



Liebert® PCW Chilled Water Room Cooling Units

Installer/User Guide

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.

The products covered by this instruction manual are manufactured and/or sold by Vertiv. This document is the property of Vertiv and contains confidential and proprietary information owned by Vertiv. Any copying, use, or disclosure of it without the written permission of Vertiv is strictly prohibited.

Names of companies and products are trademarks or registered trademarks of the respective companies. Any questions regarding usage of trademark names should be directed to the original manufacturer.

Technical Support Site

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

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

TABLE OF CONTENTS

1 Important Safety Instructions	1
1.1 Conventions	1
1.2 Agency Listed	8
1.3 Residual Risks	8
1.3.1 Electric and Control System	8
1.3.2 Components at High Temperature	8
1.3.3 Sharp Elements	9
1.3.4 Automatic Start-up and Rotating Elements	9
1.3.5 Automatic Start-up and Strong Air Flow	9
1.3.6 Lifting and Moving	9
1.3.7 Handling Area	10
2 Nomenclature and Components	11
2.1 Vertiv™ Liebert® PCW Model Number Nomenclature	11
3 Intended Use	15
3.1 Purpose of the Unit	15
3.2 Assembly	15
3.3 Heat Transfer Fluid	15
3.4 Functional Limits	15
3.5 Space Limits	15
3.6 Environment	15
3.6.1 Storage Conditions	16
3.6.2 Operating Conditions	16
4 Pre-Installation Preparation and Guidelines	17
4.1 Site Preparation	17
4.2 Operations on the Unit	17
4.3 Specifications for Site Preparation	18
4.3.1 Location	18
4.3.2 Space Requirements	18
4.4 Dimensions and Weights	19
4.4.1 Overview	19
4.5 Overall Dimensions	19
4.6 Height from the Floor	20
4.6.1 Height of the Accessories at Bottom	20
4.6.2 Height of the Accessories on Top	21
4.6.3 Free Space from the Floor	21
4.6.4 Free Space from the Ceiling	22
4.6.5 Downflow Up Units - Floor Opening Dimensions	22
4.6.6 Downflow Down Units - Floor Opening Dimensions	24
4.6.7 Weights	25

- 5 Equipment Inspection and Handling 27**
 - 5.1 Handling the Modules While Packaged 28
 - 5.1.1 Removing the Unit from the Skid with a Forklift or a Pallet Jack 28
 - 5.1.2 Removing the Unit from the Skid Using a Crane 29
 - 5.2 Unpacking the Unit 30
 - 5.2.1 Pump Location 30
 - 5.3 Preparing for Assembly 31
 - 5.3.1 Moving the Unit to the Installation Location Using Piano Jacks 31
- 6 Description 35**
 - 6.1 Versions Overview 35
 - 6.1.1 Unit Frame 35
 - 6.1.2 Air Distribution 36
 - 6.1.3 Cabinet Width 37
 - 6.1.4 Cabinet Height 37
 - 6.1.5 Accessories 37
 - 6.2 Structure 38
 - 6.2.1 Standard Version 38
 - 6.3 Cooling System 39
 - 6.3.1 Circuit Versions and Operating Principle 39
 - 6.3.2 Water Valve Types 40
 - 6.3.3 Chilled Water Connection Configurations 40
 - 6.4 Air System 41
 - 6.4.1 Fans 41
 - 6.4.2 Filters 41
 - 6.4.3 Heating (optional) 42
 - 6.4.4 Humidifier (optional) 43
 - 6.4.5 Condensate Pan 43
 - 6.4.6 Condensate Pump (optional) 44
 - 6.4.7 Sensors and Instruments 44
 - 6.5 Electric and Control System 45
 - 6.5.1 Main Components 45
 - 6.5.2 Standard or Dual Power Supply 47
 - 6.5.3 Disconnecting Switches 48
 - 6.5.4 Control Panel 48
 - 6.5.5 Protective Functions 48
 - 6.5.6 Fan Control 48
 - 6.5.7 Vertiv™ Liebert® SmartAisle™ 49
 - 6.6 Modbus Connections 49
 - 6.6.1 General Description 49
 - 6.6.2 Fan Management 50
- 7 Technical Data 53**

7.1 System Data	53
7.2 Physical Data	59
7.3 Structure	61
7.4 Water System	61
7.4.1 Water Valves Differential Pressure	61
7.5 Electrical System	62
7.5.1 Unit Electrical Data	62
7.5.2 Fans	63
7.5.3 Electrical Heaters	64
7.5.4 Infrared Humidifier	64
7.6 Noise Level	65
8 Installing the Unit	69
8.1 Connecting the Unit Sections	69
8.1.1 Positioning	69
8.1.2 Placing the Unit on a Floor Stand	69
9 Electrical Connections	71
9.1 Electrical System Requirements	72
9.1.1 Power Supply Requirements for the Unit	72
9.1.2 Local Codes	72
9.1.3 Protection	73
9.1.4 Power Supply Variability	73
9.1.5 Power Supply Type	73
9.1.6 Cable Connections	74
9.1.7 Check Integrity	75
9.1.8 Hot Surfaces	75
9.2 Power Supply Cable	75
9.2.1 General instructions	75
9.2.2 Standard Power Supply or Dual Power Supply Parallel	75
9.2.3 Contacts for the Unit Status Signals	77
9.2.4 Sensors Connections	80
9.2.5 Supply Air Temperature Sensor	80
9.3 Modbus Connections and Settings	81
9.3.1 Connecting a Device to the Modbus Cable	81
9.3.2 Setting Modbus Devices	81
10 Piping Requirements	83
10.1 Chilled Water Requirements	84
10.1.1 Thermal insulation	84
10.1.2 Piping Layout	84
10.1.3 Condensate Piping Requirements	85
10.1.4 Water Supply Requirements	85
10.2 Piping Connections	86

10.2.1 General Instructions	87
10.2.2 Chilled Water	87
10.2.3 Condensate Drain without Condensate Pump	88
10.2.4 Condensate Drain with Condensate Pump	89
10.3 Filling the Water System	93
10.3.1 Water Supply	93
11 Checklist for Completed Installation	97
11.1 Moving and Placing Equipment	97
11.2 Piping Installation Checks	97
11.3 Other Installation Checks	97
11.4 Electrical System	98
11.5 Cooling System	98
11.6 Air System	98
11.7 Safeguards	98
12 Operation	99
12.1 Power On/Off	99
12.2 Start	100
12.3 Check the Operation	100
12.4 Restart	101
12.5 Teamwork	101
13 Maintenance	103
13.1 Warning Labels	104
13.2 Spare Parts	104
13.3 Removing the Upper Panels	104
13.4 Draining the Chilled Water System	105
13.5 Replacing Components	107
13.5.1 Replacing the Control Board	107
13.5.2 Replacing the Air Filter	109
13.5.3 Replacing a Fan	111
13.5.4 Replacing a Fan - Upflow Units	112
13.5.5 Replacing a Fan - Downflow Units	114
13.5.6 Replacing the Valve Actuator - 2/3 Way Valves	117
13.6 Calibrations	117
13.6.1 Clogged Filter Differential Pressure Switch	117
13.6.2 Temperature Safety Switch (if heating is present)	117
14 Preventive Maintenance Checklist	119
15 Troubleshooting	123
16 Dismantling the Unit	125
16.1 Operations	125
Appendices	127
Appendix A: Technical Support and Contacts	127

Appendix B: Chilled Water Circuit 129

Appendix C: Connections 131

Appendix D: Accessories 141

Appendix E: Infrared Humidifier 147

Appendix F: ATS (Automatic Transfer Switch) - Optional 153

Appendix G: Additional Options 163

Acronyms

Item	Definition
ATS	Automatic Transfer Switch
EC	Electronically Commutated (fans)
STO	Safe Torque Off
Ultracap	Ultra Capacitor
UPS	Uninterruptible Power Supply

1 Important Safety Instructions

1.1 Conventions



WARNING! Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION: Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Indicates a property damage message.

ENVIRONMENT

Indicates an environment damage message.

Lockout-Tagout (LOTO)

The power must be disconnected and proper LOTO safety procedures must be followed.

Safeguards Raised Floor

When you finish the operations on the unit, always remember the following:

- Remount and fix with screws all the safeguards (panels, grids).
- If present, close and lock all the doors.
- Install all the floor panels around and under the unit.
- Never operate the unit without the above mentioned safeguards.

SAVE THESE INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of the Vertiv™ Liebert® PCW. 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. Building and equipment damage may also result. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC, and local codes, as applicable.

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

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



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

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



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

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



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



WARNING! Risk of 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. Do not operate upflow units without installing a plenum, duct work or guard over the blower opening(s) on the top surface of the unit cabinet. Ductwork must be connected to the blower(s), or a plenum must be installed on the blower deck for protection from rotating blower wheel(s) on upflow units.



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.



WARNING! Risk of top heavy unit falling over when improperly lifted or moved. Can cause serious injury or death. Building and equipment damage may also result. 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 weights are specified in **Table 4.3** on page 25 .



WARNING! Risk of improper moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity indicator. Shipping weights and unit weights are listed in **Table 4.3** on page 25 . Use the center of gravity indicators on the unit to determine the position of the slings.



WARNING! Risk of improper piping installation, leak checking, fluid chemistry, and fluid maintenance can cause equipment damage and personal injury. Installation and service of this equipment should be done only by qualified personnel who have been specifically-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.



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 feet (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 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 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 contact with hot surfaces. Can cause injury. Personal burn injury can be the result of touching a humidifier reservoir pan and/or water contained within the pan, 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 infrared humidifier parts inclusive of its bulbs, metal enclosure, humidifier reservoir pan and/or water contained within the pan, and drain tubing. All infrared humidifier parts are very hot during and remain very hot shortly after operation.



CAUTION: Risk of improper handling of boiling water. Can cause leaks, equipment and building damage, or burn injury. The unit requires a drain line that may contain boiling water. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should service the drain line or work on parts near or connected to the drain line.



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.



CAUTION: Risk of smoke generation. Can cause injury. Can cause fire suppression and alarm system activation, resulting in building evacuation and mobilization of emergency fire and rescue services. Start-up operation of optional electric reheat elements can create smoke or fumes that can activate the facility alarm and fire suppression system. Prepare and take appropriate steps to manage this possibility. Activating reheat during initial start-up may burn off particulates from electric reheat elements. Before beginning initial start-up checks, make certain that unit was installed according to the instructions in this manual. All exterior panels must be in place.



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.

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 start-up, commissioning, testing or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power source voltages should be stabilized and regulated to within $\pm 10\%$ 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 expensive building damage. Cooling coils, heat exchangers, and piping systems are at high risk of freezing and premature corrosion. Fluids in these systems must contain an inhibitor to prevent premature corrosion.

The system coolant fluid must be analyzed by a competent fluid treatment specialist before start-up to establish the inhibitor level and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion. The fluid complexity and variations 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 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 shutoff valves to reduce the amount of coolant fluid leakage and consequential equipment and building damage. The shutoff 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 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 improper water supply. Can reduce humidifier efficiency or obstruct humidifier plumbing.

Do not use a hot water source. It will cause deposits that will eventually block the fill valve opening.

NOTICE

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

Downflow unit internal drain lines contain a factory installed trap. Do not externally trap the unit.

Upflow unit internal drain lines do not contain a factory installed trap. Trap the unit externally.

Sagging condensate drain lines may inadvertently create an external trap.

Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with local codes.

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. Can cause unit damage.

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

NOTICE

Risk of equipment snagging cables and wiring. Can damage the unit wiring and components.

Carefully monitor the position of the EC-fan wire harnesses and other parts while lowering the fan to be sure that they are not caught or pinched.

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.

1.2 Agency Listed

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



1.3 Residual Risks

1.3.1 Electric and Control System

The unit contains potentially lethal voltage in some circuits.

The electric and control panel can retain a stored high-voltage electrical charge for up to 10 minutes.

Risk of arc flash and electric shock.

Can cause injury or death.

General safety measures:

- Only properly trained and qualified personnel may perform repair, maintenance and cleaning.
- The key of the electric panel must be kept by the person responsible for maintenance.
- Always wear the protective equipment prescribed by the local regulations.
- It is forbidden to operate on the electrical components without using insulating platforms, or in the presence of water and humidity.

Before working inside the electrical and control panels proceed as follows:

1. Open all of the local and remote disconnecting switches of the unit.
2. Wait at least 10 minutes.
3. Verify with a voltmeter that the power is OFF.

1.3.2 Components at High Temperature

The following components are at high temperature:

- Electrical heaters
- Humidifiers

General safety measures:

- Always wear temperature resistant gloves when operating the unit.

1.3.3 Sharp Elements

Evaporators and condensers are made of plates and fins, which may have sharp edges and burrs.

Also other elements inside the unit may have sharp edges, burrs, splinters, and exposed fasteners.

General safety measures:

- Always wear cut resistant gloves.

1.3.4 Automatic Start-up and Rotating Elements

This unit operates and restarts automatically.

The fan blades can automatically start rotating without warning at any time during a cooling cycle or after the power is restored after a power failure.

Risk of contact with high-speed rotating fan blades.

Can cause serious personal injury or death.

Before working inside the unit, removing the fan guards or servicing the fans (speed control, blades, motors) proceed as follows:

- Turn all the disconnecting switches to OFF and follow the local LOTO safety procedure.

1.3.5 Automatic Start-up and Strong Air Flow

This unit operates and restarts automatically.

The fans may suddenly start blowing out a strong air flow, which may carry particles and small objects from inside the unit.

If the door is opened, the air flow may slam the door closed.

Can cause serious personal injury.

General safety measures:

- Wear eyes protection when you need to get close to the unit while it is operating.
- Pay attention to the warning labels on the unit.

Before working on the unit proceed as follows:

- Turn all of the disconnecting switches to OFF and follow the local LOTO safety procedure.

1.3.6 Lifting and Moving

- Make sure to use transport and lifting equipment rated for the unit dimensions and weight.
- Pay attention to the gravity center and warning labels placed on the unit.
- Make sure that the lifting point is aligned with the gravity center.
- Refer to [Dimensions and Weights](#) on page 19 for dimensions, weight, and gravity center position.

1.3.7 Handling Area

- Never walk or stay below a suspended load.
- The area for handling and moving must be free from obstacles and persons.
- Unauthorized personnel must keep at safe distance from the handling area.
- The floor of the handling area must be suitable to bear the weight of the unit and of the moving equipment.

2 Nomenclature and Components

This section describes the model number for Vertiv™ Liebert® PCW units and components.

2.1 Vertiv™ Liebert® PCW Model Number Nomenclature

Table 2.3 below describes each digit of the model number.

Table 2.1 Liebert® PCW Model Number Digits 1-20 Example

Model Number Digits 1-20																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
P	W	0	4	5	U	L	E	A	2	0	7	0	8	H	1	D	0	1	0

Table 2.2 Liebert® PCW Model Number Digits 21-40 Example

Model Number Digits 21-40																			
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	A	*	*	*

Table 2.3 Liebert® PCW Model Number Digit Definitions

Digit	Description
Digits 1-2 = Unit Family	
Digits 3, 4, 5 = Nominal Capacity, kW	
Digit 6 = Cabinet Configuration U = Upflow (not available on PW145 or PW170) H = Downflow Front Discharge (not available on PW145 or PW170) D = Downflow, fans in unit E = Downflow, fans in raised floor	
Digit 7 = Coil Configuration L = Standard Coil	
Digit 8 = Fan Type E – Motorized impeller for systems without reheat P - Motorized impeller for systems with reheat	
Digit 9 = Power Supply A = 460/3/60 B = 575/3/60	

Table 2.3 Liebert® PCW Model Number Digit Definitions (continued)

Digit	Description
Digit 10 = Valve	<p>2 = 2-Way Valve High Pressure</p> <p>3 = 3-Way Valve High Pressure</p>
Digit 11 = Humidification	<p>0 = None</p> <p>H = Infrared w/Auto-Flush</p>
Digit 12 = Display	<p>7 = iCOM (7" High Definition)</p>
Digit 13 = Reheat	<p>0 = None</p> <p>1 = Electric, Single Stage (Models 035-045)</p> <p>2 = Electric, Two Stage (Models 060-170)</p>
Digit 14 = Filters	<p>8 = 2" MERV 8 + Filter Clog Switch</p> <p>9 = 2" MERV 11 + Filter Clog Switch</p>
Digit 15 = Piping Options	<p>H = Piping out the bottom of cabinet (downflow only)</p> <p>T = Piping out the top of cabinet (upflow only up to PW080)</p> <p>S = Piping out the left side of cabinet (upflow only)</p>
Digit 16 = Enclosure	<p>1 = Standard Color, RAL7021</p>
Digit 17 = Power Input Options	<p>D = Standard Power Supply</p> <p>U = Standard Power Supply with Capacitive Buffer</p> <p>A = Dual Power Supply, with ATS (PW045+, Not Available on 575V)</p> <p>G = Dual Power Supply with ATS and Capacitive Buffer (PW045+, Not Available on 575V)</p>
Digit 18 = Static Pressure Control	<p>0 = None</p> <p>P = Static Pressure Control</p>
Digit 19 = Monitoring	<p>1 = Standard (SNMP, BACnet IP, Modbus TCP, SMTP, HTTP, HTTPS)</p> <p>2 = Standard plus Modbus RTU</p> <p>3 = Standard plus BACnet MSTP</p>

Table 2.3 Liebert® PCW Model Number Digit Definitions (continued)

Digit	Description
Digit 20 = Low Voltage Options 0 = None L = Low Voltage Terminal Package D = Low Voltage Terminal Package and Remote Humidity Contact	
Digit 21 = Packaging N = Domestic Packaging E = Export Packaging	
Digit 22 =Sensors 0 = None F = Smoke and High Temperature	
Digit 23 = Power Meter 0 = None 1 = Power Meter	
Digit 24 = Factory Condensate Pump 0 = None C = Condensate Pump	
Digit 25 - Ethernet Switch 0 = None S = Ethernet Switch	
Digit 26 = Harmonic Filters 0 = None H = Harmonic Filters	
Digit 27 = Water Temp Sensors (Future) 0 = None	
Digit 28 = Placeholder 0 = Placeholder	
Digit 29 = Placeholder 0 = Placeholder	
Digit 30 = Placeholder 0 = Placeholder	
Digit 31 = Placeholder 0 = Placeholder	
Digit 32 = Placeholder 0 = Placeholder	
Digit 33 = Placeholder 0 = Placeholder	

Table 2.3 Liebert® PCW Model Number Digit Definitions (continued)

Digit	Description
Digit 34 = Placeholder 0 = Placeholder	
Digit 35 = Placeholder 0 = Placeholder	
Digit 36 = Placeholder 0 = Placeholder	
Digit 37 - Special Requirements A-Z = No SFA S = SFA Included	
Digit 38 = Factory configuration number	
Digit 39 = Factory configuration number	
Digit 40 = Factory configuration number	

3 Intended Use

3.1 Purpose of the Unit

The Vertiv™ Liebert® PCW units have been designed and manufactured for the following purpose:

- Precision air conditioning for indoor use (for data centers, network closets, technological rooms).

3.2 Assembly

The Liebert® PCW units are factory assembled, including all of the internal wiring.

The only operations to be made at the installation site are the following:

- Electrical connections for power supply, low volt signals, and communication
- Water piping connections to the chilled water supply system
- Other optional piping connections (condensate drain and condensate pump kit)

See [Description](#) on page 35 for details about the unit structure, versions, and optional components.

NOTE: Do not assemble or connect the unit with systems or machines that are different from what is specified in this manual for your unit. Contact Vertiv Technical Support with any questions.

3.3 Heat Transfer Fluid

The heat transfer fluid is chilled water or a mixture of water and glycol supplied by an external system.

In this document we will use the word “water” in the case of water and glycol mixture when not otherwise specified.

3.4 Functional Limits

See [Technical Data](#) on page 53.

NOTE: Risk of component failure or breakage. Do not use fluids and voltage that are different from what is specified in this manual for your unit. Contact Vertiv Technical Support with any questions.

3.5 Space Limits

Overall Unit Dimensions

See [Dimensions and Weights](#) on page 19.

Clearance

Keep free space around the unit as explained in [Space Requirements](#) on page 18.

3.6 Environment

NOTE: Do not use in explosive, acid or anyway aggressive atmosphere.

3.6.1 Storage Conditions

Table 3.1 Ambient Conditions for Storage

Storage Environment	Indoor environment, protected against weather agents Clean (no dust), well-ventilated, non-condensing
Ambient Temperature	Above freezing and below 100°F (38°C)
Ambient Humidity	<90% and preventing condensation
Storage Time	The total storage time should not exceed six months. If the storage time is longer than six months, then you must check the functionality of sensors and other electronic devices before putting the unit in operation.
Position	Keep the unit vertically upright.

3.6.2 Operating Conditions

Table 3.2 Ambient Conditions for Operation

Operating Environment	The unit is designed for indoor installation, protected from weather agents, with the following ambient conditions.
Air returning to the unit inlet (indoors conditions)	Temperature 64°F - 105°F (+18°C - +41°C)
	Absolute humidity 5.5 — 11 g steam / kg air
	Relative humidity 20 - 60 %
	The allowed thermal load must be higher than 20% of the unit nominal cooling capacity. A lower thermal load will cause inaccurate temperature and humidity control.
Chilled Water System	Minimum water inlet temperature 41°F (5°C)
	Maximum water pressure 27.6 bar (400 psig)
Power Supply Tolerance	Voltage ± 10%
	Frequency ± 2 Hz
See also Electrical System Requirements on page 72 - Power Supply Variability.	

4 Pre-Installation Preparation and Guidelines

Carefully read [Important Safety Instructions](#) on page 1.

Pay attention to the safety labels on the unit and to the safety warnings in this chapter.

4.1 Site Preparation

NOTE: Vertiv takes no responsibility for systems not compliant with the specifications given in this manual. Lack of compliance to the specifications given by Vertiv voids the warranty.

The customer is responsible for the following operations.

Table 4.1 Operations

Operation	See
Prepare the area.	See Location on the next page and Space Requirements on the next page .
Prepare the piping for the connection of the unit to the facility systems (chilled water, drainage).	See Condensate Piping Requirements on page 85 .
Make sure that the water supply is suitable.	See Water Supply Requirements on page 85 .
Prepare the electric system.	See Electrical System Requirements on page 72 .

4.2 Operations on the Unit

The following operations must be done on the unit at the installation site:

Table 4.2 Operations on the Unit

Operation	See
1. Assemble any optional accessory.	See Accessories on page 141 .
2. Position the unit at the final location and fix it on the floor or the supporting structure.	See Installing the Unit on page 69 .
3. Connect the unit to the chilled water system.	See Piping Connections on page 86 .
4. Connect the unit to the drain system.	
5. Connect the water supply and the water drain piping of the humidifier.	See Infrared Humidifier on page 147 .
6. Connect the electric power supply.	See Power Supply Cable on page 75 .
7. Connect the electric equipment to the electric panel.	See Contacts for the Unit Status Signals on page 77 .
8. Check or adjust the Modbus settings.	See Modbus Connections and Settings on page 81 .
9. Fill the chilled water system.	See Water Supply on page 93 .
10. Check the whole system.	See Checklist for Completed Installation on page 97 .
11. Start the unit.	See Operation on page 99 .

4.3 Specifications for Site Preparation

4.3.1 Location

- Verify that the floor is level, solid, and sufficient to support the unit. See **Table 4.3** on page 25 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 Liebert® CW 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.

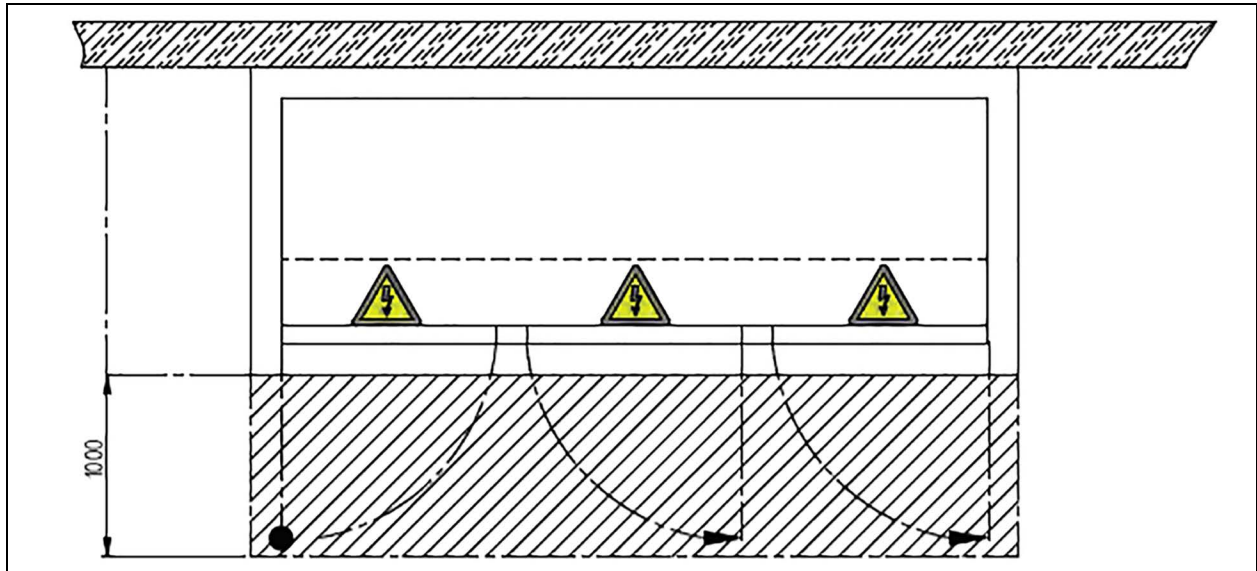
4.3.2 Space Requirements

See [Dimensions and Weights](#) on the facing page .

Keep free space between the unit and any obstacle as shown in **Figure 4.1** below .

NOTE: Leave a free space of at least 39.3 in. (1,000 mm) on the front to allow safe installation and maintenance operations.

Figure 4.1 Space Requirements



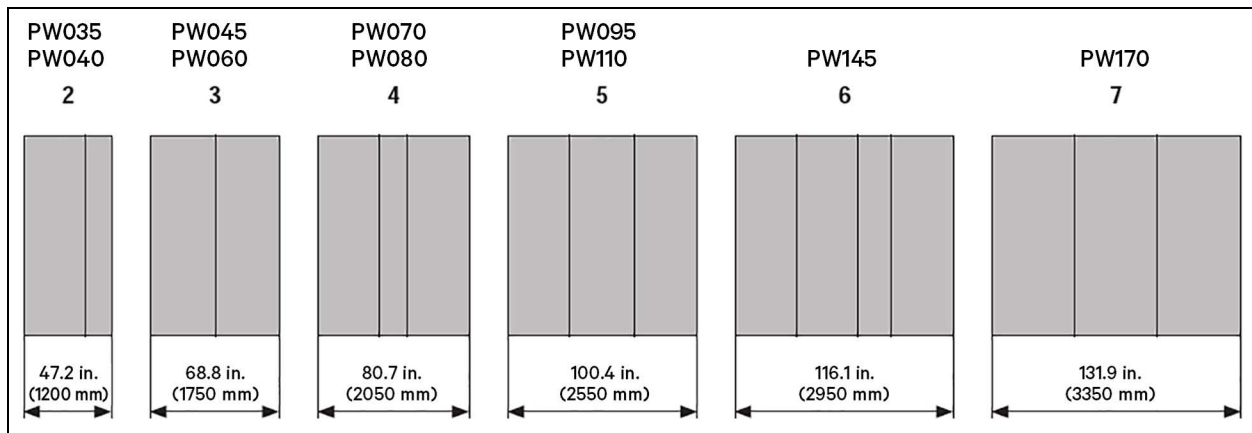
4.4 Dimensions and Weights

4.4.1 Overview

Identify the model and air distribution of your unit.	See Nomenclature and Components on page 11 .
Identify the type of frame of your unit.	See Structure on page 61 .
Find the overall dimensions for the unit frame, without accessories.	See Height from the Floor on the next page .
Check which accessories are mounted on the unit.	Accessories on page 141 .
Find the dimensions of the accessories. Calculate the total height of the unit.	See Height of the Accessories on Top on page 21 .
Check if there is enough free space at top and bottom of the unit.	See Free Space from the Floor on page 21 and Free Space from the Ceiling on page 22 .
If you are going to install a downflow unit, find the dimensions of the hole in the raised floor.	See Downflow Up Units - Floor Opening Dimensions on page 22 and Downflow Down Units - Floor Opening Dimensions on page 24 .
Check if there is enough free space for service in front of the unit.	See Space Requirements on the previous page .

4.5 Overall Dimensions

Figure 4.2 Length by Frame Type



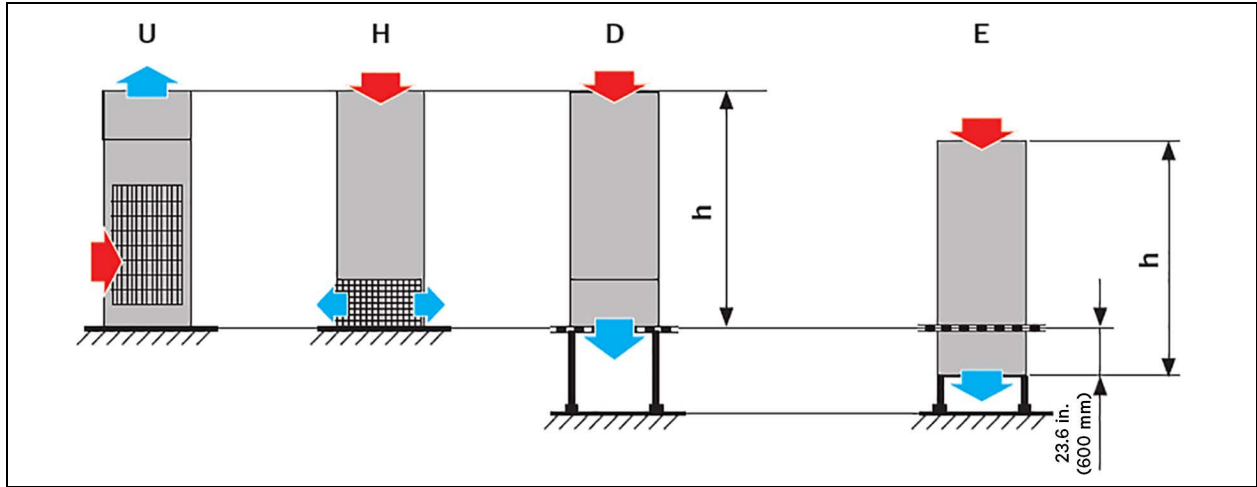
For all frame types:

Depth: 35 inches (890 mm)

Standard height: 77.6 inches (1,970 mm)

4.6 Height from the Floor

Figure 4.3 Height from the Floor

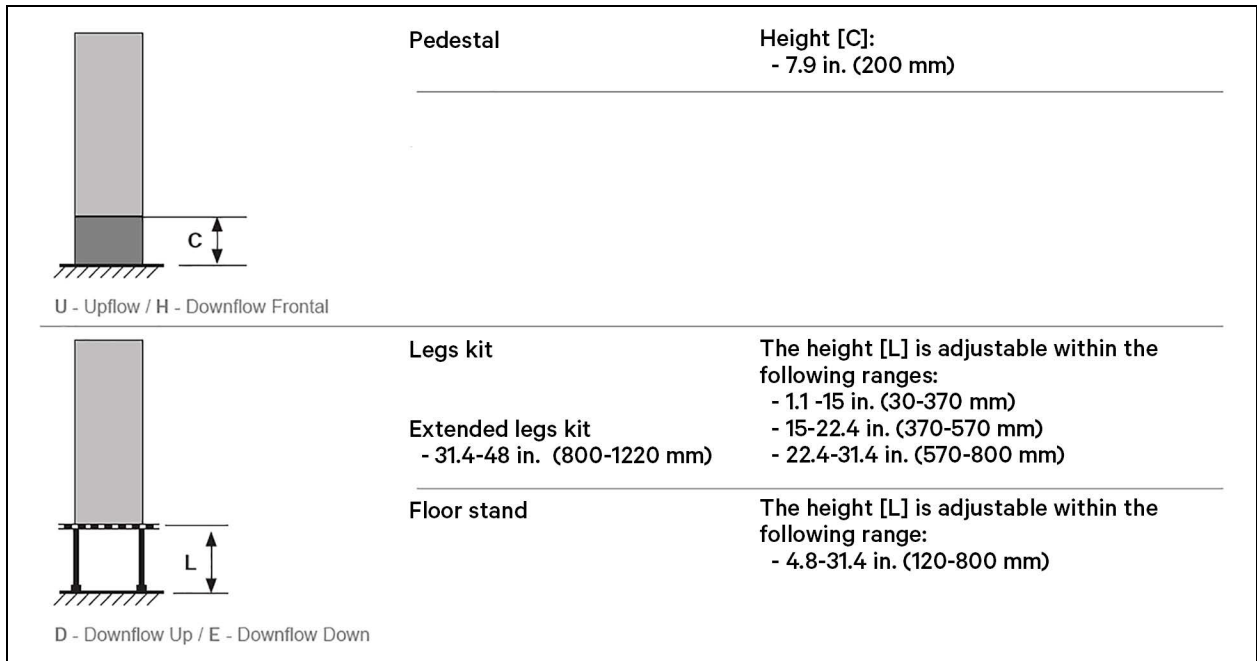


Standard $h = 76$ in. (1,970 mm)

Figure 4.3 above shows the height from the floor for each air distribution configuration.

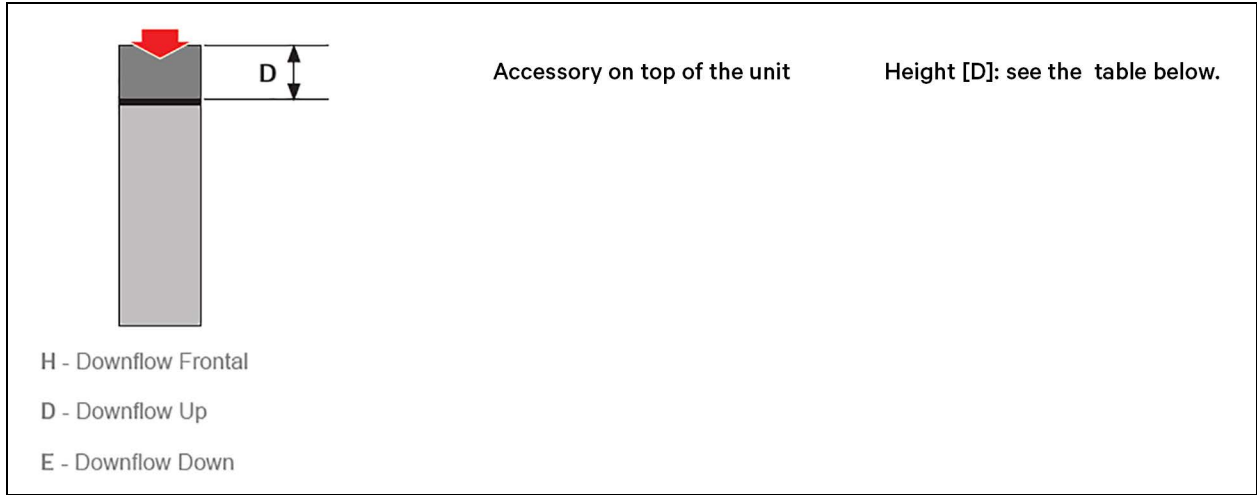
4.6.1 Height of the Accessories at Bottom

Figure 4.4 Height of Accessories at Bottom



4.6.2 Height of the Accessories on Top

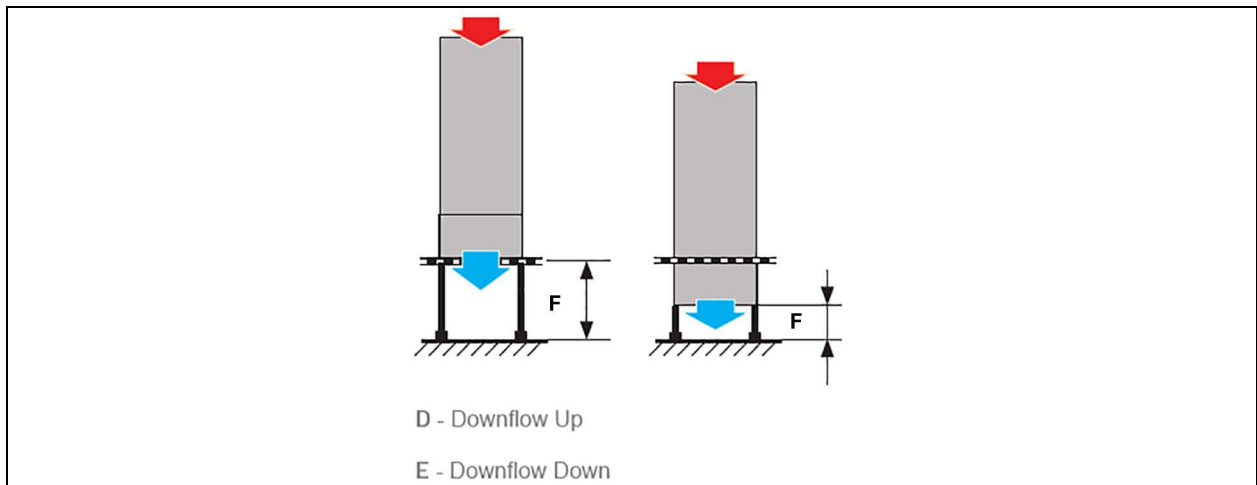
Figure 4.5 Height of the Accessories on Top



Accessory	Height D
Ducted plenum	20, 24, 31.4, 35.4 in. (500, 600, 800, 900 mm)
Grilled discharge plenum	24 in. (600 mm)

4.6.3 Free Space from the Floor

Figure 4.6 Free Space Between the Bottom of the Unit and the Floor

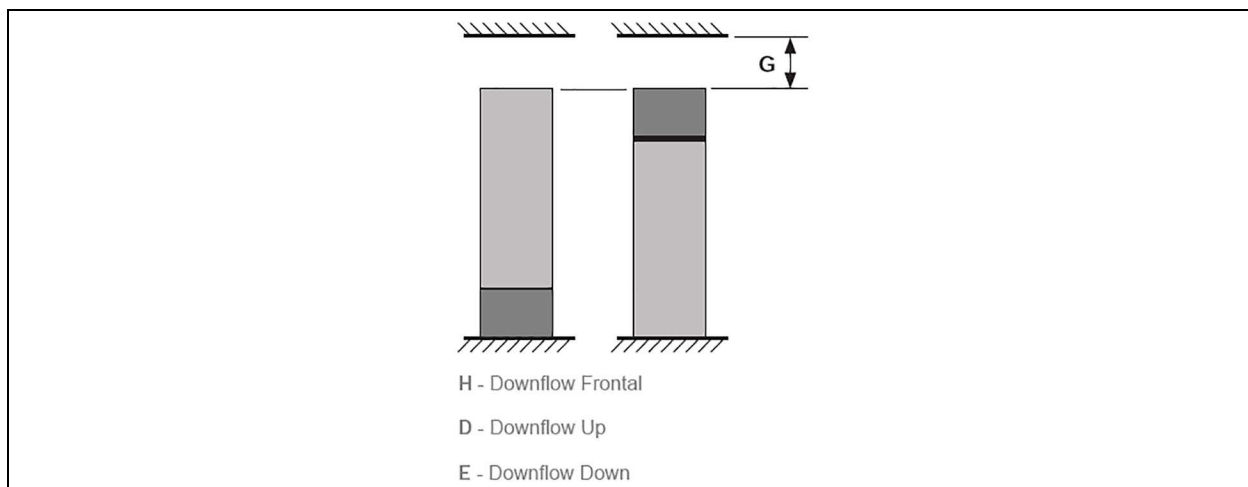


Free space [F] between the bottom of the unit and the floor

- Maximum: 31.4 in. (800 mm), which is the maximum available height for the base frame or legs kit (see above).
- Minimum to obtain the declared performances: 24 in. (600 mm)
- Minimum allowable to obtain the minimum working conditions: 12 in. (300 mm)

4.6.4 Free Space from the Ceiling

Figure 4.7 Free Space Between the Ceiling and the Unit Top

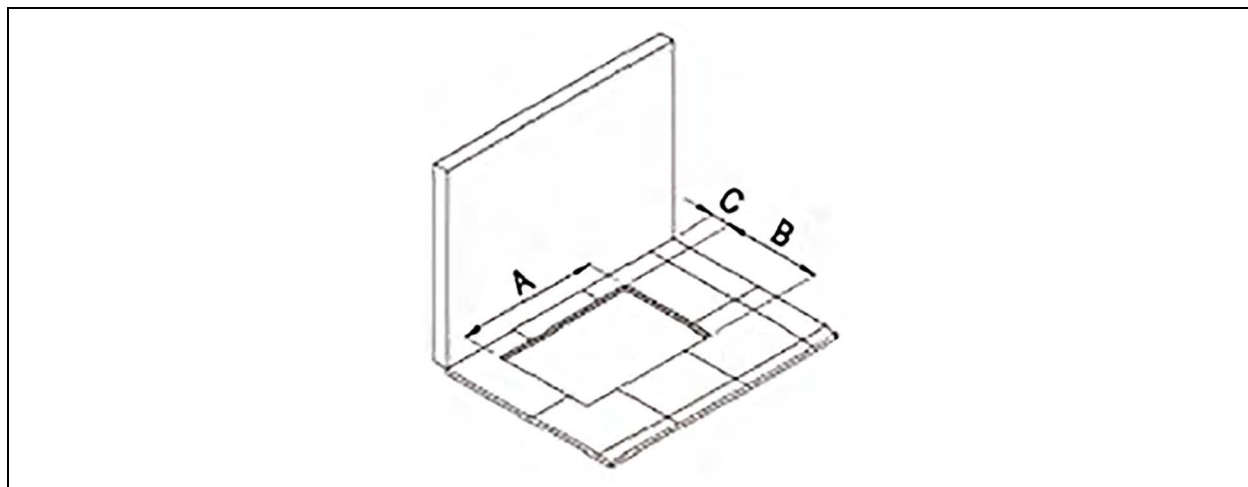


Free space [G] between the ceiling and the unit top, including any accessory mounted on top or bottom

- Minimum to obtain the declared performances: 24 in. (600 mm)
- Minimum allowable to obtain the minimum working conditions: 12 in. (300 mm)

4.6.5 Downflow Up Units - Floor Opening Dimensions

Figure 4.8 Floor Opening Dimensions

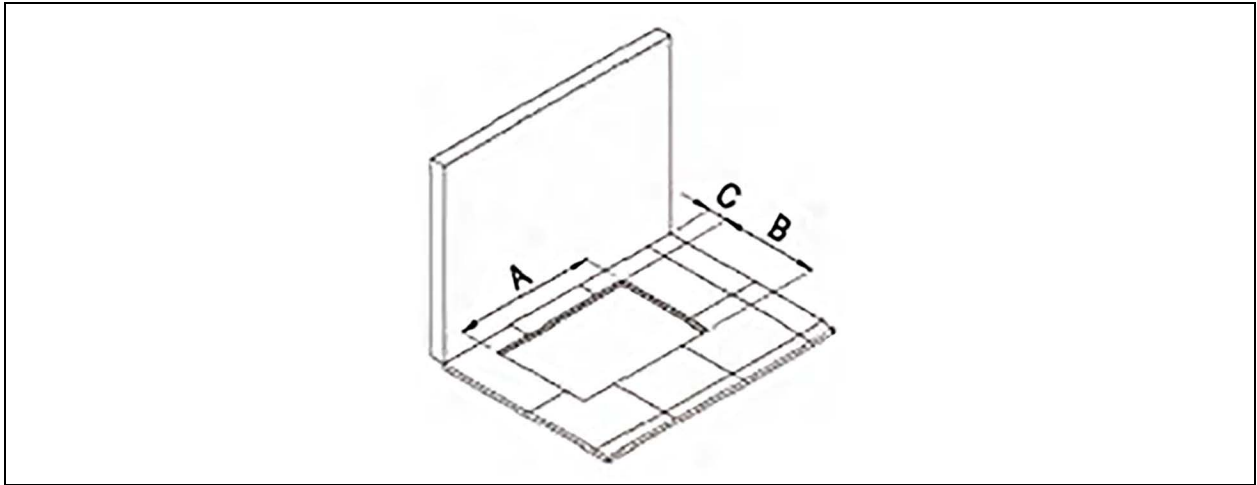


Frame Type									
	No Accessories for Support			With Legs Kit			With Base Frame		
	A in (mm)	B in (mm)	C in (mm)	A in (mm)	B in (mm)	C in (mm)	A in (mm)	B in (mm)	C in (mm)
2	433 (1100)	30 (760)	2.8 (70)	45.5 (1156)	32.2 (820)	1.2 (30)	46.2 (1176)	33 (840)	1.2 (30)
3	65 (1650)	30 (760)	2.8 (70)	67.1 (1706)	32.2 (820)	1.2 (30)	68 (1726)	33 (840)	1.2 (30)
4	77 (1950)	30 (760)	2.8 (70)	79 (2006)	32.2 (820)	1.2 (30)	80 (2026)	33 (840)	1.2 (30)
5	96.4 (2450)	30 (760)	2.8 (70)	99 (2506)	32.2 (820)	1.2 (30)	99.4 (2526)	33 (840)	1.2 (30)
6	112.2 (2850)	30 (760)	2.8 (70)	114.4 (2906)	32.2 (820)	1.2 (30)	115.2 (2926)	33 (840)	1.2 (30)
7	128 (3250)	30 (760)	2.8 (70)	130.2 (3306)	32.2 (820)	1.2 (30)	131 (3326)	33 (840)	1.2 (30)

NOTE: [C] is the minimum free space between the unit at its final position and any back wall or obstacle. You might need more space for assembly or installation operations. In that case, do the assembly or installation operation nearby and then place the unit at the final position.

4.6.6 Downflow Down Units - Floor Opening Dimensions

Figure 4.9 Floor Opening Dimensions



Frame Type	No Accessories for Support			With Floor Tiles Support Kit		
	A	B	C	A	B	C
	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)
2	47 (1182)	33.3 (846)	.78 (20)	48 (1220)	35 (885)	2 (50)
3	68.1 (1732)	33.3 (846)	.78 (20)	47 (1770)	35 (885)	2 (50)
4	80 (2032)	33.3 (846)	.78 (20)	81.4 (2070)	35 (885)	2 (50)
5	100 (2532)	33.3 (846)	.78 (20)	101.1 (2570)	35 (885)	2 (50)
6	115.4 (2932)	33.3 (846)	.78 (20)	117 (2970)	35 (885)	2 (50)
7	131.1 (3332)	33.3 (846)	.78 (20)	133 (3370)	35 (885)	2 (50)

NOTE: [C] is the minimum free space between the unit at its final position and any back wall or obstacle. You might need more space for assembly or installation operations. In that case, do the assembly or installation operation nearby and then place the unit at the final position.

4.6.7 Weights

Table 4.3 Unit Weight

Model	Single Circuit Unit (dry weight) (lbs/kg)	Dry Unit Shipping Domestic (lbs/kg)
Standard Height Unit		
PW035	785 lbs (356 kg)	945 (429 kg)
PW040	823 lbs (373 kg)	982 (445 kg)
PW045	1061 lbs (481 kg)	1290 (585 kg)
PW060	1127 lbs (511 kg)	1357 (616 kg)
PW070	1284 lbs (582 kg)	1513 (686 kg)
PW080	1319 lbs (598 kg)	1548 (702 kg)
PW095	1500 lbs (680 kg)	1769 (802 kg)
PW110	1632 lbs (740 kg)	1901 (862 kg)
PW145	1881 lbs (853 kg)	2192 (994 kg)
PW170	2106 lbs (955 kg)	2416 (1096 kg)

This page intentionally left blank

5 Equipment Inspection and Handling



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.



WARNING! Risk of top-heavy unit falling over when improperly lifted or moved. Can cause serious injury or death. Building and equipment damage may also result. 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 weights are specified in **Table 4.3** on page 25 .



WARNING! Risk of unsecured unit rolling off pallet. Can cause serious injury or death. Building and equipment damage may also result. The unit is on casters. Ensure that the unit and pallet is located on a flat surface before loosening the hardware securing the unit to its shipping pallet.



CAUTION: Risk of improper moving, lifting and handling. Can cause injury. Building and equipment damage may also result. Only properly trained and qualified personnel should work on this equipment. Evaporator fan modules weigh in excess of 125-lb (56.7-kg). Use proper lifting techniques and wear appropriate OSHA-approved PPE to avoid injury and dropping the fan module 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 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 improper storage. Can cause unit damage.

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

Keep the unit in storage with the ambient conditions given in [Storage Conditions](#) on page 16 .

Inspection

- After receiving the product, check the accessories against the packing list.
- If any parts are found missing or damaged, please report it to the carrier immediately.
- If you find any damage, please report it to the carrier and to the local distributor.

5.1 Handling the Modules While Packaged

NOTE: The following instructions are valid for both the standard units and the modules of the units (coil module and fan module).

