LABFREEZ®

Vacuum Freeze Dryer

# Instructions Manual

FD-10F-TP

LABFREEZ INSTRUMENTS GROUP CO., LTD

## Ⅰ Introduction

The vacuum freezing–drying technology, which is also called sublimation drying, is a technical method that freezes the samples in advance, and then sublimates its moisture in the vacuum state. Goods are easier for long-term preservation after freezing-drying processing. They can be restored to the original state and maintain its chemical and biological characteristics after being watered. So the freezing-drying technology is widely used in medicine, food, chemistry industry and biological products etc.

The FD-10F-TP freezing dryer is a new patented product. It has changed the traditional tedious operation and has realized the automation.

## Ⅱ Characteristics and technical parameters

**1**、Main characteristic

(1) The process of pre-freezing and drying finishes in situ. The freeze dryer is equipped with observation windows and the drying process is intuitive.

(2) The shelf temperature control error is less than ±1.0℃. The drying effect is uniform.

(3) The shelf temperature is adjustable and controlled.

(4) The drying chamber and condenser is separated so the water-capture capability is higher and the drying time is shorter.

(5) Touching-screen operation, Fuzzy logic PID control algorithm, display drying curve, the record device is available.

(6) The product tray is square so it's easy to clean and operate.

(7) Valve with nitrogen is optional.

(8) The drying chamber adopts transparent ACRYLIC door, and the changing process of product is visible.

2、Technical parameters

(1) Condenser temperature: ≤-60℃（No load）

(2) Shelf temperature: -40℃~80℃

(3) Ultimate vacuum: ≤5Pa (No load)

(4) Shelf dimension: the size of the shelf is 270mm×400mm, 1 layer.

Max liquid material: 1L (10mm thickness)

Φ22 Vials：226

Φ16 Vials：430

Φ12 Vials：777

(5) Overall dimension: 820×850×1200 (mm)

## Ⅲ Working conditions

1、Environment temperature in normal working condition: 10℃~30℃.

Relative humidity: ≤70%.

Power supply voltage: 1Ph+N+PE AC220V±5% 50Hz.

Vacuum pump voltage: 1Ph+N+PE AC220V±5% 50Hz.

The working environment should be no conductive dust, no explosive,

no corrosive gases and no strong electromagnetic interference.

2、Storage conditions

Environment temperature: -30℃～50℃.

Relative humidity: ≤90%.

The storage conditions should be well-ventilated, no corrosive gases.

3、The safety classification: Grade I Type B.

## Ⅳ Installation and preparations for freeze-drying

1、The vacuum pump and main engine is connected by pumping vacuum pressure pipe. Both end using standard quick clamp. Apply appropriate amount of vacuum grease on the sealed rings before connecting.

2、Connect the main engine power and vacuum pump power.

3、Please read carefully the vacuum pump manual. Check the vacuum pump carefully and confirm the vacuum pump with enough oil. Don't run without oil!!!

4、The white sealed ring embedded in glass door should be kept clean. Apply a layer of vacuum grease before using.

5、The mode of defrost is natural defrosting.

## Ⅴ Freeze-drying operation

The control system uses industrial touch screen, easy to operate; each screen can display abundant process data; store many recipes, each recipe can set up 50 steps(standard type); use intelligent Fuzzy PID control

algorithm, the temperature control is accurate and stable; the control temperature parameters can be modified at any time in freeze drying process; when freeze drying control starts, system executes automatically product pre-freezing, vacuum pump starting, then execute the freeze drying process; system adopts a variety of stable measures to make sure system stable and reliable running. The control system contains following function screens:

