Liebert® XDH

High Heat Density Precision Air Conditioning

User Manual

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Purpose of the Document

This document applies to the series of precision air conditioners and cooling solutions which maintain optimal environmental control of technological ecosystems at minimal operating costs. This document gives an overview of the specifications, installation, commissioning, and maintenance procedures with troubleshooting from the user perspective. The figures used in this document are for reference only.

Please read this manual carefully before installing, maintaining, and troubleshooting.

Liebert XDH precision air conditioners is professional device, it is only for professionals and they are adapted to the place where entry is restricted for normal people.

Styling used in this Guide

The styles used in the manual will be defined as mentioned in the following table:

Situation	Description
Warning/Danger/Caution 	• *The Warning/Danger/Caution note indicates a hazardous or potentially harmful situation that can result in death or injury. It also indicates instructions that need to be adhered to, failing which may result in danger and safety issues thereby having an adverse effect on the reliability of the device and security. Even for practices not related to physical injury, to avoid equipment damage, performance degradation, or interruption in service, follow the warning instruction.*
Note 	• *The Note section indicates additional and useful information. It also calls attention to best practices and industry-best protocols that are standardized and help make maximum utilization of the resources at hand. Helpful information related to the product also comes under the Note heading, helping the users with the definitions, concepts, and terminologies used in the manual.*

Version History

Version	Revision Date	Issue	Changes
1.0	26.03.2019		---

Safety Precautions and Measures

The important safety precautions and measures that should be followed during the installation and maintenance are described in the following sections.

Read the manual prior to installation and operation of the unit. Only qualified personnel should move, install, or service this equipment.

The user reads and considers all the precautions, compliance, and safety measures before working on the equipment. The unit control must be used exclusively for the purpose which it is intended for; the manufacturer takes no liability for incorrect use or a modification to the unit control.

Adhere to all the Warnings and Cautionary measures included in the manual.

Please read this manual carefully before installing, maintaining and troubleshooting; especially the Warning/Danger/Caution information in the User Guide. Apart from the User Guide, also pay attention to the warning labels on the unit and its components.

This manual is retained for the entire service life of the unit. The user must read all the precautions, danger, warnings, and cautionary measures mentioned in the manual prior to carrying out any operations on the unit. Each unit is equipped with an electric insulation which allows the users to work in safe conditions. The main switch is positioned on the electrical panel cover; Open the right door to access it. Before any maintenance operation, switch off the unit with this electrical insulation device to eliminate risks such as electrical shocks, burns, automatic restarting, moving parts, and remote control. The panel key, supplied along with the unit, must be kept by the personnel responsible for the maintenance. The protective covers can be removed after the electric power has been cut off by opening the main switch.

In the following sections, notice the various cautionary measures and warnings that need to be read carefully prior to installing or operating the system.

Disconnect the local and remote power supplies prior to working with the unit.

Prior to the installation process, read all the instructions, verify if all the parts are in place, and check the nameplate to ensure the voltage matches the available utility power for the unit.

The controller doesn't isolate power from the unit even in the Off mode, and some internal components still require and receive power during the Off mode.

If the unit door is open while the fans are operating, the airflow may result in abrupt slamming of the door resulting in injury. Another aspect is the presence of small objects in the fans bay which may result in object ejection during the fan start-up and there is a probable risk of being hit by these objects leading to grievous injury as well as causing equipment damage.

The unit contains fluids and gases under high pressure. Therefore, the pressure should be relieved before working with the piping.

Some components can be extremely hot during the unit operation. Therefore, allow sufficient time for the unit to cool down before working with the unit cabinet. Handle the unit with extreme caution and wear safety equipment such as protective gloves, safety shoes, and arm protection while working with the hot components.

There is a risk of leaking water that can cause damage to the equipment as well as the building. There should be an effective water drain connection and facilities. Installation should be precise. Implementation of the application and service practices should be suitable and fault-free. Not complying with these norms will result in water leakage from the unit. Water leakage can result in massive damage and loss of critical equipment in the hosting ecosystem. Therefore, care should be taken to ensure that the unit must not be located directly above any equipment that could sustain damage due to water and excessive moisture. Using a leak detection system for the unit and system supply lines are recommended by Vertiv Co.

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Table of Contents

Chapter 1: Product Overview

This chapter introduces the product description, model description, product appearance and main components of the XDH precision air conditioner. The Liebert®XDH™ high heat density precision air conditioner (hereinafter referred to as “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 XDH precision air conditioner is a precision environment control equipment for small to medium-sized server rooms, data hall and similar ecosystems that also calls for energy-saving and high heat density requirements. It is specifically designed to ensure that equipment providing precisely controlled output performance such as sensitive equipments, industrial process equipments, communication equipments and other types of computing equipments should have a reasonable and safe operating environment.

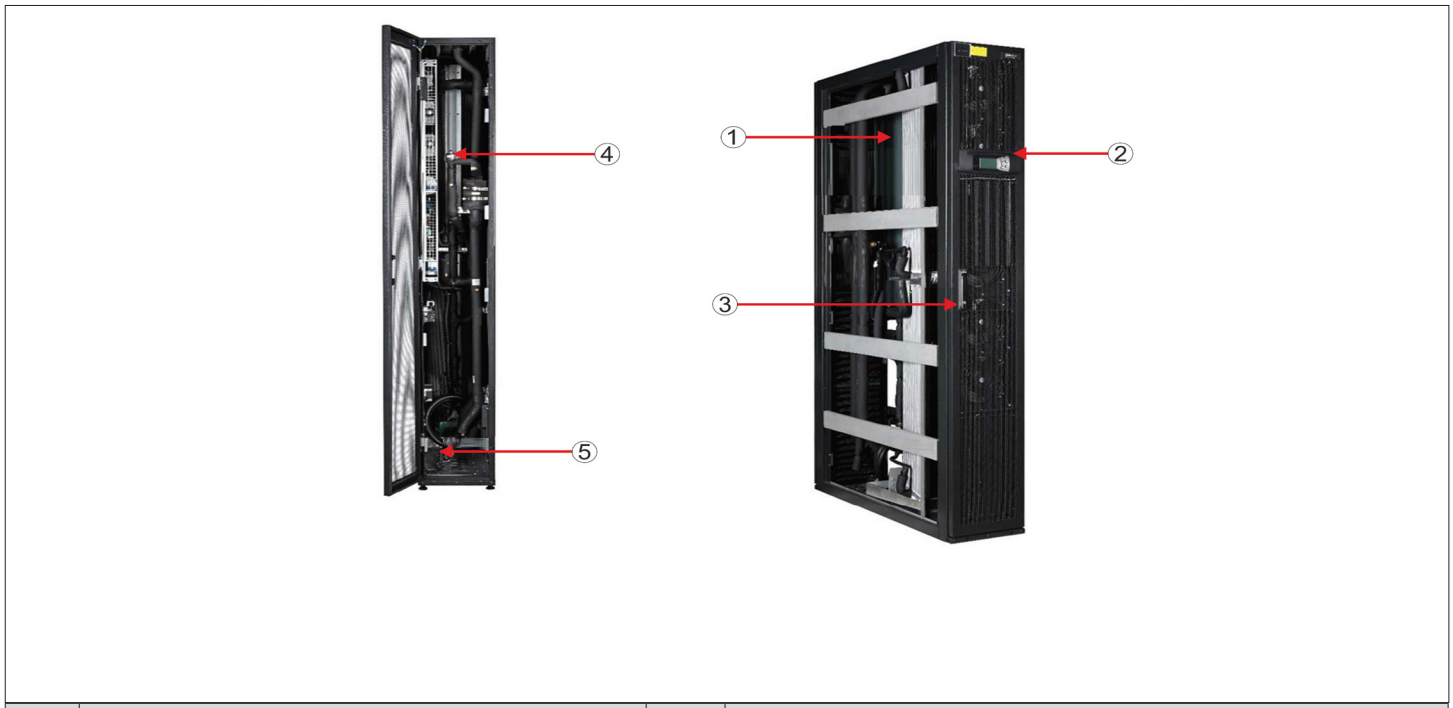
The XDH features high reliability, high sensible-heat ratio and high airflow rate. The XDH operates on R410A/R134a environment friendly refrigerant that adheres to the international standards. The XDH precision air conditioner is also equipped with a high-efficiency micro-channel evaporator coil (heat exchanger) which has a profound design and layout that results in an excellent heat exchanging performance. It is combined with an EC fan that delivers large airflow rate with low energy consumption, which increases the operational efficiency of the unit drastically. An electronic expansion valve helps to evenly distribute the refrigerant flow in an intelligent way to accommodate the variations in the cooling load.

XDH architecture is an effective and efficient solution to the problem of heat dissipation in server rooms with high heat density and it is installed where cooling load changes drastically.

1.2.Model Description

The physical appearance of XDH is shown in Figure 1-1.

Figure 1-1 Appearance of the Liebert XDH Precision Air Conditioner



No.	Description	No.	Description
1	Micro channel evaporator	4	Electronic expansion valve
2	Microprocessor controller	5	Drain pump
3	EC fans		

Figure 1-2 Main Components

1.3.Model Nomenclature

The model of the XDH PAC is fully-defined by eleven digits, as represented in Table 1-1.

Table 1-1 Nomenclature of XDH Unit

1	2	3	4	5	6	7	8	9	10	11
XD	H	0	3	0	B	S	1	L	H	0

Digit 1,2 Product Model		**Digit 8 Refrigerant Type**	
XD	X-treme Heat Density System	1	R410a
H	Horizontal Row Cooler	2	R134a
Digit 3 Cooling Capacity kW		**Digit 9 Water Pump**	
0-9	Nominal Net Cooling Capacity - kW	L	Non-Water Pump
Digit 4 Cooling Capacity kW		5	Water Pump
0-9	Nominal Net Cooling Capacity - kW	**Digit 10 Supply Air Type**	
Digit 5 Cooling Capacity kW		R	Grille
0-9	Nominal Net Cooling Capacity - kW	H	Non-grille
Digit 6 Module Size		**Digit 11 Version**	
B	300 mm Base Unit	0	Non-Water Pump and Grille
L	600 mm Large Unit	1	Water Pump and Grille
Digit 7 Power Supply			
S	220 V to 240 V/ 1 Ph/ 50 Hz, 220 V to 240 V/ 1 Ph/ 60 Hz		

1.4.Components

This section provides an overview of the main components and their features of the XDH unit. Liebert XDH includes the micro-channel heat exchanger evaporator coil, EC fans, electronic expansion valve, air filter, refrigerant filter dryer, condensate drain pump, microprocessor controller, and a power module.

1.4.1.Micro-channel Evaporator

It provides higher heat transfer efficiency for high heat density applications. The heat exchanger design facilitates hassle-free access to the coil, large surface area for efficient heat absorption, low air pressure difference across the coil even at higher airflow rates, and it is also light and compact for easy removal, and repair/ replacement.

1.4.2.EC Fan

EC fans are designed to deliver large airflow rates, higher static pressures, and much lower power consumption. The capacity output of the system can be adjusted according to the cooling demand by modulating the fan rotational speed.

1.4.3.Electronic Expansion Valve (EEV)

The unit is incorporated with an electronic expansion valve that simultaneously collects temperature and pressure signals to accurately regulate the refrigerant flow. The EEV can ensure that refrigerant flow is evenly distributed throughout the system. The EEV's wide operating envelope reduces the condensing pressure, thereby resulting in significant energy savings.

1.4.4.Air Filter

Air filter acts as a protective barrier within the cooling space for solid contaminants such as dust and dirt. XDH is equipped with a specifically designed air filter with a high filtration efficiency capable of filtering the air impurities and dust.

1.4.5.Filter Dryer

A filter dryer is installed in the refrigerant line to effectively extract any water/ moisture and impurities present in the system while the unit is operational for a long term. It prolongs the operational life and also ensures the normal operation of the system.

1.4.6.Drainage Pump

The XDH unit is equipped with a drainage pump that uses a brushless DC pump with a power module. The rated voltage is 220 V ac. The operational logic of the pump is designed to support idling and overload protection which ensures timely discharge of condensate water quickly.

1.4.7.Microprocessor Controller

The XDH precision air conditioner is equipped with a Vertiv microprocessor controller that functions on the advanced PID regulation technology. Microprocessor controller has a display resolution of 240×128 pixels (small display: 128×64, large display: 240×128) with a blue back-light (small display: white color back-light, large display: blue color back-light) color screen. The user interface is simple and integrated with a multi-level password protection which can effectively prevent unauthorized operation. The controller features protective functions of self-recovery upon power failure, high-voltage & low-voltage protection. The operation times of main components are available through the menu.

The fault diagnostic system at the expert level can automatically display current fault information, facilitates easy maintenance and can store up to 400 records of history events. The controller is configured with the RS485 port and standard communication protocol of Ministry of Information Enterprise (Industrial Standard MODBUS Protocol).

1.4.8.Power Module

The XDH unit is equipped with a highly efficient power module with minimum electrical losses. The unit has built-in two power modules as a back up to each other to ensure seamless operation, thereby providing reliability and stability to the system.

Chapter 2: Pre-Installation

XDH precision air conditioner is a distinctly engineered equipment which requires preliminary preparation before installation. This chapter provides the pre-installation details, including how to prepare the installation environment, space and reserve the maintenance area. It also gives the air conditioner operational and storage environment requirements, followed with the procedure to unpack the unit and placement strategies.

- *Strict adherence to the installation procedure is mandatory to ensure that the air conditioner unit is installed properly.*

2.1.Equipment Room Requirements

- Before installation, the equipment room must be prepared to ensure a smooth operating flow and to achieve the expected results. The data center must meet the standards, to obtain proper heating and ventilation. The design specifications for the air conditioners must be ideal and should be in-line with the energy-efficient design standards.

- To ensure the normal operation of environment control system, the room should be moisture-proof and the equipment room should have a sealed damp-proof layer. Polyethylene film should be used for the damp-proof layer of the ceiling and walls. Alternatively, the same effect similar to polyethylene can be simulated with moisture-proof paint. It is important to ensure that the coating on the concrete wall and floor is damp-proof.

- The equipment room should be free of air leakage, reduced to a minimum because outdoor air can increase the system load and de-stabilize the temperature gradient. It is recommended that the leakage rate of outdoor air should be kept below 5% of the total indoor airflow.

- To avoid any outside air infiltration into the room, all the doors and windows should be properly closed.

- *Avoid locating the indoor unit in concave or narrow areas which can affect the airflow. It is prohibited to use the XDH precision air conditioner in an unconducive outdoor environment.*

- *Vertiv recommends that the site preparation is defined as per the requirements. However, if these requirements are not met, Vertiv recommends that rectifications should be made on the site in order to comply with the specified requirements and conditions.*

- *However, if the rectifications or modifications are not implemented, then Vertiv does not guarantee the accuracy and precision of the temperature and humidity provided by the unit.*

2.2.Installation Space Requirements

The XDH precision unit is a set of high heat density air conditioning units. It is recommended to install the XDH unit with a row of high heat density server cabinets in an alternative manner, to form a hot aisle and cold aisle configuration, as shown in Figure 2-1

2.2.1.Maintenance Space Requirements for XDH

When the XDH air conditioning unit is installed in the server room as shown in Figure 2-1, a provision space of 600 mm in the front and rear sides should be reserved for maintenance activities. Refer Figure 2-2 for better understanding.

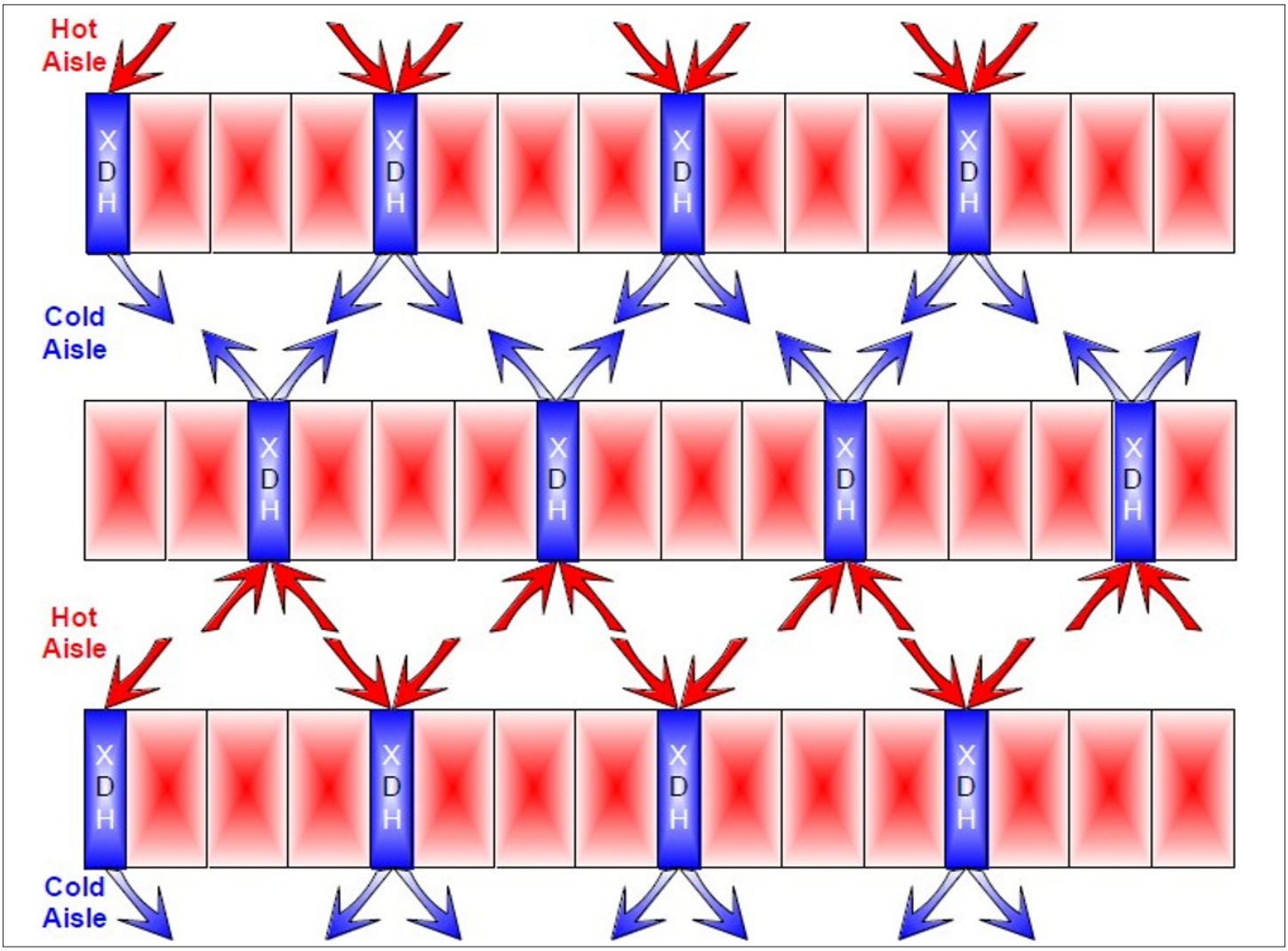


Figure 2-1 XDH Installation Location in Server Room

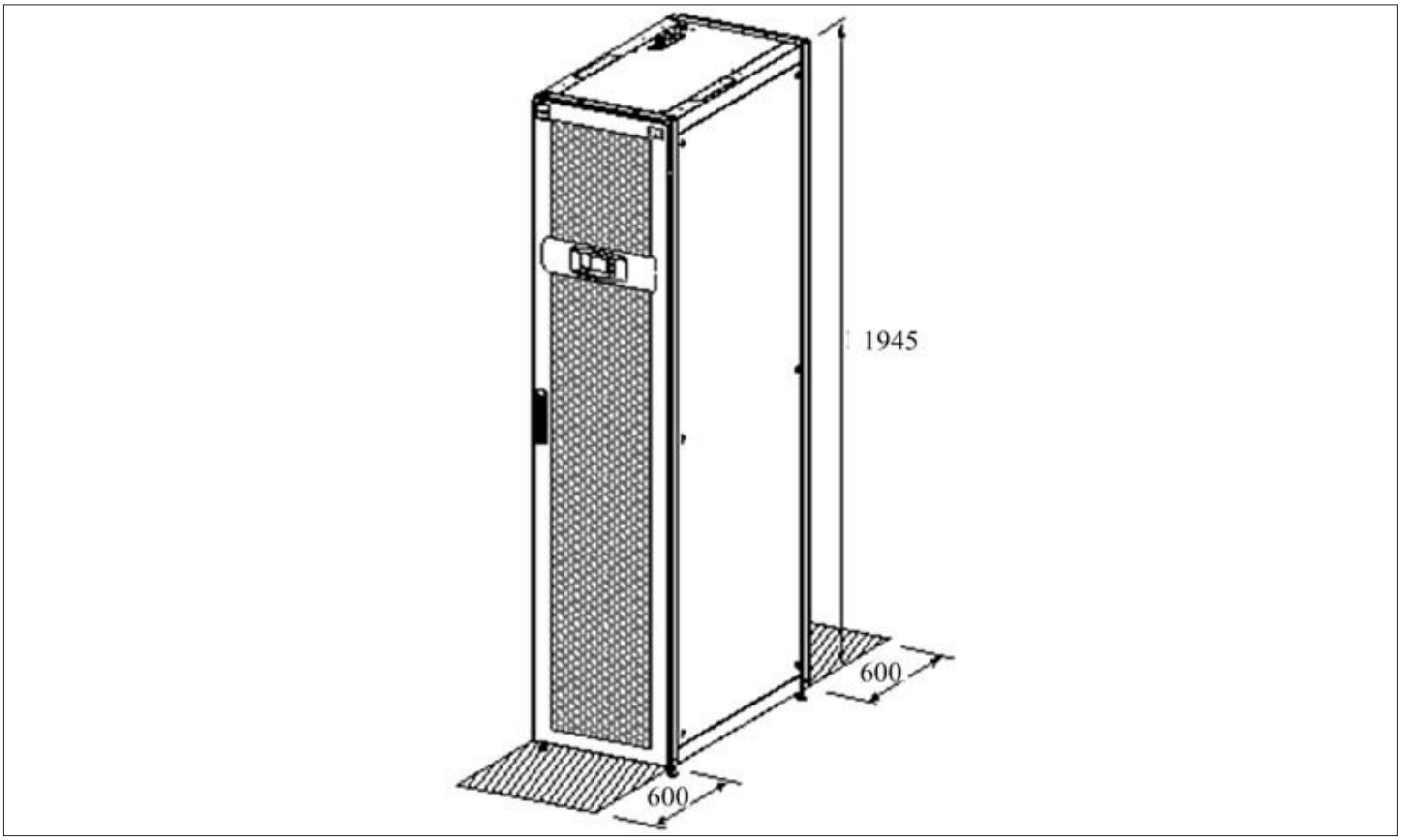


Figure 2-2 Space Clearance for Maintenance for XDH Unit

Table 2-1 describes the requirements for minimum maintenance space.

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

Space locations	XDH030BS1LH0	XDH030BS15R1
Front	600	600
Rear	600	600

- *The space is used to facilitate regular maintenance activities, such as replacing the filter net, fan, filter dryer and maintenance of electronic control box.*
- *Consult Vertiv local representative for any special application.*

2.3.Storage & Operating Environmental Requirements

2.3.1.Operating Environment

The operation environment of XDH precision air conditioner meets the requirements of GB4798.3-2007. See Table 2-2 for details.

Table 2-2 Operating Environment Requirements

Items	Requirements
Ambient temperature	Indoor temperature: 18 °C to 40 °C, RH<60%
Protection level (cooling unit)	IP20
Altitude	<1000 m, Derating is required when located altitude is above 1000 m
Operation voltage range	220 V±10%, 1 Ph, 50 Hz/ 60 Hz
Contamination level	Level II

2.3.2.Storage Environment

The storage environment of XDH precision air conditioner meets the requirements of GB4798.1-2005. See Table 2-3 for details.

Table 2-3 Storage Environment Requirements

Items	Requirements
Storage Environment	Clean room (no dust)
Environment humidity	Less than 95% RH
Ambient temperature	-25 °C to +55 °C
Storage time	Total transportation and storage time should not exceed six months, otherwise the performance of the system needs to be re-calibrated.

Please contact Vertiv local representative when operating in the following conditions

- *The voltage of the air conditioning unit is beyond the range of the operating voltage.*
- *The altitude is higher than 1000 m.*
- *If the application condition is other than Table 2-2.*

2.4.Refrigerant Requirements

Refer Section 5.2.3 for details of refrigerant charging

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

2.5.Transportation, Unpacking and Inspection

2.5.1.Transportation and Movement

Railroad and shipping are the preferable transport options for the CRAC. If transport by rail or ship is unavailable, transport by road is recommended. When selecting road transport, roads without too many bumps are highly recommended.

- Liebert XDH unit is heavy, it is recommended to use the mechanical equipment like electrical forklift to move the unit.
- Move the equipment to the location near the installation site.
- If an electric forklift is used, insert the tines of the forklift below the pallet as displayed in Figure 2-5.
- Figure 2-5 shows how the forklift tines are inserted underneath the pallet and shows in the same picture the illustration to the right that the lines should be aligned with the center of gravity to prevent the equipment from falling over.

