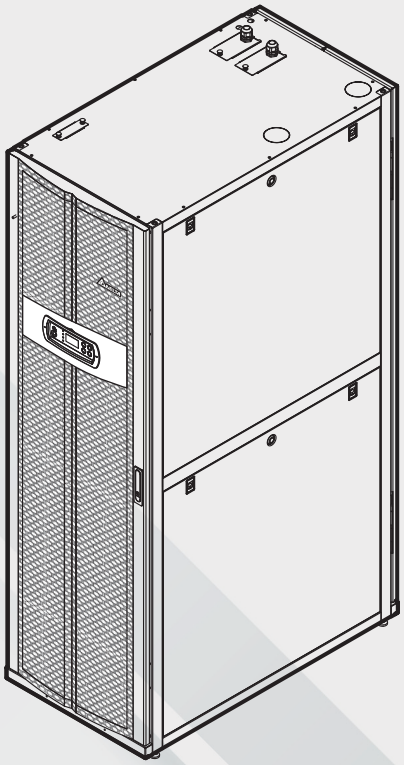


The power behind competitiveness

Delta InfraSuite Precision Cooling

RowCool

Chilled Water Type (HCH1CB0 & HCH1DB0)

User Manual

www.deltaww.com

SAVE THIS MANUAL

This manual contains important instructions and warnings that you should follow during the installation, operation, storage and maintenance of this product. Failure to heed these instructions and warnings will void the warranty.

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Chapter 1 : Guide for Safe Operation

1.1 Safety Instructions

- Please carefully read all chapters of the Manual before any installation, operation, and maintenance. To avoid personal injury and equipment damage, please be sure to operate the product in accordance with the instructions in this Manual and the markings on the cabinet.
- The unit should only be moved by at least two people so as to guarantee safety.
- In handling or removal of the equipment, please pay attention to its height and center of gravity. When using a transportation tool for handling, it must be raised from the bottom to avoid toppling.
- The unit contains moving components. Be careful to keep it away from your arms, legs, hair, clothes or jewelry so as to avoid any danger.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.

1.2 Installation Instructions

- The unit can be connected with a single or dual power source. Make sure the input power is disconnected before making a connection. If necessary, use a multi-meter to confirm this.
- It is suggested that the installation area should not have flammable objects and the equipment should be installed on a stable floor.
- This unit is only intended for indoor use. The indoor environment must be separated from the outside air so as to avoid temperature and humidity interference. Consult the national or local regulations for separating the installation environment.
- The appliance shall be installed in accordance with national wiring regulations. Meanwhile, the grounding wires of the unit must be effectively connected with the grounding system.
- The appliance is fitted with means for disconnection from the supply mains having a contact separation in all poles that provide full disconnection under overvoltage category III conditions, and these means must be incorporated in the fixed wiring in accordance with the wiring rules.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

1.3 Instructions for Use

- The inner high voltage of the unit may be fatal! The inner components may have hidden dangers and only qualified service personnel can operate the unit. Improper operation may lead to serious injury or death or equipment damage. Be sure to follow all the instructions and warnings contained in the Manual.
- When replacing the side panels or front or back doors, make sure there is no foreign matter in the cabinet.

Chapter 2 : Introduction

2.1 Product Introduction

The Delta InfraSuite RowCool Precision Cooling Unit (Chilled Water Type) adopts a parallel cabinet design and can be set in an area adjacent to a heat load. Its high cooling efficiency can create an effect of dropping temperature. The modularized design facilitates expansion or movement and can be flexibly integrated into your data center environment. With enlargement of your data centers, increased cooling needs can be met by easy re-configuration or addition of the equipment.

When installed in a data center, the untreated air will be sucked in from the rear of the cooling unit and the air, after treatment, will be released from the front of the unit to achieve the aim of cooling.

You can manage your cooling unit via a user-friendly interface. The cooling efficiency can be actively controlled by its built-in MCU and it will remind you of any abnormality via the alarm system so as to guarantee normal operation.

2.2 Functions and Features

- **Intelligent temperature and humidity control**

  Accurate detection and management of the data center's temperature and humidity by the built-in MCU.

- **User-friendly control interface**

  Easy setting and monitoring and access to system status.

- **A-B dual power source input**

  A-B dual power source design for enhancing system reliability.

- **Automatic spring-resetting of three-way ball valve**

  In abnormal power interruption, the inner flow-rate actuator will automatically close the three-way ball valve in a short time to stop chilled water from continuously flowing into the coil and generating condensed water, which may lead to water leakage.

- **Elastic Piping**

  Supports upper or lower piping to enable a flexible piping configuration.

- **Alarm system**

  Detection of abnormality and reminding the user via a buzzer or an external dry contract device.

- **Detection of heat load temperature**

  Accurate monitor of the heat load temperature and humidity by remote temperature and humidity sensors.

- **Leakage detection**

  Optional maximum 50m water leakage detector (4m is provided as default), which will immediately inform the user of any water leakage so as to protect the safety of the equipment.

- **Output and input dry contacts**

  Two output and two input dry contacts for fire alarm, smoke alarm, system alarm, etc.

- **Heat insulation side panels**

  Isolate the interference of outside temperature.

- **Lockable front and rear doors and side panels**

  Prevent any unauthorized operation.

- **Condensed water pump**

  The condensed water pump at the bottom of the cabinet automatically drains the condensed water (some types of units are not configured with the condensed water pump).

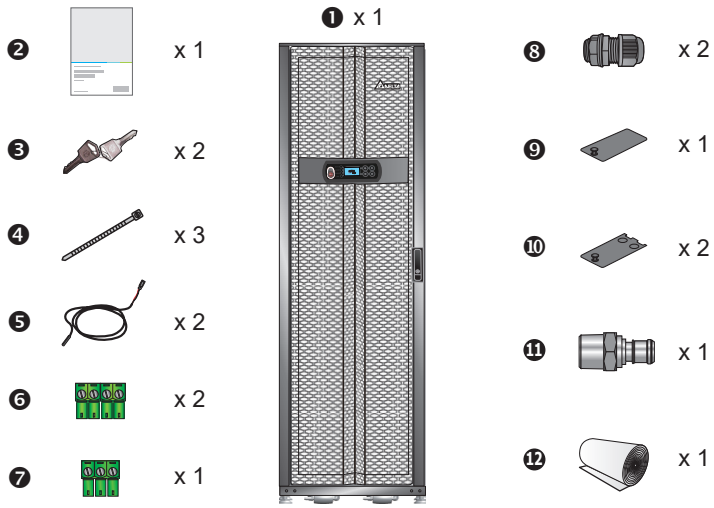
- **Casters**

  For convenient movement or relocation.

- **Compatible SNMP card (optional)**

  Monitoring management through SNMP protocol.

2.3 Packing List



No.	Description	Quantity
❶	Delta InfraSuite RowCool Precision Cooling Unit	1
❷	User manual	1
❸	Key (shared by front & rear doors and side panels)	2
❹	Cable Tie	3
❺	Water leakage detector (4m)	2
❻	4-pin terminal block	2
❼	3-pin terminal block	1
❽	Cable gland	2
❾	Cover plate for communication wiring duct	1
❿	Cover plate for power supply	2
⓫	Quick connector	1
⓬	Non-woven filter*	1

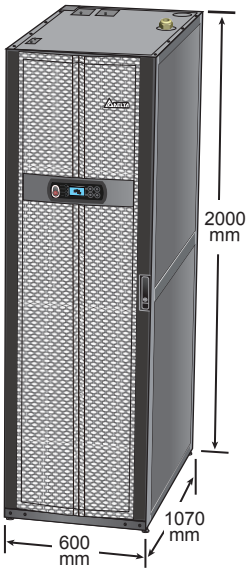
*Use only for dustproof at trial operation by engineering personnel. Do not continue to use in normal operation.

2.4 Optional Accessories

For purchase of the following optional accessories, please contact service personnel.

- **SNMP card:** Use the Delta SNMP card to achieve the best compatibility.
- **Connecting pipe for upper configuration:** Optional water output pipe for upper configuration to obtain a flexible water input and output mode
- **Humidifier assembly:** Optional electrode humidifier, which provides humidity control and supports upper and lower water input modes.
- **Heater assembly:** Optional fin electrical heating, which provides a good dehumidification function.
- **Remote temperature and humidity sensors**
- **Stainless steel hose:** diameter: 1 1/4”, length: 1.5M, dual-side PT tooth, which can reduce installation difficulty.

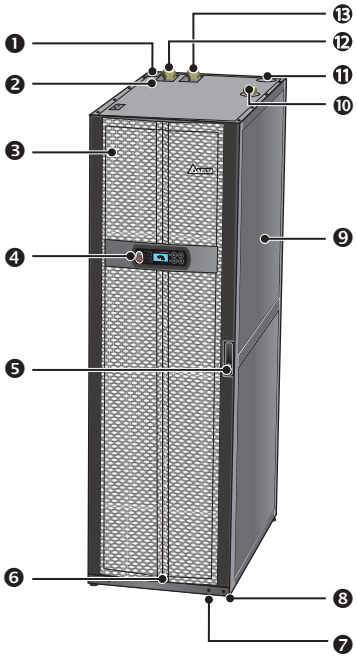
2.5 Appearance



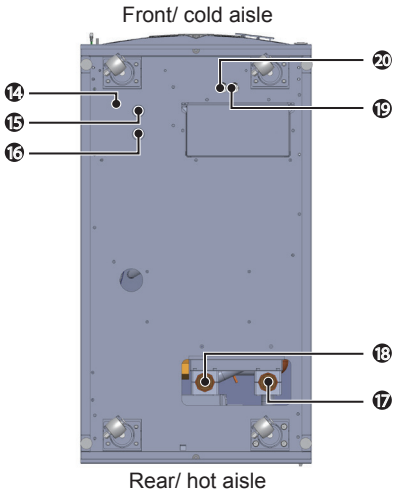
(Fig. 2-1: Appearance and dimensions)

2.6 Components Identification

External



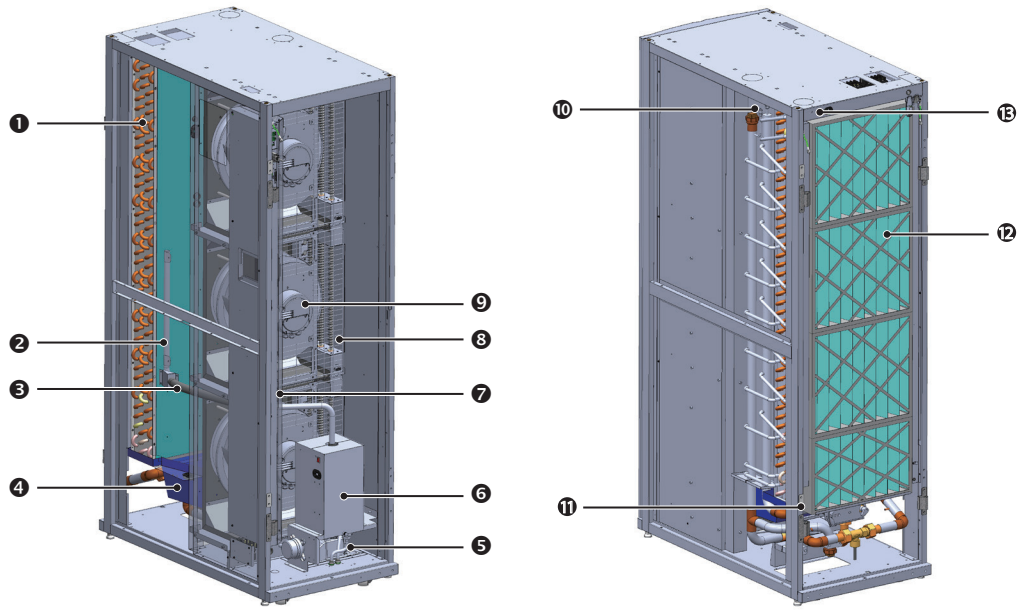
(Fig. 2-2: Front view)



(Fig. 2-3: Bottom view)

No.	Description	No.	Description
❶	Upper drain hole	⓫	Upper outlet hole of chilled water
❷	Upper water inlet hole of humidifier	⓬	Upper Feed A power inlet hole
❸	Front door	⓭	Upper Feed B power inlet hole
❹	Control panel	⓮	Hole for water leakage detector
❺	Front door lock	⓯	Lower Feed A power inlet hole
❻	Gradienter	⓰	Lower Feed B power inlet hole
❼	Casters	⓱	Lower outlet hole of chilled water
❽	Levelers	⓲	Lower inlet hole of chilled water
❾	Detachable heat insulation side panels	⓳	Lower humidification water inlet hole
❿	Upper inlet hole of chilled water	㉑	Lower drain hole

