



# Product operating Manual for PCR

Suitable for T960

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# Chapter 1 Important Notice

## 1 Unpacking check

Upon receiving T960 PCR, please unpack the box to confirm if the items comply with the packing list or not:

If the contents do not comply with the packing list, please contact the distributor as soon as possible.



**Notice: If you find the package seriously broken or the instrument obviously damaged after receiving the instrument, please keep the original package and contact your distributor as soon as possible so we can change a new one for you.**

## 2 Safety notice



**Please read the manual carefully before operating the instrument, the wrong operation may be hazardous to the operator or the **instruments** itself.**

### ① Operating safety

- The power cord for the instrument should be grounded reliably. The instrument adopts three-core grounding plug, and should be connected with appropriate power socket. Before connecting to the power, you must make sure that the voltage and power load of the socket is in accordance with the capacity on the instrument's nameplate.
- Please change the power cord with the same type if the skin of the cord is found to be broken. Nothing is allowed to be placed on the power cord and the cord shall not be placed in the area that may be easily approached by people. Be sure to hold the plug tightly while inserting, pulling of the cord directly is forbidden.
- While the instrument is in operation, the sample plate block and the heat lid will produce the high temperature, so no part of human body is allowed to touch the

metal block or the heat lid while the instrument is in operation in case of any scalding.

- For the good ventilation, no articles are allowed to be placed within 30cm around the instrument.

## ②Maintenance Safety

The block and the heat lid of the instrument need regular cleaning to guarantee the precision of the experiment. Before cleaning, the sample plate block is suggested to be taken out for soft scrubbing by the clean soft cloth stained with the pure alcohol in appropriate amount. No corrosive cleaning agent is allowed for use and dripping the cleaning agent into the taper hole is forbidden in case of any damage to the instrument. And the sample plate block should be put back into the instrument after cleaning.

Please cut off the power at once and stop the experiment and then immediately contact the distributor or the professional maintenance personnel in case of any occurrence of the following situations:

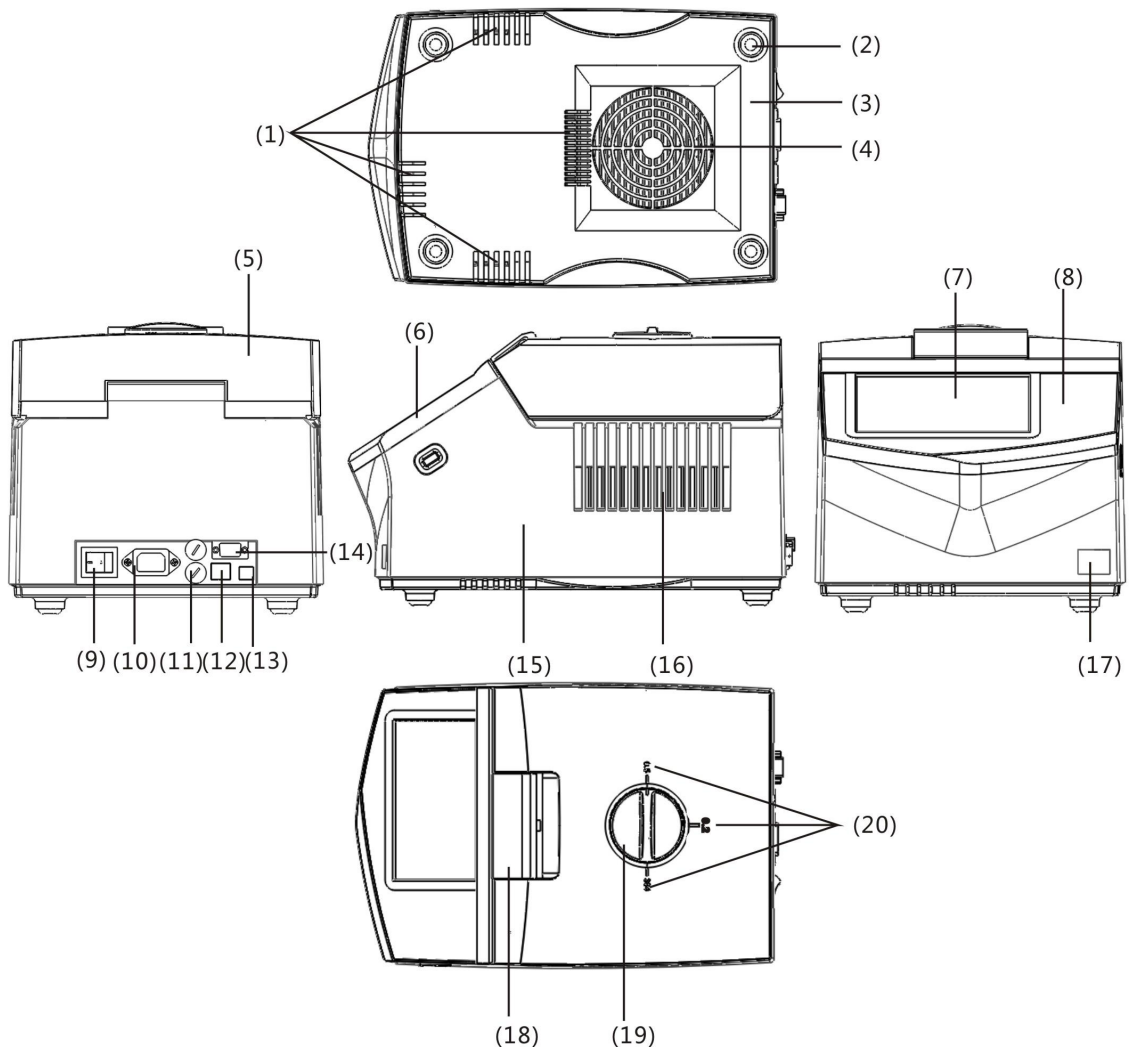
- Any reagent, rain water or other liquid enters into the instrument.
- The instrument falls from a high place or the instrument shell is damaged.
- The operating instrument produces the abnormal noise or the pungent odor.
- The features of the instrument change apparently, such as failures of startup or shutdown or failure to run user program, etc.



**Notice: For your personal safety and the normal operation of the instrument, please do not disassemble the instrument by yourself. Any such behavior may endanger your safety and deprive your guarantee right of the instrument.**