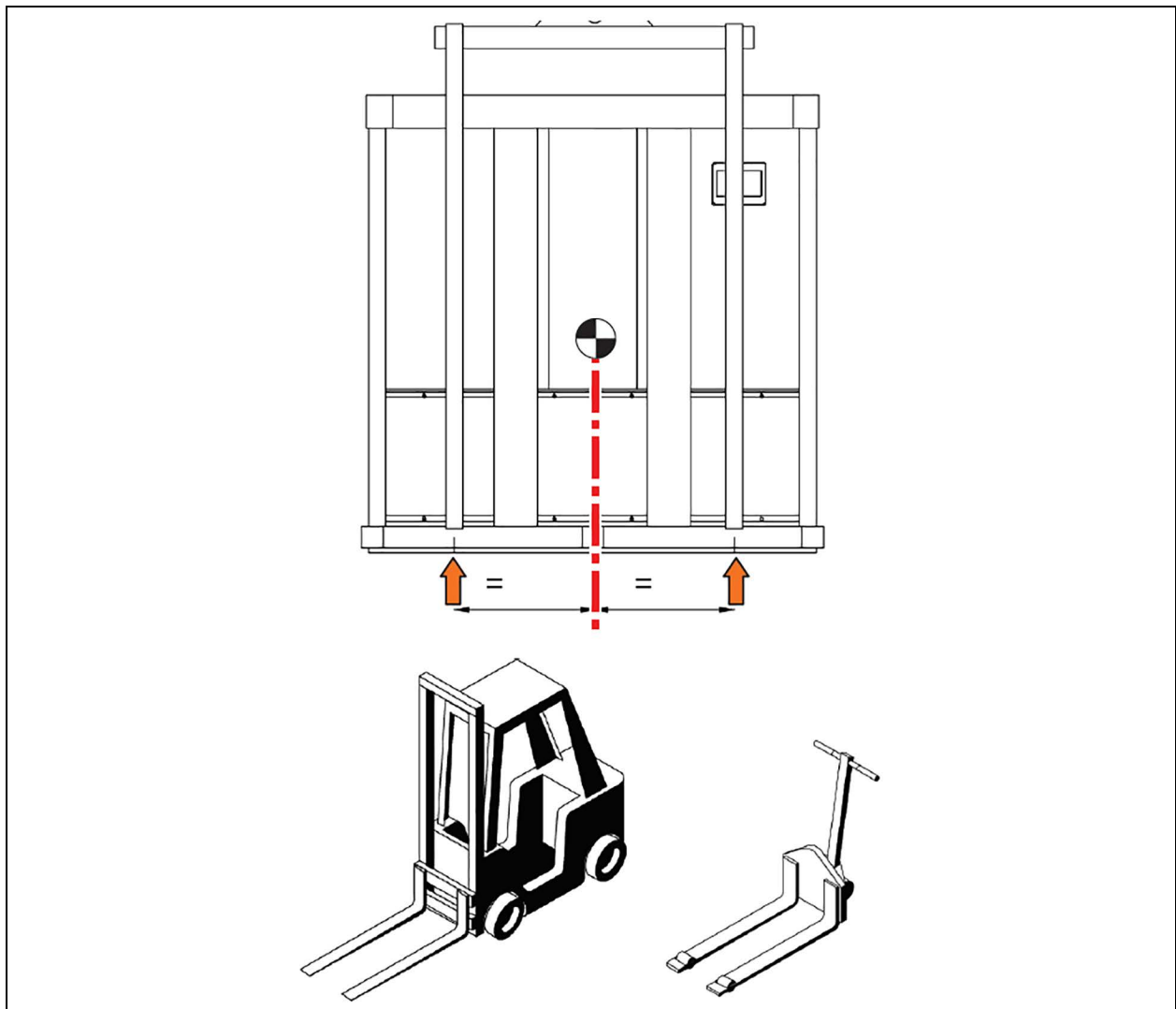
5.1.1 Removing the Unit from the Skid with a Forklift or a Pallet Jack

- Make sure that the fork length and distance is suitable for the unit length to ensure the unit stability.
- Spread the forks to the widest allowable distance to still fit under the skid.
- Lift the unit from the side that is indicated in the instructions on the package.
- Refer to the local safety regulations about lifting and handling heavy loads.

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.

Figure 5.1 Forklift



5.1.2 Removing the Unit from the Skid Using a Crane



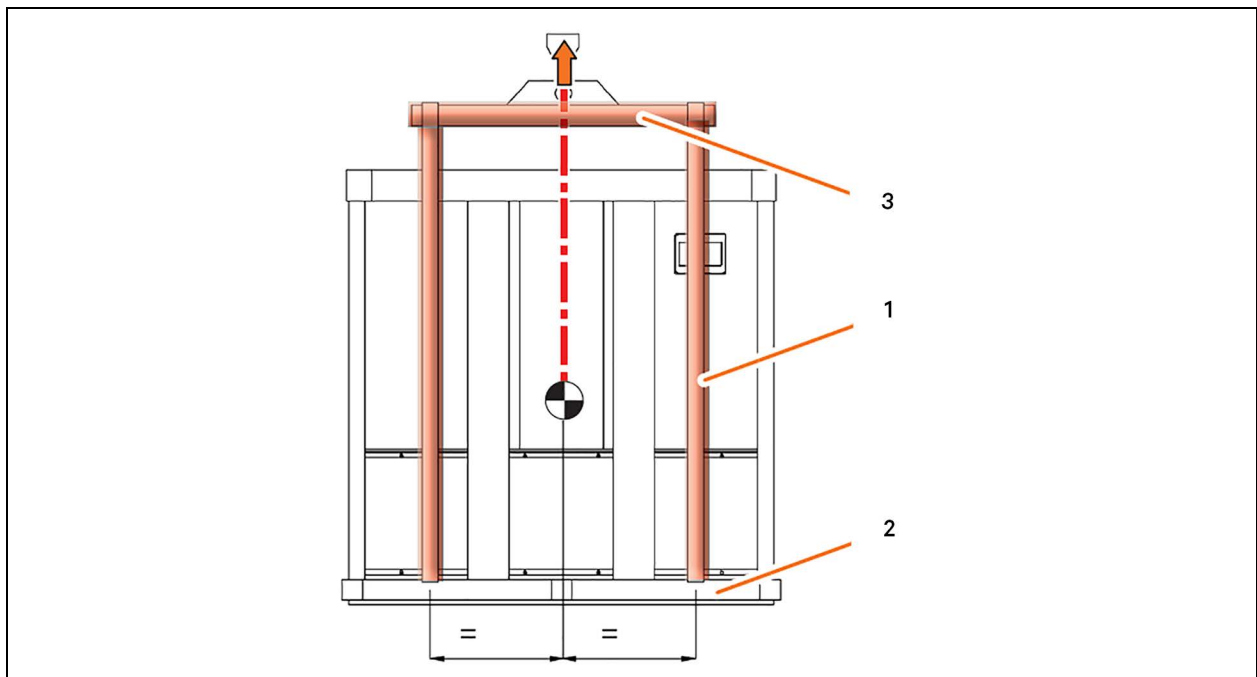
WARNING! Risk of improper moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity indicator. Shipping weights and unit weights are listed in **Table 4.3** on page 25 . Use the center of gravity indicators on the unit to determine the position of the slings.

1. Place the slings between the unit bottom rails and the skid, at the widest allowable distance. See **Figure 5.2** below .
2. Be sure that the distance between slings guarantees the unit stability.
3. Fix the slings to the spreader bar.

NOTICE

Lift the unit with a speed suitable for the load to be moved, so as not to damage the structure.

Figure 5.2 Lifting the Unit with a Crane



Item	Description
1	Slings
2	Skid
3	Spreader bar

5.2 Unpacking the Unit



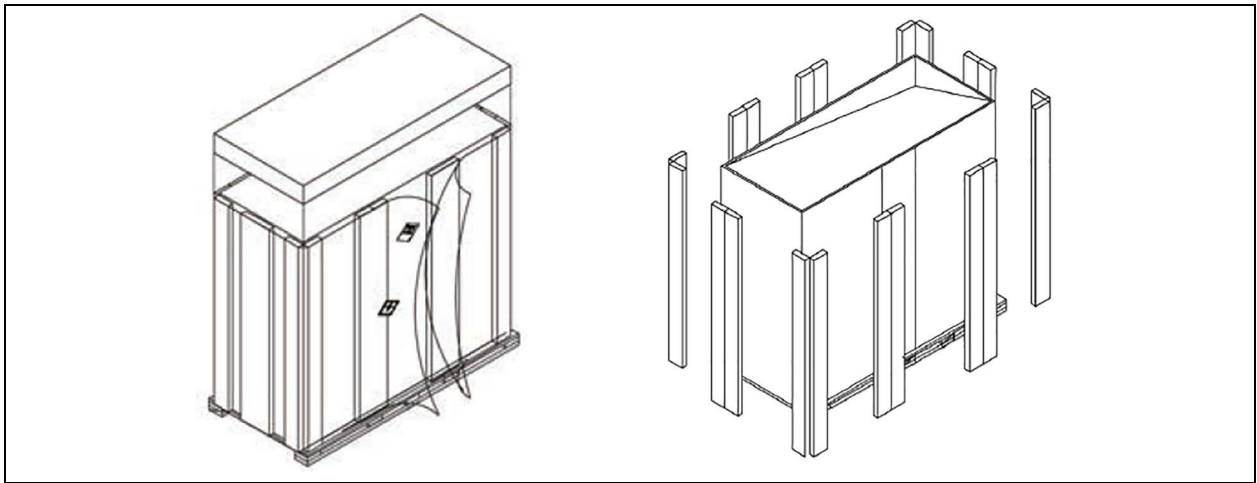
CAUTION: Risk of contact with sharp edges, splinters and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to move, lift, remove packaging from or prepare the unit for installation.

NOTE: The following instructions are valid both for standard units and the modules of the units (coil module and fan module).

1. Remove the exterior packaging material from around the unit. See **Figure 5.3** below .
2. Remove the top cover, the corner, and the side planks.

NOTE: All material used to package this unit is recyclable. Please save for future use, or dispose the package materials according to the local regulations about waste disposal.

Figure 5.3 Unpacking the Unit



5.2.1 Pump Location

1. Remove the back panel to locate the condensate pump package. Multiple panels may need to be removed to locate the pump package. See **Figure 5.4** on the facing page and **Figure 5.5** on the facing page .

Figure 5.4 Downflow Units Example (back view)

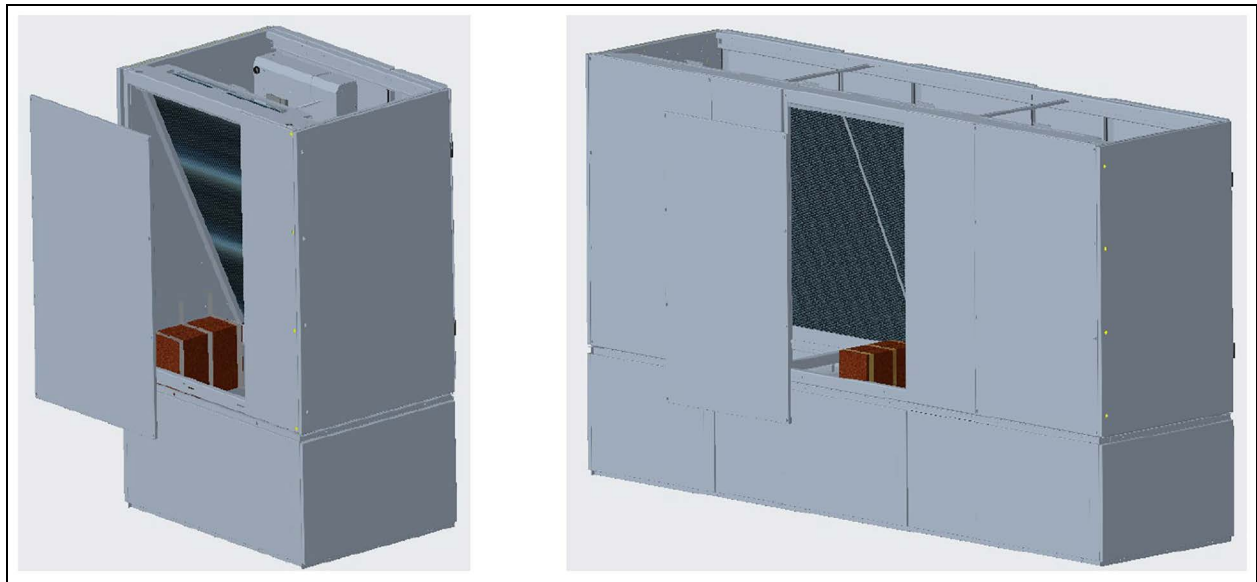
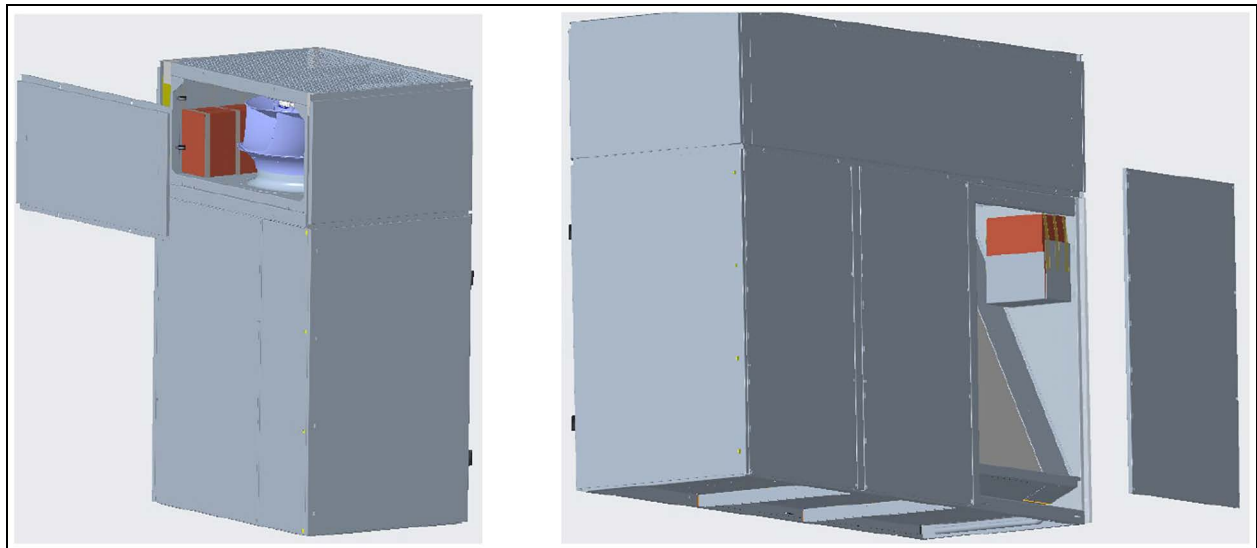


Figure 5.5 Upflow Units Example (back view)



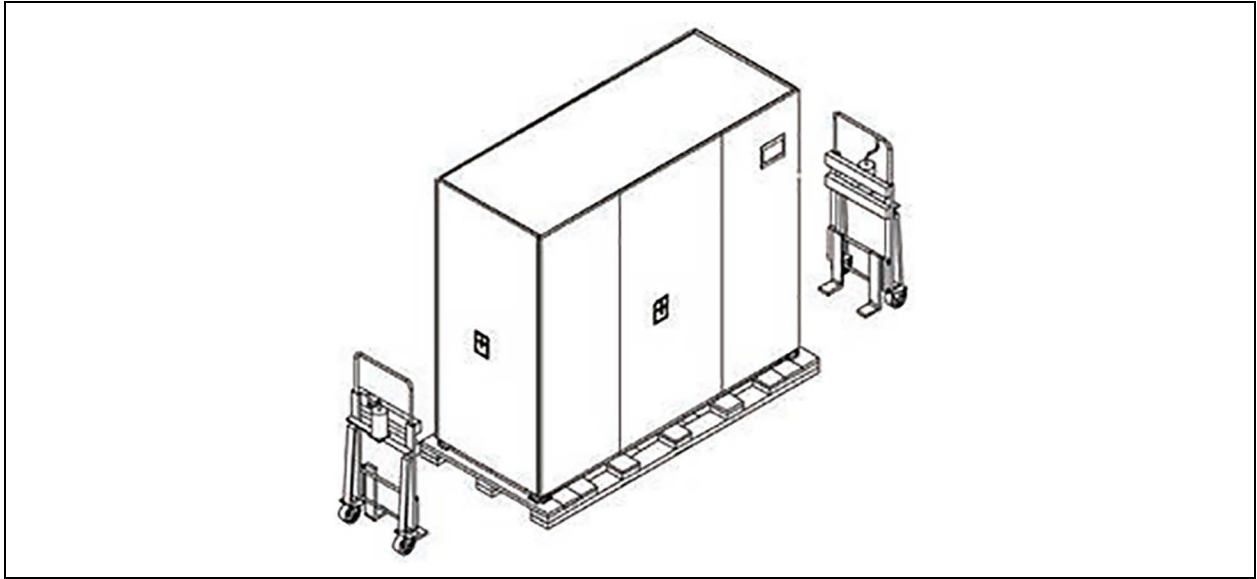
5.3 Preparing for Assembly

NOTE: The following instructions are valid for both standard units except upflow with left customer connections.

5.3.1 Moving the Unit to the Installation Location Using Piano Jacks

1. Make sure that the floor can support the unit when you move it with piano jacks. If necessary, cover the floor with metal plates or other support that can distribute the weight on the floor.
2. Place the piano jacks on both sides of the unit. See **Figure 5.6** on the next page .

Figure 5.6 Module and Piano Jacks



3. Remove the four bolts (two on each side) that attach the unit to the skid. See **Figure 5.7** below and **Figure 5.8** on the facing page .

Figure 5.7 Removing Bolts - Downflow Unit

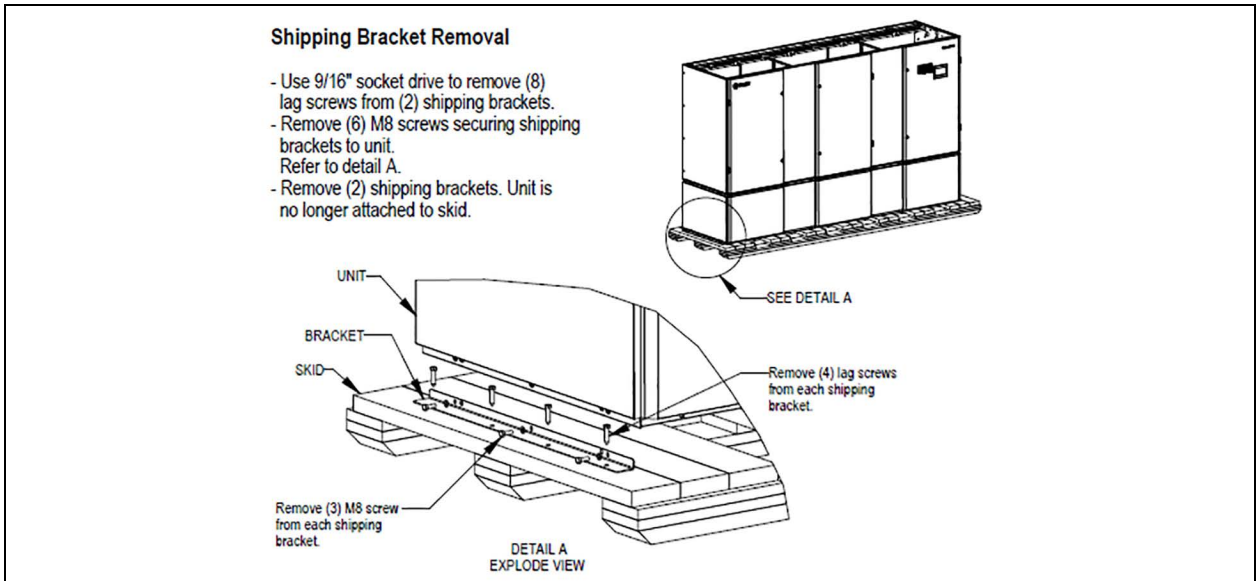
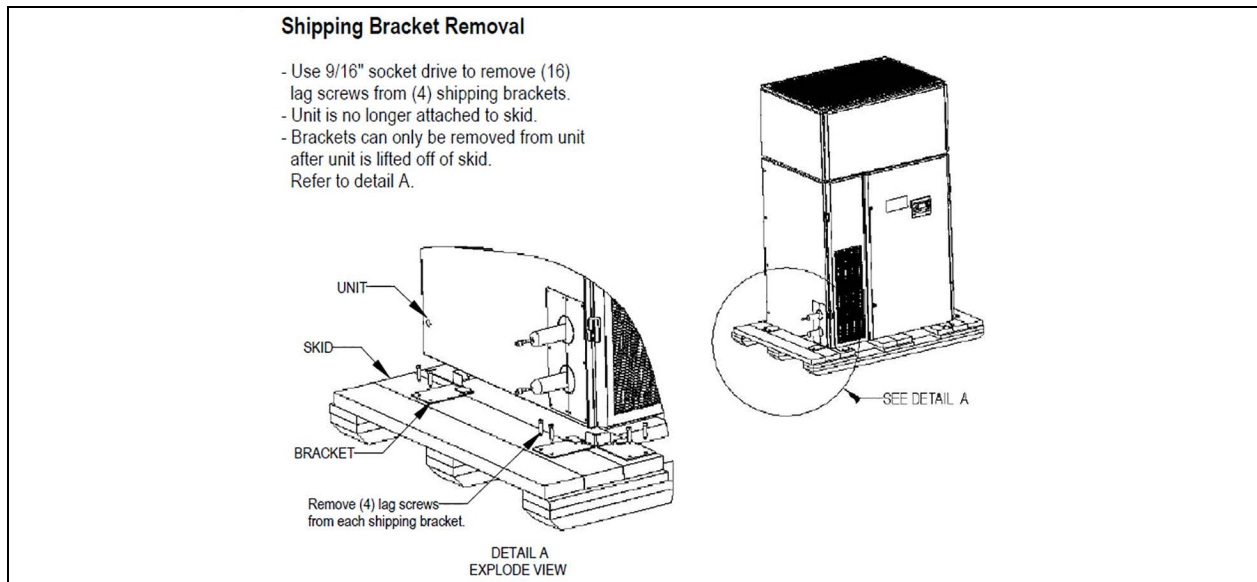
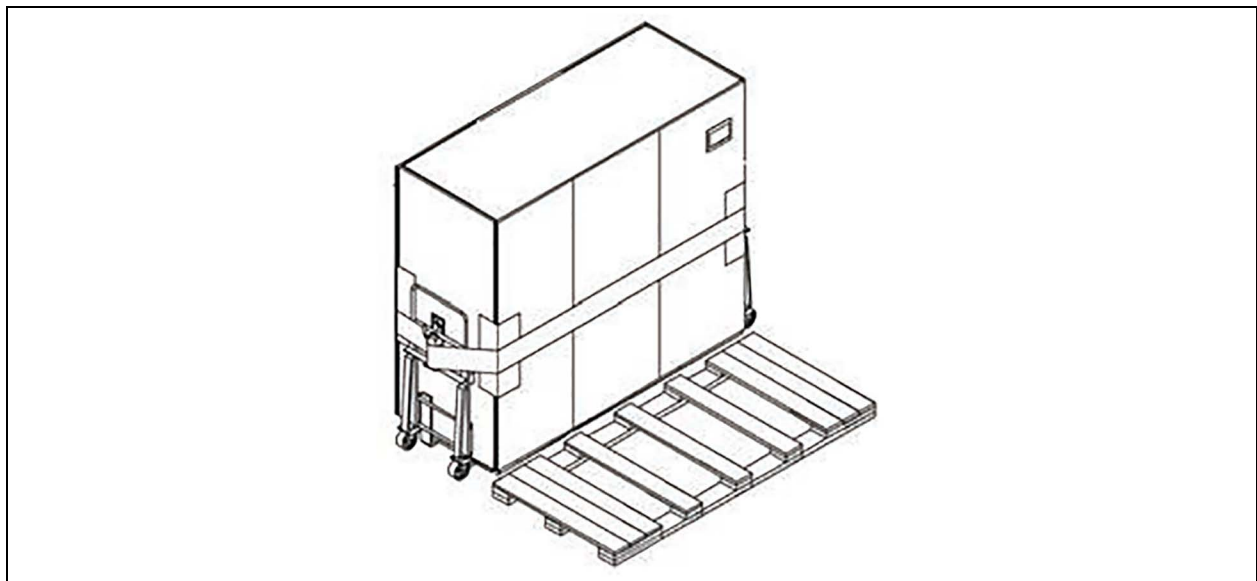


Figure 5.8 Removing Bolts - Upflow Unit



4. Slide the forks of the piano jacks between the unit and the pallet.
5. Place a protective material between the unit and the piano jacks.
6. Attach the piano jacks to the unit with straps. Place protective material between the unit and the straps.
7. Slightly lift the forks of the piano jacks and remove the pallet.

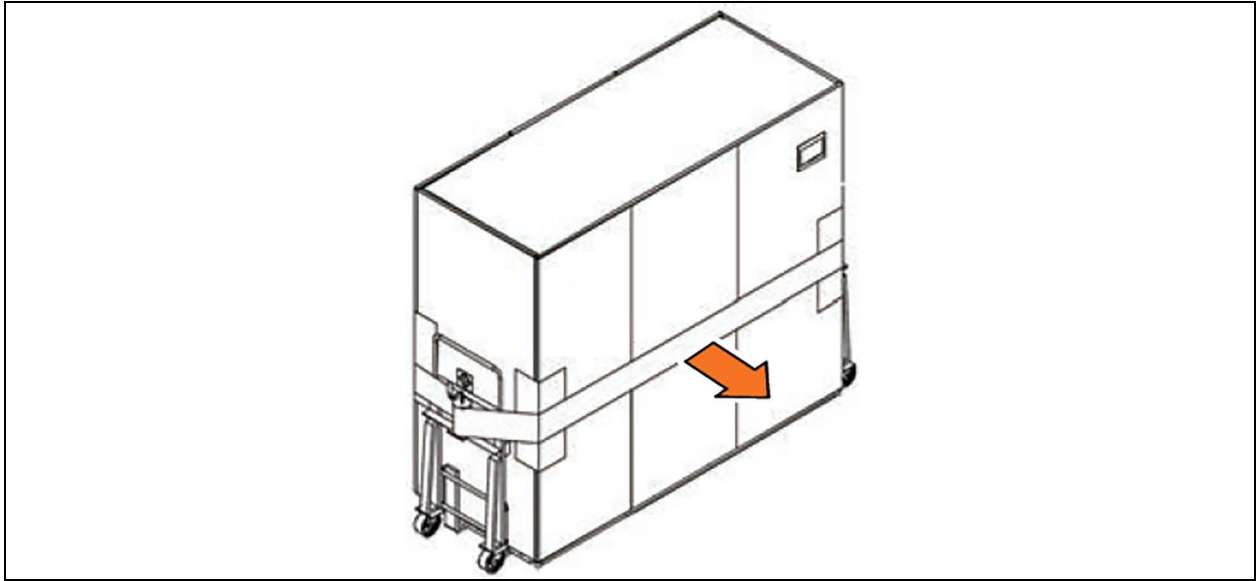
Figure 5.9 Removing the Pallet



8. Move the unit to its installation site. See **Figure 5.10** on the next page.

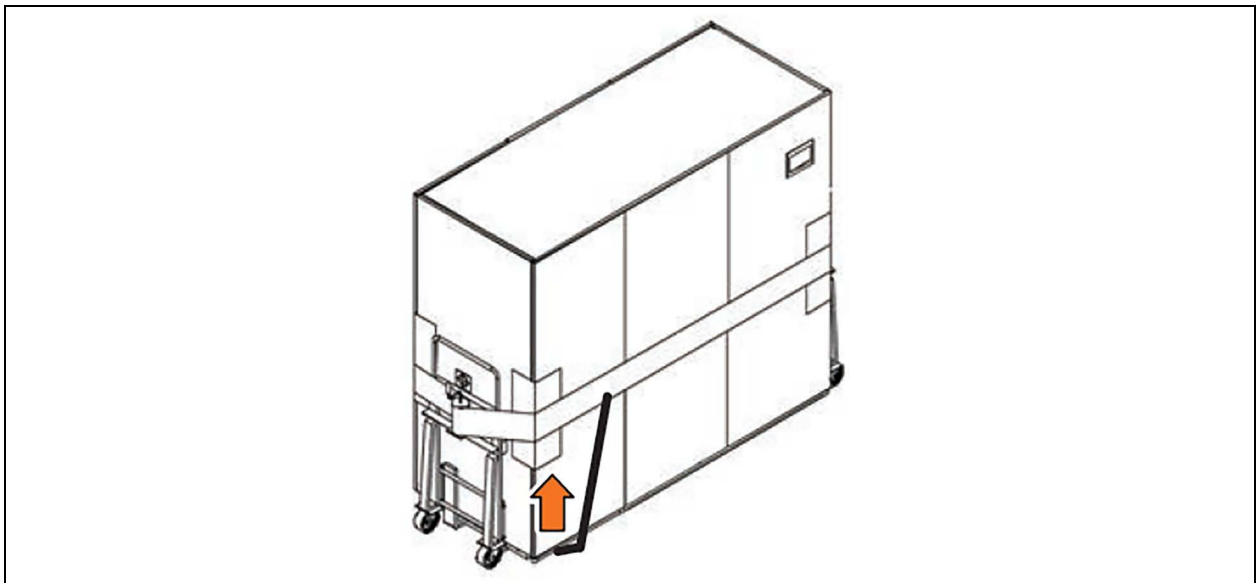
NOTE: At least two persons are needed.

Figure 5.10 Moving the Unit



9. Remove the piano jacks.
10. Place the unit as low as the piano jacks allow.
11. Remove all of the straps.
12. Using a pry bar or a similar tool, lift the unit at one side high enough to remove the piano jack. See **Figure 5.11** below .
13. Do the same on the other side.
14. Remove the protective materials.

Figure 5.11 Lifting the Unit with Pry Bar



NOTE: Condensate pump must be removed from unit before installation. See [Pump Location](#) on page 30 .

6 Description

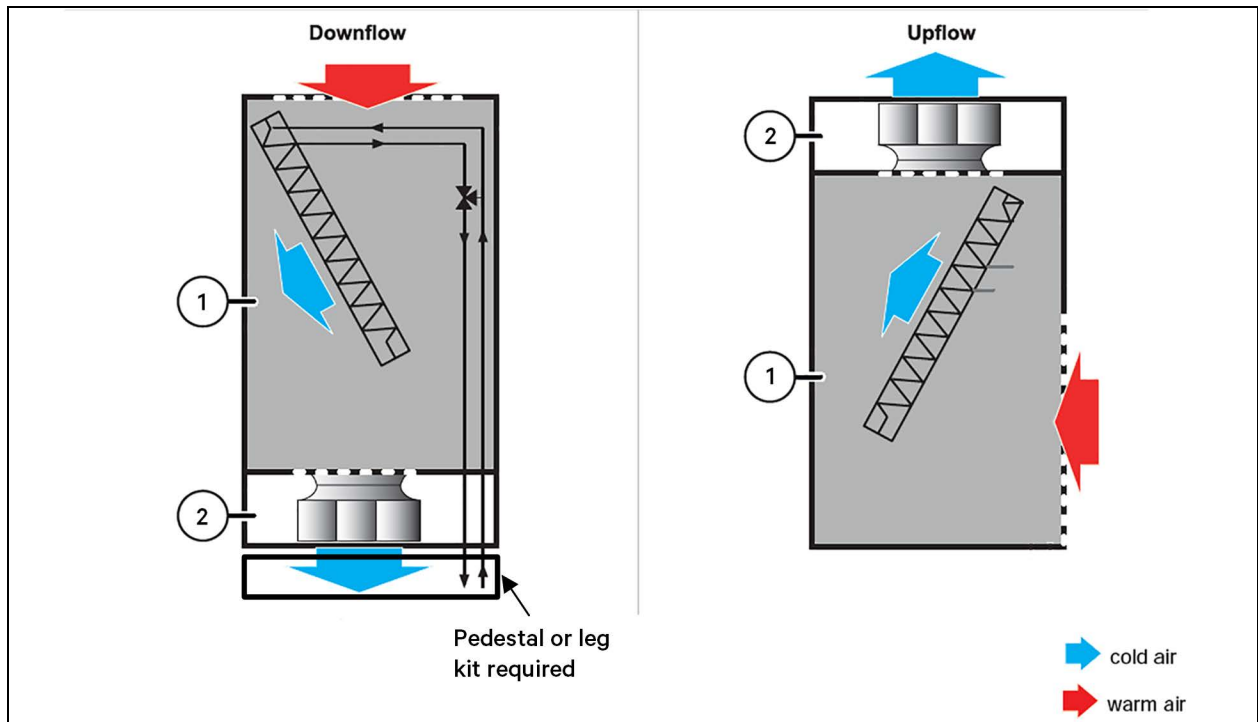
NOTE: The images in this manual refer to sample units. Some components may be different for other units but the function remains the same.

6.1 Versions Overview

6.1.1 Unit Frame

The unit frame is made by the coil section and the fan section. See **Figure 6.1** below. The coil section contains the cooling system of the unit, the electric panel, and the control system. The fan takes the warm air from the room into the unit. The air flows through the heat exchange, cools down, and blows out again in the room.

Figure 6.1 Unit Frame Coil and Fan Sections

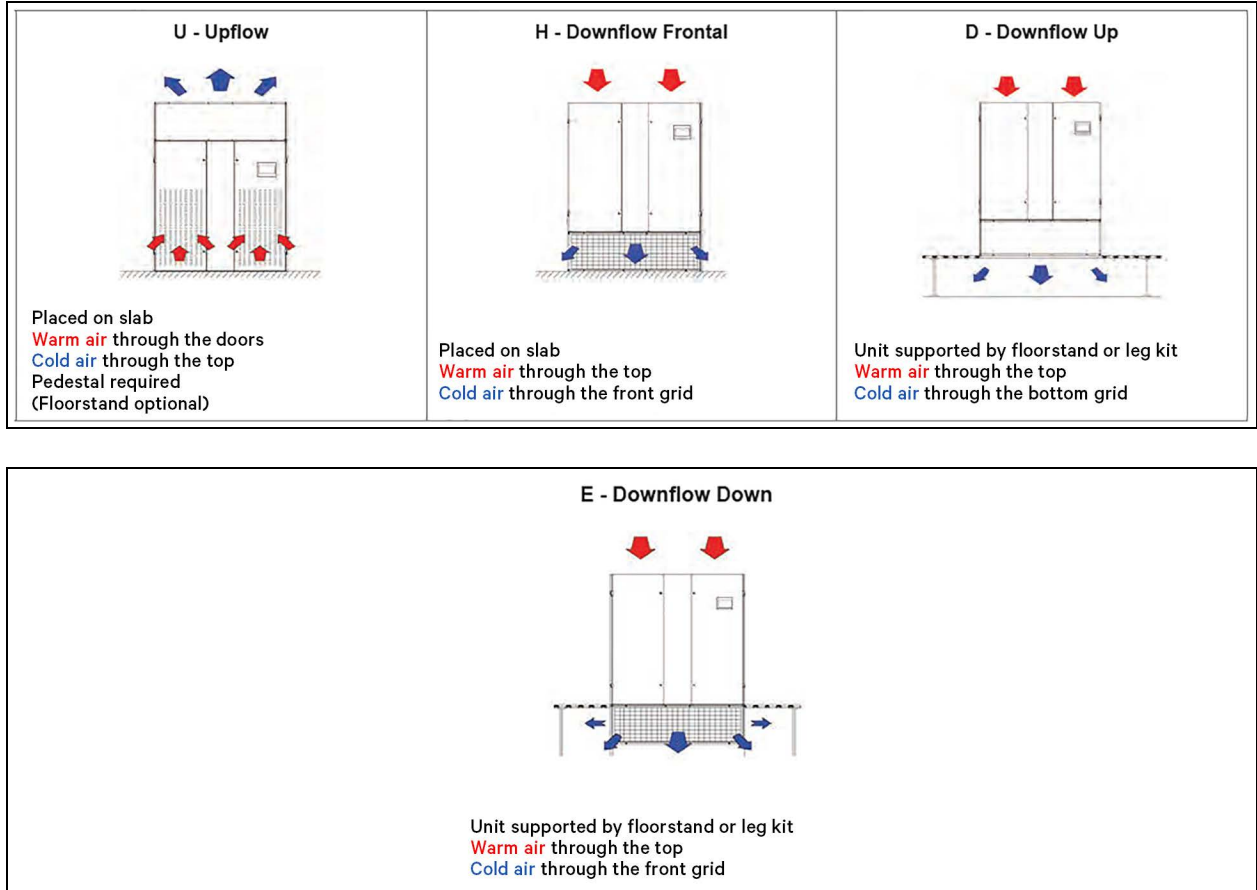


Item	Description
1	Coil section
2	Fan section

6.1.2 Air Distribution

The air flow direction can be either upflow (fan section on top) or downflow (fan section at the bottom). Upflow units require pedestal or optional floorstand, downflow units can be supported by floorstand or leg kit. The following combinations are available:


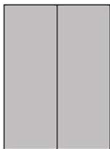
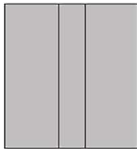
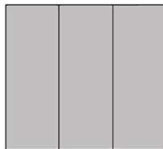
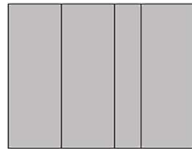
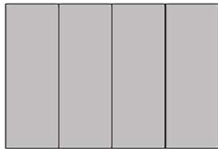
Figure 6.2 Air Distribution Combinations



6.1.3 Cabinet Width

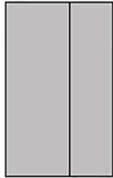
The units can have the following cabinet size:

Figure 6.3 Cabinet Width

Width	Frame type	2	3	4	5	6	7
	Number of bays	1.5	2	2.5	3	3.5	4
							
<p>NOTE In the units with frame types 2, 3, 5 and 7 the coil section and the fan section are separate modules that are assembled together.</p>							

6.1.4 Cabinet Height

Figure 6.4 Cabinet Height

<p>Standard H = 77.6 in. (1970 mm)</p> 	<p>The coil and the fan sections are factory assembled in the same cabinet.</p>
--	---

6.1.5 Accessories

Several accessories are available for the following purposes:

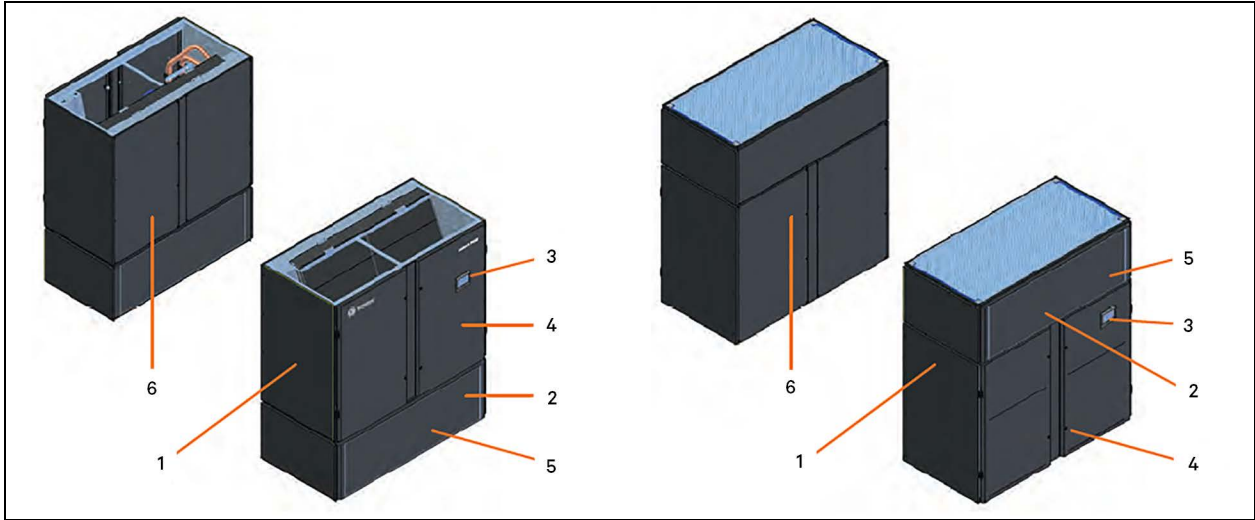
- Support and adjustment of the unit height: floor stand, leg kits and pedestals
- Plenums

See [Accessories](#) on page 141 for details.

6.2 Structure

6.2.1 Standard Version

Figure 6.5 Structure

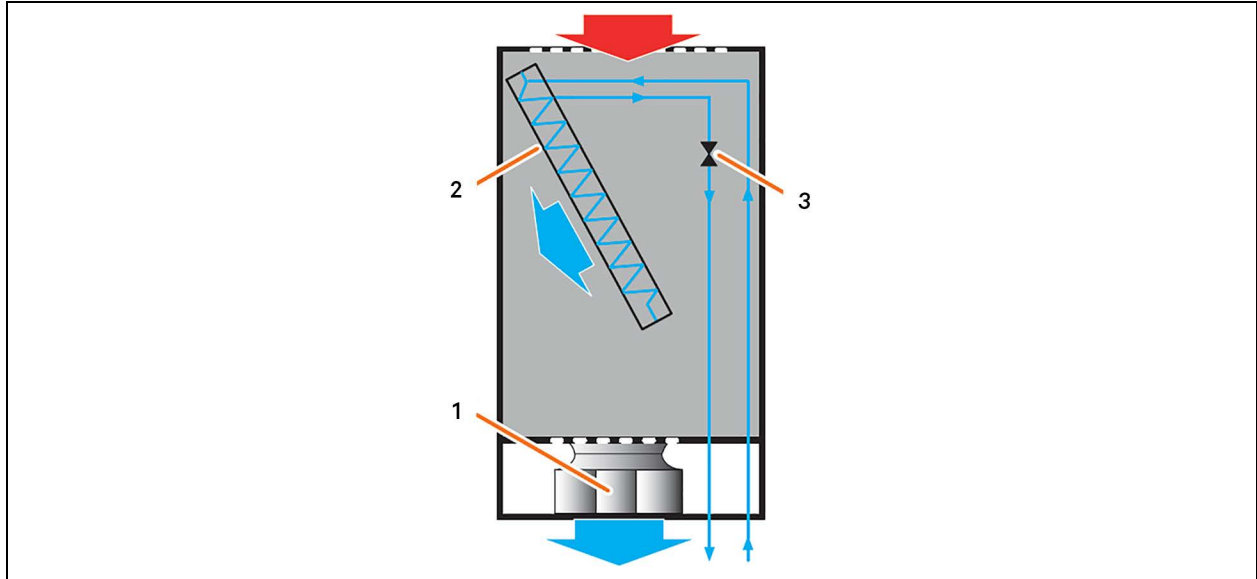


Item	Description	Remarks
1	Coil section	The coil section is completely closed by panels and by the door for protection against any contact with electric parts and hot or cold surfaces.
2	Fan section	The fan section is completely closed by panels and grids for protection against any contact with moving parts.
3	Control panel	The control panel is placed on the front door.
4	Doors	The doors can be opened only by the proper tool.
5	Fan safeguards	The fixed panels (safeguards) can be removed only by loosening the screws.
6	Rear safeguards	

6.3 Cooling System

6.3.1 Circuit Versions and Operating Principle

Figure 6.6 Single Circuits



Item	Description
1	Fan
2	Water coil
3	Water valve

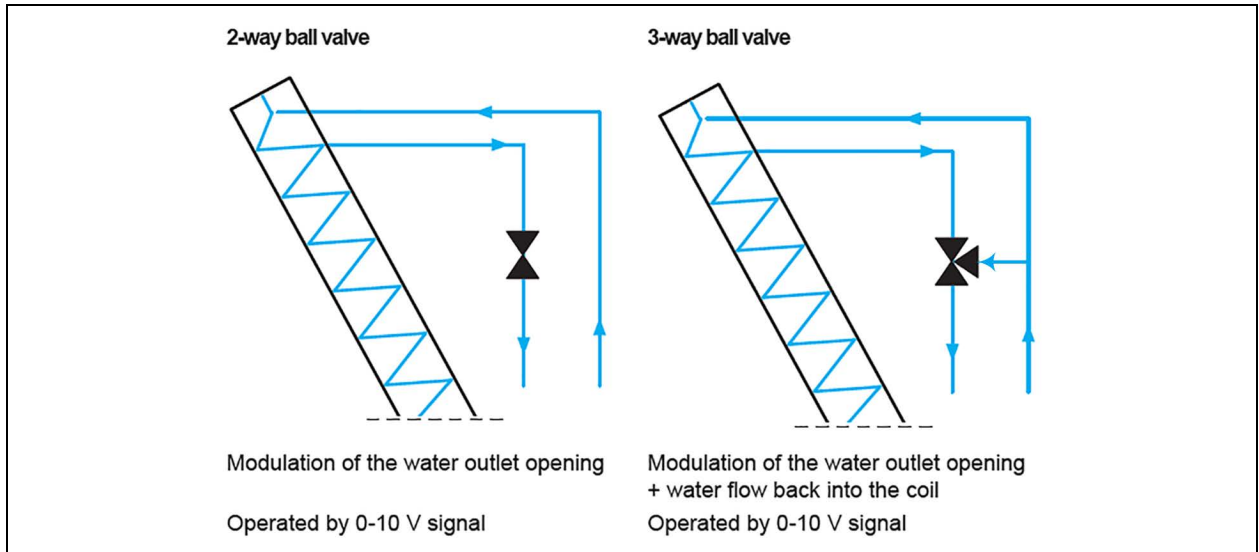
Operating Principle

Figure 6.6 above shows a simplified scheme for a downflow unit with single circuit. Refer to [Chilled Water Circuit](#) on page 129 for details.

The operating principle is the same for all of the models (also including upflow air distribution and double circuits). The fan allows the warm air coming from the room to flow through the water coil. See Figure 6.6 above. The water cools down the air, which flows again into the room. The control system operates the opening and closing of the water valve at the water outlet in order to control the water flow rate to maintain the desired operating conditions.

6.3.2 Water Valve Types

Figure 6.7 Water Valves



NOTICE

Do not exceed the nominal operating pressure of the circuit components.

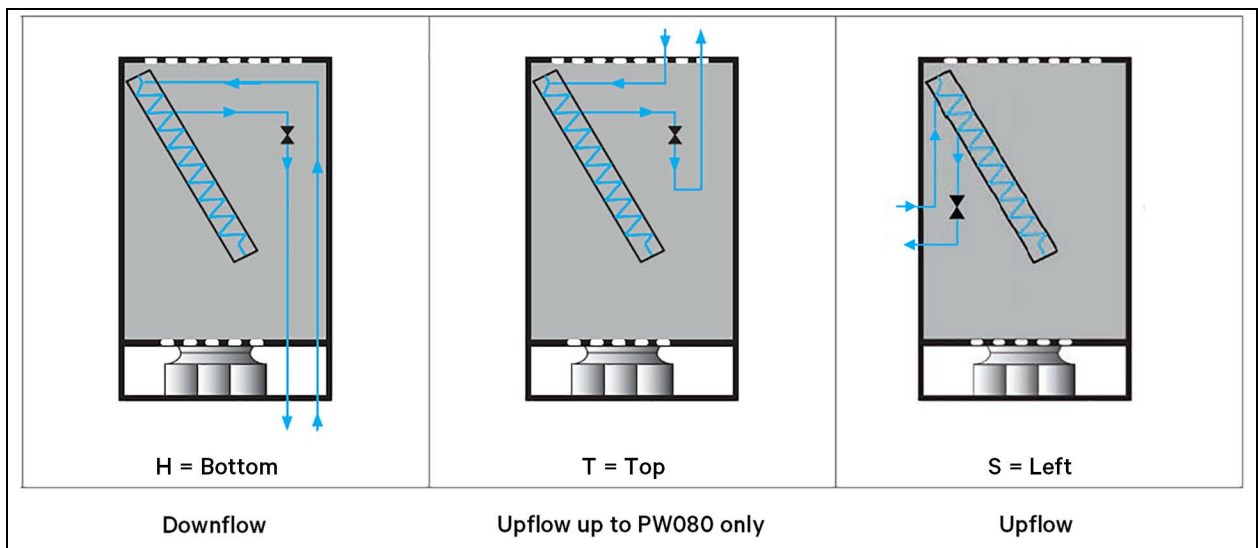
All valves are internally threaded.

To get precise pressure drop data, please use selection software.

NOTE: Recommended glycol mixture is less than 50%.

6.3.3 Chilled Water Connection Configurations

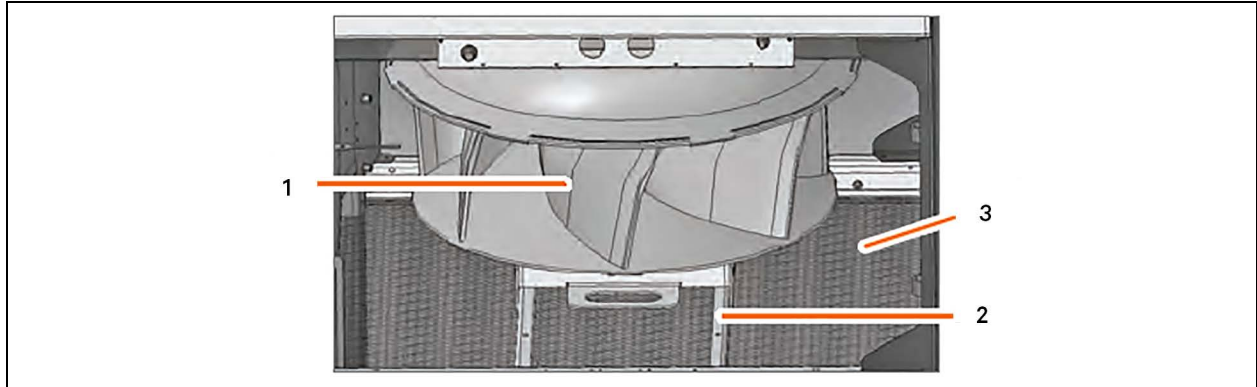
Figure 6.8 Chilled Water Connection Configurations



6.4 Air System

6.4.1 Fans

Figure 6.9 Fans

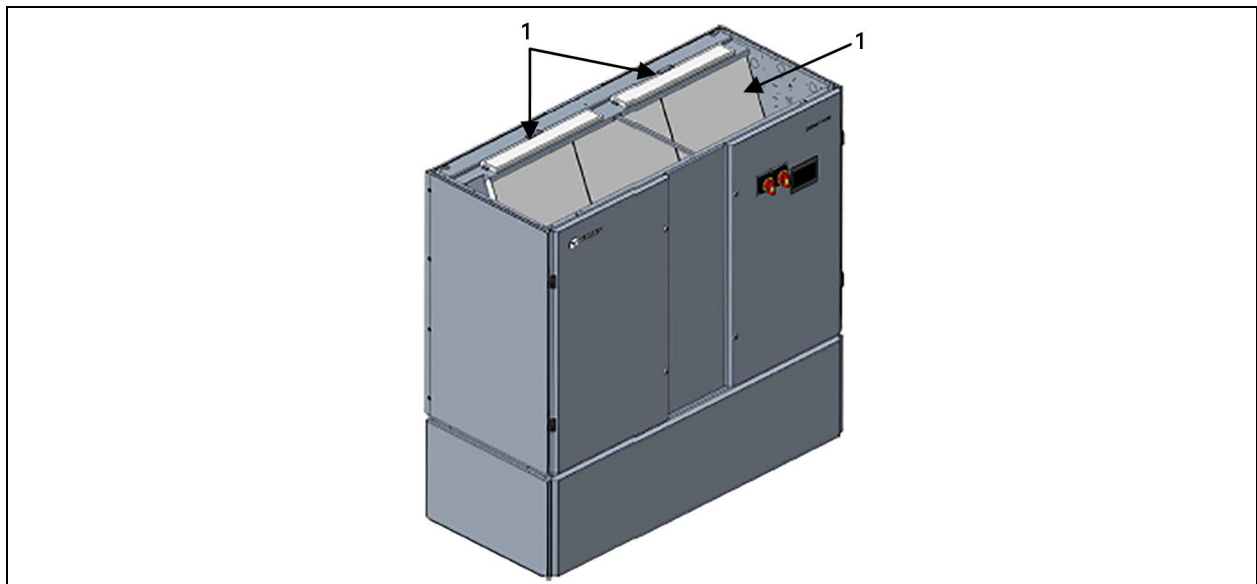


Item	Description
1	Fan
2	Fan supporting frame
3	Protective grid The grids protect against contact from the top (for the upflow versions) or from below the floor, if the floor is opened for any reason near the machine (for the downflow versions).

