



# NUAIRE BLIZZARD ULTRA LOW TEMPERATURE VARIABLE FREQUENCY TOUCHSCREEN FREEZER

**NU-99729VFT**

**SERVICE MANUAL**



**OM0300**

Series A

Revision 2

April 2022



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## Table of Contents

<b>1.0</b>	<b>Features of the Product</b> .....	<b>3</b>
1.1	Main Functions and Features of the Product .....	3
<b>2.0</b>	<b>Product Details</b> .....	<b>3</b>
2.1	Temperature Control .....	3
2.2	Safety Control .....	3
2.3	Refrigeration system .....	3
2.4	Practical design .....	4
2.5	VIP .....	4
2.6	Temperature monitoring function.....	4
2.7	Noise .....	4
<b>3.0</b>	<b>Parts of the Freezer</b> .....	<b>5</b>
3.1	Freezer Overview .....	5
3.2	Inner Door Components .....	6
3.3	Electrical Components .....	8
3.4	System Structure.....	12
<b>4.0</b>	<b>Process Overview</b> .....	<b>14</b>
4.1	Administrator Permission .....	14
4.2	Precautions .....	19
<b>5.0</b>	<b>Technical Parameters</b> .....	<b>20</b>
<b>6.0</b>	<b>Preventive Measures, Product Use and Daily Maintenance</b> .....	<b>21</b>
6.1	Principle of Ultra-Low Temperature Frequency Conversion Refrigeration .....	21
6.2	Use Method of Ultra-Low Temperature Cabinet .....	21
6.3	Working Principle of Pressure Switch .....	22
6.4	Characteristics of Refrigerant .....	22
6.5	Filling Process of Refrigerant .....	22
<b>7.0</b>	<b>Refrigeration Schematic and Wiring Diagram</b> .....	<b>25</b>
7.1	Refrigeration Diagram.....	25
7.2	Wiring Diagram .....	26
<b>8.0</b>	<b>Control System</b> .....	<b>27</b>
8.1	Control of Compressor .....	27
8.2	Control of Fans .....	29
8.3	Battery Control.....	29
8.4	Heating Wire Control .....	31
8.5	USB Data Download .....	31
8.6	Remote Alarm Function .....	31
<b>9.0</b>	<b>Installation and Disassembly Process</b> .....	<b>32</b>
9.1	Installation Location.....	32
9.2	Handling and Removal of Packaging Materials.....	32
9.3	Moving the Unit .....	33
9.4	Removal of Display Cover .....	34
<b>10.0</b>	<b>Troubleshooting and Frequently Asked Questions</b> .....	<b>35</b>
10.1	Problems and Possible Solutions .....	35
10.2	Troubleshooting Table .....	36
10.3	High Alarm Processing Method .....	39
10.4	Low Alarm Processing Method .....	40
<b>11.0</b>	<b>Diagram and Spare Parts List</b> .....	<b>41</b>

## 1.0 Features of the Product

### 1.1 Main Functions and Features of the Product

1. The application range of the ultra-low temperature cabinet is  $-40^{\circ}\text{C}$  to  $-86^{\circ}\text{C}$ .
2. The freezer is designed to balance the internal and external pressure of the cabinet, allowing ease of opening and closing the door.
3. The Microprocessor, 10-inch LCD screen, and the digital display screen can simultaneously display the temperature inside the cabinet, the setting temperature, the ambient temperature, and the input voltage.
4. Users can set high and low temperature alarm, temperature inside the cabinet, ambient temperature alarm, user login, inquiry and download data of temperature curve, event record, alarm record, and running status.
5. Multiple fault alarms (high and low temperature alarm, sensor alarm, condenser dirty alarm, excess ambient temperature alarm, door opening alarm, low battery power alarm, power outage alarm).
6. Two alarm modes (beep alarm, light flashing alarm) and start-up delay protection (start-up delay time can be set by user's requirement).
7. Network functionality as well as an RS-485 data interface to connect to a computer to display the temperature inside the cabinet and the alarm information through the computer, and can control the temperature and monitor whether the equipment is normal.
8. 5V power supply output function, which allows the user to directly supply power to the cold chain module.
9. Remote alarm functions and can connect the alarm to other rooms.
10. The standard USB data storage module supplied with the product can store high and low temperature set, actual temperature, ambient temperature, and voltage inside the cabinet for more than 10 years.
11. The freezer is supplied with 2 standard 25.5mm test ports.
12. Equipped with casters which are flexible, movable, lockable, supported, and can be adjusted as required.
13. Available options include: a chart recorder, network monitoring system, electromagnetic lock, card punching module.
14. The LCD screen comes with Wi-Fi module and can connect wireless network to entry sample library function (optional) to manage sample easily.

## 2.0 Product Details

### 2.1 Temperature Control

Computer controlled, temperature digital display, regulating unit of  $0.1^{\circ}\text{C}$ , and the application temperature range of  $-40$  to  $-86^{\circ}\text{C}$ .

### 2.2 Safety Control

1. Multiple fault alarms (high and low temperature alarm, sensor alarm, condenser dirty alarm, excess ambient temperature alarm, door opening alarm, low battery power alarm, power outage alarm).
2. Two alarm modes (buzzing alarm, light flashing alarm and prompt box alarm), start-up delay protection (start-up delay time can be set by user's requirement).
3. All independent components have safe grounding.

### 2.3 Refrigeration system

1. Intelligent frequency conversion cascade refrigeration technology, imported brand compressor, strong refrigerating capacity, environment-friendly refrigerant, no fluorine, zero emission.
2. High-density insulated combined cabinet body design, made of VIP special thermal insulation material, with good thermal insulation effect.

3. Independent multi-layer sealing structure and thermal insulation system design, which can effectively eliminate frosting phenomenon.
4. Specially designed computer control, which can automatically select the optimal compressor start-stop scheme according to the set temperature and the use environment to reduce the noise and improve the efficiency.

## 2.4 Practical design

1. LCD display screen, which can display the temperature inside the cabinet, set temperature, ambient temperature, input voltage, can set high and low temperature alarm and the temperature inside the cabinet, and have the function of fault prompt and early warning.
2. Adjustable shelf design to facilitate access of goods.
3. Safety door lock, designed with double locks (one padlock and one key built-in lock), to prevent the opening without permission.
4. Integrated innovative handle design and compact caster design, flexible and convenient.
5. With the function of network and remote alarm, advanced and practical.
6. Unique 5V power supply module, which solves the user's trouble in pulling-down the power supply separately and is directly powered by 5V output of the whole machine.

## 2.5 VIP

PU foaming layer + VIP vacuum thermal insulation material is adopted, which reduces the floor area of equipment to the maximum extent at the time of thermal insulation.

## 2.6 Temperature monitoring function

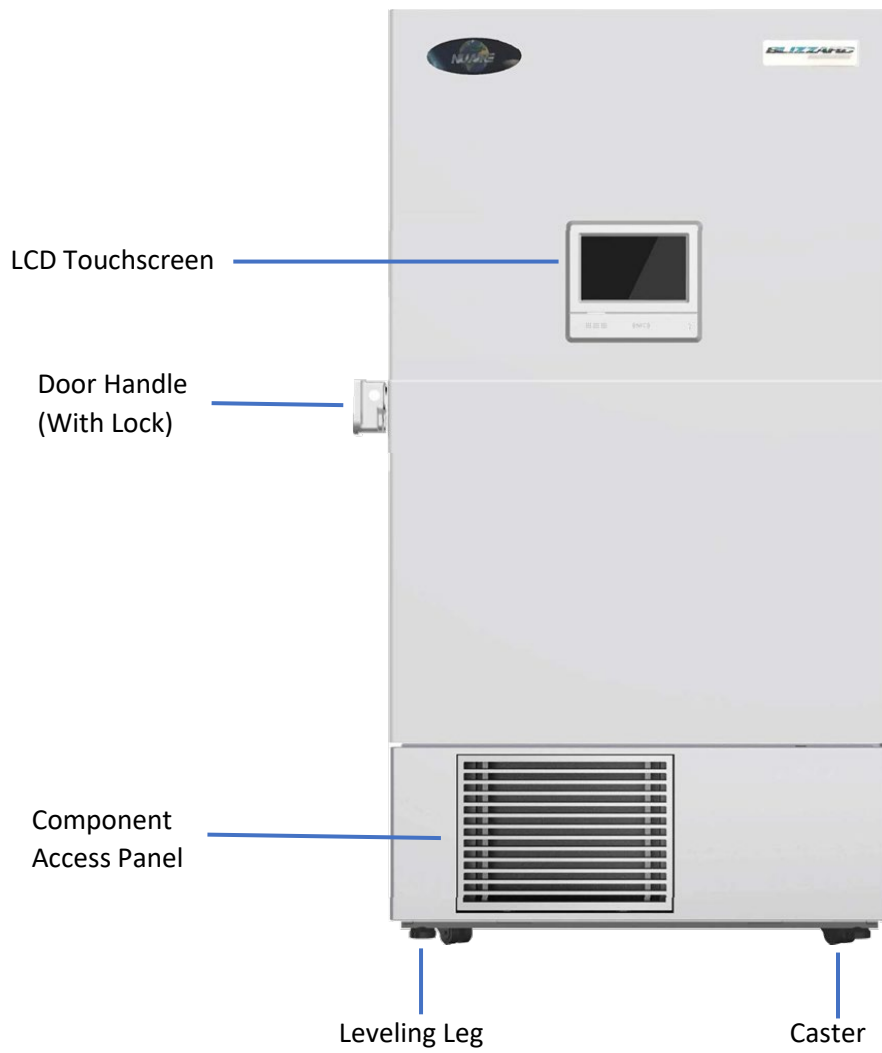
1. The alarm information of the equipment can be sent to the registered mobile phone users in the form of short messages.
2. The actual operating temperature inside the cabinet can be downloaded through the USB data storage module;

## 2.7 Noise

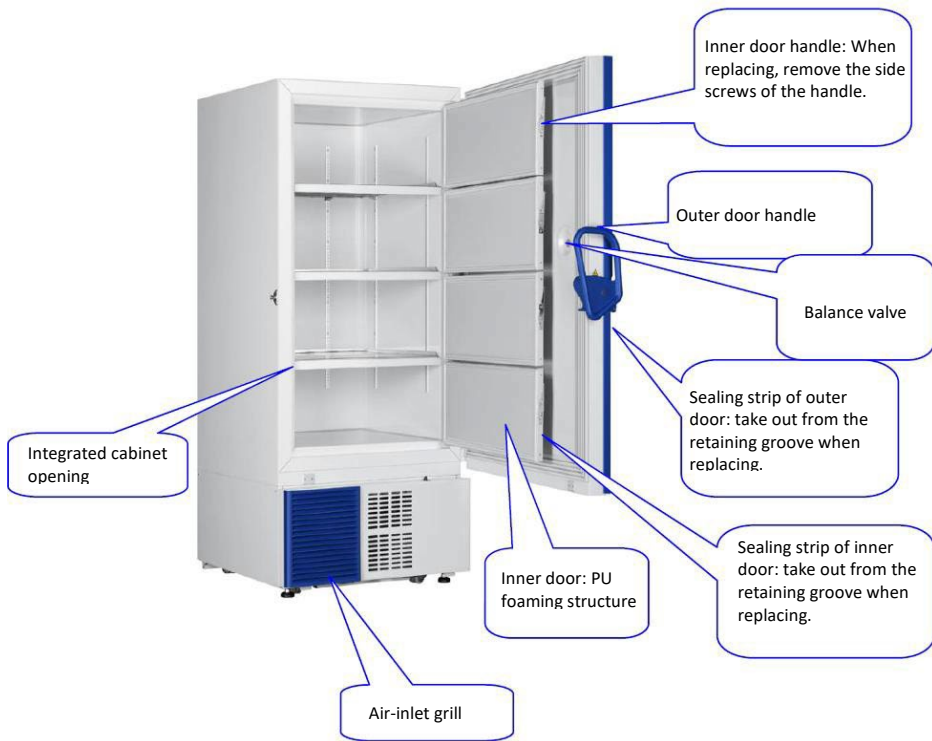
Unique intelligent compressor start-stop control, enabling lower noise, leading in the world and comfortable working environment.

