Vertiv™ Liebert® XDH

High Heat Density Precision Air Conditioner

User Manual

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. Refer to other local practices or building codes as applicable for the correct methods, tools, and materials to be used in performing procedures not specifically described in this document.

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 for additional assistance.

Product	BOM	Version	Date	Revision
XDH	31014399	1.0	17-06-2021	R1
XDH	31014399	1.0	29-01-2021	R0

This page is intentionally left blank.

Table of Contents

1 Overview

This chapter introduces the product description, model description, product appearance and main components of Vertiv™ Liebert® XDH High Heat Density Precision Air Conditioner (hereafter referred as Liebert XDH). The Liebert XDH is a specially engineered equipment for the applications which does not permit any unauthorized and unqualified access in the system. It must be used only by professionally trained personnel if it is placed in shopping malls, light industry, or any business environment.

1.1. Product Introduction

The Liebert XDH unit is suitable for the environmental control of small and medium-sized modified computer rooms, modular computer rooms, and large computer rooms that require energy saving and high heat density. It is designed to ensure precision equipment such as sensitive, industrial processing, communication, and computers have a controlled operating environment.

It also has features such as high reliability, high sensible heat ratio, and large air volume; it uses R410A an energy-efficient refrigerant to meet the international environmentally safe requirements. The finned tube heat exchanger with a sophisticated design and layout provides excellent heat exchanging performance. The EC fan with large air volume and low energy consumption makes the system run more energy-efficient. The electronic expansion valve (EEV) intelligently controls the uniform distribution of refrigerant flow and effectively solving the heat dissipation problem of the high heat density server cabinet.

1.2. Product Appearance

The appearance of Vertiv™ Liebert® XDH unit is shown in Figure 1-1.

Figure 1-1 Air Conditioner Appearance Drawing

1.3. Model Nomenclature

Vertiv™ Liebert® XDH is defined by twelve digits, as represented in Table 1-1.

Table 1-1 Vertiv™ Liebert® XDH Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12
X	D	H	0	3	0	B	S	1	0	R	1

Digit 1, 2 Product Model	
XD	***X-treme High Density***
Digit 3 Cooling System	
H	***Horizontal Cabinet In-row Installation***
V	Vertical on Rack
O	Overhead Rack
Digit 4, 5, 6 Cooling Capacity kW	
0-9	30 kW
Digit 7 XD Modular Type	
B	***Standard Cabinet Pump System Terminal***
C	Standard Cabinet Compressor System Terminal
Digit 8 Power Supply	
S	***220 V to 240 V, 1 Ph, 50 Hz***
N	380 V to 415 V, 3 Ph, 50 / 60 Hz+N
M	380 V to 400 V, 3 Ph, 50 Hz
Digit 9 Refrigerant	
1	***R410A***
2	R134A
Digit 10 Condensate Pump	
0	***None***
L	Without Condensate Pump
5	With Condensate Pump
Digit 11 System Type	
R	***With Air Direction Grille***
H	Without Air Direction Grille
Digit 12 Order Identifier	
1~9	***Version***
C	China Version
A	America Version
E	EMEA

The standard components are represented in ***'Bold Italic'*** font.

1.4. Main Components

The main terminal components of the Vertiv™ Liebert® XDH unit include evaporator, EC fan, electronic expansion valve, filter net, dry filter, drain pump, power module, etc.

1.4.1. Evaporator

The finned tube heat exchanger with high heat dissipation efficiency, and the V-shaped symmetrical layout is adopted with an elegant design that improves the efficiency of the heat exchange.

1.4.2. EC Fan

The unit is equipped with highly energy efficient fans with large air volume, high air pressure, low power consumption, real-time adjustable fan speeds in accordance to the terminal cooling demand, which provide more energy-saving and more reliable performance.

1.4.3. Electronic Expansion Valve (EEV)

The unit is provided with electronic expansion valve to adjust the flow of refrigerant more accurately and ensure the uniformity of flow distribution at each terminal. This also helps in monitoring the temperature and pressure signals of the flow simultaneously.

Figure 1-2 Electronic Expansion Valve (EEV)

1.4.4. Filter Net

Liebert XDH unit is provided with a filtration net, which is highly efficient in protecting the unit by filtering the impurities and dust in the air.

1.4.5. Dry Filter

The dry filter can effectively filter the moisture and impurities generated in the long-term operation of the system to ensure the normal operation of the system.

1.4.6. Drain Pump (Optional)

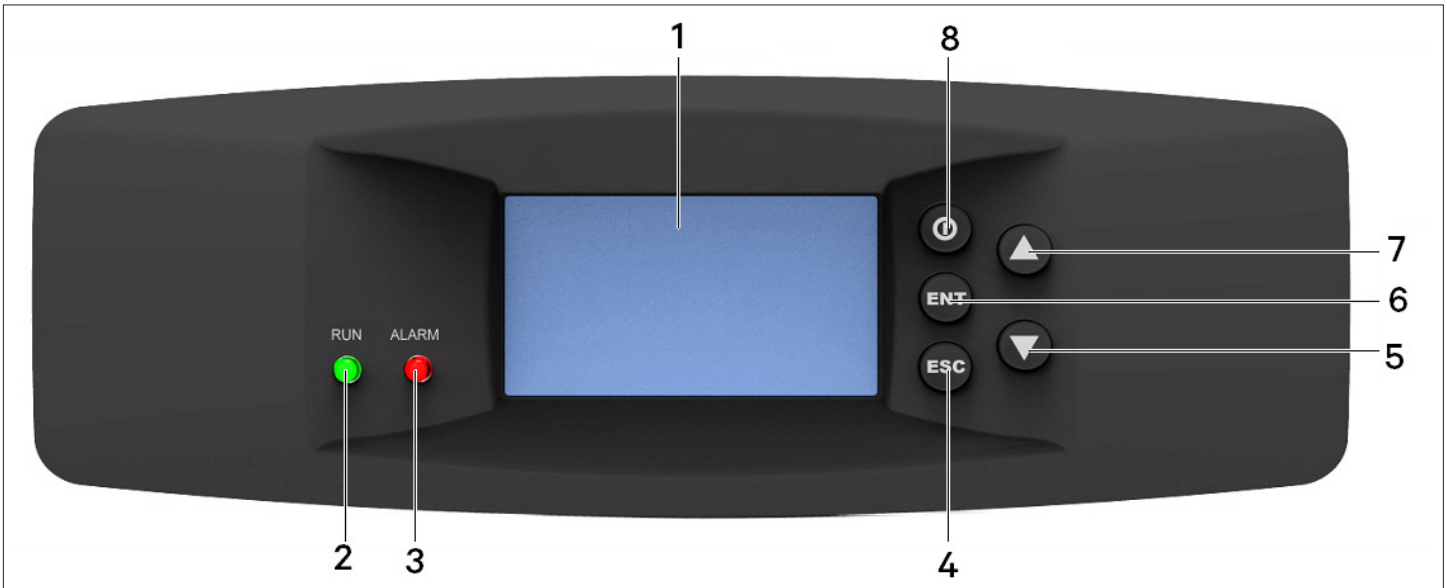
Vertiv™ Liebert® XDH unit adopts a self-priming drainage pump with small size, low noise and high reliability; the rated voltage required for the system is 220 Vac. It also includes the idling protection and overload protection functions to ensure timely rapid discharge of condensate water.

1.4.7. Microprocessor Controller

The Liebert XDH unit is equipped with a Vertiv™ Microprocessor Controller and adopts advanced PID regulation technology. The microprocessor controller uses a 128×64 small board (large board: 240×128) dot matrix white backlight (large board blue backlight) LCD screen. The user interface of the controller is simple to operate with multi-level password protection that can effectively prevent illegal operations.

The microprocessor controller has a power-down self-recovery function and high/low voltage protection. Through the menu operation, user can accurately understand the running time of each main component. The expert fault diagnosis system can automatically display the current fault contents, which is convenient for maintenance personnel to maintain equipment.

It can store up to 200 historical event records and it is equipped with RS485 interface, with industrial standard Modbus RTU communication protocol.



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	LCD Screen	5	Down button
2	Run indicator	6	ENT button
3	Alarm indicator	7	Up button
4	ESC button	8	On/Off button

Figure 1-3 Microprocessor Controller Display Screen

1.4.8. Power Module

The power module has high efficiency, low electrical loss, reliable and stable operation, two modules are mutually backed up to ensure the normal operation of the terminal unit.

1.5. Temperature and Humidity Sensors

Vertiv™ Liebert® XDH units are equipped with return air temperature and humidity sensor, and supply air temperature sensor as standard options. These sensors enable controller to control and modulate the cooling capacity of the unit and also help in monitoring and triggering alarms if any threshold value exceeds the setup parameters.

1.6. Refrigerant Requirements

- Do not use inferior quality refrigerant as it can cause an extensive damage to the system.
- Vertiv does not undertake any responsibility for all the related consequences that result from using a inferior quality refrigerant.

1.7. Environmental Requirements

1.7.1. Operating Environment

The operating environment of the Vertiv™ Liebert® XDH main unit meets the requirements of GB4798.3-2007, as shown in Table 1-2.

Table 1-2 Operating Environment Requirements

Items	Requirements	
Ambient temperature	Indoor	18 ˚C to 40 ˚C, RH<60%
Unit protection level	IP20	
Altitude	1000 m, more than 1000 m, please contact Vertiv local representative	
Operating voltage range	220 V to 240 V ±10%, 1 N~, 50 Hz / 60 Hz	
Pollution level	Level II	

1.7.2. Storage Environment

The storage environment of the Liebert XDH main unit meets the requirements of GB4798.1-2005, as shown in Table 1-3.

Table 1-3 Storage Environment Requirements

Items	Requirements
Storage environment	Indoor, clean (no dust)
Environment humidity	< 95% RH
Ambient temperature	-25 ˚C to +55 ˚C
Storage time	The total transportation and storage time does not exceed 6 months, and the performance needs to be re-calibrated after 6 months

2 Mechanical Installation

This chapter introduces the mechanical installation of the Vertiv™ Liebert® XDH unit, including computer room requirements, maintenance space requirements, equipment handling, unpacking, inspection, installation notes, system installation layout, installation of unit piping and installation inspection, etc.

2.1. Room Requirements

The equipment room requirements are as follows:

1. In order to ensure the normal operation of the environment control system, the equipment room should be moisture-proof and heat-insulated.
2. The equipment room must have the moisture-proof layer of the ceiling and walls must be made of polyethylene film or painted with moisture-proof paint.
3. The entry of outdoor air may increase the load of the system, so it is necessary to minimize the entry of outdoor air into the equipment room. It is recommended that the intake of outdoor air be kept below 5% of the entire indoor air circulation.
4. All doors and windows should be fully enclosed and the gap should be as small as possible.
5. In order to ensure the normal application of Liebert XDH, it is recommended that the equipment room be equipped with a dehumidifier.

The Liebert XDH precision air-conditioner main unit is prohibited to be used in the open harsh outdoor environment.

2.2. Maintenance Space Requirements

The Liebert XDH is a set of high heat density cooling unit, which is ceiling-mounted above the heat dissipating cabinet to form a “hot aisle-cold aisle” layout.

- Maintenance Space Requirements

When installing an air conditioner unit, a maintenance space of at least 600 mm must be provided in the front and rear sides, as shown in Figure 2-1.

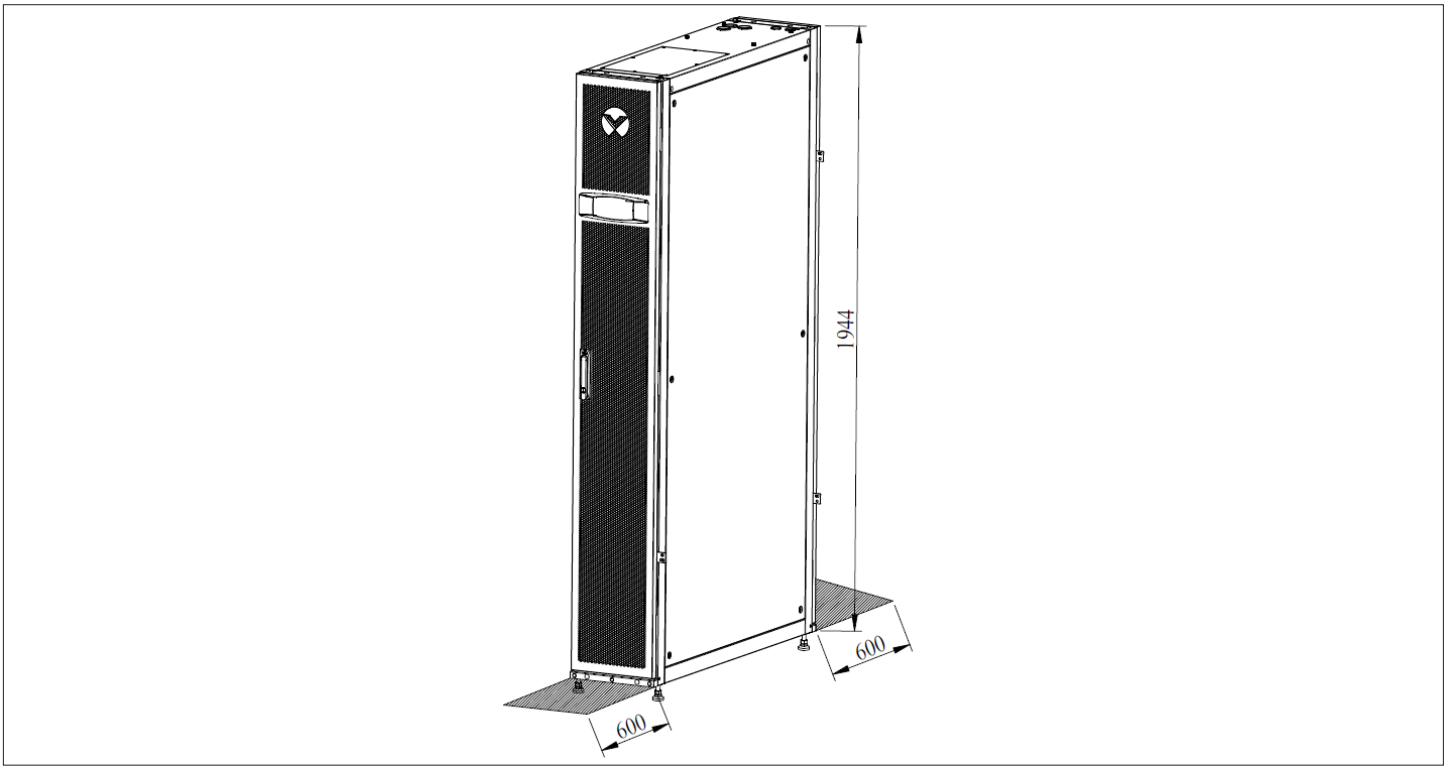


Figure 2-1 Unit Maintenance Space

The minimum maintenance space requirements of the unit are shown in Table 2-1.

Table 2-1 Minimum Maintenance Space (unit: mm)

Location	XDH030CS1LRC
Front door	600 mm
Rear door	600 mm

Note: In case of a special application, consult Vertiv local representative.

2.3. Unpacking and Inspection

2.3.1. Transportation and Handling

1. When transporting, the priority shall be given to rail or water transportation. If user choose road transportation then a road with better road conditions should be select to prevent excessive bumps.
2. Vertiv™ Liebert® XDH unit is heavy. Refer Table 2-2 for weight parameters. Mechanical handling tools, such as electric forklifts are required for unloading and handling.
3. When transporting, transport the unit to the place closest to the installation site. Figure 2-2 illustrates the forklift lifting the unit and the fork should be at the center of gravity to prevent tipping of the unit.

Figure 2-2 Forklift Position to Lift the Unit

While moving the indoor unit, keep the obliquity within the range of 75° to 105°, as shown in Figure 2-3.

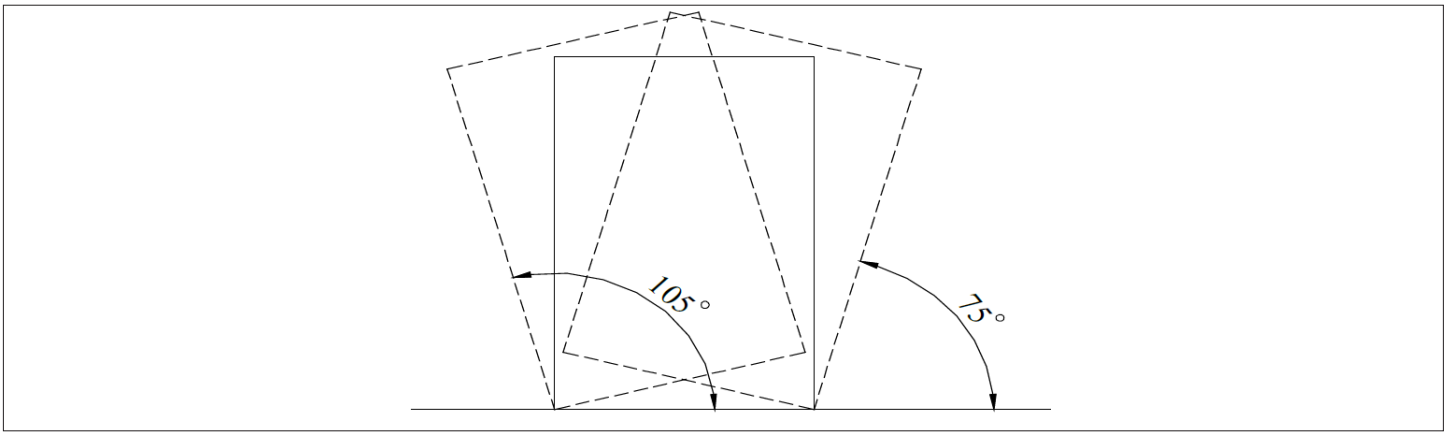


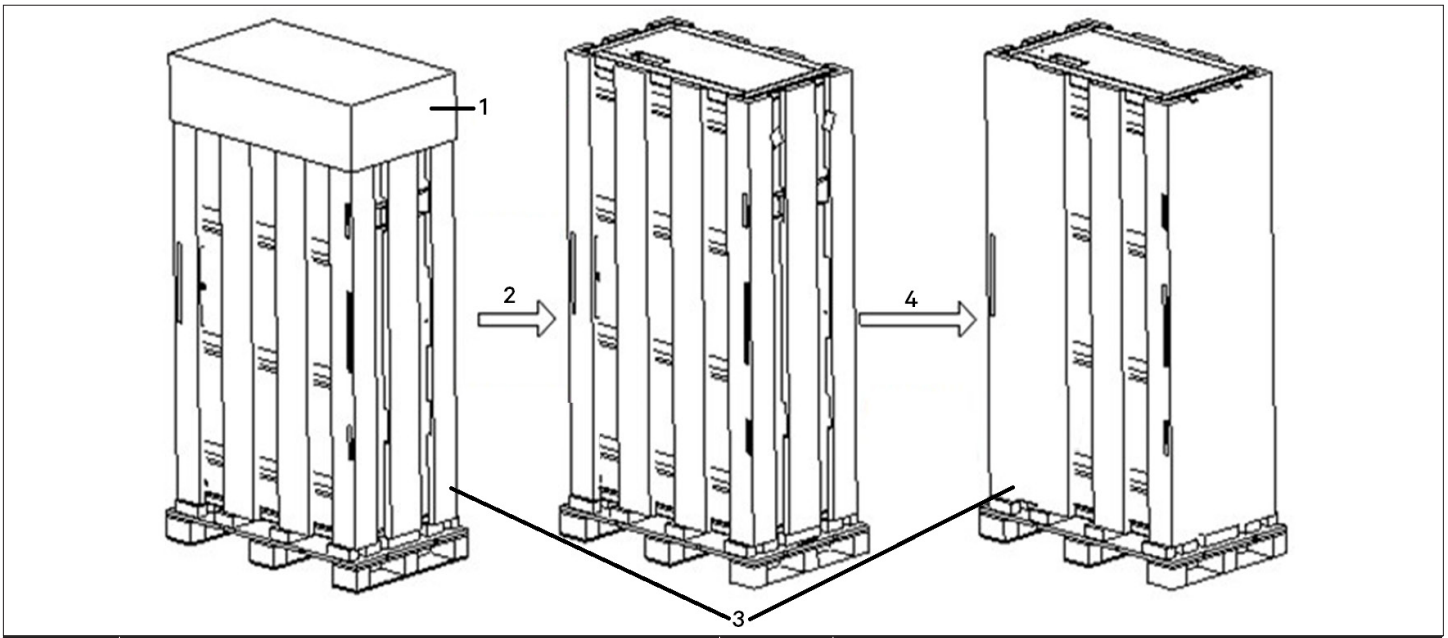
Figure 2-3 Handling Angle

2.3.2. Unpacking

The unit's cabinet is packed with honeycomb cardboard and stretch film. After moving the unit to the place closest to the final installation site, unpack it.

The unpacking procedures are as follows:

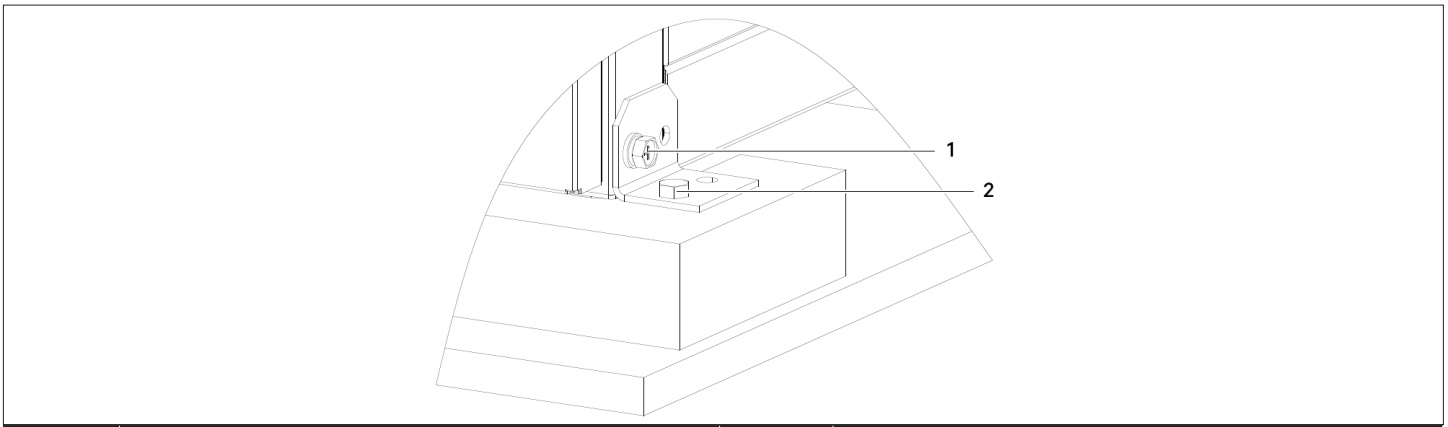
1. First remove the top cover and winding stretch film, then remove the honeycomb cardboard, as shown in Figure 2-4.