The fan motors are protected by time delayed fuses. See [Electric and Control System](#) on page 45 for details.

6.4.2 Filters

Figure 6.10 Filter Locations



Item	Description
1	Filter locations

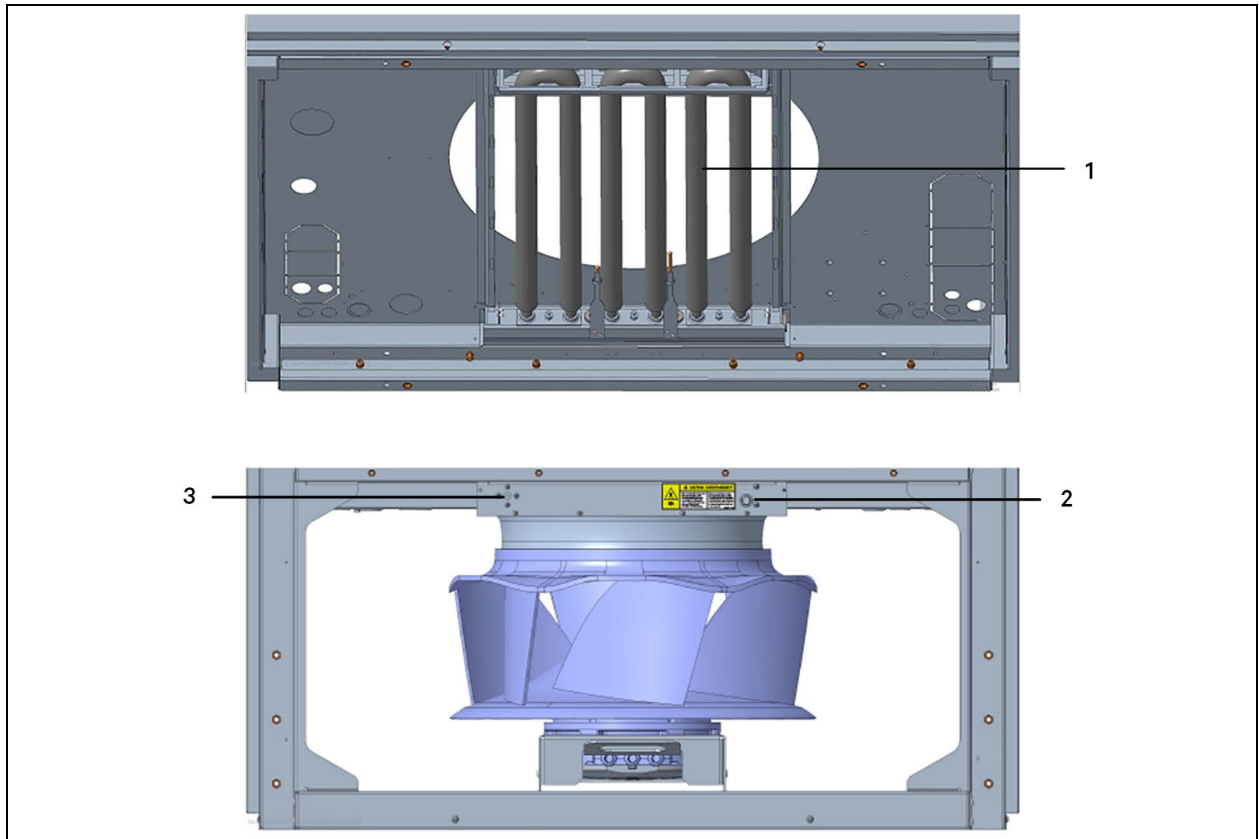
Figure 6.10 on the previous page shows standard filter locations.

Filter Clog Sensor

A sensor sends an alarm to the control system if the pressure difference through the filter is higher than a threshold setting, meaning that the filter is clogged. Measured by filter differential pressure switch located in the control panel.

6.4.3 Heating (optional)

Figure 6.11 Heater



Item	Description
1	Heater
2	Manual resettable safety thermostat
3	Auto resettable safety thermostat

Heater Temperature Switch

The temperature switch is installed on the heater. It switches off the heater if its temperature is higher than the alarm value. The unit will continue to operation without heat.

The auto reset temperature switch opens at 185°F and closes at 178°F. The manual reset temperature switch opens at 248°F.

Reset Button Function

In case of activation of the temperature switch, a manual reset is required.

- Press the button to manually reset of the heater. See **Figure 6.11** on the previous page .
- Reset the temperature alarm on the control panel.

Safety Air High Temperature Sensor

This sensor measures the air temperature at the unit outlet and switches off the heater if the air temperature is higher than the alarm threshold. The unit will continue to operate without heat.

This sensor is a thermistor in the fan module. The control has a setting of 104°F for when it alarms.

6.4.4 Humidifier (optional)

Figure 6.12 Infrared Humidifier

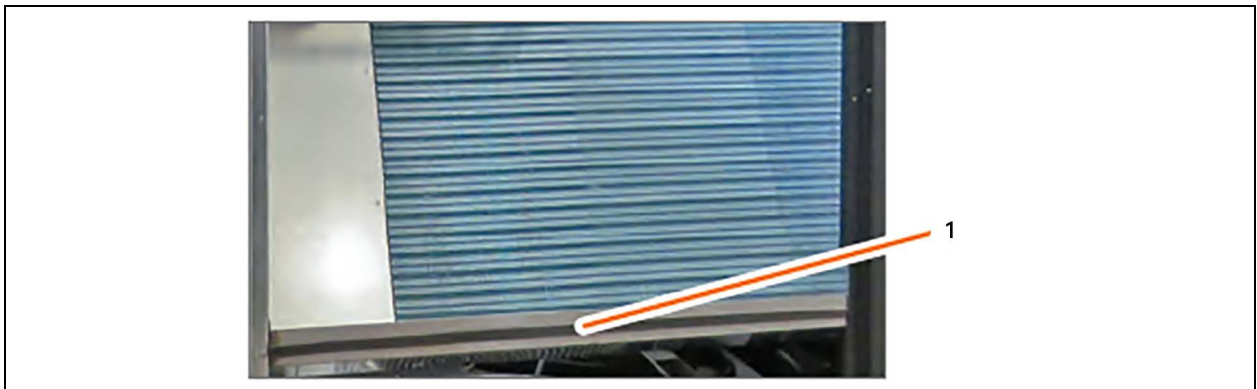


Installed inside the unit. See [Infrared Humidifier](#) on page 147 .

6.4.5 Condensate Pan

The tray collects the condensate from the evaporator. See **Figure 6.13** below .

Figure 6.13 Condensate Pan

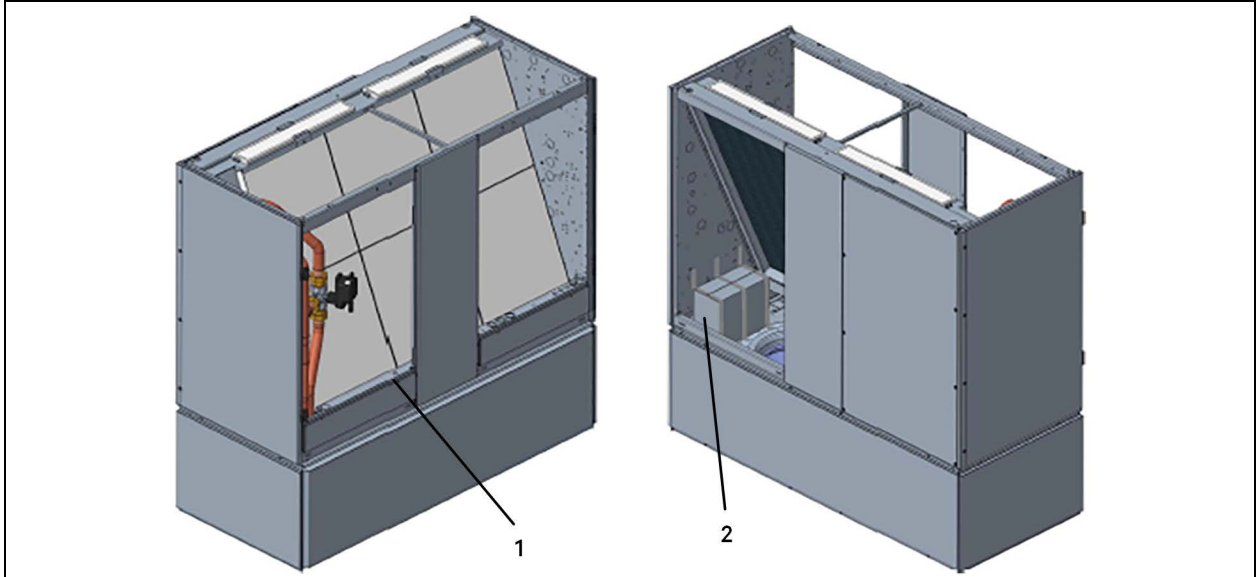


Item	Description
1	Condensate pan

6.4.6 Condensate Pump (optional)

An optional condensate pump is available to deliver the condensate to an higher level. The pump discharges both condensate water from the exchange coil and drain water from humidifier (if installed). See **Figure 6.14** below .

Figure 6.14 Condensate Pan and Condensate Pump



Item	Description
1	Condensate pan
2	Condensate pump

Condensate pump is shipped inside unit but must be installed external of unit. Shipping location of condensate pump will vary from unit to unit.

6.4.7 Sensors and Instruments

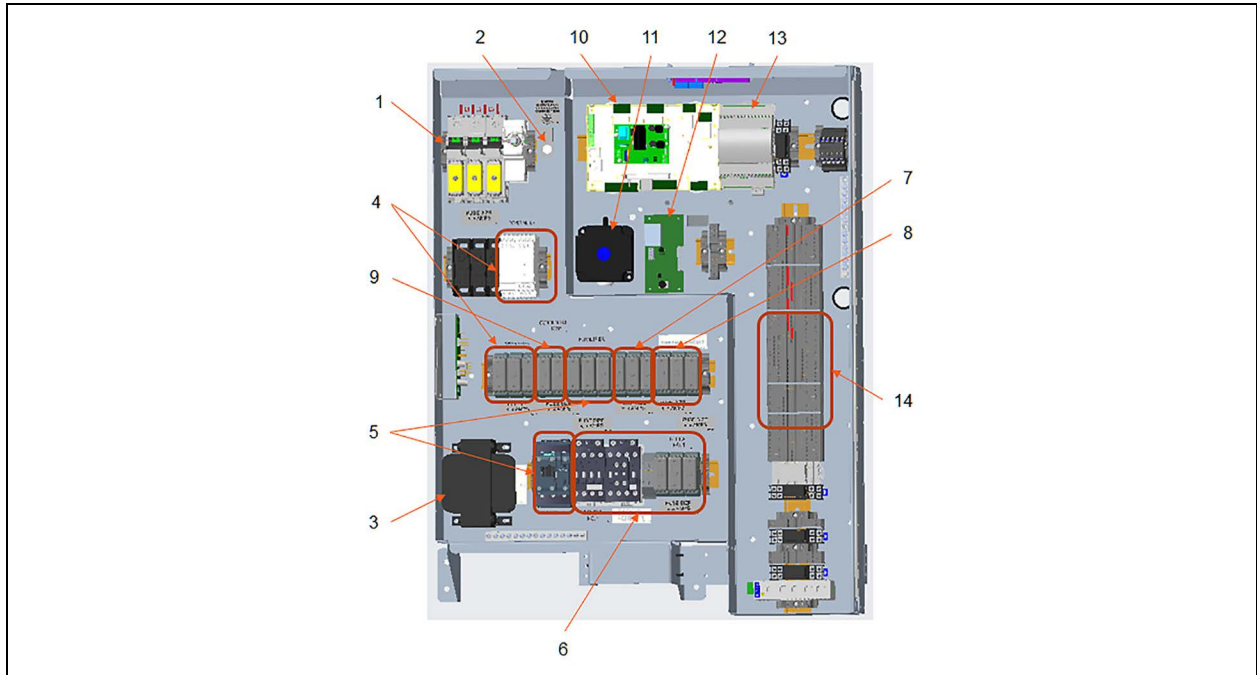
- Humidity and temperature sensor for the air returning from the room into the unit
- Temperature sensor (NTC type) for the air at the unit outlet

NOTE: Other optional remote temperature sensors may be connected to the unit by the end user. Only Modbus type are allowed. See [Modbus Connections](#) on page 49 for details.

6.5 Electric and Control System

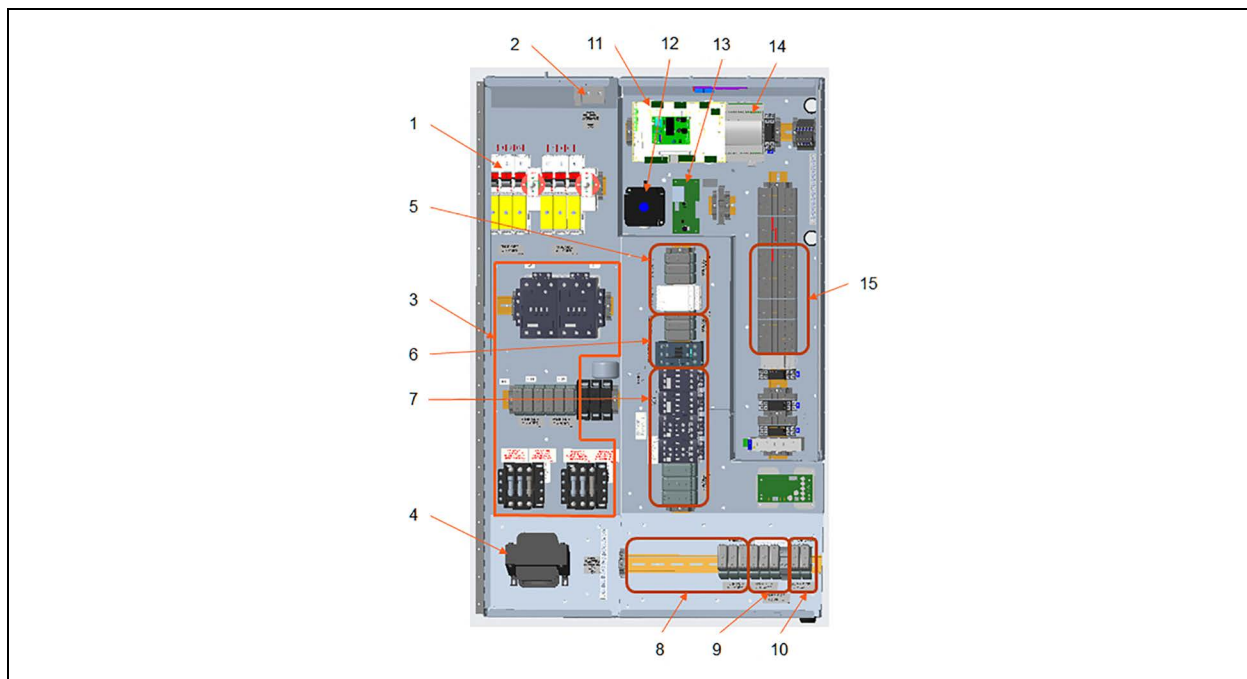
6.5.1 Main Components

Figure 6.15 PW035 and PW040 Electric Panel



Item	Description
1	Fused disconnects
2	Earth ground connection
3	Control transformer
4	Power meter (optional)
5	Humidifier
6	Reheat
7	Fan fuses
8	Control transformer fuses
9	Condensate fuses
10	Control board
11	Filter clog
12	Smoke detector reset
13	Ultracap buffer (optional)
14	Low volt customer terminals

Figure 6.16 PW045-170 Electric Panel



Item	Description
1	Fused disconnects
2	Earth ground connection
3	ATS assembly
4	Control transformer
5	Power meter
6	Humidifier
7	Reheat
8	Fan fuses
9	Control transformer fuses
10	Condensate fuses
11	Control board
12	Filter clog
13	Smoke detector reset
14	Ultracap buffer
15	Low volt customer terminals

6.5.2 Standard or Dual Power Supply

The unit may be delivered with standard power supply or optional dual power supply in order to have the units up and running if the main power supply fails. **Table 6.1** below explains the main options.

Refer to the Electric Diagrams for details about your unit power supply system.

See [Technical Data](#) on page 53 for the power supply relevant data and limits (voltage, frequency, etc).

Table 6.1 Options

Option	Description	What happens in case of power failure	What happens when power is restored
Standard Power Supply without UltraCap Option	Single supply line	Without power supply (and ultracap) the control board dies. The controls inside the fan will be powered a few seconds while it's capacitor bank discharges, but the fan's motor is not powered. The impeller's momentum will cause it to continue to spin as it decelerates.	After the control board rebooting time, the unit restarts automatically.
Standard Power Supply with UltraCap Option	Single supply line	An Ultracap device supplies power to the control for about 60 seconds. The controls inside the fan will be powered a few seconds while it's capacitor bank discharges, but the fan's motor is not powered. The impeller's momentum will cause it to continue to spin as it decelerates.	The unit restarts automatically. The control system reboots if the down time is more than 60 seconds.
Dual Power Supply Alternate without UltraCap Option	Double power supply to the ATS electric panel, which is connected to the main electrical panel. Each power supply can completely supply the unit. <div data-bbox="402 1087 737 1381" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> </div>	During the ATS switching, the control board dies (Power supply is missing and the Ultracap is not present). The controls inside the fan will be powered a few seconds while it's capacitor bank discharges, but the fan's motor is not powered. The impeller's momentum will cause it to continue to spin as it decelerates.	After the control board rebooting time, the unit restarts automatically.
Dual Power Supply Alternate with UltraCap Option	Double power supply to the ATS electric panel, which is connected to the main electrical panel. Each power supply can completely supply the unit. <div data-bbox="402 1570 737 1864" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> </div>	In case of failure of the main supply, the ATS (Automatic Transfer Switch) automatically switches to the second power supply. The ultracapacitor keeps the main control board alive during the ATS switching time. <p style="color: blue; margin-top: 10px;">NOTE: The Ultracap supplies power to the control for about 60 seconds.</p> <p style="color: blue; margin-top: 10px;">NOTE: Depending on the electric system configuration, the unit may be set to remain switched off for a certain time.</p>	The unit restarts automatically as soon as the power supply is available.

6.5.3 Disconnecting Switches

NOTE: Due to the presence of optional Ultracaps for the control and other devices, the electric and control panels can retain a stored high voltage electrical charge for a certain time.

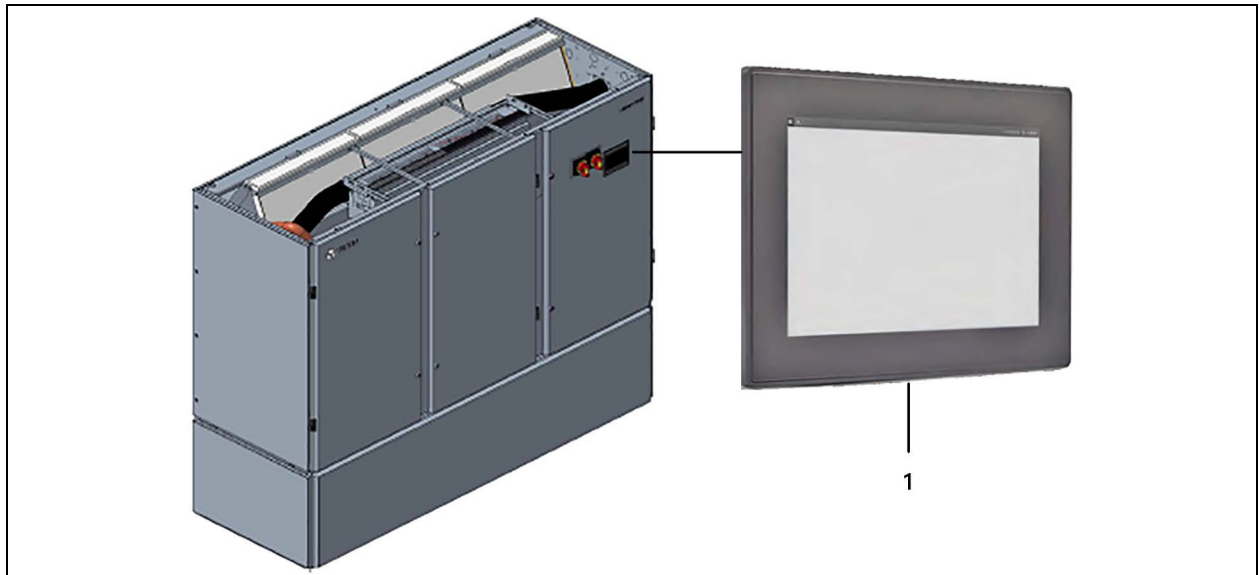
Before removing the panels and working inside the electric and control panels, proceed as follows:

- Open all the local and remote disconnecting switches of the unit.
- Wait at least 10 minutes.
- Verify with a voltmeter that the power is OFF.

6.5.4 Control Panel

The unit has a control panel in the front door. See the Liebert® PCW Control Application User Manual for details.

Figure 6.17 Control Panel



Item	Description
1	Control panel

6.5.5 Protective Functions

The control system manages all the safety and operating devices needed for reliable automatic operation. The main alarms are briefly explained below. Refer to the Liebert® PCW Control Application Manual for details.

6.5.6 Fan Control

All the units have EC fans. The unit control system adjusts the fan rotation speed depending on the operating conditions.

Protective Functions

- Electronics overheating protection
- Motor overheating protection
- Locked rotor protection
- Short circuit at the motor output

Fans

Connection to the unit through Modbus protocol. If the Modbus connection is interrupted, then the fans continue to run at a preset speed. Speed adjustment between 30% and 100% of the maximum speed.

NOTE: It is possible to set a limit to the maximum speed at the factory in order to reduce the noise of the emission. The ability to change the maximum speed depends on unit configuration.

6.5.7 Vertiv™ Liebert® SmartAisle™

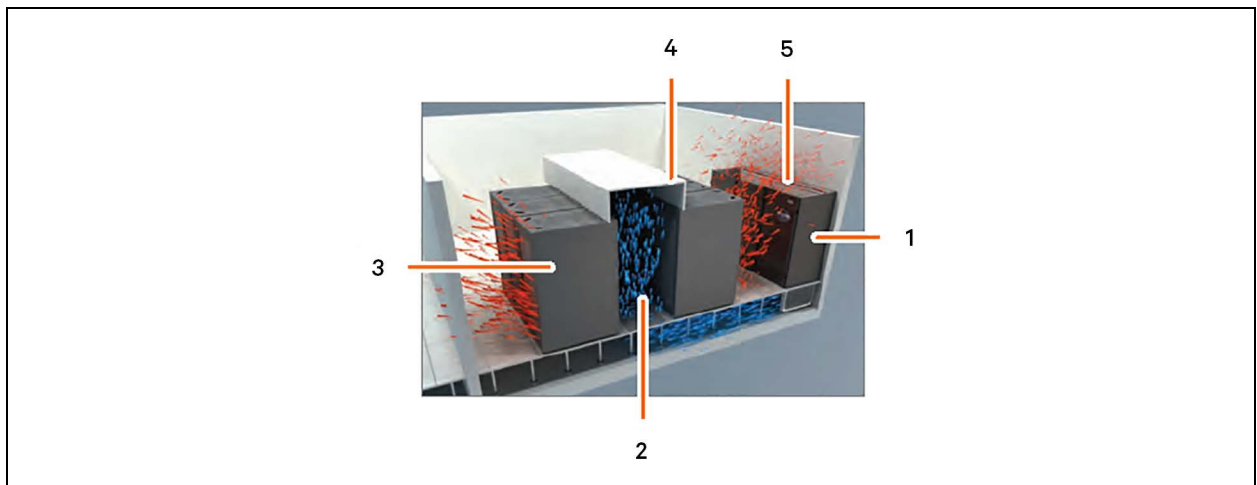
The Vertiv™ Liebert® PCW units can be used in a Vertiv™ Liebert® SmartAisle™ system. The SmartAisle™ is a Liebert patented system for the control of the units in a room with cold aisle arrangement. See **Figure 6.18** below .

The unit blows the air into the cold aisle through the raised floor. The hot air coming from the active equipment returns to the unit.

The unit airflow is managed by the fan speed modulation according to the readings from remote temperature sensors installed on the border of cold/hot aisle area.

The temperature setpoint is based on supply air.

Figure 6.18 Liebert® SmartAisle™



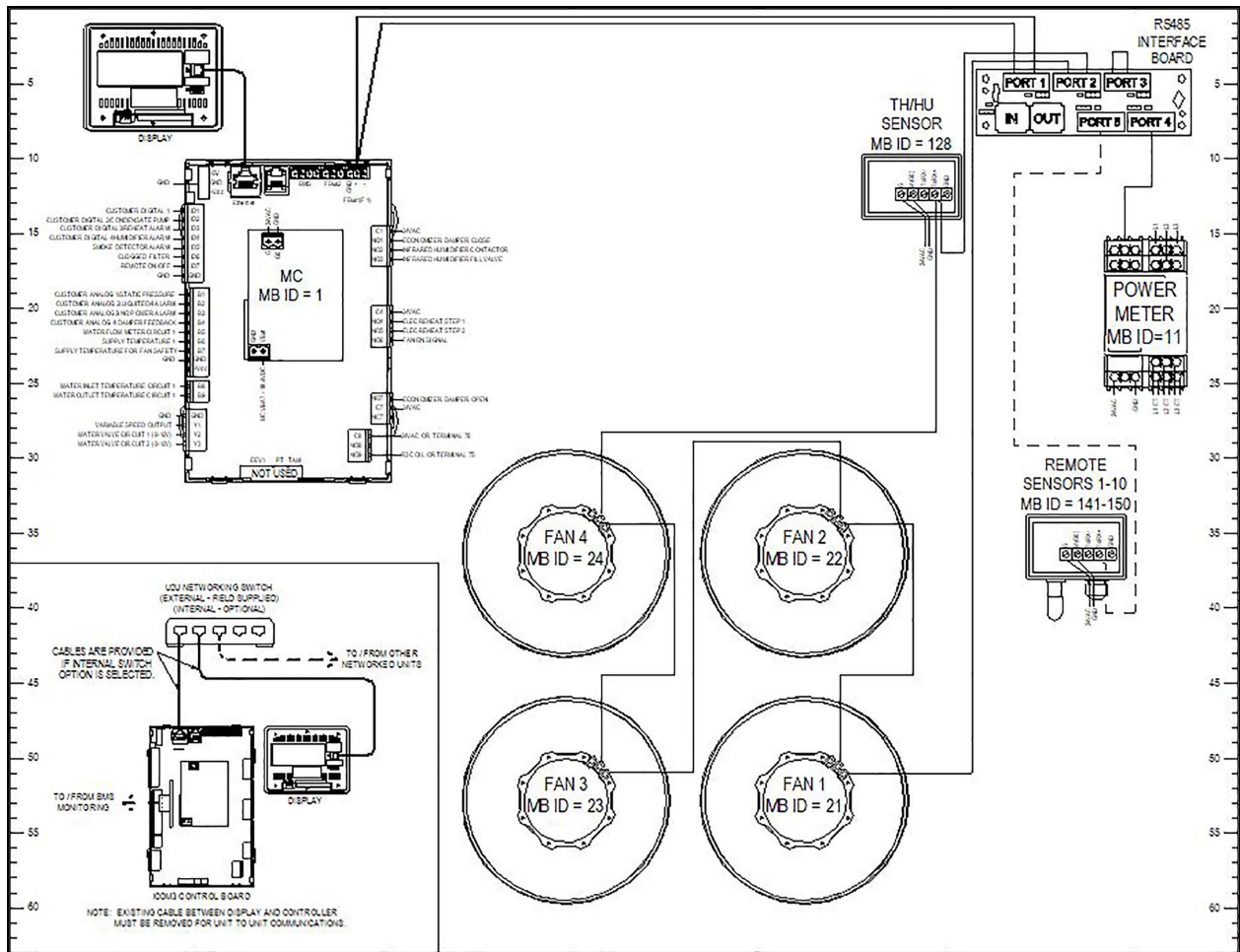
Item	Description
1	Unit
2	Cold aisle
3	Active equipment
4	Temperature sensors
5	Motorized dampers

6.6 Modbus Connections

6.6.1 General Description

The Vertiv™ Liebert® iCOM™ system can manage different devices via Modbus. The following figures show the architecture and details of the structure.

Figure 6.19 Modbus Connections



Settings

The internal connections and the related settings are factory made, but you may need to connect more remote devices at the installation or modify the settings of some Modbus devices. In that case, you need to redo the settings for the Modbus connection. See [Modbus Connections and Settings](#) on page 81.

6.6.2 Fan Management

Speed Control

The fan speed can be managed in one of the following ways:

Table 6.2 Fan Speed Management

Return Sensor	The fan speed is modulated from minimum value to maximum value following the return temperature deviation.
Supply Sensor	The fan speed is modulated from minimum value to maximum value following the supply temperature deviation.
Remote Sensor	The fan speed is modulated from minimum value to maximum value following the remote temperature deviation.
Delta (temperature difference)	The control tries to achieve a fixed temperature difference between return temperature and supply temperature. When the temperature difference is inside the deadband the fan speed will not change.

Table 6.2 Fan Speed Management (continued)

	<p>When the temperature difference is outside the deadband the control will change (increasing or decreasing) the speed of the fan to try to put the temperature difference inside the deadband.</p> <ul style="list-style-type: none"> • If the temperature difference Return-Supply is lower than the difference setpoint, then the fan will decrease the speed. • If the temperature difference Return-Supply is higher than the difference setpoint, then the fan will increase the speed.
Static Pressure	<p>The speed of the fans are modulated in order to keep fixed the static pressure in the raised floor.</p> <p>When the pressure is inside the deadband the fan speed does not change; when the pressure is outside the deadband the control increases or decreases the speed of the fan trying to put the pressure inside the deadband.</p>
Return CW Priority	<p>The CW valve modulates from 0% and 50% of the call for cooling based on return temperature. The fan speed modulates from 50% and 100% of the call for cooling based on return temperature. This means the fan starts to modulate only when the CW valve is fully open.</p>
Fixed Speed	<p>During normal operation the fan will operate at the fixed speed set.</p>

Fan Speed Override

The fan speed can be limited or overwritten in the following cases:

Table 6.3 Fan Speed Override

High Temperature Alarm	The fan will run at defined speed. This feature can be enabled or disabled.
No Power	The fan will run at defined speed.
Modbus High Speed Operation	If enabled, in the case of single fan failure or single fan communication failure, (or up to N-1), the remaining fans will be forced to maximum speed.
Fan and cooling forcing by user (cool/fan 100%)	The fan will run at 100%.
Heating ON Humidification ON Dehumidification ON	The fan will run at defined speed. If a higher call for fans speed occurs, the fan will operate at the higher call.
Control Sensor Failure	<p>Teamwork Mode:</p> <ul style="list-style-type: none"> • Return, Return CW Priority, Remote or Static Pressure Control: The fan will work using the system value. • Supply or Delta: The fan will run at defined speed. If a higher call for fan speed occurs, the fan will operate at the higher call. <p>No Teamwork Mode:</p> <ul style="list-style-type: none"> • The fan will run at defined speed. If a higher call for fan speed occurs, the fan will operate at the higher call.

This page intentionally left blank

7 Technical Data

7.1 System Data

Table 7.1 Capacity and Physical Data, PW035-PW070

Model		PW035	PW040	PW045	PW060	PW070
Net Capacity Data Based on 45°F (7.2°C) Entering Water, 10°F (5.5°C) Water Rise						
75°F DB, 61°F WB, 52°F DP 44% RH (23.9°C, DB 16.1°C WB)	Total Capacity kW (BTUH)	39.7 (-135.5)	46.4 (-158.4)	52.3 (-178.5)	74.0 (-252.6)	82.6 (-281.9)
	Sensible Capacity kW (BTUH)	39.1 (-133.4)	44.3 (-151.2)	50.0 (-170.7)	72.5 (-247.4)	80.4 (-274.4)
	Flow Rate, GPM (lps)	28.7 (-1.8)	33.3 (-2.1)	37.5 (-2.4)	53.6 (-3.4)	59.6 (-3.8)
	Pressure drop, ft. of water (kPa)	18.7 (-55.7)	28.0 (-83.5)	21.4 (-63.8)	40.9 (-121.9)	27.0 (-80.5)
80°F DB, 62.8°F WB, 52°F DP WB 38% RH (26.7°C DB, 17.1°C WB)	Total Capacity kW (BTUH)	49.0 (-167.2)	56.5 (-192.8)	63.7 (-217.4)	90.6 (-309.2)	100.8 (-344.0)
	Sensible Capacity kW (BTUH)	48.3 (-164.8)	54.2 (-185.0)	61.2 (-208.9)	89.1 (-304.1)	98.7 (-336.9)
	Flow Rate, GPM (lps)	35.0 (-2.2)	40.2 (-2.6)	45.2 (-2.9)	64.8 (-4.2)	71.9 (-4.6)
	Pressure drop, ft. of water (kPa)	26.9 (-80.2)	39.3 (-117.2)	29.9 (-89.1)	57.8 (-172.3)	37.9 (-113.0)
85°F DB, 64.4°F WB, 52°F DP DP 32% RH (29.4°C, DB 18°C WB)	Total Capacity kW (BTUH)	58.2 (-198.6)	66.1 (-225.6)	74.8 (-255.3)	106.8 (-364.5)	118.6 (-404.8)
	Sensible Capacity kW (BTUH)	57.5 (-196.2)	63.8 (-217.7)	72.2 (-246.4)	105.4 (-359.7)	116.5 (-397.6)
	Flow Rate, GPM (lps)	41.2 (-2.6)	46.7 (-3.0)	52.7 (-3.4)	75.8 (-4.9)	83.8 (-5.4)
	Pressure drop, ft. of water (kPa)	36.4 (-108.5)	51.8 (-154.4)	39.6 (-118.1)	76.9 (-229.2)	50.1 (-149.4)
Net Capacity Data Based on 50°F (10°C) Entering Water, 12°F (6.7°C) Water Rise						
75°F DB, 61°F WB, 52°F DP 44% RH (23.9°C, DB 16.1°C WB)	Total Capacity kW (BTUH)	26.7 (-91.1)	32.0 (-109.2)	35.9 (-122.5)	50.7 (-173.0)	56.8 (-193.9)
	Sensible Capacity kW (BTUH)	26.7 (-91.1)	32.0 (-109.2)	35.9 (-122.5)	50.7 (-173.0)	56.8 (-193.9)
	Flow Rate, GPM (lps)	16.5 (-1.1)	19.6 (-1.3)	22.0 (-1.4)	31.5 (-2.0)	35.0 (-2.2)
	Pressure drop, ft. of water (kPa)	6.7 (-20.0)	10.5 (-31.3)	8.0 (-23.8)	15.3 (-45.6)	10.2 (-30.4)

Table 7.1 Capacity and Physical Data, PW035-PW070 (continued)

Model		PW035	PW040	PW045	PW060	PW070
80°F DB, 62.8°F WB 38% RH (26.7°C DB, 17.1°C WB)	Total Capacity kW (BTUH)	36.5 (-124.6)	42.4 (-144.7)	47.7 (-162.8)	68.2 (-232.8)	76.0 (-259.4)
	Sensible Capacity kW (BTUH)	36.5 (-124.6)	42.4 (-144.7)	47.7 (-162.8)	68.2 (-232.8)	76.0 (-259.4)
	Flow Rate, GPM (lps)	22.0 (-1.4)	25.5 (-1.6)	28.6 (-1.8)	41.4 (-2.7)	45.8 (-2.9)
	Pressure drop, ft. of water (kPa)	11.3 (-33.7)	16.8 (-50.1)	12.9 (-38.5)	25.0 (-74.5)	16.5 (-49.2)
85°F DB, 64.4°F WB, 52°F DP 32% RH (29.4°C, DB 18°C WB)	Total Capacity kW (BTUH)	45.9 (-156.7)	52.4 (-178.8)	59.0 (-201.4)	85.2 (-290.8)	94.6 (-322.9)
	Sensible Capacity kW (BTUH)	45.9 (-156.7)	52.4 (-178.8)	59.0 (-201.4)	85.2 (-290.8)	94.6 (-322.9)
	Flow Rate, GPM (lps)	27.3 (-1.8)	31.1 (-2.0)	35.0 (-2.2)	51.0 (-3.3)	56.3 (-3.6)
	Pressure drop, ft. of water (kPa)	16.8 (-50.1)	24.1 (-71.8)	18.5 (-55.2)	36.5 (-108.8)	23.9 (-71.2)
Net Capacity Data Based on 50°F (10°C) Entering Water, 14°F (7.8°C) Water Rise						
75°F DB, 61°F WB, 52°F DP 44% RH (23.9°C, DB 16.1°C WB)	Total Capacity kW (BTUH)	23.0 (-78.5)	28.6 (-97.6)	31.8 (-108.5)	44.5 (-151.9)	50.1 (-171.0)
	Sensible Capacity kW (BTUH)	23.0 (-78.5)	28.6 (-97.6)	31.8 (-108.5)	44.5 (-151.9)	50.1 (-171.0)
	Flow Rate, GPM (lps)	12.4 (-0.8)	15.2 (-1.0)	16.9 (-1.1)	24.0 (-1.5)	26.8 (-1.7)
	Pressure drop, ft. of water (kPa)	4.0 (-11.9)	6.6 (-19.7)	5.0 (-14.9)	9.4 (-28.0)	6.4 (-19.1)
80°F DB, 62.8°F WB 38% RH (26.7°C DB, 17.1°C WB)	Total Capacity kW (BTUH)	33.1 (-113.0)	39.4 (-134.5)	44.2 (-150.9)	62.7 (-214.0)	70.1 (-239.3)
	Sensible Capacity kW (BTUH)	33.1 (-113.0)	39.4 (-134.5)	44.2 (-150.9)	62.7 (-214.0)	70.1 (-239.3)
	Flow Rate, GPM (lps)	17.3 (-1.1)	20.4 (-1.3)	22.8 (-1.5)	32.8 (-2.1)	36.4 (-2.3)
	Pressure drop, ft. of water (kPa)	7.2 (-21.5)	11.2 (-33.4)	8.6 (-25.6)	16.4 (-48.9)	11.0 (-32.8)
85°F DB, 64.4°F WB, 52°F DP 32% RH (29.4°C, DB 18°C WB)	Total Capacity kW (BTUH)	42.7 (-145.7)	49.7 (-169.6)	55.8 (-190.4)	80.0 (-273.0)	89.1 (-304.1)
	Sensible Capacity kW (BTUH)	42.7 (-145.7)	49.7 (-169.6)	55.8 (-190.4)	80.0 (-273.0)	89.1 (-304.1)
	Flow Rate, GPM (lps)	21.9 (-1.4)	25.3 (-1.6)	28.4 (-1.8)	41.2 (-2.6)	45.6 (-2.9)
	Pressure drop, ft. of water (kPa)	11.2 (-33.4)	16.6 (-49.5)	12.7 (-37.9)	24.7 (-73.6)	16.4 (-48.9)

Table 7.1 Capacity and Physical Data, PW035-PW070 (continued)

Model		PW035	PW040	PW045	PW060	PW070
Net Capacity Data Based on 50°F (10°C) Entering Water, 16°F (8.9°C) Water Rise						
75°F DB, 61°F WB, 52°F DP 44% RH (23.9°C, DB 16.1°C WB)	Total Capacity kW (BTUH)	18.9 (-64.5)	24.7 (-84.3)	27.3 (-93.2)	37.7 (-128.7)	42.7 (-145.7)
	Sensible Capacity kW (BTUH)	18.9 (-64.5)	24.7 (-84.3)	27.3 (-93.2)	37.7 (-128.7)	42.7 (-145.7)
	Flow Rate, GPM (lps)	9.1 (-0.6)	11.6 (-0.7)	12.9 (-0.8)	18.1 (-1.2)	20.3 (-1.3)
	Pressure drop, ft. of water (kPa)	2.0 (-6.0)	4.0 (-11.9)	2.9 (-8.6)	5.6 (-16.7)	3.9 (-11.6)
80°F DB, 62.8°F, 52°F DP WB 38% RH (26.7°C DB, 17.1°C WB)	Total Capacity kW (BTUH)	29.5 (-100.7)	36.1 (-123.2)	40.3 (-137.5)	56.7 (-193.5)	63.6 (-217.1)
	Sensible Capacity kW (BTUH)	29.5 (-100.7)	36.1 (-123.2)	40.3 (-137.5)	56.7 (-193.5)	63.6 (-217.1)
	Flow Rate, GPM (lps)	13.6 (-0.9)	16.4 (-1.1)	18.3 (-1.2)	26.2 (-1.7)	29.1 (-1.9)
	Pressure drop, ft. of water (kPa)	4.7 (-14.0)	7.6 (-22.7)	5.8 (-17.3)	10.9 (-32.5)	7.4 (-22.1)
85°F DB, 64.4°F WB, 52°F DP 32% RH (29.4°C, DB 18°C WB)	Total Capacity kW (BTUH)	39.4 (-134.5)	46.7 (-159.4)	52.3 (-178.5)	74.6 (-254.6)	83.2 (-284.0)
	Sensible Capacity kW (BTUH)	39.4 (-134.5)	46.7 (-159.4)	52.3 (-178.5)	74.6 (-254.6)	83.2 (-284.0)
	Flow Rate, GPM (lps)	17.8 (-1.1)	20.9 (-1.3)	23.4 (-1.5)	33.7 (-2.2)	37.4 (-2.4)
	Pressure drop, ft. of water (kPa)	7.6 (-22.7)	11.7 (-34.9)	8.9 (-26.5)	17.2 (-51.3)	11.5 (-34.3)
Fan Data						
CFM (CMH)	Air Volume at 0.2" ESP	6,900 (-11,723)	6,900 (-11,723)	7,900 (-13,422)	13,000 (-22,087)	13,900 (-23,616)
Fan Motor hp (W), Operating	Fan Power, kW*	2.4	2.6	2.8	4.8	5.0
* @ 85F						

Table 7.2 Capacity and Physical Data, PW080-PW170

Model		PW080	PW095	PW110	PW145	PW170
Net Capacity Data Based on 45°F (7.2°C) Entering Water, 10°F (5.5°C) Water Rise						
75°F DB, 61°F WB, 52°F DP 44% RH (23.9°C, DB 16.1°C WB)	Total Capacity kW (BTUH)	90.3 (-308.2)	102.0 (-348.1)	124.2 (-423.9)	149.6 (-510.6)	177.9 (-607.2)
	Sensible Capacity kW (BTUH)	87.0 (-296.9)	98.6 (-336.5)	119.9 (-409.2)	140.7 (-480.2)	169.8 (-579.5)
	Flow Rate, GPM (lps)	65.0 (-4.2)	72.2 (-4.6)	89.6 (-5.7)	107.2 (-6.9)	127.9 (-8.2)
	Pressure drop, ft. of water (kPa)	23.6 (-70.4)	29.4 (-87.6)	30.9 (-92.1)	36.7 (-109.4)	42.1 (-125.5)
80°F DB, 62.8°F WB, 52°F DP WB 38% RH (26.7°C DB, 17.1°C WB)	Total Capacity kW (BTUH)	110.4 (-376.8)	123.6 (-421.8)	151.5 (-517.1)	181.0 (-617.8)	216.9 (-740.3)
	Sensible Capacity kW (BTUH)	106.8 (-364.5)	120.2 (-410.2)	146.9 (-501.4)	171.4 (-585.0)	207.9 (-709.6)
	Flow Rate, GPM (lps)	78.6 (-5.0)	86.9 (-5.6)	108.0 (-6.9)	128.5 (-8.2)	154.3 (-9.9)
	Pressure drop, ft. of water (kPa)	33.3 (-99.3)	41.1 (-122.5)	43.6 (-130.0)	51.3 (-152.9)	59.8 (-178.3)
85°F DB, 64.4°F WB, 52°F DP DP 32% RH (29.4°C, DB 18°C WB)	Total Capacity kW (BTUH)	129.6 (-442.3)	144.7 (-493.9)	177.7 (-606.5)	210.9 (-719.8)	254.0 (-866.9)
	Sensible Capacity kW (BTUH)	125.8 (-429.4)	141.4 (-482.6)	173.2 (-591.1)	201.0 (-686.0)	244.6 (-834.8)
	Flow Rate, GPM (lps)	91.5 (-5.9)	101.1 (-6.5)	125.7 (-8.1)	148.7 (-9.5)	179.3 (-11.5)
	Pressure drop, ft. of water (kPa)	44.0 (-131.2)	54.2 (-161.6)	57.7 (-172.0)	67.4 (-200.9)	79.4 (-236.7)
Net Capacity Data Based on 50°F (10°C) Entering Water, 12°F (6.7°C) Water Rise						
75°F DB, 61°F WB, 52°F DP 44% RH (23.9°C, DB 16.1°C WB)	Total Capacity kW (BTUH)	62.0 (-211.6)	71.0 (-242.3)	85.7 (-292.5)	103.7 (-353.9)	122.5 (-418.1)
	Sensible Capacity kW (BTUH)	62.0 (-211.6)	71.0 (-242.3)	85.7 (-292.5)	103.7 (-353.9)	122.5 (-418.1)
	Flow Rate, GPM (lps)	38.1 (-2.4)	42.6 (-2.7)	52.7 (-3.4)	63.2 (-4.1)	75.0 (-4.8)
	Pressure drop, ft. of water (kPa)	8.8 (-26.2)	11.2 (-33.4)	11.5 (-34.3)	13.6 (-40.5)	15.2 (-45.3)
80°F DB, 62.8°F WB 38% RH (26.7°C DB, 17.1°C WB)	Total Capacity kW (BTUH)	82.8 (-282.6)	93.8 (-320.1)	114.2 (-389.8)	136.1 (-464.5)	162.8 (-555.6)
	Sensible Capacity kW (BTUH)	82.8 (-282.6)	93.8 (-320.1)	114.2 (-389.8)	136.1 (-464.5)	162.8 (-555.6)
	Flow Rate, GPM (lps)	49.8 (-3.2)	55.5 (-3.6)	68.8 (-4.4)	81.5 -5.2	97.7 -6.3
	Pressure drop, ft. of water (kPa)	14.3 (-42.6)	17.9 (-53.4)	18.7 (-55.7)	21.7 (-64.7)	24.9 (-74.2)

Table 7.2 Capacity and Physical Data, PW080-PW170 (continued)