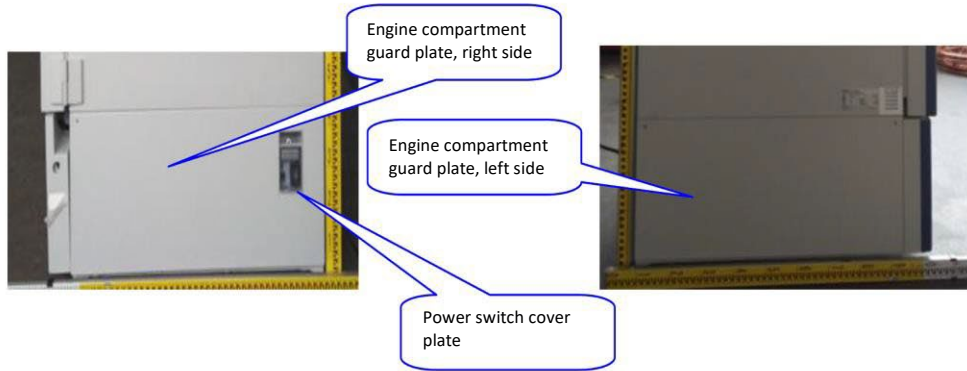
## 3.0 Parts of the Freezer

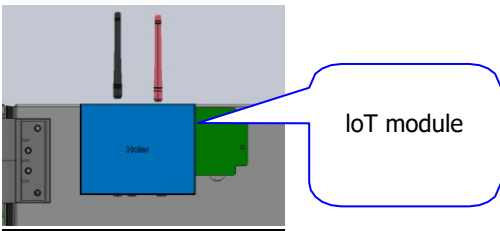
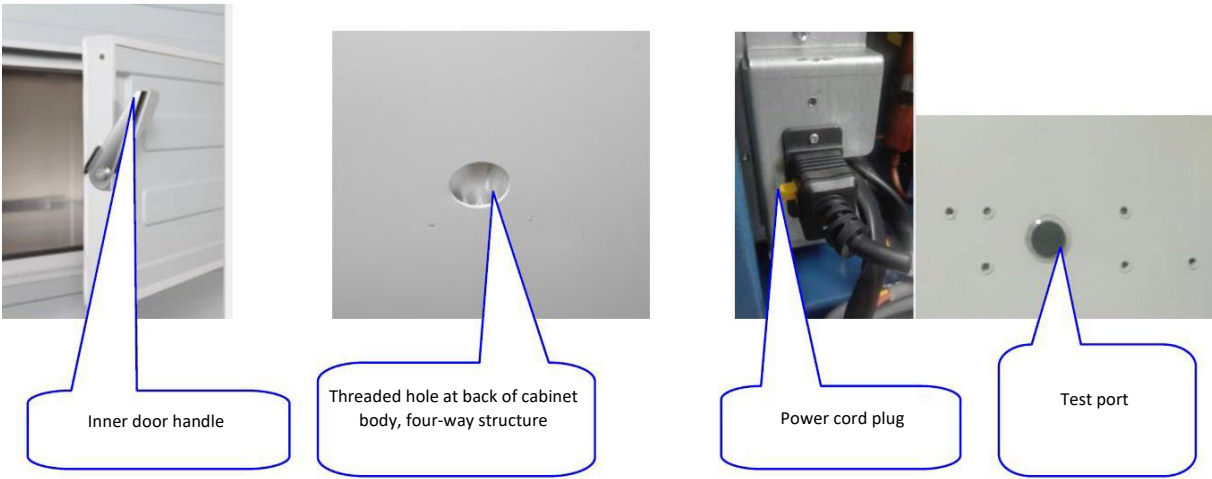
### 3.1 Freezer Overview



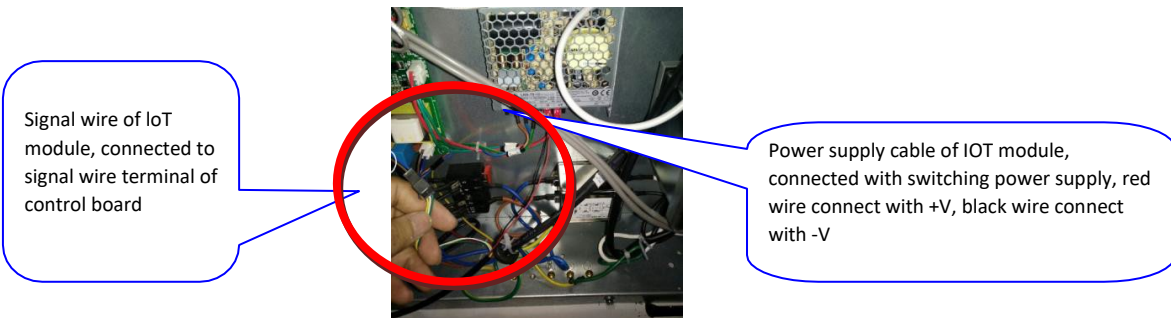
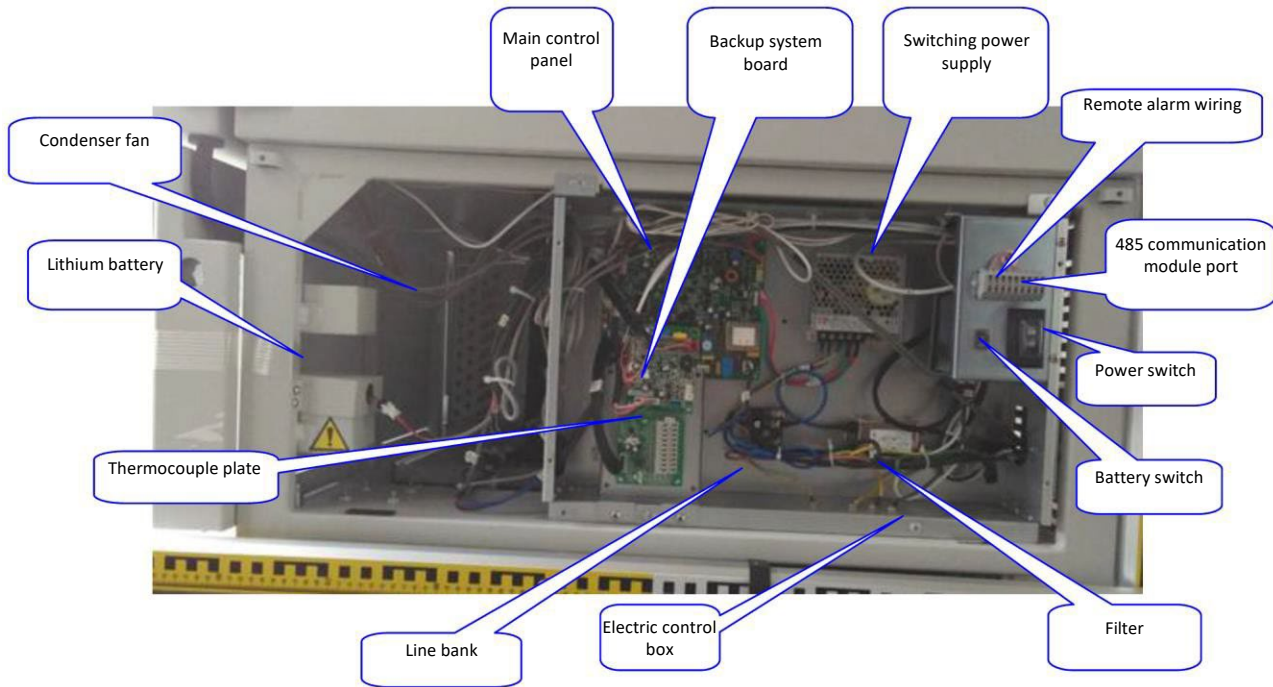
### 3.2 Inner Door Components