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Top cover	3	Honeycomb cardboard
2	Remove the top cover	4	First remove the winding stretch film and then remove the honeycomb cardboard

Figure 2-4 Unpacking the Unit

2. Remove the bottom pallet, the unit is fixed on the bottom pallet with M8x20 and M8x80 screws (as shown in Figure 2-5), and a 17 mm open wrench, ratchet wrench or socket can be used for disassembly.



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Screw GB9074_13-88_M8 x 20	2	Hexagon head bolt GB/T 5782-2000_M8 x 80

Figure 2-5 Bottom Pallet Screw Fixing Position

2.4. Inspection

After unpacking, check whether the accessories are complete according to the packing list and check whether any part is damaged.

If any part is found to be missing or damaged during inspection, or if any concealed damage is identified, it should be reported immediately to the carrier and Vertiv local representative and product supplier.

2.5. Installation

In order to realize the design performance of the unit and maximize its service life, proper installation is essential. The content of this section should be applied in conjunction with the current mechanical and electrical installation regulations

- Installation Notes

1. Vertiv™ Liebert® XDH precision air conditioner unit uses a split floor installation method and must be installed on the floor of the equipment room or computer room.
2. Prior to installing the unit, confirm whether the installation environment meets the requirements (refer Section 1.6 Environment Conditions), and confirm whether the building need any modification to match the requirement of piping layout, for more details consult Vertiv local representative.
3. The installation must strictly follow the design drawings, and reserve maintenance space for daily maintenance and repairs. Refer to the engineering dimension drawing provided by the manufacturer.

2.6. System Installation Layout

2.6.1. Overall System Layout

Refer to the relevant content of the overall system layout in “Vertiv™ Liebert® XDC multi-connected air conditioner main unit User Manual”.

2.6.2. System Installation Diagram

Refer to the relevant content of the system installation diagram in “Vertiv™ Liebert® XDC multi-connected air conditioner main unit User Manual”.

2.7. Installation of the Unit

2.7.1. Mechanical Parameters

The Vertiv™ Liebert® XDH unit dimensions and mechanical parameters are shown in Figure 2-8 and Table 2-2.

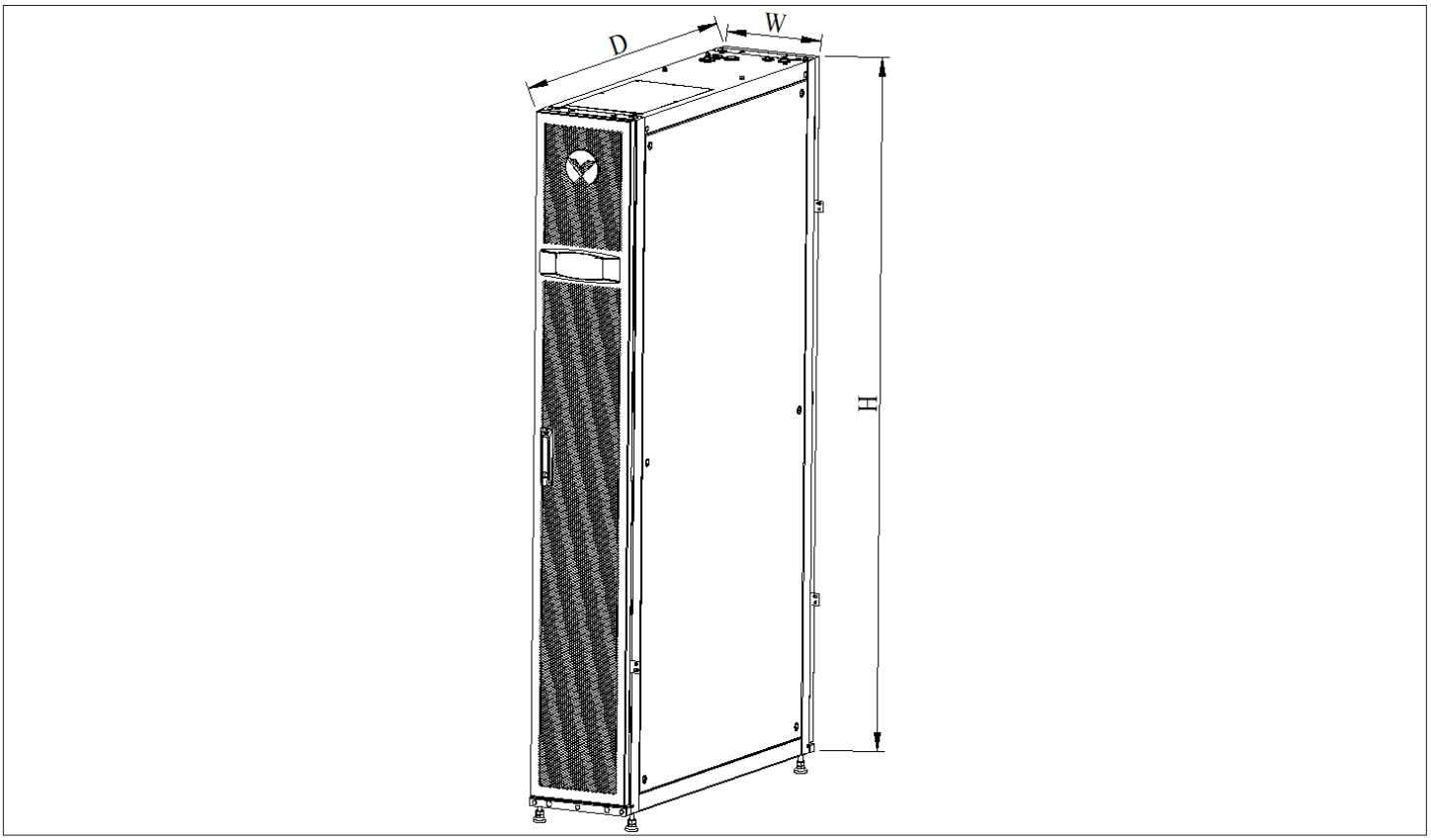


Figure 2-6 Dimension of Liebert XDH Unit

Table 2-2 Mechanical Parameters of Liebert XDH Unit

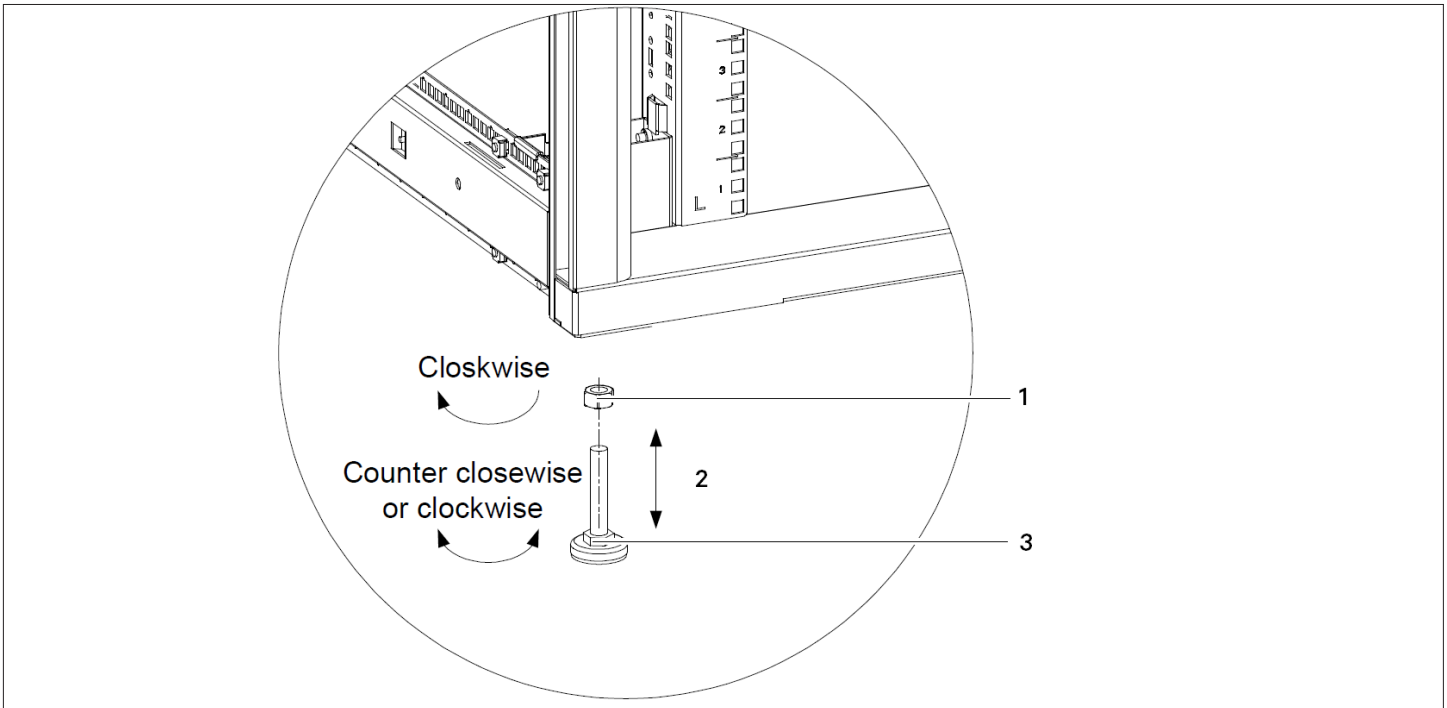
Product Model	Mechanical Parameters (WxDxH) (mm)	Operation Weight (kg)
XDH030CS1LRC	300×1100×1944 (without leveling feet)	160

Note: The total cabinet height including leveling feet is 2000 mm; and total height excluding leveling feet is 1944mm.

2.7.2. Leveling the Cabinet

The followings are steps to level the Vertiv™ Liebert® XDH cabinet

1. Place the unit on the open floor of the installation site.
2. Use an adjustable wrench to loosen the fastening nuts on the 4 hexagonal bolts in a clockwise direction (refer Figure 2-7).
3. Turn the hexagonal bolt at the bottom of the foot until the foot is raised or lowered to the desired position. Use a spirit level to ensure that the cabinet is in a horizontal position, as shown in Figure 2-8.



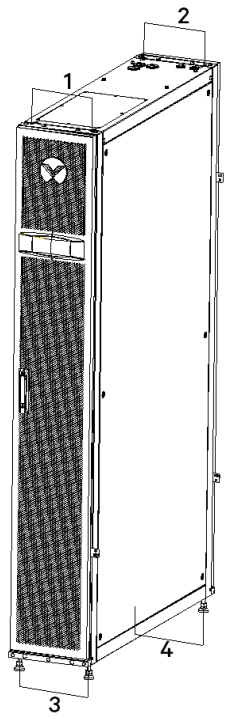
ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Fixing nut	3	Hexagon bolt
2	The feet rise or drop		

Figure 2-7 Leveling Feet

4. Tighten the fastening nut on the anchor screw counterclockwise to complete the adjustment. If there is a mounting bracket in the equipment room, user needs to remove the leveling feet and fix the cabinet on the mounting bracket.

2.7.3. Removing Leveling Feet and Fixing Cabinet

To avoid personal injury and damage to the unit, the operation should be performed by two trained professional.



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Front top fixing hole	3	Front bottom fixing hole
2	Rare top fixing hole	4	Rare bottom fixing hole

Figure 2-8 Cabinet Fixing Holes

- Remove the Leveling Feet

1. Use an adjustable wrench to loosen the fastening nuts on the 4 hexagonal bolts in turn clockwise.
2. Turn the hexagonal bolt at the bottom of the leveling foot clockwise until the foot falls off the cabinet frame.

- Fix the Cabinet

There are two holes on each side of the top, bottom, front, and rear, as shown in Figure 2-8. Four bottom holes are bolted to the floor bracket in the equipment room (front fixing holes at the bottom of the cabinet are symmetrical to the rear fixing holes, and only the front fixing holes are shown in the figure). The four holes at the top can be connected to the top bracket of the room after they are installed with bolts.

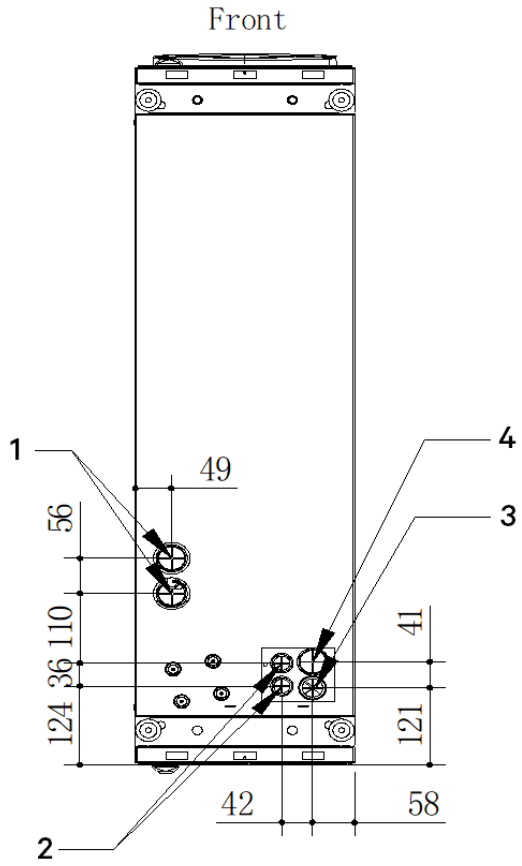
2.7.4. Piping Outlet Position and Sizes on Bottom Plate

Table 2-3 shows the outlet piping specifications of the Vertiv™ Liebert® XDH host.

Table 2-3 Liebert XDH Piping Outlet Specifications

Pipeline Type	Pipe Size (OD, mm)
Suction Pipe	22
Liquid Pipe	16

The location and dimensions of the inlet and outlet piping of the unit at the bottom plate are shown in Figure 2-9

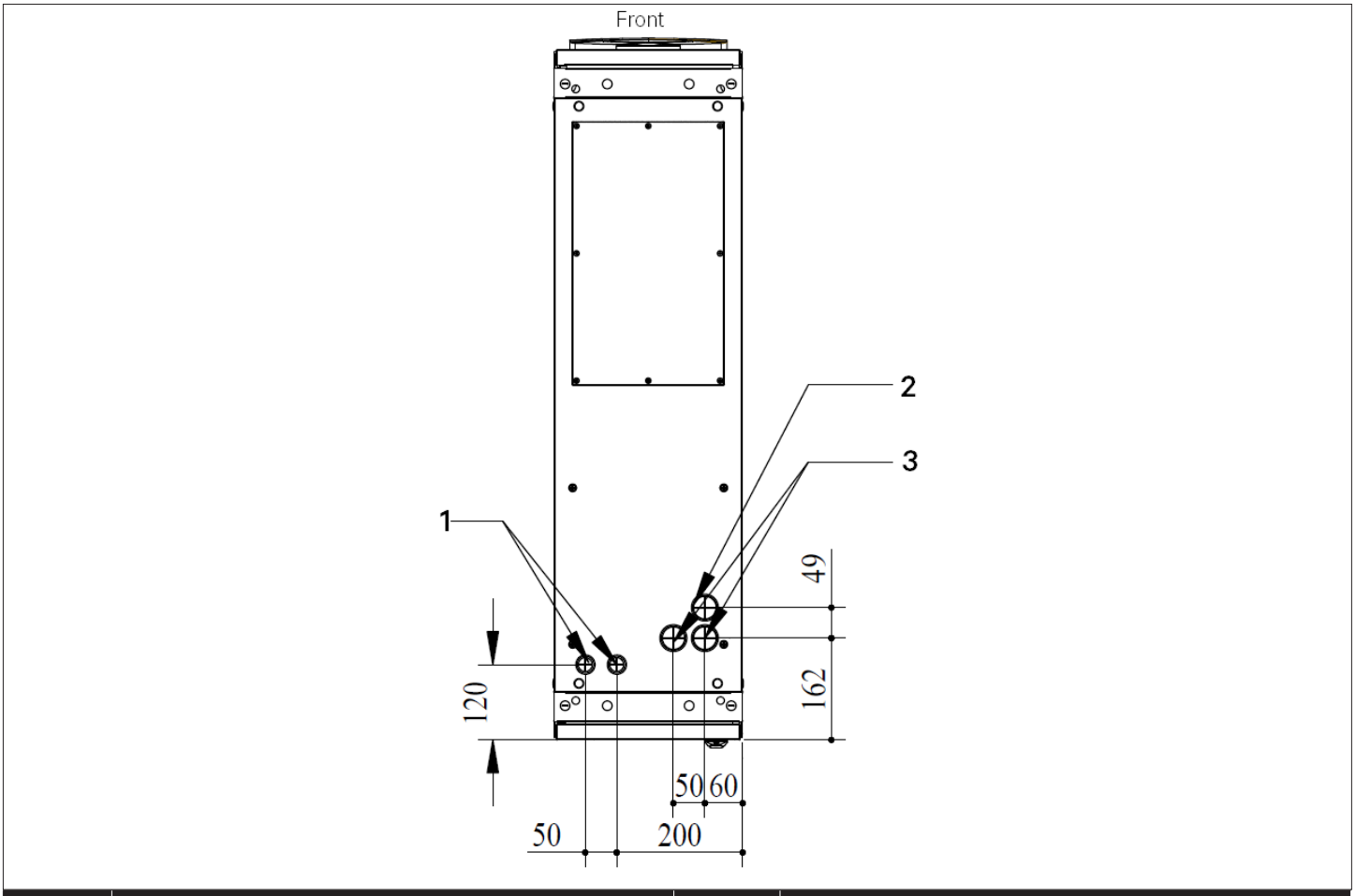


ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Drain	3	Refrigerant Outlet
2	Inlet Cable	4	Refrigerant Inlet

Figure 2-9 Inlet and Outlet Piping Position on the Bottom Plate

2.7.5. Piping Outlet Position and Sizes on Top Plate

The reserved location and positioning dimensions of the outlet pipes of the unit top plate are shown in Figure 2-10.



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Reserved inlet	3	Reserved Refrigerant inlet/outlet
2	Reserved drain		

Figure 2-10 Inlet and Outlet Piping Position on the Top Plate

Note: The front side of the unit is defined as the side with the display screen, and the opposite side is the rear side.

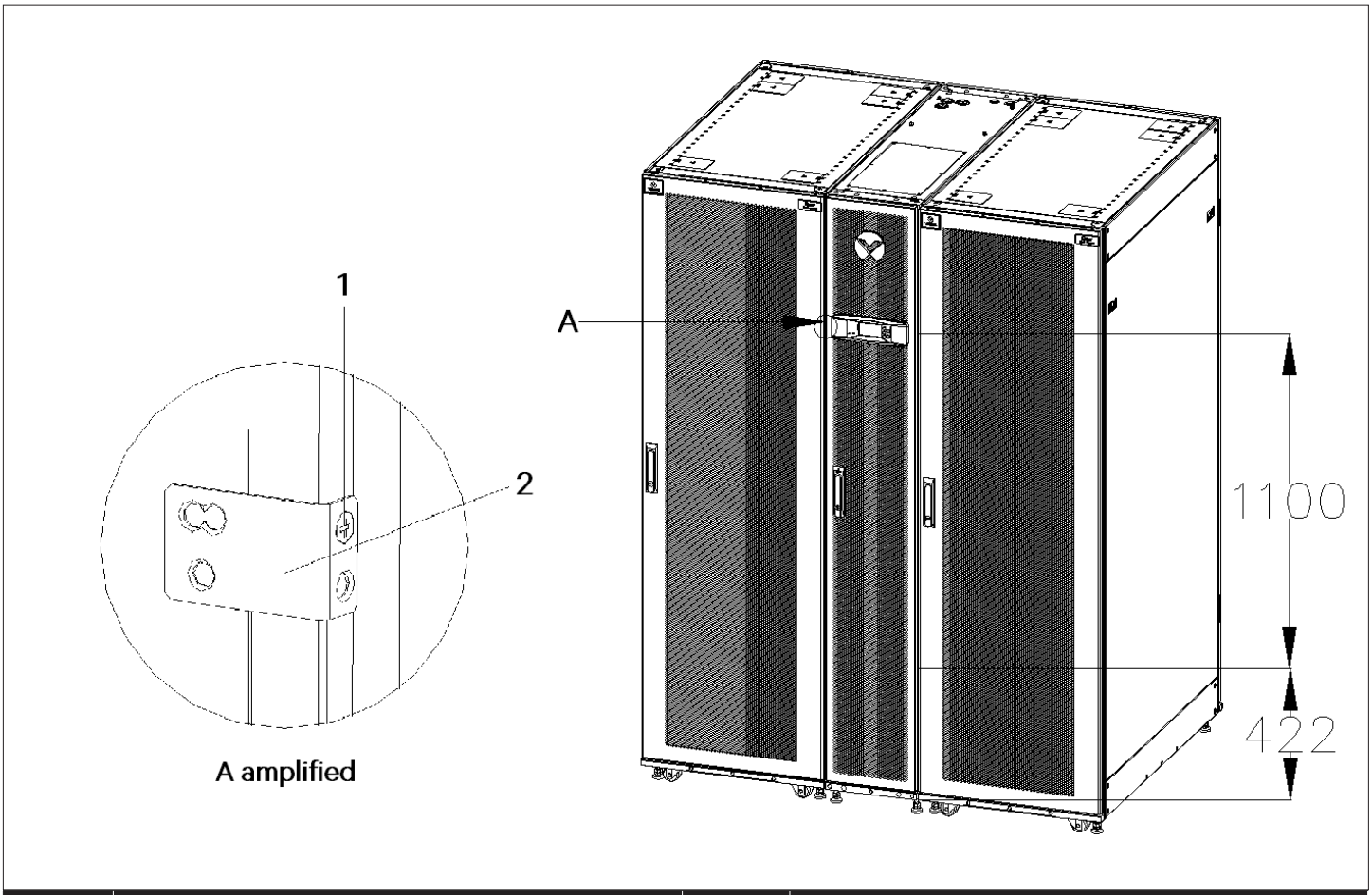
2.8. Parallel Connecting Cabinets

The cabinet parallel connecting parts are provided in the accessories kit, and user can fix them with adjacent cabinets through the parallel connecting parts. There are totally four cabinets panels on the filter side of the terminal unit (for the top, bottom, left and right), and two cabinets panels on the fan side (for the top and bottom on the left).
For example, the cabinet installation on the filter side, installation method is same for the rest of the panels.