Model		PW080	PW095	PW110	PW145	PW170
85°F DB, 64.4°F WB, 52°F DP 32% RH (29.4°C, DB 18°C WB)	Total Capacity kW (BTUH)	102.7 (-350.5)	115.8 (-395.2)	141.7 (-483.6)	167.0 (-570.0)	201.2 (-686.7)
	Sensible Capacity kW (BTUH)	102.7 (-350.5)	115.8 (-395.2)	141.7 (-483.6)	167.0 (-570.0)	201.2 (-686.7)
	Flow Rate, GPM (lps)	61.1 (-3.9)	67.9 (-4.4)	84.3 (-5.4)	98.9 (-6.3)	119.4 (-7.7)
	Pressure drop, ft. of water (kPa)	20.6 (-61.4)	25.8 (-76.9)	27.1 (-80.8)	31.0 (-92.4)	36.2 (-107.9)
Net Capacity Data Based on 50°F (10°C) Entering Water, 14°F (7.8°C) Water Rise						
75°F DB, 61°F WB, 52°F DP 44% RH (23.9°C, DB 16.1°C WB)	Total Capacity kW (BTUH)	54.7 (-186.7)	63.4 (-216.4)	75.9 (-259.0)	93.4 (-318.8)	108.6 (-370.7)
	Sensible Capacity kW (BTUH)	54.7 (-186.7)	63.4 (-216.4)	75.9 (-259.0)	93.4 (-318.8)	108.6 (-370.7)
	Flow Rate, GPM (lps)	29.2 (-1.9)	32.9 (-2.1)	40.5 (-2.6)	49.2 (-3.2)	57.5 (-3.7)
	Pressure drop, ft. of water (kPa)	5.5 (-16.4)	7.0 (-20.9)	7.2 (-21.5)	8.6 (-25.6)	9.3 (-27.7)
80°F DB, 62.8°F WB 38% RH (26.7°C DB, 17.1°C WB)	Total Capacity kW (BTUH)	76.4 (-260.8)	87.1 (-297.3)	105.6 (-360.4)	127.3 (-434.5)	150.8 (-514.7)
	Sensible Capacity kW (BTUH)	76.4 (-260.8)	87.1 (-297.3)	105.6 (-360.4)	127.3 (-434.5)	150.8 (-514.7)
	Flow Rate, GPM (lps)	39.6 (-2.5)	44.3 (-2.8)	54.8 (-3.5)	65.6 (-4.2)	77.9 (-5.0)
	Pressure drop, ft. of water (kPa)	9.5 (-28.3)	12.0 (-35.8)	12.4 (-37.0)	14.5 (-43.2)	16.3 (-48.6)
85°F DB, 64.4°F WB, 52°F DP 32% RH (29.4°C, DB 18°C WB)	Total Capacity kW (BTUH)	96.9 (-330.7)	109.6 (-374.1)	133.7 (-456.3)	159.2 (-543.3)	190.4 (-649.8)
	Sensible Capacity kW (BTUH)	96.9 (-330.7)	109.6 (-374.1)	133.7 (-456.3)	159.2 (-543.3)	190.4 (-649.8)
	Flow Rate, GPM (lps)	49.5 (-3.2)	55.2 (-3.5)	68.4 (-4.4)	81.0 (-5.2)	97.1 (-6.2)
	Pressure drop, ft. of water (kPa)	14.1 (-42.0)	17.7 (-52.8)	18.5 (-55.2)	21.4 (-63.8)	24.6 (-73.3)
Net Capacity Data Based on 50°F (10°C) Entering Water, 16°F (8.9°C) Water Rise						
75°F DB, 61°F WB, 52°F DP 44% RH (23.9°C, DB 16.1°C WB)	Total Capacity kW (BTUH)	46.6 (-159.0)	54.9 (-187.4)	64.9 (-221.5)	81.5 (-278.2)	92.6 (-316.0)
	Sensible Capacity kW (BTUH)	46.6 (-159.0)	54.9 (-187.4)	64.9 (-221.5)	81.5 (-278.2)	92.6 (-316.0)
	Flow Rate, GPM (lps)	22.1 (-1.4)	25.1 (-1.6)	30.7 (-2.0)	38.0 (-2.4)	43.6 (-2.8)
	Pressure drop, ft. of water (kPa)	3.3 (-9.8)	4.4 (-13.1)	4.4 (-13.1)	5.4 (-16.1)	5.5 (-16.4)

Table 7.2 Capacity and Physical Data, PW080-PW170 (continued)

Model		PW080	PW095	PW110	PW145	PW170
80°F DB, 62.8°F, 52°F DP WB 38% RH (26.7°C DB, 17.1°C WB)	Total Capacity kW (BTUH)	69.4 (-236.9)	79.7 (-272.0)	96.2 (-328.3)	117.4 (-400.7)	137.4 (-468.9)
	Sensible Capacity kW (BTUH)	69.4 (-236.9)	79.7 (-272.0)	96.2 (-328.3)	117.4 (-400.7)	137.4 (-468.9)
	Flow Rate, GPM (lps)	31.7 (-2.0)	35.7 (-2.3)	44.0 (-2.8)	53.2 (-3.4)	62.5 (-4.0)
	Pressure drop, ft. of water (kPa)	6.3 (-18.8)	8.1 (-24.1)	8.3 (-24.7)	9.9 (-29.5)	10.8 (-32.2)
85°F DB, 64.4°F WB, 52°F DP 32% RH (29.4°C, DB 18°C WB)	Total Capacity kW (BTUH)	90.7 (-309.6)	102.9 (-351.2)	125.3 (-427.6)	150.5 (-513.7)	178.6 (-609.6)
	Sensible Capacity kW (BTUH)	90.7 (-309.6)	102.9 (-351.2)	125.3 (-427.6)	150.5 (-513.7)	178.6 (-609.6)
	Flow Rate, GPM (lps)	40.7 (-2.6)	45.5 (-2.9)	56.3 (-3.6)	67.2 (-4.3)	80.0 (-5.1)
	Pressure drop, ft. of water (kPa)	9.9 (-29.5)	12.5 (-37.3)	13.0 (-38.8)	15.2 (-45.3)	17.1 (-51.0)
Fan Data						
CFM (CMH)	Air Volume at 0.2" ESP	13,900 (-23,616)	16,300 (-27,694)	19,500 (-33,131)	20,800 (-35,339)	26,000 (-44,174)
Fan Motor hp (W), Operating	Fan Power, kW*	5.3	4.1	7.2	7.7	9.6
* @ 85F						

7.2 Physical Data

Table 7.3 Physical Data, PW035-PW070

Model Number	PW035	PW040	PW045	PW060	PW070
Frame Type. See Description on page 35 for more info.	2		3		4
Quantity of Fans	1	1	1	2	2
Fan Data - EC Fans					
Air Volume CFM (CMH) @ 0.2" (50 Pa) ESP with MERV8 filters	6,900 (11,723)	6,900 (11,723)	7,900 (13,422)	13,000 (22,087)	13,900 (23,616)
Face Velocity FPM (m/s)	539 (916)	539 (916)	391 (664)	644 (1093)	572 (972)
Fan Motor, Maximum kW, each	3.50				
Chilled Water Coil					
Coil Rows	4	5	4	4	4
Coil Face Area ft2 (m2)	12.80	12.80	20.20	20.20	24.30
Valve Actuator, Sensors, and Body	Modulating Valve Actuator with Proportional Sensors and either 2-Way or 3-Way Valve Body				
Valve Quantity	1				
2-way Valve Size, in. (mm)	1-5/8" (41 mm)				2-1/8" (54 mm)
Valve, Cv	Different Cv for 2 and 3 way resulting in a more complex chart				
Valve Close-off pressure rating psi (kPa)	200 psi (1379 kPa)				
Valve rating psi (kPa)	400 psi (2758 kPa)				
System Design pressure rating psi (kPa)	400 psi (2758 kPa)				
Performance data available upon request					
Filter Section					
Disposable Type - Nominal Size and Quantities, MERV8 and MERV11 (Optional)					
Nominal Size, in.					
Quantity	6	6	6	6	6
Reheat Section					
Electric Reheat Stages	1			2	
Capacity, kW	7.50	7.50	7.50	15	15
Humidifier Section					
Type	Infrared				
Capacity, lb/hr (kg/h)	11			22	
Kw input, Nominal	4.80			9.60	

Table 7.3 Physical Data, PW035-PW070 (continued)

Model Number	PW035	PW040	PW045	PW060	PW070
Piping Connection Sizes					
Customer Supply & Return Chilled Water Connection, O.D. Copper	1-5/8"				2"
Condensate Drain Connection	5/8" x 1 ea				
Humidifier Connection (discharge / supply)	I.D. Hose 3/4 in./O.D. 1/4 in.				
Weight (dry)	see DPNxxx				

Table 7.4 Physical Data, PW080-PW170

Model Number	PW080	PW095	PW110	PW145	PW170
Frame Type. See Description on page 35 for more info	4	5		6	7
Quantity of Fans	2	3	3	3	4
Fan Data - EC Fans					
Air Volume CFM (CMH) @ 0.2" (50 Pa) ESP with MERV8 filters	13,900 (23,616)	16,300 (27,694)	19,500 (33,131)	20,800 (35,339)	26,000 (44,174)
Face Velocity FPM (m/s)	572 (972)	528 (896)	631 (1072)	570 (968)	619
Fan Motor, Maximum kW, each	35				
Chilled Water Coil					
Coil Rows	5	4	5	6	6
Coil Face Area ft2 (m2)	24.30	30.90	30.90	36.50	42
Valve Actuator, Sensors, and Body	Modulating Valve Actuator with Proportional Sensors and either 2-Way or 3-Way Valve Body				
Valve Quantity	1				
2-way Valve Size, in. (mm)	2-1/8" (54 mm)	2-5/8" (67 mm)			
Valve, Cv	Different Cv for 2 and 3 way resulting in a more complex chart				
Valve Close-off pressure rating psi (kPa)	200 psi (1379 kPa)				
Valve rating psi (kPa)	400 psi (2758 kPa)				
System Design pressure rating psi (kPa)	400 psi (2758 kPa)				
Performance data available upon request					
Filter Section					
Disposable Type - Nominal Size and Quantities, MERV8 and MERV11 (Optional)					
Nominal Size, in.					
Quantity	6	6	6	8	10

Table 7.4 Physical Data, PW080-PW170 (continued)

Model Number	PW080	PW095	PW110	PW145	PW170
Reheat Section					
Electric Reheat Stages	2				
Capacity, kW	15	25.50	22.50	22.50	22.50
Humidifier Section					
Type	Infrared				
Capacity, lb/hr (kg/h)	22				
Kw input, Nominal	9.6				
Piping Connection Sizes					
Customer Supply & Return Chilled Water Connection, O.D. Copper	2"	2-5/8"			
Condensate Drain Connection	5/8" x 1 ea	5/8" x 2 ea			
Humidifier Connection (discharge /supply)	I.D. Hose 19 mm (3/4 in.)/O.D. Cu 6 mm (1/4/ in.)				
Weight (dry)	see DPNxxx				

7.3 Structure

Table 7.5 Frames and Air Distribution

Unit Model	Frame Type	Number of Bays	U - Upflow	H - Downflow Frontal	D - Downflow Up	E - Downflow Down
PW035	2	1.5	Yes	Yes	Yes	Yes
PW040	2	1.5	Yes	Yes	Yes	Yes
PW045	3	2	Yes	Yes	Yes	Yes
PW060	3	2	Yes	Yes	Yes	Yes
PW070	4	2	Yes	Yes	Yes	Yes
PW080	4	2	Yes	Yes	Yes	Yes
PW095	5	3	Yes	Yes	Yes	Yes
PW110	5	3	Yes	Yes	Yes	Yes
PW145	6	3	---	---	Yes	Yes
PW170	7	4	---	---	Yes	Yes

7.4 Water System

7.4.1 Water Valves Differential Pressure

Table 7.6 Water Valves Differential Pressure

	2-Way and 3-Way Valve	
	Max Differential Pressure (kPa)	Close-off Pressure (kPa)
For all models	50 psi or 345 kPa	200 psi or 1379 kPa

7.5 Electrical System

7.5.1 Unit Electrical Data

General Remarks

- The cables have to be sized in compliance with local standards and according to the type and characteristics (for example amperes) of installation.
- The data in the tables does not consider other options not explicitly described.

The Modbus wiring is field supplied and must be:

- Shielded
- 22-18 AWG (0.20-0.82 mm²) stranded tinned copper until 107m , 18-16 AWG (0.82-1.31 mm²) stranded tinned copper until 200m
- 120 ohm nominal impedance
- Low capacitance (17pF/ft or less)
- Plenum rated (NEC type CMP) if required by local codes
- UV and moisture resistant or run within conduit once in an outdoor environment, and must be temperature and voltage rated for conditions present

NOTE: Do not run the Modbus cable in the same conduit, raceway or chase used for high voltage wiring. Mandatory shield connection to ground close Master (indoor unit control board). For Modbus network lengths greater than 200 m, contact Vertiv for assistance.

Units with Power Supply 460 V/3 ph/60 Hz + Earth Ground

Table 7.7 Electrical Data for Cooling Only - 460 V/3 ph/60 Hz + Earth Ground

460V		Without Condensate Pump				With Condensate Pump			
		Reheat and Humidifier	Reheat Only	Humidifier Only	Fans Only	Reheat and Humidifier	Reheat Only	Humidifier Only	Fans Only
PW035, PW040	FLA	19.7	13.9	10.3	4.5	20.9	15.1	11.5	5.7
	WSA	24.6	17.4	12.9	5.6	26.1	18.9	14.4	6.8
	OPD	25	20	15	15	30	20	15	15
PW045	FLA	25.5	13.9	16.1	4.5	26.7	15.1	17.3	5.7
	WSA	31.9	17.4	20.1	5.6	33.4	18.9	21.6	6.8
	OPD	35	20	25	15	35	20	25	15
PW060 PW080	FLA	39.4	27.8	20.6	9	40.6	29	21.8	10.2
	WSA	49.3	34.8	25.8	10.1	50.8	36.3	27.3	11.3
	OPD	50	35	30	15	60	40	30	15
PW095 PW145	FLA	53.3	41.7	25.1	13.5	54.5	42.9	26.3	14.7
	WSA	66.6	52.1	31.4	14.6	68.1	53.6	32.9	15.8
	OPD	70	60	35	15	70	60	35	20

Table 7.7 Electrical Data for Cooling Only - 460 V/3 ph/60 Hz + Earth Ground (continued)

460V		Without Condensate Pump				With Condensate Pump			
		Reheat and Humidifier	Reheat Only	Humidifier Only	Fans Only	Reheat and Humidifier	Reheat Only	Humidifier Only	Fans Only
PW170	FLA	57.8	46.2	29.6	18	59	47.4	30.8	19.2
	WSA	72.3	57.8	37	19.1	73.8	59.3	38.5	20.3
	OPD	80	60	40	20	80	60	40	25

Units with Power Supply 575 V/3 ph/60 Hz + Earth Ground

Table 7.8 Electrical Data - 575 V/3 ph/60 Hz + Earth Ground

575V		Without Condensate Pump				With Condensate Pump			
		Reheat and Humidifier	Reheat Only	Humidifier Only	Fans Only	Reheat and Humidifier	Reheat Only	Humidifier Only	Fans Only
PW035 PW040	FLA	18.5	11.1	11.0	3.6	19.4	12.0	11.9	4.5
	WSA	23.1	13.9	13.8	4.5	24.3	15.0	14.9	5.4
	OPD	25	15	15	15	25	20	15	15
PW045	FLA	22.7	11.1	15.2	3.6	23.6	12.0	16.1	4.5
	WSA	28.4	13.9	19.0	4.5	29.5	15.0	20.2	5.4
	OPD	30	15	20	15	30	20	25	15
PW060 PW080	FLA	33.8	22.2	18.8	7.2	34.7	23.1	19.7	8.1
	WSA	42.3	27.8	23.5	8.1	43.4	28.9	24.7	9.0
	OPD	45	30	25	15	45	30	25	15
PW095 PW145	FLA	44.9	33.3	22.4	10.8	45.8	34.2	23.3	11.7
	WSA	56.1	41.6	28.0	11.7	57.3	42.8	29.2	12.6
	OPD	60	45	30	15	60	45	30	15
PW170	FLA	48.5	36.9	26.0	14.4	49.4	37.8	26.9	15.3
	WSA	60.6	46.1	32.5	15.3	61.8	47.3	33.7	16.2
	OPD	70	50	35	20	70	50	35	20

7.5.2 Fans

Table 7.9 Fans Electrical Data

Unit Model	EC Fan Advance - HE			EC Fan Advance - HP		
	Motor Size (kW)	FLA @ 50 Hz (A)	FLA @ 60 Hz (A)	Motor Size (kW)	FLA @ 50 Hz (A)	FLA @ 60 Hz (A)
For all models	3.5	5.2	4.5	3.5	5.2	4.5

NOTE: Values given for each single fan. The model is the same for both 50 Hz and 60 Hz.

7.5.3 Electrical Heaters

Table 7.10 Reheat Electric

Unit Model	460V		575V	
	FLA [A]	Nominal Power [kW]	FLA [A]	Nominal Power [kW]
PW035	9.4	7.5	7.5	7.5
PW040	9.4	7.5	7.5	7.5
PW045	9.4	7.5	7.5	7.5
PW060	18.8	15	15.1	15
PW070	18.8	15	15.1	15
PW080	18.8	15	15.1	15
PW095	28.3	22.5	22.6	22.5
PW110	28.3	22.5	22.6	22.5
PW145	28.3	22.5	22.6	22.5
PW170	28.3	22.5	22.6	22.5

7.5.4 Infrared Humidifier

Table 7.11 Infrared Humidifier Electrical Data

Unit Model	460 V/3ph/60 Hz	
	FLA (A)	Nominal Power (kW)
PW035	6.0	4.8
PW040	6.0	4.8
PW045	12.0	9.6
PW060	12.0	9.6
PW070	12.0	9.6
PW080	12.0	9.6
PW095	12.0	9.6
PW110	12.0	9.6
PW145	12.0	9.6
PW170	12.0	9.6

7.6 Noise Level

*Measurement conditions: High Power EC fan mode, max airflow

Table 7.12 Sound Power Level (dB) - Downflow Up Configuration, High Efficiency EC Fan Module, Max Airflow

	Unit Model	Level	Octave Band Frequency (Hz)								Sound Level [dB] (A)]	
			31.5	63	125	250	500	1000	2000	4000		8000
Downflow Up	PW035	PWL	77.0	77.0	81.7	86.3	90.0	91.2	87.0	92.5	77.1	96.8
		SPL	68.4	68.4	73.7	73.7	66.6	60.2	55.6	47.3	38.8	68.8
	PW040	PWL	76.5	76.5	81.2	85.8	89.5	90.7	86.5	92.0	76.9	96.3
		SPL	67.9	67.9	73.2	73.2	66.1	59.7	55.1	46.8	38.3	68.3
	PW045	PWL	78.1	78.1	82.8	87.4	91.2	92.4	88.1	93.5	78.1	97.9
		SPL	67.9	67.9	73.2	73.2	66.1	59.7	55.1	46.8	38.3	68.3
	PW060	PWL	71.9	71.9	78.1	83.0	86.3	88.1	84.9	83.7	73.3	92.0
		SPL	70.1	70.1	75.4	75.4	68.3	61.9	57.3	49.0	40.5	70.5
	PW070	PWL	73.7	73.7	79.1	84.0	88.0	89.7	85.8	87.1	74.6	93.9
		SPL	70.0	70.9	75.3	75.3	68.2	61.8	57.2	48.9	40.4	70.4
	PW080	PWL	73.2	73.2	79.8.6	83.5	87.5	89.2	85.3	86.6	74.1	93.4
		SPL	69.5	69.5	74.8	74.8	67.7	61.3	56.7	48.4	39.9	69.9
	PW095	PWL	74.7	74.7	80.6	85.5	89.0	90.8	87.4	86.9	75.9	94.8
		SPL	72.1	72.1	77.4	77.4	70.3	63.9	59.3	51.0	42.5	72.5
	PW110	PWL	74.2	74.2	80.1	85.0	88.5	90.3	86.9	86.4	75.4	94.3
		SPL	71.6	71.6	76.9	76.9	69.8	63.4	58.8	50.5	42.0	72.0
	PW145	PWL	74.6	74.6	80.2	85.2	88.9	90.7	87.0	87.3	75.6	94.7
		SPL	71.0	71.0	76.3	76.3	69.2	62.8	58.2	49.9	41.4	71.4
PW170	PWL	77.0	77.0	83.4	85.4	86.4	89.0	88.2	82.7	75.4	93.4	
	SPL	74.7	74.7	80.0	80.0	72.9	66.5	61.9	53.6	45.1	75.1	

Table 7.13 Sound Power Level (dB) - Downflow Down Configuration, High Efficiency EC Fan Module, Max Airflow

	Unit Model	Level	Octave Band Frequency (Hz)								Sound Level [dB] (A)]	
			31.5	63	125	250	500	1000	2000	4000		8000
Downflow Down	PW035	PWL	76.0	76.0	80.7	85.3	89.0	90.2	86.0	91.5	76.1	95.8
		SPL	67.4	67.4	72.7	72.7	65.6	59.2	54.6	46.3	37.8	67.8
	PW040	PWL	75.4	75.4	80.1	84.7	88.4	89.6	85.4	90.9	75.5	95.2
		SPL	66.8	66.8	72.1	72.1	65.0	58.6	54.0	45.7	37.2	67.2
	PW045	PWL	77.1	77.1	81.8	86.4	90.2	91.4	87.1	92.5	77.1	96.9
		SPL	66.9	66.9	72.2	72.2	65.1	58.7	54.1	45.8	37.3	67.3
	PW060	PWL	71.1	71.1	77.3	82.2	85.5	87.3	84.1	82.9	72.5	91.2
		SPL	69.3	69.3	74.6	74.6	67.5	61.1	56.5	48.2	39.7	69.7
	PW070	PWL	73.0	73.0	78.4	83.3	87.3	89.0	85.1	86.4	73.9	93.2
		SPL	69.3	69.3	74.6	74.6	67.5	61.1	56.5	48.2	39.7	69.7
	PW080	PWL	72.4	72.4	77.8	82.7	86.7	88.4	88.5	85.8	73.3	92.6
		SPL	68.7	68.7	74.0	74.0	66.9	60.5	55.9	47.6	39.1	69.1
	PW095	PWL	74.1	74.1	80.0	84.9	88.4	90.2	86.8	86.3	75.3	94.2
		SPL	71.5	71.5	76.8	76.8	69.7	63.3	58.7	50.4	41.9	71.9
	PW110	PWL	73.2	73.2	79.1	84.0	87.5	89.3	85.9	85.4	74.4	93.3
		SPL	70.6	70.6	75.9	75.9	68.8	62.4	57.8	49.5	41.0	71.0
	PW145	PWL	73.5	73.5	79.1	84.1	87.8	89.6	85.9	86.2	74.5	93.6
		SPL	69.9	69.9	75.2	75.2	68.1	61.7	57.1	48.8	40.3	70.3
	PW170	PWL	75.7	75.7	82.1	84.1	85.1	87.7	86.9	81.4	74.1	92.1
		SPL	73.4	73.4	78.7	78.7	71.6	65.2	60.6	52.3	43.8	73.8

Table 7.14 Sound Power Level (dB) - Downflow Up Frontal Air Delivery Configuration, High Efficiency EC Fan Module, Max Airflow

	Unit Model	Level	Octave Band Frequency (Hz)								Sound Level (dB) (A)	
			31.5	63	125	250	500	1000	2000	4000		8000
Downflow Frontal	PW035	PWL	80.3	80.3	85.0	89.6	93.3	94.5	90.3	95.8	80.4	100.1
		SPL	71.7	71.7	77.0	77.0	69.9	63.5	58.9	50.6	42.1	72.1
	PW040	PWL	79.8	79.8	84.5	89.1	92.8	94.0	89.8	95.3	79.9	99.6
		SPL	71.2	71.2	76.5	76.5	69.4	63.0	58.4	50.1	41.6	71.6
	PW045	PWL	81.4	81.4	86.1	90.7	94.5	95.7	91.4	96.8	81.4	101.2
		SPL	71.2	71.2	76.5	76.5	69.4	63.0	58.4	50.1	41.6	71.6
	PW060	PWL	75.1	75.1	81.3	86.2	89.5	91.3	88.1	86.9	76.5	95.2
		SPL	73.3	73.3	78.6	78.6	71.5	65.1	60.5	52.2	43.7	73.7
	PW070	PWL	77.0	77.0	82.4	87.3	91.3	93.0	89.1	90.4	77.9	97.2
		SPL	73.3	73.3	78.6	78.6	71.5	65.1	60.5	52.2	43.7	73.7
	PW080	PWL	76.4	76.4	81.8	86.7	90.7	92.4	88.5	89.8	77.3	96.6
		SPL	72.7	72.7	78.0	78.0	70.9	64.5	59.9	51.6	43.1	73.1
	PW095	PWL	77.9	77.9	83.8	88.7	92.2	94.0	90.6	90.1	79.1	98.0
		SPL	75.3	75.3	80.6	80.6	73.5	67.1	62.5	54.2	45.7	75.7
	PW110	PWL	77.4	77.4	83.3	88.2	91.7	93.5	90.1	89.6	78.6	97.5
		SPL	74.8	74.8	80.1	80.1	73.0	66.6	62.0	53.7	45.2	75.2

Table 7.15 Sound Power Level (dB) - Upflow Up Frontal Delivery Configuration, High Efficiency EC Fan Module, Max Airflow

	Unit Model	Level	Octave Band Frequency (Hz)								Sound Level [dB (A)]	
			31.5	63	125	250	500	1000	2000	4000		8000
Upflow	PW035	PWL	73.2	73.2	77.9	82.5	86.2	87.4	83.2	88.7	73.3	93.0
		SPL	64.6	64.6	69.9	69.9	62.8	56.4	51.8	43.5	35.0	65.0
	PW040	PWL	72.8	72.8	77.5	82.1	85.8	87.0	82.8	88.3	72.9	92.6
		SPL	64.2	64.2	69.5	69.5	62.4	56.0	51.4	43.1	34.6	64.6
	PW045	PWL	74.5	74.5	79.2	83.8	87.6	88.8	84.5	89.9	74.5	94.3
		SPL	64.3	64.3	69.6	69.6	62.5	56.1	51.5	43.2	34.7	64.7
	PW060	PWL	68.7	68.7	74.9	79.8	83.1	84.9	81.7	80.5	70.1	88.8
		SPL	66.9	66.9	72.2	72.2	65.1	58.7	54.1	45.8	37.3	67.3
	PW070	PWL	74.8	74.8	80.2	85.1	89.1	90.8	86.9	88.2	75.7	95.0
		SPL	71.1	71.1	76.4	76.4	69.3	62.9	58.3	50.0	41.5	71.5
	PW080	PWL	69.6	69.6	75.0	79.9	83.9	85.6	81.7	83.0	70.5	89.8
		SPL	65.9	65.9	71.2	71.2	64.1	57.7	53.1	44.8	36.3	66.3
	PW095	PWL	71.4	71.4	77.3	82.2	85.7	85.7	84.1	83.6	72.6	91.5
		SPL	68.8	68.8	74.1	74.1	67.0	60.6	56.0	47.7	39.2	69.2
	PW110	PWL	71.2	71.2	77.1	82.0	85.5	87.3	83.9	83.4	72.4	91.3
		SPL	68.6	68.6	73.9	73.9	66.8	60.4	55.8	47.5	39.0	69.0

The sound levels are global and for each octave band are expressed in dB with a tolerance of (0/+2) dB.

PWL - Sound Power Level calculated according to ISO 3744 procedure method.

SPL - Sound Pressure Level measured in free field conditions and at 6.6 ft. (2 meters) from the front of the unit and 5 ft. (1.5 meters) above the surface according to ISO 3744 average method.

All Liebert® PCW units have very high noise emission at maximum airflow.

LEGEND

The sound levels are global and for each octave band are expressed in dB with a tolerance of (0/+2) dB.

1. Only ventilation (30 Pa available external static pressure), 6.6 ft. (2 m) in front of the unit and 5 ft. (1.5 m) height, in free field conditions.

8 Installing the Unit

8.1 Connecting the Unit Sections

NOTE: If the condensate option is selected, remove the condensate pump package from the unit before moving the unit into its final position.

1. Move the unit or the modules close to the final position as explained in [Moving the Unit to the Installation Location Using Piano Jacks](#) on page 31.
2. If necessary, assemble the modules as explained below.

NOTE: For all of the versions above, if you need to assemble any accessory, see [Accessories](#) on page 141.

8.1.1 Positioning

1. Move the unit to its final position as explained in [Moving the Unit to the Installation Location Using Piano Jacks](#) on page 31.
2. Place the unit as explained below.

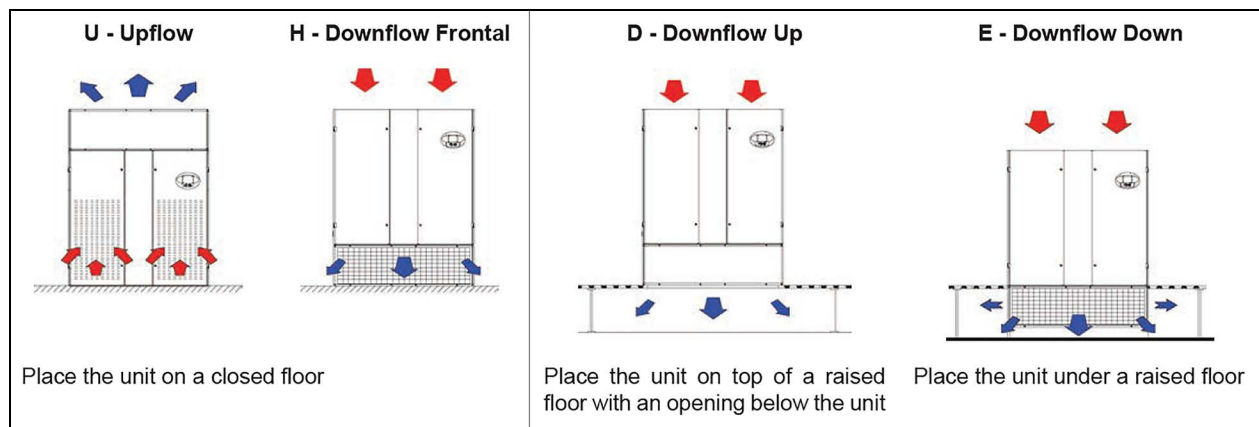
8.1.2 Placing the Unit on a Floor Stand



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.

Refer to the floor-stand installation sheet, located inside the floor-stand package. Unit to be placed onto floor stand using process that will provide safest method based on site layout. Professional installers to be used when placing unit. Unit may require lift onto a floor stand if elevated flooring has not been installed. If flooring is installed, unit will be placed over floor opening containing floor stand.

Figure 8.1 Unit Placement



See [Dimensions and Weights](#) on page 19.

NOTICE

See [Pre-Installation Preparation and Guidelines](#) on page 17 for specifications about the installation site.

Ensure isolation between the unit and the floor to avoid transmission of vibration.

NOTICE

The downflow down units must be placed at the right height with respect to the floor level.

Provide the right support under the unit.

See [Accessories](#) on page 141 for the available support systems.

NOTICE

The unit may contain special brackets or supports that secure some elements for the transport. They are highlighted by special labels.

When you finish assembly and positioning of the unit, make sure that all the transport brackets and supports have been removed.

9 Electrical Connections



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

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

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



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

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



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. 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.

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 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.



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

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



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

9.1 Electrical System Requirements

9.1.1 Power Supply Requirements for the Unit

NOTICE

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

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

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

NOTE: Units with the THD filter option must have the voltage stabilized and regulated to +5%, -10% of the nameplate nominal voltage.

- Check the electrical data on the label applied on the unit.
- Check that the available power supply is consistent with the unit power requirements given in [Technical Data](#) on page 53.
- Refer to the electrical schematic supplied with the unit when making line voltage supply, low voltage main unit interlock, and any low voltage alarm connections.

9.1.2 Local Codes

- Electrical service must conform to national and local electrical codes.
- All wiring must be done in accordance with all applicable local, state, and national electrical codes.

9.1.3 Protection

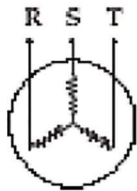
- Select and install the line side electrical supply wire and over current protection device(s) according to the specifications on the unit nameplate(s), per the instructions in this manual, and according to the applicable national, state, and local code requirements.
- The customer is responsible for the system protection.

9.1.4 Power Supply Variability

- Check that the maximum unbalance between the phases does not exceed the value given in [Technical Data](#) on page 53.
- Make sure to comply with the following data:
 - Electrical voltage between 0.9 and 1.1 nominal voltage
 - For units with the THD filter, electrical voltage between 0.9 and 1.05 nominal voltage.
 - Frequency between 0.95 and 1.05 the nominal frequency
 - Voltage unbalance of supply voltage less than 5%

See **Figure 9.1** below for variability evaluation.

Figure 9.1 Example of Calculating Phase to Phase Variability

<p>1. The 460 V supply has the following variability: $RS = 458 \text{ V}$ $ST = 461 \text{ V}$ $RT = 462 \text{ V}$</p> <p>2. The average voltage is: $\frac{458 + 461 + 462}{3}$</p> <p>3. The maximum deviation from the average is: $462 - 460 = 2 \text{ V}$</p> <p>4. The phase to phase variability is: $\frac{2}{460} \times 100 = 0.43 \text{ (acceptable)}$</p>	
---	---

9.1.5 Power Supply Type

Acceptable:

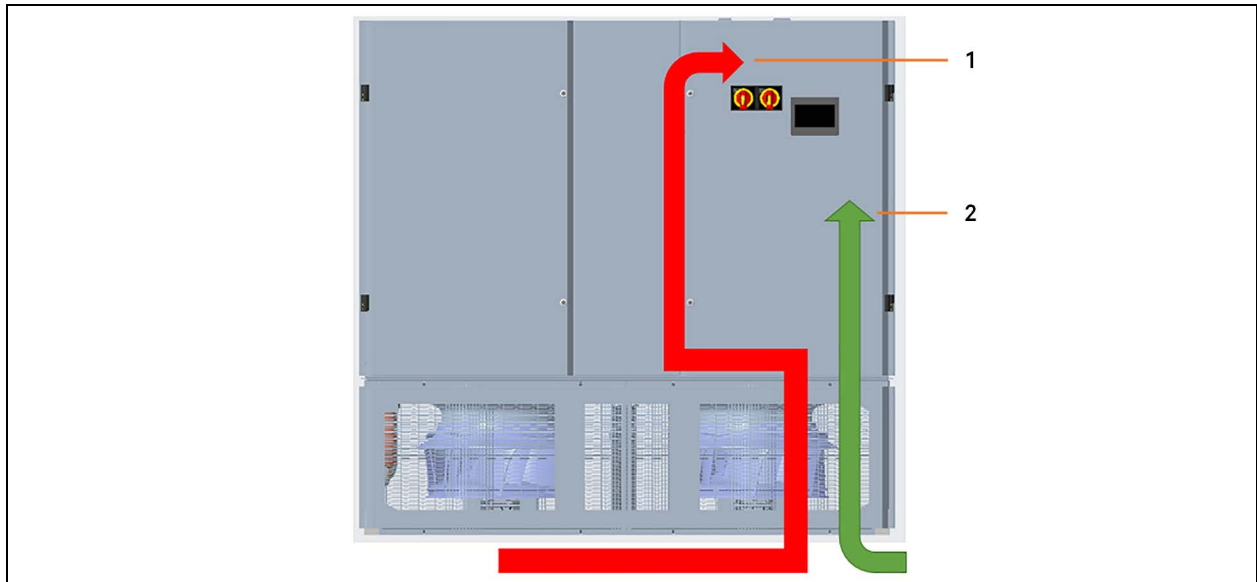
- Wye with solidly grounded neutral (266 V line to ground)
- Δ with corner ground.

Unacceptable:

- Wye without ground connection
- Δ without ground
- Δ with center tap

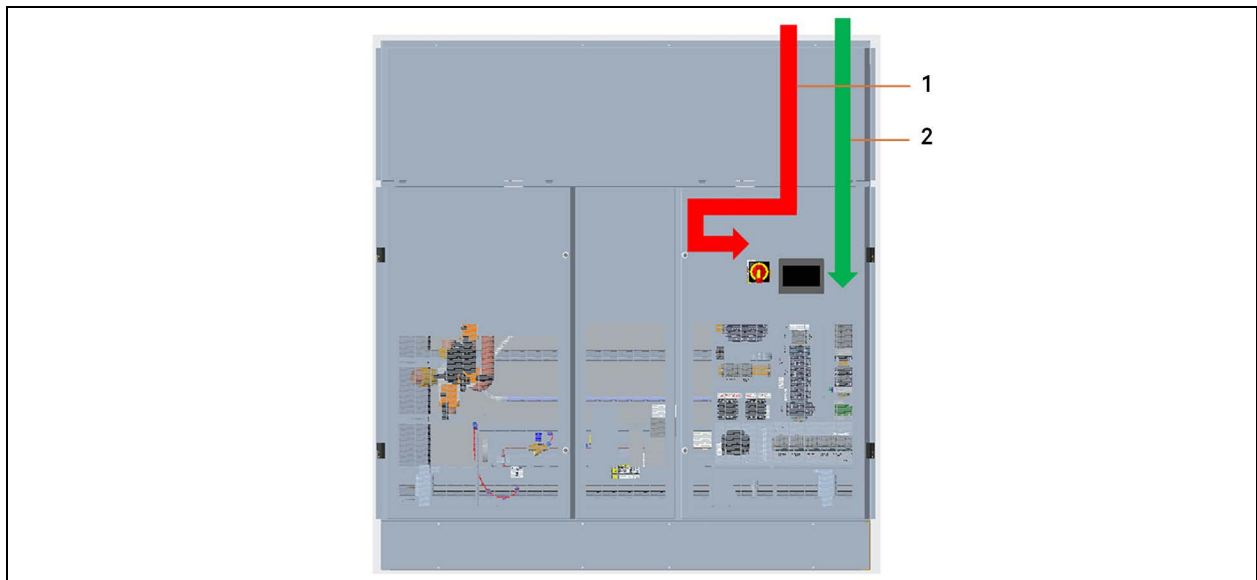
9.1.6 Cable Connections

Figure 9.2 Downflow Cable Connections



Item	Description
1	Power cable
2	Sensor/alarms cable

Figure 9.3 Upflow Cable Connections



Item	Description
1	Power cable
2	Sensor/alarms cable

- Do not fit the supply cable in the raceways inside the electric panel. The electrical cables must pass through the unit shoulder; the power cable on left and sensor/alarms cable on the right. See **Figure 9.2** on the previous page.
- The connection for remote ON-OFF must be done by the installer.
- The general alarm terminals allow remote alarm signaling.

9.1.7 Check Integrity

- Make sure that all electrical connections are tightened to the correct torque.
- Make sure that all electrical components are undamaged.

9.1.8 Hot Surfaces

- The cables must not touch hot surfaces. If necessary, wrap the electrical cables with a thermal insulating sheath.

9.2 Power Supply Cable

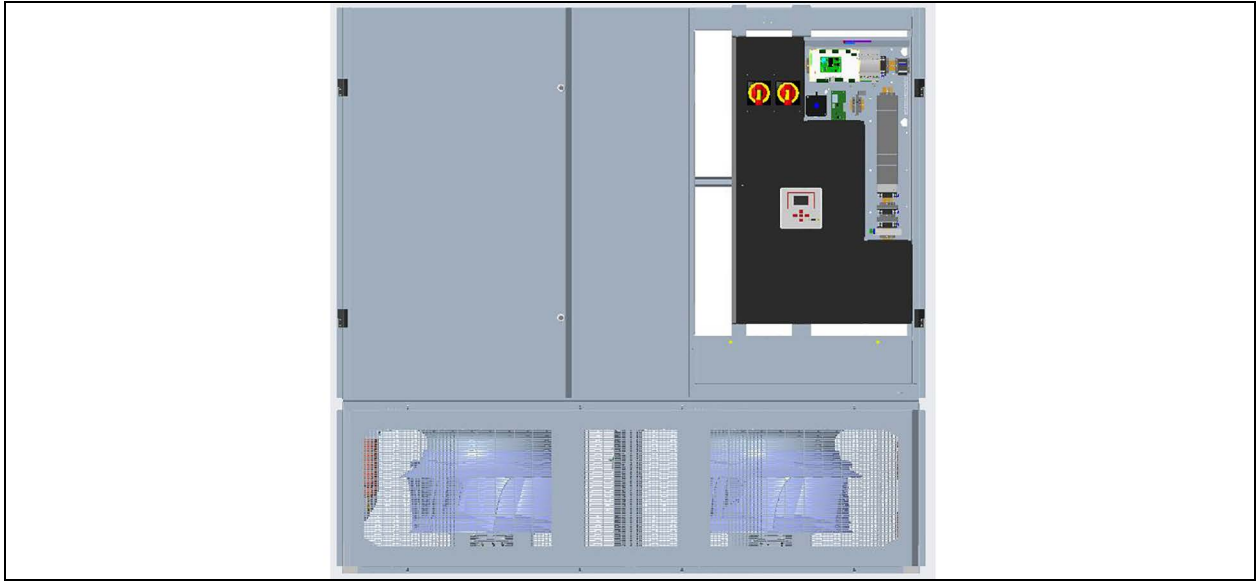
9.2.1 General instructions

1. After opening the passage in the structural works (precut) for the supply line inlet, restore the original protection degree with suitable accessories for the wiring and junction boxes.
2. Install the cable, carefully avoid touching hot surfaces.
3. After connecting the cable, restore the protections against direct contacts.
4. The system/line cable protection is to be arranged by the customer.
5. For details about the cable entrance holes see [Connections](#) on page 131.

9.2.2 Standard Power Supply or Dual Power Supply Parallel

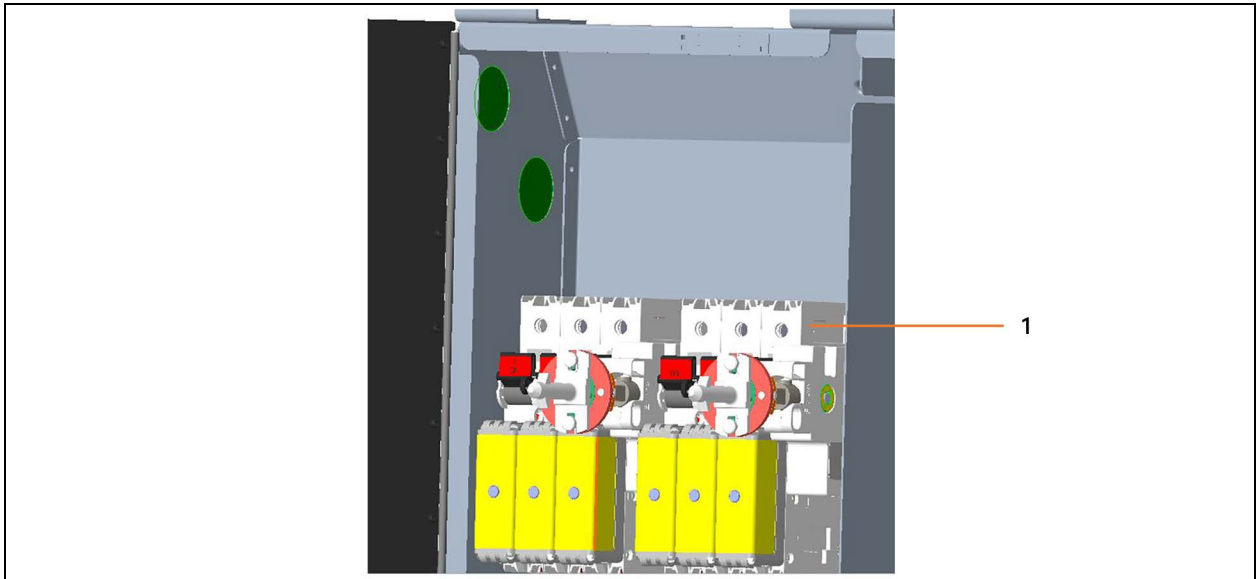
1. Open the front door to access the electrical panel and the internal safety panels.
2. Open the electrical panel dead-front door.
3. Remove the frontal panels or frontal grids from the fan module.
4. Run the power cable from the bottom through the precut in the fan module.
5. Use appropriate cable ties to fix the cable to the frame on the left shoulder.

Figure 9.4 Power Supply



6. Connect the power cable to the inlet terminals. See **Figure 9.5** below .

Figure 9.5 Connecting the Power Cable to the Inlet Terminals

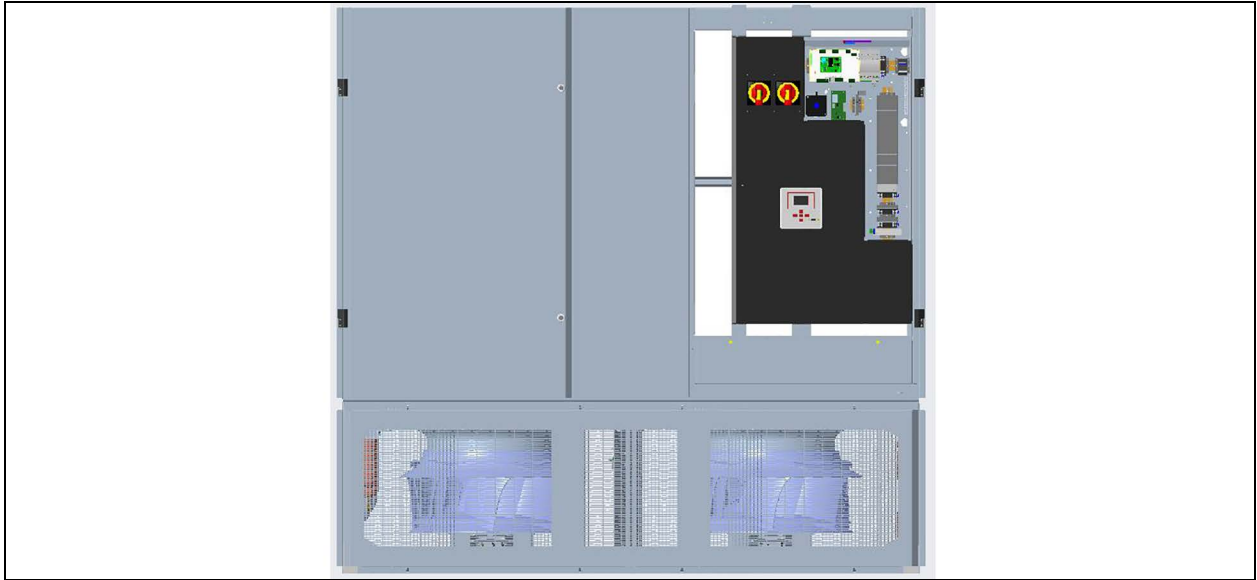


Item	Description
1	Inlet terminals

7. Replace all the panels removed for the cable connection:
 - The electrical panel cover
 - The fan electrical connection cover inside the fan module
 - The panels or grids removed from the fan module
8. Make sure not to damage the electrical cable between the panels and the unit.

If the unit is provided with ATS, then the procedure is the same as for a standard power supply, but there are two power cables (4 + 4 cords) to be connected to the inlet terminals of the ATS panel.

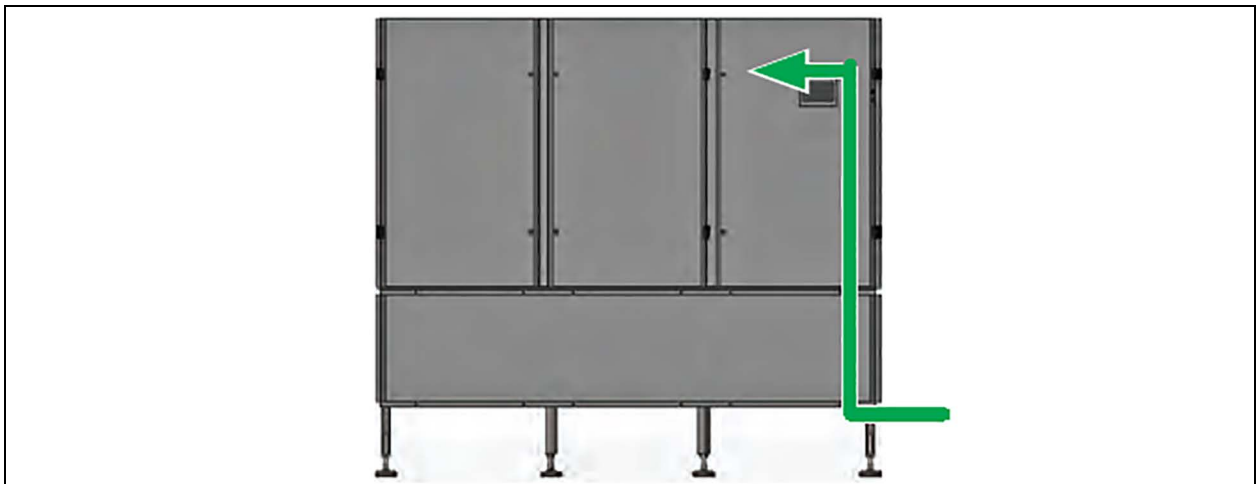
Figure 9.6 Replace Panels



9.2.3 Contacts for the Unit Status Signals

1. Run the signal cable through the precut on the right shoulder of the frame.
2. For details about the cable entrance holes see [Connections](#) on page 131.
3. Use appropriate cable ties to fix the cable to the frame on the left shoulder.
4. Restore the original protection degree with suitable accessories for the wiring and junction boxes.
5. Be sure to allow enough slack to allow the EP section to swing out.

Figure 9.7 Installing the Cable



The dry contacts can be used only with Class 2 sources.

Table 9.1 on the next page shows the available terminals and their meaning (refer to the electric diagrams for details).

The cable must be protected by a sheath.

NOTE: *The C8-NO8 (warning) and C9-NO9 (alarm) terminals are on the control board.

NOTE: The fan alarms are managed through Modbus.

NOTE: The ID contacts are on the control board.

Table 9.1 Available Terminals

24A	24V Hot connection terminals
24B	
24C	
24D	
24E	
24F	
24G	
24H	
24J	
24K	
CM1	24V Common Connection Terminals
CM2	
CM3	
CM4	
CM5	
CM6	
CM7	
CM8	
CM9	
CM10	
CM11	
	End Plate
G1	Common for Liquitect alarm input
G2	Common for power supply alarm input
G3	Common for customer input (terminal 44)
G4	Common for customer input (terminal 50)
G5	Common for customer input (terminal 51)/CPAR alarm relay input
G6	Common for customer input (terminal 54) / Reheat alarm input
G7	Common for customer input (terminal 55) / Humidifier alarm input
37	Common for customer remote shutdown terminal
38	Hot for Customer remote shutdown

Table 9.1 Available Terminals (continued)

75	Common alarm terminal connections
76	
41	Universal customer input 1 (Analog or digital)
43	Universal customer input 2 (Analog or digital)
44	Universal customer input 3 (Analog or digital)
50	Digital customer input 1
51	Digital customer input 2
54	Digital customer input 3
55	Digital customer input 4
	End Plate
80	Input for smoke detector trouble relay alarm
81	Common for smoke detector trouble relay alarm
91	Dry contacts to indicate smoke detector trouble relay.
92	
93	
HTS1	High Temperature Thermostat
HTS2	
	End Plate
37B	Extra remote shutdown terminals
38B	
37C	
38C	
94	Extra common alarm connections
95	
96	
97	"Fan on" contact terminals
84	
85	Spare terminals
R3 Relay	Alarm Relay
MFAS Relay	Main Fan Relay
	End Plate

Table 9.1 Available Terminals (continued)

11	Remote humidifier
12	
Remote Humid Relay	Reheat and humidifier lockout relay
End Plate	
88	Condensate pump customer terminals
89	
197	
CPAR Relay	Condensate Pump Relay

9.2.4 Sensors Connections

Any remote or additional sensor must be connected to the unit via [Modbus Connections and Settings](#) on the facing page .

