



# Liebert® CW Thermal Management System

**Installer/User Guide and System Design**

440 kW Capacity, 60 Hz

The information contained in this document is subject to change without notice and may not be suitable for all applications. While every precaution has been taken to ensure the accuracy and completeness of this document, Vertiv assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions.

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™ Liebert® CW Thermal Management System. 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! Arc flash and electric shock hazard. Can cause serious injury or death. 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.



**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 moving. Can cause equipment damage, injury or death. 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 the tables in [Unit Weights and Shipping Dimensions](#) on page 10 . Use the center of gravity indicators on the unit to determine the position of the slings.



**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 contact with high speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure. Do not operate the unit with any or all cabinet panels removed.



**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 improper lifting. Can cause serious injury or death. Building and equipment damage may also result. A spreader bar or equivalent must be used when rigging to ensure the lifting force is completely vertical at these fasteners. Lift points are rated for lifting this section only. Do not lift assembled sections from these lift points.



**WARNING!** Risk of improper wire sizing/rating and loose electrical connections. Can cause overheated wire and electrical connection terminals resulting in smoke, fire, equipment and building damage, injury or death. 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.



**CAUTION:** Risk of improper moving, lifting and handling. Can cause equipment damage or injury. Only properly trained and qualified personnel should work on this equipment. Use proper lifting techniques and wear appropriate, OSHA-approved PPE to avoid injury and dropping the fan assembly during removal. Equipment used in handling/lifting, and/or installing the fan assembly must meet OSHA requirements. Use handling/lifting equipment rated for the weight of the fan assembly. Use ladders rated for the weight of the fan assembly and technicians if used during installation. Refer to handling/lifting, and/or installation equipment operating manual for manufacturer's safety requirements and operating procedures.



**CAUTION:** Risk of heavy unit falling into defective raised floor. Can cause injury and equipment damage. Prior to installation, all floor tiles immediately around floor stand 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 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 improper handling heavy and lengthy parts. Can cause injury. Building and equipment damage may also result. Cabinet panels can exceed 5 ft. (1.5 m) in length and weigh more than 35 lb (15.9 kg). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to remove or install cabinet panels.



**CAUTION:** Risk of exposure to harmful noise levels. Can cause hearing injury or loss. Depending on the installation and operating conditions, a sound pressure level greater than 70 dB(A) may arise. Take appropriate technical safety measures. Operating personnel must wear appropriate, OSHA-approved PPE and observe all appropriate hearing-protection safety requirements.



**CAUTION:** Risk of contact with hot surfaces. Can cause injury. Personal burn injury can be the result of touching an electronics housing, fan motor, 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, including when replacing or performing maintenance on the fans.



**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 specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.

## 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: backup generator systems) for startup, 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  $\pm 10\%$  of the load nameplate nominal voltage. Also, ensure that no three phase sources are single phased at any time.

## NOTICE

Risk of piping system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Cooling coils and piping systems are at high risk of freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil and piping 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/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 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.

## NOTICE

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

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

Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in catastrophic and expensive building and equipment damage and loss of critical data center equipment.

Do not locate unit directly above any equipment that could sustain water damage.

We recommend installing a monitored fluid detection system to immediately discover and report coolant fluid system and condensate drain-line leaks.



**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 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 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 water backing up in the drain line. Leaking and overflowing water can cause equipment and building damage.

Install an external, 5-1/2 in. trap in the drain line (if desired). The factory unit does not contain a trap.

Sagging condensate drain lines may inadvertently create an external trap.

**NOTICE**

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

**NOTICE**

Risk of improper storage. Can cause unit damage.

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

**NOTICE**

Risk of improper control circuits. Can cause equipment damage.

When using jumpers for troubleshooting, always remove jumpers when maintenance is complete. Jumpers left connected could override controls and cause equipment damage.

**NOTICE**

Risk of improper filter installation. Can cause filter collapse and airflow reduction.

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## 2 Nomenclature and Components

This section describes the model number for Vertiv™ Liebert® CW Thermal Management System units and components.

### 2.1 Vertiv™ Liebert® CW Model Number Nomenclature

Table 2.2 below describes each digit of the model number.

**Table 2.1 Liebert® CW Model Number Example**

1	2	3	4	5	6	7	8	9	10	11	12	13	14
C	W	4	4	0	D	C	1	A	1	A	X	X	X

**Table 2.2 Liebert® CW Model Number Digit Definitions**

Digit	Description
Digits 1 and 2 = Unit Family	CW = Liebert® CW floor mounted, chilled water unit
Digit 3, 4, 5 = Nominal Cooling Capacity, kW	440 = 440 kW
Digit 6 = Air Distribution	D = Downflow
Digit 7 = Cooling Type	C = Chilled water
Digit 8 = Fan Type	1 = EC fan H = EC fan with THD transformer
Digit 9 = Voltage	A = 460 V - 3 ph - 60 Hz B = 575 V - 3 ph - 60 Hz
Digit 10 = Valve Type	1 = 2-way, high pressure
Digit 11 = Configuration Code	A-Z = Standard configuration S = SFA
Digit 12, 13, 14 = Factory configuration number	

## 2.2 Component Location

The unit component locations are described in the submittal documents included in the [Submittal Drawings](#) on page 61.

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

**Table 2.3 Component Location Drawings**

Document Number	Title
10020389	Component Location Diagram CW440

## 3 Planning Guidelines

### 3.1 Capacity and Physical Data

**Table 3.1 Performance Data, Standard Chilled Water Unit with EC Fans**

Model No.	440	
NET CAPACITY DATA kBTU/H (kW) BASED ON 45°F (7.2°C) ENTERING WATER, 10°F (5.5°C) WATER RISE <sup>(1)</sup>		
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH		
Total Capacity, kBTUH (kW)	1,698 (498)	
Sensible Capacity, kBTUH (kW)	1,467 (429)	
Flow Rate, GPM (l/s)	362 (22.8)	
Pressure Drop, ft (kPA)	27 (81.8)	
<b>Fan Data - EC Fans - Available in Downflow Orientations</b>		
Nominal Air Volume, CFM (CMH)	57,500 (97,693)	
Fan Motor, Maximum hp (kW), each	16.1 (12.0)	
Standard Ext. Static Pressure, inches of water (PA)	0.2 (49.8)	
Number of fans	4	
<b>Chilled Water Coil</b>		
Face Area, ft <sup>2</sup> (m <sup>2</sup> )	130 (12.08)	
Number of Rows	6	
Face Velocity, FPM (m/s)	442 (2.24)	
<b>Chilled Water Valves</b>	Maximum design water pressure 300 PSI (2068 kPa)	
<b>Valve Actuator, Sensors and Body</b>		
Valve CV	130	
Quantity	2	
Valve Type	Modulating Ball Valve (3" Belimo, reference 319754P3)	
Valve Size, in.	3.0	
2-way Valve Close-off Pressure, PSI (kPA)	100 (689)	
<b>Filter Section</b>		
<b>Disposable Type - MERV8 (standard) or MERV11 (option)</b>		
Nominal Sizes, in.	20 x 24 x 4	18 x 24 x 4
Quantity of each	22	11

**Table 3.1 Performance Data, Standard Chilled Water Unit with EC Fans (continued)**

Model No.	440
Connection Sizes	
Chilled Water (grooved, black pipe)	4 in.
Condensate Drain	2 x 1-1/4 in.
Condensate Discharge (when supplied with pump), OD	1/2-in. compression
<p><b>NOTE:</b> When entering fluid temperature is lower than the dew point temperature, hydrophilic coil is required. If entering fluid temperature is higher than the dew point temperature, aluminum fin coil may be used. Please contact Vertiv sales representative to discuss application options based on site performance parameters and ASHRAE operating envelope.</p>	

**Table 3.2 Electrical Data—with EC Fans, 460 V/60 Hz**

Model	Qty. fans	Voltage	No reheat/No humidifier
CW440	4	FLA	62.0
		WSA	65.9
		OPD	80.0

## 3.2 Unit Weights and Shipping Dimensions

**Table 3.3 Unit Weights and Shipping Dimensions for Vertiv™ Liebert® CW440**

Section*	Weight			Domestic Shipping Dimensions L x W x H, in. (mm)
	Dry Weight lbs (kg)	Operating Weight lbs (kg)	Domestic Shipping Weight lbs (kg)	
Coil	3,302 (1498)	3,591 (1629)	3,992 (1811)	190 x 70 x 87 (4826 x 1778 x 2210)
Fan	2,454 (1113)	2454 (1113)	3,886 (1763)	190 x 70 x 87 (4826 x 1778 x 2210)
Filter Box	742 (337)	742 (337)		
*Each system ships on two skids. Skid 1 is the coil section. Skid 2 is the fan and filter box sections.				

### 3.3 Planning Dimensions

The unit, floor stand, and plenum dimensions are described in the submittal documents included in the [Submittal Drawings](#) on page 61.

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

**Table 3.4 Dimension Planning Drawings**

Document Number	Title
<b>Downflow Units with EC Fans</b>	
DPN003569	Cabinet Dimensional Data CW440 and Filter Plenum (Plenum Shipped Separately)
<b>Floor Stands for Units with EC Fans</b>	
DPN003570	Fan Section Dimensional Data CW440 Model
DPN003676	Optional Ducted Rear Connection CW440 Model

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## 4 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 **Table 2.2** on page 7, and 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 61.

- Verify that the floor is level, solid and sufficient to support the unit. See [Unit Weights and Shipping Dimensions for Vertiv™ Liebert® CW440](#) on page 10, 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).
- Do not install a Vertiv™ Liebert® CW Thermal Management System in an alcove or at the end of a long, narrow 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 water detection system. Contact your Vertiv representative for information.

### 4.1 Site Preparation

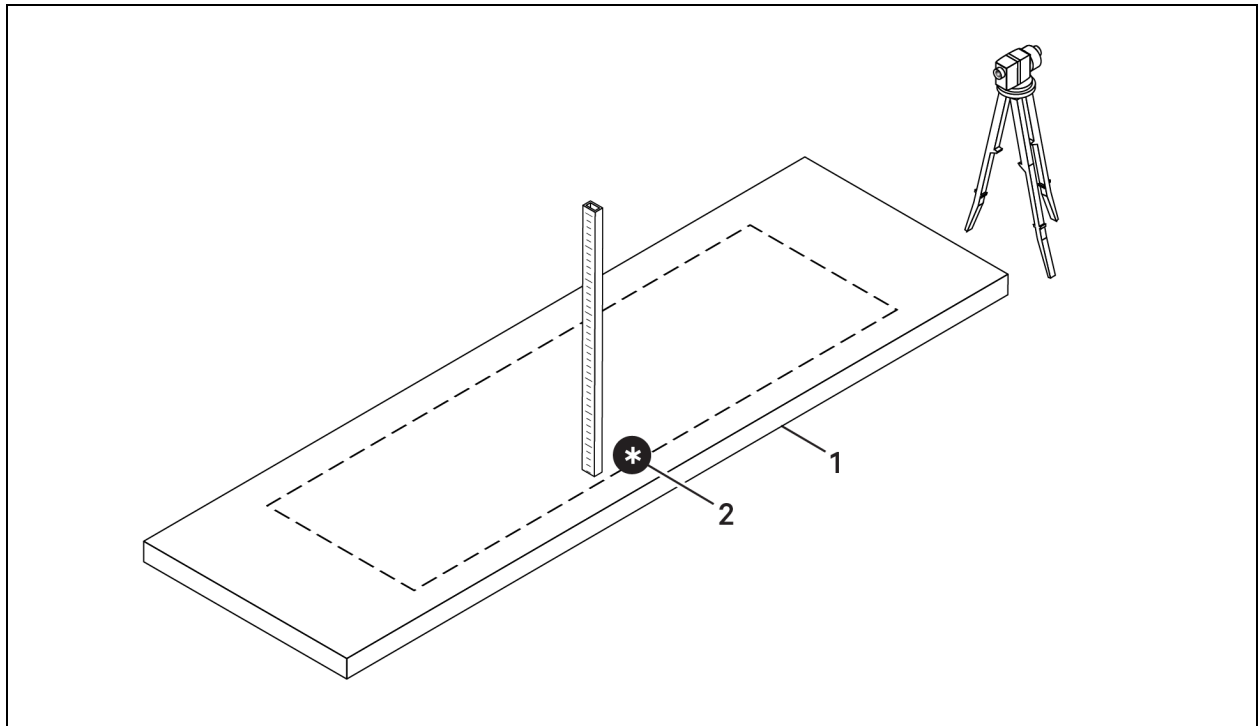
Prepare the site for installation prior to arrival and unloading of the unit.

- 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).

#### 4.1.1 Preparing a Concrete Slab

1. Sweep the slab broom clean.
2. Lay out the final location of the unit on the slab, using either chalk line or tape, see **Figure 4.1** on the next page.
3. Using a laser level or optical level, locate the high point on the slab and mark it, see **Figure 4.1** on the next page.

Figure 4.1 Unit and High Point Marking on Concrete Slab



Item	Description
1	Concrete slab
2	High point

## 5 Equipment Inspection and Handling



**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. Unit table weights are specified in [Unit Weights and Shipping Dimensions](#) on page 10 .



**WARNING!** Risk of improper moving. Can cause equipment damage, injury or death. 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 the tables in [Unit Weights and Shipping Dimensions](#) on page 10 .



**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.
- For initial access use a 7/32-in. Allen wrench for panel removal.

### Equipment Recommended for Handling the Unit:

- Forklift
- Slings
- Spreader bars

## 5.1 Hardware Kit

The coil section of the unit ships with a hardware kit containing materials for reassembly of the unit sections.

- 1-in. wide adhesive backed foam (1/2-in. wide for seismic) for gasketing between unit sections
- 1-in. wide adhesive backed foam for panel gasketing at the field weld locations of sections (seismic only)

## 5.2 Rigging



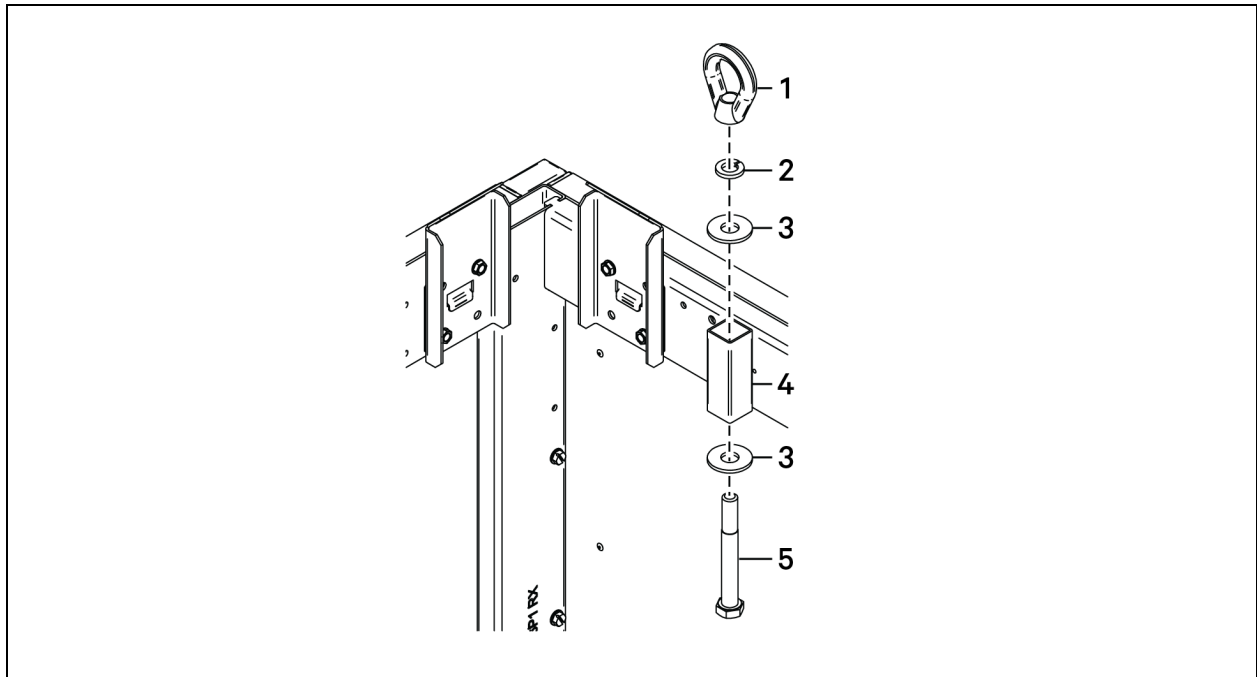
**WARNING! Risk of improper lifting. Can cause equipment damage, injury, or death. A spreader bar or equivalent must be used when rigging to ensure the lifting force is completely vertical at these fasteners. Lift points are rated for lifting this section only. Do not lift assembled sections from these lift points.**

Vertiv does not provide rigging. Refer to the following for recommended rigging process.

- Use proper rigging equipment to make sure attachment and lifting at the designated lift points is in the vertical direction. See [Lift Points on the Coil Section](#) on page 18 , and [Lift Points on Filter Plenum, Plenum Extension, and Fan Sections](#) on page 19 , for lift-point locations on the sections.
- All sections have four lift points to use rigging fasteners supplied.
- One rigging-fastener kit provided with fan and filter-section skid. See [Rigging Fastener Installation](#) on the facing page , for installation.
- Rigging fasteners are pre-installed on coil section, [Lift Points on the Coil Section](#) on page 18 .

