



CoolPhase CDU

Installer/User Guide

Liquid to Refrigerant Cooling Distribution Unit XDM300

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Vertiv recommends installing a monitored fluid detection system that is wired to activate the automatic closure of field-installed coolant fluid supply and return shut off valves, where applicable, to reduce the amount of coolant fluid leakage and consequential equipment and building damage. Refer to local regulations and building codes relating to the application, installation, and operation of this product. The consulting engineer, installer, and/or end user is responsible for compliance with all applicable laws and regulations relating to the application, installation, and operation of this product.

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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.

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1 Important Safety Instructions

SAVE THESE INSTRUCTIONS

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

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

Adhere to all warnings, cautions, notices and installation, operating, and safety instructions on the unit and in this manual. Follow all installation, operation and maintenance instructions and all applicable national and local building, electrical, and plumbing codes.



WARNING! Risk of improper moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity indicator. Shipping weights and unit weights are listed in **Table 3.3 on page 24 . Use the center of gravity indicators on the unit to determine the position of the slings.**



WARNING! Risk of top heavy unit falling over. Improper handling can cause equipment damage, injury, or death. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from, or prepare the unit for installation.



WARNING! Risk of unit falling over. Improper installation of floor stand can cause equipment damage, injury, or death. Read all instructions before attempting to install floor stand.



WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious injury or death. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.



WARNING! Risk of overpressurization of the refrigeration system. Can cause explosive discharge of high pressure refrigerant, loss of refrigerant, environmental pollution, equipment damage, injury, or death. This unit contains fluids and gases under high pressure. Use extreme caution when charging the refrigerant system. Do not pressurize the system higher than the design pressure marked on the unit's nameplate.



WARNING! Risk of explosive discharge of high-pressure refrigerant. Can cause serious injury or death. Building and equipment damage may also result. Neutral and service ports on the compressor service valves do not have a valve core. Front-seat the service valves and relieve pressure from the compressor before loosening a part or a component attached to the service valve. Follow local codes to properly reclaim refrigerant.



WARNING! Arc flash and electric shock hazard. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off, and wear appropriate, OSHA approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC, and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert® iCOM™ controller. The factory supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



WARNING! Risk of electric shock. Can cause equipment damage, injury, or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



WARNING! Risk of short circuits and electric shock. Can cause serious injury or death. Building and equipment damage can result from cut insulation or damaged wires. Can cause overheated wiring, smoke, fire, activation of fire suppression systems and EMS personnel, and loss of power to fans. Verify that all wiring connections are tight and that all wiring is contained within the junction box prior to closing and securing the cover.

Insert CSA-certified or UL-listed bushings into holes and/or knockouts used to route wiring through metal panels to protect the wire insulation from contact with sheet metal edges.



WARNING! Risk of improper wire sizing/rating and loose electrical connections causing overheated wire and electrical connection terminals resulting in smoke or fire. Can cause serious injury or death. Building and equipment damage may also result. Use correctly sized copper wire only and verify that all electrical connections are tight before turning power On. Check all electrical connections periodically and tighten as necessary.



WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ controller.

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



CAUTION: Risk of contact with sharp edges, splinters, and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate, OSHA approved PPE should attempt to move, lift, remove packaging from, or prepare the unit for installation.



CAUTION: Risk of contact with sharp edges, splinters, and exposed fasteners. Can cause injury. Wear appropriate OSHA approved personal protective equipment (PPE) when attempting to move, lift, remove packaging from, or prepare for installation.



CAUTION: Risk of heavy unit falling into defective raised floor. Can cause injury and equipment damage. Prior to installation, all floor tiles immediately around the floorstand are to be removed and inspected. Make sure tiles are not cracked, and ribs have not been cut. If free from defects, re-install. Replace with new tiles if defects are found.



CAUTION: Risk of excessive refrigerant line pressure. Can cause equipment damage or injury resulting from tubing and component rupture. Do not close off the refrigerant line isolation valve for repairs unless a pressure relief valve is field installed in the line between the isolation valve and the check valve. The pressure relief valve must be rated 5% to 10% higher than the system design pressure. An increase in ambient temperature can cause the pressure of the isolated refrigerant to rise and exceed the system design pressure rating (marked on the unit nameplate).



CAUTION: Risk of contact with hot surfaces. Can cause injury. Personal burn injury can be the result of touching a compressor, refrigerant discharge lines, and some electrical components that are extremely hot during unit operation. Allow sufficient time for them to cool to a touch-safe temperature before working within the unit cabinet.

Use extreme caution and wear appropriate, OSHA-approved PPE when working on or near hot components.



CAUTION: Risk of improper piping installation, leak checking, fluid chemistry, and fluid maintenance. Can cause injury. Building and equipment damage may also result. Installation and service of this equipment should be done only by qualified personnel who have been specialized training for liquid cooling equipment and who are wearing appropriate, OSHA-approved PPE.



CAUTION: Risk of contact with extremely hot and/or cold surfaces. Can cause injury. Verify that all components have reached a temperature that is safe for human contact or wear appropriate, OSHA approved PPE before working within the electric connection enclosures or unit cabinet. Perform maintenance only when the system is de-energized and component temperatures have become safe for human contact.

NOTICE

This equipment is required to be installed only in locations not accessible to the general public. Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications.

NOTICE

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off the skid. Measure the unit and passageway dimensions, and refer to the installation plans prior to moving the unit to verify clearances.

NOTICE

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

NOTICE

Risk of improper storage. Keep the unit upright, indoors, and protected from dampness, freezing temperatures, and contact damage.

NOTICE

Upon arrival verify that labeled equipment matches Bill of Lading. Carefully inspect all items for either visible or concealed damage.

Damage should be immediately reported to carrier and a damage claim filed with a copy sent to Vertiv or to your sales representative.

NOTICE

Risk of oil contamination with water. Can cause equipment damage.

Vertiv™ CoolPhase CDU systems require the use of POE (polyolester) oil. POE oil absorbs water at a much faster rate when exposed to air than previous used oils. Because water is the enemy of a reliable refrigeration system, extreme care must be used when opening systems during installation or service. If water is absorbed into the POE oil, it will not be easily removed and will not be removed through the normal evacuation process. If the oil is too wet, it may require an oil change. 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 into the compressor.

NOTICE

Units should never be operated with no refrigerant charge, a holding charge, a proper load or without additional oil as required added. Tag out system to prevent unauthorized personnel from accidentally starting equipment and damaging compressors if any of these conditions exist.

NOTICE

Risk of improper refrigerant charging. Can cause equipment damage.

R-410A is a blended refrigerant and must be introduced and charged from the cylinder only as a liquid.

Care must be exercised to avoid damage to the compressor. We recommend connecting a manifold charging hose equipped with a ball valve to the liquid line Schrader port.

NOTICE

Risk of improper operation. Can cause compressor failure.

Operating the unit with the EEV closed can cause compressor failure. A minimum of 20 psig (138 kPa) must be established and maintained for the compressor to operate. The charging function can be reset as many times as required to complete.

NOTICE

The unit must have line voltage applied to the unit at least 12 hours before compressor start-up to allow the compressor crankcase heaters time to warm the compressors and boil off any liquid refrigerant in the compressors after pre-charge.

NOTICE

Risk of frozen pipes and corrosion from improper coolant mixture. Can cause water leaks resulting in equipment and building damage.

When the cooling unit or piping may be exposed to freezing temperatures, charge the system with the proper percentage of glycol and water for the coldest design ambient temperature. Automotive antifreeze is unacceptable and must NOT be used in any glycol fluid system. Use only HVAC glycol solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

NOTICE

Risk of piping system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Piping systems are at risk of freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature corrosion. The water or water/glycol solution must be analyzed by a competent local water treatment specialist before start-up to establish the inhibitor and antifreeze solution requirement and at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

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

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

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

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

We recommend installing a monitored fluid detection system that is wired to activate the automatic closure of field installed coolant fluid supply and return shut-off valves to reduce the amount of coolant fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close off against the maximum coolant fluid system pressure in case of a catastrophic fluid leak.

NOTICE

Risk of no flow condition. Can cause equipment damage.

Do not leave the water/coolant fluid supply circuit in a continuous no flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of tubes. Keep unit switched On and water/coolant fluid supply circuit system operating continuously. In multiple unit teams, allow standby units to enter the rotation automatically or schedule regular manual rotations.

NOTICE

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

Lines and joints must be inspected regularly. Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage.

Vertiv recommends installing monitored leak detection equipment for the unit and supply and return lines.

NOTICE

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

Install an overflow drain pan under the unit with a monitored leak detection system in the pan and shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. If it is not possible to install an overflow drain pan, then a monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

The overflow drain pan should have a drain line connected to it that flows to a floor drain or maintenance sink in case of a shutoff valve or leak detection system malfunction.

NOTICE

Risk of leaking fluid. Can cause equipment damage and serious building damage. Check the cooling fluid system for leaks before commissioning. Check the fluid pipe connection to the heat exchanger and inspect the mechanical condition of the cooling fluid circuit and connections thoroughly.

NOTICE

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within +/- 10% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

See transformer label for primary tap connections. Installer will need to change transformer primary taps if applied unit voltage is other than pre-wired tap voltage.

NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

NOTICE

Risk of improper electrical connection of three phase input power. Can cause backward compressor rotation and unit damage. Service technicians should use a gauge set on the system during the initial start-up to verify that the three phase power is connected properly. Three phase power must be connected to the unit line voltage terminals in the proper sequence so that the compressors rotate in the proper direction. Incoming power must be properly phased to prevent compressors from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that power connections were made correctly. We also recommend verifying discharge and suction pressures during start-up to ensure that the compressors are running in the correct direction.

NOTICE

Risk of improper maintenance. Can cause equipment damage.

All maintenance must be performed only by authorized, properly trained, and qualified personnel.

Ignoring safety instructions is dangerous. Soiled parts cause a loss of performance and, for switch or control devices, can lead to the breakdown of the unit performance and operation.

NOTICE

Risk of improper compressor lubrication. Can cause compressor and refrigerant system damage.

Failure to use oil types, viscosities and quantities recommended by the compressor manufacturer may reduce compressor life and void the compressor warranty.

NOTICE

Risk of improper component re-installation. Can cause equipment damage.

Identify and mark location of suction pressure transducer and discharge pressure switch. These devices look similar and they must be reinstalled in their original location.

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2 Nomenclature and Components

This section describes the model number for Vertiv™ CoolPhase CDU units and components.

2.1 Model Number Nomenclature

Table 2.3 on page 12 describes each digit of the 36 digit configuration number. The 14 digit model number consists of the first 10 digits and last four digits of the configuration number.

Table 2.1 Vertiv™ CoolPhase CDU Model Number Example, Part 1

Model # Part 1 Model Details																				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
X	D	M	3	0	0	R	C	A	T	5	2	D	U	1	0	L	L	B	0	P

Table 2.2 CoolPhase CDU Model Number Example, Part 2

Model # Part 2 Model Details																	
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0

Table 2.3 Model Number Digit Definitions for CoolPhase CDU

Digit and Description
Digits 1, 2 = The base unit Liebert® XD = Extreme Heat Density System
Digit 3 = System Type M = Modular Distribution Unit
Digit 4, 5, 6 300
Digit 7 = Primary to Secondary Fluid Type R = Refrigerant AC to liquid
Digit 8 = Load Device* D = Door cooling C = Chip Cooling *CDU cooling also allowed.
Digit 9 = Power Supply Options A = 460, 3 phase, 60Hz B = 575-3ph-60Hz

Table 2.3 Model Number Digit Definitions for CoolPhase CDU (continued)

Digit and Description
Digit 10 = Cooling Configuration Options T = Tandem with digital, R-410A
Digit 11 = Condenser Match-up 4 = Liebert® MCV440 5 = Liebert® MCV430
Digit 12 = Display 2 = Liebert® iCOM™ high definition
Digit 13 = Motor Selection C = 10 HP D = 15 HP
Digit 14 = Customer Piping Location U = Top Connection (Both CW and DX) - XDM300
Digit 15 = Enclosure 1 = Color standard 2 = Color optional
Digit 16 = Seismic 0 = None
Digit 17 = High Voltage Options L = Locking disconnect S = Dual locking disconnect with reversing starter and condenser subfeed, with buffer P = Dual Locking disconnect B with reversing start and condenser subfeed with buffer disconnect C pumps and control
Digit 18 = Option Packages L = Low voltage terminal package
Digit 19 = Monitoring B = Base comms and connectivity
Digit 20 = None 0 = None
Digit 21 = Packaging P = Domestic C = Export crating
Digit 22 = Extreme Low Ambient 0 = None

Table 2.3 Model Number Digit Definitions for CoolPhase CDU (continued)

Digit and Description
Digit 23 = Secondary Circuit Filtration 0 = None 2 = Fitted (50µ) 3 = Fitted (100µ) 4 = Fitted (500µ)
Digit 24 = None 0 = None
Digit 25 = None 0 = None
Digit 26 = Power Meter 0 = None P = Power meter
Digit 27 = None 0 = None
Digit 28 = None 0 = None
Digit 29 = None 0 = None
Digit 30 = Remote Sensor 3 = 30' Remote temp and humidity sensor 6 = 60' Remote temp and humidity sensor 9 = 90' Remote temp and humidity sensor 2 = 120' Remote temp and humidity sensor 5 = 150' Remote temp and humidity sensor
Digit 31 = None 0 = None
Digit 32 = None 0 = None
Digit 33 = None 0 = None
Digit 34 = None 0 = None
Digit 35 = None 0 = None
Digit 36 = None 0 = None

Table 2.3 Model Number Digit Definitions for CoolPhase CDU (continued)

Digit and Description
Digit 37 = Configuration Code 0 = None
Digit 38 = Configuration Code 0 = None
Digit 39 = Configuration Code 0 = None

2.2 Component Location

The unit component locations are described in the submittal documents included in the [Submittal Drawings](#) on page 107 .

The following table lists the relevant documents by number and title.

Table 2.4 Component Location Drawings

Document Number	Title
20000061	CoolPhase CDU Component Location Diagram

2.2.1 Vertiv™ CoolPhase CDU

The Vertiv™ CoolPhase CDU is an indoor chiller that connects directly to the Vertiv™ Liebert® DCD cooling modules and is designed to circulate and control coolant to single-phase liquid cooled IT equipment. The CoolPhase CDU keeps the coolant temperature above the room dew point by using sensors.

The CoolPhase CDU is a chiller with two distinct circuits:

- A refrigerant circuit. This circuit is a dual direct expansion circuit. It contains tandem scroll compressors, expansion valves, brazed plate heat exchanger, and piping.
- A water/glycol circuit. The water/glycol circuit uses two circulating pumps, a brazed plate exchanger, and piping.

Heat removal is accomplished by using condensers connected to the dual direct expansion circuit. Heat rejection is an outdoor air cooled condenser. See **Figure 2.1** on the facing page .

Figure 2.1 Vertiv™ CoolPhase CDU System - Rear Door Heat Exchangers

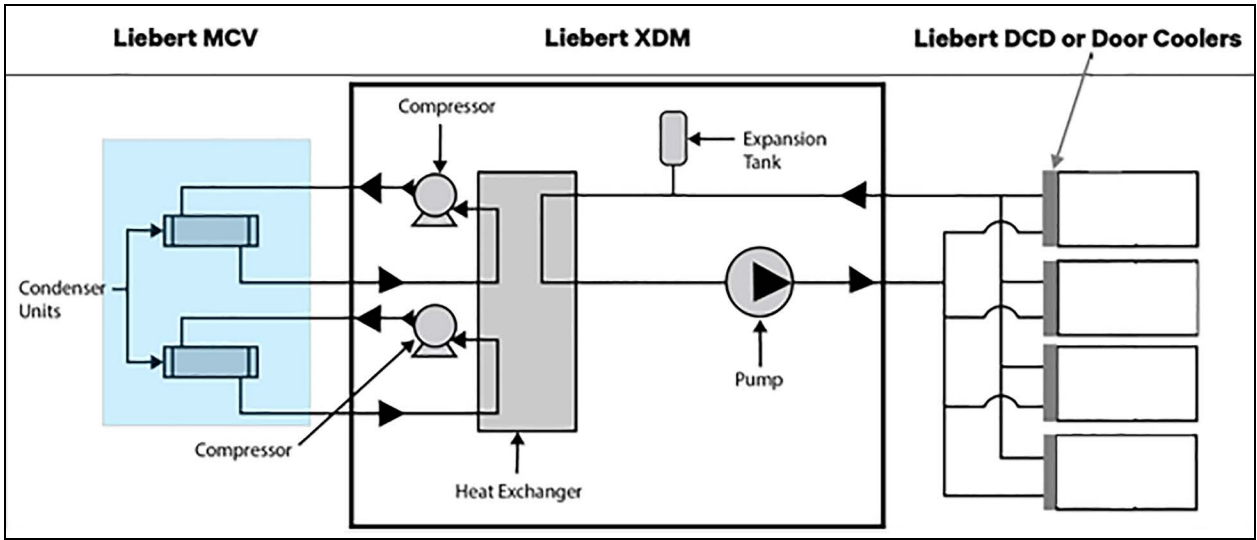


Figure 2.2 CoolPhase CDU System - Direct to Chip Application

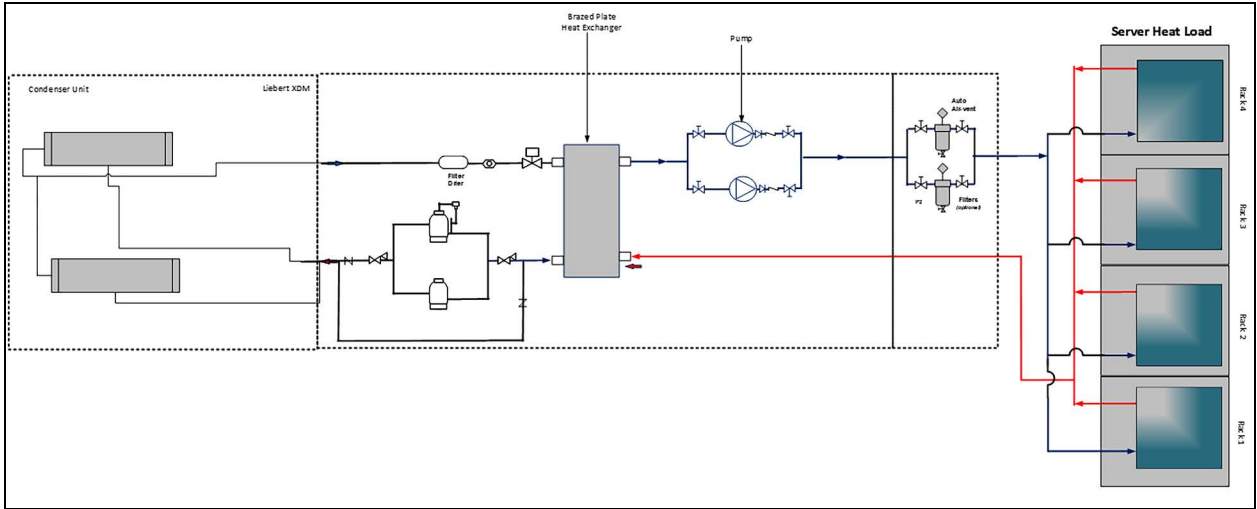
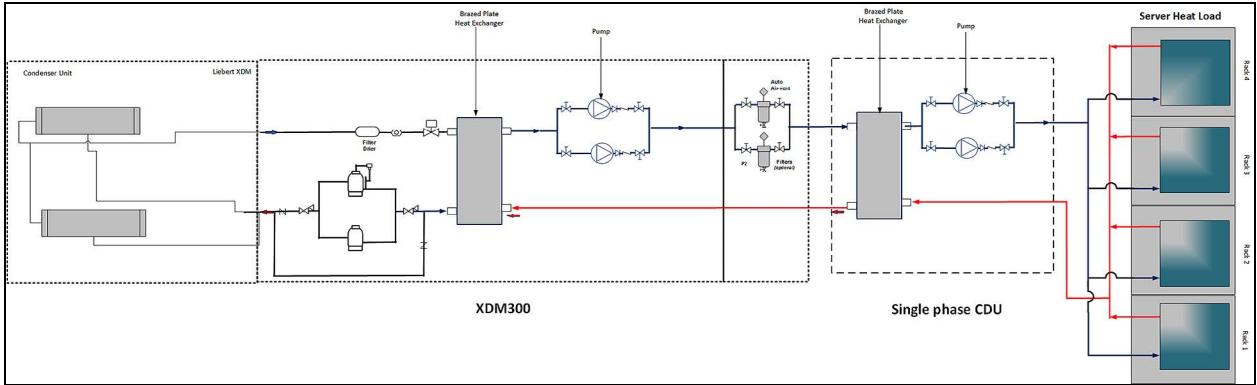


Figure 2.3 CoolPhase CDU System - Split Chiller Application



The advanced control enables users to monitor essentially all aspects of the Vertiv™ CoolPhase CDU system from operating status to maintenance. Please refer to the Liebert® iCOM™ Installer User Guide for the CoolPhase CDU.

2.2.2 Determining Cooling Equipment Needs

In order to determine cooling equipment needs, the following questions need to be considered.

1. Site must have humidity control and filtration.
2. Site must have a vapor barrier.
3. Engineer of record to determine indoor unit, condenser location, and service access.
4. What is the server load in each cabinet going to be?
5. What is the maximum distance between the Vertiv™ CoolPhase CDU unit and the farthest heat load (rear door or direct chip server cabinet) in the proposed layout? Look at the pump chart drawing.
6. Is the piping sized so that the available CoolPhase CDU pump head pressure is sufficient for this run?
 - Refer to the pump curve drawing in [Submittal Drawings](#) on page 107 .
7. Engineer of record is responsible to determine if the items listed below are required for the secondary fluid circuit:
 - a. Before running the whole system, the following tasks must be completed.
 - Acquire water load banks and thermal reserve tank and fill station.
 - Clean /flush all external supplied components.
 - Thermal reserve tank must be free of any oil or material contamination before installation.
 - Fill station must be free of any oil or material contamination before installation.
 - Water load banks connect to external pump and filter station before placing them into the CoolPhase CDU secondary circuit.
 - When cleaning the water load bank, set the flow rate to match the system.
 - A external filter station must be used to capture/remove contamination from the water load banks.
 - Load banks must be flushed in steps (50µm, 10µm and 5µm) to remove contamination inside the water load banks.
 - b. Install thermal reserve tank, fill station, and external water load bank into the secondary fluid circuit row manifold.
 - c. Secondary fluid circuit must have a strainer in the cooling loop to protect the IT equipment and CoolPhase CDU brazed plate heat exchanger.
 - d. Install air vents in the secondary fluid circuit to remove air from the cooling loop.
 - e. Isolation valves at CDU and the supply and return connection to the heat load.
 - f. External fluid leak detection device is placed alongside the secondary fluid row manifold.
 - g. Secondary fluid coolant contains biocide and corrosion inhibitors.
 - h. Use the fill station to fill the secondary system.
 - i. Secondary fluid circuit has been flushed multiple times before installing/connecting IT equipment into the cooling loop.
 - Flush the secondary fluid circuit per [Secondary Fluid Circuit Requirements](#) on page 61 .

- The secondary fluid circuit must be filled per the guidelines in [Secondary Fluid Circuit Requirements](#) on page 61 .
 - The secondary fluid circuit must be charged with the approved fluid and the secondary circuit fluid temperature must be within +/- 5°F and 9°C of the operating point.
8. If the operating point changes, the secondary fluid coolant volume may need to be adjusted according to the new operating point.
 9. The return secondary fluid temperature to the CoolPhase CDU must be stable before loading IT equipment into fluid circuit.
 - a. If the secondary fluid temperature is not stable that may be due to a lack of heat load in the circuit which will require additional load banks .

2.3 Cooling Configuration

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 computational infrastructure is being planned. It is more difficult to accomplish when the computer room is already populated with operating hardware.

Table 2.5 Legend, Dual System, Single Common Loop Reversed Return

Figure	System	Loop	Style	Redundant	Teamwork
Dual System, Separate Coolant Loops Interlaced (See Figure 2.5 on the next page .)	Dual	Dual	Interlaced	Yes (Some)	No
Single System (See Figure 2.4 below).	Single	Single	Simple	No	No
Dual System, Single Common Loop Reversed Return (See Figure 2.6 on page 17 .)	Dual	Single	Reverse return	Yes	Yes

Figures illustrate some piping alternatives suitable for small installations. Larger multi-module layouts are possible with a wide variety of piping configurations to support redundancy, maintainability, and other considerations.

Figure 2.4 Single Loop

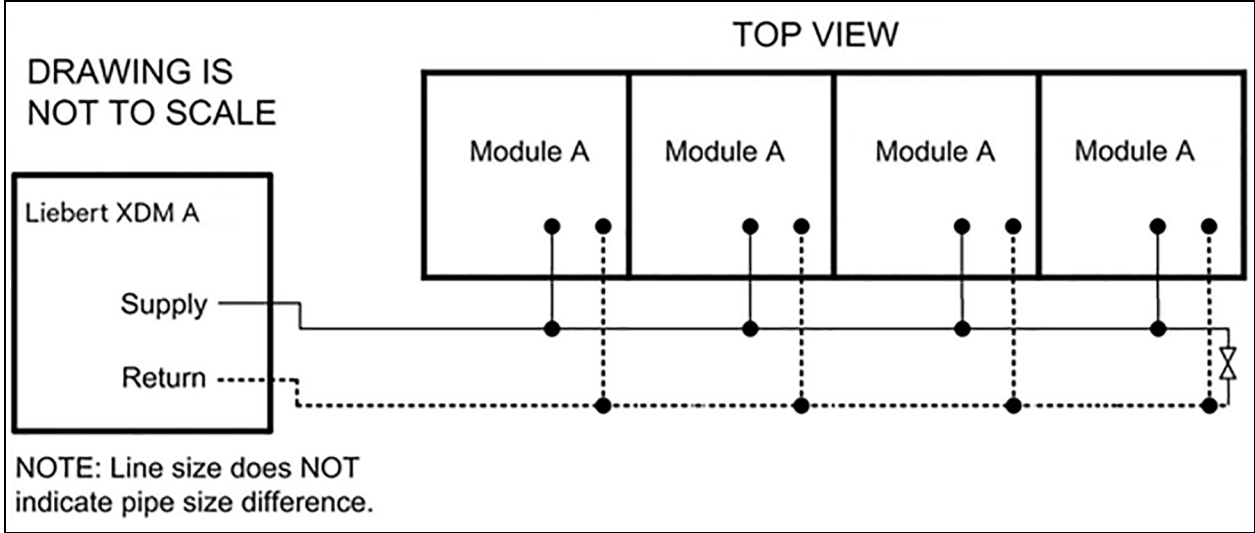


Figure 2.5 Interlaced Separate Loops

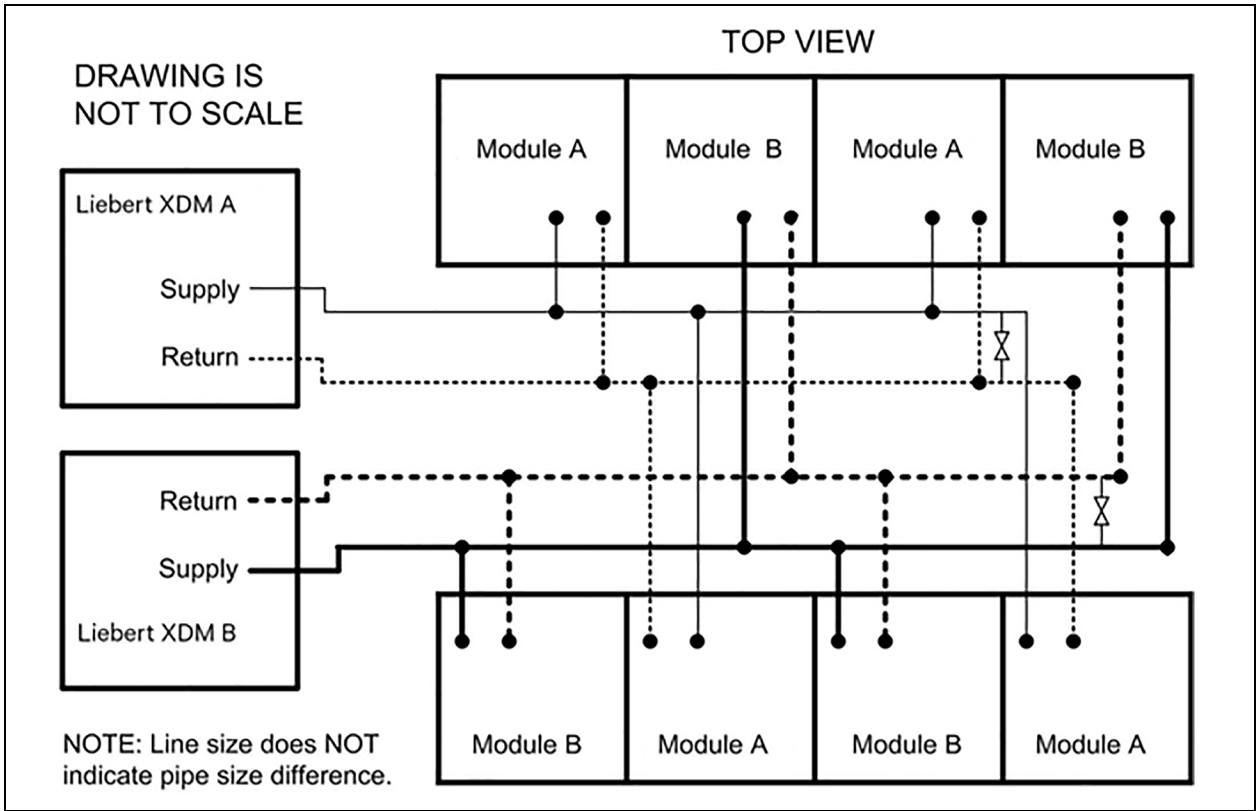


Figure 2.6 Dual Single Common Loop Reversed Return

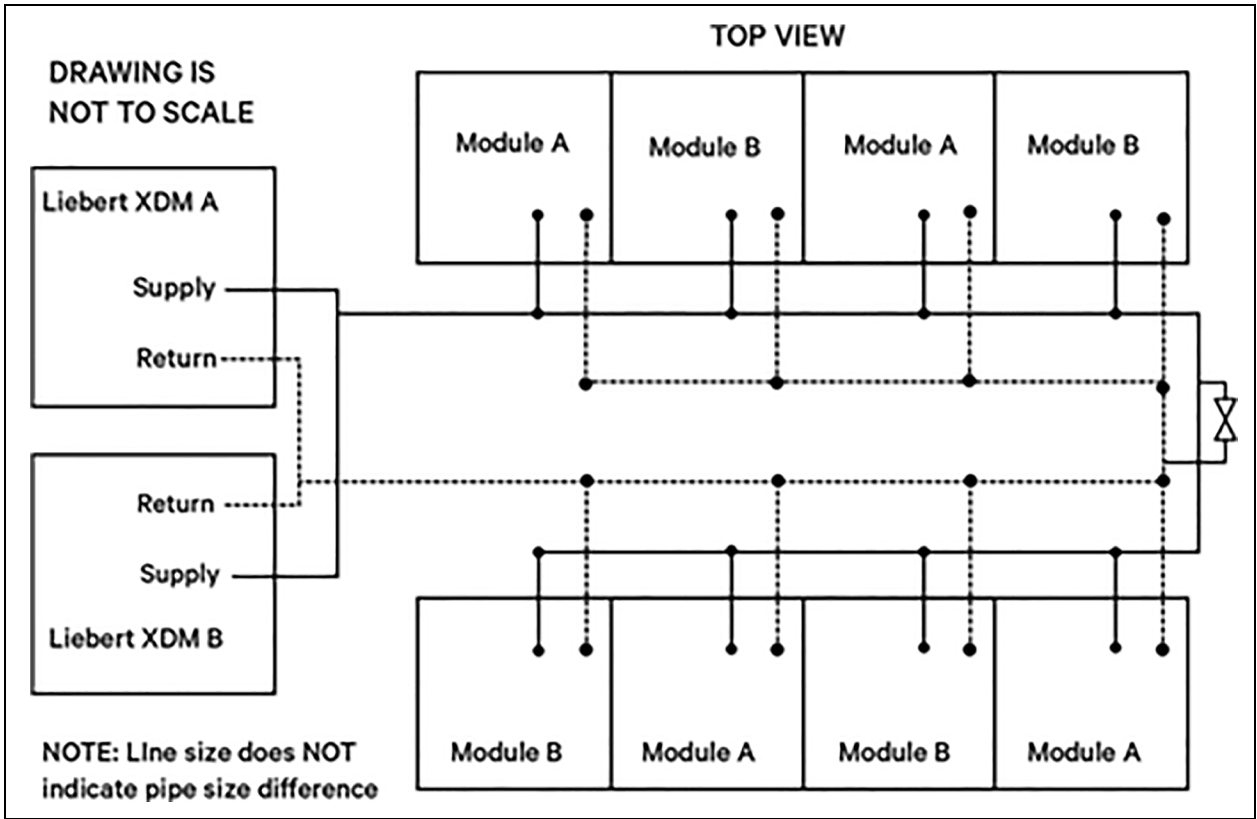
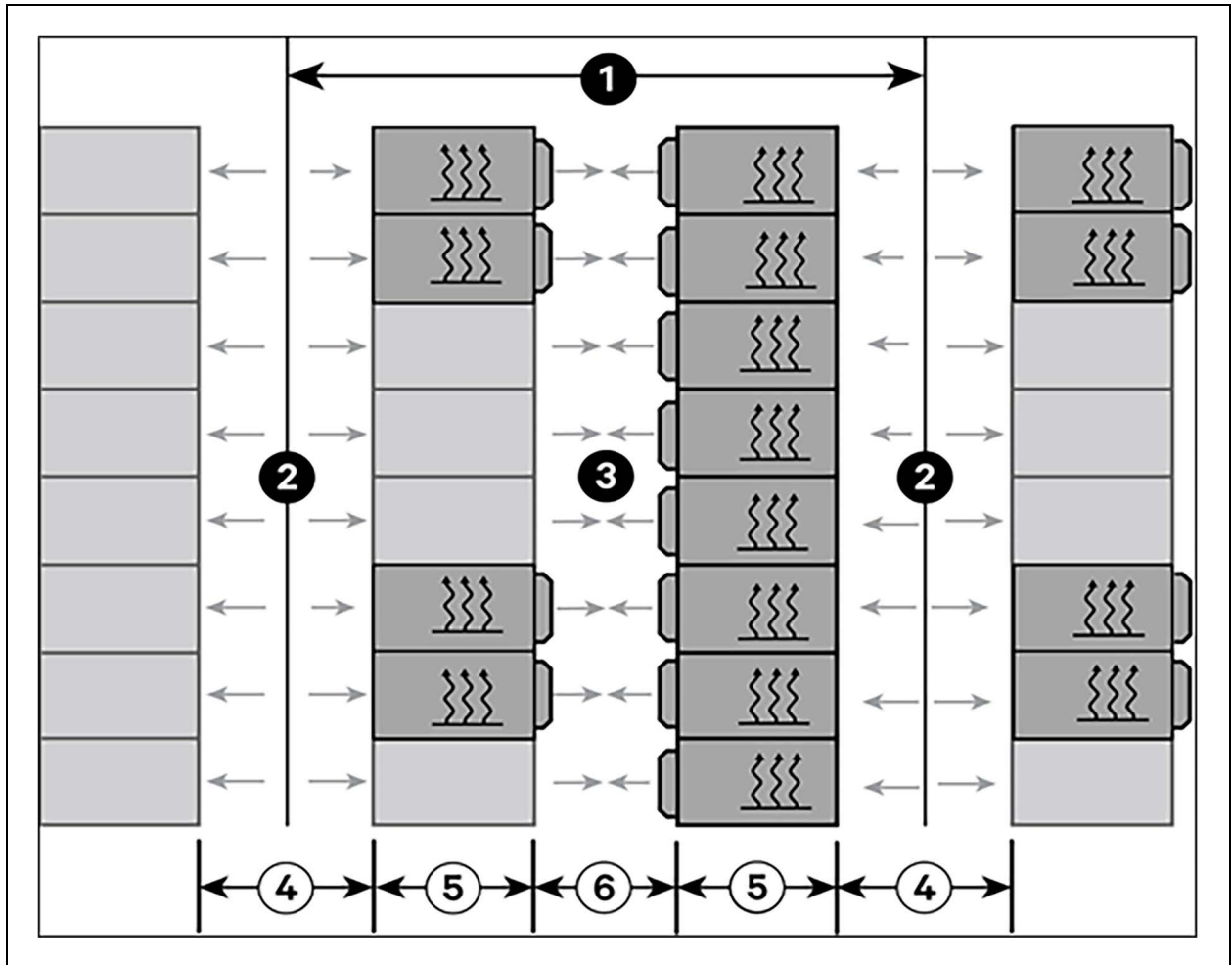
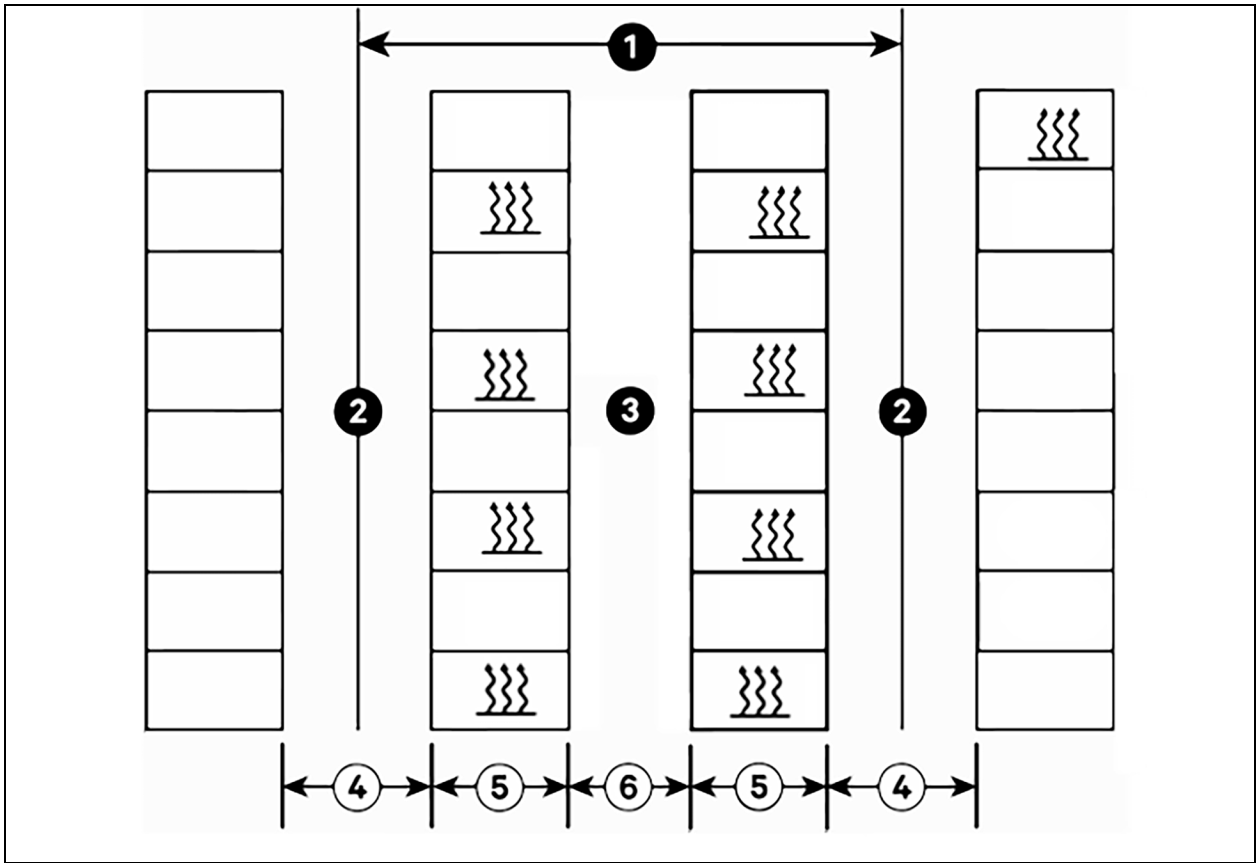


Figure 2.7 Vertiv™ CoolPhase CDU with DCD in Hot/Cold Aisle Application



Item	Description
1	Aisle pitch, 7 tiles, 14 ft. (4.3 m)
2	Cold aisle
3	Hot aisle
4	Cold aisle, 4 ft. (1.2 m)
5	Rack, 42 in. (1,067 mm)
6	Hot aisle, 3 ft. (0.91 m)

Figure 2.8 Vertiv™ CoolPhase CDU Chip Cooler in Hot/Cold Aisle Application



Item	Description
1	Aisle pitch, 7 tiles, 14 ft. (4.3 m)
2	Cold aisle
3	Hot aisle
4	Cold aisle, 4 ft. (1.2 m)
5	Rack, 42 in. (1,067 mm)
6	Hot aisle, 3 ft. (0.91 m)

2.3.1 Vertiv™ CoolPhase CDU Minimum Load

The CoolPhase CDU minimum recommended operating load is 10% of system nominal capacity.

- The minimum load for a CoolPhase CDU 60Hz system is 30kW.
- IT load below minimum values will affect system operation.

NOTE: Unit may cycle with overcooling at low loads during some outdoor conditions.

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3 Pre-installation Preparation and Guidelines

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

Refer to [Model Number Nomenclature](#) on page 9 and the appropriate submittal drawings to determine the type of system being installed and anticipate building alterations, piping, and duct work needed.

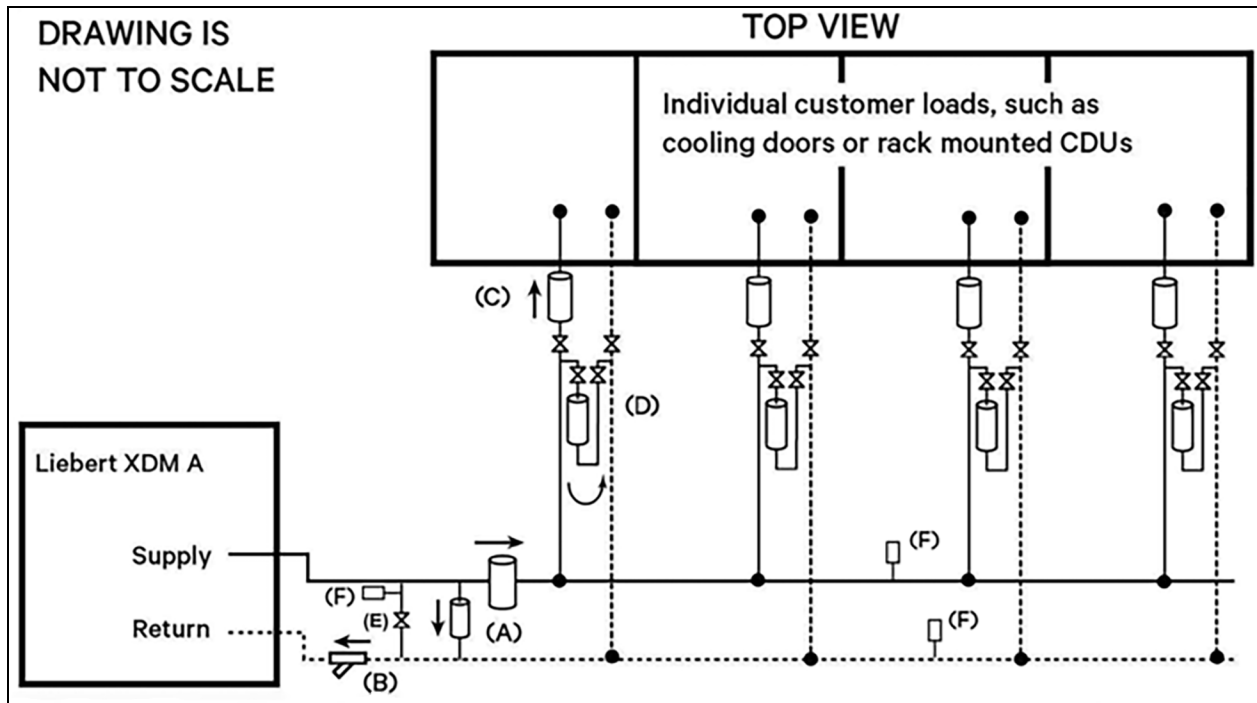
The unit dimensions, pipe connection locations, and piping schematics are described in the submittal documents included in the [Submittal Drawings](#) on page 107.

For initial start-up runtime of the customer fluid loop, consider the options listed in **Table 3.1** below, dependent upon the situation.

Table 3.1 Initial Start-up Runtime Options for Customer Loop

Option	Detailed Explanation	Requirement	Refer to Figure 3.1 on the next page
1. Filters and strainers	Per customer requirements, there may be micron filters or additional strainers specified by the customer or their consulting engineer, as a requirement for their unique application. This requirement may be driven by an equipment supplier (e.g., liquid cooled servers or rack mounted CDUs) or it may be best practices for the CW loop (to maintain water quality).	Follow CW loop design by others.	A
2. Field provided 30-40 mesh strainer at inlet of CoolPhase CDU	This Y-strainer is required near the Vertiv™ CoolPhase CDU at the CW return line to prevent debris or particulates from entering the CoolPhase CDU heat exchanger. This is to reduce the likelihood of a flow blockage in the heat exchanger. The biggest culprit may be construction debris so after initial operation, the strainer should no longer require cleaning.	Always required with Liebert® CoolPhase CDU installations.	B
3. Strainer or micron filter at cooling load	Heat exchangers with fine passages may need to be protected from construction debris. So a filter or strainer should be provided to allow that debris to be caught and removed as part of the initial fill and start-up operation. The rating of this filter or strainer will be specified by the heat exchanger requirements.	Per heat exchanger manufacturer's specifications.	C
4. Loop to flush piping	Include a loop or bypass located at the branch locations to individual loads, to flush debris prior to load connections.	Per in rack manifold and cold plate manufacturer's specifications.	D
5. Bypass arrangement	Field supplied and installed for rear door heat exchanger application where the fluid flow rate is less than minimum recommendation.	Field supplied and installed.	E
6. Auto-vent for air in fluid loop	Long horizontal pipe runs and high points of fluid piping tend to trap air and make it hard for the unit to run effectively. It is recommended to place automatic air vents in several places around the loop for an easier start-up process.	Field supplied and installed	F

Figure 3.1 Diagram of Initial Start-up Runtime Options for Customer Loop



- Verify that the floor is level, solid, and sufficient to support the unit. See **Table 3.3** on page 24, for unit weights.
- Confirm that the room is properly insulated and has a sealed vapor barrier.
- For proper humidity control, keep outside or fresh air to an absolute minimum (less than 5% of total air circulated in the room).
- Install the units as close as possible to the largest heat load.
- Allow at least the minimum recommended clearances for maintenance and service. See the appropriate submittal drawings for dimensions.
- We recommend installing an under floor leak detection system. Contact your Vertiv representative for information.

3.1 Site Preparation

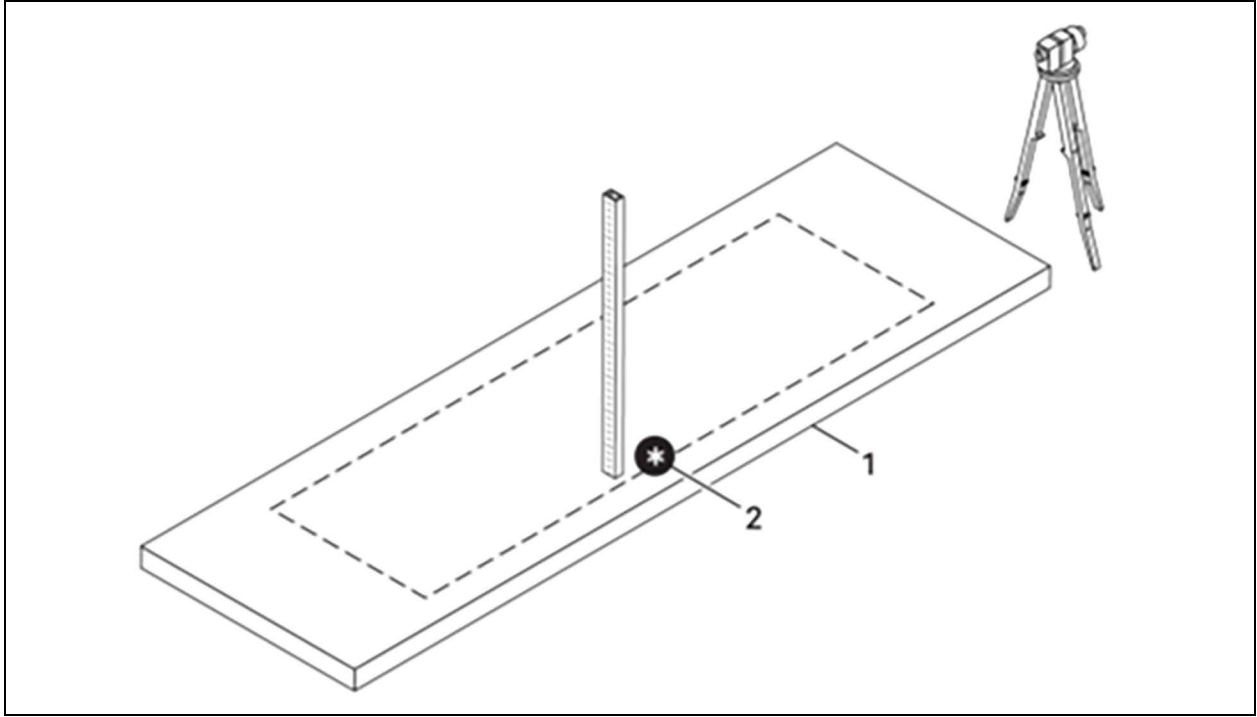
Prepare the site for installation prior to arrival and unloading of the unit.