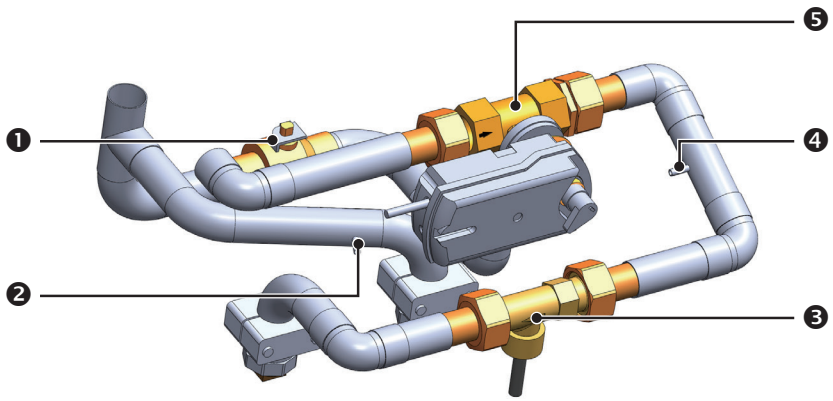
Internal



(Fig. 2-4: Internal components)

No.	Description	No.	Description
❶	Coil	❽	Heaters *
❷	Steam diffuser *	❾	Fans
❸	Steam connecting tube *	❿	Upper water inlet pipe
❹	Condensed water pan	⓫	Joint of upper outlet water pipe
❺	Drain pump	⓬	Filters
❻	Humidifier *	⓭	Exhaust vent of return water
❼	Electric panel		

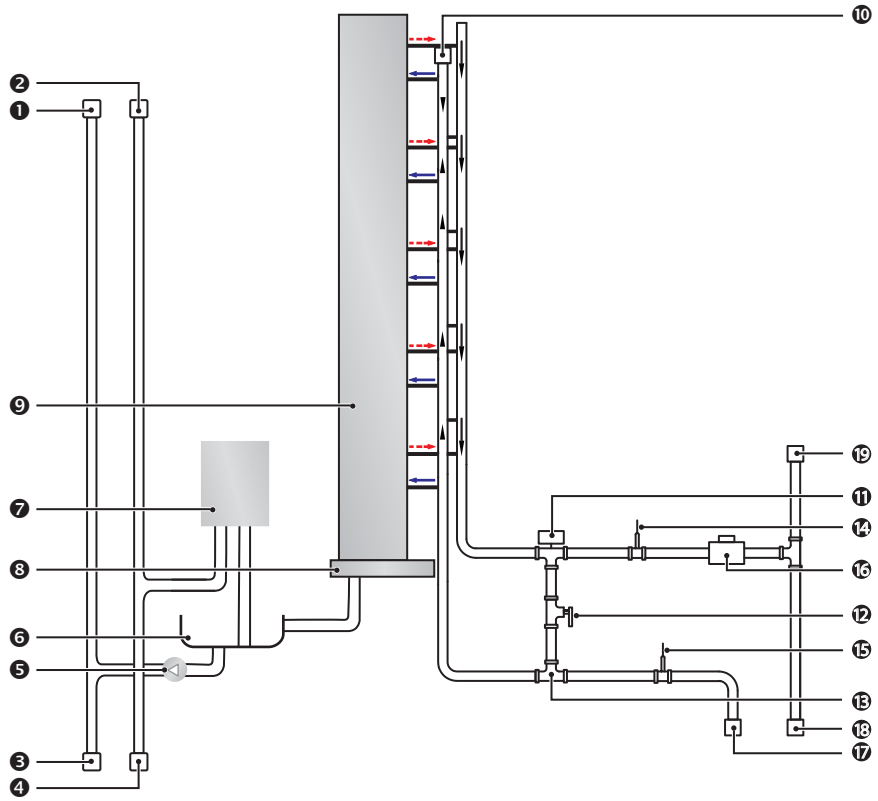
*Configured according to models



(Fig. 2-5: Main pipe components)

No.	Description
❶	Bypass value
❷	Inlet water temperature sensor
❸	Flow meter
❹	Outlet water temperature sensor
❺	Three-way ball valve and actuator

2.7 Piping System

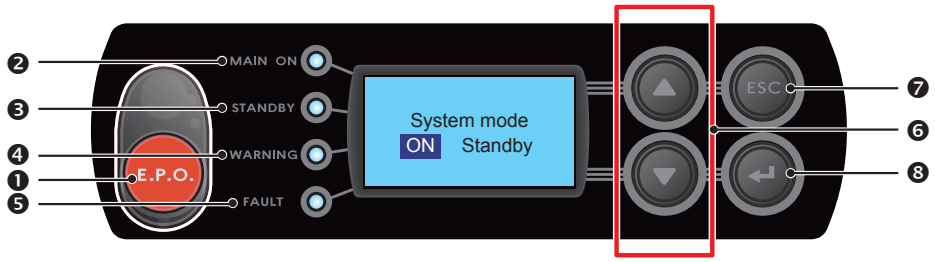


(Fig. 2-6: Pipe circuit diagram)

No.	Description	No.	Description
❶	Upper drain connector *	⓫	Three-way ball valve
❷	Upper water supplement connector *	⓬	Manual shut-off valve
❸	Lower drain connector	⓭	Three-way connector
❹	Lower water supplement connector	⓮	Outlet water temperature sensor
❺	Drain pump	⓯	Inlet water temperature sensor
❻	Drain pump water pan	⓰	Flow meter
❼	Humidifier *	⓱	Lower inlet connector of chilled water
❽	Condensed water pan	⓲	Lower outlet connector of chilled water
❾	Coil	⓳	Upper outlet water connector*
❿	Upper inlet connector of chilled water *		

* Configured according to models

2.8 Control Panel



(Fig. 2-7: Control panel)

No.	Item	Description
❶	E.P.O.	Emergency power off button.
❷	MAIN ON	The green light indicates power-on. The flashing indicator indicates the unit is in installation mode.
❸	STANDBY	The yellow light indicates the unit runs in standby mode. The flashing indicator indicates the unit runs in force mode.
❹	WARNING	The yellow light indicates alarm information.
❺	FAULT	The red light indicates fault information.
❻	▲/▼	Goes back to previous screen or goes to next screen/ Moves up or down/ Increases or decrease number.
❼	ESC	Goes back to previous screen or cancels current operation.
❽	↵	Enters your selected item or confirms your selection or setting.

NOTE: The emergency power off button (E.P.O.) is OFF by default. If such a function is needed, please contact service personnel.

Chapter 3 : Installation

WARNING:

1. Only service personnel can perform the following installation procedures. No installation, piping or handling should be performed without authorization so as to avoid equipment damage and personal injury.
2. The high voltage in the equipment is potentially fatal! The inner components have potential dangers and only qualified service personnel can perform wiring.

3.1 Installation Site

When planning the installation site for the cooling unit, you must take the following into consideration so as to guarantee the best efficiency.

- Environmental requirements: The installation site must allow the equipment to move in and out, the flooring must bear the weight of the equipment and there is a sufficient space for maintenance, operation, and pipe repair. The cooling unit can only be located indoors and the indoor environment must be isolated from the outside air to avoid temperature and humidity interference. The outside humidity entry must be minimized in accordance with the local or national regulations so as to avoid the increase of operation costs due to loss of cooling capacity.
- Humidity and heat source: Implement water-proof and heat insulation engineering for the indoor environment so as to isolate the outside humid hot air.

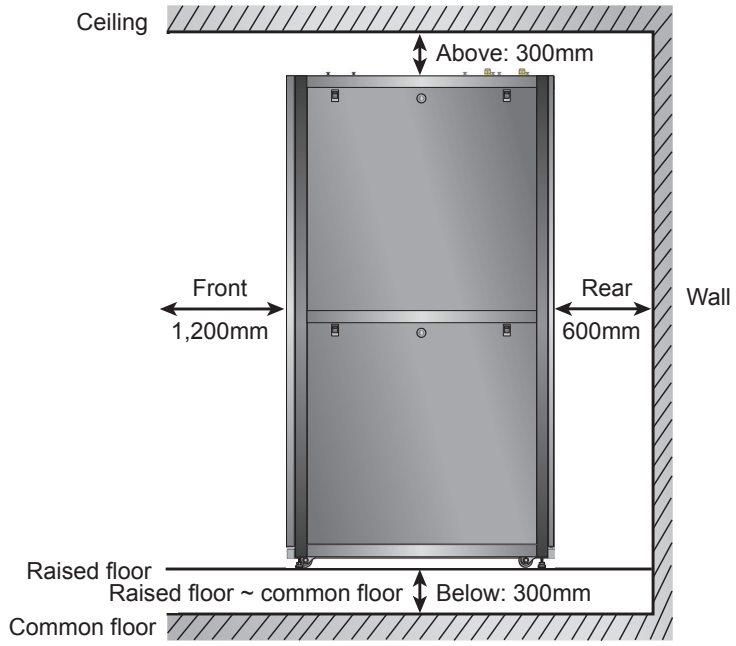
NOTE: If the humidity of the installation environment exceeds the operation scope (refer to ***4.4 Operating Temperature and Humidity***), the condensation of the water of the coil may lead to a rise in the water level of the condensed water pan, triggering an alarm.

- Noise impact: At a high load, the operation of this cooling unit may produce loud noise. Therefore, it is not suitable to install the unit close to offices.
- Input power: In connecting the power supply, make sure that the power conforms to the rated value and the power distribution device is sufficient to satisfy the load requirement. Inspect the rated values of each unit and make sure they have been properly grounded. One branch circuit or power distribution device can only be connected with one cooling unit.

3.2 Space Reservation

In order to facilitate maintenance, operation, and air circulation, please reserve a net space around the equipment.

It is suggested to preserve 1200mm for the front passage, 600mm for the rear passage and at least 300mm above the cabinet for pipe installation. If the pipeline adopts a lower connection mode, the height of the raised floor should not be lower than 300mm. If the pipeline adopts an upper connection mode, the equipment can be set on a common floor.



(Fig. 3-1: Space reservation)

3.3 Handling

- **Handling Instructions**

  Before moving the equipment to the installation site, plan the route according to the following instructions:

  1. Make sure the passage, floor, elevator or slope on the handling route can bear the weight of the equipment and handling device, and there is a sufficient net space to avoid collisions.
  2. In the case of a slope on the handling route, its inclination must not be greater than 15 degrees so as to avoid toppling the cabinet.
  3. The bottom casters are only suitable for short distance movement. For long distance movement, use a handling device (such as ***Fig. 3-2 Forklift handling***) so as to avoid damage to the casters.

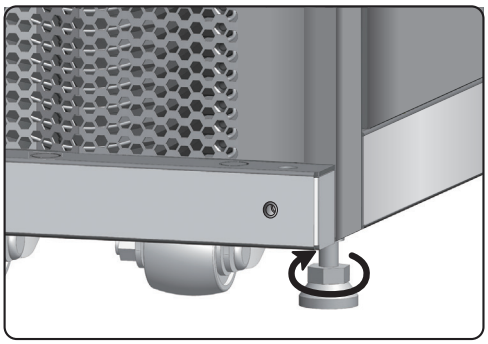


(Fig. 3-2: Forklift handling)

4. The casters are only suitable for moving on flat surfaces. Avoid heavy falling of and moving of the unit on uneven ground, which may damage the casters or even result in toppling.
5. When moving the unit, pay attention to its height and center of gravity. At least two people working together should handle the unit so as to guarantee safety.

- **Levelers**

  After moving the unit into place, use a wrench to rotate clockwise the four levelers beside the casters to put them down and stable on the floor. Make sure the unit cannot slide or topple.



(Fig. 3-3: Rotate each leveler clockwise)

WARNING:
The levelers are only used for leveling the unit and cannot be used to compensate for the height difference of the floor so as to avoid toppling.

3.4 Positioning

After moving the unit into place and it is parallel with the adjacent cabinet, you must position it so as to ensure its stability. The following two methods can be used, depending on the installation environment:

- **Cabinet fasteners**

  If the adjacent cabinets are Delta cabinets (MSR1110 and MSR2110), you may use connecting fasteners to fix the equipment. Each cooling unit is provided with four connecting fasteners (two at the front and two at the rear). You must remove the front and back doors before making the fastener connection. Refer to the following procedures:

  1 If the front door is locked, use the attached key to open it.

  2 Remove the unit's earth wire and the control panel's flat cable, raise the front door, and take it out.

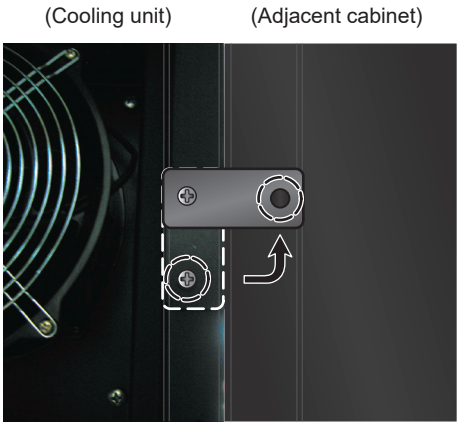
3 Use the key to unlock the rear door, remove the earth wire, raise the door, and take it out. The rear door is of the split type and, if necessary, take down both doors.

NOTE: Put the front and rear doors that have been removed in a safe place so as to avoid any equipment damage or personal injury due to collisions.