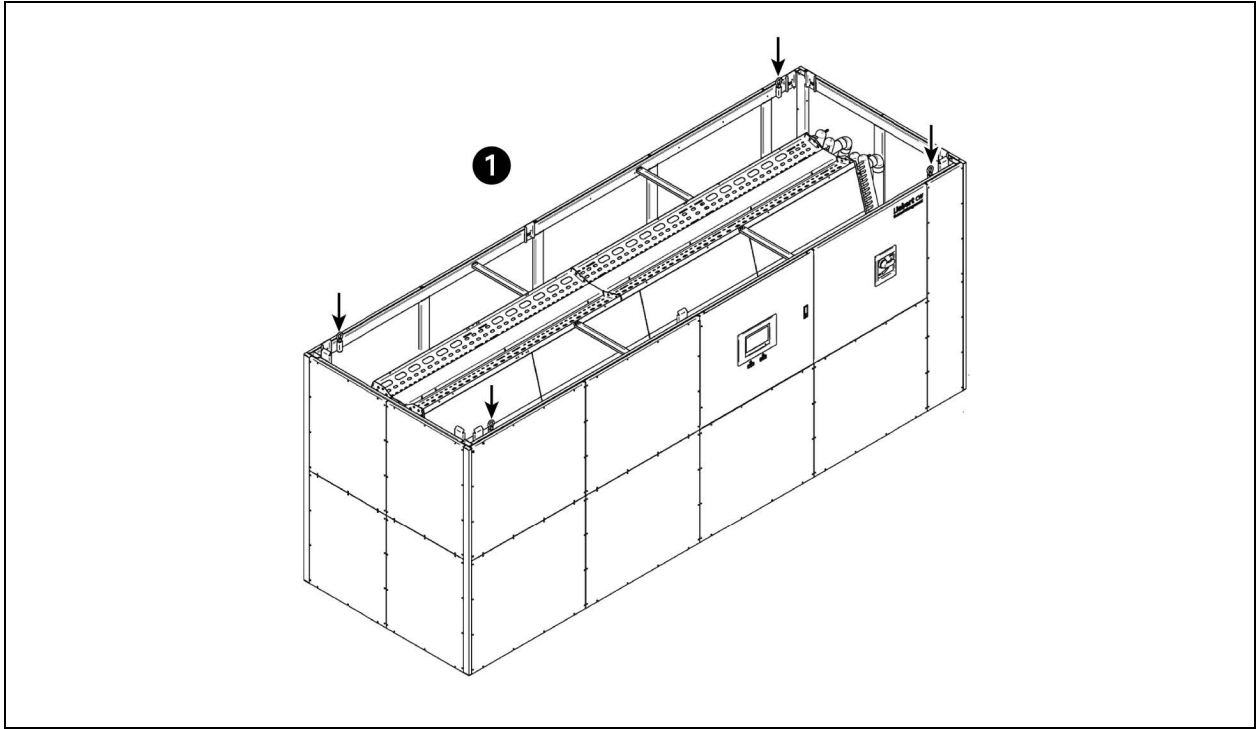
**NOTE: The rigging fastener kit provided with the fan and filter sections include additional hardware and instructions for installation and use. See instructions included with the rigging-fastener kit. Refer to **Figure 5.1** on the facing page for fastener location and lift points on the coil section.**

Figure 5.1 Rigging Fastener Installation



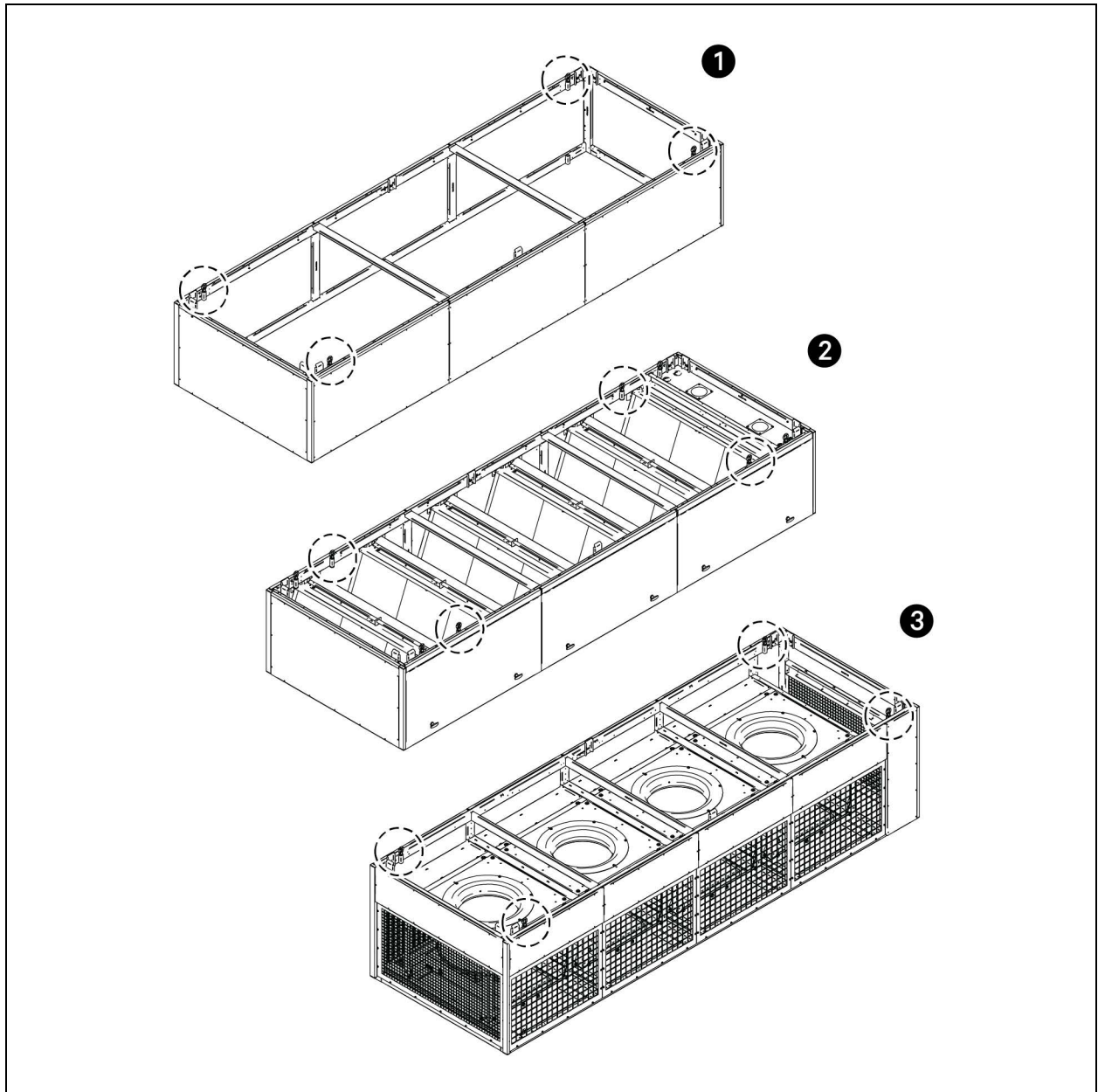
Item	Description
1	Eye nut, 1/2-13 thread
2	Lock washer, 1/2-in.
3	Flat washer, 1/2-in.
4	1-in. x 1-in. tube
5	Screw, 1/2-13 x 4 in.

Figure 5.2 Lift Points on the Coil Section



Item	Description
1	Coil section

Figure 5.3 Lift Points on Filter Plenum, Plenum Extension, and Fan Sections



Item	Description
1	Plenum extension
2	Filter plenum
3	Fan section

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## 6 Installing the Unit



**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.



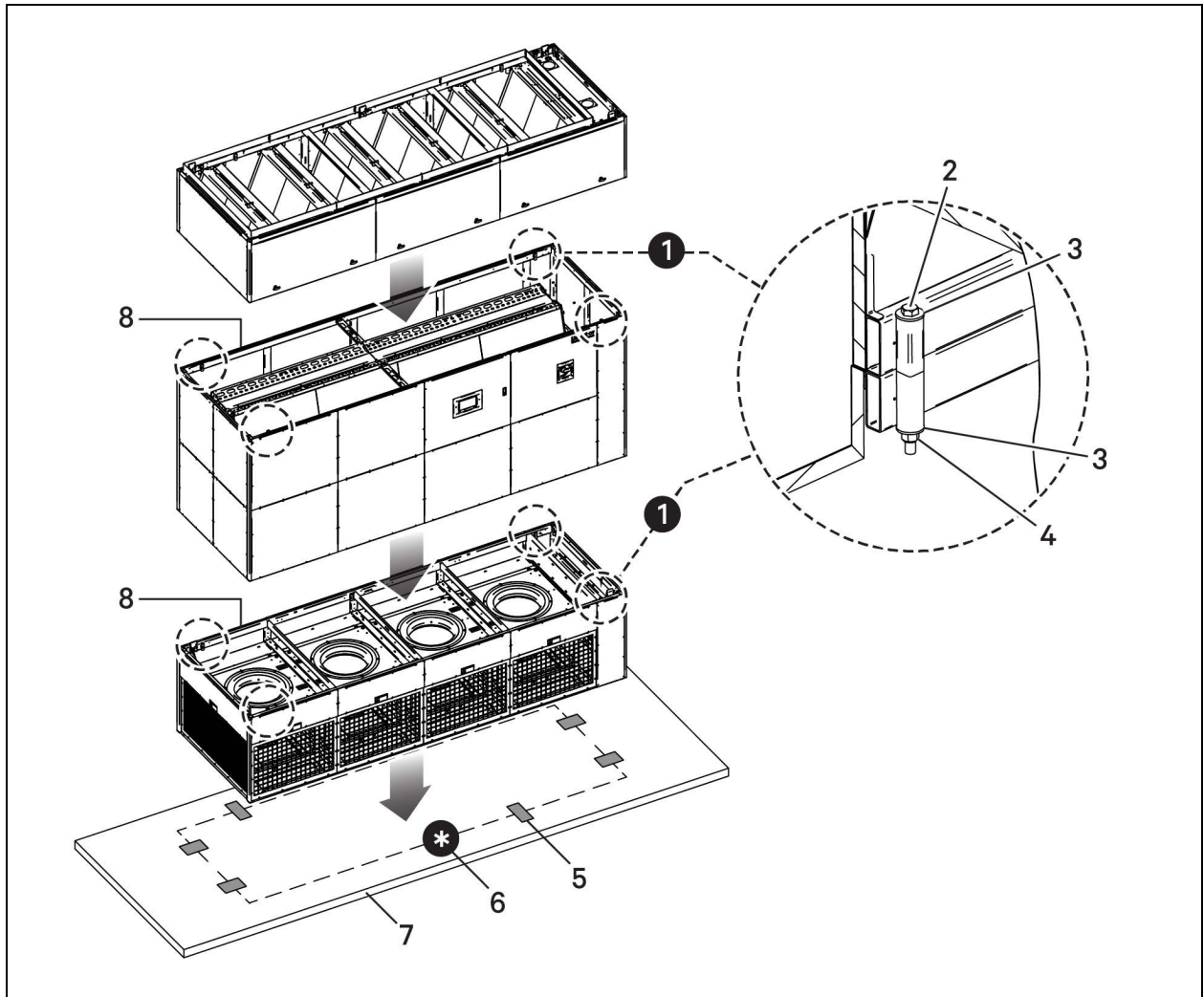
**CAUTION:** Risk of heavy unit falling into defective raised floor. Can cause injury and equipment damage. Prior to installation, all floor tiles immediately around fan section are to be removed and inspected. Make sure tiles are not cracked, and ribs have not been cut. If free from defects, re-install.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

**NOTE:** Unit to be placed onto fan section using process that will provide safest method based on site layout. Professional installers to be used when placing unit. Unit may require lift onto fan section if elevated flooring has not been installed. If flooring is installed, unit will be placed over floor opening containing fan section.

Referring to **Figure 6.1** on the next page, perform the following steps:

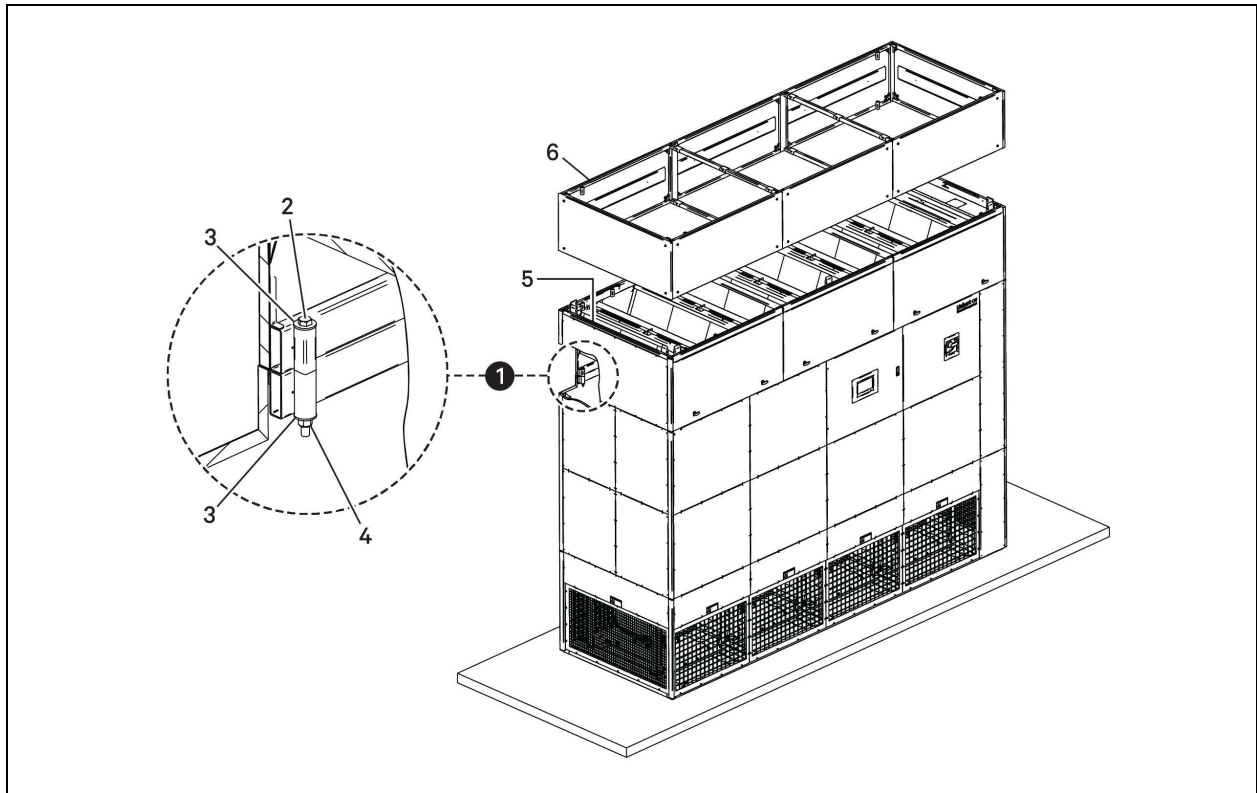
1. Referencing the highest point, set the fan section on marked location and level it with steel shims.
2. Install additional steel shims, spaced not more than 6 ft apart.
3. Apply 1-in. (25-mm) wide [1/2-in (13 mm) wide on Vertiv™ Liebert® CW440 seismic installations] adhesive-backed foam (factory supplied) to the inner-most edge of the mating surface of the bottom section.
4. Once the section is in place, remove rigging fasteners (shown in [Rigging](#) on page 16) before stacking next section on top of lower section.
5. Swing the upper, split unit section within 2 to 3 inches of the first section.
6. Make final adjustments to align the sections, and lower the upper section onto the section(s) below.
7. Repeat steps 3 to 5 to place the filter and the (optional) plenum sections, see [Placing the Optional Plenum](#) on page 23, for plenum placement.

Figure 6.1 Placing the Unit and Upper Sections



Item	Description
1	Connection locations
2	Bolt, 1/2-13 x 7.5 in.
3	Flat washer, 1/2-in.
4	Lock nut, 1/2-13 thread
5	Steel shims under all lifting points
6	Established high point
7	Concrete slab or Housekeeping pad
8	Install factory supplied foam gasketing

Figure 6.2 Placing the Optional Plenum



Item	Description
1	Connection locations
2	Bolt, 1/2-13 x 7.5 in.
3	Flat washer, 1/2-in.
4	Lock nut, 1/2-13 thread
5	Install factory supplied foam gasketing
6	Optional, 18-in. decorative plenum

## 6.1 Connecting Unit Sections (Recommended)

Secure the coil section frame to the fan base frame and the filter section frame to the coil section frame.

Ten locations on the Vertiv™ Liebert® CW440 are provided to connect the 3 unit sections. If a plenum option is included, 14 locations on the CW440 are provided.

The following is the factory supplied hardware required (per location):

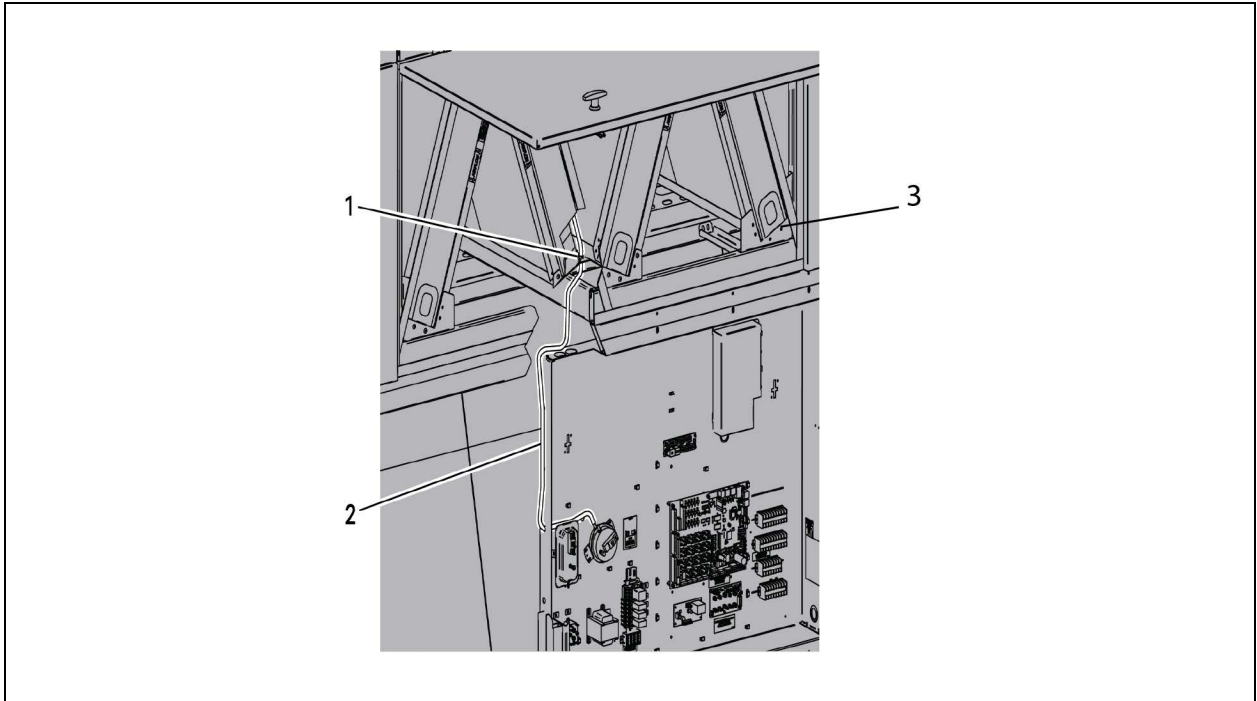
- Bolts 1/2-in. x 7.5-in.
- Nut hex, 1/2-in.
- Two flat washers, American National Standard Series W, type A, plain washers

## 6.2 Routing the Filter Clog Pickup Tube in the Plenum

The pressure pick-up tube must be routed and mounted for proper operation of the filter clog alarm. The tube is factory connected to the filter clog switch in the low voltage control box of the coil sections.

1. Locate the pickup tube, which is coiled outside the low voltage control box in the coil section.
2. Uncoil and route the tube into the filter plenum through the hole labeled "Filter Clog Sample Tube" on the filter slide rail, see **Figure 6.3** below .

**Figure 6.3 Pressure Tube Routed from Filter Clog switch into the Filter Plenum**



Item	Description
1	Filter clog sample tube hole
2	Pressure pickup tube
3	Filter

## 7 Electrical Connections in the Unit



**WARNING!** Arc flash and electric shock hazard. Can cause serious injury or death. 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.



**WARNING!** Risk of improper wire sizing/rating and loose electrical connections. Can cause overheated wire and electrical connection terminals resulting in smoke, fire, equipment and building damage, injury or death. 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 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.

The electrical connections are described in the submittal documents included in the [Submittal Drawings](#) on page 61.

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

**Table 7.1 Electrical Field Connection Drawings**

Document Number	Title
DPN005078	Electrical Field Connections, Downflow CW440

## 7.1 Fan High Voltage Connections

Unshielded wiring is used for ON/OFF switching of the fans.