- If installing the unit on a concrete slab or housekeeping pad, sweep the concrete clean and mark the final position of the unit(s) on the slab.
- Verify that all required clearances as specified by Vertiv are met.
- Mark the direction of the final unit placement to avoid accidental reversal of the unit.
- Protect stub outs for electric conduit and any other projections against damage and clearly mark their locations.
- Locate and mark the high point on the slab. This step is critical for the placement of multiple, joined units.
- If installing on a structural steel support structure, verify suitability of the supports beneath the unit(s).

3.2 Preparing a Concrete Slab

- Sweep the slab clean.
- Lay out the final location of the unit on the slab, using either a chalk line or tape, see **Figure 3.2** below .
- Using a laser level or optical level, locate the high point on the slab and mark it, see **Figure 3.2** below .

Figure 3.2 Unit and High Point Marking on Concrete Slab



Item	Description
1	Concrete slab
2	High point

3.3 Planning Dimensions

The unit and floor stand dimensions are described in the submittal documents included in [Submittal Drawings](#) on page 107 .

The following table lists the relevant documents by number and title.

Table 3.2 Vertiv™ CoolPhase CDU Dimension Planning Drawings

Document Number	Title
20000058	CoolPhase CDU Cabinet Dimensional Data 300kW
Floorstand	
20000060	CoolPhase CDU Floorstand Dimensional Data 300kW

3.4 Unit Weights

Table 3.3 Vertiv™ CoolPhase CDU Shipping Dimensions and Unit Weights, Domestic

Domestic Packaging		Dry Shipping Weight, lb (kg)	Unit Weight With Fluid, lb (kg)	Packaging Weight, lb (kg)	Total Weight, lb (kg)
Model No.	Shipping Dimensions, in. (mm)				
Liebert® XDM 300	128 x 66 x 97 (3,251 x 1,676 x 2,464)	Lower Module =2,873 (1,303) Upper Module =416 Lb (188)	3,489 (1,582)	484 (220)	3,773 (1,711)

4 Equipment Inspection and Handling



WARNING! Risk of improper moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity indicator. Shipping weights and unit weights are listed in **Table 3.3** on page 24 . Use the center of gravity indicators on the unit to determine the position of the slings.



WARNING! Risk of top heavy unit falling over. Improper handling can cause equipment damage, injury, or death. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from, or prepare the unit for installation.



CAUTION: Risk of contact with sharp edges, splinters, and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate, OSHA approved PPE should attempt to move, lift, remove packaging from, or prepare the unit for installation.

NOTICE

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off the skid. Measure the unit and passageway dimensions, and refer to the installation plans prior to moving the unit to verify clearances.

NOTICE

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

NOTICE

Risk of improper storage. Keep the unit upright, indoors, and protected from dampness, freezing temperatures, and contact damage.

Upon arrival of the unit and before unpacking:

- Verify that the labeled equipment matches the bill of lading.
- Carefully inspect all items for visible or concealed damage.
- Report damage immediately to the carrier and file a damage claim with a copy sent to Vertiv or to your sales representative.

4.1 Packaging Material



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

4.2 Storing Before Installation

If storing the unit for long periods before installation:

- Remove all packaging except unit bag. Clearance is to be maintained around the unit to prevent incidental contact.
- Inspect the unit periodically for condensation or other effects from the storage environment.
- If storing at low temperatures, install electric heaters near the unit to prevent condensation.

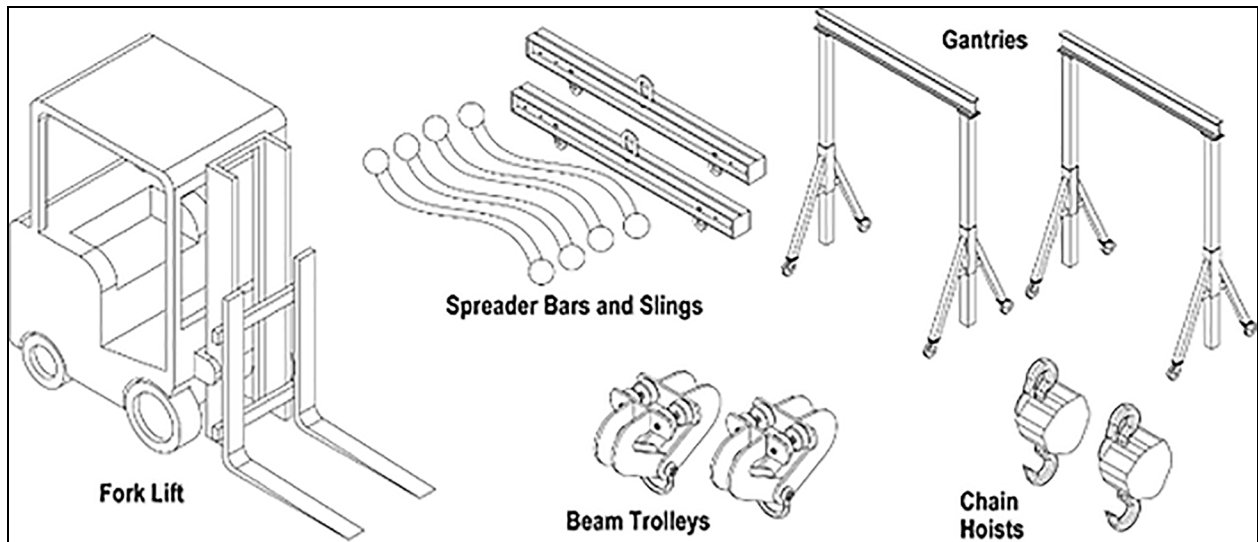
4.3 Handling Units While Packaged

- Transport the packaged unit using a fork lift.
- When using a fork lift, make sure lift has adjustable forks. Forks are to be spread to widest allowable distance to still fit under skid. Make sure fork length is suitable for skid length. Skid length is 128" (3251 mm).
- When using a fork lift, unit shall not be lifted any higher than 2"-4" (51-102 mm) off ground when handled. All by-standing personnel shall be no closer than 12' (3.7 m) to handled packaged unit.
- If circumstances require unit to be lifted higher than 4" (102 mm) great care shall be exercised, and all by-standing personnel shall be no closer than 20' (5 m) to lift point of unit.

4.3.1 Recommended Unit Handling Equipment

- Fork lift
- Dolly carts
- Spreader bars and slings
- Chain hoists
- Beam trolleys
- Gantries

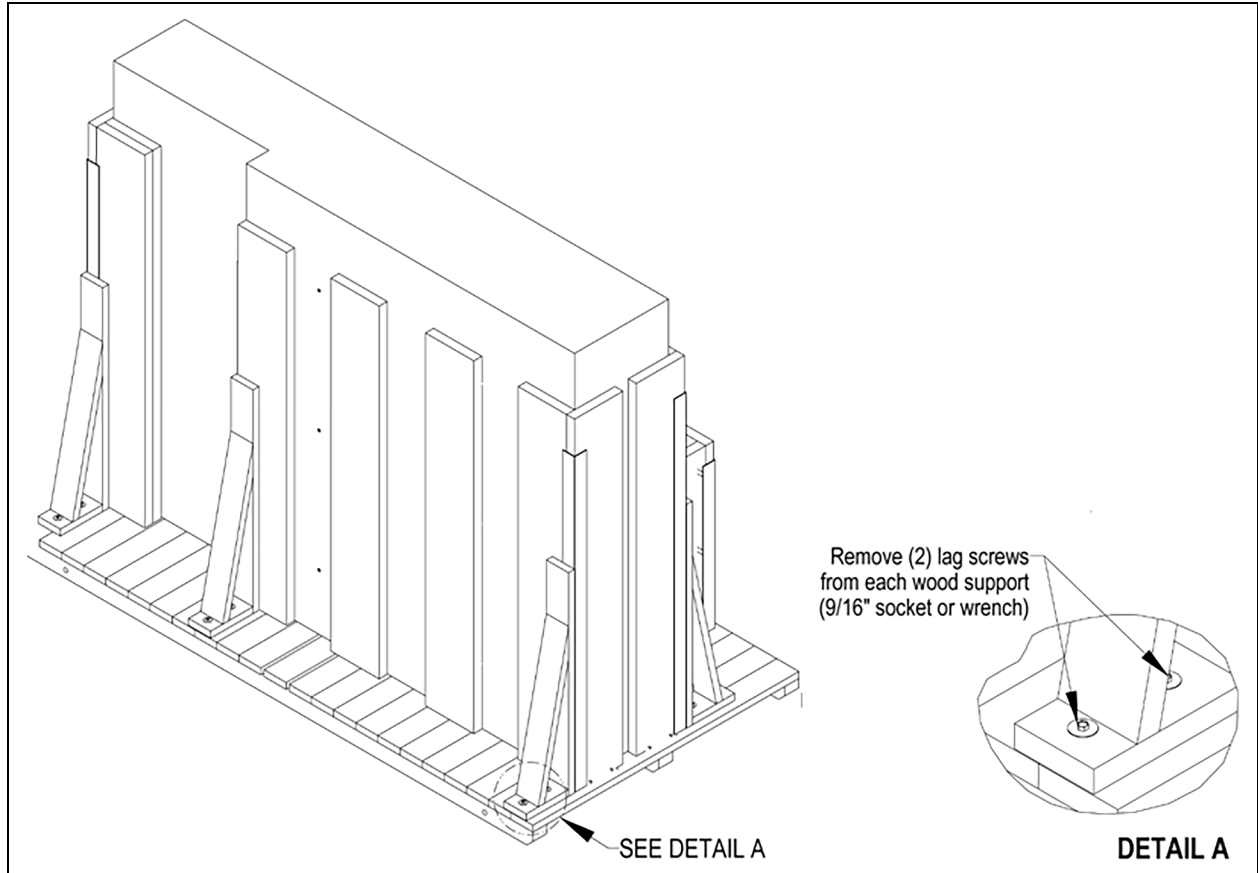
Figure 4.1 Recommended Unit Handling Equipment



4.4 Unpacking the Vertiv™ CoolPhase CDU Domestic Units

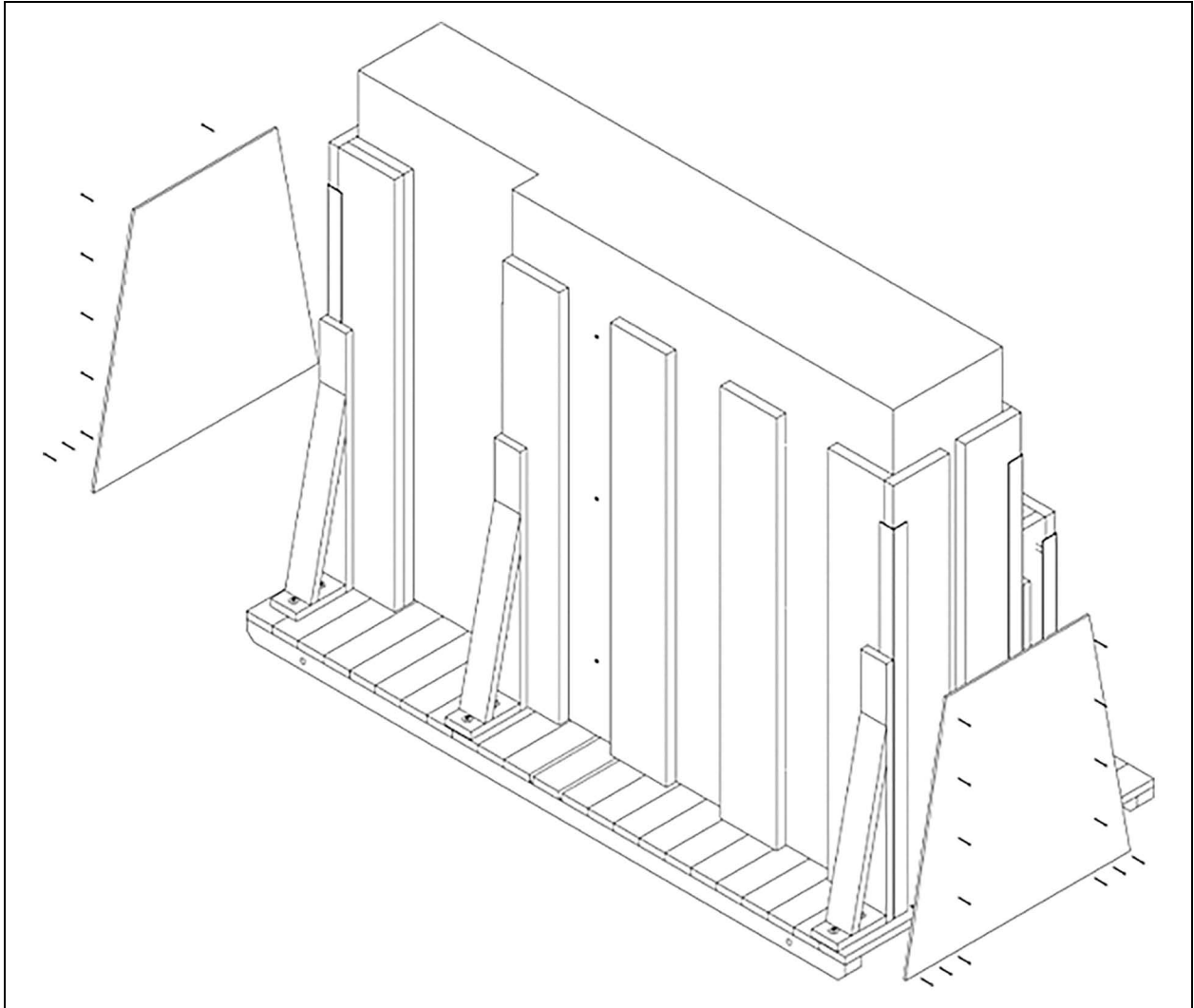
Remove the stretch wrap and exterior packaging material from the units.

Figure 4.2 Packaged CoolPhase CDU



4.4.1 Shipping Bracket Removal, Lower Module

- Remove plywood panels from each end of the packaged unit. See **Figure 4.3** on the next page .
- Use a 9/16-in. socket drive to remove 12 lag screws from six shipping brackets. Refer to Detail A in **Figure 4.2** above .
- Remove lag screws securing the five wood supports.
- Remove wood supports.

Figure 4.3 Vertiv™ CoolPhase CDU Shipping Bracket Removal

4.4.2 Unpacking/Removal of the Upper Module

- Move packaged unit to area for installation or to staging preparation area.
- Remove exterior package material from the upper module of the unit.
- Remove end panels from the upper module, set aside for re-attachment.
- Remove fasteners securing the upper module to the shipping skid. Refer to **Figure 4.5** on page 30 , Detail B.
- Re-attach the upper module end panels.
- Attach the recommended lifting device or site appropriate lifting device to all lift lugs on top of the upper module.
- Lift the upper module off the shipping skid and away from the lower module.
- Place the upper module in a protective location until required for final installation.

Figure 4.4 Packaged Vertiv™ CoolPhase CDU, Upper Module

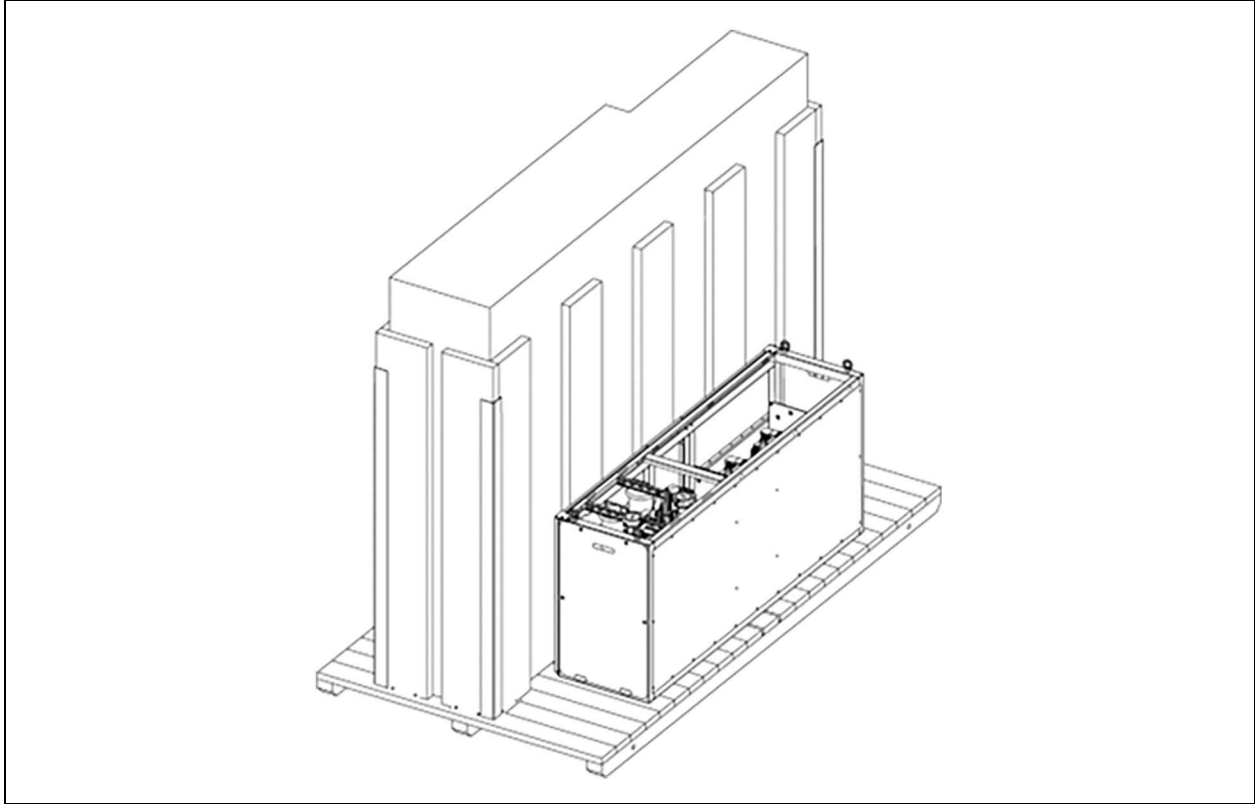
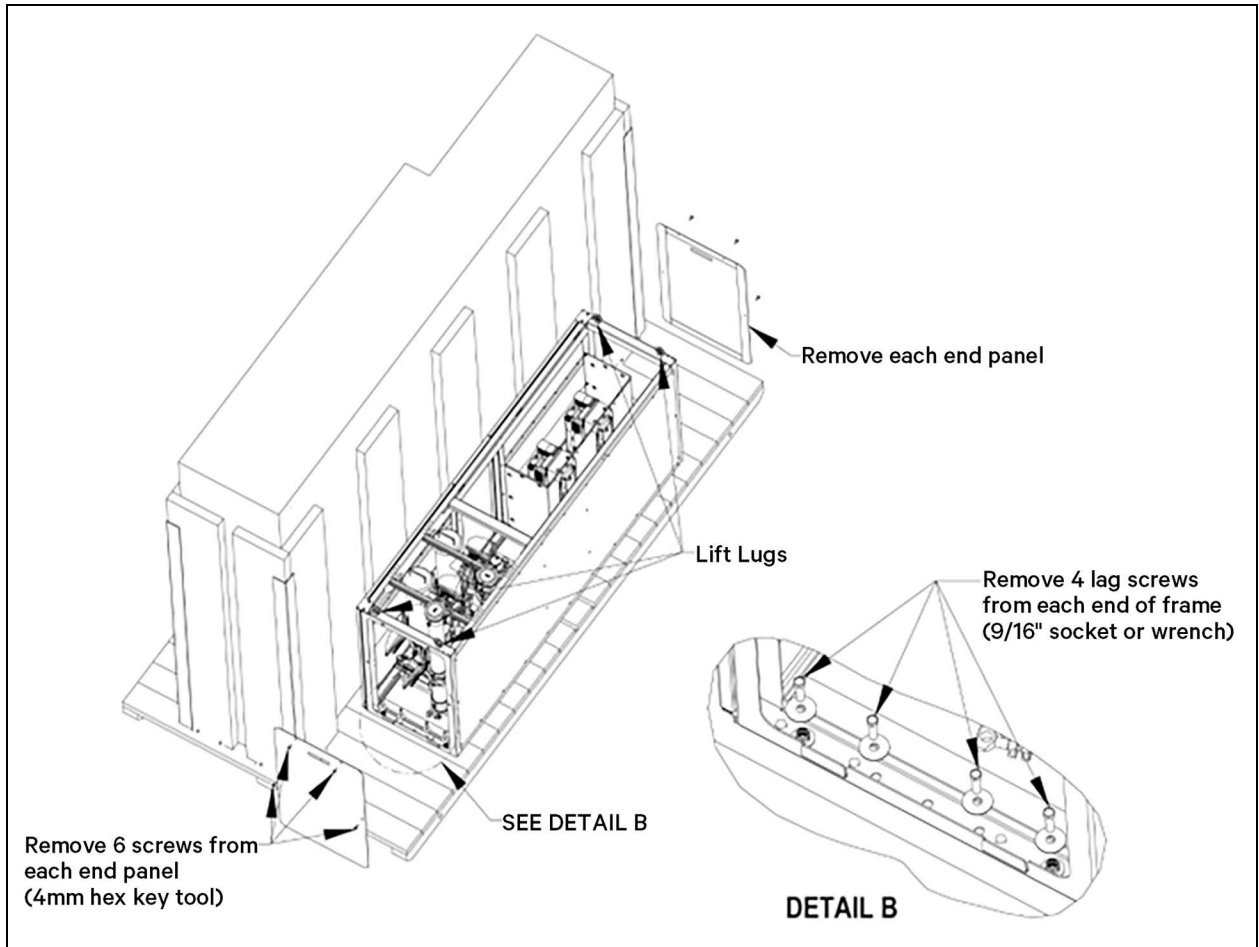


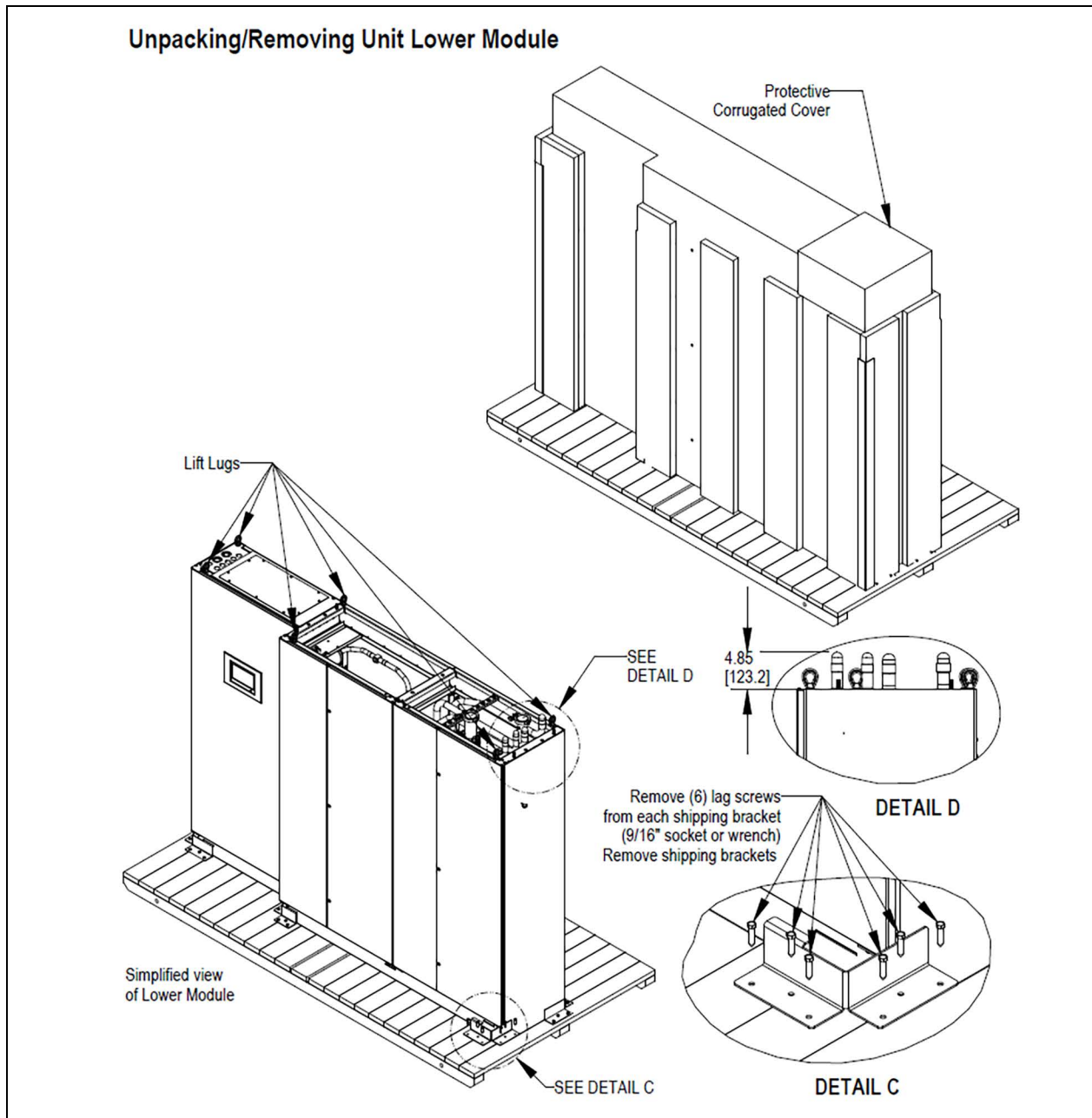
Figure 4.5 Vertiv™ CoolPhase CDU Shipping Bracket Removal



4.4.3 Unpacking/Removal of the Lower Module

- Remove exterior package material from the lower module of the unit.
- Remove fasteners securing five shipping brackets to the shipping skid. Refer to **Figure 4.6** on the facing page, Detail C.
- Remove shipping brackets from the lower module of unit. Refer to **Figure 4.6** on the facing page, Detail C.

Figure 4.6 Vertiv™ CoolPhase CDU Shipping Bracket Removal Detail C Enlargement



4.4.4 Removal

- Attach the recommended lifting device or site appropriate lifting device to all lift lugs on top of the lower module.
- Lift the lower module off of the shipping skid and move to final installation location.

4.5 Placing the Unit on a Floorstand



WARNING! Risk of unit falling over. Improper installation of floorstand can cause equipment damage, injury, or death. Read all instructions before attempting to install floorstand.



CAUTION: Risk of contact with sharp edges, splinters, and exposed fasteners. Can cause injury. Wear appropriate OSHA approved personal protective equipment (PPE) when attempting to move, lift, remove packaging from, or prepare for installation.



CAUTION: Risk of heavy unit falling into defective raised floor. Can cause injury and equipment damage. Prior to installation, all floor tiles immediately around floorstand are to be removed and inspected. Make sure tiles are not cracked, and ribs have not been cut. If free from defects, re-install. Replace with new tiles if defects are found.

NOTICE

Upon arrival verify that labeled equipment matches Bill of Lading. Carefully inspect all items for either visible or concealed damage.

Damage should be immediately reported to carrier and a damage claim filed with a copy sent to Vertiv or to your sales representative.

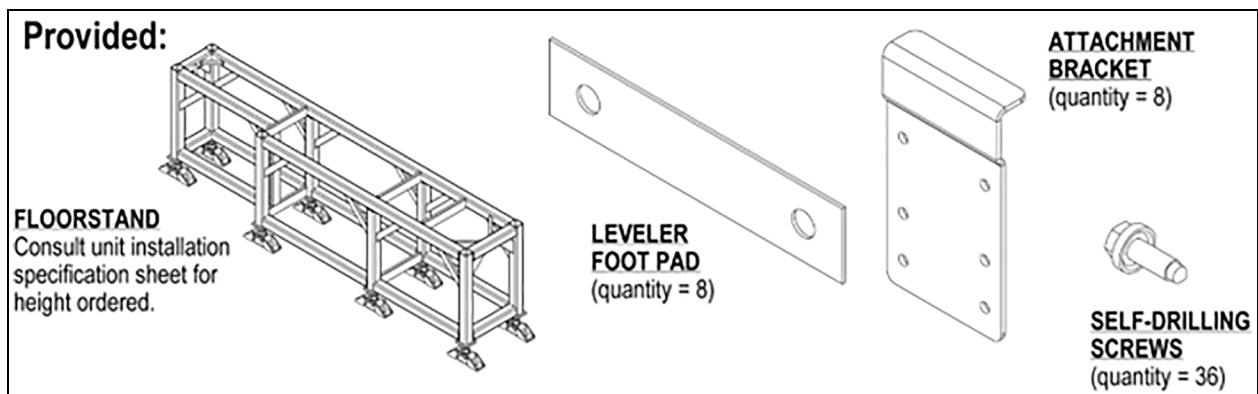
NOTE: Unit to be placed onto lower module using process that will provide safest method based on site layout. Professional installers to be used when placing unit.

4.5.1 Packaging Material



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

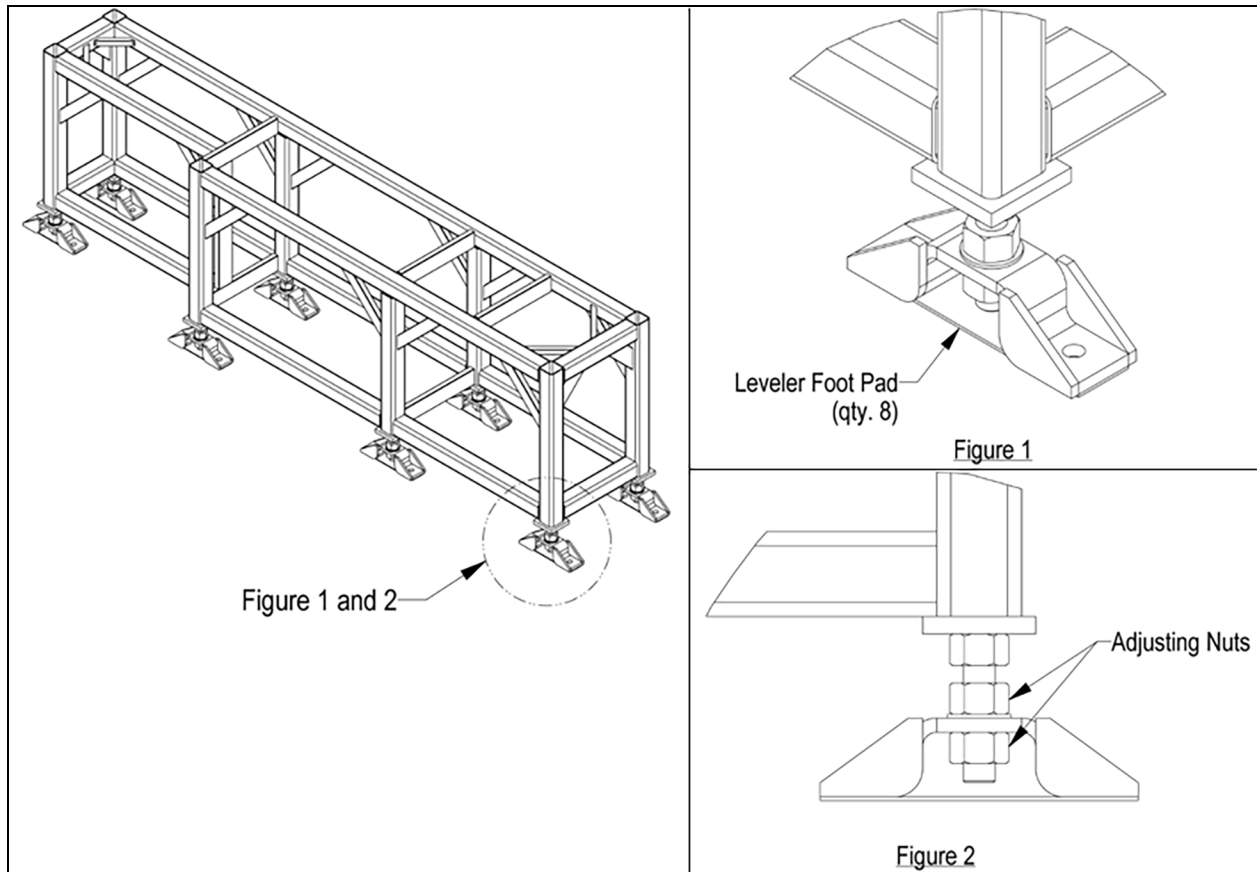
Figure 4.7 Vertiv™ CoolPhase CDU Floorstand and Hardware



4.5.2 Floorstand Preparation

1. Position floorstand at final installation location.
2. Leveler foot pads to be added (if specified by engineer of record) to bottom side of adjustable leveler feet. Refer to **Figure 4.8** below (detail figure 1).
3. Vertical height can be adjusted and tightened using nuts and jam nuts on adjustable leveler feet. Refer to **Figure 4.8** below (detail figure 2).
4. Floorstand must be level and all feet must be in contact with floor before proceeding.

Figure 4.8 Vertiv™ CoolPhase CDU Floorstand Details



4.5.3 Floorstand Anchorage

Mounting requirement details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection, and attachment to non-building structures must be outlined and approved by engineer of record for project or building.

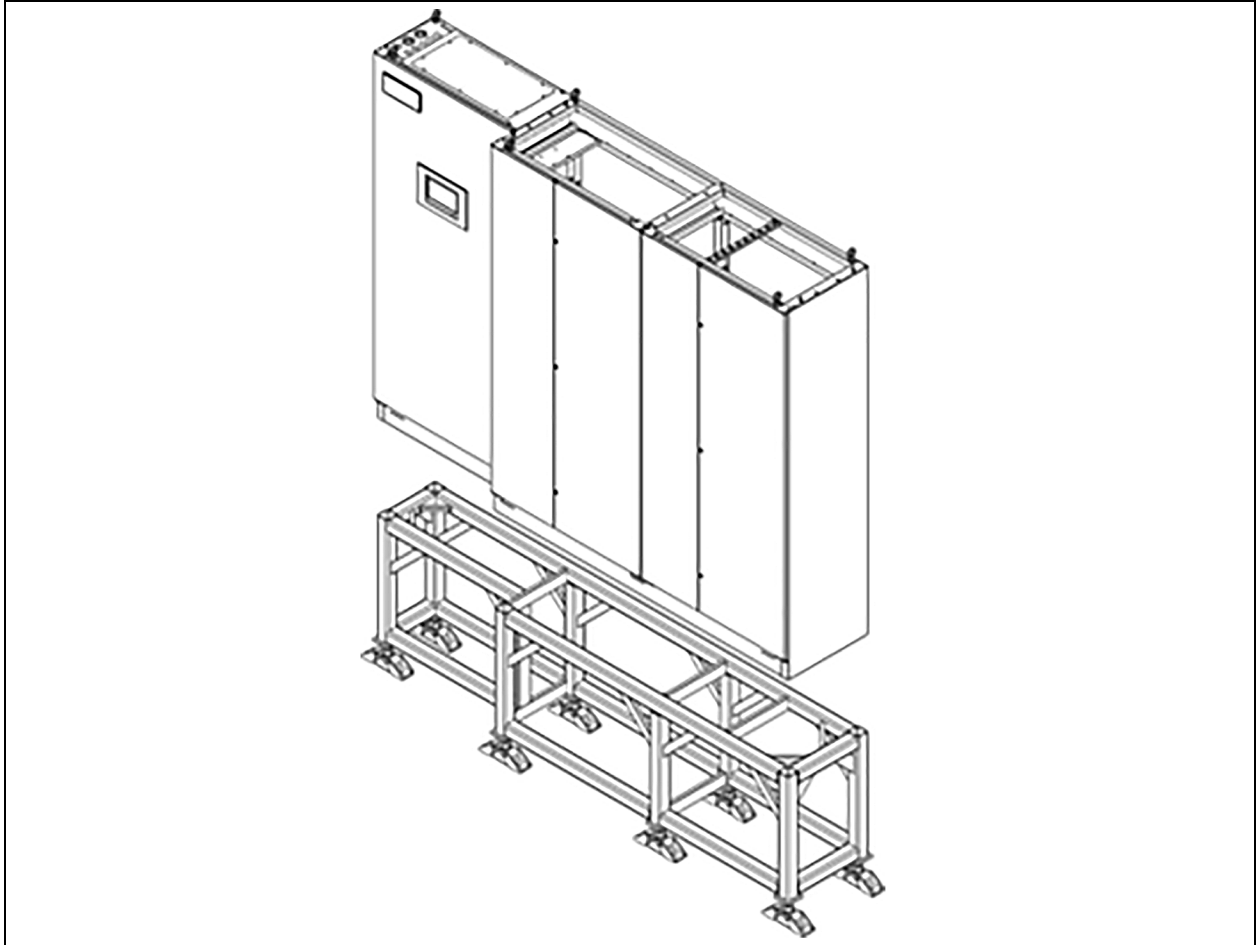
Structural floors and housekeeping pads must also be approved by project or building structural engineer of record.

Installing contractor is responsible for proper installation of all anchors and mounting hardware, and observing mounting requirements outlined by engineer of record.

4.5.4 Placing Unit onto Floorstand

- Unit to be placed onto floorstand using process that will provide safest method based on site layout.
- Professional installers to be used when placing unit.
- Unit may require lift onto a floorstand if elevated flooring has not been installed.
- When elevated flooring is installed, unit will be placed over floor opening containing floorstand.
- Make sure to align edges of unit frame with edges of floorstand.

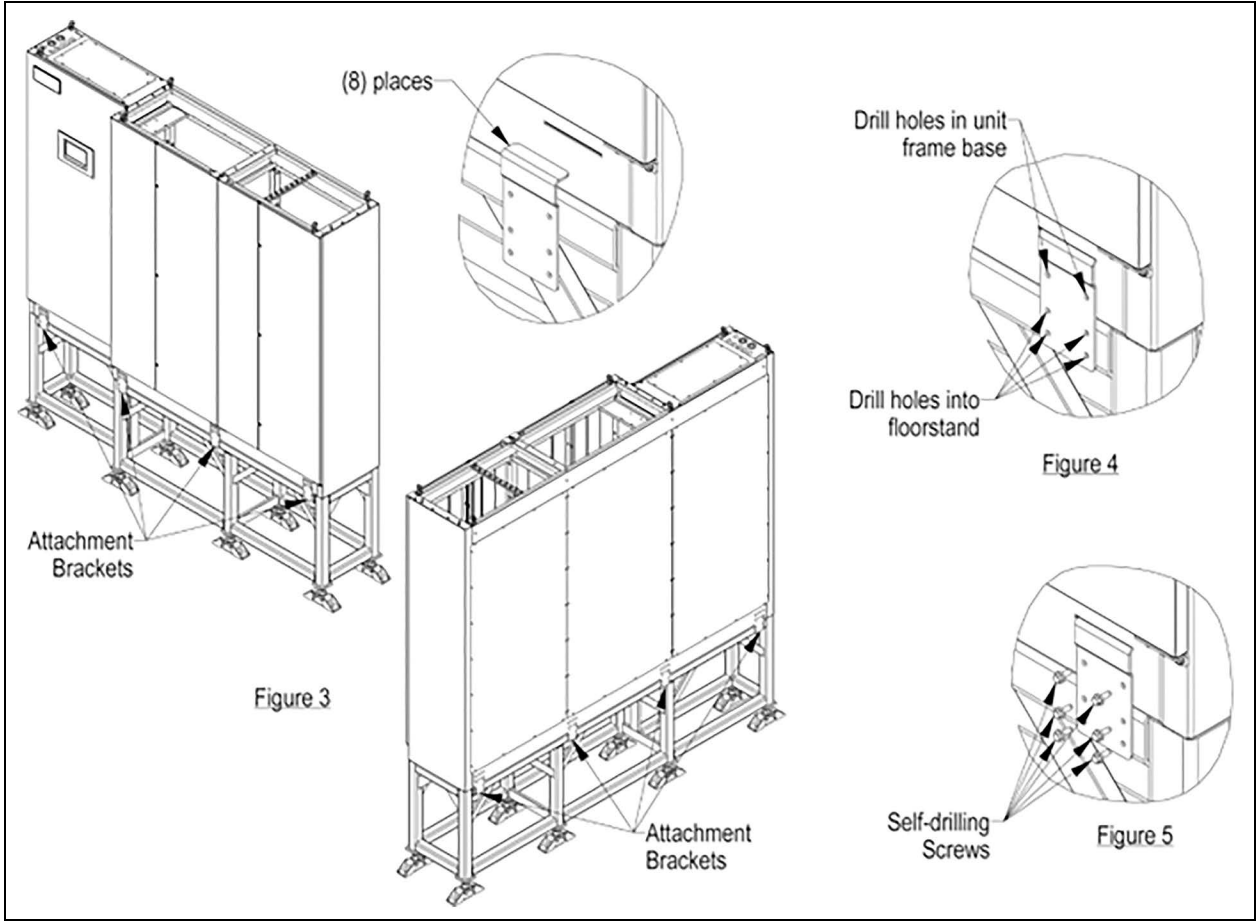
Figure 4.9 Vertiv™ CoolPhase CDU Floorstand Details



4.5.5 Securing Unit to Floorstand

1. Insert provided attachment brackets into eight indicated slots (four on both sides) of unit frame base. Refer to **Figure 4.10** on the facing page, Figure 3.
2. Using holes in attachment brackets as a template, drill two 7/32" holes into unit frame base and four 7/32" holes into floorstand. Refer to **Figure 4.10** on the facing page, Figure 4.
3. Install six provided self-drilling screws through each attachment bracket, into unit frame base and floorstand. Refer to **Figure 4.10** on the facing page, Figure 5.

Figure 4.10 Vertiv™ CoolPhase CDU Floorstand Details



4.6 Installing the Unit without a Floorstand

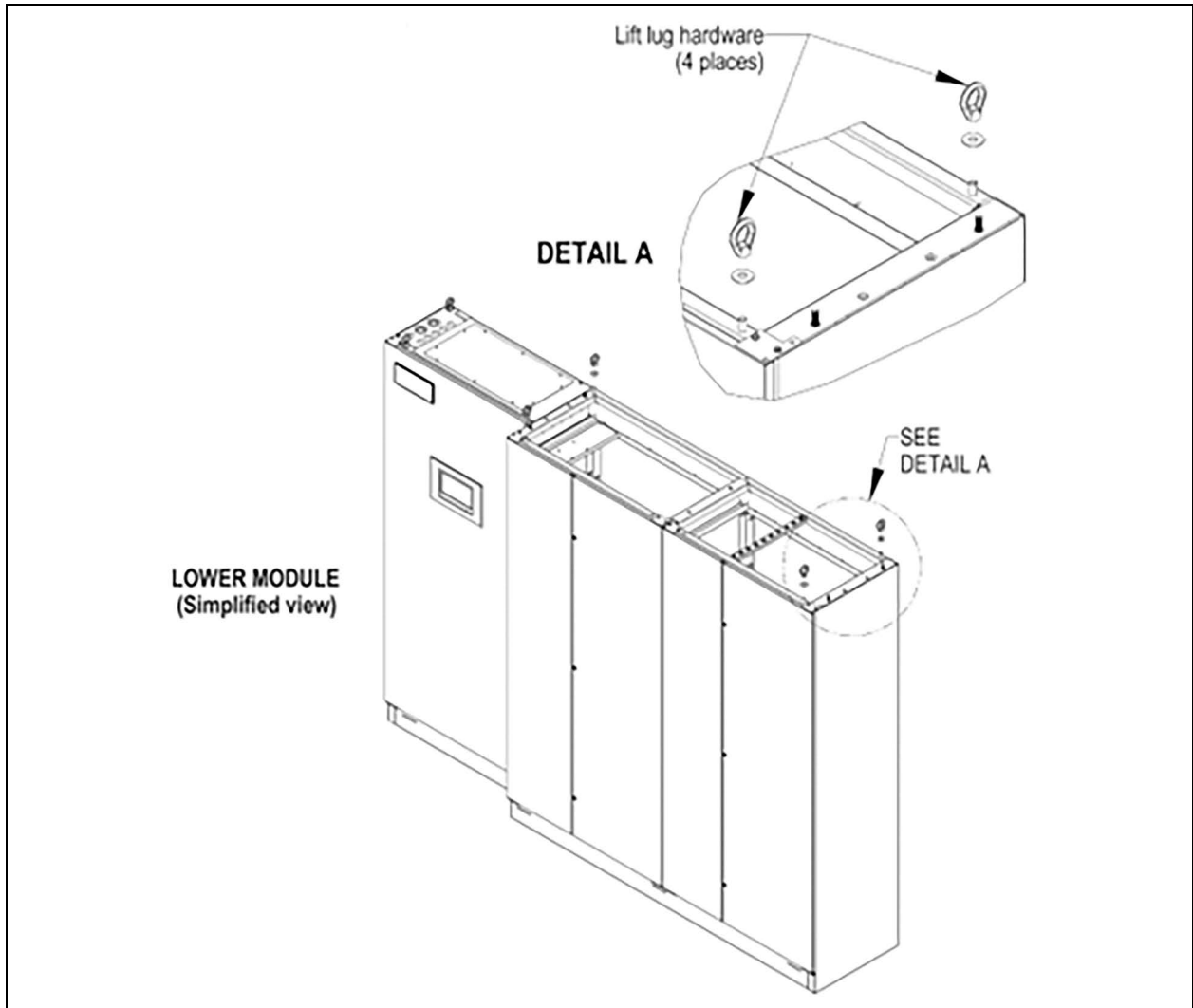
! **WARNING!** Risk of improper wiring, piping, moving, lifting, and handling. Can cause equipment damage, serious injury or death. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.

NOTE: Unit to be placed onto lower module using process that will provide safest method based on site layout. Professional installers to be used when placing unit.

4.6.1 Module Preparation for Attachment

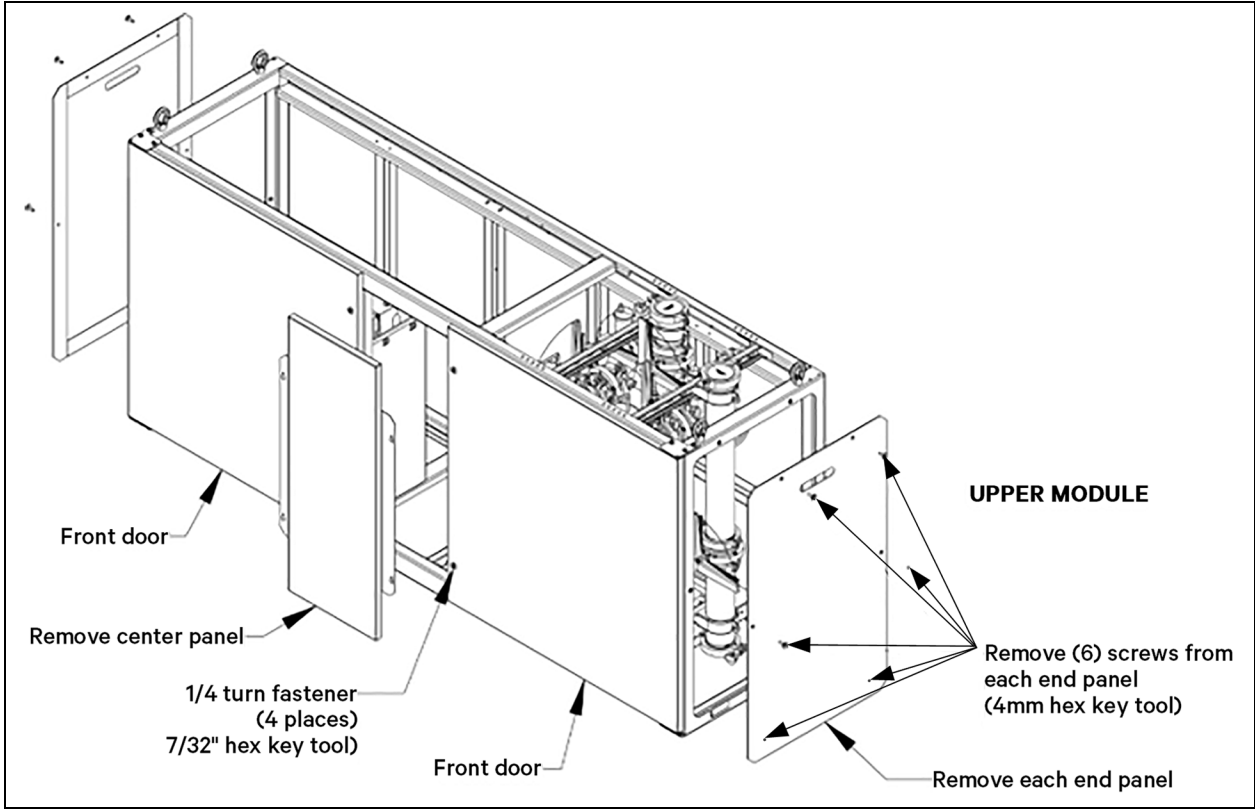
1. Remove the lift lug hardware from the installed lower module. Hardware to be removed from four corners of widest section. Refer to **Figure 4.11** below , Detail A.
2. Remove the end panels from the upper module, set aside in a safe location for later re-attachment. See **Figure 4.12** on the facing page .