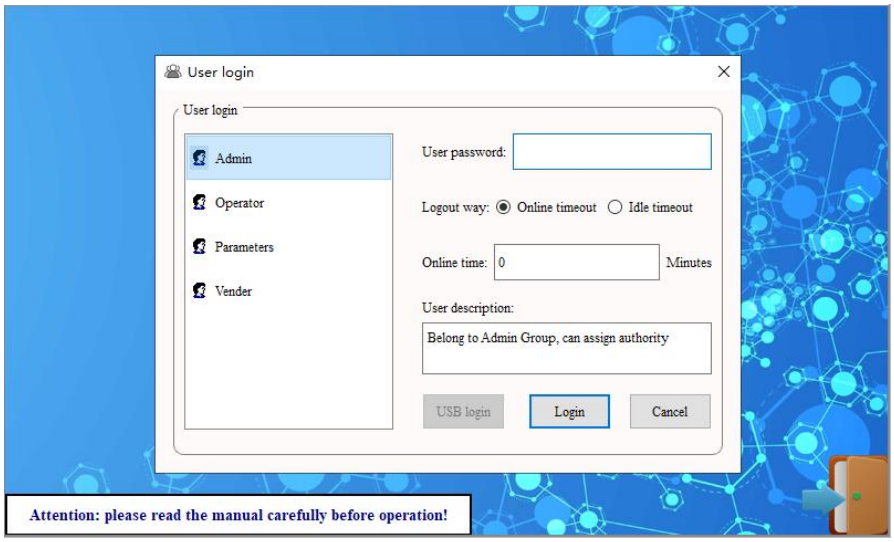


Fig1-1 Startup screen

1、Startup screen

Press the “Main power” button, the control system displays the login interface; in figure1-1 shows the details; Input the password (Admin default password: 111111; Operator default password: 222222; Parameters default password: 333333), the control system will enter automatically into next screen "Main screen".

2、Main screen

This screen displays the following contents:

"Current Step" displays current freeze drying running step;

"Current Tem." displays current set temperature;

"Time Set" displays current step set time;

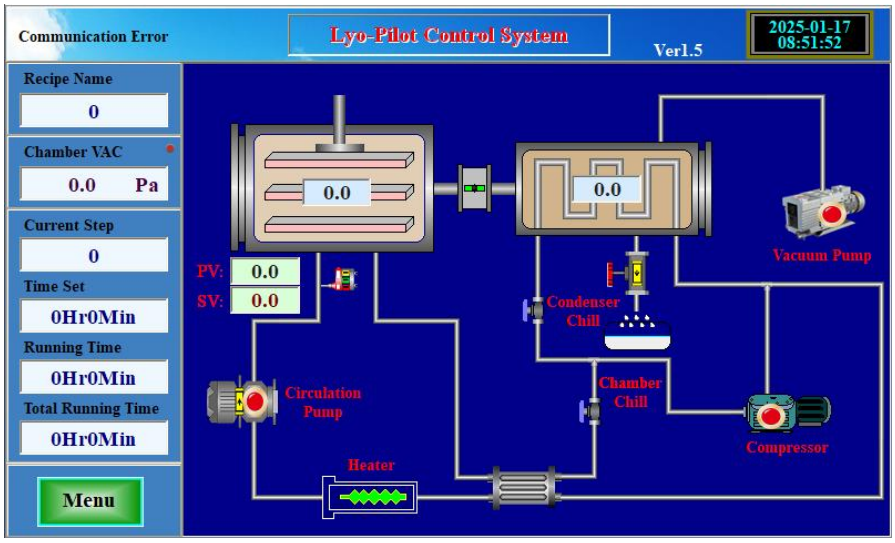


Fig1-2 Main screen

"Total Running Time" displays total freeze drying time;

"Running Time" displays current step running time;

"System Time" displays the system time;

"Product Tem." displays product temperature;

"Shelf Tem." displays the temperature of shelf;

"Condenser Tem." displays the temperature of condenser;

"Interstage Tem." displays the temperature that controls compressor2 startup;

"Vacuum" displays the current chamber vacuum value;

"System Error" displays the system status, the system time background color red flickering for error, check details in “History Alarm” screen;

When click the "Menu" button, and then select the "Freeze Dry Recipe",

the system will switch into "Freeze Dry Recipe" screen.