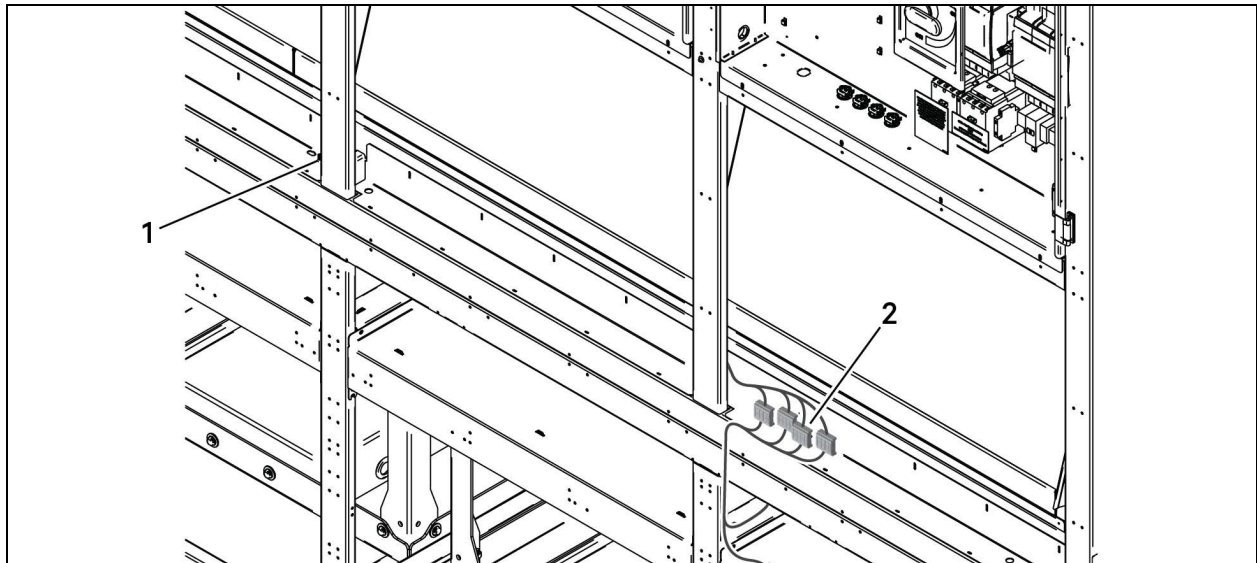
- Locate the high voltage (AC power for fans) wires that are coiled and secured on top of the lower section.
- Refer to the wire and fan numbers listed in the submittal drawing and **Figure 7.1** below, to connect the wires from the lower section to the upper section of the unit.
- Use the quick connect sockets located at the base of the coil section to connection to the high voltage panel.

## 7.2 Fan Control Low Voltage Connections

Shielded wiring is used for analog control of the fans.

- Locate the low voltage (control wiring for fans) wires that are coiled and secured on top of the lower section.
- Connect the wires from the lower section to the upper section of the unit, see **Figure 7.1** below.

**Figure 7.1 High and Low Voltage Connections in the Fan Section**



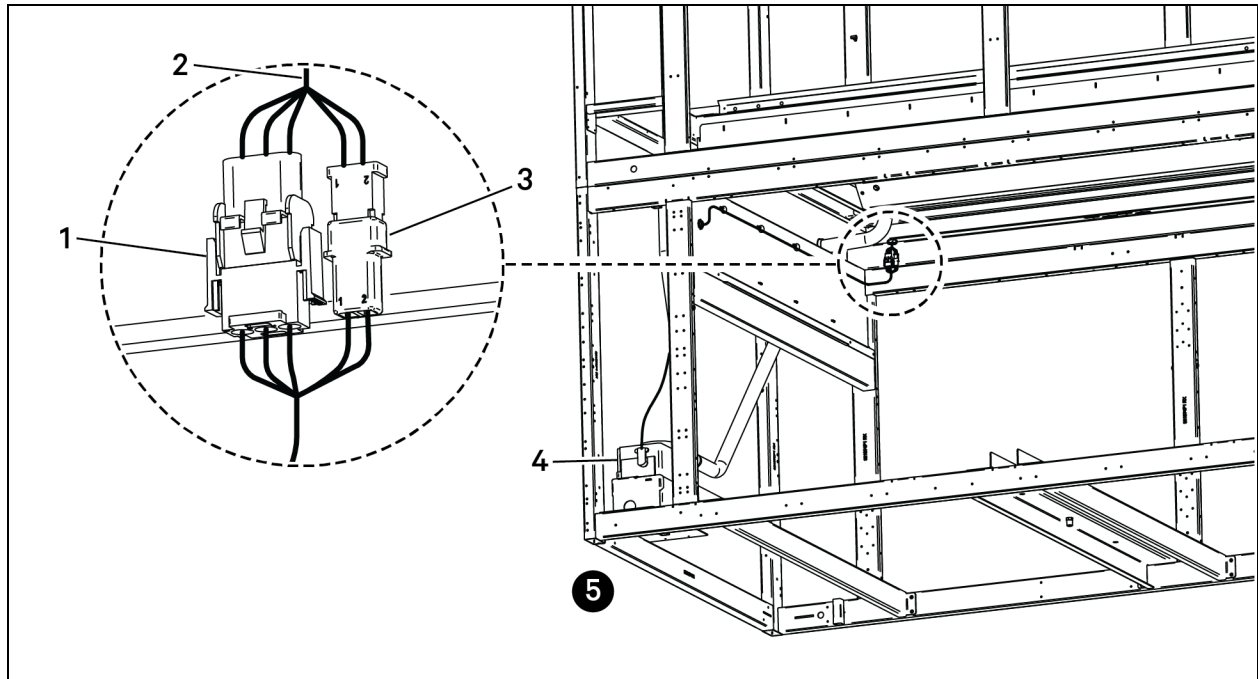
Item	Description
1	RS-485 connection
2	High voltage connections. CW440 connections shown.

## 7.3 Condensate Pump High and Low Voltage Connections

The coil and fan sections are factory wired with a quick connect connector for the condensate pump.

After the coil section is lowered and secured to the fan section, connect the pump harness from the fan section to the plug provided in the underside of the coil section, see **Figure 7.2** below .

**Figure 7.2** Condensate Pump Harness Connection



Item	Description
1	High voltage power connection
2	Wire harness from EP
3	Low voltage alarm connection
4	Condensate pump
5	Rear side view

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## 8 Piping Requirements

Factory installed piping brackets must not be removed. Field installed 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 below the elevated floor must be located so that it offers the least resistance to air flow. Careful planning of the piping layout under the raised floor is required to prevent the air flow from being blocked. When installing piping on the subfloor, we recommend that the pipes be mounted in a horizontal plane rather than stacked one above the other. Whenever possible, the pipes should be run parallel to the air flow.

The pipe connection locations, piping general arrangement and schematics are described in the submittal documents included in the [Submittal Drawings](#) on page 61.

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

**Table 8.1 Piping Connection Drawings**

Document Number	Title
10031843	Primary Connection Locations, CW440: Units with Grooved Field Connections
10020355	Primary Connection Locations, CW440: Units with Flanged Field Connections
10031842	Primary Connection Locations, CW440: Units with Brazed Field Connections

### 8.1 Installing Water Supply and Return Piping

We recommend installing an additional valve in a water supply pipe to flush the system prior to start-up. The additional valve may also provide water for periodic maintenance that includes cleaning the coils.

- Install all water supply and water return lines in accordance with industry best practices and all local codes.
- The cooling water pipes are grooved to receive field supplied, grooved pipe connectors.
- Follow the instructions provided by the manufacturer of the grooved pipe connectors for correct installation and torque requirements of the assembly bolts.

**Table 8.2 Internal Water Volume**

Model	Volume
	Gallons (Liters)
CW440	80 (330)

## 8.1.1 Field Installed, Gravity Drain Line Requirements

### NOTICE

Risk of water backing up in the drain line. Leaking and overflowing water can cause equipment and building damage.

Sagging condensate drain lines may inadvertently create an external trap.

A 3/4-in NPT female drain connection is provided on units without an optional condensate pump.

Observe the following requirements when installing and routing the drain line:

- The drain line must be sized for 2 gpm (7.6 l/m) flow.
- The drain line must be located so it will not be exposed to freezing temperatures.
- The drain should be the full size of the drain connection.
- The drain line must slope continuously away from the unit. Pitch drain line toward drain a minimum of 1/8 in. (3 mm) per 1 ft (305 mm) of length.
- The drain line must be rigid enough so that it does not sag between supports which unintentionally creates traps.
- The drain line must comply with all applicable codes.
- We recommend installing monitored, under floor leak detection equipment.

## 8.2 Installing Drain Traps on a Unit without a Condensate Pump

Install field fabricated drain traps at all trap locations on the unit. Drain traps are essential to allow water to flow out of the drain pan(s). More importantly, when there is negative internal static within the unit, the trap prevents outdoor air from being pulled into the unit and splashing water inside the unit. Drain trap design is dependent on the total static pressure (TSP). We recommend installing threaded plugs at several locations to permit periodic cleaning and filling of the trap.

- See [Drain Trap Locations](#) on the facing page, for the location and number of traps.
- Drain-trap materials are installer-provided.
- Use industry best practices and follow all local codes when fabricating the traps.
- **Figure 8.2** on the facing page, shows a typical drain-trap design or, if a negative pressure trap is needed, see **Figure 8.3** on page 32, and observe the following:
  - Dimension “H” equals the Total Static Pressure in inches of water column plus a minimum of one inch.
  - The outlet side of the drain trap should have a water column equal to one-half of dimension “H.”
  - Use materials and fittings as local conditions dictate.
  - Because the trap must be filled with water at all times, consider fabricating the trap from metal so that an electric heat tape can be installed to prevent freezing.

Figure 8.1 Drain Trap Locations

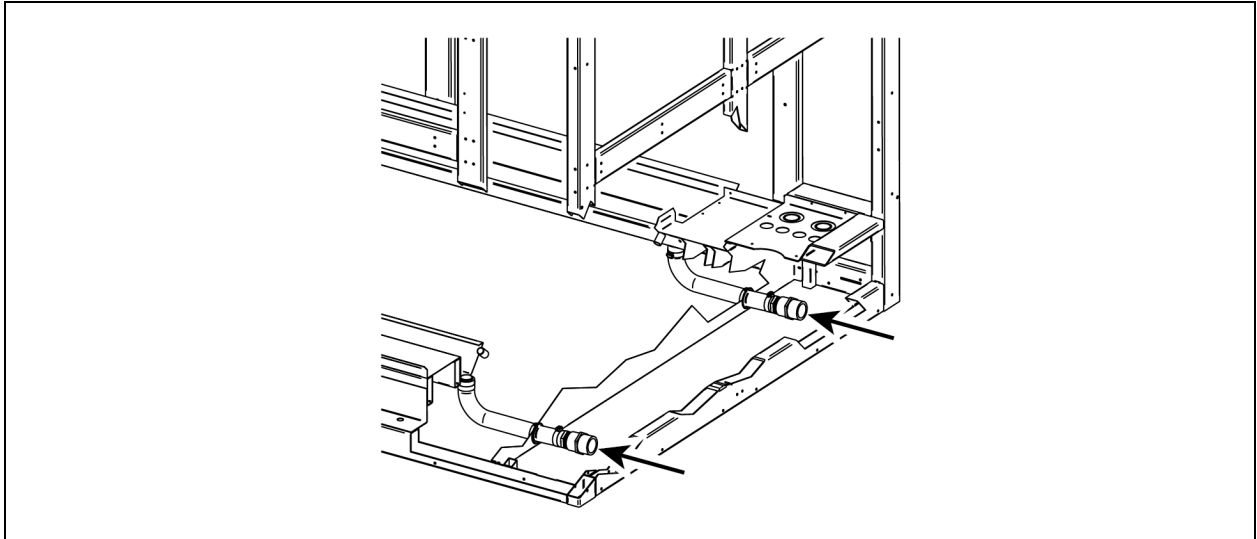
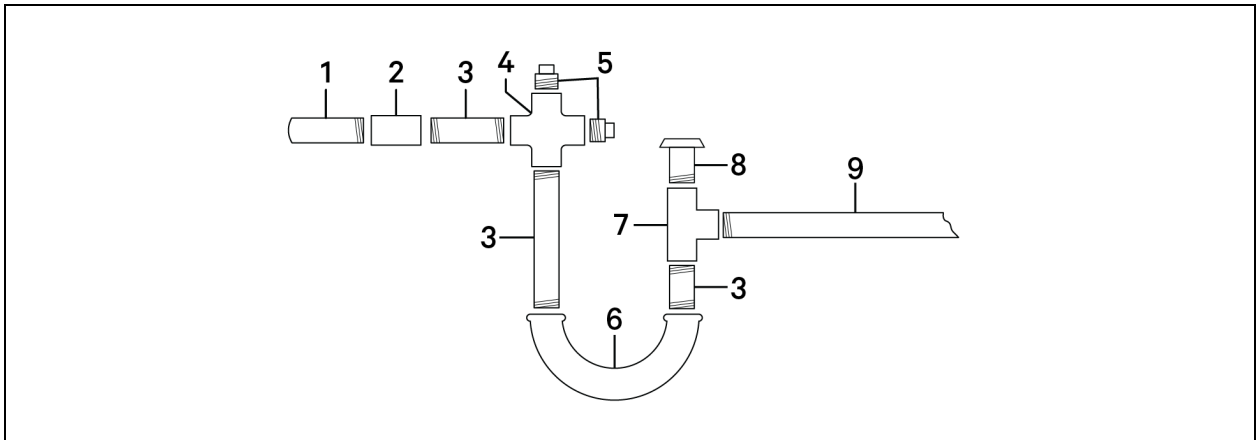
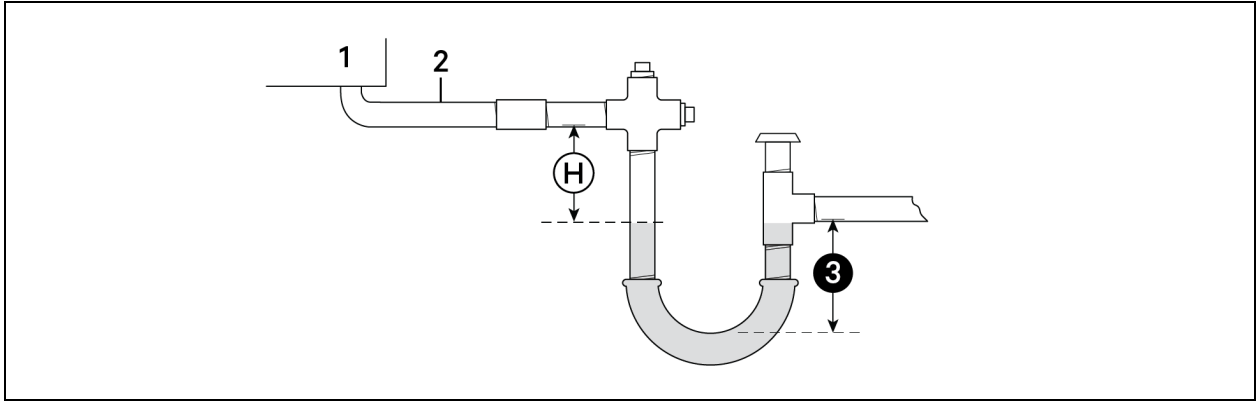


Figure 8.2 Typical Drain Trap Construction



Item	Description
1	Condensate discharge pipe from unit
2	Coupling (threaded socket)
3	Nipple
4	Cross
5	Threaded plugs (for clean out)
6	Bend
7	Tee
8	Vacuum breaker
9	Sloped drain pipe

**Figure 8.3 Negative Pressure Drain Trap Construction**



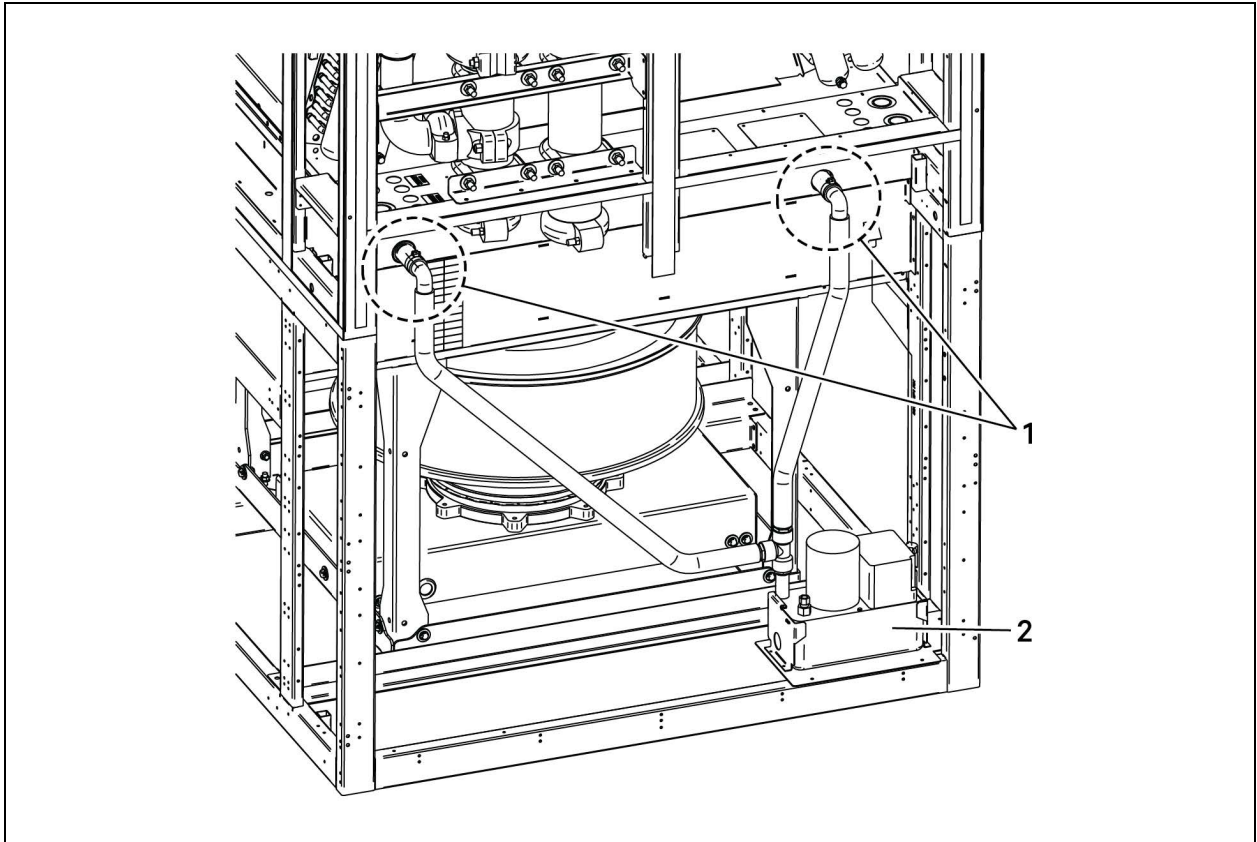
Item	Description
1	Condensate drain pan
2	Condensate discharge pipe from unit/drain pan
3	One-half of dimension "H"
H	Total static pressure in inches of water column plus a minimum of one inch.

### 8.3 Installing Condensate Discharge Tubing on Units with a Condensate Pump

On units with a condensate pump, the factory mounted pump requires field assembly to the two condensate connections on the coil. After the unit is assembled, see **Figure 8.4** on the facing page, to connect the piping to the pump. The pump discharge connection is ½-in. copper compression. The factory provides the compression a ring and nut for the discharge tube attached to the drain line into the pump.

