



Vacuum Freeze Dryer
NovaDryer-DHF400/ DHF600
(PLC Control System)

Quick Installation & Operation Guide
(Version202003)

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BEFORE YOU USE THIS FREEZE DRYER FOR THE FIRST TIME, PLEASE READ ALL THE DOCUMENTS AND COMPLETE THE TRAINING COURSE LISTED BELOW:

- User Manual
- Quick installation and Operation Guide
- Parameter Setting Chart for Different Materials
- Video Training Course
- Technical Bulletin

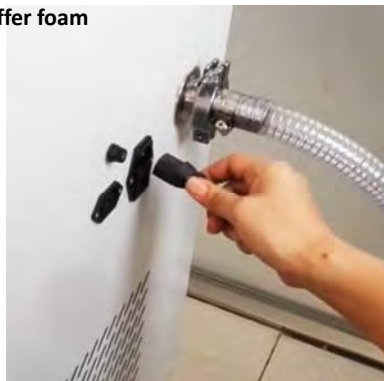
PART 1. UNPACKING

WHEN RECEIVING THE GOODS:

1. If any damage is found, please contact insurance company for compensation claim.
*For CIF,CIP and DDP, please contact Senova to obtain necessary assistance.
2. After unpacking, please check the freezer and all the accessories are received in good condition according to your order.
3. After unpacking, please remove the protective buffer foam filled inside the chamber(Pic-1)



Pic-1



Pic-2



Pic-3

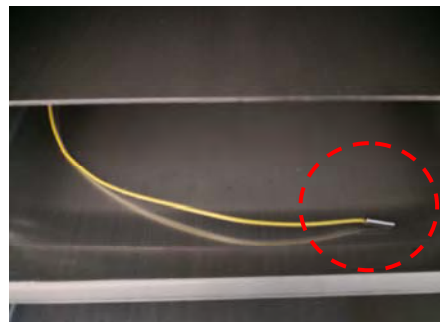
4. Remove the black dust-proof plastic cap(Pic-4) on discharge outlet of the vacuum pump before using.

Caution:

There is an external temperature sensor (Pic-5) inside the chamber. Do not damage it!



Pic-4



Pic-5

PART 2. PREPARATION BEFORE OPERATION

1. Find power cord, metal soft vacuum tube, and connectors. Connect the vacuum pump to the freeze dryer (Pic-2 & 3)

2. Vacuum pump oil:

2-1. Please find vacuum pump oil inside the package.

2-2. Add it into the vacuum pump to the oil level or 2/3 position of the side window.

2-3. If the freeze dryer is shipped by air, vacuum pump oil is removed before shipment according to civil aviation security regulation. Please purchase vacuum pump oil (#100 or #68 for vacuum pump 2XZ-2/4 and #46 or #68 for vacuum pump DRV-10) for any brand locally. Mobil and Shell are recommended.

2-4. Vacuum pump oil is consumable and needs to be replaced after running for 100-200 hours, please prepare some vacuum pump oil for spare use.

2-5. Vacuum pump oil can be recycled after frozen and sedimentation so as to save cost. For details, please contact us.

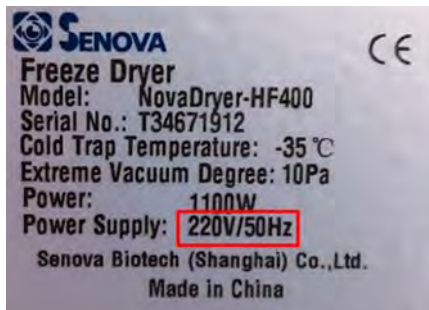


Pic-6



Pic-7

3. Connect the freeze dryer to proper power supply (220V/50Hz, 220V/60Hz or 110V/60Hz) as marked on the label on the side of the freeze dryer.



Pic-8

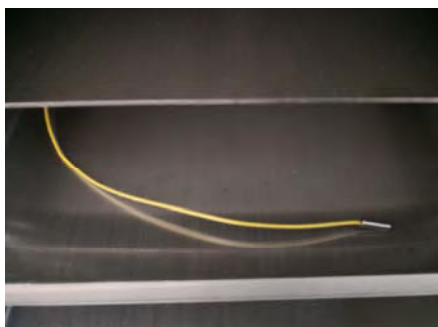


Pic-9

4. Open the door, load the trays onto the rack.

5. External temperature sensor:

Insert the sensor into the materials so as to detect material temperature during freeze drying.