4 Use a screwdriver to loosen the screw below the fastener and lock it on the adjacent cabinet.

5 Fix the front and rear (8 in all) fasteners with the adjacent cabinet.

6 After fixing the fasteners, please re-install the front and rear doors.



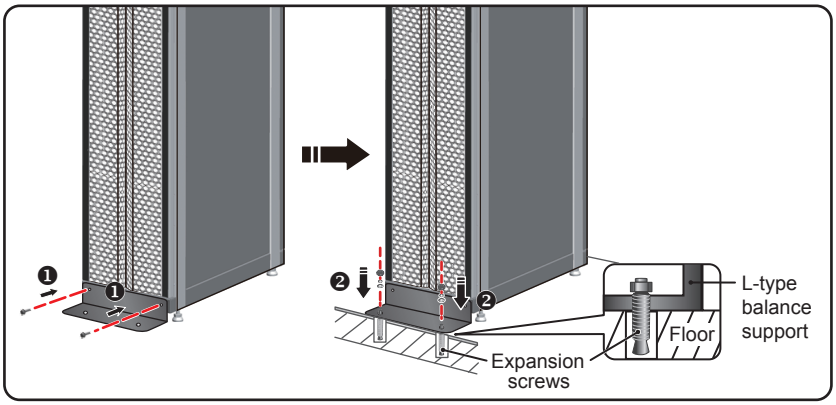
(Fig. 3-4: Join the cooling unit and the adjacent cabinet together)

- **L-type balance support**

  The L-type balance support is originally used to fix the cooling unit on the pallet during transportation and can be used for ground fixing after positioning to provide extra locking force.

  1 Use two M6 screws to fix the L-type balance support below the front door (with the extruding part forward) as shown in the figure.

  2 Use expansion screws to fix the extruding end on the floor.

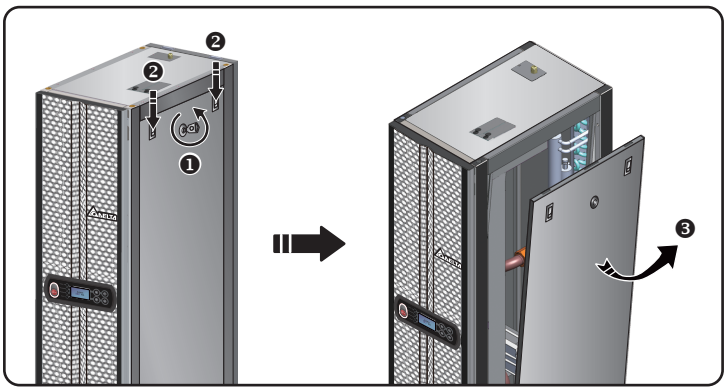


(Fig. 3-5: Installation of L-type balance support)

3.5 Open the Front Door and Remove the Side Panels

To open the front door, use the attached key to unlock the front door, push the door handle's button and rotate the handle.

To remove a side panel, use the same attached key to unlock the side panel, simultaneously press down the two door holders located at each side of the side panel and take the panel out.



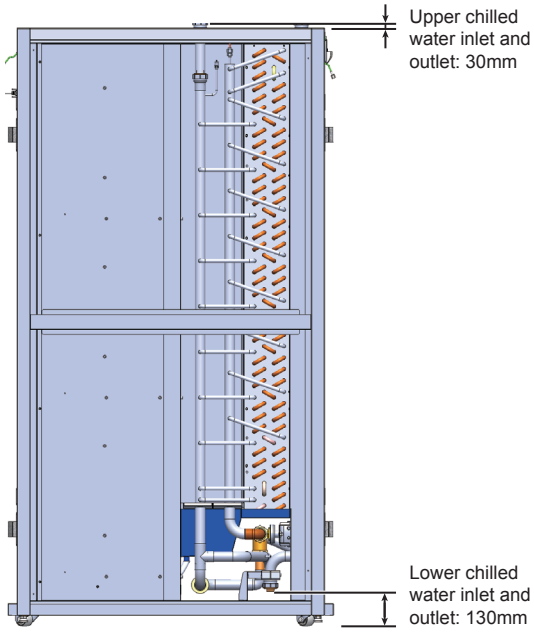
(Fig. 3-6: Removal of side panel)

To re-install the side panel, align the two lower holes and press down the two door holders at the same time to re-install the side panel. After maintenance, please remember to lock the front door and each side panel, and only let the authorized person to keep the key.

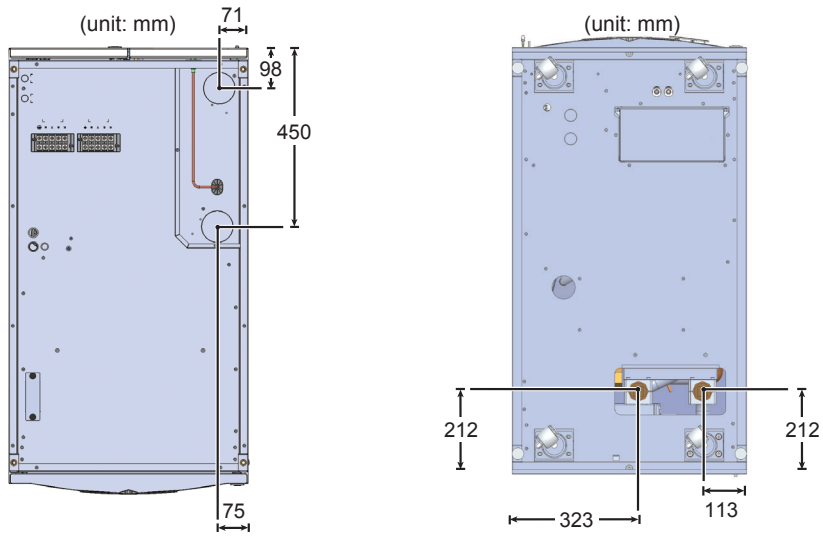
3.6 Hole Drilling

Drill holes in the raised floor or ceiling according to the piping mode (upper or lower) as shown in the following figures for pipe passing.

The pipeline is wrapped with an external heat insulation layer to reduce the interference of outside temperature and avoid condensed water. The hole diameter should be about 13mm.

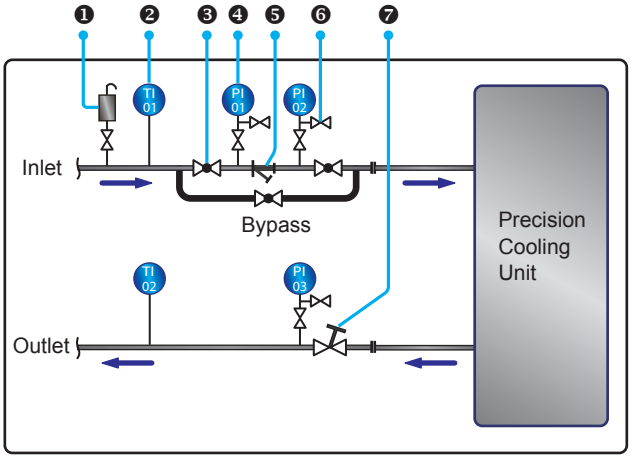


(Fig. 3-7: Upper and lower piping positions and dimensions)



(Fig. 3-8: Hole diameter and positions for upper and lower piping)

3.7 External Piping



(Fig. 3-9: Suggested external piping)

No.	Description	No.	Description
❶	Automatic exhaust valve	❺	Y-type filter
❷	Thermometer	❻	Shut-off valve
❸	Ball valve	❼	Balance valve
❹	Pressure meter		

Configure an external pipeline and an automatic exhaust valve ❶ at the water inlet end as shown in ***Figure 3-9*** for removing the air in the pipeline. Set a Y-type filter ❺ in the water inlet pipe to filter out the impurities and chemical substances in the water. Install a ball valve ❻ in front of or behind the Y-type filter to set up a branch circuit. When the filter needs cleaning or maintenance, close the ball valve to let the chilled water go to the cooling unit via the branch so as to avoid shut-off loss. Install a pressure meter ❹ in front of and after the Y-type filter and judge if there is a blockage according to the pressure difference.

Configure a multiple functional balance valve ❼ at the return water end for adjusting the return water flow rate.

- **Pipeline washing**

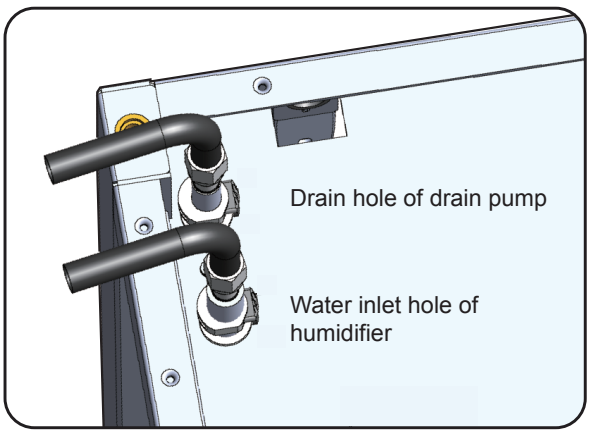
  To guarantee cooling efficiency, you must purify the pipeline to filter out impurities and chemical substances. For pipeline washing, use a hose to create a short circuit to make the chilled water go directly from the inlet end to the return end without passing through the cooling unit. Use a fine-meshed filter (20-mesh suggested) in the Y-type filter to filter out the fine impurities and after 12h~24h water circulation in the pipeline, change a larger-meshed filter (3-mesh suggested).

3.7.1 Condensed water pipe and humidifier's pipe

The condensed water pipe has been connected in the lower part of the cabinet at one end, and you must pass the other end through the reserved hole at the bottom to drain the condensed water. The condensed water is drained by making use of the height difference of the unit. Make sure the horizontal slope of the two ends of the pipe should be greater than 5 degrees.

Meanwhile, the unit is provided with a condensed water pump and a humidifier and the upper or lower piping may be selected. In piping, use the attached quick connector to connect the draining system. The vertical lift of the draining system should not be higher than 5m and the inlet water pressure should be kept at 1~8bar.

Fig. 3-10 shows the piping of the humidifier and the drain pump. If you want to adopt a lower piping mode, the piping configuration should be the same as upper piping. Please refer to the following figure.



(Fig. 3-10: Pipe connection for the drain pump's water outlet and the humidifier's water inlet)

3.8 Power Connection

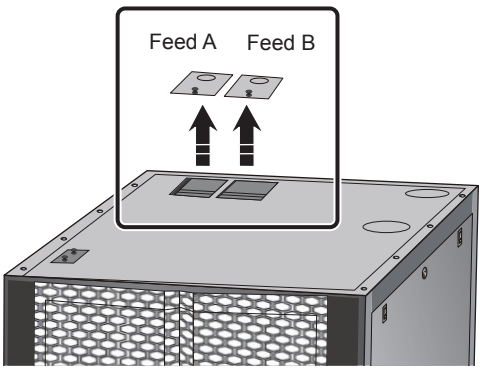
3.8.1 Power

WARNING:

1. The input power must conform to the rated value on the equipment nameplate.
2. The appliance of the power wires and backup connecting wires should conform to national or local regulations. The suggested wire specification is as follows: PVC cord with a diameter of 10AWG (4.0mm^2) and a temperature resistance of 105°C.
3. In locking the screws for wiring at the power terminal block, use the recommended installation torque (12.2Kgf-cm).
4. If there is no wire passing through the communication wire duct at the top of the cabinet, cover the duct with the cover plate provided in the accessory package so as to avoid dust accumulation.
5. Reserve inlet wire length on site wiring and make sure the G wire is longer than the R, S, T, and N wires.

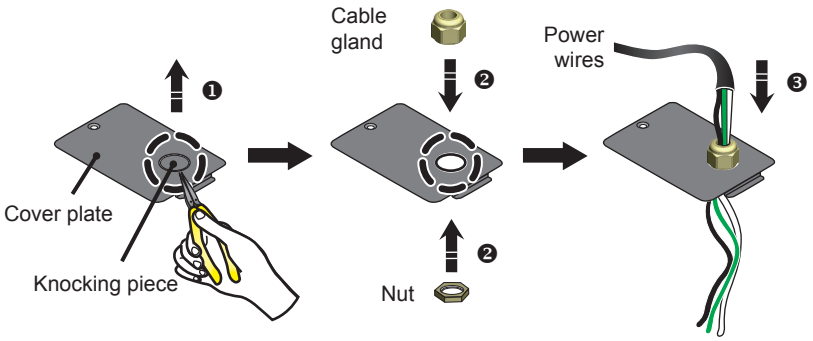
- **Upper power feed**

  1 Manually loosen and take out the power supply's cover plates at the rear of the cabinet top.



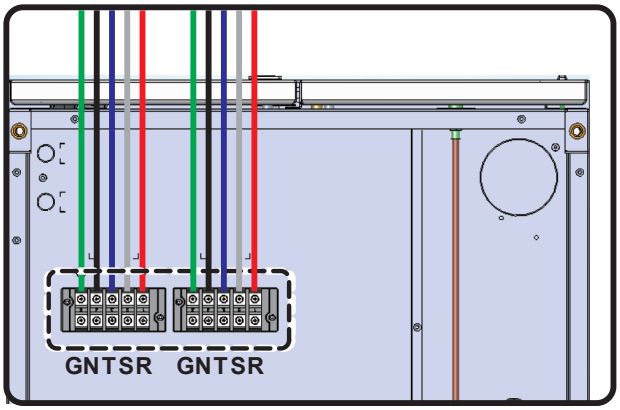
(Fig. 3-11: Removal of the power supply's cover plates)

  2 Use nippers to remove each cover plate's knocking-piece, take out each cable gland from the accessory package, remove its nut, rotate and tighten the cable gland on the cover plate, and pass the power wires through it.