- Size the piping based on available condensate head.
- Condensate pump discharge (drain) line must comply with all applicable codes.

**Figure 8.4** Field Connections for the Factory Piped Condensate Pump: Units with Grooved Customer Pipe Connections

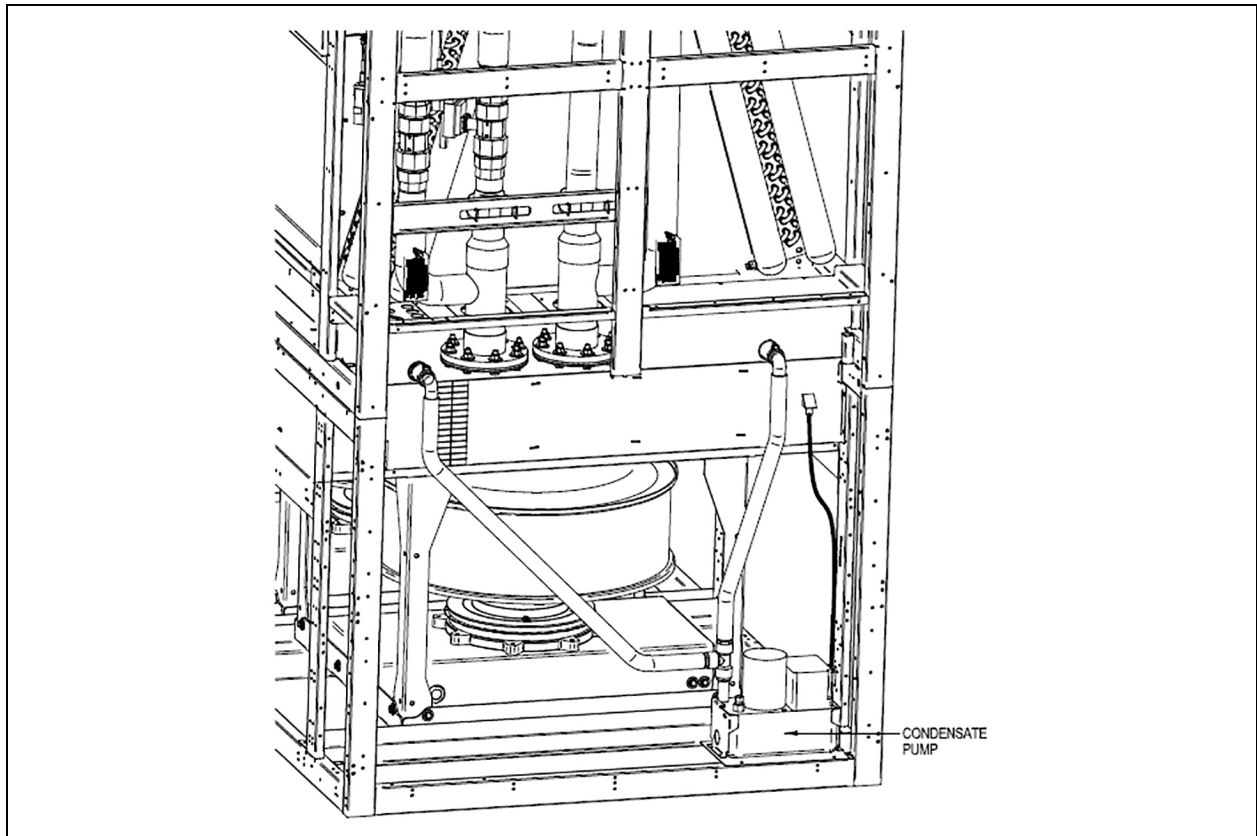


Item	Description
1	Connection locations
2	Condensate pump

**NOTE:** This image represents the location of the condensate pump. (Grooved shown as an example and is generally valid for brazed connections.)

Figure 8.5 on the next page shows the connection for flanged.

**Figure 8.5 Field Connections for the Factory Piped Condensate Pump: Units with Flanged Customer Pipe Connections**



### 8.3.1 Flanged Connections

For specifications on the flange used, please refer to [Flange Specifications](#) on page 59 .

#### Checking 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™ Liebert® CW440 and Field Supplied Flange

1. Visually examine the flange alignment to ensure that an acceptable fit has been obtained.
2. While aligning flanges, make sure that there are no residual stresses in the joint. The use of heat correction for the alignment of flanges is strictly prohibited.
3. Flange faces should be parallel and aligned.
4. The flange bolt holes should be in line so that bolts will pass freely.

## Nuts and Bolts Check

1. Visually examine the nuts, studs, and bolts before installation to ensure that they are free from defects such as corrosion and damaged threads. Nuts or bolts with damaged threads should not be used.
2. Check the length of the stud or bolt to avoid short bolting and excessive threads. Flange bolts shall be furnished in a sufficient length to allow use of bolt tensioning equipment or spades, spaces, drip rings and water valves, and the associated extra gaskets.
3. Visually examine studs and nuts after cleaning to ensure that they are free from burrs. Studs and nuts shall be cleaned using a wire brush to remove any dirt on the threads. Lubricant shall be applied on threads and nuts to flange contact surfaces. Lubricant shall not be used in the gasket and in the gasket seating area.
4. The bolt and nut material grades should be correctly identified before they are used.
5. Bolts and nuts can only be re-used if it is known that they have not been overloaded or have not exceeded their yield point.
6. When assembling the nut on the bolt, the nut identification marking must always point outwards.

## 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 gasket 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.
  - b. Then install all studs and run up all nuts hand-tight.
3. Visually examine gaskets before installation to ensure that they are free from defects.
4. Color coding shall be maintained per the rate and type of gasket provided by the manufacturer.
5. Clean the gasket seating by using a wire brush.
6. Make sure the material is as specified. Look for any possible defects or damage in the gasket such as folds or creases.
7. Soft material gaskets should be replaced with new ones whenever an opened joint is to be closed again.
8. The full face flange gasket shall only be used once.

## Flange Bolt Torque Sequence

Follow industry standards when assembling torque bolts and nuts in a criss-cross sequencing using a minimum of three torquing passes.

After the three basic passes are completed, repeat criss-cross sequence until no further rotation of the nut is observed. Field flange connection to the Vertiv™ Liebert® CW440 unit must be installed in accordance with local codes and best industry practice.

## 8.4 Flushing the Entire Water System before Start-up

Both the pressurized water system and the drain system must be flushed before start-up:

- Flush all fresh water lines before connecting to the cooling coils until the water runs clear and all debris is flushed out.
- Flush again after the fresh water lines are connected to the coils to clear any debris from the cooling coils. Do not flush debris from the water lines into the coils.
- Thoroughly flush the drain system by running clean water through all drain pans and drain lines, then visually inspect drain pans to verify that all debris is removed.



## 9 Checklist for Completed Installation

### 9.1 Moving and Placing Equipment

1. Unpack and check received material.
2. Proper clearance for service access has been maintained around the equipment.
3. Equipment is level and mounting fasteners are tight.
4. Proper evaporator drip pan clean out system is in place.

### 9.2 Electrical Installation Checks

1. Supply voltage and phase matches equipment nameplate.
2. Power wiring connections completed to the disconnect switch.
3. Power line circuit breakers or fuses have proper ratings for equipment installed.
4. All internal and external high and low voltage wiring connections are tight.
5. Confirm that unit is properly grounded to an earth ground.
6. Control transformer setting matches incoming power.
7. Electrical service conforms to national and local codes.

### 9.3 Piping Installation Checks

1. Piping has been leak checked.
2. Piping is properly sized.
3. Check piping inside and outside of equipment for proper support and adequate spacing to prevent rub through.
4. Ensure that factory clamps have been reinstalled.
5. Drain line connected, not obstructed, and pitched per local code.

### 9.4 Other Installation Checks

1. Ducting complete
2. Filters installed.
3. Check that fasteners that secure and motors—some may have become loose during shipment.
4. Verify water detection is properly installed around all units (recommended).
5. All fans are free of debris.
6. Seal openings around piping and electrical connections.
7. Installation materials and tools have been removed from equipment (literature, shipping materials, construction materials, tools, etc.).
8. Locate blank start-up sheet, ready for completion by installer or start-up technician.

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## 10 Initial Start-up Checks and Commissioning Procedure for Warranty Inspection



**WARNING!** Arc flash and electric shock hazard. Can cause serious injury or death. 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.



**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 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.

- Confirm that all items on have been done.
- Locate “Liebert® CW Thermal Management System Warranty Inspection Check Sheet” in the unit’s electric panel.
- Complete “Liebert® CW Thermal Management System Warranty Inspection Check Sheet” during start-up.
- Forward the completed “Liebert® CW Thermal Management System 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 for contacts.

# 11 Troubleshooting



**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 improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. 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 control circuits. Can cause equipment damage.

When using jumpers for troubleshooting, always remove jumpers when maintenance is complete. Jumpers left connected could override controls and cause equipment damage.

**Table 11.1 Blower Troubleshooting**

Symptom	Possible Cause	Check or Remedy
Blower will not start	No main power	Check L1, L2 and L3 for rated voltage. Check Vertiv™ Liebert® CW Thermal Management System for unit status (Stand-by, Unit Off, Monitoring Off or Remote Off).
	Blown fuse or tripped circuit breaker (CB)	Check fuses or CBs to main fan.
	No output voltage from transformer	Check for 24 VAC between P24-2 and P24-1. If no voltage, check primary voltage.
	Control fuse blown or circuit breaker tripped	Check for 24 VAC between P4-4 and E1. If no voltage, check for short. Replace fuse or reset circuit breaker.

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## 12 Maintenance



**WARNING!** Arc flash and electric shock hazard. Can cause serious injury or death. 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 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 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 electric shock. Can cause serious injury or death. The Vertiv™ 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.

- Good maintenance practices are essential to minimizing operation costs and maximizing product life.
- Read and follow monthly and semi-annual maintenance schedules included in this manual. These MINIMUM maintenance intervals may need to be more frequent based on site specific conditions.
- See the Liebert® iCOM™ user manual SL-31075 for instructions on using the controller to predict some service maintenance intervals.
- We recommend the use of trained and authorized service personnel, extended service contracts and factory specified replacement parts. Contact your Vertiv sales representative.

## 12.1 Filters

### NOTICE

Risk of improper filter installation. Can cause filter collapse and airflow reduction.

Filters are usually the most neglected item in an environmental control system. To maintain efficient operation, they should be checked monthly and changed as required. Because replacement intervals vary with environmental condition and filter type, each unit is equipped with a filter clog switch. This warns of restricted airflow through the filter compartment by activating the Change Filter alarm.

- Turn power Off before replacing filters.
- Filters can be replaced through the filter plenum.
- Replacement filters are commercially available in several efficiencies. Refer to **Table 3.1** on page 9 .
- After replacing the filter(s), test the operation of the filter clog switch. Turn the adjusting screw counter clockwise to trip the switch—this will energize the Clogged Filter alarm. Acknowledge the alarm by pressing the horn button once.

### To adjust the switch:

1. With the fan running, set the switch to energize the light with clean filters. The unit panels must all be in place and closed to accurately find this point.
2. Turn the adjusting knob one turn clockwise, or to the desired filter change point.

## 12.2 Blower Drive System—EC Fans



**WARNING! Risk of electric shock. Can cause serious injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within the fan motor electric connection enclosures. Fan motor controls can maintain an electric charge for 10 minutes after power is disconnected. Wait 10 minutes after power is verified as off before working within the electric control/connection enclosures. Use only fully trained and qualified HVAC technicians to perform maintenance on the fans.**



**WARNING! Risk of contact with high speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure. Do not operate the unit with any or all cabinet panels removed.**



**WARNING! Risk of improper moving, lifting and handling. Can cause equipment damage or injury. Only properly trained and qualified personnel should work on this equipment. Use proper lifting techniques and wear appropriate, OSHA-approved PPE to avoid injury and dropping the fan assembly during removal. Equipment used in handling/lifting, and/or installing the fan assembly must meet OSHA requirements. Use handling/lifting equipment rated for the weight of the fan assembly. Use ladders rated for the weight of the fan assembly and technicians if used during installation. Refer to handling/lifting, and/or installation equipment operating manual for manufacturer's safety requirements and operating procedures.**



**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: backup generator systems) for startup, 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  $\pm 10\%$  of the load nameplate nominal voltage. Also, ensure that no three phase sources are single phased at any time.

**NOTICE**

Risk of improper installation. Can cause equipment damage.

Only a properly trained and qualified technician should install or open this motor.

Use 60/75°C Class 1 copper wire only.

**12.2.1 Protective Features**

Monitoring functions protect the motor against over temperature of electronics, over temperature of motor and incorrect rotor position detection. With any of these failures, an alarm will display through the Vertiv™ Liebert® iCOM™ controller and the motor stops electronically. There is no automatic restart. The power must be switched off for a minimum of 20 seconds once the motor is at a standstill.

The motor also provides locked rotor protection, under voltage/phase failure detection and motor current limitation. These conditions will display an alarm through the Liebert® iCOM™.

**12.2.2 Fan Impellers and Bearings Maintenance**

Fan impellers should be periodically inspected and any debris removed. Check to ensure that the impellers can rotate freely and that the fan guards are still properly mounted for sufficient protection against accidentally contacting the impeller.

Bearings used on the units are maintenance free. Consult the factory for more information.

**12.2.3 Fan Assembly Troubleshooting**

Any safety hazards stemming from the device must be re-evaluated once it is installed in the end device.

Do not make any modifications, additions or conversions to the fan assembly without the approval of Vertiv.



**WARNING! Risk of electric shock. Can cause serious injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before opening the fan motor electric-connection enclosure. Use only fully-trained and qualified HVAC technicians to replace or perform maintenance on the EC fans.**



**WARNING! Risk of contact with high speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure. Do not operate the unit with any or all cabinet panels removed.**



**CAUTION:** Risk of exposure to harmful noise levels. Can cause hearing injury or loss. Depending on the installation and operating conditions, a sound pressure level greater than 70 dB(A) may arise. Take appropriate technical safety measures. Operating personnel must wear appropriate, OSHA-approved PPE and observe all appropriate hearing-protection safety requirements.



**CAUTION:** Risk of contact with hot surfaces. Can cause injury. The fan motor, and some electrical components 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.

**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: backup generator systems) for startup, 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.

**NOTE:** Do not assume that the fan blades will not start to spin. If the motor is in a fault condition, it will safely shut down. Once the fault condition is cleared, there are certain conditions in which the motor will automatically resume operation.

**EC Fan Fault Conditions**

**Table 12.1 EC Fan Fault Conditions**

Fault Condition	Reset Trigger	Description
Phase Failure	Automatic	One phase is missing. In this case the motor will come to a stop and then automatically restart when all phases are present.
Locked/Blocked Rotor	Automatic	The rotor is blocked. Once the locking mechanism has been removed, the motor will automatically restart.
Hall Effect Sensor Error	Manual (Mains/Software)	The Hall Effect Sensor is used to monitor fan speed. If there is a hall sensor communication failure with the electronics, the motor will stop. In this case there has to be a manual restart (either with the mains power or software).
Motor Over Temperature	Manual (Mains/Software)	The motor will stop in the event there is a motor over temperature condition. In this case there has to be a manual restart (either with the mains power or software).
Electronics Over Temperature	Manual (Mains/Software)	The motor will stop in the event there is an electronics over temperature condition. In this case there has to be a manual restart (either with the mains power or software).
Line Under Voltage	Automatic	Once the line voltage returns within permitted operating range, the fan will automatically restart.

### EC Fan High Voltage Tests

1. Check fuses. If fuses are okay, perform the following:
  - Check all connections.
  - Make sure connections are on the wire strand and not on the wire insulation.
  - Cycle power. Disconnect mains voltage to power down the motor and then re-apply power.
  - Check mains voltage at each phase (phase to ground) at the KL1 connector. Confirm phase failure not present.
  - Check that the voltage is within the acceptable voltage range at the KL1 connector. Confirm line under voltage is not present.
2. Check fuses. If fuses are blown, perform the following:
  - Check resistances across the phases at the KL1 connector and note them in the following table.

**NOTE: Power wires must be removed from the motor for resistance test.**

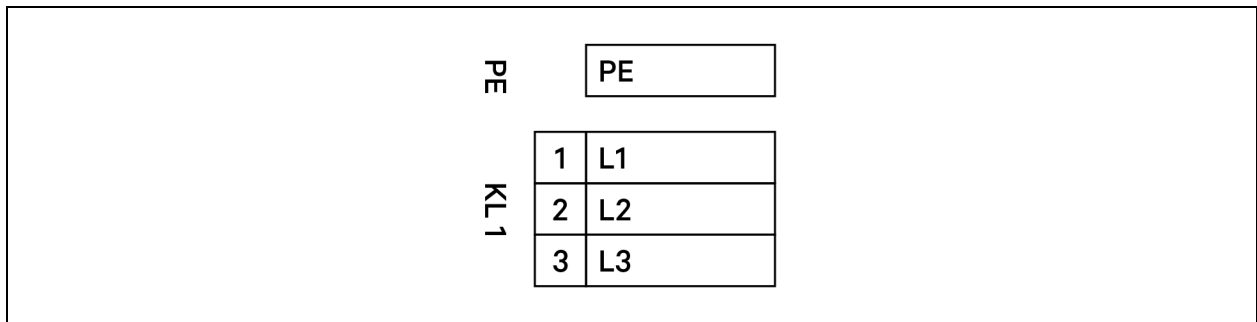
**Table 12.2 Resistances at KL1 Connector**

L1 - L2		Ohm
L2 - L3		Ohm
L1 - L3		Ohm

See **Figure 12.1** below .

- Resistances should be similar for all 3 readings.
- Resistance readings should be greater than 2 Ohm.
  - Check all connections. Make sure connections are on the wire strand and not on the wire insulation.
  - Replace fuses.
  - Check mains voltage at each phase (phase to ground) at the KL1 connector. Confirms phase failure not present.

**Figure 12.1 KL1 Connector**



- Check that the voltage is within the acceptable voltage range at the KL1 connector. Confirms line under voltage is not present.

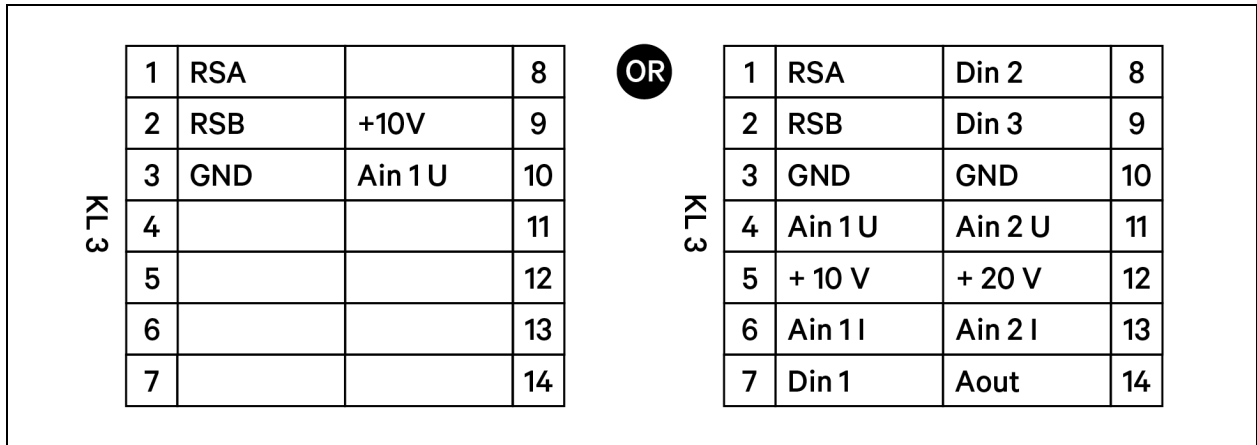
### EC Fan Low Voltage Tests

- Check control input at the KL3 connector (Ain1U to GND). Confirm that there is a control voltage present at the KL3 connector.