Figure 4.11 Vertiv™ CoolPhase CDU Hardware Removal



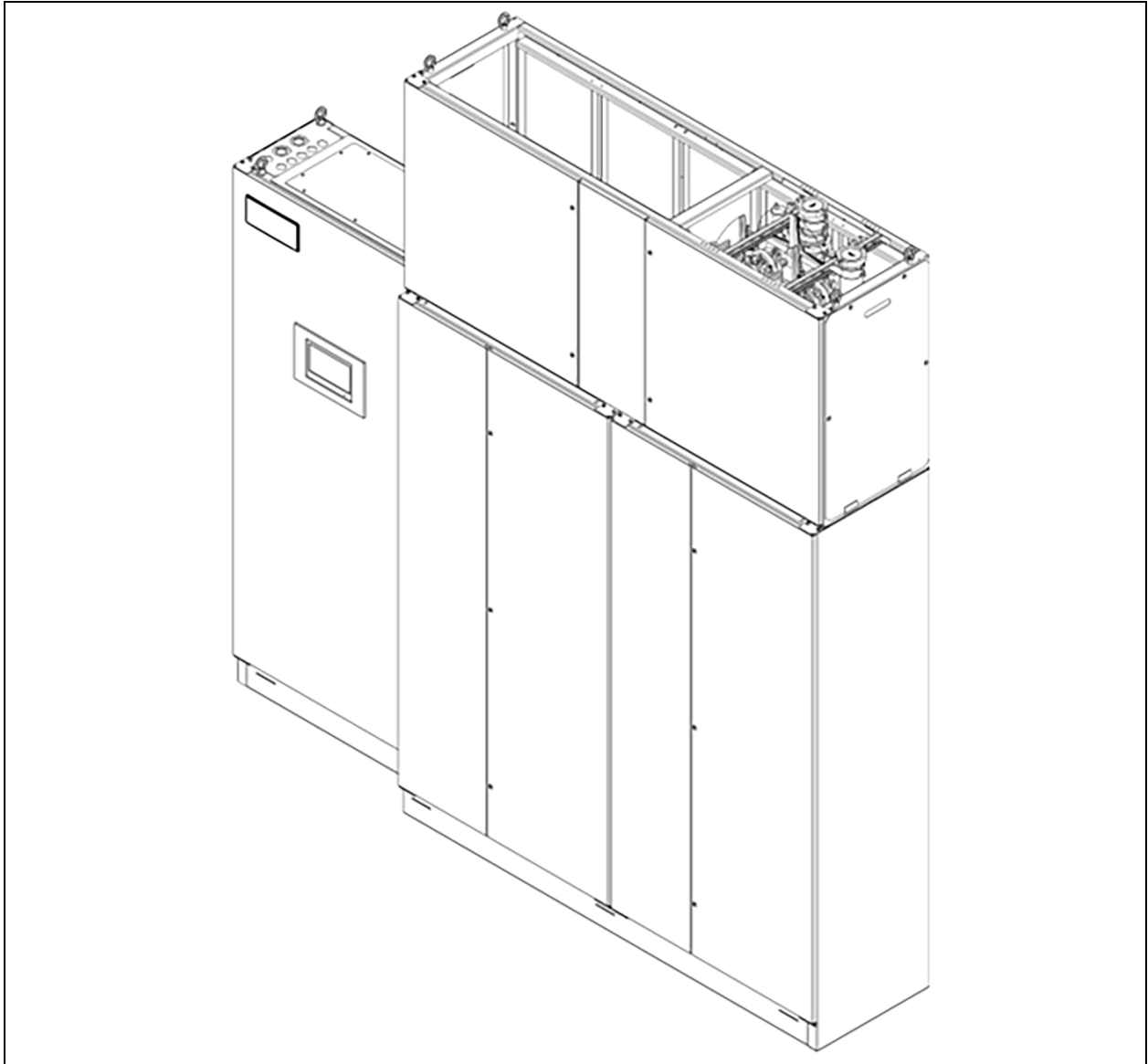
3. Disengage 1/4-turn fasteners on the front doors of the upper module. Open the front doors to access fasteners holding the center panel in place. Loosen fasteners to remove the center panel, set aside with removed end panels. Close the front doors and re-engage 1/4-turn fasteners. See **Figure 4.13** on page 38 .

Figure 4.12 Vertiv™ CoolPhase CDU End Panel Removal



NOTE: : Uninstall caps and gasket supply and return connections in upper and bottom section

Figure 4.13 Vertiv™ CoolPhase CDU Assembled



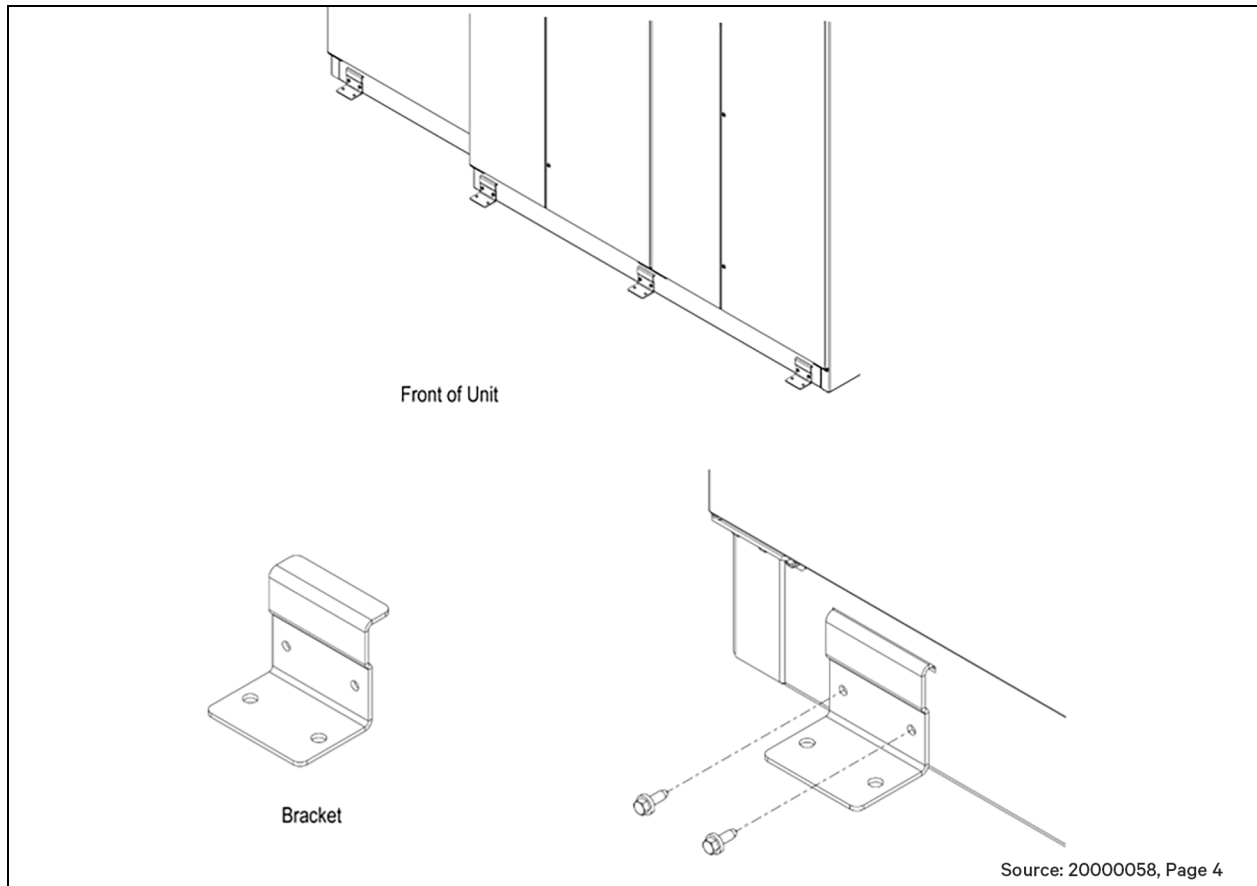
4.6.2 Securing Unit to Concrete Slab Floor

Mounting requirement details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection, and attachment to non-building structures must be outlined and approved by engineer of record for project or building.

Insert provided attachment brackets into eight indicated slots (four on both sides) of unit frame base. Refer to **Figure 4.14** on the facing page . Using holes in attachment brackets as a template, drill two 7/32" holes into unit frame base and two 7/32" holes into concrete slab. Install two provided self-drilling screws through each attachment bracket, into unit frame base.

Structural floors and housekeeping pads must also be approved by project or building structural engineer of record. Installing contractor is responsible for proper installation of all anchors and mounting hardware, and observing mounting requirements outlined by engineer of record.

Figure 4.14 Vertiv™ CoolPhase CDU Main Unit Anchorage Detail



4.6.3 Upper Module Placement onto Lower Module

1. Attach site appropriate lifting device to lift lugs on the top of the upper module.
2. After lower section is secured to floorstand or concrete slab, lift the upper module to a height that will safely clear the lower module height.
3. Before lowering the upper module to the lower module, remove clamps, end caps, and gaskets from the two connection points of the upper module. For the two connection points of the lower module, remove the clamps and set aside for later use. After removing clamps, remove the end caps of the lower module but leave the gaskets in place. Open the front door of the upper module to access the inside connection point. Refer to **Figure 4.15** on the next page, Detail B.
4. Align the upper module over the lower module and slowly lower the upper module. Make sure to align four threaded studs placed on top of the lower module with indicated holes in the bottom frame of the upper module. Refer to **Figure 4.16** on page 41, Detail D.
5. After lowering the upper module to the lower module, reapply one clamp to the two connection points. Refer to **Figure 4.16** on page 41, Detail C.

Figure 4.15 Vertiv™ CoolPhase CDU Module Placement

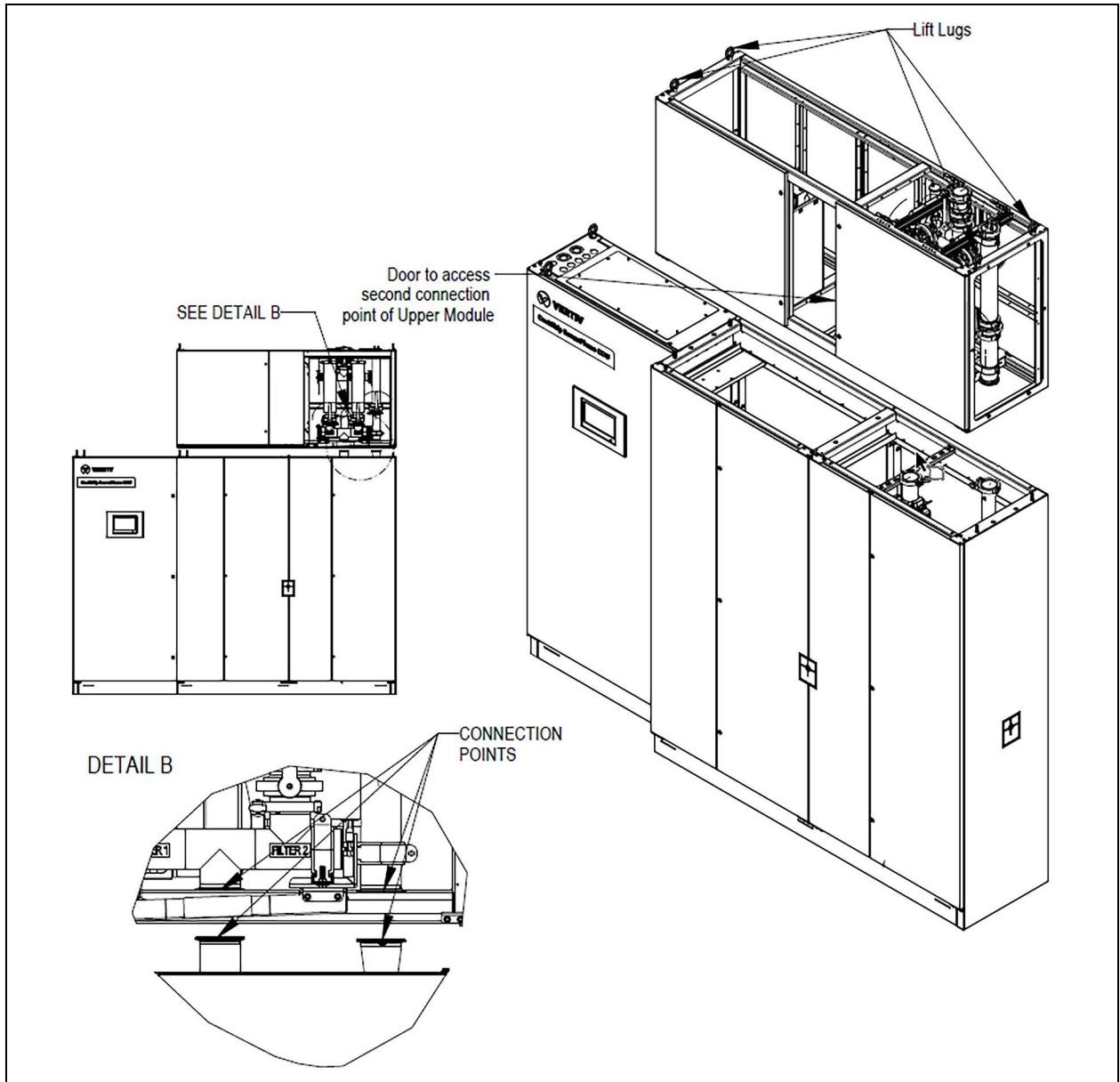
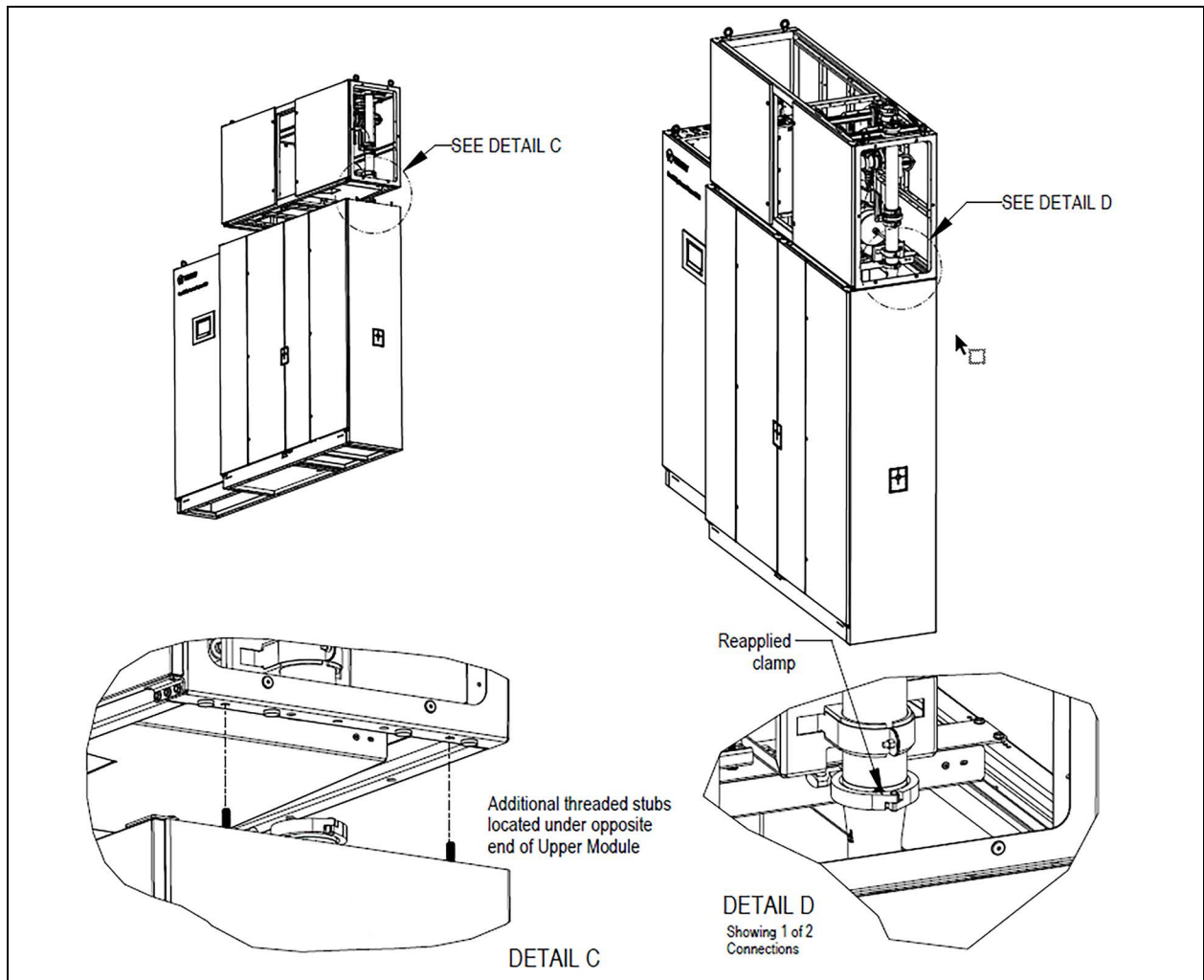


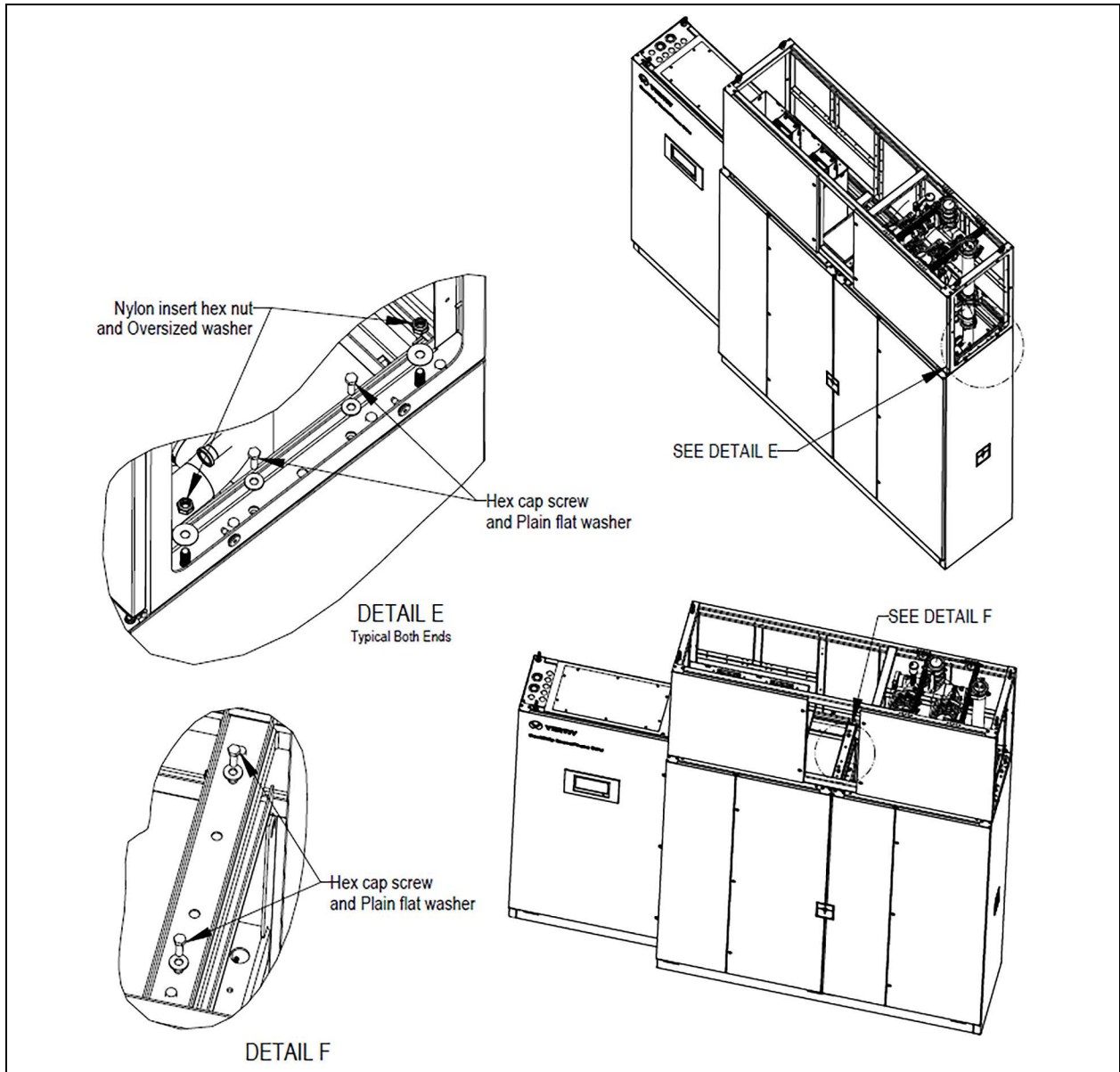
Figure 4.16 Vertiv™ CoolPhase CDU Module Placement



4.6.4 Upper Module Attachment

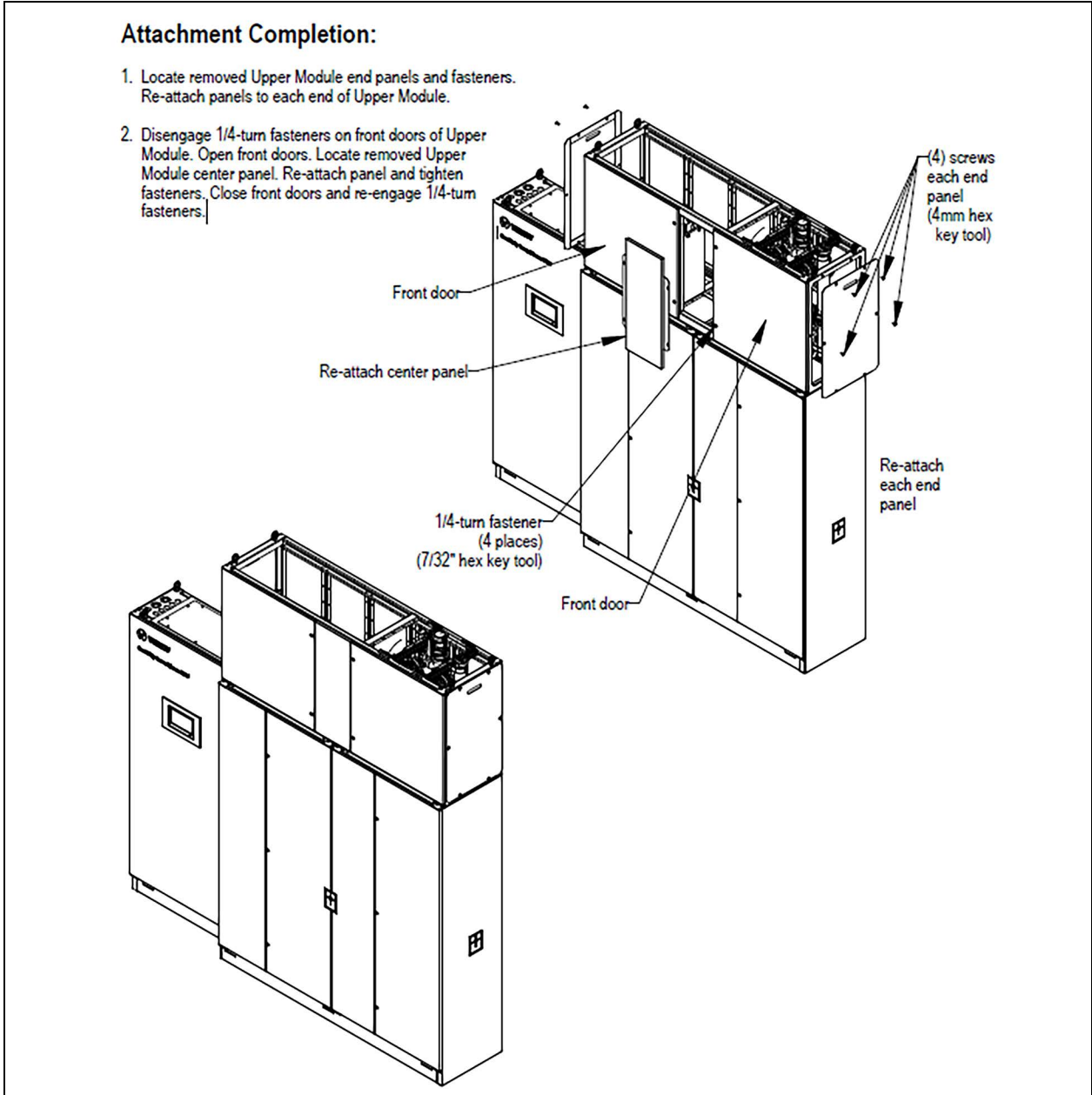
1. Place M10 oversized washer and M10-15 nylon insert hex nut onto threaded stud, two at each end. Tighten and torque to 7.74 ft lb. (10.5 Nm). Refer to **Figure 4.17** on the next page, Detail E.
2. Place 5/16 plain flat washer and 5/16-18 x 1" G5 hex cap screw at indicated holes of the upper module. Thread screws into inserts in frame of lower module, two at each end. Tighten and torque to 13 ft lbs. (17.6 Nm). Refer to **Figure 4.17** on the next page, Detail F.
3. Place additional 5/16 plain flat washers and screws at indicated holes of center frame member of the upper module. Thread screws into inserts in the frame of the lower module. Tighten and torque to 13 ft lbs. (17.6 Nm). Refer to **Figure 4.17** on the next page, Detail F.

Figure 4.17 Upper Module Attachment



4. Locate removed upper module end panels and fasteners. Re-attach panels to each end of the upper module. See **Figure 4.18** on the facing page.
5. Disengage 1/4-turn fasteners on front doors of the upper module. Open front doors. Locate removed upper module center panel. Re-attach panel and tighten fasteners. Close front doors and re-engage 1/4-turn fasteners.

Figure 4.18 Attachment Completion



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5 Refrigerant Piping Requirements

The main fluid connections are flange fittings with a factory installed plate. These connections may be at the top of the unit.

- Field installed refrigerant piping must be installed in accordance with local codes and must be properly assembled, supported, isolated, and insulated. Avoid piping runs through noise sensitive areas, such as office walls and conference rooms.
- Refer to specific text and detailed diagrams in this manual for other unit specific piping requirements.
- All piping will be elevated above the unit and must be arranged so that it offers the least resistance. Careful planning of the piping layout above the raised floor is required. When installing piping above the unit, we recommend installing the pipes in a horizontal plane rather than stacked one above the other.
- Whenever possible, the pipes should be run parallel.
- Install shutoff ball valves on the inlet and outlet pipes to ease maintenance.
- Install optional thermostats and pressure gauges on the inlet and outlet pipes.

The pipe connection locations, piping general arrangement and schematics are described in the submittal documents included in [Submittal Drawings](#) on page 107 .

The following tables list the relevant documents by number and title.

Table 5.1 Piping General Arrangement Drawings

Document Number	Title
20000059, p1	CoolPhase CDU Piping Schematic Liebert® XDM with Vertiv™ Liebert® MCV
20000059, p2	CoolPhase CDU Piping Schematic Liebert® XDM Secondary Coolant Loop
10025700	Glycol and Water Requirements

Table 5.2 Piping Connection Drawings

Document Number	Title
20000057	CoolPhase CDU Primary Connections Top (Fluid and Refrigerant) 300kW
Refrigeration Piping Layout and Condenser Positioning Drawings	
20000101, p1	CoolPhase CDU Air Cooled Piping Schematic Liebert® MCV Mounted above Liebert® XDM
20000101, p2	CoolPhase CDU Piping Schematic Liebert® MCV and Liebert® XDM at Similar Level

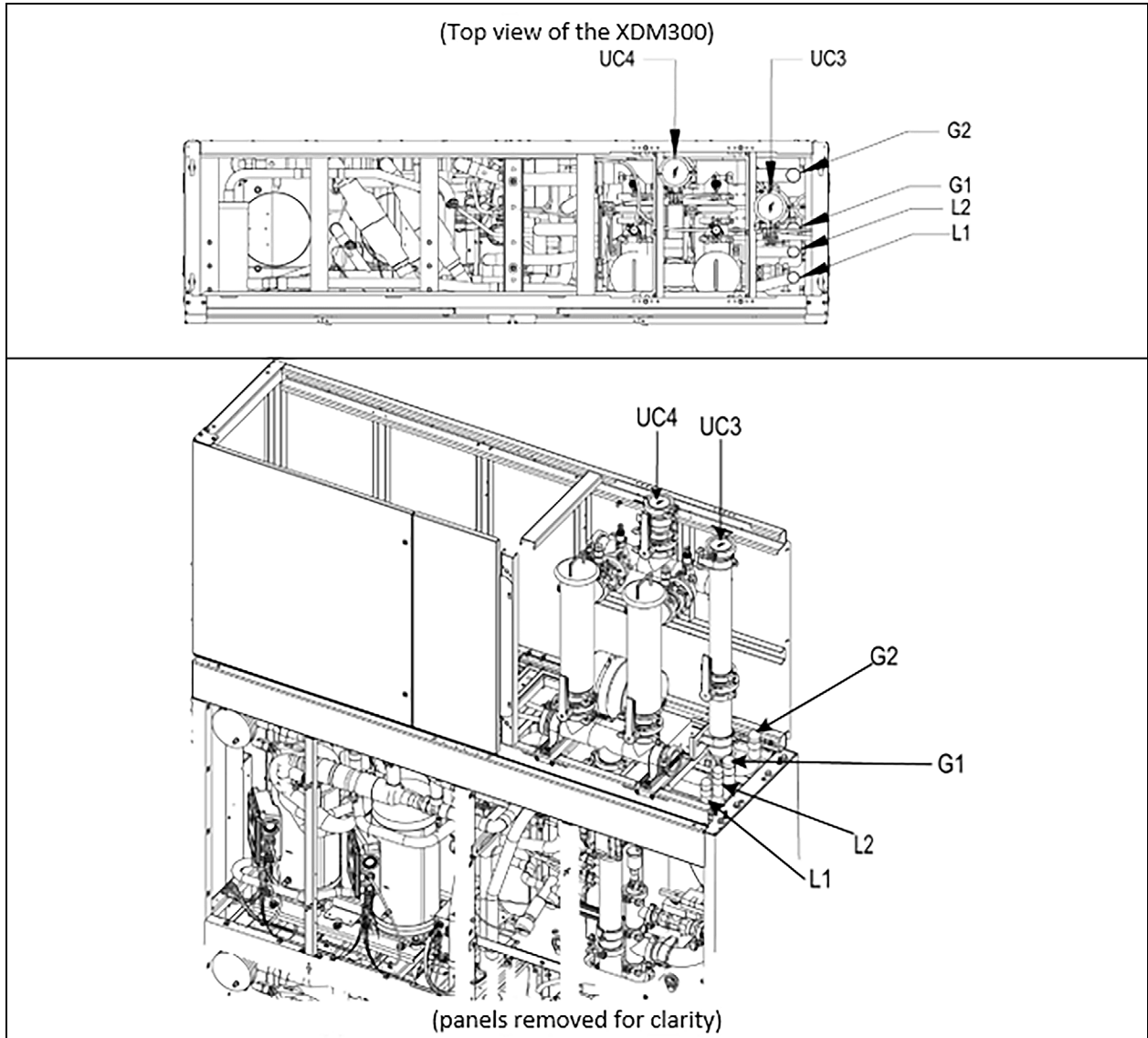
5.1 Refrigerant Pipe Connection Sizes

Table 5.1 on the previous page lists the refrigerant copper pipe connections at the Vertiv™ CoolPhase CDU.

5.2 Refrigerant Connection Locations

All refrigerant and secondary circuit fluid connections are located on the top of the Vertiv™ CoolPhase CDU. See Figure 5.1 below.

Figure 5.1 Connection Locations (secondary fluid and refrigerant connection locations)



Item	Description
UC4	Secondary fluid return connections
UC3	Secondary fluid supply connections
L1 and L2	Supply refrigerant connections (outdoor air-cooled condensers)
G1 and G2	Return refrigerant connections (outdoor air-cooled condensers)

NOTE: For installation clearance and access information, refer to Vertiv drawings 20000058 in Submittal Drawings on page 107 .

5.3 Refrigerant Piping and Charging



WARNING! Risk of over pressurization of the refrigeration system. Can cause explosive discharge of high pressure refrigerant, loss of refrigerant, environmental pollution, equipment damage, injury, or death. This unit contains fluids and gases under high pressure. Use extreme caution when charging the refrigerant system. Do not pressurize the system higher than the design pressure marked on the unit's nameplate.



WARNING! Risk of explosive discharge of high-pressure refrigerant. Can cause serious injury or death. Building and equipment damage may also result. Neutral and service ports on the compressor service valves do not have a valve core. Front-seat the service valves and relieve pressure from the compressor before loosening a part or a component attached to the service valve. Follow local codes to properly reclaim refrigerant.



CAUTION: Risk of excessive refrigerant line pressure. Can cause equipment damage or injury resulting from tubing and component rupture. Do not close off the refrigerant line isolation valve for repairs unless a pressure relief valve is field installed in the line between the isolation valve and the check valve. The pressure-relief valve must be rated 5% to 10% higher than the system design pressure. An increase in ambient temperature can cause the pressure of the isolated refrigerant to rise and exceed the system design pressure rating (marked on the unit nameplate).



CAUTION: Risk of contact with hot surfaces. Can cause injury. Personal burn injury can be the result of touching a compressor, refrigerant discharge lines, and some electrical components that are extremely hot during unit operation. Allow sufficient time for them to cool to a touch-safe temperature before working within the unit cabinet.

Use extreme caution and wear appropriate, OSHA-approved PPE when working on or near hot components.

Consult local building and plumbing codes for installation requirements of additional pressure relief devices when isolation valves are field installed. Do not isolate any refrigerant circuits from over pressurization protection.

Refrigerant R-410A		
	High Side	Low Side
Design Pressure	530 psig 3,655 kPa	235 psig 1,620 kPa
High Pressure Cut Out Safety Switch	580 psig 3,999 kPa	N/A
Field installed interconnecting piping must be properly selected and installed based on local and national codes, the user manual, and the unit serial tag. Source: DPN000788.		

NOTICE

Risk of oil contamination with water. Can cause equipment damage.

Vertiv™ CoolPhase CDU systems require the use of POE (polyolester) oil. POE oil absorbs water at a much faster rate when exposed to air than previous used oils. Because water is the enemy of a reliable refrigeration system, extreme care must be used when opening systems during installation or service. If water is absorbed into the POE oil, it will not be easily removed and will not be removed through the normal evacuation process. If the oil is too wet, it may require an oil change. 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 into the compressor.

NOTICE

Units should never be operated with no refrigerant charge, a holding charge, a proper load or without additional oil as required added. Tag out system to prevent unauthorized personnel from accidentally starting equipment and damaging compressors if any of these conditions exist.

5.3.1 Refrigerant Piping Guidelines for Air Cooled Systems

- Field installed interconnecting piping should be properly selected based on local codes and unit labeling.
- Air cooled units ship with a nitrogen holding charge. Do not vent the charge until all refrigerant piping is in place, ready for connection to the unit and condenser.
- Use copper piping with a brazing alloy with a minimum temperature of 1,350°F (732°C), such as Sil-Fos. Avoid soft solders, such as 50/50 or 95/5.
- Use a flow of dry nitrogen through the piping during brazing to prevent formation of copper oxide scale inside the piping. When copper is heated in the presence of air, copper oxide forms. POE oils will dissolve these oxides from inside the copper pipes and deposit them throughout the system, clogging filter driers and affecting other system components.
- A pure dry nitrogen flow of 1-3 ft³/min (0.5-1.5 l/s) inside the pipe during brazing is sufficient to displace the air. Control the flow using a suitable measuring device.
- Ensure that the tubing surfaces to be brazed are clean and that all burrs have been removed from the ends of the tubes.
- Ensure that all loose material has been cleaned from inside the tubing before brazing.
- Protect all refrigerant line components within 18 in. (460 mm) of the brazing site by wrapping them with a wet cloth or with a suitable heat-sink compound.
- The Vertiv™ Liebert® MCV heat rejection skid cannot be installed below the evaporator.
- Isolate piping from building using vibration-isolating supports.

- **The Vertiv™ CoolPhase CDU is used with a Vertiv™ Liebert® MCV heat rejection skid without receiver tanks.** For these systems, the bottom of the condenser coil cannot be more than 15 ft. (4.6 m) below the elevation of the EEV inside the indoor units. The bottom of the condenser coil must be no greater than 60 ft. (18.3 m) higher than the elevation of the EEV inside the indoor unit. Refer to 20000101 included in [Submittal Drawings](#) on page 107 .
- Install traps on hot gas (discharge) lines at the base of vertical risers over 5 ft (1.5 m) and then for vertical rises over 25 ft. (7.6 m), install a trap in 20 ft (6 m) increments or evenly-divided over the vertical rise.
- Pitch horizontal hot gas piping down at a minimum rate of 1/2 in. per 10 ft. (42 mm per 10 m) so that gravity will aid in moving oil in the direction of refrigerant/oil flow.
- Consult factory if piping run exceeds 200 ft. (61 m) linear length or 300 ft. (91 m) equivalent length.
- Keep piping clean and dry, especially on units with R-410A refrigerant.
- Avoid piping runs through noise sensitive areas.
- Do not run piping directly in front of discharge air stream.
- Refrigerant oil—do not mix oil types.
- Refrigerant piping must be Type ACR copper pipe.
- Refrigerant connections to the unit must be high-temperature brazed joints. Do not use soft soldering.
- Field installed piping must be installed in accordance with local codes and must be properly assembled, supported, isolated, and insulated.

Refer to ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping. The indoor cooling unit has a factory installed high pressure safety switch in the high side refrigerant circuit.

NOTE: All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated. The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.

- Refer to [Refrigerant Line Sizes and Equivalent Lengths](#) on the next page , for recommended refrigerant piping sizes based on equivalent pipe lengths.
- Refer to [Refrigerant Charge Requirements for Air Cooled Systems](#) on the next page for the refrigerant charge requirements of the system.
- Refer to [Charging the Refrigerant Circuit to an Outdoor Air Cooled Condenser without Receivers \(MCV430\)](#) on page 1 for more information.

5.3.2 Piping Layout and Condenser Positioning

The piping layout and condenser positioning is detailed in the submittal documents included in [Submittal Drawings](#) on page 107 .

The following table lists the relevant documents by title and number.

Table 5.3 Refrigeration Piping Layout and Condenser Positioning Drawings

Document Number	Title
20000101	CoolPhase CDU Air Cooled Piping Schematic Vertiv™ Liebert® MCV Mounted above Liebert® XDM

5.3.3 Refrigerant Line Sizes and Equivalent Lengths

Table 5.4 Recommended Refrigerant Line Sizes, OD Copper

Model	XDM300	
Equivalent Length	Hot Gas Line, in.	Liquid Line, in.
50 ft. (15 m)	1-5/8	1-3/8
100 ft. (30 m)	1-5/8	1-3/8
150 ft. (45 m)	1-5/8*	1-3/8*
300 ft. (91 m)	1-5/8*	1-3/8*
450 ft. (137 m)	Consult the Factory	Consult the Factory

*Consult factory for Vertiv™ CoolPhase CDU unit can be extended to max 200ft (61m) linear or 300ft. (91m) equivalent.
Source: DPN000788.

NOTE: See the piping schematics for your system in [Submittal Drawings](#) on page 107 . For installations using pre-fabricated heat rejection skids, included piping must be factored into total equivalent length calculation. Please consult factory for details.

5.3.4 Refrigerant Charge Requirements for Air Cooled Systems

The following tables provide the refrigerant charge requirements for the Vertiv™ CoolPhase CDU, connected piping, and condenser options.

Table 5.5 Indoor Unit Refrigerant Charge

Indoor Unit Type	Model	Circuit 1 lb. (kg)	Circuit 2 lb. (kg)
Air Cooled	Liebert® XDM300	25 (11.3)	25 (11.3)

See [Table 12.2](#) on page 96 for recommended oil for the system.

To calculate the full system charge, use the data in this table and the data located in the following tables:

- [Table 5.6](#) on the facing page
- [Table 5.7](#) on the facing page
- [Table 5.9](#) on page 53

For system charges over 200 lb. (90.7kg), consult your Vertiv representative.

Table 5.6 Approximate R-410A Refrigerant Required per Circuit for Vertiv™ Liebert® MCV Heat Rejection Skid

Heat Rejection Skid	System No	Circuit No.	Charge per Circuit lb (kg)
Liebert® MCV430 and MCV440 Single skid with (1) PRE unit	1	1	62 (28.1)
		2	
Liebert® MCV430 and MCV440 Dual skid with (2) PRE units	1	1	62 (28.1)
		2	
	2	1	
		2	
The heat rejection skid contains: <ul style="list-style-type: none"> • Liebert® MCV condensers • Liebert® EconoPhase (PRE) units, and all internal piping. Liebert® receivers are used with Liebert® MCV440 heat rejections when the outdoor ambient is above 105°F.			

Table 5.7 Interconnecting Piping Refrigerant Charge for R-410A, lb. per 100 ft. (kg per 30 m)

Line Size, OD (in)	Liquid Line (in/mm)	Hot Gas Line (in/mm)
1-3/8	51.5 (23.0)	5.9 (2.6)
1-5/8	—	8.4 (3.7)
Source: DPN003099, Rev. 1		

Table 5.8 Liebert® Pump Module Refrigerant Charge for R-410A per Circuit

System Type	Model	Charge per Circuit, lb. (kg)
Liebert® EconoPhase Pumping Unit	PR250	9.2 (4.2)

5.4 Additional Oil Requirements for Scroll and Digital Scroll Compressors

NOTICE

Risk of improper compressor lubrication. Can cause compressor and refrigerant system damage.

Failure to use oil types, viscosities, and quantities recommended by the compressor manufacturer may reduce compressor life and void the compressor warranty. See **Table 12.2** on page 96 for the recommended oil for the system.

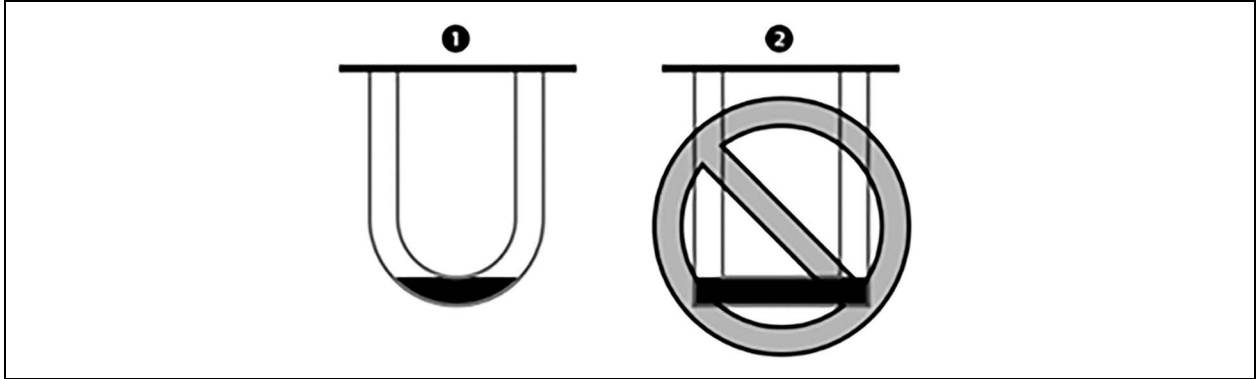
- Do not mix polyolester (POE) and mineral based oils.
- Do not mix oils of different viscosities.

Consult your Vertiv sales representative, visit <https://www.Vertiv.com/en-us/support/>, or contact the compressor manufacturer if questions arise.

See [Refrigerant Charge Requirements for Air Cooled Systems](#) on page 50 for the amount required for various system level charges.

In addition to oil added based on system charge, additional oil is required for discharge line field installed traps. Standard formed tube traps are required. See **Figure 5.2** below and **Table 5.9** on the facing page .

Figure 5.2 Standard Formed Tube Trap Versus Straight Tubes and Fittings Trap



Item	Description
1	Standard form fitted tube trap
2	Straight tubes and fittings trap

Straight tubes and fittings used as traps require much more oil and the length of the straight tube can vary.

With the total calculated refrigerant charge for each circuit, see **Table 5.8** on the previous page for the refrigerant charge amount that was calculated and follow that line to the right to see how much additional compressor oil is required for each circuit. Count the numbers of traps in each circuit. See **Table 5.10** on page 54 for the discharge line pipe diameter. Follow the line to the right to see how much oil is needed per trap. Multiply the number of traps per circuit by the oil volume. Add the additional compressor oil amount and the trap oil volume together. This will be the total amount of oil that will need to be added before the refrigerant is added to each circuit.

The amount of oil added by field service must be recorded on the tag marked "Oil Added Field Service Record" that is attached to each compressor. The date of oil addition must be included as well.

Table 5.9 Refrigerant System Charge, Additional Oil per Circuit

Refrigerant System Charge per Circuit, lb (kg)	Additional Oil per Circuit, oz (ml)
<40 (18.1)	0
40 (18.1)	10 (300)
50 (22.7)	18 (530)
60 (27.2)	26 (770)
70 (31.8)	34 (1010)
80 (36.3)	42 (1240)
90 (40.8)	50 (1480)
100 (45.4)	58 (1720)
110 (49.9)	66 (1950)
120 (54.4)	74 (2190)
130 (59.0)	82 (2430)
140 (63.5)	90 (2660)
150 (68.0)	98 (2900)
160 (72.6)	106 (3130)
170 (77.1)	114 (3370)
180 (81.6)	122 (3610)
190 (86.2)	130 (3840)
200 (90.7)	138 (4080)

System Charge: Indoor unit, Liebert® MCV heat rejection skid, refrigerant lines. Calculated per circuit.
Source: DPN003950 Rev. 6

Compressor Type	Oil Type for R-410A refrigerant
Copeland Scroll and Digital Scroll	POE Oil - ISO 32 Centistokes Viscosity

NOTE: System charge: Indoor unit + condenser + refrigerant lines. For system charges over 200 lb. (91.7kg), consult your Vertiv representative.

NOTE: Use Copeland POE Oil ULTRA 32-3MAF or other Copeland-approved oils.

Table 5.10 Volume of Oil in Standard Form Trap by Pipe Diameter

Pipe Diameter, in.	Oil Volume, oz (ml)
1/2	0.2 (5.9)
5/8	0.4 (11.8)
3/4	0.6 (17.7)

Table 5.10 Volume of Oil in Standard Form Trap by Pipe Diameter (continued)

Pipe Diameter, in.	Oil Volume, oz (ml)
7/8	0.9 (26.6)
1-1/8	1.8 (53.2)
1-3/8	3.3 (97.6)
1-5/8	5.5 (162.7)

Source: DPN003950, Rev. 6

5.5 Evacuation, Leak Testing, and Charging Air Cooled Systems

Two discharge lines and two liquid lines must be field installed between the indoor unit and outdoor condenser.

NOTE: Keep the evaporator unit and condenser closed with their factory charge of dry nitrogen while all field piping is installed. Keep the field piping clean and dry during installation. Do not allow it to stand open to the atmosphere.

When all the field interconnecting piping is in place, vent the dry nitrogen charge of each evaporator unit, making its piping connection last. Follow all proper brazing procedures, including a dry nitrogen purge to maintain system cleanliness. The condenser connection pipes must be wrapped with a wet cloth to keep the pressure and temperature sensors cool during any brazing.

5.6 Evacuation and Leak Testing Air Cooled Systems

For proper leak check and evacuation, you must open all system valves and account for all check valves.

NOTE: The system includes a factory-installed check valve and an additional downstream Schrader valve with core in the compressor discharge line. Proper evacuation of the condenser side of the compressor can be accomplished only using the downstream Schrader valve. See the appropriate piping schematic for your system in [Submittal Drawings on page 107](#).

- Starting with Circuit #1, open the service valves and place a 150 psig (1,034 kPa) of dry nitrogen with a tracer of refrigerant. Check the system for leaks with a suitable leak detector.
- With pressure still in Circuit #1, open the compressor service valves in Circuit #2.
 - If pressure increases in Circuit #2, the system is cross-circuited and must be re-checked for proper piping.
 - If there is no pressure increase, repeat Step 1 on Circuit #2.
 - Check pressure on fluid side of unit. If pressure has risen over starting pressure (should be 30 psig or less), the BPHE is leaking from the refrigerant to water side and should be replaced.
- After completion of leak testing, release the test pressure (observe local code) and pull an initial deep vacuum of 500 microns on the system with a suitable pump.
- After four hours, check the pressure readings and if they have not changed, break vacuum with dry nitrogen. Pull a second and third vacuum to 500 microns or less. Re-check the pressure after two hours.
- When the three checks are complete, remove the jumper hose from the service valve fitting and the condenser. Proceed to [Charging the Refrigerant Circuit to an Outdoor Air Cooled Condenser without Receivers](#) on the facing page or [Charging the Refrigerant Circuit to an Outdoor Air Cooled Condenser without Receivers \(MCV430\)](#) on page 1.

