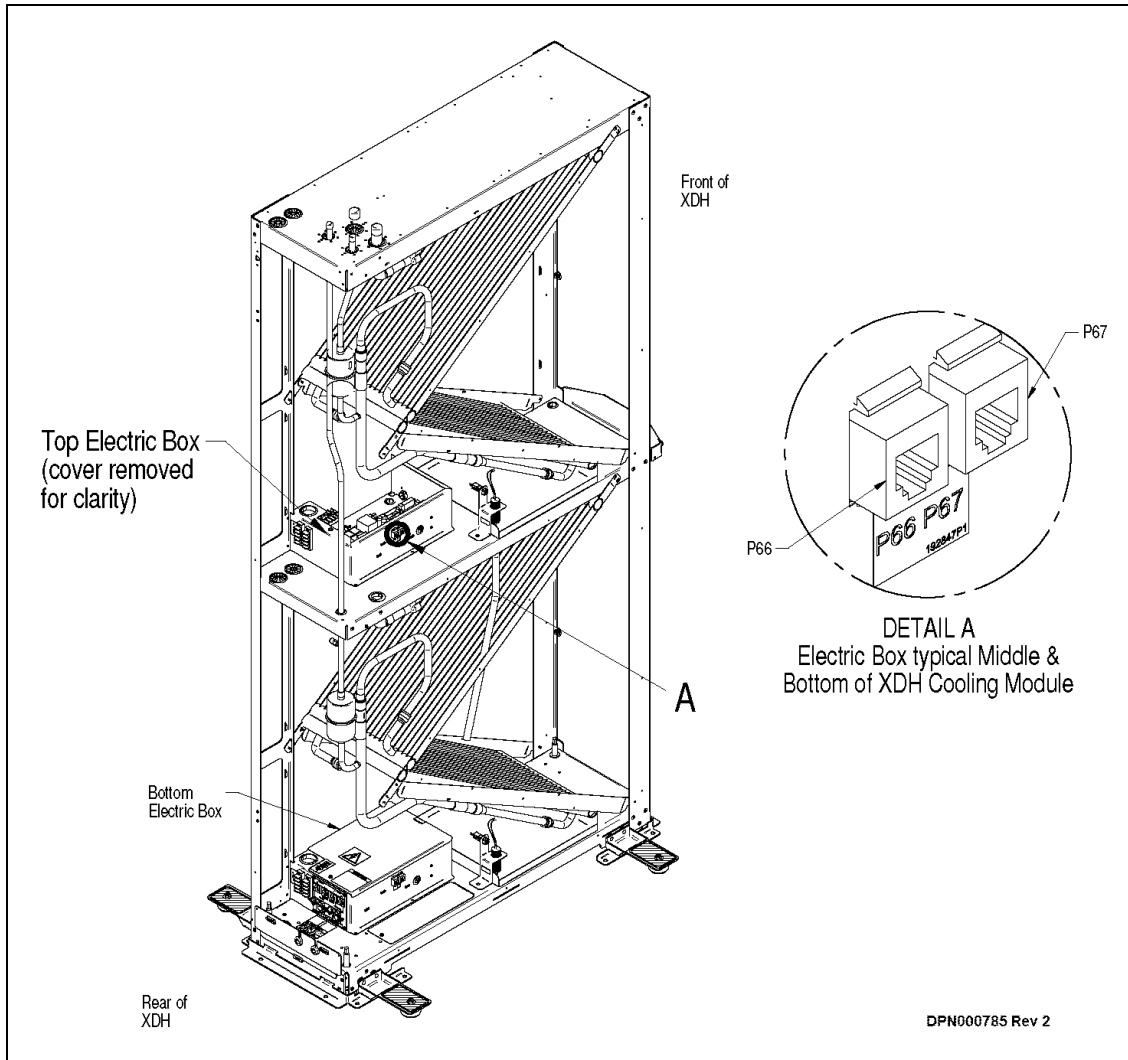


7.11.3 Connecting to the Liebert® XDH Smart Modules

Liebert® XDH CANbus Port Locations

The Liebert® XDH CANbus ports are located on the side of the electrical box. The cable from the Liebert® XDP or XDC side will be connected to Port P66. The leaving cable will be connected to Port P67. See **Figure 7.14** below .

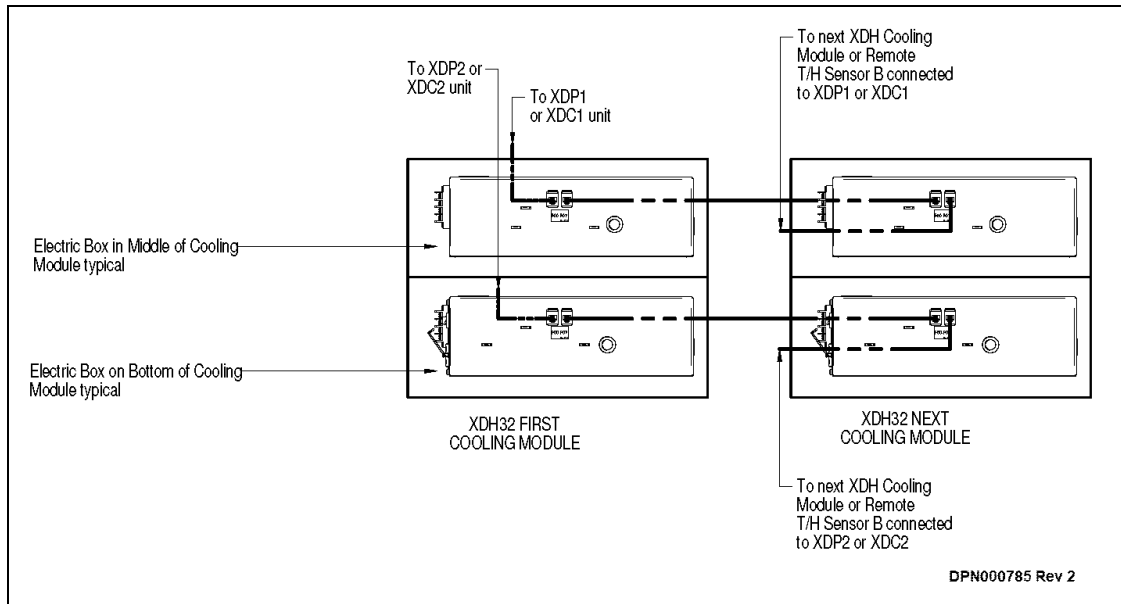
Figure 7.14 Liebert® XDH CANbus Port Locations



Liebert® XDH Single-Circuited CANbus Connections

For Liebert® XDHs with both top and bottom circuits tied to the same Liebert® XDP or XDC, the top and bottom control boards must be tied together using a CANbus cable with a length of 6.25ft. (1.9m). See **Figure 7.15** below .