**NOTE: Use the GND in the KL3 connector. Do not connect the control ground to the PE in KL1!**

- Check +10 V output on KL3 connector (between +10 V and GND).

Figure 12.2 KL3 Connector



### EC Fan Alarm Contact Tests

Check the alarm contact at KL2 to determine if there are any fault conditions present.

Figure 12.3 KL2 Connector

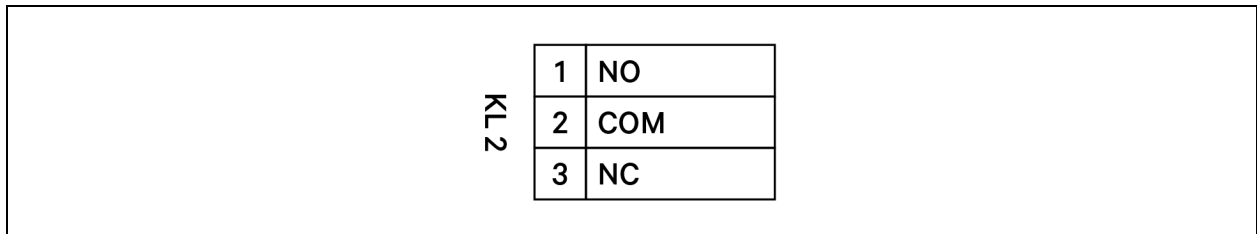


Table 12.3 No Fault/Fault Conditions while Motor Actively Energized

Condition	No Fault Condition	Fault Condition
NO - COM	Open	Closed
NC - COM	Closed	Open

**NOTE: The table refers to conditions while the motor is actively energized. When the motor is de-energized, it will be in a fault condition.**

- Check EC Control to determine the fault condition.

## 12.3 Condensate Drain and Condensate Pump System Maintenance

### 12.3.1 Condensate Drain

Check for and clear obstructions in tubing during routine maintenance.

### 12.3.2 Condensate Pump



**WARNING! Risk of electric shock. Can cause serious injury or death. 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. Condensate pump will stay energized and has the potential to operate even in the "Unit Off" mode.**

**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.**

#### To maintain the condensate pump:

1. Disconnect power to the unit using the disconnect switch.
2. Check for and clear obstructions in gravity lines leading to the condensate pump.
3. Remove the sump, clean with a stiff nylon brush and flush with water.
4. Inspect and clear clogs in the discharge check valve and float mechanism.
5. Reassemble and check for leaks.

## 12.4 Fluid and Piping Maintenance

### NOTICE

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Heat exchangers and piping systems are at high risk of freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil and piping corrosion. When the cooling unit or piping may be exposed to freezing temperatures, charge the system with coolant fluid based on the coldest ambient design temperature. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

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.

### NOTICE

Risk of no-flow condition. Can cause equipment damage. Do not leave the water/coolant fluid-supply circuit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of the 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 clogged or leaking drain lines and leaking water-supply lines. Can cause equipment and building damage.

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

Improper installation, application and services practices can result in water leakage from the unit. Water leakage can result in catastrophic and expensive building and equipment damage and loss of critical data center equipment.

Do not locate unit directly above any equipment that could sustain water damage.

We recommend installing a monitored fluid-detection system to immediately discover and report coolant-fluid system and condensate drain-line leaks.

**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 water backing up in the drain line. Leaking and overflowing water can cause equipment and building damage.

Install an external, 5-1/2 in. trap in the drain line (if desired). The factory unit does not contain a trap.

Sagging condensate drain lines may inadvertently create an external trap.

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.

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# 13 Preventive Maintenance Checklist

Source: DPN002952, Rev. 4

Inspection Date	Job Name		
Indoor Unit Model #	Indoor Unit Serial Number #		
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 the Components and Nomenclature section.

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:**

### **Evaporator/Filters**

1. Check/replace filters
2. Grille area unrestricted
3. Wipe section clean
4. Coil clean
5. Clean condensate pan
6. Clean trap in condensate drain
7. Check/test filter clog switch operation (if equipped)

### **Blower Section (EC fan)**

1. Mounting bolts tight
2. Fan guard bolts tight
3. Impeller spins freely
4. Check/test air sail switch (if equipped)
5. Motor amp draw
  - Compare to nameplate amps

#1	L1	L2	L3
#2	L1	L2	L3
#3	L1	L2	L3

### **Condensate Pump (if equipped)**

1. Check for debris in sump.
2. Check operation of float(s) (free movement).
3. Check/clean discharge check valve.

### **Electrical Panel**

1. Check fuses.
2. Check contactors for pitting (replace if pitted).
3. Check/re-torque wire connections.

### **Controls**

1. Check/verify control operation (Sequence).
2. Check/test changeover device(s) (if equipped).
3. Check/test water detection device(s) (if equipped).
4. Check/test CAN connection between indoor and outdoor units (if equipped).

### **Chilled Water**

1. Verify proper water maintenance is being performed.
2. Check for water/glycol leaks.
3. Stroke valve open and closed.

# 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

1-800-543-2778

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

### A.2 Locations

#### United States

Vertiv Headquarters

1050 Dearborn Drive

Columbus, OH, 43085, 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: Vertiv™ Liebert® CW440 Seismic Application

Electrical wiring, conduit, and/or other connections to the equipment is the responsibility of others. Data and recommendations are supplied in the [Submittal Drawings](#) on page 61.

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

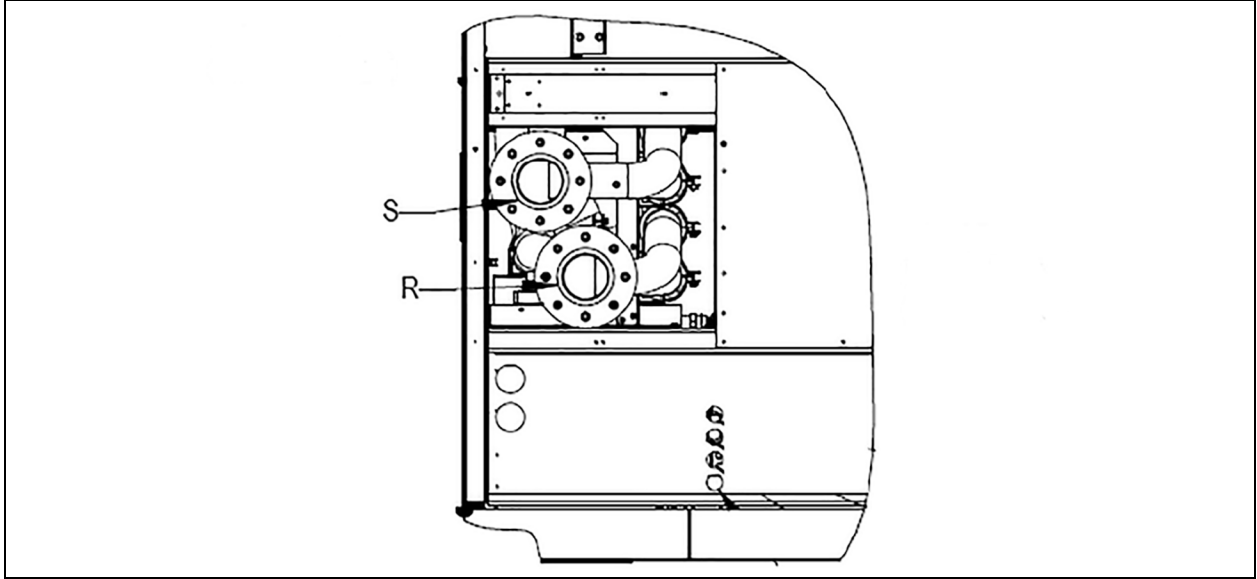
**Table B.1 Seismic Application Drawings**

Document Number	Title
DPN003636	Seismic Data Anchorage for CW440D

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## Appendix C: Flange Specifications

Figure C.1 Flange Detail



For use with water.

Table C.1 Flange Specifications

<b>Wrot/Steel Flange</b>	
Shape	Straight
Type	2 piece wrot/epoxy floating flange
Class	150 lb.
Connection type	Copper tubing
Connection style	Socket connection X flanged
Flanged connection surface	Raised
Gender	Female
Pipe Size	4
Flange OD	9 in.
For bolt diameter	5/8 in.
<b>Bolt Hole</b>	
Diameter	3/4 in.
Number of	8
Bolt circle diameter	7-1/2 in.
Maximum Pressure	50 psi at 72°F

**Table C.1 Flange Specifications (continued)**

<b>For Fitting</b>	
Schedule	40
Material	Copper Body: Lead Free Uns C12200
	Steel Base: ASTM A36 Steel Plate
	Steel Base Coating: Dielectric
	Insulating Epoxy Coating
<b>Specifications Met</b>	ASME B26.22
<b>Specifications</b>	Conforms to NSF/ANSI 61 Annex G requirements
	Wrot copper sleeve manufactured to ASME B16.22
	Steel flange holes drilled to ANSI B16.5 specifications
	Temperature range from -66°F to 272°F
<b>Flange Type/Torque Sequence</b>	8 bolt flange/1,5,3,7,2,6,4,8
<b>Torque the flange per standard practice for chilled water applications.</b>	

**Table C.2 Full Face Rubber Silicon Flange Gasket**

For use with	WaterRef
For pipe size	8 (ANSI Class 150)
Thickness	1/8 in.
Color	Black



## Appendix D: Submittal Drawings

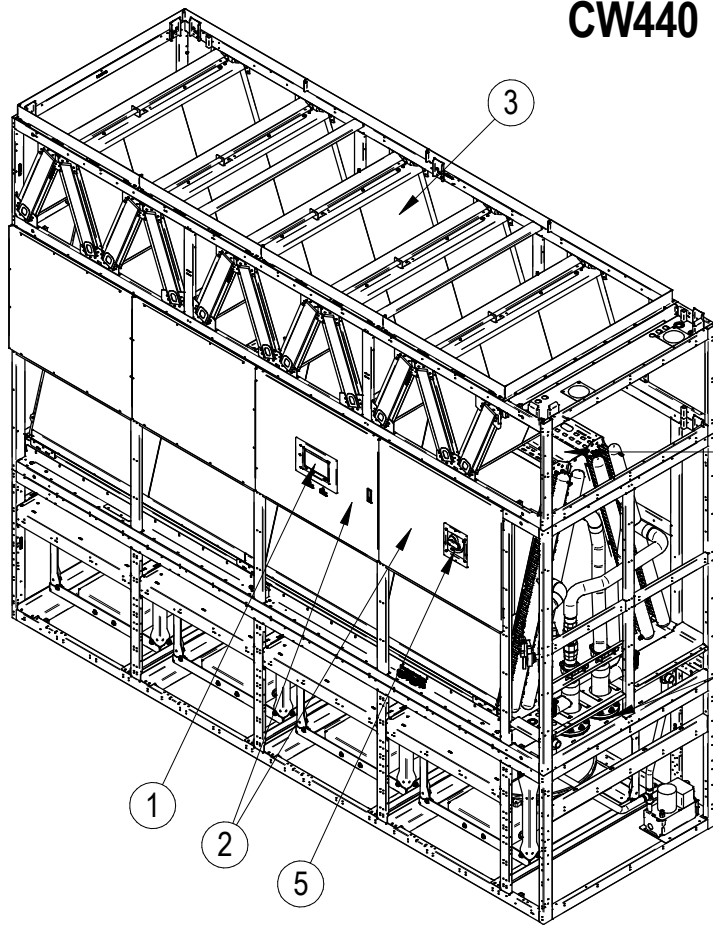
Submittal drawings are listed below in order of appearance.

**Table D.1 Submittal Drawings**

Document Number	Title
<b>Component Locations</b>	
10020389	Component Location Diagram CW440
<b>Dimension Planning Drawings—Downflow Units with EC Fans</b>	
DPN003569	Cabinet Dimensional Data CW440 and Filter Plenum (Plenum Shipped Separately)
<b>Planning Dimensions—Floor Stands for Units with EC Fans</b>	
DPN003570	Fan Section Dimensional Data CW440 Model
DPN003676	Optional Ducted Rear Connection CW440 Model
<b>Electrical Field Connection Drawings</b>	
DPN005078	Electrical Field Connections, Downflow CW440
<b>Piping Connection Drawings</b>	
10031843	Primary Connection Locations, CW440: Units with Grooved Field Connections
10020355	Primary Connection Locations, CW440: Units with Flanged Field Connections
10031842	Primary Connection Locations, CW440: Units with Brazed Field Connections
<b>Seismic Anchorage Data</b>	
DPN003636	Seismic Data Anchorage for CW440

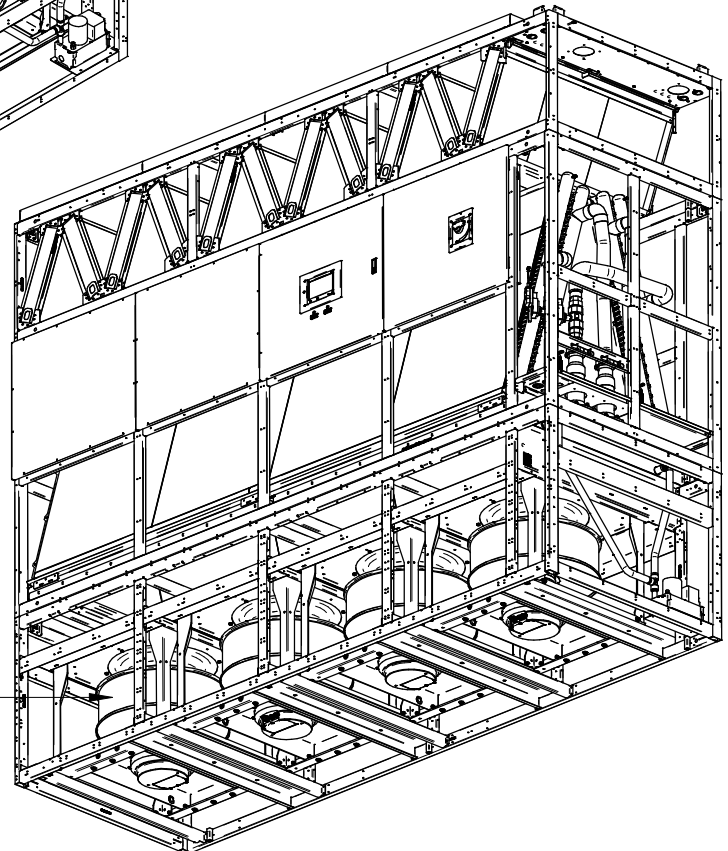
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**COMPONENT LOCATION DIAGRAM  
CW440**



1. Liebert® iCOM™ Control Display
2. Electric Box
3. Filters
4. Coil
5. Disconnect
6. EC Fans

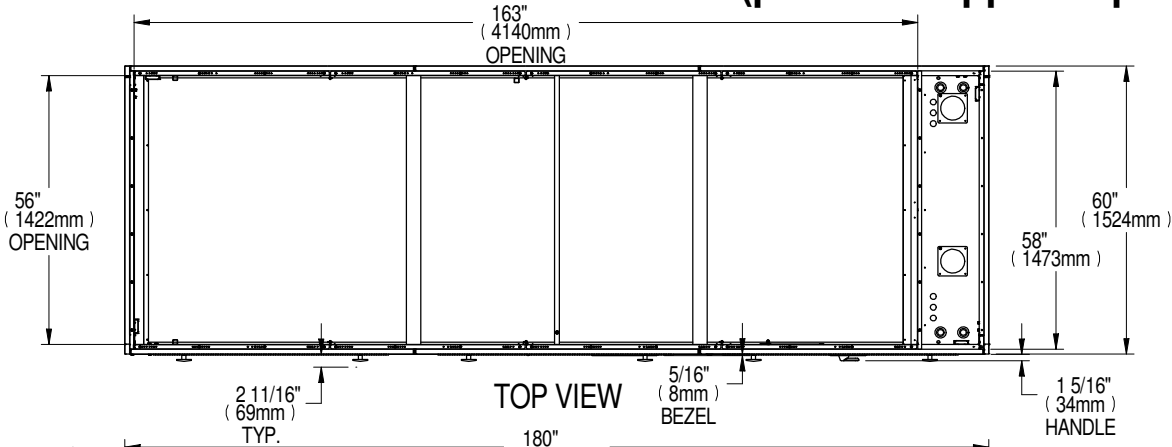
Customer Flange Connection shown,  
Brazed (Spun Closed) or Grooved  
Connections also available when ordered.



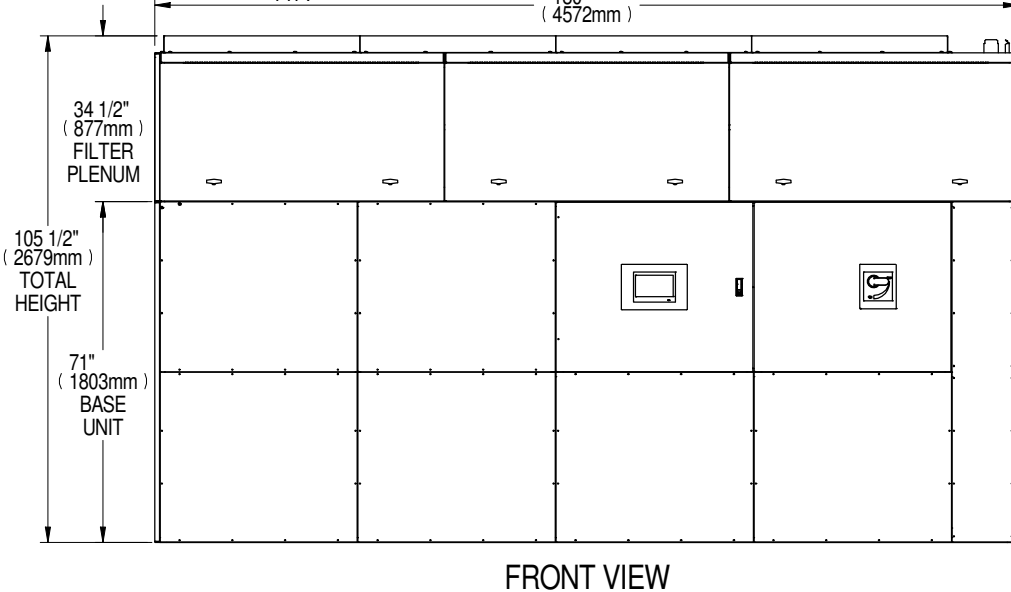
**Note:**


1. Plenum and fan section ship separately.
2. Some panels removed from views for clarity.

**CABINET DIMENSIONAL DATA**  
**CW440 & FILTER PLENUM (plenum shipped separately)**



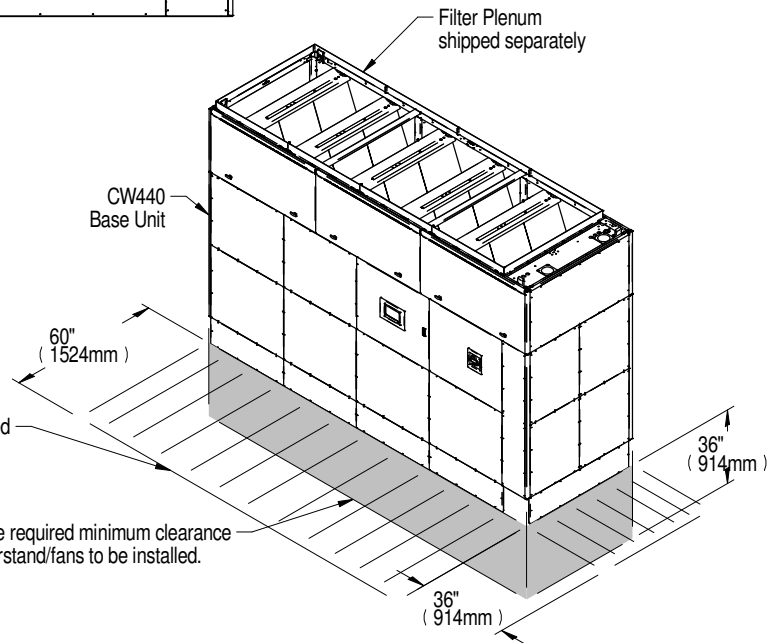
- Note:
1. Filters are accessible through front of unit only.
  2. Electrical connections can be made from top or bottom of unit.