# Chapter 2 Basic Functions

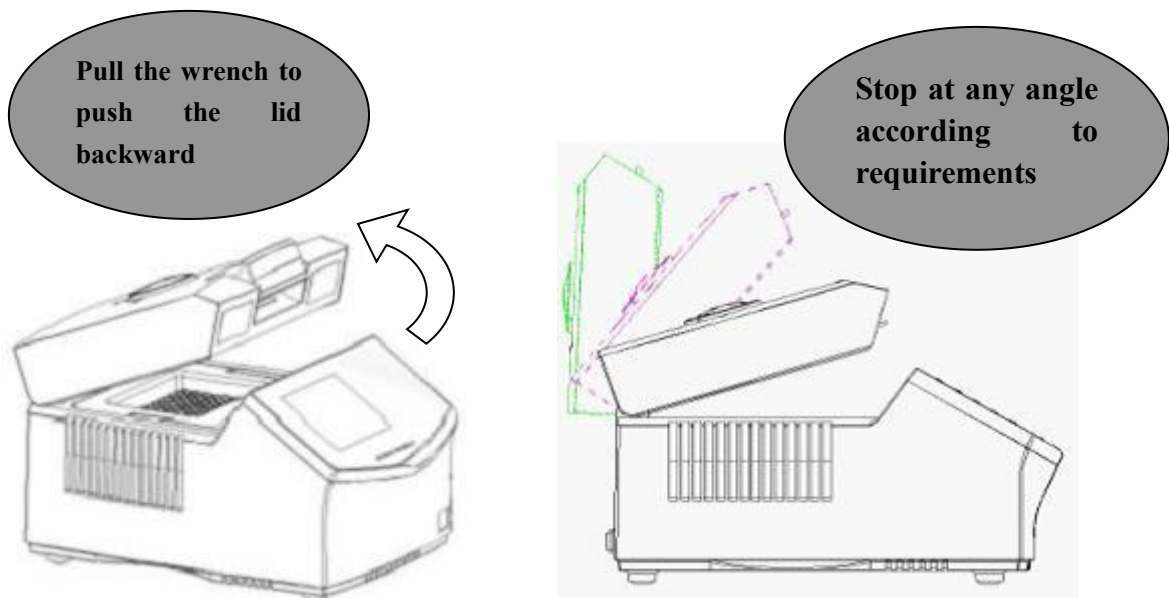
## 2.1 Structure of T960



- (1) Ventilation window (2) Foot rest (3) Base (4) Ventilation window (5) Upper lid
- (6) LCD panel (7) LCD Screen (8) Aluminum panel (9) Power switch (10) Power socket
- (11) Fuse socket (12) Network interface (13) USB interface (14) JTEG interface (15) Shell
- (16) Ventilation window (17) Logo label (18) Lid wrench (19) Block selecting knob (20) Block selecting indicator

## 2.2 Lid-opening angle

This type of instrument takes a leading role in adopting the hinge joint technology, enabling the upper lid of the instrument to stay at any angle according to requirement and solving such problems brought by the traditional method of relying on spring elasticity to open the lid as unreliability, instability, large inertia and short life etc.

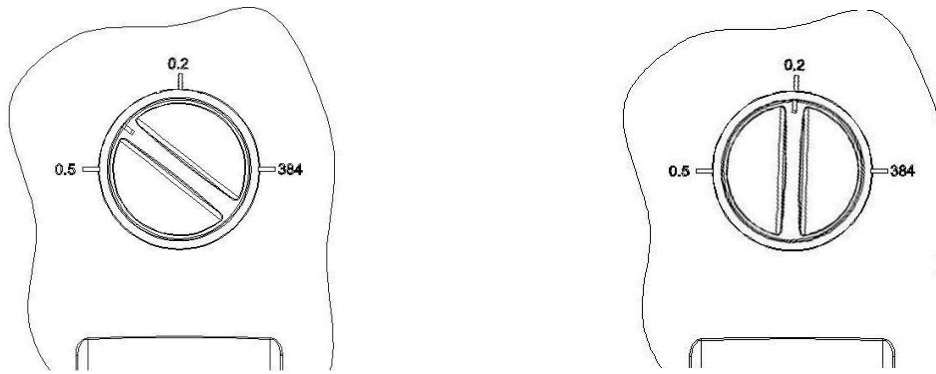


As indicated in the above two figures, when the wrench is raised the buckle will be released, and then the user can set the upper lid at any angle according to their requirement. Humanistic structure endows the product more beautiful and practical characteristics, and guarantees the safety and convenient operation.

**Notice: According to the instrument characteristics, the open angle scope between upper lid and the shell is 0°~ 90°, please keep it within the scope to prevent any damage to the instrument.**

## 2.3 Heat Lid positions

Frequently, experiments need different reaction tubes, that is, use different blocks to match the tubes. The design of the heat lid gear positions realize the heat lid to match different sample plate blocks just by turning the knob to the appropriate position.



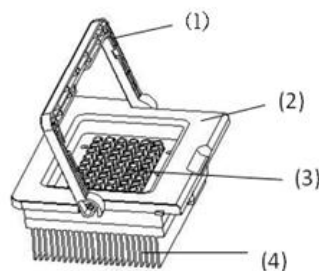
As the above figures indicate that the mark of 0.5, 0.2,384 (clockwise) on the panel respectively corresponds to the gear position of tube 0.5ml, 0.2ml and 384sample plate blocks. If you need the 0.2ml tube for experiment, you only need to change the block with 0.2ml block (See *2.4 Module* for details), then switch the gear to the mark of 0.2, and then you can start your experiment. The design abandons the traditional practice of changing heat lid/or even instrument.