Figure 2-3 Forklift Removal

While moving the indoor unit, keep the obliquity within the range of 75° to 105°, as shown in Figure 2-6.

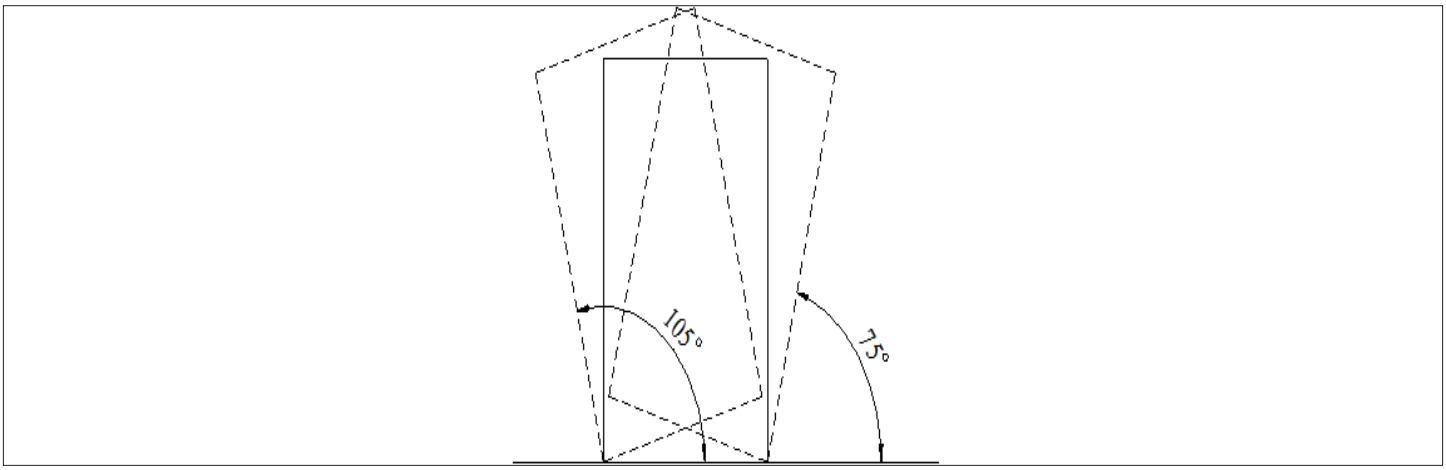


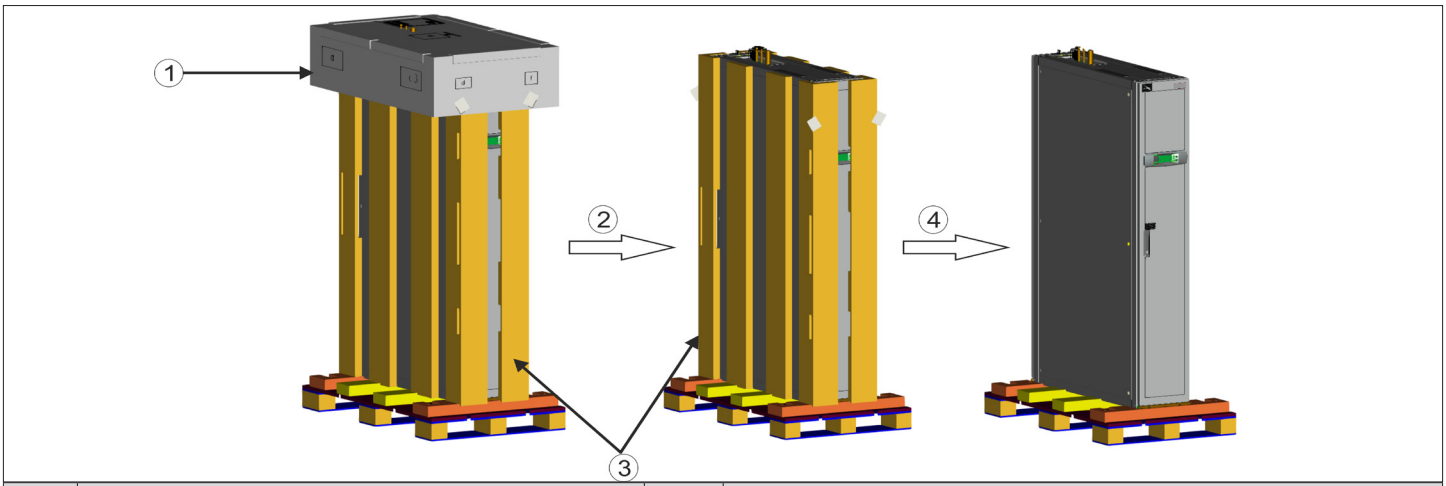
Figure 2-4 The Obliquity of Indoor Unit

2.5.2.Unpacking

Move the equipment to the location near the final installation site and unpack it. Follow the procedures below for unpacking.

- Removal of Paper Packaging

Remove the packaging tape and carton at first, then remove the top cover followed by dismantling the unit wrapped in the sealing plastic, finally, remove the Honey Comb Paper Board. For better understanding see Figure 2-7.

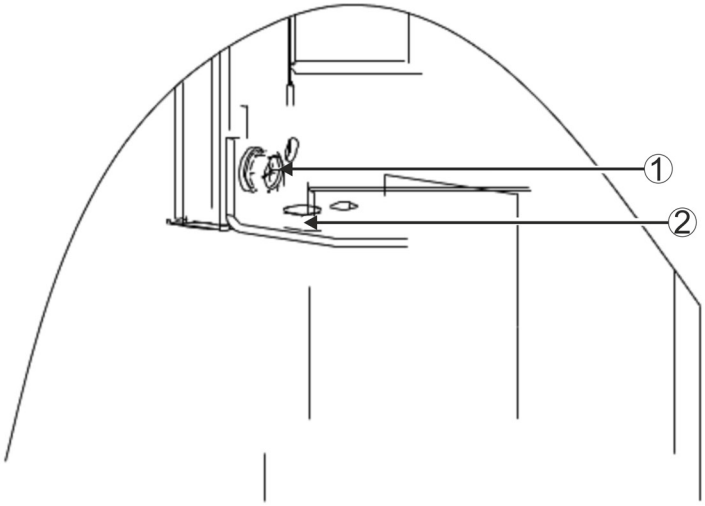


No.	Description	No.	Description
1	Top cover	3	Honeycomb cardboard
2	Remove the top cover	4	First remove the winding stretch film and then remove the honeycomb cardboard

Figure 2-5 Removing External Package

- Removing the pallet

The unit is fixed onto the pallet with M8×20 and M8x80 screws, as shown in Figure 2-8. Use a 17 mm open-end spanner, ratchet spanner or sleeve can be used to remove the screws.



No.	Description	No.	Description
1	Screw M8x20	2	Hexagon head bolt M8x80

Figure 2-6 Screws on Pallet

2.6.Inspection

- Check that the fittings are complete and the components are intact against the packing list. Ensure that everything is in its designated position.
- If any parts or components are missing or damaged, immediately report to the local offices of the carrier and Vertiv local representative at the earliest.

Chapter 3: Mechanical Installation (Site Preparation)

This chapter describes the procedures that must be carried out to ensure proper installation of Liebert XDH system including installation notes, system installation layout, unit piping installation and installation checklist. And to achieve optimum performance and prolong product life, correct installation is essential.

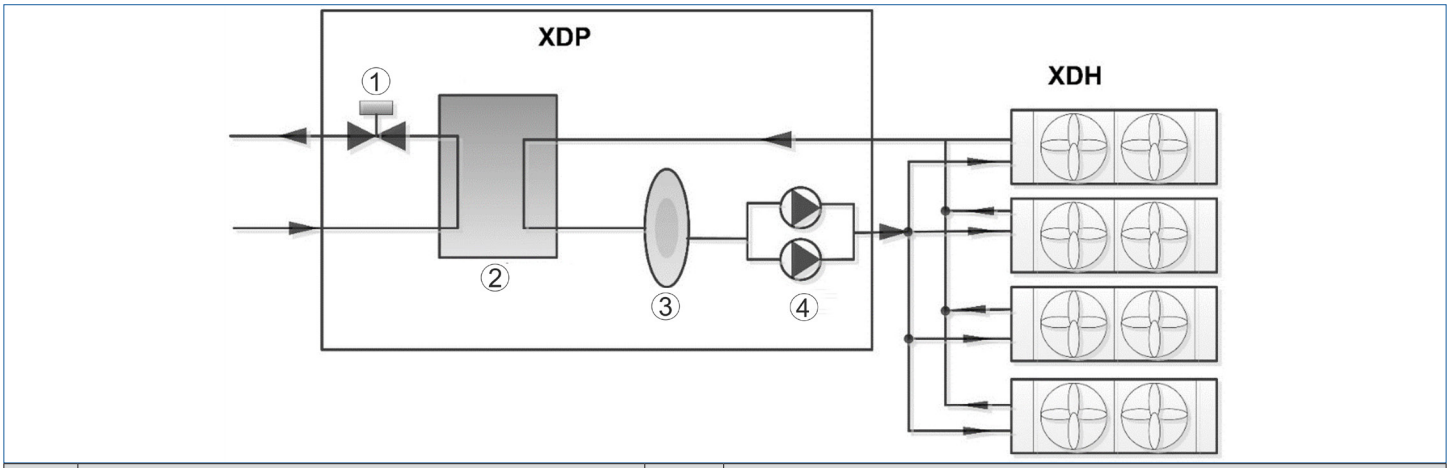
3.1.Installation Notes

- *The XDH needs to be installed in a vertically upright position.*
- *The XDH is designed to install with an integrated floor. It should preferably be installed on the room/ equipment room floor or mounted on the false floor as per the server room construction.*
- *The XDH should be installed next to the high heat density server cabinet in-line with the most suitable server rack.*
- *Prior to the installation, ensure that the installation preparations have been read and implemented (refer Chapter 2 for site preparation).*
- *Industry-wise standards are followed for the selection, layout, and fixing of the piping.*
- *When installing the equipment, follow the design drawings strictly and reserve the space for maintenance, refer manufacturer's engineering dimensions drawings for details.*

3.2.System Installation Layout

3.2.1.Overall Layout of the System

Figure 3-1 shows the overall layout of the XDH air conditioning system.



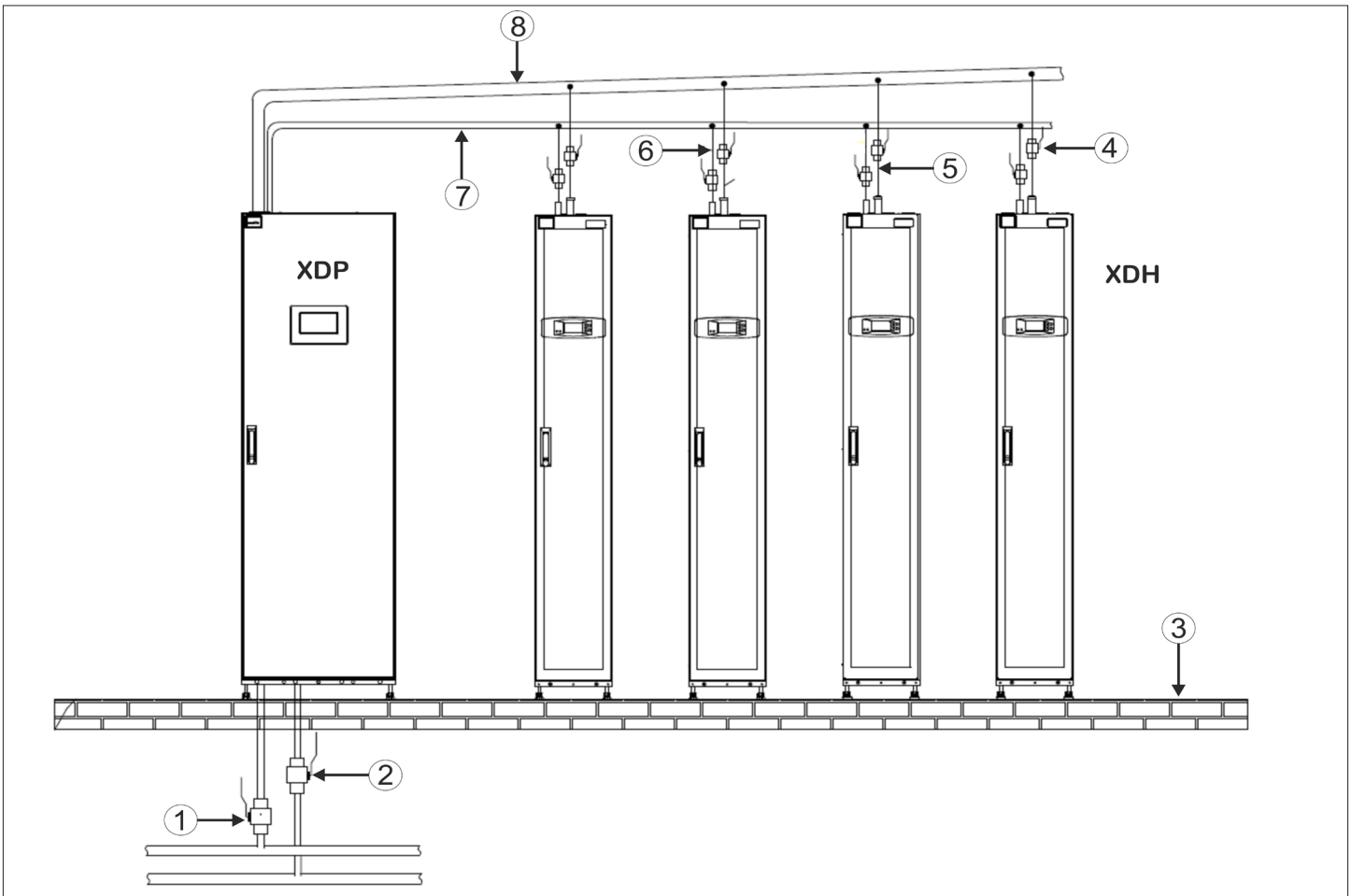
No.	Description	No.	Description
1	Two-port valve	3	Fluid reservoir
2	Plate heat exchanger	4	Pump

Figure 3-1 Overall System Layout

- *Once the locations of the XDP and XDH are fixed, the piping between them is to be connected by the site engineers. Refer Table 3-3 for piping dimensions.*
- *Figure 3-1 of XDH fans shows that multiple number of XDH units can be connected to a single XDP based on its total cooling capacity.*
- *The total connections for one XDP are not limited to XDH only, it can be connected to other compatible XD products as per its total available cooling capacity.*

3.2.2.Schematic System Installation Diagram

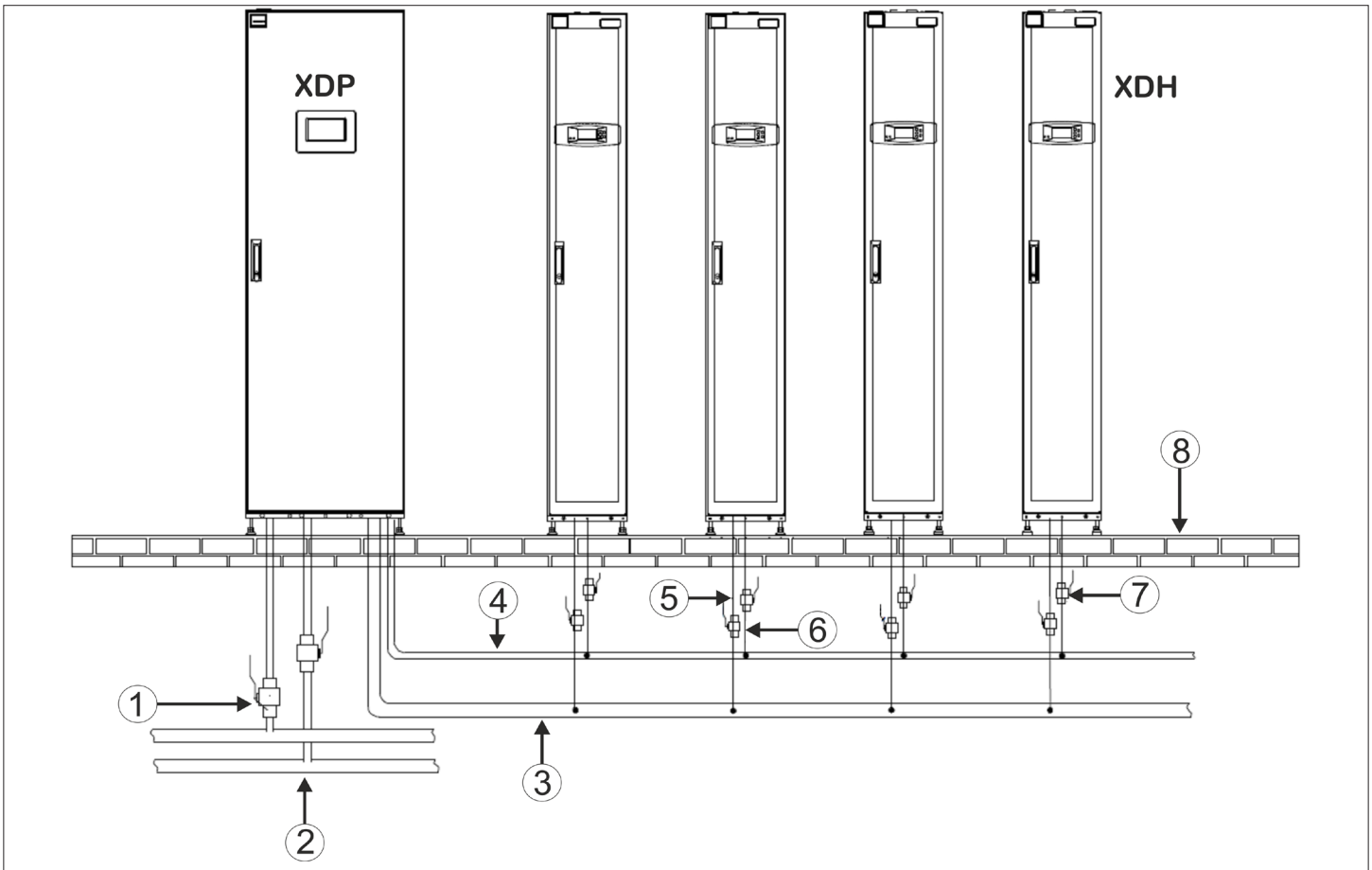
The connection between the XDP and the XDH can be in upper or lower piping modes, as shown in Figure 3-2 and Figure 3-3 respectively.



No.	Description	No.	Description
1	Chilled water piping	5	Gaseous refrigerant dis-tributary pipe
2	On/Off ball valve	6	Liquid refrigerant dis-tributary pipe
3	Activities floor	7	Liquid refrigerant main pipe
4	On/Off ball valve	8	Gaseous refrigerant main pipe

Figure 3-2 Installation of the XDP and XDH with Top Piping Connections

- *One set of XD unit is configured with one XDP unit and six connections to XDH. The Figure 3-2 & Figure 3-3 show the configuration of one XDP and four XDH in top and bottom piping connections. These illustrations are for reference only.*



No.	Description	No.	Description
1	On/ Off ball valve	5	Gaseous refrigerant dis-tributary pipe
2	Chilled water piping	6	Liquid refrigerant dis-tributary pipe
3	Gaseous refrigerant main pipe	7	On/ Off ball valve
4	Liquid refrigerant main pipe	8	Activities floor

Figure 3-3 Installation of the XDP and XDH with Bottom Piping Connections

- *In order to prevent air gaps or bubbles inside the refrigerant system, the refrigerant vapor line is connected from the XDH (the end is tilted downwards along the direction to the XDP) to the XDP, this connection must have a certain degree of tilt, specifically 25.4 mm to 51 mm for every 6 m distance.*

- *For the liquid refrigerant and the gaseous refrigerant piping, the ball valves on the individual branched piping are required to be installed on site. The size and specifications of the ball valves are subject to the pipe diameters of the liquid refrigerant and gaseous refrigerant piping.*

3.2.3.Ball Valves on XDP and XDH Units

Both the gas and liquid pipes of XDH unit are installed with switch ball valves for separating XDH unit during maintenance. In case of serious breakdown, such as refrigerant leakage of XDH unit, the XDH can be repaired or completely taken out of the row after closing the ball valves, refer Figure 3-2, Figure 3-3 and Figure 3-4 for better understanding.