5.6.1 Break Vacuum

Using a manifold charging hose equipped with a ball valve, properly connect to a tank of refrigerant, and purge the hose with refrigerant to ensure non-condensables do not enter the system. Connect the hose assembly to the liquid line Schrader port and break circuit vacuum with a portion of the calculated refrigerant pre-charge. Add enough refrigerant to bring pressure slightly above positive. Close ball valve and remove refrigerant tank.

5.7 Charging the Refrigerant Circuit to an Outdoor Air Cooled Condenser without Receivers

NOTICE

Risk of improper refrigerant charging. Can cause equipment damage.

R-410A is a blended refrigerant and must be introduced and charged from the cylinder only as a liquid.

Care must be exercised to avoid damage to the compressor. We recommend connecting a manifold charging hose equipped with a ball valve to the liquid line Schrader port.

NOTICE

Risk of improper operation. Can cause compressor failure.

Operating the unit with the EEV closed can cause compressor failure. A minimum of 20 psig (138 kPa) must be established and maintained for the compressor to operate. The charging function can be reset as many times as required to complete.

NOTICE

Units should never be operated with no refrigerant charge, holding charge, proper load, or without additional oil as required. Tag out system to prevent unauthorized personnel from accidentally starting equipment and damaging compressors if any of these conditions exist.

To charge the system:

1. Check the nameplate on the indoor unit for the refrigerant type to be used. Unit control configurations differ depending upon the refrigerant type.
2. Charge one unit at a time. Refer to [Checklist for Completed Installation](#) on page 85 .
3. Calculate the amount of charge for the system. See [Refrigerant Charge Requirements for Air Cooled Systems](#) on page 50 .
4. Add Additional Compressor and trap oil. See [Additional Oil Requirements for Scroll and Digital Scroll Compressors](#) on page 51 .
5. Accurately weigh in about 80% of the calculated system charge before starting the unit. Do not exceed the calculated charge by more than 0.5 lb (0.37 kg).
6. Close the Vertiv™ Liebert® MCV heat rejection skid disconnect switch.

7. Before running the whole system, the following tasks must be completed.
 - Clean/flush external supplied water load banks with clean fluid (per the fluid quality guidelines) at the proper proportion of the design flow rate before placing them into the Vertiv™ CoolPhase CDU secondary circuit. For example, if total design flow rate is 320 gpm (1211 Lpm) for 1 MW, and the load banks are 250 kW each, divide 320 by 4 and flush each load bank with 80 gpm (303 Lpm).
 - Flush the secondary fluid circuit per [Secondary Fluid Circuit Requirements](#) on page 61.
 - Requires 40 mesh strainer. Refer to **Table 3.1** on page 21.
 - The secondary fluid circuit must be filled per the guidelines in [Secondary Fluid Circuit Requirements](#) on page 61.
 - The secondary fluid circuit must be charged with the approved fluid and the secondary circuit fluid temperature must within +/- 9°F (5°C) of the operating point.
8. If the operating point changes, the charge may need to be adjusted according to the new operating point.
9. The return secondary fluid temperature to the CoolPhase CDU is being charged it must be stable. If this is not possible due to the lack of heat load, then additional load banks must be used to offset the cooling load during start-up.

NOTICE

The unit must have line voltage applied to the unit at least 12 hours before compressor start-up to allow the compressor crankcase heaters time to warm the compressors and boil off any liquid refrigerant in the compressors after pre-charge.

10. In the Service menu of the Vertiv™ Liebert® iCOM™ controller, select Diagnostics/Service > Diagnostics.
 - a. Enable Manual Mode.

NOTE: Manual mode will time out after 60 minutes.

- b. In the Search Box type E177 and press Enter.

Two parameters appear in the Parameter Directory (E177.1 and E177.2).

Press the gear icon in the upper right corner.

Select Make Writeable.

Change E177.1 and E177.2 from five minutes to two minutes.

This will reduce the superheat setpoint from 24°F (13.3°C) to 13°F (7.2°C) degrees in two minutes.
- c. In the Pump options, set Pump to On to operate the pump during Manual Mode.
- d. It is recommended to start with setting the Vertiv™ CoolPhase CDU pump speed manually to operate at 100 ± 5 gpm (303 ± 19 Lpm) with approximately 250 kW of load to charge both circuits simultaneously, or 50 ± 5 gpm (151 ± 19 Lpm) with 125 kW of load for one circuit at a time.
- e. It is best to charge both circuits simultaneously since sub-cooling values need to be confirmed on both circuits once charging is complete. If you wish to charge one circuit at a time, **Table 5.11** on the facing page provides a target sub-cooling value. However, the target sub-cooling value for two circuits running should be verified as well once both circuits are charged.

NOTE: Adjust the load as needed to maintain the customer's desired supply fluid temperature ±9°F (5°C).

- f. In Compressor Circuit 1 options, set the Compressor Mode to Charge to operate Compressors 1A and 1B at full capacity. Turn Compressor 1A and 1B to On. The EEV will modulate to control superheat setpoint.
- g. Reset the charge function as many times as needed to complete unit charging.

NOTE: : You must establish and maintain a minimum 20 psig (138 kPa) for the compressor to operate.

11. Check the subcooling using the Schrader port on the liquid line just before the expansion valve, or at the Schrader near the inlet connections. Affix a thermocouple on the pipe next to the Schrader port you use. Superheat should be around 13°F (7.2°C) before verifying subcooling.
12. After adjusting the refrigerant charge, allow the system to operate an additional 15 minutes before checking the need for further adjustment.

NOTE: A digital scroll compressor can have a clear unit sight glass on the liquid line only when operating at 100% capacity. When operating below 100% capacity, the unit sight glass may show bubbles with each 15 second unloading cycle.

Table 5.11 Target Subcooling

Approximate Load		Subcooling	
	kW	°F	°C
2 circuits	300	12	6.7
1 circuit	150	14	7.8

Subcooling should be within $\pm 3^{\circ}\text{F}$ (1.7°C)

Adjust load during charging to get customer's desired supply fluid temperature.

Adjust flow rate to get customer's desired dT at the Vertiv™ CoolPhase CDU.

13. Repeat steps 10 through 12 for Compressor Circuit 2.
14. Run both circuits simultaneously to verify sub-cooling meets the 2-circuit value.
15. Change E177.1 and E177.2 back to five minutes after both circuits are charged.

5.7.1 Additional Compressor Oil

Once the circuits are topped off with refrigerant, more compressor oil may need to be added to each circuit if the final charge is over 10 pounds of the calculated refrigerant charge. Record this additional oil amount on the manilla tag hanging on the compressor service valve.

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6 Heat Rejection Skid

6.1 Planning Dimensions

The unit dimensions are described in the submittal documents included in the [Submittal Drawings](#) on page 107.

Table 6.1 below lists the relevant documents by number and title.

Table 6.1 Dimension Planning Drawings

Document Number	Title
DPN004259	Cabinet Dimensional Data, MCV440, Single Skid
DPN004261	Cabinet Dimensional Data, MCV440, Dual Skid
10032070	Cabinet & Anchor Dimensional Data, Liebert® MCV430 + Liebert® EconoPhase + Base Assembly
10032072	Cabinet & Anchor Dimensional Data, Liebert® MCV430 (2) + Liebert® EconoPhase (2) + Base Assembly

6.2 Vertiv™ Liebert® MCV Electrical Power Requirements

Condenser-rated voltage should be verified with available power supply before installation. Refer to the unit's electrical schematic and serial tag for specific electrical requirements. Line voltage electrical service is required for all condensers at the location of the condenser.

For the most reliable operation of the system, the indoor unit and the Liebert® MCV condenser should be on the same power source. The Vertiv™ Liebert® DSE system offers an option for a power feed from the active source on the indoor unit to the outdoor condenser. This configuration provides the greatest reliability and fastest recovery during power loss or source change.

When powering the outdoor condenser from the indoor unit, there is a breaker/fuse on the indoor unit and the wire sizing requirements are provided in **Table 6.2** on the next page.

A unit disconnect is standard on the Liebert® MCV skid. However, a site disconnect may be required per local code to isolate the unit for maintenance. Refer to the unit's serial tag for specific condenser electrical requirements (**Table 6.2** on the next page).

Route the supply power to the site disconnect switch and then to factory-provided high-voltage enclosure located on the Liebert® MCV heat-rejection skid. Reference submittal drawings listed in **Table 6.2** on the next page.

Table 6.2 Heat Rejection Skid Electrical Data, Three-Phase

Model	Voltage	FLA	WSA	OPD
MCV440 + PR250*****2	2 = 380V/60Hz	36.4	37.5	40
	A = 460V/60Hz	29.4	30.3	35
	G = 415V/50Hz	35.4	36.3	40
	B = 575V/60Hz	23.5	24.2	35

Table 6.2 Heat Rejection Skid Electrical Data, Three-Phase (continued)

Model	Voltage	FLA	WSA	OPD
MCV440 + PR250****5	2 = 380V/60Hz	35.8	36.8	40
	A = 460V/60Hz	28.8	29.6	30
	G = 415V/50Hz	N/A	N/A	N/A
	B = 575V/60Hz	23.1	23.8	35
MCV430 + PR250	2 = 380V/60Hz	29.4	30.5	35
	A = 460V/60Hz	23.8	24.7	25
	G = 415V/50Hz	28.4	29.3	30
	B = 575V/60Hz	19.0	19.7	30

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

Table 6.3 Vertiv™ Liebert® MCV Condenser Only Electrical Data, Three-Phase

Model	Voltage	FLA	WSA	OPD
MCV440	2 = 380V/60Hz	28.0	28.9	30
	A = 460V/60Hz	22.4	23.1	25
	M = 380-415V/50Hz	28.0	28.9	30
	G = 415V/50Hz	28.0	28.9	30
MCV430	2 = 380V/60Hz	21.0	21.9	25
	A = 460V/60Hz	16.8	17.5	20
	M = 380-415V/50Hz	21.0	21.9	25
	G = 415V/50Hz	21.0	21.9	25

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

7 Secondary Fluid Circuit Requirements

7.1 Interconnection with Cooling Modules

ASTM type ACR copper piping or stainless piping must be used in the secondary fluid circuit. The Vertiv™ CoolPhase CDU may be connected to Vertiv™ Liebert® DCD cooling modules or IT server equipment with prefabricated piping assembly or rigid, off-the-shelf piping. The cooling modules or IT server equipment are connected in parallel between main return and supply pipes going to and from the CoolPhase CDU.

7.2 Fluid Requirements

See 10025700 included in [Submittal Drawings](#) on page 107 to determine if water or a water/glycol mixture is best suited for your application.

7.3 Secondary Fluid Loop Piping Guidelines



CAUTION: Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance. Can cause injury. Building and equipment damage may also result. Installation and service of this equipment should be done only by qualified personnel who have specialized training for liquid cooling equipment and who are wearing appropriate, OSHA-approved PPE.

NOTICE

Risk of frozen pipes and corrosion from improper coolant mixture. Can cause water leaks resulting in equipment and building damage.

When the cooling unit or piping may be exposed to freezing temperatures, charge the system with the proper percentage of glycol and water for the coldest design ambient temperature. Automotive antifreeze is unacceptable and must NOT be used in any glycol fluid system. Use only HVAC glycol solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

NOTICE

Risk of piping system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Piping systems are at risk of freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature corrosion. The water or water/glycol solution must be analyzed by a competent local water treatment specialist before start-up to establish the inhibitor and antifreeze solution requirement and at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

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

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

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

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

We recommend installing a monitored fluid detection system that is wired to activate the automatic closure of field installed coolant fluid supply and return shut-off valves to reduce the amount of coolant fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close off against the maximum coolant fluid system pressure in case of a catastrophic fluid leak.

NOTICE

Risk of no flow condition. Can cause equipment damage.

Do not leave the water/coolant fluid supply circuit in a continuous no flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of tubes. Keep unit switched On and water/coolant fluid supply circuit system operating continuously. In multiple unit teams, allow standby units to enter the rotation automatically or schedule regular manual rotations.

NOTICE

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

Lines and joints must be inspected regularly. Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage.

Vertiv recommends installing monitored leak detection equipment for the unit and supply and return lines.

NOTICE

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

Install an overflow drain pan under the unit with a monitored leak detection system in the pan and shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. If it is not possible to install an overflow drain pan, then a monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

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

Follow local piping codes and safety codes.

- During brazing, fill lines with flowing nitrogen to prevent excessive oxidation and scale formation inside the piping. Inside of secondary piping must be protected from excessive oxidation and scale formation (whether welded or brazed.)

- Qualified personnel must install and inspect system piping.
- Contact a local water consultant regarding water quality, corrosion protection and freeze-protection requirements.
- Field supplied manual shut off valves at the supply and return line should be added so the unit can be isolated from the rest of the piping as needed.
- Install a monitored fluid detection system that is wired to activate the automatic closure of field installed coolant fluid supply and return shut off valves to reduce the amount of coolant fluid leakage and consequential equipment and building damage. The shut off valves must be sized to close off against the maximum coolant fluid system pressure in case of a catastrophic fluid leak.
- Insulate all piping lines to prevent condensation in applications where the dew point approaches the chilled water temperature.
- A field provided wye strainer is required in the chilled water return line to the CoolPhase CDU. The wye strainer protects the pump, brazed plate heat exchanger and system components from debris.

Refer to specific text and detailed diagrams in this manual for other unit specific piping requirements.

The pipe connections and field provided wye strainer are described in the [Submittal Drawings](#) on page 107

7.3.1 Inspect Hygienic Sanitary Flange Connections

Check Flange Condition

1. Check the condition of the flange faces for scratches, dirt, and scale.
2. Check for corrosion pitting and tool marks.
3. Inspect the gasket seating surfaces.
4. Check the areas on the flange where the nuts will seat. These areas should be flat and free from pitting and excessive wear.
5. Confirm that the flange is corrosion free and undamaged.

Flange Alignment between Vertiv™ CoolPhase CDU and Field Supplied Flange

1. Visually examine the flange alignment to ensure that an acceptable fit has been obtained.
2. Flange faces should be parallel and aligned.

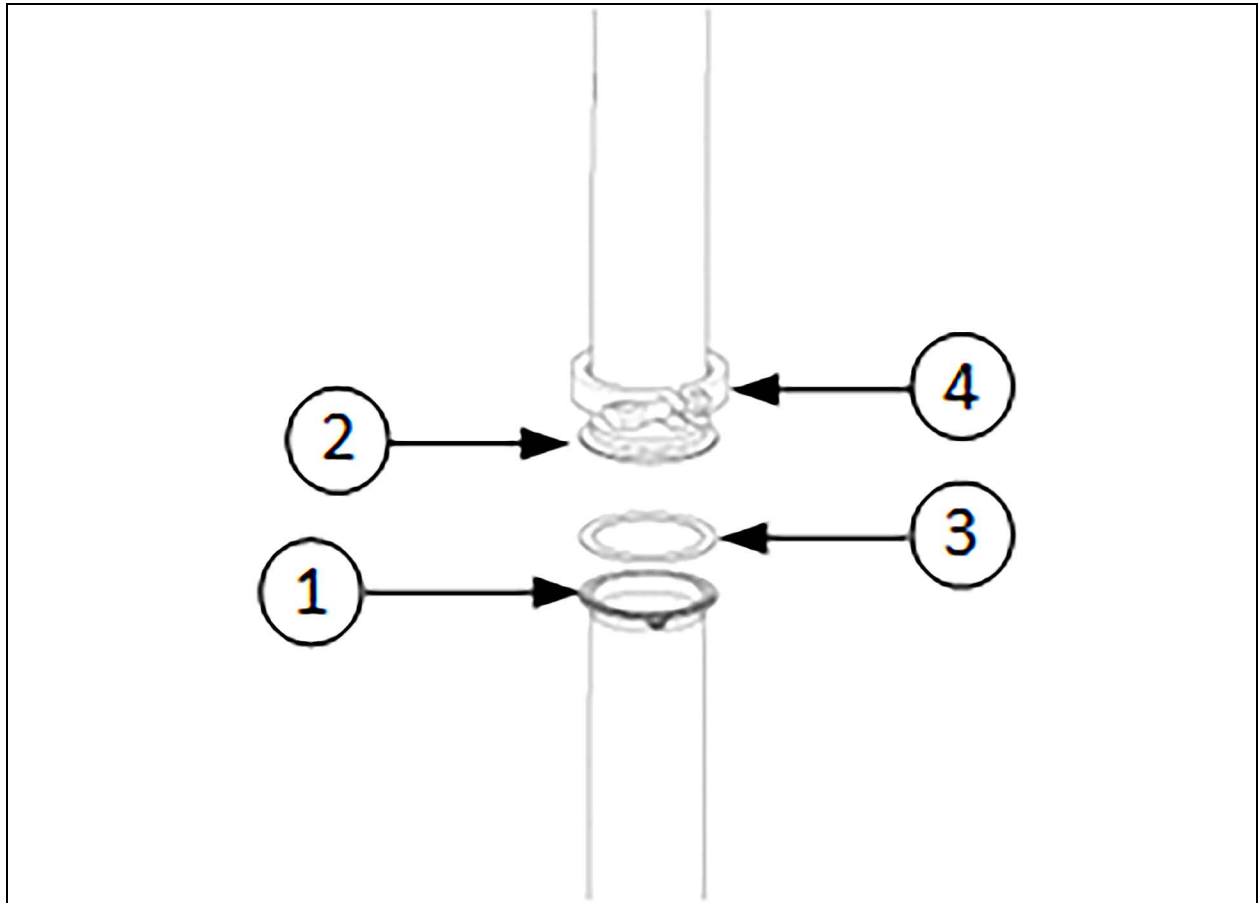
Gasket Check

1. Do not use sealing compound, grease, or other paste or adhesive on the gasket or flange faces.
2. Do not force the gasket into the seat between the mating flange faces during insertion.
 - a. Once the gasket is seated, bring the mating flanges together carefully without shaking the gasket off the seat.
3. Visually examine gaskets before installation to ensure that they are free from defects.
4. Clean the gasket seat.
5. Make sure the material is as specified. Look for any possible defects or damage in the gasket such as folds or creases.

Gasket Installation

1. Position the gasket between the ferrule flanges.
2. Align the gasket head with the grooves of both ferrule flange faces.
3. Mate the faces together, applying the clamp.
4. Tighten Wingnut to 25 in. lb.
5. Review joint due to thermal cycling testing of pipes and their hygienic clamp connections, then a re-torque may be needed.

Figure 7.1 Hygienic Sanitary Flange Assembly



Item	Description
1 and 2	Hygienic Sanitary Flange
3	Hygienic Gasket
4	Hygienic Sanitary Clamp

7.3.2 Secondary Fluid Top Circuit

Recommended Secondary Fluid Pipe Sizes

Connect the main pipes between the Vertiv™ CoolPhase CDU and the Vertiv™ Liebert® DCD or IT equipment according to site specific documentation and the configuration guide.

Minimize elbows and restrictions to get good fluid flow.

Table 7.1 Supply or Return Pipe Size Requirements for CoolPhase CDU- 10 HP

Nominal Pipe Size in.	Flow Rate (gpm)	Flow Velocity (fps)	Max Equivalent Length* ft, 50 Micron	Max Equivalent Length* (ft), No Filter
2.5	150	9.8	660	740
	100	6.5	2,260	2,300
	75	4.9	6,980	7,040
3	150	6.8	1,560	1,740
	100	4.5	5,380	5,500
	75	3.4	17,480	17,640
4	150	3.8	6,160	6,820
	100	2.5	21,260	21,720
	75	1.9	69,920	70,580
5	150	2.5	18,860	20,880
	100	1.5	70,160	71,700
	75	1	314,660	317,680

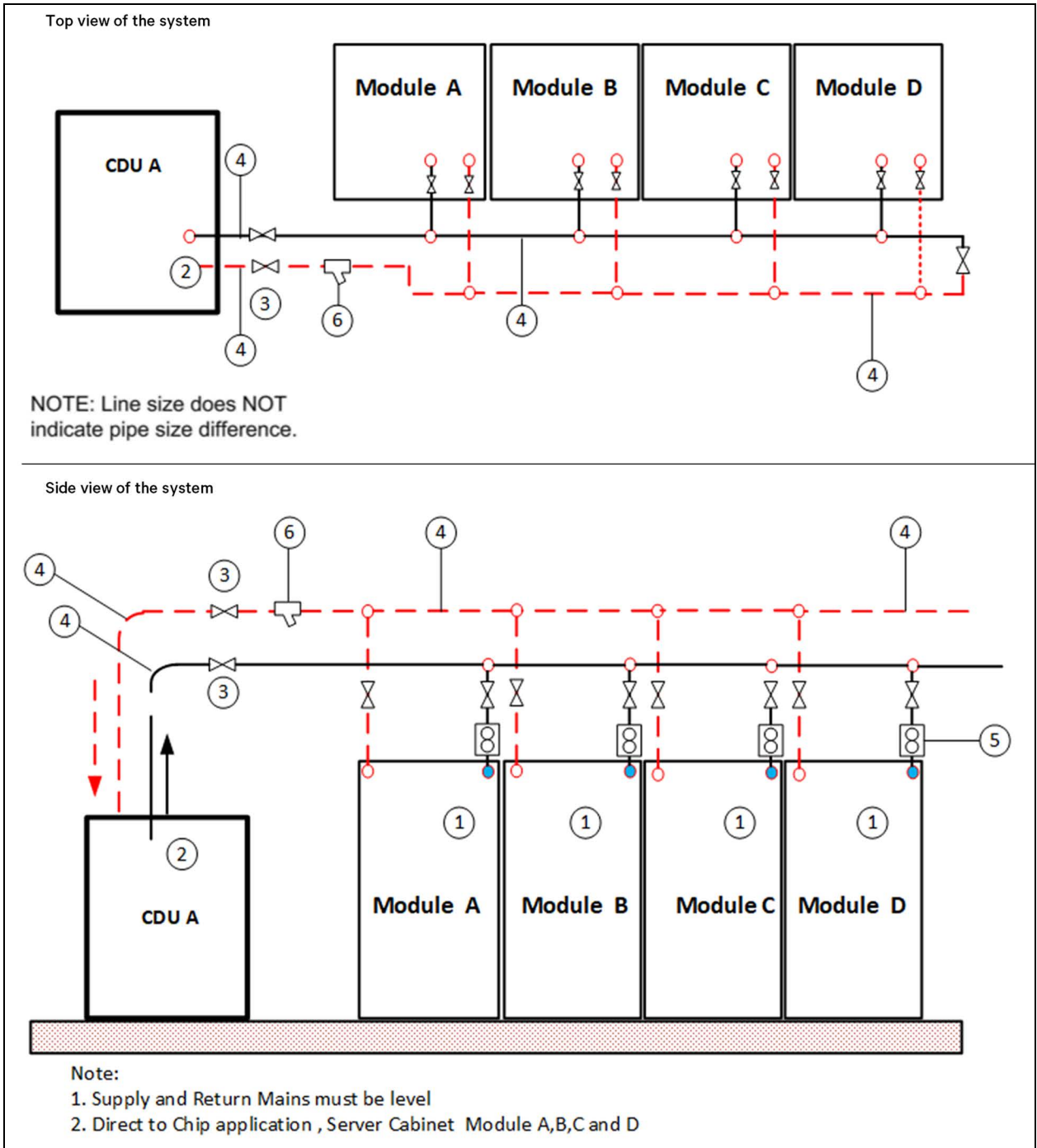
* Max equivalent length applies to full loop from XDM supply to return connections.
Max equivalent length calculations based on copper piping.

Table 7.2 Supply or Return Pipe Size Requirements for CoolPhase CDU- 15 HP

Nominal Pipe Size in.	Flow Rate (gpm)	Flow Velocity (fps)	Max Equivalent Length* ft, 50 Micron	Max Equivalent Length*(ft), No Filter
3	200	9	680	920
	150	6.8	2,020	2,180
	100	4.5	6,160	6,280
4	200	5	2,680	3,600
	150	3.8	7,960	8,620
	100	2.5	24,280	24,760
5	200	3	8,060	10,820
	150	2.5	24,360	26,380
	100	1.5	80,160	81,700
* Max equivalent length applies to full loop from XDM supply to return connections . Max equivalent length calculations based on copper piping.				

NOTE: For systems with multiple CoolPhase CDU modules, larger pipe sizes may be required, per total design flow.

Figure 7.2 Vertiv™ CoolPhase CDU Fluid System (Top Connections)



Item	Description
1	Heat Load
2	CoolPhase CDU
3	Ball Valve

Item	Description
4	Air Bleeders
5	Balance Valve
6	Strainer

7.3.3 Air Bleeders

Install air bleeders on horizontal pipe between branch runs and at each high point in the secondary fluid field piping circuit.

To do so, connect an air bleeder to the ¼" QC thread of the Schrader valve on the pump discharge line. You will need to “bump” the pump after the system is filled with fluid to help remove the air. Also plan in an air separator or other means to easily remove air from the data center piping loop. Failure to do so will cause delays during start-up.

7.3.4 Fluid Volume for Unit and Connection Piping

The following tables provide the fluid volume requirements for the Vertiv™ CoolPhase CDU and connected piping/hosing.

Table 7.3 Volume of Unit Internal Fluid Circuit

Unit Model	Fluid Volume, gal. (L)
Liebert® XDM 300	24 (90)

7.3.5 Field Piping Connection Volumes

Field supplied, field installed piping (copper, etc.) depends on pipe diameter and length. Table 7.3 below describes the typical fluid volumes depending on pipe diameter.

NOTE: If total fluid system volume per Vertiv™ CoolPhase CDU is over 95 gallons for glycol (40% or less), or 175 gallons for water, a system thermal expansion tank is required. Size per expansion tank manufacturer recommendation.

Table 7.4 Piping Fluid Volume Gallon per Foot (Liter per Meter) Reference Type L Copper

Line Size, OD, in	Fluid Volumes	
	gal/ft	l/m
2-1/2	0.25	3.105
3	0.35	4.347
3-1/2	0.48	5.961
4	0.62	7.699
5	1.02	25.3

7.3.6 Wetted Materials List Vertiv™ CoolPhase CDU

Primary Circuit (Refrigerant Side)	
Component	Materials
Plate heat exchanger	Plates-Alloy 316L, Ports-Alloy 304L
Pipe Work	Copper (ACR)
2-way shut off valve	Brass body with copper extended fitting , stainless steel stop, Teflon seal
Sight glass	Brass (body) , Teflon seal
Schrader valves	Brass (body), stainless steel (valve insert)
Pressure sensors	Stainless steel (body), Teflon seal
Main pump(s)	Steel (body), O-ring seal (Polyester)
External Filter drier	Welded steel shell, desiccant material
Pressure Relief Valve	Brass (body), Ni-Cr (spring), EPDM (seal)
Rotolock Adaptor	Steel 12L14, zinc chromate finish
EEV valve	Stainless steel
Service Valve	Brass (body)
Secondary Circuit (Pump Side)	
Component	Materials
Hygienic fittings	316 stainless steel, EPDM seals
Butterfly hygienic valves	316 stainless steel, EPDM seals
Pipe work	316 Stainless steel
Machined pipe fittings	304 Stainless steel
Main pump(s)	stainless steel liquid end components, EPDM
Insert non-return valve	Acetal (body & valve), high resistance elastomer (O-ring seals), control spindle is antidezincification alloy
Check Valve	316 Stainless steel, EPDM seals
Gasket	Grade "E" EPDM
Plate heat exchanger	Plates-Alloy 316L, Ports-Alloy 304L
Chilled Water 3-way valve	Nickel-plated brass (body), stainless steel (ball & stem), with PTFE seats & EPDM (O-ring seals)
Pressure sensors	17-4 PH stainless steel, 316L
Filter	304 & 316 stainless steel, EPDM (O-ring seals)
Drain valves	316 stainless steel, PTFE seats
Automatic air vent	Brass chrome plated (body), stainless steel (spring), high resistance polymer (float), steel (control spindle), EPDM (seals)
Expansion vessel	Steel (shell), EPDM (membrane)
Check Valve	316 stainless steel, EPDM seals

7.3.7 Secondary Fluid Flow Considerations for Rear Door Heat Exchangers

Secondary fluid flow should be maintained between the values of 25 gpm (minimum) and 200 gpm (maximum) per running unit depending on pump size.

Refer to individual cooling module specifications to estimate the maximum combined allowable flow for all units connected to the Vertiv™ CoolPhase CDU. If the allowable combined flow rate is less than 25 gpm (5.8 m³/h) per CoolPhase CDU module, adjust bypass valves (field provided) as necessary to maintain a flow above 25 gpm (5.8 m³/h) through the CoolPhase CDU.

For example, the maximum allowable water flow rate for a Vertiv™ Liebert® DCD unit is 22.7 gpm (5.2 m³/h). If four of these units are connected in parallel to the CoolPhase CDU, you can have a total flow over 90 gpm (20.4 m³/h).

22.7 gpm X 4 DCD units = 90.8 gpm total flow

5.2 m³/h X 4 DCD units = 20.9 m³/h total flow

If only one of the Liebert® DCD20 units is connected to the CoolPhase CDU, you must open bypass valves (field provided) to maintain the total flow through the CoolPhase CDU within the 25-170 gpm per module range.

7.3.8 Secondary Fluid Flow Considerations for Direct to Chip Cold Plates

Secondary fluid flow should be maintained between the values of 25 gpm (minimum) and 200 gpm (maximum) per running unit depending on pump size.

Refer to individual IT specifications to estimate the maximum combined allowable flow for all IT cabinets connected to the CoolPhase CDU. If the allowable combined flow rate is less than 25 gpm (5.8 m³/h) per CoolPhase CDU module, adjust bypass valves (field provided) as necessary to maintain a flow above 25 gpm (5.8 m³/h) through the CoolPhase CDU.

7.3.9 Fluid Quality Requirements for Rear Door Heat Exchanger and Direct to Chip Applications

The cooling water used must be soft enough to prevent deposits, but it must not be too soft because that would lead to corrosion in the water system.

Water/glycol solutions have different requirements. As stated in the notice in [Secondary Fluid Circuit Requirements](#) on page 61 a local water treatment specialist could be consulted.

Table 7.5 below lists the most important impurities and measures for their removal.

Table 7.5 Water Impurity (Rear Door Heat Exchangers)

Water Impurity or Condition	Corrective Method
Particles (dp < 0.3 mm)	Filter the water.
Excessive hardness	Soften the water by ion exchange.
Moderate level of particles and hardeners	Add dispersion or stabilization agents.
Moderate level of chemical impurities	Add deadening agents and inhibitors.
Biological impurities (bacteria and algae)	Add biocides.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor and antifreeze solution requirement and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion. The fluid complexity and variants of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components. The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of sulfate reducing bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system. Consult fluid manufacturer for testing and maintenance of inhibitors.

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

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

The secondary circuit should be filled with particulate free coolant (see suggested specification below) treated with suitable corrosion inhibitors and biocides for the cooling application. Failure to use proper water treatment can result in decreased system performance and reliability due to corrosion, scaling, fouling, and microbiological growth and may invalidate the unit warranty.

Table 7.6 Deionized Water Specification

Property	Value
Conductivity	< 15 μ S/0.4 in. (1 cm)
pH	6 to 8
Source: SL-70625 section 5.5.5	

Table 7.7 Mineral Content

Property	Value
Cadmium (Cd)	< 10 μ g/33.8 fl. oz. (1 L)
Copper (Cu)	< 10 μ g/33.8 fl. oz. (1 L)
Iron (Fe)	< 10 μ g/33.8 fl. oz. (1 L)
Lead (Pb)	< 10 μ g/33.8 fl. oz. (1 L)
Manganese (Mn)	< 10 μ g/33.8 fl. oz. (1 L)
Nickel (Ni)	< 10 μ g/33.8 fl. oz. (1 L)
Zinc (Zn)	< 10 μ g/33.8 fl. oz. (1 L)
Chloride (Cl)	< 2 μ g/33.8 fl. oz. (1 L)
Source: SL-70625 section 5.5.5	

To safeguard the maximum lifetime of the secondary fluid system, the coolant used for cooling purposes must meet the ASHREA standards .

The coolant used must be soft enough to prevent deposits, but it must not be too soft because that would lead to corrosion in the water system.

Water/glycol solutions have different requirements. As stated in the notice in [Secondary Fluid Circuit Requirements](#) on page 61 a local water treatment specialist could be consulted.

Table 7.8 below , lists the most important impurities and measures for their removal.

Table 7.8 Water Quality Guidelines for the TCS

Parameter	TCS (Table 6.2, ASHRAE 2014)
pH	8.0 to 9.5
Corrosion inhibitor(s)	Required
Biocide	Required
Sulfide	<1 ppm
Sulfate	<10 ppm
Chloride	<5 ppm
Bacteria	<100 CFUs/mL
Total hardness (as CaCO ₃)	<20 ppm
Conductivity	.2 to 20 micromho/cm
Total suspended solids	<3 ppm
Residue after evaporation	<50 ppm
Turbidity	<20 NTU (Nephelometric)

7.4 Filling and Flushing Secondary Fluid Circuit

The piping must be filled prior to operating the pumps to avoid damage to the pump and pump seals. The pump seals are cooled and hydrodynamically lubricated by the system fluid.

The expansion tank contains a bladder that is pre-charged to 12 psig and is ready for use without adjustment.

When filling, bleed air from all vent locations until a steady stream of fluid is observed. Vent locations are provided as 1/4" SAE flare connections at various points in the factory piping of the Vertiv™ CoolPhase CDU. Vent locations should be provided at high points and long horizontal runs of the field piping as well.

Test the fluid quality when filling the system. Refer to [Fluid Quality Requirements for Direct to Chip Applications](#) on page 1 and [Fluid Quality Requirements for Rear Door Heat Exchanger and Direct to Chip Applications](#) on page 70 .

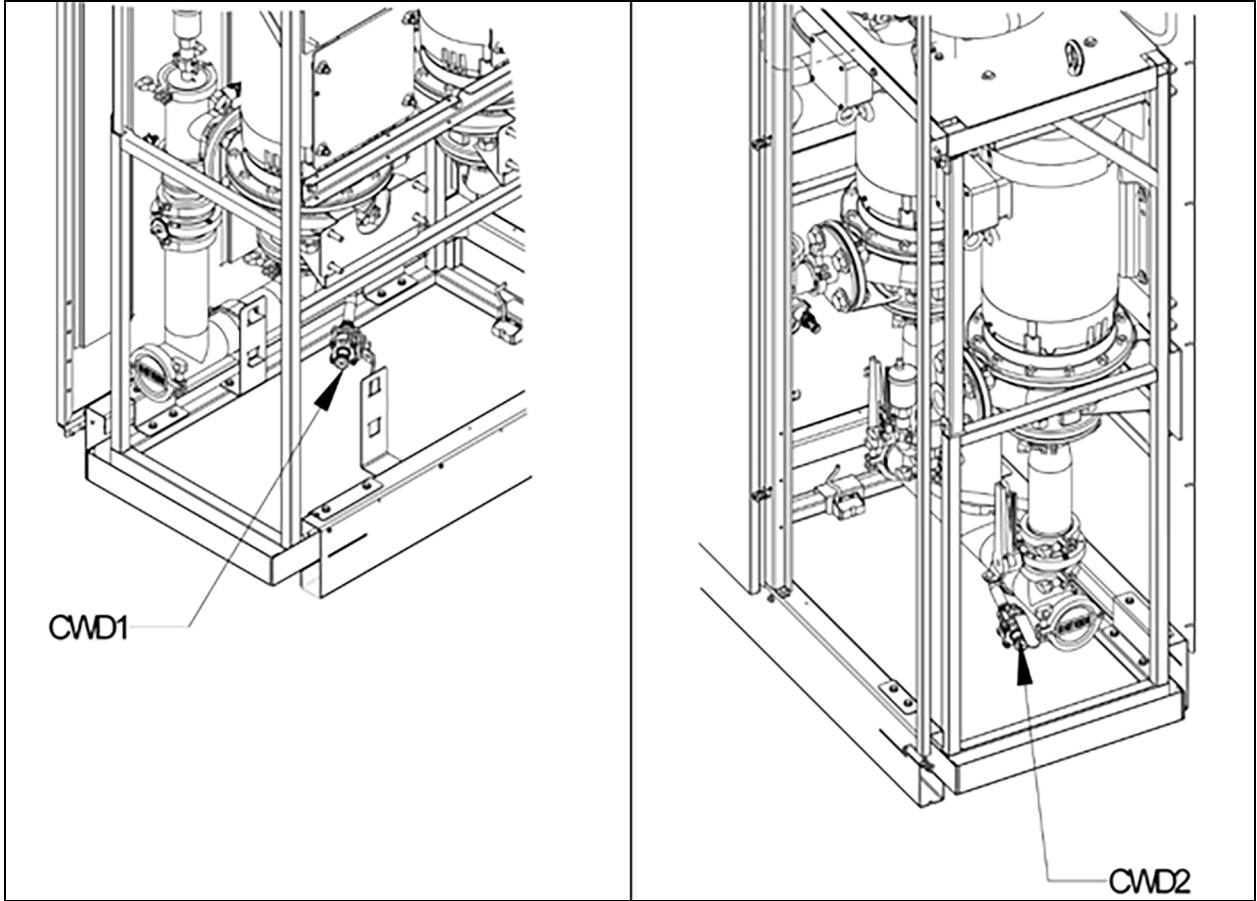
7.4.1 Flush the Secondary Row and Rack Manifold without IT Equipment

1. Locate the fill connection shown in **Figure 7.3** on the facing page in the Vertiv™ CoolPhase CDU module. Note that each CoolPhase CDU module has its own bladder tank, so on multiple CoolPhase CDU systems you may fill at one or more points, according to the CW piping system design.
2. Connect the fill water or glycol source to the desired fill valve. See **Figure 7.3** on the facing page .
3. Open high point vents where appropriate. See **Figure 7.4** on page 74 .

- 4. Turn on the water fill source. Allow it to run until all of the air is purged from the hose connected to the high point vents. Failure to properly purge the air will result in pump cavitation and premature pump failure.

NOTE: CoolPhase CDU controls will cause the unit to stop operation if enough air remains in the piping. This will show up as a "Loss of Flow" warning.

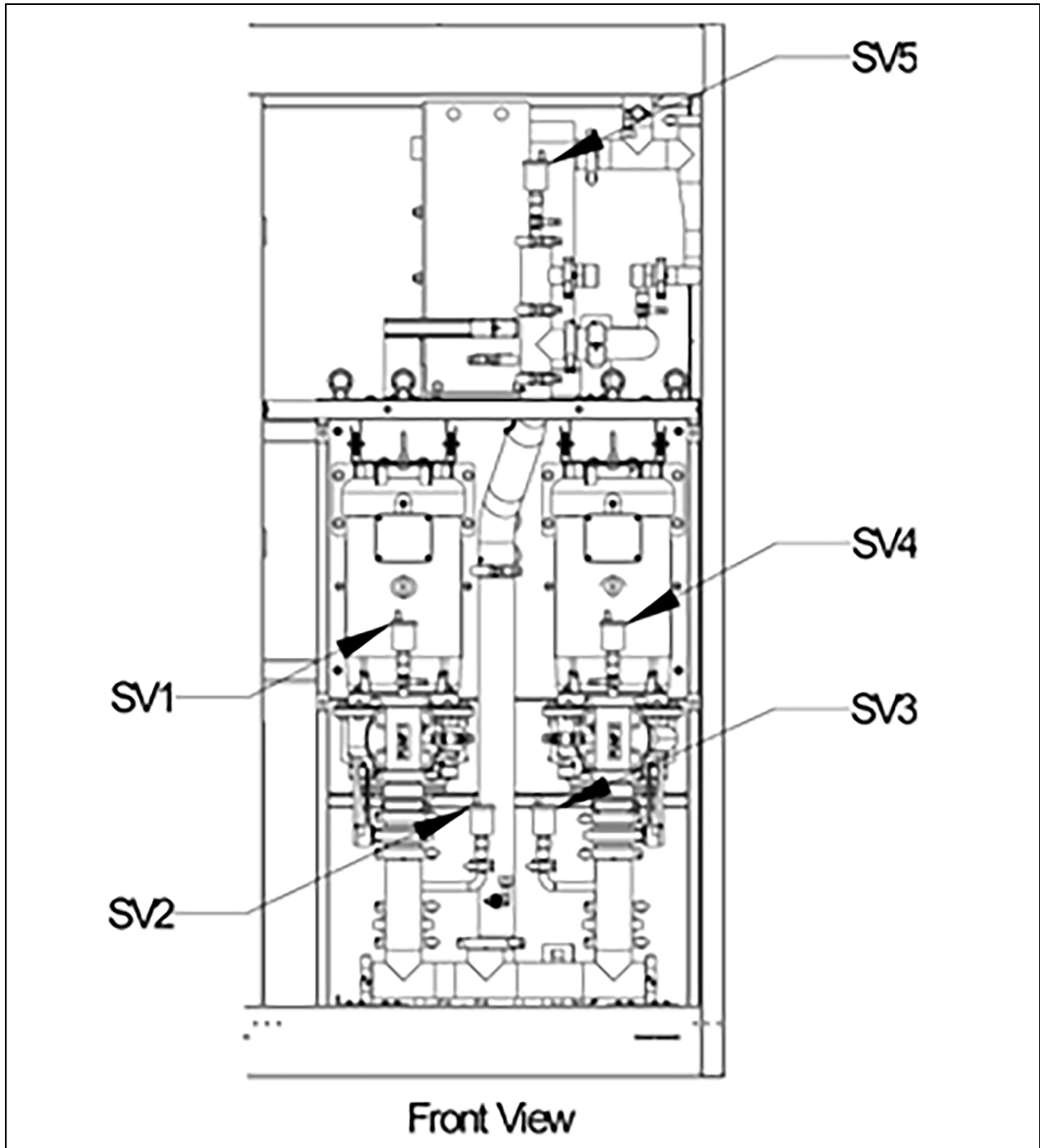
Figure 7.3 Drain/Fill Valve Location



Item	Description	Connection Size
CWD1	Chilled Water Drain	5/8" (16mm)
CWD2	Chilled Water Drain Fill Connection	

- 5. Close air vents when purged or return auto air vents to specified position (open/closed) according to field piping design. Allow water fill pressures to stabilize. The unit fill volume is listed in **Table 7.3** on page 68 .
- 6. With the unit in manual mode, turn pump(s) on for a few seconds at a time initially, resting for a minute or so between cycles, to get trapped air to move to the high points. Add additional fluid volume as needed to get a stagnant pressure of 20 psig.

Figure 7.4 Secondary Circuit Vent Port Location in the Vertiv™ CoolPhase CDU



Item	Description	Connection Size
SV1, SV2, SV3, SV4, and SV5	CoolPhase CDU vent port location	5/8" (16mm)

NOTE: A higher stagnant pressure (i.e., over 30 psig) results in a higher pump discharge pressure. Initial stagnant pressure will need to be balanced with maximum supply pressure allowed (not to exceed 100 psig).

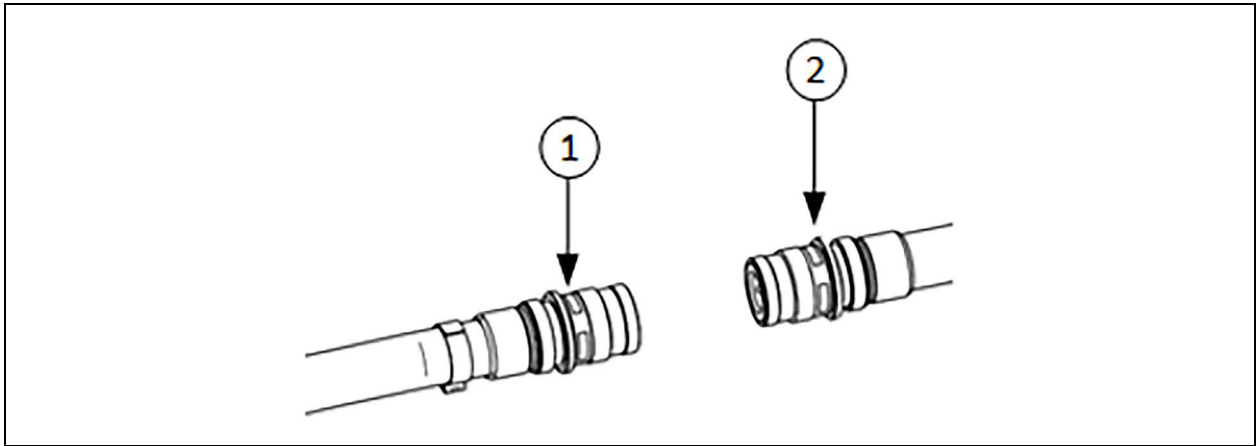
- 7. Check the pump inlet fluid pressure. Pump must be able to run at maximum pump speed for desired differential pressure and/or flow rate with inlet pressure no lower than 4 psi. Pump inlet pressure can be checked from the Liebert® iCOM™ screen. Refer to the Vertiv™ CoolPhase CDU and Vertiv™ Liebert® iCOM™ User Manuals.

It may be necessary to repeat the fill steps after the pump(s) have run to remove trapped air from the system.

NOTE: Manual mode will time out after 30 minutes.

- 8. Engineer of record and installer must provide and install a bypass jumper assembly at the rack manifold. The engineer of record must specify and determine the type of in-rack bypass assembly at the manifold (supply/return). Engineer of record to specify quantity and location of bypass assembly.

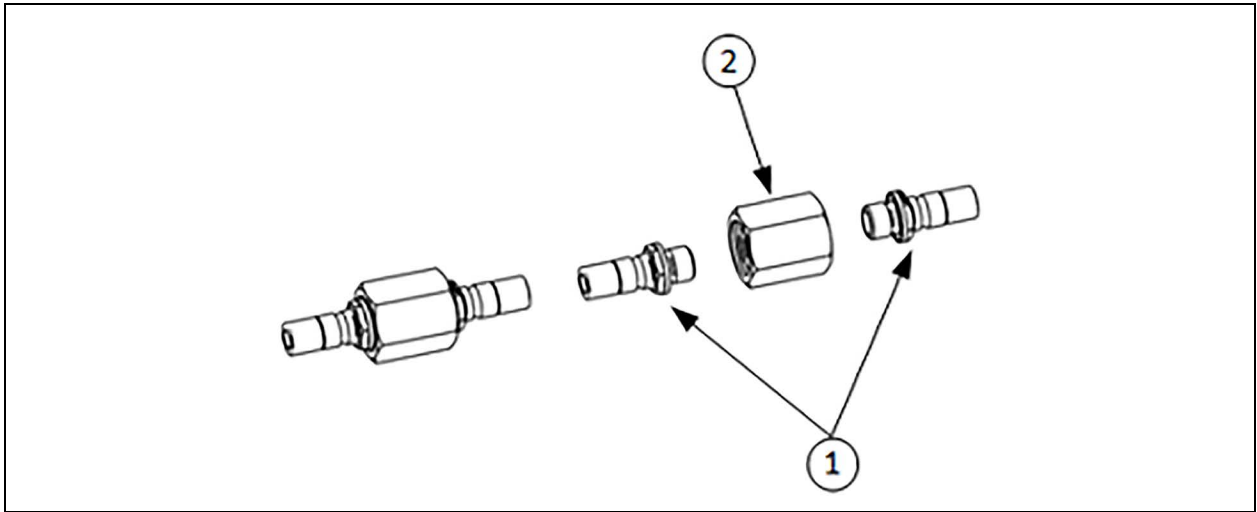
Figure 7.5 Example of In-Rack Manifold Supply and Return Hose Kits with Field Provided Quick Connects



Item	Description
1	In-rack hose connection to IT equipment – Supply
2	In-rack hose connection to IT equipment – Return

NOTE: IT Quick connect coupling size will be selected by the engineer of record.

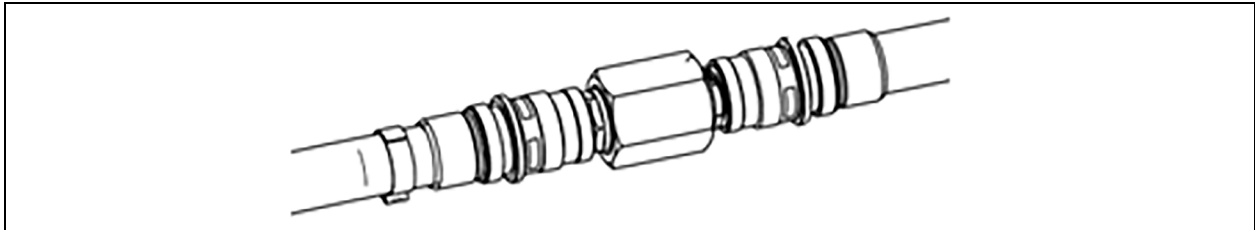
Figure 7.6 Example of a Bypass Jumper



Item	Description
1	Male Socket connect (Qty 2)
2	High pressure threaded straight (Qty 1)
NOTE: Engineer of record is responsible to make final determination regarding parts and arrangement.	

9. Connect in-rack manifold supply and return to the bypass jumper assembly.

Figure 7.7 Example of Connecting In-Rack Manifold to Bypass Jumper Assembly



10. Verify that newly fitted secondary pipework and connections, including hoses have been tested for leaks.
11. Confirm connection of hoses to row manifold and racks are tight.
12. Run system with chilled water load banks. (This step is done without customer IT equipment.)
13. Leak check system.