Note: Ensure to level the cabinets, before connecting the cabinets in parallel. For the adjustment method, refer Section 2.7.2 Leveling the Cabinets.

Following are the steps for connecting the cabinets in parallel

1. Remove the L-shape combined cabinet part from the unit accessories kit. Figure 2-11 shows position A (left) of the L-shape combined cabinet parts.
2. Use M5 countersunk screws to fix the cabinet parallel connecting parts (L-shaped) on the unit frame (hinge side) and the installation holes of the adjacent server rack, as shown in Figure 2-11.
3. Repeat the Step 1 and Step 2 for all other cabinets.



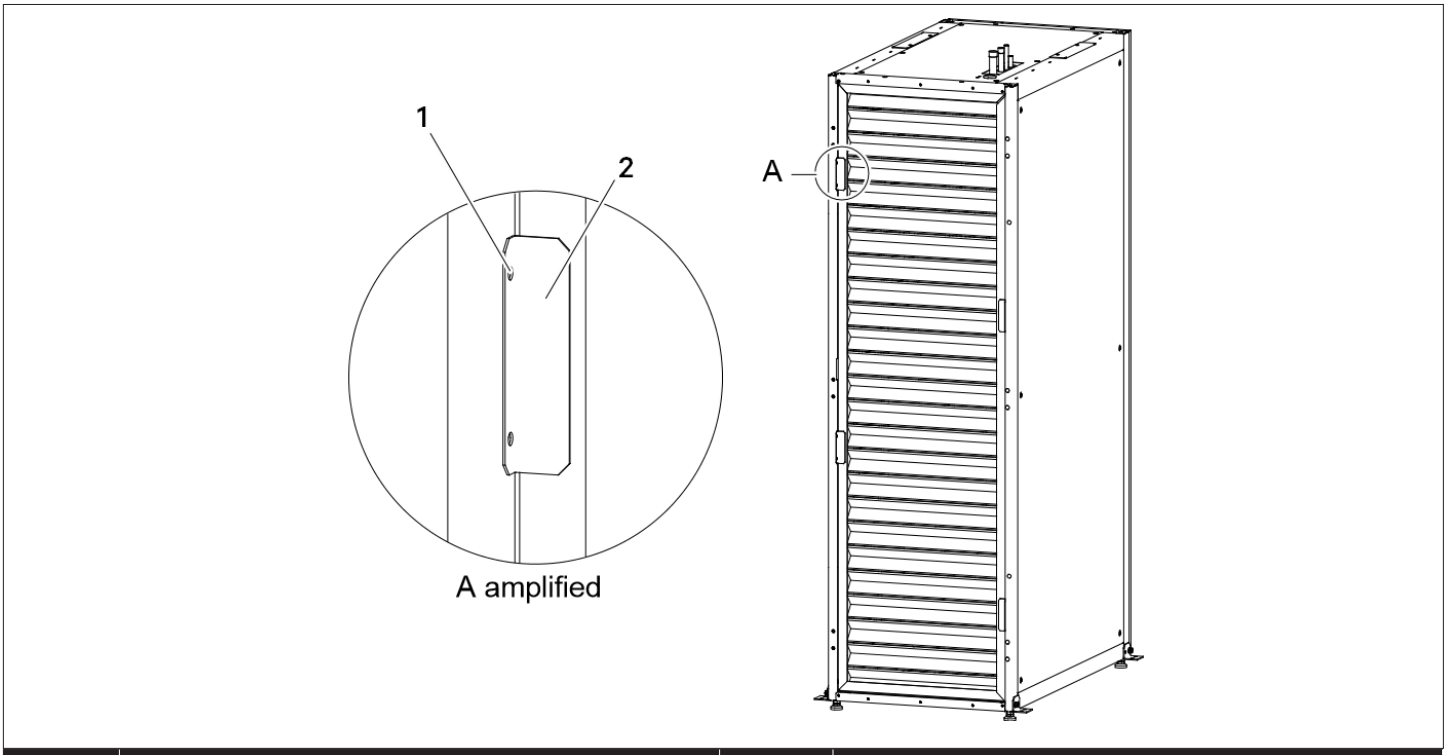
ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Mounting screw GB819_1_2000_M5 x 12	2	Cabinet connector

Figure 2-11 Connecting the Unit and Server Racks in Parallel

2.9. Unit Piping Installation

2.9.1. Removing the Filter Net

Remove the filter net first before connecting the terminal pipelines; then open the rear door of the cabinet, user can see the upper and lower filter nets. First loose the fixing screws on the upper filter net fixing piece, remove the fixing piece to take out the upper filter net, and then use the same method to take out the lower filter net, as shown in Figure 2-12.



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Mounting screw GB9074_4_88_M4 x 12	2	Fixing flake of the filter

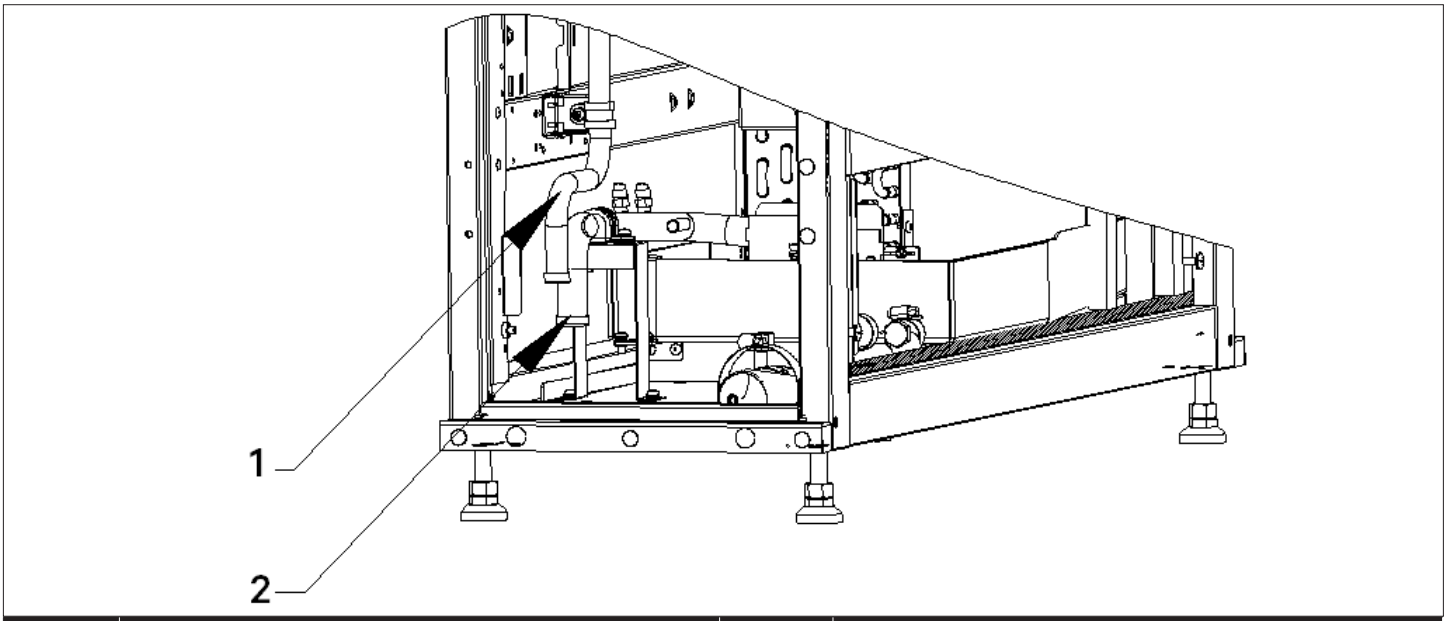
Figure 2-12 Removing the Filter Net

2.9.2. Internal Piping Specifications in the Terminal

After removing the filter net, user can see the internal piping of the Vertiv™ Liebert® XDH unit, including the refrigerant inlet and outlet piping and the condensate drain piping. The specifications of the three piping are shown in Table 2-4, and the location of the pipeline is shown in Figure 2-13 and Figure 2-14.

Table 2-4 Liebert XDH Internal Piping Specifications

Pipeline Type	Pipe Size (OD, mm)
Refrigerant inlet pipe (upper and lower)	16
Refrigerant outlet pipe (upper and lower)	22
Condensate pipe	12.7



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Refrigerant inlet	2	Refrigerant outlet

Figure 2-13 Bottom Piping of the Unit

2.9.3. Copper Pipe Connection between the Main Unit and the Terminal

Refer to the relevant content of installing the unit pipeline in the "Vertiv™ Liebert® XDC multi-connected air conditioner main unit User Manual".

2.9.4. Air Tightness Test

Refer to the relevant content of air tightness test in the "Vertiv™ Liebert® XDC multi-connected air conditioner main unit User Manual".

2.9.5. Terminal Condensate Drain Pipe Connection

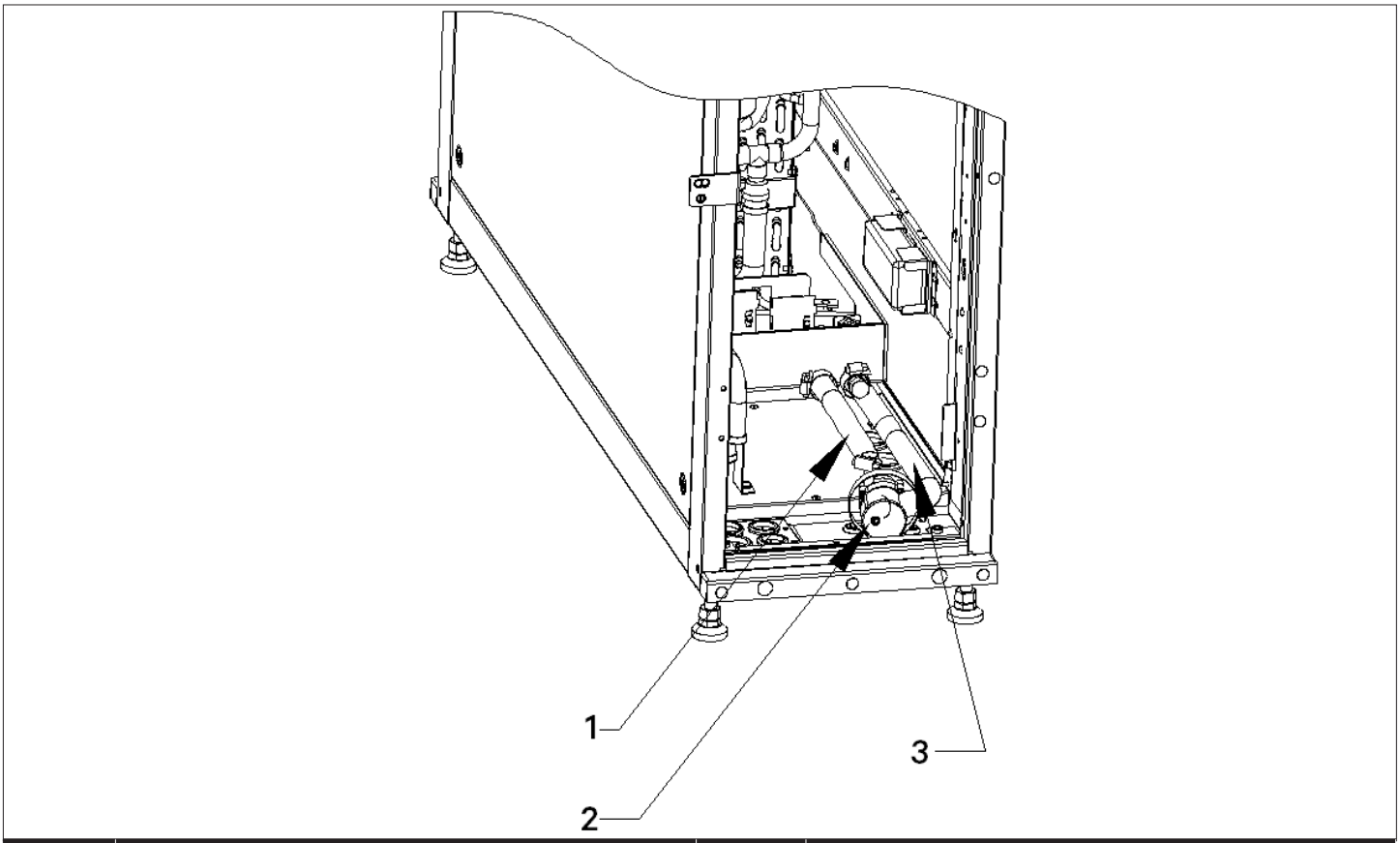
In the dehumidification mode, the drain pan collects the condensed water of the evaporator and the drain pump discharges it through the drainage piping. The drainage copper piping of the upper drainage unit has its own check valve to prevent back flow of the water in the engineering piping from the unit's drain pan. The external piping must be done from customer end, and the recommended material is PVC that should be used for piping.

Following are the drainage conditions and available setups

- If the unit has a water pump and the user needs to drain water from the top of the unit.

1. Connect the drain hose at the outlet of the drain pump to the upper drain copper piping, the inner diameter of the drain hose is 9 mm, and the outer diameter of the upper drain copper pipe is 12.7 mm;
2. Take out the hose clamp in the accessories kit, and fix the drain hose on the drain tower joint. The required hose clamp torque is 1.5 N-m (15 kg-cm).
3. Connect the external drain pipe at the reserved upper drain hole on the top of the cabinet as shown in Figure 2-10 (pipe joints: 3/4"-BSP), and the external drain pipe should be inclined in the drain direction. Prevent the water pump from stalling and back flow of condensate.

- If the unit is equipped with a water pump, and the user needs to drain water from the bottom of the unit, route the drain hose through the drain hole under the water pump of the unit (there is a mark on the cabinet floor in Figure 2-14) and connect it to the condensate drain pipe on site.

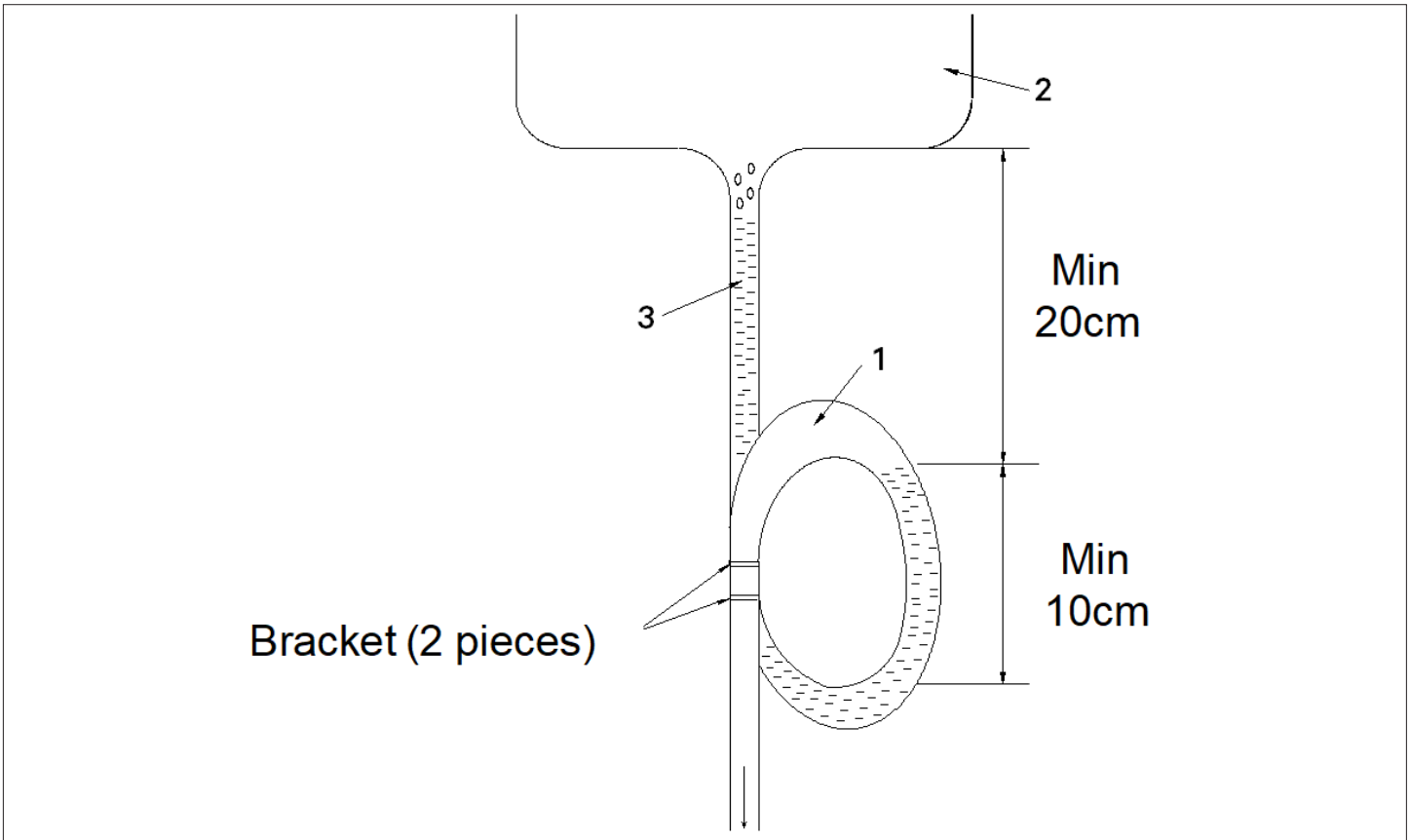


ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Pump drain pipe	3	Drain pipe
2	Pump		

Figure 2-14 Drain Piping Connection

- If the unit is not equipped with a drain pump, the drain pan comes with two drain ports, both of which drain naturally. When connecting on site, remove the drain Hose 1 and Hose 3 (factory default length is 2 m, and the outer diameter is 16 mm). The drainage hole under the water pump and the drainage hole under gravity are penetrated (refer Figure 2-14) and connected to the external drainage piping.
  In order to ensure that the condensate can be drained, a trap must be installed separately, as shown in Figure 2-15, and the requirements are as follows:

1. Use galvanized steel pipes, PVC or flexible polyethylene pipes.
2. It is allowed to incline 2% in the drainage direction.
3. A trap (1) must be placed 20 cm below the water pan (2), and the trap must be placed in the raised floor below the unit.
4. Fill the trap with water (3).



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Trap	3	Pipe filled with water
2	Water pan		

Figure 2-15 Drainage Piping Trap

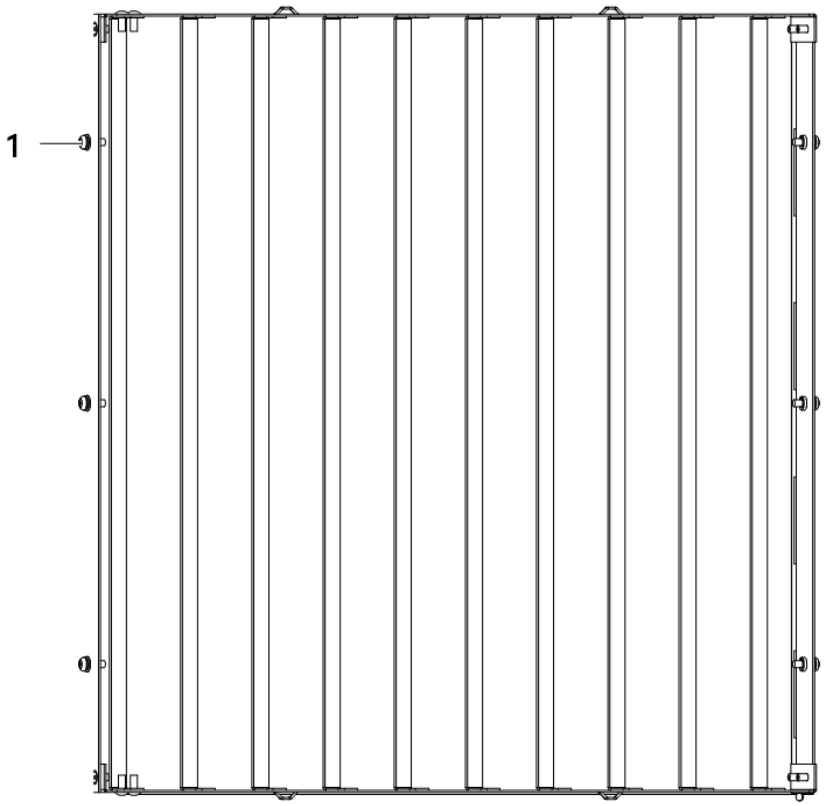
Note1: Do not cut the bracket of the trap, otherwise the drainage of condensate will be affected.
Note2: Before starting up, fill the trap with water to avoid blowing water.
Note3: To avoid water leakage, use Teflon raw material tape between the flexible piping and the joint.

2.10. Installation Finishing Work

After the Vertiv™ Liebert® XDH is installed, the piping and component fasteners must be checked and firmly tightened before commissioning. At the same time, the guide grille should be adjusted and the installation holes on the top of the cabinet must be blocked with the rubber plugs and bolts in the mechanical parts accessories.

- **Adjust the Guide Grilles**

According to the installation position of Liebert XDH unit at the site, the installation direction of the air guide grille can be adjusted to guide the air stream in the left or right direction. The guide grille is composed of several linear pieces which is fixed at left and right ends. Remove the screws on the left and right sides of the single guide grille, rotate it 180 degrees, and install it to change the wind direction. The mounting screws of single piece guide grille are as shown in Figure 2-16.