- *These ball valves are installed at the customer site.*

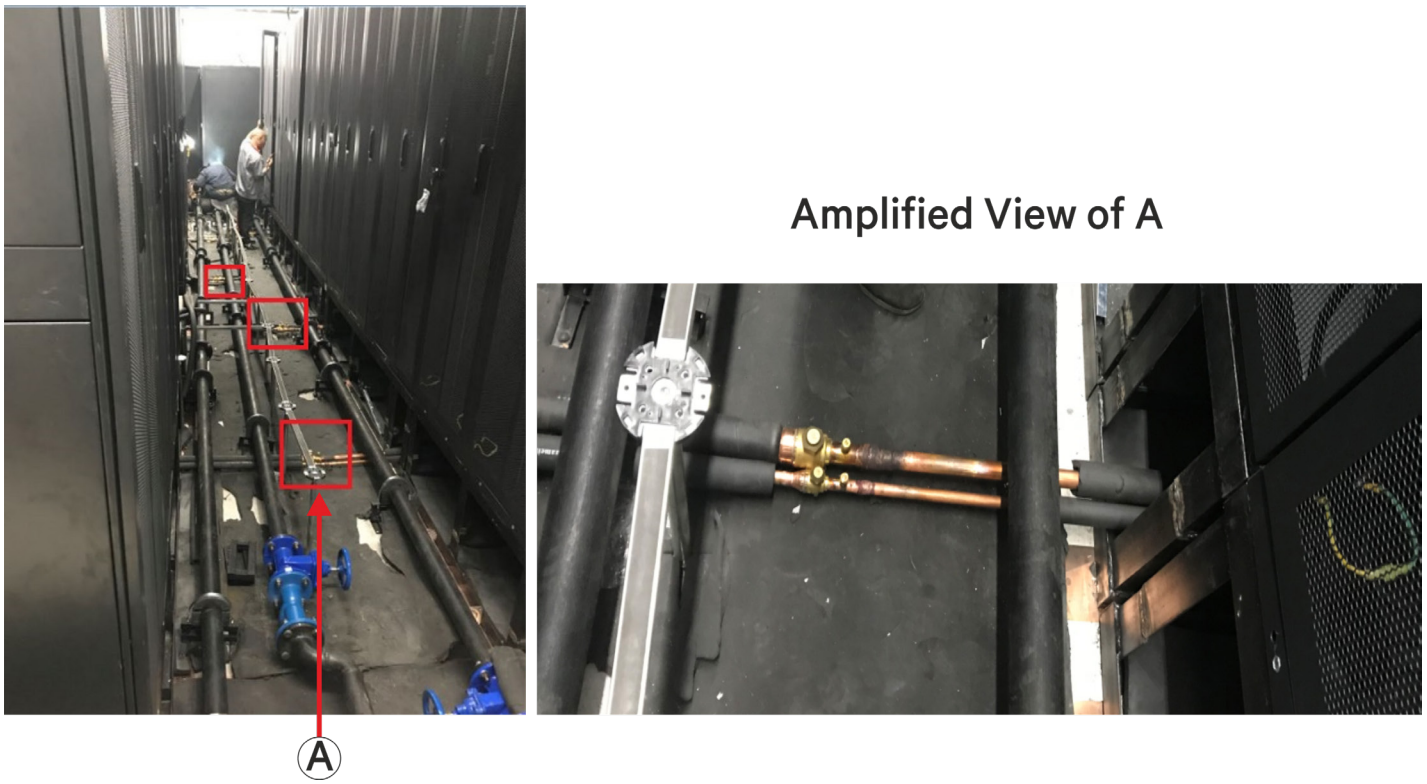


Figure 3-4 Ball Valve Switches

3.2.4.Mechanical Parameters

The mechanical parameters of the XDH unit are shown in Figure 3-5 and Table 3-1

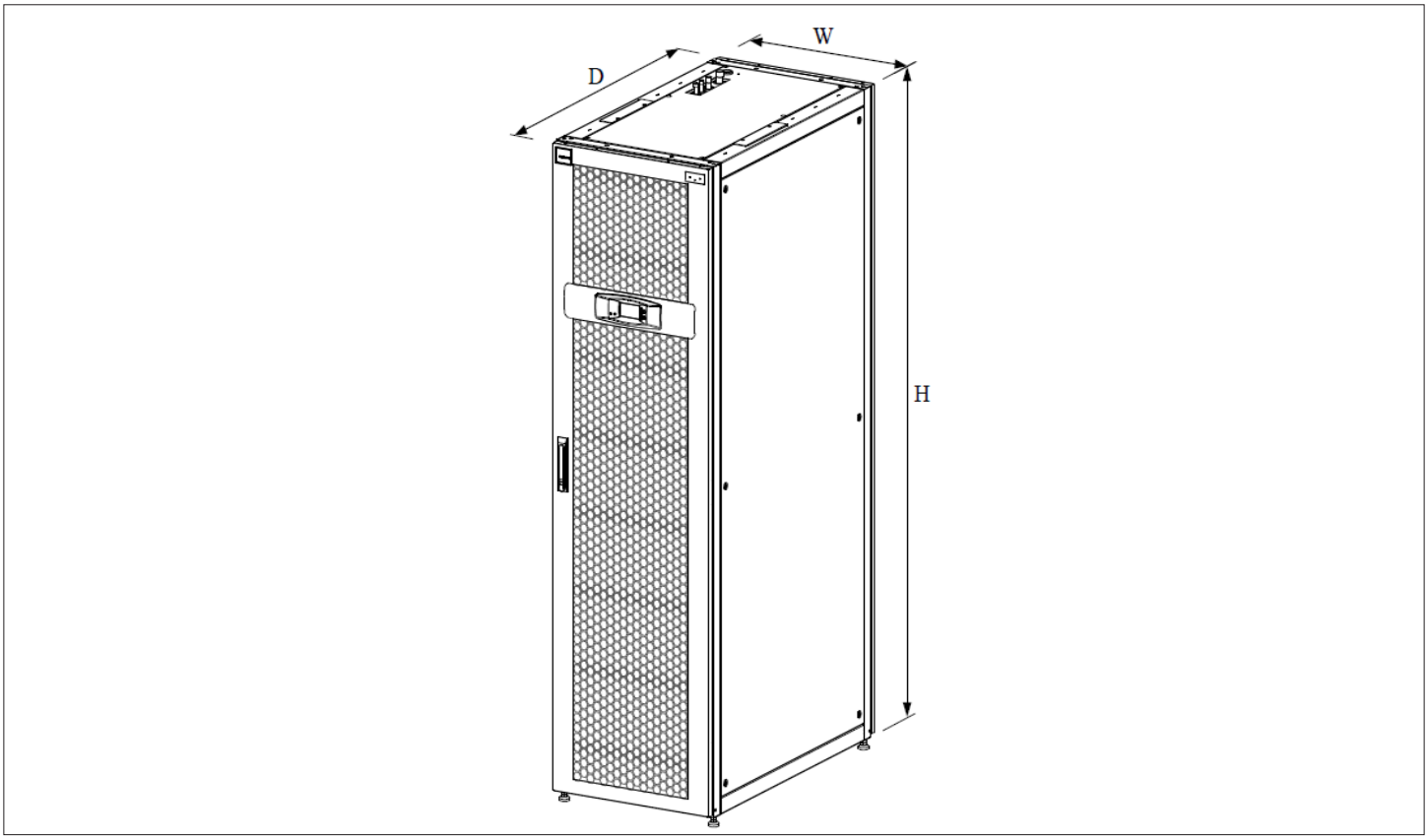


Figure 3-5 Mechanical Parameters of the XDH Units

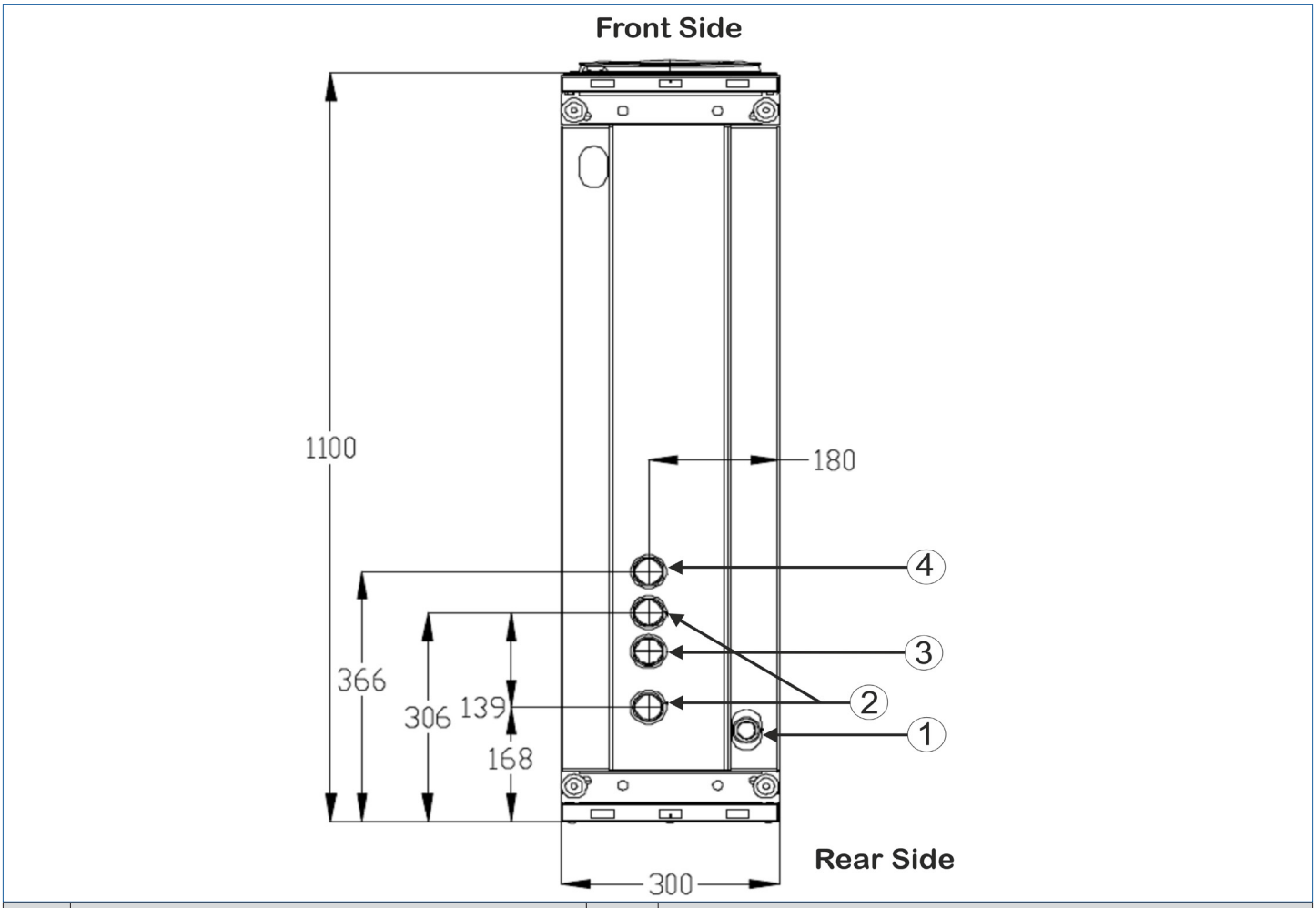
Table 3-1 Mechanical Parameters of the XDH Units

Model	Dimensions (WxDxH)		Operational Weight (kg)
	mm	inch	
XDH030BS1LH0	300×1100×1945	11.8”x43.3”x76.6”	170
XDH030BS15R1			172

- *The cabinet height with the leveling feet is 2000 mm and without leveling feet is 1945 mm.*

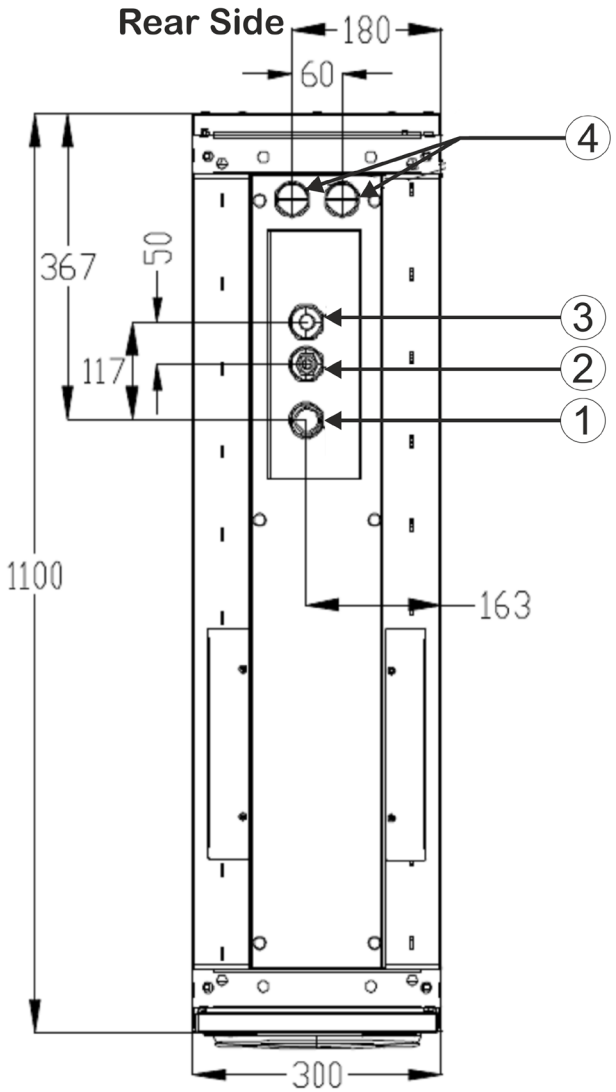
3.2.5.Dimension of the Outlet Pipe on Base and Top Plates

- Location of the refrigerant piping connections on the base plate: Figure 3-6 shows the position of the refrigerant inlet and outlet piping connections on the base plate.
- Location of the refrigerant piping connections on the top-plate: Figure 3-7 shows the position of the refrigerant inlet and outlet piping on the top plate.



No.	Description	No.	Description
1	Power port	3	Return refrigeration circuit
2	Drain pipe	4	Supply refrigeration circuit

Figure 3-6 Position of the Refrigerant Piping Connections on the Base Plate



No.	Description	No.	Description
1	Supply refrigeration circuit	3	Return refrigeration circuit
2	Drain pipe	4	Power port

Figure 3-7 Position of the Refrigerant Piping Connections on the Top Plate

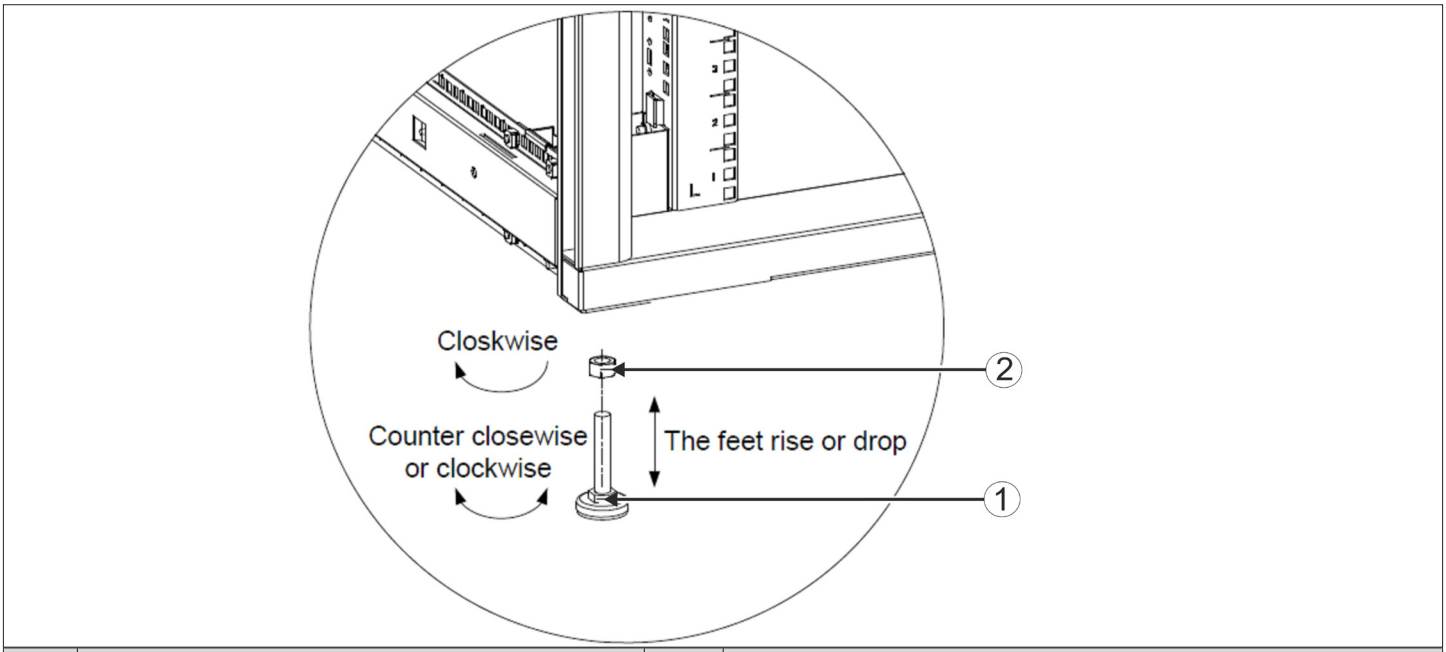
3.3.XDH Installation

3.3.1.Leveling the Cabinet

XDH precision air conditioner is installed in-between the racks, with at least one side of the unit placed beside the server racks. After installing each XDH unit, it needs to be precisely leveled.

Procedures of leveling the cabinet

1. Place the XDH unit on clear and flat ground.
2. Use a movable wrench to loosen the four fixing nuts on the four leveling screw rods in clockwise direction (see Figure 3-8).
3. Rotate the hex bolt at the bottom of the leveling foot until the foot is raised or lowered to the ideal position. Use a leveling meter to ensure the XDH unit is in level with the server racks, as shown in Figure 3-8.



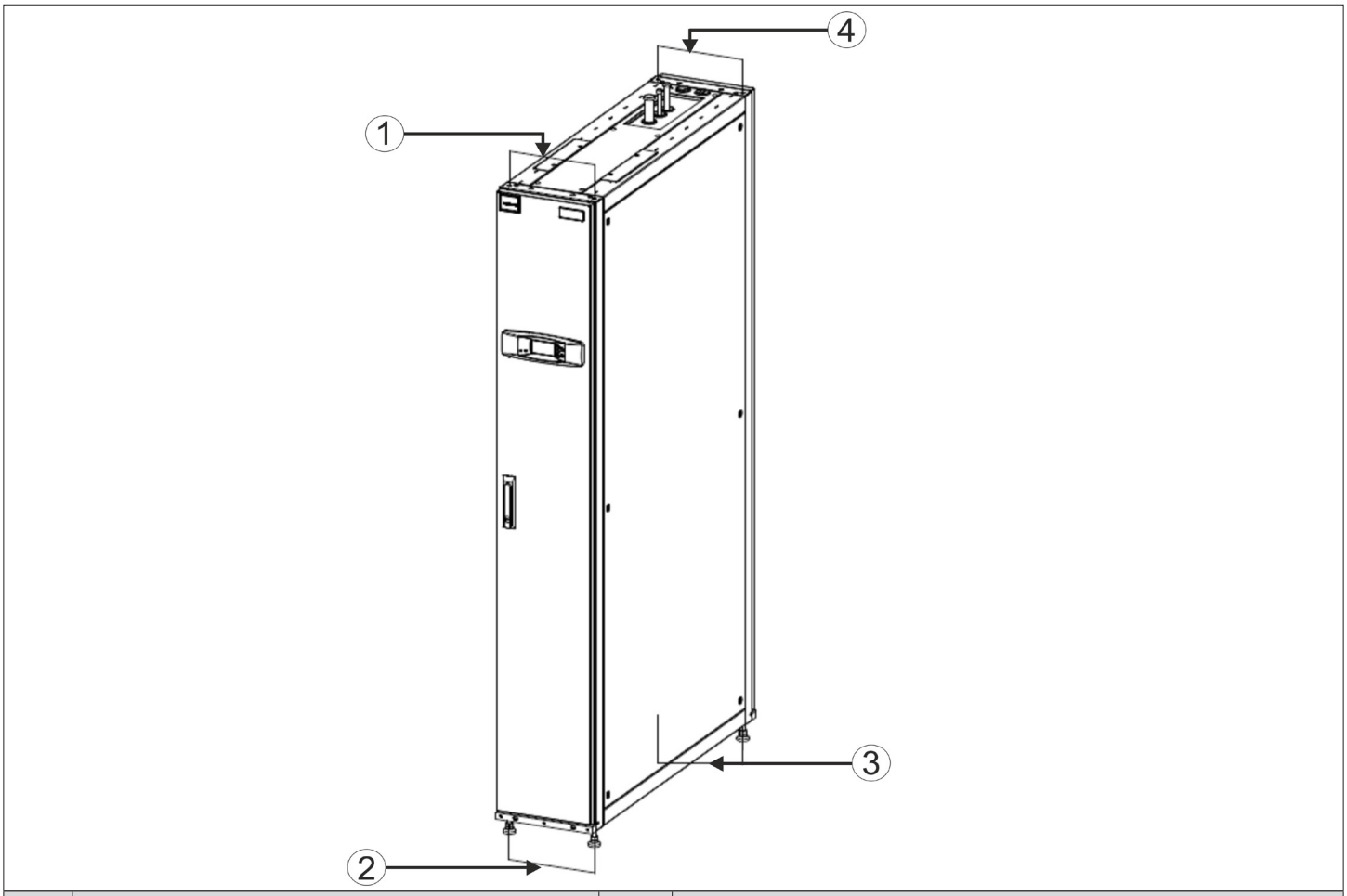
No.	Description	No.	Description
1	Hexagon bolt	2	Fixing nut

Figure 3-8 Leveling Feet

4. Tighten the fixing nuts on the leveling foot by rotating them counter-clockwise to complete the level adjustment. If there is a provision for mounting bracket in the equipment room, then the leveling feet must be removed and the XDH unit should be fixed on the mounting bracket.

3.3.2.Removing Leveling Feet and Fastening

- *To avoid injury to personnel or any damage to XDH unit, this operation should be completed by two installation personnel together.*



No.	Description	No.	Description
1	Front top fixing hole	3	Rear bottom fixing hole
2	Front bottom fixing hole	4	Rear top fixing hole

Figure 3-9 Fixing Holes of the Cabinet

Removing the leveling feet

1. Use a movable wrench to loosen the four fixing nuts on the four leveling screw rods one by one in clockwise direction.
2. Rotate the hexagonal bolt at the bottom of the leveling feet in clockwise direction until the leveling feet can be removed from the XDH unit frame.

Fixing the cabinet

There are two holes on each side of the top, bottom, front, and rear, as shown in Figure 3-9. Four bottom holes are bolted to the floor bracket in the equipment room. After four top holes are bolted, they can be connected to the top bracket in the equipment room.

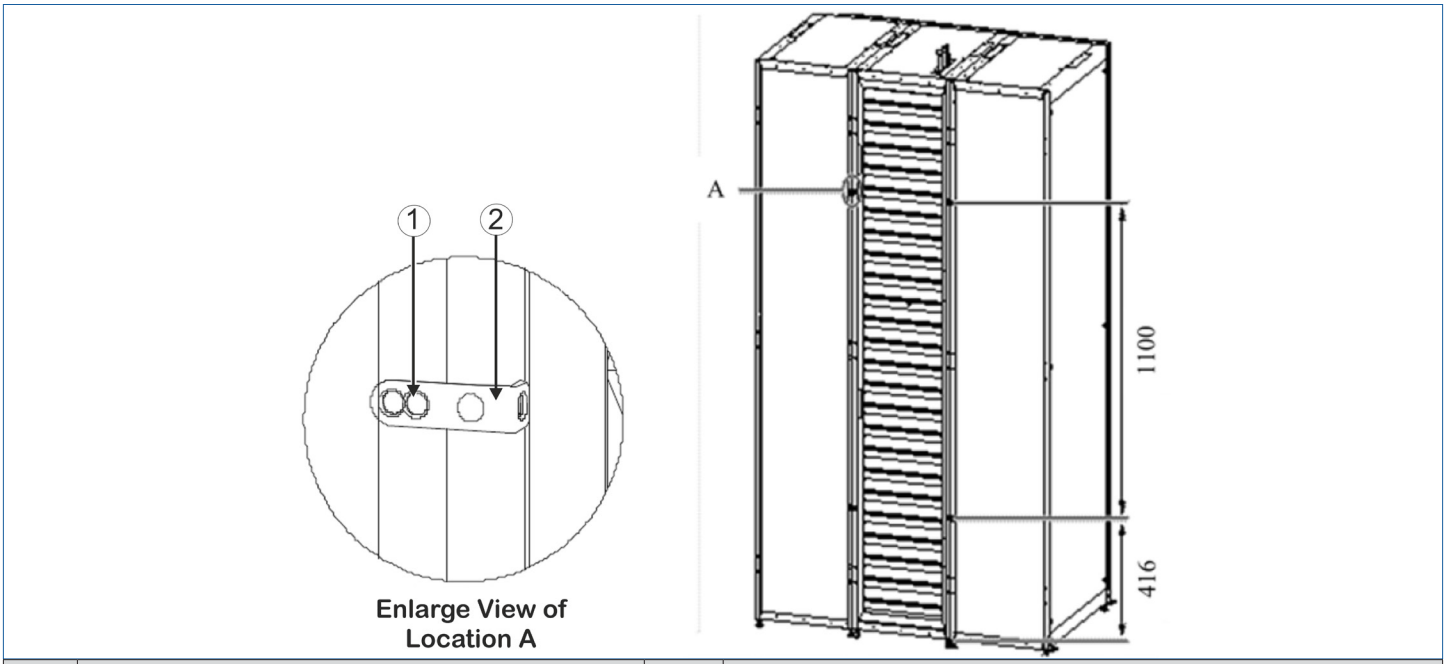
3.3.3.Assembly of Cabinet Parts

Assembling the parts of the cabinet which are supplied with XDH units. There are four combined cabinet parts at the end filter side (each on the left, right, front and rear) and two combined cabinet parts on the fan side (each at top and bottom). Refer Section 3.4.1 for assembly procedure.

- *Level the cabinet before paralleling the cabinets and refer Section 3.3.1 Leveling the Cabinet for the leveling method.*

Procedures for fixing the cabinet:

1. Remove the L-shaped combined cabinet part from the unit accessories kit. Figure 3-10 shows magnified view of the L-shaped combined cabinet parts in position A (left).
2. Use M5 countersunk screw to fix the parallel cabinet kit (L-shaped) to the XDH unit frame (hinge side) through the mounting holes on the neighboring cabinet frame, as shown in Figure 3-10.



No.	Description	No.	Description
1	Mounting screw M5x12	2	Parallel kit

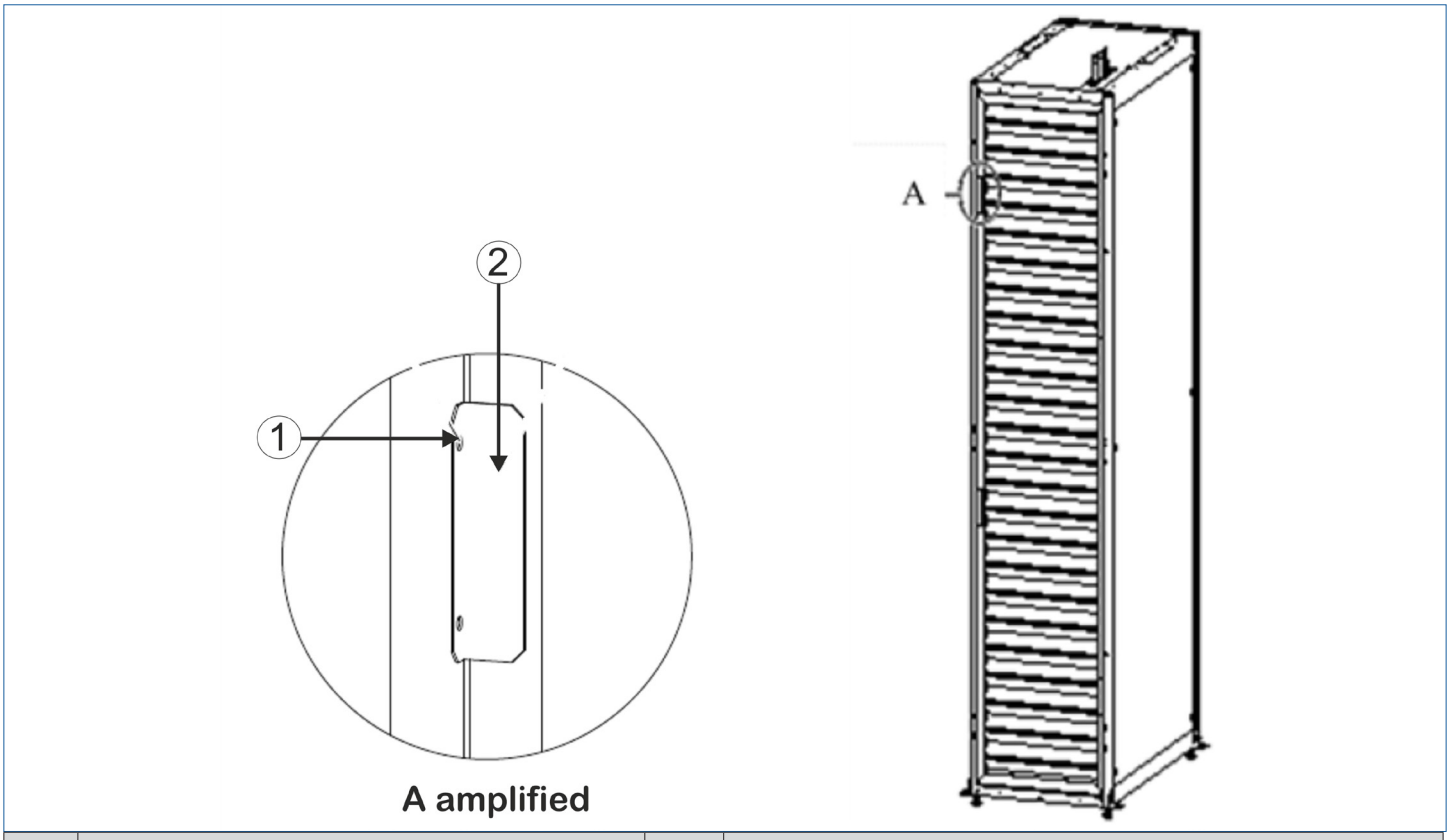
Figure 3-10 Paralleling the Cabinets using Combined Parts

3. Use the same method to fix the other parallel cabinet kit.

3.4.Unit Piping Installation

3.4.1.Removing Filter Net

- Prior to connecting the pipes of the indoor unit, ensure to remove the filter net.
- Open the rear door of the cabinet, you can see two filter nets on top and bottom. First loose the fixing screws on the fixing chip of the filter net, remove the fixing chip to remove the top filter net and use the same method to remove the bottom filter net, as shown in Figure 3-11.