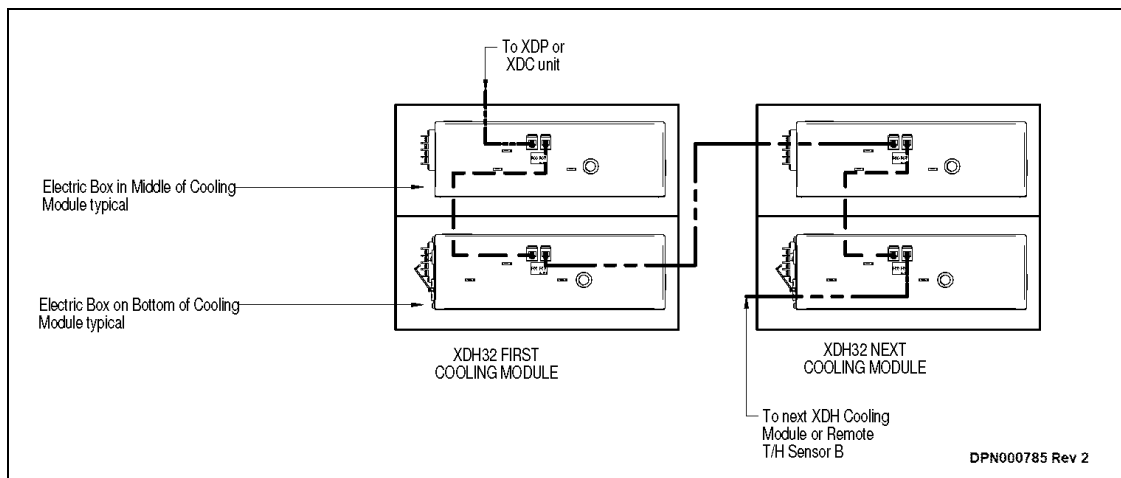
Figure 7.15 Single Circuited Liebert® XDHs



Liebert® XDH Dual-Circuited CANbus Connections

The Liebert® XD Smart Modules are to be tied only to the Liebert® XDP or XDC that they are mechanically connected to. For Liebert® XDHs with the top and bottom circuits tied to different Liebert® XDPs or XDCs, the control boards must be connected in the same manner. See **Figure 7.16** below .

Figure 7.16 Dual Circuited Liebert® XDHs

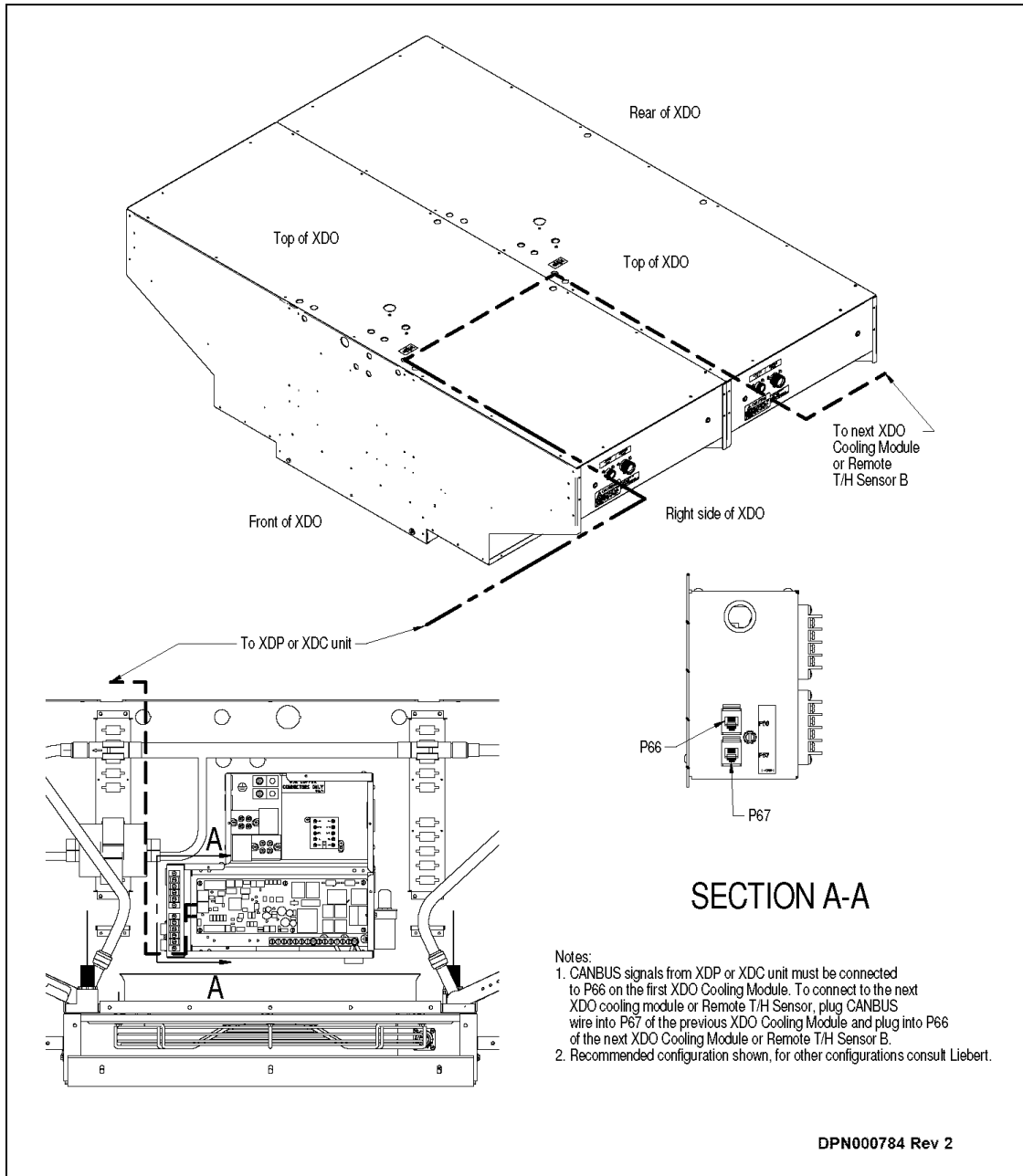


7.11.4 Connecting to the Liebert® XD Smart modules

Liebert® XDO CANbus Port Locations

The Liebert® XDO CANbus ports are located on the side of the electrical box. The cable from the Liebert® XDP Liebert® XDC side will be connected to Port P66. The leaving cable will be connected to Port P67. See **Figure 7.17** below .

Figure 7.17 Liebert® XDO CANbus Port Locations



7.12 CANbus Termination

The last device in the chain must be terminated.

- The remote temperature and humidity sensors are terminated at the factory.
- The Liebert® XD smart modules are not terminated at the factory. Improper termination will cause communication errors.

7.12.1 Remote Temperature and Humidity Sensors Termination

The control board is terminated at the factory. If a remote sensor is the last device in the CANbus chain, no changes are necessary. The termination jumper must be removed if a remote sensor is not the last device in the CANbus chain. Refer to the Liebert® XD module user manual for terminating procedures.