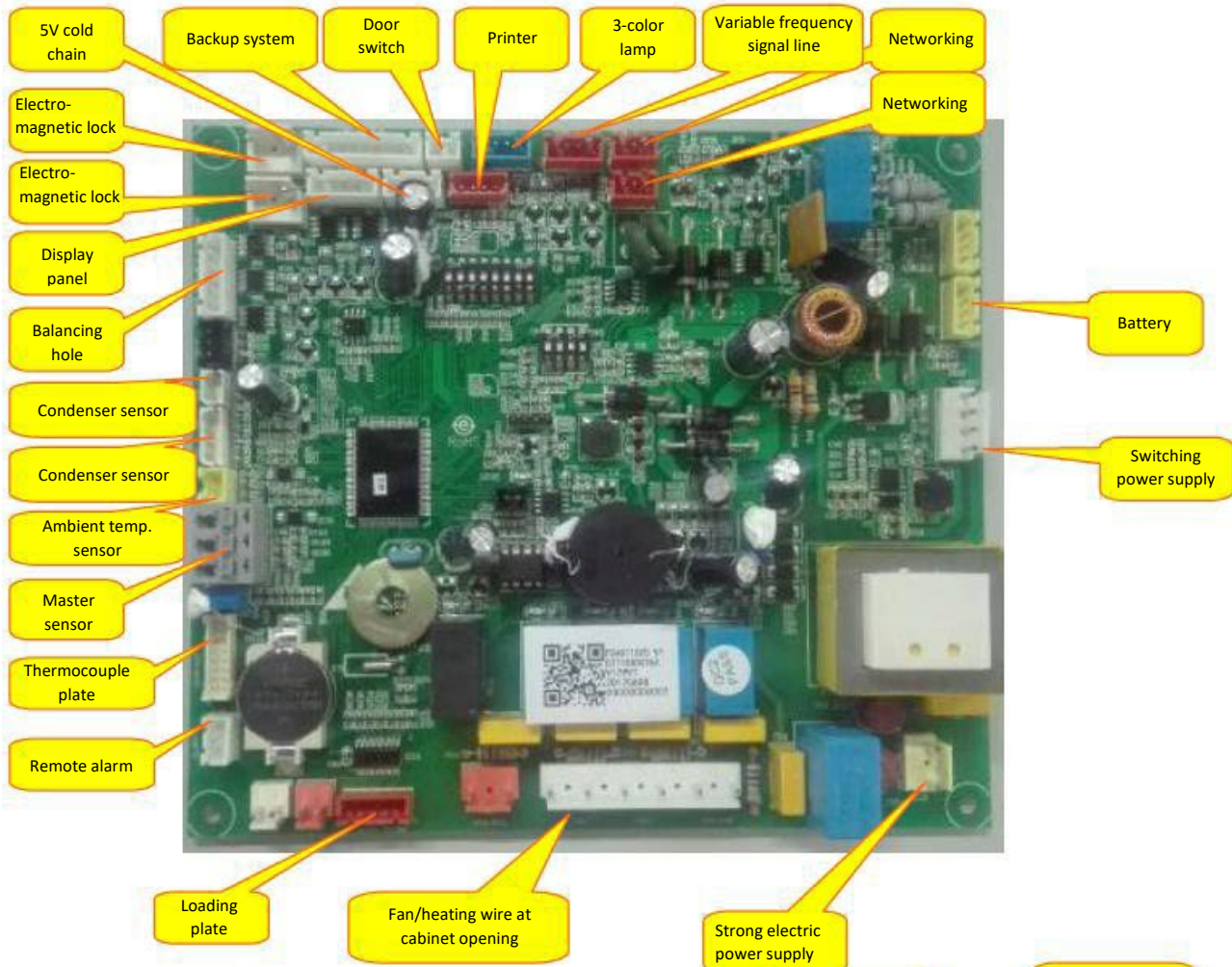


### 3.3 Electrical Components

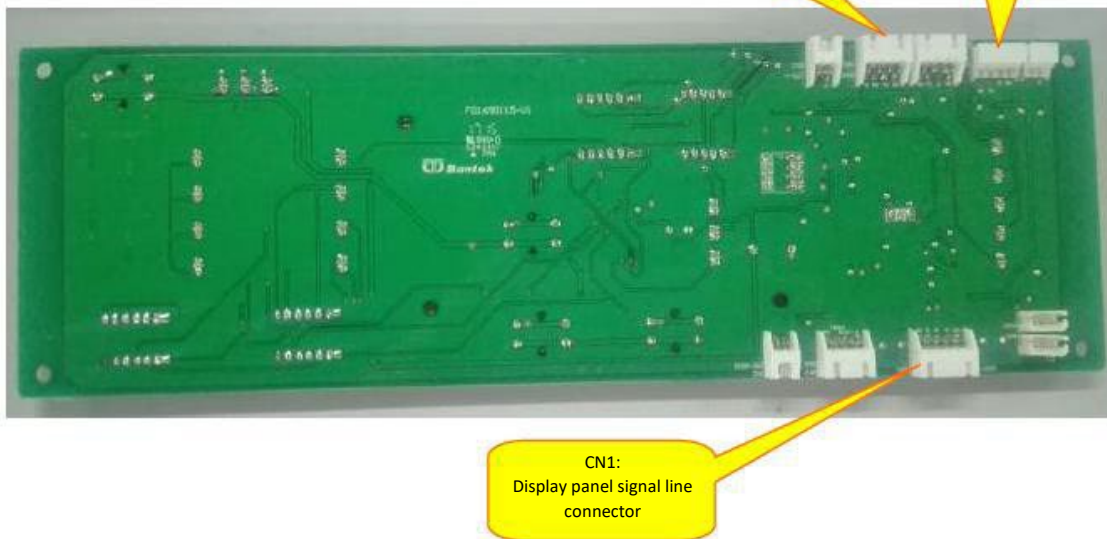




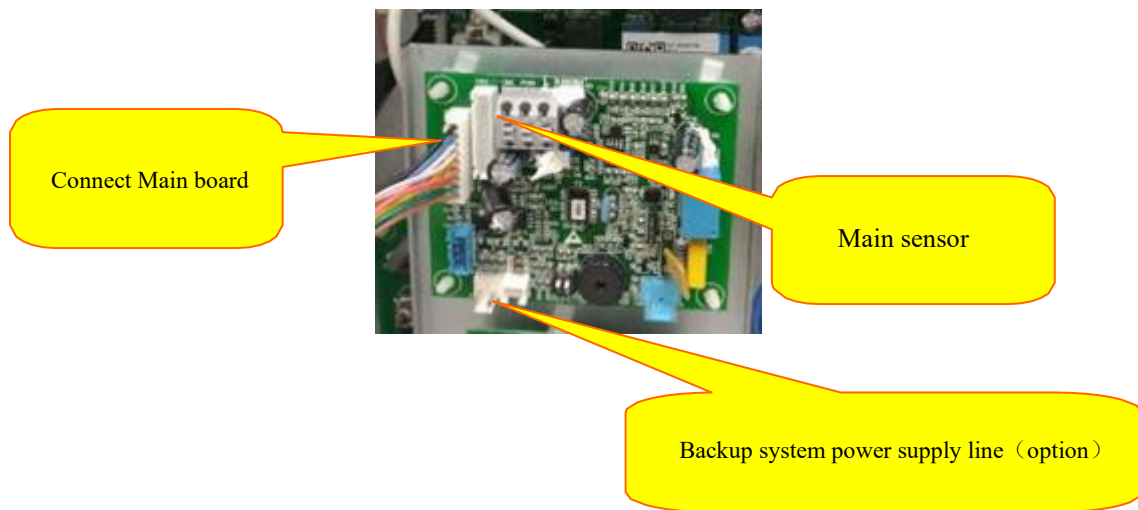
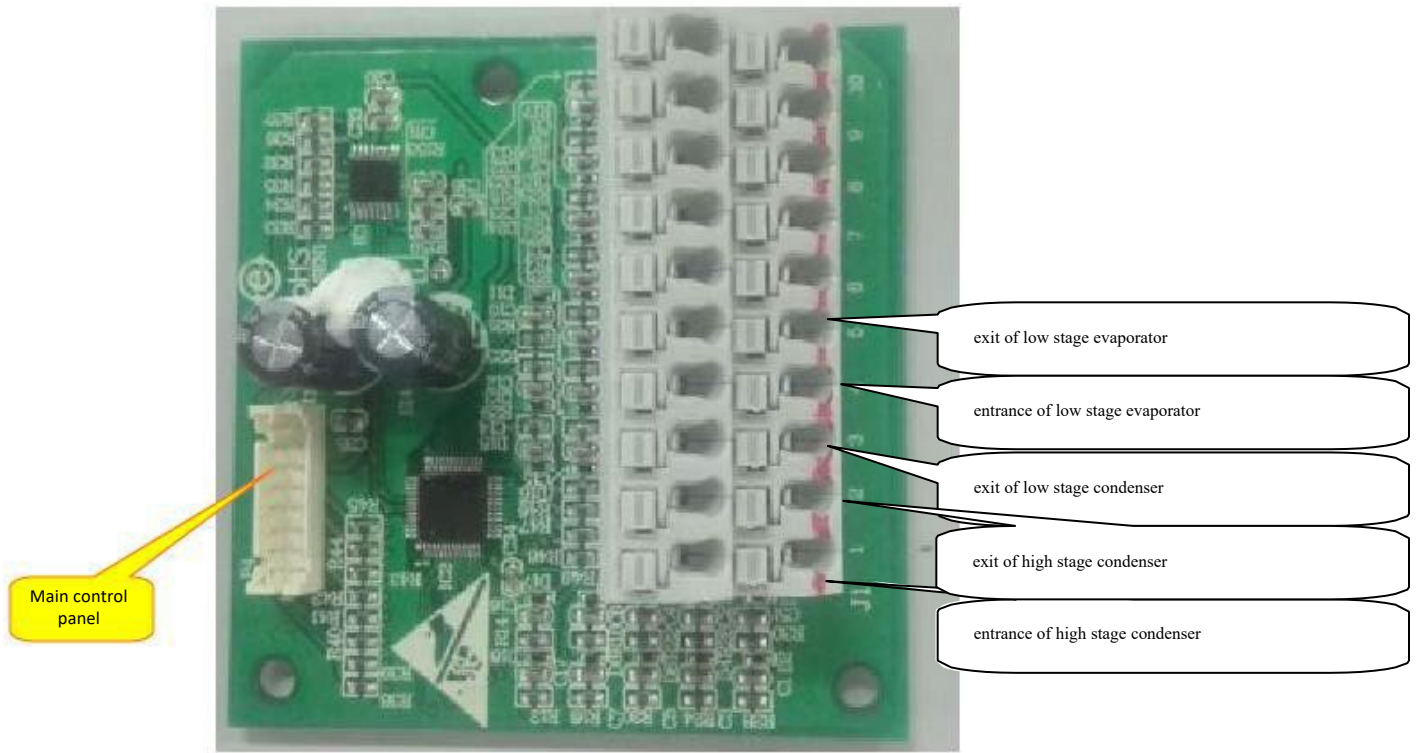
# Main Control Panel

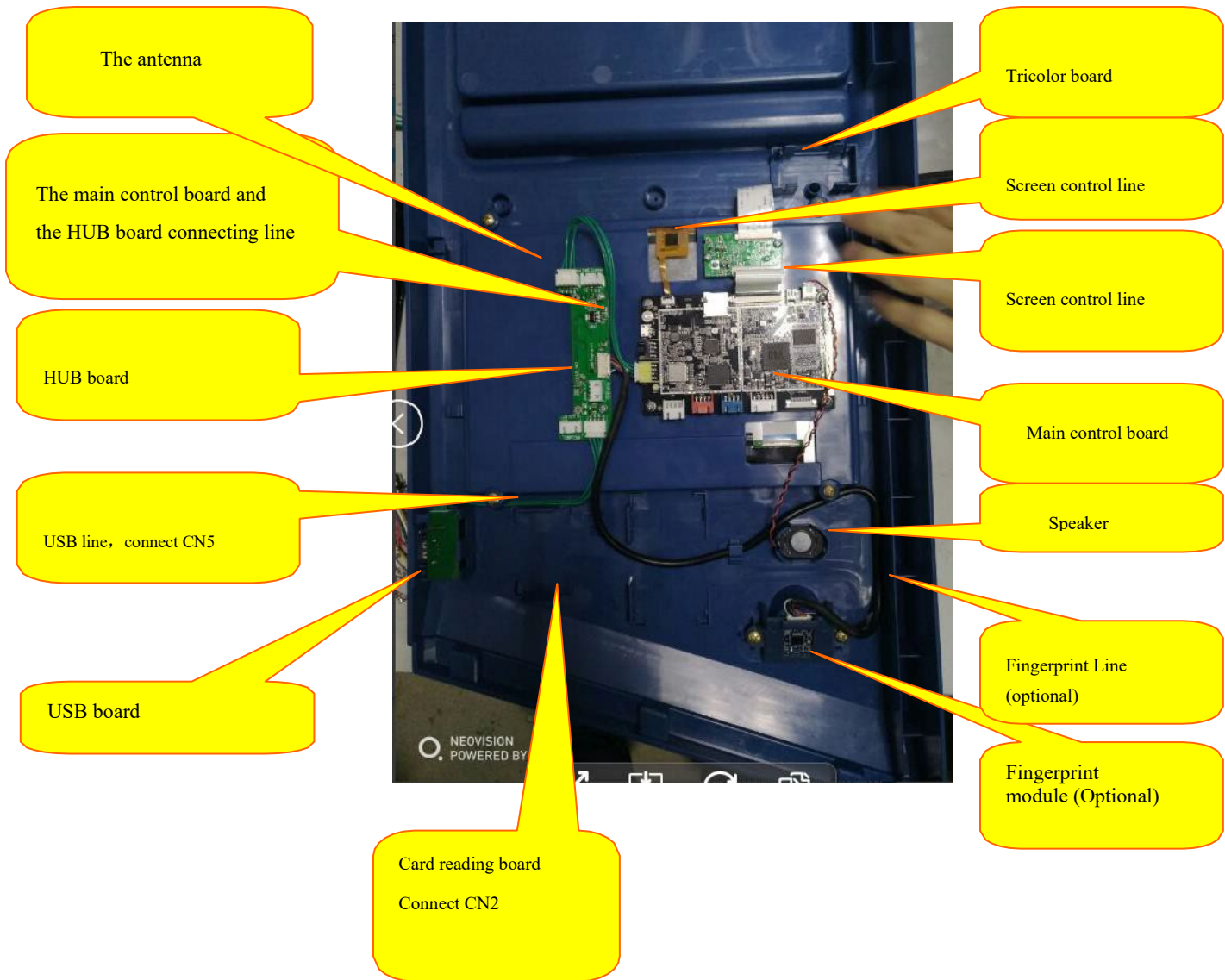


# Display Panel

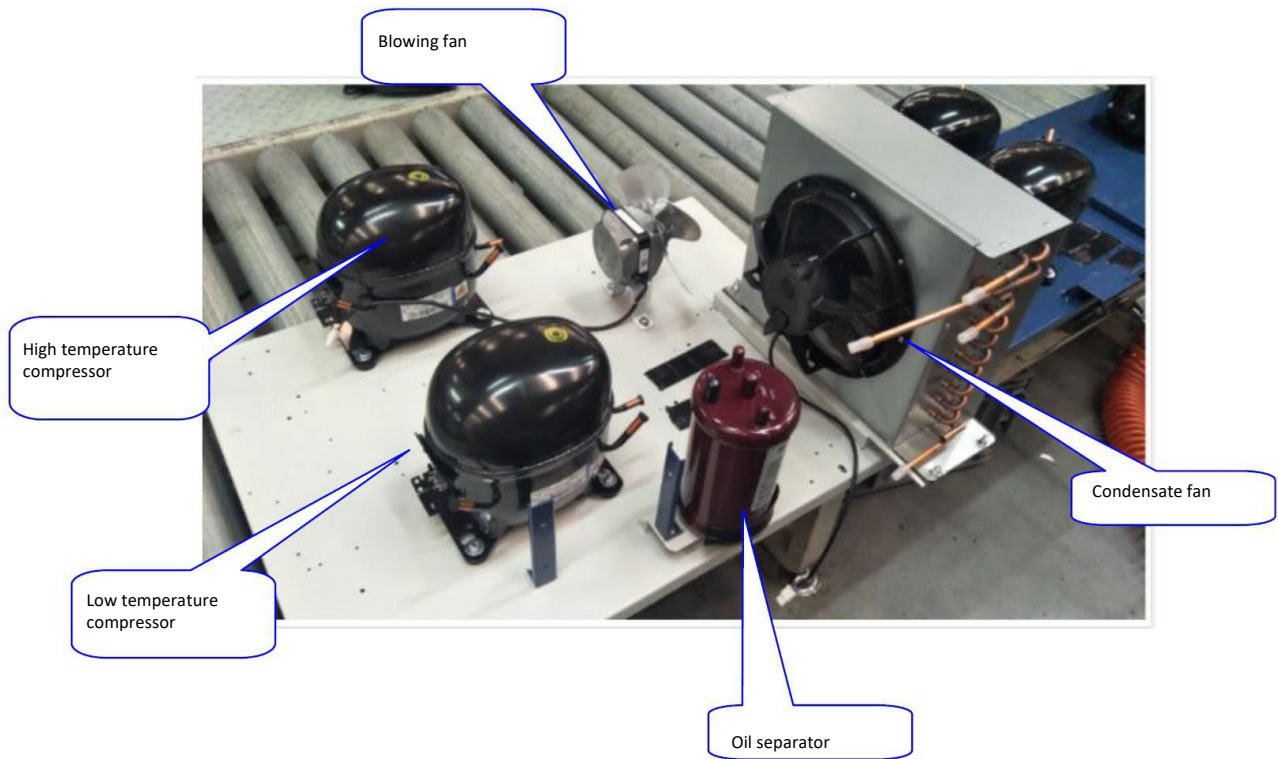
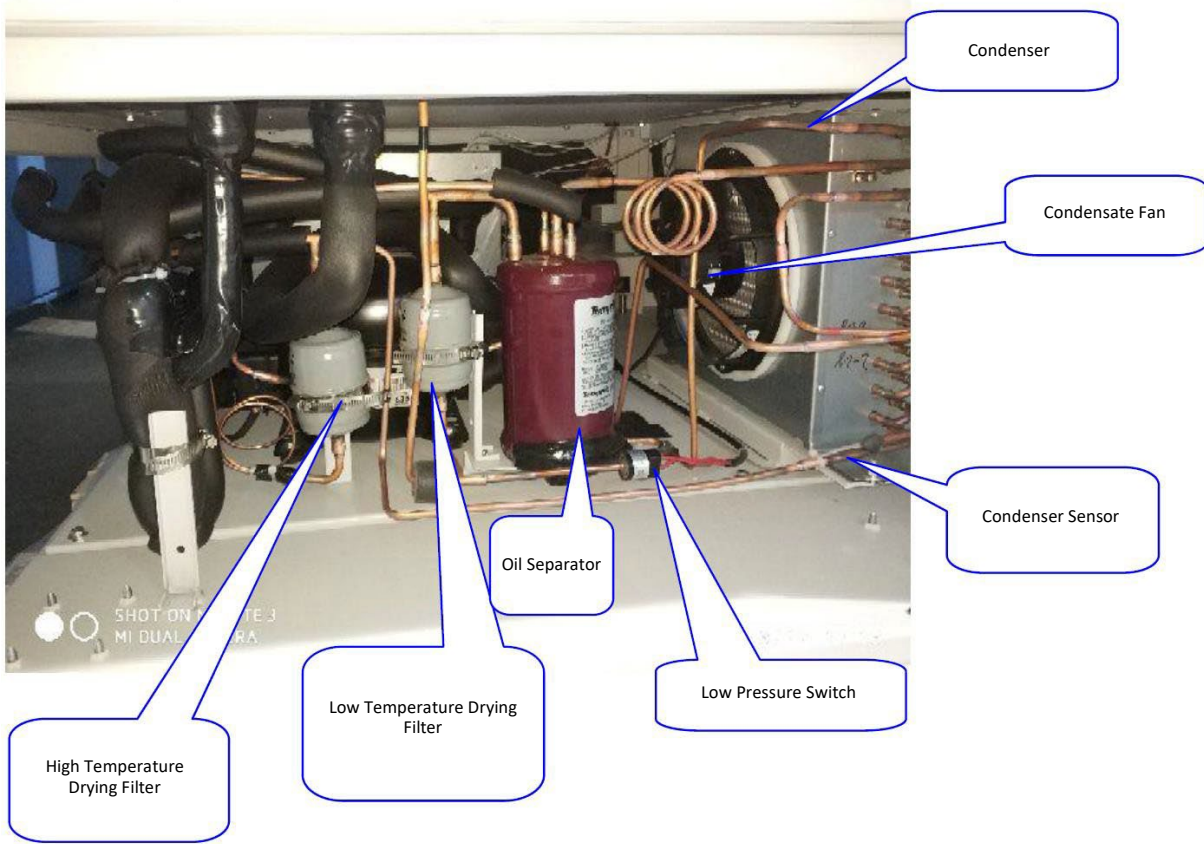