Pic-10



Pic-11

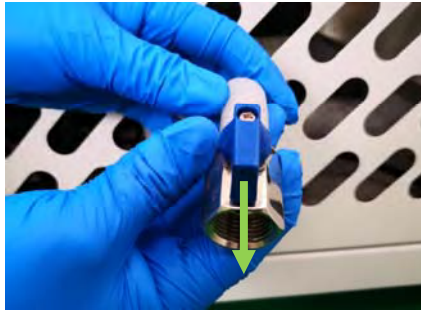
6. Close the door. Check and make sure there is no air leakage with the vacuum tube, connectors and door

7. Rotate the vacuum /water draining valve to the close position.

*This valve is combined with functions as a vacuum valve for chamber pressure and a water draining valve after defrosting



vacuum /water draining valve



Open Position



Close Position

8. Turn on main power. Switch on the freeze dryer. The freeze dryer is ready to use now.



Pic-12

PART 3. BASIC KNOWLEDGE ABOUT THIS FREEZE DRYER

1. There are 5 working stages in the freeze drying process.

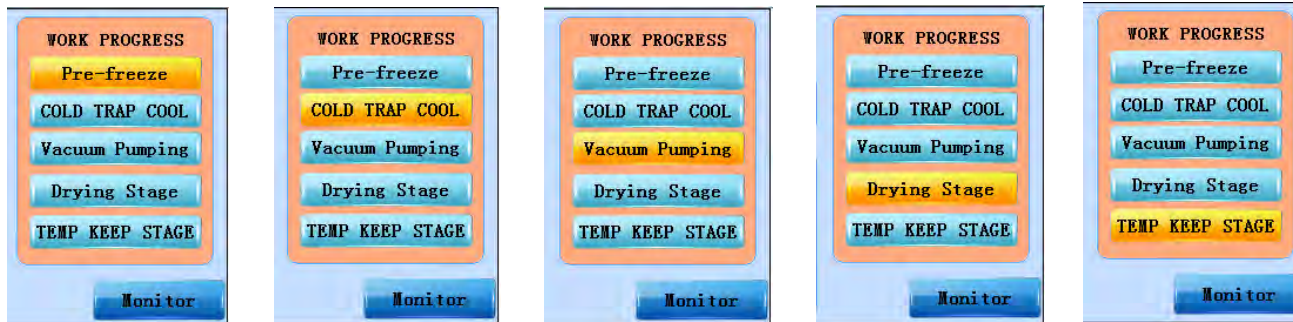
It takes a freeze dryer 24-30 hours to finish the complete process including: Pre-freeze, Cold Trap Cooling, Vacuum Pumping, Drying and Temperature keeping.

Total freeze drying time (24-30 hours) depends on sugar contents, oil contents, water contents, size of the materials, and room temperature.

If -45C deep freezer is available, please use it to pre-freeze the materials for about 9 hours so the freeze dryer can skip the pre-freeze stage (set pre-freeze time: 1 minute) to reduce freeze dryer's total working time to about 18 hours (Cold trap cooling needs to be started before the pre-frozen materials are loaded into the chamber to cool the chamber to low temperature requested for the next stage-vacuum pumping)



2. The working stage indicator keeps flashing in each stage all the time. This flashing is normal and does not mean any alarm.



3. There are 2 control modes for this freeze dryer: Vacuum Control and Program Control.

Both modes share the same settings in the first 3 stages (pre-freeze, cold trap cooling and pre-vacuum) but have different settings at drying stage.

Vacuum Control mode: Parameters at drying stage is preset and the user is not allowed to modify parameters.

Program Control mode: Parameters at drying stage is not preset and the user is allowed to modify parameters according to different materials.

Program Control Mode is recommended because this mode can be used for all the materials while Vacuum Control Mode is not suggested for some materials such as milk and flowers.

4. A parameter setting chart is offered by us according to our tests on different materials. The user can try to modify it after the best parameter setting is found after some trial running.

5. After started, the freeze dryer and vacuum pump can run automatically according to the set parameters.

6. The vacuum pump does NOT start at the first 2 stages (pre-freeze, cold trap cooling). It will be started automatically from vacuum pumping stage and will keep running in working status until end of freeze drying (except it is stopped by the user).

7. After started, the vacuum pump will initially be a little noisy (about 60-70dB), together with white smoke discharge from outlet of the vacuum pump. This will last for a few minutes. It is normal.

After that, noise will be reduced and white smoke will disappear.

It is normal that the vacuum pump feels hot all the time.



8. There are 3 working status displayed on the main menu:

Run Time	88 : 88	Normal Status	
Shelf Temp.1	8888 °C	Vacuum Degree	88888 Pa
Shelf Temp.2	8888 °C	Left Sect.Time	88888min
Cold Trap Temp.	8888 °C	Current Section	88888
Material Temp.	8888 °C	Current Recipe	88888
Ambient Temp.	8888 °C	Current Status	FINAL DRYING
PARAMETER SET FORMULA TEMP. CONTROL OPERATION			

Normal Status

Indicating the freeze dryer is working in good condition.