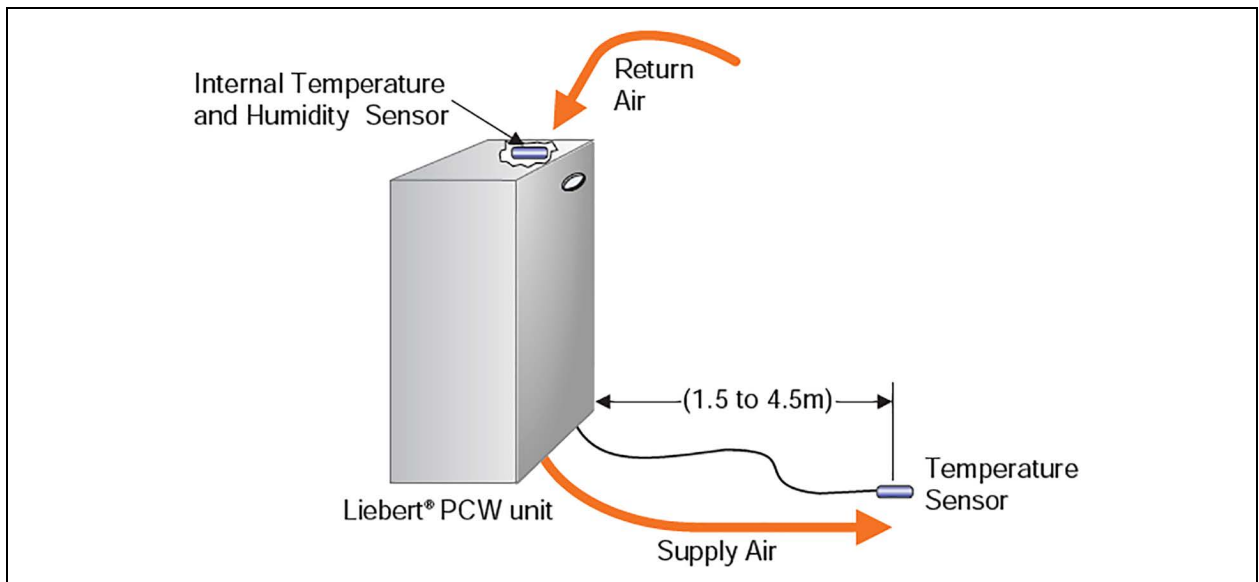
9.2.5 Supply Air Temperature Sensor

The supply temperature sensors should be installed in an area that is influenced only by the unit it is connected to. The supply sensor should be 1.5-4.5 m from the cooling unit to provide an accurate reading for the control.

The sensor has already been installed in the unit and it is fixed in the fan module with at least 5 m of cable length available. Remove the stripe and place it according the drawing.

NOTE: To grant a proper unit regulation, install the sensor according the drawing. Vertiv is not responsible in case of improper installation.

Figure 9.8 Supply Air Temperature Sensor



9.3 Modbus Connections and Settings

9.3.1 Connecting a Device to the Modbus Cable

1. Use a Modbus (RS485) cable, which is made of four shielded cables inside the sheath. See **Figure 9.9** below .
2. Connect a positive and a negative wire to the inlet terminal.
3. Connect a positive and a negative wire to the outlet terminal.

Figure 9.9 Modbus Connections



9.3.2 Setting Modbus Devices

Setting a Modbus device requires setting the following parameters:

Figure 9.10 Setting Modbus Parameters

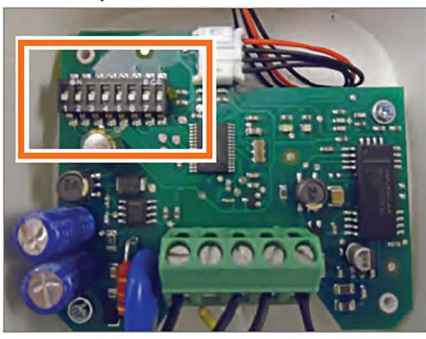
<p>Dip switched address</p>	<p>Address of the device (unique)</p>	<ul style="list-style-type: none"> • For T/H sensor: set the pins on its board.  <ul style="list-style-type: none"> • For the fans (inside the unit): the setting is factory made. However you might need to do again the setting in case of fan replacement. Do the setting by the programming tool (see the <i>PDX-PCW Control Application</i>)
<p>Baud rate = 19200 Parity = Even StopBits = 1</p>	<p>Same parameter for all the devices in the Modbus chain</p>	

Figure 9.11 on the next page and **Table 9.2** on the next page provide the details and the addresses for the settings.

Figure 9.11 Modbus Options

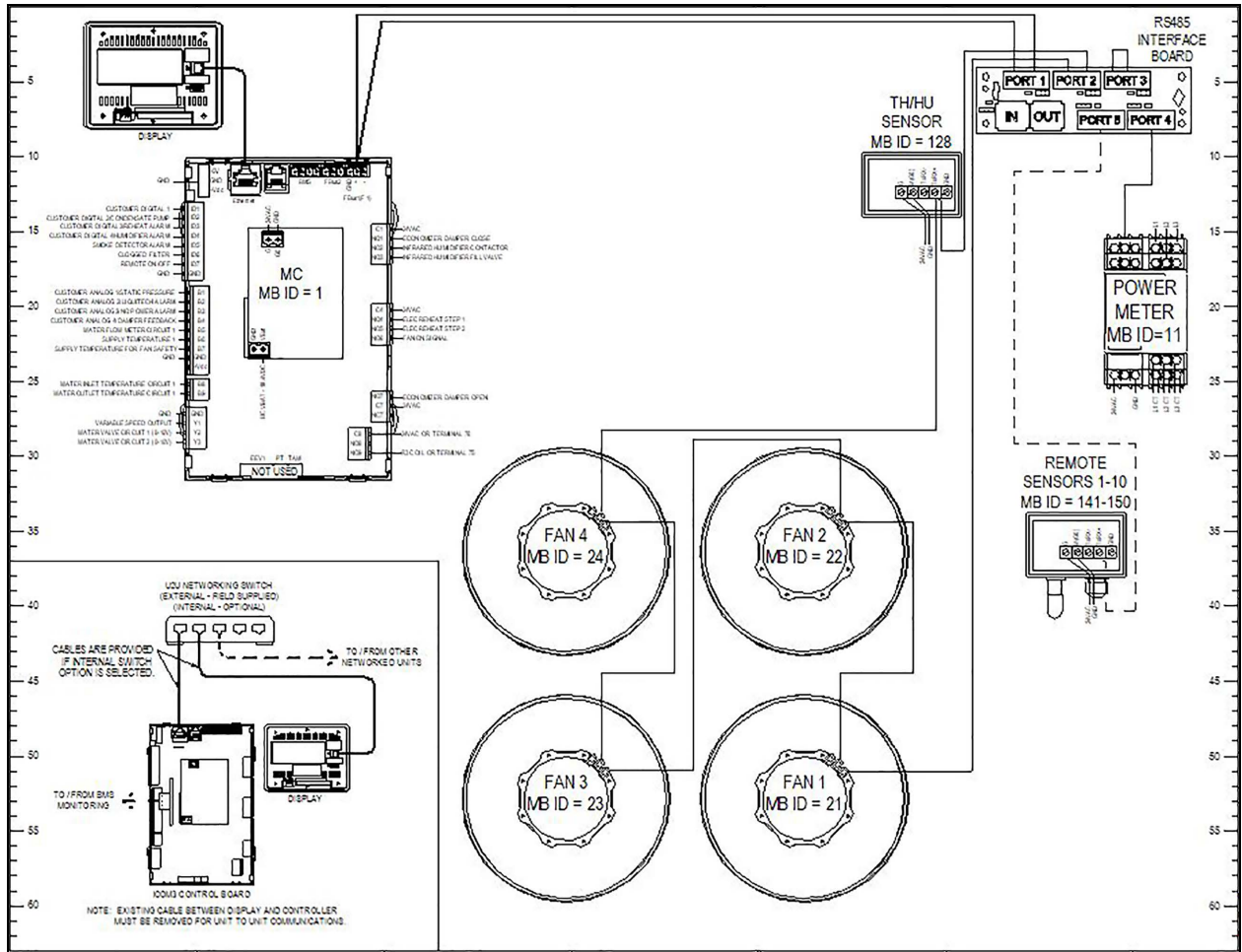


Table 9.2 Modbus Options and Addresses

MD ID = 1	MC
MD ID = 11	Power meter
MD ID = 12	ATS controller
MB ID = 21	Fan 1
MD ID = 22	Fan 2
MD ID = 23	Fan 3
MD ID = 24	Fan 4
MB ID = 128	TH/HU sensor
MB ID = 141-150	Remote sensors T or T+H (1-10)

10 Piping Requirements



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 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.

Install a monitored, fluid-detection system that is wired to activate the automatic closer 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 catastrophic fluid leak.

10.1 Chilled Water Requirements

Prepare the piping for connecting the main unit according to the specifications in [Connections](#) on page 131.

Material - Use copper tubing.

Connections - All units tubing is spun closed with access valve. Cut the tube ends and braze to on-site chilled water piping. Relieve pressure through the access valve before working on, cutting into, disconnecting joints or removing components of the coil or piping system.

10.1.1 Thermal insulation

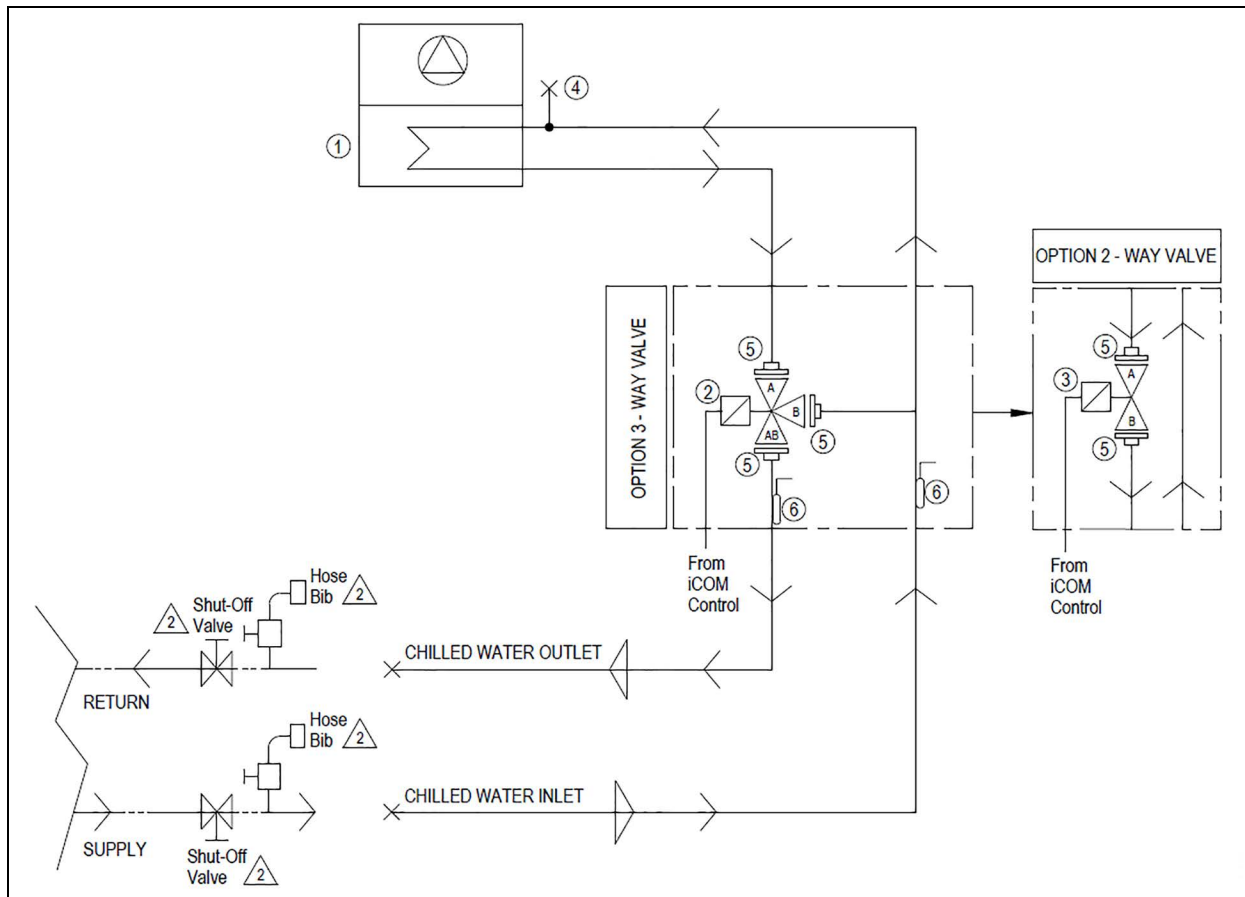
Wrap the piping by using thermal insulating material such as Armaflex.

10.1.2 Piping Layout

Prepare the external piping as following:

- Place shut-off ball valves at the unit inlet and outlet to allow easy maintenance. See **Figure 10.1** below.
- It is advisable to install a thermometer and a manometer on the unit inlet and outlet.
- Install a drain valve at the lowest point in the circuit.
- Place the piping on supporting brackets.
- Insulate both pipes using Armaflex insulation.

Figure 10.1 Piping Layout



Item	Description
1	Chilled water cooling coil
2	3-way valve
3	2-way valve
4	Manual air bleeding valve
5	Valve fittings
6	Water temperature sensor
2 with triangle	Field supplied but required for proper operation

10.1.3 Condensate Piping Requirements

Follow local code.

The condensate pump is field installed.

Prepare the piping for connecting the unit to the condensate drain system according to the following specifications.

Table 10.1 Piping Connection Requirements

	Without Condensate Pump	With Condensate Pump (optional for upflow units)
Material	PVC or flexible polythene tubing	½ in. copper sweat connection
Connections	Hose barb	The units are provided with smooth pipe stubs, ready for the connection by brazing.
Piping Layout	The drain pipe must have at least a 2% gradient from the unit outlet to the connection to the site drainage system.	Maximum discharge total head allowed 9.84 ft. (head and hydraulic connection loss). The final drain must be able to receive .264 gpm water at high temperature (max water temperature 100 °C).

10.1.4 Water Supply Requirements



WARNING! Risk of improper piping installation, leak checking, fluid chemistry, and fluid maintenance can cause equipment damage and personal injury. Installation and service of this equipment should be done only by qualified personnel who have been specifically-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.

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 improper water supply. Can reduce humidifier efficiency or obstruct humidifier plumbing.

Do not use a hot water source. It will cause deposits that will eventually block the fill valve opening.

NOTE: The following instructions refer to both chilled water and hot water.

Analyze the Water

It is the user's responsibility to establish the quality of the water and make sure that this is compatible with the materials used in the exchangers.

The quality of water may significantly affect the operation and the life of the exchangers.

The first step in planning the treatment water is chemical analysis, which must be performed by qualified personnel from specialist organizations.

10.2 Piping Connections



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.

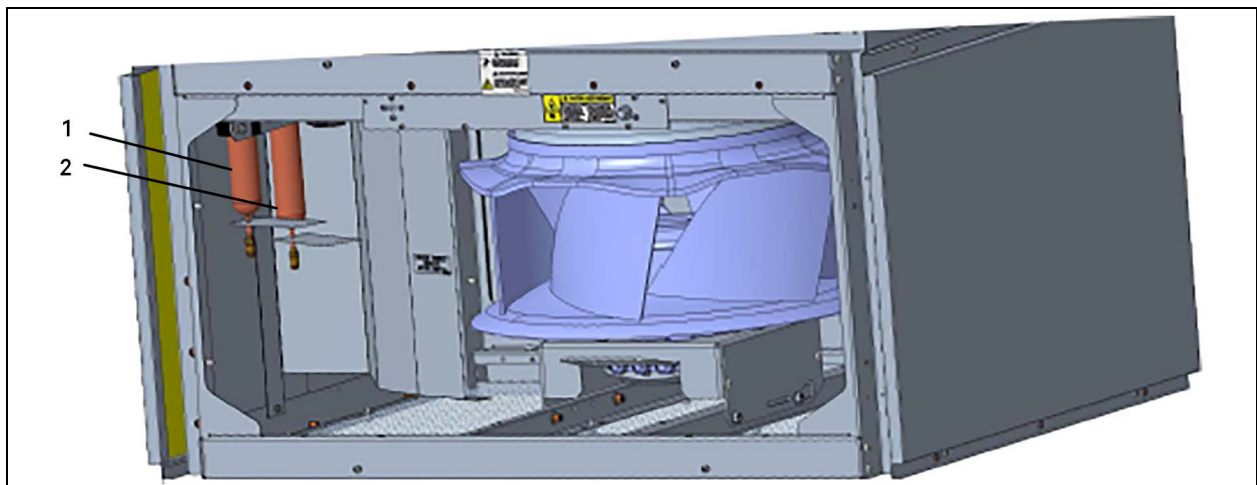
10.2.1 General Instructions

Connections	The inlet and outlet directions are clearly marked with labels and arrows on the respective pipings. Pay attention to follow the directions.
Keep clean	<ul style="list-style-type: none"> Keep the piping clean and dry. Make sure that the surfaces to be brazed are clean and that the ends of the tubes have been carefully reamed to remove any burrs. Ensure that all loose material has been cleaned from inside the tubing before brazing.
Brazing	<p>NOTE: When copper is heated in the presence of air, copper oxide forms.</p> <ul style="list-style-type: none"> Use copper piping with a brazing alloy with a minimum temperature of 1,350°F (732°C), such as Sil-Fos. Avoid soft solders such as 50/50 or 95/5. Follow local piping codes and safety codes. Qualified personnel must install and inspect system piping. The water/glycol-cooled system will operate in conjunction with a cooling tower, city water or drycooler. Contact a local water consultant regarding water quality, corrosion protection, and freeze-protection requirements. Install manual shut-off valves at the supply and return line to each indoor unit to permit routine service and emergency isolation of the unit. Install a monitored, fluid-detection system that is wired to activate the automatic closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.
Piping layout	<ul style="list-style-type: none"> Keep the piping as short as possible. This helps to minimize the pressure drops. Avoid bends as much as possible. Make bends with large radius (bending radius at least equal to the pipe diameter). For hard copper piping use preformed curves. You may bend soft copper piping by hand or by using a bending tool. Support both the horizontal and the vertical piping by vibration dampening clamps that include rubber gaskets. Place the clamps every .06-.08 in. (1.5-2 mm).

10.2.2 Chilled Water

1. Connect the chilled water inlet piping to the pipe. See **Figure 10.2** below .
2. Connect the chilled water outlet piping to the pipe.
3. Use the two smooth pipe sections that are provided with the units. Ready to connect by brazing.
4. See recommendation for brazing (par.9.4).
5. Insulate both tubes using insulation with closed cells (e.g. Armaflex).

Figure 10.2 Connecting the Inlet and Outlet Piping



Item	Description
1	Inlet piping
2	Outlet piping

10.2.3 Condensate Drain without Condensate Pump

1. Take the flexible pipe coming out of the drain pan. See **Figure 10.3** below and **Figure 10.4** below .

Figure 10.3 Drain Systems Downflow Units

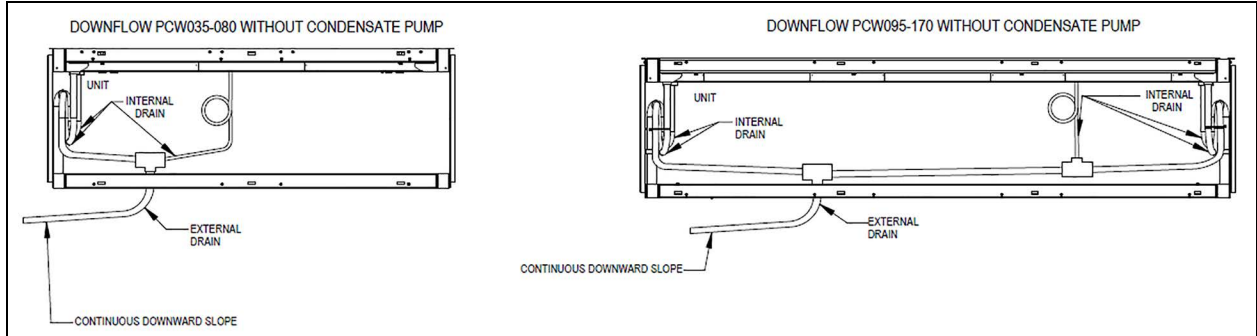
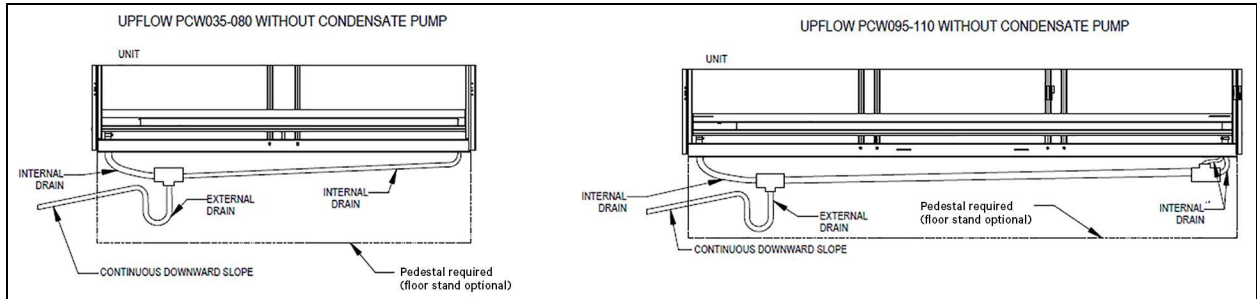


Figure 10.4 Drain Systems Upflow Units

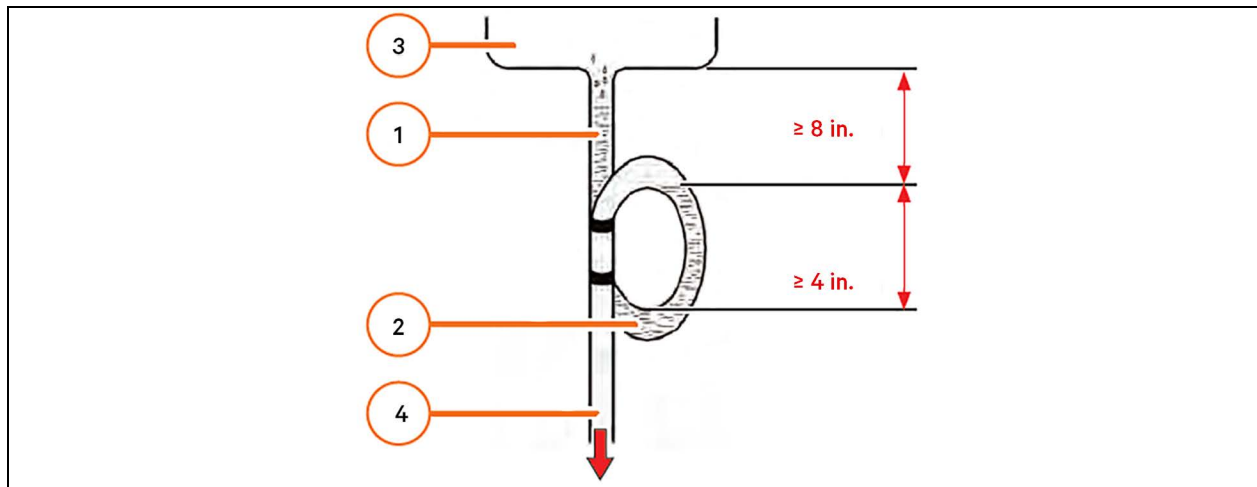


2. Make a drain trap on the hose, placed at least 7.9 in. (200 mm) below the drain tray and with a minimum height of 4 in. (100 mm) as shown in the **Figure 10.5** on the facing page .
3. Connect the hose outlet to the on-site drainage system.
4. In the upflow configuration units, the drain trap must placed under the unit, in the raised floor.
5. To avoid spraying the condensate, fill the drain trap with water before start-up.

NOTE: If the drain trap is done inside the fan module in the downflow units, attach the hose and the drain trap properly to the fan module frame using cable ties/brackets, to avoid the risk of contact with fans.

NOTE: Downflow units contain a factory installed condensate trap. Do not trap external to the unit. Upflow units do not contain a factory installed condensate trap. Trap external to the unit.

Figure 10.5 Condensate Drain



Item	Description
1	Flexible pipe
2	Drain trap
3	Drain tray
4	Hose outlet

10.2.4 Condensate Drain with 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 Vertiv™ 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.



CAUTION: Risk of contact with sharp edges and exposed fasteners. Can cause injury. Use only qualified HVAC installation personnel to install block-off kit. Wear appropriate OSHA approved personal protection equipment (PPE) while installing this EC fan front block off kit to prevent injury.

Contact your local sales representative or technical support if you have any questions or problems during installation. Visit <https://www.Vertiv.com/en-us/support/> or call 1-800-543-2778 for contacts.

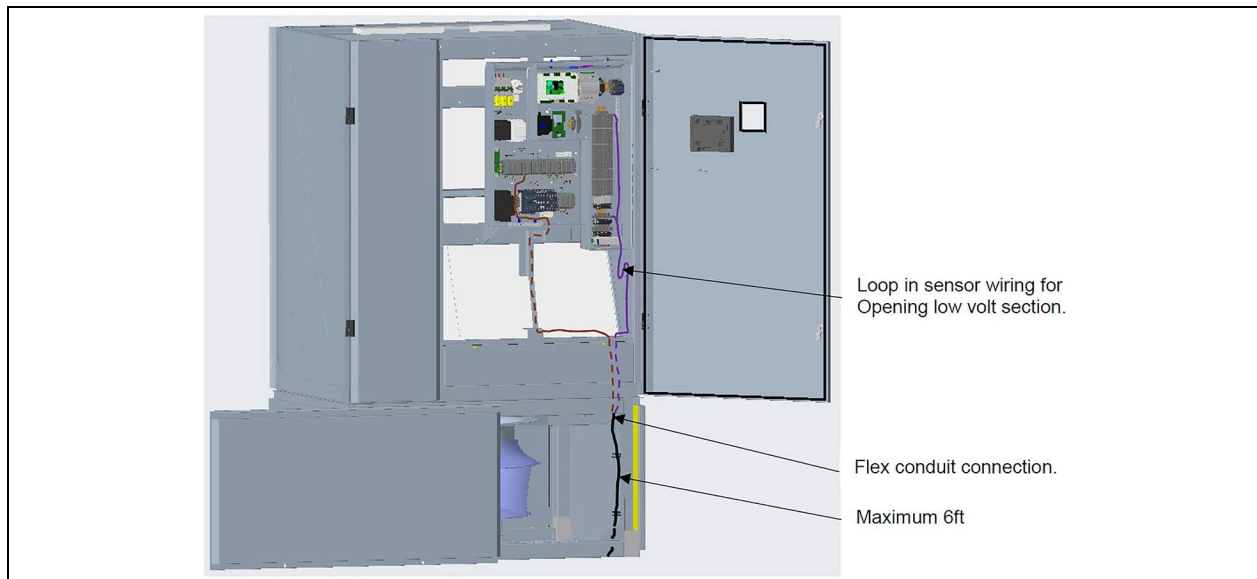
The condensate pump package ships inside the unit and must be removed before the unit is set in place.

Wiring Instructions

1. The condensate pump package will include the pump with wires and a length of 3/8 in. flex with conduit fittings. The pump location should be positioned to limit the length of the flex conduit at 6 ft. or less. See **Figure 10.6** below.
2. Feed the pump wires through the flex and connect the flex to the pump using the compression fitting on the pump.
3. Connect the other end of the conduit to the knockout provided in the sheet metal of the unit using the provided conduit fitting. A knockout reducer may be needed.
4. Route the power (brown) and ground (green) wires to the high voltage section.
5. Route the float sensor wires (purple) to the low volt section.

NOTE: Provide a loop in the sensor wires to allow the low volt section to swing out.

Figure 10.6 Wiring



6. Wire the brown power wires to the fuse holders labeled Condensate Pump. The fuses will need to be removed to tighten the wires to the torque value of 20 lb-in.
7. Remove the terminal ring on the green ground wire and strip to a 3/8 in. length. Connect the wire to the ground bar in the high voltage section. Tighten to the torque of 35 lb-in.
8. Connect one of the condensate sensor purple wires to terminal labeled 24B. It is located at the top of the terminal assembly.
9. Connect the other purple wire to the terminal labeled 197 located at the bottom of the terminal assembly beside the CPAR relay.

Drain Connection

NOTICE

Risk of water leakage. Can cause severe property damage and loss of critical data center equipment.

The Vertiv™ Liebert® PCW unit requires a water drain connection. Improper installation, application, and service practices can result in water leakage from the unit.

We recommend installing monitored leak detection equipment for the water supply lines and the internal unit water lines.

NOTICE

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

Do not install an external trap in the drain line on downflow units. This line already has a factory-installed trap inside the cabinet. Installation of a second trap will prevent drain-water flow and will cause the water to overflow the drain pan.

Sagging condensate drain lines may inadvertently create an external trap.

1. Units will contain multiple drain lines. All drain lines must be sloped toward the condensate pump with a minimum of 1/8 in. per 1 ft. length. See **Figure 10.7** below, **Figure 10.8** below, **Figure 10.9** on the next page, and **Figure 10.10** on the next page for some examples.
2. Verify there are no kinks or collapsed sections in the hose. Do not bend the hose more than a 50° angle.

Figure 10.7 Downflow PCW035-080 Condensate Drain with Condensate Pump

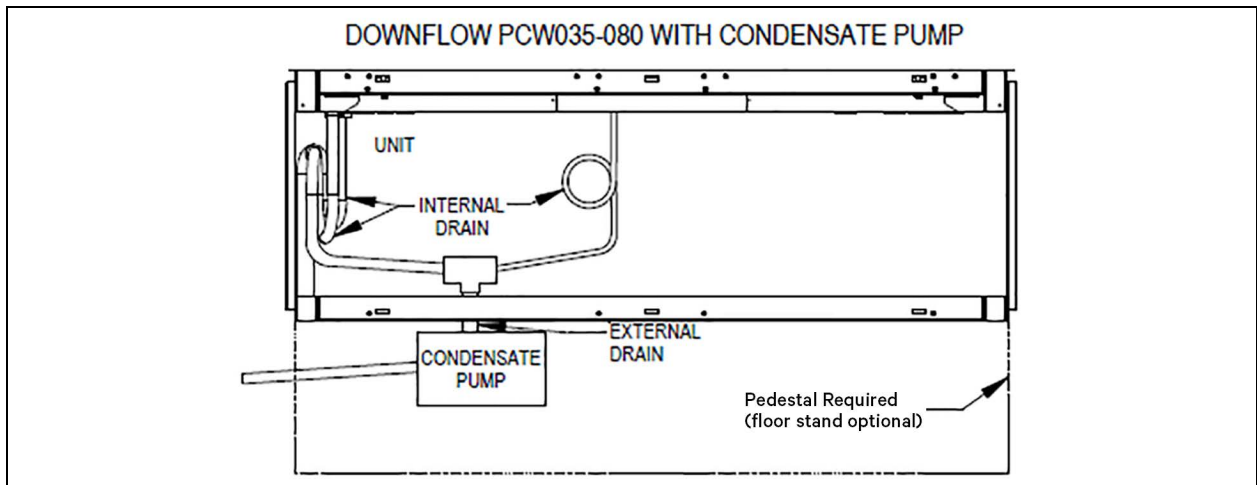


Figure 10.8 Downflow PCW095-170 Condensate Drain with Condensate Pump

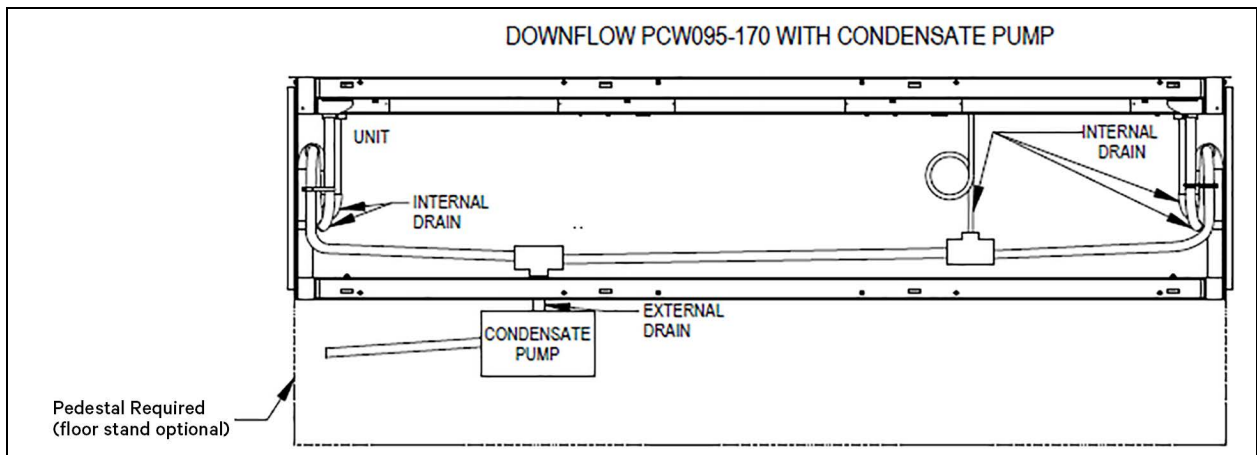


Figure 10.9 Upflow PCW035-080 Condensate Drain with Condensate Pump

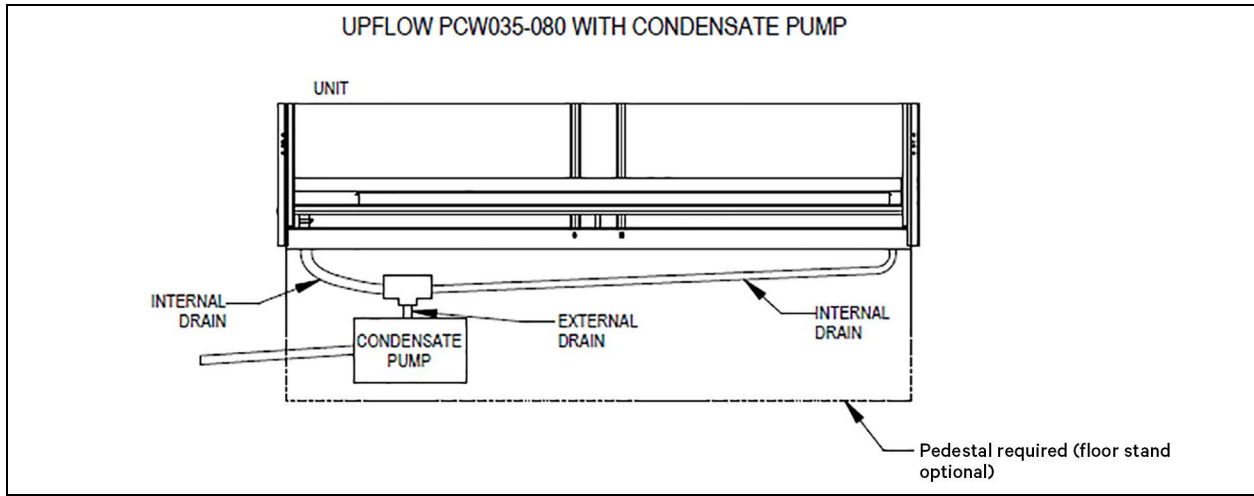
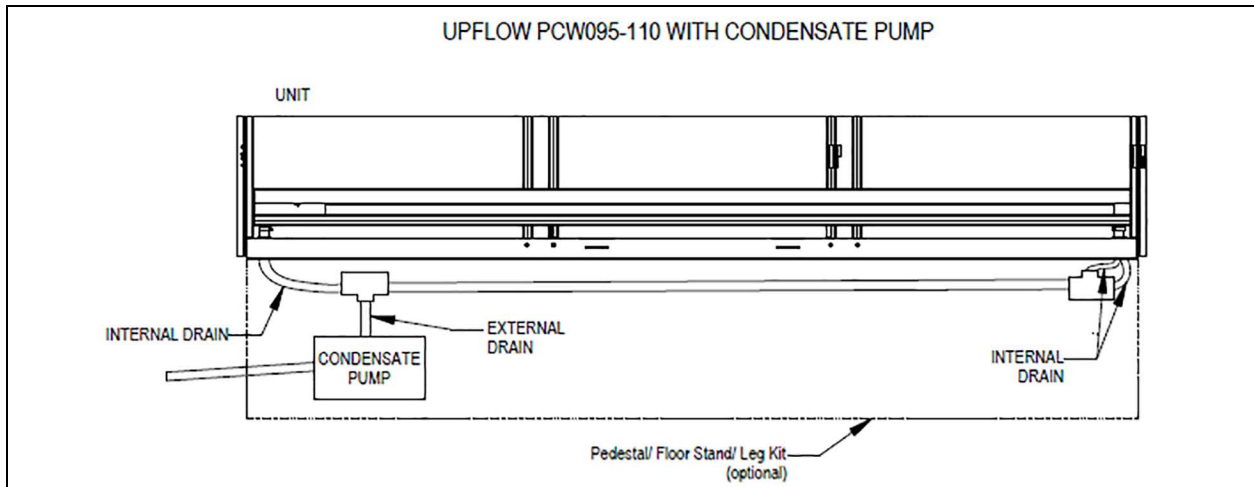


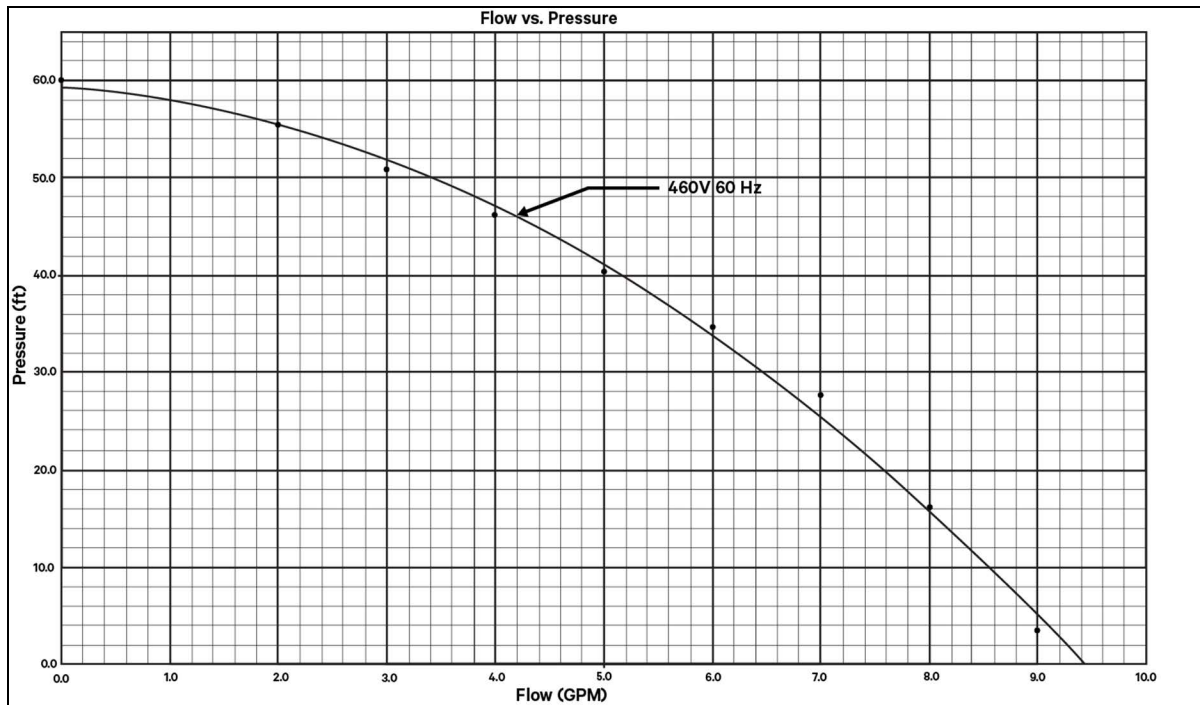
Figure 10.10 Upflow PCW095-110 Condensate Drain with Condensate Pump



3. Connect the drain hose from the unit to the 3/4 in. barb located at the top of the pump.
4. The condensate pump discharge is provided with a 1/2 in. copper sweat connection for connecting to the building drain.
5. Observe the following requirements when installing and routing the drain line.
 - a. The drain line must be located so it will not be exposed to freezing temperatures.
 - b. Size the piping based on the available condensate head.
 - c. On **downflow units**, the drain is trapped internally. Do not externally-trap the drain line on **downflow** units.
 - d. The drain line must be rigid enough that it does not sag between supports, which unintentionally creates traps.
 - e. We recommend installing monitored, under-floor leak-detection equipment.

Technical information about pump will be shipped with the unit.

Figure 10.11 Condensate Pump Curve



10.3 Filling the Water System

NOTE: The following instructions refer to chilled water.

10.3.1 Water Supply

For each coil:

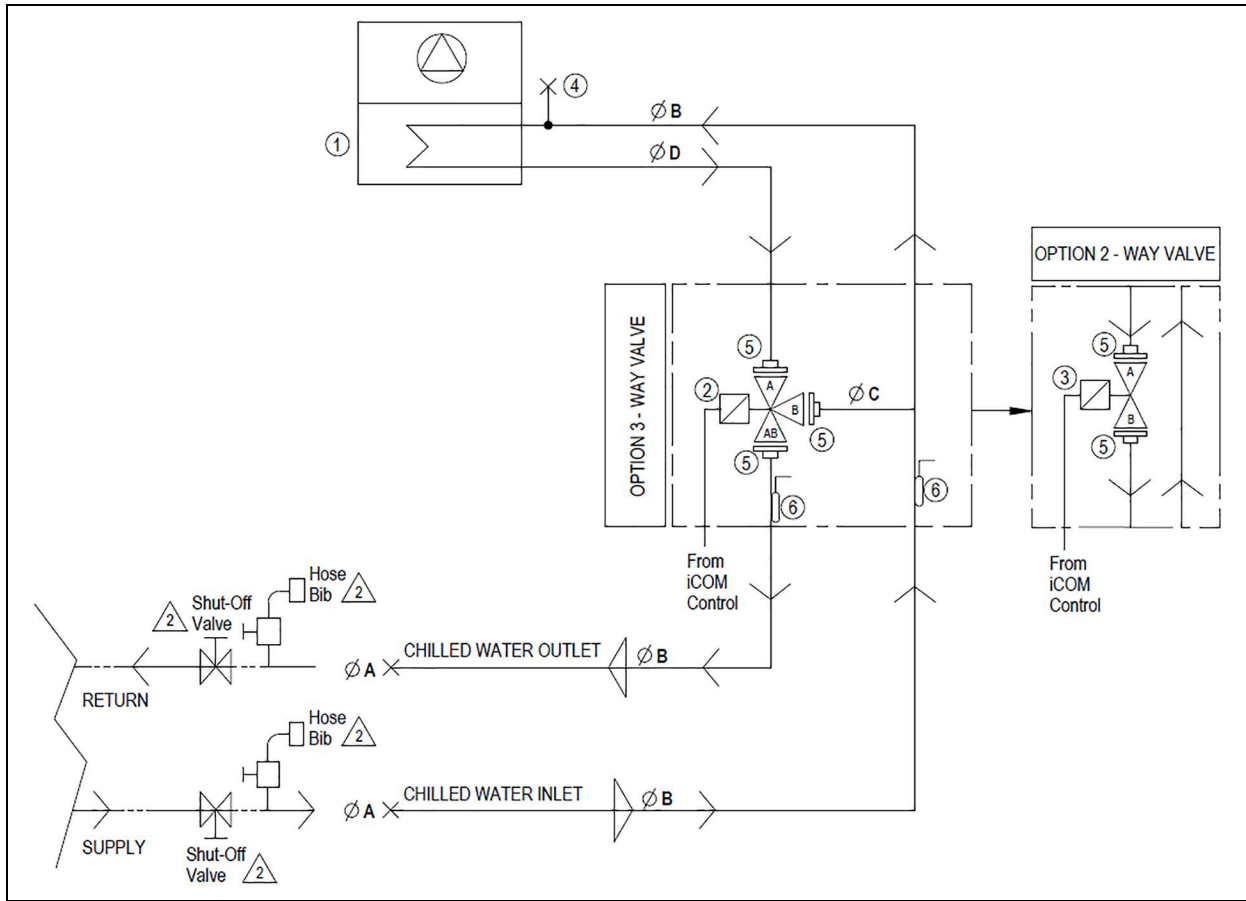
1. Make sure that the drain valves (see **Figure 10.12** on the next page) are closed.
2. Depress the schrader valves to vent the chilled water coil.
3. If there are shut-off valves (see **Figure 10.12** on the next page) on the water return (building facility), then make sure that they are open.
4. Open the shut-off valves on the water supply system upstream from the unit (building facility).
5. Supply water through a filling group or from the plant.
6. Release the schrader valves when only water and no air blows out of them.
7. If necessary, fill-in or tip-up the ethylene glycol.

NOTICE

Do not exceed the nominal operating pressure of the circuit components.

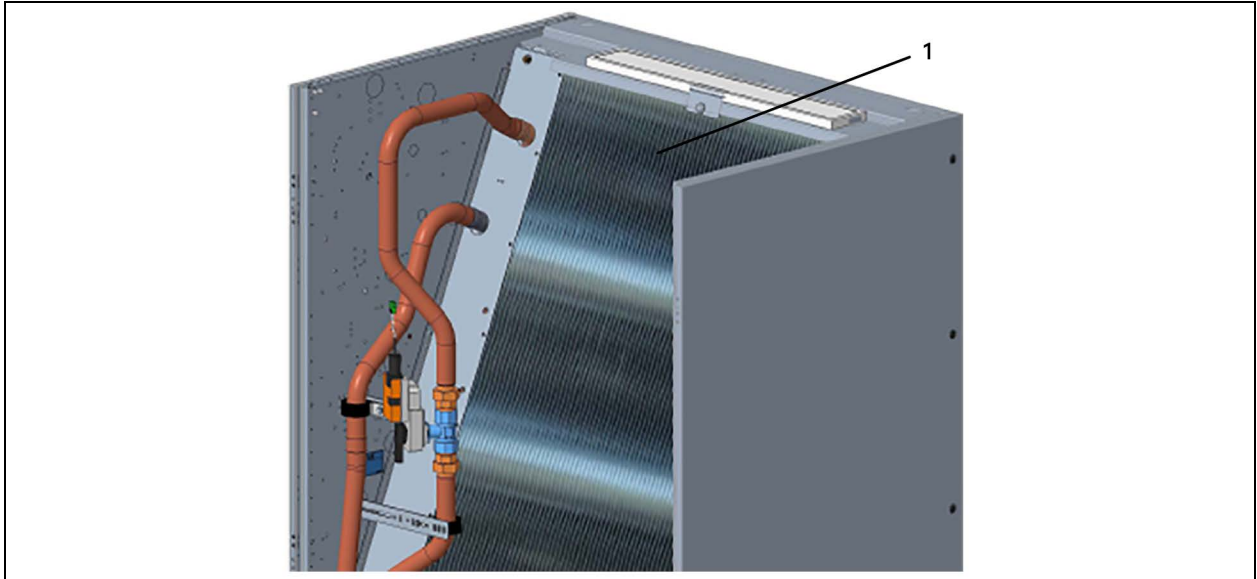
Air bubbles in the circuit can cause a loss of precision in cooling action so venting is recommended.

Figure 10.12 Drain Valve and Shut-off Valve



Item	Description
1	Drain valve
2	Shut-off valve

Figure 10.13 Chilled Water Coil



Item	Description
1	Chilled water coil

This page intentionally left blank

11 Checklist for Completed Installation

NOTE: Follow these instructions at first start-up and also in case of restart after a long stop.

NOTE: Record the functional data on the Start-Up certificate.

11.1 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. If equipment has been disassembled for installation, unit must be reassembled per instructions.

11.2 Piping Installation Checks

1. Piping completed to coolant loop.
2. Piping has been leak-checked.
3. Piping has been flushed to clear debris, pipe dope, and contaminants.
4. Check piping inside and outside of equipment for proper support and adequate spacing to prevent rub through.
5. Ensure that factory clamps have been reinstalled.
6. Drain line connected, not obstructed, and pitched per local code.
7. Water supply line connected to humidifier and not leaking.
8. Condensate drain connected.
9. Condensate pump, if applicable, is operational.

11.3 Other Installation Checks

1. Ducting or plenum assembly complete (if required), maintain access to filters.
2. Filters installed.
3. Check fasteners that secure , reheats, humidifier, 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. Remove rubber band from float in optional infrared humidifier.
7. Seal openings around piping and electrical connections.
8. Installation materials and tools have been removed from equipment (literature, shipping materials, construction materials, tools, etc.).
9. Locate blank start-up sheet, ready for completion by installer or start-up technician.

11.4 Electrical System

1. Check all of the cable connections particularly the main power connections on the power fuses and contactors.
2. Check that all thermal protections are calibrated according to the electrical data tables reported on wiring diagram.
3. Check the electrical absorption of all components.
4. Check the tightening of all terminal block and screws.

11.5 Cooling System

1. Make sure that the condensate drain line is connected and not obstructed.
2. Make sure that all the factory clamps that secure the piping to the structure have been reinstalled (if removed during the installation).

11.6 Air System

1. Check that the unit fans are operating properly.
2. Check that all of the unit options that involve the air flow management (such as air economizer, return dampers, and Vertiv™ Liebert® SmartAisle™) operate properly.
3. Check that all of the temperature and humidity probes read a correct value.
4. Make sure that the humidifier supply and drain water connections are connected properly.
5. Check that the humidifier works properly.
6. Check that electrical heaters operate when required.

11.7 Safeguards

1. Make sure that all the safeguards (panels, grids) have been remounted.
2. Close and lock all the doors.
3. Place all the floor panels around and under the unit.