Dry Weight	
Section	lb. (kg)
Base Unit	3302 (1498)
Filter Plenum	742 (337)
Fan Section 	2454 (1113)

Striated area indicates the recommended minimum clearance to be provided for component access in the fan section, main unit, and filter plenum.

Shaded area indicates the required minimum clearance below the unit for the floorstand/fans to be installed.

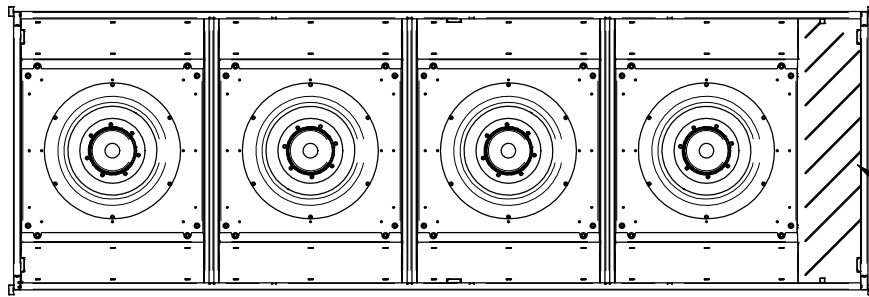
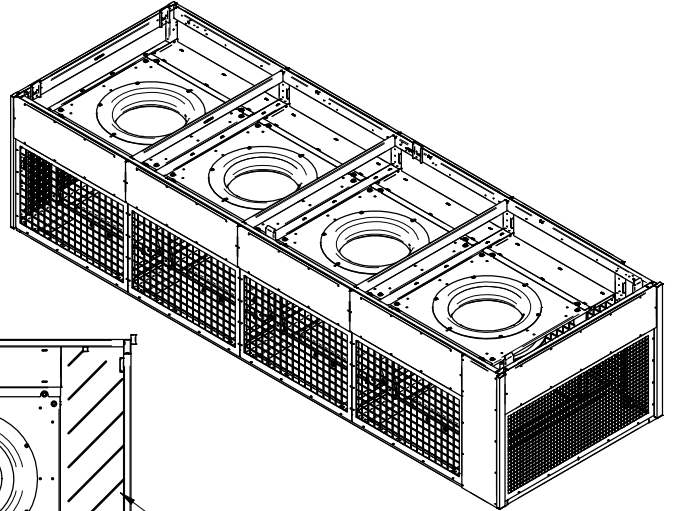


Notes:

1. Fan Section dimensions shown on DPN003570.

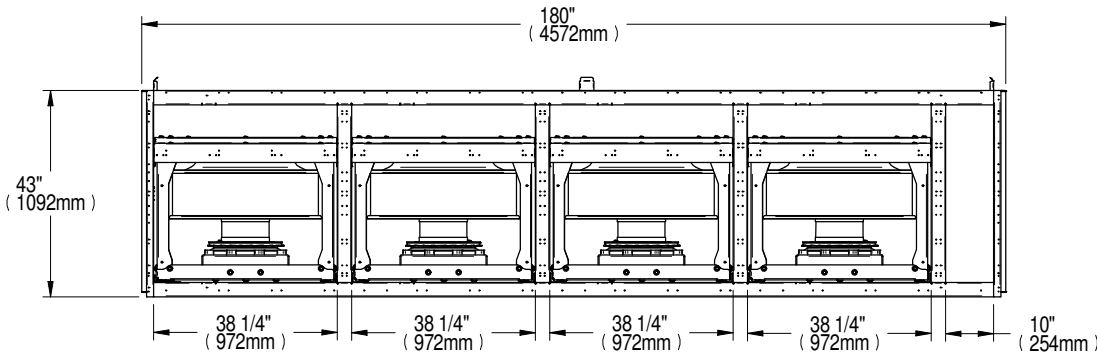
**FAN SECTION DIMENSIONAL DATA  
CW440 MODEL**

Dry Weight lbs. (kg)
2454 (1113)

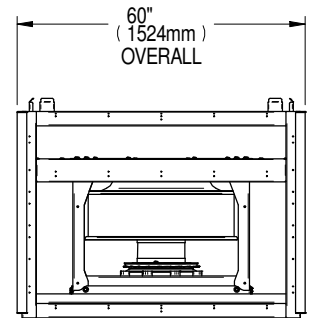


Piping access area  
(See Note 5)

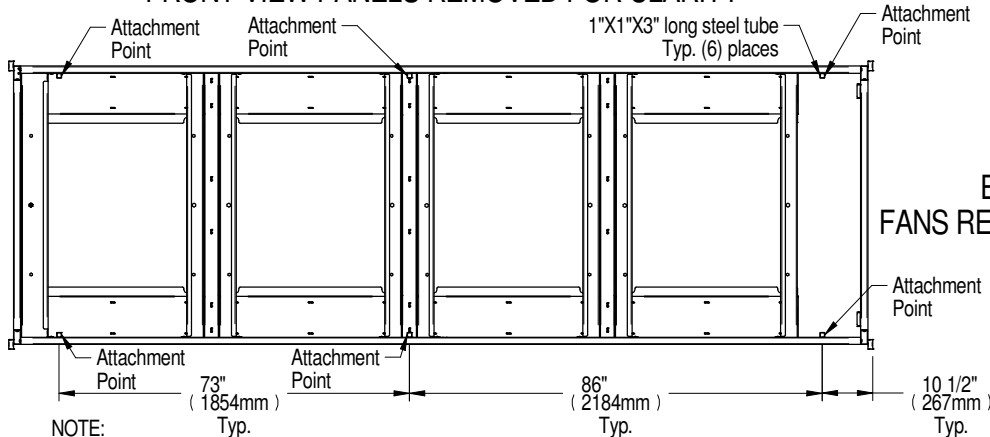
**TOP VIEW**



**FRONT VIEW PANELS REMOVED FOR CLARITY**



**RIGHT SIDE  
PANELS REMOVED FOR CLARITY**

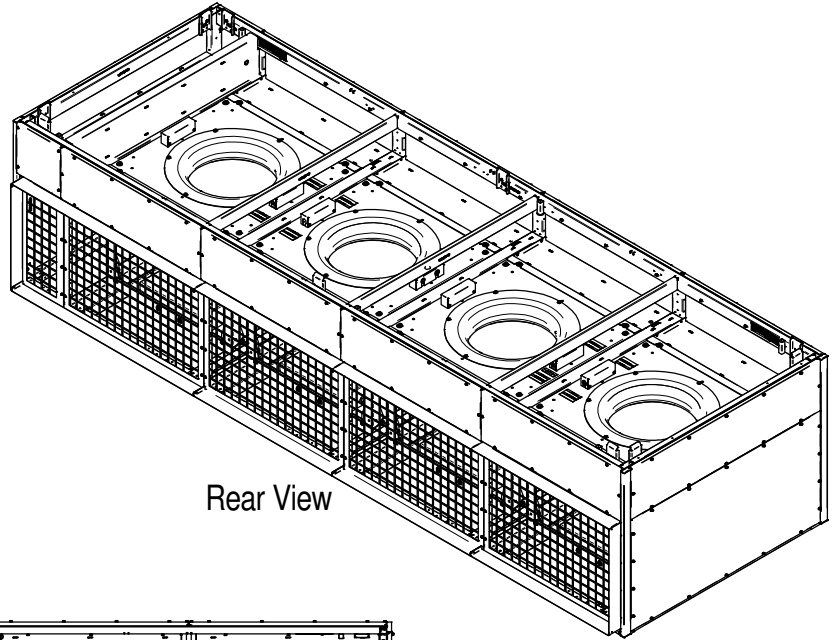


**BOTTOM VIEW  
FANS REMOVED FOR CLARITY**

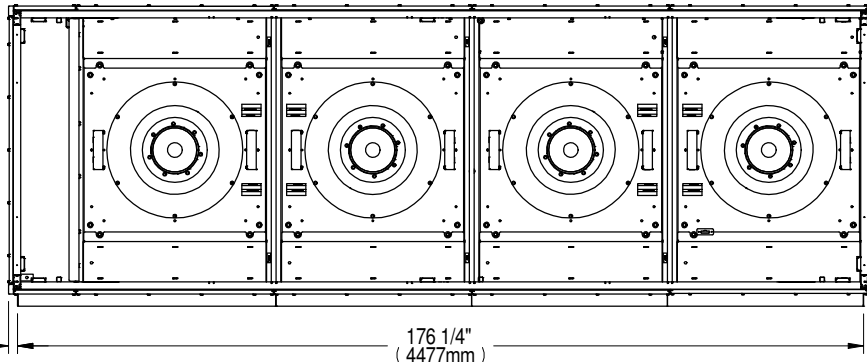
**NOTE:**

1. This fan section is designed for 36" (914mm) raised floor height and can accommodate floors between 34" - 43" (864mm - 1092mm) high.
2. The fan section is not symmetrical and its orientation to the Liebert® CW is critical for proper installation.
3. The EC fans must be field wired into connectors inside of the unit.
4. The EC fans are removed out the front of the fan section, and there must be clearance in front of fan section to be able to service fans (See DPN003569).
5. The fan section may be ordered with the piping access area at the opposite end, and the fans oriented accordingly.

**OPTIONAL DUCTED REAR CONNECTION  
CW440 MODEL**

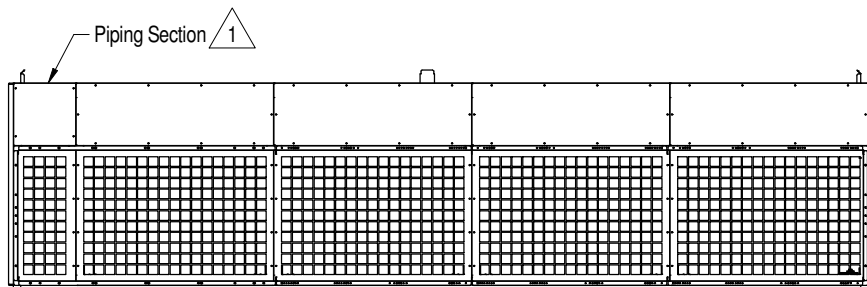


Rear View

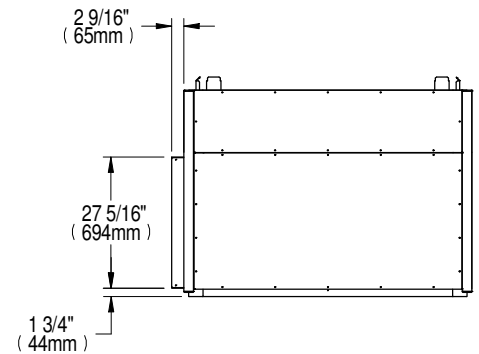


1 7/8" (48mm)      176 1/4" (4477mm)

Top View



Rear View  
Fans Removed For Clarity



Notes:

1. Because Piping Section may appear at either end of unit dimensions shown may be reversed depending on configuration ordered.



## ELECTRICAL FIELD CONNECTION DEFINITIONS AND LOCATIONS CW440 DOWNFLOW MODELS

### STANDARD ELECTRICAL CONNECTIONS

- 1) **Primary high voltage entrance** - 2.50" (64mm); 1.75" (44mm) @ EP Box; 1.375" (35mm) diameter concentric knockouts located at the top of the right side of the high voltage section
- 2) **Primary low voltage entrance** - Quantity (3) 1.375" (35mm) diameter knockouts located in the top right of the low voltage section
- 3) **Three phase electrical service** - Terminals are on top of disconnect switch. Three phase service not by Liebert.
- 4) **Earth ground** - Terminal for field supplied earth grounding wire.
- 5) **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.
- 6) **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.
- 7) **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.
- 8) **Fan section RS485 connections** – Quick connect socket located at the base of the coil section, below the low voltage panel provides RS485 control for the fans. Requires field connection of fan section low voltage harness.
- 9) **Fan section high voltage connections** – Quick connect sockets located at the base of the coil section, below the high voltage panel provide three phase power to the fans. Requires field connection of fan section high voltage harness.
- 10) **Unit factory installed fused disconnect switch**– 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.

### OPTIONAL ELECTRICAL CONNECTIONS

- 11) **Secondary disconnect switch and earth ground** – Fuses are included in the 65KAIC SCCR fused disconnect switch models.
- 12) **Smoke sensor alarm** - Factory wired dry contacts from smoke sensor are 91-common, 92-NO, and 93-NC. Supervised contacts, 80 & 81, open on sensor trouble indication. This smoke sensor is not intended to function as, or replace, any room smoke detection system that may be required by local or national codes. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 13) **Condensate alarm** (with condensate pump option) - On pump high water indication, normally open dry contact is closed across terminals 88 & 89 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 14) **Remote Humidifier** - On any call for humidification, normally open dry contact is closed across terminals 11 & 12 to signal field supplied remote humidifier. 1AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 15) **Reversing Starter Power Supply Notification** – Normally open contact terminals 102 and 103 will close when Power Supply 1 is engaged; 106 and 107 will close when Power Supply 2 is engaged.

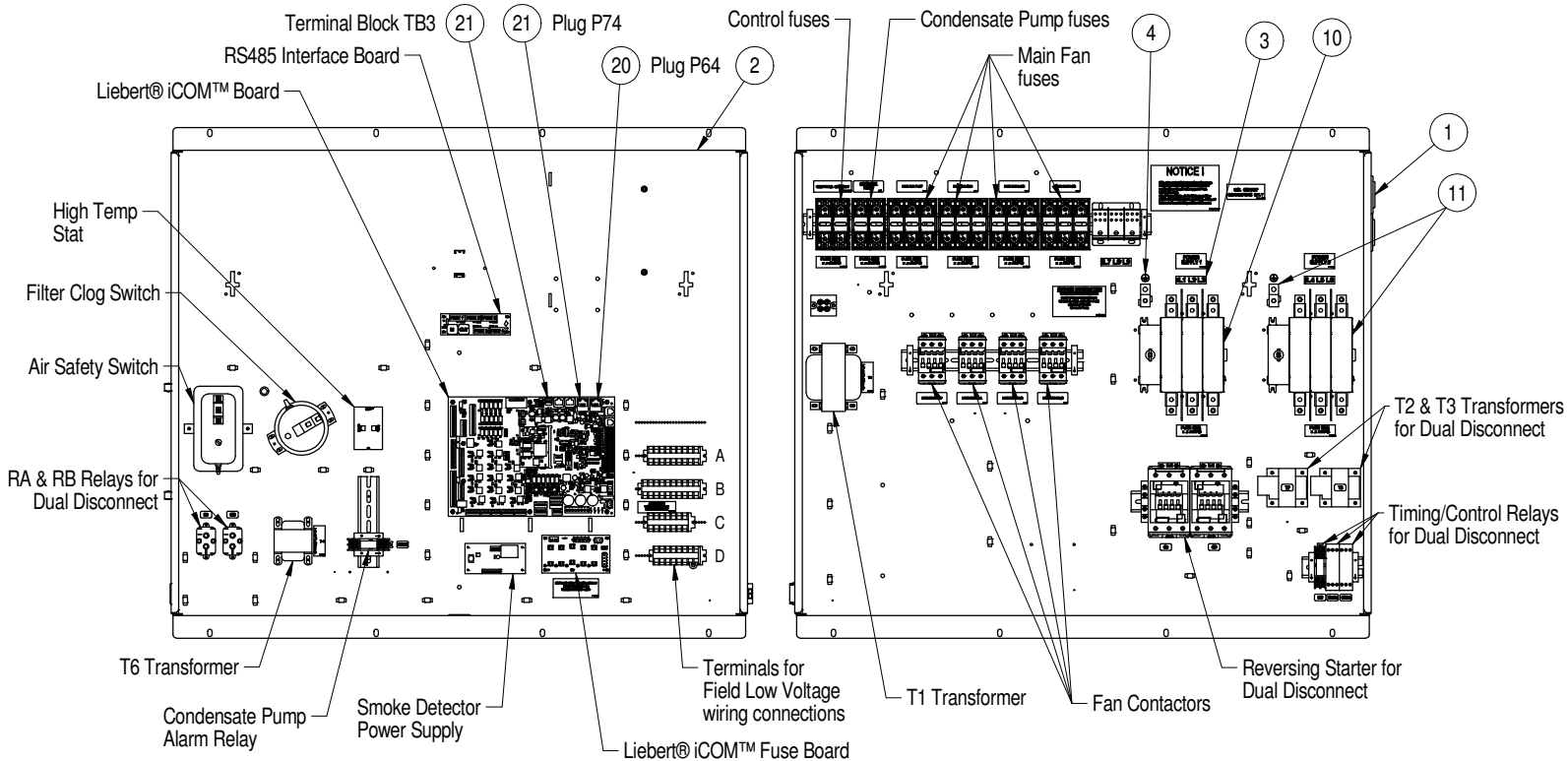
### OPTIONAL LOW VOLTAGE TERMINAL PACKAGE CONNECTIONS

- 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) **Main fan auxiliary switch** - On closure of main fan contactor, 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 and dry contact** - On Liebert® Liqui-Tect™ activation, normally open dry contact is closed across terminals 58 & 59 for remote indication (Liqui-Tect sensor ordered separately). 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.