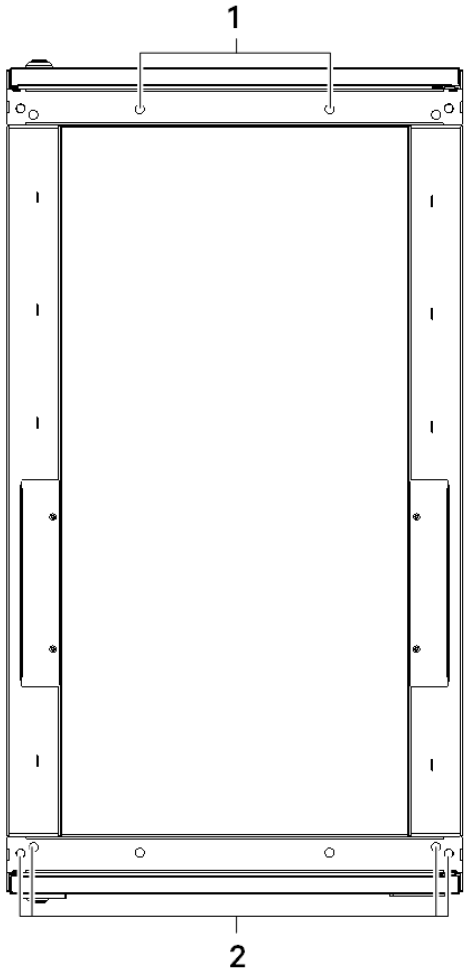


ITEMS	DESCRIPTION
1	M4 Screw (SIx pcs)

Figure 2-16 Guide Grille Fixing Screw Position

- Block the holes in the top plate of the cabinet

In order to facilitate on-site installation (connect the cabling rack on the top of the equipment room, etc.), small holes are reserved on the top of the unit cabinet. After the on-site installation of the cabinet is completed, the remaining holes need to be blocked with the rubber plugs and bolts in the mechanical parts accessories, use M13.5 rubber plugs to block 4 holes on the top plate of the cabinet, and block 8 holes on the top plate of the cabinet with M12x30 bolts, as shown in Figure 2-17.



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Use the provided four M13.5 rubber plugs to seal the holes	2	Use the provided eight M12 x 30 bolts to seal the holes

Figure 2-17 Holes on the Top of the Unit Cabinet

2.11. Mechanical Installation Checklist

Initiate the inspection checks after the mechanical installation is completed. Pre-check and confirm that there are no discrepancies or faults. Ensure that all the points in the checklist (refer Table 2-5 for installation checklist) are complying accordingly..

Table 2-5 Mechanical Installation Checklist

Check Items	Results
Reserve maintenance space for easy unit maintenance.	
The unit is installed upright and vertically, and the installed fastening parts have been firmly locked.	
The connecting piping between the main unit and the terminal unit has been installed properly, and the ball valves in the terminal have been fully opened.	
The direction of the air guide grille is adjusted as per the requirement (if necessary).	
Condensate drain piping is connected firmly.	
All piping joints are rigidly tightened.	
Piping fasteners are checked and fixed reliably.	
After the unit is installed, the debris inside or around the unit must be removed (such as transportation materials, mechanical parts materials, tools, etc.)	

Everything is checked and verified, follow the electrical installation.

3 Electrical Installation

This chapter introduces the electrical installation of Vertiv™ Liebert® XDH unit, including installation notes, cabling and electrical inspection for the unit.

Note1: Liebert XDH unit is a professional unit, used in industrial, commercial or other professional environment, and is not sold to the general public.

3.1. Installation Tasks and Cautions

3.1.1. Cabling Connection at the Site

1. Liebert XDH unit power supply cables and control cables.
2. Unit input and output control cabling:

- The communication cabling between the main unit and the terminal
- Remote switch cabling
- Floor overflow sensor cabling
- Remote temperature sensor cabling
- External general alarm cabling

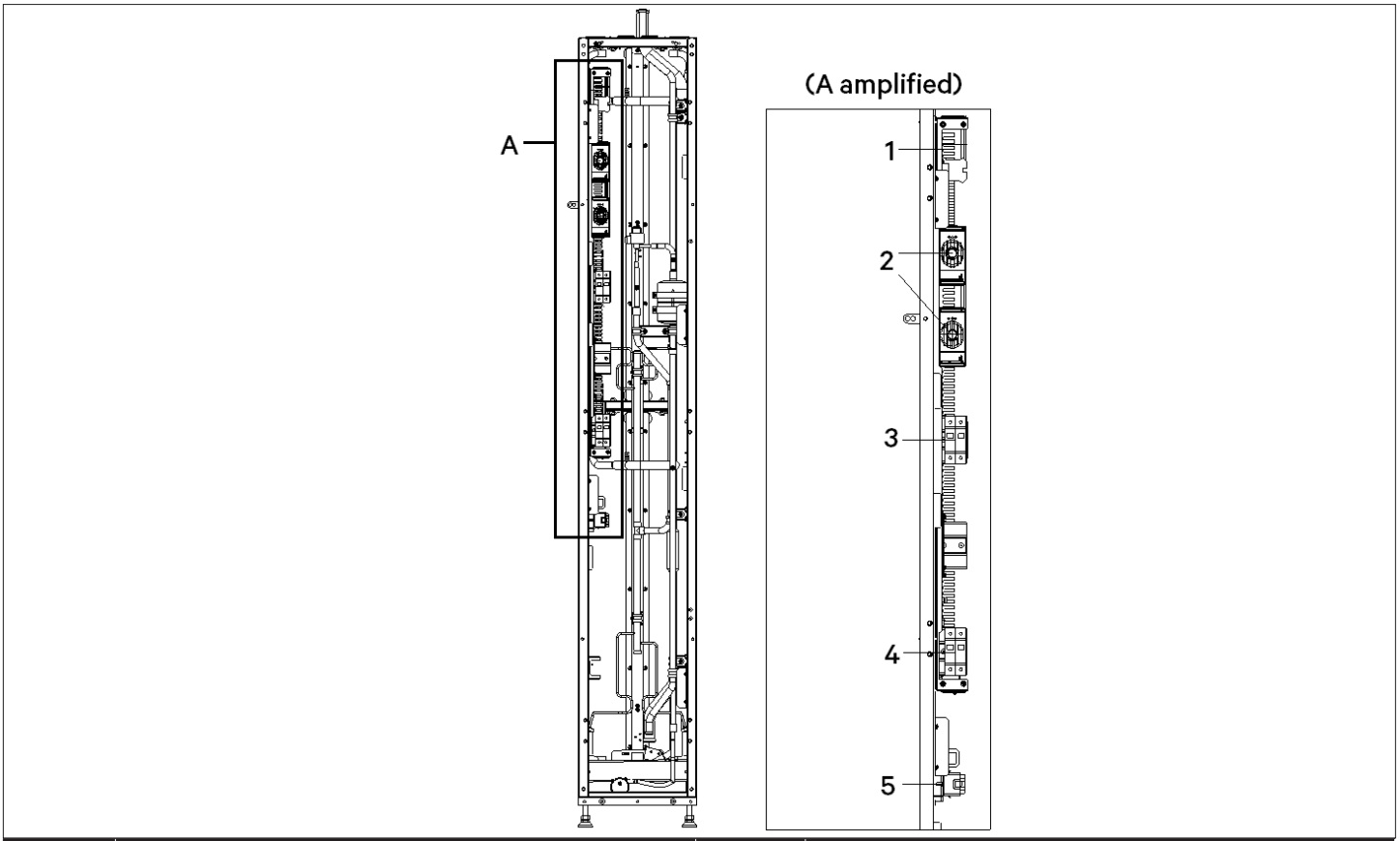
3.1.2. Installation Notes

3. The connection of all power cables, control cables, and ground cables must comply with the national and local electrician regulations.
4. For full load current, refer to the unit's nameplate. The cable size should comply with local cabling/wiring regulations.
5. Main power supply requirement: 220 V to 240 V (±10%)V, 1N, 50 Hz/60 Hz; power grid system: TN/TT.
6. The power supply cord adopts Y-type connection. If the power supply cord is damaged, it must be replaced by professional maintenance personnel.
7. The electrical installation and maintenance must be performed by authorized and trained professionals.
8. Before connecting the circuit, use a voltmeter to measure the input power voltage, and ensure the power supply is off.
9. The unit needs to be fixed firmly with screws, guide rails or other methods during installation to avoid shaking during startup or operation.
10. The emergency power supply off and emergency stop requirements of the air conditioner should be considered in the power distribution system, and a suitable all-pole disconnection device for disconnection of the power supply should be provided.
11. Appropriate RCD should be installed according to the actual installation situation.
12. Without the confirmation of Vertiv technical personnel, the user cannot install electrical devices, such as electric meters, in the unit.

3.2. Cabling of the Unit

3.2.1. Electrical Interface Location of the Unit

Open the rear door of the Vertiv™ Liebert® XDH unit and remove the filter net, user can see the specific distribution position of the low-voltage components, as shown in Figure 3-1. The detailed distribution information of low-voltage electrical components is represented according to the labeling attached to the cabinet.



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	Terminal block	4	Main breaker
2	Power module of fan	5	Fixed clip
3	Breaker of power module		

Figure 3-1 Electrical Control Box and User Cabling

3.2.2. Connection of Unit Power Supply Cables

The specific location of the power interface of the Vertiv™ Liebert® XDH terminal unit is shown in Figure 3-1. L, N, and PE are connected to the corresponding ends of the external power supply. Leave a certain margin for the incoming cable and fix it on the cable fixing clamp, which is fixed on the inner panel of the unit. The top inlet/outlet holes and the bottom inlet holes are shown in Figure 2-9 and Figure 2-10.

Refer to the rated full load current value (FLA) of the unit for the selection of cabling model, Table 3-1 provides the FLA values of the unit.

Table 3-1 Full Load Current Value of the Unit (unit: A)

Model	Standard Unit
XDH030CS1LRC	7

Note1: The cable size should comply with local and national regulations.

Note2: The above full load current value does not include the outdoor unit and Vertiv™ Liebert® XD terminal.

3.3. Control Cables Connections

Figure 3-2 shows the location of the cabling terminals used for field cabling/wiring.

Before connecting the control cables, the person who carries out cabling work must take corresponding anti-static measures.

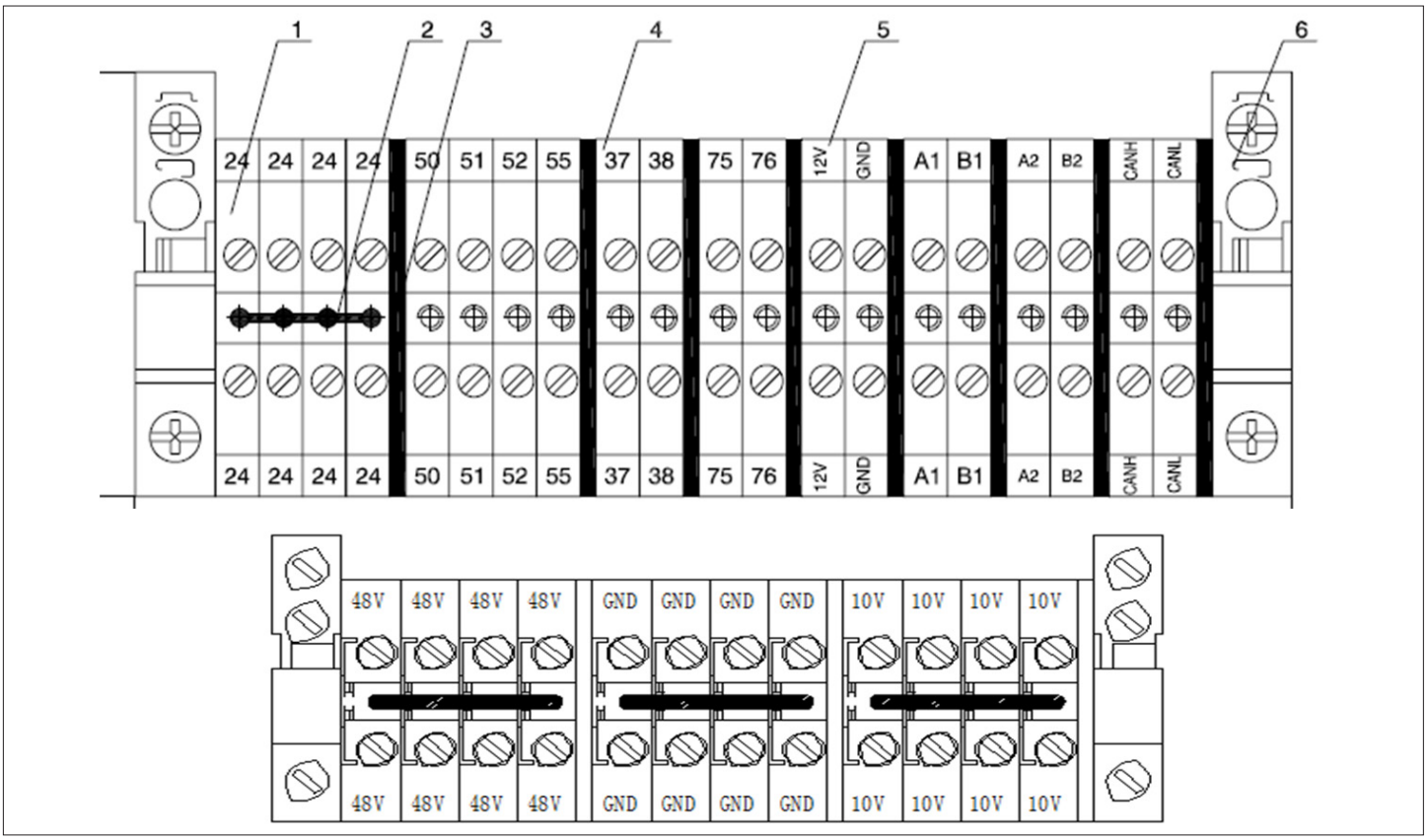


Figure 3-2 Field Cabling Terminal

- Communication cables

CAN communication is used between the main unit and the Vertiv™ Liebert® XDC terminal, and the user needs to connect the cables on site. The communication cables are from the CANH/CANL terminal of the unit and further connected in series with the CANH/CANL on each terminal block of the terminal.

Note: The communication cable must be a shielded twisted pair, away from strong interference sources, and ensure that both ends of the shielding layer are grounded.

Note: The communication cables and power cables must be routed separately.

- Remote shutdown

Figure 3-2 shows the terminals 37# and 38# that can be connected to the remote shutdown switch. The terminals have been short-circuited in the factory. When a remote shutdown is required, remove the short-circuit cables.

Note: When the 37# and 38# terminals are disconnected, the unit will shut down.

- Floor Overflow Sensor Cabling

The unit is provided with a floor water leakage detection sensor. When configuring the detector sensor, the user needs to connect one end to the 51# terminal of the terminal block and the other end to the 24# common terminal end. Each unit can be connected to any number of detection sensors in parallel, but there will be only one floor water leak alarm, and the alarm information is confirmed through the controller.

It is recommended to installed the water leak detection sensor at a low point on the floor under the base of the unit, and the distance from the unit should not exceed 0.5 m. And the water leak detection sensor should be placed away from a wet water trap or floor drainage piping.

Note1: Before tightening any assembly connections and cabling connections, ensure that the power supply of the control unit is turned off.

Note2: It is forbidden to use the water leak detection sensor near the flammable liquids.

Note3: It is prohibited to use the water leak detection sensor to detect flammable liquids.

- Remote temperature sensor

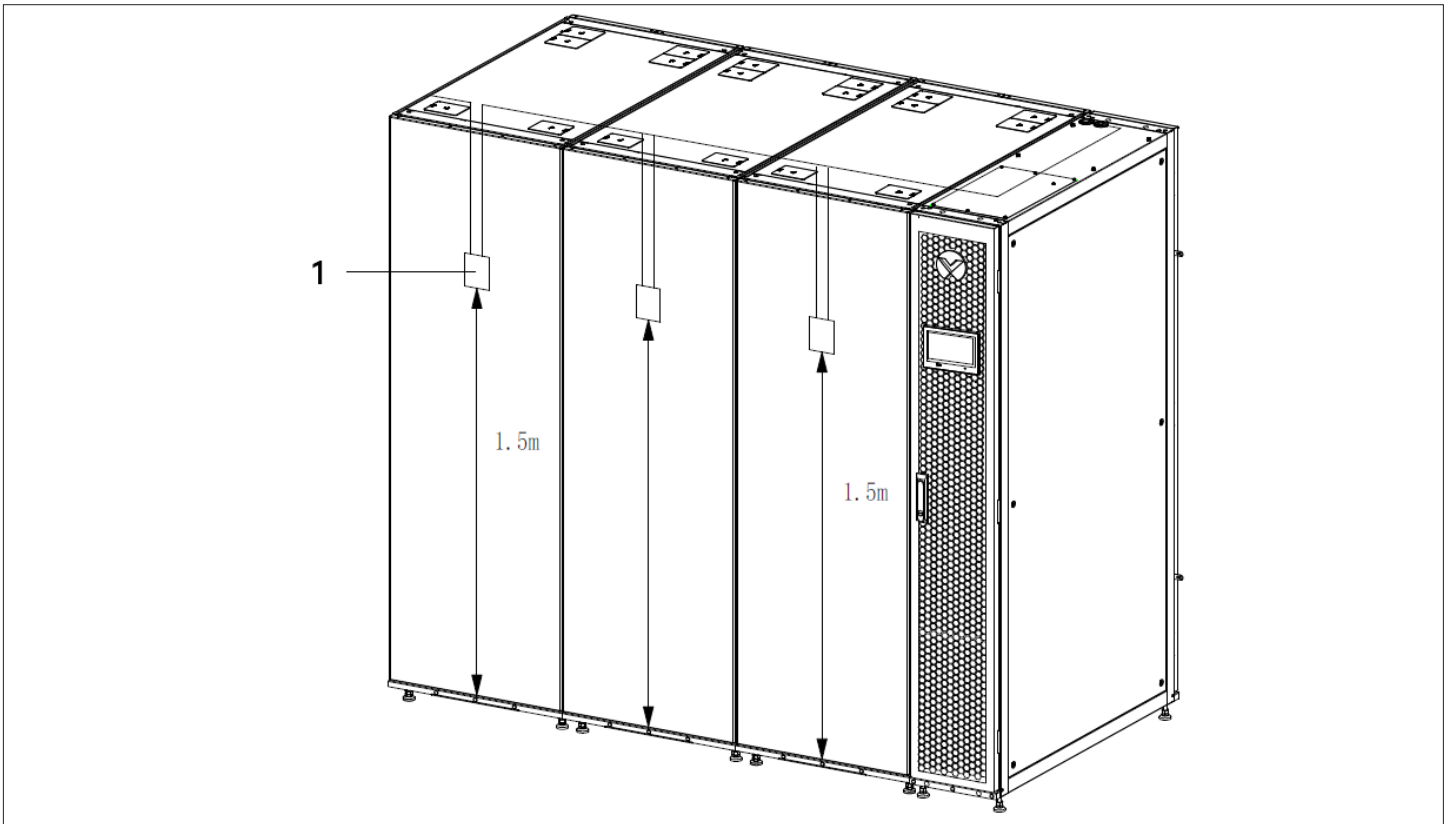
Each unit can be provided with up to 6 remote temperature sensors. It is recommended to place the sensor in front of the thermal load to obtain the most accurate temperature values. If the sensors are connected in series (see Figure 3-3), each temperature sensor monitors the air temperature entering each rack device, and the temperature value reading is used to control the operation of the unit.

The standard position of the sensor is 1.5 m high. Therefore, the sensor must be placed in the position shown in Figure 3-3, otherwise the sensors cannot operate normally. Insert the connector of the rack temperature sensor into the TB2 interface.

After connecting the cables, lead the cable from the top or bottom of the unit, and connect it to the first sensor, then connect the first sensor to the second sensor, and so on, forming a connection chain.

Fix the temperature sensor in front of the hottest heat source in the rack, do not fix it in front of the empty slot. Each sensor is provided with a magnetic base to attach it on the surface of the rack cabinets The sensor should be fixed in the place most likely to lack sufficient cold air.

The address setting of the rack temperature sensor IRM-S02TH is shown in Table 3-2.



ITEMS	DESCRIPTION
1	Sensor

Figure 3-3 Rack Sensor Layout

Table 3-2 Rack temperature sensor IRM-S02TH address setting

Sensor	1	2	3	4	5	6	ID	
Rack temperature 1	0	0	0	1	0	0	10	ON - "1" OFF - "0"
Rack temperature 2	0	0	0	1	0	1	11	
Rack temperature 3	0	0	0	1	1	0	12	
Rack temperature 4	0	0	0	1	1	1	13	
Rack temperature 5	0	0	1	0	0	0	20	
Rack temperature 6	0	0	1	0	0	1	21	

- External general alarm terminals

The external general alarm can be connected to the 75# and 76# terminals, and its output is used to trigger the external alarm devices, such as alarm lights. When a major alarm occurs, the contact is closed. This can be used to send out remote alarms, signal to the building management system or automatically dial the paging system. The user needs to provide the power supply of the external public alarm system circuit.

For other terminal definitions, refer *Appendix I Vertiv™ Liebert® XDH Circuit Diagram*.

3.4. Electrical Inspection Checklist

After the electrical installation is completed, check and confirm according to Table 3-3.

Table 3-3 Electrical Installation Checklist

Check Items	Results
The power supply voltage is the same as the rated voltage on the unit's nameplate	
There is no open or short circuit in the electrical circuit of the system	
The power supply and ground cables are firmly connected to the disconnect switches	
The rated value of the circuit breaker or fuse is correct	
The control cable is connected	
All cables and circuit connectors have been tightened, and the tightening screws are not loose	

After confirming the above points, user can start the commissioning.

Users are prohibited from powering on the unit before the professional and technical personnel authorized from Vertiv have checked and confirmed the electrical connections.

4 System Startup and Commissioning

This chapter introduces the system startup and commissioning, including the specific operation steps for startup and commissioning the unit.