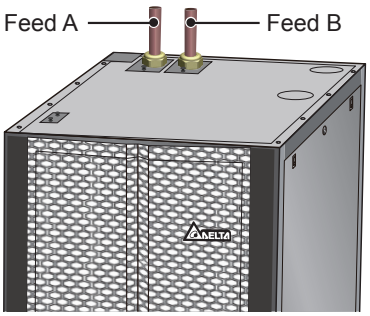
(Fig. 3-12: Insertion of power wires)

3 Use a screwdriver to loosen the screws of the terminal block and insert R, S, T, N, and G wires into it and lock them.



(Fig. 3-13: Installation of power wires)

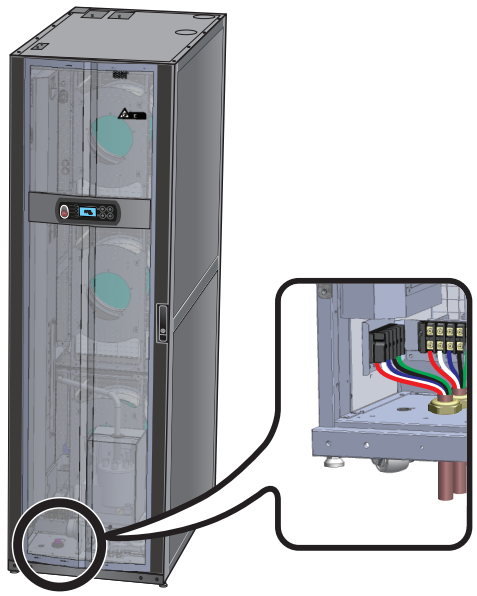
4 Re-install the power supply's cover plates and lock the cable glands tightly.



(Fig. 3-14: Re-install the power supply's cover plates)

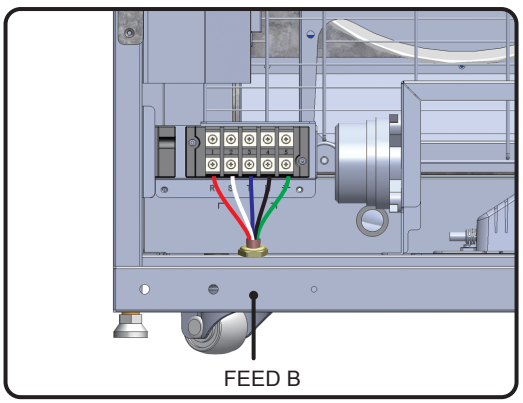
- **Lower power feed**

1 The lower power feed is at the left lower part of the unit. Use nippers to remove the knocking-piece on each power supply's cover plate, take out each cable gland from the accessory package, remove its nut, rotate and tighten the cable gland on the cover plate, and pass the power wires through it.



(Fig. 3-15: Lower power feed position)

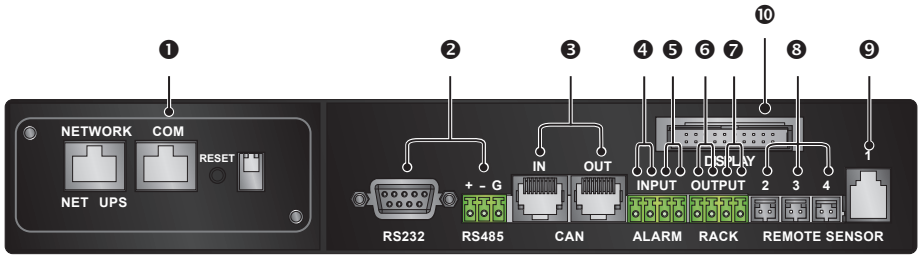
2 Feed A is at the left side and Feed B is at the front. Use a screwdriver to loosen the screws of the terminal block and insert R, S, T, N, and G wires into it and lock them.



(Fig. 3-16: Lower power feed wiring)

3.8.2 Control box

- **Front**



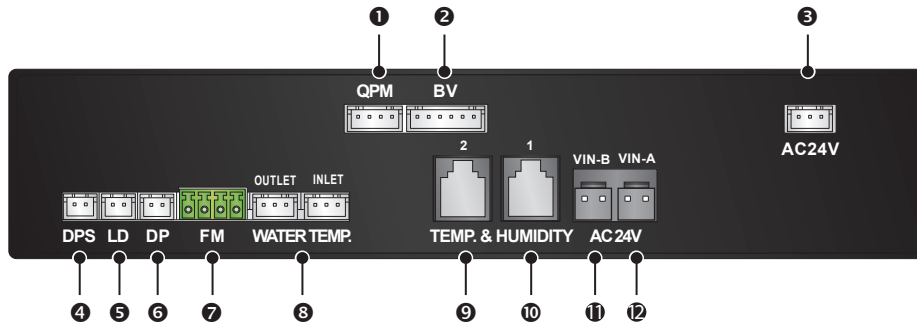
(Fig. 3-17: Front of control box)

No.	Item	Description
❶	SNMP card slot	This unit is compatible with an SNMP card (optional) and can be connected with a workstation so as to monitor and manage the system based on the SNMP protocol. To install the SNMP card, first remove the dust cover from the control box, use an RJ45 cable (purchase separately) to connect the workstation and the SNMP card. For SNMP card operation and setting, refer to its user manual.
❷	RS232, RS485	The RS232 or RS485 port allows you to connect a workstation or power distribution device based on Modbus protocol for remote use.
❸	CAN-Link IN/OUT	It is reserved for series connection of several cooling units. It adopts one-Input one-Output mode.
❹/❺	Input dry contacts	Normally open, for connecting the fire alarm or smoke detector. When an event occurs, the dry contact device is triggered to form a short circuit. The system will record it in the event log and shut down the cooling unit. Port ❹: Fire alarm Port ❺: Smoke detector
❻/❼	Output dry contacts	Connect two dry contact output devices and trigger the contacts at specific events. Port ❻ (System alarm event): Normally open. Connect the dry contact device to this port and the device will be triggered when an alarm event occurs (close the circuit). You may set the triggering conditions. Refer to ***5.7.1 Local setting***. Port ❼ (Start of cooling unit) Normally open. Automatically trigger to form a short circuit at the start of the cooling unit to remind the chiller to output chilled water and turn to the normally open status until the cooling unit is powered off.

No.	Item	Description
❽	Remote temperature sensor ports	At most, three remote temperature sensors (two are provided) can been connected. Qualified service personnel will connect and locate them for you in installation for accurate detection of the temperature of heat loads.
❾	Remote temperature and humidity sensor port	Connects the remote temperature-humidity sensor (purchase separately) for accurate detection of the temperature and humidity of heat loads. It is suggested that qualified service personnel perform installation.
❿	Display interface	Connects the control panel locating in front of the unit for information output.

- **Rear**

The interfaces at the rear of the control box have been connected at delivery. The connecting components are shown in the table below.



(Fig. 3-18: Rear of control box)

No.	Connects to	No.	Connects to
❶	Pressure sensor	❼	Flow meter
❷	Three-way ball valve actuator	❽	Outlet and inlet water temperature sensor
❸	Output power (AC 24V)	❾	Temperature and humidity sensor 2
❹	Pressure difference switch (detects whether filters are clogged)	❿	Temperature and humidity sensor 1
❺	Water leakage detector	⓫	Input power of control box -B (AC 24V)
❻	Drain pump sensor	⓬	Input power of control box -A (AC 24V)

Chapter 4 : Initial Startup

4.1 Pre Start-up Inspection

WARNING:

1. Only qualified service personnel can carry out the installation procedures in this chapter.
2. The inner high voltage of this unit is potentially fatal! Make sure the input power has been disconnected before the following actions.
3. A startup without correctly completing ***4.1 Pre Start-up Inspection*** may lead to serious personal injury or equipment damage!

Please complete all the following inspections before implementing the initial startup procedures.

Inspection List

- **General items**

  ___The unit has no external damage.

  ___The unit is stably fixed and close to the adjacent cabinet.

  ___All the installation procedures have been performed in accordance with the instructions in ***Chapter 3: Installation***.

  ___The pipes in and outside the cabinet have been correctly connected and the thermal insulating layer of the pipes are free of damage and leakage.

  ___The front and back doors have been reinstalled and the flat cable of the control panel has been connected.

- **Environment**

  ___The inner environment is an enclosed space and isolated from interference from outside temperature and humidity.

  ___The reserved space around the cabinet conforms to the regulation (See ***3.2 Space Reservation***).

- **Electronic connection**

  ___The rated value of the input power conforms to that marked on the nameplate.

  ___The equipment has been properly grounded.

  ___All electronic connections are tight and stable.

___The remote temperature (humidity) sensors have been correctly connected and located properly.

___The water leakage detector has been correctly laid.

- **Mechanical connection**

___The pipes and valves are free of breaks or damage.

___The condensed water drain pipe has been correctly connected and led to the draining site.

___The temperature of the water supplied by the external chiller is stable (5~15°C).

4.2 Water Quality Requirements

The water quality requirements are established to minimize scale formation, corrosion and microbial growth within the system, which maintains heat transfer efficiency, ensures reliable system operation and extends equipment lifetime.

During system operation, water quality must be maintained within the specified limits listed in the table below. Regular water quality testing and evaluation should be conducted at least once every three months to ensure long-term system reliability and performance.

If test results indicate abnormal conditions or exceed the specified water quality limits, appropriate corrective actions should be taken promptly. These may include chemical water treatment, system blowdown or filtration to restore and maintain the water quality within the recommended limits.

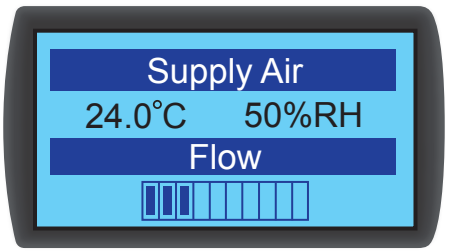
For water quality requirements, please follow the table below.

No.	Parameter	Water
1	pH	7.0 to 9.0
2	Corrosion inhibitor (s)	Required
3	Biocide	-
4	Sulfide	< 10 ppm
5	Sulfate	< 100 ppm
6	Chloride	< 50 ppm
7	Bacteria	< 1000 CFUs/ ml
8	Total hardness (ppm as $CaCO_3$)	< 200 ppm
9	Conductivity	10 ~ 2500 μS/ cm
10	Total suspended solids	-

No.	Parameter	Water
11	Residue after evaporation	< 500 ppm
12	Turbidity	< 20 NTU
13	Iron (mg/L)	≤ 1.0 ppm
14	Copper (mg/L)	≤1.0 ppm
15	Particle size	< 500 μm

4.3 Power Supply

Power on the cooling unit and it will automatically enter standby mode. For the sake of safety, the fans will not automatically rotate. Only when it goes through manual mode, automatic mode, force mode or installation mode and returns to the standby mode, will the fans run at the minimum speed. After the display of the Delta trademark for three seconds, the LCD will enter the following status screen.



(Fig. 4-1: LCD status screen)

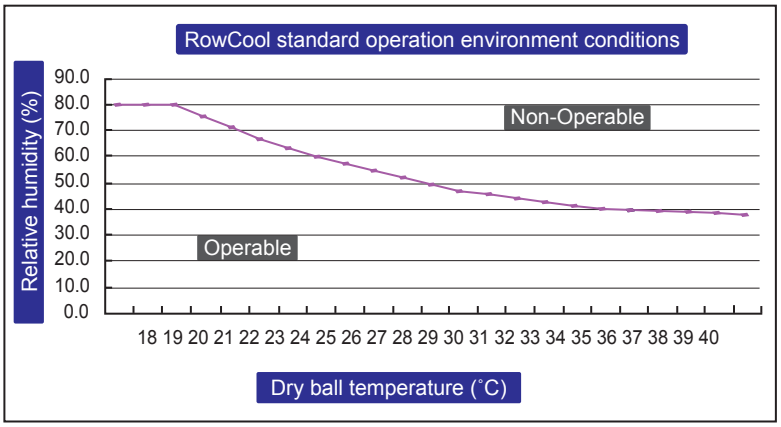
To know each screen's meaning and how to operate the control panel, please refer to ***5.2 Control Panel Operation***.

4.4 Operating Temperature and Humidity

When using 7°C chilled water, use an auxiliary de-humidifier or air conditioner to adjust the indoor temperature and humidity until they fall within the operation scope.

WARNING:

If the indoor humidity is too high, the condensing effect around the coil may lead to too much condensed water, which could cause leakage.