# Thermocouple Board





### 3.4 System Structure

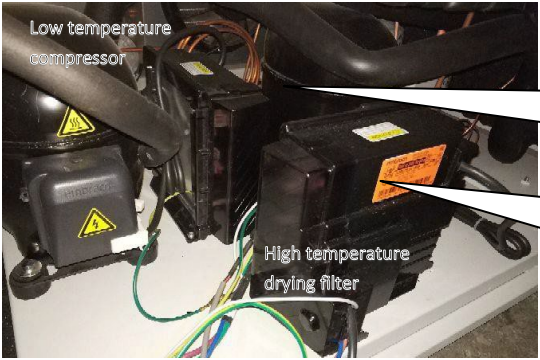
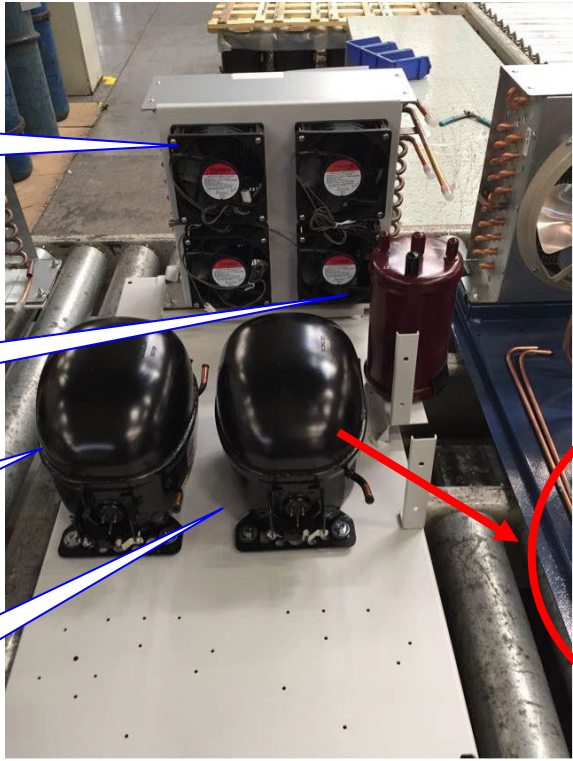


4 wide-voltage condensate fan

Oil Separator

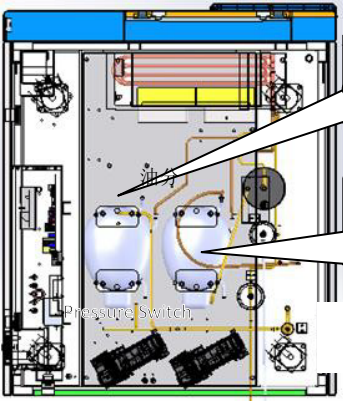
High temperature

Low temperature



High-temperature inverter

Low-temperature inverter



冷凝器传感器  
High temperature

Low-temperature inverter

The long line of frequency converter signal line connects to the low-temperature frequency converter, with the short-line connected to high-temperature frequency converter

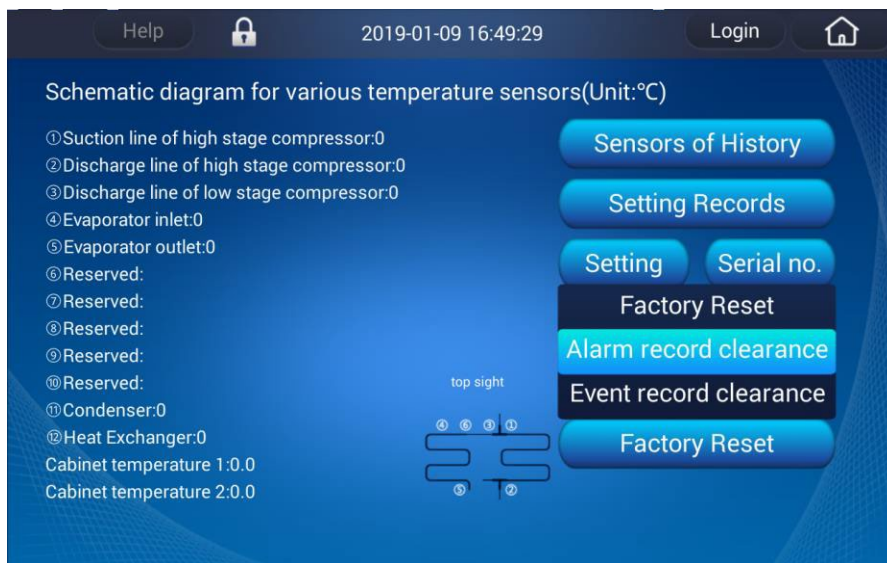
## 4.0 Process Overview

### 4.1 Administrator Permission

Entry method: press “login”, input password **8888888888** to enter the administrator interface.

Connect the thermocouple sensor to the corresponding position on thermocouple board in electrical box,

- ① Suction line of high stage compressor: corresponding position is No.1 on thermocouple board, it states temperature of this thermocouple sensor, help to look up cause when fault repair.
- ①-⑤ is for frequency conversion models
- ⑦-⑧ is for dual system models.



#### [Sensors of History]

The screenshot shows the 'Sensors of History' interface. At the top, there is a navigation bar with 'Help', a lock icon, the date and time '2019-01-09 16:39:42', a back arrow, and a home icon. Below the navigation bar, there is a table with the following columns: High stage inlet, High stage outlet, Low stage outlet, Evaporator inlet, Evaporator outlet, Level-L capillary inlet, Condenser, Heat exchanger, Ambient, and Voltage. The table contains several rows of data, each representing a timestamped record. At the bottom of the interface, there are buttons for 'Start time', 'End time', 'Inquiry', and 'Download'.

High stage inlet	High stage outlet	Low stage outlet	Evaporator inlet	Evaporator outlet	Level-L capillary inlet	Condenser	Heat exchanger	Ambient	Voltage
-36	-36	-36	-36	-36	0	9	-22	9	221
2019-01-09 13:34:35									
-36	-36	-36	-36	-36	0	10	-29	10	224
2019-01-09 13:28:35									
-36	-36	-36	-36	-36	0	12	-34	10	220
2019-01-09 13:22:35									
-36	-36	-36	-36	-36	0	8	-23	9	222
2019-01-09 13:16:35									
-36	-36	-36	-36	-36	0	13	-29	10	220
2019-01-09 13:10:35									
-36	-36	-36	-36	-36	0	12	-35	10	220
2019-01-09 13:04:35									

Input start time and end time, press “inquiry” to view temperature record of all sensors in this period time; press “download” to download temperature data. If press download without inputting time period, it will download temperature data for all time period.

## [Setting Records]



Input start time and end time, press “inquiry” to view setting records in this period time, press “download” to download setting record data. If press download without inputting time period, it will download setting record data for all time period.

## [Setting]



Model: the model information for this unit, system self-determination

**Temperature calibration of tank:** when real measured temperature of tank deviates from temperature displayed on display panel, calibrate sensor temperature of tank, default value is 0, adjust range is -10°C ~ 10°C, displayed temperature doesn't change after calibration. Example : -80°C is displayed on the machine, but the user measures that the temperature in the freezer is just -78°C, In order to lessen the difference, the temperature deviation can be adjusted by +2°C. Thus, the -78°C is displayed.

**Calibration of ambient temp:** when displayed ambient temperature deviates from real measured ambient temperature, calibrate the display panel value, default value is 0, adjust range is -10°C~10°C, displayed ambient temperature changes after calibration. Example : 30°C is displayed on the machine, but the user measures that the ambient temperature is 35°C, In order to lessen the difference, the temperature deviation can be adjusted by +5°C. Thus, the 35°C is displayed.

**Calibration if voltage:** when displayed voltage value deviates from real measured voltage value, calibrate the display panel value, default value is 0, adjust range is -9V~9V, displayed value changes after calibration.  
Example: 215V is displayed on the machine, but the user measures that the voltage is 220V, in order to lessen the difference, the voltage deviation can be adjusted by +5°C. Thus, 220V is displayed.

**Temperature recording interval:** Temperature recording interval of U disk, default value is 6min, adjustable range is 1~30min

**Backup system temperature calibration:** When the temperature value of backup system PT100 sensor deviates from temperature value of main control board PT100 sensor, calibrate the backup system PT100 sensor value, default value is 0, adjust range is -10°C~10°C, temperature value of backup system sensor changes after calibration.

**Sample library function:** To use this program, first must enable sample library function  
**Fingerprint function:** To use fingerprint lock (optional), first enable fingerprint function, or it displays fingerprint is not available when pressing the screen.

**Card reading function (Optional):** To use solenoid lock, first must enable card reading function, or it displays card is not available when press the screen.

#### [Next Page]



This page displays compressor protection temperature, compressor run time and design life expectancy, fan motor run time and design life expectancy, reference only for maintenance.



### [Input serial no.]

To replace display panel, input the serial no. to produce bar code, in order to use a scanning gun and serial no. inquiry operation.



**Shielding function:** if select one fault shielding and save, when this alarm occurs, it will not display on the screen.



Ambient temperature alarm shielding – shield the ambient temperature alarm

Condenser sensor error shielding - shield the condenser sensor error

Cabinet main sensor error shielding - shield the cabinet main sensor error

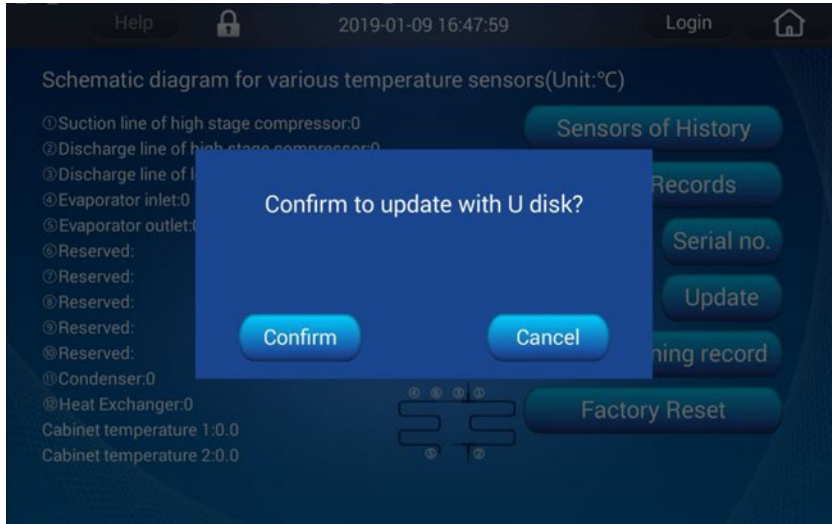
Heat exchange sensor error shielding - shield the heat exchange sensor error

Backup control sensor error shielding - shield the backup control sensor error

Battery disconnected error shielding - shield the battery disconnected error

### [Update]

Press “update” to update program with U disk



### [Alarm record]

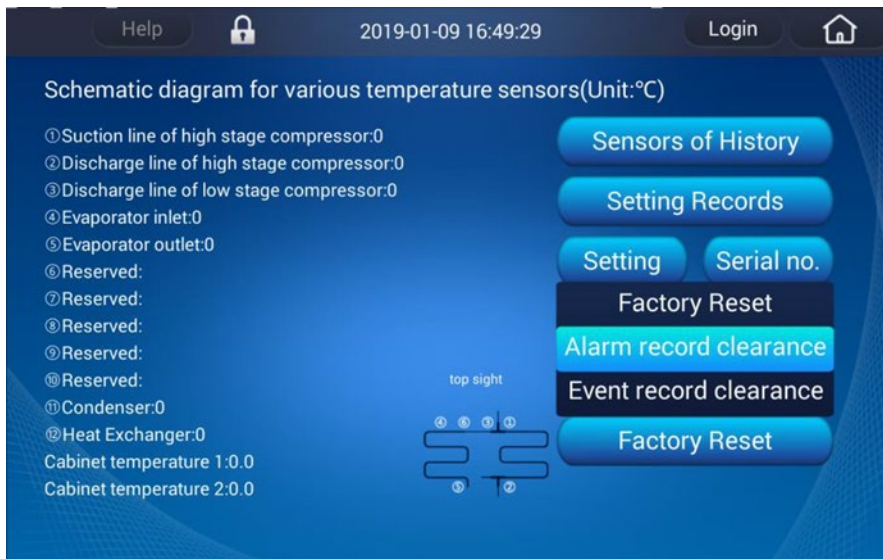
View and delete alarm record, can delete individual record, or delete all records

### [Factory reset]

**Factory reset:** Clear all data and factory reset

**Alarm record clearance:** wipe all alarm record, can't recover

**Event record clearance:** wipe all event record, can't recover



## 4.2 Precautions

1. After the first installation or moving of the equipment, rotate the horizontal support clockwise to support and fix the storage box on the ground, and then power on the freezer and use it 24h after its installation and fixing.
2. Room temperature should be kept below 28 °C, as cooling efficiency rapidly decreases when the ambient temperature is higher than 32 °C. If the ambient temperature is higher than 32 °C for an extensive amount of time, it will likely damage or reduce service life of the compressor; therefore, it is recommended to install air conditioning in the usage environment of the freezer.
3. A single equipment shall use a separate socket, and the power socket shall be able to withstand the current of over 16A and reliably grounded.
4. First, turn on the battery switch on the machine electric cabinet when powering on, and power off the switch if it is necessary to shut down for a long time.
5. The door of cryogenic refrigerator shall be opened for not more than 1 minute each time, and any water on the door seal shall be wiped clean before closing the door to ensure proper sealing effect.
6. To extend the lifetime and reduce the energy of the equipment, provided that the safety of storage items is ensured, it is suggested that the freezer temperature is appropriately to be set within the range of -50°C ~ -80°C.
7. The equipment is used to store articles at low temperature and should not be used as a quick-freezing box, so it should not force it to quickly freeze large quantities of hot items or large-volume liquid items.
8. If the equipment cannot refrigerate after power on for 2~3 hours, please disconnect the power supply and contact with the local after-sales service provider as soon as possible.
9. When an alarm fault or other faults occurs, please read the instruction book, and remove the fault according to the prompts on the display screen. Do not dismantle the equipment without approval if there are no prompts or the fault cannot be removed. Please contact with the local after-sales service provider to send professional maintenance personnel to remove it.