4.1. Startup and Commissioning

4.1.1. Preparation Before Commissioning

- Mechanical Part

1. According to the instruction label at the valve, ensure that all valves of the main unit and Vertiv™ Liebert® XDH terminals are open.
2. The refrigerant piping system has passed the air tightness test and confirmed that there is no leakage.
3. Ensure that the total charge of the system has been roughly calculated.
4. The condensate drain piping system has been reliably connected and check if there is any sign of leakage.
5. The temperature of the equipment room is above 18 °C and has a certain thermal load. If not available, other heating devices should be used to preheat the environment of the equipment room to ensure the necessary thermal load for the commissioning.

- Electrical Parts

6. Confirm that the input voltage of the main power supply is within ±10% of the nominal range of rated voltage and the power isolation switch of the outdoor unit air-cooled condenser is closed.
7. Confirm that all electrical or control connections are correct, and firmly fixed all electrical and control connections.
8. Confirm that the power supply cables and low-voltage control cables are arranged separately.
9. Confirm that the high water level cable has been connected correctly.
10. Confirm that the ground cabling/wiring of the unit is reliably connected.

4.1.2. Commissioning Procedures

Since the Vertiv™ Liebert® XDC main unit and Vertiv™ Liebert® XDH terminals are connected as a system and are used together, the main unit and terminal adopt the same commissioning method. Refer to the related contents of the startup and commissioning in the “Vertiv™ Liebert® XDC multi-connected air conditioner main unit User Manual”.

4.2. Commissioning Inspection Checklist

After debugging, check and confirm according to Table 4-1.

Table 4-1 Commissioning Inspection Checklist

Inspection Items	Results
All output functions are automatic	
The temperature and humidity settings and control accuracy are correct	
Whether there is any abnormal alarm	
Other settings are correct	

5 Controller Operation Instructions

This chapter provides a detailed description on feature, appearance, color Interface, control buttons, control interface and menu structure of the Vertiv™ Liebert® XDH precision air conditioner.

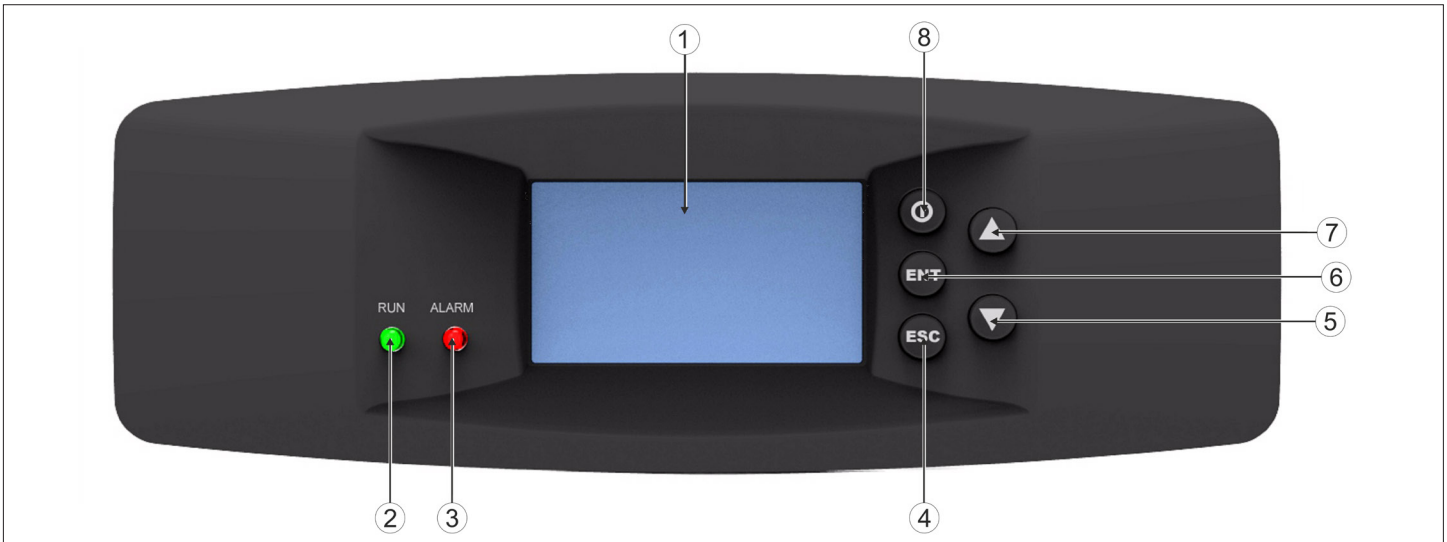
5.1. Feature

The micro-processing controller has the following features:

- It can monitor and display the operation status of Liebert XDH unit to maintain the environment within the range of setpoints.
- Equipped with a 128×64 dot graphics color Interface with white backlight with a user-friendly interface.
- Provides a three-level password protection to prevent unauthorized operation.
- Provides multiple functions, including self-recovery upon power failure, high & low voltage protection, phase loss protection and protection against phase-reversal.
- Accurately record the run-time of important components through menu operation.
- The expert-level fault diagnostic system can automatically display the current fault information to facilitate technician personnel in maintenance activities.
- Stores up to 200 historical alarm records.
- Configured with an RS485, using MODBUS-RTU communication protocol.

5.2. Appearance

The micro-processing controller panel is shown in Figure 5-1.



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	LCD Screen	5	Down button
2	Run indicator	6	ENT button
3	Alarm indicator	7	Up button
4	ESC button	8	On/Off button

Figure 5-1 Micro-processing Controller Panel

5.3. Graphic Color Interface

The graphic color Interface displays English menus with white backlight. When the system is operating normally, the upper half part of its main interface is shown in Figure 5-2. More detailed operating status of certain component and alarm information are available from the Main Menu Interface. The selected menu option will be highlighted while browsing. The digit to be changed will be highlighted while scrolling through the settings menu.

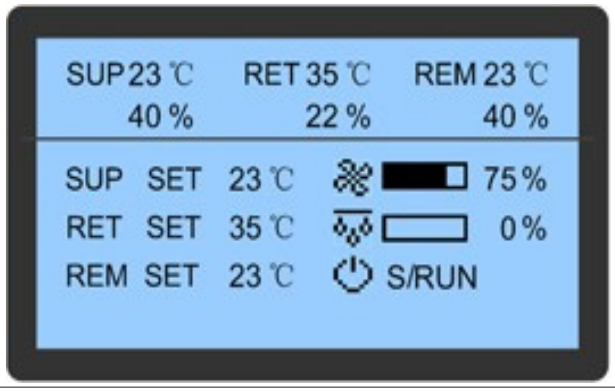
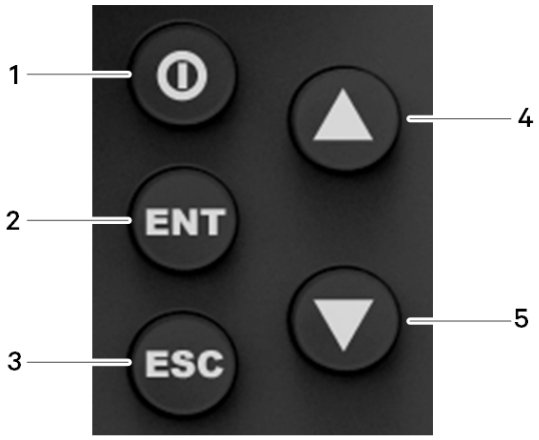


Figure 5-2 Display Interface

5.4. Control Buttons

5.4.1. Function Description

The micro-processing controller has five control buttons, as shown in Figure 5-3. The functions of the control buttons are described in Table 5-1.



ITEMS	DESCRIPTION	ITEMS	DESCRIPTION
1	On/Off button	4	Down button
2	Enter button	5	Up button
3	ESC button		

Figure 5-3 Control Buttons

Table 5-1 Function Descriptions of Control Buttons

Button	Function Description
On/ Off	Switch On/ Off the controller by pressing for 3s.
Enter button ENT	Enter the selected menu Interface. Validate the parameter setting value.
Escape button ESC	Exit the current menu and return to the normal Interface or previous menu Interface. Abort parameter change; silence the audible alarm.
Up button	Move the cursor up or increase the parameter value. For a toggle selection: scroll through the options. For a multi-Interface menu: scroll up the Interface.
Down button	Move the cursor down or decrease the parameter value. For a toggle selection: scroll through the options. For a multi-Interface menu: scroll down the Interface.

5.4.2. Operation Example

Example 1: Enter the password to access the Main Menu

After the unit is powered on, user can enter the Main Menu by accessing the following operations on the Normal Interface.

1. Press the Enter button to access the Password Interface.
2. Press the Enter button to highlight the input data field in the Password Interface.
3. Press the Up or Down button to change the current password number.
4. Press the Enter button to confirm the password and enter the Main Menu Interface.

Example 2: Modify parameters

The setting of the Supply Air High Temperature alarm value menu item in the Alarm Value Setting menu as an example:

5. In the main menu interface, press the up or down key to move the cursor to the Alarm Menu.
6. Press Enter to access the Alarm Menu interface.
7. In the alarm menu interface, press the up or down key to move the cursor to the Alarm Setting.
8. Press Enter to enter the Alarm Setting interface.
9. In the alarm setting interface, press the up or down key to move the cursor to the Alarm Value Setting.
10. Press Enter to access the Alarm Value Setting interface.
11. Press the Enter key to reverse the display of the air supply high temperature parameter position.
12. Press the up or down key to select the parameter.
13. After the parameters are selected, press the Enter key to confirm, and the parameters take effect.
14. Press the exit key to return to the previous menu interface.

After changing the parameters, if you don't press the Enter key to confirm, the supply air high temperature alarm value will keep the original parameters.

5.5. Control Interface

5.5.1. Startup Interface

After the unit is powered On, the graphic color Interface will display the ON Interface, as shown in Figure 5-4.

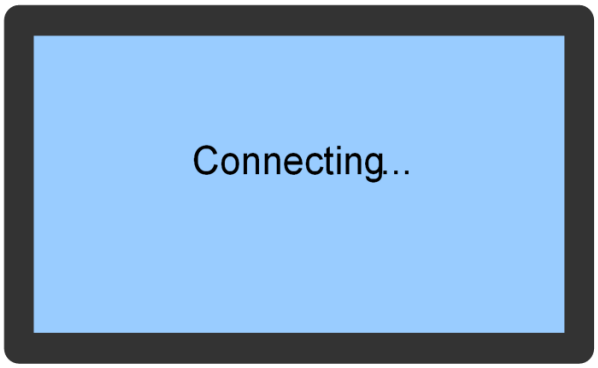


Figure 5-4 Startup Interface

5.5.2. Normal Interface

After the unit is powered On, the Normal Interface will be displayed after 10 seconds. The upper part of the Interface displays the current airflow temperature and humidity (first column), return air temperature and humidity (second column), and remote temperature and humidity (third column). The lower part displays the unit temperature, fan output, dehumidification state, and unit running state (power Off or running). Refer Figure 5-5 for better understanding.

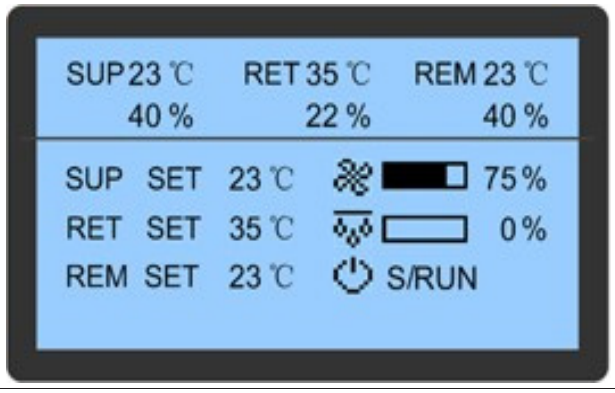


Figure 5-5 Normal Interface

5.5.3. Unit Working Icons

The icons and their definitions are listed in Table 5-2.

Table 5-2 Description of Icons

Icon	Description
SUP	Current airflow temperature and humidity
RET	Current return air temperature and humidity
REM	Current remote return air temperature and humidity
SUP SET	Specified airflow temperature
RET SET	Specified return air temperature
REM SET	Specified remote return air temperature
	Rotating speed rate of the fan, ranging from 30% to 100%
	Dehumidification state. In dehumidification state, the value is 100%. Otherwise, the value is 0%
	Unit attribute/ running state. S: standalone; RUN: running; OFF: shutdown

5.5.4. Password Interface

Press the Enter button on the Normal Interface, and the Password Interface will appear, as shown in Figure 5-6.

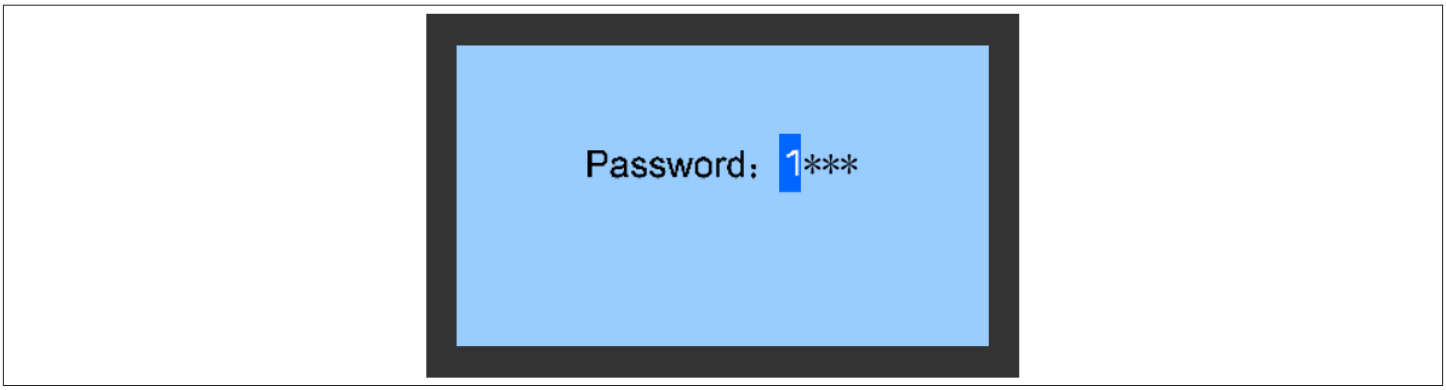


Figure 5-6 Password Interface

Three levels of passwords are provided for accessing the menus. The detailed descriptions are listed in Table 5-3.

Table 5-3 Password Level

Password Level	User	Initial Password	Remark
Level 1	General operator	1490	Browse all menu information. Only set temperature and humidity setpoints and cannot change the values and settings
Level 2	Maintenance personnel	-	Browse all menu information. Set all parameters
Level 3	Factory technician	-	

For detailed operation on entering the password, refer to Section 5.4.2 Operation Example. If incorrect password is entered in the controller, the menu options can only be viewed, but the parameter settings can not be changed. In this case, to return to the Normal Interface, you can press the ESC button and then press the Enter button to re-enter the Password Interface.

Note: If user press the Enter button on the Password Interface instead of entering a password, the menu settings can only be viewed, but no parameters can be changed.

5.6. Menu Structure

5.6.1. Main Menu

Enter and confirm the password on the Password Interface, and the Main Menu Interface is displayed, as shown in Figure 5-7. For detailed menu structure, refer to *Appendix II Menu Structure*. After selecting a certain menu, the menu item will be highlighted. Some menu items are changeable and others are not. For detailed setting procedures, refer to Section 5.4.2 *Operation Example*.

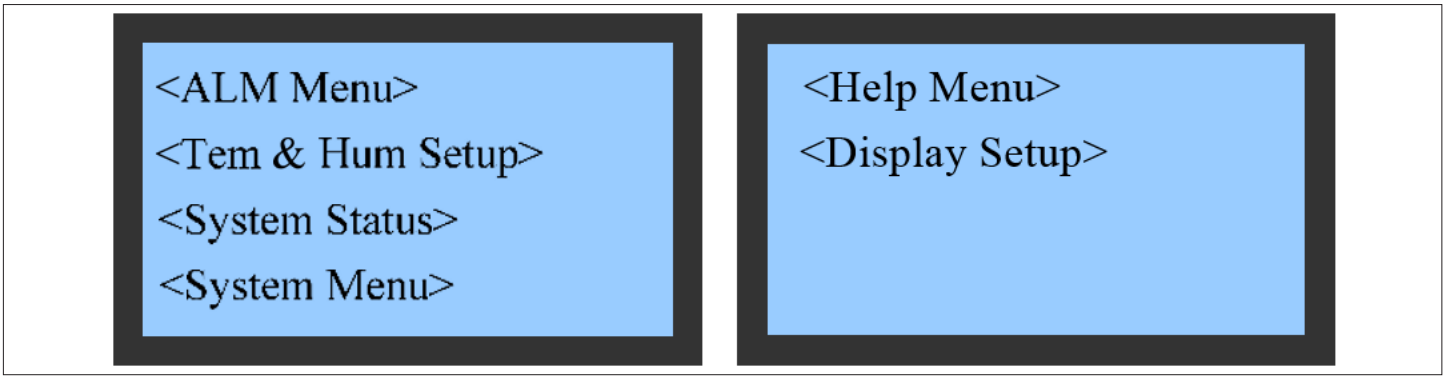


Figure 5-7 Main Menu Interface

Table 6-4 describes the options displayed on the main Interface.

Table 5-4 Description of the Main Menu

Menu	Description
Alarm menu	Query the alarm state records and historical alarm records, and set alarm parameters
Humidity and Temperature settings	Set the working mode, temperature, humidity, and relevant parameters of the fan
System status	Query the system running state, environment temperature and humidity, system input and output state, actual running and shutdown records of the system and key components, and analog calibration.
System menu	Set the basic parameters of the system and fan, running parameters of the electronic expansion valve, optional functions, teamwork parameters, and manual mode.
Help menu	Set the time, change the password, and firmware version information.
Display settings	Adjust the Interface contrast, and change the language.

5.6.2. Alarm Menu

To enter the Interface shown in Figure 5-8, select Alarm Menu on the Main Menu Interface. To scroll up or down the menu items, click the Up or Down button respectively.

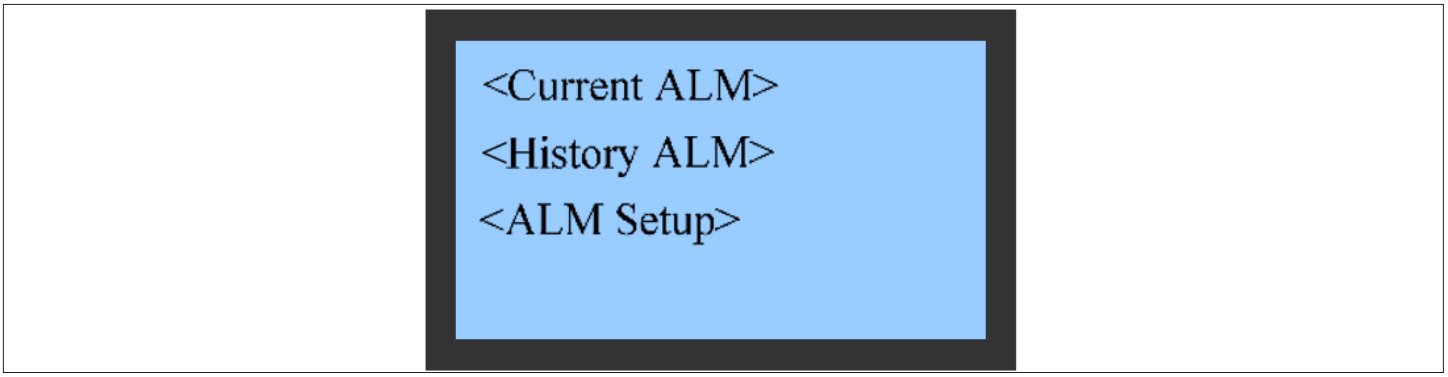


Figure 5-8 Alarm Menu Interface

5.6.3. Current Alarm

The current alarm menu is used to monitor the current alarm status of the air conditioner unit. It prompts either NO ALARM or specific alarm information. The specific alarm information includes XX/ YY, alarm type, and alarm generation time, as shown in Figure 5-9. XX indicates the alarm SN, and YY indicates the total number of reported alarms.

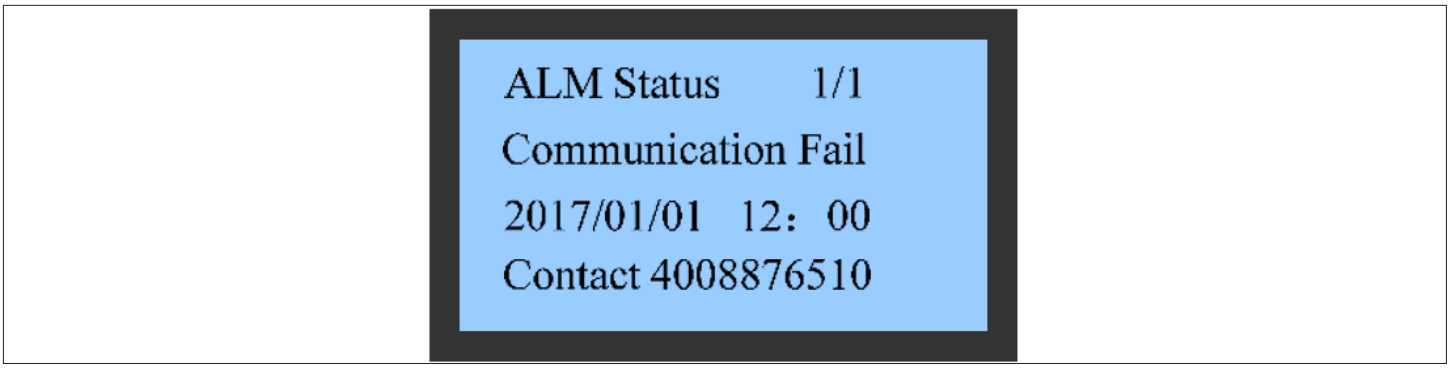


Figure 5-9 Current Alarm Menu

Note1: The largest number is the latest SN alarm. When more than one alarm is activated, press the Up or Down button to scroll through the alarm status records.

Note2: The current alarms are automatically cleared upon system power failure.