Run Time	88 : 88	Vacuum Alarm	
Shelf Temp.1	8888 °C	Vacuum Degree	88888 Pa
Shelf Temp.2	8888 °C	Left Sect.Time	88888min
Cold Trap Temp.	8888 °C	Current Section	88888
Material Temp.	8888 °C	Current Recipe	88888
Ambient Temp.	8888 °C	Current Status	FINAL DRYING
PARAMETER SET FORMULA TEMP. CONTROL OPERATION			

Vacuum Alarm

Refer to point 9 for solution: "How to Eliminate Vacuum Alarm"

Run Time	88 : 88	Please Remove Materials	
Shelf Temp.1	8888 °C	Vacuum Degree	88888 Pa
Shelf Temp.2	8888 °C	Left Sect.Time	88888min
Cold Trap Temp.	8888 °C	Current Section	88888
Material Temp.	8888 °C	Current Recipe	88888
Ambient Temp.	8888 °C	Current Status	FINAL DRYING
PARAMETER SET FORMULA TEMP. CONTROL OPERATION			

Please Remove Materials

Refer to 8-2:

8-1. Normal Status: The freeze dryer is working in good condition.

8-2. Please Remove Materials:

Materials have finished freeze drying and can be removed from the freeze dryer.

[Caution] Before removing materials, please confirm materials are in stable status first:

Go to Main Menu, press "Temp.Control" to check if vacuum record in the past one hour has been keeping stable.

When vacuum record in the past one hour is stable, stop the freeze dryer, open the water draining valve, remove materials from the chamber, and run "Defrost" in "OPERATION" menu.

*Before running the next freeze drying cycle, check and make sure there are no frost, ice or water in the chamber.

8-3. Vacuum Alarm:

This alarm is caused some reasons related to the material itself and air leakage. Refer to point 9 for solutions.

9. How to Eliminate Vacuum Alarm

When "Vacuum Alarm" keeps flashing on the main menu, please try the 2 solutions given below:

9-1. If vacuum degree on the main menu is between 900-1000 (Pa)(Pic-9) when "Vacuum Alarm" keeps flashing on the Main Menu.

☞ It means critical leakage which causes failure of vacuum pumping.

Step 1. Stop the freeze dryer.

Step 2. Check and make sure the door is closed tightly, and there is no leakage with all the vacuum tubes outside/inside the freeze dryer and connectors.

*If necessary, some parts need to be replaced to fix leakage.

Step 3. Re-start the freeze dryer

Step 4. Go to Main Menu, Press "FORMULA". Modify "Pre-freeze Time" from 600(minutes) into 1(minute).

*This is because pre-freeze stage has completed before re-start and it needs to skip this stage after re-start. So the pre-freeze stage can run only for 1 minute then go to vacuum pumping stage quickly.

Run Time	88 : 88	Vacuum Alarm	
Shelf Temp.1	8888 °C	Vacuum Degree	950
Shelf Temp.2	8888 °C	Left Sect.Time	88888min
Cold Trap Temp.	8888 °C	Current Section	88888
Material Temp.	8888 °C	Current Recipe	88888
Ambient Temp.	8888 °C	Current Status	FINAL DRYING
PARAMETER SET	FORMULA	TEMP. CONTROL	OPERATION

Pic-9

Pre-freeze Time	600	Recipe Upload	<input type="button" value=""/>
		Recipe Download	<input type="button" value=""/>
Cold Trap Ref.	Temp. 888.8	Time/Min 88888	Recipe No. 88888
Pre-Vacuum	Set Pressure 88888	Time min 88888	Vacuum Limit 88888
<input type="button" value="Monitor"/>	<input type="button" value="NEXT"/>		

Pre-freeze Time	1	Recipe Upload	<input type="button" value=""/>
		Recipe Download	<input type="button" value=""/>
Cold Trap Ref.	Temp. 888.8	Time/Min 88888	Recipe No. 88888
Pre-Vacuum	Set Pressure 88888	Time min 88888	Vacuum Limit 88888
<input type="button" value="Monitor"/>	<input type="button" value="NEXT"/>		

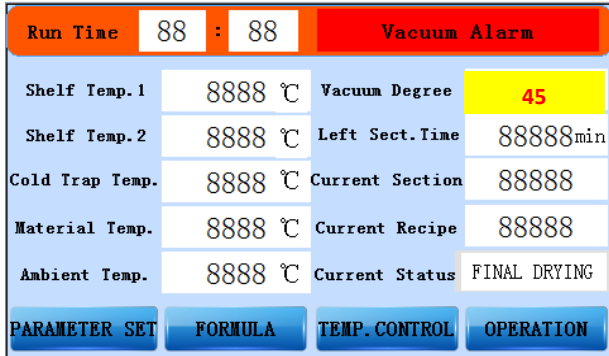
Step 5. Go to Main Menu, press "OPERATION". On OPERATION menu, press "Stop Vacu. Alarm" to eliminate vacuum alarm.