(Fig. 4-2: Standard Operation Environment Conditions)

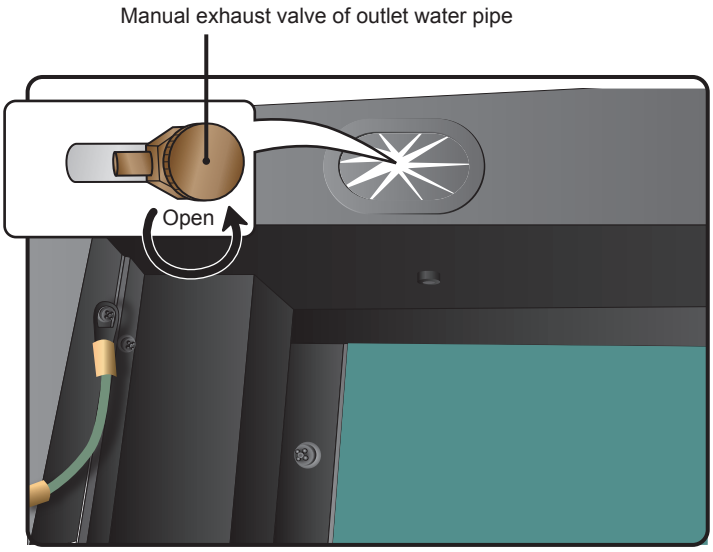
If there is no auxiliary dehumidifier or air conditioner indoors, you may start the installation mode to reduce the humidity in the cabinet. See the following procedures:

1. In the status screen, press ↵ to enter into **Main Menu**, utilize ▲ and ▼ to select **Factory Setting** and press ↵ .
2. Enter **administer password**
3. After entry, select the installation mode and press ↵ to confirm. Now, the fans will run at the minimum speed and the three-way ball valve will fully open and the bypass is closed. Press **ESC** for several times to return to the status screen and observe the change of temperature and humidity.
4. When the humidity falls within the operation scope, the **WARNING** indicator will flash and the buzzer will issue sustained short beeps for 0.5 second. The alarm will continue until you leave the installation mode.

4.5 Air Exhaust

You must carry out air exhaust procedures to get the air in the pipe naturally exhausted in accordance with the following procedures:

1. Start the system to get the chilled water to normally circulate in the chilled water pipe.
2. Connect a PVC transparent pipe (not provided) with the manual exhaust valve (see ***Figure 4-3***) and place a vessel at its output end to avoid water leakage during air exhaust.
3. Rotate counterclockwise the manual exhaust valve to squeeze out the air.



(Fig. 4-3: Open the manual exhaust valve of outlet water pipe)

4 After 6~7 seconds, when the air is exhausted and water begins to be discharged from the pipe, turn off and lock the manual exhaust valve.

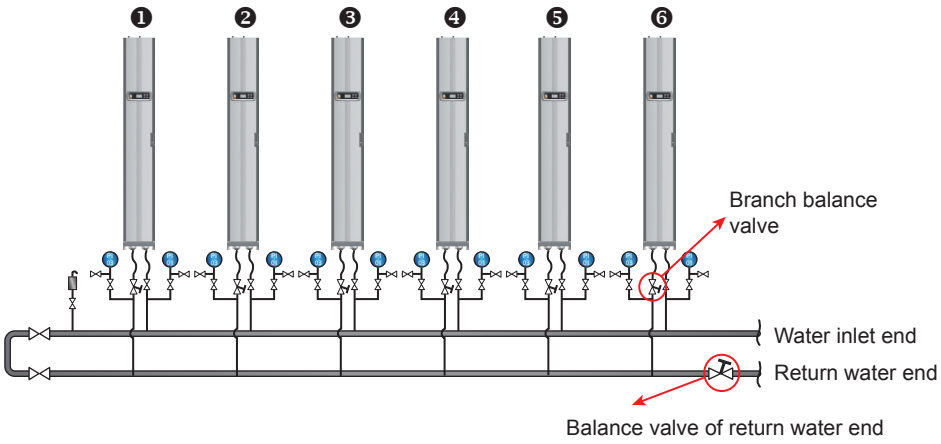
NOTE: You must do the air exhaust procedures after any change in the pipeline structure. It is recommended to install an automatic exhaust valve for external piping. Refer to ***3.7 External Piping***.

4.6 Water Leakage Detector

This cooling unit is provided with a water leakage detector at the cabinet bottom when delivered, which will be triggered to issue an alarm when in contact with water or liquid, reminding you to take proper measures. You must manually set the detector at the site for leakage detection, such as a low-lying place. If the lower piping is adopted, it is suggested to set it close to the pipeline below the raised floor.

Pass one end of the water leakage detector through the small hole at the lower part of the cabinet and set the detector at the above-mentioned place.

4.7 Water Balance



(Fig.4-4: Water balance)

The program adopts a compensation method and adjusts the flow rate with the first (most remote) cooling unit as a reference point. The process needs at least three people to work at the same time. It is suggested keeping communication by handheld walkie talkie. The number of the cooling units in a circuit varies and we take the six-unit configuration as an example. See the following procedures.

1. Set a balance valve at the return water end of the main pipe to adjust the total flow rate of the circuit.

2. Set all cooling units in the installation mode, (see ***4.4 Operating Temperature and Humidity***) and the three-way ball valves will automatically fully open (100%).

3. Fully open the balance valve of the return water end and the branch balance valves at all branches and record the flow rate of each unit.

4. Adjust the balance valve of the return water end to 110% of the rated total flow rate. If the balance valve cannot reach this value when fully opened, keep it at full opening, and adjust the flow rate of each branch proportionally.

5. Fully open the branch balance valve of Unit 1, adjust the balance valve of the return water end of the main pipe circuit to enable Unit 1 to reach its rated flow rate (±5%). Make sure once again its branch balance valve is kept fully open.

6. Adjust the branch balance valve of Unit 2 to get it to reach the rated flow rate. Another person will observe the flow rate change of Unit 1, dynamically adjust the balance valve of the return water end and make up water to enable Unit 1 to reach the rated flow rate (±5%). After adjustment, record the opening of the branch balance valve of Unit 2.

7 Adjust the branch balance valve of Unit 3 to get it to reach the rated flow rate. Another person will observe the flow rate change of Unit 1, dynamically adjust the branch balance valve of Unit 1 and complement water to enable Unit 1 to reach the rated flow rate (±5%). After adjustment, record the opening of the branch balance valve of Unit 3.

8 Repeat the procedures 6 ~ 7 to adjust Units 4~6 and record the opening of the branch balance valves.

9 When all units are adjusted, record the opening of the balance valve of the return water end and the total flow rate (rated flow rate ±10%).

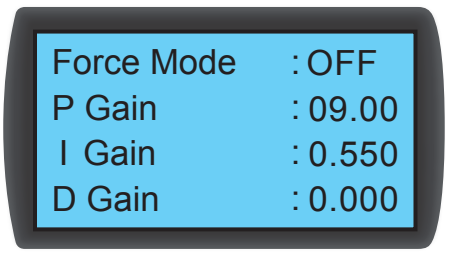
10 If the circuit is unable to reach the rated value of the total flow rate after adjustment, please adjust the water flow of the chiller and water pump.

4.8 PID Setting

In light of different environmental conditions of data centers, the PID parameter values must be adjusted by qualified service personnel after installation so as to achieve the best cooling efficiency.

Please first read ***5.2 Control Panel Operation*** to get familiar with basic operation.

Path: **Main Menu→ Setting→ Controller**



(Fig. 4-5: Setting of PID Values)

- **Proportional constant (P)**

  Adjust according to the error between the measured temperature and the set value.

- **Integration constant (I)**

  Eliminate the error by adding or subtracting the integration coefficient by small incremental output.

- **Differential constant (D)**

  Adjust the output according to the error change so as to correct the time-dependent correction rate.

The PID default values of the three-way ball valve are shown as follows:

P	I	D
9.00	0.55	0.000

- **Adjustment procedures**

The adjustment is made based on an open circuit method as follows:

1. Keep the fans running at high speed (at least 70%) and observe the flow rates at the high, medium, and low openings of the three-way ball valve from the control panel.

2. Adjust the three-way ball valve to the opening at half of the rated flow rate, which varies according to the pipeline configuration and pressure distribution at site. If the opening is too large (above 70%), reduce it to a medium opening (about 50%).

3. When the temperature and humidity of outlet air and return air are stable, record the readings of time-dependent outlet air temperature and observe if the inlet and outlet water temperatures are stable.

4. Use the control panel to start the manual mode and increase the opening (above 75%). Due to the internal delay of the system, the outlet air temperature will change with the time.

5. Execute the Modbus Recorder program via the RS485 interface and calculate Td and τ values. The definition is as follows:

   τ=1.5 x (T2-T1) [the time difference between 28.3% (T1) and 63.2% (T2) x 1.5]

   Td (Pseudo Dead Time) may be defined as Td= T1 –τ

6. Calculate the best PID values in different modes in accordance with the following table.

Mode	Gain	Reset	Derivative
P	tau/ (Td x G)		
PI	0.9 tau/ (Td x G)	0.3/ Td	
PID	1.2 tau/ (Td x G)	0.5/ Td	0.5 Td

   * G (response gain): it varies with opening values and therefore, the medium opening or the opening at a medium flow rate is selected as the reference point.

   * Reset and Derivative are defined: Reset=I/P, Derivative=D/P

7. The I and D values can be found from the Reset and Derivative values.

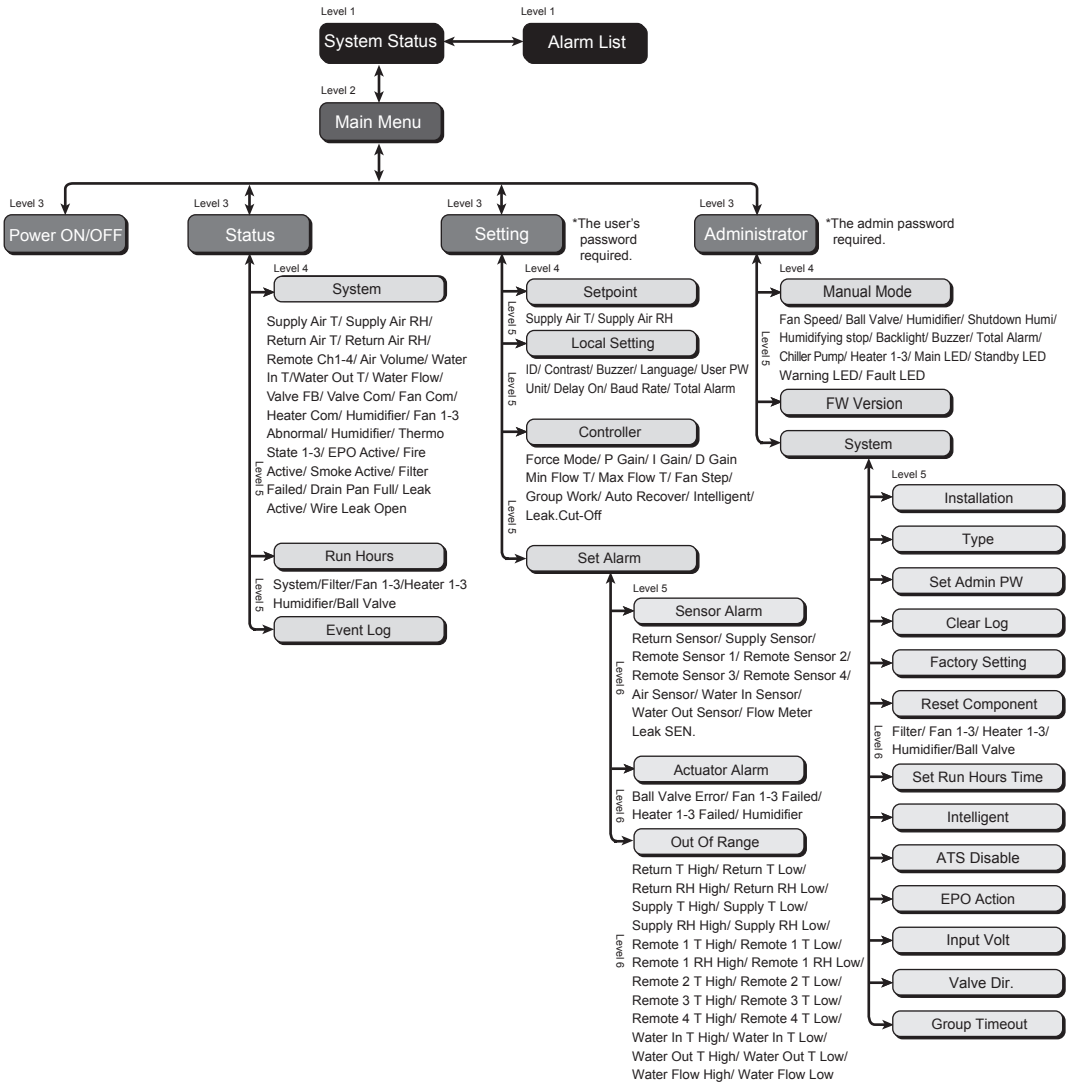
8 Enter the PID values found on the control panel, start the automatic mode, and make continuous observation of temperature oscillation. If the temperature is stable, record the value on a sheet of paper and output the adjusted set values (including supply air and return air temperature and humidity, fan speed, inlet water temperature, and outlet water temperature) via the SNMP interface.