5.6.4. Historical Alarm

The historical alarm menu is used to query the historical alarm information of the air conditioner unit, including the XX/ YY, alarm type, alarm generation time, and alarm clearing time, as shown in Figure 5-10. XX indicates the alarm SN, and YY indicates the total number of reported alarms.

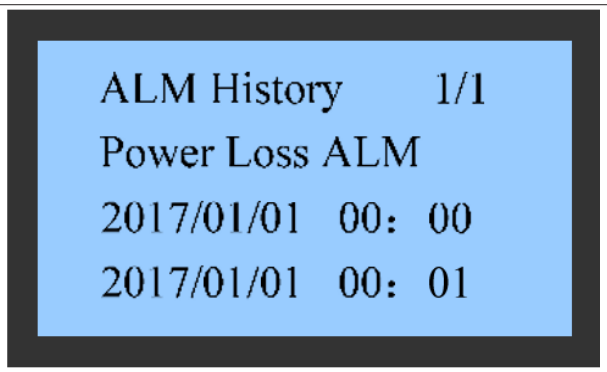


Figure 5-10 Historical Alarm Menu

5.6.5. Alarm Setup

On the Alarm Menu, select the Alarm setup to enter the Alarm Setup Interface. Use the Up or Down key to query menu items. The Alarm Setup menu includes the alarm values, system alarm attributes, sensor alarm attributes, and fault alarm polarity. Parameter settings can be saved permanently.

- **Alarm value settings**

On the Alarm Setup Interface, set the alarm values, as shown in Figure 5-11. Use the Up or Down key to scroll the menu items.

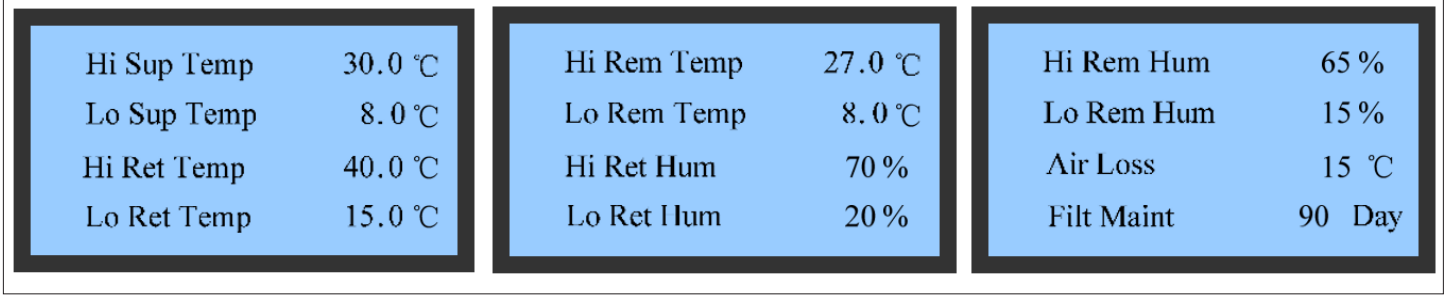


Figure 5-11 Items of the Alarm Value Setup Menu

- **System alarm attributes**

On the Alarm Setup Interface, set the alarm attributes, as shown in Figure 5-12. Use the Up or Down key to query menu items. Table 5-5 describes the alarm output logic.

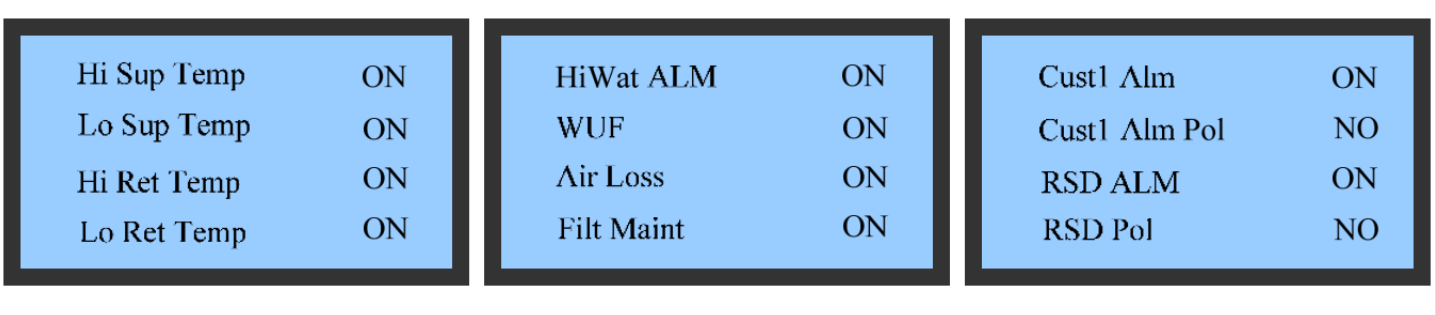


Figure 5-12 Items of the Alarm Attributes Setup Menu

The abbreviations of the system alarms are mentioned below

Abbreviation	Description
Hi Sup Temp	High Superheat Temperature Alarm
Lo Sup Temp	Low Superheat Temperature Alarm
Hi Ret Temp	High Return Air Temperature Alarm
Lo Ret Temp	Low Return Air Temperature Alarm
Hi Wat ALM	Hi Wat Alarm
WUF	Water Under flow Alarm
Air loss	Air Flow Loss
Filt Maint	Filter Maintenance
Custl Alm	Customized Alarm
Custl Alm Pol	Customized Alarm Polarity
RSD ALM	Reserved Alarm
RSD Pol	Reserved Polarity

Table 5-5 Alarm Output Logic

Value	Historical Alarm	Alarm State Record	Alarm Tone	Alarm Prompt
Enable	Yes	Yes	Yes	Yes
End	Yes	Yes	No	No
Disable	No	No	No	No

Alarms indicating airflow loss, high water level, floor water overflow, fan fault, and remote shutdown are severe alarms and cannot be disabled. Such alarms have only Enable and End states.

- **Sensor Alarm Attributes**

On the Alarm Setup Interface, set the sensor alarm attributes, as shown in Figure 5-13. Use the Up or Down key to query menu items.

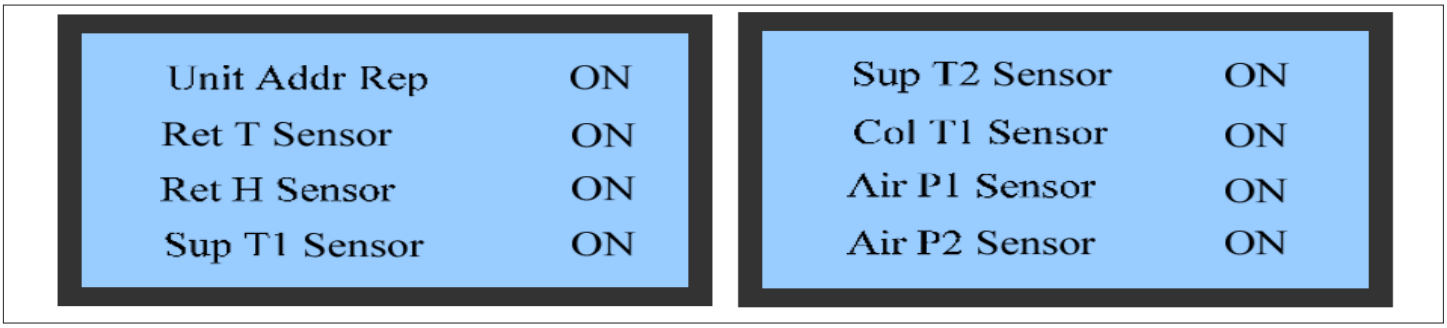


Figure 5-13 Items of the Sensor Alarm Attribute Setup Menu

The abbreviations of the sensor fault alarms are mentioned below

Abbreviation	Description
Unit Addr Rep	Unit Address Rep
Ret T Sensor	Return Air Temperature Sensor Fault Alarm
Ret H Sensor	Return Air Humidity Sensor Fault Alarm
Sup T1 Sensor	Supply Air Temperature Sensor T1 Fault Alarm
Sup T2 Sensor	Supply Air Temperature Sensor T1 Fault Alarm
Col T1 Sensor	Coil Temperature Sensor T1 Fault Alarm
Air P1 Sensor	Air Pressure Sensor P1 Fault Alarm
Air P2 Sensor	Air Pressure Sensor P2 Fault Alarm

- **Fault Alarm Attributes**

Figure 5-14 shows the fault alarm attributes of major components. Use the Up or Down key to query menu items.

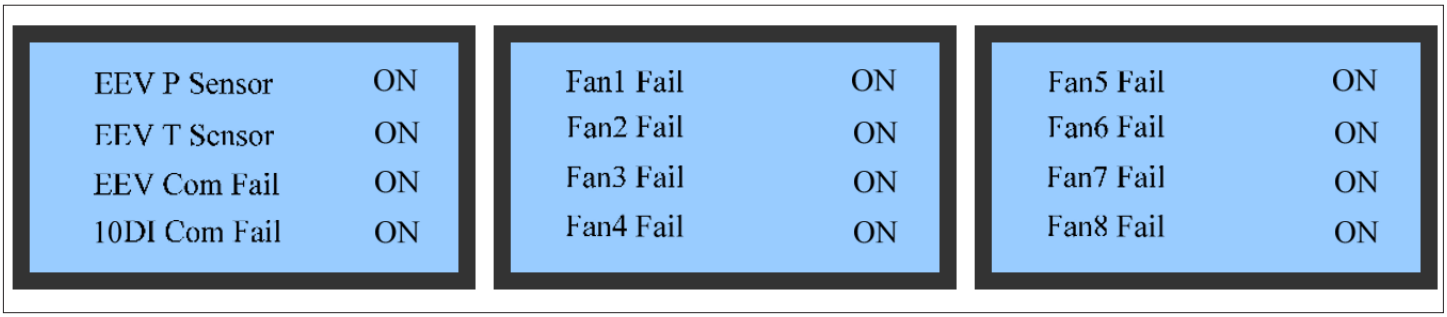


Figure 5-14 Items of the Fault Alarm Attribute Setup Menu

- **Temperature & Humidity Setting**

Select Main Menu and access the Temp & Hum Set and Interface as shown in Figure 5-15, and the Temperature and Humidity Setting values will be permanently saved.

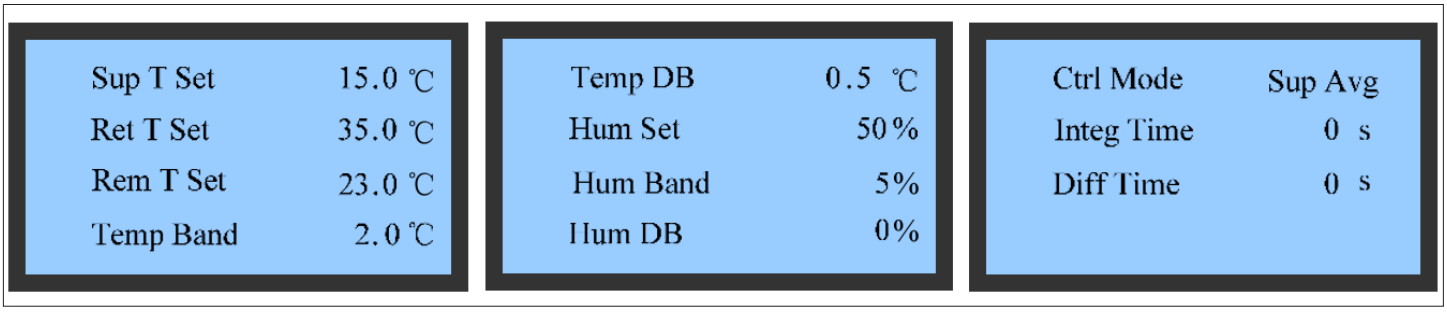


Figure 5-15 Temp & Hum Set Menu

The abbreviations of the set point conditions and alarms are mentioned below

Abbreviation	Description
Sup T Set	Supply Air Temperature Setpoint
Ret T Set	Return Air Temperature Setpoint
Rem T set	Remote Air Temperature Setpoint
Temp Band	Temperature Bandwidth (2.0 °C indicates +/-1 °C 0
Temp DB	Temperature Deadband zone
Hum Set	Relative Humidity Setpoint
Hum Band	Relative Humidity Bandwidth
Hum DB	Relative Humidity Deadband zone
Ctrl Mode	Mode of capacity control: Average Supply Air Temperature
Integ Time	Integrated Time (Part of the PID Logic)
Diff Time	Differential Time (Part of the PID Logic)

Note1: The specified temperature value is the target temperature for ensuring normal operation of the system. When the control mode is set to supply air mode, the specified temperature is the temperature of the supply air.

Note2: When the control mode is set to air return, the specified temperature is the temperature of the return air. This setting for the remote mode is also similar.

5.6.6. System State

Select Main Menu to access System State menu, as shown in Figure 5-16.

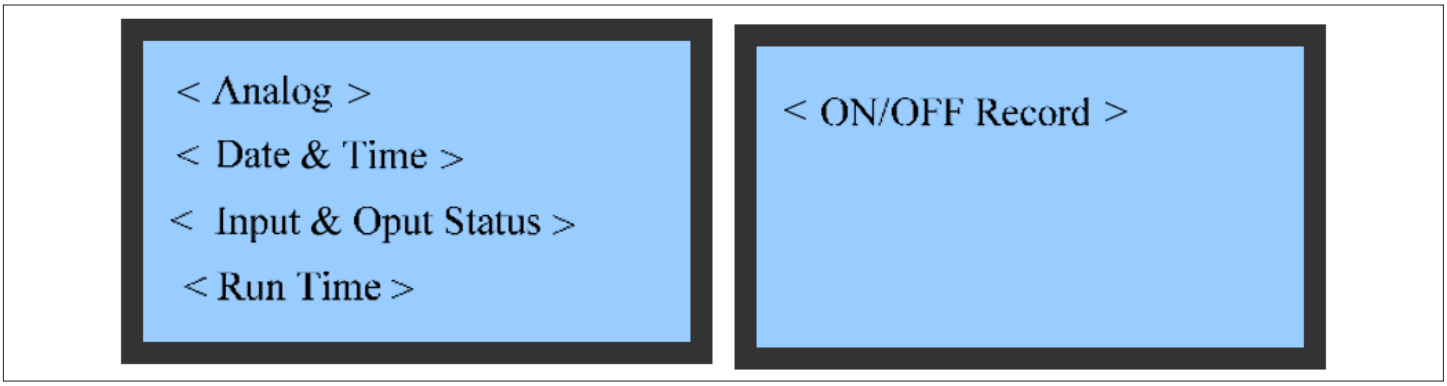


Figure 5-16 System State

- **Analog Values**

The Analog Value menu displays important parameters of the system operation in real time, including the temperature and humidity of return air, dew point temperature, and refrigerant temperature, as shown in Figure 5-17.

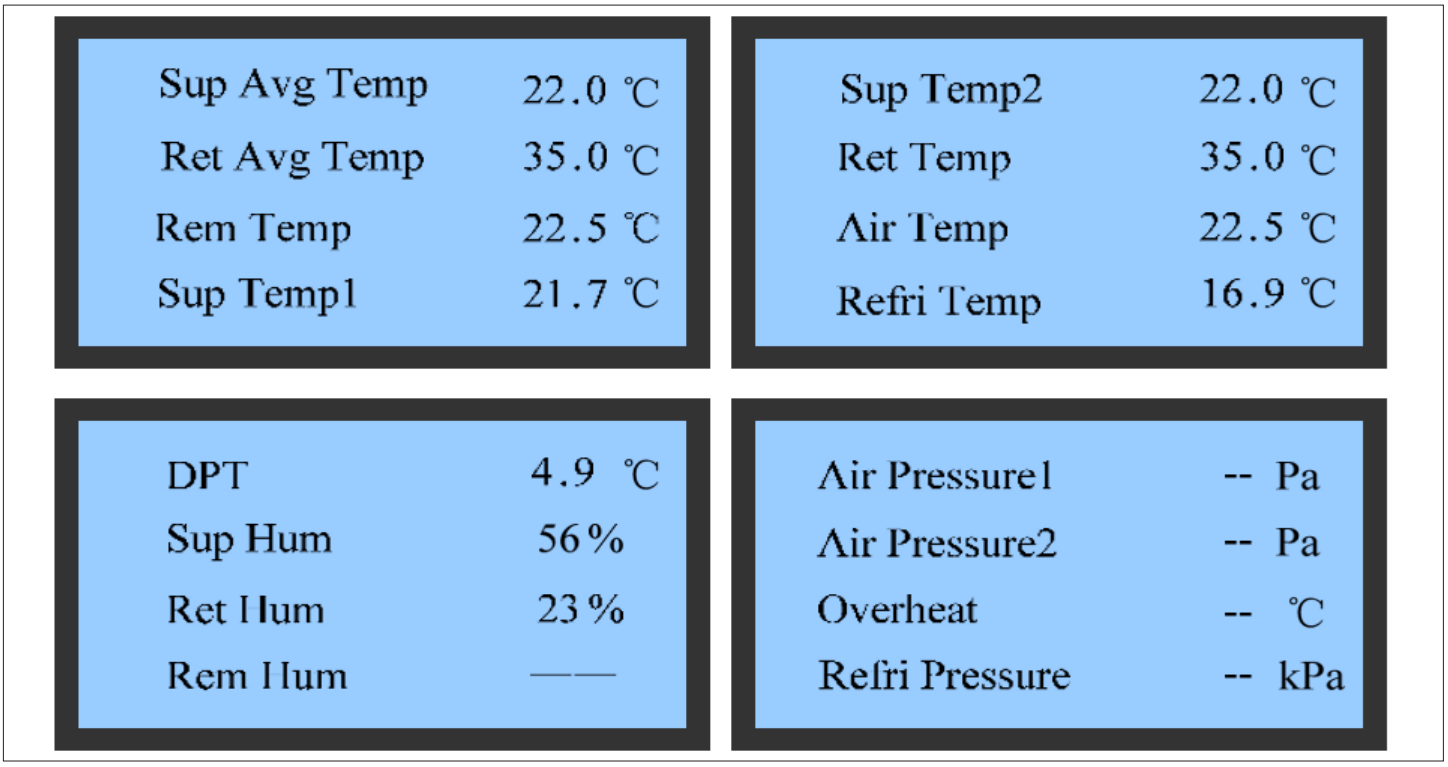


Figure 5-17 Analog Value Menu

The abbreviations of the actual operating conditions are mentioned below

Abbreviation	Description
Sup Avg Temp	Average Supply Air Temperature
Ret Avg Temp	Average Return Air Temperature
Rem Temp	Remote Air Temperature
Sup Temp1	Supply Temperature at point 1
Sup Temp2	Supply Temperature at point 2
Ret Temp	Return Air Temperature
Air temp	Supply Air Temperature
Refri Temp	Entering Refrigerant Liquid Temperature
DPT	Dew Point Temperature
Sup Hum	Supply Air Humidity
Rem Hum	Remote Ar Humidity
Air Pressure1	Air Pressure at point 1
Air Pressure2	Air Pressure at point 2
Overheat	Cooling demand is more than cooling capacity
Refrigerant Pressure	Saturated Liquid Refrigerant Pressure

- **Time and Date**

Figure 5-18 shows the date and time menu. User can query the current date and time on this menu Interface.

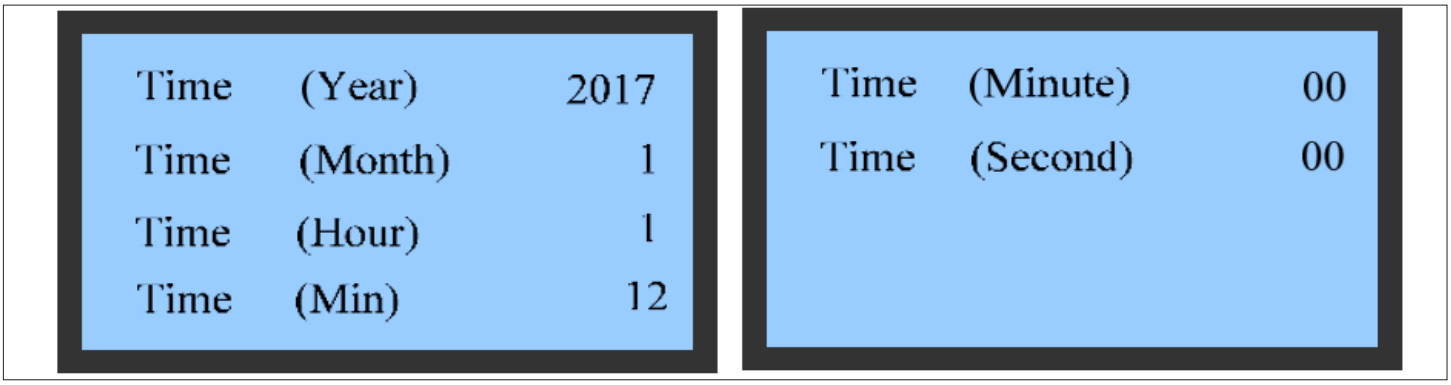


Figure 5-18 Time and Date Menu

- **Running Time**

Figure 5-19 shows the Running Time menu. The operation time can be saved permanently. You can query the operation time of the device on this menu Interface.

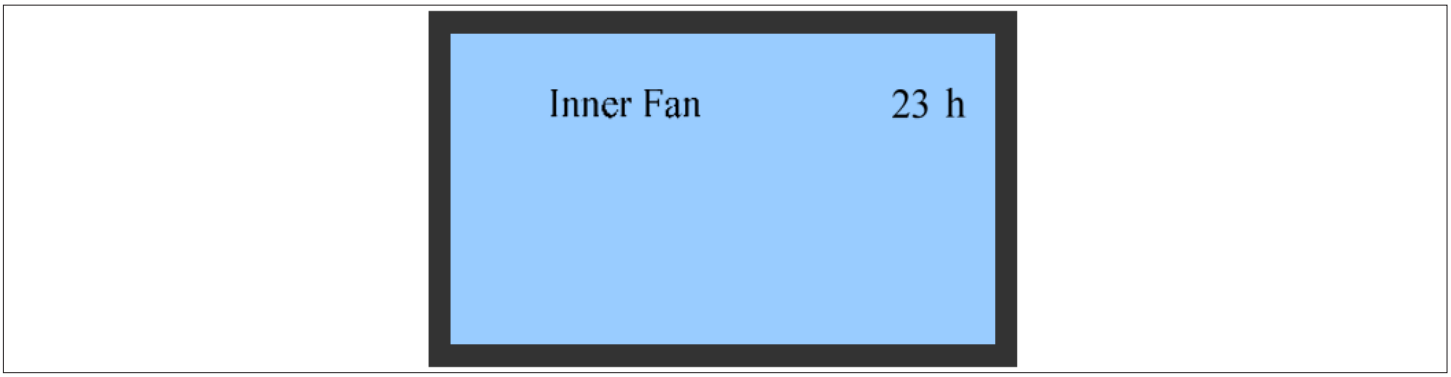


Figure 5-19 Running Time Menu

- **Input and Output State**

Figure 5-20 shows the input and output state menu. You can query the enable state of the device on this menu.