NOTE: We recommend isolating the CoolPhase CDU unit with field installed shut off valves during leak checking of field installed piping. When the units are included in a leak test, use of fluid for pressure testing is recommended. When pressurized gas is used for leak testing the unit, the maximum recommended pressure is 30 psig (207 kPa) and tightness of the unit would be verified by pressure decay over time (<2 psig/hour [13.8 kPa/hour]) or sensing a tracer gas with suitable instrumentation. Dry seals in fluid valves and pumps may not hold a high gas pressure.

NOTICE

Risk of leaking fluid. Can cause equipment damage and serious building damage. Check the cooling fluid system for leaks before commissioning. Check the fluid pipe connection to the heat exchanger and inspect the mechanical condition of the cooling fluid circuit and connections thoroughly.

To check for leaks:

- Check that the secondary row manifold and drip tray have been installed in the correct location (if applicable).
 - Confirm that the flow directions of field installed components are correct.
 - Confirm that all isolating valves are open.
 - Repair any leaks.
14. If no leaks are present, drain secondary fluid circuit and clean filters at the CoolPhase CDU.
 15. Run the system loop at max design flow and periodically visually check the filters in the CoolPhase CDU for contamination. Clean the filters before reintroducing them into the loop or system and continue cleaning the loop until no contamination is present. The process of running the unit and checking the filters needs to be done repeatedly until the engineer of record determines that it is appropriate to install the IT equipment.
 16. Run at the max design flow rate.

7.4.2 Fill the Secondary Row and Rack Manifold (IT equipment)

1. Locate the fill connection shown in **Figure 7.3** on page 73 in the Vertiv™ CoolPhase CDU module. Note that each CoolPhase CDU module has its own bladder tank, so on multiple CoolPhase CDU systems you may fill at one or more points, according to the CW piping system design.
2. Connect the fill water or glycol source to the desired fill valve. See **Figure 7.3** on page 73.
3. Open high point vents where appropriate. See **Figure 7.4** on page 74.
4. Turn on the water or glycol fill source. Allow it to run until all of the air is purged from the hose connected to the high point vents. Failure to properly purge the air will result in pump cavitation and premature pump failure.
5. Close air vents when purged or return auto air vents to specified position (open/closed) according to field piping design. Allow water fill pressures to stabilize. The unit fill volume is listed in **Table 7.3** on page 68.
6. With the unit in manual mode, turn pump(s) on for a few seconds at a time initially, resting for a minute or so between cycles, to get trapped air to move to the high points. Add additional fluids while pump is running as needed to get a stagnant pressure of 20 psig.
7. Fill the secondary row and rack manifold with IT equipment.
8. Run the system.

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8 Electrical Connections



WARNING! Arc flash and electric shock hazard. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off, and wear appropriate, OSHA approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC, and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert® iCOM™ controller. The factory supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



WARNING! Risk of electric shock. Can cause equipment damage, injury, or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



WARNING! Risk of short circuits and electric shock. Can cause serious injury or death. Building and equipment damage can result from cut insulation or damaged wires. Can cause overheated wiring, smoke, fire, activation of fire suppression systems and EMS personnel, and loss of power to fans. Verify that all wiring connections are tight and that all wiring is contained within the junction box prior to closing and securing the cover.

Insert CSA-certified or UL-listed bushings into holes and/or knockouts used to route wiring through metal panels to protect the wire insulation from contact with sheet metal edges.



WARNING! Risk of improper wire sizing/rating and loose electrical connections causing overheated wire and electrical connection terminals resulting in smoke or fire. Can cause serious injury or death. Building and equipment damage may also result. Use correctly sized copper wire only and verify that all electrical connections are tight before turning power On. Check all electrical connections periodically and tighten as necessary.

NOTICE

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within +/- 10% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

See transformer label for primary tap connections. Installer will need to change transformer primary taps if applied unit voltage is other than pre-wired tap voltage.

NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

Before proceeding with the electrical connections, ensure that:

- All electrical components are undamaged.
- All terminal screws are tight.
- The supply voltage and frequency are as indicated on the unit.

NOTE: The serial tag on the 600mm (24 in.) unit is on the inside of the display panel.

8.1 Power Supply Cable Connection Guidelines

- Connect the cable to the line inlet terminal board.
- Use the appropriate cable size for the current draw, supply voltage, and installation type.
- Protect the supply using a backup fuse or circuit breaker.
- Do not fit the supply cable in the raceways inside the unit's electric board—600 mm (24 inch) units.
- Use only multi-polar cables with sheath (CEI20-22).

8.2 Wiring Connection Guidelines

- Remote On/Off connections must be provided by the installer.
- The General Alarm terminals allow remote alarm signaling.

In case of short circuit, check the affected switch for sticking and replace it, if necessary.

8.3 Electrical Field Connections

The electrical connections are described in the submittal documents included in **Table 8.1** below .

The following table lists the relevant documents by number and title.

Table 8.1 Electrical Field Connection Drawings

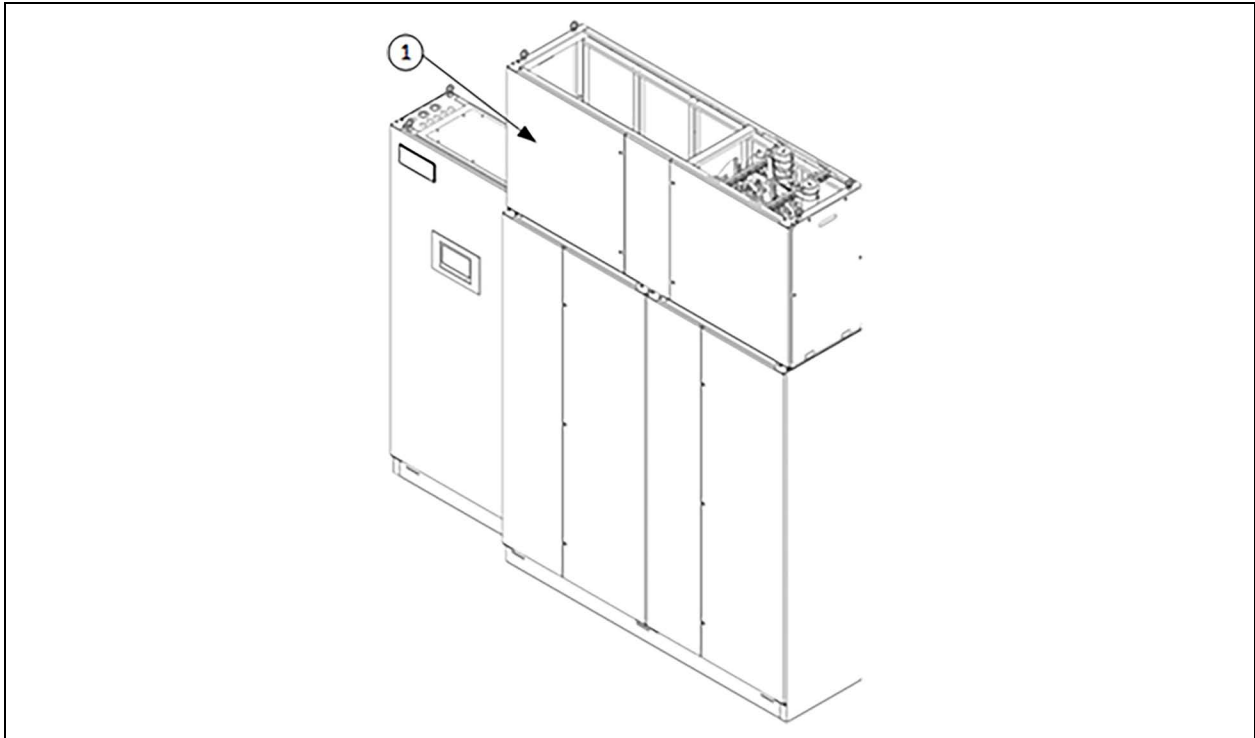
Document Number	Title
20000062	Vertiv™ Liebert® XDM Electrical Field Connections Liebert® XDM Models
DPN005140	Liebert® CoolPhase CDU CANbus and Interlock Connections Vertiv™ Liebert® MCV + Vertiv™ Liebert® EconoPhase + Base Assembly
DPN005241	CoolPhase CDU and Liebert® XDM Electrical Data

8.4 Wiring the Upper Section to the Bottom Module

The electrical connections between the upper and lower module need to be completed.

1. Open front door on the top model shown in **Figure 8.1** below .

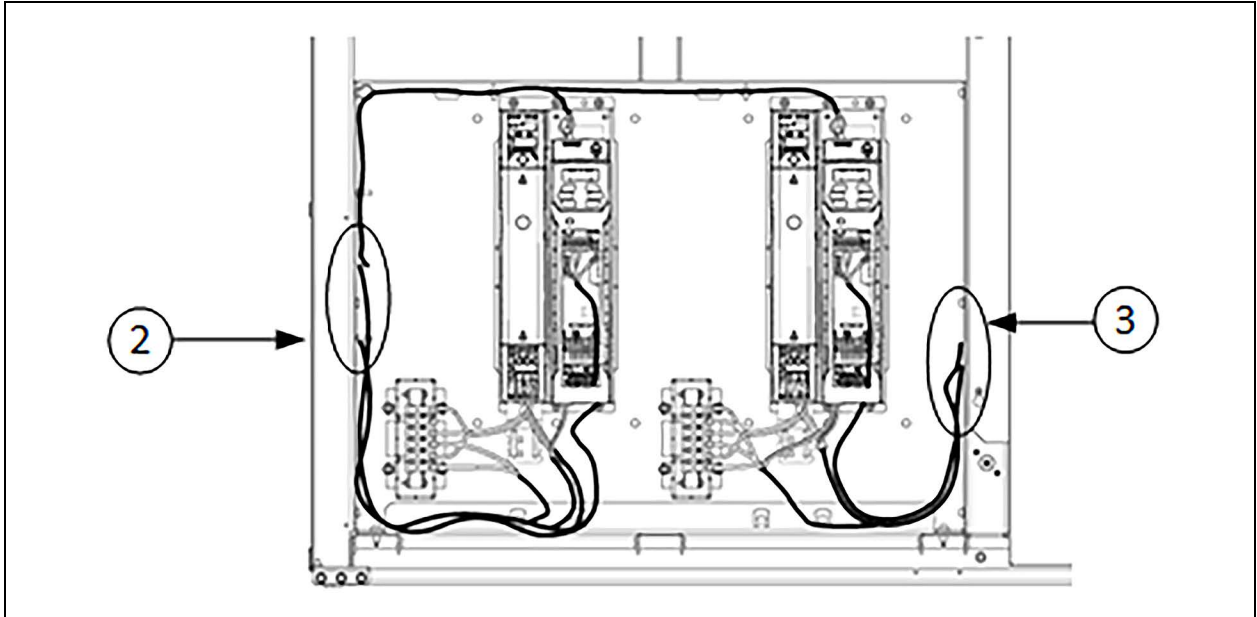
Figure 8.1 CoolPhase CDU Front Door



Item	Description
1	Front Door

2. The cables for the VFD pump are coiled up and cabled tied to the internal frame of the top module, shown in **Figure 8.2** on the next page .

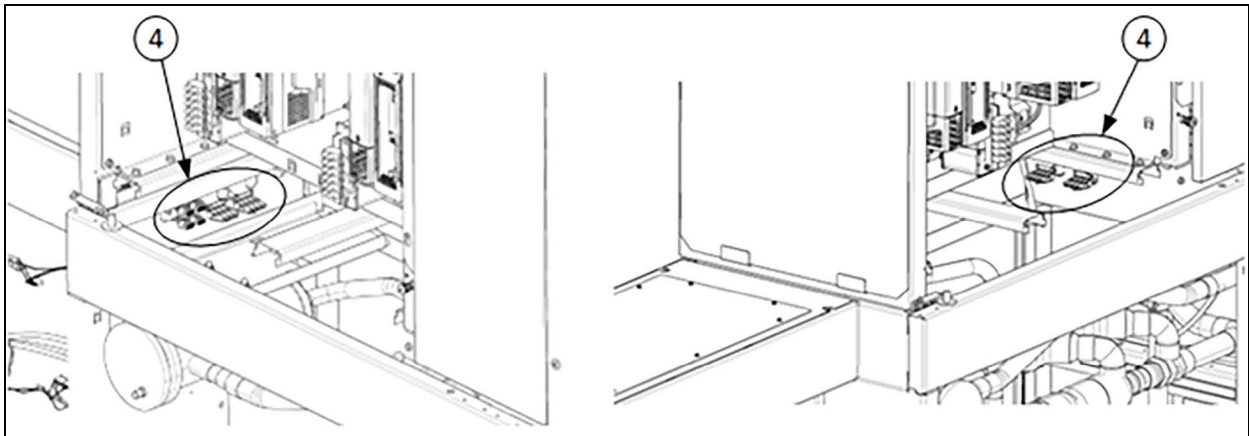
Figure 8.2 VFD Pump Cables



Item	Description
2	Pump 1 cables
3	Pump 2 cables

3. The cables will be labeled for pump 1 and pump 2 by the factory.
4. Connect the uncoiled cables for pump 1 and pump 2 to their matching connectors located in the lower module. See **Figure 8.3** below.

Figure 8.3 Pump Cable Connections



Item	Description
4	Pump cable connections

5. Make sure to connect any transducer wire harness from the bottom module to the top module, reference the main unit electrical schematic for details.

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9 Checklist for Completed Installation

NOTE: Risk of unintended pump start. Can cause equipment damage.

Do not install the ship loose fuses until the system is fully charged with fluid. Operating pumps without a full fluid charge can result in equipment damage.

9.1 Start the Vertiv™ CoolPhase CDU

To start the CoolPhase CDU:

1. Open all valves in the secondary cooling circuit according to the instruction label attached to the valve. Verify valves are located properly and that any electric valves are operating as required. (Refer to [Filling and Flushing Secondary Fluid Circuit](#) on page 72 for fluid filling and air venting instructions.)
2. Close the main switch to apply power to the unit.

NOTE: The default setting for the Vertiv™ Liebert® iCOM™ control is for standalone operation. The standalone mode lets you turn on the unit by rotating the main switch on the electrical panel. The yellow LED on the Liebert® iCOM™ display panel lights after the unit is turned on because electrical power is present.

3. Check the supply voltage on all phases.
4. Check to ensure that there are no water leaks in the secondary cooling circuit.
5. Start the unit through the home menu on the display. Tap the three bars in the upper left of the display, then turn unit on.
6. Check the amp draw on all components. (See [Electrical Connections](#) on page 79.)

9.2 Checks to Perform after Start-up

Once the system is operating under load, check the various components as follows:

1. Verify that the compressors are operating properly.
2. Ensure that the supply fluid temperature and flow are being controlled.
3. Record the following on the warranty inspection form:
 - a. Compressor and pump voltages and current draws.
 - b. All fluid temperatures.
 - c. Fluid entering and leaving pressure.
4. Check the internal filters in the Vertiv™ CoolPhase CDU, external strainers and clean if necessary.
5. Check the water filters and replace if necessary. Required due to possible debris in field piping.
6. Check pressure across pump for proper head.

9.3 Electrical Installation Checks

1. Check that supply voltages and phase matches equipment nameplate.
2. Check that power wiring connections completed to the disconnect switch, evaporator unit, and heat rejection equipment.
3. Check that power line circuit breakers or fuses have proper ratings for equipment installed.
4. Check that control wiring connections are completed between indoor evaporator and heat rejection equipment.
5. Ensure that all internal and external high and low voltage wiring connections are tight.
6. Confirm that unit is properly grounded to an earth ground.
7. Confirm that electrical service conforms to national and local codes.
8. Check compressors for proper rotation.

9.4 Vertiv™ Liebert® DX Piping Installation Checks

1. Check that piping is completed to the refrigerant loop.
2. Confirm that piping has been leak checked.
3. Check that additional oil has been added for system charges over 40 pounds (18.1kg) per circuit. See [Additional Oil Requirements for Scroll and Digital Scroll Compressors](#) on page 51 .
4. Check that piping is properly sized, sloped, and trapped as shown in the piping schematics.
5. Check piping inside and outside of equipment for proper support and adequate spacing to prevent rub through.
6. Ensure that factory clamps have been installed.
7. Confirm that the drain line is connected, not obstructed, and pitched per local code.

9.5 Vertiv™ Liebert® Secondary Circuit Piping Installation Checks

1. Check that piping is properly sized, sloped as shown in the piping schematics.
2. Check that piping is completed.
3. Check that air bleeders are installed at the high point in the piping circuits.

For overhead piping, install Vertiv™ CoolPhase CDU supply pipe at the highest point in the field piping and in long horizontal runs.

For under floor piping, the CoolPhase CDU supply pipe has the highest point and can be used to help bleed air. Also install air bleeders in the under floor piping circuit to vent trapped air from long horizontal runs.

4. Confirm that the supply line is connected, not obstructed, and pitched to the top of the unit to assist in air venting.
5. Check piping inside and outside of equipment for proper support and adequate spacing to prevent rub through.
6. Confirm that secondary cooling circuit field piping has been leak checked.
7. Confirm that between secondary cooling circuit field piping and in-rack manifold connection the field piping has been leak checked.
8. Confirm that all the in-rack manifold connections have been leak checked.
9. Confirm that the secondary cooling circuit has been flushed (without the customer equipment).
10. Confirm that the drain line is connected, not obstructed, and pitched per local code as needed.
11. Verify water detection is properly installed around all units (recommended).

10 Troubleshooting



WARNING! Arc flash and electric shock hazard. Can cause serious injury or death. Building and equipment damage may also result. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.

Verify with a voltmeter that power is Off. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components still require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The factory-supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. Follow all local codes.



WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ controller.

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.

Table 10.1 below lists possible issues, probable causes, and corrective steps.

Table 10.1 Unit Diagnostics

Symptom	Possible Cause	Check or Remedy
Pump will not energize	No main power.	Check L1, L2, and L3 for rated voltage.
	Loose electrical connections	Tighten connections.
	Blown fuse	Check fuses to pumps.
	Incorrect phase wiring	Check wiring phase.
Pump will not start or run	Pump Shutdown Alarms	Check alarm history on unit for PUMP OP W/NO FLOW or XD FLOW BLOCKED events. Check system for closed valves or blockages preventing pump flow.
	VFD error	Check alarm history on unit for PUMP INVRTR FAIL.
	No enable signal	Check 1MPR relay closure and connections.
	No control signal	Check 0-10 VDC Analog signal from P51 connections at VFD.

Table 10.1 Unit Diagnostics (continued)

Symptom	Possible Cause	Check or Remedy
Pump noisy	Air in the system	Purge air from high point vent on the top of unit.
	Cavitation due to vapor in pump	Check for adequate charge in system, see Filling and Flushing Secondary Fluid Circuit on page 72 .
	Worn motor bearings	Replace pump.
	Pump is rotating in reverse.	Check wiring phase.
Pump suddenly stops	Loss of power	When power is restored, the Vertiv™ CoolPhase CDU Liquid to Air Cooled Chiller automatically restarts.
	Clogged strainer or impeller	Clean out the debris.
Pipe rattle	Loose pipe connections	Check pipe connections.
Return water temperature high	Low fluid flow	Check alarm history for related alarms. Clean strainer. Check pressure drop of hose set and connected load. Check flow meter.
	Room temperature too high	Reduce room temperature.
Economizer Pump/compressor will not energize	No main power.	Check L1, L2, and L3 for rated voltage.
	Loose electrical connections.	Tighten connections.
	Incorrect phase wiring.	See Electrical Installation Checks on page 86 .
Local display is not operational, but unit operates	Local display cable disconnected	Connect cable.
	Local display cable damaged.	Replace cable.
	Local display configuration is lost.	Contact Vertiv Technical Support.
Local display is not operational and unit does not operate	Unit electrical supply is off	Restore electrical supply.
	Unit main switch is off.	Switch the unit on.
	Control board supply issues.	Contact Vertiv Technical Support.
	Control board issues.	Contact Vertiv Technical Support.
Vertiv™ CoolPhase CDU not making capacity.	Air in the system.	Check for adequate charge in system. See Filling and Flushing Secondary Fluid Circuit on page 72 .
	Incorrect refrigerant charge.	Check charge per conditions referenced in Table 5.11 on page 57 .

Table 10.1 Unit Diagnostics (continued)

Symptom	Possible Cause	Check or Remedy
Supply water temperature high.	Dew point margin controlling water setpoint.	Check if the dew point in the room is lower than the desired water temperature.
	Cooling system not running.	Check alarm history for related alarms.
		Compressors off due to cycling at low pressure.
		Compressors off due to high discharge pressure.

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11 Initial Start-up Checks and Commissioning Procedure for Warranty Inspection



WARNING! Arc flash and electric shock hazard. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off, and wear appropriate, OSHA approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC, and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert® iCOM™ controller. The factory supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ controller.

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious injury, or death. Installation and service of this equipment should be done only by qualified personnel who have been specially trained in the installation of air conditioning equipment and who are wearing appropriate, OSHA approved PPE.

NOTICE

Risk of improper electrical connection of three phase input power. Can cause backward compressor rotation and unit damage. Service technicians should use a gauge set on the system during the initial start-up to verify that the three phase power is connected properly. Three phase power must be connected to the unit line voltage terminals in the proper sequence so that the compressors rotate in the proper direction. Incoming power must be properly phased to prevent compressors from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that power connections were made correctly. We also recommend verifying discharge and suction pressures during start-up to ensure that the compressors are running in the correct direction.

- Confirm that all items in the [Checklist for Completed Installation](#) on page 85 have been done.
- Locate the Vertiv™ CoolPhase CDU Warranty Inspection Check Sheet in the unit's electrical panel.
- Complete the CoolPhase CDU Warranty Inspection Check Sheet during start-up.

- Forward the completed Vertiv™ CoolPhase CDU Warranty Inspection Check Sheet to your local sales office. This information must be completed and forwarded to validate warranty.
- Contact your local sales representative or technical support if you have any questions or problems during unit start-up and commissioning. Visit <https://www.Vertiv.com/en-us/support/> or call 1-800-543-2778.

12 Maintenance

12.1 Safety Instructions

All maintenance operations must strictly observe national, state, and local accident prevention regulations, especially the regulations concerning electrical systems, refrigerators, and manufacturing resources.

Air conditioning equipment maintenance may be performed only by authorized properly trained and qualified personnel.

To keep all warranties valid, the maintenance must adhere to the manufacturer's regulations.



WARNING! Arc flash and electric shock hazard. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off, and wear appropriate, OSHA approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC, and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert® iCOM™ controller. The factory supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ controller.

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



CAUTION: Risk of contact with extremely hot and/or cold surfaces. Can cause injury. Verify that all components have reached a temperature that is safe for human contact or wear appropriate, OSHA approved PPE before working within the electric connection enclosures or unit cabinet. Perform maintenance only when the system is de-energized and component temperatures have become safe for human contact.

NOTICE

Risk of improper maintenance. Can cause equipment damage.

All maintenance must be performed only by authorized, properly trained, and qualified personnel.

Ignoring safety instructions is dangerous. Soiled parts cause a loss of performance and, for switch or control devices, can lead to the breakdown of the unit performance and operation.

12.2 Maintenance Schedule

Conduct monthly, quarterly, biannual, and annual checks according to the following guidelines.

All tasks and time periods listed here are the manufacturers’ regulations and must be documented in an inspection report.

Table 12.1 Maintenance Schedule

Component		Maintenance Period			
		Monthly by User	Every 3 Months	Every 6 Months	Annually
General	Check and clean strainer.			X	
Compressor	Check oil levels.			X	
	Check for oil leaks.			X	
	Check compressor mounts.			X	
	Verify that cap tubes are not rubbing.			X	
	Check/re-torque wire connections.			X	
	Check compressor operations.			X	
	Check crankcase heater fuses. Check for refrigerant leaks			X X	
Electrical/Electronics	Check condition of contacts. Check electrical connections.			X	X
	Check operation of controller. Check unit operation sequence.			X X	
	Check all sensors for proper readings.			X	
	Pumps	Check for irregular noise from the pumps.		X	
Check for leaks of the pump casing and seals.		X			
Check motor mounts for tightness.					X

12.3 Fluid and Piping Maintenance

Maintaining the system fluid quality is required throughout the life of the system. Fluid and piping system maintenance schedules must be established and performed. A coolant fluid maintenance program must be established that will evaluate fluid chemistry and apply necessary treatment. The complexity of water condition problems and the variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced water treatment specialist and follow a regularly scheduled coolant fluid system maintenance program.

Perform periodic inspections of the heat exchanger and coolant fluid piping system for leaks and visible damage.

12.4 Spare Parts

Only original spare parts made by Vertiv must be used. Using third-party material will invalidate the warranty. When seeking technical assistance, always refer to the component list supplied with the equipment, and specify the model number, serial number and, if available, the part number.

NOTE: When replacing a faulty component, follow the relevant manufacturer instructions.

NOTE: When the spare parts must be brazed, be careful not to damage the internal parts (gaskets, seals, O-rings, etc.).

12.5 Electronic Expansion Valve (EEV) Maintenance

The EEV controls superheat through the Vertiv™ Liebert® iCOM™ controls by actively measuring suction pressure via a transducer attached to the suction line rotalock and suction temperature via a thermister strapped to the suction line. The EEV actively adjusts the orifice size and resulting mass flow of refrigerant to maintain the superheat setpoint (set in Liebert® iCOM™).



WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ controller.

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.

NOTE: Intermittent loss of subcooling may result in EEV/superheat instability. If superheat instability is observed, check for proper refrigerant level in receiver ([Refrigerant Piping Guidelines for Air Cooled Systems](#) on page 48 for the proper charge level). If proper charge is observed in receiver, and superheat remains unstable, then increase superheat setting in the Liebert® iCOM™ to 15°F (8.49°C).

12.6 Compressor Maintenance

12.6.1 Compressor Oil

NOTICE

Risk of improper compressor lubrication. Can cause compressor and refrigerant system damage.

Failure to use oil types, viscosities and quantities recommended by the compressor manufacturer may reduce compressor life and void the compressor warranty.

- Do not mix polyolester (POE) and mineral-based oils.
- Do not mix oils of different viscosities.
- Consult Vertiv technical support or the compressor manufacturer if questions arise.

Table 12.2 Compressor Oil Types for R-410A Refrigerant

Compressor Type	Oil Type
Copeland Scroll and Digital Scroll	POE Oil - ISO 32 Centistoke Viscosity ¹
1. Use Copeland POE Oil ULTRA 32-3MAF or other Copeland-approved oils.	
Source: DPN003950, Rev. 6	

12.6.2 Replacement Compressors Compressor Electrical Failure (Motor Burnout)

Replacement compressors are available through your Vertiv sales office. Do not attempt to remove the compressor without first contacting Vertiv support at 1-800-543-2778. Compressors are shipped in reusable packaging, and the original compressor should be returned in the same packaging. If the unit is under warranty, the replacement compressor must be obtained from and the original compressor returned to your local Vertiv sales office.

If a burnout has occurred, a full system clean out is required. If not cleaned, compressor and system problems will continue.

12.6.3 Replacing a Compressor without Rotalock Valve on Digital Scroll Compressors with Electrical Failure (Motor Burnout)

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. Follow all local codes. Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications.



WARNING! Risk of electric shock. Can cause serious injury or death. The Liebert® iCOM™ microprocessor does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert® iCOM™ control. Open all local and remote electric power disconnect switches and verify with a voltmeter that power is Off before working on any component of the system.



WARNING! Risk of over pressurization of the refrigeration system. Can cause explosive discharge of high pressure refrigerant, loss of refrigerant, environmental pollution, equipment damage, injury, or death. This unit contains fluids and gases under high pressure. Use extreme caution when charging the refrigerant system. Do not pressurize the system higher than the design pressure marked on the unit's nameplate.

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

1. Attach suction and discharge gauges to access fittings.
2. Recover refrigerant using an approved recovery procedure and equipment. Use a filter drier when charging the system with recovered refrigerant.
3. Remove marked pressure transducer and discharge pressure switch. Disconnect all electrical connections.
4. Detach service valves from compressor.
5. Remove failed compressor.
6. Follow compressor manufacturer's suggested clean-out procedures.

7. Install replacement compressor and make all connections. Replace gaskets or seals on service valves. Replace unloading solenoid.
8. Evacuate, charge and operate per the appropriate procedure per local codes:
 - See [Evacuation, Leak Testing, and Charging Air Cooled Systems](#) on page 54

NOTICE

Risk of improper component re-installation. Can cause equipment damage.

Identify and mark location of suction pressure transducer and discharge pressure switch. These devices look similar and they must be reinstalled in their original location.

12.7 Flow Sensor



WARNING! Arc flash and electric shock hazard. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off, and wear appropriate, OSHA approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC, and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the Liebert® iCOM™ controller. The factory supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ controller.

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



CAUTION: Risk of contact with extremely hot or cold surfaces. Can cause injury. Verify that all components have reached a temperature that is safe for human contact or wear appropriate, OSHA-approved PPE before working with the electric connection enclosures or unit cabinet. Perform maintenance only when the system is de-energized and component temperatures have become safe for human contact.

Fluid flow is sensed and reported to the unit control by an ultrasonic flow sensor. The sensor is clamped to the unit piping without penetrating the pipe or obstructing the flow.

To replace the flow sensor:

1. Shut off all power to the unit by opening the main disconnect switch on the electrical panel on the front of the Vertiv™ CoolPhase CDU.
2. Open the display door and the high voltage deadfront.
3. Remove the front panel by turning the quarter turn latches located in the top two corners of the panel, and lifting it up off the tabs in the base.
4. Disconnect the flow sensor cable.
5. Unscrew the two sensor mounting screws and remove the sensor.
6. Attach the new flow sensor to the mounting bracket with the two screws. Tighten screws evenly to ensure even pressure on the rubber backing of the flow meter.

NOTE: Do not adjust the flow sensor location once the rubber backing has made contact with the pipe. The rubber may tear, causing the flow sensor to not work properly.

7. Attach the sensor cable to the new flow sensor.
8. Replace the electric panel deadfront and restore power to the unit.
9. Program the flow sensor parameters using the instructions provided with the sensor. (See **Figure 12.1** on the facing page.)
10. Shut off all power to the unit by opening the main disconnect switch on the electrical panel on the front of the CoolPhase CDU.
11. Slide the front panel over the tabs at the base, and hold in place by turning the quarter turn latches located in the top two corners of the panel.
12. Close the high voltage deadfront and display door, fastening it in place with the quarter turn latches.
13. Restore power to the unit and close the display door.

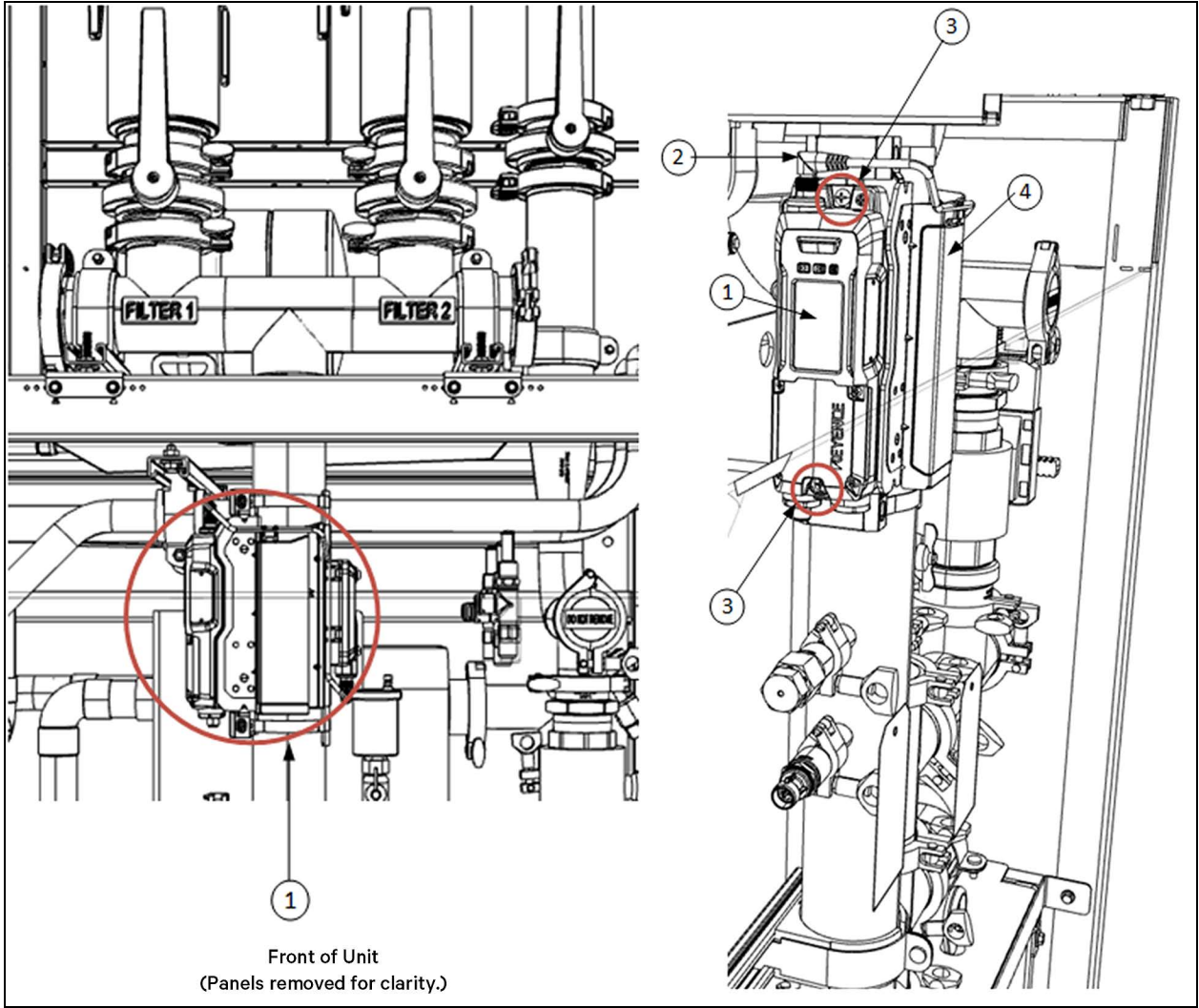
Table 12.3 Parameter Settings

Parameter Setting	Value
Analog output lower limit (A-LOF)	0 gpm
Analog output upper limit (A-HIF)	202 gpm

Table 12.4 Initial Parameter Settings

CH2	ANLG
GAL	ON
PIPE	2

Figure 12.1 Flow Sensor



Front of Unit
(Panels removed for clarity.)

Item	Description
1	Flow sensor
2	Cable connection
3	Mounting screws
4	Mounting bracket

12.8 Outdoor Heat Rejection Condenser Maintenance

Restricted airflow will reduce operating efficiency and could result in high compressor head pressure and loss of cooling.

- Clear the coil surface of all debris that will inhibit airflow.
- Check for bent or damaged coil fins and correct.
- Do not permit snow to accumulate around or under the outdoor unit.
- Periodically consider commercial cleaning of the coil surface.
- Inspect fans, motors, and controls for proper operation.
- Check all piping and capillaries for proper support.
- Inspect for leaks.
- Check contactors for pitting. Replace if pitted.

12.9 Mesh Filter Cleaning

1. Close valves on filter inlet and outlet to isolate filter in top module.
2. Vent pressure from filter through ball valve at filter outlet.
3. Remove clamp holding on filter cap and pull filter tube out of unit (cap may be hard to remove due to suction and gasket seating; carefully use a tool to help pry the edge up if gently rocking and twisting cap doesn't work.)
4. Cleaning process

- a. Backflushing

In this process, the flow of media in the filtration system is reversed as a means of removing clogged or accumulated particles from the mesh apertures. This is an important step for cleaning wire mesh filters, as removing hard-to-reach particles can help ensure that the filtration system remains compliant throughout. Do not use high velocity jets for this.

- b. Pressure Washing (optional)

Pressure washing is the use of pressurized jets of water to clean stubborn particles that are normally difficult to remove. While this method minimizes the amount of daily manual scrubbing, it is not as effective as the backflushing method when attempting to remove particles that are clogged in the mesh. Only use enough pressure to remove particles to avoid damage to liner.

5. Briefly submerge the wire mesh in a bath filled with warm water.
6. Be sure to gently scrub it with soft nylon brushes, while it is submerged to remove more stubborn contaminants.
7. Rinse thoroughly with clean water, then you may wish to blot, or gently blow dry.

13 Preventive Maintenance Checklist

Inspection Date		Job Name	
Indoor Unit Model #		Indoor Unit Serial Number #	
Condenser Model #		Condenser Serial #	
Room Temperature/Humidity	° %	Ambient Temperature	°

Not all units will have all components. To determine your unit's configuration, compare the Indoor Unit Model # above and the information in [Nomenclature and Components](#) on page 9.

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

Check all that apply:

Electrical Panel

1. Check the fuses.
2. Check the contactors for pitting.
3. Check/re-torque the wire connections.

Controls

1. Check all sensors for proper readings.
2. Check/verify the control operation (sequence).
3. Check/test the change over device(s) (if equipped).
4. Check/test the water detection devices(s) (if equipped).
5. Check/re-torque the wire connections.

Refrigerant Piping

1. Check the refrigerant lines (clamps secure, no rubbing, no leaks).
2. Check for moisture.
3. Check for restriction temperature drop across filter drier.

Compressor Section

1. Check the oil level.
2. Check for oil leaks.
3. Check the compressor mounts (springs/bushings).
4. Verify that the cap tubes are not rubbing.
5. Check/re-torque the wire connections (inside the compressor box).
6. Check the compressor operation (vibration/noise).
7. Check the crank case heater fuses (operation).
8. Check for refrigerant leaks.

<input type="checkbox"/> Suction Pressure	Circuit #1	_____	Circuit #2	_____
<input type="checkbox"/> Discharge pressure	Circuit #1	_____	Circuit #2	_____
<input type="checkbox"/> Superheat	Circuit #1	_____	Circuit #2	_____
<input type="checkbox"/> Low pressure switch cut out	Circuit #1	_____	Circuit #2	_____
<input type="checkbox"/> Low pressure cut in	Circuit #1	_____	Circuit #2	_____
<input type="checkbox"/> High pressure cut out	Circuit #1	_____	Circuit #2	_____
<input type="checkbox"/> Amp draw				

Pump

- Check for pump motor bearing noise.
- Verify that pump suction pressure is above 10 psi.

Suction:							
----------	--	--	--	--	--	--	--

- Pump amp draw

#1	L1		L2		L3	
#2	L1		L2		L3	

- Verify pump change over (if multiple pumps).

Other

1. Verify that the expansion tank air pressure is above 10 psi.
2. Verify that proper water maintenance is being performed.
3. Check for water leaks.
4. Compare the pump to nameplate amps.
5. Check for restriction temperature drop across the filter drier.
6. Check/test the water detection device(s), if equipped.

Pump Customer Fluid Loop

1. For optional main and bypass water filters, check pressure drop. If necessary, replace filter. Customer to provide BMS monitoring for filter replacement.
2. Check strainer to determine if it needs to be cleaned.
3. Check for leaks at all connections.

Vertiv™ Liebert® MC or Vertiv™ Liebert® MCV Condenser

1. Make sure that the coil is clean of debris (clean coil if required).
2. Verify that the fans are free of debris.
3. Ensure that the fans are securely mounted.
4. Confirm that the motor bearings are in good condition.
5. Check all refrigerant lines for vibration isolation. Support as necessary.
6. Check for refrigerant leaks.
7. Check the surge protection device (if installed) status-indicator lights.

- 8. Check/Re-torque the wire connections.
- 9. Check the contactors for pitting (replace if pitted).
- 10. Verify the operation sequence/set points.
- 11. Charge verification:
 - a. Outdoor ambient temperature.
 - b. Subcooling
 - c. Indoor unit return air temperature

Motor amp draw

#1	L1		L2		L3	
#2	L1		L2		L3	
#3	L1		L2		L3	
#4	L1		L2		L3	
#5	L1		L2		L3	
#6	L1		L2		L3	
#7	L1		L2		L3	
#8	L1		L2		L3	
#9	L1		L2		L3	
#10	L1		L2		L3	
#11	L1		L2		L3	
#12	L1		L2		L3	
#13	L1		L2		L3	
#14	L1		L2		L3	
#15	L1		L2		L3	
#16	L1		L2		L3	

Vertiv™ Liebert® EconoPhase Pumped Refrigerant Economizer

- 1. Check for refrigerant leaks.
- 2. Check/re-torque the wire connections.
- 3. Check the contactors for pitting (replace if pitted).
- 4. Verify the pump speed control operation.
- 5. Check the pump mounting.

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, USA

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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Appendix B: Submittal Drawings

Below is a list of related submittal drawings. The drawings follow the list and are presented in the same order as the list.

Table B.1 Submittal Drawings Contents

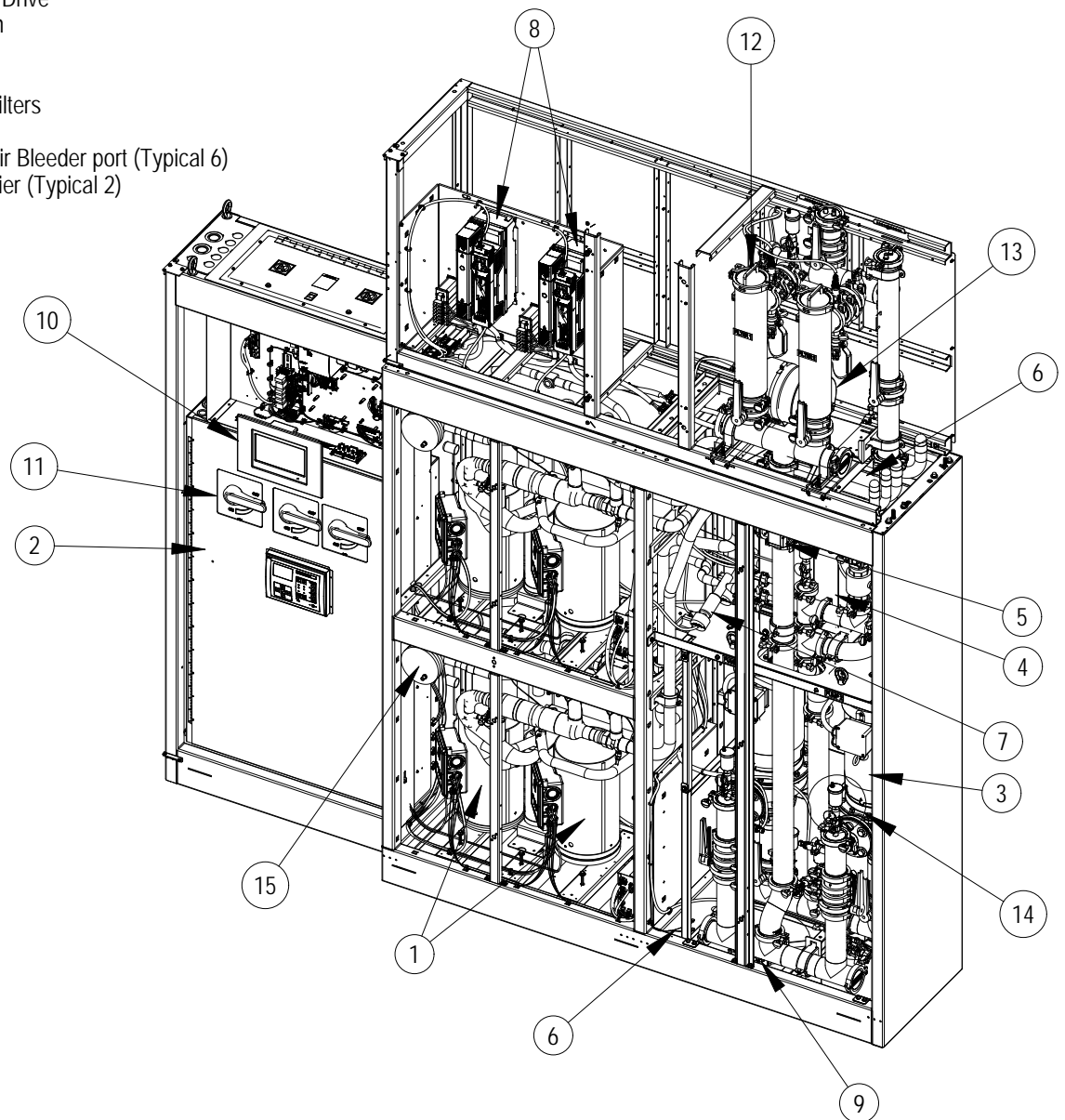
Document Number	Title
Component Locations	
20000061	CoolPhase CDU Component Location Diagram
Planning Dimensions XDM	
20000058	CoolPhase CDU Cabinet Dimensional Data
10032070	Liebert® Heat Rejection Cabinet & Anchor Dimensional Data Liebert® MCV430 + Liebert® EconoPhase + Base Assembly
10032072	Liebert® Heat Rejection Skid Cabinet & Anchor Dimensional Data Liebert® MCV430 (2) + Liebert® EconoPhase (2) + Base Assembly
10032077	Liebert® Heat Rejection Skid Cabinet Lifting Points Liebert® MCV430 + Liebert® EconoPhase + Base Assembly
10032078	Liebert® Heat Rejection Skid Cabinet Lifting Points Liebert® MCV430 (2) + Liebert® EconoPhase (2) + Base Assembly
Planning Dimensions Floorstand	
20000060	CoolPhase CDU Floorstand Dimensional Data 300kW
Piping General Arrangement	
10025700	Glycol and Water Requirements
20000059	CoolPhase CDU Piping Schematic
20000101	CoolPhase CDU Air Cooled Piping Schematic Liebert® MCV without Receiver Mounted Above XDM300
Piping Connection Drawings	
20000057	CoolPhase CDU Primary Connection Locations
10032073	Liebert® Heat Rejection Skid Primary Connection Locations Liebert MCV, MCV430 + Liebert® EconoPhase + Base Assembly
10032075	Liebert Heat Rejection Skid Primary Connection Locations Liebert® MCV430 (2) + Liebert® EconoPhase (2) + Base Assembly
Refrigeration Piping Layout and Condenser Positioning Drawings	
20000101, p1	CoolPhase CDU Air Cooled Piping Schematic Liebert® MCV Mounted above Liebert® XDM
20000101, p2	CoolPhase CDU Piping Schematic Liebert® MCV and Liebert® XDM at Similar Level
DPN000788	Recommended Refrigerant Line Sizes CU, OD Air Cooled Systems Using R-410A
Electrical Field Connections	
20000182	CoolPhase CDU CANbus and Interlock Connections Liebert® MCV + Liebert® EconoPhase + Base Assembly
DPN005241	CoolPhase CDU and Liebert® XDM Electrical Data
20000062	CoolPhase CDU Electrical Field Connections
Liebert® iCOM™ Display	
DPN004350	Liebert® iCOM Product Information Unit Mounted Display

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COOLPHASE CDU

COMPONENT LOCATION DIAGRAM XDM300

1. Compressors (Typical 4)
2. Electric Panel
3. Pump (Typical 2)
4. Heat Exchanger
5. Flowmeter
6. Leak Detection
7. Electronic Expansion Valves (Typical 2)
8. Variable Frequency Drive
9. Fluid Fill Connection
10. Liebert® iCOM™
11. Main Disconnect
12. Secondary Circuit Filters
13. Expansion Tank
14. Secondary Circuit Air Bleeder port (Typical 6)
15. Refrigerant Filter Drier (Typical 2)

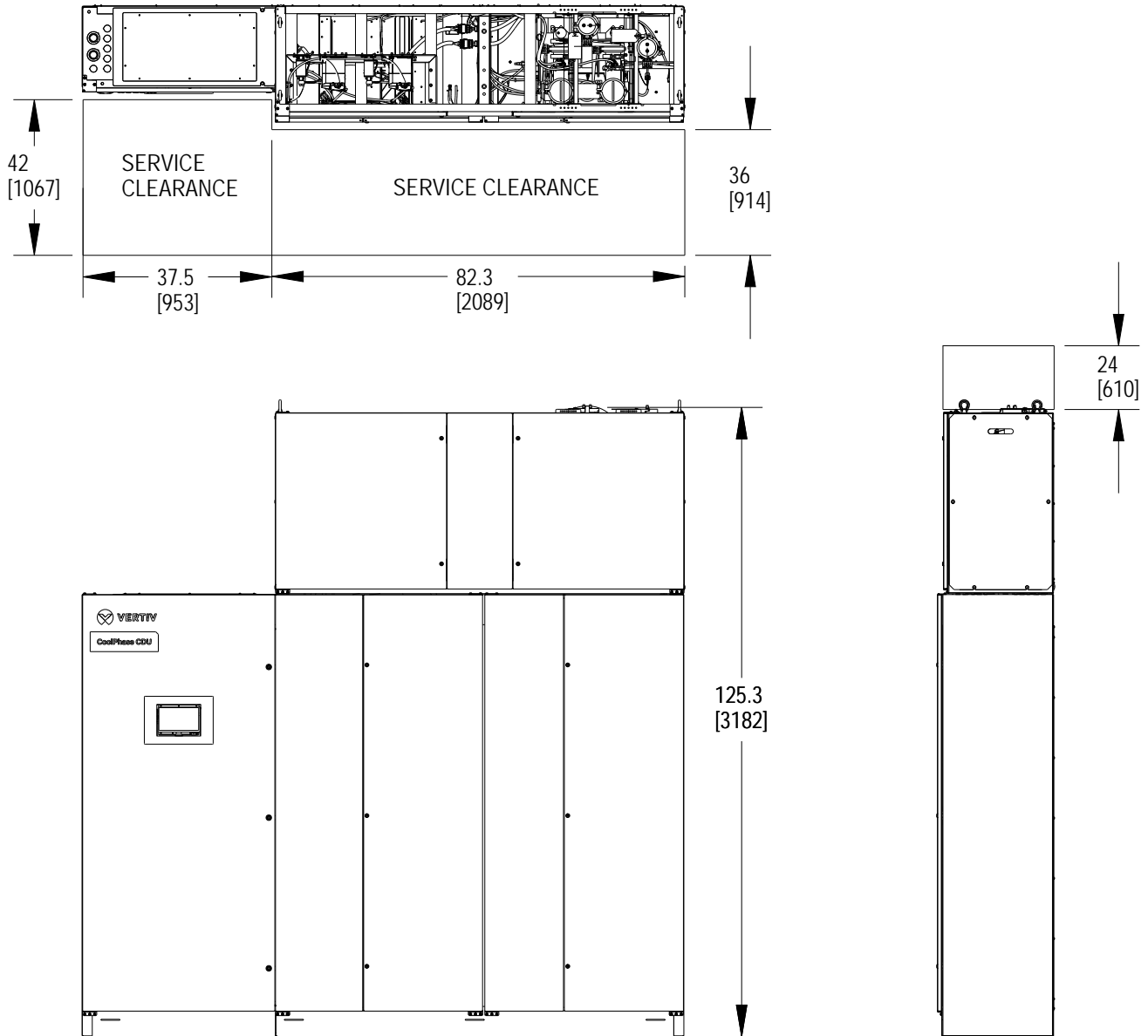




COOLPHASE CDU

CABINET & ANCHOR DIMENSIONAL DATA XDM300

XDM300 FULLY ASSEMBLED



Notes:
1. All dimensions are in inches [mm].