- **Operation trial**

  1. Confirm that the cooling unit is in automatic mode and observe if the supply and return air temperature and humidity, water flow rate, and water temperature are stable.
  2. Change the set point, record the stability time (reaching the set point of supply air temperature) via the SNMP interface, and observe if there is instability and temperature oscillation.
  3. Export the data and store them.

Chapter 5 : Operation

5.1 LCD Display Hierarchy



(Fig. 5-1: LCD display hierarchy)

5.2 Control Panel Operation



The four buttons on the right of the control panel are used for operation and set-up:

No.	Button	Description
1	ESC	Goes back to previous screen or cancels current operation.
2	↵	Enters your selected item or confirms your selection or setting.
3	▲	Goes back to previous screen, moves up or increases number.
4	▼	Goes to next screen, moves down or decreases number.

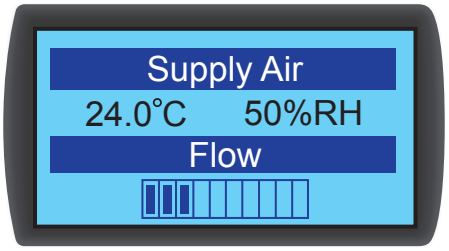
After entering a screen, if its options exceed four, you may press ▲▼ to turn the page. Press ↵, a highlighted zone appears and represents the current selected option, and press ▲▼ to move the highlighted zone.

To enter or change values (such as password or temperature), please use ▲ ▼. Press ↵ to skip to next field. In the last field, press ↵ to store and submit. Press **ESC** to cancel the current operation.

If it is kept in idle without operation, the display will automatically turn off and the backlight will go off.

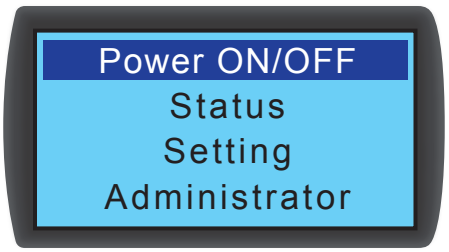
NOTE: The default language of the control panel is English. The route for setting your preferred language is **Main Menu→ Setting→ Local Setting→ Language** .

5.3 Status Screen and Main Menu



The LCD display will go off when the unit is idle. Press ↵ to wake up the backlight and display the status screen. You may view the air supply status and the air flow percentage of the fans. The air flow percentage represents the fan speed and the more solid grids there are, the higher the fan speed.

In the status screen, press ↵ to enter the **Main Menu** shown below.



- **Power ON/OFF**

  Start up the cooling unit (automatic mode) or enter the standby mode.

- **Status**

  View the system status, sensor readings, operation time and event records.

- **Setting (the user's password required)**

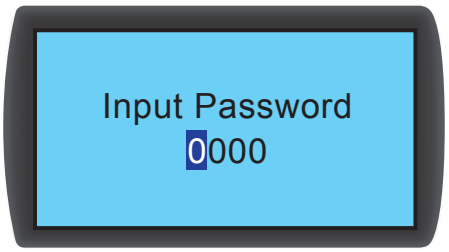
  Adjust the set point, local setting, controller setting and alarm setting.

- **Administrator (the admin password required)**

  Enter the manual mode and view the firmware version and system setting.

5.4 Account Authority and Login

The cooling unit has two accounts. **The administrator** has the highest authority and can alter all settings while **the user** can only alter the system setting.



When you try to enter **Setting** or **Administrator** screen, a password prompt will occur. If no operation is performed for a long time after login, the login status will become invalid after the system becomes idle. If you want to re-enter the above menu, you must re-enter the password.

In the password prompt screen, entering **the admin password** means the entry of administrator and entering **the user password** represents the entry of general users. If you only enter **Power ON/ OFF** or **Status** screen, no password is required.

The user's default password is **0000**.

NOTE: To avoid unauthorized change of and access to important settings, do not disclose the admin password. To get the admin password, contact service personnel.

5.5 Operation Modes

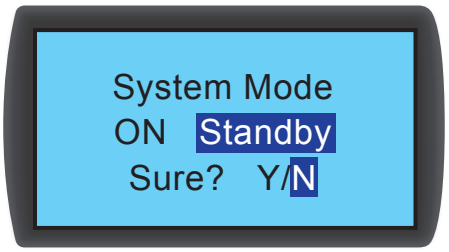
The cooling unit has five operation modes:

Operation mode	Description
Automatic mode	Path : **Main Menu → Power ON/ OFF → ON** To get the cooling unit to automatically control its cooling capacity, please select the automatic mode and the system will automatically micro-adjust the fan speed and the opening of the three-way ball valve in accordance with the set points. You may also simultaneously press ▲▼ for three seconds in any screen to quickly switch between the automatic mode and the standby mode. **NOTE:** In the manual mode, the simultaneous pressing of ▲▼ for 3 sec will not make the unit automatically enter the automatic mode or standby mode.

Operation mode	Description
Standby mode	Path: **Main Menu → Power ON/ OFF → Standby** In the standby mode, the fans stop running, the three-way ball valve is fully closed and the chilled water goes through bypass without passing the coil.
Manual mode	Path: **Main Menu → Administrator → Manual Mode** The manual mode is used to test if the components work normally or make the system operate in accordance with the manual setting. In this mode, you may manually set: fan speed, ball valve opening, indicator on-off, backlight on-off, buzzer on-off, alarm dry contact on-off, chiller's water pump dry contact on-off, humidification proportion, humidifier on-off and heater on-off. In the manual mode, press **ESC** to automatically return to the standby mode.
Installation mode	Path: **Main Menu → Administrator → System → Installation** This mode is used to de-humidify and adjust the water balance. When it is started, the three-way ball valve will fully open and the fans will rotate at the minimum speed. When the system humidity falls within the operation scope, the **WARNING** indicator will flash and the buzzer will issue 0.5 sec short beeps continuously until you leave the installation mode. For the operating temperature and humidity, refer to ***4.4 Operating Temperature and Humidity***.
Force mode	Path: **Main Menu → Setting → Controller** The three-way ball valve is fully open and the fans run at the highest speed. This mode is generally used for unit testing or emergency cooling request.

5.6 Shutdown

Path: **Main Menu → Power ON/ OFF → Standby**



WARNING: In the standby mode, the unit is still in power-on status! In the standby mode, you must disconnect the input power or two circuits of feeds (Feed A & Feed B) to get the unit to fully power-off.

To shut down the cooling unit, you must first enable the standby mode. After selecting the standby mode, select **Y** and press ↵ to confirm. If the **STANDBY** indicator lights, the unit is in the standby mode. Now, the cooling unit is still in power-on status and the fans stop running.

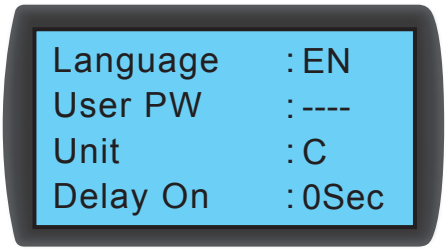
Next, disconnect the external power and make sure that the fans stop and the LCD display is off.

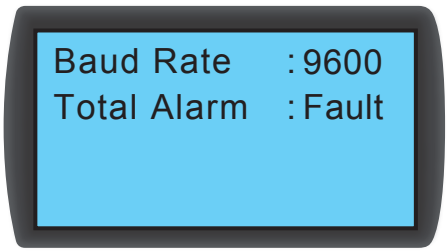
5.7 Setting of Cooling Unit

5.7.1 Local setting

Path: **Main Menu** → **Setting** → **Local Setting**







- **System time**

  Use ▲▼ to set up the system time and press ↵ to skip to the next field and finally press ↵ to confirm.

- **ID (Number)**

  Represent the number of the cooling unit connected in series and also the ID in the Modbus protocol. The default number is **1**. If several cooling units are connected in series, you must designate each unit with a different number.

- **Contrast**

  Adjust the display screen contrast (0~5) and the default value is **2**.

- **Buzzer**

  Set the buzzer on-off and issue an alarm beep to remind the user of an alarm event, if any. The default is **ON**.

- **Language**

  Set the display language. Select a language and press ↵ to confirm. The default is English **(EN).**

- **User PW**

  To alter the current user's password , enter four digits.

- **Unit**

  Set the temperature unit and the default is (°C).

- **Delay On**

  The time difference between setting the startup of automatic mode and the actual operation. The cooling unit will start up in the seconds you have designated.

- **Baud rate**

  Please set the on-line speed based on the Modbus protocol. The options include **9600**, **19200**, **38400** and **57600** and the default value is **9600**.

- **Total Alarm**

  Decide what event can trigger the output dry contact **1**. Please refer to the following descriptions:

  1. All: Any alarm and fault event can trigger it.
  2. Fault: Only fault events can trigger it.

  Alarm events

1. Filters are clogged	5. High and low of chilled water flow
2. Abnormal internal communication	6. High and low air volume
3. High and low of air supply/ return temperature and humidity	7. High and low of remote temperature and humidity
4. High and low chilled water inlet/ outlet temperature	8. Overtime of maintenance

Fault events

1. Emergency stop/ remote emergency stop
2. Overflow of condensed water
3. Leakage alarm/ leakage open-circuit alarm
4. Fire
5. Smoke
6. Abnormal air supply/ return temperature and humidity sensor
7. Abnormal input voltage/ current/ branch circuit
8. Abnormal remote sensor
9. Abnormal chilled water inlet/ outlet sensor
10. Abnormal chilled water flow meter
11. Abnormal fan
12. Abnormal three-way ball valve
13. Abnormal heater
14. Abnormal humidifier

5.7.2 Set point

Path: **Main Menu → Setting → Set point**

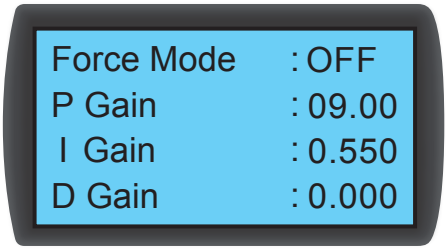


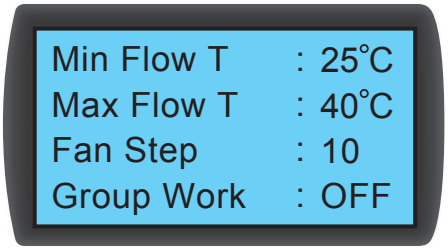
- **Supply Air T (temperature) and RH (relative humidity)**

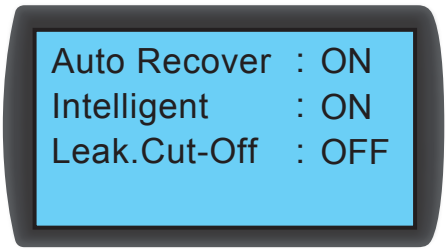
  In the automatic mode, the cooling unit will automatically adjust the fans, three-way ball valve or humidifier in accordance with this targeted supply air temperature and humidity.

5.7.3 Controller setting

Path: **Main Menu → Setting → Controller**







- **Force Mode**

  When the force mode is enabled, the fans will run at full speed and the three-way ball valve will fully open, which is generally used for performance testing or at a high heat load. If the **STANDBY** indicator on the control panel flashes, the unit is in the force mode.

  Set the proportional constant, integral constant and derivative constant **(PID)**. Refer to ***4.8 PID Setting***.

- **Min Flow T**

  When the return air temperature is lower than this value, the fans will run at the minimum speed to save energy and the default is **25°C**.

- **Max Flow T**

  When the return air temperature is higher than this value, the fans will run at the maximum speed to save energy and the default is **40°C**.

- **Fan Step**

  It is used to set the fan speed (range: 0~15) in the automatic mode. The default is **0** and the cooling unit will adjust the fan speed according to your setup.

- **Auto Recover**

  When this function is enabled and the system is in the automatic mode before power-off, at a restart, the unit will directly return to the automatic mode.

- **Intelligent**

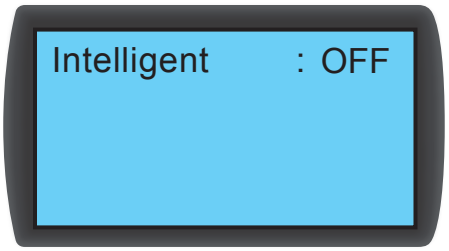
  Display if the intelligent temperature control is enabled. This option only displays the status. You cannot change the setting. For change of setting, refer to ***5.7.4 Setting of automatic control mode***.

- **Leak. Cut-Off**

  Set if the unit will stop when the water leakage detector detects any leakage so as to prevent leakage expansion.

5.7.4 Setting of automatic control mode

Path: **Main Menu** → **Administrator** → **System** → **Intelligent**



This unit supports two kinds of automatic control modes:

1. **Intelligent control (default)**

   The system will automatically adjust the fans and the actuator in accordance with the set supply air temperature and humidity.