<input type="button" value="Program Control"/>	<input type="button" value="Stop Vacu. Alarm"/>	WORK PROGRESS	
<input type="button" value="Auto"/>	<input type="button" value="Stop"/>	<input type="button" value="Pre-freeze"/>	<input type="button" value="COLD TRAP COOL"/>
<input type="button" value="Defrost ON"/>		<input type="button" value="Vacuum Pumping"/>	<input type="button" value="Drying Stage"/>
Defrost Time	Defrost Temp.	<input type="button" value="TEMP KEEP STAGE"/>	
88888	888.8	<input type="button" value="Manual"/>	<input type="button" value="Monitor"/>

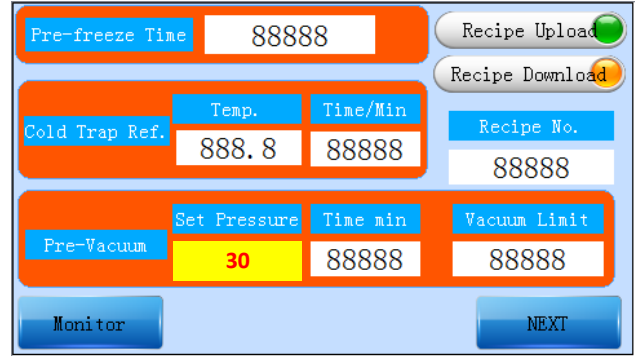
Step 6. On OPERATION menu, press "Start" to run the freeze dryer in good condition without vacuum alarm.

The Problem is solved.

9-2. If vacuum degree on the main menu is lower than 900 (Pa) but higher than Pre-vacuum pressure set by the user (for example, 30Pa) when “Vacuum Alarm” keeps flashing on the main menu.
 For example. Vacuum degree displayed on the main menu is 45Pa (Pic-10) and pressure set for Pre-vacuum is 30Pa (Pic-11).



Pic-10



Pic-11

There are 2 reasons:

Reason 1: There is minor leakage.

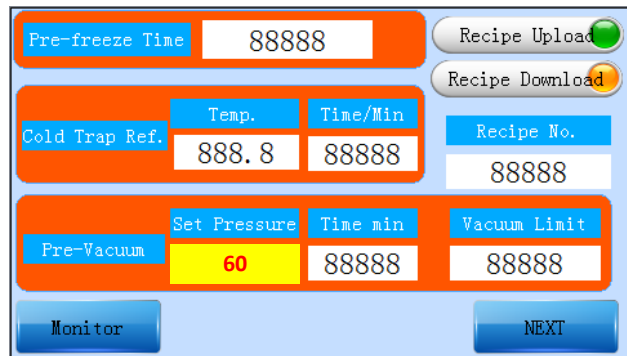
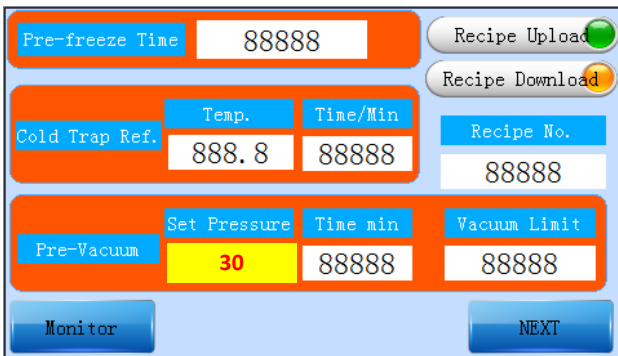
Solution:

Step 1. Do NOT stop the freeze dryer.

Step 2. Check and make sure the door is closed tightly, and there is no leakage with all the vacuum tubes outside/inside the freeze dryer and connectors.

Step 3. Go to Main Menu, Press “FORMULA”. Modify “Pre-Vacuum Pressure from 30(Pa) into a value (e.g. 60Pa) higher than vacuum degree (e.g. 45Pa) as displayed on the main menu

*This is because pre-freeze stage has completed before re-start and it needs to skip this stage after re-start. So the pre-freeze stage can run only for 1 minute then go to vacuum pumping stage quickly.



Step 4. Go to Main Menu, press “OPERATION”. On OPERATION menu, press “Stop Vacu. Alarm” to eliminate vacuum alarm.



Then the freeze dryer can continue to run in good condition without vacuum alarm.

The Problem is solved.

Reason 2: Characteristics (such as water contents) of the materials itself does not allow to reach a pressure (e.g. 30Pa) as set for pre-vacuum which is lower than the vacuum degree (e.g. 45Pa) displayed on the Main Menu. It means the materials can finish freeze drying in the vacuum degree (e.g. 45Pa) displayed on the Main Menu. And it is impossible to reach the lower pressure (e.g. 30Pa) as set for pre-vacuum.

Solution:

Step 1. Do NOT stop the freeze dryer.