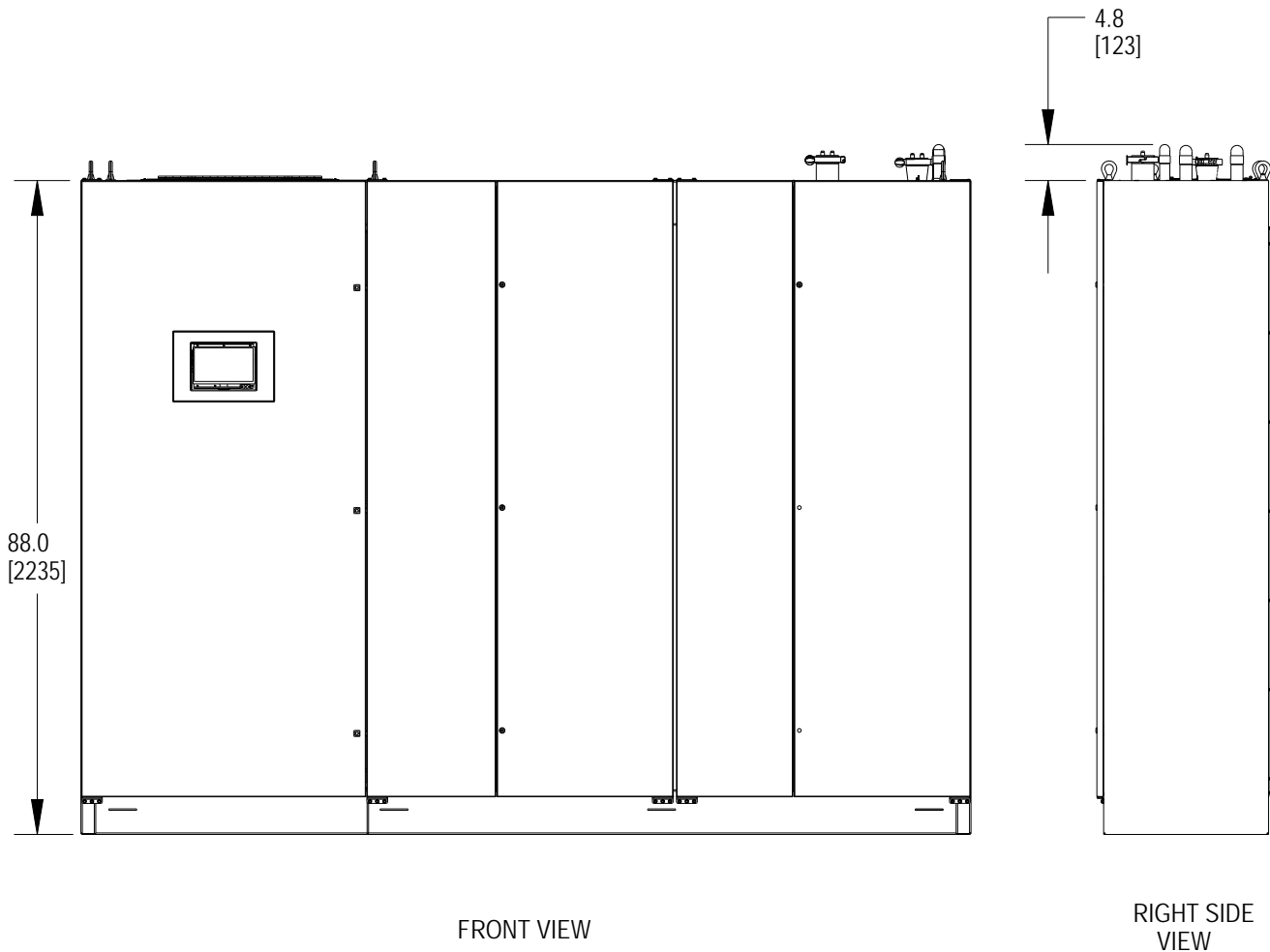
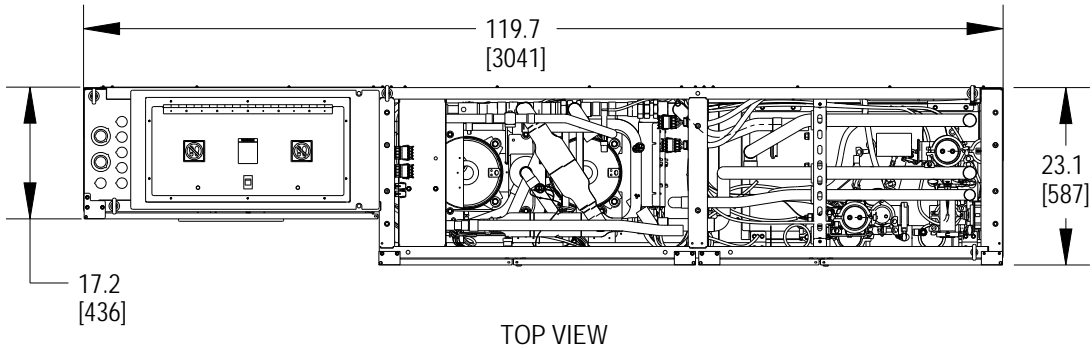
Approximate Dry Weight lbs. (kg.)	
Bottom Module	2873 (1303)
Upper Module	415 (188)



COOLPHASE CDU

CABINET & ANCHOR DIMENSIONAL DATA XDM300

LOWER MODULE



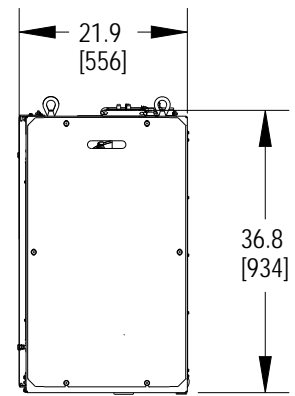
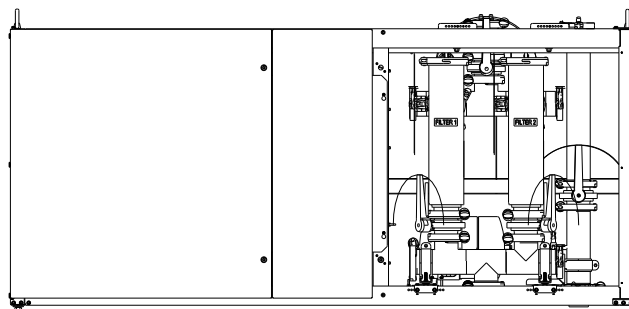
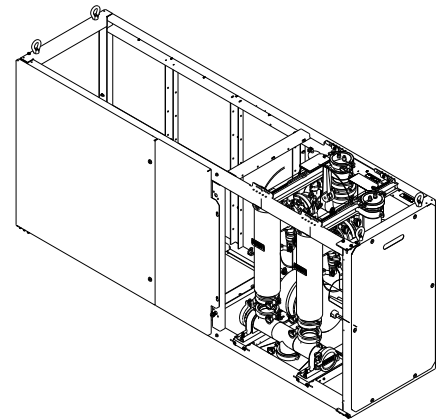
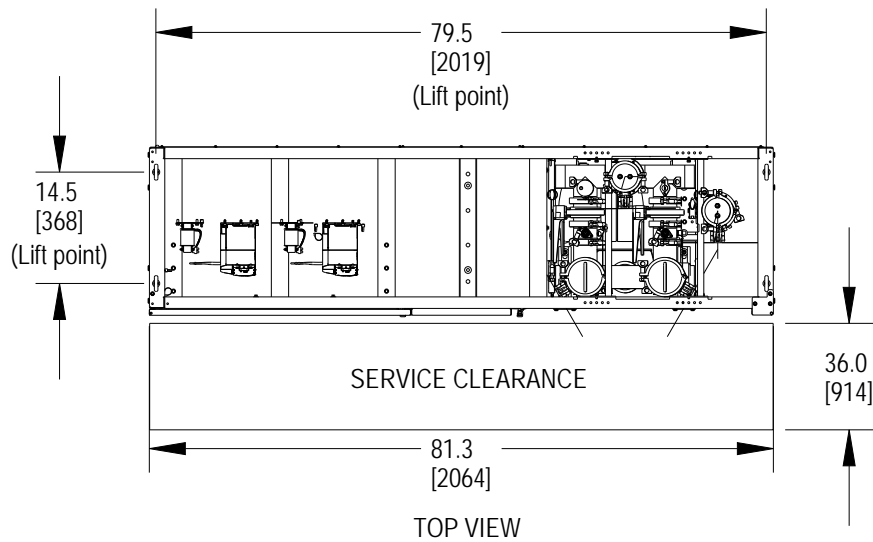
Notes:

1. All dimensions are in inches [mm].

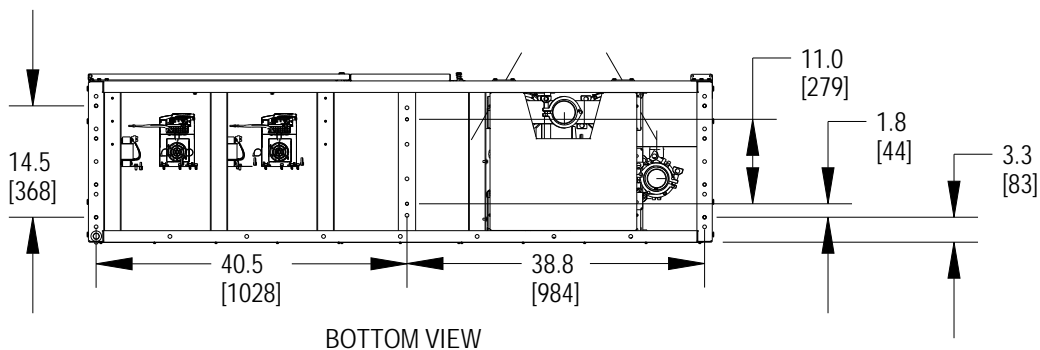
COOLPHASE CDU

CABINET & ANCHOR DIMENSIONAL DATA XDM300

UPPER MODULE



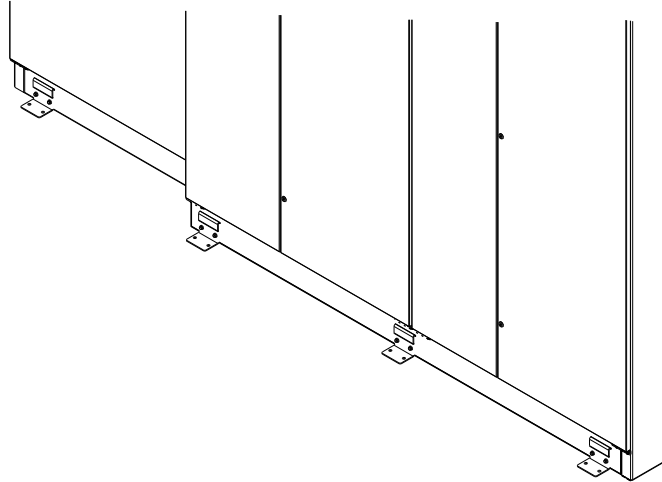
Panels removed for clarity to show Secondary Circuit shut off valves



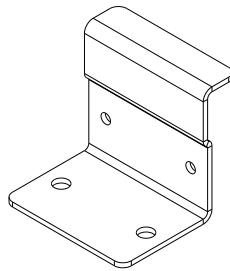
Notes:

1. All dimensions are in inches [mm].

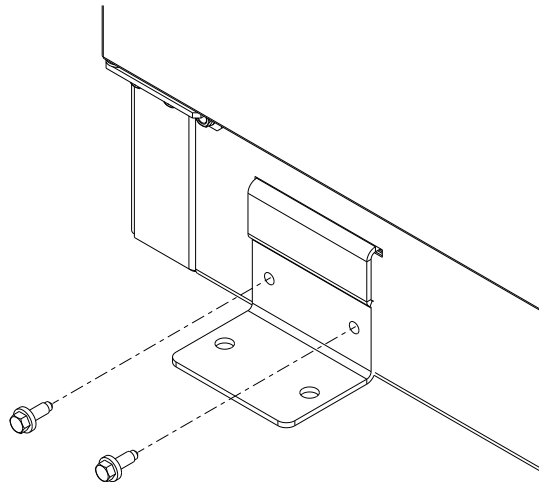
CABINET & ANCHOR DIMENSIONAL DATA XDM300



FRONT OF UNIT



BRACKET



Notes:

1. Orient the bracket as shown
2. Drill a qty 2 (7/32 inch (0.218 mm)) holes into the XDM Frame
3. Install two (2) 1/4-20 self drilling screws into the XDM Frame. (Typical 8 Places)
4. Anchor Bolt sized and specified by Engineer of Record.

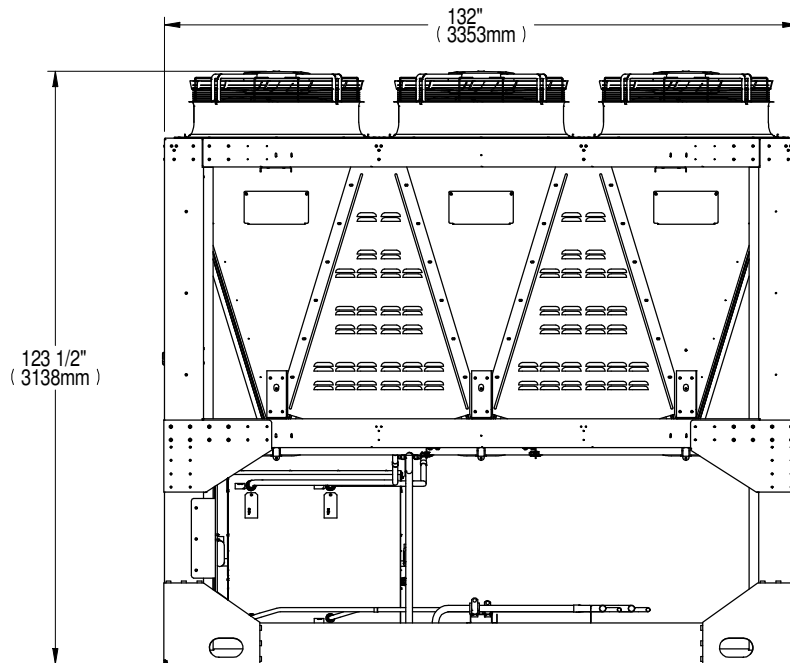
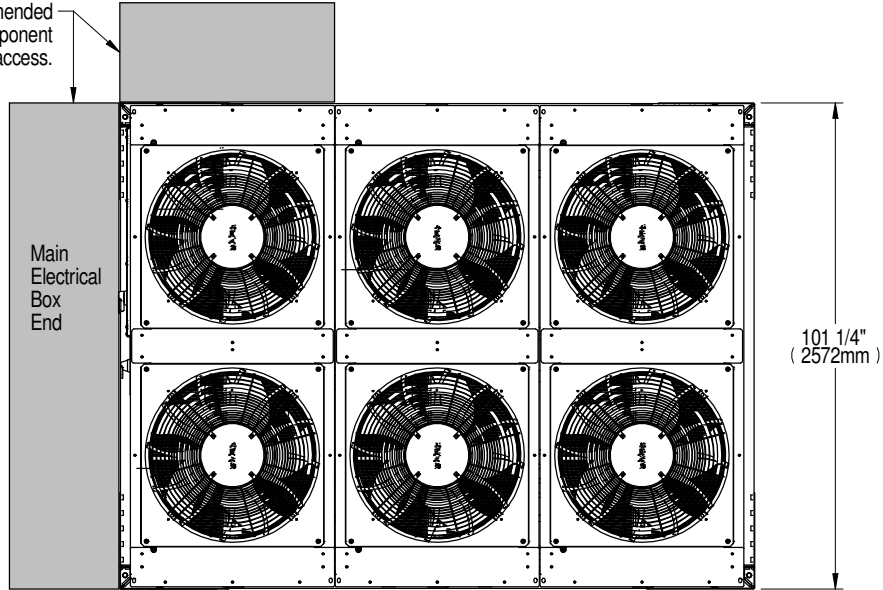


LIEBERT® HEAT REJECTION SKID

CABINET & ANCHOR DIMENSIONAL DATA

LIEBERT® MCV430 + LIEBERT® ECONOPHASE + BASE ASSEMBLY

Shaded area indicates recommended 36" (914mm) clearance for component access.



Domestic Shipping Weight lb. (kg)	Export Shipping Weight lb. (kg)
4,900 (2,223)	5,100 (2,313)

NOTES:

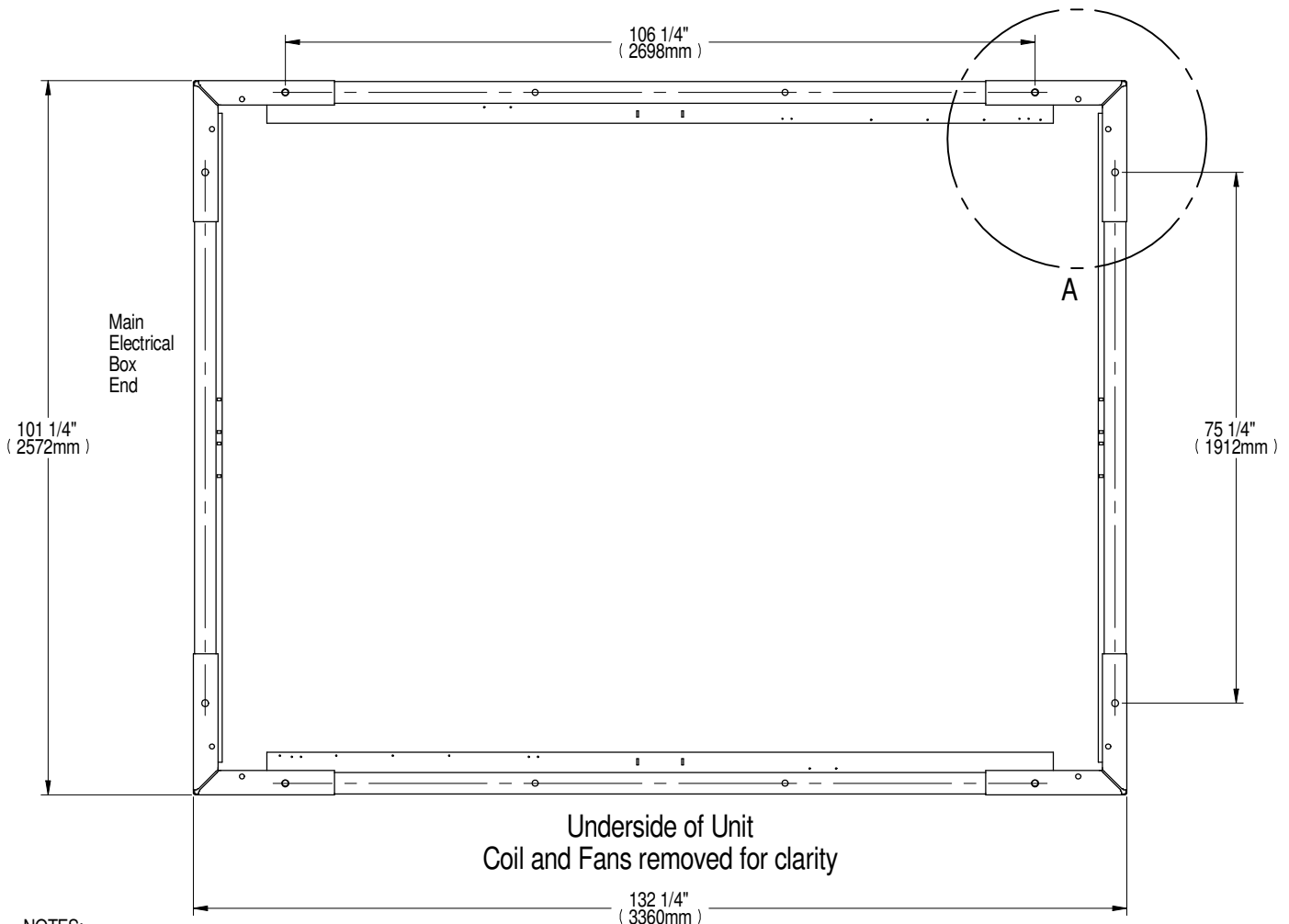
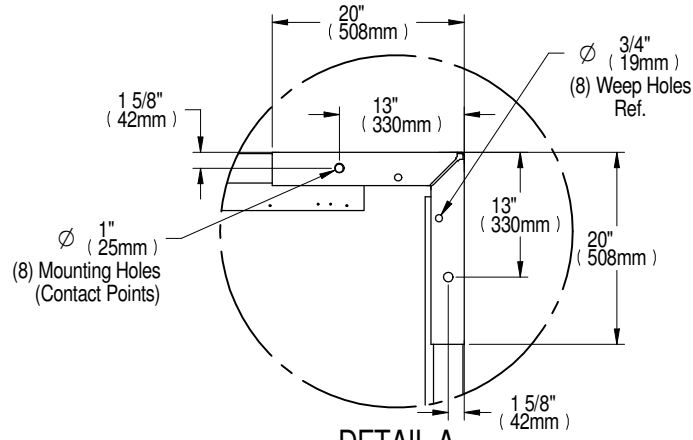
- 1) Minimum clearance on the Main Unit Disconnect Enclosure shall be 48" (1219mm) or per local code.
- 2) Recommended minimum 48" (1219mm) clearance when multiple skids are mounted side by side to ensure proper airflow. Contact the factory for other spacing requirements.



LIEBERT® HEAT REJECTION SKID

CABINET & ANCHOR DIMENSIONAL DATA

LIEBERT® MCV430 + LIEBERT® ECONOPHASE + BASE ASSEMBLY



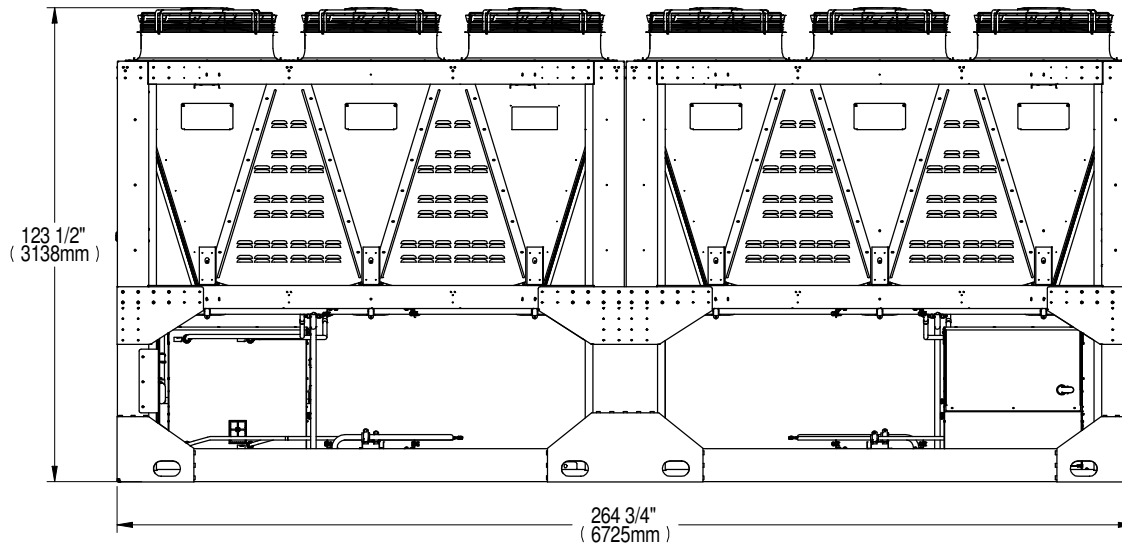
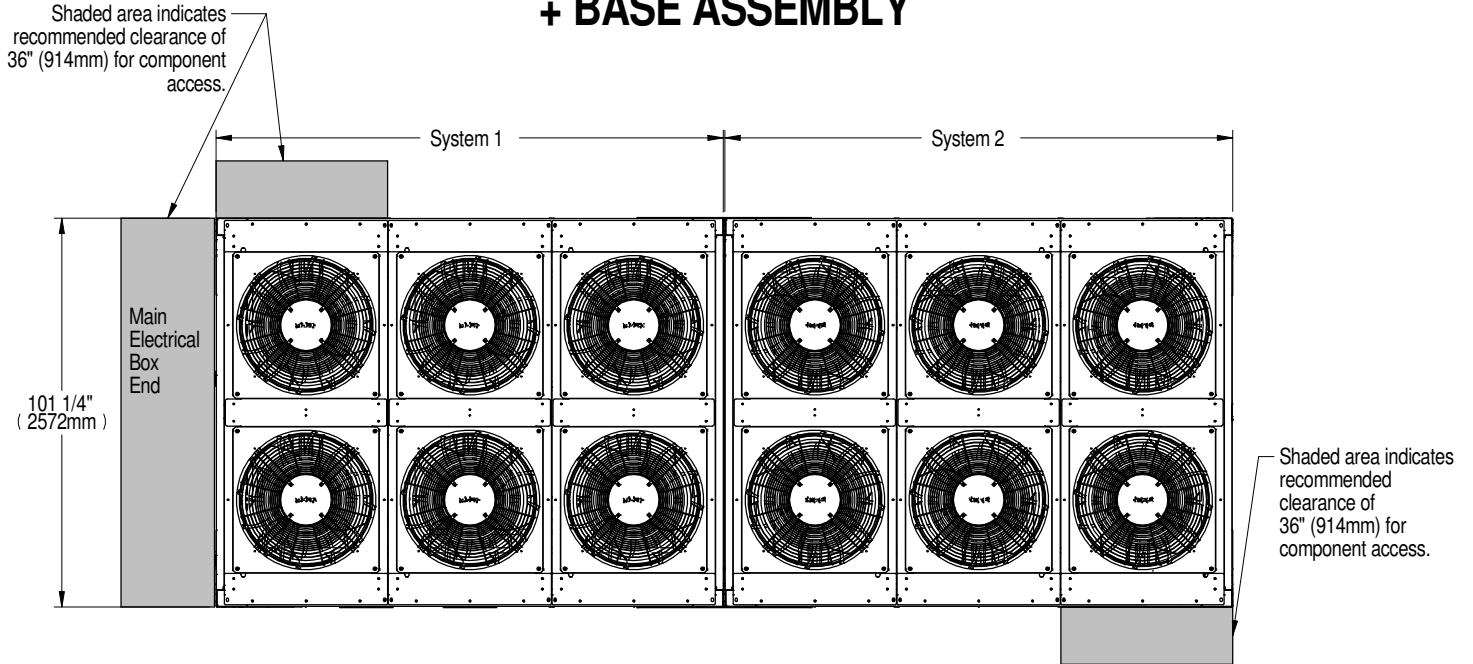
NOTES:

- 1) Underside of unit, coil and fan removed for clarity.
- 2) Four mounting holes and four 3/4" field supplied bolts required to secure skid base assembly to customer support structure. Bolt grade to be specified by local requirements.



LIEBERT® HEAT REJECTION SKID

CABINET & ANCHOR DIMENSIONAL DATA LIEBERT® MCV430 (2) + LIEBERT® ECONOPHASE (2) + BASE ASSEMBLY



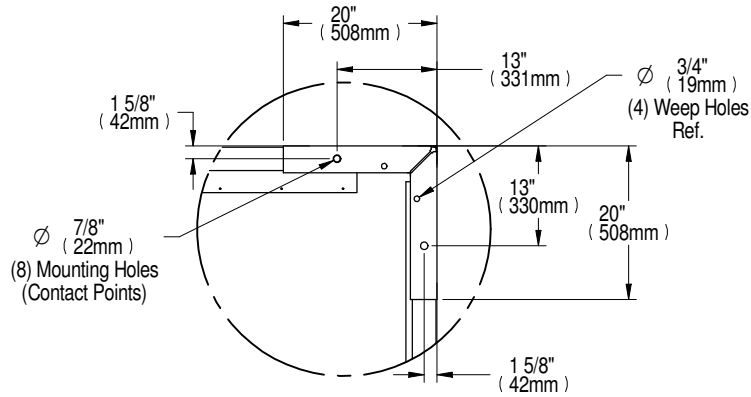
Domestic Shipping Weight lb (kg)	Export Shipping Weight lb (kg)
9,800 (4,445)	10,150 (4,604)

Notes:

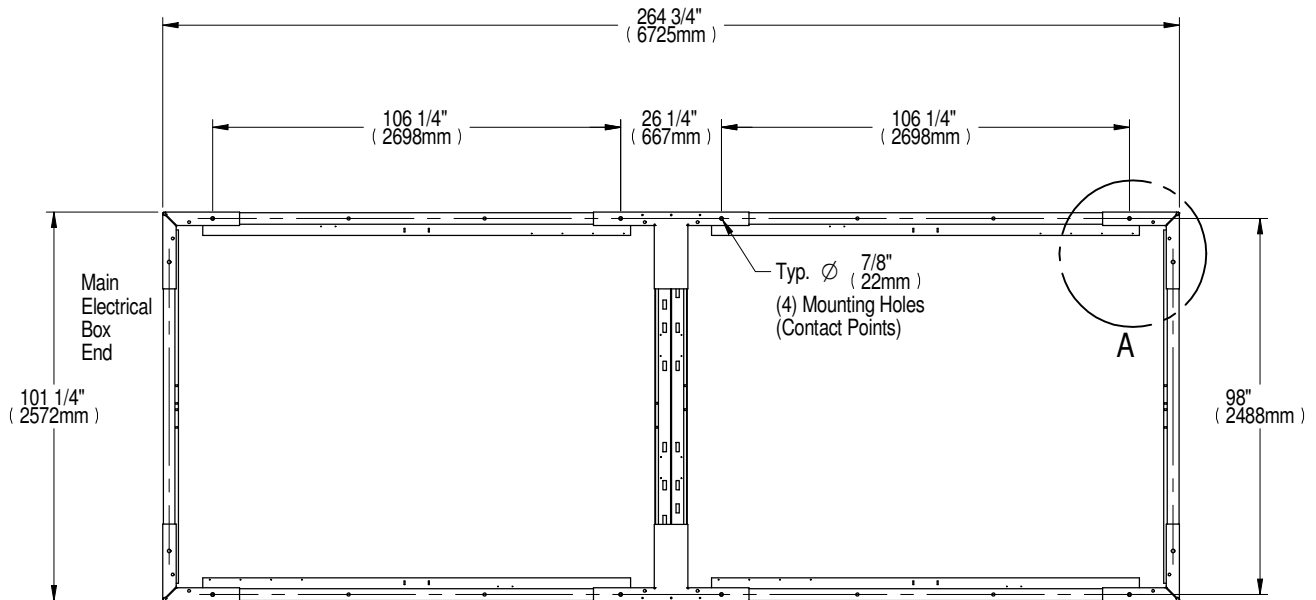
1. Minimum clearance of the Main Unit Disconnect Enclosure shall be 48" (1219mm) or per local electrical code.
2. Recommended minimum 48" (1219mm) clearance when multiple skids are mounted side by side to ensure proper airflow. Contact the factory for other spacing requirements.

LIEBERT® HEAT REJECTION SKID

CABINET & ANCHOR DIMENSIONAL DATA LIEBERT® MCV430 (2) + LIEBERT® ECONOPHASE (2) + BASE ASSEMBLY



DETAIL A
TYP. (4) PLACES



Underside of Unit
Coil and Fans removed for clarity

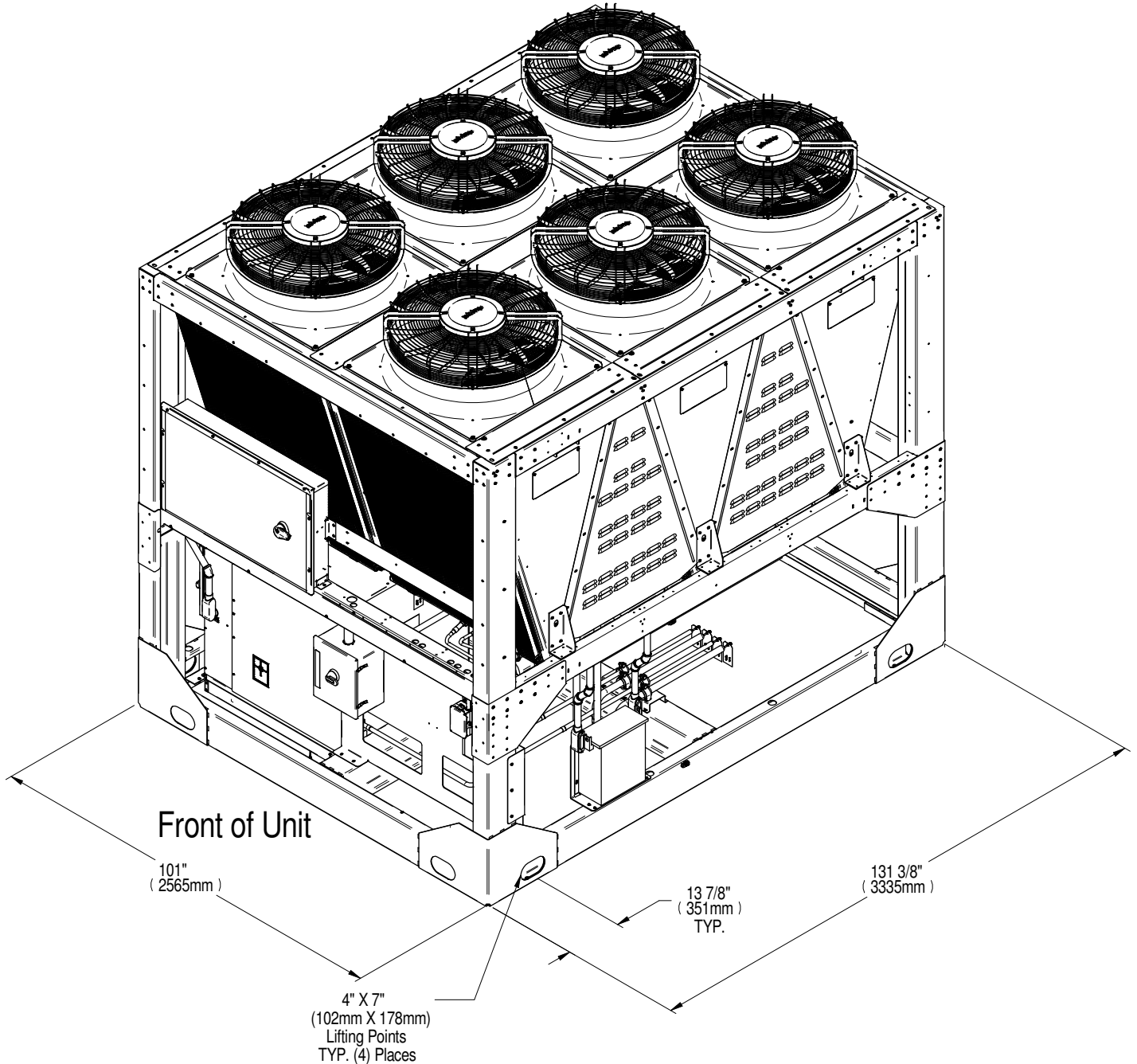
Notes:

1. Underside of unit, coil and fan removed for clarity.
2. Eight mounting holes and eight 3/4" field supplied bolts required to secure skid base assembly to customer support structure. Bolt grade to be specified by local requirements.

LIEBERT® HEAT REJECTION SKID

CABINET LIFTING POINTS

LIEBERT® MCV430 + LIEBERT® ECONOPHASE + BASE ASSEMBLY

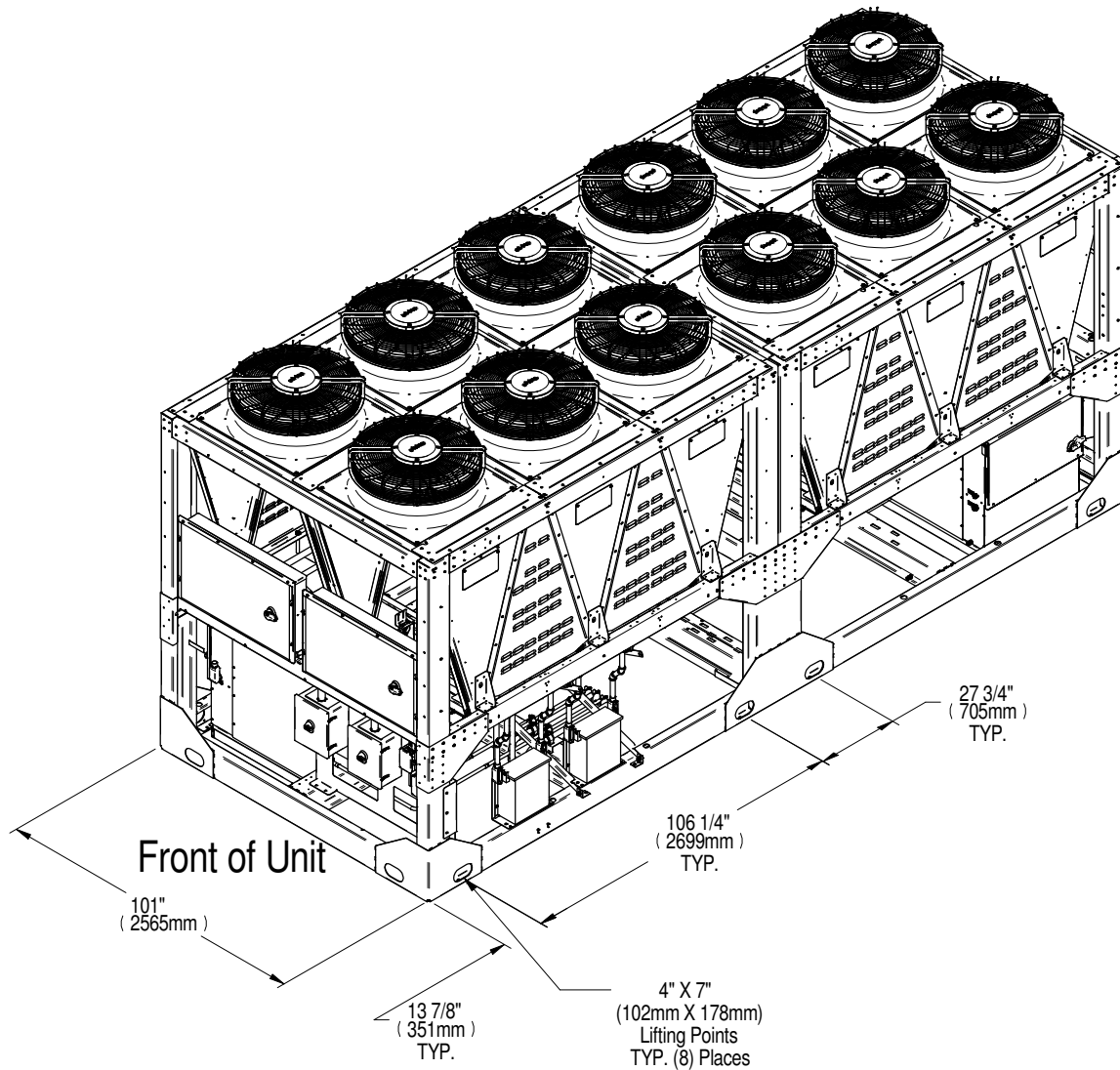


Notes:

1. Use indicated lifting points to lift the unit. Use spreader bars and/or shimmed blocks to prevent external damage.
 2. Unit must be lifted level. Tilting can cause damage to the equipment inside.
 3. Use proper rigging equipment to make sure attachment and lifting at the designated lift points is in the vertical direction.
- Refer to User Manual for site instructions.

LIEBERT® HEAT REJECTION SKID

CABINET LIFTING POINTS LIEBERT® MCV430 (2) + LIEBERT® ECONOPHASE (2) + BASE ASSEMBLY

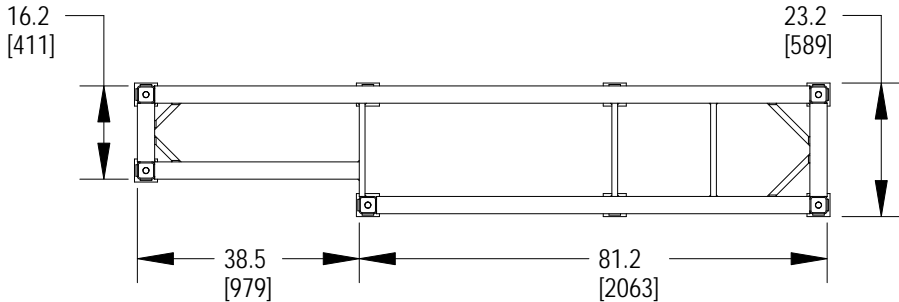


Note:

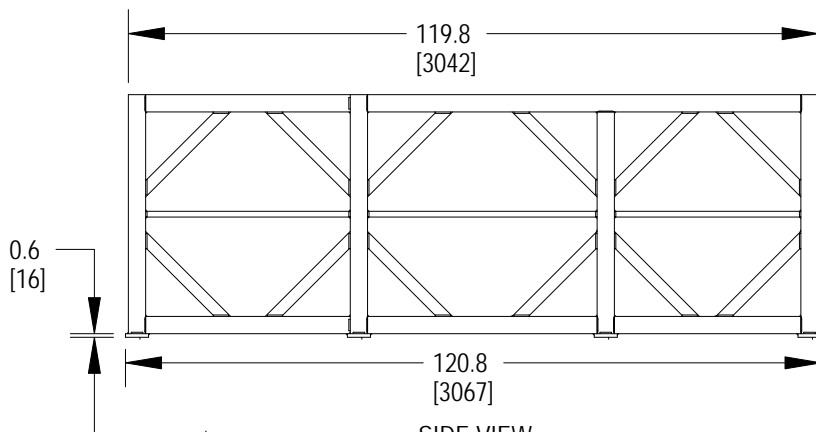
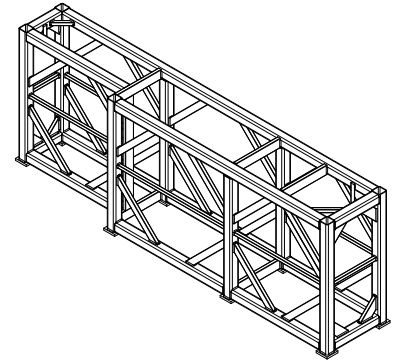
1. Use indicated lifting points to lift the unit. Use spreader bars and/or shimmed blocks to prevent external damage.
2. Unit must be lifted level. Tilting or twisting can cause damage to internal components.
3. Use proper rigging equipment to make sure attachment and lifting at the designated lift points is in the vertical direction.
-Refer to User Manual for site instructions.

FLOORSTAND & ANCHOR DIMENSIONAL DATA

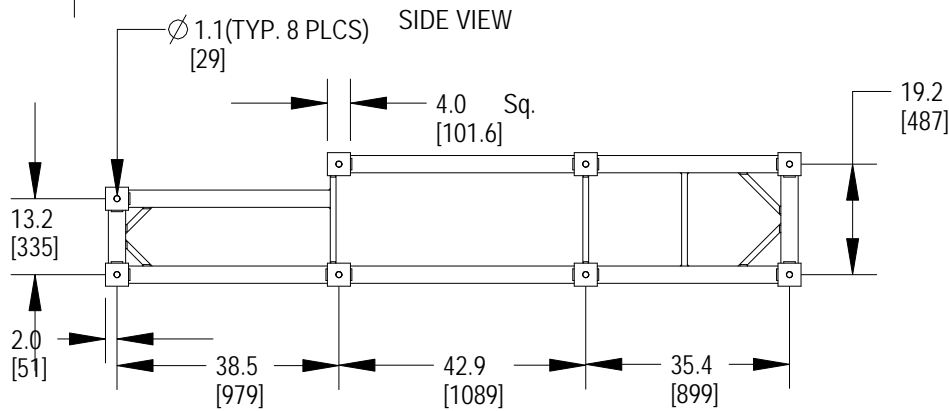
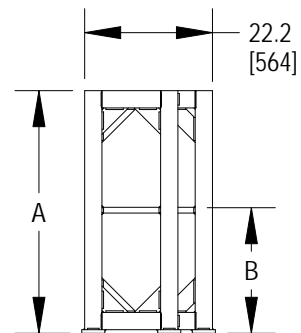
XDM300



TOP VIEW



SIDE VIEW



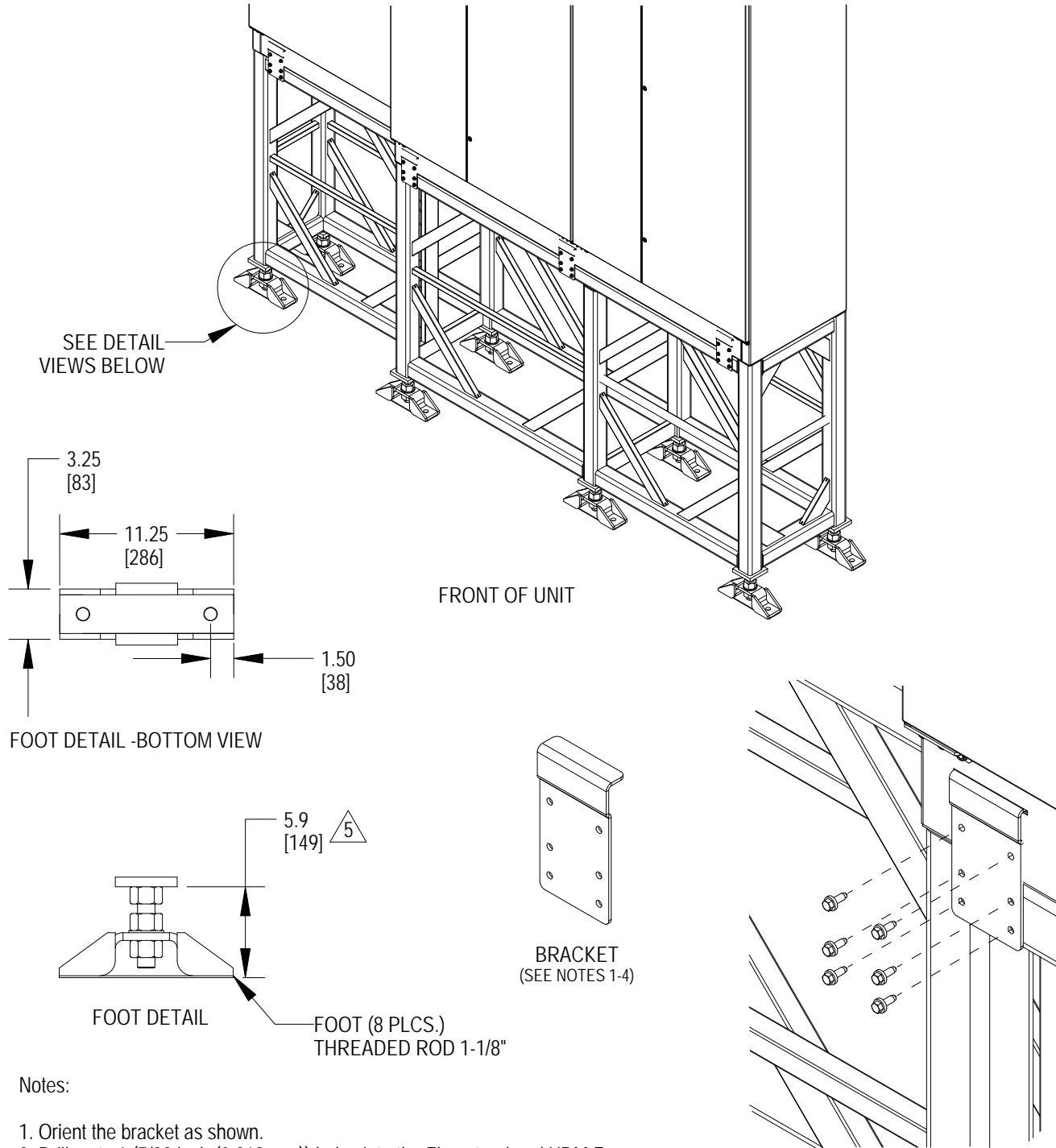
BOTTOM VIEW

Notes:

1. Leveling feet are provided with $\pm 1\text{-}1/2\text{'}$ (38mm) adjustment from final height.
2. All dimensions are in inches [mm].
3. Refer to Pg. 2 for leveling foot details.