7.12.2 Terminating a Smart Module

Liebert® XD smart modules must be properly terminated or communication errors will result. Smart modules are shipped from the factory unterminated. If the smart module is the last device in the chain—in other words, the last module is not connected to a remote sensor—the smart module control board must be terminated. Refer to the Liebert® XD module user manual for terminating procedures.

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8 Monitoring

The Liebert® XDC and XDP with iCOM allow for control down to the Smart Module level. Many of the Liebert® XD system data points can be monitored through a building management system. For specific protocol mapping, refer to the protocol specific reference guide for registers, available at www.Vertiv.com.

Table 8.1 Liebert® XDC/XDP Monitoring Points

Data Description	Definitions
Auto Restart Delay	If power is lost, the control will delay this amount of time after power is restored before restarting the unit.
Calculated Next Maintenance Month	Calculated month of the next scheduled maintenance. Used in conjunction with (Calculated Next Maintenance Year).
Calculated Next Maintenance Year	Calculated year of the next scheduled maintenance. Used in conjunction with (Calculated Next Maintenance Month).
Circuit 1 Low Suction Pressure	Compressor Circuit 1 low suction pressure.
Circuit 2 Low Suction Pressure	Compressor Circuit 2 low suction pressure.
Compressor 1A High Head Pressure	Compressor 1A High Head Pressure
Compressor 1A Short Cycle	Compressor 1A short cycle. A short cycle is defined as turning On and Off a number of times over a set time period.
Compressor 1A State	Compressor 1A operational state.
Compressor 1B High Head Pressure	Compressor 1B high head pressure.
Compressor 1B Short Cycle	Compressor 1B short cycle. A short cycle is defined as turning On and Off a number of times over a set time period.
Compressor 1B State	Compressor 1B operational state.
Compressor 2A High Head Pressure	Compressor 2A high head pressure.
Compressor 2A Short Cycle	Compressor 2A short cycle. A short cycle is defined as turning On and Off a number of times over a set time period.
Compressor 2A State	Compressor 2A operational state.
Compressor 2B High Head Pressure	Compressor 2B high head pressure.
Compressor 2B Short Cycle	Compressor 2B short cycle. A short cycle is defined as turning On and Off a number of times over a set time period.
Compressor 2B State	Compressor 2B operational state.
Customer Input 1	Customer Input 1.
Dew Point Temperature	Dew point temperature, using the highest reading from all sensors.
Ext Air Over Temp Threshold	Threshold value used in the ([Ext Air Sensor A Over Temperature], [Ext Air Sensor B Over Temperature]...) events.
Ext Air Sensor A Dew Point Temp	Dew point temperature as measured by External Air Sensor A.
Ext Air Sensor A Humidity	Relative humidity as measured by External Air Sensor A.
Ext Air Sensor A Issue	The External Air Sensor A is disconnected or the signal is out of range.
Ext Air Sensor A Over Temperature	(Ext Air Sensor A Temperature) has exceeded (Ext Air Over Temp Threshold).
Ext Air Sensor A Temperature	Air temperature as measured by External Air Sensor A.

Table 8.1 Liebert® XDC/XDP Monitoring Points (continued)

Data Description	Definitions
Ext Air Sensor A Under Temperature	(Ext Air Sensor A Temperature) has dropped below (Ext Air Under Temp Threshold).
Ext Air Sensor B Dew Point Temp	Dew point temperature as measured by External Air Sensor B.
Ext Air Sensor B Humidity	Relative humidity as measured by External Air Sensor B.
Ext Air Sensor B Issue	The external air sensor B is disconnected or the signal is out of range.
Ext Air Sensor B Over Temperature	(Ext Air Sensor B Temperature) has exceeded (Ext Air Over Temp Threshold).
Ext Air Sensor B Temperature	Air temperature as measured by External Air Sensor B.
Ext Air Sensor B Under Temperature	(Ext Air Sensor B Temperature) has dropped below (Ext Air Under Temp Threshold).
Ext Air Under Temp Threshold	Threshold value used in the ([Ext Air Sensor A Under Temperature], [Ext Air Sensor B Under Temperature]...) events.
Ext Dew Point Over Temp Threshold	Threshold value used in the (Ext Dew Point Over Temperature) event.
Ext Dew Point Over Temperature	At least one dew point temperature reading ([Ext Air Sensor A Dew Point Temp], [Ext Air Sensor B Dew Point Temp]...) has exceeded (Ext Dew Point Over Temp Threshold).
Fan Issue	One or more fans are not operating within their operational parameters.
Hot Gas Solenoid Valve 1 Position	Hot gas solenoid Valve 1 position.
Hot Gas Solenoid Valve 2 Position	Hot gas solenoid Valve 2 position
Hot Gas Valve 1 Open Position	Hot gas Valve 1 open position.
Hot Gas Valve 2 Open Position	Hot gas Valve 2 open position.
Maintenance Ramp	The ratio of operations performed to the calculated operations available between maintenance intervals.
Minimum Room Temperature Set Point	Minimum desired room air temperature. If the room air temperature falls below this set point, the unit will reduce the cooling.
Pump 1 Loss of Flow	Loss of flow is detected in Pump 1. The loss of flow condition occurs when no differential pressure is detected across the pump.
Pump 1 State	Pump 1 operational state.
Pump 2 Loss of Flow	Loss of flow is detected in Pump 2. The loss of flow condition occurs when no differential pressure is detected across the pump.
Pump 2 State	Pump 2 operational state.
Pump Short Cycle	Pumps have short cycled. A short cycle is defined as turning On and Off a number of times over a set time period.
Shutdown - Loss Of Power	System lost power. This event becomes active when the unit is powered on following an unexpected loss of power.
Supply Refrig Over Temp Threshold	Threshold value used in the (Supply Refrigerant Over Temp) event.
Supply Refrig Over Temp Threshold	Threshold value used in the (Supply Refrigerant Over Temp) event.
Supply Refrigerant Over Temp	Event that is activated when (Supply Refrigerant Temperature) exceeds (Supply Refrig Over Temp Threshold). The event is deactivated when the temperature drops below the threshold.
Supply Refrigerant Temp Sensor Issue	The supply refrigerant temperature sensor is disconnected or the signal is out of range.
Supply Refrigerant Temperature	Supply refrigerant temperature.
Supply Refrigerant Under Temp	(Supply Refrigerant Temperature) has dropped below a specified threshold.