## 5.0 Technical Parameters

Model	NU-99729VFT
<b>Technical Parameters</b>	
Orientation	Vertical
Climate type	N
Control mode	Microcomputer control
Display	LED display (minimum display accuracy 0.1°C)
Temperature sensor	PT100
<b>Basic Parameters</b>	
Volume (L)	729
Voltage Frequency (V/Hz)	100~230/50/60
Power (W)	460
Current (Stable) (A)	7 (4.6)
Internal dimensions (W*D*H)	766*716*1310 (mm)
External dimensions (W*D*H)	1046*998*1980 (mm)
Net Weight/ Gross Weight (kg)	350/385
<b>Materials of Construction</b>	
Outer Material	Electric plated zinc
Internal Material	Electric plated zinc
Insulation	VIP + fluoride-free PU foam
Door Thickness	90mm
Box Thickness	90mm
Outer Door Sealing Material	Four-layer silica gel sealing strip
Inner Door Sealing Material	Independent inner door single-layer silica gel sealing strip
Door lock	Y/1
<b>Product Accessories</b>	
Number of separating plates/ inner doors	3 / 4
Size of separator (W x D)	752 x 650
Castor/ Test Holes	4 / 2
Compressor Brand and Type	Fully closed /SECOP/2
Compressor	NLV12.6CN
Refrigerant Type	HC-Free/R290/R170

## 6.0 Preventive Measures, Product Use and Daily Maintenance

### 6.1 Principle of Ultra-Low Temperature Frequency Conversion Refrigeration

The low-temperature refrigerator adopts a cascade refrigeration system which is usually composed of two or more refrigeration systems, referred to as high-temperature level and low-temperature level respectively. The high temperature level uses the medium-temperature refrigerant and the low-temperature level uses the low-temperature refrigerant, each of them is a complete refrigeration system; these two parts are contacted by a condensing evaporator, so such evaporator is a high-temperature level evaporator and a low-temperature level condenser. The low temperature refrigerant absorbs heat of the cooled object in the evaporator of the low-temperature level system and transfers such heat to the refrigerant of the high temperature level system by means of a condensing evaporator, and then such heat is transferred to the cooling medium in the high-temperature level condenser by the refrigerant of the high-temperature level system.

It is designed with double compressor cascade refrigeration system using the technology of variable frequency compressor, so the system is more reliable. According to the temperature requirement of the box, the rotating speed of the compressor is automatically adjusted, to adjust the refrigerating capacity of the system. The temperature fluctuation inside the box is smaller, reaching better uniformity. In the stable operation stage, low-speed refrigerating capacity is used, so that the noise is lower, and the power consumption is lower. After opening the door, it is automatically changed to high rotating speed to provide large refrigerating capacity, so that the temperature inside the box is quickly restored to the temperature before opening door

### 6.2 Use Method of Ultra-Low Temperature Cabinet

#### *Use method:*

When the ultra-low temperature cabinet is used for the first time, or the ultra-low temperature cabinet is transported, or the ultra-low temperature cabinet is powered off (including power failure) for more than 10 hours, it is necessary to test the machine before using (or before powering on and reusing). The test is qualified and confirmed.

#### *Use method of low temperature cabinet:*

- 1). The refrigerator must be allowed to stand for at least 24 hours before powering on.
- 2). Make the cabinet empty and do not put any articles in it, power on to start the refrigerator, then cool the refrigerator to  $-40\text{ }^{\circ}\text{C}$  in stages, then drop to  $-60\text{ }^{\circ}\text{C}$  after normal start-stop; adjust to  $-80\text{ }^{\circ}$  after 8 hours of normal start-up and observe the refrigerator when it is normally opened for more than 24 hours. It is proved that the performance of the refrigerator is normal.
- 3). After confirming that the refrigerator is normal by operation 2, the items can be stored in the refrigerator. In principle, items of  $-60\text{ }^{\circ}\text{C}$  shall be stored, not exceeding 1/3 cabinet capacity.
- 4). Forbidden matters: all low-temperature storage tanks are of low-temperature storage equipment and used for storing low-temperature articles and cannot store high-freezing high-temperature plasma products; in addition, it is strictly forbidden to put too much relatively hot items, so that the compressor cannot stop for a long time, the temperature does not drop, the compressor is easily burnt, and the items in the tank will be damaged. The items must be put in batches, and the temperature shall be reduced in steps until the required low temperature is reached.

### 6.3 Working Principle of Pressure Switch

- A. Principle: When the pressure in middle of the pipeline at the pressure switch exceeds 2.1MPa, the contact is disconnected and the low temperature cabinet stops, the pressure starts to drop; when the pressure drops to 1.35MPa, the contact is connected and the low-temperature cabinet is started; and when the pressure exceeds 2.1MPa again, the contact is disconnected again, repeating in such way in sequence.
- B. Precautions: When the pressure switch is burnt, place the wet towel on it to keep the temperature not higher than 100 degrees. This pressure switch parameter is not adjustable.
- C. Parameter: Voltage 220V, 50Hz, Contact Capacity 6A

### 6.4 Characteristics of Refrigerant

1. The refrigerant is a mixed working medium, flammable and explosive; so the filling site shall be ventilated; and once the refrigerant is leaked, the igniting or sparking is not allowed nearby. The problem of the refrigerating system shall be determined and report back by the local after-sales service personnel who will then be instructed by the technical personnel of the medical department according to the specific circumstances.
2. Refrigerant code (frequency conversion): R290 for high temperature level, and R170 for low temperature level.

### 6.5 Filling Process of Refrigerant

1. Preparations
  - a. Refrigerant (R290, R170)
  - b. Hanson valve
  - c. Standard electronic scale (error  $\leq \pm 2g$ )
  - d. Vacuum pump ( $\geq 4L$ )
  - e. Pressure gauge (high voltage and low pressure can be read at the same time) as shown in Figure 1
2. Opening the system
  - a. Cut apart the fault system from the end of the process pipe by pipe vice, and drain off the refrigerant in the system.
  - b. Weld the opened pipeline and the pressure gauge within 20 minutes of the opening of the system.

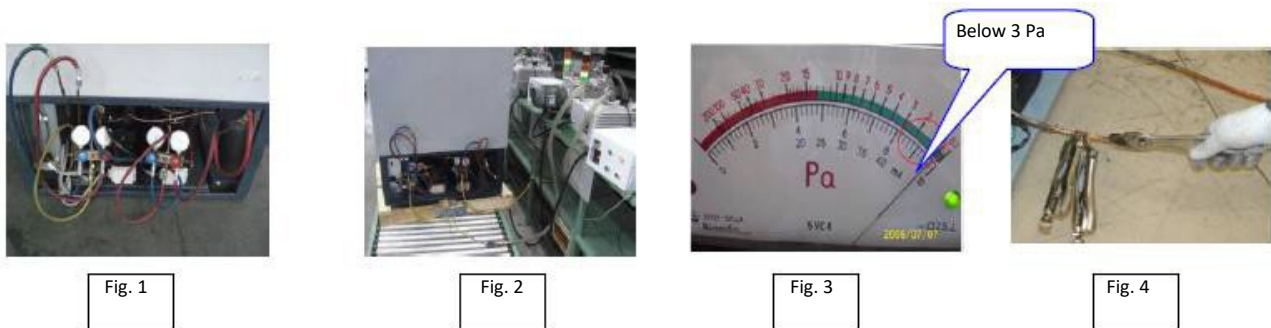
#### [Precautions]

- The humidity in the maintenance workshop shall not be too large; in case of rainy days, it is prohibited to open the system, and the pipelines of machine of which the system has been opened shall be immediately welded.
  - Because the machine has higher requirement for the water in the system, when the machine pipeline is open, the pipe junctions shall be sealed at once with adhesive tape to prevent the air from entering the system, and all opened pipelines shall be welded in 20 minutes.
3. Pumping the vacuum
    - a. Connect the joint of vacuum pump to the common joint in the middle of the pressure gauge, see Figure 2
    - b. Open the vacuum pump to vacuumize, require the vacuum degree to be less than and equal to 3Pa, and the vacuumizing time can refer to the precautions attached below. See Fig. 3
    - c. When the requirement of vacuum degree is reached, the high-pressure vacuumizing is stopped firstly, and the high-temperature filling pipe is welded and sealed quickly (because the pressure of the refrigerant is too high when the machine is refrigerating, it is difficult to be sealed), and the vacuumizing is continued under low pressure. See Fig. 4

- d. After the low pressure is evacuated for an hour, the pressure gauge valve is closed, at which time the machine is required to remain in the negative pressure state for more than one hour to check whether the machine system is in a vacuum state, or observe if the pressure gauge has recovered during this period; otherwise, the vacuumizing is conducted for more than one hour and then it should continue to be kept under the negative pressure state for one hour or more, under which the vacuumizing is carried out until the pressure does not recover, then the filling can be conducted.

[Precautions]

- The vacuum pumps of over 4L must be pumped for more than 12 hours



4. Filling the Refrigerant

- a. When filling at high temperature, the machine shall be stopped before filling R290 refrigerant, and the filling amount shall be subject to the following table.

[Precautions]

- In order to ensure that the refrigerant is filled in place at one time, the cylinder shall be inverted to be filled with the liquid when filling the above refrigerant, as shown in Fig. 5.
- b. When filling at low temperature, the machine shall also be stopped before filling R170 refrigerant, and R170 refrigerant pressure is higher. The filling amount shall be subject to the following table!
- c. The filling process pipe shall be sealed after filling, with the sealing effect as shown in Fig.6

[Precautions]

- Low temperature level filling amount must be accurate, because the slight difference will affect the refrigeration effect.
- R170 refrigerant pressure is high, the refrigerant in the cylinder is relatively less, so the steel cylinder valve is slowly opened at the time of filling, so as to avoid the waste of refrigerant.
- R170 refrigerant pressure is too high, and the general steel cylinder cannot withstand high pressure, so the oxygen cylinder is used to contain R170 refrigerant. When using, it is necessary to block the outlet below the steel cylinder to prevent the leakage of the refrigerant and fill the refrigerant from the upper outlet; when filling the refrigerant as stated above, the steel cylinder can be upright for filling gas.
- In order to ensure the accuracy of refrigerant filling, all refrigerant must be weighed with electronic scales before filling.
- The evacuation and refrigerant filling are not performed in accordance with the above requirements so that the machine has a poor refrigerating effect or does not refrigerate and is required to be replaced; in such case, once verified by the head office, the expenses twice as the maintenance costs of the machine will be claimed if re-repair is required, and the branch shall pay for any return and replacement of the machine.

- The requirements for quantity accuracy (g) of the refrigerant filling of the ultra-low temperature cabinet product system is very strict, so the branch must prepare a standard electronic scale with an error of 2g before maintenance.



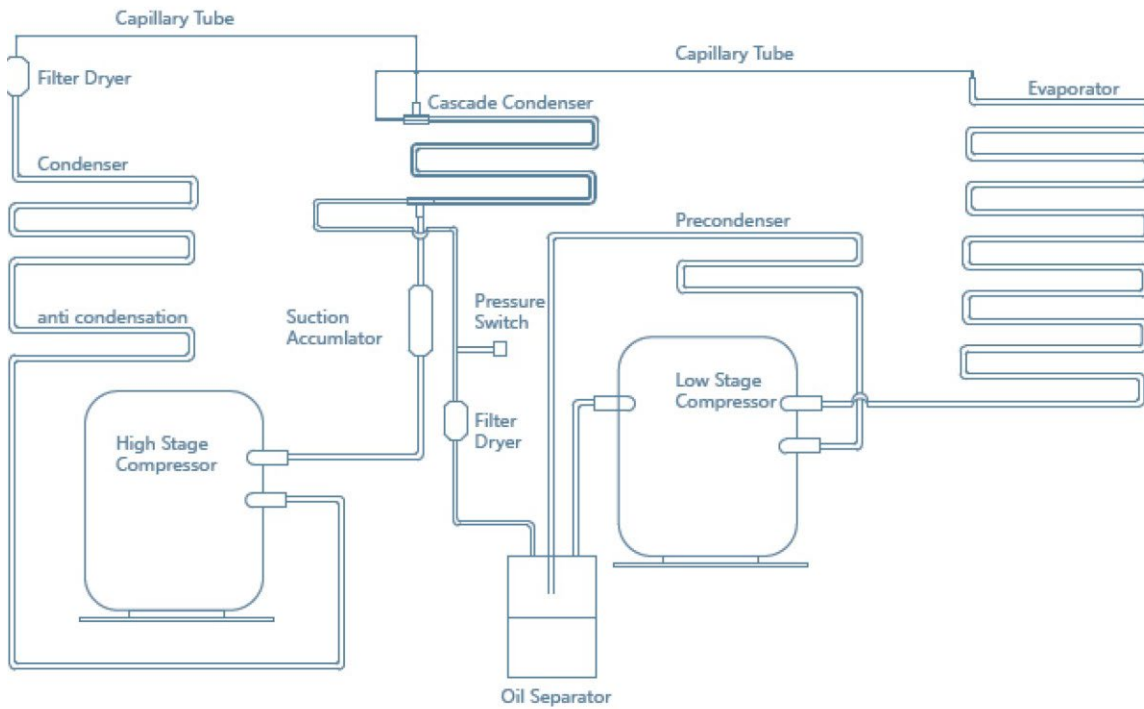
Fig. 6

<b>Filling Amount of Refrigerant</b>		
Model	Refrigerant (type/ quantity)	Refrigerant (type/ quantity) 2
	High temperature level (g)	Low temperature level (g)
	R290	R170
DW-86L729BPT	140	110