**Notice: According to characteristics of the instrument, the turning range of the switch is between 0.5 to 384, do not try to turn the switch out of this range.**

## 2.4 Module

For the need of users to use tubes of different specifications for experiment in the same instrument, and for the convenience of users to change relevant parts directly and effectively, the instrument adopts the portable design with auto-lock function to make the instrument meet the experiments of different tubes on the condition of changing least parts, which fully reflects the humanistic design of the instrument.

### Block components



- (1) Handle
- (2) Frame
- (3) Block
- (4) Heat sink

The above figure indicates that the integrated block parts design of the instrument greatly improves operational convenience no matter in installation or replacement, and the overall dimension, assembly process and installation method of all the blocks of all specifications are the same (The block parts of different specifications differ with blocks corresponding to tubes of different specifications). And this guarantees that

users can change or install the block in a fast and high-efficient way only by choosing the block with specification needed.

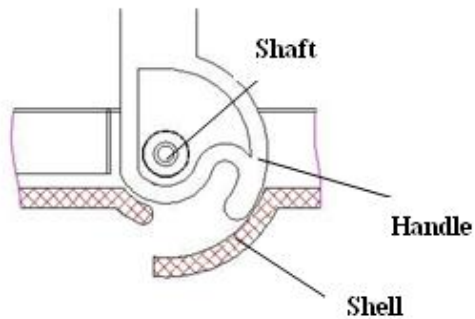


Figure 1

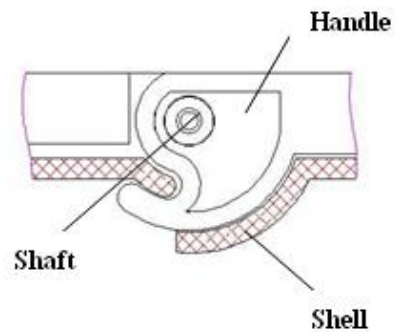


Figure 2

Figure 1 show how to change the block unit. When changing the block, the user shall pull the handle upward, when the handle and the shell are in a vertical state, the block will be unlocked, and then the user can easily take out the block part by pulling the handle vertically. Figure 2 show how to insert the block, when the user confirm the block part of certain specifications needed, the user only needs to hold the block' s handle. Vertically insert the block in position, then put the handle down to complete the operation.