12 Operation

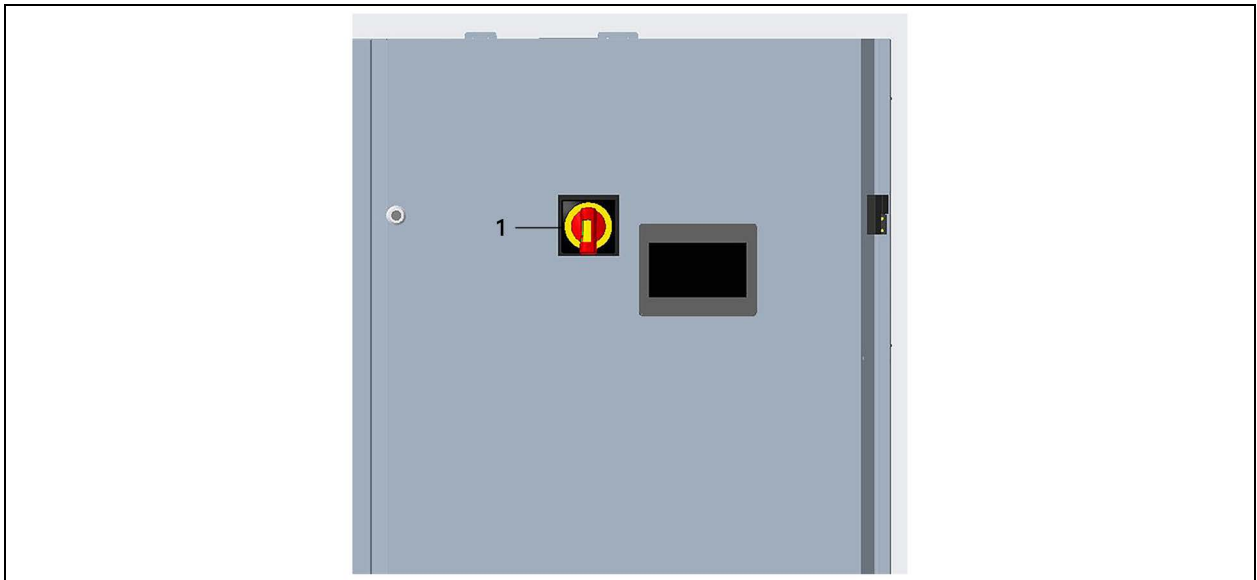
NOTICE

The power supply should never be disconnected during normal operation except when performing maintenance.

12.1 Power On/Off

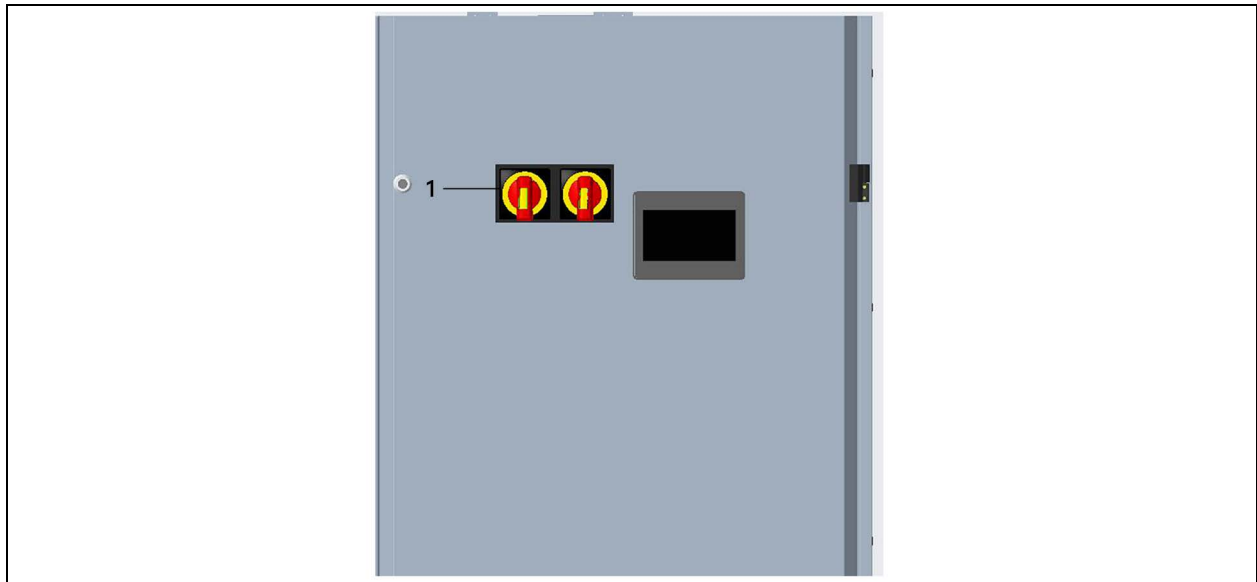
1. Close the disconnection device upstream of the unit (to be installed by the customer).
2. Close the disconnecting switch (see **Figure 12.1** below and **Figure 12.2** on the next page .
 - If the display is present, then check that it switches on.
 - In case of first start-up or after maintenance on the electric system, check again by a voltmeter or tester if the voltage and phase difference fall within the indicated limits.
3. Perform steps 1 and 2 in reverse to power off unit.

Figure 12.1 Single Power Supply



Item	Description
1	Disconnecting switch

Figure 12.2 Dual Power Supply



Item	Description
1	Disconnecting switch

12.2 Start

- Adjust the setpoint as indicated in the Liebert® PCW Control Application.
 - The LED lights up, showing the presence of the electric power.
 - See the Liebert® PCW Control Application for details.
 - If the LED does not light up see [Troubleshooting](#) on page 123 .

NOTE: The fan starts immediately (the fan always works when the unit is ON). The heaters can start 10 seconds later.

12.3 Check the Operation

NOTICE

Check the operation of the unit at the following scenarios:

- At first start-up
- Restart after a long stop
- At time intervals during normal operation

Alarms

Make sure that all the alarms due to protective device interventions have been reset (see Liebert® PCW Control Application).

Control and Safety Devices

Check the correct operation of the control and safety devices.

12.4 Restart

After a short stop

The unit is still powered

- Set the ON/OFF switch to ON.

After a long stop

- Do the complete procedure as described in: [Power On/Off](#) on page 99 and [Start](#) on the previous page .

In case of power blackout

See [Standard or Dual Power Supply](#) on page 47 .

12.5 Teamwork

The factory setting for the control system is the stand-alone mode. If the unit is connected to other units in a network (by Ethernet), a master unit controls switching ON/OFF of all of the units. Refer to Vertiv™ Liebert® iCOM™ 3 manual for details regarding compatibility with iCOM™ 1 and iCOM™ 2.

The base configuration for Teamwork can be one of the following:

- Lead-Lag (standby, rotation, and changeover on alarm)
- Cascade

See the Liebert® PCW Control Application for more information and instructions about the Teamwork configuration.

Three Teamwork modes can be adopted:

- Teamwork Mode 1 (Parallel) - The control uses the system PI's for driving cooling, heating, ventilation, humidification, and dehumidification.
- Teamwork Mode 2 (Independent)
 - The control drives cooling, heating, ventilation, humidification, and dehumidification based on local requests, while avoiding operational conflict with the other units in the network.
- Teamwork Mode 3 (Vertiv™ Liebert® SmartAisle™)

This page intentionally left blank

13 Maintenance



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

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

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



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

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



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 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.

For downflow units installed on a raised floor:



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.

NOTE: Rotating elements, hot surface elements. If you need to remove the floor tiles within a distance of 33.4 in. (850 mm) from the unit, first disconnect the unit from the power supply.

13.1 Warning Labels

- Check regularly that the warning labels are still on the unit and that they are clearly visible.
- Replace any missing or damaged label.

13.2 Spare Parts

The use of original spare parts is recommended.

Using third-party material can invalidate the warranty.

When placing an order, refer to the Component List enclosed with the unit and quote the unit model and serial number.

NOTE: If you need to replace a component, carefully follow the manufacturer's instructions that come with the component.

NOTICE

If you need to weld a component, be careful not to damage other components (like gaskets, seals, and O-rings).

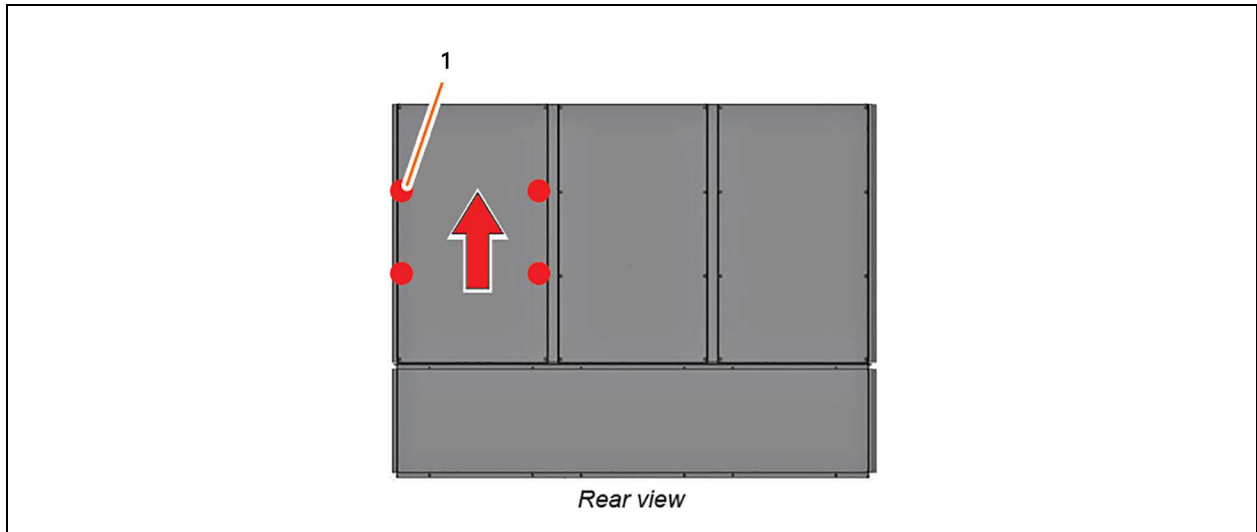
13.3 Removing the Upper Panels



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.

1. Loosen the fixing screws. See **Figure 13.1** on the facing page .
2. Lift the panel and release it from the hook on top.

Figure 13.1 Removing Upper Panels



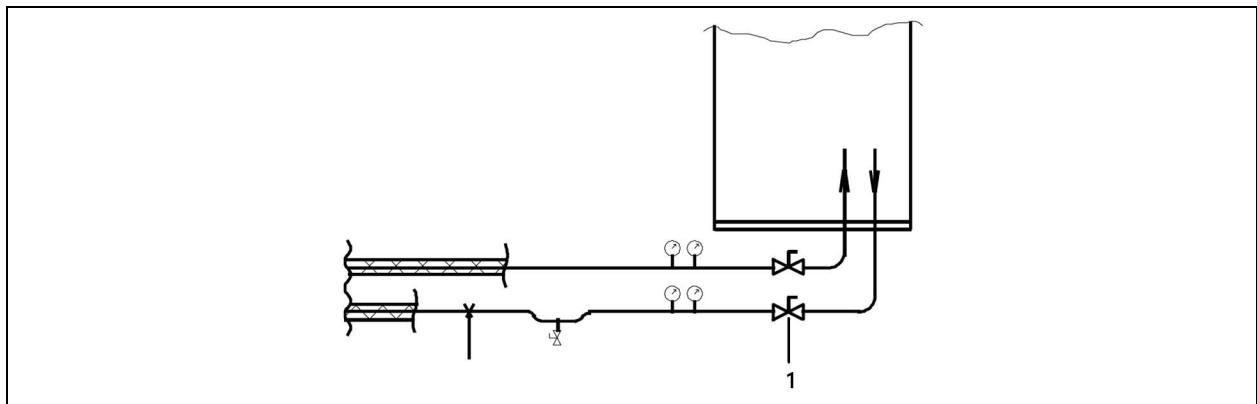
Item	Description
1	Screws

13.4 Draining the Chilled Water System

For each coil:

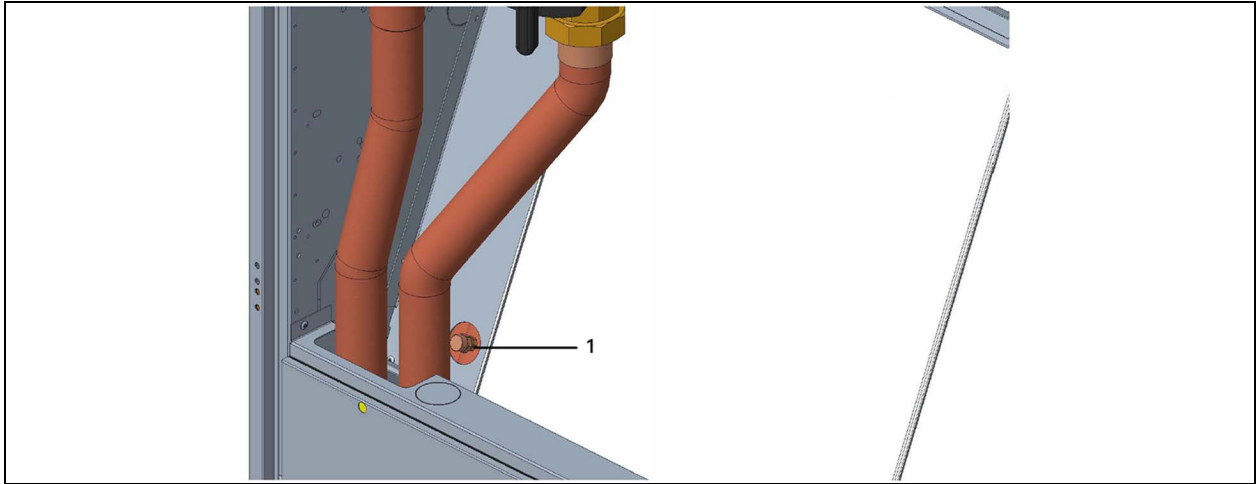
1. Close the shut-off valves on the water supply system upstream of the unit (building facility). See **Figure 13.2** below .
2. Open the drain plug. See **Figure 13.3** on the next page .
3. Open the vent valves. See **Figure 13.4** on the next page .
4. Keep the drain plug open until no more water flows out.

Figure 13.2 Shut-off Valves



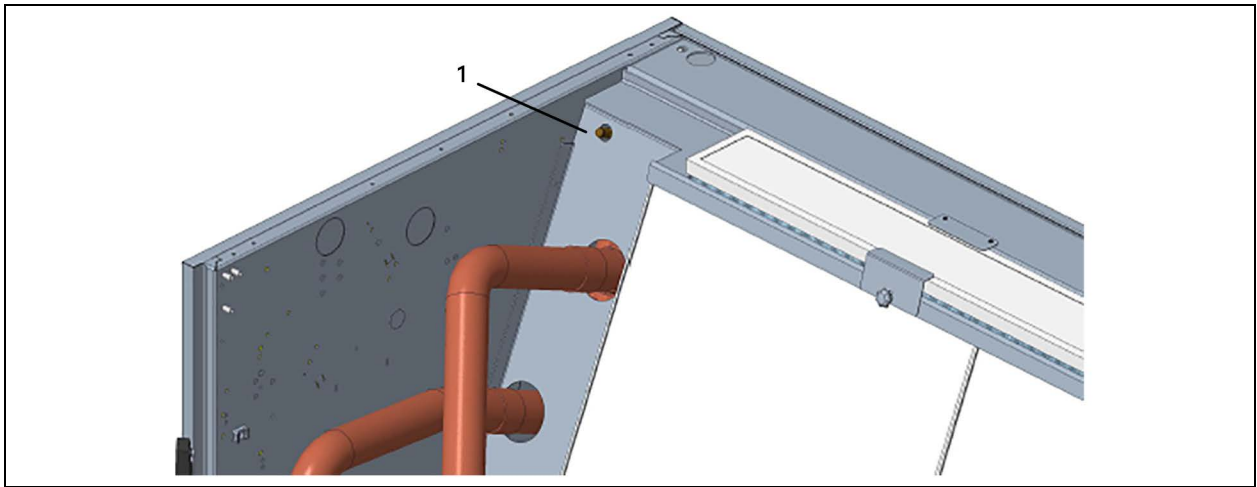
Item	Description
1	Shut-off valve

Figure 13.3 Drain Plug Location



Item	Description
1	Drain plug on water outlet piping

Figure 13.4 Vent Valve Location



Item	Description
1	Vent valve on chilled water coil

13.5 Replacing Components

13.5.1 Replacing the Control Board



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 Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ controller.

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.

How to Remove

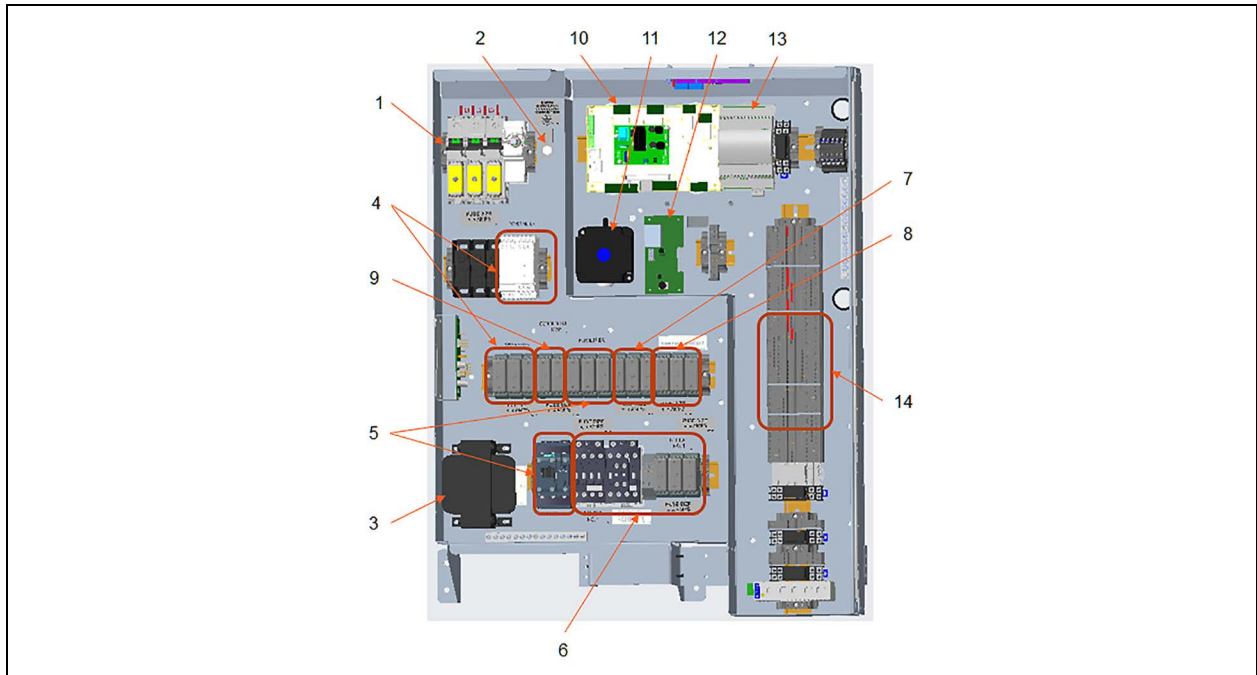
1. Remove the cover plate of the electrical and control panel.
2. Remove all of the cables connected to the control board.
3. Insert a screw driver into one of the eyes and lever out the control board. See **Figure 13.5** on the next page .
4. Repeat for the other eye(s) until the control board is released.

How to Reassemble

1. Press the control board in the DIN rail until it locks.
2. Reconnect the cables.
3. Reassemble the cover plate of the electrical and control panel.
4. Connect the unit to the power supply.
5. Upload the software from the computer (or USB drive) to the control board (if applicable).
6. Restart the unit.

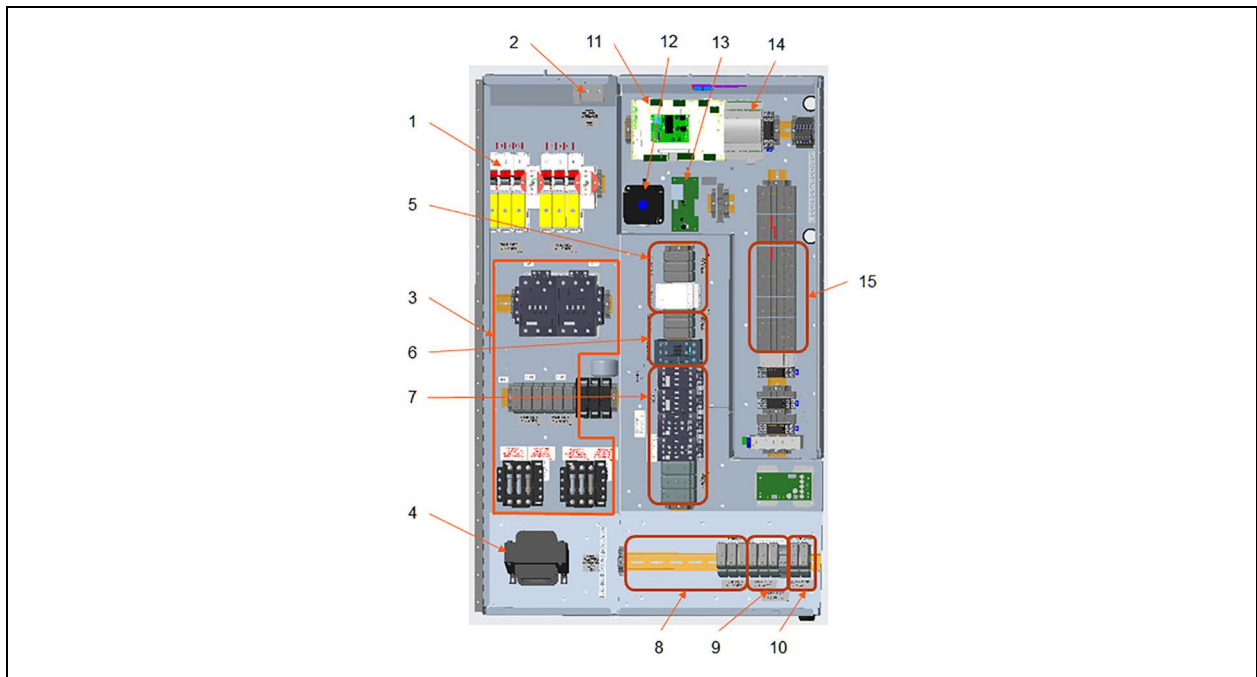
NOTE: Battery type - Lithium button (removable), BR2032, 3Vdc. Duration minimum eight years in normal operating conditions.

Figure 13.5 PW035 and PW040 Control Board



Item	Description
1	Fused disconnects
2	Earth ground connection
3	Control transformer
4	Power meter
5	Humidifier
6	Reheat
7	Fan fuses
8	Control transformer fuses
9	Condensate fuses
10	Control board
11	Filter clog
12	Smoke detector reset
13	Ultracap buffer
14	Low volt customer terminals

Figure 13.6 PW045 - PW170 Control Board



Item	Description
1	Fused disconnects
2	Earth ground connection
3	ATS assembly
4	Control transformer
5	Power meter
6	Humidifier
7	Reheat
8	Fan fuses
9	Control transformer fuses
10	Condensate fuses
11	Control board
12	Filter clog
13	Smoke detector reset
14	Ultracap buffer
15	Low volt customer terminals

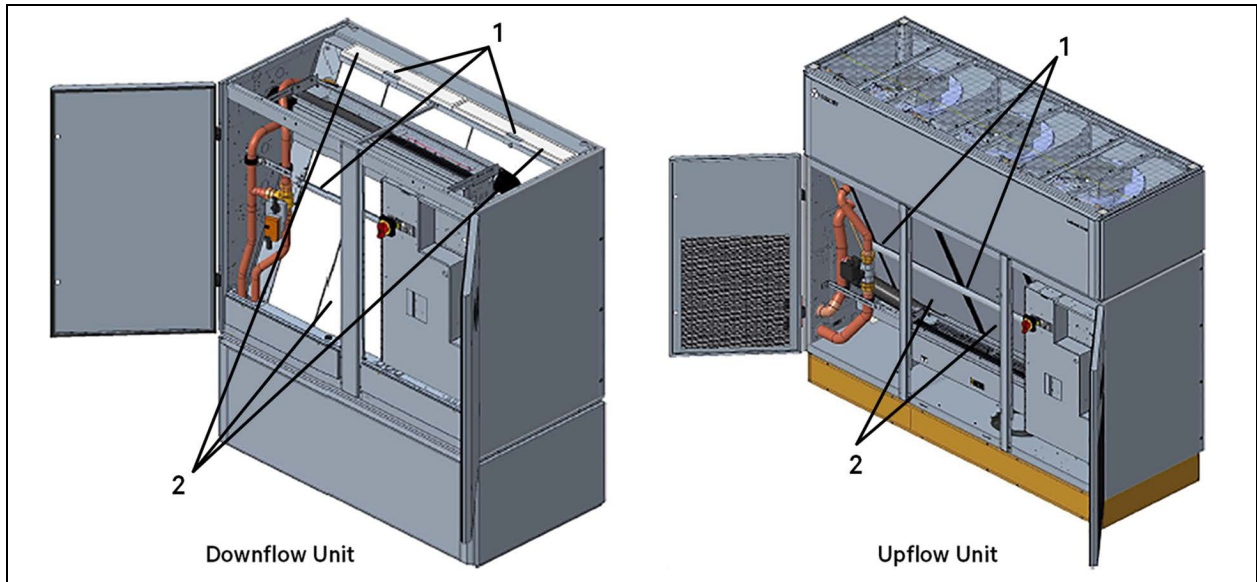
13.5.2 Replacing the Air Filter

NOTICE

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

NOTE: Upflow filters require plastic frame to prevent moisture damage.

Figure 13.7 Air Filter Replacement



Item	Description
1	Filter brackets
2	Air filters

See **Table 7.3** on page 59 and **Table 7.4** on page 60 for air filter sizes.

13.5.3 Replacing a Fan



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

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

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



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

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 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.

Do not operate upflow units without installing a plenum, ductwork or guard over the blower opening(s) on the top surface of the unit cabinet.

Ductwork must be connected to the blower(s) or a plenum must be installed on the blower deck for protection from rotating blower wheel(s) on upflow units.



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.



WARNING! Risk of extremely heavy fan modules dropping downward suddenly. Can cause serious injury or death. Building and equipment damage may also result. Fan modules weigh in excess of 125-lb (56.7-kg) each. Support fan modules before removing mounting hardware. Use caution to keep all body parts out of the fan module pathway of movement during removal or repositioning. Only properly trained and qualified personnel should work on this equipment.

More than one person may be required to complete the assembly and installation. Installer(s) must be properly trained and qualified to lift, move and manipulate very heavy equipment from floor level to the top of the unit. Wear appropriate, OSHA-approved PPE when moving, lifting, installing, and removing the fan(s) and plenum. Read and follow the lifting equipment and/or ladder manufacturer's operating instructions and safety requirements.



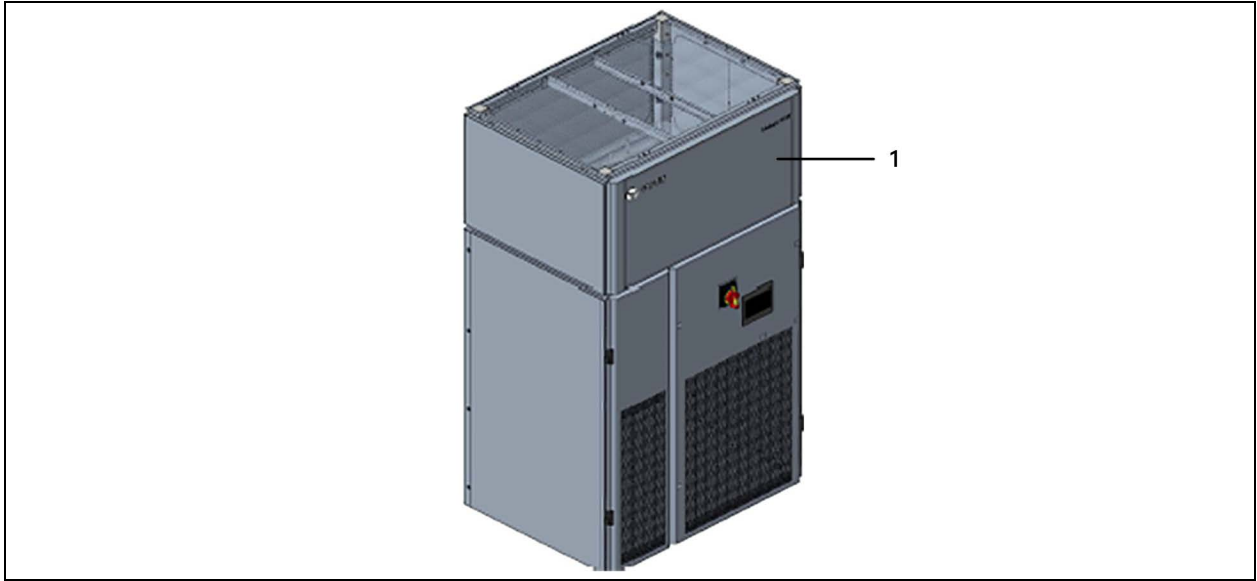
CAUTION: Risk of improper moving, lifting and handling. Can cause injury. Building and equipment damage may also result. Only properly trained and qualified personnel should work on this equipment. Evaporator fan modules weigh in excess of 125-lb (56.7-kg). Use proper lifting techniques and wear appropriate OSHA-approved PPE to avoid injury and dropping the fan module 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.

Refer to the fan manufacturer's instructions for transporting, handling, and mounting the fans. After reassembling, connect the fan to a laptop and use the configuration software provided by the manufacturer to set the fan Modbus address (see [Setting Modbus Devices](#) on page 81 and the Liebert® PCW Control Application for details).

13.5.4 Replacing a Fan - Upflow Units

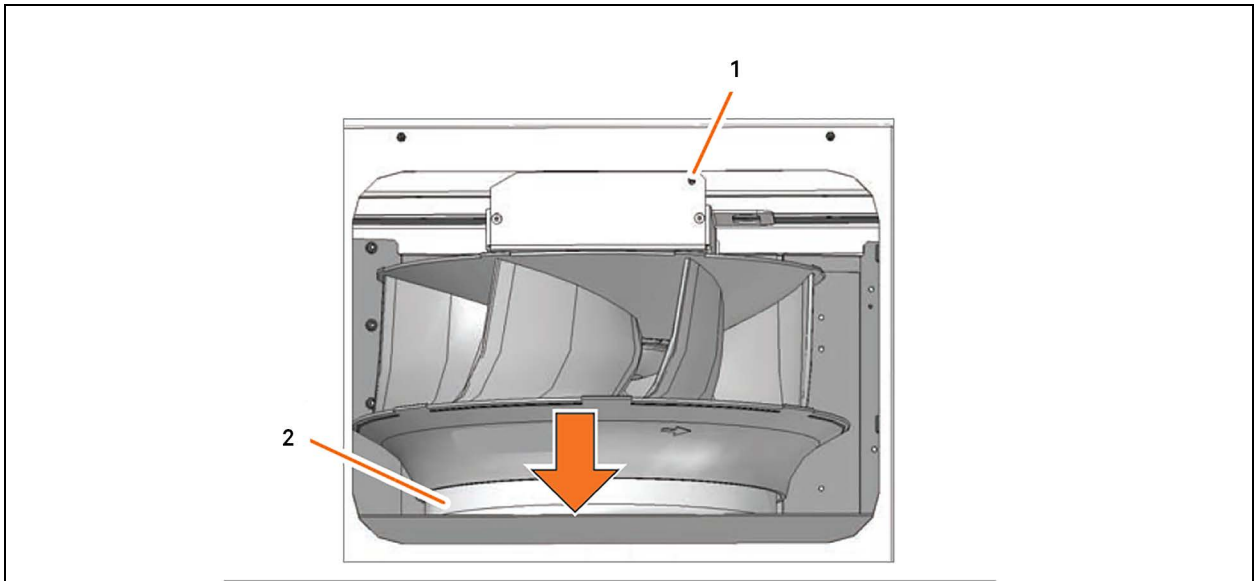
1. Remove the panel. See **Figure 13.8** on the facing page .
2. Disconnect the fan electrical cable from the connector.
3. Remove the screw and slowly put down the fan on its inlet collar. See **Figure 13.9** on the facing page .
4. Remove the screw. See **Figure 13.10** on page 114 .
5. Lift the fan higher than its inlet collar.
6. Pull the handle to slide the fan out of the bay.
7. Proceed in reverse order to reassemble the fan.

Figure 13.8 Removing Panel



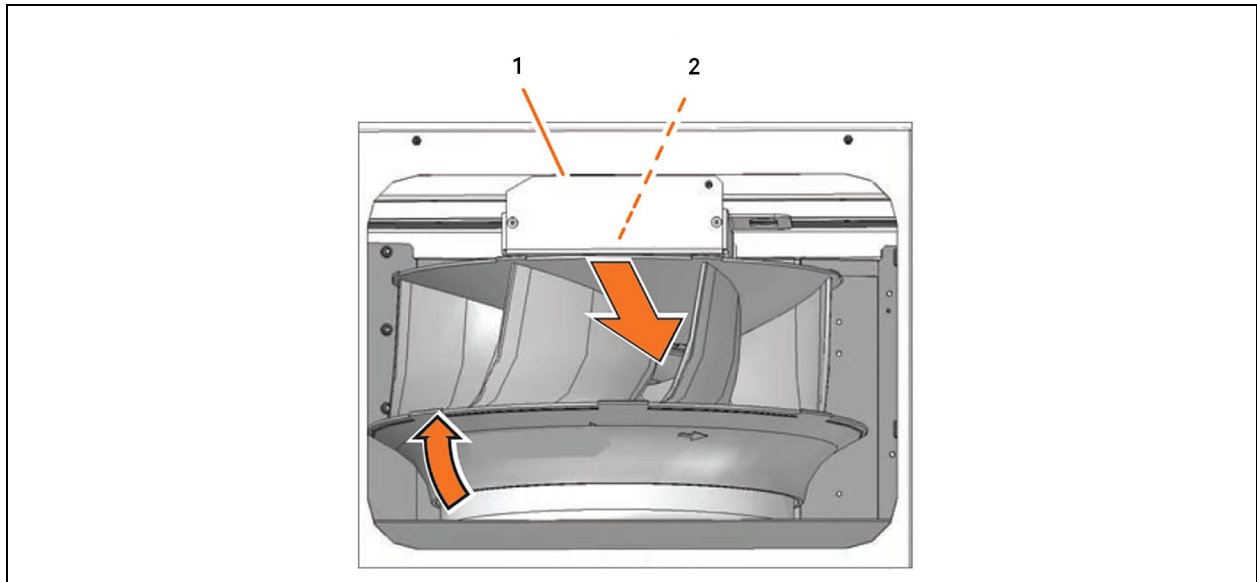
Item	Description
1	Panel

Figure 13.9 Fan with Inlet Collar



Item	Description
1	Screw
2	Inlet collar

Figure 13.10 Fan with Handle



Item	Description
1	Screw
2	Handle

13.5.5 Replacing a Fan - Downflow Units

1. Remove a few floor tiles in front of the fan section.
2. Remove any obstacle in front of the fans to allow the fan extraction (raised floor structure, piping, etc.).
3. Remove the panel or the grid. See **Figure 13.12** on the facing page .
4. Disconnect the fan electrical cable from the connector.
5. Remove the two front screws that attach the fan support to the sliding bars. See **Figure 13.13** on page 116 .
6. Loosen the two back screws that attach the fan support to the sliding bars. **Figure 13.13** on page 116 .
7. Slide down the fan by pulling the handle. See **Figure 13.14** on page 116 .
8. Completely remove the two screws on the back of the fan. See **Figure 13.13** on page 116 .
9. Pull the handle to slide the fan out of the bay.

Figure 13.11 Fan - Downflow Unit

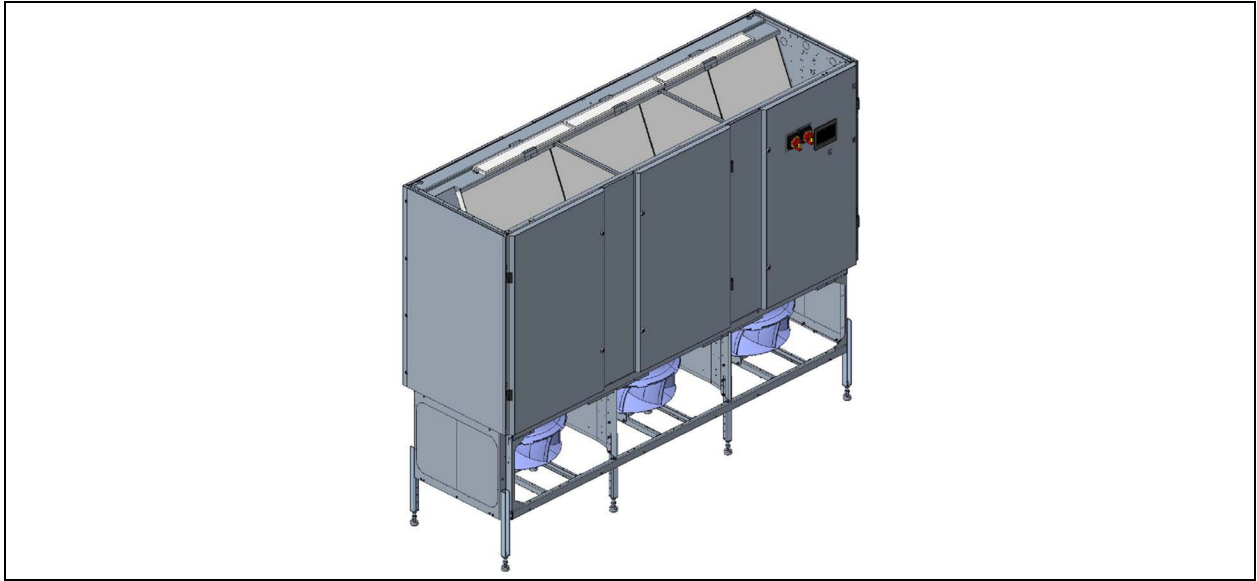
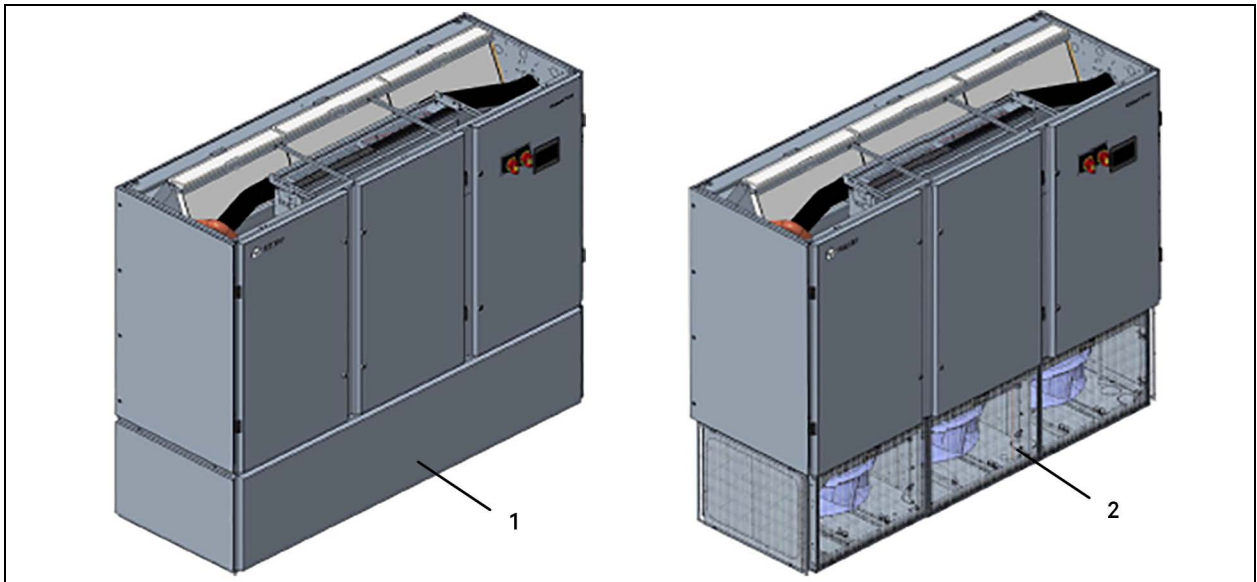
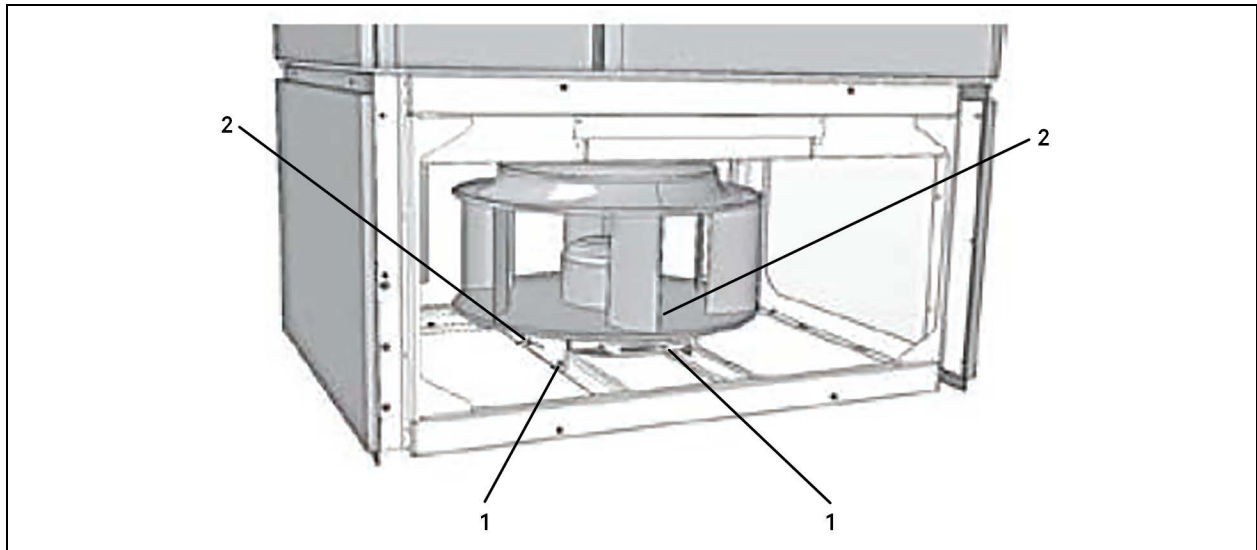


Figure 13.12 Removing Panel or Grid



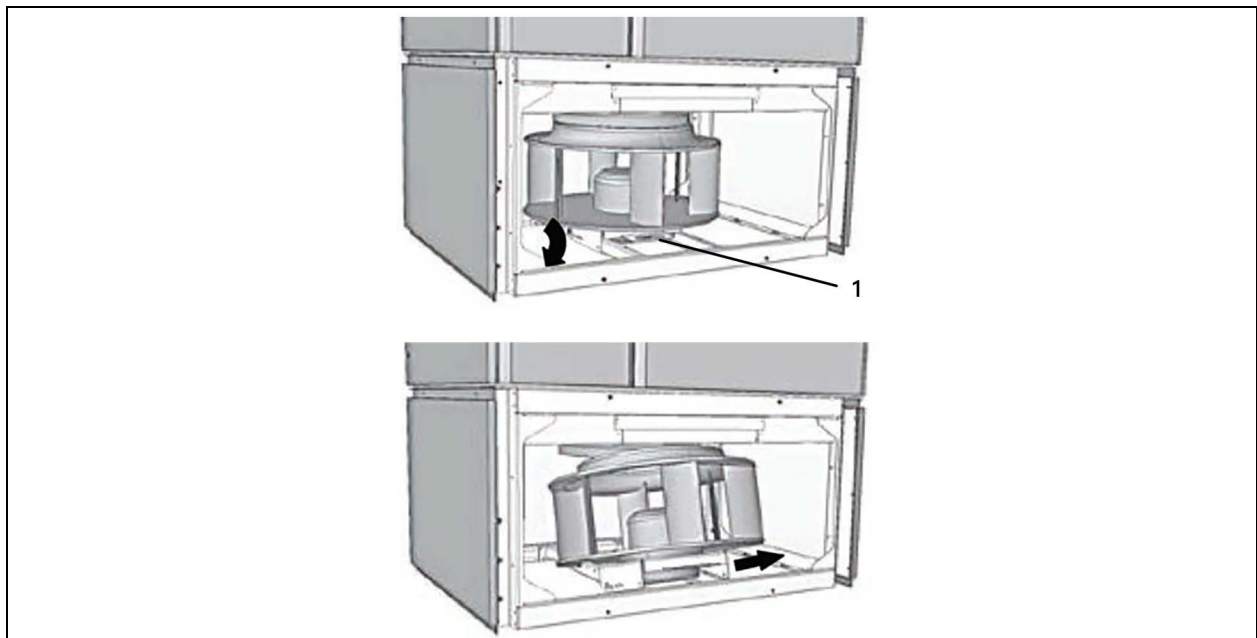
Item	Description
1	Panel
2	Grid

Figure 13.13 Disconnect Fan Electric Cable



Item	Description
1	Front screws
2	Back screws

Figure 13.14 Removing Fan from the Bay



Item	Description
1	Handle

13.5.6 Replacing the Valve Actuator - 2/3 Way Valves

1. Turn off the unit by setting the disconnection switch of the unit to position “0”.
2. Disconnect the 4 pin connector from the actuator.
3. Press the clutch button down and hold it in position by pressing the latch.
4. Manually turn the valve using the actuator handle until you reach the end stop.
5. To remove the actuator follow instructions included with the replacement.
6. To install new actuator it is necessary to set ring to end stop. Then proceed with steps 5 through 1 in this order.

13.6 Calibrations

A misuse or an incorrect calibration of the unit leads to increased energy consumption, resulting in an economic and environmental damage.

For control system calibrations refer to Liebert® PCW Control Application.

13.6.1 Clogged Filter Differential Pressure Switch

Adjustment range: 0.5 – 4 mbar

Setting: 3 mbar (300 Pa)

To replace the clogged filter differential pressure switch, turn the screw to adjust the setting. See **Figure 13.15** below .

Figure 13.15 Clogged Filter Differential Pressure Switch



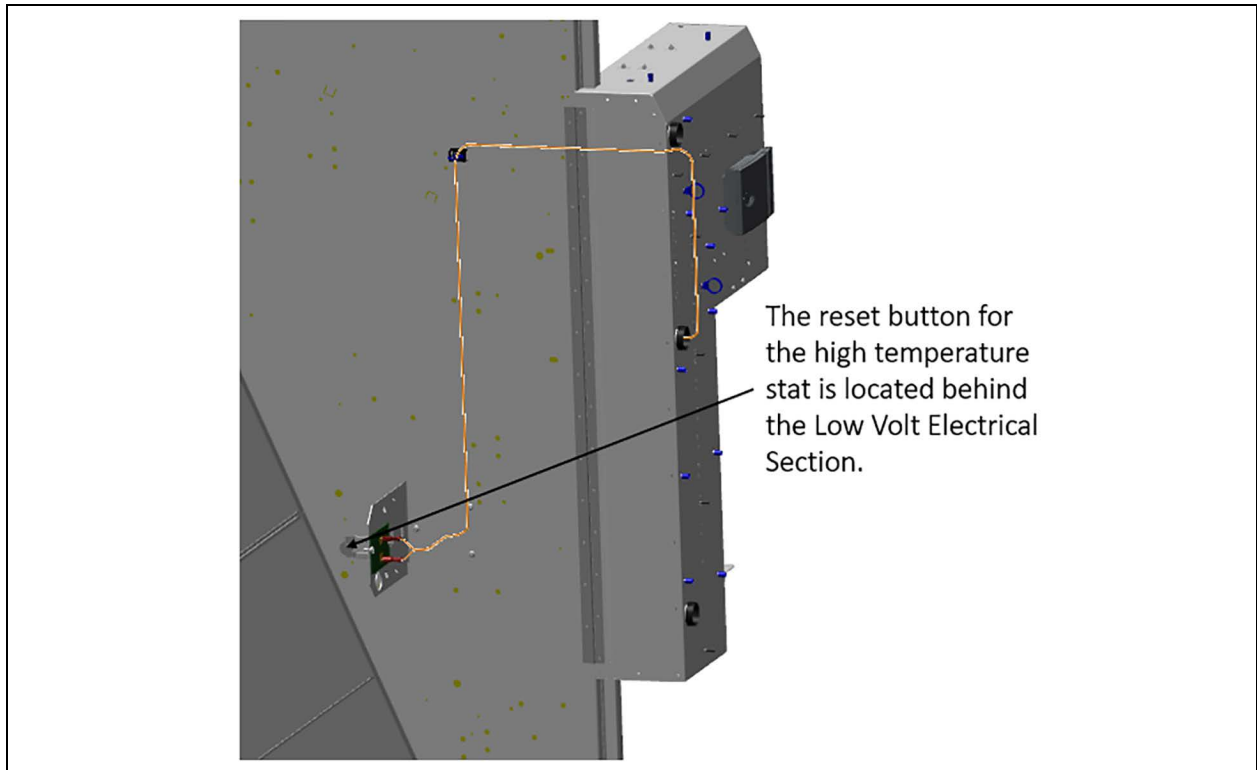
Item	Description
1	Adjustment screw

13.6.2 Temperature Safety Switch (if heating is present)

Setting: 125°F +/- 6°F

Manual reset

Figure 13.16 High Temperature Stat Reset Switch



14 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 # and the information in the [Nomenclature and Components](#) on page 11.

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 is unrestricted.
3. Wipe section clean.
4. Clean coil.
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
#4	L1	L2	L3

Reheat (if equipped)

1. Inspect elements.
2. Check/re-torque wire connections (inside reheat box).
3. Reheat amp draw.

#1	#2	#3
----	----	----

Infrared Humidifier (if equipped)

1. Check drain lines and trap for clogs/leaks.
2. Check/clean pan for mineral deposits.
3. Clean reflector.
4. Check water make-up valve for leaks.
5. Check humidifier lamps (replace if burnt out).
6. Check/re-torque wire connections (inside humidifier box). Torque is: Ceramic terminals - 35 lb-in., thermostat - 18 lb-in.
7. Check humidifier high water alarm operation.
8. Humidifier Amp draw.