No.	Description	No.	Description
1	Mounting screw M4x12	2	Fixing flake of the filter

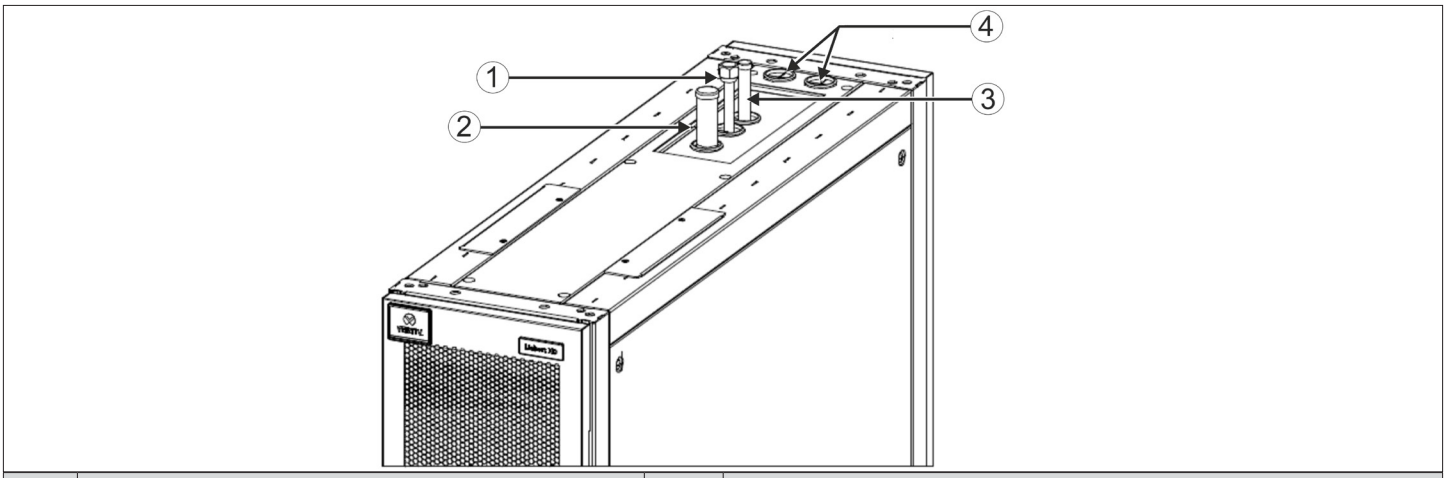
Figure 3-11 Removing the Filter Net

3.4.2.Specifications of the Internal Piping of the End

The internal piping can be seen after the filter is removed. The liquid refrigerant inlet and the gaseous refrigerant outlet piping are included in the standard end configuration. The XDH unit's complete piping configuration includes a liquid inlet refrigerant pipe, gaseous refrigerant outlet pipe and water drain pipe condensate. Table 3-2 describes specifications of three pipes. The locations of the piping connections are shown in Figure 3-12.

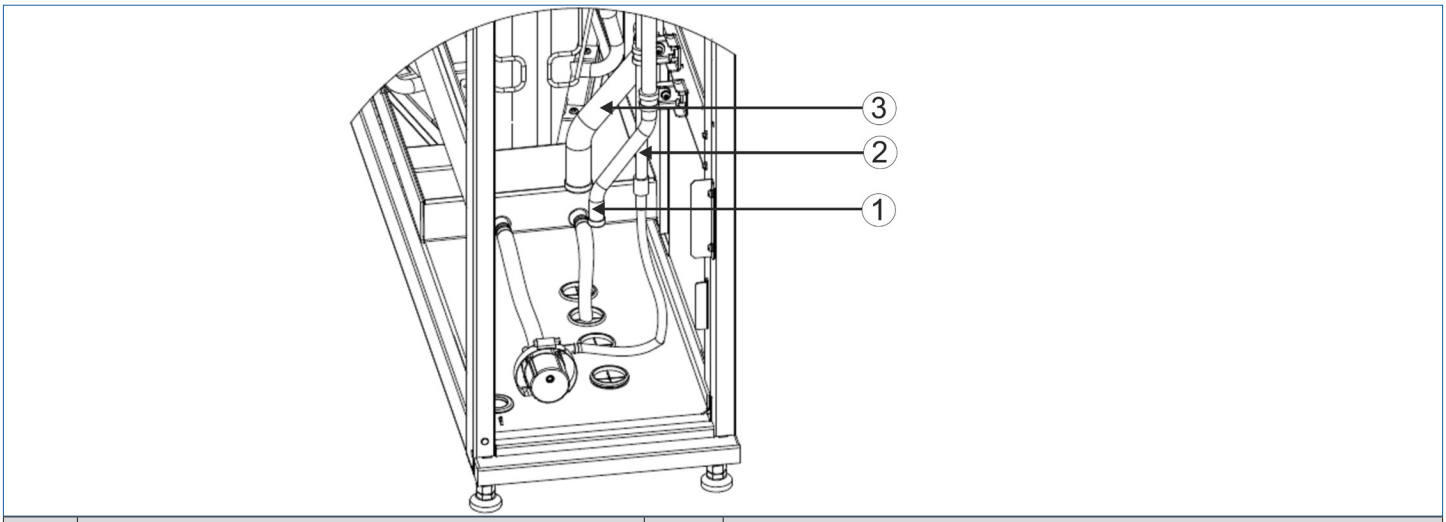
Table 3-2 Specifications of the Internal Pipes of the XDH Unit

Refrigerant Line	Pipe Dimensions (Outer Diameter)	
	mm	inch
Liquid refrigerant inlet pipe (top and bottom)	16	0.63”
Gaseous Refrigerant outlet pipe (top and bottom)	28	1.10”
Condensate water drain pipe	12.7	0.50”



No.	Description	No.	Description
1	Drainage pipe	3	Coolant inlet pipe
2	Coolant outlet pipe	4	Inlet/ outlet hole for cable

Figure 3-12 Top Plate Piping Connections



No.	Description	No.	Description
1	Refrigerant inlet pipe	3	Refrigerant outlet pipe
2	Upper drain pipe		

Figure 3-13 Bottom Plate Piping Connections

3.4.3.Brass Connection Between XDP and XDH Units

Pipes that need to be connected on site include liquid refrigerant pipe and gaseous refrigerant pipe from XDHs to XDP, followed with the connection of condensate water piping of the XDH.

- *All cooling pipe joints shall be soldered by silver brazing.*
- *Pipe selection, arrangement and fixing, system vacuum and refrigerant filling must be operated according to industry standards.*
- *Design and construction must take into account the distance between the host and the end, reduced pipe pressure, reduced noise and vibration.*

As shown in Figure 3-2 and Figure 3-3, the XDP and XDH are connected through the main liquid refrigerant piping and main gaseous refrigerant piping to the liquid refrigerant dis-tributary piping and gaseous refrigerant dis-tributary piping for each XDH unit respectively. Table 3-3 provides the pipe diameters for the liquid refrigerant line, gaseous refrigerant line and the condensate drain line.

Connect the pipes firmly based on the recommended pipe diameters or contact Vertiv local representative for confirmation. Both liquid refrigerant main piping and dis-tributary piping of the XDH need a switch type ball valves for isolating each XDP from the refrigerant lines during its maintenance. The switch ball valves need to be installed at site. The connection length of the main refrigerant pipe is according to the distance between the XDP and the furthest XDH. And the connection length of the dis-tributary refrigerant pipe can be determined as the distance between any XDH and the XDP.

Table 3-3 Recommended Pre-designed Pipe Diameter to Connect XDP and XDH

Refrigerant Piping	Connection Length	Pipe Diameter	
	(m)	mm	inch
Main gaseous refrigerant pipe	0< L ≤10	42	1.7”
	10< L ≤20	45	1.8”
	20 < L <60	54/	2.1”
Main liquid refrigerant pipe	0< L ≤10	22	0.9”
	10< L ≤20	25	1.0”
	20< L ≤40	28	1.1”
	40< L <60	32	1.3”
Gaseous refrigerant dis-tributary pipe	1< L ≤5	25	1.0”
	5< L ≤10	28	1.1”
Liquid refrigerant dis-tributary pipe	1< L ≤5	16	0.6”
	5< L ≤10	19	0.7”

Take a note of the following when installing the refrigerant engineering pipes:

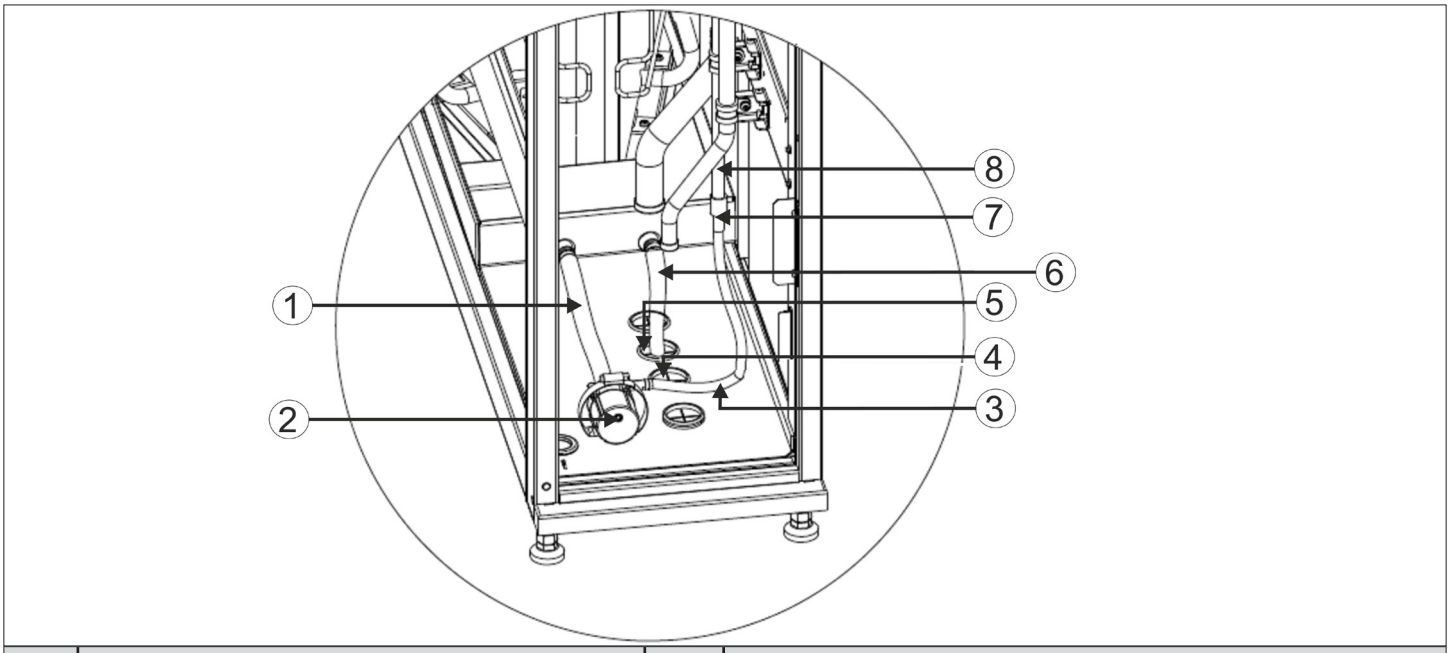
- *The pipe connectors have the corresponding labels. Connect the end gas pipe and liquid pipe according to the label indication. Do not remove the labels. If the gas pipe is in the place where it can be affected by the cooling device (including the bed-hedgehopping floor), heat isolation measures must be taken.*
- *During pipe brazing, if necessary pipe support fixture is required, fill the pipe with nitrogen, preventing excessive oxidation during brazing and forming an oxide film on the inner wall of the pipe.*
- *After the pipeline brazing, check if there is any leakage and then charge the piping with appropriate amount of nitrogen.*

3.4.4.Connecting the Condensate Water Outlet Pipe of the XDH Unit

In the dehumidification mode, the condensate water of the evaporator is collected by condensate drain pan and discharged from the drain pump or directly through the drain pipe.

- If the unit is equipped with a condensate drain pump and if the user needs to connect the drain pipe from the top of the unit, the following procedure needs to be carried out at site:

1. Connect drain hose 2 of the drain pump outlet to the top connection of the copper condensate drain pipe. The inner diameter of the drain hose 2 is 9 mm, the outer diameter of the top connection drain copper pipe is 12.7 mm.
2. Remove the hose clamp from the accessory box that came along with the unit shipment, and fix the drain hose 2 on the drainage tower connector, as shown in Figure 3-14. The torque required to tightening the joint is 15 kgf.cm.
3. Connect the external drain pipe to the top drain hole (the pipe connection is installed, 3/4”-BSP) on the top side of the cabinet. The external drain pipe should be tilted in the direction of drainage to prevent stopping of the pump due to a condensate water backflow.



No.	Description	No.	Description
1	Drain hose 1	5	Drain hole of gravity
2	Drain Pump	6	Drain hose 3
3	Drain hose 2	7	Drainage tower connector
4	Drain hole of water pump	8	Upper drain pipe

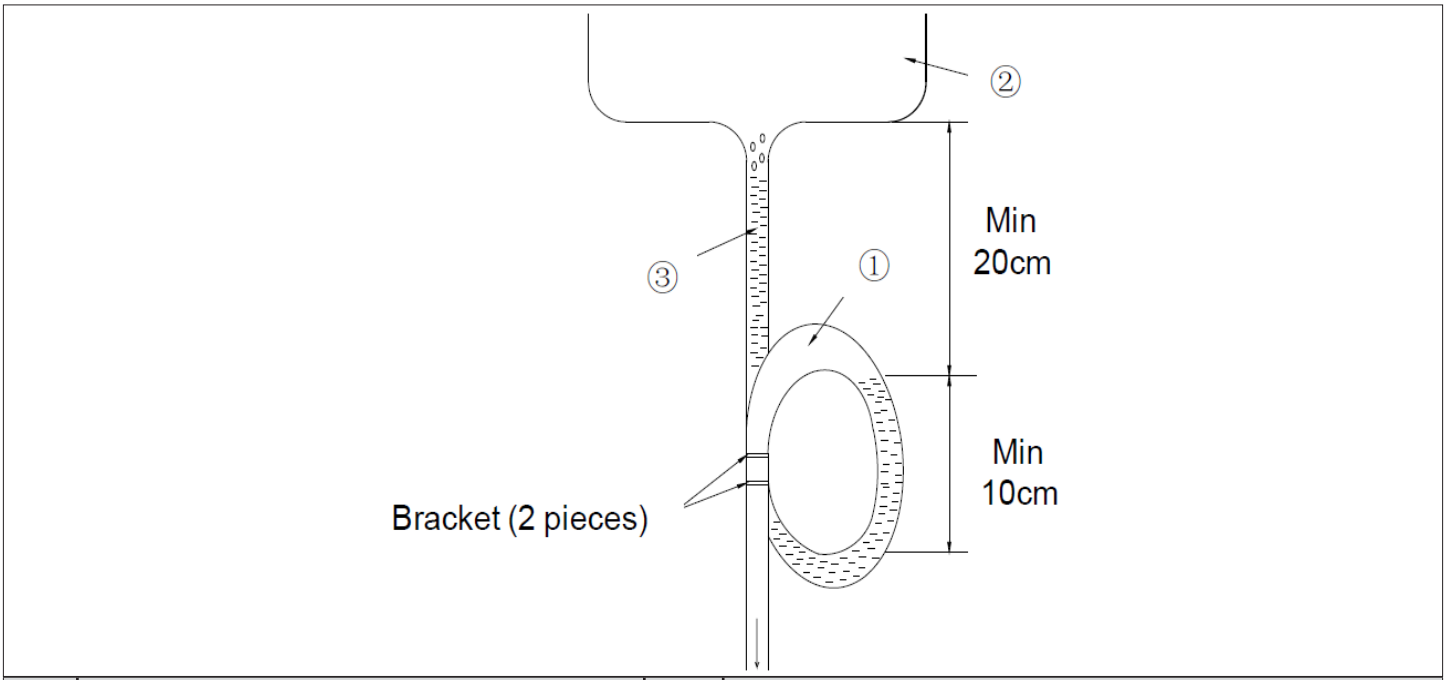
Figure 3-14 Connecting the Condensate Drain Pipe

If the unit is equipped with a water pump and the user needs to drain from the bottom of the unit. Lead the drain hose 2 from the drain hole of the water pump (indicated on the baseplate of the cabinet, as shown in Figure 3-14), and connect it to the customer's condensate drain pipe.

- If the unit is not equipped with condensate drain pump, the condensate drain pan is diversified into two sets of drain passages to drain the condensate water.

1. During on-site connection, the drain hose 1 and drain hose 3 (reserved length: 2 m, outer diameter: 16 mm) are led from the lower drain holes of the pump and by drain hole of gravity respectively (see Figure 3-15) further connected to the external drain.
2. In order to ensure that the condensate water can be discharged, a separate trap must be provided in the condensate drain line. The requirements are as follows:

- Use galvanized steel pipe, PVC or flexible polyethylene pipe;
- Allow to slope at 2% in the direction of drainage;
- A Water-trap[1] must be installed at a minimum of 20 cm below the Condensate-drain-pan[2] and the trap must be installed in the floor under the unit;
- Charge-water[3] in the water trap;



No.	Description	No.	Description
1	Water trap	3	Charge water
2	Condensate drain pan		

Figure 3-15 Draining the Condensate Water

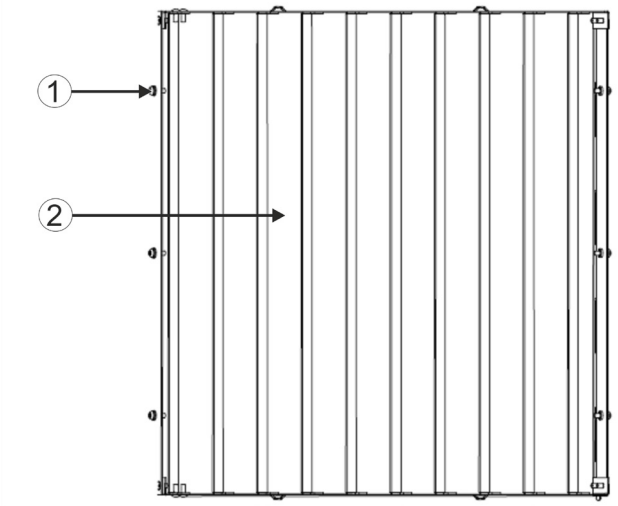
- *Do not cut off the bracket of the water trap, otherwise the drainage of the condensed water will be affected.*
- *Prior to startup, charge water in the water trap to avoid blowing the water.*
- *To avoid water leakage, use a Teflon sealing tape between flexible pipes and connectors.*

3.5.Post-Installation Arrangements

After the installation of the unit, the piping connections along with all the fasteners of the XDH unit must be inspected and fastened before commissioning. The air baffles and the installation holes on the top of the cabinet must be adjusted as per the site requirements.

3.5.1.Adjusting Air Baffles

Adjust the direction of the air baffle according to the installation position of the XDH precision air conditioner so as to guide the airflow towards left or right side. The baffle consists of several blocks the direction of which can be adjusted by removing the screws on the left and right sides of the grille, rotating it by 180 degrees and then installing again to change the airflow direction. The mounting screws of the air baffle is shown in Figure 3-16.

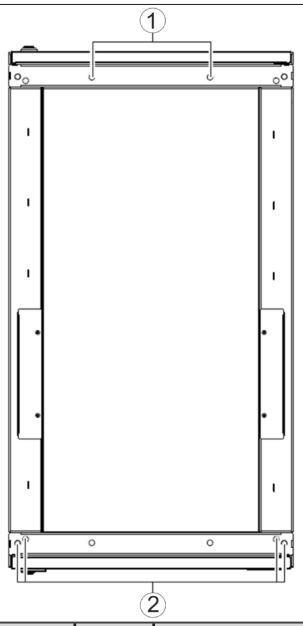


No.	Description	No.	Description
1	M4x6 screw	2	Air baffle

Figure 3-16 Position of Screws on the Air Baffles

3.5.2.Blocking Holes on Top Plate of XDH Unit

There are some small holes on the top plate of the XDH unit for the convenience of field installation (to connect to the top cabling bracket). After completing the installation of XDH unit at site, use the rubber plugs and bolts in the accessories box to block/ seal the remaining holes. Use M13.5 plugs to block/ seal the four holes on the top plate of the XDH unit, and use M12x30 bolts to block/ seal the eight holes on the top plate, as shown in Figure 3-17.



No.	Description	No.	Description
1	Use the provided four M13.4 rubber plugs to seal the holes	2	Use the provided eight M12x30 bolts to seal the holes

Figure 3-17 Blocking the Holes on the Top of the XDH Unit

3.5.3.Leakage Detecting by Nitrogen

The pressure of nitrogen charged shall be more than 20 bar. The nitrogen shall be kept for more than 12hrs, before and after which the pressure should be the same. The pressure gauge is connected to the Schrader valve at the outlet of the refrigerant pump as shown in the Figure 3-18.

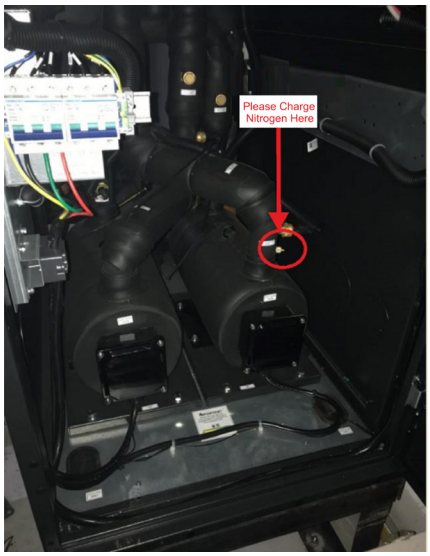


Figure 3-18 Location of the Schrader Valve

3.6.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 3-4 for installation checklist) are complying accordingly.

Table 3-4 Installation Checklist

Items	Results
Sufficient space for maintenance activities at site.	
The equipment is installed vertically and the installation fasteners have been fixed.	
The connecting pipe between the XDP and XDH units is installed and the ball valve at the XDH unit side has been fully opened.	
The airflow direction of the air baffles have been adjusted (if necessary).	
The condensate drain pipe is connected.	
All pipe joints tightened.	
All pipe connectors and fasteners are tightly fastened.	
All connected copper and water pipes shall be insulated properly.	
Irrelevant things (such as transportation material, structure material, and tools) inside or around the equipment have been cleared after the equipment is installed.	

After all the items are checked and confirmed, perform the electrical installation operation.

Chapter 4: Electrical Installation

This chapter describes the electrical installation of XDH precision air conditioner, including task introduction, installation precautions, end cable connection and electrical inspection.