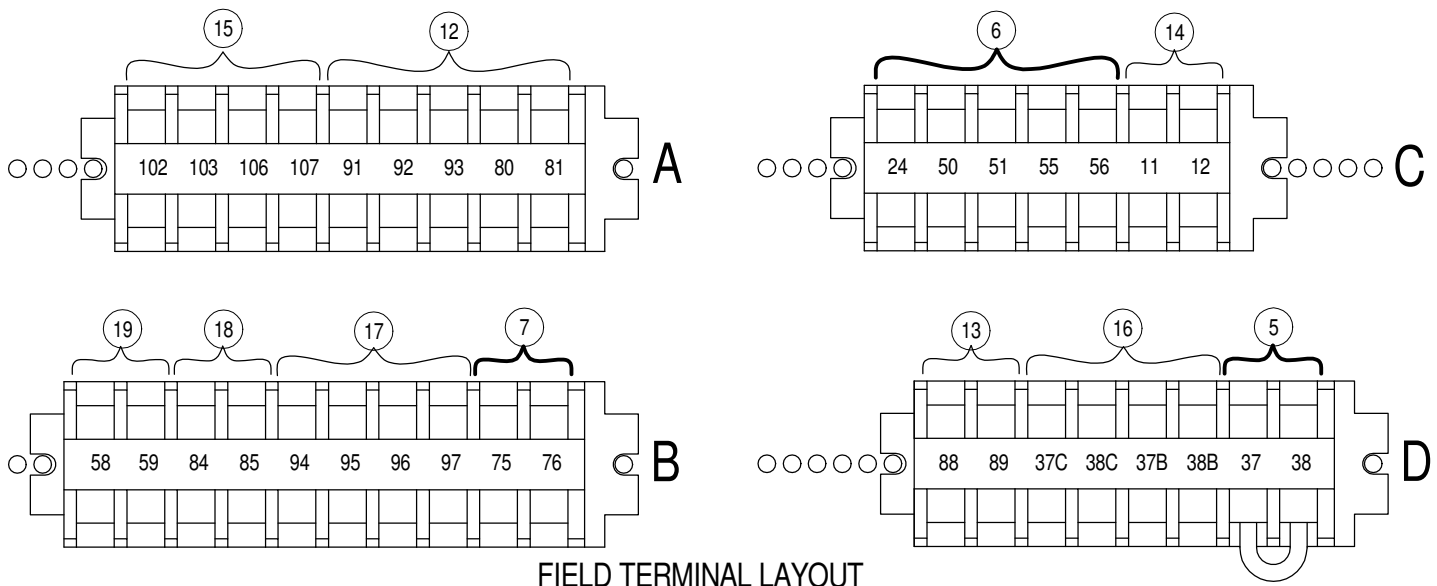
### OPTIONAL COMMUNICATION CONNECTIONS

- 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.

## ELECTRICAL FIELD CONNECTION DEFINITIONS AND LOCATIONS CW440 DOWNFLOW MODELS



**Note: Typical arrangement for dual fused disconnect switches shown. Component location varies by option and unit.**

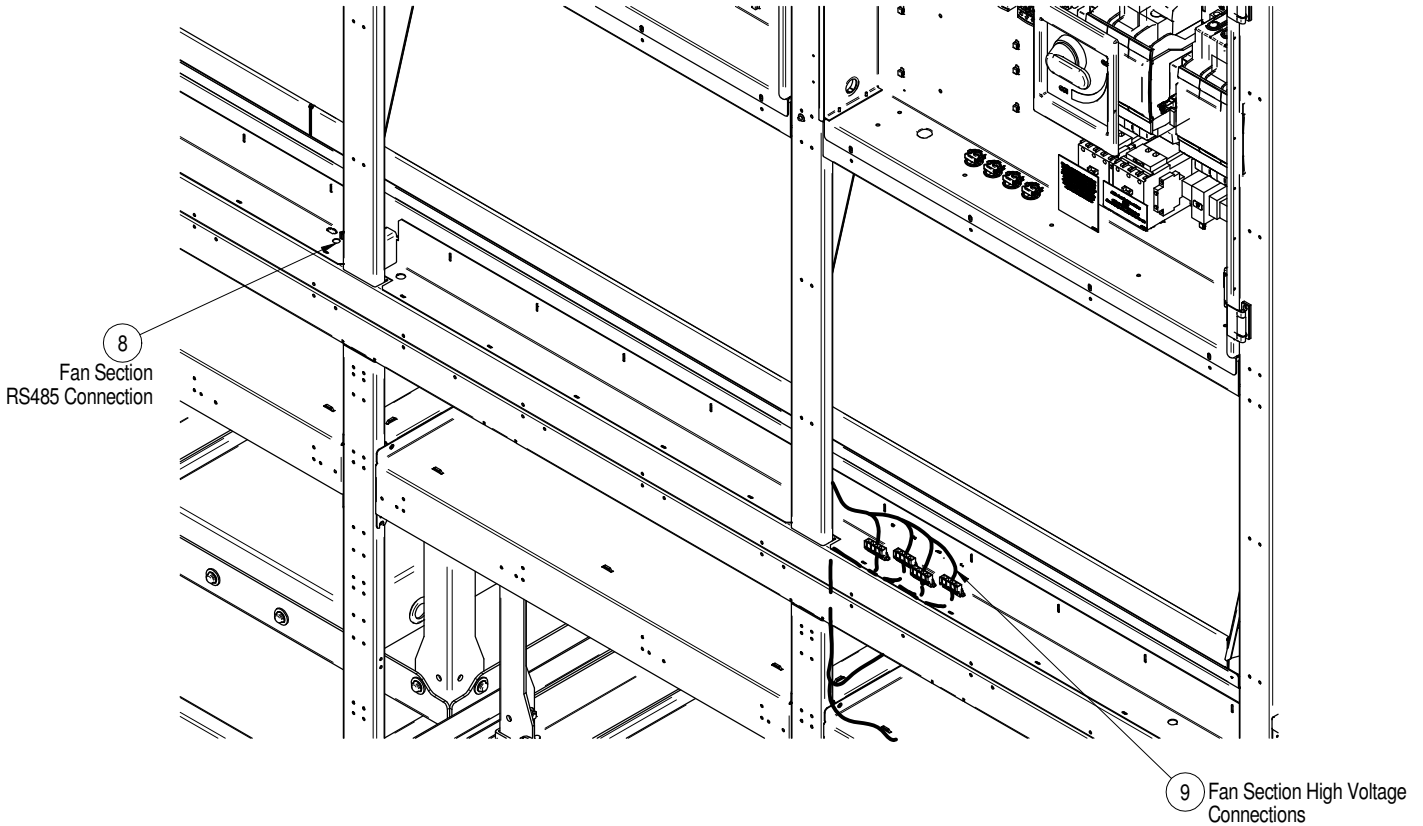


Note: Refer to Page 1 of 3 for descriptions of numbered callouts.

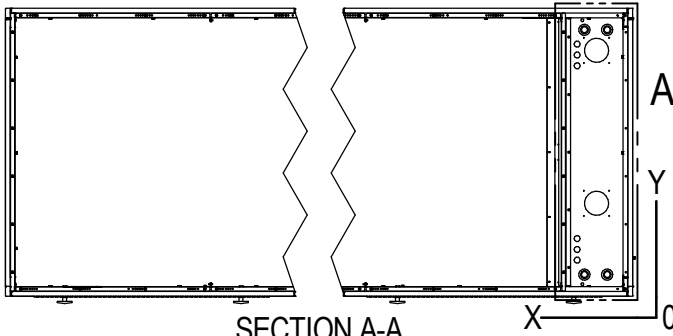


## ELECTRICAL FIELD CONNECTION DEFINITIONS AND LOCATIONS CW440 DOWNFLOW MODELS

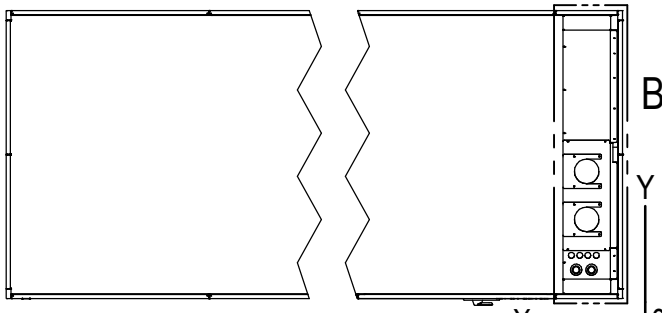
### Field Fan Section Connections



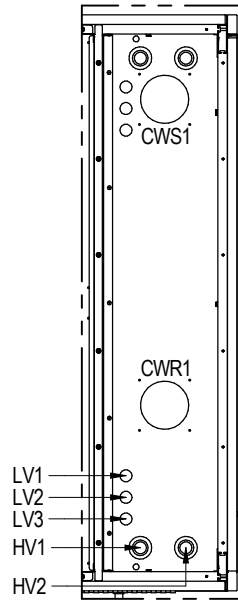
## PRIMARY CONNECTION LOCATIONS CW440 WITH GROOVED FIELD CONNECTIONS



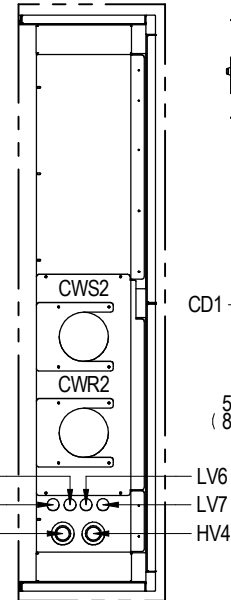
SECTION A-A  
Top Piping Option Connection Locations



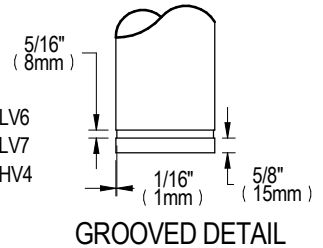
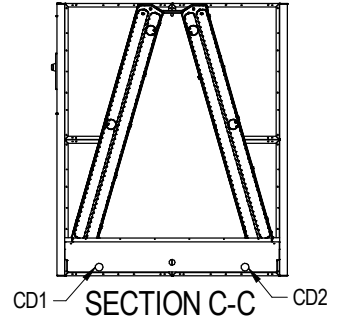
SECTION B-B  
Bottom Piping Option Connection Locations



DETAIL A  
Top Connection

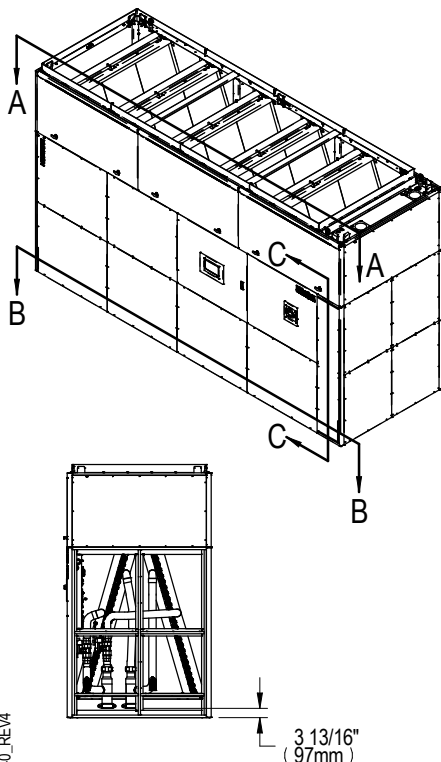





DETAIL B  
Bottom Connection



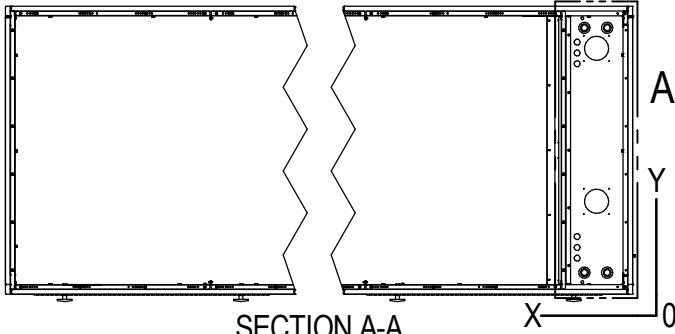
**Notes:**

- 1 All views shown in standard configuration. Liebert CW440 can be ordered with piping and electrical connection locations located on left end of unit with fan sections adjusted as required.
2. If unit is ordered with Piping & Electrical Connection locations on the left side, then the callouts & dimensions shown in this drawing will be reversed.
3. All "X" & "Y" dimensions are from front right corner of unit as shown. If unit is ordered with Piping & Electrical Connections on left side, then dimensions are from front left corner.
- 4 Knockout diameters are concentric (see Detail A & B).
- 5 Field pitch Condensate Drain line a minimum of 1/8" (3.2mm) per 12" (305mm). All units with a gravity drain require an external condensate trap. Select appropriate drain system materials. The drain line must comply with all local codes.

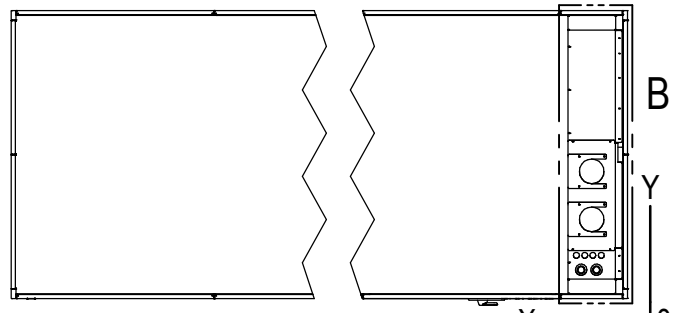


POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE/OPENING
CD1	Condensate Drain 	2-5/16 (59)	11 (279)	1-1/4" NPT Female
	(w/ optional pump)			1/2" O.D. Cu Hose Barb
CD2	Condensate Drain 	7-1/2 (191)	49 (1245)	1-1/4" NPT Female
	(w/ optional pump)			1/2" O.D. Cu Hose Barb
CWS1	2-way Chilled Water Supply (Top Conn)	7-1/2 (191)	51-1/4 (1302)	4-1/8" O.D. Cu Grooved Connection
CWS2	2-way Chilled Water Supply (Btm Conn)		26-1/2 (673)	
CWR1	2-way Chilled Water Return (Top Conn)	16-1/2 (419)	19-3/8 (492)	
CWR2	2-way Chilled Water Return (Btm Conn)		16-1/2 (419)	
HV1	Electrical Connection (High Voltage)	5-5/16 (135)	4-7/16 (113)	1-1/4" (32mm) [1-5/8" (41mm) / 2-1/8" (54mm)] 
HV2	Electrical Connection (High Voltage)	10-1/16 (256)		
HV3	Electrical Connection (High Voltage)	10-1/4 (260)	6 (153)	
HV4	Electrical Connection (High Voltage)	6-1/2 (165)		
LV1	Electrical Connection (Low Voltage)	11-9/16 (294)	11-15/16 (303)	1-1/4" (32mm)
LV2	Electrical Connection (Low Voltage)		9-11/16 (246)	
LV3	Electrical Connection (Low Voltage)		7-7/16 (189)	
LV4	Electrical Connection (Low Voltage)	11-1/4 (286)	9 (229)	1-3/8" (35mm)
LV5	Electrical Connection (Low Voltage)	9-3/8 (238)		
LV6	Electrical Connection (Low Voltage)	7-3/8 (187)		
LV7	Electrical Connection (Low Voltage)	5-1/2 (140)		

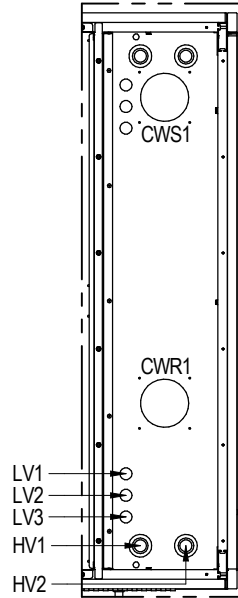
**PRIMARY CONNECTION LOCATIONS  
CW440 WITH FLANGED FIELD CONNECTIONS**



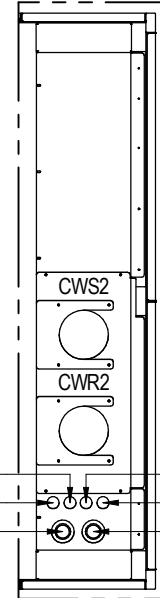
SECTION A-A  
Top Piping Option Connection Locations



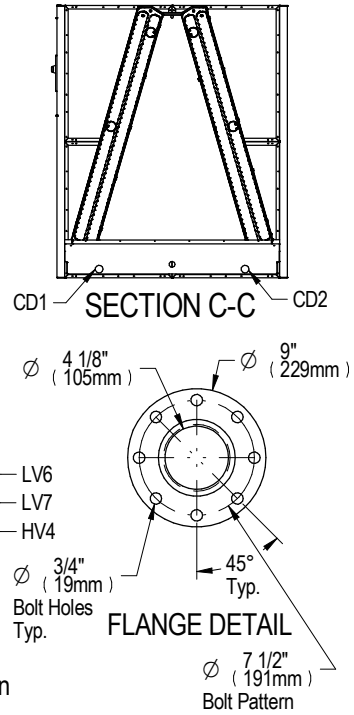
SECTION B-B  
Bottom Piping Option Connection Locations



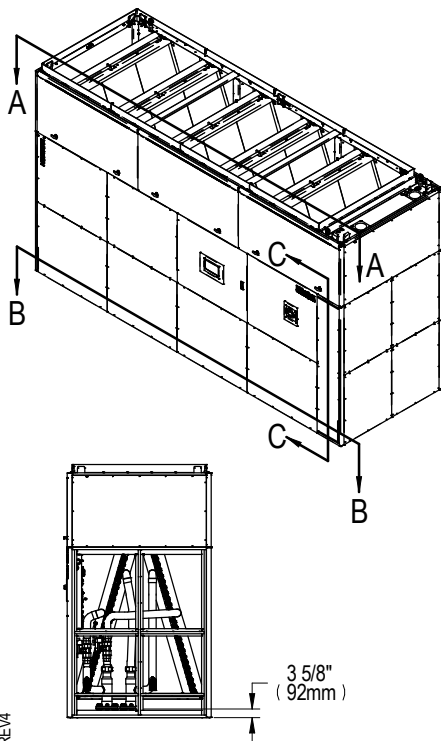
DETAIL A  
Top Connection



DETAIL B  
Bottom Connection

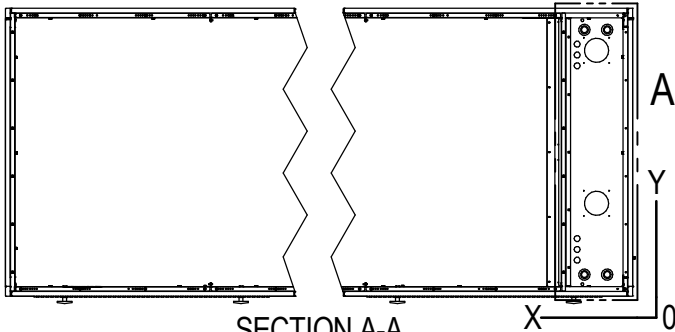


- Notes:
- 1 All views shown in standard configuration. Liebert CW440 can be ordered with piping and electrical connection locations located on left end of unit with fan sections adjusted as required.
  2. If unit is ordered with Piping & Electrical Connection locations on the left side, then the callouts & dimensions shown in this drawing will be reversed.
  3. All "X" & "Y" dimensions are from front right corner of unit as shown. If unit is ordered with Piping & Electrical Connections on left side, then dimensions are from front left corner.
  4. Knockout diameters are concentric (see Detail A & B).
  5. Field pitch Condensate Drain line a minimum of 1/8" (3.2mm) per 12" (305mm). All units with a gravity drain require an external condensate trap. Select appropriate drain system materials. The drain line must comply with all local codes.