3、" Freeze Dry Recipe " screen

As shown above, it has the following function icons:

"Total Steps" is the total freeze drying steps;

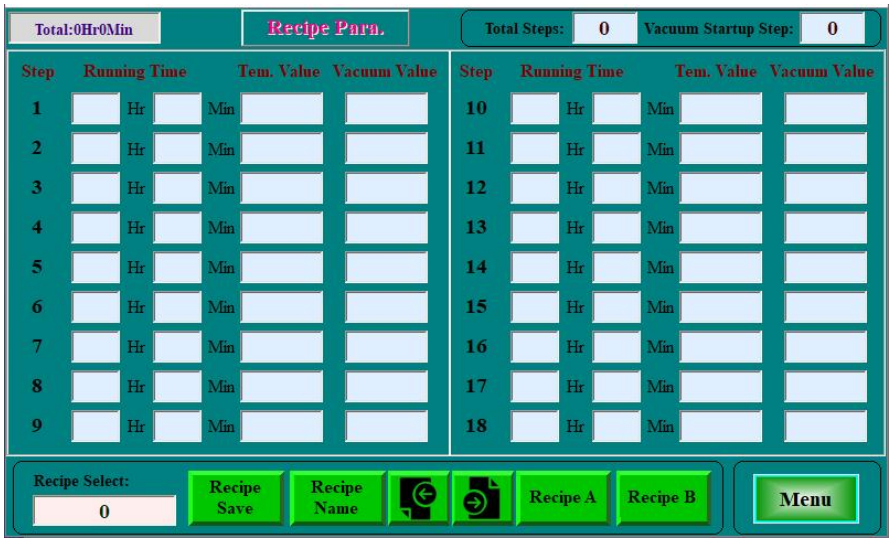


Fig1-3 Freeze Dry Recipe screen I

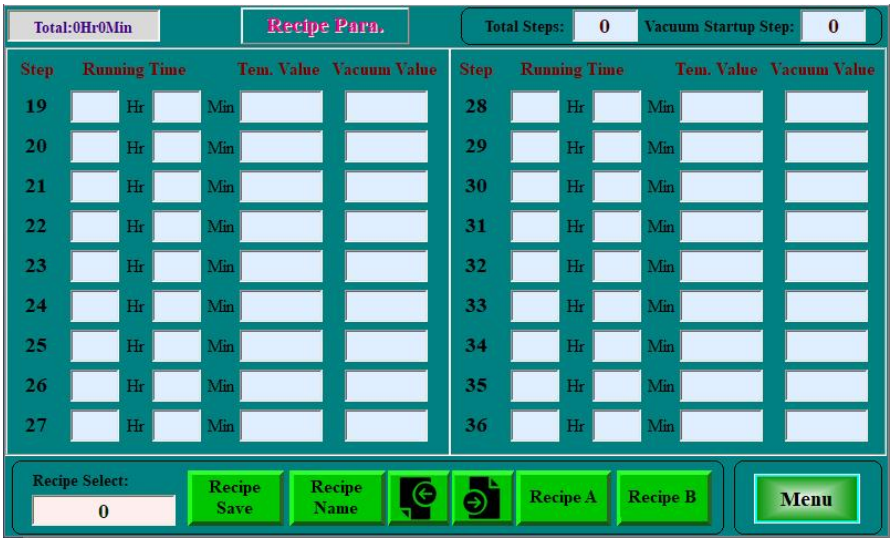


Fig1-4 Freeze Dry Recipe screen II

"Vacuum Startup Step" is step that prepare for vacuum pump startup;

"Recipe Select" is used for selecting the recipe number (0~99);

"Recipe Save" is used for saving the current freeze drying recipe;

"Recipe Name" is used for naming the freeze drying recipes.