4.1.Task Introduction and Notes

4.1.1.Cables to Connect On-site

- Power cable of the XDP
- Control cable of the XDP
- Communication cable between the XDP and the XDH
- Remote power-on/off cable
- Cable of the water sensor on the floor
- Remote temperature sensor cable
- External common alarm cable

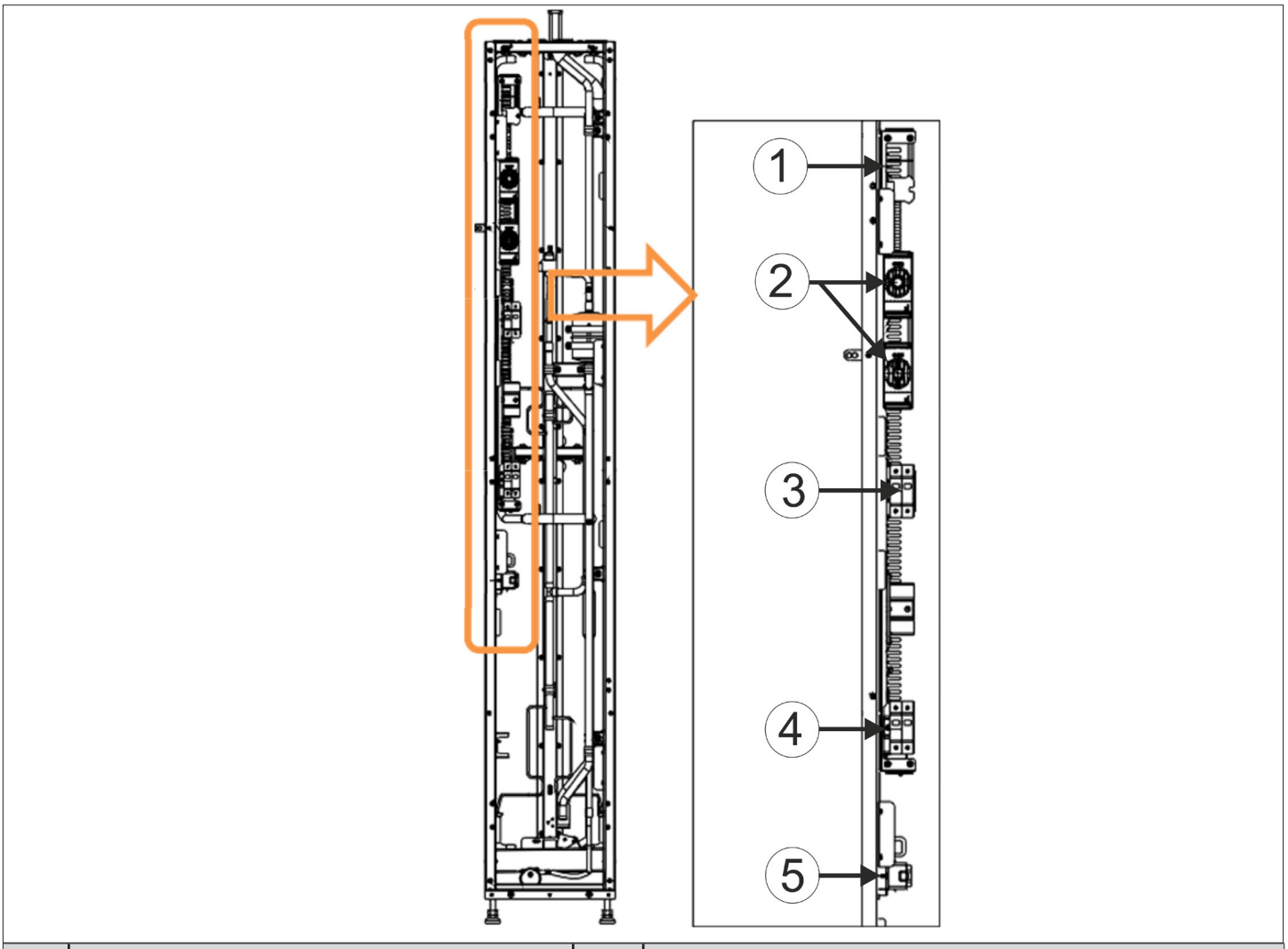
4.1.2.Installation Notes

- *The connection of all power cables, control cables and ground cables should comply with the local and national electrical regulations.*
- *See the equipment name-plate for the full load current. The cable sizes should meet the local wiring standards.*
- *Mains supply requirement: 220 V±10%, 1N, 50 Hz/ 60 Hz.*
- *The application grid for this air conditioner, TN, TT star connection power system; consult Vertiv local representative for other connection.*
- *The electrical installation and maintenance must be performed by authorized professional personnel.*
- *If the soft power cable uses Y-connection, and if the cable is damaged, it must be replaced by professional service personnel.*
- *Before performing any electrical works, use a voltmeter to measure the power supply voltage and ensure that the power supply has been switched off.*
- *The equipment needs to be fixed with screws, rails and other methods to avoid shaking during startup or running process.*
- *A rated circuit breaker shall be provided to disconnect the unit from power supply.*

4.2.XDH Cable Connection

4.2.1.Positions of Electrical Interfaces of the XDH Unit

Open the XDH precision air conditioner's rear door. After removing the filter, there are low-voltage components located at predefined locations. Low-voltage electronic components are distinguished by the labels on the XDH unit.



No.	Description	No.	Description
1	Terminal block	4	Main breaker
2	Power module of fan	5	Fixed clip
3	Breaker of power module		

Figure 4-1 Cable Connection of the Electronic Control Box and the Terminals

4.2.2.Connecting the Power Cable of the XDH Unit

Figure 4-1 shows the position of the power port of the XDH unit. L, N, and PE are connected to the corresponding ends of the external power supply. Reserve a certain margin at the inlet cable and fix it on the cable clamp then fix the cable on the unit's inner board. To understand the location of the top inlet/ outlet hole and bottom inlet/ outlet hole properly see Figure 3-6 & Figure 3-7 in Chapter 3. Table 4-1 describes the rated full-load current value (FLA) of the unit.

Table 4-1 Full-load Current Values (unit: A)

Model	Full Load Amp (A)
XDH030BS1LH0	8
XDH030BS15R1	

- *The cable sizes should meet the local wiring regulations.*

4.2.3.Connecting Control Cables

The field connection terminals are located as shown in Figure 4-1, and the enlarge view of the connection terminal is shown in Figure 4-3. Figure 4-2 shows the connection layout of XDP and XDH

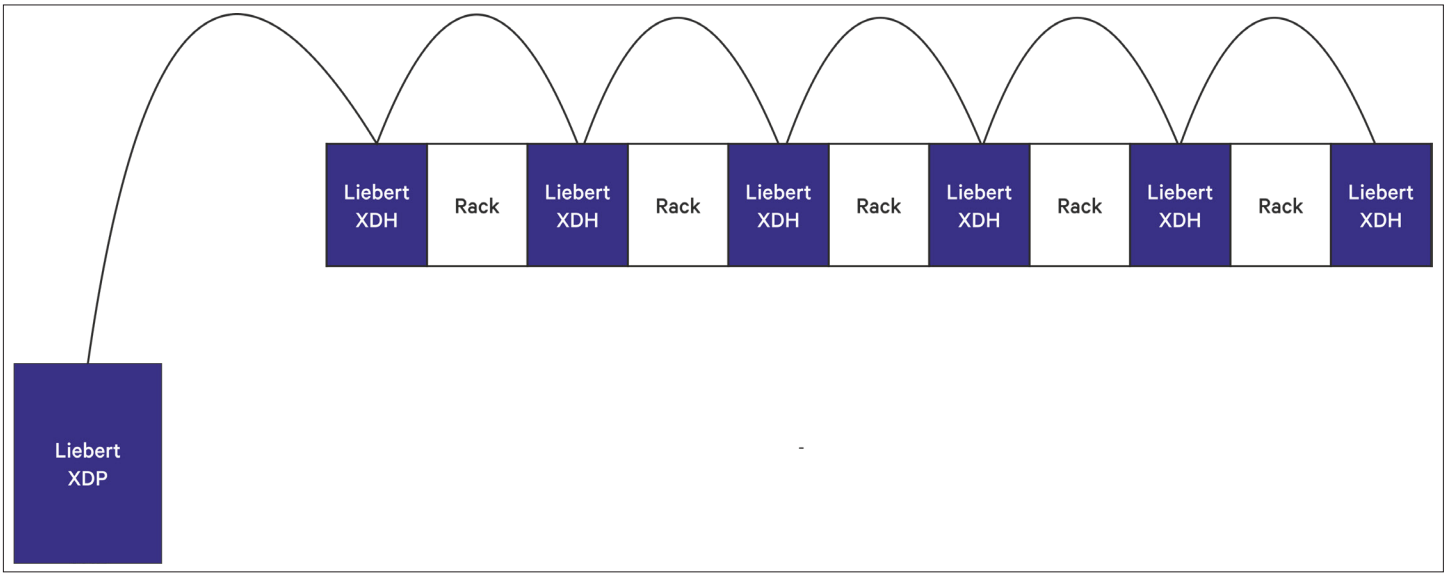
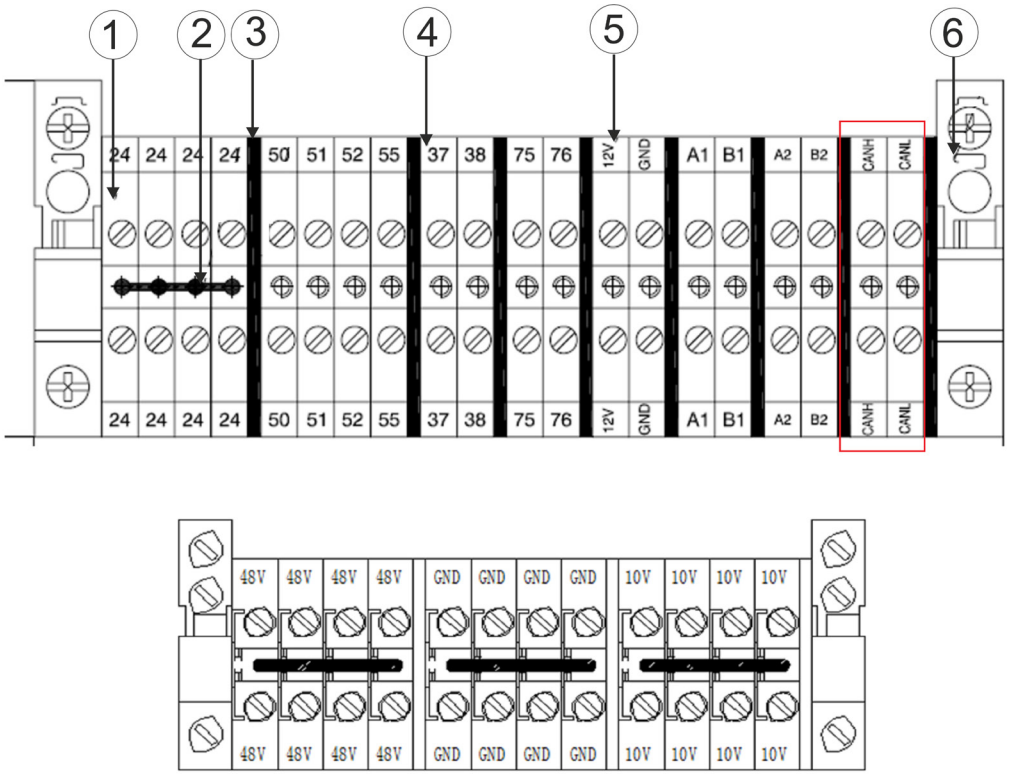


Figure 4-2 Layout of XDP and XDH



No.	Description	No.	Description
1	Terminal	4	Cross mark
2	Contact part	5	Vertical mark
3	Partition	6	Holder

Figure 4-3 On-site Connection Terminal

- *The connection personnel must take anti-static measures before connecting the control cables.*

- **CAN communication cable between XDP and XDH units**

XDP and XDH units communicate over the CAN cable. The communication cable is led from the CANH/ CANL terminal and connected to the CANH/CANL on each XDH terminal bar in a serial mode. See Figure 4-3 for CANH/ CANL terminal block of XDH.

- **Remote power-off**

The remote power-off switch can be connected to Terminals 37# and 38#. The terminals are short-circuited upon delivery. Remove the short circuit table while connecting the terminals to a remote power-off switch.

- *When terminals 37# and 38# are disconnected, the unit is shut down.*

- **Water sensor on the floor**

A floor-water-sensor is delivered with the unit in the accessories kit. Connect one end of the floor-water-sensor to Terminal 51# on the terminal bar and the other end to Terminal 24#. Each device can be connected in parallel to any number of detection sensors. However, there is only one floor-water-leakage alarm and it can be checked through the controller.

It is recommended to install the floor-water-sensor near the ground level in the vicinity of the unit's baseplate, with a minimum distance of 0.5 m to the unit. The floor-water-sensor should also be placed away from the bay or floor drains of the wet storage.

- *Before tightening any assembly connections and line connections, ensure that the control unit's power is turned off.*
- *It is not permitted to use a floor-water sensor near flammable liquids.*
- *It is not permitted to use a floor-water sensor for the detection of flammable liquids.*

- **Remote Temperature Sensor**

Each unit can be equipped with four remote temperature sensors, if there is an external power supply it can be expanded up to eight sensors. Depending upon the airflow or return air temperature which is remotely controlled by the unit. The accurate temperature value can be obtained by locating the sensor in the cold or hot aisle appropriately. The temperature value is used to control the operation of the unit. Otherwise, the device may not run normally.

If sensors are connected as a chain, connect the remote temperature sensor connector to the pre-determined network interface terminal. After the cable is connected, lead the cable from the designated top or bottom outlet hole of the unit, then connect the cable to the first sensor, and further connect the first sensor to the second sensor. Use the same connection method on other sensors. Table 4-2 describes the IRM-S01T address settings of the remote temperature sensors.

Table 4-2 IRM-S01T Address Settings of the Remote Temperature Sensors

Sensor	1	2	3	4	5	6	ID	
Remote temperature sensor 1	0	0	0	1	0	0	1	ON — "1" OFF — "0"
Remote temperature sensor 2	0	0	0	1	0	1	2	
Remote temperature sensor 3	0	0	0	1	1	0	3	
Remote temperature sensor 4	0	0	0	1	1	1	4	
Remote temperature sensor 5	0	0	1	0	0	0	5	
Remote temperature sensor 6	0	0	1	0	0	1	6	
Remote temperature sensor 7	0	0	1	0	1	0	7	
Remote temperature sensor 8	0	0	1	0	1	1	8	

The remote temperature sensor address specific setting method is described below:

The DIP switch of the remote temperature and humidity sensor is used to set the sensor address and it communicates with the control board via MODBUS protocol. The sensor address consists of Group number and sequence number in the group, wherein, DIP1 to DIP4 are used to set the Group number, and DIP5 to DIP6 are used to set the sequence number in the group.

If the sensor address is 71, the setting method is as shown in Figure 4-4, wherein, 0111 represents the Group No.7, 01 represents the sequence number 1 within the group.

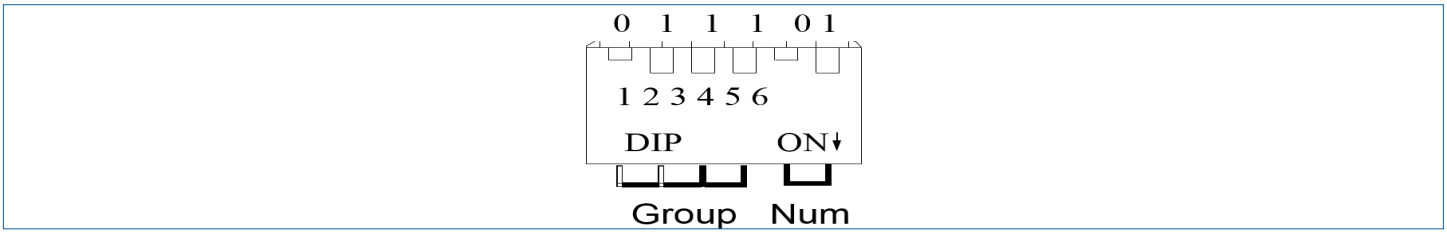


Figure 4-4 Sensor Address Setting

The setting of the DIP switches DIP1 to DIP6 are shown in Table 4-3.

Table 4-3 DIP Switch Setting

DIP1~ DIP4	Group No.	DIP1~ DIP4	Group No.	DIP1~ DIP4	Group No.	DIP5~ DIP6	Sequence No.
0 0 0 0	0	0 1 1 0	6	1 1 0 0	C	0 0	0
0 0 0 1	1	0 1 1 1	7	1 1 0 1	D	0 1	1
0 0 1 0	2	1 0 0 0	8	1 1 1 0	E	1 0	2
0 0 1 1	3	1 0 0 1	9	1 1 1 1	F	1 1	3
0 1 0 0	4	1 0 1 0	A				
0 1 0 1	5	1 0 1 1	B				

If the number of remote temperature sensors are less than 8, configure them in sequence. For example, if there are three remote temperature sensors, set the address to 1, 2, and 3. Ensure that the addresses are consecutive. The addresses of the remote temperature sensors must be set at site.

- *If the DIP switch is set to ON, this means 1.*
- *The sensor address cannot be set to 00.*

- **External general alarm**

The external general alarms can be assigned to Terminal 75# and 76#. Further they generate signals to external alarm devices, such as alarm indicator. When a critical alarm occurs, the contact will be closed to trigger remote alarms and send signals to the building management system or dial the paging system automatically. The power supply of the external general alarm system is user-prepared. Refer to Appendix I Circuit Diagram for details definition of other terminals.

4.3.Electrical Installation Inspection

After the electrical installation is completed, confirm the following points as given in Table 4-4.

Table 4-4 Electrical Installation Inspection

Items	Results
The power supply voltage meets the rated voltage on the unit name-plate.	
The system electrical loop has no open or short circuit.	
The power cables and ground cables to the air-breaker switch are connected.	
The ratings of the MCBs and fuses are correct (refer *Table 4-1* to select suitable MCB or fuses).	
The control cables are well connected.	
All the cables connections are fastened, and screws fitted correctly.	
Control transformer setting matches the incoming power.	

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

- *Do not power on the unit until Vertiv authorized technical personnel has checked and confirmed all the parameters of electrical installation in the unit are correct.*

Chapter 5: Startup Commissioning

This chapter describes the startup commissioning, including specific operations.

5.1.Preparations Before Commissioning

1. **Mechanical Part**

- Ensure that the piping between the XDP and each XDH are soldered to connect as an entire system.
- Follow the instructions at the valve to open all valves in the refrigerant loop.
- Ensure that the total system charge has been roughly accounted.
- Connect the condensate water drain system and inspect the leakages, if any.
- Ensure that the room temperature has at least 40% heat load of the design heat load; if not, use other heating devices to warm up the room to ensure necessary amount of heat load is available for commissioning.

2. **Electrical Part**

- Ensure that the input voltage of the main power supply is within ± 10% of the rated voltage and that the power disconnector is closed.
- Ensure that all electrical or control connections are correct, and tighten all electrical and control connectors.
- Ensure that the power cable and low-voltage control cable are separately arranged.
- Ensure that the high-water-level cable is correctly connected.

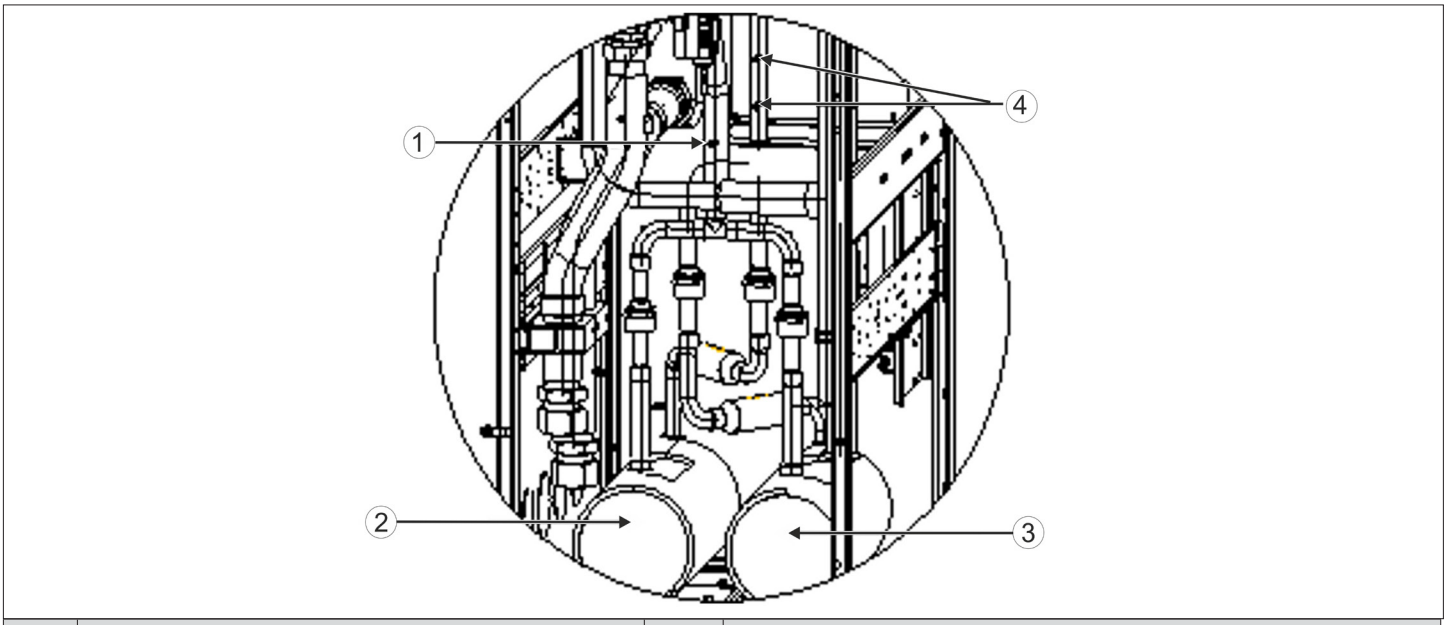
5.2.Commissioning Procedure

Because the XDP host and XDH end are connected as a system, the host and the end adopt the same commissioning method.

5.2.1.Maintaining the Pressure

Connect the high and low-pressure composite pressure gauge to the XDP pump inlet and outlet valves (Schrader valve position as shown in Figure 5-1), fill the system with 27 bar of nitrogen, and initially check for any obvious leakage.

- If a refrigerant leakage is evident (focus on the soldered joints) and repair the leakage.
- If no refrigerant leakage occurs, maintain pressure (at least for 24 hours) and check if the pressure is reduced after 24 hours.



No.	Description	No.	Description
1	Schrader valve on the inlet pipe	3	Pump 2
2	Pump 1	4	Schrader valve on inlet pipe

Figure 5-1 Pump Outlet and Inlet Valves

5.2.2.Evacuating the System

- Fully release the factory-charged nitrogen.
- Power On the XDH during the evacuation. The EEV will automatically open to ensure that the system is evacuated thoroughly.
- Connect the high and low pressure composite pressure gauge to the front and rear sides of the Schrader valves of the XDP pump, and evacuate the refrigeration system loop for more than 3 hours or less than 500 microns.

1. Evacuating while XDH is powered On

After XDH is powered On, press the boot button of all the XDHs, and then the electronic expansion valve will automatically open. Then the system could be evacuated at any position of the Schrader valves shown in the Figure 5-1. As the XD system is large, it is suggested that several vacuum pumps can be used to evacuate the system.

- *Ensure that all the ball valves on XDP and XDHs are open before evacuating the system.*

2. Evacuating while XDH is powered Off

If the unit is evacuated during powered Off, in addition to evacuating at the XDP, the system shall be evacuated at the Schrader valve installed before the XDH electronic expansion valve, as shown in Figure 5-2 the red box below.