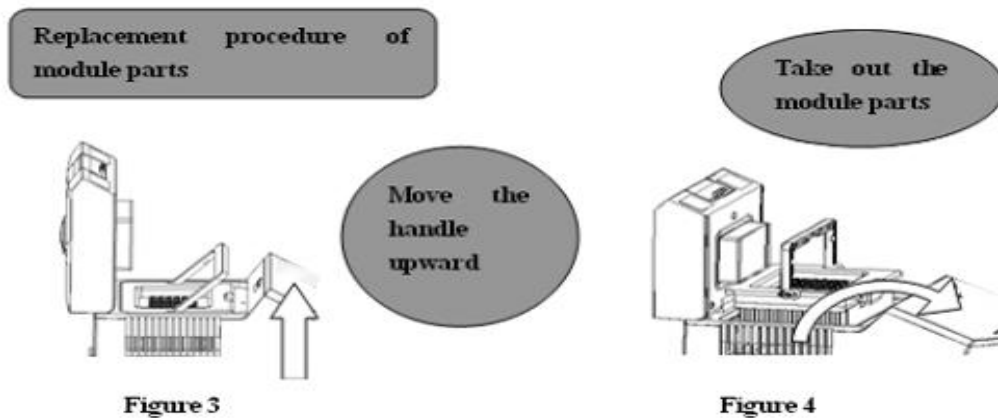


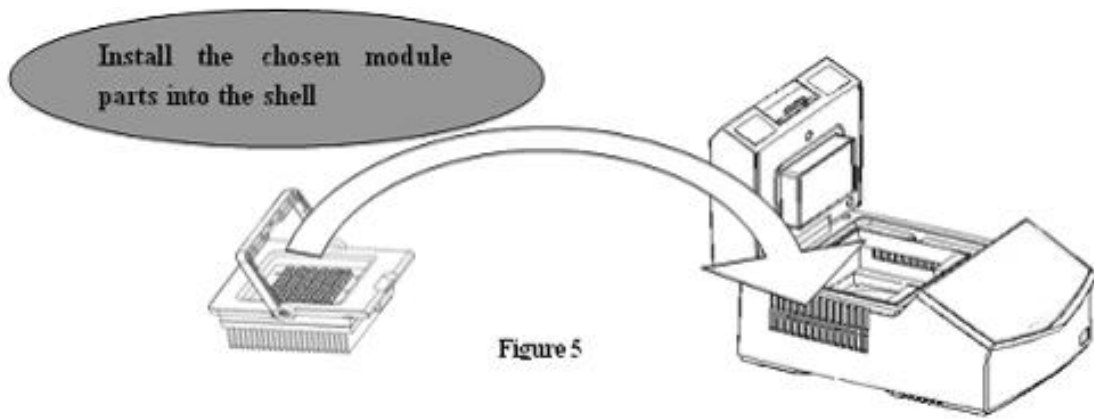
Figure 3

Figure 4

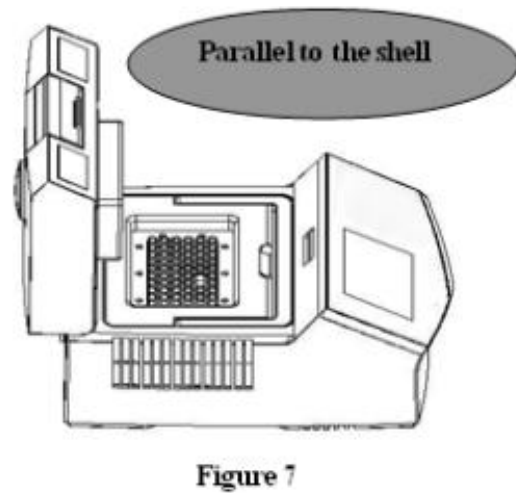
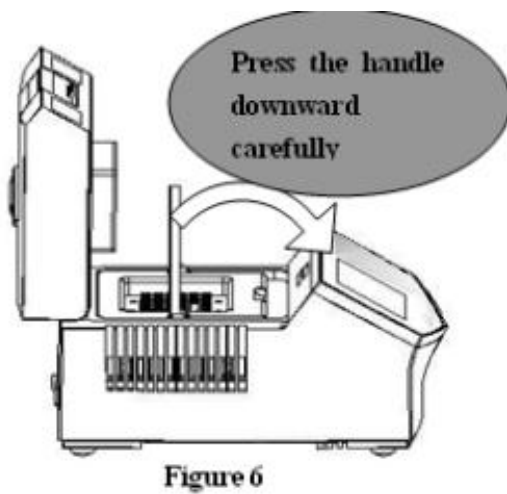
Step 1: Move the handle to the state vertical to the shell to make the block parts unlocked. (Figure 3)

Step 2: Move the block parts upward slightly, and lay it in a safe place after the block parts are completely off the shell. (Figure 4)





Step 3: Choose the block parts of specifications needed and gently put them into the shell vertically.



Step 4: After the block parts completely contact the shell, put the handle down. (Figure 6)

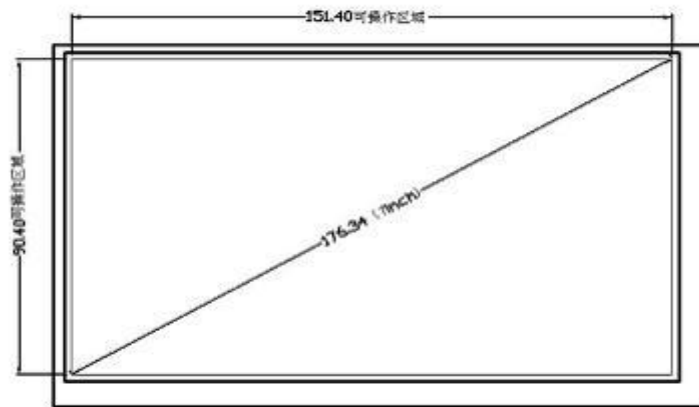
Step 5: When the block parts and the shell lock tight, the replacement of block parts is ok. (Figure 7)