Step 2. Go to Main Menu, Press "FORMULA". Modify "Pre-Vacuum Pressure from 30(Pa) into a value (e.g. 60Pa) higher than vacuum degree (e.g. 45Pa) as displayed on the main menu

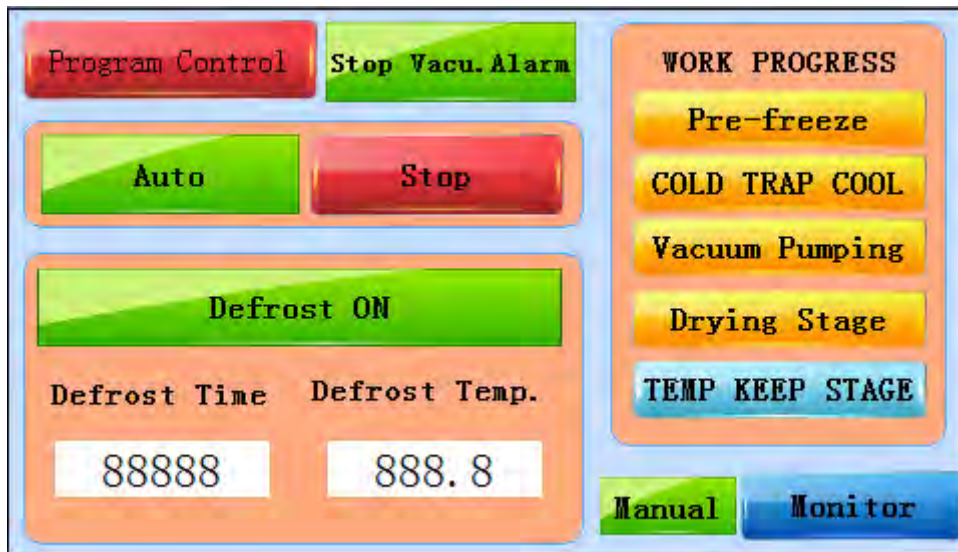
*This is because pre-freeze stage has completed before re-start and it needs to skip this stage after re-start. So the pre-freeze stage can run only for 1 minute then go to vacuum pumping stage quickly.



Pre-freeze Time	Temp.	Time/Min	Recipe No.
88888	888.8	88888	88888

Pre-Vacuum	Set Pressure	Time min	Vacuum Limit
88888	88888	88888	88888

Step 4. Go to Main Menu, press "OPERATION". On OPERATION menu, press "Stop Vacu. Alarm" to eliminate vacuum alarm.



Then the freeze dryer can continue to run in good condition without vacuum alarm.

The Problem is solved.

PART 4. SYSTEM OPERATION

1.After power-on The system enters into Main Menu (Monitoring Interface) with parameters including time the freeze dryer has run from start, real-time vacuum degree (1000Pa is shown if higher than 1000Pa) , temperature of shelves, cold trap (working chamber) and materials, current section at current stage, and current working stage.

Run Time	88 : 88	Vacuum Alarm	
Shelf Temp. 1	8888 °C	Vacuum Degree	88888 Pa
Shelf Temp. 2	8888 °C	Left Sect. Time	88888min
Cold Trap Temp.	8888 °C	Current Section	88888
Material Temp.	8888 °C	Current Recipe	88888
Ambient Temp.	8888 °C	Current Status	FINAL DRYING
PARAMETER SET		FORMULA	TEMP. CONTROL
		OPERATION	

2.Click "FORMULA" for recipe management. Set parameters according to materials to be freeze dried.

i. Set Pre-freezing time (600 minutes is recommended).

ii. Set cold trap temperature and time (Timing starts when cold trap reaches temperature set by the user). -30°C and 3 minutes are recommended.

iii. Set pre-vacuum pumping value and time (Timing starts when vacuum reaches value set by the user). 30Pa and 30 minutes are recommended. If vacuum does not reach the set value within 30 minutes, the system will display vacuum abnormal alarm. In such situation, check door, drain valve and vacuum pump connectors.

iv. Set vacuum limit for drying stage (If vacuum in drying stage exceeds this limit, heating is stopped).

Pre-freeze Time	88888		Recipe Upload
			Recipe Download
Cold Trap Ref.	Temp.	Time/Min	Recipe No.
	888.8	88888	88888
Pre-Vacuum	Set Pressure	Time min	Vacuum Limit
	88888	88888	88888
Monitor		NEXT	

After finishing above setting, you will have 2 control modes(Vacuum Control and Program Control) to choose.

Program Control Mode is recommended because this Mode can be used for all the materials while Vacuum Control Mode is not suggested for some materials such as milk and flowers.

Please refer to details on the next page.