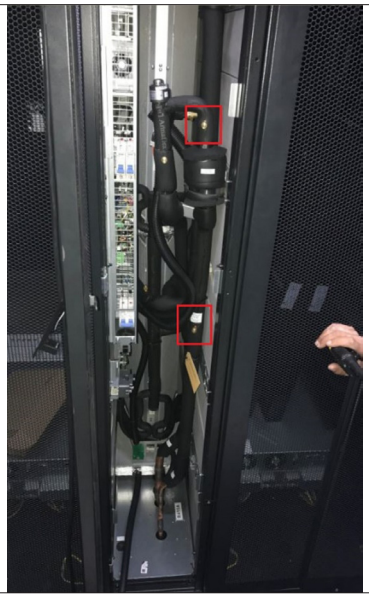
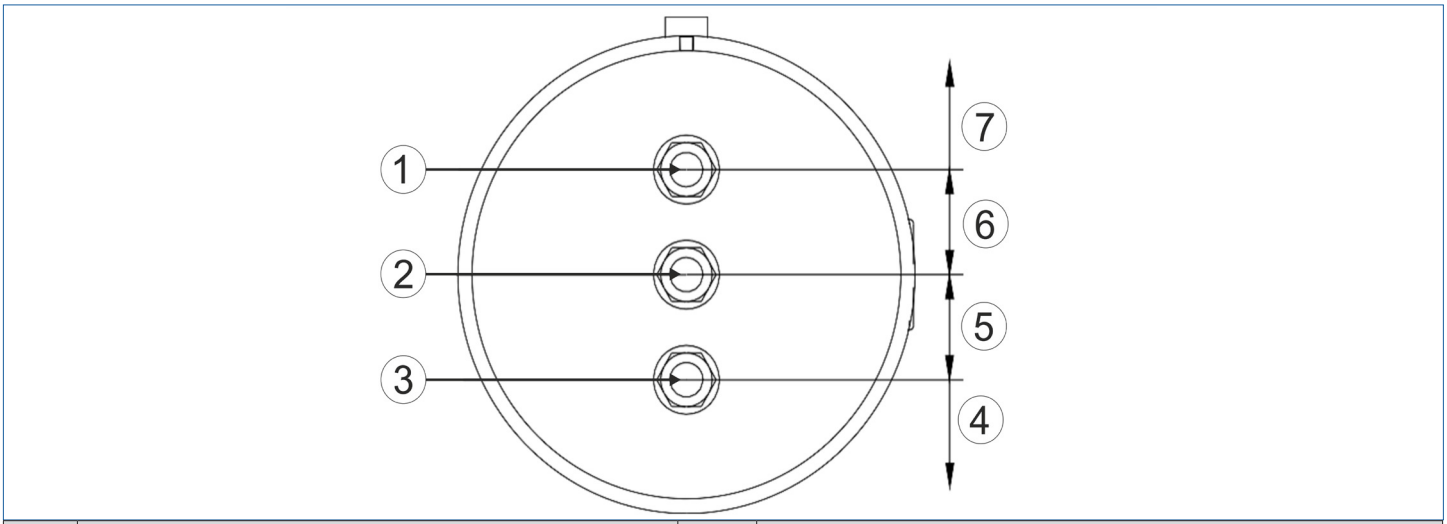


Figure 5-2 Location of the Schrader Valve in the XDH Unit

3. Starting the system

- Switch ON the main circuit breaker of the XDP, close the circuit breaker of the power module, and then close the circuit breaker of pumps 1 and 2.
- Press the power On button to start the system. Start the XDP and the liquid refrigerant valve. Observe the opening of the liquid refrigerant valve.
- After the pump is started, observe the pump speed and head of delivery. Test the running current of the pump and listen to the sound when the pump is operating.
- Check for any abnormality in the operation. If the unit is stable, the refrigerant level in the tank should be observed. If the liquid level is below the lowest level of sight glass, charge some more liquid refrigerant at the inlet Schrader valve.
- When the unit is running normally, ensure the liquid level is between the first and the second level in the liquid sight glass. Figure 5-3 shows the refrigerant liquid level in sight glass.

- *Evacuate the air in the connecting hose of the composite pressure gauge.*
- *For safety purpose, before entering the equipment room, wear ear-caps, earplugs and other equipment to protect hearing.*
- *The methods for evacuation and charging the refrigerant are same for XDP and XDH units.*



No.	Description	No.	Description
1	Sight glass 3	5	Acceptable operating level
2	Sight glass 2	6	Recommended operating level
3	Sight glass 1	7	Operation level is not allowed below sight glass 3
4	Operation level is not allowed above sight glass 1		

Figure 5-3 Refrigerant Sight Glass and the Current Refrigerant Liquid Level

5.2.3.Refrigerant Charging

- When charging the refrigerant, ensure that the circuit breakers of the XDP are open, the circuit breakers of the XDH are closed, and the fan is running.
- At the inlet Schrader valve, start charging in the refrigerant inside the system. When the refrigerant cannot be charged in, stop the charging.
- Use the refrigerant cylinder heater to heat the refrigerant tank during refrigerant charging, at least to ensure the maximum level of refrigerant reaches in the inspection sight glass. Figure 5-3 shows the position of the liquid refrigerant in the sight glass of the liquid tank.
- The pump should be powered Off during refrigerant charging process.
- The volume of XD system is large. It is strongly recommended that one or more refrigerant charging machine is used.
- Refrigerant charge can be calculated according to the Table 5-1. The pump should be powered On only when charging is finished.

Table 5-1 Amount of Refrigerant Charge

Items	R134a (kg)	R410A (kg)
XDP, kg/ each	73.2	64
XDH, kg/ each	2.41	2.1
Main gas pipe: OD 42 mm kg/m	0.5	0.4
Main gas pipe: OD 45 mm; kg/m	0.6	0.5
Main gas pipe: OD 54 mm; kg/m	0.8	0.7
Main gas pipe: OD 22 mm; kg/m	0.34	0.3
Main gas pipe: OD 25 mm; kg/m	0.45	0.4
Main gas pipe: OD 28 mm; kg/m	0.6	0.5
Main gas pipe: OD 32 mm; kg/m	0.8	0.7

5.3.Post Commissioning Inspection

Inspection after commissioning is vital, refer Table 5-2 for the commissioning checklist.

Table 5-2 Post Commissioning Checklist

Inspection Items	Inspection Results
Check all outputs are functional.	
Check the temperature & humidity settings are correct and are controlled within range.	
Is there any abnormal alarm.	
Ensure all the other functions are set correctly.	
Ensure that electrical installation checklist is confirm refer Table 4-4.	

Chapter 6: Controller Operation Instructions

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

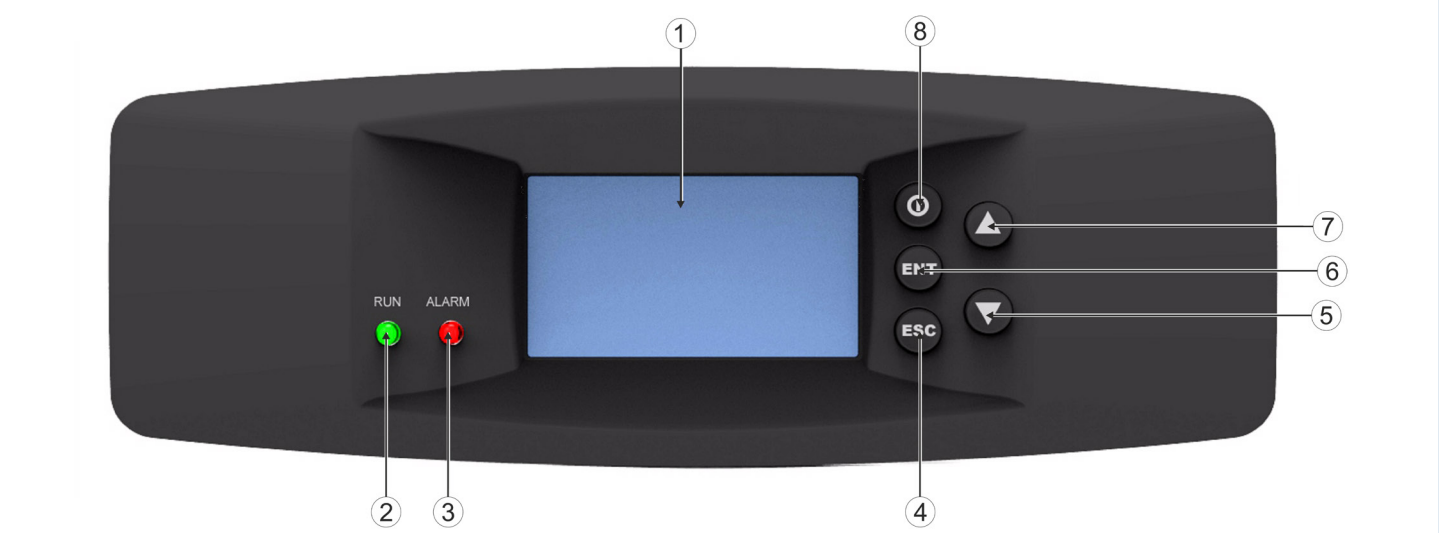
6.1.Feature

The micro-processing controller has the following features:

- It can monitor and display the operation status of XDH unit to maintain the environment within the range of setpoints.
- Equipped with a 128×64 dot graphics color screen 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 400 historical alarm records.
- Configured with an RS485, using MODBUS-RTU communication protocol.

6.2.Appearance

The micro-processing controller panel is shown in Figure 6-1.



No.	Description	No.	Description
1	LCD screen	5	Down button
2	Run indicator	6	ENT button
3	Alarm indicator	7	Up botton
4	ESC button	8	On/Off button

Figure 6-1 Micro-processing Controller Panel

6.3.Graphic Color Screen

The graphic color screen displays English menus with white backlight. When the system is operating normally, the upper half part of its main interface is shown in Figure 6-2. More detailed operating status of certain component and alarm information are available from the Main Menu screen. The selected menu option will be highlighted while browsing. The digit to be changed will be highlighted while scrolling through the settings menu.

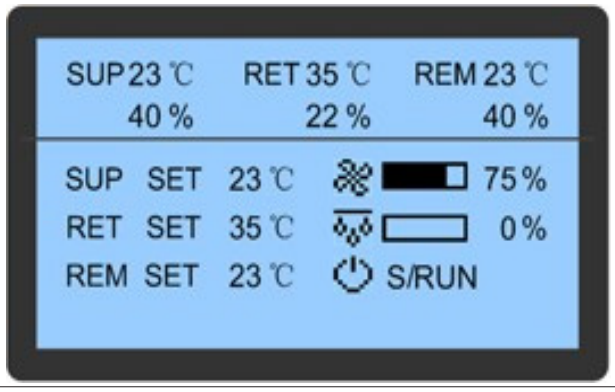
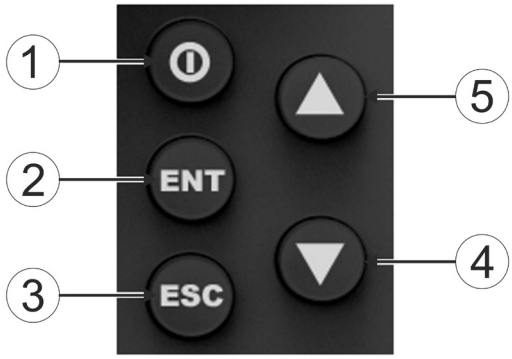


Figure 6-2 Display Screen

6.4.Control Buttons

6.4.1.Function Description

The micro-processing controller has five control buttons, as shown in Figure 6-3. The functions of the control buttons are described in Table 6-1.



No.	Description	No.	Description
1	On/Off button	4	Down button
2	Enter button	5	Up bottom
3	ESC button		

Figure 6-3 Control Buttons

Table 6-1 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 screen. Validate the parameter setting value.
Escape button ESC	Exit the current menu and return to the normal screen or previous menu screen. 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-screen menu: scroll up the screen.
Down button	Move the cursor down or decrease the parameter value. For a toggle selection: scroll through the options. For a multi-screen menu: scroll down the screen.

6.4.2.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 screen.

1. Press the Enter button to enter the Password screen.
2. Press the Enter button to highlight the input data field in the Password screen.
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 screen.

Instance 2: Modify parameters

To set the high temperature alarm of the airflow in the alarm setup menu, perform the following steps:

1. In the main menu, move the cursor up or down to point it to the alarm menu.
2. Press Enter to enter the alarm menu screen.
3. In the alarm menu, move the cursor up or down to point it to the alarm settings.
4. Press Enter to enter the alarm settings screen.
5. In the alarm settings screen, move the cursor up or down to point it to the alarm value settings.
6. Press Enter to enter the alarm value settings screen.
7. Press the Enter button to highlight the parameter field of Hi Temp of Supply Air.
8. Press the Up or Down button to select the parameter option.
9. After selecting, press the Enter button to confirm. The parameter will take effect.
10. Press the Esc button to return to the previous menu screen.

- *If user do not press the Enter button to validate the changed parameter after changing the parameter, the change of Hi Temp to Supply Air is invalid.*

6.5.Control Screen

6.5.1.ON Screen

After the AC unit is powered On, the graphic color screen will display the ON screen, as shown in Figure 6-4.

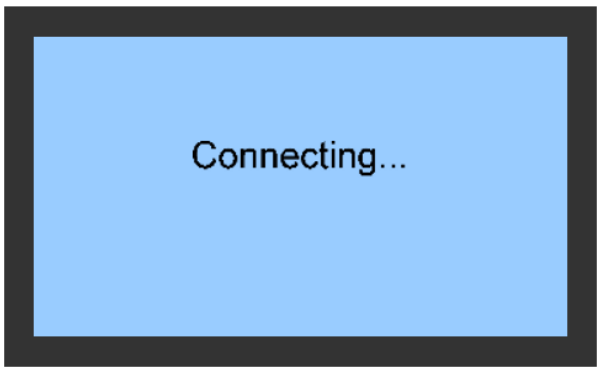


Figure 6-4 ON Screen

6.5.2.Normal Screen

After the unit is powered On, the Normal screen will be displayed after 10 seconds. The upper part of the screen 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 6-5 for better understanding.

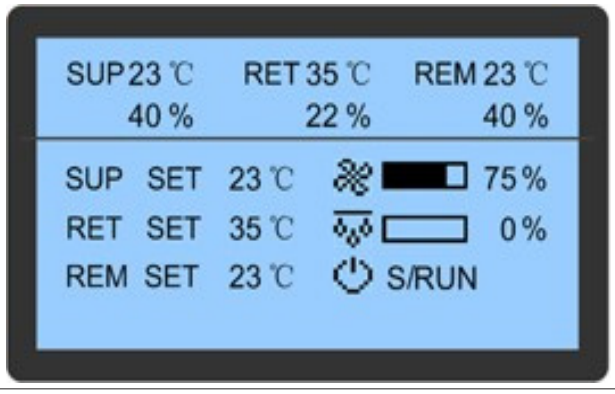


Figure 6-5 Normal Interface

6.5.3.Unit Working Icons

The icons and their definitions are listed in Table 6-2.

Table 6-2 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

6.5.4.Password Screen

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

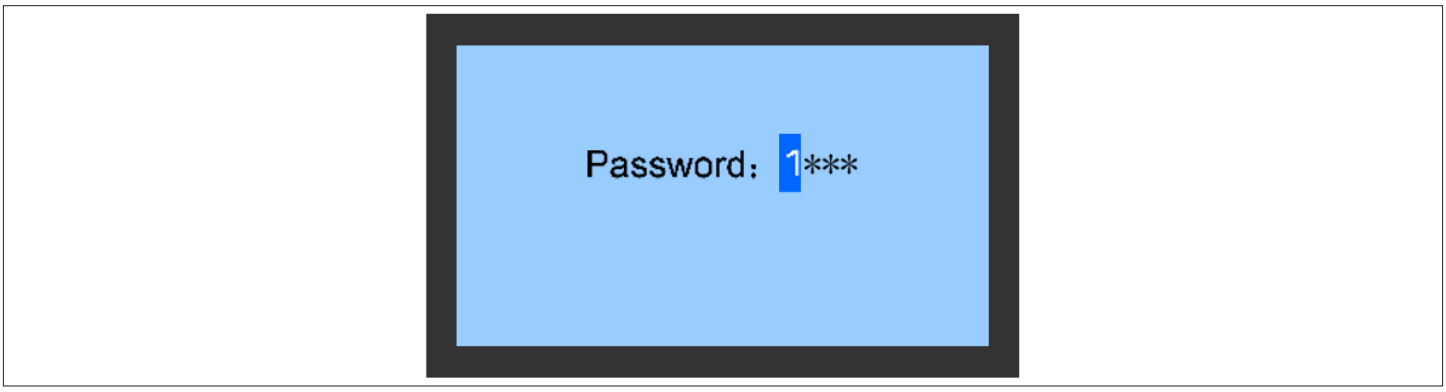


Figure 6-6 Password Screen

Three levels of passwords are provided for accessing the menus. The detailed descriptions are listed in Table 6-3.

Table 6-3 Password Level

Password Level	User	Initial Password	Remark
Level 1	General operator	0001	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 6.4.2 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 screen, you can press the ESC button and then press the Enter button to re-enter the Password screen.

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

6.6.Menu Structure

6.6.1.Main Menu

Enter and confirm the password on the Password screen, and the Main Menu screen is displayed, as shown in Figure 6-7. 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 6.4.2 *Operation Example*.

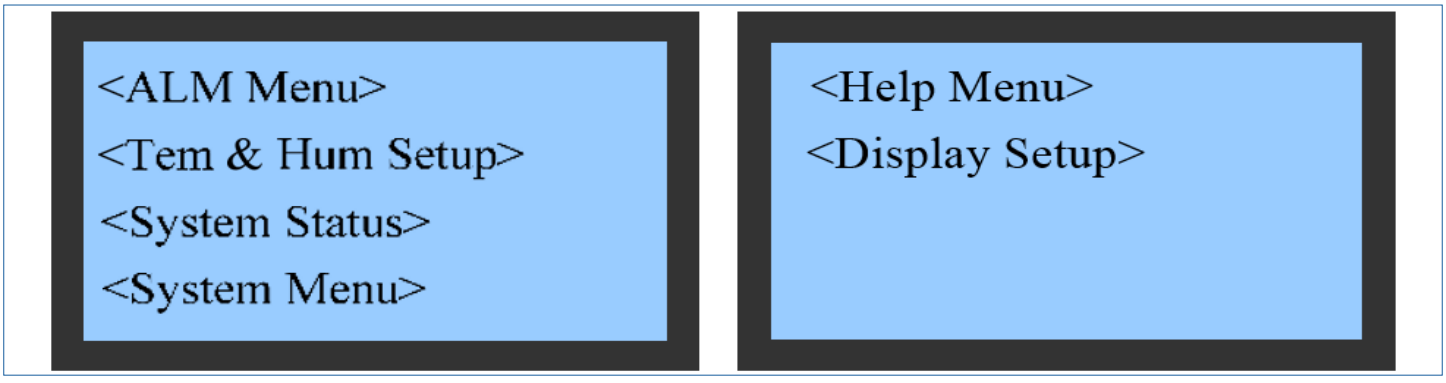


Figure 6-7 Main Menu Screen

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

Table 6-4 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 screen contrast, and change the language.

6.6.2.Alarm Menu

To enter the screen shown in Figure 6-8, select Alarm Menu on the Main Menu screen. To scroll up or down the menu items, click the Up or Down button respectively.

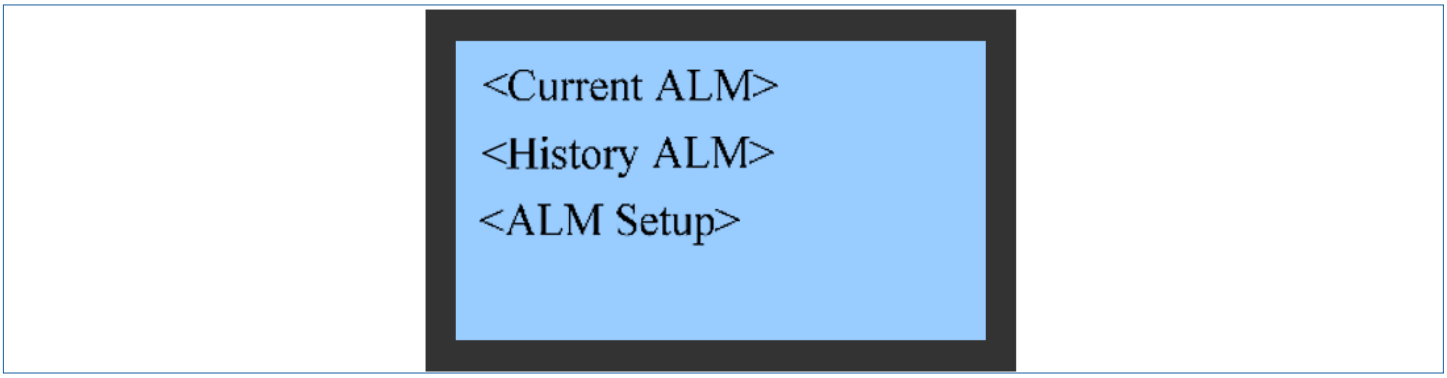


Figure 6-8 Alarm Menu Screen

6.6.3.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 6-9. XX indicates the alarm SN, and YY indicates the total number of reported alarms.

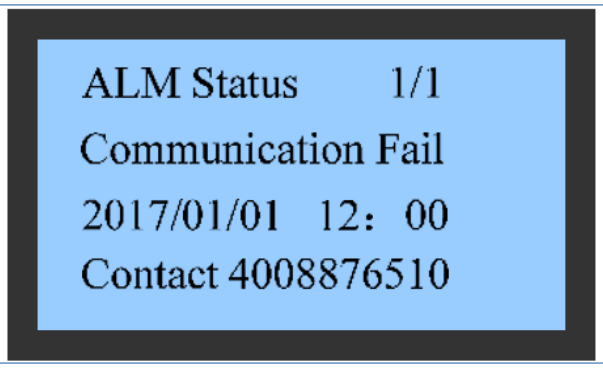


Figure 6-9 Current Alarm Menu

- *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.*
- *The current alarms are automatically cleared upon system power failure.*

6.6.4.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 6-10. XX indicates the alarm SN, and YY indicates the total number of reported alarms.

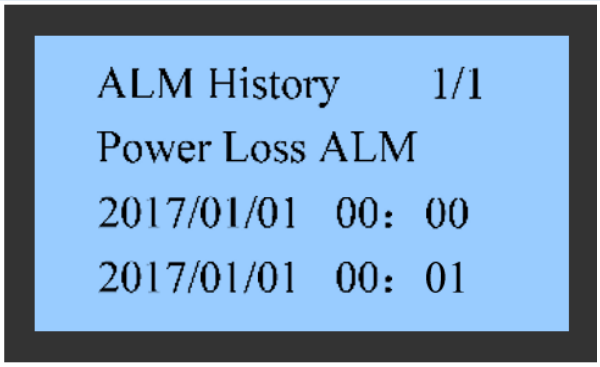


Figure 6-10 Historical Alarm Menu

- *When multiple alarms are reported, use the Up or Down key to query.*
- *Up to 400 historical alarms can be stored. Historical alarms are not cleared upon power failure.*

6.6.5.Alarm Setup

On the Alarm Menu, select the Alarm setup to enter the Alarm Setup screen. 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 screen, set the alarm values, as shown in Figure 6-11. Use the Up or Down key to scroll the menu items.

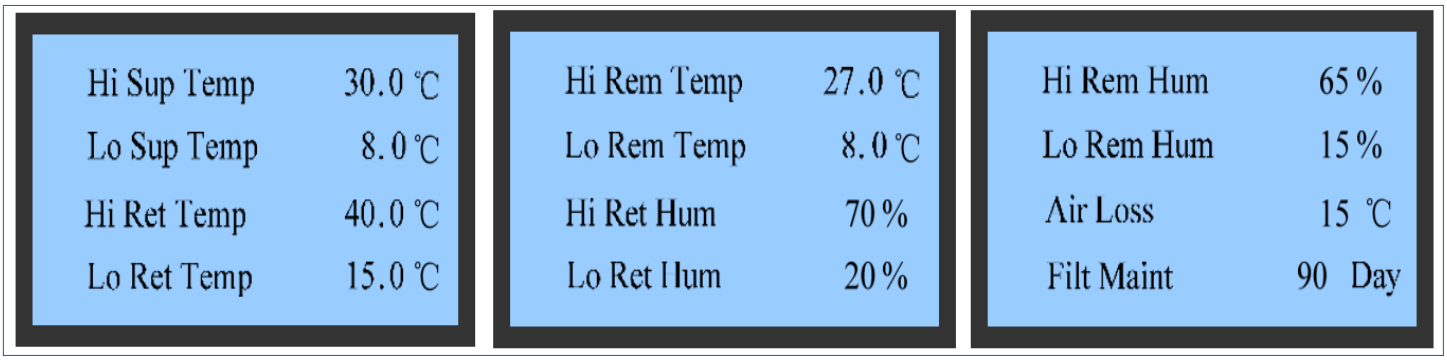


Figure 6-11 Items of the Alarm Value Setup Menu

- **System alarm attributes**

On the Alarm Setup screen, set the alarm attributes, as shown in Figure 6-12. Use the Up or Down key to query menu items. Table 6-5 describes the alarm output logic.

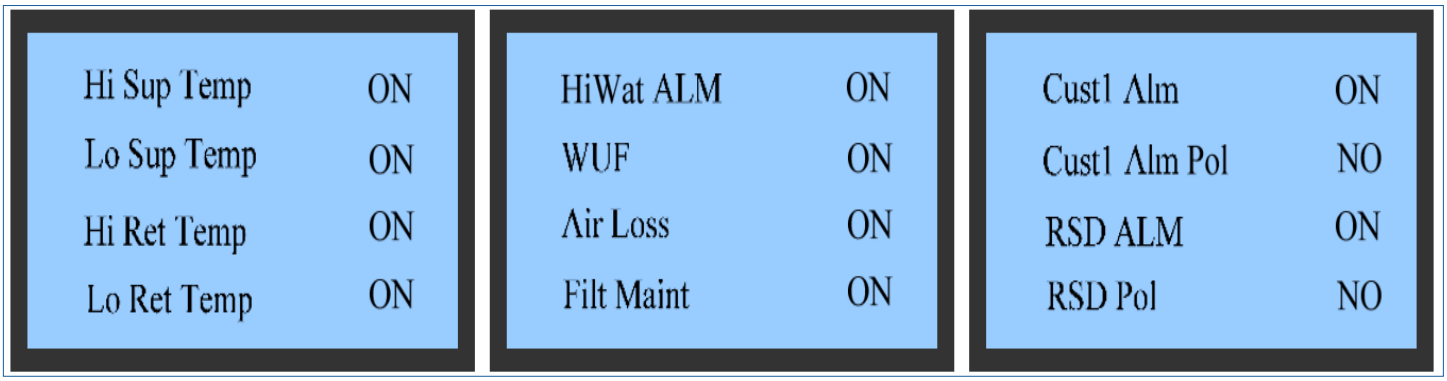


Figure 6-12 Items of the Alarm Attributes Setup Menu

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

Abbreviation	Description
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 6-5 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 screen, set the sensor alarm attributes, as shown in Figure 6-13. Use the Up or Down key to query menu items.