The integrated block parts coupled with the intelligent block auto-lock mechanism enable the user to conduct replacement in a faster and safer way. In addition, the option of block parts of various specifications enable the users to conduct experiments with tubes of different specifications in one set of instrument.

**Notice: Since all the lines of the instrument are connected by connectors, the user shall use proportional strength while taking out or installing block parts, and use skilled strength to shake them left and right. No tough strength is allowed in case of any damage to connectors.**

## 2.5 Touch screen

This machine is the latest touch-screen model, it has characteristics of convenient operation, powerful function, high sensitivity, beautiful appearance and so on.



## 2.6 Working condition and performance indicator

### 2.6.1 Instrument working condition

Ambient temperature : 10°C~30°C

Relative humidity: ≤ 70%

Power supply: AC220V±22V 250VA 50Hz±1Hz

### 2.6.2 Instrument storage condition

Ambient temperature: -20°C~55°C

Relative humidity: ≤80%

**Notice: In order to guarantee the normal use of the instrument and the accuracy of experimental results, please run or store the instrument according to prescribed working conditions and storage conditions. Or the wrong operation will damage the instrument and even personal safety.**

### 2.6.3 Instrument performance indicator

- Model: T960-A; T960-B; T960-C; T960-D
- Capacity: 96\*0.2mL(A);54\*0.5mL(B);96\*0.2mL+77\*0.5mL(C);384well(D)
- Temp range: 0°C~99.9°C (Rt≤30°C)
- Max heating rate: ≥2.0°C/s (55°C—95°C)
- Max cooling rate: ≥2.0°C/s (95°C—55°C)
- Uniformity:≤±0.5°C (45°C≥T≥95°C, Constant 10s)
- Accuracy:≤±0.1°C (45°C≥T≥95°C)
- Gradient temp range: 30°C~100°C
- Gradient spread: 1°C~30°C
- Heat lid temp: (Rt +2°C) ~110°C
- Temp control: block, tube calculated
- Stored program number: 2000(The External U disk unlimited)
- Maximum number of cycles: 999
- Display: 7 inch LCD
- Communication: USB2.0、 RS232、 RJ45
- Size: 380mm(L)\*270mm(W)\*250mm(H)
- Weight: 8.1kg

# Chapter 3 Instructions

## 3.1 Program upgrade (the manufacturer will notify the user to do upgrade if necessary)

Step1. Double click master computer icon  to enter program operation interface. (Figure 3-1)

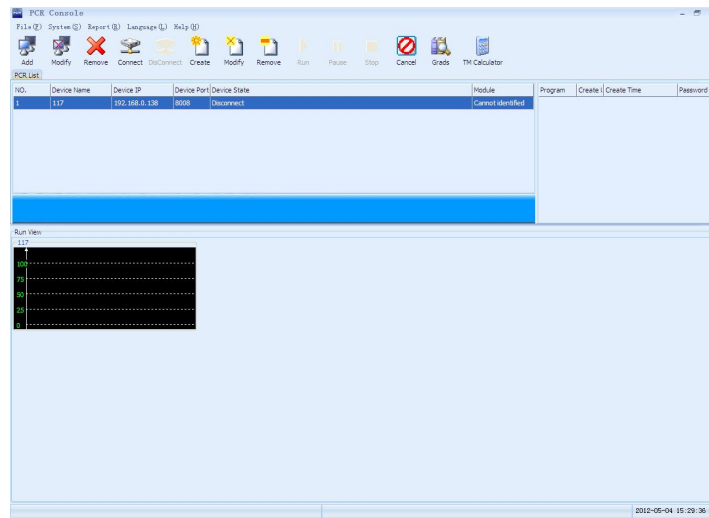


Figure 3-1

Step2. Connect the Thermal Cycler with the PC, dialog box of update version will appear. (Figure 3-2), select " Yes" to start upgrading program. (Figure 3-3)