Final Height \triangle	A	B
24 (610)	18.1 (461)	N/A
30 (762)	24.1 (613)	N/A
36 (914)	30.1 (765)	N/A
42 (1067)	36.1 (918)	18.9 (479)
48 (1219)	42.1 (1070)	21.9 (556)

FLOORSTAND & ANCHOR DIMENSIONAL DATA XDM300



Notes:

1. Orient the bracket as shown.
2. Drill a qty 6 (7/32 inch (0.219 mm)) holes into the Floorstand and XDM Frame.
3. Install six (6) 1/4-20 self drilling screws into the Floorstand and XDM Frame.
4. Repeat above steps for the rear of the unit.

△5. Leveling feet are provided with $\pm 1\text{-}1/2$ " (38mm) adjustment from final height.



COOLPHASE CDU & LIEBERT® XDM

SECONDARY LOOP GLYCOL AND WATER REQUIREMENTS BRAZED PLATE HEAT EXCHANGER

For applications when the outdoor winter design temperature is below -18°F (-27°C), use a percentage of glycol per the appropriate table below or contact your Vertiv Sales Representative and Application Engineer. The percent glycol solution values listed below in Tables 1 and 2 are for reference and are based on burst protection of the Brazed Plate Heat Exchanger (BPHE) at various outdoor winter design temperatures. This outdoor winter design temperature should be the coldest expected temperature to ensure continued operation of The Liebert® XDM product. The recommended percent values listed below are based on the Dowfrost HD (Propylene Glycol) and Dowtherm SR-1 (Ethylene Glycol) chart. If the coldest outdoor temperature does not drop below -18°F (-27°C), water is an acceptable fluid in the Liebert® Secondary Loop. If the Secondary Loop is using a coolant other than water, contact your Vertiv Sales Representative and Application Engineer.

Table 1: Propylene Glycol Values

Winter Outdoor Design Temperature °F (°C)	Secondary Side	
	Recommended % PG by Volume	Recommended % PG by Mass
Down to 15 (-9)	20	21
Down to 5 (-15)	25	26
Down to -15 (-26)	30	31
Down to -30 (-34)	35	36



COOLPHASE CDU & LIEBERT® XDM

GLYCOL AND WATER REQUIREMENTS BRAZED PLATE HEAT EXCHANGER

Table 2: Ethylene Glycol Values

Winter Outside Design Temperature °F (°C)	Secondary Side	
	Recommended % PG by Volume	Recommended % PG by Mass
Down to 15 (-9)	20	22
Down to 5 (-15)	25	27
Down to -10 (-23)	30	33
Down to -30 (-34)	35	38

There are two (2) basic types of additives:

- Corrosion Inhibitors
- Environmental Stabilizers

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

NOTICE:

Water chemistry varies greatly by location, as do the required additives that reduce the corrosion effect of the fluids on the piping system and components. The chemistry of the water used must be considered, because water from some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The water/coolant fluid must be treated and circulating through the system continuously to prevent the buildup of sediment deposits and, or growth of sulfate reducing bacteria. The complexity of water/glycol solution condition problems and the variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced water treatment specialist and follow a regularly scheduled coolant fluid system maintenance program. The water or water/glycol solution must be analyzed before start up to establish the inhibitor and antifreeze solution requirement and at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

Proper inhibitor maintenance must be performed in order to prevent corrosion of the system. Consult glycol manufacturer for testing and maintenance of inhibitors. Commercial ethylene glycol, when pure, is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the water from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

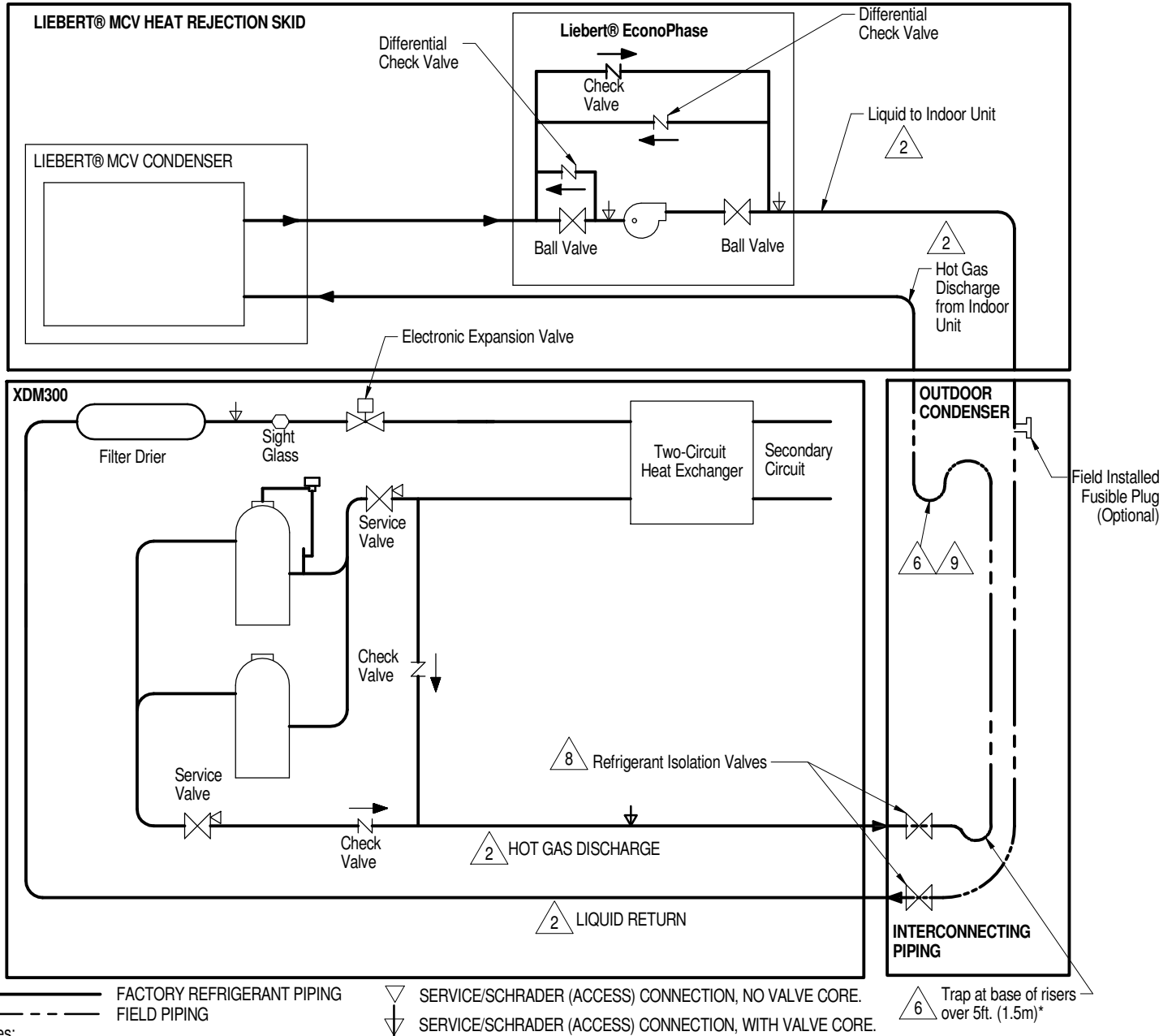
Remove any dirt, oil, or metal filings that may contaminate the cooling system piping to prevent contamination of the fresh glycol solution and fouling of the system. Flush the system thoroughly using a mild cleaning solution or high-quality water and then completely drain before charging with glycol.



Cleaning a new system is just as important as cleaning an old one. 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 most cases, special cleaners are needed to remove scale, rust, and hydrocarbon foulants from pipes, manifolds, and passages.

For more information on cleaners and degreasers, contact your Vertiv representative. Follow the manufacturer's instructions when using these products.

COOLPHASE CDU

PIPING SCHEMATIC XDM300



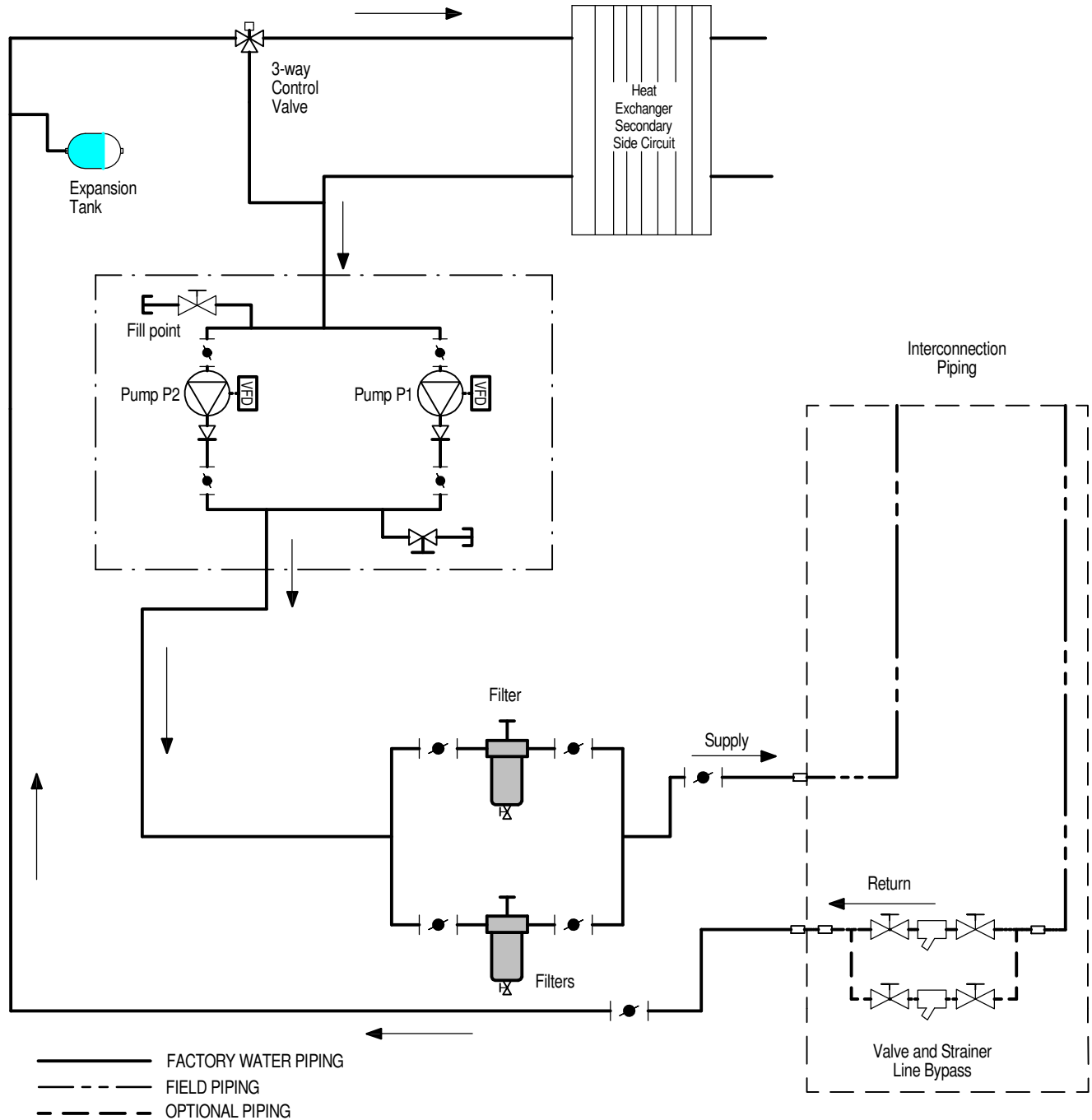
FACTORY REFRIGERANT PIPING  SERVICE/SCHRADER (ACCESS) CONNECTION, NO VALVE CORE.
 FIELD PIPING  SERVICE/SCHRADER (ACCESS) CONNECTION, WITH VALVE CORE.

Notes:

1. Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.
2. Circuit 1 must be maintained between indoor unit, condenser and Liebert® EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and Liebert® EconoPhase unit.
3. Schematic representation shown. Do not use for specific connection locations.
4. The bottom of the condenser coil must be less than 60' (18.3m) above and cannot be more than 15 ft (4.6m) below the elevation of the EEVs inside the indoor unit.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness.
6. Components are not supplied by Vertiv but are required for proper circuit operation and maintenance.
7. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid flood back to compressor. Pitch horizontal gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
8. Vertiv requires the installation of external refrigerant isolation valves on both the liquid line entering and the hot gas line leaving the indoor unit. These external isolation valves are necessary to facilitate safe recovery of the refrigerant charge from the indoor unit before servicing the compressors, filter driers, or other refrigeration components. Prior to closing the isolation valve on the liquid line, ensure that the indoor unit is in evacuation mode, which will open the EEV and will allow the migration of liquid refrigerant from this piping.
9. For rises over 25ft. (7.6m), trap every 20ft. (6m) or evenly divided

COOLPHASE CDU

PIPING SCHEMATIC XDM300

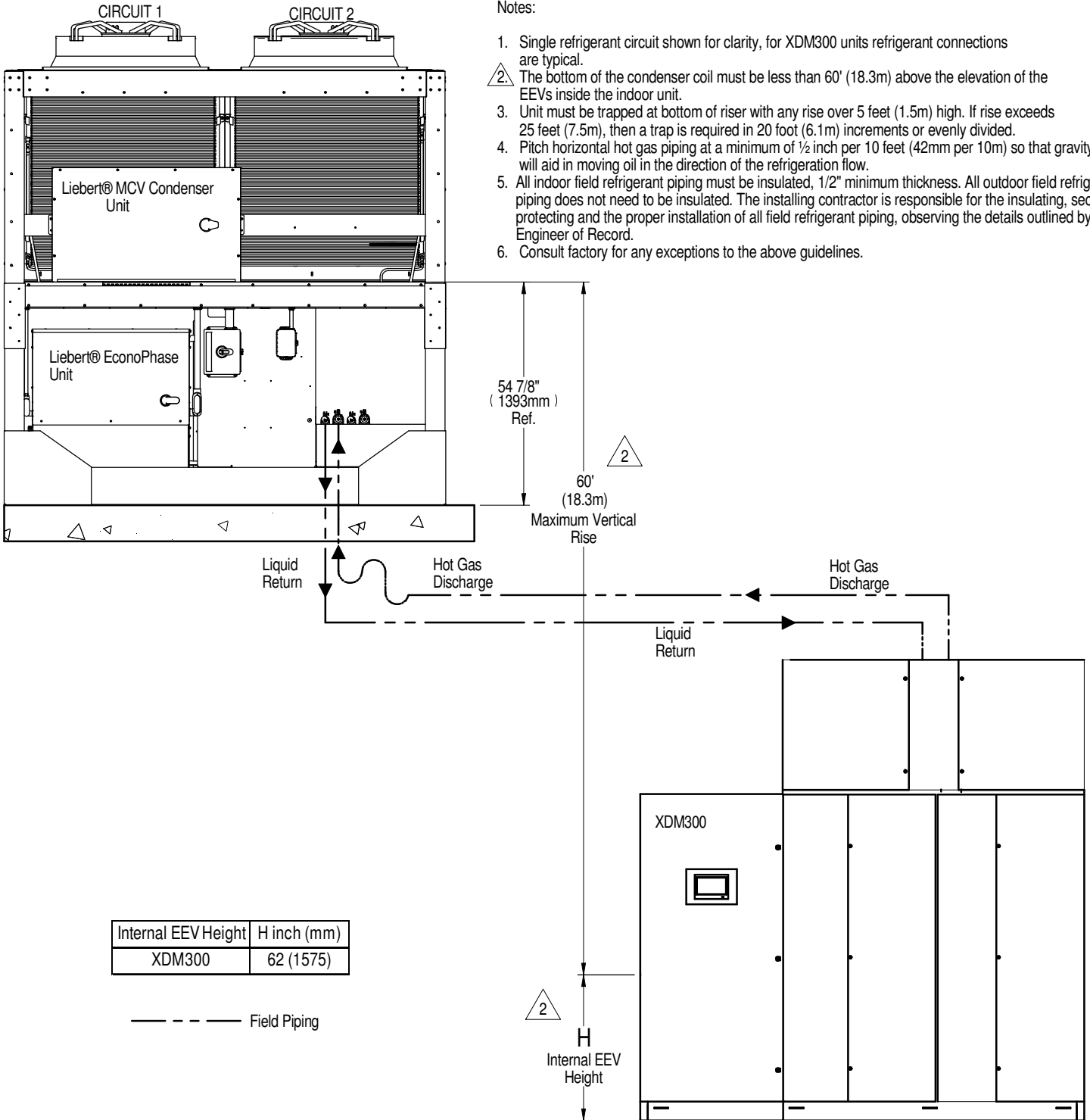


Notes:

1. Field to install strainer in field secondary (XDM) return line to Cooling Modules. Vertiv recommends a bypass piping arrangement to allow for cleaning the strainer without disrupting unit operation. Also pressure taps across the strainer to check pressure drop. Four full port ball valves, pressure taps and piping are supplied by the field. The maximum distance of this assembly is 10 feet from the XDM300 Unit.

AIR COOLED PIPING SCHEMATIC

LIEBERT® MCV WITHOUT RECEIVER MOUNTED ABOVE XDM300

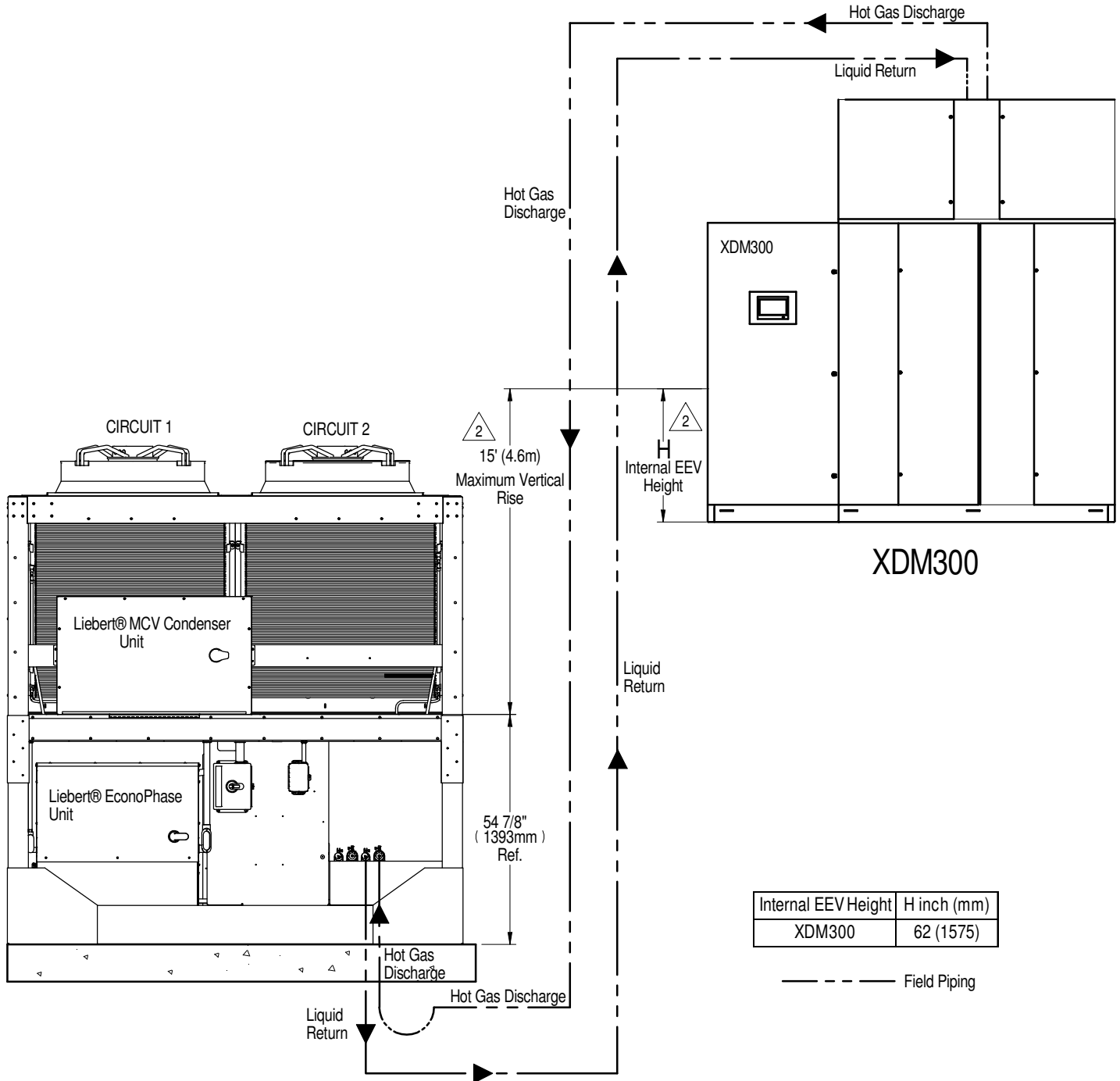


Internal EEV Height	H inch (mm)
XDM300	62 (1575)

----- Field Piping

XDM300

AIR COOLED PIPING SCHEMATIC LIEBERT® MCV WITHOUT RECEIVER MOUNTED BELOW XDM300



Notes:

1. Single refrigerant circuit shown for clarity, for XDM300 units refrigerant connections are typical.
2. The bottom of the condenser coil cannot be more than 15' (4.6m) below the elevation of the EEVs inside the indoor unit.
3. Unit must be trapped at bottom of riser with any rise over 5 feet (1.5m) high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6.1m) increments or evenly divided.
4. Pitch horizontal hot gas piping at a minimum of 1/2 inch per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated. The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
6. Consult factory for any exceptions to the above guidelines.

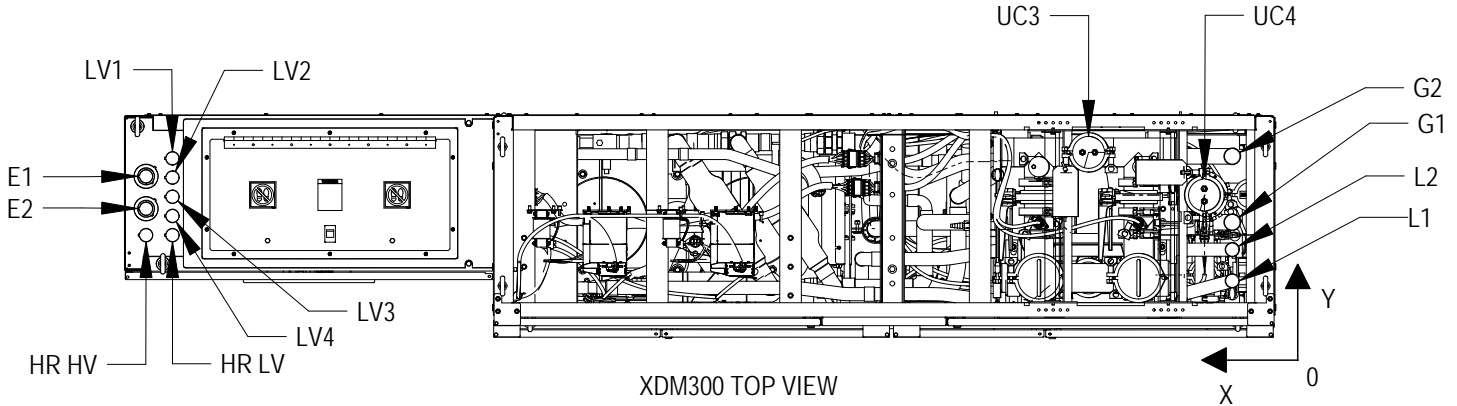
Internal EEV Height	H inch (mm)
XDM300	62 (1575)

----- Field Piping

COOLPHASE CDU

PRIMARY CONNECTION LOCATIONS XDM300

XDM300 Fully Assembled



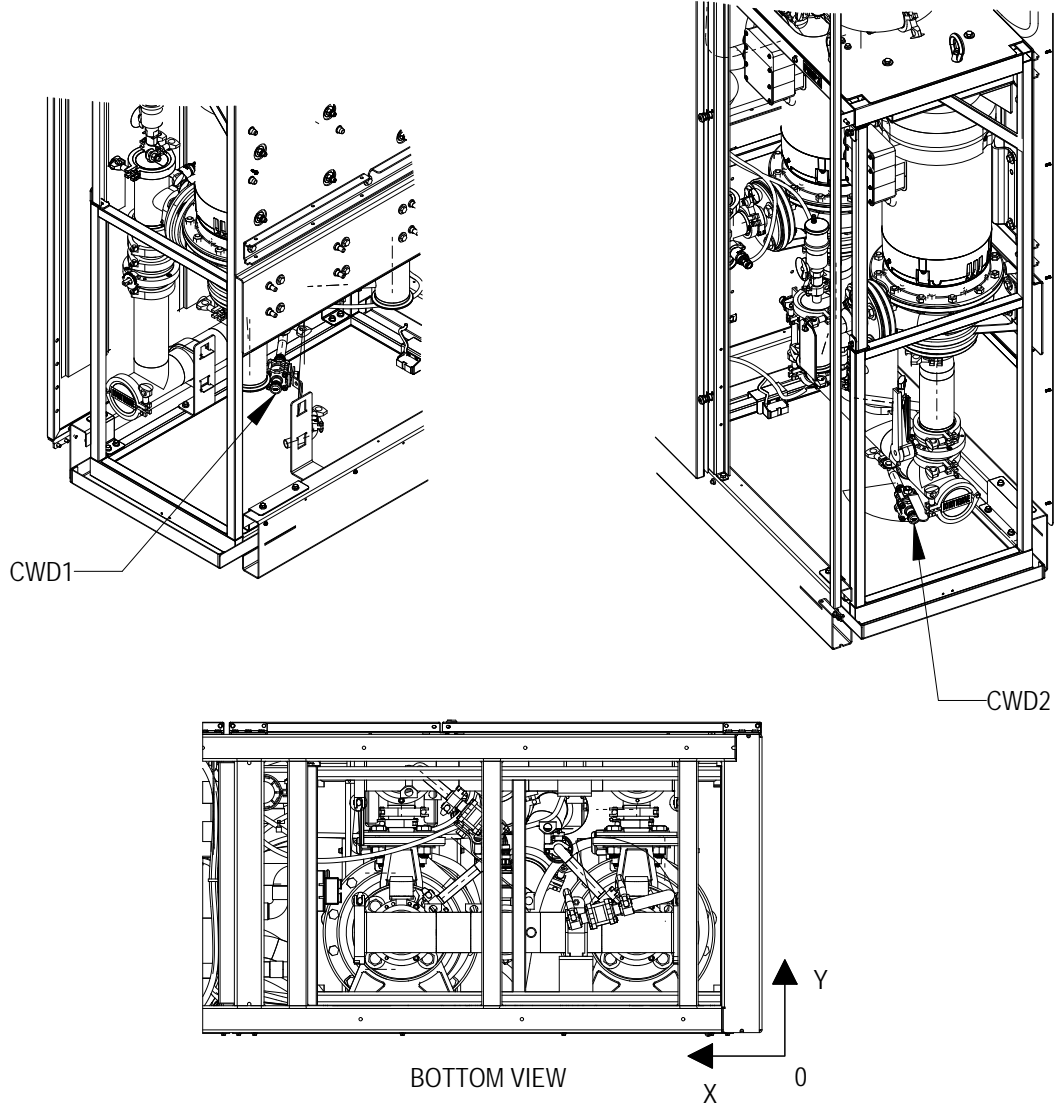
POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Connection Size Opening	
L1	Liquid Line System1 Refrigerant Connection	4.4 (112)	5.9 (149)	1-3/8" (35mm) O.D. Cu	
L2	Liquid Line System2 Refrigerant Connection		9.1 (232)	1-3/8" (35mm) O.D. Cu	
G1	Hot Gas Discharge 1 Refrigerant Connection		12 (304)	1-5/8" (41mm) O.D. Cu	
G2	Hot Gas Discharge 2 Refrigerant Connection		18.5 (479)	1-5/8" (41mm) O.D. Cu	
UC3	Chilled Water connection Supply to Heat Load	19.4 (492)	19.3 (489)	3" (76mm)	
UC4	Coolant connection Return from Heat Load	7.3 (186)	14.8 (376)		
E1	High Voltage Electrical Connections Top	117.6 (2986)	16.8 (426)	Concentric knockouts 1-3/8", 1-3/4", 2-1/2"	
E2			13.4 (341)		
LV1	Electrical Connection (Low Volt, Top)	114.8 (2916)	18.7 (474)	1-3/8" (35mm)	
LV2			16.7 (423)		
LV3			14.7 (372)		
LV4			12.7 (322)		
HR LV	Electrical Connection (Low VoltOptional, Heat Rejection Unit)	114.8 (2916)	10.7 (271)		
HR HV	Electrical Connection (High VoltOptional, Heat Rejection Unit)	117.6 (2986)			

Notes:

1. Drawing not to scale. All dimensions from right corner on service side and have a tolerance of $\pm 1/2"$ (13mm)
2. All dimensions are in inches [mm].
3. Unit has internally installed traps on the discharge lines. For rises over 25ft. (7.6m), trap every 20ft. (6m) or evenly divided.

COOLPHASE CDU

PRIMARY CONNECTION LOCATIONS XDM300

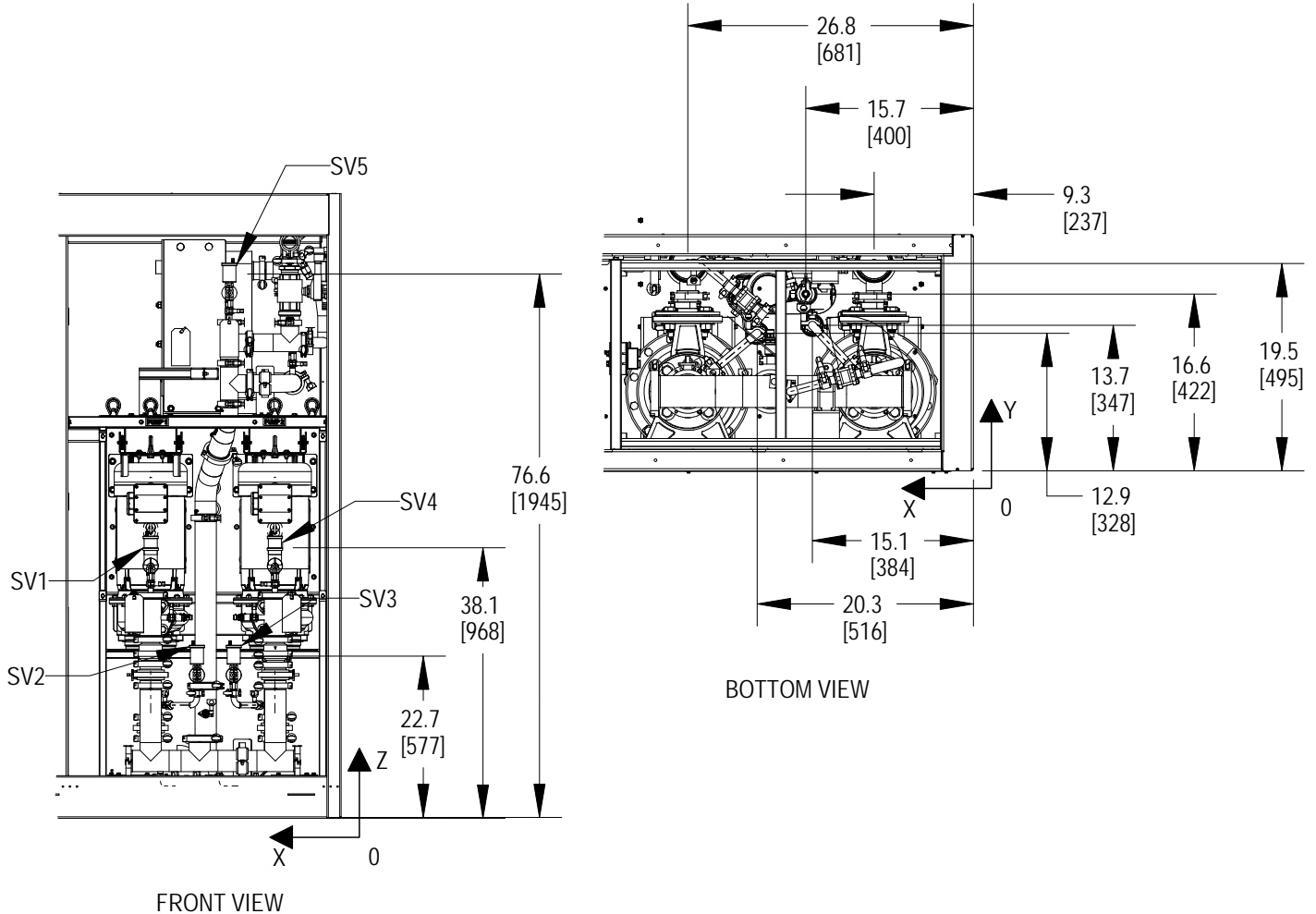


POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Z in. (mm)	Connection Size
CWD1	Suction Chilled Water Drain	20.4 (518)	8.8 (223)	4.2 (106)	5/8" (16mm)
CWD2	Discharge Chilled Water Drain	21.1 (535)	17.2 (436)		

Notes:

1. Drawing not to scale. All dimensions from right corner on service side and have a tolerance of $\pm 1/2"$ (13mm)
2. All dimensions are in inches [mm].
3. Unit has internally installed traps on the discharge lines. For rises over 25ft. (7.6m), trap every 20ft. (6m) or evenly divided.

PRIMARY CONNECTION LOCATIONS XDM300



POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Z in. (mm)	Connection Size
SV1	Secondary Circuit Customer Vent port	26.8 (681)	19.5 (495)	38.1 (968)	5/8" (16mm)
SV2	Secondary Circuit Customer Vent port	20.3 (516)	12.9 (328)	22.7 (577)	
SV3	Secondary Circuit Customer Vent port	15.1 (384)	13.7 (347)	22.7 (577)	
SV4	Secondary Circuit Customer Vent port	9.3 (237)	19.5 (495)	38.1 (968)	
SV5	Secondary Circuit Customer Vent port	15.8 (400)	16.6 (422)	76.6 (1945)	

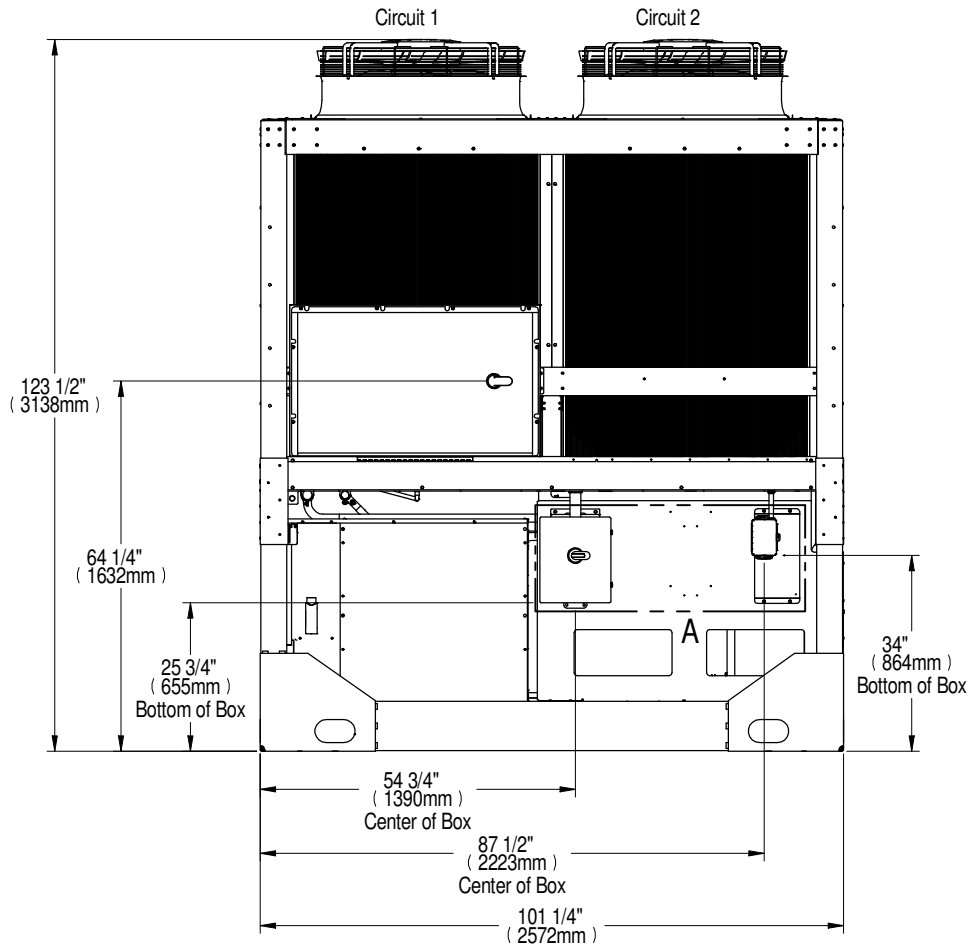
Notes:

1. Drawing not to scale. All dimensions from right corner on service side and have a tolerance of $\pm 1/2"$ (13mm).
2. All dimensions are in inches [mm].
3. Unit has internally installed traps on the discharge lines. For rises over 25ft. (7.6m), trap every 20ft. (6m) or evenly divided.

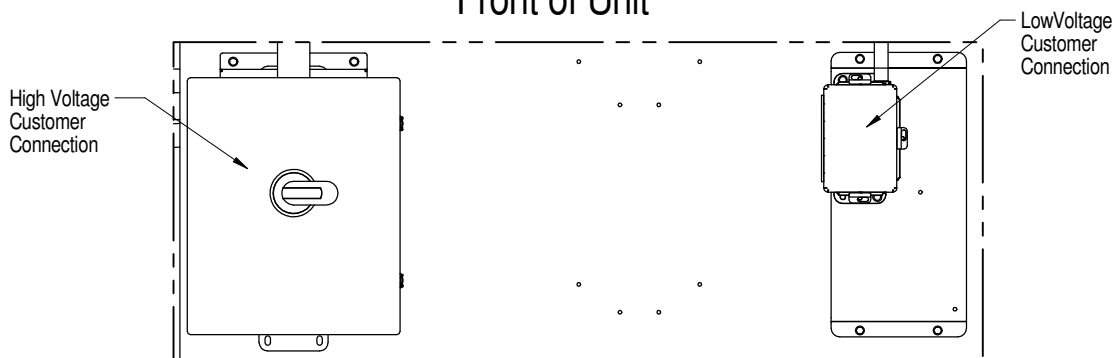
LIEBERT® HEAT REJECTION SKID

PRIMARY CONNECTION LOCATIONS

LIEBERT® MCV MCV430 + LIEBERT® ECONOPHASE + BASE ASSEMBLY



Front of Unit



DETAIL A
(Field Electrical Connections)

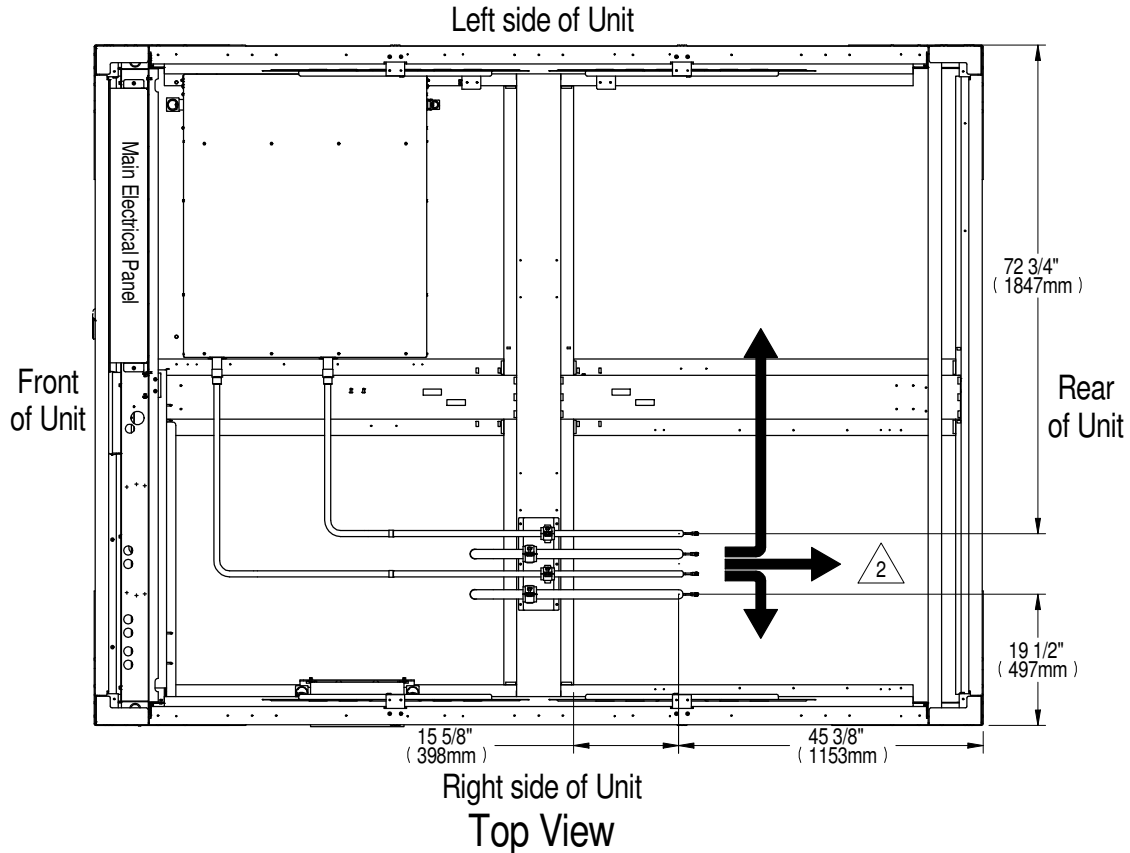
Notes:

1. Field to provide hole for conduit for high voltage disconnect box and low voltage distribution panel.

LIEBERT® HEAT REJECTION SKID

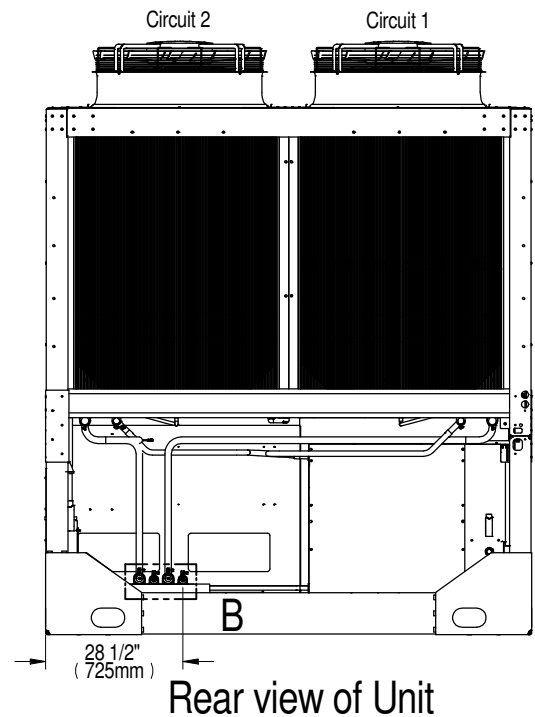
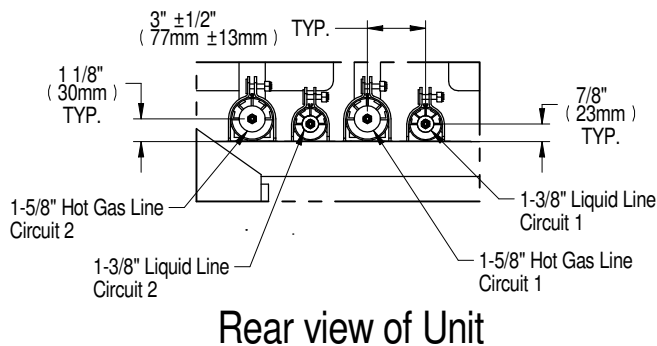
PRIMARY CONNECTION LOCATIONS

LIEBERT® MCV MCV430 + LIEBERT® ECONOPHASE + BASE ASSEMBLY




Multiple customer connection locations

DETAIL B Piping Connections



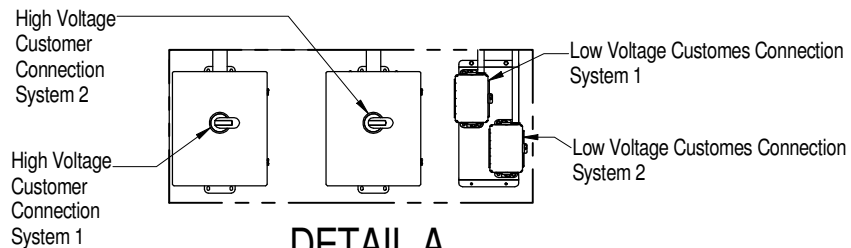
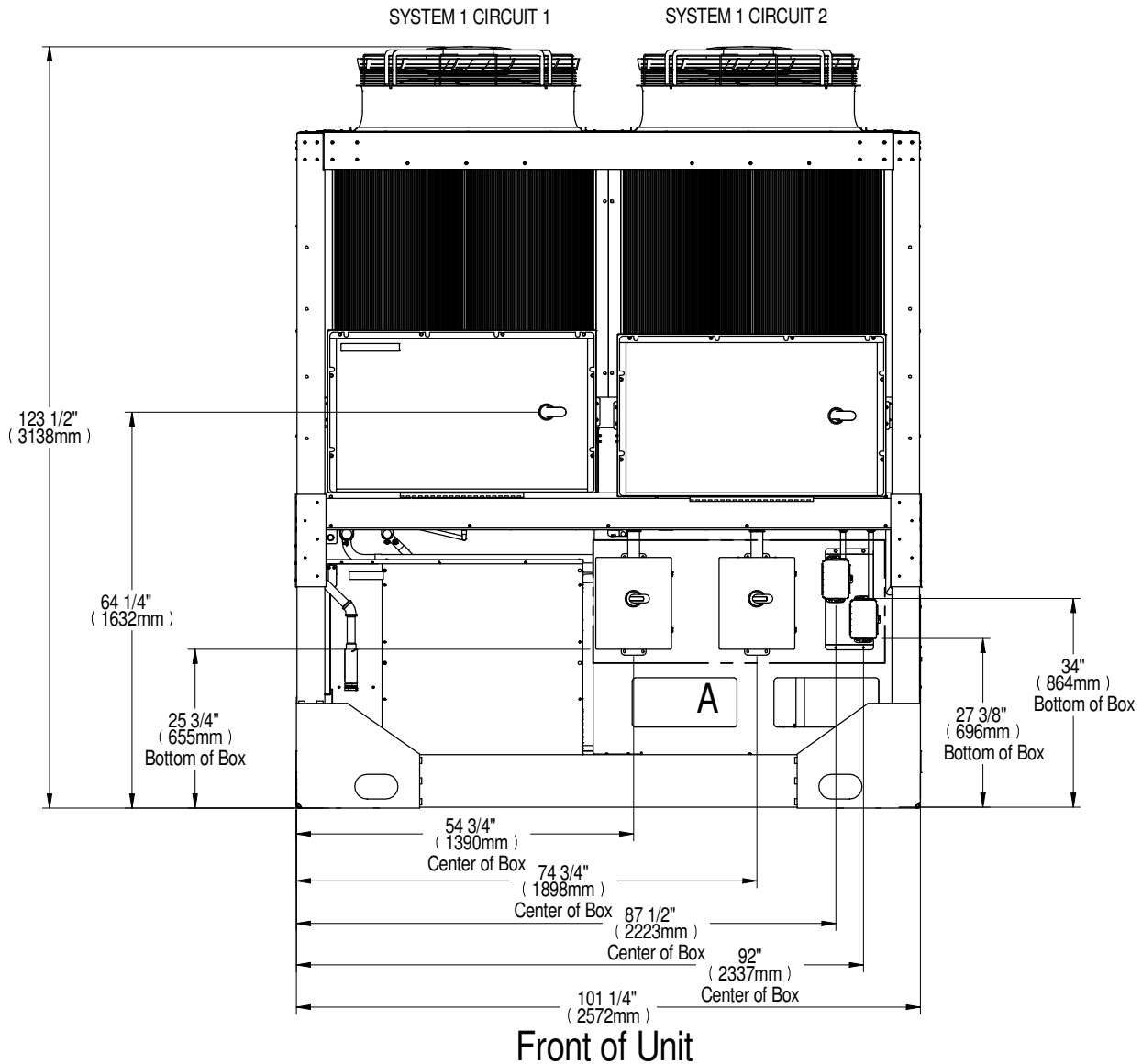
NOTE:

1. For Top View, condenser section removed for clarity.

 Piping connections can exist out left or right side or rear of the unit.