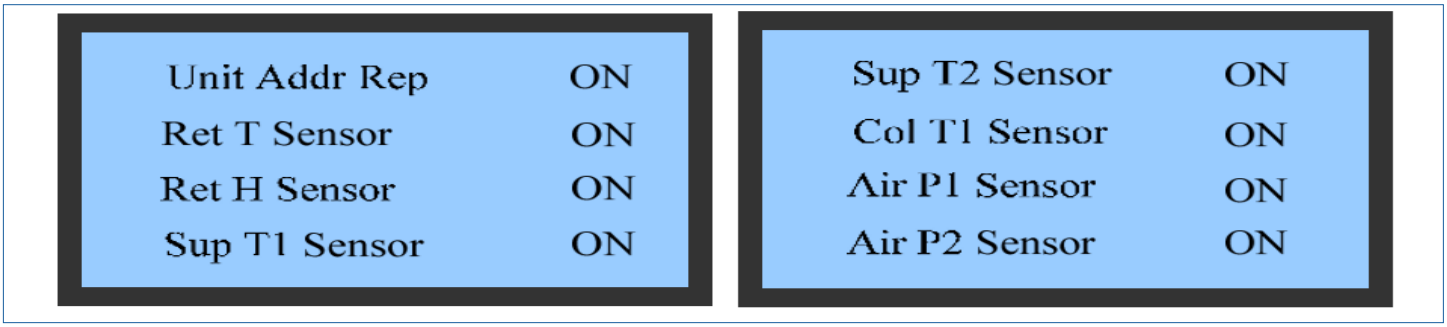


Figure 6-13 Items of the Sensor Alarm Attribute Setup Menu

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 6-14 shows the fault alarm attributes of major components. Use the Up or Down key to query menu items.

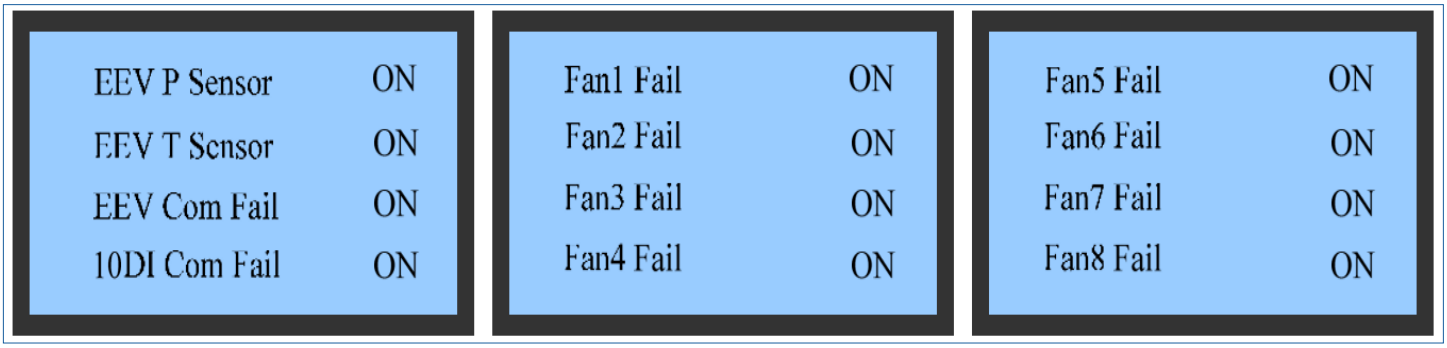


Figure 6-14 Items of the Fault Alarm Attribute Setup Menu

- **Temp & Hum Set**

Select Main Menu -> Temp & Hum Set and enter the screen as shown in Figure 6-15, and the Temperature and Humidity Setting values will be permanently saved.

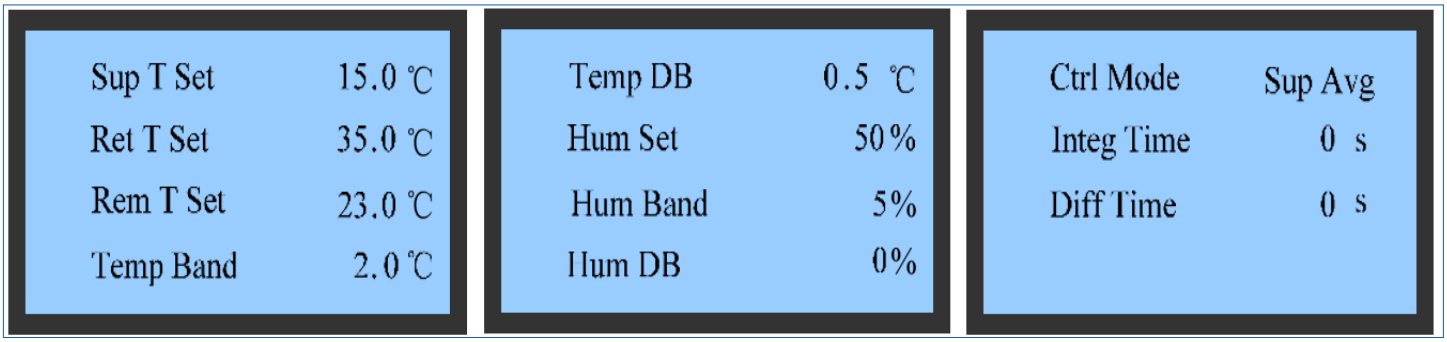


Figure 6-15 Temp & Hum Set Menu

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)

- *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. 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.*

6.6.6.System State

Select Main Menu -> System State to enter the System State menu, as shown in Figure 6-16.

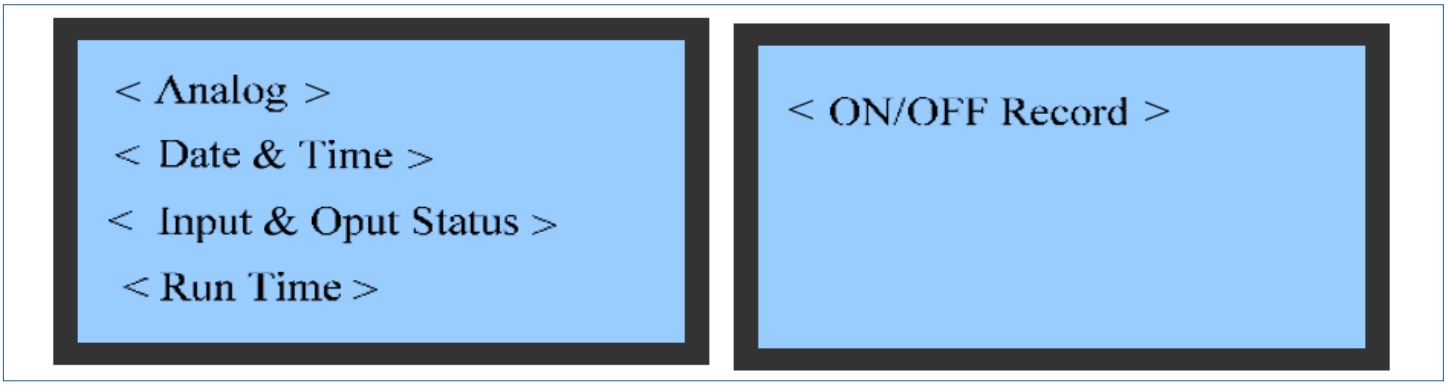


Figure 6-16 System State

- **Analog**

The analog 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 6-17.

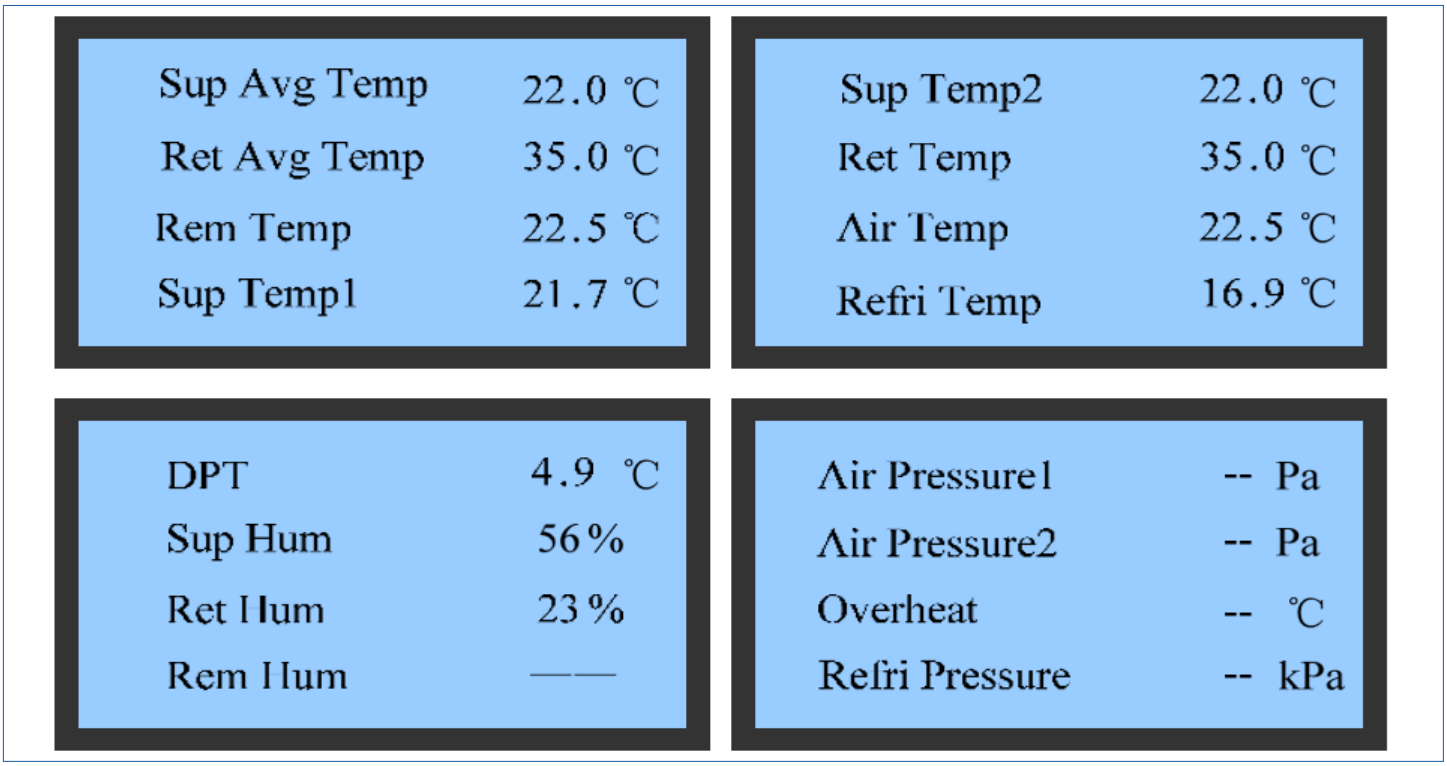


Figure 6-17 Analog Menu

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

Abbreviation	Description
Air Pressure2	Air Pressure at point 2
Overheat	Cooling demand is more than cooling capacity
Refrigerant Pressure	Saturated Liquid Refrigerant Pressure

- **Date and Time**

Figure 6-18 shows the date and time menu. User can query the current date and time on this menu screen.

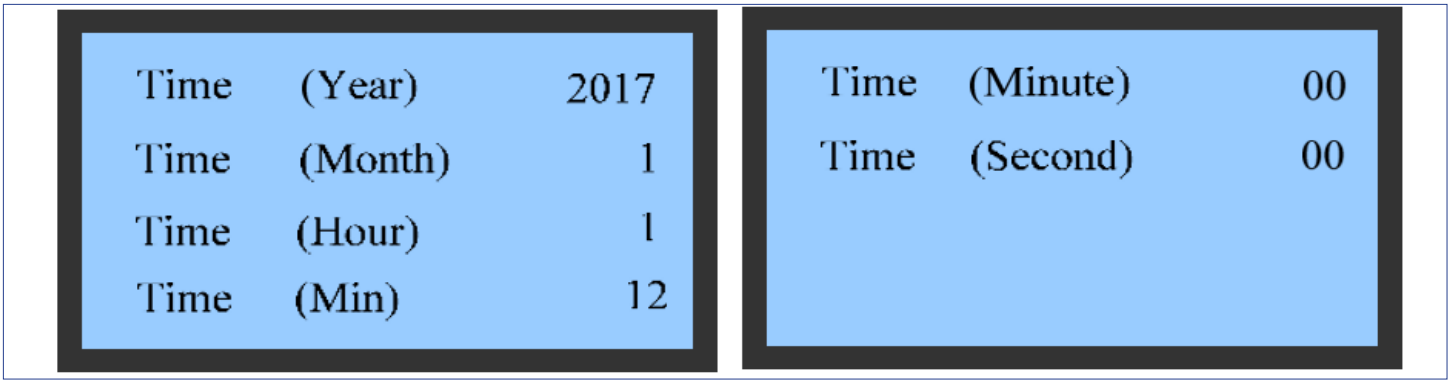


Figure 6-18 Date and Time Menu

- **Operation Time**

Figure 6-19 shows the operation time menu. The operation time can be saved permanently. You can query the operation time of the device on this menu screen.

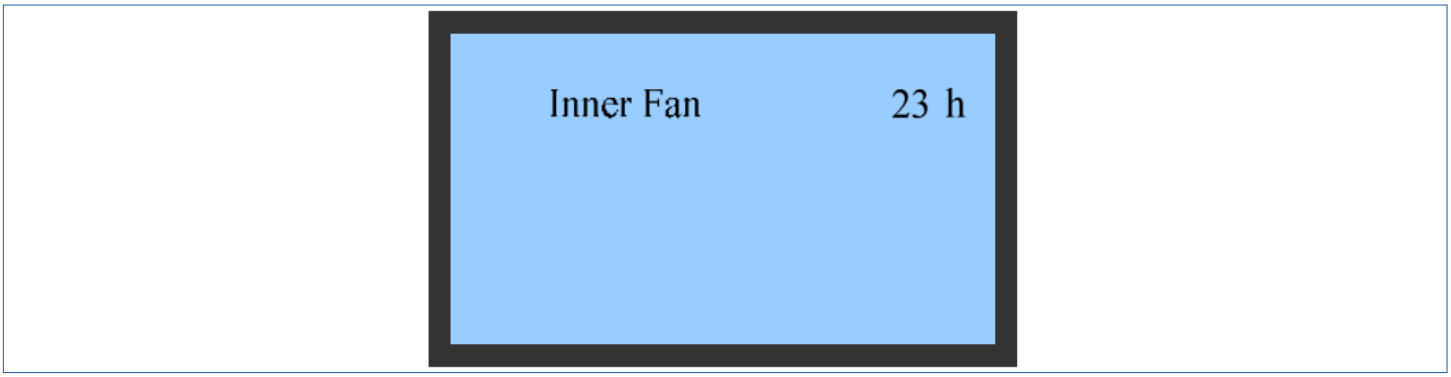


Figure 6-19 Operation Time Menu

- **Input and Output State**

Figure 6-20 shows the input and output state menu. You can query the enable state of the device on this menu.

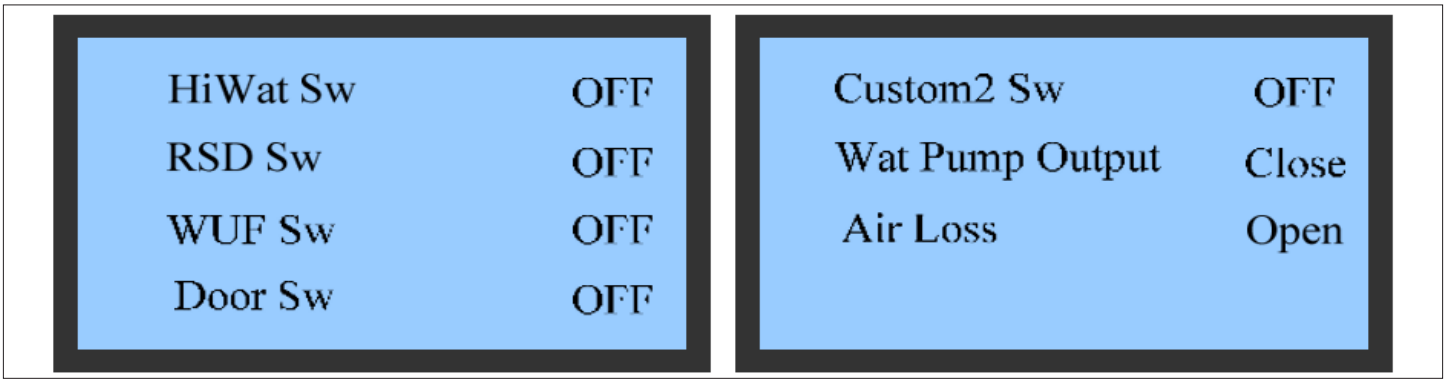


Figure 6-20 Input and Output State Menu

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 screen. The items include XX/ YY, fan start time, and fan shutdown time, as shown in Figure 6-21. XX indicates the record SN, and YY indicates the total number of records. The enable and disable records can be saved permanently.

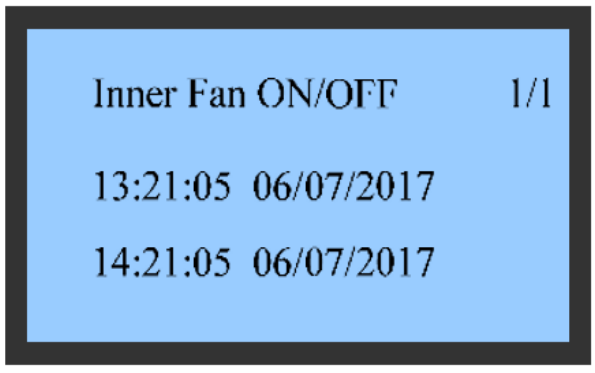


Figure 6-21 Enable and Disable Record Menu

6.6.7.System Menu

Figure 6-22 shows the system menu. Parameters on the system menu can be saved permanently.

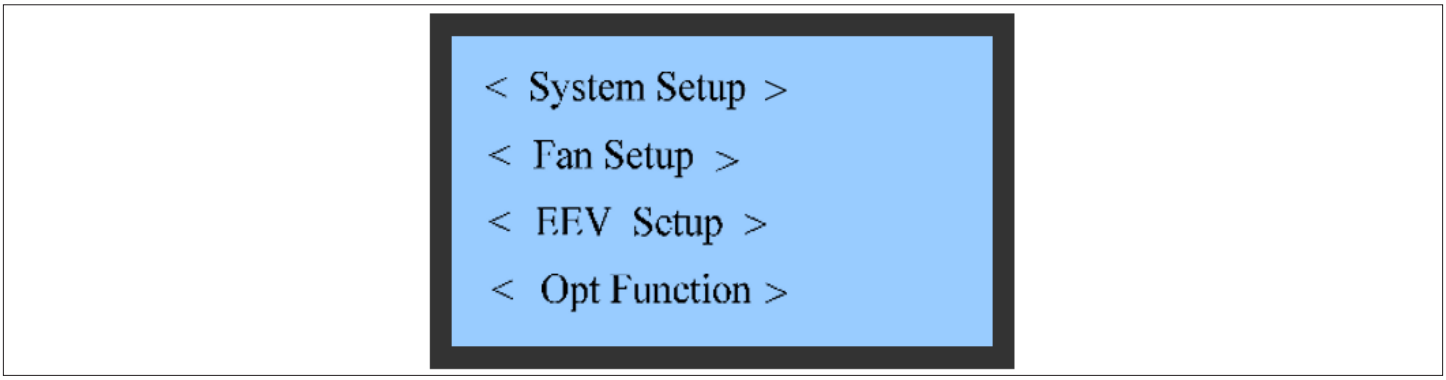


Figure 6-22 System Menu

- **System Settings**

Figure 6-23 shows the system settings menu.

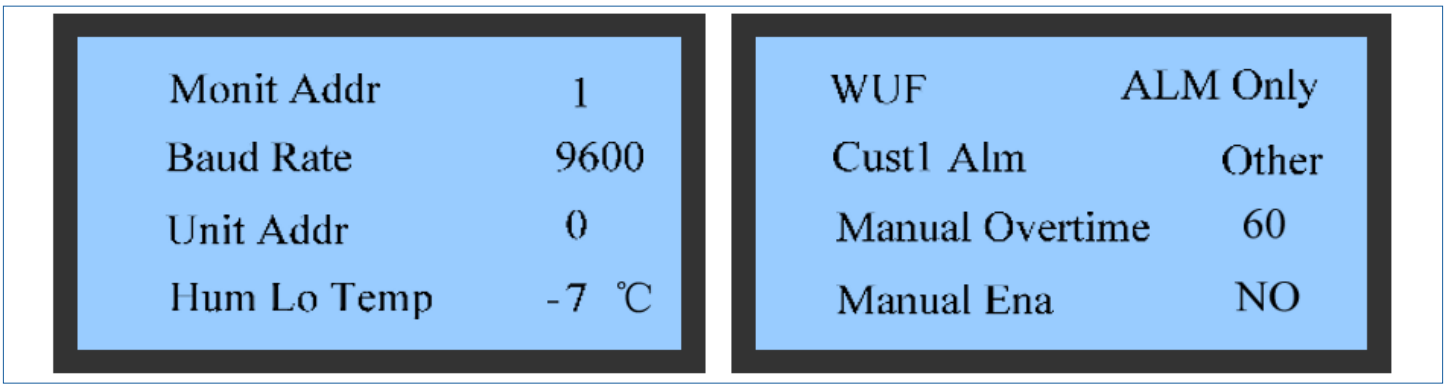


Figure 6-23 System Settings Menu

- *When one XDP is equipped with XDHs, N address code, numbered in sequence, should be set as 1, 2, ... N. Set the appropriate teamwork control addresses to 0, 1, 2, ... N-1 in system settings. The teamwork control address corresponding to XDH 1 is 0, and the teamwork control address corresponding XDH 2 is 1. The rest can be numbered by the same analogy, until the last XDH address is set.*
- *Do not set the teamwork control address to any value, for example, 1, 2, ..., N, or 1, 3, ... N. Otherwise, the XDP and the corresponding XDH cannot communicate with each other.*

- **Fan Setting**

Figure 6-24 shows the fan settings menu.

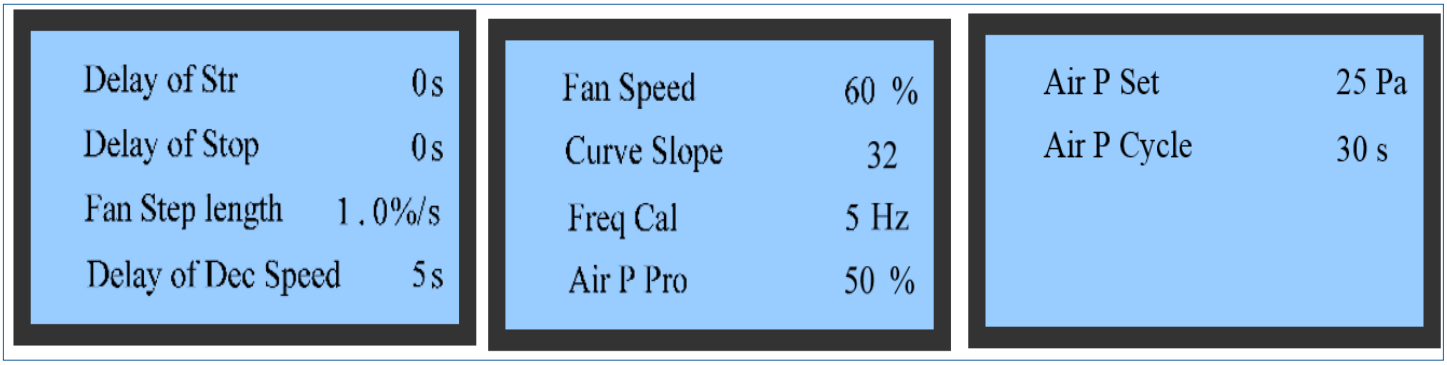


Figure 6-24 Fan Setting Menu

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

Figure 6-25 shows the EEV settings menu.