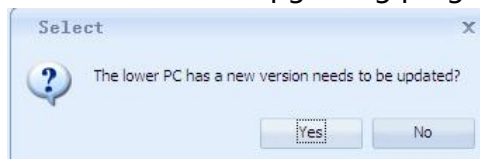


Figure 3-2

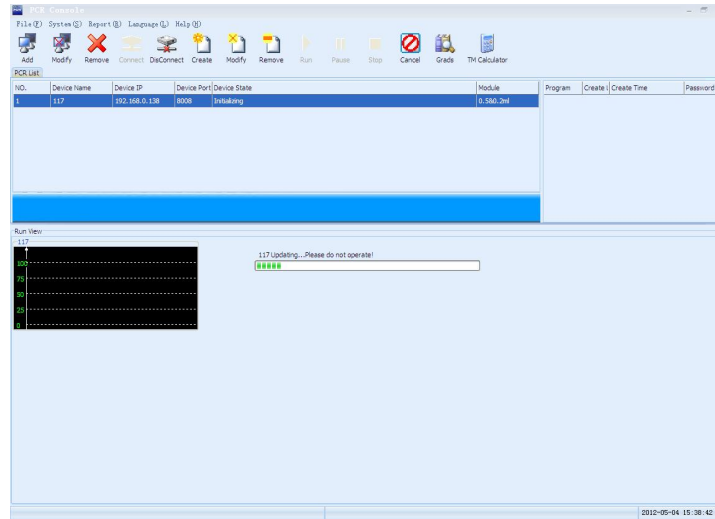


Figure 3-3

Step3. Dialog box appears when upgrade completed, (Figure 3-4), click " OK" and restart PCR, then upgrade completed.

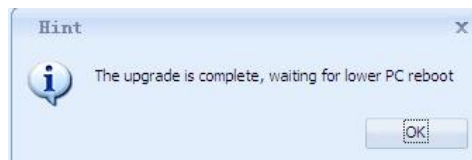


Figure 3-4

### 3.2 Startup interface

After connecting related power, turn on the power switch of the instrument and it will produces the sound of "tick-tack" , which means the instrument is in operation, and now the screen will display the startup interface (Figure 3-5), then the instrument

will start automatic systematic inspection, and then enter the stand-by interface (Figure 3-6) if no fault is found. If so, this means the instrument is free for experimental operations now. If the screen is dark or any other abnormal phenomena occur while turn on the instrument, please cut off the power immediately and refer to Chapter 5 for maintenance or contact the distributor or the supplier for settlement.