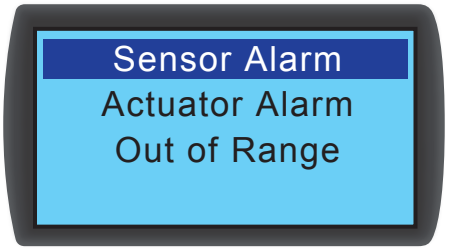
2. **PID control**

   The system will make adjustment by PID parameters.

When the unit enters the automatic mode, the default setting is intelligent control. If the intelligent control mode is off, the system will automatically adopt the PID control. To turn on or off the intelligent control, you need to key in **the admin password**.

5.7.5 Alarm setting

Path: **Main Menu** → **Setting** → **Set Alarm**

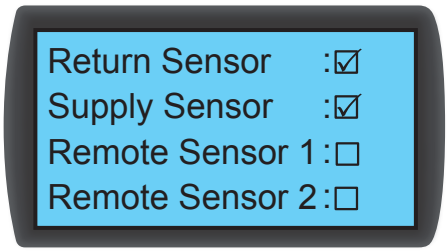


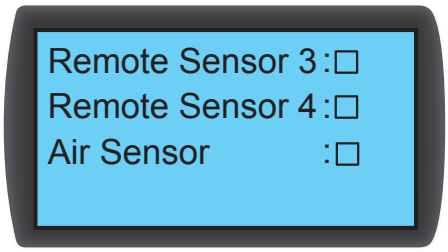
Set **Sensor Alarm**, **Actuator Alarm** and **Out-of-Range Alarm**. If an item display is ☐, this item is disabled. Press ↵ at this item, use ▲ ▼ to select ☑, press ↵ to confirm and the item is enabled.

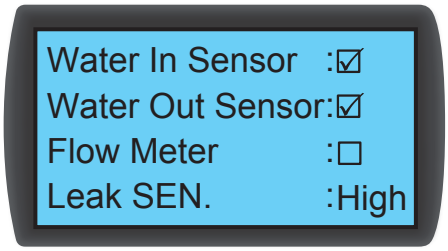
NOTE: When an alarm event occurs in the manual mode, the indicator and buzzer will not act but the event will be stored in the event log.

- **Sensor alarm**

  Path: **Main Menu** → **Setting** → **Set Alarm** → **Sensor Alarm**



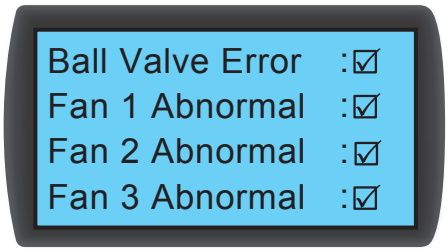




Set the alarm on/ off for **Return Sensor**, **Supply Sensor**, **Remote Sensor 1-4** , **Air Sensor**, **Water In/ Out Sensor**, **Flow Mater** and **Leak SEN** (leakage detector sensitivity).

- **Actuator alarm**

  Path: **Main Menu** → **Setting** → **Set Alarm** → **Actuator**

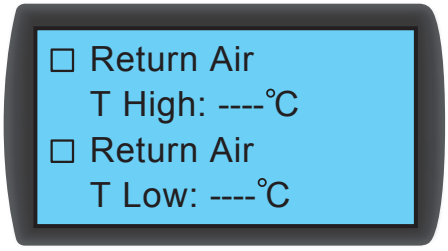


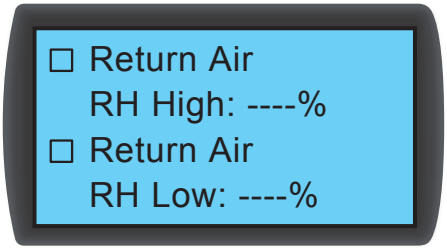


  Set the alarm on-off for **ball valve**, **fans 1-3**, **heaters 1-3** and **humidifier** .

- **Out-of-Range alarm**

  Path: **Main Menu** → **Setting** → **Set Alarm** → **Out Of Range**

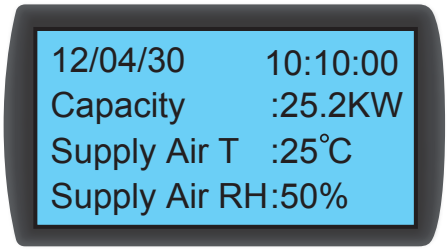


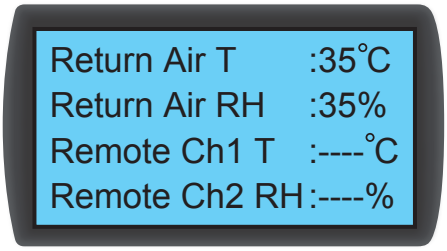


  The screens above only show parts of items. For whole items, please refer to the cooling unit's actual operation.

5.7.6 Inquiry of system status

Path: **Main Menu** → **Status** → **System**



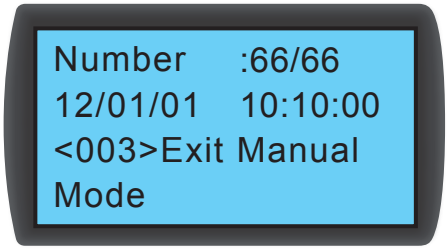




Inquire about the system related information, including **cooling capacity**, **supply air temperature and humidity**, **return air temperature and humidity**, **remote 1 temperature and humidity**, **remote 2 temperature**, **remote 3 temperature**, **air volume**, **chilled water inlet/ outlet temperature**, **chilled water flow rate**, **ball valve opening**, **ball valve command** (set the ball-valve opening), **fan command** (set the fan speed), **heater command**, and **humidifier command**.

5.7.7 Inquiry/ elimination of event log

Path: **Main Menu** → **Status** → **Event Log**



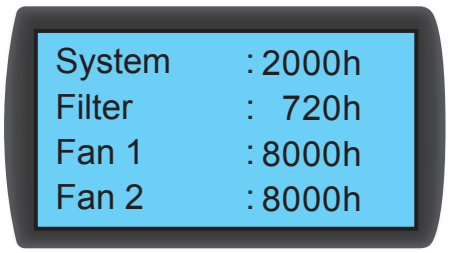
In this screen, the number of current events/ total events is displayed and at most 3000 events can be recorded. Press ▲▼ to switch events. The events are numbered according to the occurrence time and the older the event, the smaller its number is. The digit in <> is the event code. If the records exceed 3000, older events will be over-written.

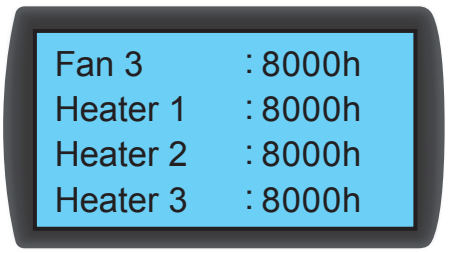
To clear any event log, **the admin password** is needed, and the route is **Main Menu** → **Administrator** → **System** → **Clear Log**.

NOTE: The event log is important information for evaluating the system status and also a reference for service personnel to perform maintenance. Therefore, do not clear the event log without authorization.

5.7.8 Inquiry / reset of running hours

Path: **Main Menu → Status → Run Hours**

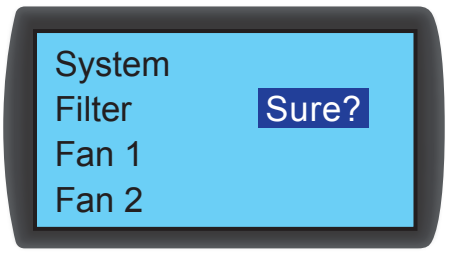






Inquire about the running hours of the system and components to assist you in evaluating the component status and judging the repair or replacement time.

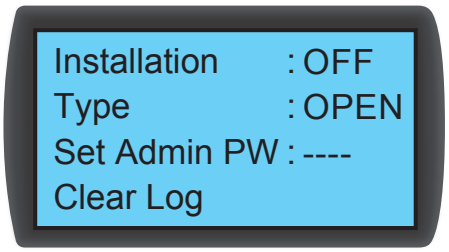
The route for re-setting each component's operation time is **Main Menu → Administrator → System → Reset Component**.



After a component is changed, reset the operation time of **Filter**, **Fans 1-3**, **Heater 1-3**, **Humidifier** or **Ball valve**.

5.7.9 Change of system type

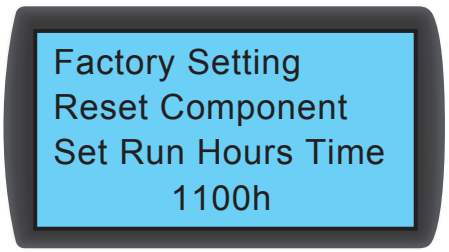
Path: **Main Menu** → **Administrator** → **System** → **Type**



Follow your data center's cold/ hot aisle configurations to set up system **Type** as **OPEN** or **CLOSE**.

5.7.10 Restoration of defaults

Path: **Main Menu** → **Administrator** → **System** → **Factory Setting**



Restore all factory defaults, including the set options and user and admin passwords.

WARNING: The restoration of factory defaults will reset the settings or parameters that have been changed! The cooling unit has selected different settings according to the different environment and random restoration may lead to system error. The restoration can be made only by qualified service personnel.

Chapter 6 : Maintenance and Cleaning

Periodic inspection and cleaning of the cooling unit can guarantee the equipment to operate at the best status.
The internal components such as fans and condensed water pan need periodic cleaning and inspection. This unit contains replaceable components and the cleaning and inspection of them can be done only by qualified service personnel.

6.1 Firmware Upgrade

For firmware upgrade, contact service personnel.

6.2 Storage

If you do not use this unit for long time, it is recommended that you wrap the unit using the original packing material and store it in a place with well controlled temperature and humidity (-15~65°C ; 0~95% RH, non-condensing) and free of corrosion substance, accumulated dust and pollutants. Do not place the unit horizontally or deposit things in or on the cabinet.

NOTE: For information and method of maintenance and cleaning, contact your local dealer or customer service. Do not perform maintenance if you are not trained for it.

Chapter 7 : Troubleshooting

WARNING: The following troubleshooting actions can only be carried out by qualified service personnel. Unauthorized action may lead to major danger or equipment damage.

System Troubleshooting:

No.	Abnormal phenomenon	Possible cause	Elimination method
1	The fans cannot start.	The power supply is abnormal.	Make sure the input voltage is within the permissible range, the circuit breaker or switch is set at **ON**, and the cooling unit is correctly grounded.
		The fans are abnormal.	Make sure that each fan wiring is normal and change the abnormal fans if necessary.
2	The cooling unit cannot start.	The input voltage is abnormal.	1) Make sure the input voltage is within the permissible range, the circuit breaker or switch is set at **ON**, and the cooling unit is correctly grounded. 2) If the voltage and the other things are normal, contact service personnel to see if the unit setting is wrong.
		The EPO is triggered.	The main switch or breaker's handle is at the middle position. Adjust the handle down to the **OFF** position and then lift it to the **ON** position and supply the power.
		The heater protector is triggered.	Use a multi-meter (short circuit is normal) to inspect if the over-temperature protector is triggered. If it is triggered, contact service personnel to carry out reset (the heater should be removed). After reset, confirm if the unit operates normally.
3	Forgot the password?	Forgot the user password or admin password?	Contact service personnel.

No.	Abnormal phenomenon	Possible cause	Elimination method
4	The operation noise is too high.	Foreign matter is attached to the fans or the fans' ball bearings are damaged.	Clean and inspect the fans.
		The fan speed is too high.	Check if the unit runs in the force mode or if the fans are running at full speed. Adjust the set point or the fan speed accordingly.
		There is foreign matter or impurity in the pipeline.	Inspect the Y-type filter of the external piping and clean it if necessary.
5	LCD display is abnormal and does not display.	The wiring is wrong.	Inspect if the wiring of the control panel is correct or re-start the cooling unit if necessary.
6	The alarm condition is satisfied but the buzzer does not beep.	The buzzer alarm function is not enabled.	Use the control panel to enable the buzzer alarm function. Path: **Main Menu→ Setting→ Local Setting**.
7	The set point cannot be reached.	The fans are old or abnormal.	Inspect the fans and change abnormal ones if necessary.
		The sensor detection is abnormal.	Inspect the sensors.
		The PID parameters are wrong.	Refer to ***4.8 PID Setting*.**
		The heat load exceeds the cooling capacity.	Reduce the heat load or increase cooling units.
		The filers are clogged.	Replace or clean the filters.
		The coil is blocked.	Carry out the coil washing procedures.
		The chilled water flow rate is insufficient or its temperature is too high.	Inspect the flow rate and temperature of the chiller (5~15 degrees are ideal).
		The control module is wrong.	Repair or replace the control box.
		The actuator is abnormal.	Repair the actuator.
		The heaters are abnormal.	Inspect the heaters.
		The humidifier is abnormal.	Inspect if the humidifier is abnormal and replace it if necessary.