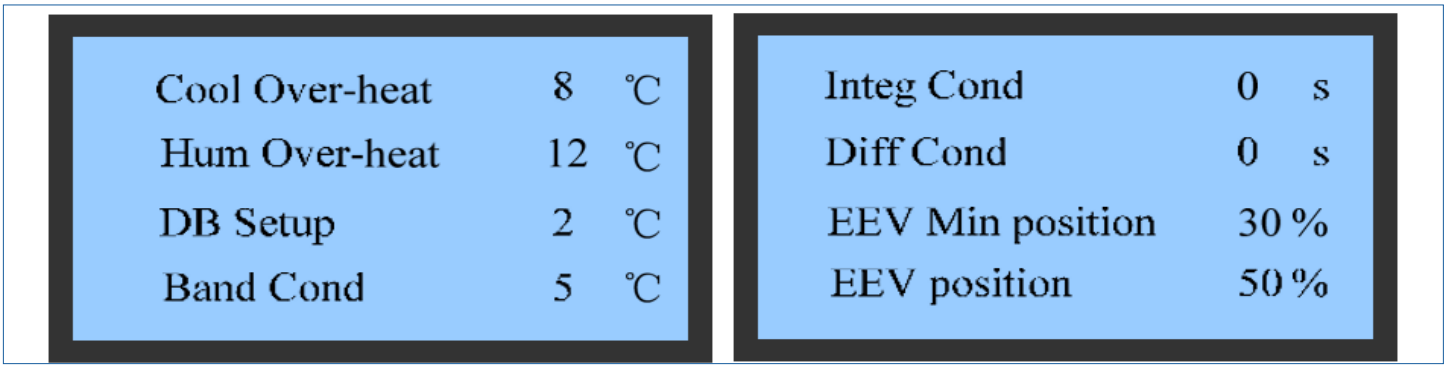


Figure 6-25 EEV Setting Menu

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 6-26 shows the optional function settings menu. Remote temperature calibration parameters can be saved permanently.

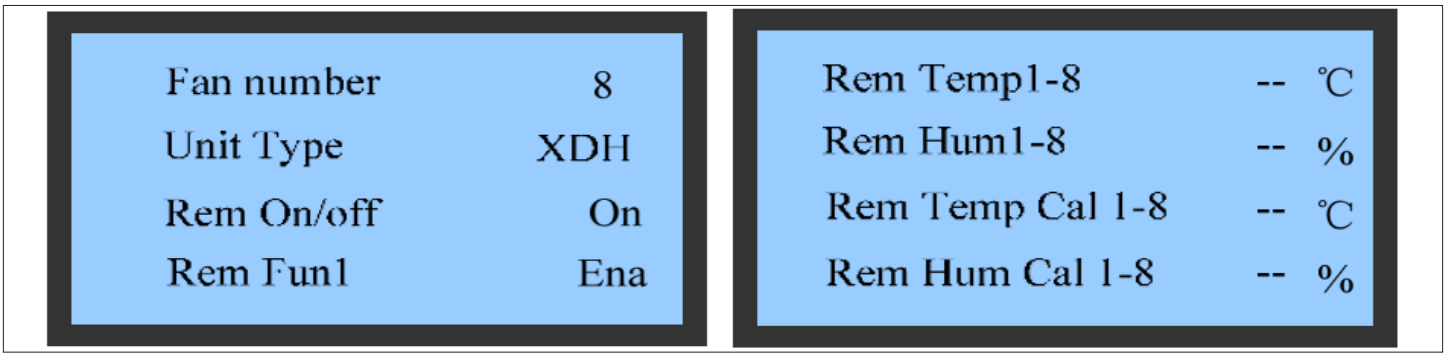


Figure 6-26 Optional Function Menu

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)
Rem Temp Cal 1-8	
Rem Hum Cal 1-8	

- **Changing the Password**

The password change settings can be saved permanently. Figure 6-27 shows the password change menu.

Figure 6-27 Password Change Menu

6.6.8.Help Menu

Figure 6-28 shows the help menu. The menu includes version information, enabling the deployment (unavailable to users), and service information. User can view the relevant information.

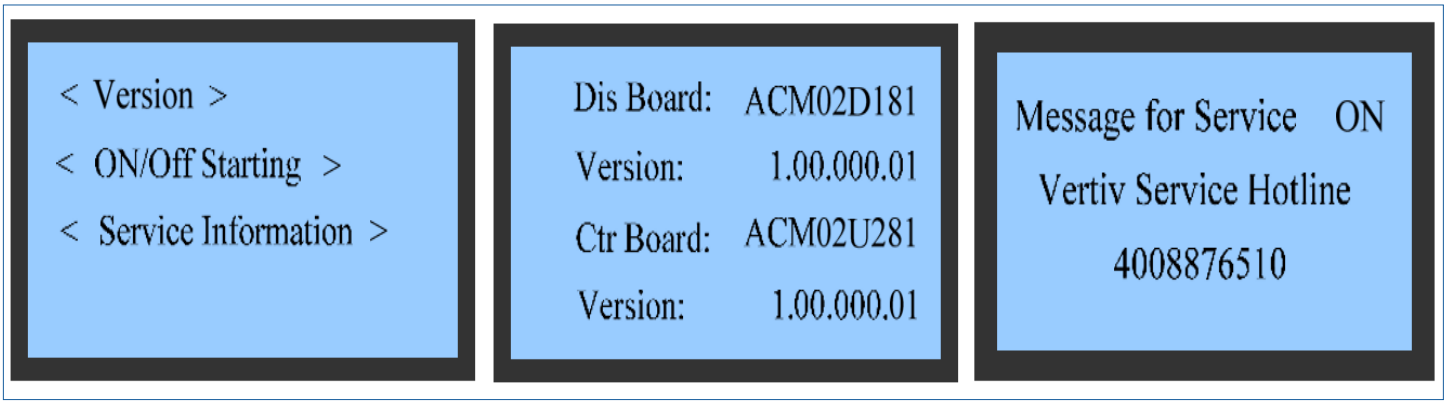


Figure 6-28 Help Menu

6.6.9.Display Set

Select Main Menu -> Display Set to enter the Display Set screen, as shown in Figure 6-29.

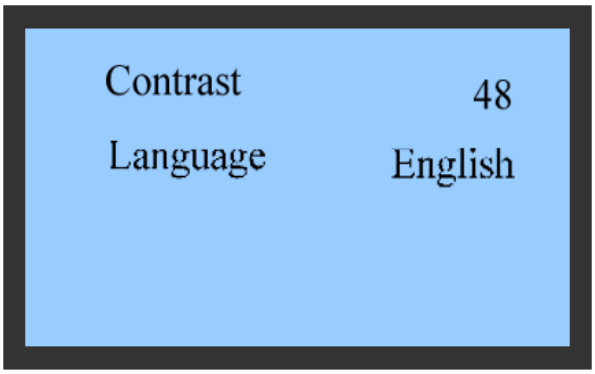


Figure 6-29 Display Set

Chapter 7: System Operation And Maintenance

Periodic system maintenance is crucial to ensure product reliability and validity. This chapter describes operation and maintenance of the XDH precision air conditioner, including routine maintenance, system diagnosis testing, and maintenance of filters, fan components, refrigeration systems and drainage systems.

- *During the running of Liebert XDH, there may be lethal voltage within the unit. The system must therefore comply with all cautions and warnings mentioned in this manual or which may cause casualties.*
- *Only qualified service and maintenance personnel can perform system operation and maintenance.*

7.1.Routine Inspection Items (Monthly)

Check the system components monthly, focusing on system function and component wearing symptoms, and the inspection items are shown in Table 7-1.

Table 7-1 Routine Inspection Items (Monthly)

Component	Inspection Items	Remarks
Filter	Check for clogging or damage	
	Clean the filter	
Fan	Check if fan blades are distorted	
	Check whether the fan generates any noise during running	
	Check whether any fan stops rotating	
Refrigeration system	Check the cleanliness of the evaporator surface	
	Check whether sufficient quantity of refrigerant is charged into the system (Using the liquid refrigerant sight glass to check)	
Drainage pump	Check whether there are impurities and debris in the condensate water pan	
	Check the drain pump port for clogging	

7.2.Routine Inspection Items (Semi-Annual)

See Table 7-2 for the routine maintenance items semi-annual.

Table 7-2 Routine Check List of Items (Semi-Annual)

Component	Inspection Items	Remarks
Filter	Check for clogging or damage	
	Check whether the unit prompts for filter maintenance	
	Clean the filter	
Fan	Check fan blades are not distorted	
	Check whether the fan generates any noise during running	
	Check whether any fan stops rotating	
	Check and fasten the circuit connectors	
Electronic expansion valve	Check whether the wiring and coil of the electronic expansion valve control board are loose	
Cooling circulation system	Check the cleanliness of the evaporator surface	
	Check whether the refrigeration pipe has leakage and proper support	
	Check whether refrigerant is filled into the system (using the fluid inspection mirror to check)	
Electrical control part	Check whether the main air circuit breaker and the air circuit breaker cable of the power module are tightly connected	
	Check and fasten the circuit connectors	
	Check whether the cables and meter reading of each sensor are within prescribed range	
Drainage pump	Check whether there are impurities and debris in the water drainage pan	
	Check the drain pump connection line for clogging	
	Check whether the cable of the drain pump is loose	

7.3.System Diagnosis Testing

The microprocessor controller supports the manual mode and provides diagnostic functions such as manually enabling and disabling parts. Such functions can be used to detect states of the system functional parts, for example, manual adjustment of the opening of the two-port water valve.

7.4.Electrical Connection Inspection

7.4.1.Electrical Maintenance

Check the appearance of the electrical connections and take actions according to the following procedures:

1. Conduct overall electrical insulation test: find out the non-insulated contacts and rectify them with proper insulation cover.
2. Clean the electrical panel and panel boards with a brush from dust or blow dry compressed air at low pressure.
3. Properly fasten all the electrical connection terminals.
4. Check whether the sockets and plugs are in good condition. Replace the loose ones with new sockets and plugs
5. If the power cables are damaged, professional personnel must replace the cables to avoid any non-standard installation practices.

- *Disconnect all the fuses or MCBs of the control part during test as the high supply voltage can damage the control components.*

7.4.2.Control Part Maintenance

Check the appearance of the control parts and take actions according to the following procedures:

1. Check the appearance of the power module and measure the output voltage.
2. Check whether the surfaces of the control interface board, control board, temperature and humidity sensor board, fan fault detection board, and electronic expansion valve control board show any signs of aging or wear & tear.
3. Use an electronic dust cleaning agent to clean dust and dirt from the electrical control components and control board with a brush.
4. Check and fasten the input and output connectors of the control interface boards, including the control board, interface board, temperature and humidity sensor board, fan fault detection board, and EEV control board.

5. Check the connection between the control terminals (37#, 38#, and CANH/ CANL) of the cables and the control interface board.

6. Check whether the contact and connection of the fan power cable, signal cable, and rotating speed feedback signal cable are firmly fixed.

7. Check whether the interconnection terminals between the control interface board and the temperature or pressure sensor are firmly fixed. If there is any loose, poor contact, or fault, immediately replace the interconnection terminal.

8. Replace the faulty electrical components such as the control fuse (or air breaker) and control board.

9. Use the temperature and humidity measurement meter with high precision to measure and calibrate the reading of the temperature and humidity sensor.

10. Adjust the setpoints. Check the motion of each functional component according to the control logic.

7.5.Filter Maintenance Guidance

A filter net is mounted on the rear side of the unit. To ensure the normal operation of the filter, the filter service alarm logic is provided by the controller. The default fan running time is 2000 hours (depending on the local running environment), the filter service alarm will be triggered when the time is exceeded. Based on its obstructed condition, the filter needs to be replaced. The filter must be checked for its condition once a month, and be replaced as required during operation.

7.6.Maintenance Guidance for Fan Kit

- Periodic inspection includes the state of the fan impellers, fastening of fan components, abnormal noise of the fan, and cable connection of the fan.

- Pay close attention to assess whether the fan kit and impeller are properly fixed, and the rotation of fan blade does not physically interfere with other components. Ensure that the air discharge path is free from any obstacles to the airflow.

- If the EC fan does not rotate, check the analog signal cable, rotating speed feedback cable, power cable of the power module, and the power module.

- *Do not operate and maintain the fan in a running condition to avoid any injury to the operator or damage the fan blades.*

- *During the unit operation, do not touch the fan cover as it may lead to mechanical damage to the unit by the rotating fan blades.*

7.7.Cooling System Maintenance

The cooling system components must be inspected monthly to detect any abnormalities in the operation that cause abrasions due to continuous operation. As the failure or damage of components is usually accompanied by corresponding faults, regular checks are required to prevent most system failures.

The surface of the evaporator coil should be kept clean and have no rupture.

The major reasons for EEV failure are related to electrical failure and/ or mechanical failure. The electrical failure can be attributed to the failure of the power supply of the EEV control panel and coil, loosely connected control board wiring, and pressure & temperature sensor failure. The mechanical failure in an EEV can be the effect of blocking in the refrigerant flow. Therefore, pay close attention to the control panel power supply, control board wiring, pressure & temperature sensor wiring or the valve itself when the EEV is defective.

Refrigerant pipes must be fixed properly and must not vibrate against the wall, floor or frame of the unit. Inspect every six months (semi-annual) all refrigerant pipes and bracket for the signs of wear.

- *It is not recommended to adjust the electronic expansion valve without prior permissions. If need arises, contact Vertiv local representative.*

7.8.Condensate Water Drain System Maintenance

In order to ensure the proper drain process of condensate water, the condensate pan should be checked periodically to ensure that there is no water scales, debris and leakage in the water drain pan.

In addition, check whether the power supply of the drain pump is proper, whether the wiring is secure, whether the drain pump is blocked, and whether the drain pipe is unobstructed.

Chapter 8: Troubleshooting

This chapter introduces the failure diagnosis and troubleshooting, and can be used together with the alarm section.

- *Prior to operation and maintenance, the lethal voltage may be present in the unit which can be fatal. All notes, warnings, and cautions marked on the equipment as well as the ones mentioned in the manual must be considered, otherwise, it may lead to injury and fatality.*

- *If jumpers are used for troubleshooting, ensure to remove the jumpers after the troubleshooting is done. If the connected jumpers are not removed, they may bypass certain control function causing damage to the unit.*

8.1.Fan Troubleshooting

The fan troubleshooting is listed in Table 8-1.

Table 8-1 Fan Fault Diagnosis and Handling

Symptom	Potential Causes	Check Items and Handling Methods
EC fan cannot be started	The MCB is open	Check if the fan MCB is closed.
	Fan power module failure	Check the alarm indicator of the fan power module to check if the control board fails.
	The cable is faulty	Check whether the cable from the main control board, fan fault detection board, or power module to the control terminal bar are firmly connected. Check whether the cable from the control terminal bar to the plug wire terminal of the fan is firmly connected.

8.2.Fault Diagnosis and Handling of Electronic Expansion Valve (EEV)

As a key component for refrigerant system and cooling capacity adjustment, the working of the EEV is important. Table 8-2 describes the fault diagnosis and handling methods.

Table 8-2 Fault Diagnosis and Handling Methods of EEV

Symptom	Potential Causes	Check Items and Handling Methods
The adjustment of the EEV is faulty.	The temperature sensor or pressure sensor is faulty	Check whether the sensor cable is firmly connected. Check whether the sensor cable position on the control board is correct.
	The control board is power Off	Check whether the output fuse of the transformer has tripped/broken. Check whether the input power of the control board of the EEV has 24 V power supply.
	The cable connection of the control board is faulty	Check whether the valve cable connection on the control board of the EEV is faulty. Check whether the communication cable between the EEV control board and the main control board is properly connected.

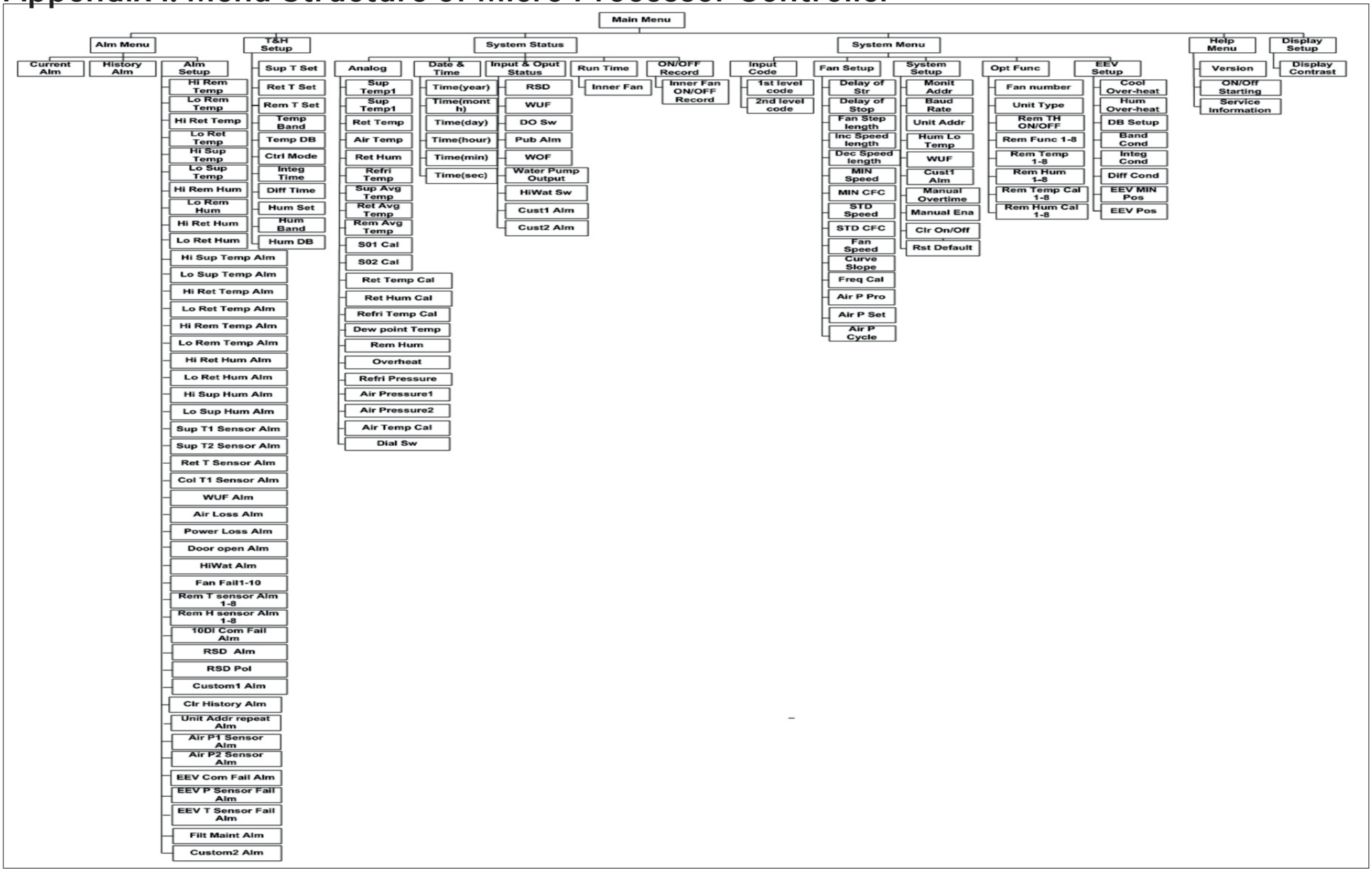
8.3.Fault Diagnosis and Handling of the Air Conditioning System

When the air conditioning system component is faulty, identify the potential causes and tackle the problem to ensure normal operation of the unit. Table 8-3 describes the major faults and troubleshooting methods in the refrigeration system.

Table 8-3 Refrigeration System Faults and Troubleshooting Methods

Symptom	Potential Causes	Check Items and Handling Methods
The surface of the evaporator has serious condensation.	The two-port water valve is faulty	Check whether the two-port water valve is faulty, resulting in low water temperature due to imbalance.
	Check whether the surface of the evaporator is filth blocked	Check the surface of the evaporator, blockage may result in non-smooth discharge of the condensate water.
Air volume decrease	The air filter is blocked	Periodically check the filter and replace it in a timely manner to avoid air volume attenuation due to filth blockage.
	The fan is faulty	Check whether the fan is faulty. Table 8-1 describes the diagnosis and handling methods.
	Blockage of the evaporator	Check the surface of the micro-channel evaporator and periodically handle the blockage problem.

Appendix I: Menu Structure of Micro Processor Controller



Appendix II: Alarm Output Menu

XDP loss alarm	High return air temperature	Return air temperature sensor failure	Repeated address alarm
Underfloor water overflow alarm	Low return air temperature	Return air humidity sensor failure	Fan fault detection board communication fault alarm
High water level	Low-temperature air flow	Air flow temperature sensor failure	
Fan failure	High-temperature air flow	Remote temperature sensor	
Power module 1 failure	High return air humidity	Air pressure sensor 1 failure	
Power module 2 failure	Low return air humidity air	Air pressure sensor 2 failure	
Air flow loss	Remote high temperature	Electronic expansion valve failure	
Air filter maintenance prompt	Remote low temperature	Electronic expansion valve communication failure	
Micro switch alarm	Remote high humidity	Alarm for pressure sensor failure	
User-defined alarm 2	Remote low humidity	Alarm for temperature sensor failure	

Appendix III: Equipment Maintenance Checklist (Monthly)

Date: _____ Prepared by: _____

Model: _____ Serial Number: _____

Equipment Maintenance Checklist (Monthly)

Component	Inspection Items	Remarks
Filter	Check for clogging or damage	
	Clean the filter	
Fan	Check if fan blades are distorted	
	Check whether the fan generates any noise during running	
	Check whether any fan stops rotating	
Refrigeration system	Check the cleanliness of the evaporator surface	
	Check whether sufficient quantity refrigerant is charged into the system (Using the liquid refrigerant sight glass to check)	
Drainage pump	Check whether there are impurities and debris in the condensate water pan	
	Check the drain pump port for clogging	

Signature_____

Note: Please copy this table as a record keeping purposes.

Appendix IV: Routine Maintenance Inspection Items (Semi-Annual)

Date: _____ Prepared by: _____

Model: _____ Serial Number: _____

Routine Maintenance Inspection Item (Semi-Annual)

Component	Inspection Items	Remarks
Filter	Check for clogging or damage	
	Check whether the unit prompts for filter maintenance	
	Clean the filter	
Fan	Check fan blades are not distorted	
	Check whether the fan generates any noise during running	
	Check whether any fan stops rotating	
	Check and fasten the circuit connector	
Electronic expansion valve	Check whether the wiring and coil of the electronic expansion valve control board are loose	
Cooling circulation system	Check the cleanliness of the evaporator surface	
	Check whether the refrigeration pipe has leakage and proper support	
	Check whether refrigerant is filled into the system (using the fluid inspection mirror to check)	
Electrical control part	Check whether the main air circuit breaker and the air circuit breaker cable of the power module are tightly connected	
	Check and fasten the circuit connector	
	Check whether the cables and meter reading of each sensor are within prescribed range	
Drainage pump	Check whether there are impurities and debris in the water tray	
	Check the drain pump connection line for clogging	
	Check whether the cable of the drain pump is loose	

Signature_____

Note: Please copy this table as a record keeping purposes.

Appendix V: Table Names and Content of Harmful Substances in Products

Harmful Substances in Products

Part Name	Harmful Substance					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr (VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Cabinets	○	○	○	○	○	○
Refrigeration accessories	○	○	○	○	○	○
Fan unit	○	○	○	○	○	○
ECU	×	○	○	○	○	○
LED	×	○	○	○	○	○
Heat exchanger	○	○	○	○	○	○
Copper Pipe	○	○	○	○	○	○
Cables	○	○	○	○	○	○

This form is prepared in accordance with the provisions of SJ/T 11364.
O: Indicates claim limit concentration of the hazardous substances in homogeneous materials for all components specified in GB/T 26572 or less;
X: Represents the hazardous substance content of at least one homogeneous material of the member exceeds the limit requirement GB/T 26572 specified.

Vertiv has been committed to the design and manufacture of environmentally friendly products, we will reduce and eliminate toxic and hazardous substances in products through ongoing research. The following application components, or toxic and hazardous substances is not limited to the current level of technology or no reliable alternative mature solution:
1. Parts of the above reasons lead: Copper alloy member containing lead; high temperature solder of lead; high temperature solder of lead diodes; uranium glass resistor lead (exempt); electronic ceramics containing lead (exempt);
2. The backlight lamp contains Mercury;
3. Distribution of the switch contact portion containing Cadmium and Cadmium compounds

Notes on environmental protection use period: Environmental protection use period of the product (identified in the body of the product), means that under normal conditions of use and compliance with safety precautions from the date of production of this product (excluding battery) Term toxic and hazardous substances or elements contained no serious impact on the environment, persons and property.

Scope: Liebert XDH series of Air Conditioner