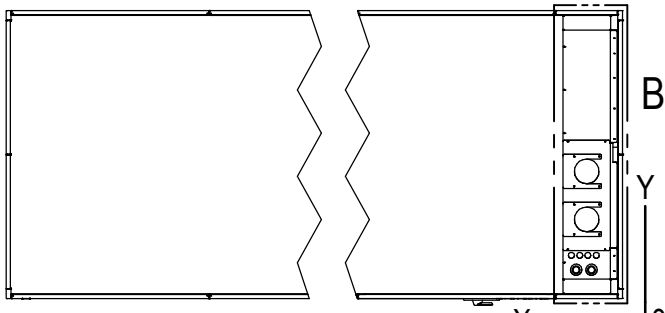


POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE/OPENING
CD1	Condensate Drain <sup>5</sup>	2-5/16 (59)	11 (279)	1-1/4" NPT Female
	(w/ optional pump)			1/2" O.D. Cu Hose Barb
CD2	Condensate Drain <sup>5</sup>		49 (1245)	1-1/4" NPT Female
	(w/ optional pump)			1/2" O.D. Cu Hose Barb
CWS1	2-way Chilled Water Supply (Top Conn)	7-1/2 (191)	51-1/4 (1302)	4-1/8" O.D. Cu ASME 150 lb Flange
CWS2	2-way Chilled Water Supply (Btm Conn)		26-1/2 (673)	
CWR1	2-way Chilled Water Return (Top Conn)		19-3/8 (492)	
CWR2	2-way Chilled Water Return (Btm Conn)		16-1/2 (419)	
HV1	Electrical Connection (High Voltage)	5-5/16 (135)	4-7/16 (113)	1-1/4" (32mm) [1-5/8" (41mm) / 2-1/8" (54mm)] <sup>4</sup>
HV2	Electrical Connection (High Voltage)	10-1/16 (256)		
HV3	Electrical Connection (High Voltage)	10-1/4 (260)	6 (153)	
HV4	Electrical Connection (High Voltage)	6-1/2 (165)		
LV1	Electrical Connection (Low Voltage)	11-9/16 (294)	11-15/16 (303)	1-1/4" (32mm)
LV2	Electrical Connection (Low Voltage)		9-11/16 (246)	
LV3	Electrical Connection (Low Voltage)		7-7/16 (189)	
LV4	Electrical Connection (Low Voltage)		11-1/4 (286)	9 (229)
LV5	Electrical Connection (Low Voltage)	9-3/8 (238)		
LV6	Electrical Connection (Low Voltage)	7-3/8 (187)		
LV7	Electrical Connection (Low Voltage)	5-1/2 (140)		

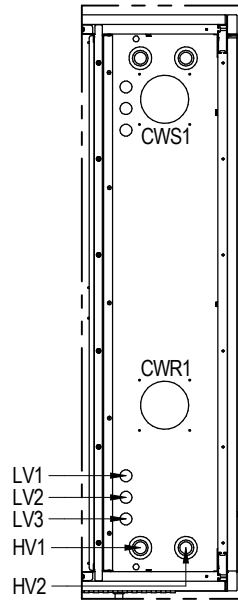
**PRIMARY CONNECTION LOCATIONS  
CW440 WITH BRAZED FIELD CONNECTIONS**



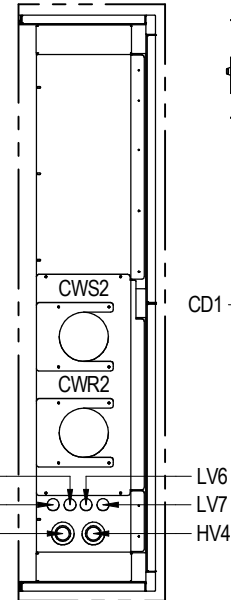
SECTION A-A  
Top Piping Option Connection Locations



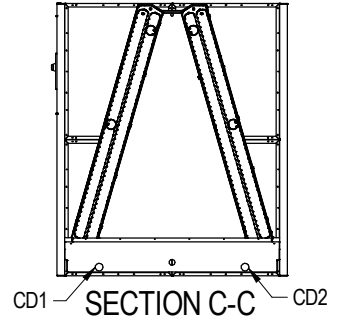
SECTION B-B  
Bottom Piping Option Connection Locations



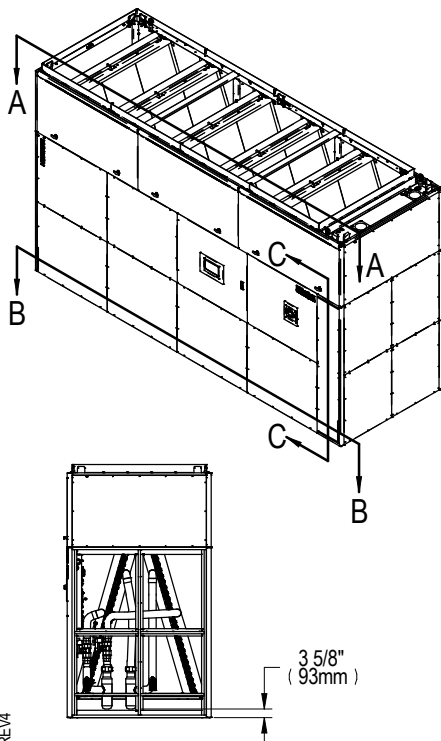
DETAIL A  
Top Connection






DETAIL B  
Bottom Connection

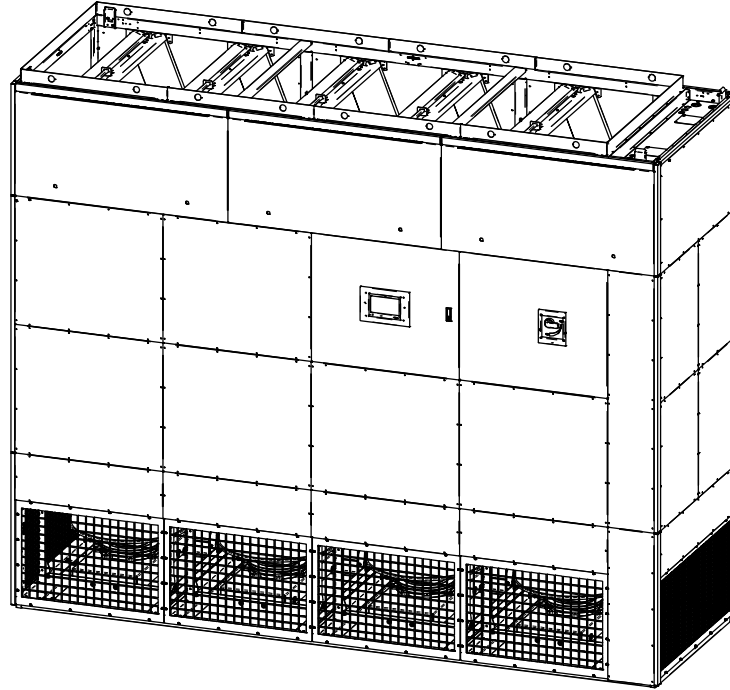


- Notes:
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  - 4 Knockout diameters are concentric (see Detail A & B).
  - 5 Field pitch Condensate Drain line a minimum of 1/8" (3.2mm) per 12" (305mm). All units with a gravity drain require an external condensate trap. Select appropriate drain system materials. The drain line must comply with all local codes.



POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE/OPENING
CD1	Condensate Drain 	2-5/16 (59)	11 (279)	1-1/4" NPT Female
	(w/ optional pump)			1/2" O.D. Cu Hose Barb
CD2	Condensate Drain 	2-5/16 (59)	49 (1245)	1-1/4" NPT Female
	(w/ optional pump)			1/2" O.D. Cu Hose Barb
CWS1	2-way Chilled Water Supply (Top Conn)	7-1/2 (191)	51-1/4 (1302)	4-1/8" O.D. Cu Braze Connection (Spun Closed End)
CWS2	2-way Chilled Water Supply (Btm Conn)		26-1/2 (673)	
CWR1	2-way Chilled Water Return (Top Conn)		19-3/8 (492)	
CWR2	2-way Chilled Water Return (Btm Conn)		16-1/2 (419)	
HV1	Electrical Connection (High Voltage)	5-5/16 (135)	4-7/16 (113)	1-1/4" (32mm) [1-5/8" (41mm) / 2-1/8" (54mm)] 
HV2	Electrical Connection (High Voltage)	10-1/16 (256)		
HV3	Electrical Connection (High Voltage)	10-1/4 (260)		
HV4	Electrical Connection (High Voltage)	6-1/2 (165)		
LV1	Electrical Connection (Low Voltage)	11-9/16 (294)	11-15/16 (303)	1-1/4" (32mm)
LV2	Electrical Connection (Low Voltage)		9-11/16 (246)	
LV3	Electrical Connection (Low Voltage)		7-7/16 (189)	
LV4	Electrical Connection (Low Voltage)		11-1/4 (286)	
LV5	Electrical Connection (Low Voltage)	9-3/8 (238)	9 (229)	1-3/8" (35mm)
LV6	Electrical Connection (Low Voltage)	7-3/8 (187)		
LV7	Electrical Connection (Low Voltage)	5-1/2 (140)		

## SEISMIC DATA ANCHORAGE FOR CW440D



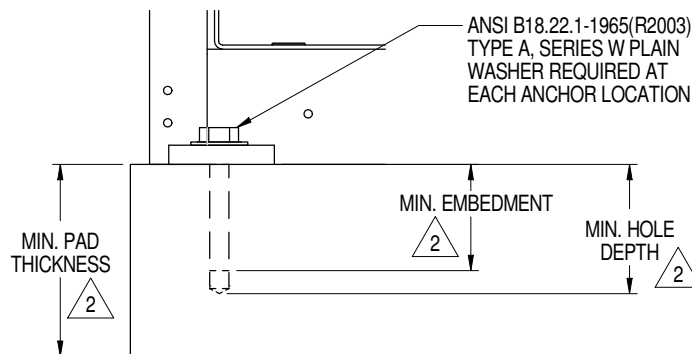
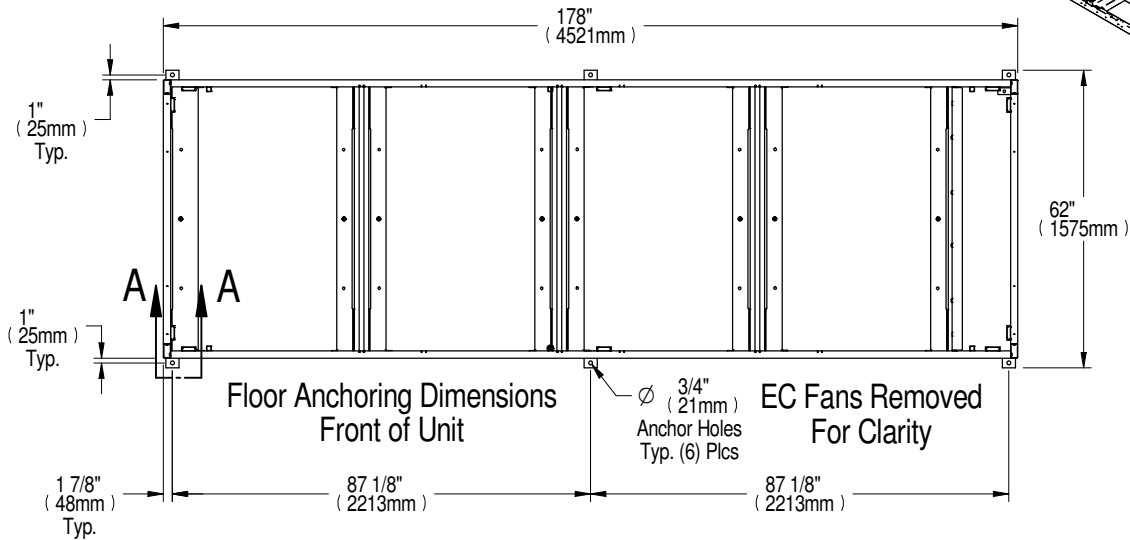
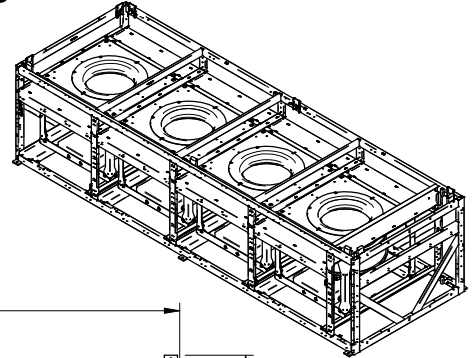
### **IMPORTANT SEISMIC REQUIREMENTS COMPLIANCE NOTE:**

Values presented in this document are provided for unit anchorage sizing and do not imply compliance to IBC, ASCE, or OSHPD seismic requirements. The CW440 has not been tested and certified. The anchorage loads are provided as guidelines for the sizing of anchors for the attachment of the unit to the building structure or housekeeping pad. Approval of all anchorage is subject to approval by the engineer of record for the project or building.

#### Notes:

1. The seismic overturn resistance anchorage load calculations provided for the CW440D computer room air handler are computed as defined in the International Building Code (IBC) 2009, IBC 2012, and American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and Other Structures, ASCE 7-10.
2. The computer room air handler must be installed and attached to the building structure without spring isolators per the manufacturer supplied installation instructions. The calculations exclude all non-factory supplied accessories. The unit base shall be bolted to building/structure.
3. 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 the engineer of record for the project or building. Structural floors and housekeeping pads must also be designed and approved by the project or building structural engineer of record to withstand the seismic overturn anchor loads defined in the anchor table. The installing contractor is responsible for the proper installation of all anchors and mounting hardware, observing the mounting requirements detailed in the installation drawings and additionally outlined by the engineer of record.
4. Use flat washer, lock washer and nut to connect the CW440D. A minimum of 1/2" diameter anchors with American National Standard Series W, type A, plain washers (ANSI B18.22.1-1965, R1975) selected to match the nominal anchor diameter must be installed at each anchor location between the anchor head and equipment for tension load distribution.

## SEISMIC DATA ANCHORAGE FOR CW440D



Notes:

### SECTION A-A

1. Anchor Bolt sized per Hilti Kwik Bolt TZ Carbon and Stainless in Concrete, ICC ESR-1917. Alternates are subject to review by Vertiv or Engineer of Record.

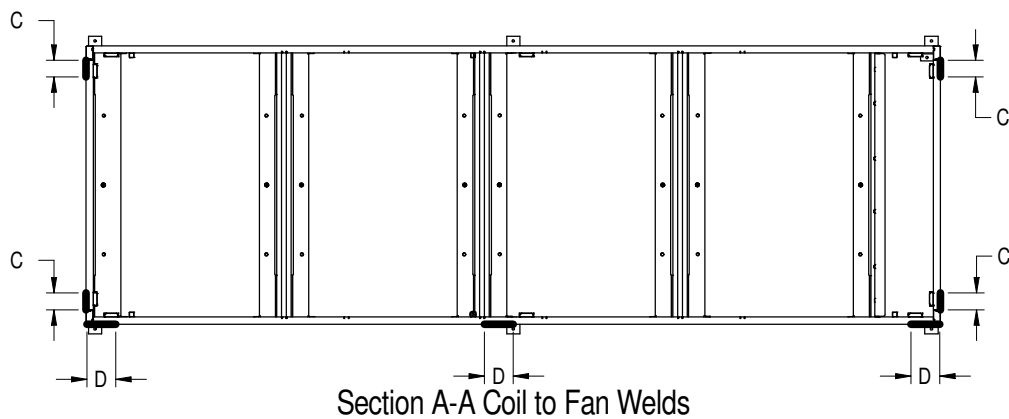
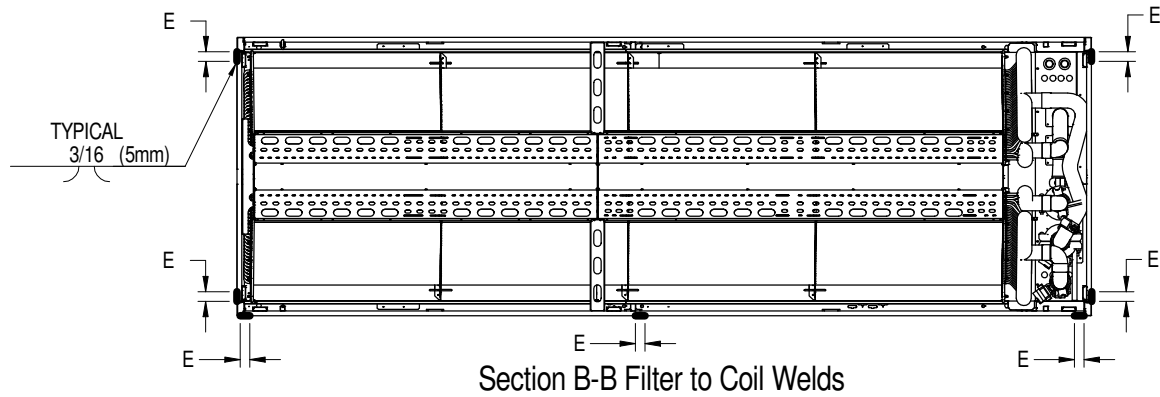
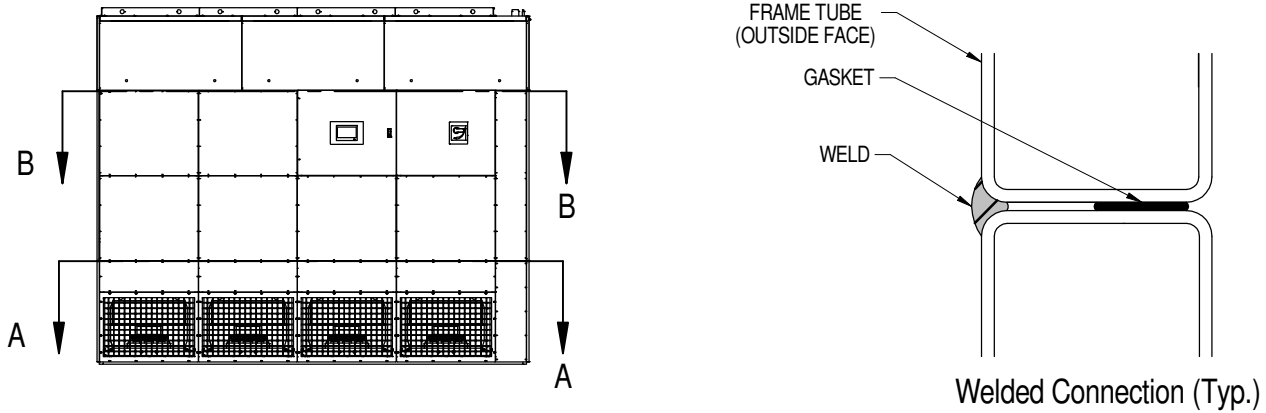
2. Specified by Engineer of Record.

3. Operating mass includes the operating refrigerant, water volume, floor stand and plenum.

Model No.	Anchor Size	Operating mass*		Maximum Compressive Reaction		Maximum Load per Anchor			
		3				Tension		Shear	
		Lbs	kg	Lbs	kg	Lbs	kg	Lbs	kg
CW440	1/2"	6500	2948	3616	1640	1910	866	991	450

Sds=1.70, Rp=6, ap=2.5, lp=1.5

## SEISMIC DATA ANCHORAGE FOR CW440D SECTION WELDING DIMENSIONS



**Notes:**

1. Gasket material is added to the inner most top mating edge of each section prior to stacking.
2. Weld material must be designated for use in welding 304L Stainless Steel (308SS or equivalent).
3. Descriptive extension plenums to be bolted in (4) places.

Model No.	Anchor Size	DIMENSIONAL DATA in. (mm)		
		C	D	E
CW440	1/2"	3-1/2 (89)	6 (152)	2 (51)

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