Table 8.1 Liebert® XDC/XDP Monitoring Points (continued)

Data Description	Definitions
System Condensation Detected	System condensation detected.
System Control Mode	System Control Mode
System Date and Time	The system date and time
System Event Acknowledge/Reset	Reset and/or acknowledge all events.
System On/Off Control	Turn system functionality On or Off.
System Operating State	Current operating state of the system.
System Status	The operating status for the system

Table 8.2 Liebert® XD Smart Module Monitoring Points

Data Description	Definitions
Cold Aisle Over Temp Threshold	Upper threshold value used in the (Cold Aisle Temp Out of Range) event.
Cold Aisle Over Temp Threshold	Upper threshold value used in the (Cold Aisle Temp Out of Range) event.
Cold Aisle Temp Out of Range	The air temperature in the cold aisle is either above (Cold Aisle Over Temp Threshold) or below (Cold Aisle Under Temp Threshold).
Cold Aisle Under Temp Threshold	Lower threshold value used in the (Cold Aisle Temp Out of Range) event.
Cold Aisle Under Temp Threshold	Lower threshold value used in the (Cold Aisle Temp Out of Range) event.
Communication Status	Communication status of remote device.
Cooling Capacity	Cooling capacity in use, expressed as a percentage of the maximum rated capacity.
Cooling Capacity	Cooling capacity in use, expressed in kilowatts.
Ext Fan Issue	One or more fans are not operating within their operational parameters.
Ext Fan Issue - Event Control	Enable/disable the activation of the (Ext Fan Issue) event. If set to "disabled," the event will not be annunciated. This implies that the event will not be placed in any active event list or in any event history list.
Ext Fan Issue - Event Type	The event type for the (Ext Fan Issue) event.
Ext Remote Shutdown	Unit is shut down by a remote signal.
Ext Remote Shutdown - Event Control	Enable/disable the activation of the (Remote Shutdown) event. If set to 'disabled', the event will not be annunciated. This implies that the event will not be placed in any active event list or in any event history list.
Ext Remote Shutdown - Event Type	The event type for the (Remote Shutdown) event.
Ext System Condensation Detected	External system condensation detected.
Ext System Condensation Detected - Event Control	Enable/disable the activation of the (Ext System Condensation Detected) event. If set to "disabled," the event will not be annunciated. This implies that the event will not be placed in any active event list or in any event history list.
Ext System Condensation Detected - Event Type	The event type for the (Ext System Condensation Detected) event.
Fan Button Control	Enable or disable the buttons from controlling the state of the fans.
Fan On/Off Control	Turn system fans On or Off.
Hot Aisle Over Temp Threshold	Upper threshold value used in the (Hot Aisle Temp Out of Range) event.
Hot Aisle Over Temp Threshold	Upper threshold value used in the (Hot Aisle Temp Out of Range) event.

Table 8.2 Liebert® XD Smart Module Monitoring Points (continued)

Data Description	Definitions
Hot Aisle Temp Out of Range	The air temperature in the Hot aisle is either above (Hot Aisle Over Temp Threshold) or below (Hot Aisle Under Temp Threshold).
Hot Aisle Under Temp Threshold	Lower threshold value used in the (Hot Aisle Temp Out of Range) event.
Hot Aisle Under Temp Threshold	Lower threshold value used in the (Hot Aisle Temp Out of Range) event.
Primary Fan Group State	Current operational state of the primary fan group.
Sensor Issue	One or more sensors are disconnected or the signals are out of range.
Sensor Issue - Event Control	Enable/disable the activation of the (Sensor Issue) event. If set to 'disabled', the event will not be annunciated. This implies that the event will not be placed in any active event list or in any event history list.
Sensor Issue - Event Type	The event type for the (Sensor Issue) event.
Fan Economy Mode	Mode in which system secondary fans are to be controlled.
Fan State	Current operational state of a group of fans.
Module Refrigerant Temperature	Refrigerant temperature as measured by Module Sensor
Module Sensor 1 Temperature	Air temperature as measured by Module Sensor 1
Module Sensor 2 Temperature	Air temperature as measured by Module Sensor 2
Module Sensor 3 Temperature	Air temperature as measured by Module Sensor 3
Visual ID Control	Visual identification control to display an LED flashing sequence, allowing it to be visually located.

Table 8.3 System Data Points

Data Description	Definitions
Unit Communication Lost	Master has lost communication with one or more networked units.
RAM Battery Issue	RAM or RAM backup battery is not operating correctly.
Master Unit Communication Lost	Communication with master unit has been lost.
Remote Shutdown	Unit is shut down by a remote signal.
Unit Code Missing	Unit code has not been entered and saved.
Unit On	Unit was turned on.
Unit Off	Unit was turned Off.
Unit Standby	Unit was placed in standby mode.
Unit Partial Shutdown	An event has occurred requiring some system components to be shutdown and disabled.
Unit Shutdown	An event has occurred requiring the unit to be shutdown and disabled to prevent damage to the system.
Maintenance Due	The calculated maintenance date has been reached.
Maintenance Completed	Maintenance has been completed on the unit.
System Operating State Reason	The reason the system is in the current operating state.
System Date and Time	The system date and time

Table 8.4 Communication Cards for Liebert® XD Units

Communication Card	Protocol
IS-WEBL	SNMPv1, SNMPv2c, HTTP, HTTPS, Email, SMS, Telnet, Liebert Protocol
IS-485L	Modbus 485
IS-IPBML	HTTP, HTTPS, Telnet, Modbus, IP, BACnet IP
IS-485EXI	Liebert® SiteScan™

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9 High Density Module Specifications and Model Number Nomenclature

Table 9.1 Liebert® XDH32 Specifications

Models	XDH32SK ¹ XDH32SS ¹ (50/60Hz)	
Cooling Capacity	XDH32 60Hz Nominal (98°F [37°C] EAT): 30kW/8.5 Tons XDH32 60Hz Maximum(105°F [41°C] EAT): 34kW/9.7 Tons XDH32 50Hz Nominal (98°F [37°C] EAT): 30kW / 8.5 Tons XDH32 50Hz Maximum(103°F [39°C] EAT): 34kW/9.7 Tons	
Conditions	Capacity rating is at 55°F (13°C) Entering Fluid Temperature and 50°F (10°C) or lower dew point	
Electrical Requirements		
Input	120V-1ph-60Hz	220-240V-1ph-50Hz, CE / 208-240V-1ph-60Hz, CSA
Input Power Connections	Two IEC320-C14 power inlets and two IEC power cords with NEMA 5-15P plugs	Two IEC320-C14 power inlets and two IEC power cords with IEC320-C14 plugs
Full Load Amps	10	5
Power Consumption, Nominal, Watts	1200	1150
Dimensions, inches (mm)		
Height—Module Only	78 (1981)	
Height—Including Pipe Connections	80 (2032)	
Width	12 (305)	
Depth	42 (1067)	
Weight, lb (kg)		
Module Only	246 (112)	246 (112)
Shipping Weight	330 (150)	330 (150)
Number of Fans	6	
Airflow, Nominal, ft ³ /min (m ³ /hr)	4000 (6796)	3850 (6541)
Audible Noise, Sound Power	86 dBa	86 dBa
Pipe Connections		
Refrigerant Supply	1/2" OD, Cu	
Refrigerant Return	7/8" OD, Cu	
Serviceable Parts	Fans and electrical components	
Cabinet Exterior Finish	Black, matte finish, heat-fused powder coat	

Table 9.1 Liebert® XDH32 Specifications (continued)

Models	XDH32SK ¹ XDH32SS ¹ (50/60Hz)		
Options			
Smart Module control board (factory-installed)	Dry contact (24VAC - 1A maximum)		
Pre-Charged Refrigerant	R-134a refrigerant, one-shot connections		
	Uni-directional or bi-directional		
Agency			
Approvals	CSA 60Hz	CE 50Hz, CSA 50/60Hz	
Refer to Figure 9.1 below for complete part number.			