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. Torque values:

Disconnects

-5 to 60A

4-6AWG wire - 35 lb-in

6-8AWG wire - 30 lb-in

8-18AWG wire - 20 lb-in

-65 to 100A

12-18AWG wire - 20 lb-in

10AWG wire - 25 lb-in

8AWG - 40 lb-in

4-6AWG - 45 lb-in

1-3AWG - 55 lb-in

Main power GND Lug - 75 lb-in

ATS Terminals - 5 lb-in

ATS contactors

Rated at 40A

Power - 35 lb-in

Coil and auxiliary switches - 11 lb-in

Rated at 80A & 96A

Power - 53 lb-in

Coil and auxiliary switches - 11 lb-in Power distribution block

Line side - 2/0 - 1/0AWG wire - 120 lb-in

1-6AWG wire - 120 lb-in

8AWG wire - 40 lb-in

10AWG wire - 35 lb-in

Load side - 4-14AWG wire - 35 lb-in

ATS Transformer Fuse Holders - 30 lb-in

PS Relay - 10 lb-in

GND bar - 35 lb-in

Power Meter - 4.5 lb-in

Low Volt Relays - 8 lb-in

Low Volt Fuses - 6 lb-in

Controller - 6 lb-in

Power din rail terminals - 15 lb-in

Cube Fuse Holders

30A 18-12AWG wire - 20 lb-in

10-8AWG wire - 25 lb-in

60A 18-10AWG wire - 20 lb-in

8-4AWG wire - 35 lb-in

Option Contactors

Power - 22 lb-in

Coil and auxiliary switches - 11 lb-in

Harmonic Filter Contactor

Power - 35 lb-in

Coil and auxiliary switches - 11 lb-in

Controls

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

Chilled Water

1. Verify proper water maintenance is being performed.
2. Check coil and supply/return lines/connections for water/glycol leaks.

15 Troubleshooting

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.

Symptom	Possible Cause	Check or Remedy
The unit does not start.	No power supply to the unit.	Check voltage at the input terminal block.
	The circuit breaker or fuse for the low voltage transformer in unit is tripped.	Locate the problem in the unit electrical panel and repair.
	Remote On/Off	Check the remote switch.
	The local control switch is opened.	Check the local switch (green=On).
High vibration on the unit	The piping is not properly fixed.	Check the piping.
	Fans have debris on blades	Check fans.
A Modbus component is not read.	Wrong Modbus cabling.	Check the cabling.
	The address name is not correct.	Check the address.
The fans do not run.	The power cables are not connected.	Connect the cables.
	There is no signal.	Check the Modbus chain.
	The fuses are open.	Check fuses.
The unit is noisy.	The fan is noisy.	Check the fan mounting.

This page intentionally left blank

16 Dismantling the Unit

The unit has been designed and built to ensure continuous operation. The working life of some of the main components depends on the maintenance that they receive. The unit must be dismantled if it is moved to another site, or at the end of its technical and operational life.



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.

Read [Important Safety Instructions](#) on page 1.

Pay attention to the safety labels on the unit and to the safety warnings in this chapter.

ENVIRONMENT

The unit contains substances and components hazardous for the environment (for example: electronic components).

At the end of useful life, when the unit is dismantled, the operation must be carried out by specialized refrigerating technicians.

The unit must be delivered to suitable centers specializing in the collection and disposal of equipment containing hazardous substances.

The components must be recovered according to the laws in force at the installation site.

16.1 Operations

Operation	Notes
1. Disconnect the disconnecting switch from the electric power supply.	Reverse the procedure from Power Supply Cable on page 75 .
2. Drain the water.	See Draining the Chilled Water System on page 105 .
3. Cut the piping at inlet and outlet of the unit.	
4. Remove the unit.	Reverse the procedure from Installing the Unit on page 69 .
5. Move away the unit.	See Equipment Inspection and Handling on page 27 .
6. If you need to keep the unit in storage for reuse	See Storage Conditions on page 16 .
If you need to scrap the unit	Contact an authorized disposal company according to the local regulations about waste disposal.

This page intentionally left blank

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

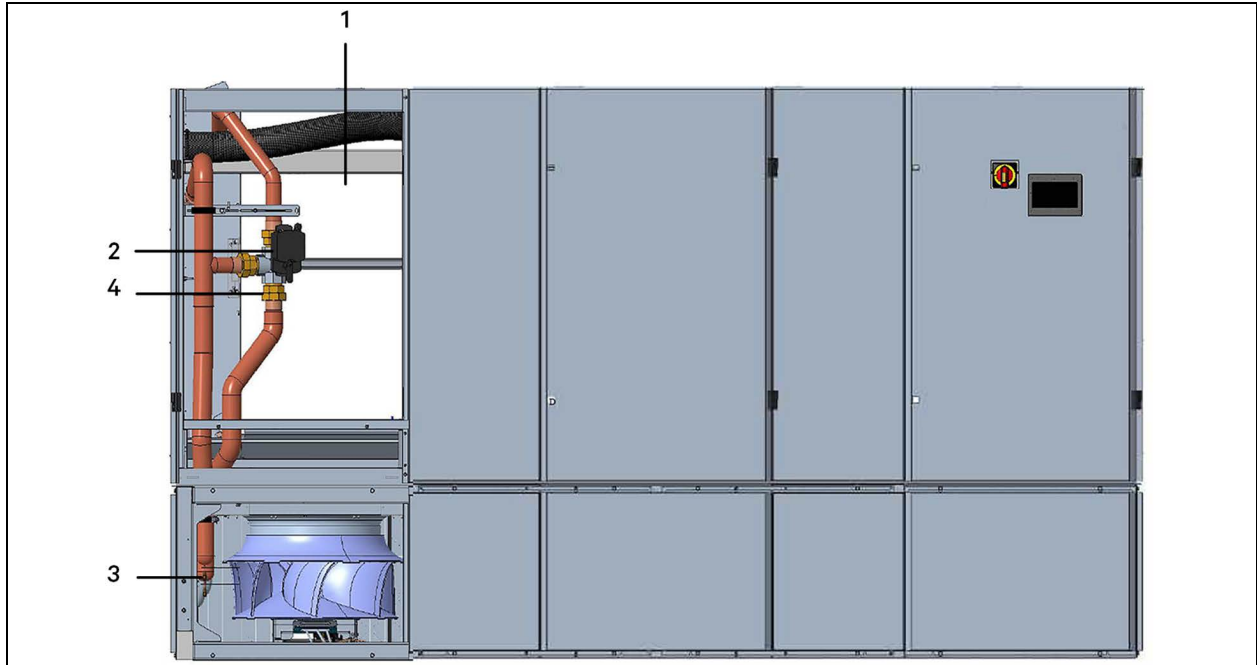
Wanchai, Hong Kong

This page intentionally left blank

Appendix B: Chilled Water Circuit

B.1 Single Chilled Water Circuit - PW035-PW170

Figure B.1 Single Chilled Water Circuit



Item	Description
1	Chilled water coil
2	Chilled water 2-way or 3-way valve
3	
4	Valve fittings

This page intentionally left blank

Appendix C: Connections

Table C.1 Piping and Electrical Connections - Downflow Versions

Unit Connection		Sizes			
Point	Description	PW035, PW040	PW045, PW060	PW070, PW080	PW090, PW110, PW145, PW170
ICW	Chilled water inlet (single chilled water circuit)	O.D. Cu 41 mm (1-5/8 in.)		O.D. Cu 54 mm (2-1/8 in.)	O.D. Cu 067 mm (2-5/8 in.)
OCW	Chilled water outlet (single chilled water circuit)	O.D. Cu 41 mm (1-5/8 in.)		O.D. Cu 54 mm (2-1/8 in.)	O.D. Cu 067 mm (2-5/8 in.)
CD	Condensate drain	I.D. Hose 019 mm (3/4 in.)			-
CD1, CD2	Condensate drain	-			I.D. Hose 019 mm (3/4 in.)
CDO	Condensate drain overflow	I.D. Hose 032 mm (1-1/4 in.)			-
CDO1, CDO2	Condensate drain overflow	-			I.D. Hose 1-1/4 in. (032 mm)
HF/HD	Humidifier drain/humidifier supply	I.D. Hose 19 mm (3/4 in.) / O.D. Cu 6 mm (1/4 in.)			
EC	Electrical power supply	022 mm (7/8 in.)			
EC Aux	Low voltage cables	029 mm (1-1/8 in.)			
EC CP	Electrical power supply, condensate pump	09.5 mm (3/8 in.)			

NOTE: Dimensions are in millimeters (inches).

NOTE: For the height from unit bottom see submittals.

Figure C.1 Downflow Units, Dimensions for Piping Bottom Option

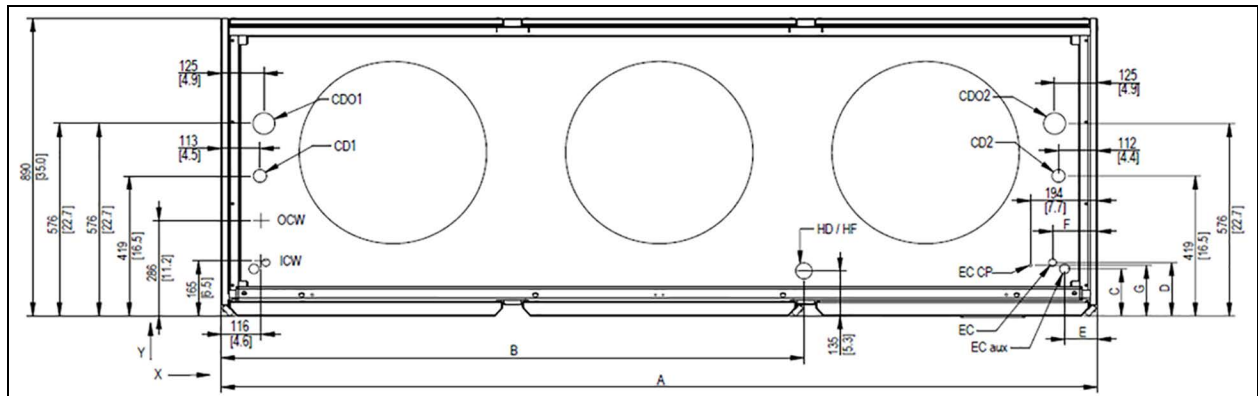


Table C.2 Downflow Units, Dimensions for Bottom Piping Option

Unit Connection	PW035 PW040	PW045 PW060	PW070 PW080	PW090 PW110	PW145	PW170
Dimensions for Piping Bottom Option Figure C.1 on the previous page						
A	1200 mm (47.2 in.)	1750 mm (68.9 in.)	2050 mm (80.7 in.)	2550 mm (100.4 in.)	2950 mm (116.1 in.)	3350 mm (131.9 in.)
B	261 mm (10.3 in.)	1341 mm (52.8 in.)	1175 mm (46.3 in.)	1696 mm (66.8 in.)	2025 mm (79.7 in.)	2372 mm (93.4 in.)
C	127 mm (5.0 in.)	163 mm (6.4 in.)	163 mm (6.4 in.)	141 mm (5.6 in.)	141 mm (5.6 in.)	141 mm (5.6 in.)
D	152 mm (6.0 in.)	123 mm (4.8 in.)	163 mm (6.4 in.)	160 mm (6.3 in.)	160 mm (6.3 in.)	160 mm (6.3 in.)
E	101 mm (4.0 in.)	110 mm (4.3 in.)	106 mm (4.2 in.)	95 mm (3.7 in.)	96 mm (3.8 in.)	96 mm (3.8 in.)
F	136 mm (5.4 in.)	100 mm (3.9 in.)	141 mm (5.6 in.)	130 mm (5.1 in.)	131 mm (5.2 in.)	131 mm (5.2 in.)
Dimensions for Piping Top and Piping Left Option Figure C.8 on page 138						
G	131 mm (5.2 in.)	131 mm (5.2 in.)	159 mm (6.3 in.)	152 mm (6.0 in.)	152 mm (6.0 in.)	152 mm (6.0 in.)

NOTE: All dimension are in millimeters (inches).

Figure C.2 Bottom Chilled Water Connections PW035, PW040, PW045, PW060, PW070, PW080 Downflow UP and Downflow Frontal, Side View

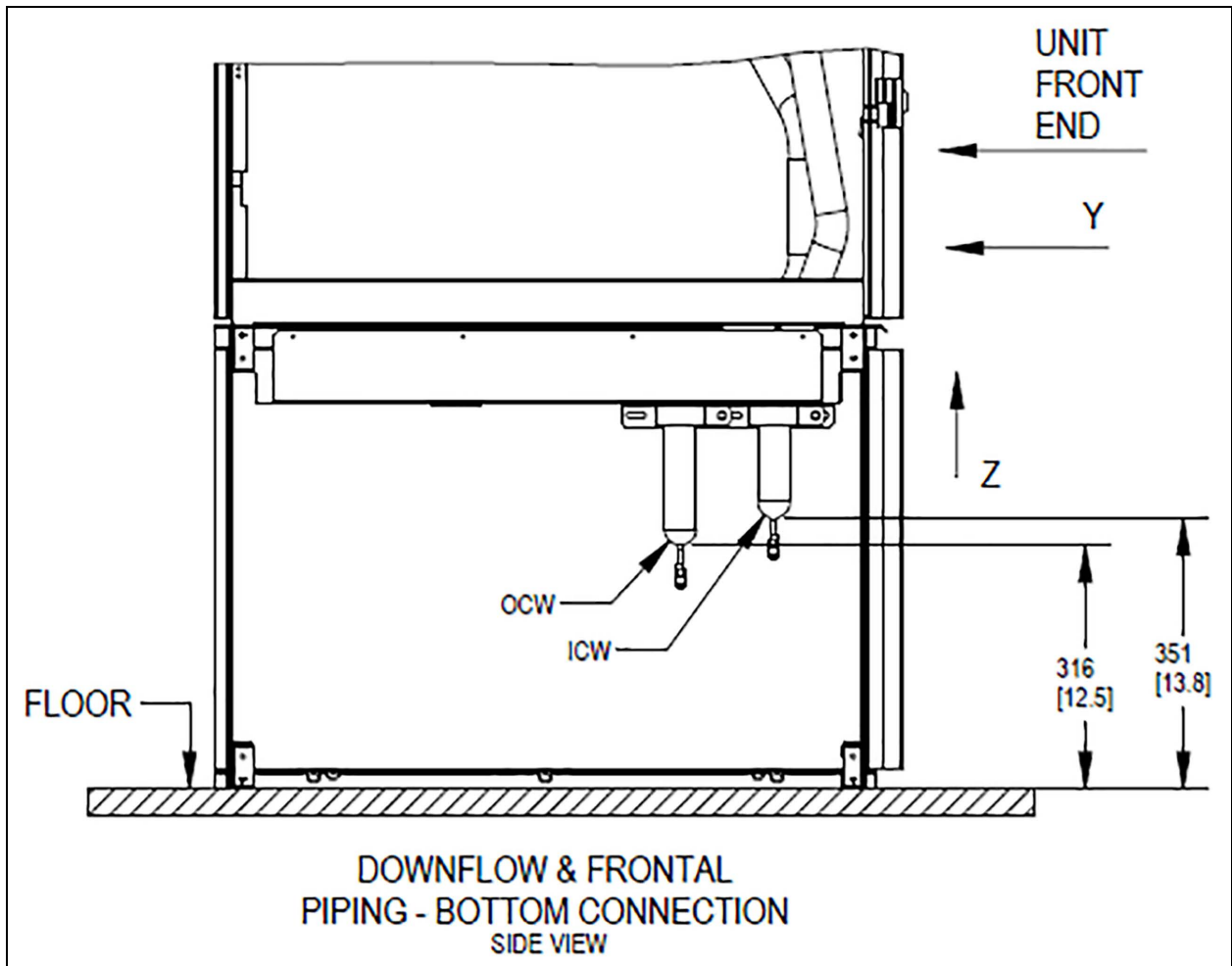


Figure C.3 Bottom Chilled Water Connections PW035, PW040, PW045, PW060, PW070, and PW080 Downflow Down, Side View

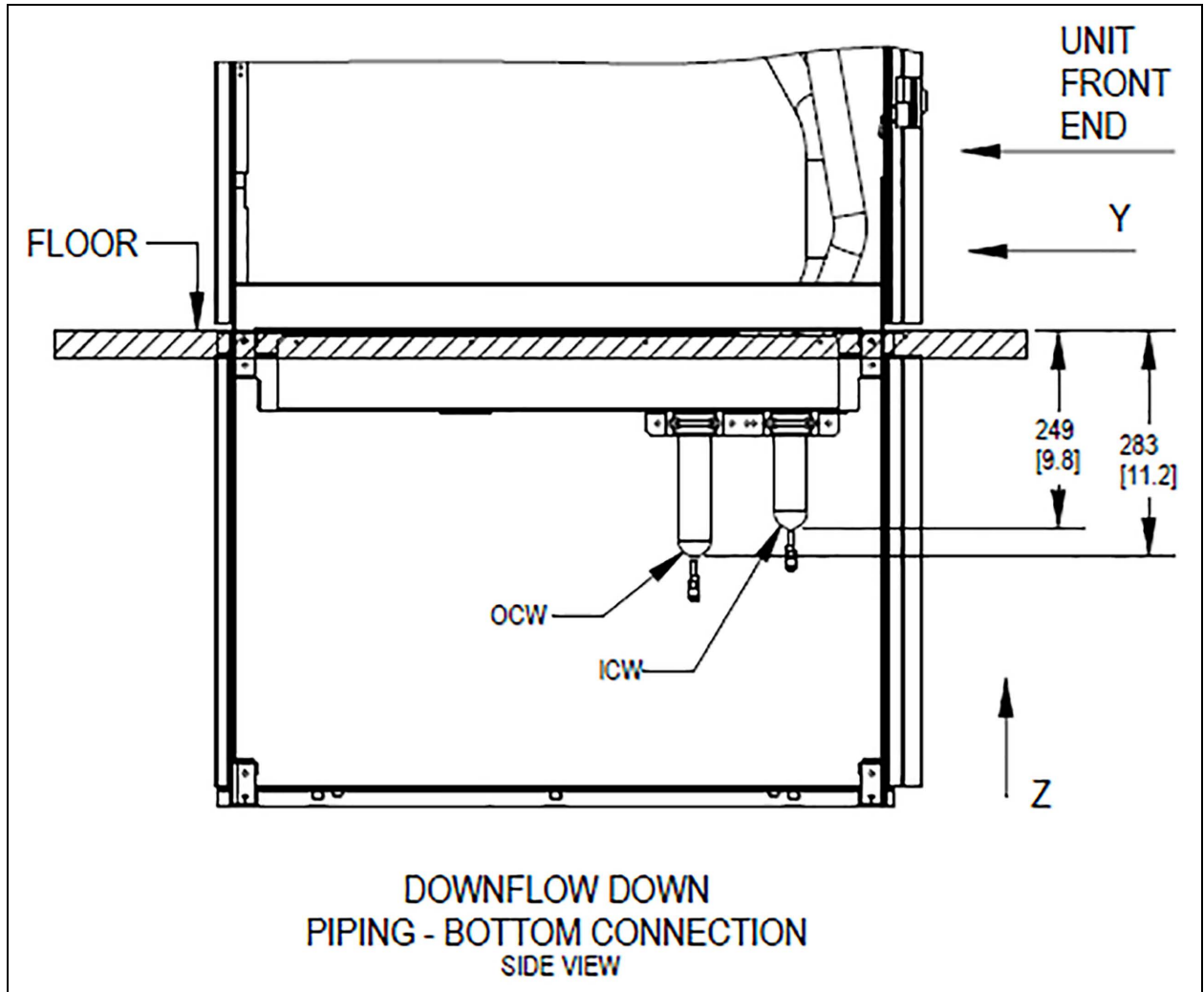


Figure C.4 Bottom Chilled Water Connections PW095, PW110, PW145, and PW170 Downflow Down, Side View

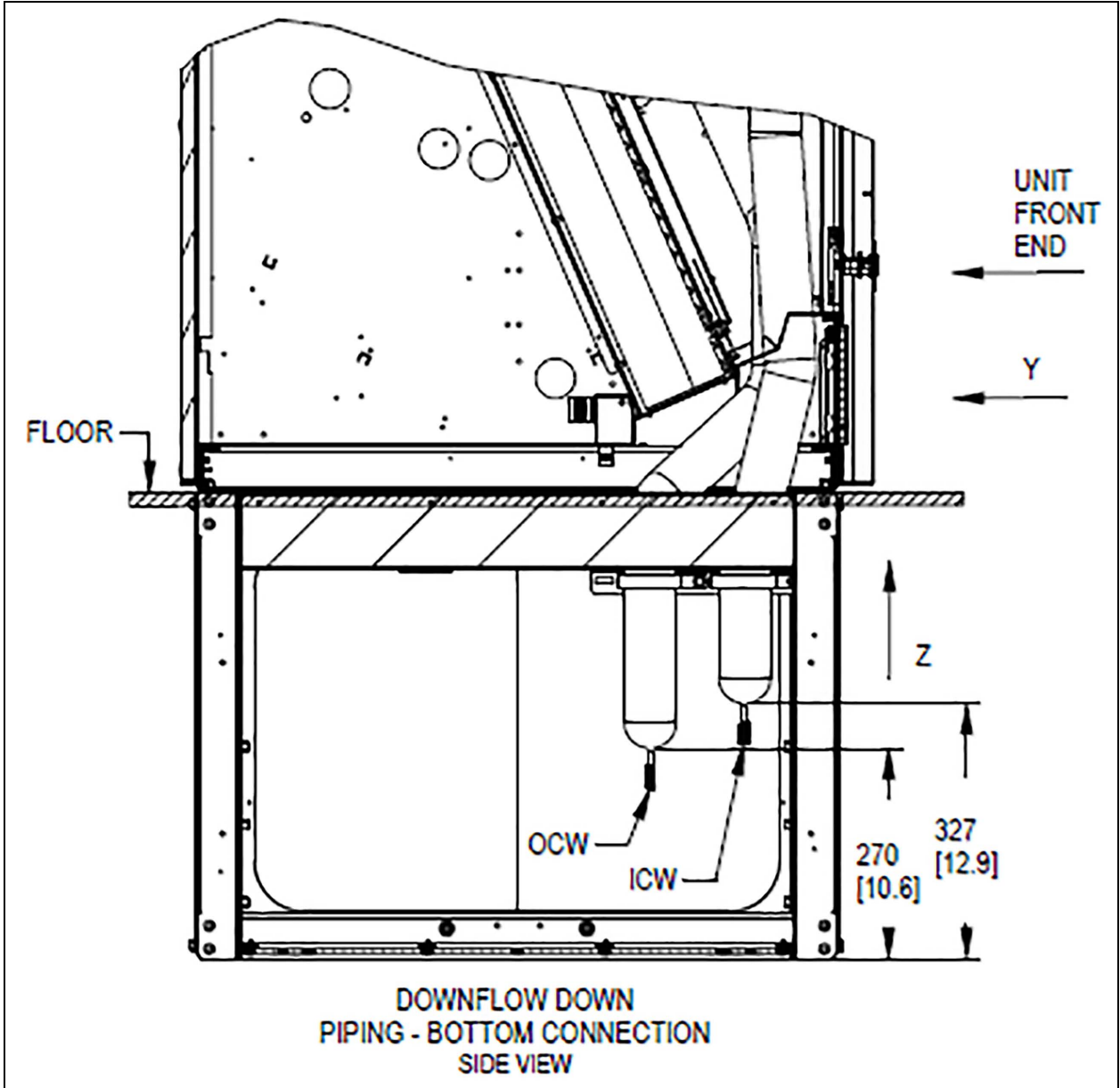


Figure C.5 Bottom Chilled Water Connections PW095, PW110, PW145, PW170 Downflow Up and Downflow Frontal, Side View

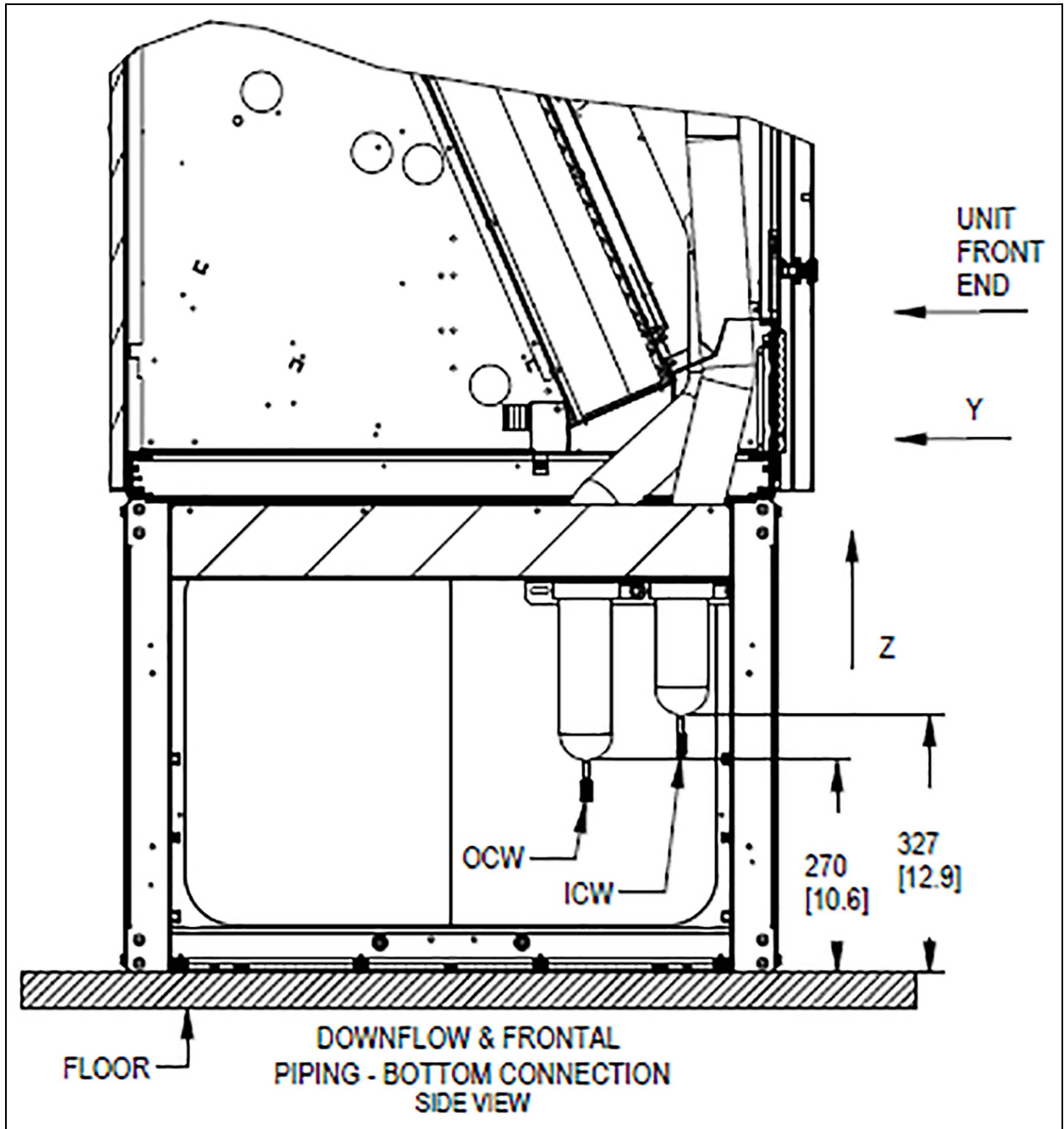


Table C.3 Piping and Electrical Connections - Upflow Versions

Unit Connection		Sizes			
Point	Description	PW035, PW040	PW045, PW060	PW070, PW080	PW090, PW110
ICW	Chilled water inlet (single circuit)	O.D. Cu 41 mm (1-5/8 in.)		O.D. Cu 54 mm (2-1/8 in.)	O.D. Cu 67 mm (2-5/8 in.)
OCW	Chilled water outlet (single circuit)	O.D. Cu 41 mm (1-5/8 in.)		O.D. Cu 54 mm (2-1/8 in.)	O.D. Cu 67 mm (2-5/8 in.)
CD	Condensate drain	I.D. Hose 019 mm (3/4 in.)			-
CD1, CD2	Condensate drain	-			I.D. Hose 019 mm (3/4 in.)
HD/HF	Humidifier drain/humidifier supply	I.D. Hose 19 mm (3/4 in.)/O.D. Cu 6 mm (1/4 in.)			
EC	Electrical power supply	022 mm (7/8 in.)			
EC Aux	Low voltage cables	029 mm (1-1/8 in.)			

NOTE: All dimensions are in millimeters (inches).

NOTE: For the height from the unit top see submittals.

Figure C.6 Piping and Electrical Connections - Upflow Versions

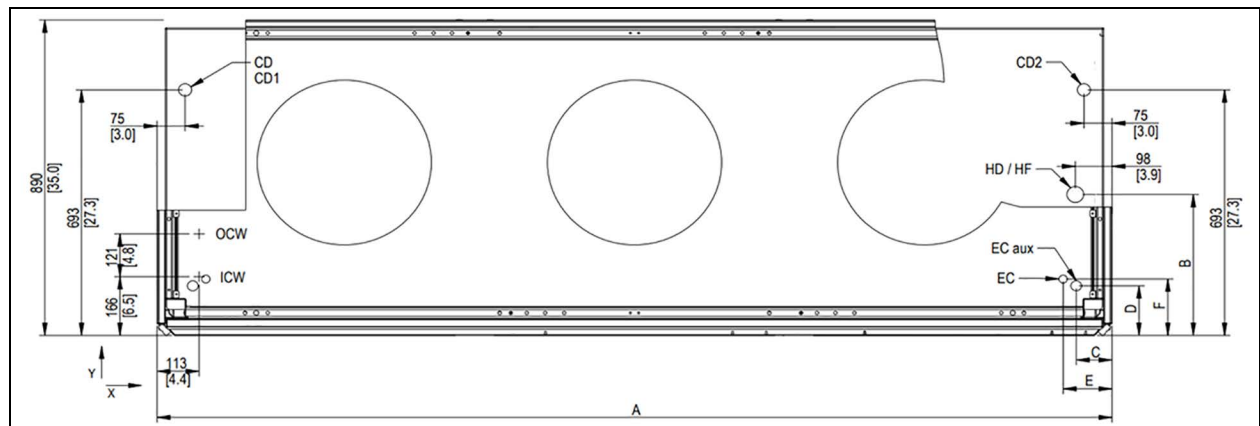


Table C.4 Upflow Unit, Dimensions for Piping Top and Piping Left Option

Unit Connection	PW035, PW040	PW045, PW060	PW070, PW080	PW090, PW110
A	1200 mm (47.2 in.)	1750 mm (68.9 in.)	2050 mm (80.7 in.)	2550 mm (100.4 in.)
B	355 mm (14.0 in.)	398 mm (15.7 in.)	398 mm (15.7 in.)	398 mm (15.7 in.)
C	167 mm (6.6 in.)	163 mm (6.4 in.)	164 mm (6.4 in.)	140 mm (5.5 in.)
D	109 mm (4.3 in.)	110 mm (4.3 in.)	106 mm (4.2 in.)	96 mm (3.8 in.)
E	144 mm (5.7 in.)	100 mm (3.9 in.)	141 mm (5.6 in.)	131 mm (5.2 in.)
F	167 mm (6.6 in.)	163 mm (6.4 in.)	164 mm (6.4 in.)	159 mm (6.3 in.)

NOTE: All dimensions are in millimeters (inches).

Figure C.7 Top Chilled Water Connections PW035, PW040, PW045, PW060, PW070, and PW080 Upflow Top, Side View

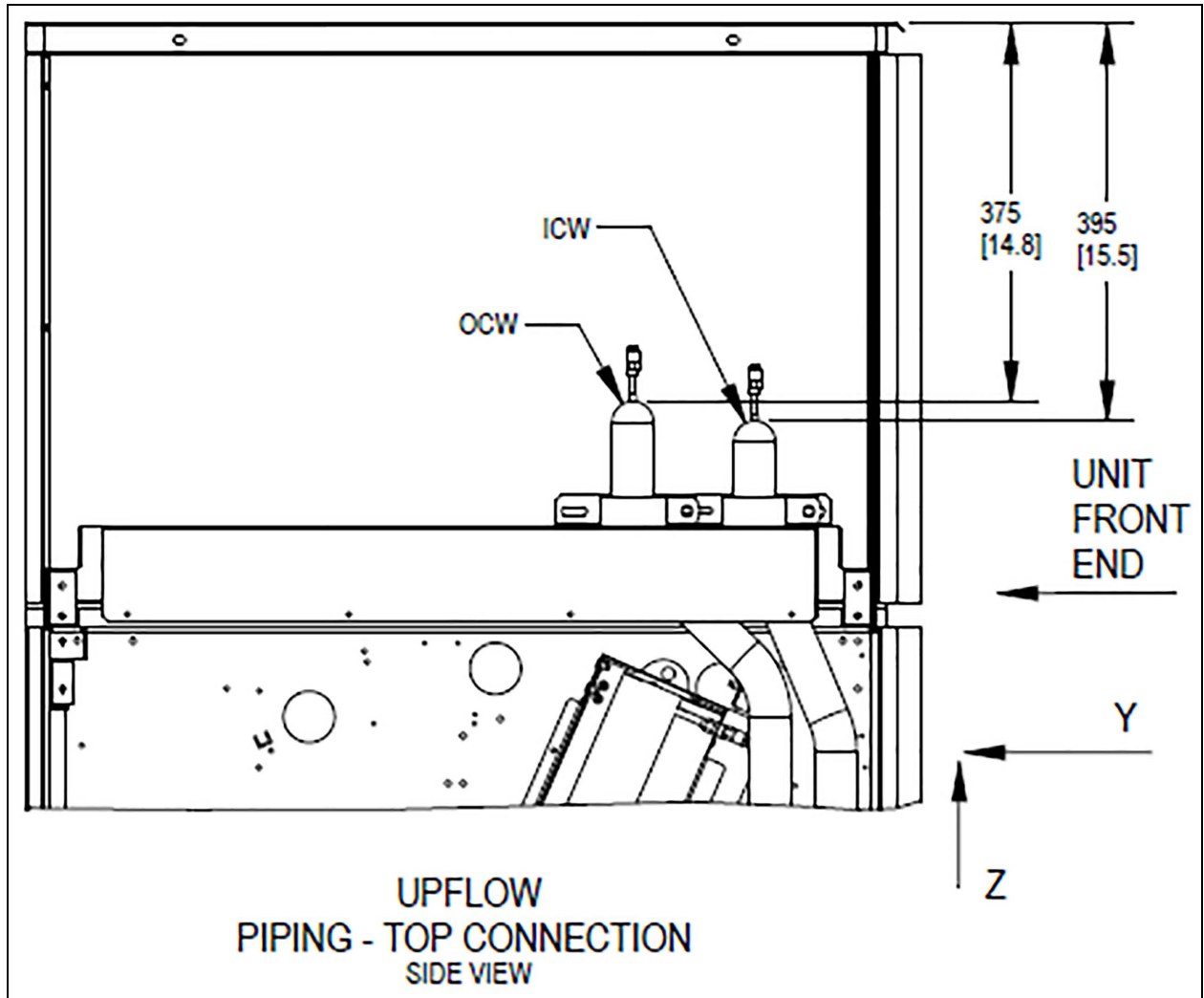


Figure C.8 Upflow Unit, Dimension for Piping Left Option

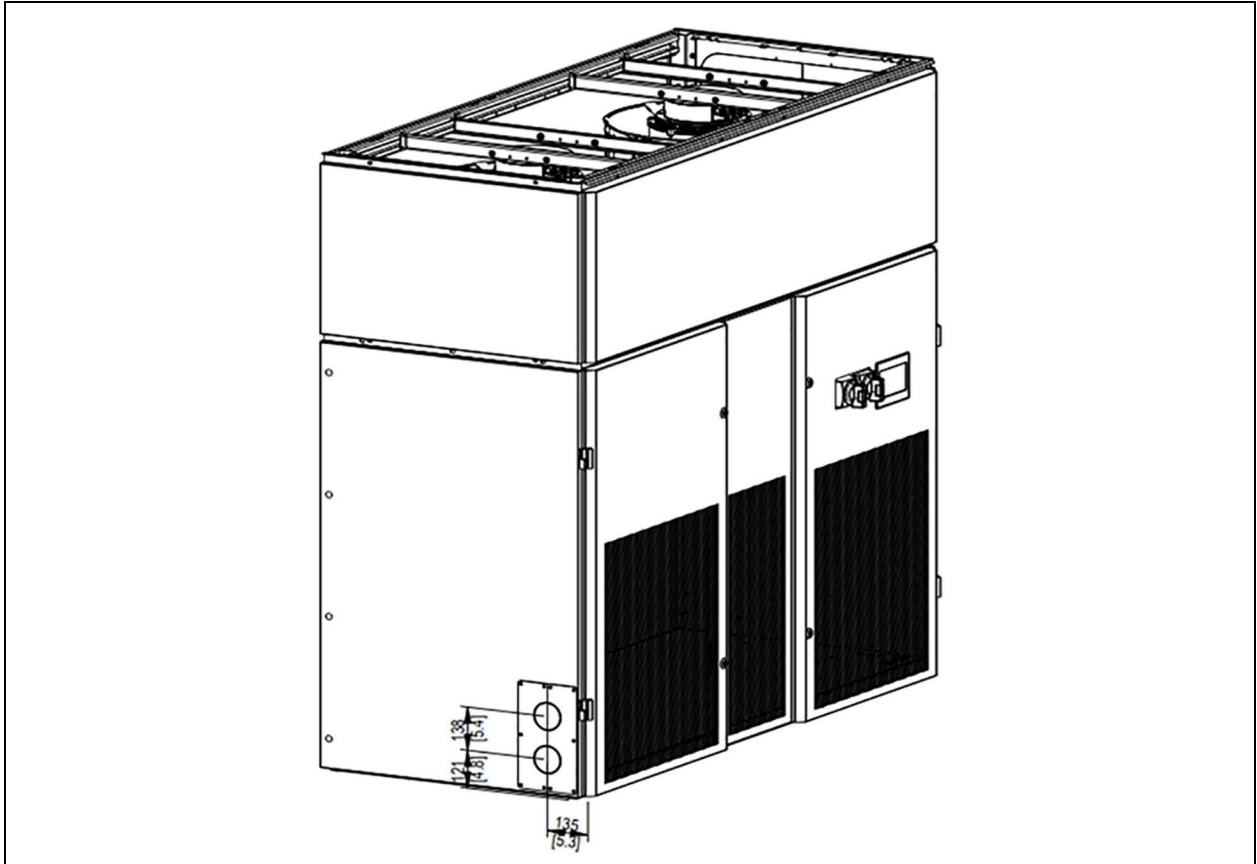


Figure C.9 Left Chilled Water Connection, Upflow Units

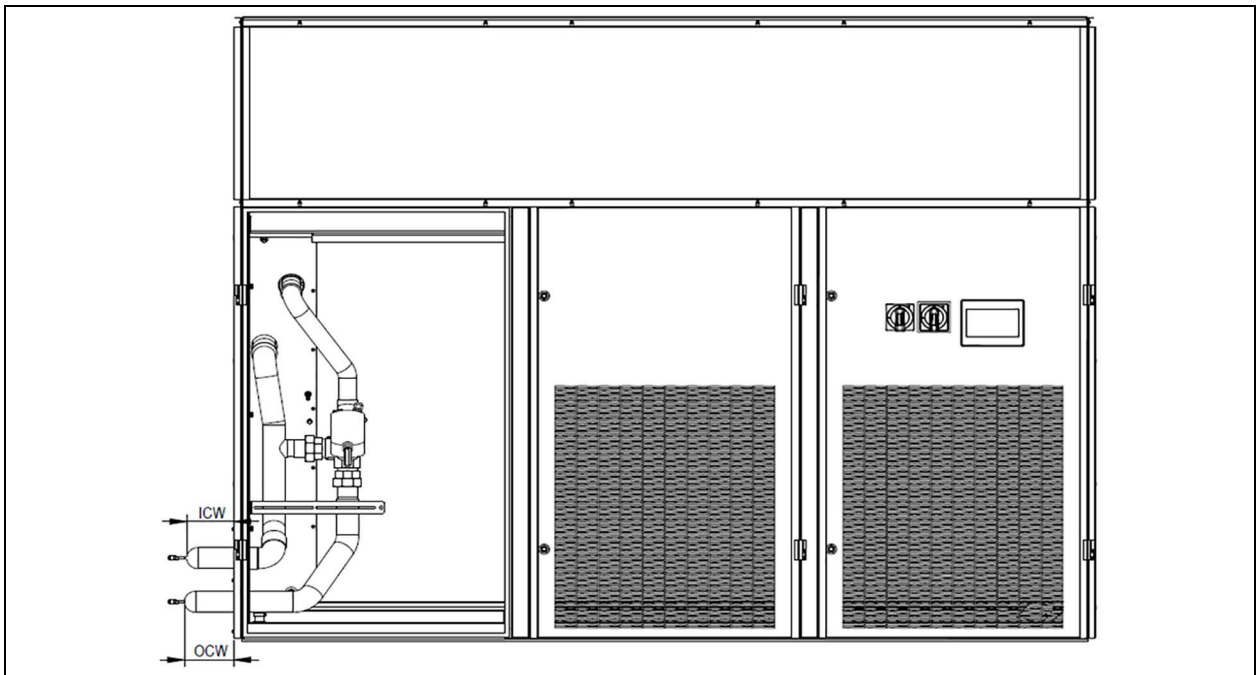


Table C.5 Left Chilled Water Connection, Upflow Units

Unit Connection	PW035, PW040	PW045, PW060	PW070, PW080	PW090, PW110
ICW	118 mm (4.7 in.)	101 mm (4.0 in.)	101 mm (4.0 in.)	136 mm (5.4 in.)
OCW	122 mm (4.8 in.)	101 mm (4.0 in.)	101 mm (4.0 in.)	136 mm (5.4 in.)

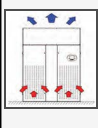
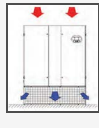
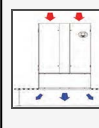
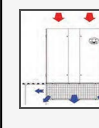
NOTE: All dimensions are in millimeters (inches).

This page intentionally left blank

Appendix D: Accessories

D.1 Overview

Table D.1 Accessories

Accessory	Purpose	Position	U - Upflow	H - Downflow Frontal	D - Downflow Up	E - Downflow Down
						
Legs Kit**	Support	Bottom	No	No	Yes	Yes
Floor Stand**	Support	Bottom	No	No	Yes	Yes
Pedestal*	Support and piping lay-down	Bottom	Yes	Yes	No	No
Vertical flow extension hood	Air Flow	Top	Yes	Yes	Yes	Yes
Horizontal hood with grid	Air Flow	Top	Yes	No	No	No
Leak Detectors	Water leak detection	Bottom	Yes	Yes	Yes	Yes
Leak detectors (i.e. 480160, LT410, LT460)	Water leak detection	Under the unit	Yes	Yes	Yes	Yes
*The pedestal is required for upflow and downflow frontal.						
**Either the floor stand or leg kit is required for downflow up or downflow down.						

D.2 Legs Kit

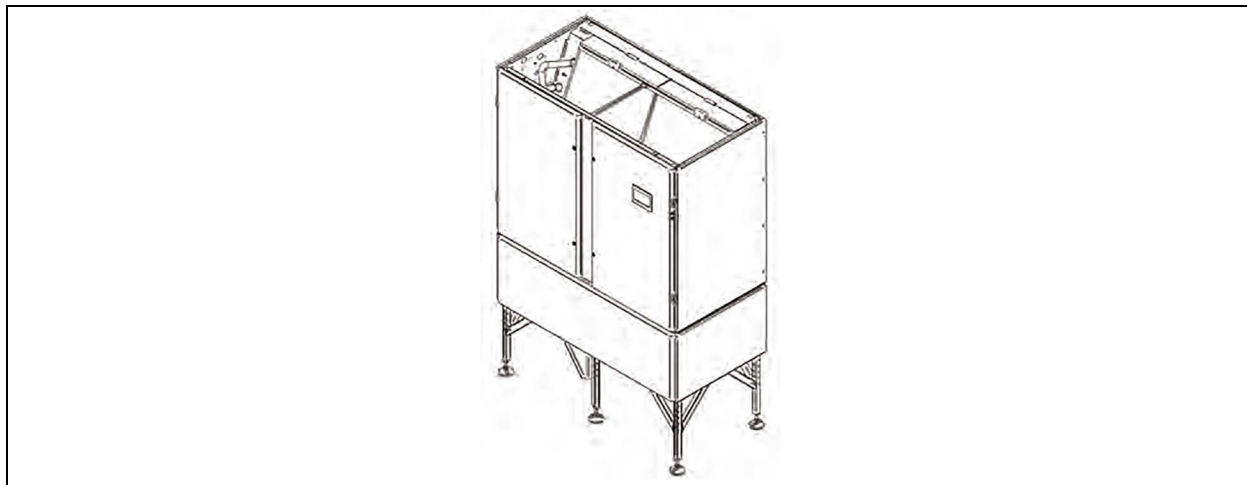


Table D.2 Legs Kit Description

Purpose	To support the unit when installed with a raised floor.
Description	The legs are adjustable and support the unit at different heights.
For Airflow Version	D - Downflow Up E - Downflow Down
Available Height	1.2-15 in. (30-370 mm) 15-22.4 in. (370-570 mm) 22.4-31.4 in. (570-800 mm) 31.4-48 in. (800 - 1219 mm)
Assembly	Fix the accessory using the threaded inserts that you find in the fan module frame. You need M8 screws (they are not supplied with the unit).

D.3 Floor Stand

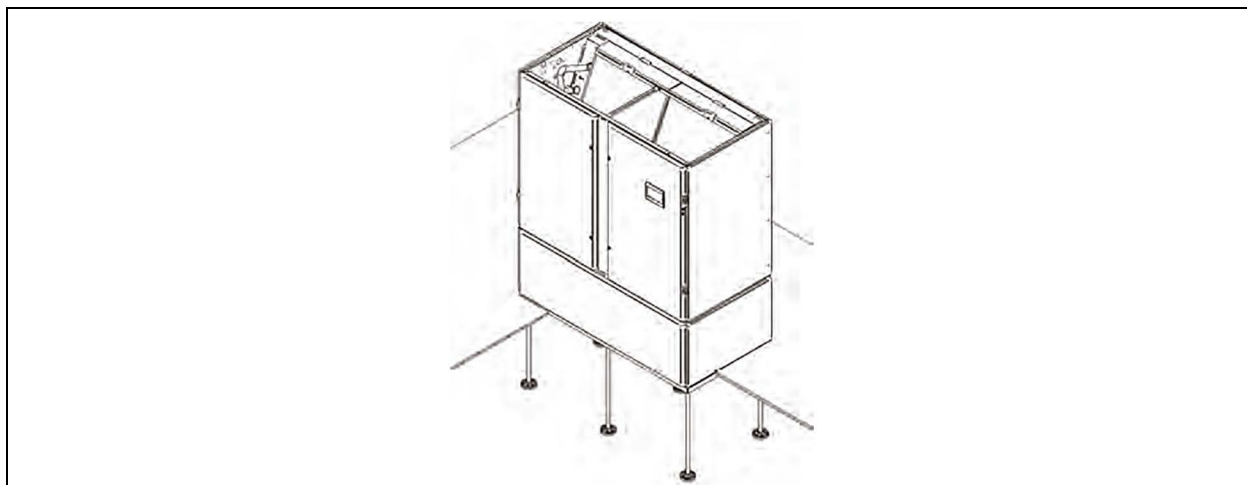
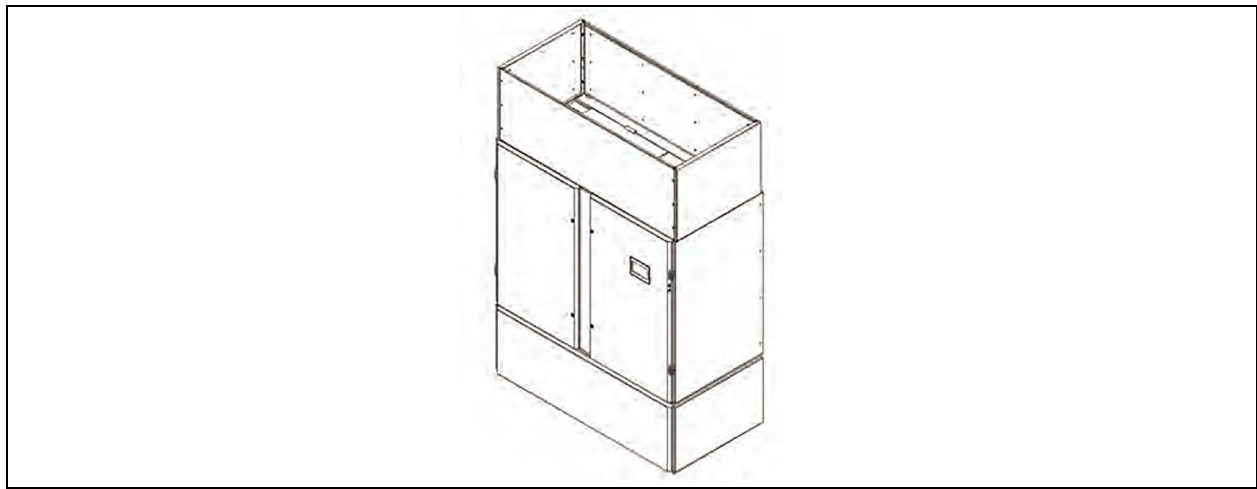


Table D.3 Floor Stand Description

Purpose	To support the unit when installed with a raised floor.
Description	The legs are adjustable and support the unit at different heights. A protective grid prevents any contact with the fans from below.
For Airflow Version	D - Downflow Up E - Downflow Down U - Upflow Frontal
Available Height	4.8-31.4 in. (120-800 mm)
Assembly	Attach the accessory using the threaded inserts that you find in the fan module frame. You need M8 screws (they are not supplied with the unit).