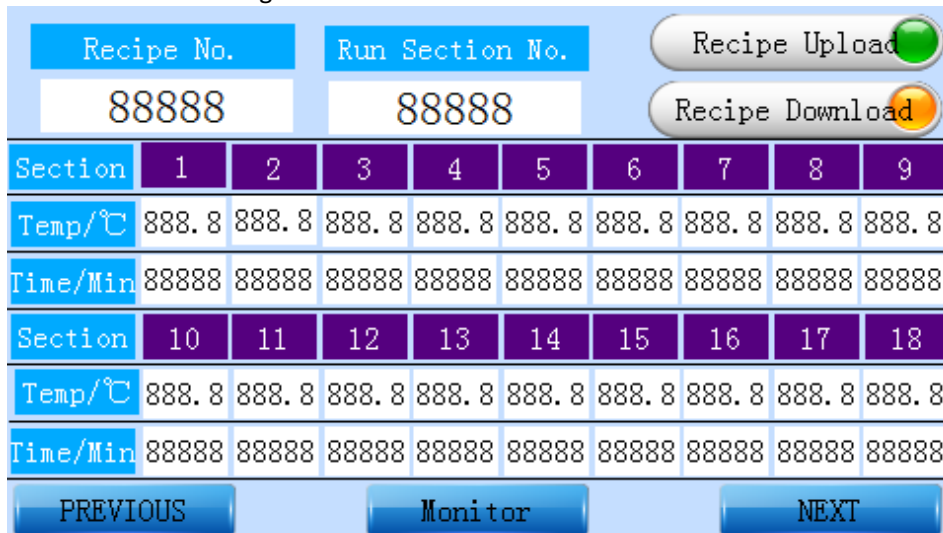
If Vacuum Control Mode is chosen:

- i. Please set Vacuum Upper Limit, Vacuum Lower Limit (In initial vacuum process. When chamber pressure \leq Vacuum Lower Limit, the system starts heating and inflating. When chamber pressure \geq Vacuum Upper Limit, the system stops heating and inflating. Vacuum Upper Limit 66Pa and Vacuum Lower Limit 33Pa are recommended.
 - ii. Set time for initial drying stage. 600 minutes is recommended. When initial drying time is reached, the system enters into secondary drying stage.
 - iii. Set keeping (maintaining) pressure and time. When chamber pressure < keeping pressure, timing starts. When time reaches keeping time set by the user, the system enters into the secondary drying stage.
 - iv. Set keeping (maintaining) temperature which can be understood as keeping (maintaining) time for the initial drying. 60°C is recommended.
- After finishing above setting, press "Next" to set parameters for the secondary drying.
- v. Set time for secondary drying. 600 minutes is recommended.
 - vi. Set temperature for secondary drying. 40°C is recommended.

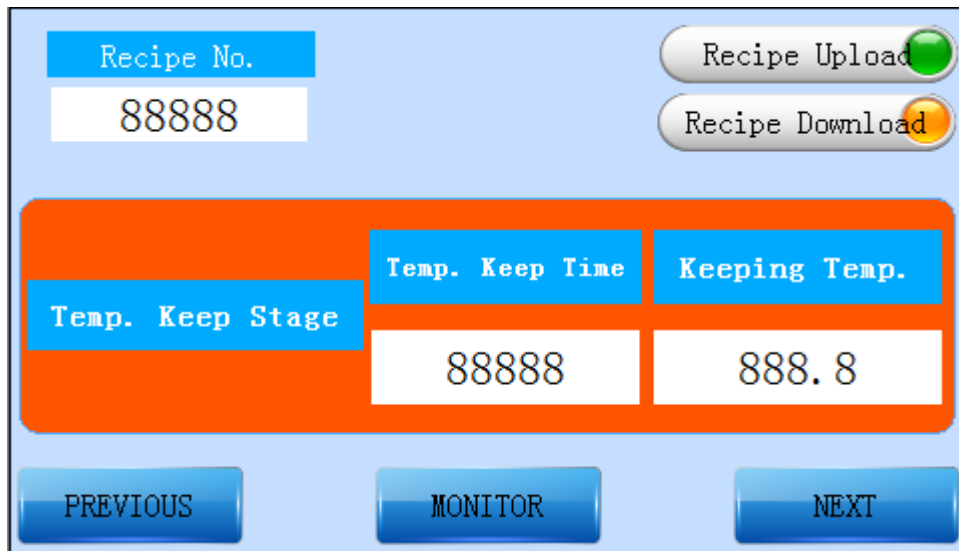


If Program Control Mode is chosen:

The user can program up to 18 sections. Set temperature and heat keeping (maintaining) time. Please input total number of all the sections in RUN SECTION NO after setting is finished.



3. Temperature-keeping (maintaining) Stage. Set keeping time 999 min, keep temperature 30°C.



4. After finishing FORMULA setting, return to Monitoring Menu (Main Interface) , press "OPERATION".

i. Choose control mode (Program Control or Vacuum Control). Refer to procedure above on the previous page for setting.



ii. Load materials into the chamber, close the door, check if the inflation/drain valve is closed tightly and vacuum pump tube is connected properly.