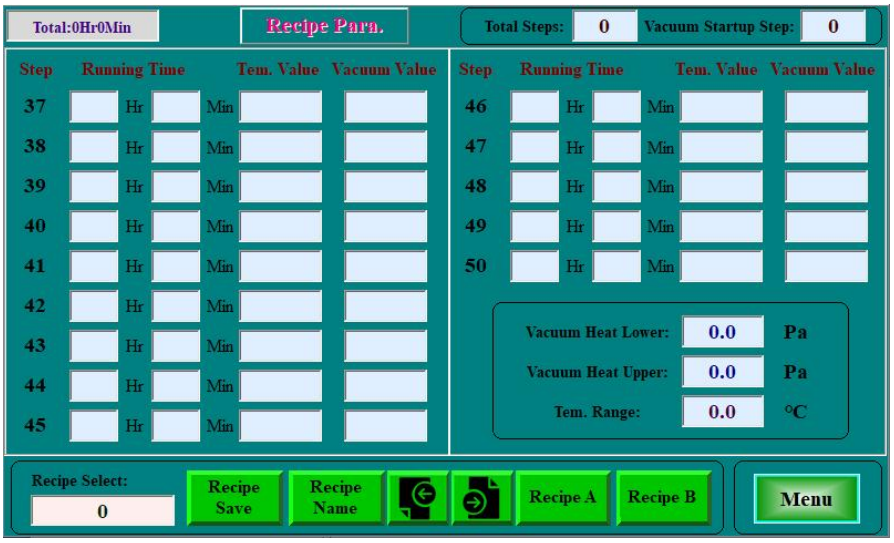


Fig1-5 Freeze Dry Recipe screen III

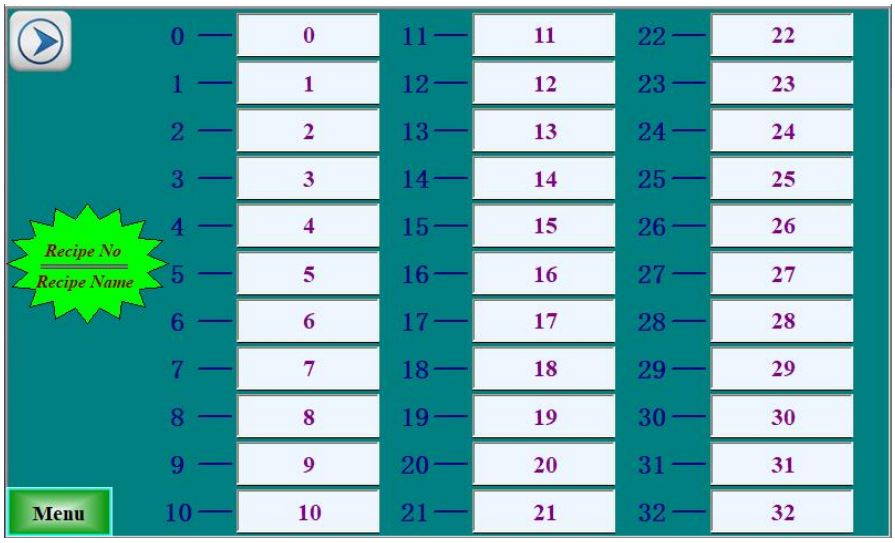


Fig1-6 Freeze Dry Recipe name

Vacuum Adjust is our standard function of our software, if no hardware is installed, you can set “0” for no working. If you input VAC Heat both “0”, it represents heating is not controlled by vacuum value. If you need vacuum heating, you need only to input the relevant value. When the current vacuum value is smaller than VAC Heat lower value, the system is in vacuum keeping status, and if after this the vacuum value is bigger

than Upper value, the vacuum alarm energizes.

"Tem. Range" is for automatic freeze drying. When the current step time elapses, and the shelf tem is in Tem Range, then the system can progress to next step and vice versa. If "Tem Range" is 0, the above function is invalid.

**Notice: the step temperature is not allowed to set the value lower than the minimum temperature of the instrument can be achieved!**

Click the "Menu" button, and then select the "Manual Operation", the system will switch into "Manual Operation" screen.