D.4 Vertical Flow Extension Hood

**Table D.4 Vertical Flow Extension Hood Description**

Purpose	Additional duct on the unit top to simplify the connection to the ceiling or to other equipment.
Description	The hood has the same design as the unit and consists of sandwich panels lined with nonflammable insulation material of class 0 (ISO 1182.2), density 30 kg/m ³ .
For Airflow Version	U - Upflow H - Downflow Frontal D - Downflow Up E - Downflow Down
Available Heights	20 in. (500 mm) 24 in. (600 mm) 31.4 in. (800 mm) 35.4 in. (900 mm)
Assembly	For the downflow units: first mount the connecting high flange on top of the unit. For all units: attach the accessory to the unit top by screws (the screws are not supplied with the unit).

D.5 Horizontal Hood with Grille

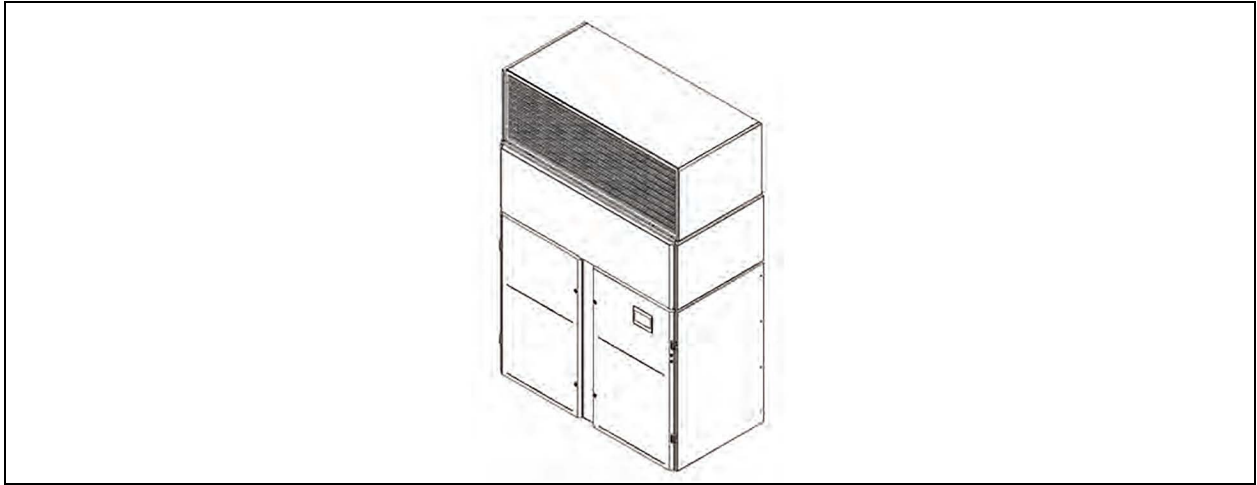


Table D.5 Horizontal Hood with Grille Description

Purpose	Airflow optimization noise reduction
Description	A supply plenum with horizontal air flow can be installed on top of the unit. The plenum consists of sandwich panels lined with non-flammable insulation material of class 0 (ISO 11822), density 30 kg/m ³ . It is equipped with a double deflection grill.
For Airflow Version	U - Upflow
Available Heights	24 in. (600 mm)
Assembly	For the downflow units: first mount the connecting high flange on top of the unit. For all units: Attach the accessory to the unit top by screws (the screws are not supplied with the unit).

D.6 Leak Detector - Liebert® Liqui-tect™

Figure D.1 LT410 - Point Leak Detection Sensor

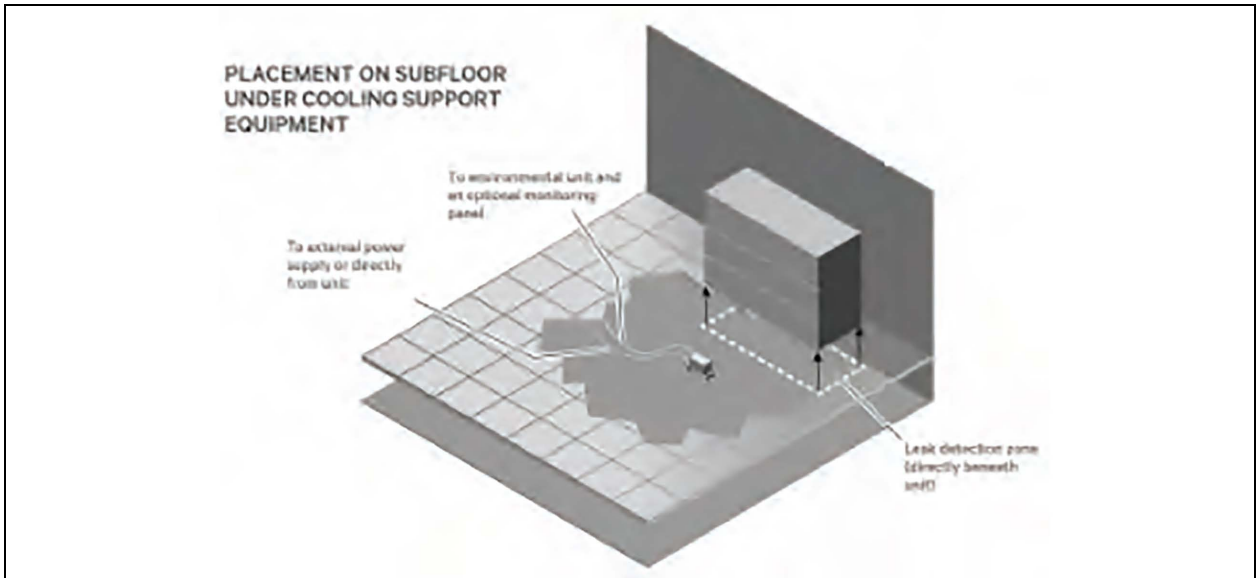


Figure D.2 LT460 - Zone Leak Detection Sensor with Cable

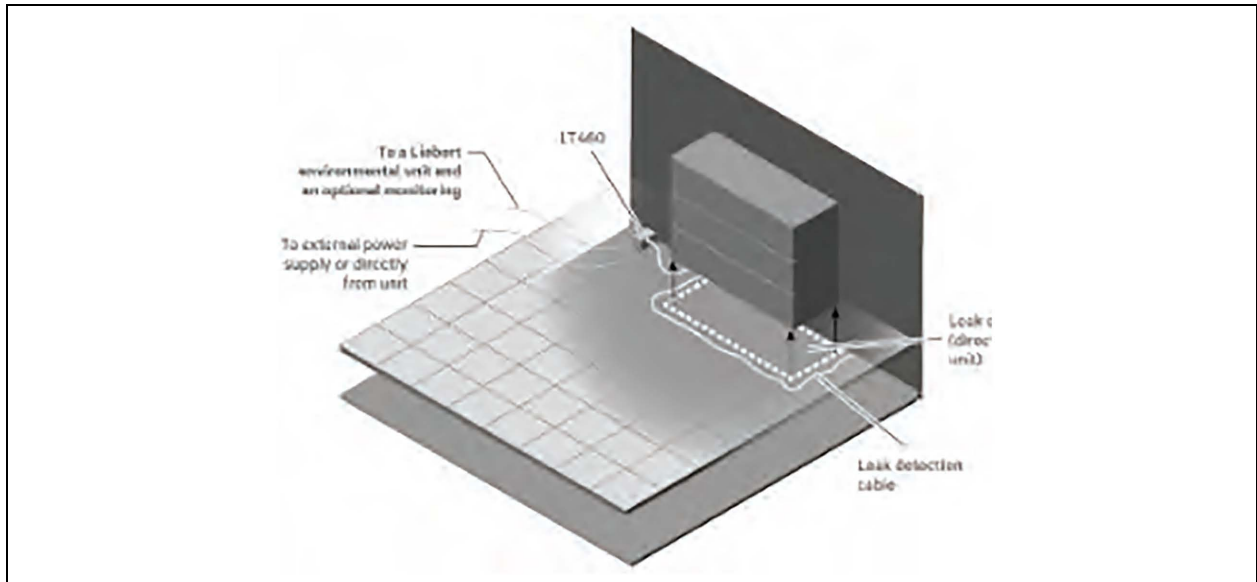


Table D.6 Leak Detector Sensor Description

Purpose	The flooding alarm detects the presence of water or any other conductive liquid and activates an alarm.
Description	Liebert® Liqui-tect™: It is made up of a corrosion-proof metal container, with access to the two terminals for connecting the line. The detector connection line must be terminated by a 10 kΩ resistor. Up to five sensors can be connected to the same flooding alarm device to control many points in the room. Leak detector: The flooding alarm detects the presence of water or any other conductive liquid and activates an alarm.
For Airflow Version	U - Upflow H - Downflow Frontal D - Downflow Up E - Downflow Down
Available Version	Liebert® Liqui-tect™ LT410 - Point leak-detection sensor LT460 - Zone leak-detection sensor with cable

D.7 Smoke/Fire Detector

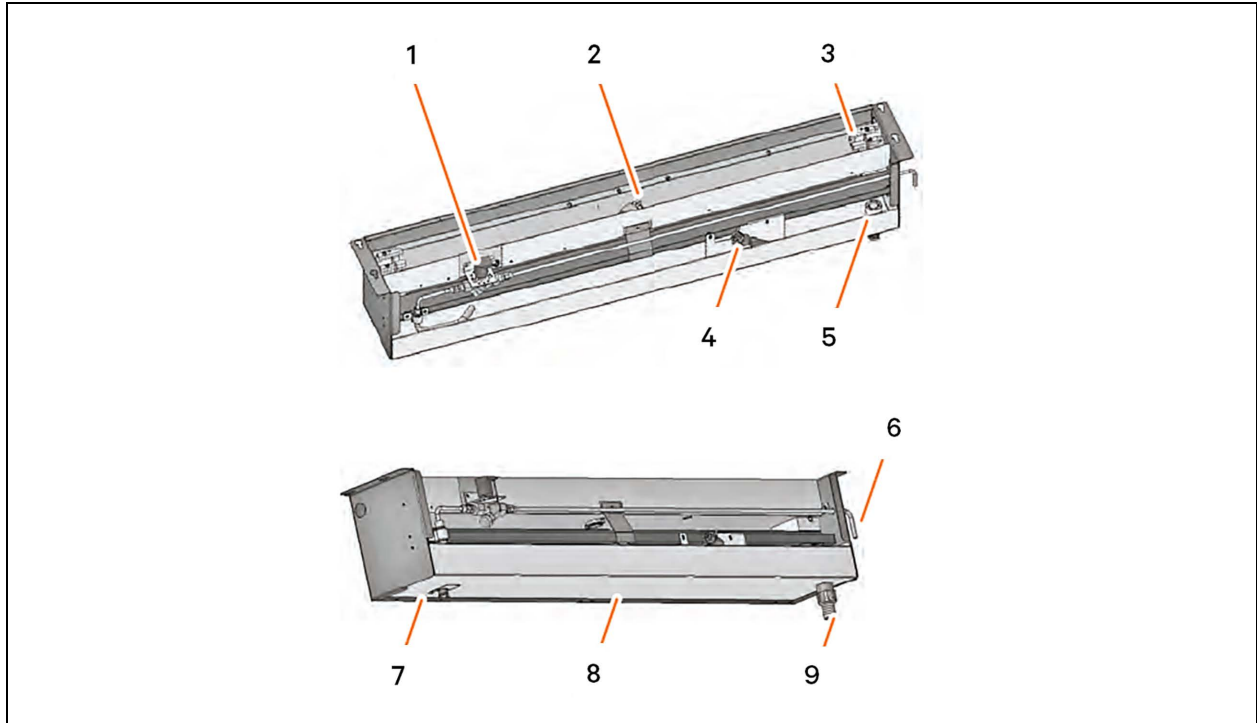
Purpose	The smoke and fire detector senses the room air: in case of smoke, the unit activates the event without any actions; instead in case of fire, the unit activates the fire alarm event and shuts the unit down. Dry contacts are available for a remote customer alarm. This smoke detector is not intended to function as or replace any room smoke detection system that may be required by local or national codes.
---------	--

This page intentionally left blank

Appendix E: Infrared Humidifier

E.1 Description

Figure E.1 Main Components



Item	Description
1	Solenoid valve flow regulation
2	Infrared quartz lamps
3	Junction block
4	Float switch
5	Standpipe
6	Water supply
7	Manual reset for the thermostat
8	Pan
9	Discharge connection

Operating Principle

The quartz lamps are mounted above the stainless steel pan, which is filled with water through the supply inlet. See **Figure E.1** on the previous page.

The float switch detects if the water level is too high.

When humidification is required, the lamps are switched on and infrared rays generate steam within seconds (without impurities or odor).

The lamps never come in contact with water.

E.2 Specifications

Technical Data

Table E.1 Infrared Humidifier Technical Data

	Volts	Pan	Capacity (kg/h)	Current	Power
Small	460	Stainless Steel	30.8	5.8	4.8 kW
	575			7.4	4.8 kW
Large	460	Stainless Steel	61.6	11.6	9.6 kW
	575			11.6	9.6 kW

Supply Water

- Pressure between 138 kPa and 1,000 kPa
- Flow rate 3.8 l/min

NOTE: Do not add disinfectants or anti-corrosive compounds to the water, as they are potential irritants. The use of well water, industrial water or water from cooling circuits and, in general, any potentially chemically or bacteriologically contaminated water is not recommended.

Drain Water

The drain water contains the same substances dissolved in the supply water, however, in larger quantities. It may reach a temperature of 100°C. It is not toxic and can be drained into the sewerage system.

Connect the drain hose to an ordinary drainage network with the following specifications:

- install a siphon that must be able to withstand temperatures up to 100°C.

E.3 Installation

The humidifier is supplied already mounted within the Vertiv™ Liebert® PCW unit. The only necessary operations are the connections to the supply water and drain water.

- Supply water connection: external diameter .23 in. (6 mm)
- Drain water connection: internal diameter .86 in. (22 mm), male thread

E.4 Startup and Operation

Initial checks	<p>Before using the humidifier, check the following conditions:</p> <ul style="list-style-type: none"> • The water supply and drain piping are properly connected. • All the wirings are properly connected.
Start-up	The humidifier starts up automatically as soon as the Liebert® PCW unit is switched on.
Operation	The adjustable parameters which determine the humidifier operation have already been factory-preset.

E.5 Maintenance



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

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

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



CAUTION: Risk of contact with hot surfaces. Can cause injury. Personal burn injury can be the result of touching a humidifier reservoir pan and/or water contained within the pan, 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 infrared humidifier parts inclusive of its bulbs, metal enclosure, humidifier reservoir pan and/or water contained within the pan, and drain tubing. All infrared humidifier parts are very hot during and remain very hot shortly after operation.



CAUTION: Risk of improper handling of boiling water. Can cause leaks, equipment and building damage, or burn injury. The unit requires a drain line that may contain boiling water. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should service the drain line or work on parts near or connected to the drain line.

NOTICE

Maintenance operations must be carried out only by authorized and trained technicians. We recommend Vertiv Customer Service.

For any operation that is not specifically mentioned in this manual, you must contact Vertiv Technical Support.

NOTE: Optical radiation from the quartz lamps. Before opening the door, always switch off the Vertiv™ Liebert® PCW unit.

Periodic Checks

- Check drain piping and trap for clogs.
- Check the pan. Clean mineral deposits.
- Clean the reflector.
- Check the water supply valve for leaks.
- Check the quartz lamps (replace if burnt out).
- Check the wiring connections (inside the humidifier electric panel).

NOTE: Deposits of mineral solids will collect in the humidifier pan and on the float switch. These must be cleaned periodically to ensure proper operation. The frequency of cleaning must be locally established because it depends on humidifier usage and local water quality. A spare pan is recommended to reduce the maintenance time. The Liebert® autoflush system can greatly increase the time between cleaning, but does not eliminate the need for periodic checks and maintenance.

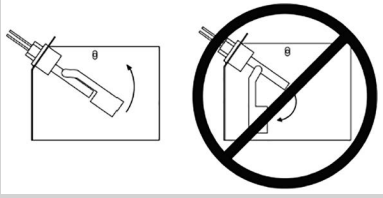
Removing the Pan

Table E.2 Instructions for Removing the Pan

Before switching off Liebert® PCW unit	<ul style="list-style-type: none"> • With the Liebert® PCW unit operating, remove the call for humidification at the control. • Let the fans operate five minutes to allow the humidifier and water to cool. • Let the pan drain and the condensate pump operate (if applicable) until the pan is dry. • If applicable, let the condensate pump operate until the drain tank is dry. • Switch off the Liebert® PCW unit.
With the Liebert® PCW unit disconnected from the power supply	<ul style="list-style-type: none"> • Remove safety panels, if installed. • Pull out the humidifier standpipe from the pan. • Inspect the O-ring (replace if necessary). • Disconnect the drain coupling from the bottom of the pan. • Remove the thermostat from the bottom of the pan. • Remove the fixing screws from the sides of the pan and slide the pan out.

Cleaning the Pan and the Float Switch

Table E.3 Instructions for Cleaning the Pan and Float Switch

<p>With the Liebert® PCW unit disconnected from the power supply</p>	<ul style="list-style-type: none"> • Loosen the scale on the side and bottom of the pan with a stiff nylon brush or plastic scraper. • Flush with water. • Carefully clean the scale from the float switch. Make sure to reassemble it correctly. <div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Reassemble pan, thermostat, standpipe, drain coupling, cover, and screws into the humidifier.
<p>With the Liebert® PCW unit connected again to the power supply</p>	<ul style="list-style-type: none"> • Operate the humidifier and check for leaks.

Changing the Lamps

NOTE: Touching quartz lamps with bare hands will severely shorten their life. Skin oils create hot spots on lamp surface. Wear clean cotton gloves when handling lamps.

With the Vertiv™ Liebert® PCW unit disconnected from power:

1. Remove the humidifier pan as explained in [Removing the Pan](#) on the previous page .
2. Remove the screws and cover from the high voltage compartment of the humidifier.
3. Disconnect one end of the purple jumper wires.
4. Using a continuity meter, locate the burnt-out lamp.
5. Remove the lamp brackets under the lamps.
6. Loosen the two screws securing the lamp lead wires to the junction block.
7. Pull the quartz lamp straight down and discard it.
8. Wrap the lead wires once around the new lamp's metal ends. This will support the lamp and allow for thermal expansion.
9. Insert the lead wires into the junction block and tighten the screws
10. Reassemble by performing the previous operations in reverse order.

E.6 Troubleshooting

Symptom	Possible Cause	Check or Remedy
No humidification	Humidifier pan not filling.	Check the water supply. Check fill valve operation. Check drain stand pipe adjustment. Check for clogged water supply piping.
	Control not calling for humidity.	Check status on control.
	Control calling but humidifier not starting.	Check visually. If contact is made, check line voltage after contactor, fuses, and circuit breakers.
		Check for open humidifier safety stat.
	Quartz lamp burned out.	Replace the quartz lamp.
Loosened lead on old quartz lamp.	Trim excess lead length on new quartz lamp to avoid shorts.	

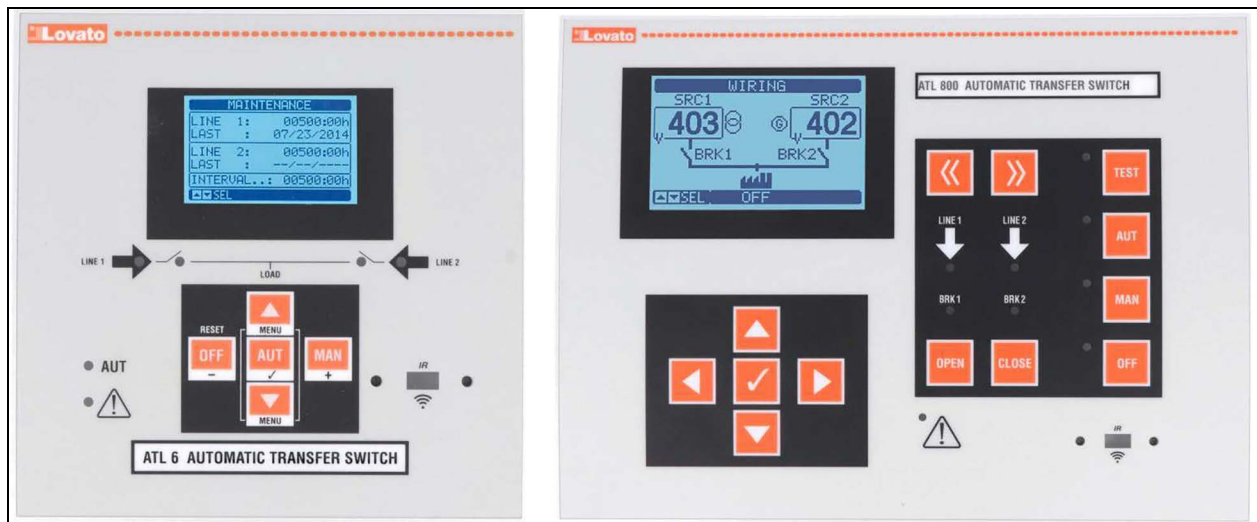
Appendix F: ATS (Automatic Transfer Switch) - Optional

F.1 Overview of Lovato ATS, Models ATL610 and ATL800

Vertiv™ Liebert® Thermal Management units equipped with the optional Lovato ATS (automatic transfer switch) control, will automatically switch over to a secondary power source upon loss of primary power. It will also return to the primary power source when it is determined it is available.

When units are equipped with the optional Capacitive Buffer feature, it will not only keep the Vertiv™ Liebert® iCOM™ control powered (minimum of three minutes) during a loss of power, but will also keep the ATS electronics powered when neither the primary or secondary source are available, allowing for a quick unit response when power is restored.

Figure F.1 ATL610 (Units up to 460V) and ATL800 (575V Units)

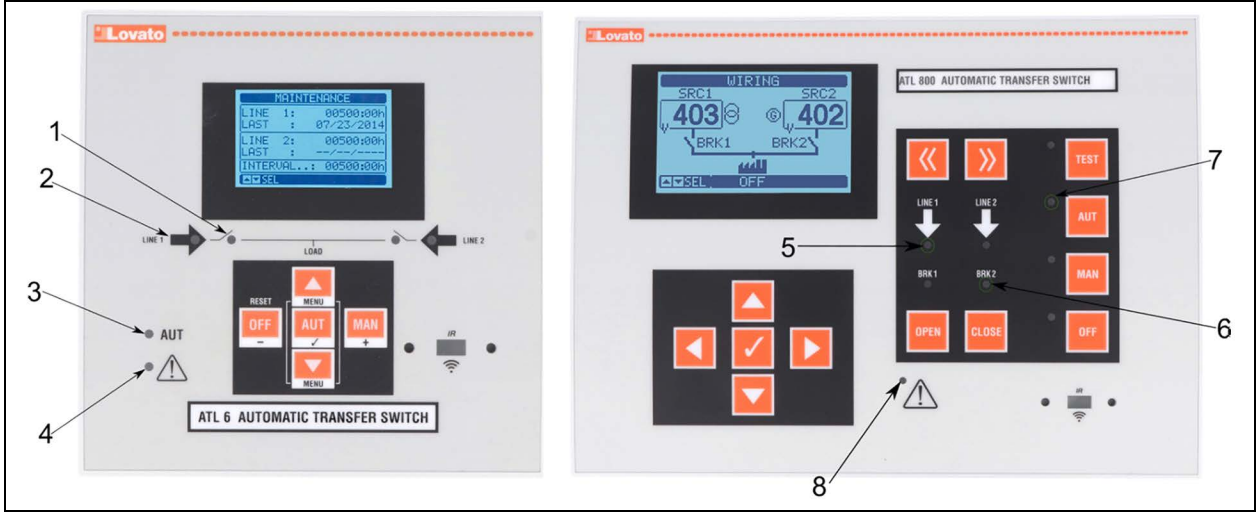


Lovato ATS, model ATL610 (or ATL800) shown in **Figure F.1** above, will be located within the cabinet of the units.

F.2 Key Capabilities of Lovato ATS, Models ATL610 and ATL800

The Lovato ATS, model ATL610 (or ATL800), will be the primary unit level device for switching between power sources. This control will be capable of the following features:

- Determine if power is available in both primary and secondary sources.
- Allow for selection of which source is primary and which is secondary.
- Ability to automatically switch from primary to secondary source, in the event of primary power loss.
- Ability to automatically switch secondary to primary source when primary power returns.
- Visible indication of available power sources.
- Visible indication of power source that is currently active.

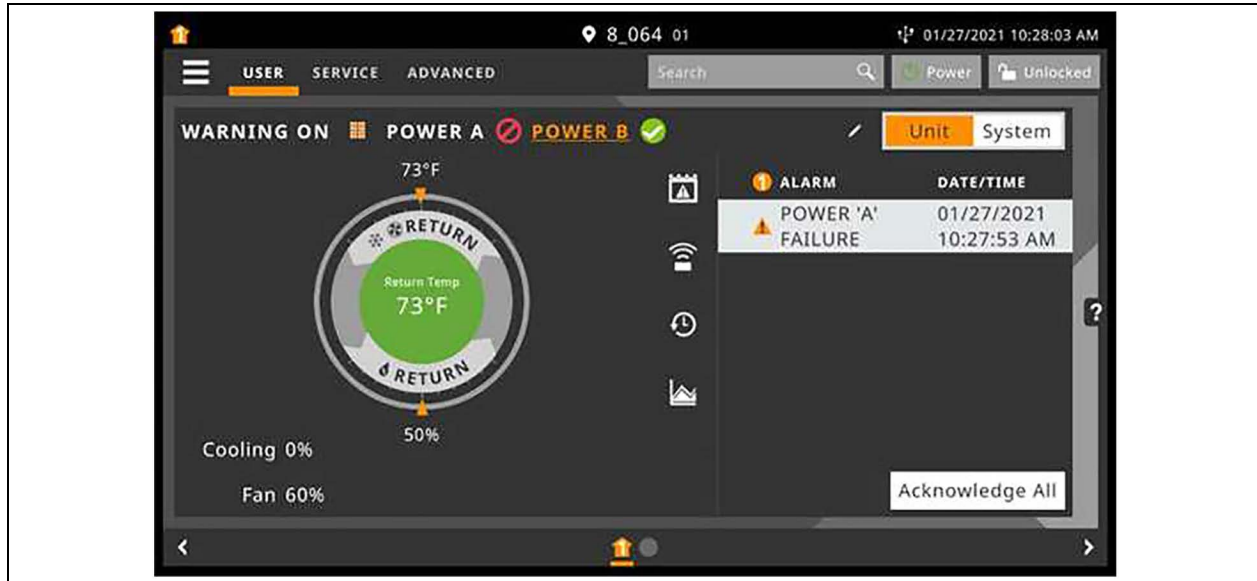


ATL610 Display		ATL800 Display	
Item	Description	Item	Description
1	LEDs indicate which source is active.	5	LEDs indicate if a source is available
2	LEDs indicate if a source is available.	6	LEDs indicate which source is active.
3	Controller is in automatic mode.	7	Controller is in automatic mode.
4	Alarm is present.	8	Alarm is present.

F.3 Interaction of Lovato ATS with Vertiv™ Liebert® iCOM™ Control

The Liebert® iCOM™ control will pull key information from the Lovato ATS, allowing for easy interpretation of the current operation without needing to open the unit's front panel, potentially interrupting operation.

Figure F.2 Identification of Current Power Source and Power Source Availability



Available via PA2.06.54.04R or greater.

Power source availability

- GREEN circle w/ check mark = power source available
- RED circle w/ cross = power source not available

Power Source A/B utilization

- ORANGE highlighted and underlined power source title = current power source being utilized.

F.4 Key Parameters of Lovato ATS, Models ATL610 and ATL800

There are multiple key parameters that are factory set by Vertiv to recommended values. Please consult a Vertiv factory technician before making any changes to these parameters.

- Priority power source selection (default = Source 1)
- Switching delay between power sources
 - If secondary power source is present at time of primary failure, delay is up to 11s (default, adjustable via multiple parameters).
 - If secondary power source is NOT present at time of primary failure, delay is 10s (default, adjustable) after secondary power source is available.
- Unit would be removed from active power source in following conditions:
 - Voltage Limit: If voltage is outside of a set limit for a set period (default = 5s)
 - Min Voltage Limit = 85% (default) of nominal
 - Max Voltage Limit = 115% (default) of nominal

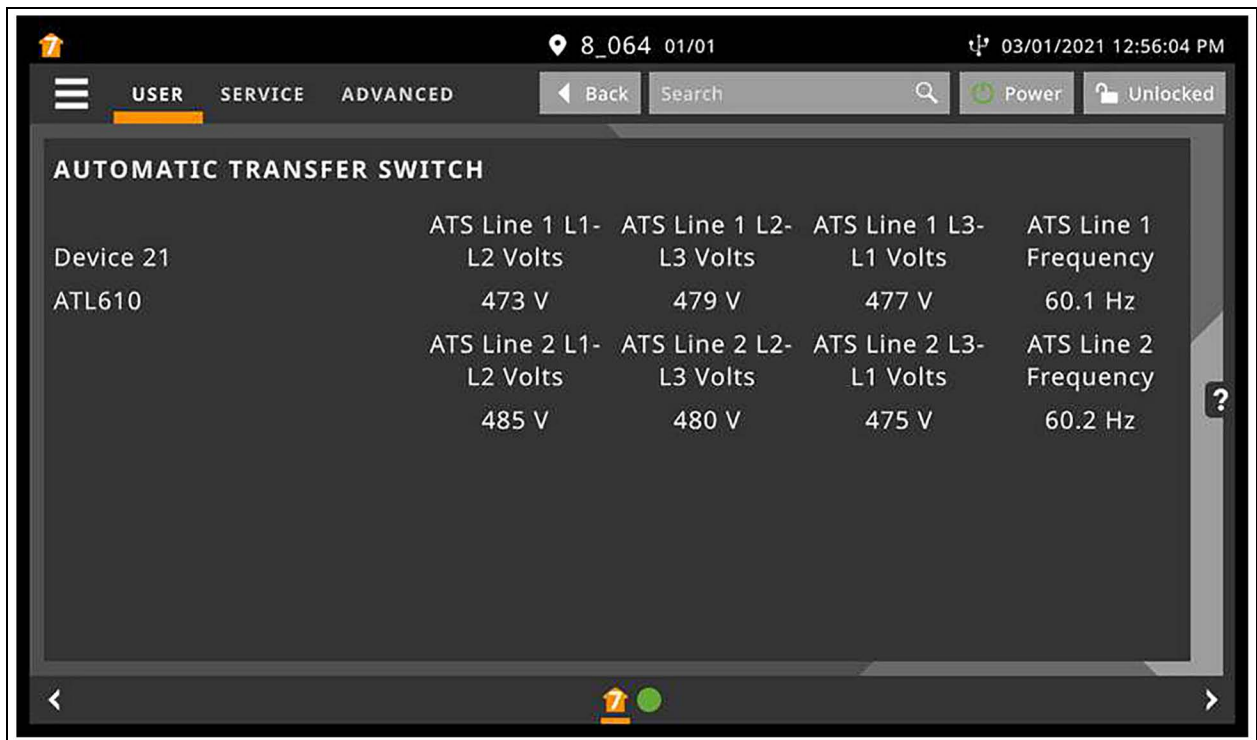
- Voltage Imbalance: If voltage imbalance (asymmetry) is greater than 15% (default) for a set period (default = 5s)
- Phase Loss: If a phase falls below 70% (default) of nominal for a set period (default = 0.1s)
- Frequency Limit: If frequency is outside of a set limit for a set period (default = 3s)
 - Min Freq Limit = 95% (default)
 - Max Frequency Limit = 105% (default)

Please note that not all parameters are applicable to Vertiv equipment operation. Consult a Vertiv factory technician before making any changes to these parameters.

F.5 Monitoring Functions of Lovato ATS, Models ATL610 and ATL800

The voltage and frequency information from the ATS can be displayed on the Vertiv™ Liebert® iCOM™ user interface, as shown in **Figure F.3** below . Further information is available via BMS monitoring through the Liebert® iCOM™ Unity Card/Embedded Unity (BACnet MSTP, BACnet IP, Modbus TCP/IP, Modbus RTU, SNMP v2, v3). The items are outlined in the **Table F.1** on the facing page .

Figure F.3 ATS Voltage and Frequency Summary Page



F.6 Monitoring Points

The below ATS specific points can be monitored through a BMS system. Alarm codes at the ATS panel will not match the BMS alarm but can be cross referenced in this chart. Please note that these points are read only.

Table F.1 ATS Specific Points

Lovato Code (at ATS)	Vertiv Alarm (BMS)	Description
ATS_EvLdTO	ATS Load Not Powered Timeout	Unit has not been powered after preset delay (default = 60s).
ATS1_L1L2	Power Source: L1-L2 voltage	Voltage reading phase L1-L2
ATS1_L2L3	Power Source: L2-L3 voltage	Voltage reading phase L2-L3
ATS1_L3L1	Power Source: L3-L1 voltage	Voltage reading phase L3-L1
ATS1_Freq	Power Source: Line Frequency	Measured frequency, per source.
ATS1_BrkOp	Power Source: Breaker Operation Count	Available to be turned on by customer, would indicate number of operations per source.
ATS1VAlOk	Power Source: All status are okay	All parameters are within limits, per source.
ATS1VLo	Power Source: Voltage Is Too Low	Voltage on active source is below acceptable range.
ATS1VHi	Power Source: Voltage Is Too High	Voltage on active source is above acceptable range.
ATS1VAsymm	Power Source: Voltages Are Asymmetric	Voltages imbalance alarm
ATS1VPhsLs	Power Source: Voltage Phase Loss	Indicates one of the phases voltage has dropped below 70% nominal.
ATS2VPhsSq	Power Source: Phase Sequence Issue	Indicates the incoming power wasn't wired per the phase sequence configured (L1-L2-L3).
ATS1VFrqLo	Power Source: Frequency Is Too Low	Frequency on active source is below acceptable range.
ATS1VFrqHi	Power Source: Frequency Is Too High	Frequency on active source is above acceptable range.
ATS2BClsd	Power Source: Breaker is closed	ATS is receiving feedback that the indicated contactor as closed.
ATS2BCClsd	Power Source: Breaker command status closed	ATS is directing the indicated contactor to close.
ATS1EvBTim	Power Source: Breaker Timeout Issue	The indicated changeover device did not complete the closing operation within the max set time.
ATS1EvHrsS	Power Source: Line Operating Hour Exceeded	Available to be turned on by customer, would indicate number of hours in operation per source

F.7 Change Over Circuit Sequence of Operations

Source 1 is out of range

1. Source 1 exceeds one or more limits of voltage, frequency, phase, or voltage symmetry.
2. A delay timer will begin to count. The amount of time depends on which Source 1 parameter is out of spec, and the value saved in the following parameters. The parameters below are the delays for each condition.

Table F.2 Parameters

Description	Default	Parameter	
		ATL610	ATL800
Voltage below the minimum limit	5s	P06.03	P09.01.03
Voltage above the maximum limit	5s	P06.06	P09.01.06
Phase failure	0.1s	P06.10	P09.01.10
Voltage exceeds the asymmetry limits	5s	P06.12	P09.01.12
Frequency exceeds the maximum limit	3s	P06.14	P09.01.14
Frequency exceeds the minimum limit	5s	P06.16	P09.01.16

3. Once the delay timer is finished, the following events will occur.
 - a. The transfer controller will de-energize Source 1 contactor coil.
 - b. The transfer controller will signal the unit is no longer being powered by Source 1.
 - c. An auxiliary switch NO contact on Source 1’s contactor will open, sending a signal to the transfer controller. This signal verifies that the load is not connected to Source 1.
 - d. The NC contacts of the same auxiliary switch will close to allow the coil of the Source 2 contactor to be energized. The Source 2 contactor coil is not energized at this time.
4. Once the transfer controller output has opened, a delay timer will begin using the value entered under parameter P05.03 (ATL610) or P07.01.02 (ATL800), default = 6s. This value should not be decreased without consent from Vertiv.
5. A presence delay is used to determine if Source 2 is a valid source. This delay will start as soon as Source 2 is available. The presence delay is based on the value entered in parameter P07.07 (ATL610) or P09.02.07 (ATL800), default = 10s. If Source 2 is available before Source 1 fails, it is possible that the delay will already be satisfied at the time Source 1 fails. If this is a manual transfer to Source 2 and Source 1 is still available, the presence delay will refer to the value in parameter P07.08 (ATL610) or P09.02.08 (ATL800), default = 60s.
6. When the timer in both step 4 and 5 are finished,
 - a. The transfer controller will energize the Source 2 contactor.
 - b. An auxiliary switch NO contact on Source 2’s contactor will close, sending a signal to the transfer controller. This signal verifies that the load is connected to Source 2.
 - c. The NC contacts of the same auxiliary switch will open to prevent the coil of Source 1 contactor from energizing.
 - d. The transfer controller will signal the unit is being powered by Source 2.

Transfer back to Source 1 when Source 2 is present.

1. When Source 1 has reached acceptable levels, a presence delay will start. The presence delay is based on the value entered in parameter P06.08 (ATL610) or P09.01.08 (ATL800), default = 60s.
2. Once this timer is finished,
 - a. The transfer controller will de-energize Source 2 contactor coil.

- b. An auxiliary switch NO contact on Source 2's contactor will open, sending a signal to the transfer controller. This signal verifies that the load is not connected to Source 2.
 - c. The NC contacts of the same auxiliary switch will close to allow the coil of the Source 1 contactor to be energized. The Source 1 contactor coil is not energized at this time.
 - d. The transfer controller will signal the unit is no longer being powered by Source 2.
3. A delay timer starts using the value in parameter P05.04 (ATL610) or P07.02.02 (ATL800), default = 6s. This value should not be decreased without consent from Vertiv.
4. When the timer in step 3 is finished,
 - a. The transfer controller will energize the Source 1 contactor.
 - b. An auxiliary switch NO contact on Source 1's contactor will close, sending a signal the transfer controller. This signal verifies that the load is connected to Source 1.
 - c. The NC contacts of the same auxiliary switch will open to prevent the coil of Source 2 contactor from energizing.
 - d. The transfer controller will signal the unit is being powered by Source 1.

Source 2 is out of range when unit is powered by Source 2

1. Source 2 exceeds one or more limits of voltage, frequency, phase, or voltage symmetry.
2. A delay timer will begin to count. The amount of time depends on which Source 2 parameter is out of spec, and the value saved in the following parameters. The parameters below are the delays for each condition.

Table F.3 Parameters

Description	Default	Parameter	
		ATL610	ATL800
Voltage below the minimum limit	5s	P07.03	P09.02.03
Voltage above the maximum limit	5s	P07.06	P09.02.06
Phase failure	0.1s	P07.10	P09.02.10
Voltage exceeds the asymmetry limits	5s	P07.12	P09.02.12
Frequency exceeds the maximum limit	3s	P07.14	P09.02.14
Frequency exceeds the minimum limit	5s	P07.16	P09.02.16

- a. The transfer controller will de-energize Source 2 contactor coil.
 - b. The transfer controller will signal the unit is no longer being powered by Source 2.
 - c. An auxiliary switch NO contact on Source 2's contactor will open, sending a signal to the transfer controller. This signal verifies that the load is not connected to Source 2.
 - d. The NC contacts of the same auxiliary switch will close to allow the coil of Source 1 contactor to be energized. The Source 1 contactor coil is not energized at this time.
4. Once the transfer controller output has opened, a delay timer will begin using the value entered under parameter P05.04 (ATL610) or P07.02.02 (ATL800), default = 6s. This value should not be decreased without consent from Vertiv.
5. A presence delay is used to determine if Source 1 is a valid source. This delay will start as soon as Source 1 is available. The presence delay is based on the value entered in parameter P06.07 (ATL610) or P09.01.07 (ATL800), default = 10s. If Source 1 is available before Source 2 fails, it is possible that the delay will already be satisfied at the time Source 2 fails. If this is a manual transfer to Source 1 and Source 2 is still available, the presence delay will refer to the value in parameter P06.08 (ATL610) or P09.01.08 (ATL800), default = 60s.

6. When the timer in both step 4 and 5 are finished,
 - a. The transfer controller will energize the Source 1 contactor.
 - b. An auxiliary switch NO contact on Source 1's contactor will close, sending a signal to the transfer controller. This signal verifies that the load is connected to Source 1.
 - c. The NC contacts of the same auxiliary switch will open to prevent the coil of Source 2 contactor from energizing.
 - d. The transfer controller will signal the unit is being powered by Source 1.

Transfer when Source 1 and Source 2 fails

If both Source 1 and Source 2 fail and are restored, the transfer controller will transfer the load to the preferred Source defined in parameter P05.02 (ATL610) or P06.01.02/P06.02.02 (ATL800), default = 1.

Figure F.4 Transfer Controller Terminal Labels – ATL610

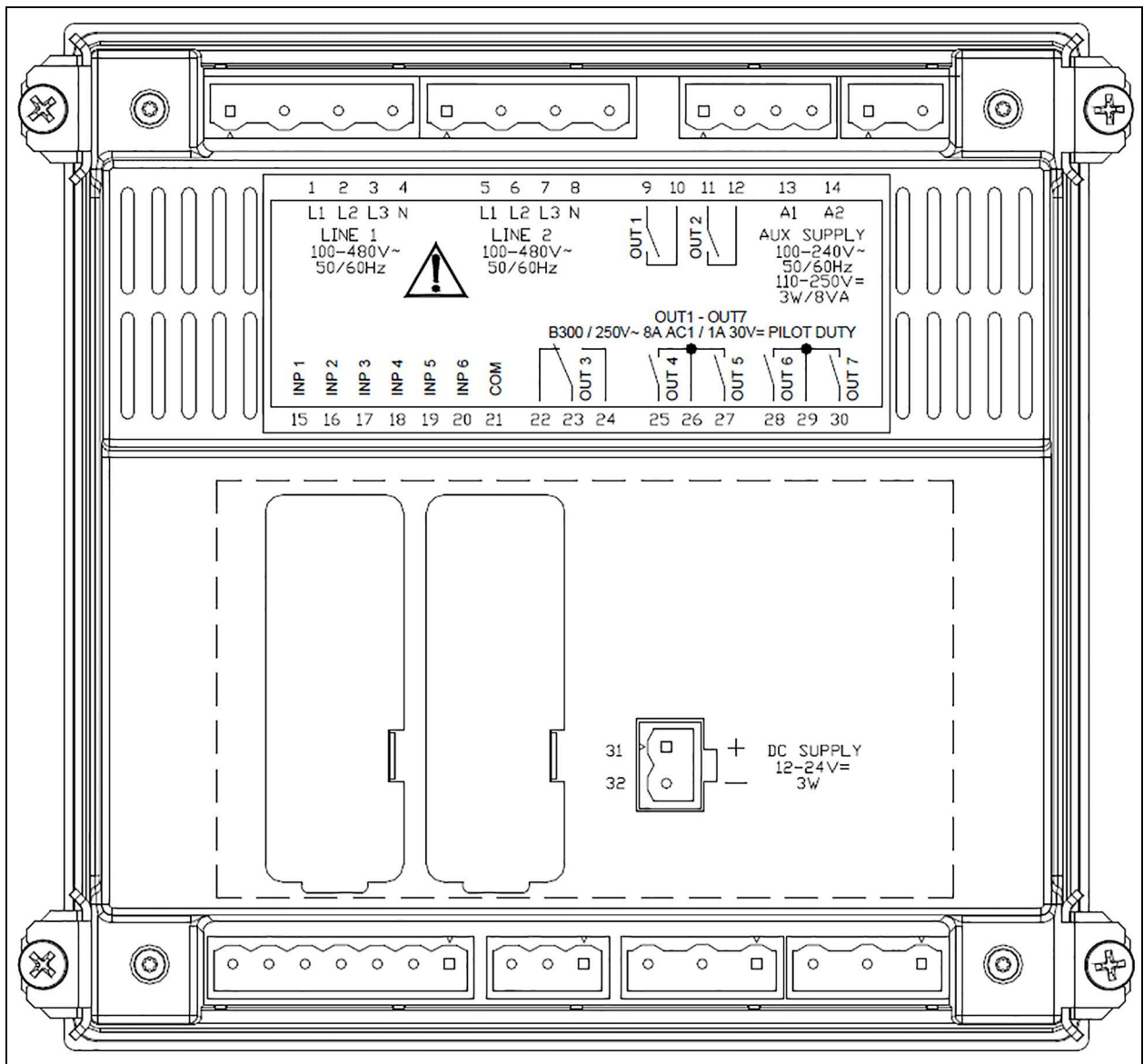
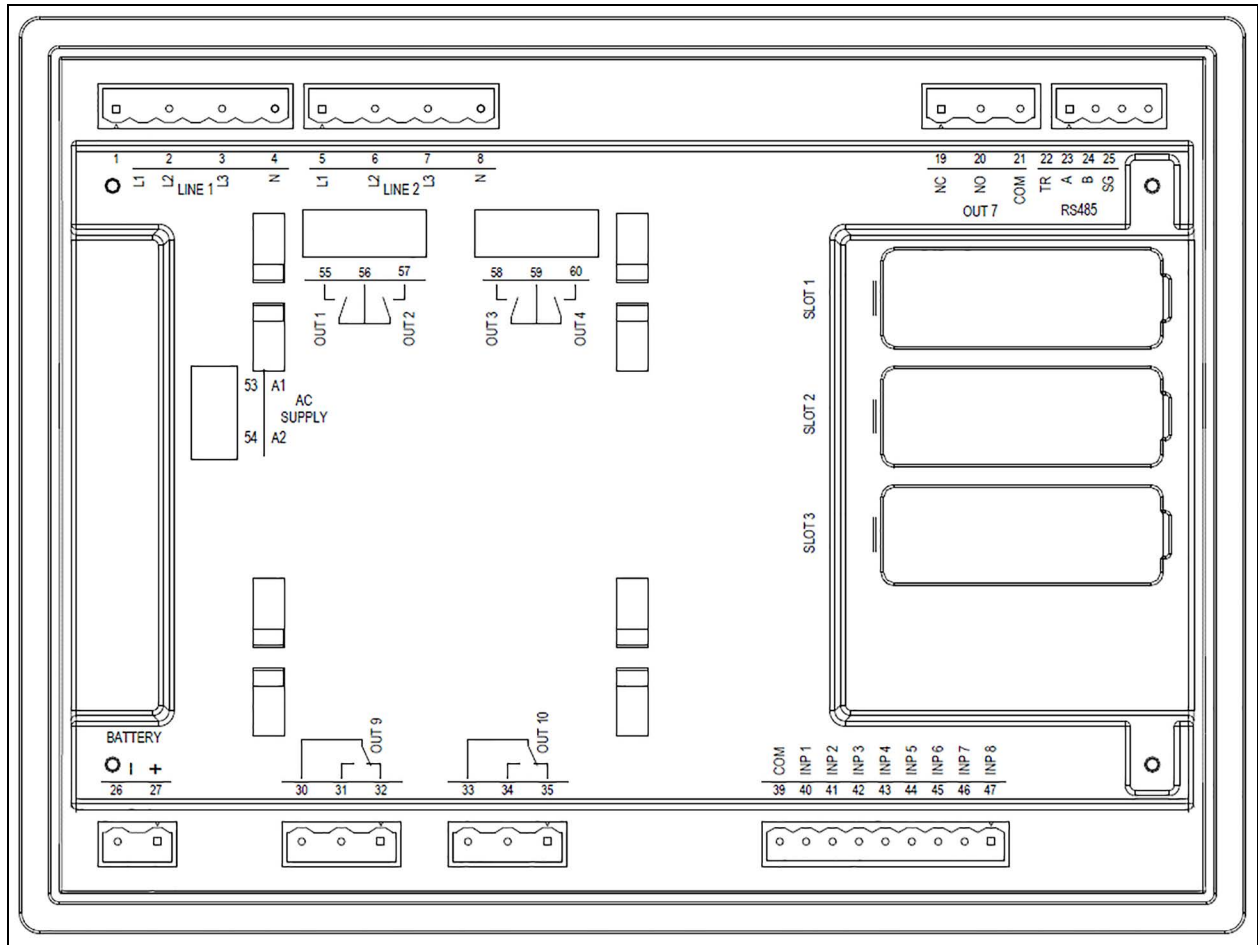


Figure F.5 Transfer Controller Terminal Labels – ATL800



This page intentionally left blank

Appendix G: Additional Options

G.1 Vertiv™ Liebert® SmartAisle™

The unit shall be ready for containment control (Liebert® SmartAisle™). The unit should have the capability to modulate airflow according to the airflow taken by the servers, using the remote temperature sensor as the controlling sensor, installed in the top part of the aisle which communicates between the aisle through a calibrated hole. This guarantees to maximize the system efficiency providing the server only airflow needed. The valve shall be modulated according to the unit air supply temperature in order to optimize server inlet temperature.

The system done by multiple units shall work with efficient cascade way, trying to maximize energy efficiency always working where EC fans are more effective.

The unit is equipped by default with a special switch that allows to easily change three different working modes:

- Automatic control of airflow and cooling
- Unit forced to off mode
- Airflow and cooling forced to 100%

This page intentionally left blank

Connect with Vertiv on Social Media



<https://www.facebook.com/vertiv/>



<https://www.instagram.com/vertiv/>



<https://www.linkedin.com/company/vertiv/>



<https://www.twitter.com/Vertiv/>



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

© 2022 Vertiv Group Corp. All rights reserved. Vertiv™ and the Vertiv logo are trademarks or registered trademarks of Vertiv Group Corp. All other names and logos referred to are trade names, trademarks or registered trademarks of their respective owners. While every precaution has been taken to ensure accuracy and completeness here, Vertiv Group Corp. assumes no responsibility, and disclaims all liability, for damages resulting from use of this information or for any errors or omissions. Specifications, rebates and other promotional offers are subject to change at Vertiv's sole discretion upon notice.

SL-19831_RevC_02-22