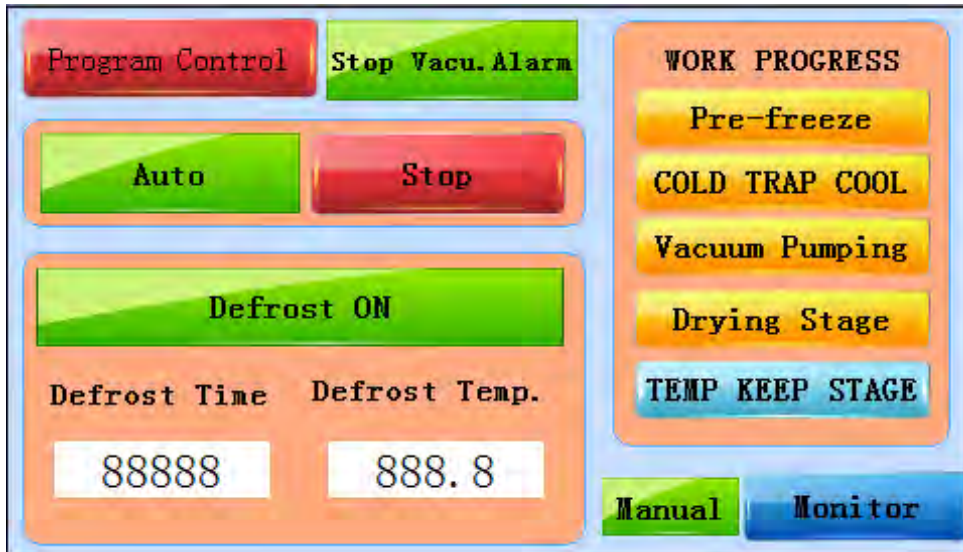
iii. Press "Start'. The system begins freeze drying process.

iv. After automatic program running is finished, Rotate the vacuum /water draining valve to the open position, then open the door and unload the freeze dried materials.



Open Position

v. Set defrost time and temperature, press "Defrost ON". 120 minutes and 60°C are recommended.



This system allows the user to check and output history record of temperature and vacuum.

In Monitoring Menu (Main Menu), press "TEMP. CONTROL" to view history temperature and vacuum chart. Press "NEXT" and "PREVIOUS" to check history record at specific time. The user can also insert a Flash Disk (this feature is available soon) to output data in Excel format. DO NOT save too many files in the flask disk. 📺 Contact us for video.

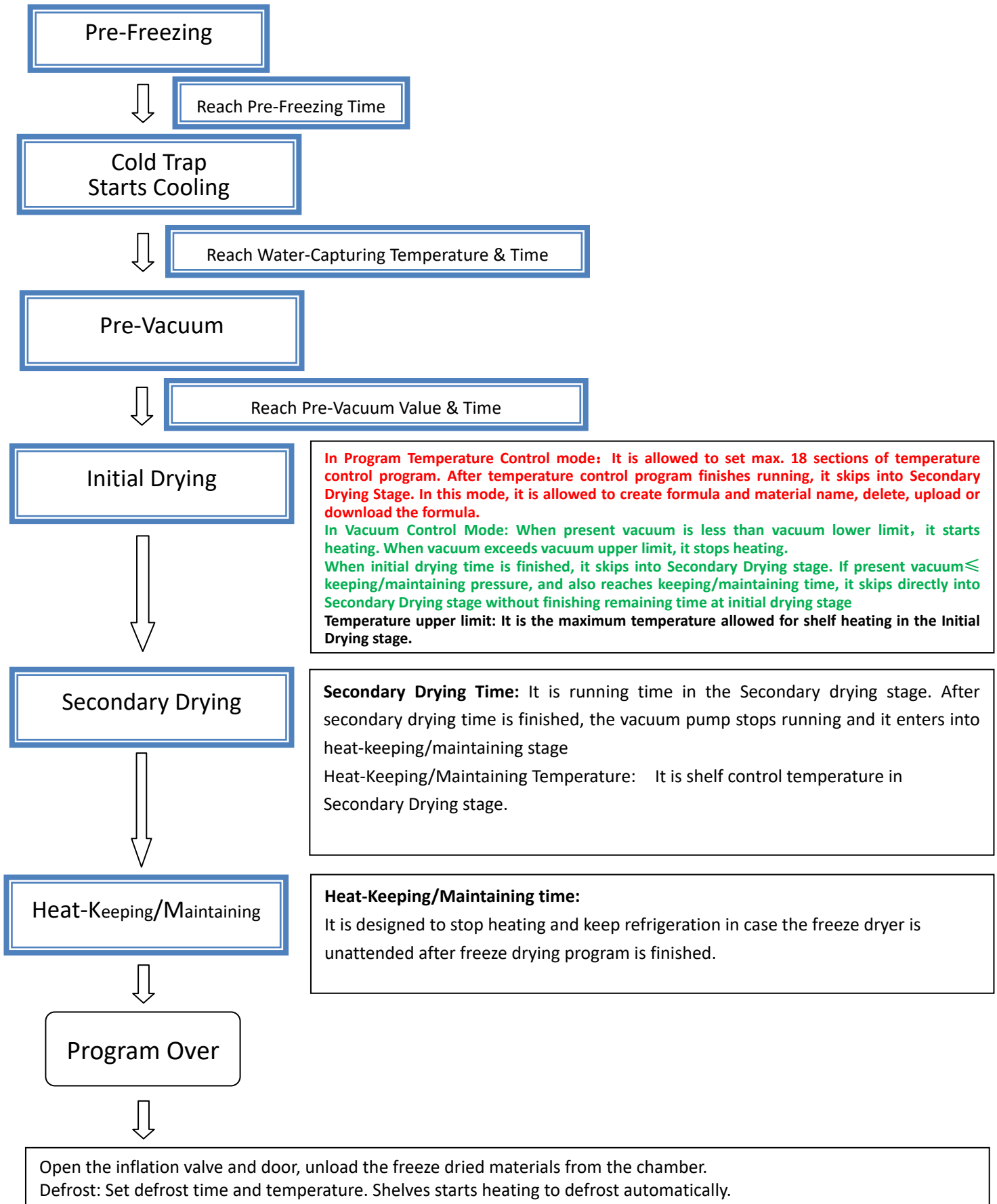
It is suggested to clear data monthly so as to ensure data integrity. If memory for the touch-screen controller is full, the system will replace the earliest data with latest data.