LIEBERT® HEAT REJECTION SKID

PRIMARY CONNECTION LOCATIONS LIEBERT® MCV430 (2) + LIEBERT® ECONOPHASE (2) + BASE ASSEMBLY



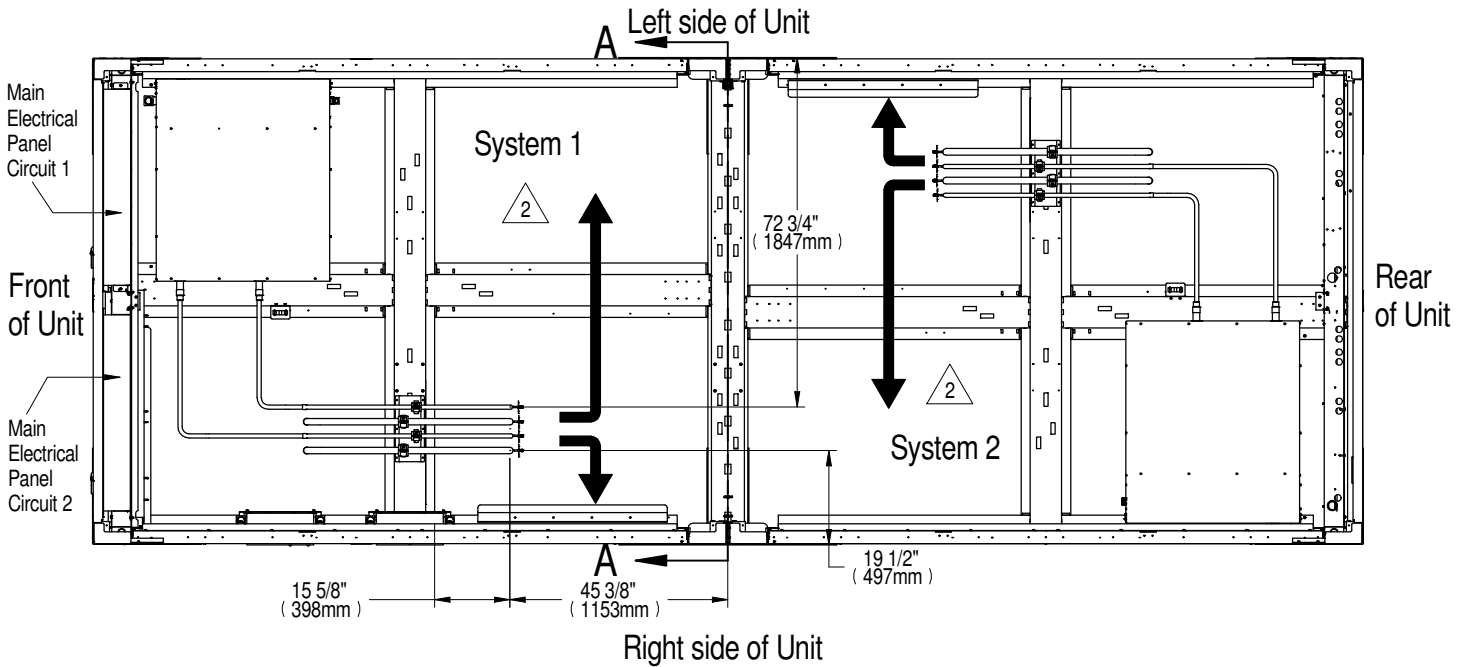
DETAIL A
Field Electrical Connections

Notes:
1. Field to provide hole for conduit for high voltage disconnect box and low voltage distribution panel.

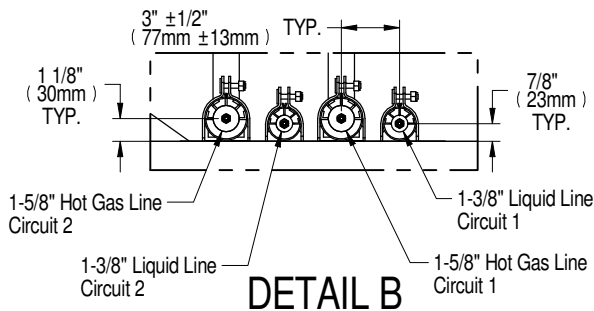


LIEBERT® HEAT REJECTION SKID

PRIMARY CONNECTION LOCATIONS LIEBERT® MCV430 (2) + LIEBERT® ECONOPHASE (2) + BASE ASSEMBLY

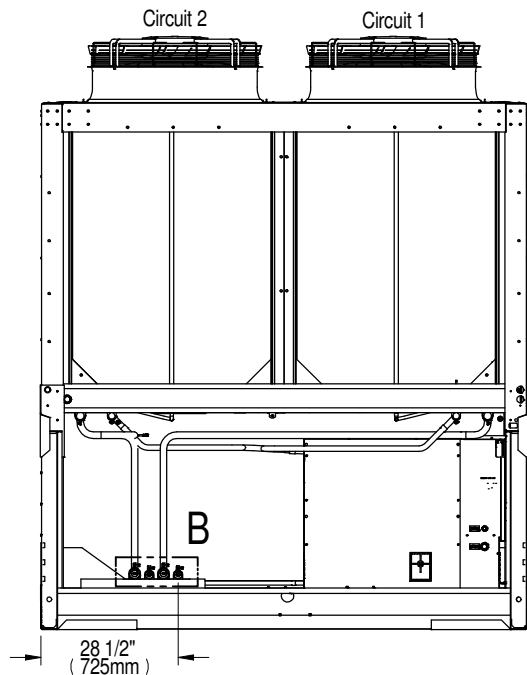


Top View
Multiple customer connection locations



DETAIL B
Piping Connections

Piping connection dimensions are typical for both systems.



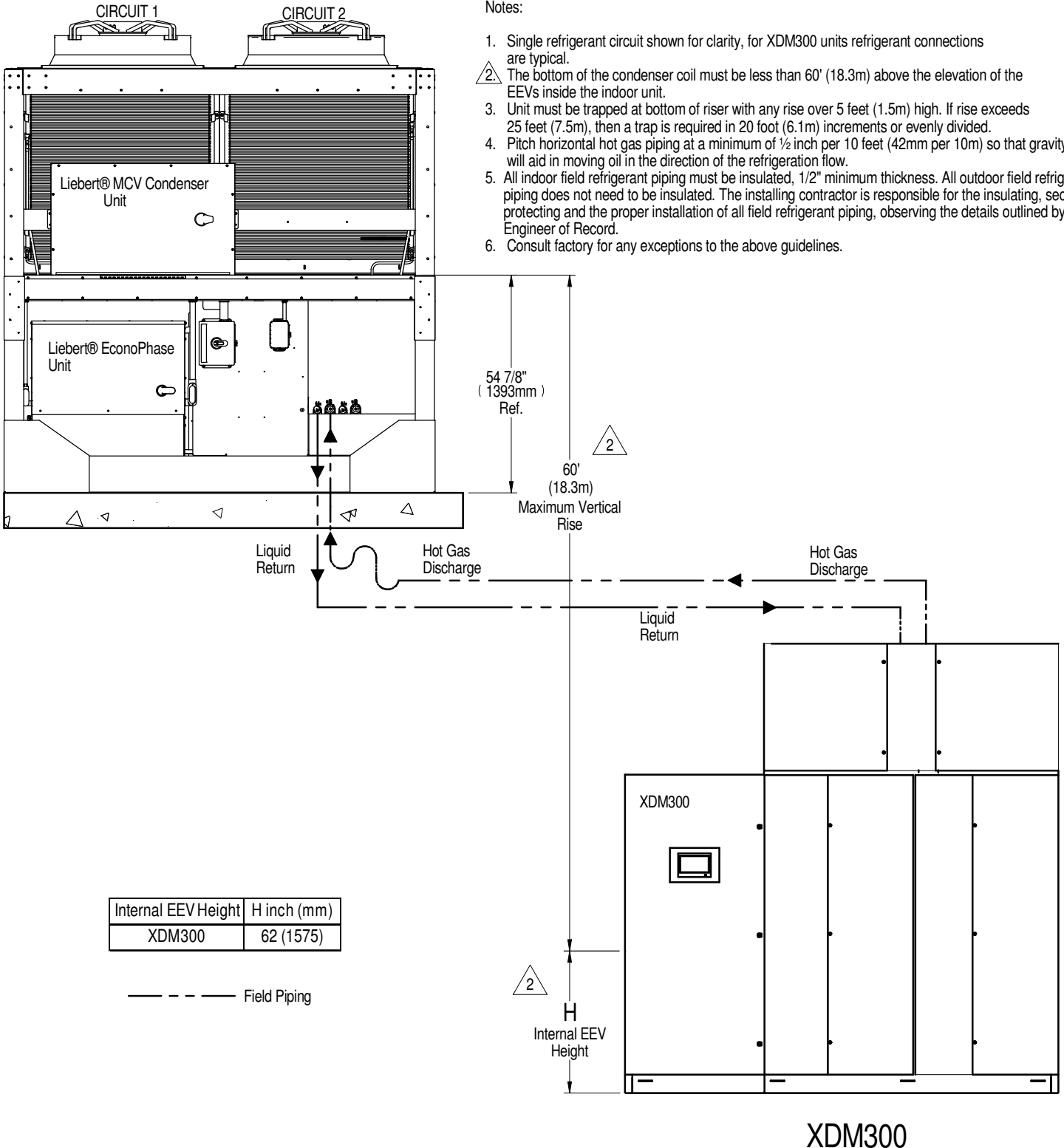
SECTION A-A

NOTE:
1. For Top View, condenser section removed for clarity.

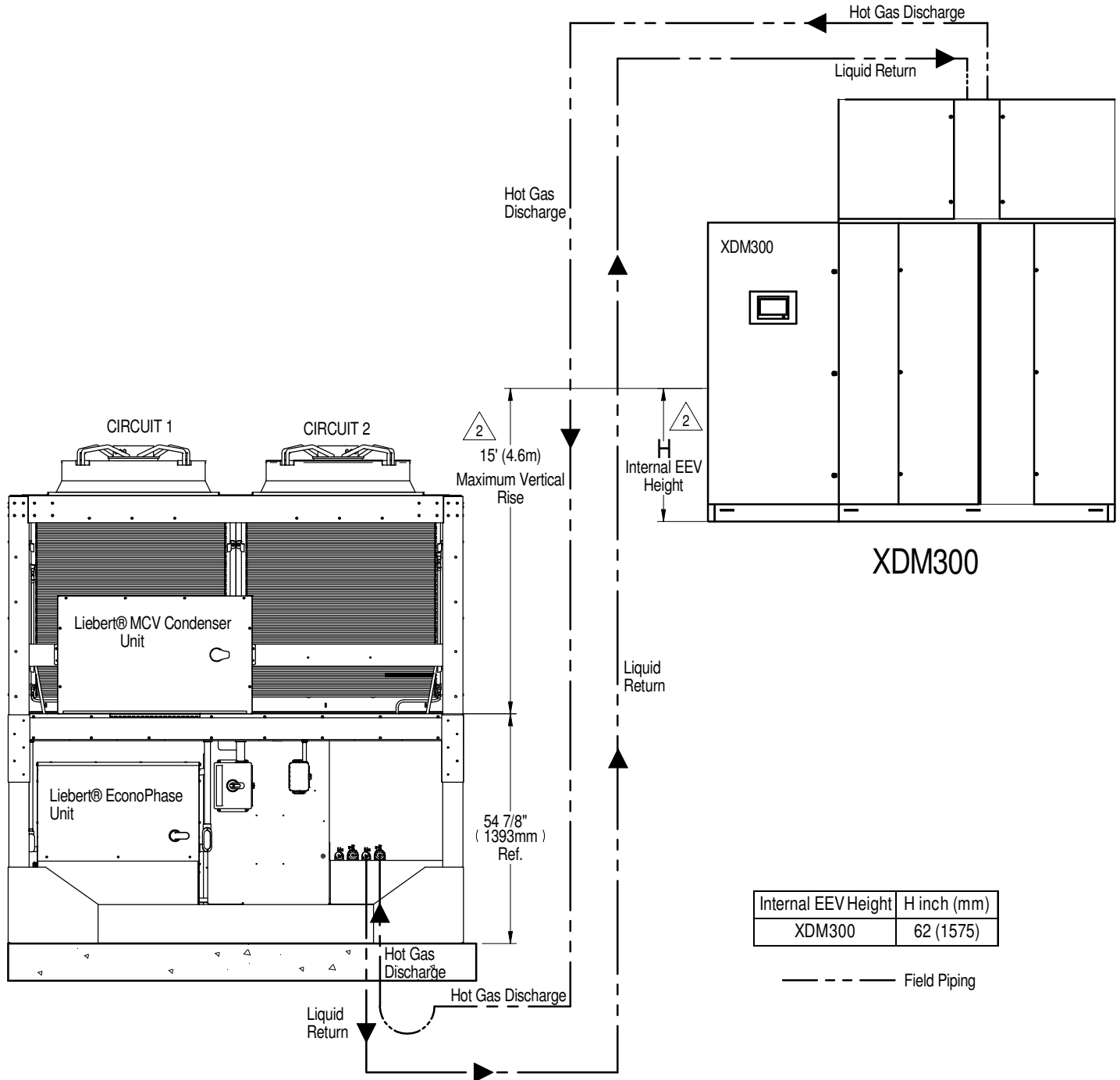
△ System 1 and 2 system piping connections can exist out left or right side of the unit.

AIR COOLED PIPING SCHEMATIC

LIEBERT® MCV WITHOUT RECEIVER MOUNTED ABOVE XDM300



AIR COOLED PIPING SCHEMATIC LIEBERT® MCV WITHOUT RECEIVER MOUNTED BELOW XDM300



Notes:

1. Single refrigerant circuit shown for clarity, for XDM300 units refrigerant connections are typical.
2. The bottom of the condenser coil cannot be more than 15' (4.6m) below the elevation of the EEVs inside the indoor unit.
3. Unit must be trapped at bottom of riser with any rise over 5 feet (1.5m) high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6.1m) increments or evenly divided.
4. Pitch horizontal hot gas piping at a minimum of 1/2 inch per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated. The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
6. Consult factory for any exceptions to the above guidelines.



LINE SIZE & PRESSURE RATINGS

RECOMMENDED REFRIGERANT LINE SIZES CU, OD AIR-COOLED SYSTEMS USING R-410A

PRODUCT	System Fluid : R-410A		Any Compressor Type					
	Indoor Model	Equivalent Length	50 ft (15m)	100 ft (30m)	150 ft (45m)	300 ft (91m)	450ft (137m)	
Liebert® CRV	CR019RA/ CR020RA	Hot Gas Line, in.	3/4	3/4	3/4	7/8 ²		
		Liquid Line, in.	5/8	5/8	5/8	3/4		
	CR035RA	Hot Gas Line, in.	7/8	7/8	7/8	1-1/8 ²		
		Liquid Line, in.	3/4	3/4 ²	3/4 ²	7/8 ²		
Liebert® PDX	PX011	Hot Gas Line, in.	1/2	5/8	5/8	5/8		
		Liquid Line, in.	3/8	1/2	1/2	1/2		
	PX018	Hot Gas Line, in.	5/8	5/8	5/8	3/4 ²		
		Liquid Line, in.	1/2	1/2	1/2	5/8		
	PX023	Hot Gas Line, in.	3/4	3/4	3/4	7/8 ²		
		Liquid Line, in.	5/8	5/8	5/8	5/8		
	PX029	Hot Gas Line, in.	7/8	7/8	7/8	1-1/8 ²		
		Liquid Line, in.	5/8	5/8	5/8	3/4		
Liebert® DSE	DA050 / DA080/ DA085	Hot Gas Line, in.	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8 ³	
		Liquid Line, in.	7/8	7/8	7/8	7/8	7/8 ³	
	DA125	Hot Gas Line, in.	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8 ³	
		Liquid Line, in.	7/8	7/8	7/8	7/8	7/8 ³	
	DA150	Hot Gas Line, in.	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8 ³	
		Liquid Line, in.	7/8	1-1/8	1-1/8	1-1/8	1-1/8 ³	
	DA165	Hot Gas Line, in.	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8 ³	
		Liquid Line, in.	7/8	1-1/8	1-1/8	1-1/8	1-1/8 ³	
Liebert® XDM	XDM 200	Hot Gas Line, in.	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8 ⁵	
		Liquid Line, in.	7/8	1-1/8	1-1/8	1-1/8	1-1/8 ⁵	
	Vertiv™ CoolPhase CDU	XDM 300	Hot Gas Line, in.	1-5/8	1-5/8	1-5/8 ⁴	1-5/8 ⁴	
			Liquid Line, in.	1-3/8	1-3/8	1-3/8 ⁴	1-3/8 ⁴	

Product	System Fluid: R-410A		Digital Scroll Models				
	Indoor Model	Equivalent Length	50 ft (15m)	75 ft (23m)	100 ft (30m)	125 ft (38m)	150 ft (45m)
Liebert® Mini-Mate Variable Capacity	MT036	Suction Line, in.	7/8	7/8	7/8	7/8	7/8
		Liquid Line, in.	1/2	1/2	1/2	1/2	1/2
	MT048	Suction Line, in.	7/8	1-1/8 ²	1-1/8 ²	1-1/8 ²	1-1/8 ²
		Liquid Line, in.	1/2	1/2	5/8	5/8	5/8
	MT060	Suction Line, in.	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8
		Liquid Line, in.	1/2	5/8	5/8	5/8	5/8

Notes:

1. Consult factory for proper line sizing for runs longer than maximum equivalent length shown in table.
2. Must downsize vertical riser one trade size (1-1/8" to 7/8" or 7/8" to 3/4" or 3/4" to 5/8" or 5/8" to 1/2").
3. Consult factory when actual pipe length between Liebert® MC/Liebert® EconoPhase and Liebert® DSE unit will exceed 300 ft (91 m).
4. Liebert® DSE DA250-265 and Vertiv® CoolPhase CDU XDM300 units can be extended to max 200ft (61m) linear or 300ft. (91m) equivalent.
5. Consult factory for Vertiv® CoolPhase CDU modules where pipe lengths exceed 300 ft (91m), or where oversized piping is considered, such as a Vertiv® CoolPhase CDU that replaces existing Liebert® DSE DA250 models and/or uses existing piping.



LINE SIZE & PRESSURE RATINGS

RECOMMENDED REFRIGERANT LINE SIZES CU, OD AIR-COOLED SYSTEMS USING R-407C

Product	System Fluid : R-407C		Standard Scroll Models (Non-Digital Scroll)				4-Step Semi-Hermetic or Digital Scroll Models		
	Indoor Model	Equivalent Length	50 ft (15m)	100 ft (30m)	150 ft (45m)	200 ft (60m)	50 ft (15m)	100 ft (30m)	150 ft (45 m)
Liebert® DS	DS035	Hot Gas Line, in.	7/8	7/8	7/8		3/4	7/8	7/8
		Liquid Line, in.	1/2	5/8	5/8		1/2	5/8	5/8
	DS042	Hot Gas Line, in.	7/8	7/8	7/8		7/8	7/8	1-1/8 ²
		Liquid Line, in.	1/2	5/8	5/8		5/8	5/8	5/8
	DS053	Hot Gas Line, in.	7/8	1-1/8	1-1/8		7/8	1-1/8 ²	1-1/8 ²
		Liquid Line, in.	5/8	7/8	7/8		5/8	7/8	7/8
	DS070	Hot Gas Line, in.	1-1/8	1-1/8	1-1/8		1-1/8 ²	1-1/8 ²	1-1/8 ²
		Liquid Line, in.	7/8	7/8	7/8		7/8	7/8	7/8
	DS077 ³	Hot Gas Line, in.	1-1/8	1-1/8	1-1/8		1-1/8	1-1/8	1-1/8
		Liquid Line, in.	7/8	7/8	7/8		7/8	7/8	7/8
	DS105 ³	Hot Gas Line, in.	1-3/8	1-3/8	1-3/8		1-3/8	1-3/8	1-3/8
		Liquid Line, in.	7/8	7/8	1-1/8		7/8	7/8	1-1/8
Liebert® XDC	XDC160	Hot Gas Line, in.	1-1/8 ⁴	1-1/8 ⁴	1-3/8 ⁴	1-3/8 ⁴			
		Liquid Line, in.	7/8	1-1/8	1-1/8	1-1/8			

Product	System Fluid : R-407C		Standard Scroll Models (Non-Digital Scroll)				
	Indoor Model	Equivalent Length	50 ft (15m)	75 (23m)	100 ft (30m)	125 ft (38m)	150 ft (45m)
Liebert® Mini-Mate2 Liebert® Datamate	MMD12	Suction Line, in.	5/8	5/8	7/8	7/8	7/8
		Liquid Line, in.	3/8	3/8	3/8	3/8	3/8
	MMD18 / DME020	Suction Line, in.	5/8	7/8	7/8	7/8	7/8
		Liquid Line, in.	3/8	3/8	3/8	1/2	1/2
	MMD24 / DME027	Suction Line, in.	7/8	7/8	7/8	7/8	7/8
		Liquid Line, in.	3/8	3/8	1/2	1/2	1/2
	MMD36/ MMD35 / DME037 / MMD96-3T / MMD95-3T	Suction Line, in.	7/8	7/8	1-1/8 ²	1-1/8 ²	1-1/8 ²
		Liquid Line, in.	1/2	1/2	1/2	1/2	1/2
	MMD60/ MMD59 / MMD96-5T /MMD95-5T	Suction Line, in.	1-1/8	1-1/8	1-1/8	1-3/8	1-3/8
		Liquid Line, in.	1/2	5/8	5/8	5/8	5/8

Note:

1. Consult factory for proper line sizing for runs longer than maximum equivalent length shown in tables above.
2. Downsize vertical riser one trade size (1-1/8" to 7/8").
3. Digital scroll not available on 077 and 105 models.
4. Double risers are required when hot gas vertical rise is 15 ft (4.6m) or more. Refer to Liebert® XDC user manual



LINE SIZE & PRESSURE RATINGS

RECOMMENDED REFRIGERANT LINE SIZES CU, OD AIR-COOLED SYSTEMS USING R-454B

		System Fluid : R-454B	Any Compressor Type				
PRODUCT	Indoor Model	Equivalent Length	50 ft (15m)	100 ft (30m)	150 ft (45m)	300 ft (91m)	450ft (137m)
Liebert® DSE	DA250 / DA265	Hot Gas Line, in.	1-5/8	1-5/8	1-5/8	1-5/8	
		Liquid Line, in.	1-3/8	1-3/8	1-3/8	1-3/8	

Notes:

1. Consult factory for proper line sizing for runs longer than maximum equivalent length shown in table.
2. Must downsize vertical riser one trade size (1-1/8" to 7/8" or 7/8" to 3/4" or 3/4" to 5/8" or 5/8" to 1/2").
3. Consult factory when actual pipe length between Liebert® MC/Liebert® EconoPhase and Liebert® DSE unit will exceed 300 ft (91 m).
4. Liebert® DSE DA250-265 unit can be extended to max 200ft (61m) linear or 300ft. (91m) equivalent.



LINE SIZE & PRESSURE RATINGS

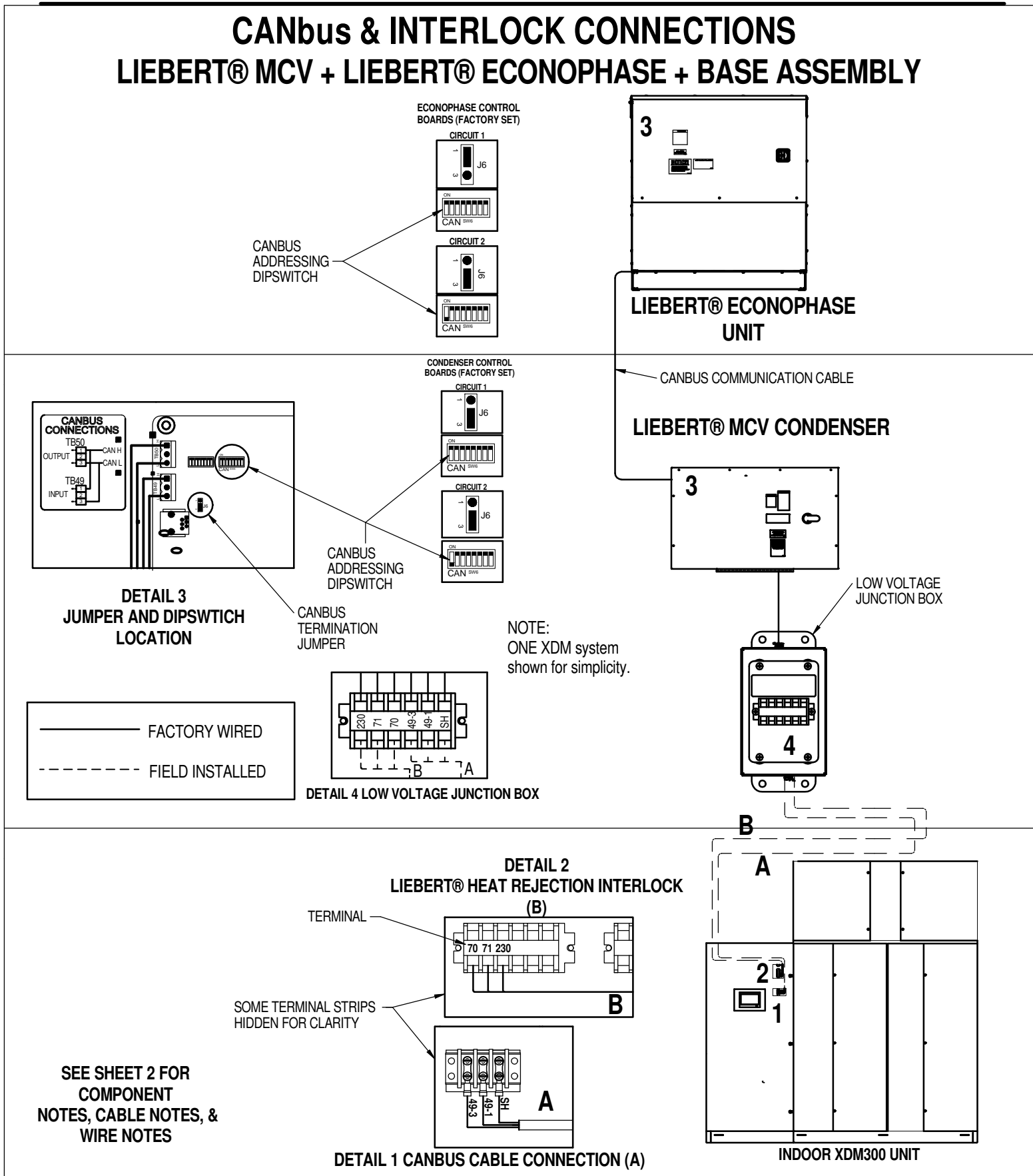
SYSTEM REFRIGERANT PRESSURES

Product	Pressure Type	System Fluid : R-407C psig (kPa)		System Fluid : R-410A psig (kPa)		System Fluid : R-454B psig (kPa)	
		High Side	Low Side	High Side	Low Side	High Side	Low Side
Liebert® CRV ²	Design Pressure	N/A	N/A	511 (3523)	235 (1620)	N/A	N/A
	High Pressure Cutout	N/A	N/A	561 (3868)	N/A	N/A	N/A
Liebert® DS ²	Design Pressure	364 (2510)	165 (1138)	N/A	N/A	N/A	N/A
	High Pressure Cutout	400 (2758)	N/A	N/A	N/A	N/A	N/A
Liebert® DSE (DA050-DA265)	Design Pressure	N/A	N/A	530 (3655)	235 (1620)	500 (3447)	215 (1482)
	High Pressure Cutout	N/A	N/A	580 (3999)	N/A	540 (3723)	N/A
Liebert® EconoPhase	Design Pressure	N/A	N/A	530 (3655)	N/A	N/A	N/A
	High Pressure Cutout	N/A	N/A	N/A	N/A	N/A	N/A
Liebert® MC Condenser	Design Pressure	364 (2510)		530 (3655)		N/A	N/A
	High Pressure Cutout	N/A	N/A	N/A	N/A	N/A	N/A
Liebert® MCV ³	Design Pressure	N/A	N/A	530 (3655)	N/A	N/A	N/A
	High Pressure Cutout	N/A	N/A	N/A	N/A	N/A	N/A
Liebert® PDX ²	Design Pressure	N/A	N/A	530 (3655)	235 (1620)	N/A	N/A
	High Pressure Cutout	N/A	N/A	580 (3999)	N/A	N/A	N/A
Liebert® Mini-Mate2 (PFH, MCD) Liebert® Datamate (DME, DMC) ²	Design Pressure	315 (2172)	165 (1138)	N/A	N/A	N/A	N/A
	High Pressure Cutout	400 (2758)	N/A	N/A	N/A	N/A	N/A
Liebert® Mini-Mate Variable Capacity (PFD, MT, MTC) ²	Design Pressure	N/A	N/A	530 (3655)	235 (1620)	N/A	N/A
	High Pressure Cutout	N/A	N/A	580 (3999)	N/A	N/A	N/A
Liebert® Fin/Tube Condenser	Design Pressure	320 (2206)	N/A	N/A	N/A	N/A	N/A
	High Pressure Cutout	N/A	N/A	N/A	N/A	N/A	N/A
Liebert® Piggyback (Condenser)	Design Pressure	300 (2068)		475 (3275)		N/A	N/A
	High Pressure Cutout	N/A	N/A	N/A	N/A	N/A	N/A
Liebert® DSE (DP060, DP400, DP500)	Design Pressure	N/A	N/A	530 (3655)	235 (1620)	N/A	N/A
	High Pressure Cutout	N/A	N/A	580 (3999)	N/A	N/A	N/A
Vertiv™ CoolPhase CDU & Liebert® XDM	Design Pressure	N/A	N/A	530 (3655)	235 (1620)	N/A	N/A
	High Pressure Cutout	N/A	N/A	580 (3999)	N/A	N/A	N/A
Liebert® XDC	Design Pressure	364 (2510)	163 (1124)	N/A	N/A	N/A	N/A
	High Pressure Cutout	400 (2758)	N/A	N/A	N/A	N/A	N/A

Notes:

1. Field installed interconnecting piping must be properly selected and installed based on local and national codes, the user manual, and the unit serial tag.
2. Values apply to air cooled and fluid cooled systems.
3. Product is a Heat Rejection packaged condenser. For more information see product manual.
4. Design Pressure is noted on the serial tag in all above product lines.
5. High Pressure Cutout is nominal in all above product lines.

CANbus & INTERLOCK CONNECTIONS LIEBERT® MCV + LIEBERT® ECONOPHASE + BASE ASSEMBLY





COOLPHASE CDU

CANbus & INTERLOCK CONNECTIONS

LIEBERT® MCV + LIEBERT® ECONOPHASE + BASE ASSEMBLY

COMPONENT NOTES:

1. COMPONENT APPEARANCE, ORIENTATION, AND POSITION MAY VARY BETWEEN PRODUCT LINES. TERMINAL NAMES REMAIN CONSTANT.
2. ALL CIRCUITS TO THESE CONNECTION POINTS REMAIN CONSTANT.

CAN & CABLE NOTES (A):

1. CABLE MUST HAVE THE FOLLOWING SPECIFICATIONS:
 - BRAIDED SHIELD OR FOIL SHIELD WITH DRAIN WIRE
 - SHIELD MUST BE WIRED TO GROUND AT INDOOR UNIT
 - 22-18AWG STRANDED TINNED COPPER
 - TWISTED PAIR (MINIMUM 4 TWISTS PER FOOT)
 - LOW CAPACITANCE (15pF/FT OR LESS)
 - MUST BE RATED TO MEET LOCAL CODES AND CONDITIONS.
 - EXAMPLES BELDEN 89207 (PLENUM RATED), OR ALPHA WIRE 6454 CATEGORY 5, 5E, OR HIGHER.
2. DO NOT RUN IN SAME CONDUIT, RACEWAY, OR CHASE AS HIGH VOLTAGE WIRING.
3. FOR CANBUS NETWORK LENGTHS GREATER THAN 450FT(137M), CONTACT LIEBERT FACTORY.

INTERLOCK WIRE NOTES (B):

1. FIELD SUPPLIED WIRE
 - 3 CONDUCTOR 18AWG OR GREATER
 - RATED 600V
2. RUN FIELD SUPPLIED WIRES BETWEEN THE INDOOR UNIT AND THE LOW VOLTAGE JUNCTION BOX.



COOLPHASE CDU & LIEBERT® XDM

ELECTRICAL DATA

Single Disconnect		
Unit Voltage Rating	XDM200	
460V/60Hz 7.5HP	FLA	91.8
	WSA	97.0
	OPD	110
460V/60Hz 5.0HP	FLA	88.7
	WSA	93.9
	OPD	110

Single Disconnect		
Unit Voltage Rating	XDM300	
460V/60Hz 10 HP	FLA	130.2
	WSA	136.9
	OPD	150
460V/60Hz 15 HP	FLA	141.6
	WSA	148.3
	OPD	175

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device
 Note: The XDM400 consists of two separate XDM200 electrical feeds.

Dual Disconnect (Rev Starter, Cap Buffer, and Cond Sub-feed)			
Unit Voltage Rating		XDM200 + MCV330 + PRE	XDM200 + MCV440 + PRE
460V/60Hz 7.5HP	FLA	108.6	114.2
	WSA	113.8	119.4
	OPD	125	125
460V/60Hz 5.0HP	FLA	105.5	111.1
	WSA	110.7	116.3
	OPD	125	125

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device
 Note: The XDM400 consists of two separate XDM200 electrical feeds.

Dual Disconnect (Rev Starter, Cap Buffer, and Cond Sub-feed)			
Unit Voltage Rating		XDM300 + MCV430 + PRE	XDM300 + MCV440 + PRE
460V/60Hz 10HP	FLA	147	152.6
	WSA	153.7	159.3
	OPD	175	175
460V/60Hz 15HP	FLA	158.4	164
	WSA	165.1	170.7
	OPD	175	175

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

Dual Disconnect for Compressors (Rev Starter, Cond Sub-feed) with Separate Disconnect for Pumps and Controls				
Unit Voltage Rating		Dual Disconnects	Dual Disconnects	Pumps/Controls Disconnect
		XDM300+MCV430+PRE	XDM300+MCV440+PRE	XDM300 Pumps
460V/60Hz 10HP	FLA	124.4	130	22.6
	WSA	131.1	136.7	25.4
	OPD	150	150	35
460V/60Hz 15HP	FLA	124.4	130	34
	WSA	131.1	136.7	38.3
	OPD	150	150	50

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device
 Note: These values are for units using 410a refrigerant, with no A2L mitigation.



COOLPHASE CDU

ELECTRICAL FIELD CONNECTIONS

XDM300

STANDARD ELECTRICAL CONNECTIONS

- 1) High voltage entrance - Located in bottom and top of box (quantity 3)
- 2) Low voltage entrance - Located in bottom and top of box (quantity 4)
- 3) Three phase electrical service - Terminals are on top of disconnect switch. Three phase service not provided by Liebert®.
- 4) Earth ground - Terminal for field supplied earth grounding wire and component ground terminal strip. Earth grounding required for Liebert® units.
- 5) Unit factory installed disconnect switch and Main Fuses - Access to the high voltage electric panel compartment can be obtained only with the switch in the "off" position. Fused disconnects are provided with a defeater button that allows access to the electrical panel when power is on.
- 6) Remote unit shutdown - Replace existing jumper between terminals 37 & 38 with field supplied normally closed switch having a minimum 75VA, 24VAC rating. Use field supplied Class 1 wiring.
- 7) Customer alarm inputs - Terminals for field supplied, normally open contacts, having a minimum 75VA, 24VAC rating, between terminals 24 & 50, 51, 55, 56. Use field supplied Class 1 wiring. Terminal availability varies by unit options.
- 8) Common alarm - On any alarm, normally open dry contact is closed across terminals 75 & 76 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 9) Heat rejection interlock - On any call for compressor operation, normally open dry contact is closed across terminals 70 & 71 & 230 to heat rejection equipment. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.

CANbus ELECTRICAL CONNECTIONS

- 10) CANbus Connector - Terminal block with terminals 49-1 (CAN-H) and 49-3 (CAN-L) + SH (shield connection). The terminals are used to connect the CANbus communication cable (provided by others) from the indoor unit to the Liebert® MCV Condenser skid
- 11) CANbus Cable - CANbus cable provided by others to connect to the outdoor condenser and optional PRE unit. No special considerations are required when the total external cable connection between the indoor unit and outdoor unit(s) is less than 450FT (137M). For total external cable connections greater than 450FT (137M). For external cable connections greater than 450FT (137M), but less than 800FT (243M) a CANbus isolator is required (Contact Factory).

Cable must have the following specifications:

- Braided shield or foil shield with drain wire
- Shield must be wired to ground at indoor unit
- 22-18AWG stranded tinned copper
- Twisted pair (minimum 4 twists per foot)
- Low Capacitance (15pF/FT or less)
- Must be rated to meet local codes and conditions
- EXAMPLES BELDEN 89207 (PLENUM RATED), OR ALPHA WIRE 6454 CATEGORY 5, 5E, OR HIGHER
- Do not run-in same conduit, raceway, or chase as high voltage wiring.
- For CANbus network lengths greater than 450FT (137M) call Factory.



COOLPHASE CDU

ELECTRICAL FIELD CONNECTIONS

XDM300

OPTIONAL ELECTRICAL CONNECTIONS

- 12) Reverse Starter contacts - Normally open dry contact is closed across terminals 102 & 103 for power supply 1 and 106 & 107 for power supply 2 to indicate the active power feed. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 13) Heat Rejection Power Connection- Terminals are on bottom of fuse block. Use field supplied wiring per local codes for connection to Heat Rejection unit.
- 14) Analog inputs- Terminals 41, 42, 43, and 44 are user configurable for 0-10V, 0-5V, or 4-20MA.
- 15) Third Disconnect - Disconnect for Pumps and Controls when provided power from customer uninterrupted power supply

OPTIONAL LOW VOLTAGE TERMINAL PACKAGE CONNECTIONS

- 16) Remote unit shutdown - Two additional contact pairs available for unit shutdown (labeled as 37B & 38B, 37C & 38C). Replace jumpers with field supplied normally closed switch having a minimum 75VA, 24VAC rating. Use field supplied Class 1 wiring.
- 17) Common alarm - On any alarm, two additional normally open dry contacts are closed across terminals 94 & 95 and 96 & 97 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 18) Pump enabled contact - On VFD enable, normally open dry contact is closed across terminals 84 & 85 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 19) Liebert[®] Liqui-Tect[™] shutdown any dry contact - On Liebert[®] Liqui-Tect[™] activation, normally open dry contact is closed across terminals 58 & 59 for remote indication (Liebert[®] Liqui-Tect[™] sensor ordered separately). 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.

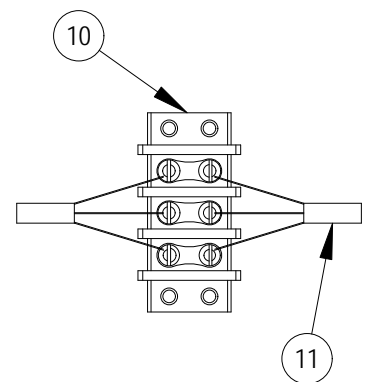
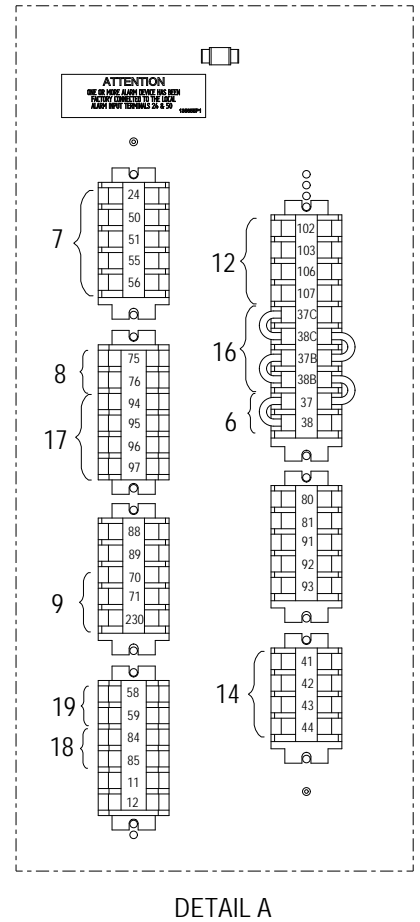
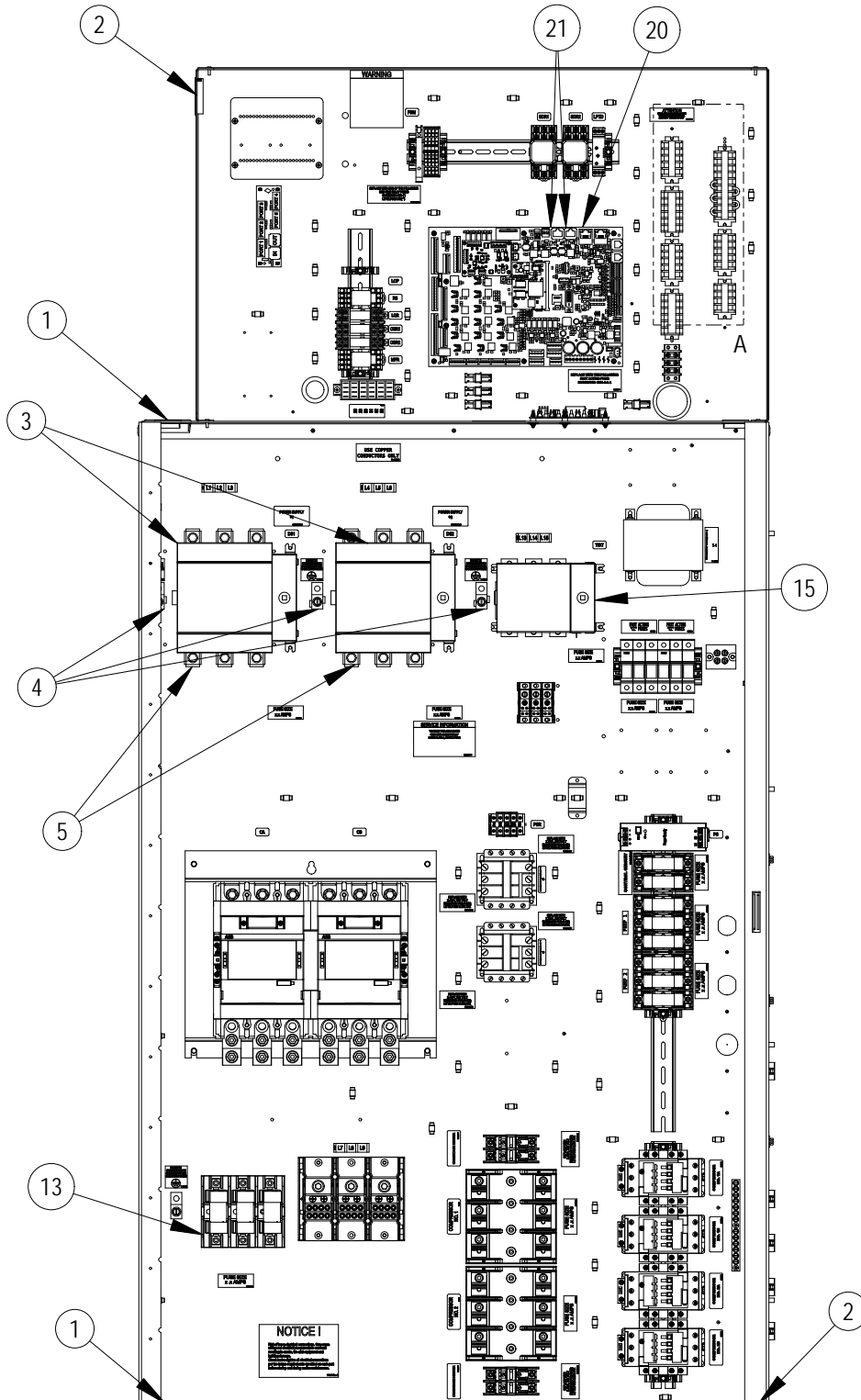
OPTIONAL COMMUNICATION CONNECTIONS

- 20) Unit-to-Unit - Plug 64 is reserved for U2U communication
- 21) Site and BMS - Plug 74 and terminal block 3 are reserved for Site and BMS connections. Plug 74 is an eight pin RJ45 for a Cat 5 cable. Terminal block 3 is a two-position screw terminal block for use with twisted pair wires.

COOLPHASE CDU

ELECTRICAL FIELD CONNECTIONS

XDM300



PRODUCT INFORMATION

UNIT MOUNTED DISPLAY



The Liebert® iCOM™ display is a 7-inch capacitive, color-touchscreen display in an ergonomic, aesthetically pleasing housing. The display and housing will be viewable while the unit accent panels are open or closed. The display can be easily detached to view while the panel is open.

Menu Layout- The menus will be broken out into two main menu screens: User screen and Service screen. The User screen contains the menus to access parameters required for basic unit control and setup. The Service screen is designed for service personal and provides access to advanced control setup features and diagnostic information.

Password Protection- The display will contain two unique passwords to protect against unauthorized changes. An auto hide/show feature allows the user to see applicable information based on the login used. These four-digit passwords may be customized according to User preference.

Unit Backup and Restore- The user shall have the ability to create safety copies of important control parameters. The display has the ability for the user to automatically backup unit configuration settings to internal memory or USB storage drive. Configuration settings may be transferred to another unit for a more streamlined unit startup.

Parameter Search- The display has search fields for efficient navigation and parameter lookup.

Parameter Download- The Liebert® iCOM™ shall enable the user to download a report that lists parameter names, factory default settings, and the user programmed settings in .csv format for remote reference.

Parameter Directory- The Liebert® iCOM™ shall provide a directory that lists all parameters in the control. The list shall provide Line ID numbers, parameter labels, and current parameter values.



LIEBERT® iCOM™

PRODUCT INFORMATION

UNIT MOUNTED DISPLAY

Context Sensitive Help- The display will have an onboard help database. The database will provide context sensitive help to assist with setup and navigation of the menus.

Display Setup- The user has the ability to configure the display information based on the specific user's preference. Language, units of measure, screen contrast, home screen layout, back light timer and the hide/show of certain readouts will be configurable through the display.

Additional Readouts- The display has the ability for the user to configure custom widgets on the main screen. Widget options will include items such as fan speed, call for cooling, call for free cooling, maintenance status, call for hot water reheat, call for electric reheat, call for dehumidification, call for humidification, airflow, static pressure, fluid flow rate and cooling capacity.

Status LEDs- The display will provide the user with the unit's operating status using an integrated LED. The LED will indicate if the unit has an active alarm; if the unit has an active alarm that has been acknowledged; or if the unit is on, off, or in a standby status.

Unit Alarms – All unit alarms are annunciated through both audio and visual cues, clearly displayed on the screen, automatically recorded in the event log, and communicated to monitoring plug connections.

Event Log – The display will automatically store the last 400 unit-only events (messages, warnings, and alarms).

Service Contact Information – The display has the ability to store the local service or sales contact information.

Upgradeable – Display and Control Board software upgrades are performed through a USB connection.

Unit-to-Unit (U2U) Communication – Communication via private Ethernet network allows for advanced control functionality (Teamwork modes, sharing sensor data, Standby Rotation, Lead-Lag, and Cascade operation).

Temperature Control- Precision temperature control is maintained while maximizing efficiency based on a user entered setpoint and tolerance.

Various Control Types- Proportional, PI (proportional-integral), or Intelligent control types can be selected for supply or return temperature. These control types have been developed to maximize component life and maintain precise environmental control.

Timers/Sleep Mode- The menus shall allow various customer settings for turning the unit On or Off.

Sensor Calibration- The menus shall allow unit sensors to be calibrated with external sensors.

Maintenance/Wellness Settings- The menus shall allow reporting of potential component problems before they occur.



LIEBERT® iCOM™

PRODUCT INFORMATION UNIT MOUNTED DISPLAY

Options Setup- The menus shall provide operation settings for the installed components.

Auto Restart- The unit will return to its previous operating status after loss of power. Units can be stagger started to minimize system current draw.

Auxiliary Boards- The menus shall allow setup of optional expansion boards.

Various Sensors: The menus shall allow setup and display of optional custom sensors. The control shall include four customer accessible analog inputs for field-supplied sensors. The analog inputs shall accept a 4 to 20mA signal. The user shall be able to change the input to 0 to 5VDC or 0 to 10VDC. The gains for each analog input shall be programmable from the front display. The analog inputs shall be able to be monitored from the front display.

Diagnostics/Service Mode- The Liebert® iCOM™ control shall be provided with self-diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as On or Off at the front display. Control outputs shall be able to be turned On or Off from the front display without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.

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