Figure 9.1 Liebert® XDH Model Number Nomenclature

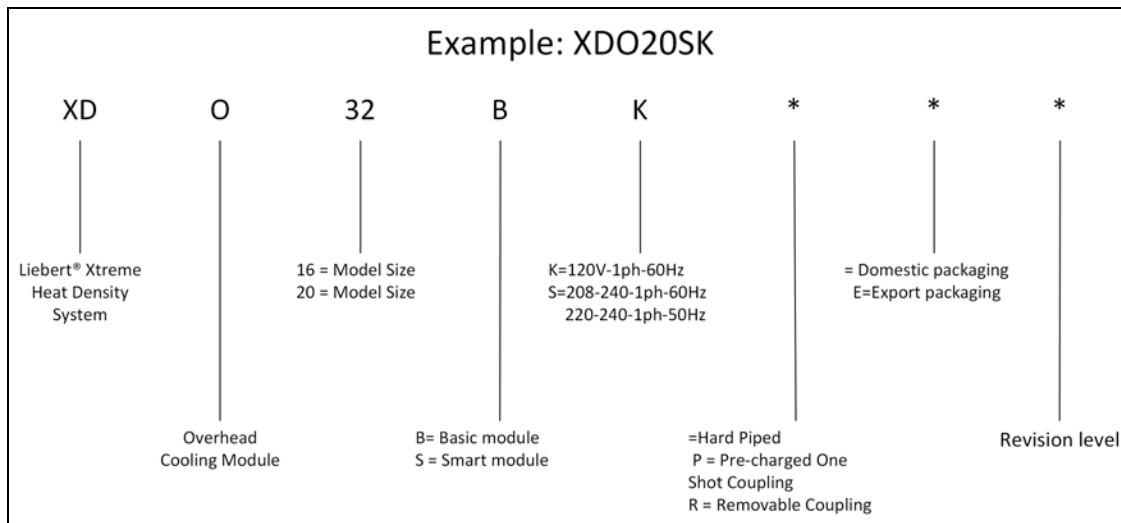


Table 9.2 Liebert® XDO20 Specifications

Models	XDO20SK ¹ XDO20SS ¹		
	60Hz		50Hz
Cooling Capacity	Nominal (92°F [33°C] EAT): 17.7kW / 5 Tons Maximum (103°F [39°C] EAT): 23.1kW / 6.6 Tons		
Conditions	Capacity rating is at 55°F (13°C) Entering Fluid Temperature and 50°F (10°C) or lower dew point		
Electrical Requirements			
Input Voltage	1ph-60Hz-120V	1ph-60Hz-220-240V	1ph-50Hz-220-240V

Table 9.2 Liebert® XDO20 Specifications (continued)

Models	XDO20SK ¹		
	XDO20SS ¹		
	60Hz		50Hz
Input Power Connections	Terminal blocks provided internal to module		
Full Load Amps	2.7A at 120V	1.64A at 230V	1.64A at 230V
Wire Size Amps	3.4	2.0	2.0
Overcurrent Protection Device	15	15	15
Power consumption, nominal, watts	335	350	350
Dimensions, inches (mm)			
Length	72-1/4 (1835)		
Width	24-1/8 (613)		
Height	22-1/2 (572) not including electrical and piping access		
Weight, lb (kg)			
Module only	150 (68)		
Shipping weight	238 (108)	296 (134)	
Installed, with refrigerant, without options	155 (70)		
Number of Fans	1	1	1
Airflow, Nominal, ft ³ / min (m ³ / hr)	2700 (4590)		2250 (3820)
Audible Noise	85 dBa sound power		83 dBa sound power
Pipe Connections (without flex pipe)			
Refrigerant Supply from Liebert® XDP/XDC	1/2" OD, Copper		
Refrigerant Return to Liebert® XDP/XDC	7/8" OD, Copper		
Serviceable Parts	Fan and electrical components		
Exterior Finish – Bottom, Sides, Front and Rear	Black matte finish, heat-fused powder coat		
Exterior Finish - Top	Hot-dipped galvanized steel		
Agency			
Approvals	CSA 60 Hz		CE 50Hz
1. Refer to Figure 9.2 on the next page for full part number.			

Figure 9.2 Liebert® XDO Model Number Nomenclature

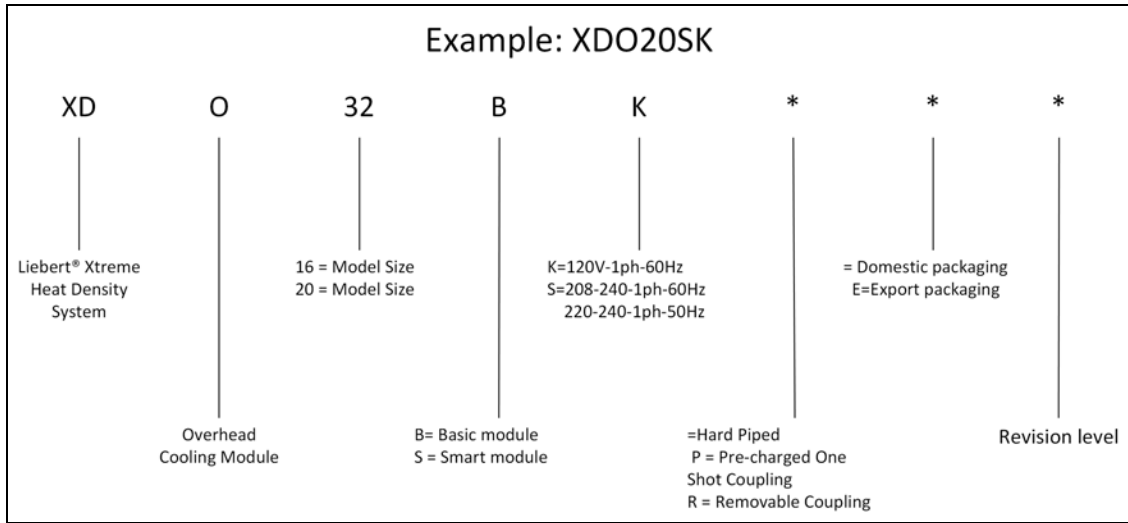


Table 9.3 Options for Liebert® XDO20

Option	Liebert® XDO - 60Hz Models	Liebert® XDO - 50Hz Models
Lighting Fixtures (ship loose)	2 Liebert® XDOs per lighting unit; 120V or 277V; 4' standard fluorescent tubes (not included)	
Power, optional lighting fixture	0.9A per 120V light fixture; 0.4A per 277V light fixture	None
Smart Module control board (factory-installed)	Dry contact 24VAC - 1A maximum	
Pre-Charged Refrigerant	R-134a Refrigerant, one-shot connections	