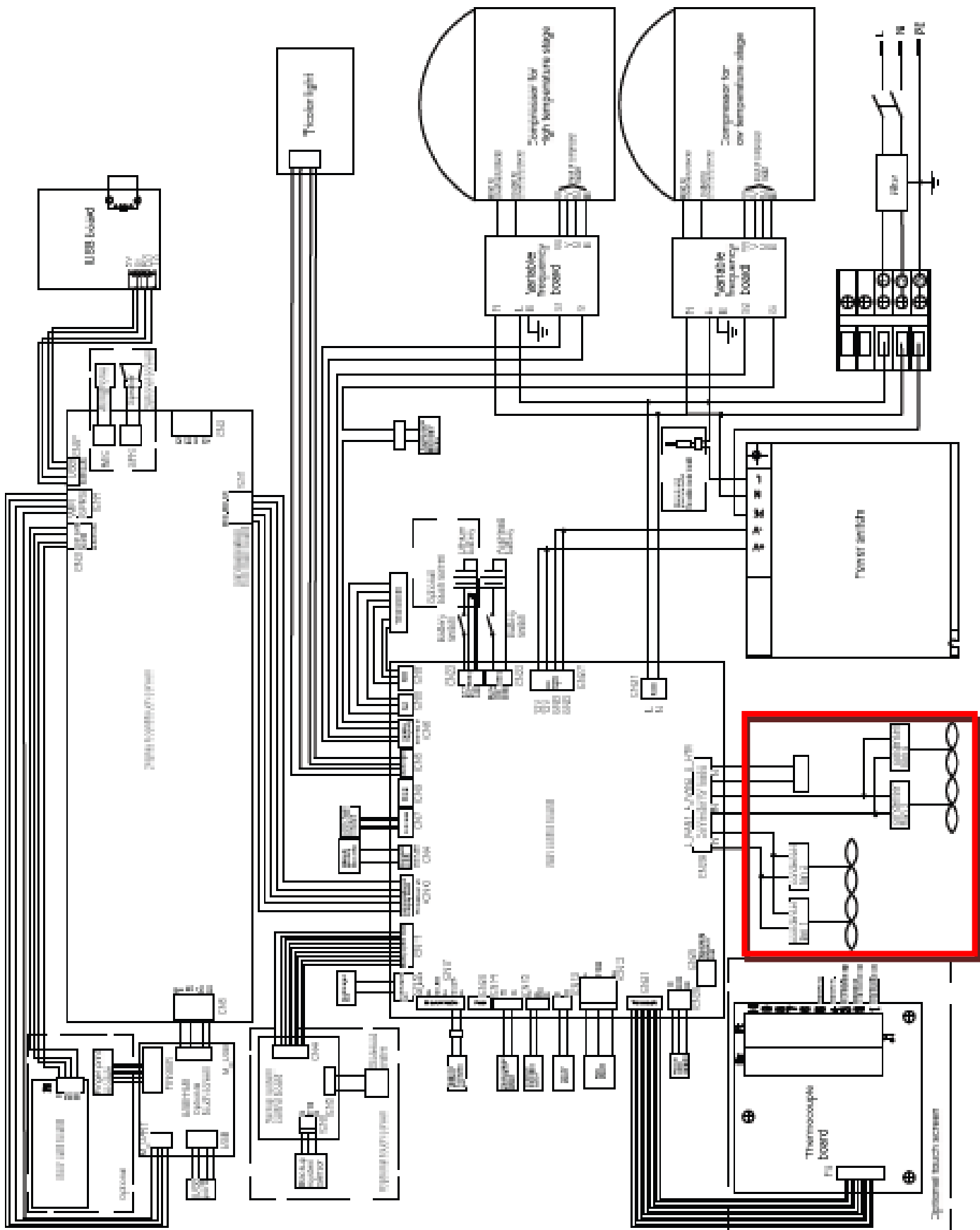
## 7.0 Refrigeration Schematic and Wiring Diagram

### 7.1 Refrigeration Diagram



**NOTE:** Variable drive controllers do are independent of each compressor and may not need to be changed out at the same time if one fails.

## 7.2 Wiring Diagram



## 8.0 Control System

### 8.1 Control of Compressor

#### 1. Start-stop control

##### a. Normal control

- i. Start-up condition: The temperature inside the box is more than and equal to the set temperature + P20 (default 5), which lasts for 30s (EEP).  
Stop condition: The temperature inside the box is less than and equal to the set temperature + P21 (default 0), which lasts for 30s (EEP).

**NOTE:** P20 and P21 range is adjustable, P20 default value is 5 (i.e. 0.5 °C), P21 default value is 0

##### ii. Control process

- (1) At the time of initial powering on, delay for 1 minute (default 1 min, adjustable at 1-15 min) (EEP), then judge:

- (a) If the starting condition is satisfied, the high-temperature compressor is started;
- (b) After the high temperature compressor has been started for 10 min (EEP), if the temperature of the heat exchanger sensor is lower than -30 °C (EEP) (including -30 °C), start the low-temperature compressor;
- (c) If the shutdown condition is satisfied, stop the compressor.

- (2) Other time:

- (a) If the starting condition is satisfied, the high-temperature compressor is started;
- (b) After the high temperature compressor has been started for 1 min (EEP), if the temperature of the heat exchanger sensor is lower than -30 °C (EEP) (including -30 °C), start the low-temperature compressor;
- (c) If the shutdown condition is satisfied, stop the compressor.

##### b. Control of Start-Stop Time

- i. During normal control, the machine can be stopped only if the startup time of high and low temperature compressor is greater than 3 min (P26) and can be started only if the shutdown time is greater than 3 min (P23).
- ii. At the time of powering on for the first time, the high and low temperature compressor does not stop for 16 hours (EEP) and is forced to stop for 10 min (EEP), and then restore normal control.
- iii. At other times, the high and low temperature compressor does not stop for 5 hours (EEP) and is forced to stop for 10 min (EEP), and then restore normal control.

##### c. Control of Compressor During Sensor Failure

- i. If the main sensor fails, high and low temperature compressor starts for 30 min(EEP), and closes for 10 min (EEP), repeating in such way; and high and low temperature compressor starts in sequence following normal control;
- ii. The main sensor is normal and the high and low temperature compressor is under normal control.
- iii. Heat exchanger sensor failure  
At the time of powering on initially, the high-temperature compressor starts for 10 min (EEP), then the low-temperature compressor starts;  
  
At other times, the high temperature compressor starts for 1 min (EEP), then the low-temperature compressor starts.
- iv. The heat exchanger sensor is normal and the low temperature compressor is under normal control.

- d. Control of the Compressor is Normal and the Low Temperature Starts for 1 min (EEP), then the low-temperature compressor start.
  - i. 220V power supply
 

When the power supply is less than and equal to 184V (EEP) which lasts for 10s (EEP), the high and low-temperature compressor keeps start-up and does not stop.

When the power supply is more than and equal to 253V (EEP) which lasts for 10s (EEP), the high and low-temperature compressor is under normal control.
  - ii. 115 V power supply
 

When the power supply is less than and equal to 93V(EEP) which lasts for 10s (EEP), the high and low-temperature compressor keeps start-up and does not stop.

When the power supply is more than and equal to 136V(EEP) which lasts for 10s (EEP), the high and low-temperature compressor is under normal control.
- e. Power-off control of power supply
  - i. After powering off, control ports of the compressor stops the output;
  - ii. If the power is switched on again, and the start-up condition of the high-temperature compressor is reached, the high-temperature compressor starts up at 4,500 rpm after delaying for 1min.
  - iii. If the power is switched on again, and the start-up condition of the low-temperature compressor is reached, the low-temperature compressor starts up at 4,500 rpm at the first time and is under normal control at other times.

## 2. Frequency Control

- a. High-temperature compressor frequency control
  - i. At the first time of powering on, the high-temperature compressor runs at 4,500 rpm (P08);
  - ii. If normal start-up, start at 2,000rpm (P00), but when the ambient temperature is higher than 30 °C, run at 4,500 rpm, and enter into automatic control of the low-temperature compressor in an idle state after 60 s (P01);
  - iii. The automatic control of the low-temperature press is not started (judge once per 80s (P02).)
 
$$F = F' + K * (T1 - (-27^{\circ}\text{C}(P03)))$$

F: This frequency value F calculated: Last frequency value  
 K calculated: 50 (P04)  
 T1: heat exchanger temperature  
 K \* (T1 - (-27°C(P03))): -20(P05) ~ 20(P06)  
 The range of K \* (T1 - (-27 °C (P03)) is: -20 (P05) - 20 (P06) F range is: 2000 (P07) ~ 4500 (P08)
  - iv. The automatic control of the low-temperature press is not started (judge once per 80s (P02).)
 
$$F = F' + K * (T1 - (-25^{\circ}\text{C}(P09)))$$

F: This frequency value calculated F ': Last frequency value calculated  
 K : 50(P04)  
 T1: heat exchanger temperature  
 The range of K \* (T1 - (-27 °C (P03)) is: -20 (P05) - 20 (P06)  
 F range is: 2000 (P07) ~ 4500 (P08)
- b. Low-temperature compressor frequency control
  - i. Start at 2,000rpm (P11) for running , but when the ambient temperature is higher than 30 °C, the rotating speed of the low-temperature compressor becomes 3,500 rpm for running and enters into automatic control after 60s (P12);
  - ii. The automatic control (judge once per 80s (P13).)
 
$$F = F' + K * (PT100 - Tset + 0^{\circ}\text{C}(P19))$$

F: This frequency value calculated (i.e. rotating speed)  
 F ': Last frequency value calculated (i.e. rotating speed)  
 K : 50(P14)

PT100: Temperature inside the box

Tset: setting temperature inside the box

$K * (PT100 - Tset + 0^{\circ}C(P19))$ :  $-20(P15) \sim 20(P16)$

The range of  $K * (PT100 - Tset + 0^{\circ}C(P19))$  is:  $-20(P15) - 20(P16)$

F range is: 2000 (P17) - 4500 (P18)

### 3. Door-opening event

- a. When the door switch detects the door opening, the temperature inside the box less set temperature is less than  $5.0^{\circ}C$  (P24)

If the high and low temperature compressor frequency is less than 3,500 rpm (P25), it is raised to 3,500 rpm (P25) and then normally controlled.

- b. When the door switch detects the door opening, the temperature inside the box less set temperature is more than and equal to  $5.0^{\circ}C$  (P24)

If the high and low temperature compressor frequency is less than 4,500 rpm (P08), it is raised to 4,500 rpm (P08) and then normally controlled.

## 8.2 Control of Fans

1. The condenser sensor is normal, and the condenser sensor is used for control:

- a. When the continuous detection of 1min meets the condenser sensor temperature of more than and equal to  $35^{\circ}C$  (EEP) (default  $35^{\circ}C$ , adjustable at  $20 - 45^{\circ}C$  is), two fans are used for running at high speed, and the relay R6 closes.

- b. When the continuous detection of 1min meets the condenser sensor temperature of more than and equal to  $35^{\circ}C$  (EEP) (default  $35^{\circ}C$ , adjustable at  $20 - 45^{\circ}C$  is), two fans are used for running at low speed, and the relays RL6 and RL7 close.

2. When the condenser sensor fails, the temperature cannot be taken. The control method that the speed-regulating fan varies with the rotating speed of the variable frequency compressor is taken:

- a. When the rotating speed of the low-temperature compressor meets the requirement of more than and equal to 3,500 rad/ min (EEP) (default 3500, adjustable at 2,000-4,500) within 1 min, two fans are used for high-speed running, and the relay RL6 closes.

- b. When the rotating speed of the low-temperature compressor meets the requirement of less than 3,500 rad/ min (EEP) (default 3500, adjustable at 2,000-4,500) within 1 min, two fans are used for low-speed running, and the relays RL6 and RL7 close.

3. Power-off control of power supply

- a. After powering off, control ports of the fan stops the output.

- b. After being powered on again, control according to the normal procedures.

## 8.3 Battery Control

### 1. Lead Acid Battery - Charging

- a. Charging start condition: (without battery reversely inserted alarm, power board fault alarm and unconnected battery alarm, if one of the following three conditions is satisfied, the charging relay is closed)

- i. The main control board is supplied with strong electricity for the first time.

- ii. 30 days (EEP) from last charging are up.

- iii. Battery voltage is less than 12.4V(EEP).

- b. Charging process control (judge once per 10s (EEP))

- i. When the battery voltage is less than 13.5V (EEP),

If the charging current is more than 610mA (EEP), the duty ratio is decreased by 1% (EEP).

If the charging current is less than 590mA (EEP), the duty ratio is increased by 1% (EEP).

- ii. When the battery voltage is more than and equal to 13.5 V (EEP) but less than 14.3 (EEP) V, If the charging current is more than 270mA (EEP), the duty ratio is decreased by 1% (EEP).  
If the charging current is less than 250mA (EEP), the duty ratio is increased by 1% (EEP).
- c. When the battery voltage is more than and equal to 14.3 V (EEP),  
If the charging voltage is more than 13.9V (EEP), the duty ratio is decreased by 1% (EEP).  
If the charging voltage is less than 13.7 V (EEP), the duty ratio is increased by 1% (EEP).
- d. After the charging time is accumulated for 36 hours (EEP), the charging ends and the charging relay opens.

## **2. Lead Acid Battery – Discharging**

- a. When the main control board is supplied with strong electricity for the first time, it should detect the battery is not inserted reversely, and the battery discharging control end is connected.
- b. When the main control board is powered off and the battery voltage is less than and equal to 10.5 V (EEP), the battery discharging control end is disconnected.
- c. After the strong electricity is switched off, the battery does not need to supply power to the balance port heating wire and the door body heating wire, nor does it need to control the strong electric load relay to close. Other functions are normal.
- d. After the strong electricity is powered off, the cold chain port CN7 needs to send strong electricity power-off instruction to the wireless cold chain module.