4、Manual Opertaion screen

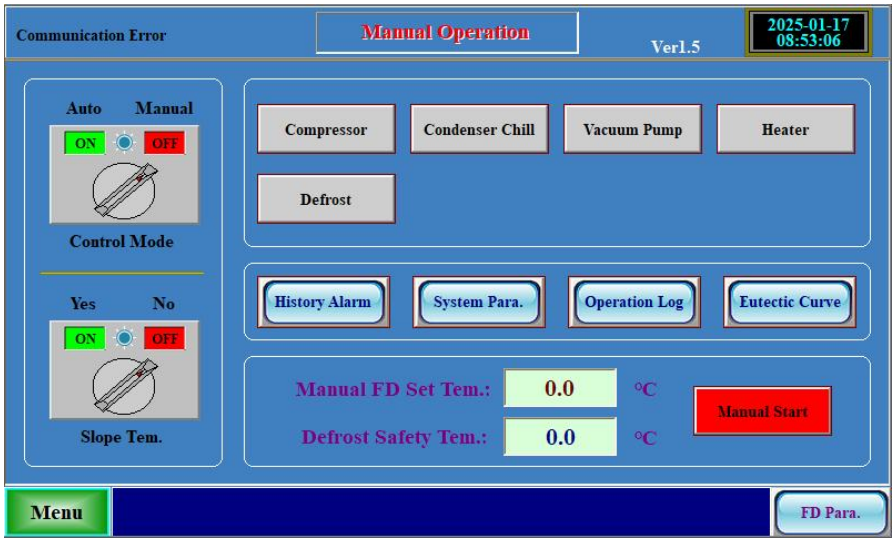


Fig1-7 Manual Operation screen

Before the operation, first you need to select the control mode to Manual position, click the “Manual Start” button, and then click the relevant button above. If the background of the button is gray, it represents the function button is invalid. If you need to switch to automatic freeze drying, you should click the “Manual Stop” button,

switch the “Control Mode” to Auto position, and then click the “Auto Start” button. **Notice: the running status of the compressor is not affected by freeze drying status!**

The startup condition of the Compressor2 is: the Compressor1 is running, and the interstage temperature is below -30℃(default). The startup condition of the vacuum pump is Condenser temperature below -40℃(default). **Notice: Forbidden to start the compressor frequently, wait at least 3 minutes to restart the compressor after stop running!**

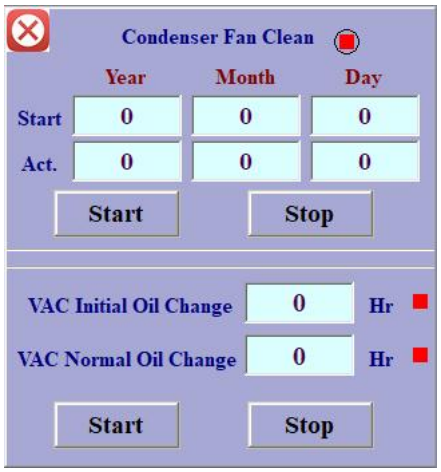


Fig1-8 System Parameter

Click the "System Para" button in the above picture, and then the system will change to "System Parameter" screen. Click the "Start" button of condenser fan clean, the system will inform when clean time elapse. The default clean time internal is 3 months. Click the "Start" button of vacuum oil change alert, the system will remind when vacuum oil change time elapse. "Vacuum initial oil change" is the new pump first oil change time; "Vacuum normal oil change" is the standard oil change

time after first oil change.

In the manual freeze drying, you can press the “FD Para.” button, and then you can set the manual vacuum control parameters. Manual freeze drying tem and the defrost time can set in the above picture.

Click the "Menu" button, and then select the "Real-time Curve", the system will switch into "Real-time Curve" screen.