Table 9.4 Liebert® XDO Dimensions—Domestic and Export

Model	Shipping Dimensions, inches (mm)						Module Dimension Unpacked, inches (mm)		
	Domestic			Export			Length	Width	Height *
	Length	Width	Height	Length	Width	Height			
All Models		30 (762)	30 (762)	83 (2108)	30 (762)	30 (762)	72-1/4 (1835)	24-1/8 (613)	25-1/2 (648)
* Includes piping connections									

Table 9.5 Liebert® XDV8 Specifications

Models	XDV8SK*	XDV8ST*		XDV8SS*
	60 Hz	60 Hz	50 Hz	50 Hz
Cooling Capacity	Nominal (92°F [33°C] EAT): 8kW / 2.3 Tons Maximum (95°F [35°C] EAT): 8.7kW / 2.5 Tons		Nominal (92°F [33°C] EAT): 7kW/2.0 Tons Maximum (103°F [39°C] EAT): 8.7kW/2.5Tons	
Conditions	Capacity rating is at 55°F (13°C) Entering Fluid Temperature and 50°F (10°C) or lower dew point, rear air inlet.			
Electrical Requirements				
Input	120V model: 1ph-60 Hz	230V model: 1ph-60 Hz	230V model: 1ph-50 Hz	

Table 9.5 Liebert® XDV8 Specifications (continued)

Models	XDV8SK*	XDV8ST*		XDV8SS*
	60 Hz	60 Hz	50 Hz	50 Hz
Input power connections	2 power connections, each model			
Full Load Amps	120V model: 2.0A	230V model: 1.0A		
Power consumption, nominal, watts	180	190	190	190
Dimensions, in. (mm)				
Height – module only	14 (355) not including pipe connections			
Height – including pipe connections	18-5/8 (473)			
Width	22-7/8 (581)			
Depth – Top	39-1/2 (1003)			
Depth – Bottom	29-5/8 (752)			
Weight, lb (kg)				
Module only	77 (35)			
Shipping weight	125 (57)			
Installed, with refrigerant	79 (36)			
Number of Fans	2	2	2	2
Airflow, Nominal, ft ³ /min (m ³ /hr)	1000 (1699) with rear inlet. Bottom inlet airflow may be less, depending on restrictions inside cabinet		833 (1415) with rear inlet. Bottom inlet airflow may be less, depending on restrictions inside cabinet	
Audible noise	78 dBa sound power		73 dBa sound power	
Pipe Connections (without Liebert Flex Pipe)				
Refrigerant Supply from Liebert® XDP/XDC	1/2" OD Cu, (optional 1/2" threaded coupler flex piping)			
Refrigerant Return to Liebert® XDP/XDC	5/8" OD Cu, (optional 3/4" threaded coupler flex piping)			
Serviceable Parts	Fans and electrical components			
Cabinet Exterior Finish	Black, matte finish, heat-fused powder coat			
Options				
Smart Module control board (factory-installed)	Dry contact, 24VAC, 1A maximum			
Pre-Charged Refrigerant	R-134a refrigerant, one-shot connections			
Agency				
Approvals	CSA 60Hz		CSA 50Hz	CE 50Hz
*Refer to Figure 9.3 on page 147 for complete part number.				

Table 9.6 Liebert® XDV10 Specifications

Models	XDV10SK*	XDV10ST*		XDV10SS*
	60 Hz	60 Hz	50 Hz	50 Hz
Cooling Capacity	Nominal (98°F [37°C] EAT): 10kW / 2.8 Tons Maximum (106°F [41°C] EAT): 11.7kW/3.3 Tons		Nominal (98°F [37°C] EAT): 8.3kW / 2.4 Tons Maximum (116°F [47°C] EAT): 11.7kW/3.3 Tons	
Conditions	Capacity Rating is at 55°F (13°C) Entering Fluid Temperature and 50°F (10°C) or lower dew point, rear air inlet.			
Electrical Requirements				
Input	120V model: 1ph-60 Hz	230V model: 1ph-60 Hz	230V model: 1ph-50 Hz	
Input power connections	2 power connections, each model			
Full Load Amps	120V model: 2.0A	230V model: 1.0A		
Power consumption, nominal, watts	180	190	190	190
Dimensions, in. (mm)				
Height – module only	14 (355) not including pipe connections			
Height – including hard pipe connections	18-5/8 (473)			
Height – including one-shot connections	19-5/8 (498)			
Width	22-7/8 (581)			
Depth – Top	39-1/2 (1003)			
Depth – Bottom	29-5/8 (752)			
Weight, lb (kg)				
Module only	77 (35)			
Shipping weight	125 (57)			
Installed, with refrigerant	79 (36)			
Number of fans	2	2	2	2
Airflow, Nominal, ft ³ /min (m ³ /hr)	1000 (1699) with rear inlet. Bottom inlet airflow may be less, depending on restrictions inside cabinet		833 (1415) with rear inlet. Bottom inlet airflow may be less, depending on restrictions inside cabinet	
Audible noise	78 dBa sound power		73 dBa sound power	
Pipe Connections (without Liebert Flex Pipe)				
Refrigerant supply from Liebert® XDP/ XDC	1/2" OD, Cu, (optional 1/2" threaded coupler flex piping)			
Refrigerant return to Liebert® XDP/ XDC	5/8" OD, Cu, (optional 3/4" threaded coupler flex piping)			
Serviceable Parts	Fans and electrical components			
Cabinet Exterior Finish	Black, matte finish, heat-fused powder coat			
Options				
Smart Module control board (factory-installed)	Dry contact, 24VAC, 1A maximum			
Pre-Charged Refrigerant	R-134a refrigerant, one-shot connections			

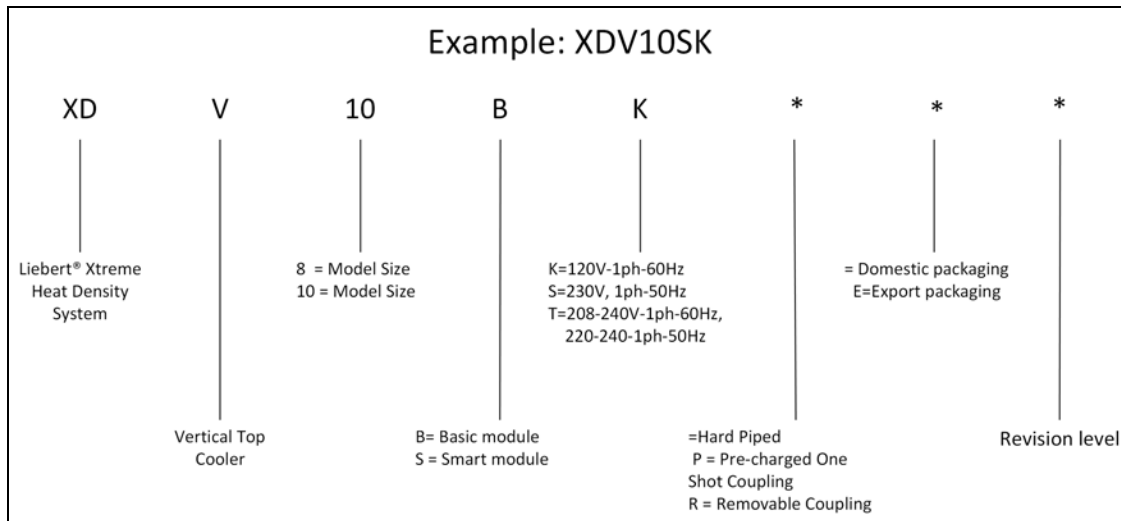
Table 9.6 Liebert® XDV10 Specifications (continued)

Models	XDV10SK*	XDV10ST*		XDV10SS*
	60 Hz	60 Hz	50 Hz	50 Hz
Agency				
Approvals	CSA 60Hz		CSA 50Hz	CE 50Hz
*Refer to Figure 9.3 below for complete part number.				