## **3. Lithium Battery – Charging**

- a. Charging start condition: (without battery reversely inserted alarm, power board fault alarm and unconnected battery alarm, if one of the following three conditions is satisfied, the charging relay is closed)
  - i. The main control board is supplied with strong electricity for the first time.
  - ii. 30 days (EEP) from last charging are up.
  - iii. Battery voltage is less than 11.2V(EEP).
- b. Charging process control (judge once per 10s (EEP))
  - i. When the battery voltage is less than 12.0V (EEP),  
If the charging current is more than 710mA (EEP), the duty ratio is decreased by 1% (EEP).  
If the charging current is less than 690mA (EEP), the duty ratio is increased by 1% (EEP).
    - ii. When the battery voltage is more than and equal to 12.0V (EEP) but less than 12.4(EEP) V,  
If the charging current is more than 330mA (EEP), the duty ratio is decreased by 1% (EEP).  
If the charging current is less than 310mA (EEP), the duty ratio is increased by 1% (EEP).
    - iii. When the battery voltage is more than and equal to 12.4 V (EEP),  
If the charging voltage is more than 12.9V (EEP), the duty ratio is decreased by 1% (EEP).  
If the charging voltage is less than 12.7 V (EEP), the duty ratio is increased by 1% (EEP).
- c. After the charging time is accumulated for 7 hours (EEP), the charging ends and the charging relay opens.

## **4. Lithium Battery – Discharging**

- a. When the main control board is supplied with strong electricity for the first time, it should detect the battery is not inserted reversely, and the battery discharging control end is connected.
- b. When the main control board is powered off and the battery voltage is less than and equal to 9.0V (EEP), the battery discharging control end is disconnected.
- c. After the strong electricity is switched off, the battery does not need to supply power to the balance port heating wire and the door body heating wire, nor does it need to control the strong electric load relay to close. Other functions are normal.
- d. After the strong electricity is powered off, the cold chain port CN7 needs to send strong electricity power-off instruction to the wireless cold chain module (reservation not implemented).

## 5. Lithium Battery Charge / Discharge Temperature Protection

When the battery temperature is higher than and equal to 65 °C (EEP), the charge and discharge of the battery are stopped.

When the battery temperature is lower than 55 °C (EEP), the charge and discharge of the battery are restored.

## 8.4 Heating Wire Control

1. Heating wire control at balance port (+ 12V control).
  - a. When the main sensor temperature is lower than and equal to -35.0 °C (EEP) for 5s (EEP), the heating wire at balance port is heated.
  - b. When the main sensor temperature is higher than -35.0 °C (EEP) for 5s (EEP), the heating wire at balance port stops heating.
2. Door heating wire control (+ 12V control)
  - a. Opening condition of door heating wire:
  - b. Closing condition of door heating wire:  
When the compressor stops and the main sensor temperature is more than -35.0 °C (EEP) for 5s (EEP), the door heating wire stops heating.

## 8.5 USB Data Download

Insert USB Drive. The temperature, alarm and event record of the machine can be exported automatically. When beginning to export, the display panel displays a flashing decimal point at the lower right corner of the most right Nixie tube of the temperature; when the exporting is finished, the decimal point keeps bright and does not flash. Pull out U disk, and the decimal point goes out.

## 8.6 Remote Alarm Function

The remote alarm function requires a normally open alarm function and a normally closed alarm function which can be selected as required. **In case of high temperature, low temperature, and external power outage (whether the backup battery switch is opened or not), the remote alarm function is started.**

## 9.0 Installation and Disassembly Process

### 9.1 Installation Location

1. Avoid direct sunlight
2. The surrounding air circulation is good
3. Avoid large quantities of dust
4. Avoid mechanical sway or vibration
5. Ambient temperature: 5 °C to 28 °C, max. 32 °C, the most ideal temperature is 18 °C to 25 °C, and air conditioning system should be used when necessary.
6. Height of operating position of equipment: below 2,000m.
7. Operating humidity: less than 80% RH. If the maximum operating temperature is 32 °C, the humidity shall be less than 57% RH.
8. Input voltage: within the range of 220V±10%.

**NOTE:** Because ultra-low temperature equipment is more sensitive to ambient temperature. The equipment cannot operate normally if it is installed in an environment other than the above. Please use the equipment after improving your environment.

### 9.2 Handling and Removal of Packaging Materials

1. Handling: Due to heavy weight of the product, the forklift or hydraulic vehicle is required in handling, so as not to cause damage to personnel and products.
2. Package removal: The product is packaged by the wooden tray + wrapped by honeycomb corrugated film + carton. In handling process, the forklift or a hydraulic truck is required to insert at the bottom of the forklift for carrying.

The packaging scheme is shown as below figure:



3. Removal of wooden tray:  
Remove two fixed connecting pieces A between the back of the whole engine room and the wooden tray by cross recessed screw; secondly, remove the big bolt B of fixed connecting pieces between two parts of the wooden tray by big adjustable spanner, as shown in figure A; finally, the maintainers are required to push the engine room to pull out the wooden tray in a crossed way, as shown in figures C and D.

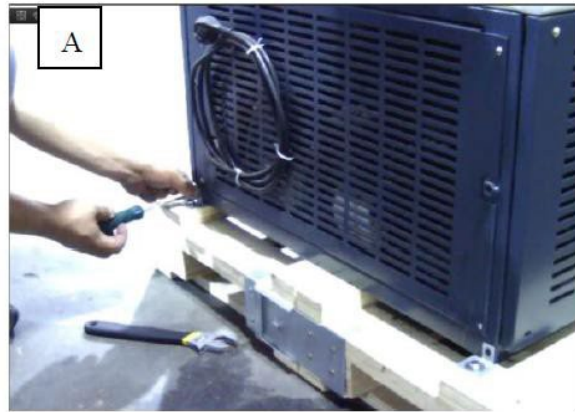




Fixed bolt A

Fixed bolt B

Fixed bolt A



### 9.3 Moving the Unit

1. **Difficulty in entering the door:** If the door height of the room door that the customer requests to be placed cannot be accessed without bottom tray and there is no other way, the cover of the engine room may be removed and open the outer door by 180 degrees. The removal and precautions of the front cover of the engine room are as follows.

**NOTE:** Generally, it is not recommended to adopt the plan of removing the front cover of the engine room.

2. **Removing the front cover**
  - a. Remove the air-inlet grill.
  - b. Remove two screws under the front cover of the engine room.
  - c. Remove the front cover.



- d. Open the outer door by 180 degrees.
- e. After the product enters the door, reinstall the front guard of the engine room as it is.

**NOTE:** Be sure to install in place, otherwise it will cause safety and performance problems!

Avoid damaging and scratching the storage box during handling. During handling, the maximum angle of inclination shall not exceed 45 ° (included angle with the horizontal direction) to avoid the failure of refrigeration system which could affect normal use.

#### 9.4 Removal of Display Cover

Remove 2 screws from the bottom of the cover

Lift upward and outwards to detach cover from the unit.

## 10.0 Troubleshooting and Frequently Asked Questions

### 10.1 Problems and Possible Solutions

**1. The display temperature is inconsistent with the actual test temperature of the machine:**

Because the display temperature is the temperature of a certain point inside the box, the temperature detected by the user is the temperature of another point inside the box, and the inconsistent position must cause different temperature, and meanwhile, there is certain error between the test tools of the users and our temperature sensing probe.

**2. The temperature difference between the upper and lower part of the machine box is too large:**

Since the unit starts cooling from top to bottom, the upper temperature is lower than the temperature below, and the temperature difference between the upper and lower parts is large; and the temperature difference of the similar products in the world is at 5-8 degrees, and ours is basically within 6 degrees; in addition, the frequent opening and closing door by the user will also the big temperature difference between the upper and lower parts.

**3. Why does -86 °C set by user rise to -82°C?**

To guarantee the service life of the machine, our products are designed so that when the ambient temperature is higher than 35 °C, and if the set temperature is lower than -82 °C, the product is adjusted to -82 °C, and if the ambient temperature is lower than 30 °C (inclusive), the product returns to the original set value.

**4. What's the reason for the fast temperature rising at the time of opening the door?**

The temperature of the ultra-low temperature cabinet is relatively low, which has a big temperature difference with the ambient temperature, and our temperature sensor probe is more sensitive, so the temperature rises rapidly when the door is opened.

**5. What are the reasons for displaying E10 and other symbols?**

The main sensor fault display E10, the condenser sensor fault display E12, the ambient temperature sensor fault display E11, check whether the above wiring is normal or not, otherwise it will be repaired and replaced by after-sales service.

**6. How to handle the machine displacement occurred at the time of opening the door?**

The machine is equipped with casters which are flexible, movable, lockable, supported, and can realize fine adjustment as required; After the machine is installed to the designated position by the user, the front two casters shall be fixed to prevent the machine from moving when the door is opened.

**7. Why can't the low temperature cabinet door cannot be opened?**

There are two cases:

The first reason is that the internal and external temperature difference is large, causing the door body to be under negative pressure. The processing method is the user inserts a fine iron sheet between the door sealing strip and the door body, to make the air is fed into the line.

The other reason is that there is moisture inside when the user stores the items, causing that the water flows to the sealing strip and freezes so that the door cannot be opened. The processing method is: to open the door by means of a tool.

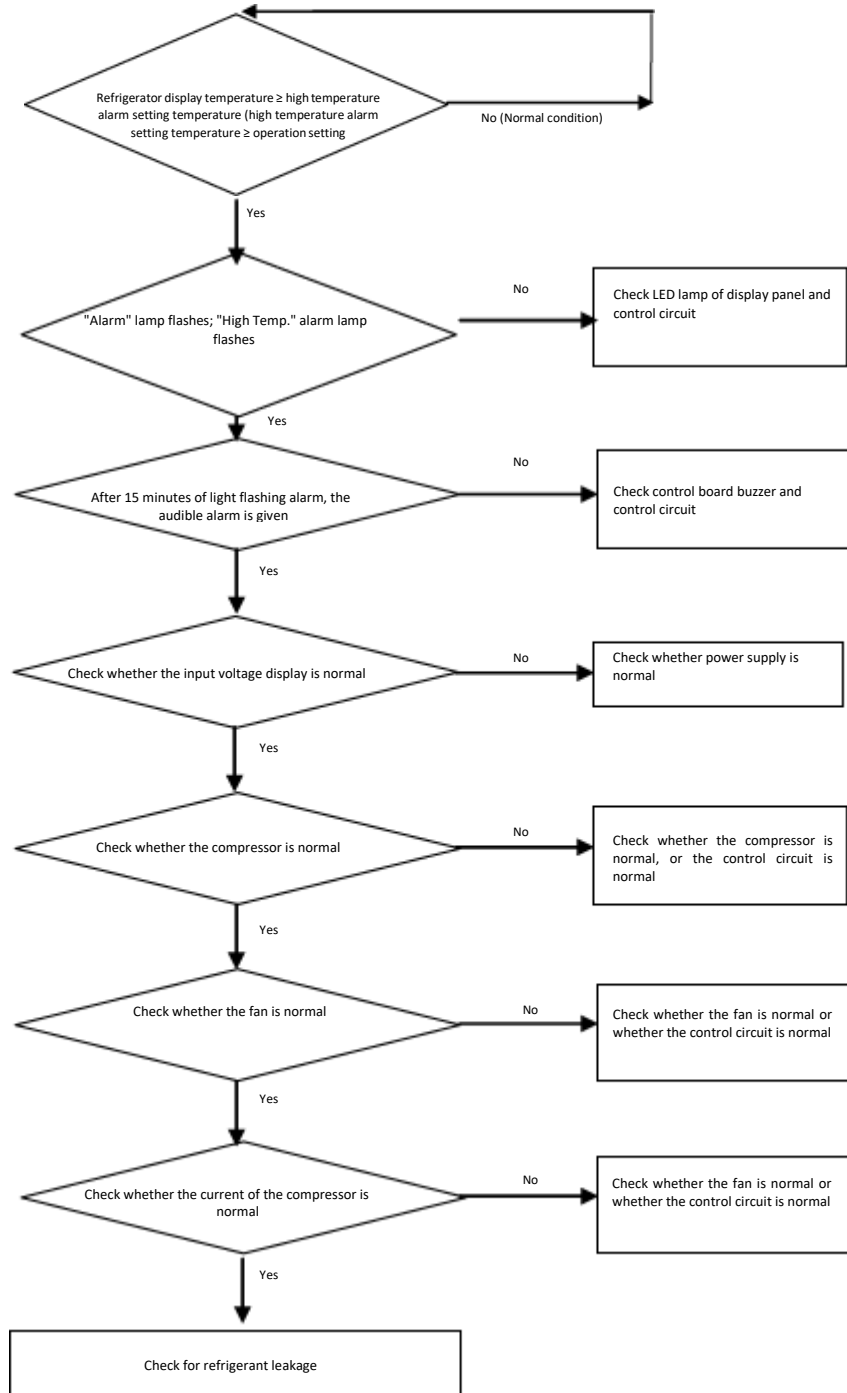
## 10.2 Troubleshooting Table

Problem	Cause analysis	Maintenance measures
<p>High-temperature compressor does not start (frequency conversion)</p> <p><b>OR</b></p> <p>The system compressors A and B do not start (dual system)</p>	Power switch or fuse failure	Use a multimeter to measure the resistance of the switch or fuse. if the switch is confirmed damaged, replace the fuse or power switch
	Connecting plug of the engine room connector is damaged.	Check whether the connecting plug of the connecting wire of engine room is damaged or the wire harness is damaged and replace the patch cord if necessary.
	Poor contact of wires	Check that the patch cord is connected poorly or not connected, and repair to normal connection
	Display board and control board connection failure	Use a multimeter to measure the resistance of the connecting wire to determine that the harness is short-circuited or open-circuited, and then replace the wire harness that cannot be repaired
	Relay, starting capacitor or thermal protector fails.	Check whether the relay, capacitor or thermal protector has signs of burnt and charred etc. If necessary, replace the electric device
	Compressor failure	In other normal power-on cases, check whether the connection plug of compressor is normal, and observe the surface temperature, abnormal noise etc. of compressor. if the compressor does not heat or the noise is abnormal, etc., the compressor is damaged and needs to be replaced. When replacing the compressor, the oil separator and the dry filter shall be replaced at the same time
	The user voltage is too low	Check whether the product display panel voltage is within the rated range ( $220 \pm 10\%$ ), and use a multimeter to measure whether the voltage in the case of power-on operation is over-voltage or not, and if the voltage is too low or too high, the customer shall be required to equip with a pressure-stabilizing booster or pressure reducer
Dual system pressure switch is not short-circuited	Check whether the pressure switch is short-circuited or not, and the dual system model is not provided with pressure switch.	
Low-temperature compressor does not start	The reason is the same as the high-temperature compressor	In other normal power-on cases, check whether the connection plug of compressor is normal, and observe the surface temperature, abnormal noise etc. of compressor. if the compressor does not heat or the noise is abnormal, etc., the compressor is damaged and needs to be replaced. When replacing the compressor, the oil separator and the dry filter shall be replaced at the same time
	Broken pressure switch	If the high-temperature compressor does not start after the low-temperature compressor has been started for 10min, it indicates that the high-temperature compressor has a poor refrigerating effect; therefore, check whether the system circuit and pipeline welding of the high-temperature compressor are good (leakage stopped) or not, and handle the fault
	High-temperature compressor has a poor refrigerating effect	If the high-temperature compressor does not start after the low-temperature compressor has been started for 10min, it indicates that the high-temperature compressor has a poor refrigerating effect; therefore, check whether the system circuit and pipeline welding of the high-temperature compressor are good (leakage stopped) or not, and handle the fault