5、Real-time Curve screen

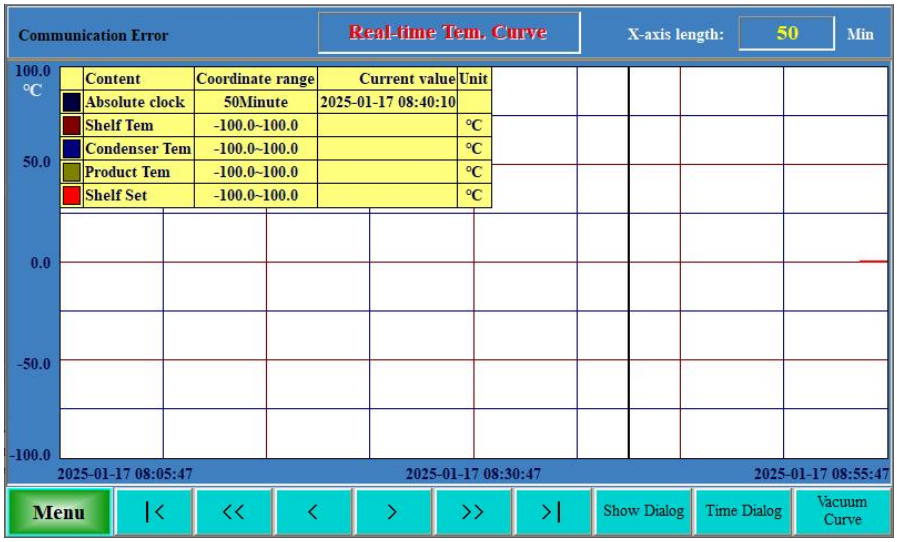


Fig1-9 Real-time Tem. Curve

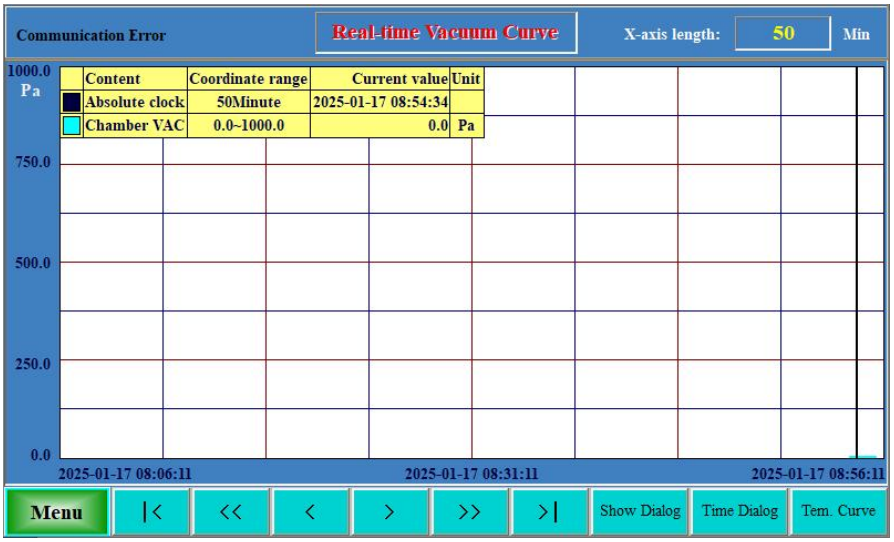


Fig1-10 Real-time Vacuum Curve

In the Real-time Curve screen, you can check the temperature curve of the freeze drying process, and click the “＞” or “＜” button to change the time length of the X-axis. You can also click the “Vacuum Curve” button to check the chamber vacuum curve. The vacuum curve Y-axis range is 0-1000.0Pa.

Click the "Menu" button, and then select the "History Curve", the system will switch into "History Curve" screen.

6、History Curve screen

You can click the “Show Dialog” to select the process curves you want to display. This screen is mainly used for displaying freeze drying process tendency curve.