Table 9.7 Liebert® XDV Dimensions—Domestic and Export

Model	Shipping Dimensions Length x Width x Height inches (mm)		Module Dimensions Unpacked Length x Width x Height inches (mm)
	Domestic	Export	Module Only
All Models	48 x 40 x 24-1/4 (1219 x 1016 x 616)	45-4/5 x 30-3/4 x 33 (1163 x 781 x 839mm)	39-1/2 x 22-7/8 x 14 (1003 x 581 x 356)

Figure 9.3 Liebert® XDV Model Number Nomenclature



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10 XDP and XDC Module Specifications and Model Number Nomenclature

Table 10.1 Liebert® XDC160 Specifications

Models	XDC160 Air		XDC160 Water/Glycol
	XDC160AA	XDC160AM	189192G3 (90-100°F) 189192G5 (65-85°F)
Cooling Capacity, tons (kW)	46 (160)	37 (130)	See Table 10.2 on the next page, Table 10.3 on page 151 and Table 10.4 on page 151 for Water/Glycol performance data
Minimum Load	40% of system nominal capacity (64 kW for 60Hz unit)		
Electrical Requirements			
Input	460V-3ph-60Hz	380/415V-3ph-50Hz	460V-3ph-60Hz
Full Load Amps	79A		
Minimum supply wire sizing ampacity	84A		
Maximum fuse or circuit breaker size	100A		
Dimensions, inches (mm)			
Height - Main unit only	78 (1981)		
Height - Main unit only, as shipped	83 (2108)		
Width - Main unit	74 (1879)		
Depth - Main unit	34-5/8 (879)		
Height - Water/Glycol-Cooled Condenser Stand	N/A	24 (607)	
Width - Water/Glycol-Cooled Condenser Stand	N/A	72 (1829)	
Depth - Water/Glycol-Cooled Condenser Stand	N/A	33 (839)	
Weight, lb (kg)			
Main unit only	1800 (817)		
Main unit only, as shipped	Domestic: 1945 (882); Export: 2093 (949)		
Water/Glycol-Cooled Condenser Stand	N/A	1075 (488)	
Water/Glycol-Cooled Condenser Stand, as shipped	N/A	1150 (521)	
Pipe Connections, inches, O.D., Cu			
Liebert® XD Coolant supply to Vertiv™ Liebert® XD cooling modules	1-1/8		
Liebert® XD Coolant return from Liebert® XD cooling modules	2-1/8		
Liquid line, DX circuit	7/8		
Hot gas line, DX circuit	1-3/8		
Heat Rejection Equipment			
95°F (35°C) ambient air-cooled condenser	2-DCSL415	N/A	

Table 10.1 Liebert® XDC160 Specifications (continued)

Models	XDC160 Air		XDC160 Water/Glycol	
	XDC160AA	XDC160AM	189192G3 (90-100°F) 189192G5 (65-85°F)	
105°F (41°C) ambient air-cooled condenser	2-DCSL616		N/A	
Number of Vertiv™ Liebert® XD Cooling Modules Connected, Maximum (Minimum)				
Liebert® XDCF10	16 (6)			
Liebert® XDH20	8 (4)			
Liebert® XDH32	5 (2)			
Liebert® XDO16	10 (4)			
Liebert® XDO20	8 (4)			
Liebert® XDV8	20 (8)			
Liebert® XDV10	16 (7)			
Cabinet Exterior Finish	Black, matte finish, heat-fused powder coat			
Maximum Ambient Operating Temperature °F (°C)	86 (30)			
Agency				
Approvals	CSA	CE	CSA	

Table 10.2 Floor Stand Specifications—Water-Cooled Liebert® XDC

	XDC160 Water Floor Stand - 60Hz				
	189192G5				189192G3
Entering Fluid Temp °F (°C)	65 (18)	70 (21)	75 (24)	85 (29)	95 (35)
Performance Data					
Cooling capacity, tons (kW)	46.1(162.3)	46.1(162.3)	46.1(162.3)	46.1(162.3)	44.5(156.5)
Flow, GPM	50	58	70	110	142
Pressure Drop, psi (Ft Water)	2.7 (6.2)	4.9 (11.3)	5.4 (12.5)	20.7 (47.8)	27.3 (63.1)
Heat Rejection Equipment					
Water regulating valve size	1"	1"	1"	1"	1"
Piping Connections					
Water / glycol supply and return lines	2-1/8"	2-1/8"	2-1/8"	2-1/8"	2-1/8"

Table 10.3 Floor Stand Specifications—Liebert® XDC with 40% Propylene Glycol

XDC160 Glycol Floor Stand - 60Hz - 40% PG			
189192G3			
Outside Ambient °F (°C)	95 (35)	100 (38)	105 (41)
Max Entering Fluid Temp °F (°C)	110 (43)	110 (43)	110 (43)
Performance Data			
Cooling capacity, tons (kW)	42.5 (149.4)		
Total Heat Rejection, (kW)	192.6		
Flow, GPM	206		
Pressure Drop, psi (ft water)	37.2 (85.9)		
Heat Rejection Equipment			
Drycooler	DDNT 940A	2 x DDNT 880A*	
Drycooler Pressure Drop, psi (ft water)	6.7 (15.8)	2.9 (6.6)	
Glycol pump package - 10hp	460V - D10ANTS1317; 208V - D10YNTS1317		
Pump Control Package - 208V	RP020HY04S0758		
Pump Control Package - 460V	RP020HA08S0758		
Pump Total Head at 206 GPM, ft water	145		
Water regulating valve size	1-1/4"		
Piping Connections			
Water / glycol supply and return lines	2-5/8"		
*When multiple drycoolers are used, ensure flow is balanced.			