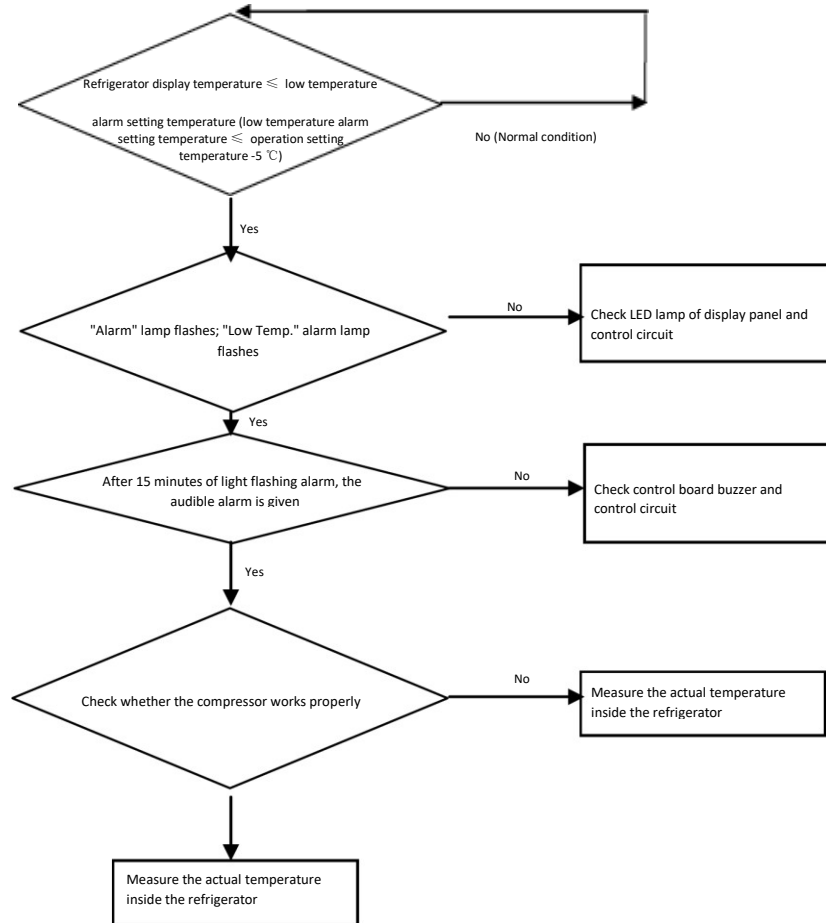
Fan does not turn	Wiring of fan fails	Check whether the patch cord of fan falls or is not plugged, and reprocess the thread ends and realign for installation
	Fan blade is blocked by foreign body	Check whether the fan blade produces the noise of touching wall during rotating or does not rotate, handle the foreign matters on and around the blade, and keep the blade running normally
	The fan fails	Use a multimeter to measure whether the resistance of the two ends of the fan wiring is short-circuited or open-circuited, and observe whether the rotating shaft rotates, if yes, replace the fan.
Temperature inside the cabinet is high	The temperature at the shutdown point set is high	Check whether the temperature set point of the product is set as required by customers, if not, re-set the temperature
	Refrigerant leakage	Check all welding joints of the engine rooms, find leaked points and repair welding. Re-fill refrigerant
	The temperature sensing probe fails	If the display panel displays an abnormal code alarm, e.g., E0/ E1/ E2E/ E3, it is indicated that the product temperature sensing probe fails while checking whether the patch cord is normal, if yes, it indicates that the temperature sensing line is bad, then replace the corresponding temperature sensing line
	Capillary or system is dirty, blocked and oil-blocked	Open the system to clean capillary or replace filter
	High ambient temperature	If the ambient temperature is high, please add the air conditioners to reduce the room temperature
	Condenser blockage	In case of condenser dirty alarm, please clean the filter screen in time.
E10 alarm	When the input voltage of the main sensor is more than and equal to 4.9V, the sensor is open-circuited; if less than and equal to 0.1V, short-circuited	Check whether the terminal of the main sensor is plugged poorly or dropped, and whether the sensor is damaged
		Check whether the sensor plug-in terminal on the main control panel is loose or poor contact; and whether the main control panel is damaged.
E11 Alarm	When the input voltage of the ambient temperature sensor is more than and equal to 4.9V, the sensor is open-circuited; if less than and equal to 0.1V, short-circuited	Check whether the terminal of the ambient temperature sensor is plugged poorly or dropped, and whether the sensor is damaged.
		Check whether the sensor plug-in terminal on the display panel is loose or poor contact; and whether the display panel is damaged.
E12 alarm	When the input voltage of the condenser sensor is more than and equal to 4.9V, the sensor is open-circuited; if less than and equal to 0.1V, short-circuited	Check whether the terminal of the ambient temperature sensor is plugged poorly or dropped, and whether the sensor is damaged.
		Check whether the sensor plug-in terminal on the display panel is loose or poor contact; and whether the display panel is damaged.
Condenser dirty alarm	If the difference between the temperature perceived by the condenser probe less the ambient temperature is more than and equal to 13°C (after lasting for 5 minutes), the alarm is given	Open the front grille to clean the filter screen.
		Check if the condenser probe is too close to the condenser outlet.
		Wrap the condenser probe with adhesive tape.

Low battery alarm	Low battery alarm goes off when the battery capacity $\leq$ 10.5V	Check whether the battery has exceeded the service life
		Check whether the wiring terminal on the battery switch is in good connection or whether the switch is damaged.
		Check whether the charging circuit is normal: after the refrigerator is powered strongly for 5min, test whether the battery terminal on the main control board outputs the voltage, and the output voltage shall be less than and equal to 5V
The temperature inside the box is nonuniform	Temperature difference inside the machine box is too big	If the temperature of the top layer is too high, handle the door seal and replace the inner door to ensure the good sealing property.
		If the temperature of the bottom layer is too high, re-open the system to add the low-temperature refrigerant R508B (or directly use the needle valve to add the refrigerant).
Display panel shows EEE	Control panel power transformer fails	When the switching power supply is damaged due to short circuit of the isolation transformer winding output of the switching power supply, and there is no + 12V output, the temperature display area inside the box immediately flashes to display EEE, the alarm indicator lamp flashes synchronously and gives the buzzing alarm.

## 10.3 High Alarm Processing Method

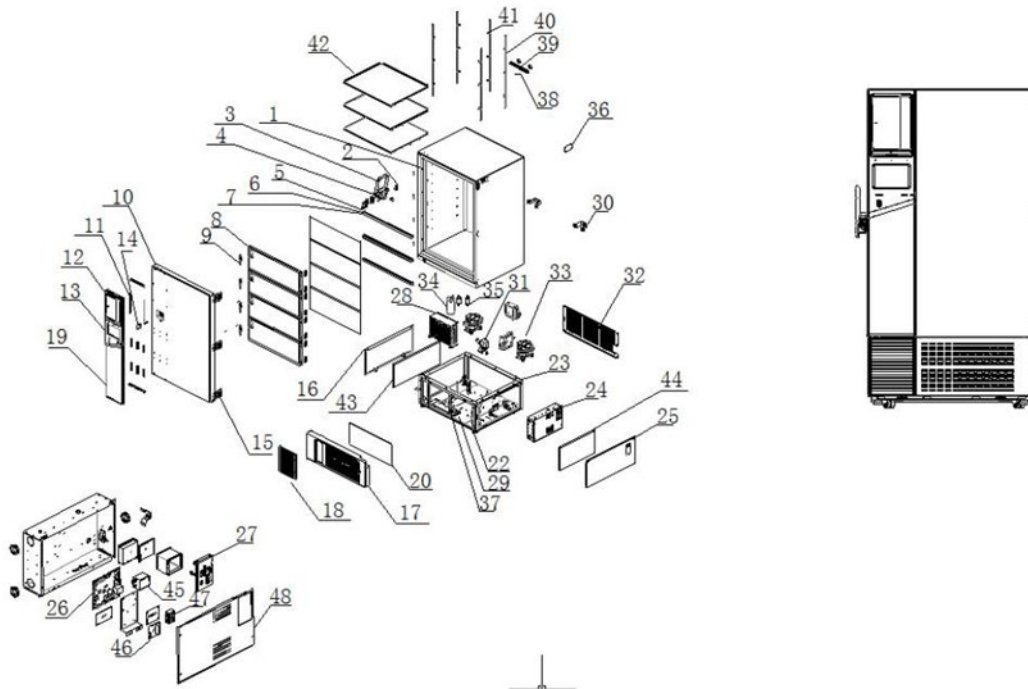


## 10.4 Low Alarm Processing Method





## 11.0 Diagram and Spare Parts List



S/N	Nu-99729VFT	Spare Part Name	Qty Per Unit	Unit
1	HAI - 270806173	Cabinet Assembly	1	EA
2	HAI - 0270103284A	Fixer for Door Lock	1	EA
3	HAI - 0270100327G	Outer Door Handle	1	EA
4	HAI - 0270101174B	Lock	1	EA
5	HAI - 0270103284B	Fixer for Outer Door Handle	1	EA
6	HAI - 270101572	Cabinet Bar	3	EA
7	HAI - 270200660	Cabinet Bar Trimming Strip, PVC Gray	3	EA
8	HAI - 270801321	Inner Door Assembly	4	EA
9	HAI - 270101508	Inner Door Handle	4	EA
10	HAI - 270806156	Outer Foaming Door Assembly	1	EA
11	HAI - 270103367	Fixer of Display Panel Holder	2	EA
12	HAI - 270201004	Display Panel Holder	1	EA
12	HAI - 270200989	Display Panel Holder	1	EA
13	HAI - 0271800034A	10" TFT Touch Screen	1	EA
13	HAI - 0271800074B	Display Panel	1	EA
14	HAI - 270200599	Pressure Equalization Port	1	EA
15	HAI - 0070107087A	Door Hinge (Common Use)	4	EA
16	HAI - 0270103137B	Right Side Guard Plate Assemblage	1	EA
17	HAI - 270103734	Front Shelter Assembly (Temperature Recorder)	1	EA
17	HAI - 0270103734A	Front Shelter Assembly	1	EA
18	HAI - 270200991	Air-Inlet Grille Assembly	2	EA

19	HAI - 0270103236A	Aluminum Shelter	1	EA
20	HAI - 270102159	Air Filter	1	EA
21	HAI - 0074090520C	Chart Recorder	1	EA
22	HAI - 0070101872C	Duplex All-Round Caster	4	EA
23	HAI - 270103737	Bottom Frame Assemblage, Dot Welding	1	EA
24	HAI - 270806167	Electric Chamber Assembly	1	EA
25	HAI - 0270103138B	Left Side Guard Plate Assemblage	1	EA
26	HAI - 0271800076F	Control Board	1	EA
27	HAI - 270200218	Switch Cover	1	EA
28	HAI - 0270700439B	Condenser	1	EA
29	HAI - 270103736	Compressor Fixer	1	EA
30	HAI - 270103228	Thrust Frame	1	EA
31	/	lq3612 /Fan for Compressor	579 : 4	EA
32	HAI - 0270101574A	Cabin Back Guard Plate	1	EA
33	HAI - 0274000436A	Compress	2	EA
34	HAI - /	BD-370LT Oil Separator	1	EA
35	HAI - 70701061	Drier Filter	2	EA
36	HAI - 270103121	5 V Cold Chain Cover	1	EA
37	HAI - 74091225	Condenser Sensor	1	EA
38	HAI - 274000256	Temperature Sensor	1	EA
39	HAI - 270101337	Fixer for Temperature Sensor	1	EA
40	HAI - 0270100174A	Shelf Strip	5	EA
41	HAI - 270100175	Resilient Clip	15	EA
42	HAI - 270101535	Shelf	3	EA
43	HAI - 0270300174A	Right Sound Insulation Cotton	1	
44	HAI - 0270300174B	Left Sound Insulation Cotton	1	
45	HAI - 274000337	Filter 15A	1	EA
	HAI - 0074600001A	Filter 20A		
46	HAI - 0271800081A	Thermocouple Board	1	EA
47	HAI - 0274300007A	Terminal Row	1	
48	HAI - 270100619	Electric Control Box Cover	1	EA
49	HAI - 271800116	Lot Module	1	EA
50	HAI - 0271800080A	Backup System Board	1	EA
51	HAI - 271800093	Fingerprint Module	1	EA
52	HAI - 271800094	USB Board	1	EA
53	HAI - 271800095	HUB Board	1	EA
54	HAI - 271800096	Speaker	1	EA
55	HAI - 270400458	USB Line	1	EA
56	HAI - 270201015	Screen Board	1	EA
57	HAI - 0074091430A	Acid Battery	1	EA
58	HAI - 274000238	Lithium Battery	1	EA