No.	Abnormal phenomenon	Possible cause	Elimination method
8	There is a water stain in the cabinet.	The humidity is too high.	Use an external de-humidifier to control the data center's humidity or enable the force mode to reduce the internal humidity of the data center.
		The inlet water temperature is too low.	Adjust the water supply temperature of the chiller (5-15 degrees are ideal).
		The fan speed is too low.	Adjust the fan speed.
		The humidifier output is abnormal.	Make sure of the electric connection of the humidifier.
		The drain pump is abnormal.	Confirm the functions of the drain pump are normal.
		The piping is abnormal.	Inspect if the chilled water pipeline and other pipelines are normal.
9	There is water leakage at the cabinet bottom.	The condensed water overflows.	Observe if the water level in the condensed water pan is too high, inspect the condensed water pump, and make sure the condensed water pipe (without bending, damage or blockage) is correctly connected and the draining is normal. If upper piping is adopted, the vertical lift shall not exceed five meters.
		The pipe system leaks.	Inspect and repair the leaking site.
		The cabinet is not on a leveled base.	Use the levelers to level the cabinet.
		The thermal insulating rubber layer of pipe is damaged.	Inspect and repair the damage site.
10	The EPO does not act.	The EPO wire goes off.	1) Inspect if the wiring is correct. 2) Contact service personnel to see if the EPO is set as **Off** (default: Off).
11	The signals of the remote sensors are abnormal.	The remote sensors are not correctly located.	Inspect each remote sensor's position.
12	The three-way ball valve has no response.	The actuator is not correctly connected.	Re-set the actuator.

No.	Abnormal phenomenon	Possible cause	Elimination method
13	It is unable to get on-line via the Modbus protocol.	The RS232 or RS485 connector is not correctly connected.	Re-connect the connector.
		The Baud rate setting is abnormal or the ID does not match.	Re-confirm the Baud rate and ID.

Alarm information on the LCD:

No.	Alarm Information	Possible cause	Elimination method
1	Filter Abnormal	The filters are clogged by foreign matter or are old.	Replace or clean the filters.
2	Drain Pan Full	The condensed water pipe or the condensed water pump is abnormal. Or the piping exceeds the vertical lift.	Remove the surplus water, inspect the condensed water pump and make sure the condensed water pipe (without bending, damage or blockage) is correctly connected and the draining is normal. If upper piping is adopted, make sure the vertical lift does not exceed five meters.
3	EPO Active	The EPO button on the control panel is pressed or emergency stop is triggered due to fire or smoke.	Eliminate the abnormality, reset the circuit breaker of the unit and re-start the unit to recover the normal operation.
		Emergency stop is triggered due to leakage	1) Eliminate the abnormality, make sure the water leakage detector is dry, reset the circuit breaker of the unit and re-start the unit to recover the normal operation. 2) If the water leakage detector cannot be dried in a short time, remove the detector first and reset the circuit breaker of the unit to recover the operation.
4	Leak Active	Leakage is detected.	Remove the surplus water and inspect the water level of the condensed water pan. Inspect if the drain function is normal and confirm that the condensed water pipe has no bending, damage or blockage. If upper piping is adopted, make sure the vertical lift does not exceed five meters.

No.	Alarm Information	Possible cause	Elimination method
5	Fire Active	Fire detection is triggered.	Inspect the environment and eliminate the abnormality.
6	Smoke Active	Smoke detection is triggered.	Inspect the environment and eliminate the abnormality.
7	Comm Abnormal	The CAN-Link port wiring is wrong or the unit ID is repeated.	Inspect the CAN-Link port wiring and confirm that the cooling units connected in series have independent and non-repeated IDs.
8	Return/ Supply Sensor	The air return/ supply sensor is abnormal or in bad contact.	Inspect the function of the air return/ supply sensor and confirm the wiring is stable.
9	Remote Sensor 1-4	The # remote sensor is abnormal or in bad contact.	Inspect the function of the # remote sensor and confirm the wiring is stable.
10	Water In Sensor	The chilled water inlet sensor is abnormal or in bad contact.	Inspect the function of the chilled water inlet sensor and confirm the wiring is stable.
11	Water Out Sensor	The chilled water outlet sensor is abnormal or in bad contact.	Inspect the function of the chilled water outlet sensor and confirm the wiring is stable.
12	Flow Meter	The flow meter is abnormal or in bad contact.	Inspect the function of the flow meter and confirm the wiring is stable.
13	Fan 1-3 Failed	The # fan is abnormal or in bad contact.	Inspect if the # fan is blocked or abnormal and confirm the connection wire is correctly connected.
14	Ball Valve Error	The three-way ball valve is abnormal.	Inspect if the three-way ball valve is in bad contact or faulty.
15	Return/ Supply T High	1) The environment temperature and humidity are abnormal. 2) The alarm setting is abnormal. 3) The sensor is abnormal. 4) The load is too large.	1) Inspect if the environment temperature and humidity are within the operation scope. 2) Inspect if the out-of-range alarm setting is correct. 3) Inspect the sensor function. 4) If the temperature is still too high after eliminating the above problems, please confirm the load does not exceed the cooling capacity of the cooling unit.
16	Return/ Supply T Low		
17	Return/ Supply RH High		
18	Return/ Supply RH Low		

No.	Alarm Information	Possible cause	Elimination method
19	Remote # T High	1) The environment temperature and humidity are abnormal. 2) The alarm setting is abnormal. 3) The remote sensor # is abnormal. 4) The load is too large.	1) Inspect if the environment temperature and humidity are within the operation scope. 2) Inspect if the out-of-range alarm setting is correct. 3) Inspect the # remote sensor function. 4) If the temperature is still too high after eliminating the above problems, please confirm the load does not exceed the cooling capacity of the cooling unit.
20	Remote # T Low		
21	Remote # RH High		
22	Remote # RH Low		
23	Water In T High	1) The temperature or flow rate of the chilled water supplied by the chiller is abnormal. 2) The alarm setting is abnormal.	1) Inspect the temperature and flow rate of the chilled water. 2) Inspect if the out-of-range alarm setting is correct.
24	Water In T Low		
25	Water Flow High		
26	Water Flow Low		
27	Run Over Hours	The periodic maintenance has not been performed.	To guarantee the normal operation of the system, carry out the maintenance immediately.
28	Humidifier	1) The humidifying water has a too high conductivity. 2) The humidifying water has a too low conductivity. 3) The humidifying inlet valve is abnormal. 4) The humidifying drain valve is abnormal. 5) The humidifying cylinder abnormal.	Inspect the humidifying cylinder.
29	Heater # Failed	1) The # heater connection is incorrect. 2) The re-heating protector is tripped.	1) Make sure the # heater connection is correct. 2) Make sure the fans run normally.

No.	Alarm Information	Possible cause	Elimination method
30	Leak Wire Open	The water leakage detector is not correctly connected.	Inspect if the water leakage detector is loose, in bad contact or broken.

NOTE: If the alarm still exists after the above possible causes are eliminated, please contact your dealer or customer service.

Appendix 1 : Technical Specifications

Model	HCH1CB0	HCH1DB0
Phase/ Frequency/ Input Voltage	3Φ4W + G/50, 60 Hz 380V ± 10%	3Φ4W + G/50, 60 Hz 208V ± 10%
Max. Power Consumption (With/ Without Heaters & Humidifier)	3/10.8 kW**	3 kW
Rated Cooling Capacity *	57.5 kW	
Max. Cooling Capacity ***	70 kW	
Air Volume	3162 l/s, 190 CMM, 6700 SCFM	
Rated Chilled Water Flow Rate	111.2 LPM	
Pressure Drop	110 kPa	
Rated Heating Capacity	10.8 kW	
Rated Humidifying Capacity (Water Conductivity Range)	3 kg/hr (75 ~ 1250 us/cm)	
Drain Pump	Flow rate: 60 l/h Rated vertical lift: 5m	
Control Accuracy	Temperature ± 1°C ; Humidity ± 10% **	
Display	HMI: LCD 64*128 pixels and four LED indicators.	
Max. Return Air Temperature	40°C	
Water Inlet Temperature Range	5 ~ 15°C	
Water Inlet Pressure Range	0.2 ~ 1 MPa, general hard pipe	
Operational Audible Noise	83 dBA@6700 CFM	
Max. Humidifying Water Inlet Pressure	0.8 MPa	
Operating Temperature	4 ~ 40°C (30 ~ 85% RH, non-condensing)	
Storage Temperature	-15 ~ 65°C (0 ~ 95% RH, non-condensing)	
Dimensions (Width x Depth x Height)	600 x 1090 x 2000 mm	
Net Weight	368/375 kg **	

NOTE: 1. Refer to the rating label for the safety rating.
2. All specifications are subject to change without prior notice.

* Testing conditions for rated cooling capacity: return air temperature: 35°C DB/ 19.8°C WB/ chilled water inlet temperature degree: 7.2°C/ chilled water outlet temperature degree: 14.9°C.

** The performances of the optional components for heating and humidification are included. The maximum power consumption is 10.8kW at normal operation and may reach 14kW for special cases.

*** Testing conditions for the maximum cooling capacity: return air temperature 40.6°C DB/ 21.6°C WB/ chilled water inlet temperature: 7.2°C/ chilled water outlet temperature: 16°C.

Appendix 2 : Periodic Inspection/ Maintenance List

Monthly Inspection/ Maintenance List

Date: Model: By:

Environment inspection	
The cooling unit is installed in?	_____
Is it free of dust and surplus moisture?	☐ Yes / ☐ No
Is the cabinet appearance perfect without damage?	☐ Yes / ☐ No
Record the supply air temperature and humidity	_____degree (s) _____ %
Record the chilled water outlet temperature	_____degree (s)
Record the supply air set point	_____degree (s) _____ %
Can the cooling unit reach the set point?	☐ Yes / ☐ No
Internal inspection	
Is there any impurity or foreign matter in the condensed water pan or the drain pump water pan?	☐ Yes / ☐ No
Do the filters function well?	☐ Yes / ☐ Replacement or cleaning is needed
Does the water in the condensed water pipe flow smoothly?	☐ Yes / ☐ No
Do the fans act normally and rotate without interference?	☐ Yes / ☐ No
Does the humidifier act normally?	☐ Yes / ☐ No
Do the heaters act normally?	☐ Yes / ☐ No
Does the drain pump act normally?	☐ Yes / ☐ No
! Be sure to disconnect the input power before making the following inspections.	
Are the electronic joints stable and free of foreign matter?	☐ Yes / ☐ No
Does the input power match the rated value of the cooling unit?	☐ Yes / ☐ No
NOTE: Signature: _____	

Please copy this page for use during the inspection/ maintenance procedures.

Quarterly Inspection/ Maintenance List

Date: Model: By:

Cleaning: Clean the following components and use an air gun if necessary.	
Filters (replace them if necessary)	☐ Completed / ☐ Replaced
Front and rear doors and side panels	☐ Completed
! Be sure to disconnect the input power before cleaning the following components.	
Condensed water pan	☐ Completed
Condensed water pipe	☐ Completed
Coil	☐ Completed
Fans	☐ Completed
Humidifying cylinder	☐ Completed / ☐ Replaced
Heaters	
General inspections	
Is the water supplied by the chiller normal?	☐ Yes / ☐ No
Does the alarm system operate normally?	☐ Yes / ☐ No
Does the unit operate normally in all modes?	☐ Yes / ☐ No
NOTE:	

Signature: _____

Please copy this page for use during the inspection/ maintenance procedures.

Appendix 3 : Glycol Correction Table

Item	Glycol type	Adding proportion**					
		0%	10%	20%	30%	40%	50%
Cooling capacity *	Ethylene	1.00	0.96	0.89	0.81	0.73	0.65
Water-side pressure drop*		1.00	1.04	1.11	1.17	1.25	1.34

NOTE: The correction parameters are based on the correction values under the following working conditions:

Return air temperature: 29.4°C DB/ 18.1°C WB; air volume: 6700CFM; temperature difference of chilled water" 7.2°C; chilled water flow rate: 136LPM.

* Multiply the values read from the unit by the above parameters and the results are taken as the corrected cooling capacity and water-side pressure drop.

** The maximum brine adding proportion of the unit is 50%.

Appendix 4 : Warranty

Seller warrants this product, if used in accordance with all applicable instructions, to be free from original defects in material and workmanship within the warranty period. If the product has any failure problem within the warranty period, Seller will repair or replace the product at its sole discretion according to the failure situation.

This warranty does not apply to normal wear or to damage resulting from improper installation, operation, usage, maintenance or irresistible force (i.e. war, fire, natural disaster, etc.), and this warranty also expressly excludes all incidental and consequential damages.

Maintenance service for a fee is provided for any damage out of the warranty period. If any maintenance is required, please directly contact the supplier or Seller.

WARNING!

The individual user should take care to determine prior to use whether the environment and the load characteristic are suitable, adequate or safe for the installation and the usage of this product. The User Manual must be carefully followed. Seller makes no representation or warranty as to the suitability or fitness of this product for any specific application.

No. : 501322350101
Version : 1.1
Release Date : 2026_11_04

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