Table 10.4 Floor Stand Specifications—Liebert® XDC with 40% Ethylene Glycol

XDC160 Glycol Floor Stand - 60Hz - 40% EG			
189192G3			
Outside Ambient °F (°C)	95 (35)	100 (38)	105 (41)
Max Entering Fluid Temp °F (°C)	110 (43)	110 (43)	110 (43)
Performance Data			
Cooling capacity, tons (kW)	42.5 (149.4)		
Total Heat Rejection, (kW)	192.6		
Flow, GPM	204		
Pressure Drop, psi (ft water)	35.9 (82.9)		
Heat Rejection Equipment			
Drycooler	DDNT 940A	2 x DDNT 880A*	

Table 10.4 Floor Stand Specifications—Liebert® XDC with 40% Ethylene Glycol (continued)

XDC160 Glycol Floor Stand - 60Hz - 40% EG	
189192G3	
Drycooler Pressure Drop, psi (ft water)	6.5 (15.1) 2.7 (6.3)
Glycol pump package - 10HP	460V - D10ANTS1317; 208V - D10YNTS1317
Pump Control Package - 208V	RP020HY04S0758
Pump Control Package - 460V	RP020HA08S0758
Pump Total Head at 204 GPM, ft water	145
Water regulating valve size	1-1/4"
Piping Connections	
Water / glycol supply and return lines	2-5/8"
*When multiple drycoolers are used ensure flow is balanced.	

Figure 10.1 Liebert® XDC Model Number Nomenclature

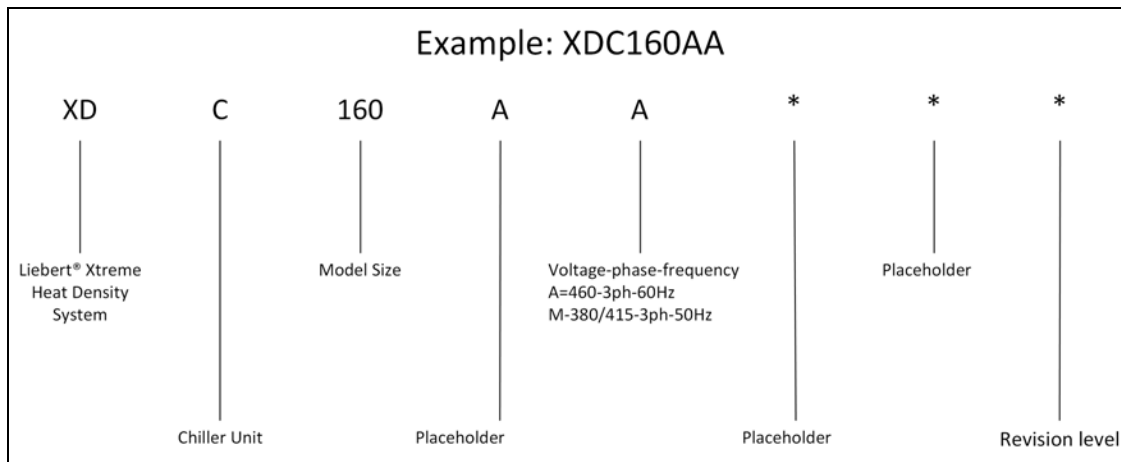


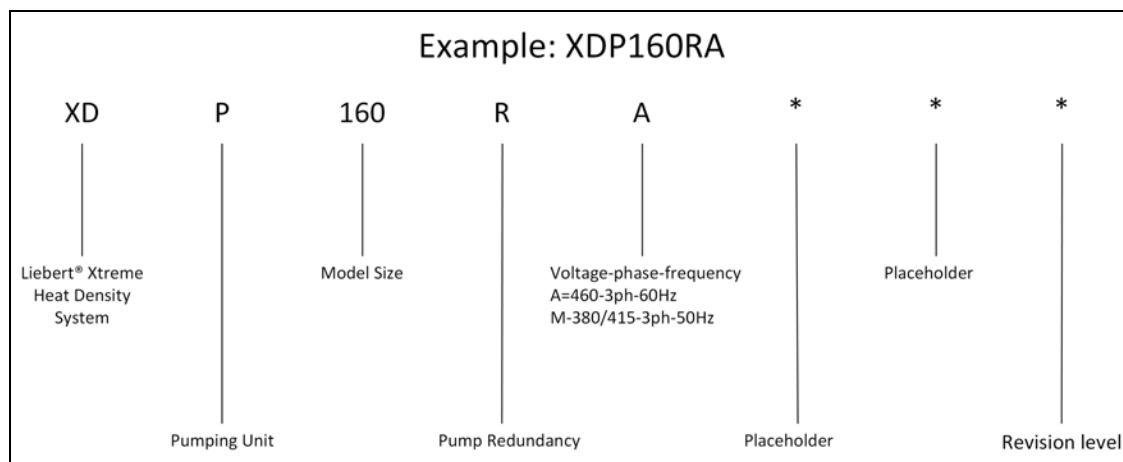
Table 10.5 VLiebert® XDP160 Specifications

Models	XDP160RC--3	XDP160RA--3	XDP160RM--3
Cooling Capacity, Nominal	160kW / 46 Tons, 60Hz		140kW / 40 Tons, 50Hz
	Each capacity is based on 45°F (7°C) entering water temperature and 140gpm (530lpm) water flow rate. Capacity is reduced when glycol mixtures are used in place of 100% water.		
Minimum Load	30% of nominal system capacity or 48kW (163,800BTU/H)		
Electrical Requirements			
Input	208V/3ph/60Hz	460V/3/ph60Hz	380/415V/3ph/50Hz
Full Load Amps		21A	23A
Dimensions, inches (mm)			

Table 10.5 VLiebert® XDP160 Specifications (continued)

Models	XDP160RC--3	XDP160RA--3	XDP160RM--3
Height – Unit only	78 (1981)		
Height – As shipped	83 (2108)		
Width	38 (965)		
Depth	34 (864)		
Weight, lb (kg)			
Unit only	821 (372)		
Shipping weight	Domestic: 990 (449); Export: 1067 (484)		
Installed, with refrigerant and chilled water	1038 (471)		
Pipe Connections			
Refrigerant supply to Liebert® XD cooling module	1-1/8" OD, Cu		
Refrigerant return from Liebert® XD cooling module	2-1/8" OD, Cu		
Chilled water supply and return	2-5/8" OD, Cu		
Control valve	2-way, 2" nominal; 35 PSIG close-off pressure rating; 150 PSIG maximum allowable pressure		
Pressure Drop – Chilled Water Side	20 psig (137kPa, 1.38bar), with 140 gpm (530lpm) water flow rate, control valve fully open		
Temperature Rise – Chilled Water Side at rated flow, °F (°C)	8.0 (4.4)	6.9 (3.8)	
Number of Liebert® XD Cooling Modules Connected, Maximum (Minimum)			
Liebert® XDCF10	16 (5)		
Liebert® XDH20	8 (3)		
Liebert® XDH32	5 (2)		
Liebert® XDV8	20 (6)		
Liebert® XDV10	16 (5)		
Liebert® XDO16	10 (3)		
Liebert® XDO20	8 (3)		
Cabinet Exterior Finish	Black, matte finish, heat-fused powder coat		
Operating Ambient Temperature, Maximum, °F (°C)	86 (30)		
Agency			
Approvals	CSA 60Hz		CE 50Hz

Figure 10.2 Liebert® XDP Model Number Nomenclature



Appendices

Appendix A: Technical Support and Contacts

A.1 Technical Support/Service in the United States

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2378

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

505 N Cleveland Ave

Westerville, OH 43082

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

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