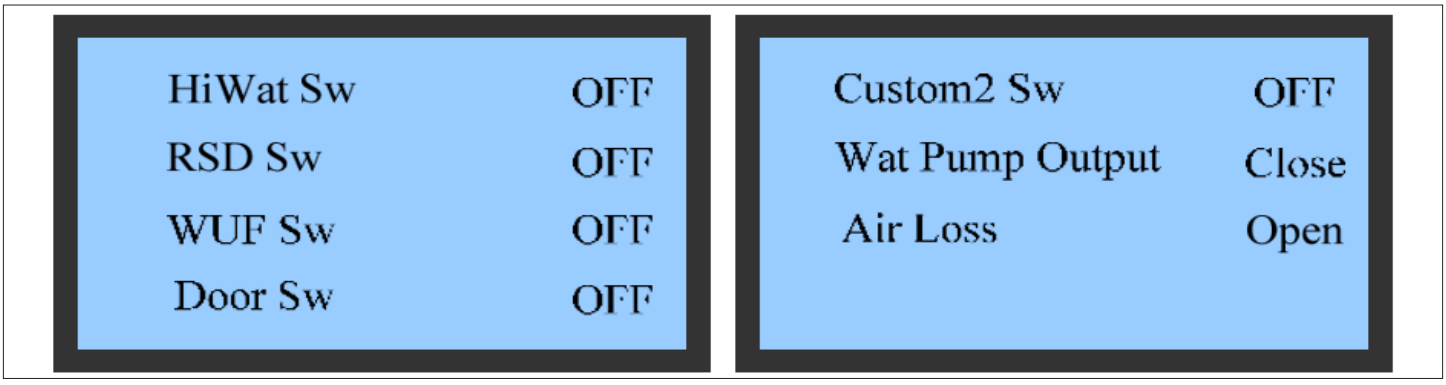


Figure 5-20 Input and Output State Menu

The abbreviations of the input and output states are mentioned below

Abbreviation	Description
HiWat Sw	High Water Level in the Drain Pan Switch
RSD Sw	Remote Smoke Detector Switch
WUF Sw	Water-Under-Floor Switch
Door Sw	Door Switch
Custom2 Sw	Customized Switch 2
Wat Pump Output	Water Pump Output Switch
Air Loss	Airflow Loss Differential Pressure Switch

- **Enable and Disable Records**

User can query the enable and disable records of the fan on this menu Interface. The items include XX/ YY, fan start time, and fan shutdown time, as shown in Figure 5-21. XX indicates the record SN, and YY indicates the total number of records. The enable and disable records can be saved permanently.

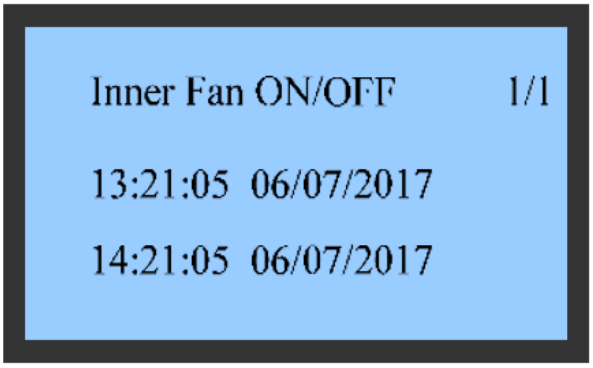


Figure 5-21 Enable and Disable Record Menu

5.6.7. System Menu

Figure 5-22 shows the system menu. Parameters on the system menu can be saved permanently.

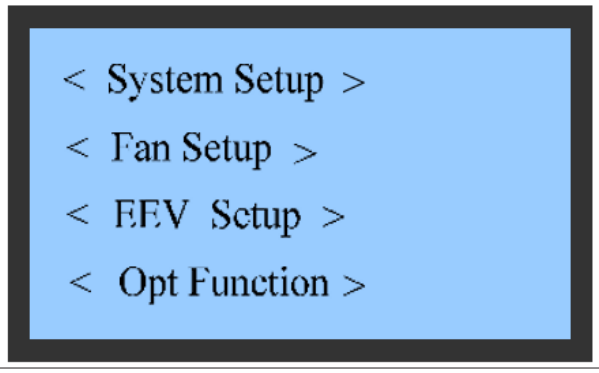


Figure 5-22 System Menu

- **System Settings**

Figure 6-23 shows the system settings menu.

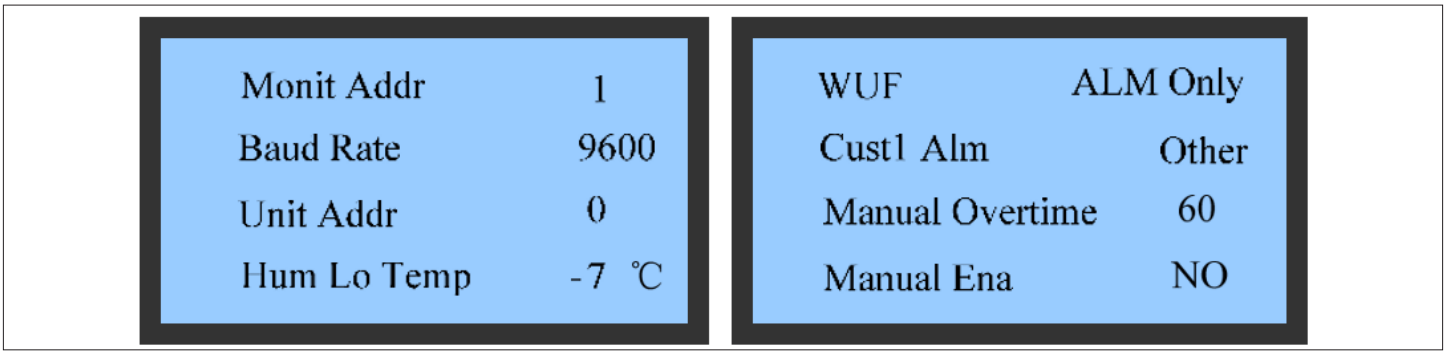


Figure 5-23 System Settings Menu

Note1: When a main unit is equipped with N terminals, the address code of each terminal needs to be set on site. Please follow the sequence of the terminal 1, 2, ..., N, and change the teamwork control address value to 0, 1, 2,... , N-1, in the system settings, that is, the No. 1 terminal corresponds to the teamwork control address value of 0, the No. 2 terminal corresponds to the teamwork control address value of 1, and so on, until the last end address is set.

Pay attention not to set the teamwork control address value to any value, such as 1, 2, ..., N or 1, 3, ..., N, etc., otherwise the main unit and the corresponding terminal will not be able to communicate..

- **Fan Setting**

Figure 5-24 shows the Fan Settings menu.

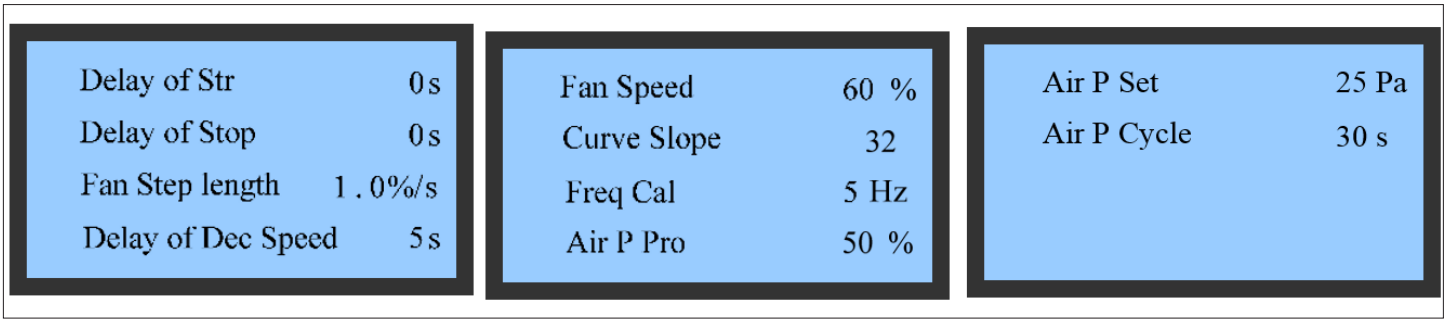


Figure 5-24 Fan Setting Menu

- **Electronic Expansion Valve (EEV) Settings**

Figure 5-25 shows the EEV Settings menu.

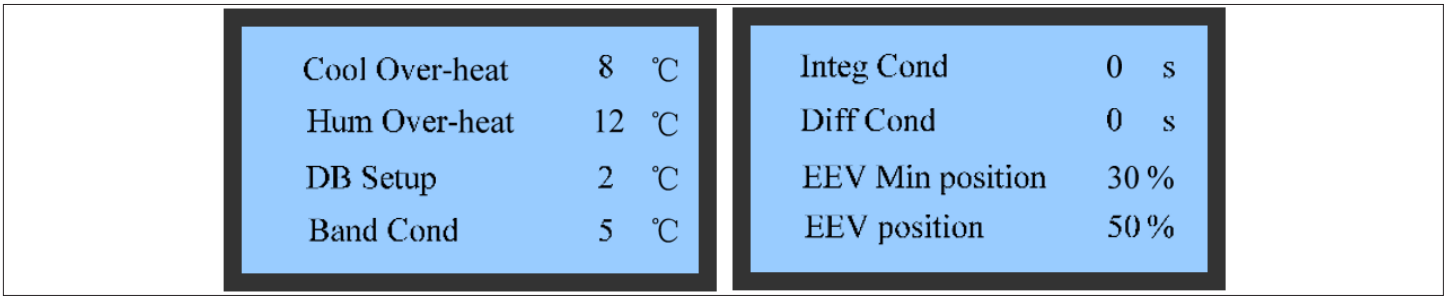


Figure 5-25 EEV Setting Menu

The abbreviations of the input and output states are mentioned below

Abbreviation	Description
Cool Over-heat	Cooling Over-heating zone
Hum Over-heat	Humidity over-heating zone
DB Setup	Dead Band set up
Band Cond	Bandwidth zone condition
Integ Cond	Integrated condition
Diff Cond	Differential condition
EEV Min position	EEV Minimum position of opening valve
EEV position	EEV Current position of opening valve

- **Optional Function Menu**

Figure 5-26 shows the Optional Function Settings menu. Remote temperature calibration parameters can be saved permanently.

Figure 5-26 Optional Function Menu

The abbreviations of the input and output states are mentioned below

Abbreviation	Description
Fan number	Number of Fans: 8
Unit Type	Type of cooling unit: XDH
Rem On/off	Remote connectivity: On/off
Rem Fun1	Remote functionality
Rem Temp1-8	Remote Air temperature sensor (1 – 8 nos)
Rem Hum1-8	Remote Air Humidity sensors (1 – 8 nos)

- **Change Password Setting**

The password change settings can be saved permanently. Figure 5-27 shows the password change menu.

Figure 5-27 Password Change Menu

5.6.8. Help Menu

Figure 5-28 shows the Help Menu. The menu includes version information, enabling the deployment (unavailable to users), and service information. User can view the relevant information.

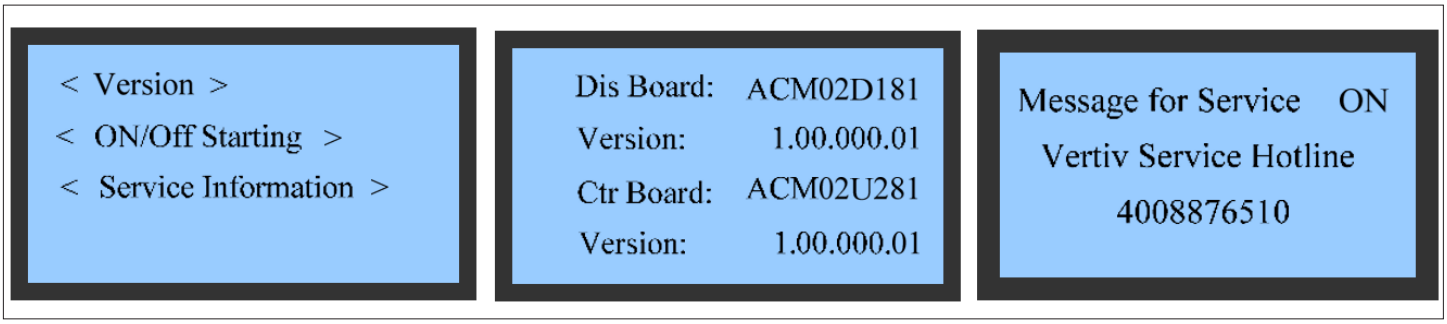


Figure 5-28 Help Menu

5.6.9. Display Setup

Select Main Menu to access the Display Setup Interface, as shown in Figure 5-29.

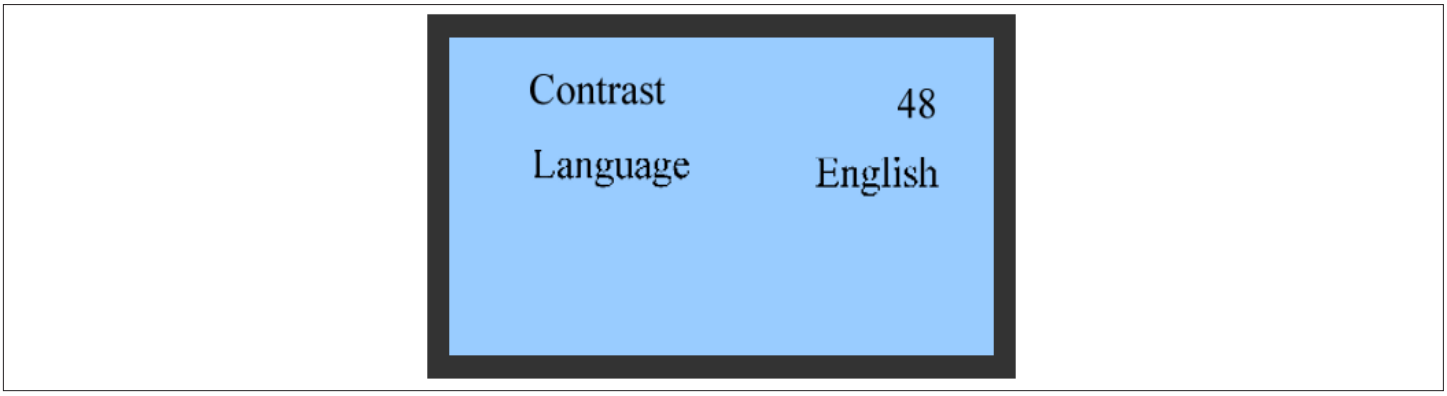


Figure 5-29 Display Setup

6 System Operation and Maintenance

Regular system maintenance is essential to ensure product reliability and effectiveness. This chapter introduces the operation and maintenance of Vertiv™ Liebert® XDH unit, including routine maintenance inspections, system troubleshooting tests, and maintenance of filter net, fan components, cooling systems, and drainage systems.

- It is recommended that the load of Liebert XDH system should not be less than 30%. If the load is lower than the requirement, consult Vertiv local representative.
- During the operation of Liebert XDH unit, lethal voltage may exist in the unit. Prior to operating, ensure to read all notes and warning information on the parts and also those which are mentioned in the manual, otherwise it may cause casualties.
- Only qualified and authorized repair and maintenance personnel can perform system maintenance.

6.1. Routine Maintenance Inspection (Monthly)

Check the system components monthly, focusing on checking whether the system functions normally and whether the components have any sign of wear. Refer to Table 6-1 for the monthly routine maintenance inspection items.

Table 6-1 Monthly Routine Inspection Items List

Part	Inspection items	Remark
Filter net	Check whether the filter net is damaged or blocked.	
	Clean the filter net regularly	
Fan	Check whether the fan impeller is deformed or damaged	
	Check whether the fan is running with abnormal noise.	
	Check whether if any single fan is stopped or interrupted.	
Cooling System	Check whether the evaporator surface is clean and free from small particles (if any).	
	Check whether it is necessary to add refrigerant (observe through the sight glass of the liquid storage tank).	
Drain Pump Filter Net	Check whether there are impurities, debris, etc. in the drain pan.	
	Check the drain pump filter net is free from any clogging.	

6.2. Routine Maintenance Inspection (Semi-annual)

Table 6-2 provides the details of semi-annual routine maintenance and inspection items of Vertiv™ Liebert® XDH unit.

Table 6-2 Semi-annual Routine Inspection Items List

Part	Inspection items	Remark
Cooling System	Check whether the evaporator surface is clean and free from small particles (if any).	
	Check whether it is necessary to add refrigerant (observe through the sight glass of the liquid storage tank).	
Electronic expansion valve	Whether the refrigerant pressure and temperature detection are accurate	
	Check if it is blocked or stuck	
Fan	Whether the fan impeller is deformed	
	Check and tighten circuit connectors	
Filter	Check whether the filter is damaged or blocked	
	Clean the filter	
Electrical control part	Check fuse and MCB	
	Check and tighten circuit connectors	
	Check control program	
	Check the closing condition of the contactor	
Water pump filter	Check if there is any foreign matter in the water pan	
	Check the water pump filter	

6.3. System Troubleshooting Test

The microprocessor controller has a manual mode, which provides on-site troubleshooting functions for manually opening and closing various components to detect the status of system functional components, such as manual adjustment of fans and electronic expansion valves.

6.4. Electrical Connection Inspection

6.4.1. Electrical Maintenance

Perform visual inspection and treatment to electrical connections according to the following items:

1. Electrical insulation test of the whole system: Find defective contacts and correct the defects. During the test, disconnect the fuse or MCB of the control section to avoid damage to the control panel due to high voltage.
2. Statically check whether each contactor is flexible and jammed.
3. Use a brush or dry compressed air to remove dust from electrical and control components.
4. Check whether the contacts of the contactor are drawn for arcing and have burn marks. If it is serious, replace the corresponding contactor.
5. Fasten the electrical connection terminals.
6. Check whether the fan's quick-to-plug terminals are in good contact. If any looseness is found, replace the terminals.
7. If the power supply cable is damaged, in order to avoid danger, it must be replaced by a professional from the manufacturer's maintenance department.

6.4.2. Control Maintenance

Perform visual inspection, simple function inspection and processing of the control part according to the following items:

1. Check the appearance of the transformer and check the output voltage.
2. Check the control interface board, control board, temperature and humidity sensor board, fan failure detection board, electronic expansion valve control board and other surfaces for any sign of aging.
3. Clean the dust and dirt on the electrical control components and control panel, and clean it with help of a brush and electronic dust remover.
4. Check and firmly connect the output and input plugs of all control interface board such as temperature and humidity sensor board, fan failure detection board, and electronic expansion valve control board.
5. Check the connection between the user cabling/wiring control terminals (37#, 38#, CANH/CANL, etc.), and the control interface board.
6. Check whether the contact and connection of the fan power supply cables, signal cables, and speed feedback signal interfaces are connected firmly.
7. Check the connection of the control interface board to the its corresponding terminals of the temperature and pressure sensors. If the connection is loose, or has poor contact, failure, etc., replace it immediately.
8. Replace the control fuse (or MCB), control board and other electrical components that have been detected with problems.
9. Use temperature and humidity measuring instruments with higher measurement accuracy to measure and calibrate the readings of temperature and humidity sensors.
10. Adjust the setpoints and check the action of each functional component according to the control logic.

6.5. Maintenance of Filter Net

1. To ensure the effective operation of the filter net, the unit controller is provided with a filter net maintenance alarm logic.
2. The default fan running time is 2160 hours (the running time can be set according to the local operating environment), which corresponds to the filter net maintenance alarm trigger point.
3. The filter net must be checked once a month during use, and the user should replace it in time according to the status of the filter net.
4. Turn off the power supply before replacing the filter net. After replacing the filter net, reset the fan running time to zero.

6.6. Maintenance of Fan Components

The regular inspections include the status of the fan impeller, the fixation of fan components, abnormal fan noise, and fan-related cabling connections.

1. Pay special attention to whether the fan assembly and the wind guide ring are firmly installed, and if there is any possible chance of rubbing the nearby sheet metal parts with the rotating blades.
2. Check for any sign of abnormal airflow channel blockage, if identified eliminate it immediately to prevent any harm to the cooling system and other relevant system components from the reduction of air volume.
3. Check if the EC fan is abnormal or does not rotate properly, if identified then check the analog signal cabling, speed feedback cabling or power supply cabling of the power module, and also check the power module as well.
4. The automatic adjustment of the electronic expansion valve (EEV) ensures that enough refrigerant is supplied to the evaporator to meet the requirements of loading conditions. By observing and measuring the temperature of superheat and the opening of the EEV , user can determine whether the EEV is operating normally.

Note1: Do not operate and maintain the fan during the rotation of the fan blades to avoid injury.

Note2: During the operation of the unit, it is forbidden to touch the fan net cover to prevent mechanical damage caused by the rapid rotation of the fan

6.7. Maintenance of Cooling System

The components of the cooling system must be inspected monthly to check if the system is functioning properly and for the sign of wearing. Since the unit failure or damage is often accompanied by corresponding failures, regular inspections are the main means to prevent most system failures.

1. The surface of the evaporator should be kept clean and there should be no reversal films.
2. The EEV is mainly subjected to electrical and mechanical faults.