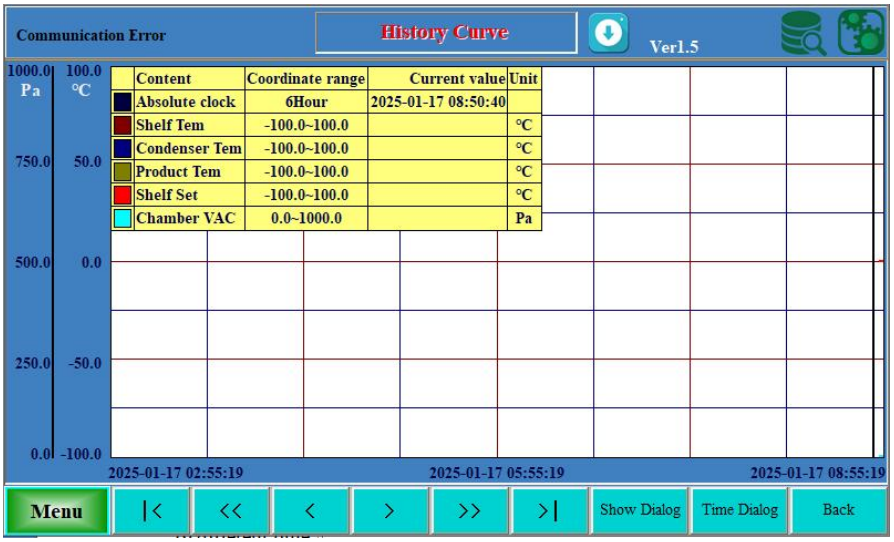


Fig1-11 History Curve

7、Data Record screen

You can check the Shelf Tem, Condenser Tem, Product Tem, Interstage Tem, Set Tem and Chamber VAC in the following screen.

Through click the "Page Up" or "Page Down" button to check the data

of different time.


Fig1-12 Data Record

Click "Data Export" button, will pop-up "Data Export" dialog. Though click "OK" button and input time range, user may copy the related data stored in the touch screen to your U disk (**U disk capacity no bigger than 16G, USB2.0**).


Fig1-13 Data Export

8、The freeze-drying process is over

8.1 After finishing the process, please open "Air Inlet" on the left of

device. Click the "vacuum pump off" button in the screen, and then close the freeze drying process.

8.2 Collect materials that have been dried.

8.3 Click the "Defrost" button. The function will be closed after the setting time.

8.4 Clean the freeze dryer.

8.5 Turn off the power.

8.6 If the vacuum pump doesn't work for a long time, please cover the pump vent to prevent dust from entering.

## Ⅵ Notices

1、The vacuum pump should be placed in the ground and keep a certain height difference with the freeze dryer.

2、The working temperature is less than or equal to 30℃. The humidity is no greater than 80%.

3、When shut downing, firstly air admitting, and then turn off the vacuum pump.

4、The ACRYLIC glass door and main engine connects by sealed ring.

5、The sealed ring should be kept clean.

6、The vacuum pump oil should be replaced after it works continuously for 200 hours for the first time.

7、Don't frequently turn on/off the compressor and vacuum pump.

8、Before collapsing the shelves, be sure they are correctly loaded or

completely empty and clear of foreign objects.

## Ⅶ Common breakdown and elimination

1、The no-load vacuum value cannot reach 15Pa:

(1) Check the release valve is whether fastened down or not.

(2) The vacuum pump and main engine is connected by vacuum tube. Check the clamp is whether fastened down or not.

(3) Check the inner side of ACRYLIC door is whether smooth or not. Check the “O” rubber ring is whether damaged or not.

(4) Check the vacuum pump oil. Generally, oil should be changed after first working 200 hours.

2、The vacuum pump leaks oil:

Check the leaking parts; Replace the corresponding parts if necessary.

3、The temperature of condenser is high:

The ambient temperature of freeze dryer is high.

The refrigeration system is break down, please connect our service department.

## Ⅷ Maintenance and Service of instrument

1、The free maintenance time is one year from the date of factory.

2、Our company is responsible for the lifetime maintenance.

LABFREEZ®

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