Time	Date	Cold trap	Shelf 1	Shelf 2	Material	Vacuum

Navigation buttons: PREVIOUS, UP, DOWN, NEXT, CURVE, EMPTY, OUTPUT, PARAMETER, FORMULA, TEMP. CONTROL, OPERATION

PART 5.

HF400/600 PLC Freeze Drying System Automatic Working Flow Chart



Note: In case of machine being unattended at completion of cycle, the duration of the final section is set at 999 minutes. However, it is not necessary to run the final section for 999 minutes. At any time during the final section, the user can remove the dried materials from the freeze dryer.

Parameters (Temp,°C/Time,min)		Fruit & Vegetable	Meat	Fruit Juice	Milk	Seafood	Microbial Products & Strain	Flower & Blueberry	Leaf	Soup	Placenta
Pre-Freezing Time (Hr)		10	10	10	10	10	10	10	10	10	10
Section 1	Temp/Time	-30/120	-30/120	-30/120	-30/120	-30/120	-30/120	-30/120	-30/120	-30/120	-30/120
Section 2	Temp/Time	-10/120	-10/120	-20/60	-30/60	-20/60	-30/30	-33/60	-30/60	-30/60	-20/60
Section 3	Temp/Time	-5/60	0/60	-10/120	-25/60	-10/120	-25/60	-32/60	-25/60	-25/60	-10/120
Section 4	Temp/Time	0/60	20/60	-5/120	-20/60	0/120	-20/60	-30/60	-20/60	-20/60	0/60
Section 5	Temp/Time	10/60	30/30	10/120	-15/60	10/60	-15/60	-28/60	-15/120	-15/120	10/120
Section 6	Temp/Time	20/30	40/30	20/30	-10/180	20/30	-10/180	-26/60	-10/240	-10/180	20/30
Section 7	Temp/Time	30/30	50/30	30/60	-5/60	30/30	-5/60	-23/60	-5/120	-5/60	30/30
Section 8	Temp/Time	55/720	60/600	45/800	0/60	55/800	0/60	-20/120	0/60	0/60	50/750
Section 9	Temp/Time	45/180	45/180	40/180	5/60	45/180	5/60	-18/120	5/30	5/30	55/180
Section 10	Temp/Time	25/999	35/999	25/999	10/120	30/999	10/120	-15/120	10/60	10/120	45/999
Section 11	Temp/Time				15/60		15/30	-13/120	20/30	15/60	
Section 12	Temp/Time				20/60		20/30	-10/240	30/60	20/30	
Section 13	Temp/Time				25/30		25/30	-8/120	40/300	30/30	
Section 14	Temp/Time				30/30		30/30	-5/120	45/240	40/300	
Section 15	Temp/Time				35/600		35/600	-3/120	35/999	50/800	
Section 16	Temp/Time				25/999		25/999	0/180		40/999	
Section 17	Temp/Time							3/240			
Section 18	Temp/Time							5/300			
Section 19	Temp/Time							7/120			
Section 20	Temp/Time							4/999			

*A video training course is available upon request.





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