- The electrical faults include electronic expansion valve control board power supply, coil faults, control board cabling loosening, and pressure & temperature sensor faults.
- The mechanical faults include electronic expansion valve body blockage and clogging, so if the EEV fails, check whether the control panel power supply, control panel wiring, pressure and temperature sensor wiring is loose or not, and whether the valve body itself is malfunctioning.

3. Check whether the refrigerant piping have the proper support, or it is leaned against the wall, floor or its frame is vibrating. If identified in such a condition fixed it immediately.
4. Check the refrigerant piping and fix the brackets in every six months.

Note: It is not recommended that customers adjust the EEV by themselves. If user need some adjustment, contact Vertiv local representative or technical support engineer.

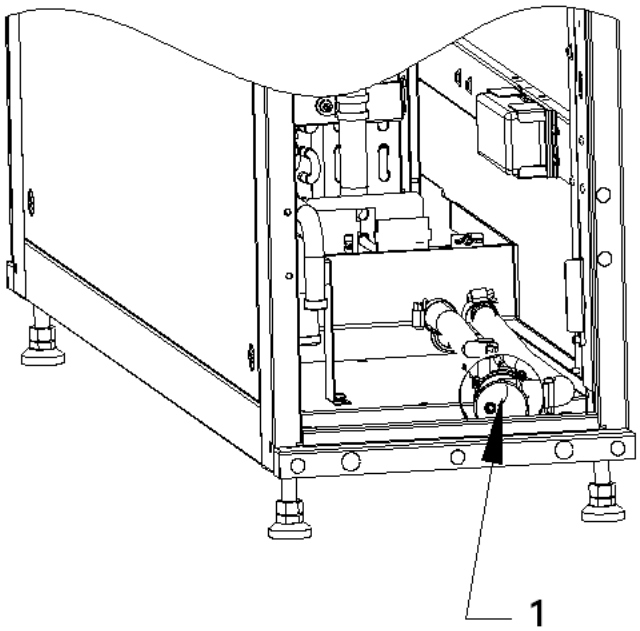
6.8. Maintenance of Drainage System

In order to ensure the normal drainage, it is necessary to check the drainage pan regularly.

- To ensure that there are no large scaling, debris, or leakages in the drain pan. Regularly check and cleaning of the drain pan filter is imperative.
- To prevent poor drainage caused by blockage, as shown in Figure 6-1. Regularly check whether the drain pump power supply is normal and whether the cabling is firmly connected.

The procedures for replacing condensate pump:

1. Cut off the power supply of the unit.
2. Open the rear door, unscrew the hose clamp and pull out the drain pipe of the water pan.
3. Unscrew the hose clamp fixing the water pump.
4. For reinstall the water pump, reverse the above steps.



ITEMS	DESCRIPTION
1	Pump

Figure 6-1 Condensate Pump Removal

Note: Regularly check whether the drain filter net of the water pan is blocked by any foreign matter and clean it immediately.

7 Troubleshooting

Troubleshooting is to be performed by the trained and qualified service personnel. However, the checklists have been provided just for reference purposes.

- Prior to troubleshooting, the lethal voltage may be present in the unit which can be fatal. All notes, warnings, and cautions marked on the unit as well as the ones mentioned in the manual must be considered, otherwise, it may lead to injury and fatality.
- Extreme care and caution is required while troubleshooting on-line.

Note1: Qualified and professional maintenance personnel are the one supposed to troubleshoot and handle the unit.

Note2: If jumpers are used for troubleshooting, remember to remove the jumpers after the troubleshooting, failing to remove connected jumpers may bypass certain control functions and increase the risk to the unit.

7.1. Troubleshooting and Fault Handling of EC Fan

The troubleshooting of EC fan is explained in the Table 7-1.

Table 7-1 Troubleshooting of the Key Components of the EC Fan

Symptom	Possible Causes	Items to be Checked or Handling Method
EC fan cannot start	MCB trip	Check whether the fan circuit breaker is closed properly.
	Fan power module failure	Check the alarm light of the fan power module to determine whether there is a fault.
	Cabling/wiring failure	Check whether the cables from the main control board, fan fault detection board, and power module to the control terminal block are correctly connected.

7.2. Troubleshooting and Fault Handling of Electronic Expansion Valve

The Electronic Expansion Valve (EEV)is a key component that adjusts system refrigerant and cooling capacity. Thus, its normal operation is very important. The troubleshooting of EEV is explained in the Table 7-2.

Table 7-2 Troubleshooting of the Key Components of the EEV

Symptom	Possible Causes	Items to be Checked or Handling Method
Electronic expansion valve adjustment failure	Temperature sensor, pressure sensor failure	Check whether the sensor wiring is loose. Check whether the sensor wiring position on the control board is correct.
	Control board power down	Check whether the transformer output fuse is burned out. Check whether the input power of the electronic expansion valve control board has 24 V power supply.
	Control board cabling/wiring	Check the valve body wiring on the electronic expansion valve control board for errors; Check whether the communication cable between the electronic expansion valve control board and the main control board is cabled incorrectly.

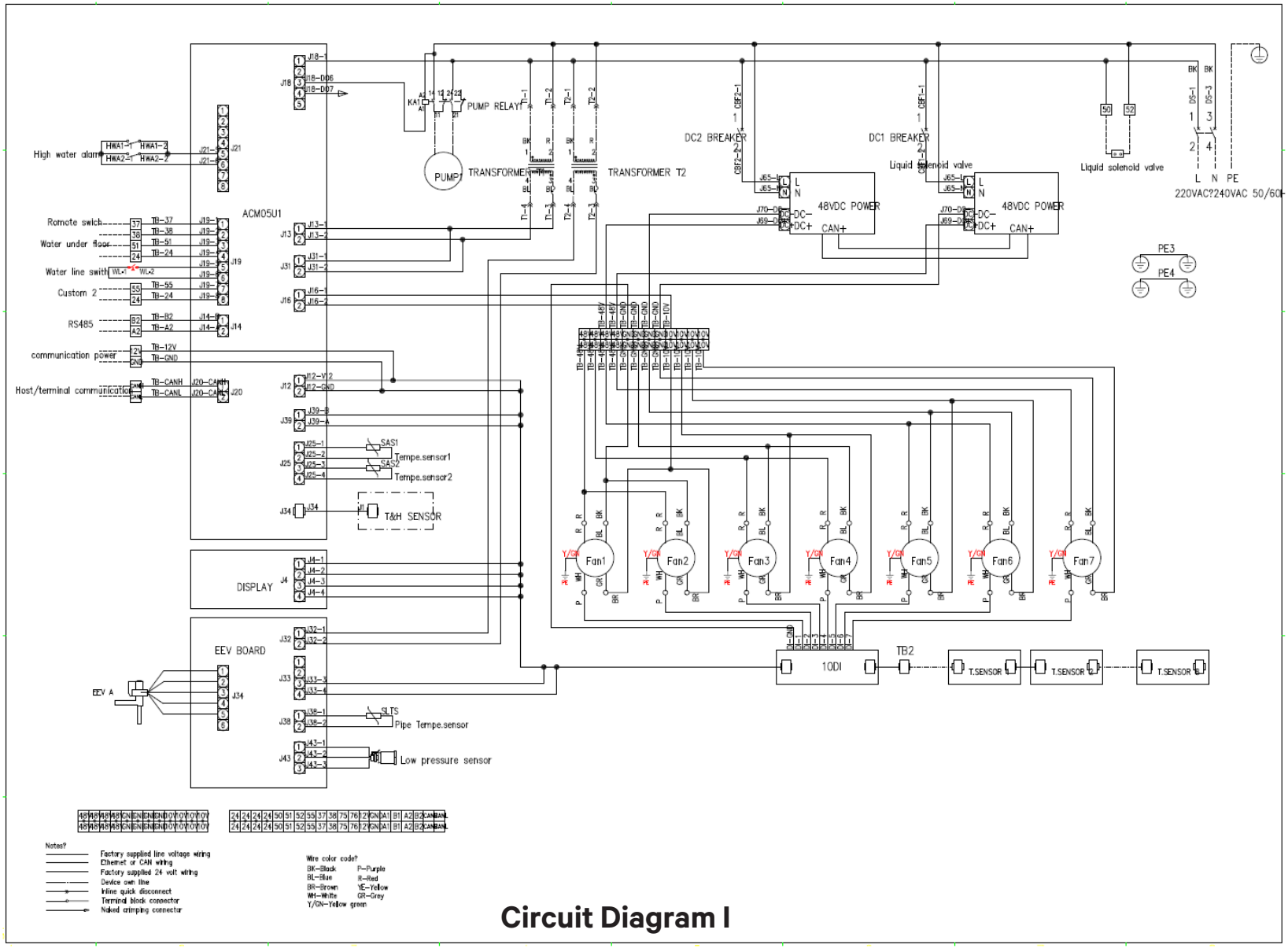
7.3. Troubleshooting and Fault Handling of Cooling System

When a cooling system component fails, analyzed and dealt with the cause immediately to avoid the abnormal operation of the units. The troubleshooting and fault handling of the cooling system are provided in the Table 7-3.

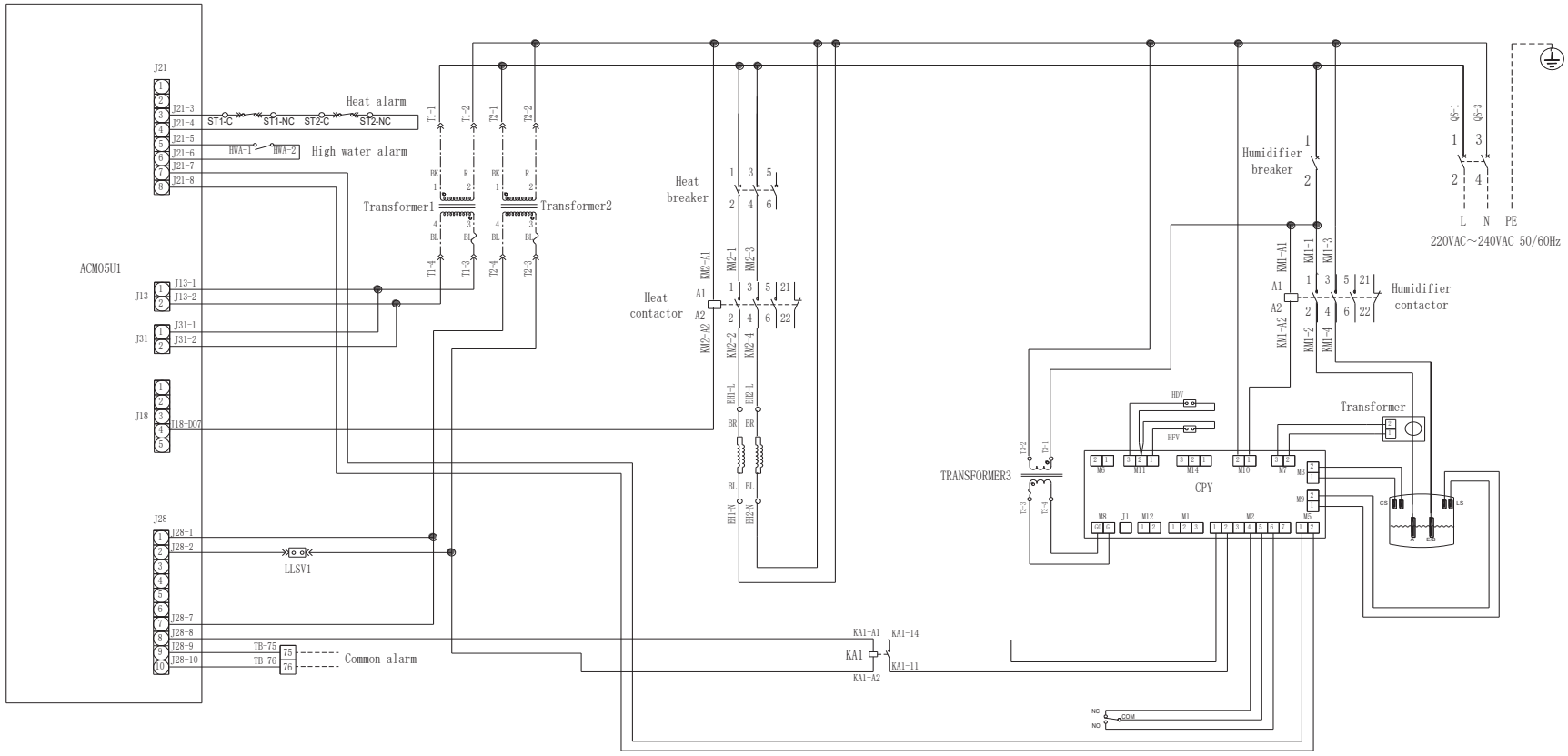
Table 7-3 Troubleshooting of the Key Components of the EEV

Symptom	Possible Causes	Items to be Checked or Handling Method
Condensation on the surface of the evaporator	Two-way water valve failure	Check whether the two-way water valve is malfunctioning, and the water temperature is too low due to the imbalance.
	Whether the surface of the evaporator is dirty and blocked	Check the cleanliness of the surface of the evaporator. Dirt blockage on the surface may cause the condensate not to drain properly.
Airflow volume is reducing	Dirty and blocked filter net	Regularly check the cleanliness of the filter and replace it to avoid reduction of air volume caused by clogging of dirty filter.
	Fan failure	Check whether the fan is malfunctioning.
	Dirty or blocked evaporator	Check the cleanliness of the surface of the microchannel evaporator, and clean it regularly.

Appendix I: Circuit Diagram of Vertiv™ Liebert® XDH

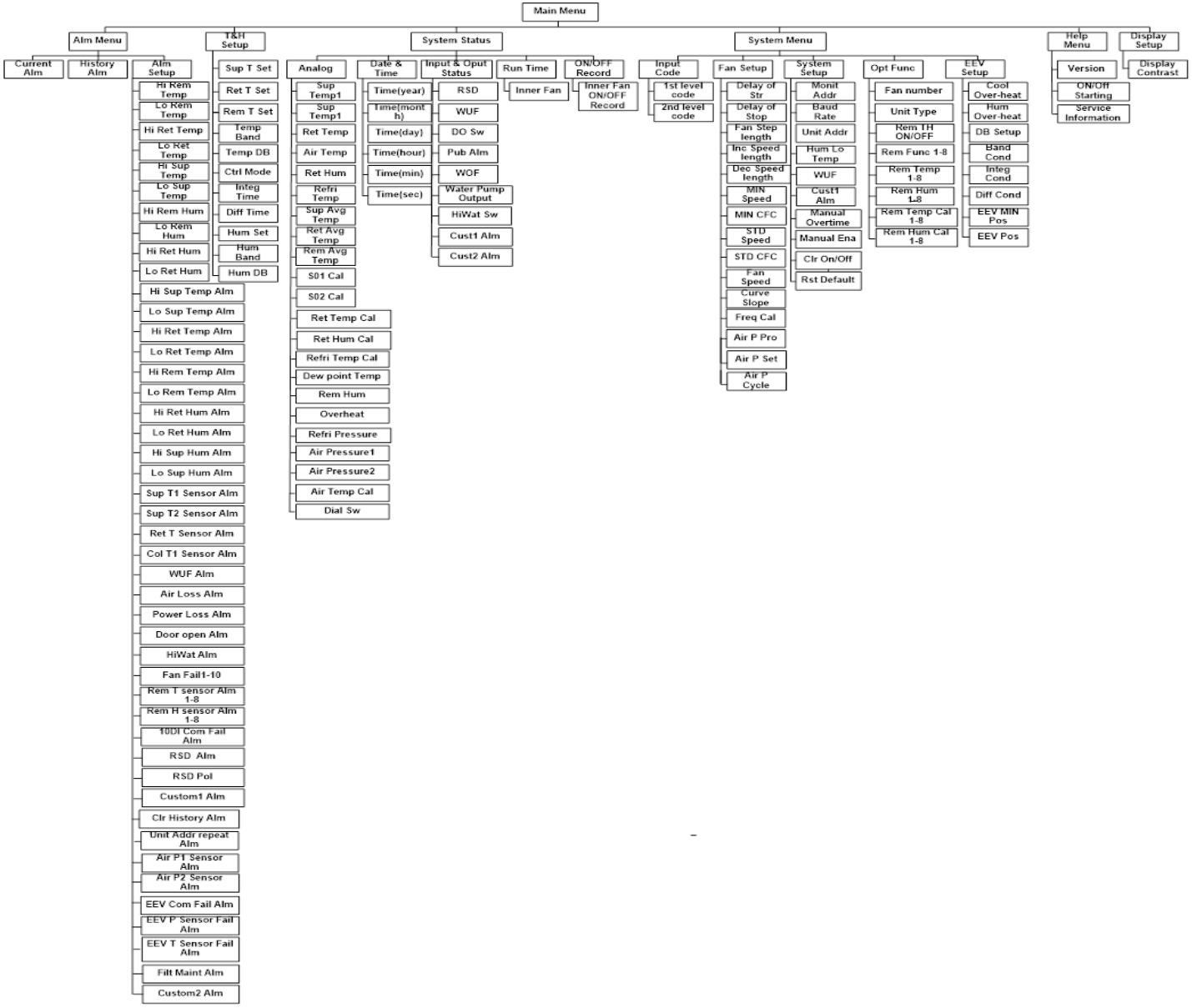


Circuit Diagram I



Circuit Diagram II

Appendix II: Microprocessor Controller Menu Structure Chart



Appendix III: Alarm Output Menu Table

Main Unit Loss Alarm	Air Return High Temp. Alarm	Air Return Temp Sensor Fault Alarm	Repetitive Address Alarm
Floor Flood Alarm	Air Return Low Temp. Alarm	Air Return Hum. Sensor Fault Alarm	Fan Fault Detection Board Comm. Fault Alarm
High Water Level Alarm	Air Supply Low Temp. Alarm	Air Supply Temp. Sensor Fault Alarm	
Fan Fault Alarm	Air Supply High Temp. Alarm	Remote Temp. Sensor Fault Alarm	
Power Module 1 Fault Alarm	Air Return High Hum. Alarm	Fan Pressure 1 Sensor Fault	
Power Module 2 Fault Alarm	Air Return Low Hum. Alarm	Fan Pressure 2 Sensor Fault	
Air Flow Loss Alarm	Remote High Temp Alarm	Electronic Expansion Valve Fault Alarm	
Filter Maintain Alarm	Remote Low Temp Alarm	Electronic Expansion Valve Comm. Fault Alarm	
Micro Switch Alarm	Remote High Hum. Alarm	Pressure Sensor Fault Alarm	
Self Defined 2 Alarm	Remote Low Hum. Alarm	Temp. Sensor Fault Alarm	

Appendix IV: List of Maintenance Inspection Items (Monthly)

Date: _____

Model: _____

Filter net:
___ 1. Check if the filter net is damaged or blocked
___2. Clean the filter net

Fan part
___ 1. Whether the fan impeller is deformed
___ 2. Whether there is abnormal noise in the operation of the fan
___ 3. Is there a single fan stall

Electronic expansion valve
___ 1. Check whether the wiring cables and coils of the electronic expansion valve are loose

Drain pump
___ 1. Check for impurities, debris, etc. in the water pan
___ 2. Check if the drain pump filter net is blocked

Prepared by: _____

Serial No.: _____

Cooling system part
___ 1. Check the cleanliness of the evaporator surface
___ 2. Check whether it is necessary to add refrigerant (observe through the sight glass of the liquid storage tank)

Signature_____
Note: Please copy this form for record archive.

Appendix V: List of Maintenance Inspection Items (Semi-annually)

Date: _____

Model: _____

Filter net:
___ 1. Check if the filter net is damaged or blocked
___ 2. Check if the unit has filter net maintenance reminders
___ 3. Clean the filter net

Fan part:
___ 1. Whether the fan impeller is deformed
___ 2. Check and tighten circuit connectors
___ 3. Whether there is abnormal noise in the operation of the fan
___4. Is there a single fan stall

Electronic expansion valve part:
___ 1. Check whether the wiring and coil of the electronic expansion valve control board are loose

Prepared by: _____

Serial No.: _____

Cooling cyclic system:
___ 1. Check the cleanliness of the evaporator surface
___ 2. Check the refrigerant pipeline for leaks and proper support
___ 3. Check whether it is necessary to add refrigerant (observe through the sight glass of the liquid storage tank)

Electrical control part:
___ 1. Check whether the wiring of the main MCB and the power module MCB is loose
___ 2. Check and tighten circuit connectors
___ 3. Check whether the wiring and readings of various types of sensors are normal

Drain pump
__ 1. Check if the drain pump filter net is blocked
__ 2. Check whether the water pump cable is loose
__ 3. Check whether there are impurities, debris, etc. in the water pan

Signature_____
Note: Please copy this form for record archive.

Appendix VI: Toxic and Hazardous Substances or Elements

Parts Name	Toxic and Hazardous Substances or Elements					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyl	Polybrominated Diphenyl Ether
	Pb	Hg	Cd	Cr^{6+}	PBB	PBDE
Cabinet	○	○	○	○	○	○
Cooling parts	○	○	○	○	○	○
Fan unit	○	○	○	○	○	○
Electronic control unit	x	○	○	○	○	○
Display screen	x	○	○	○	○	○
Heat exchanger	○	○	○	○	○	○
Copper tube	○	○	○	○	○	○
Cables	○	○	○	○	○	○

O: Indicates that the content of this toxic and hazardous substance in all homogeneous materials of this part is below the limit requirement specified in SJ/T-11363-2006;

X: Indicates that the content of the toxic or hazardous substance in at least one of the homogeneous materials of the part exceeds the limit requirement specified in SJ/T11363-2006.

Vertiv is committed to the design and manufacture of environmentally friendly products. We will continue to reduce and eliminate toxic and hazardous substances in our products through continuous research. The following components or applications contain toxic and hazardous substances that are limited to the current state of the art and cannot be reliably replaced or have no mature solutions:

Reasons for lead contained in the above components: lead in high temperature solder in diodes; lead in resistor glass uranium (exempt); lead in electronic ceramics (exempt)

Description of the environmental protection use period: The environmental protection use period of this product (identified on the product body) refers to a period from the date of production, in which the toxic and hazardous substances contained in this product does not seriously affect the environment, person and property under normal use conditions and compliance with the safety precautions of this product.

Scope of application: Vertiv™ Liebert® XDH Series

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