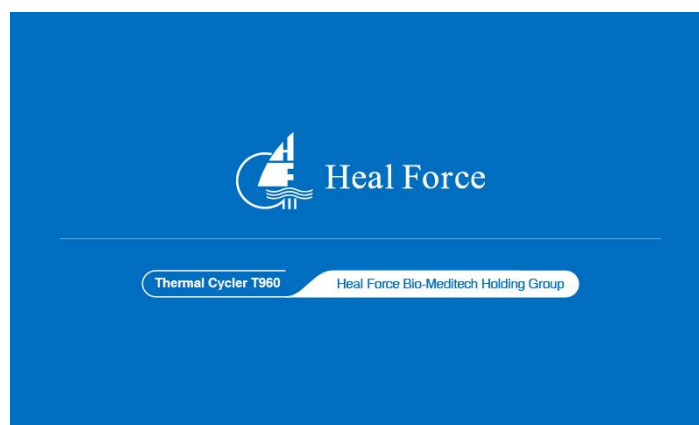


Figure 3-5

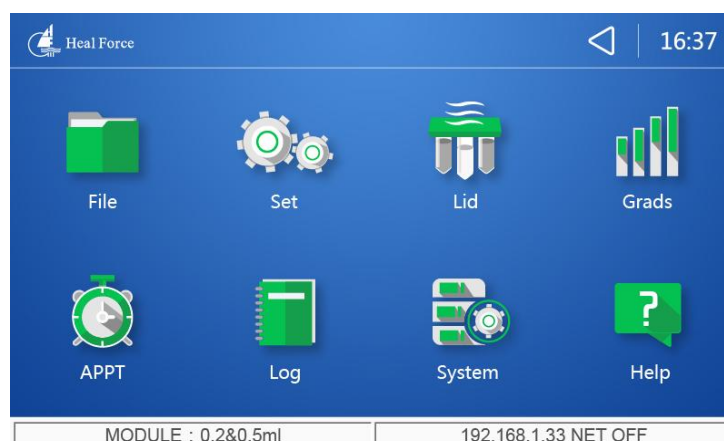


Figure 3-6

### 3.3 File

In the " Main Menu" select "File" submenu to get into the "File" interface, then you can choose to click the "Delete file " or "Create file".(Figure 3-7)

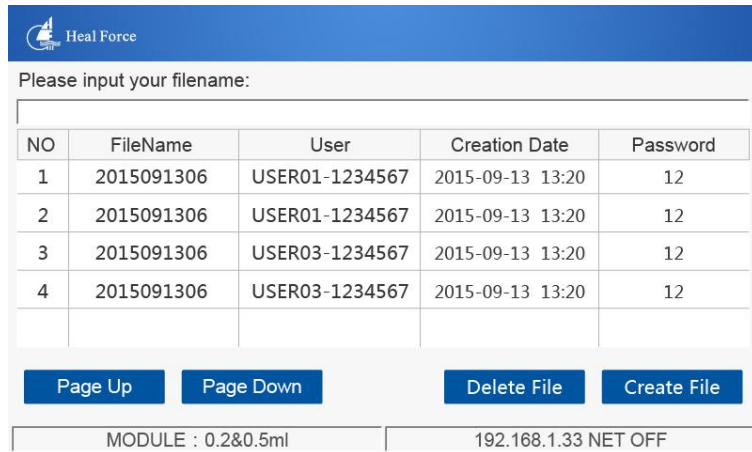


Figure 3-7

Notice: "Create file" -- Create new file.

"Delete file" -- Delete file.

Specific program file setting showed in chapter 4.

### 3.4 Setting

In the " Main Menu" select "Set" submenu to get into the "Operation Parameters Settings" interface. (Figure 3-8)

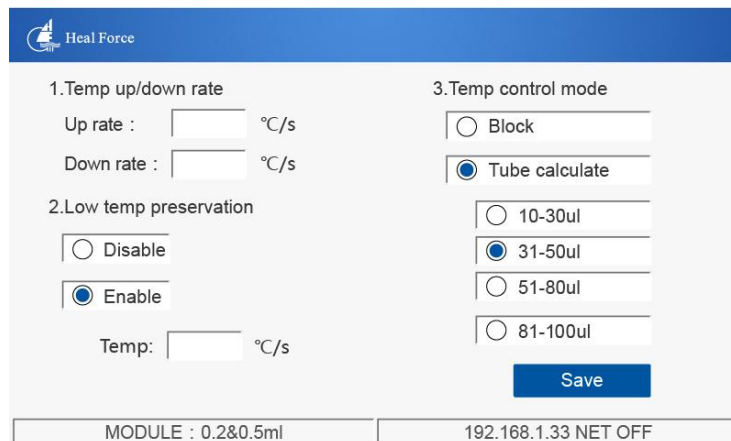


Figure 3-8

Notice: The up/down rate scope is 0.0°C/s ~ 5.0°C/s. The temperature scope of low temperature preservation is 0.0°C ~ 40.0°C. Temperature control mode: sample block control and tube control.

### 3.5 Heat Lid

In the "Main Menu" select "Lid" submenu to get into the "Heat Lid Function Settings" interface. (Figure 3-9)

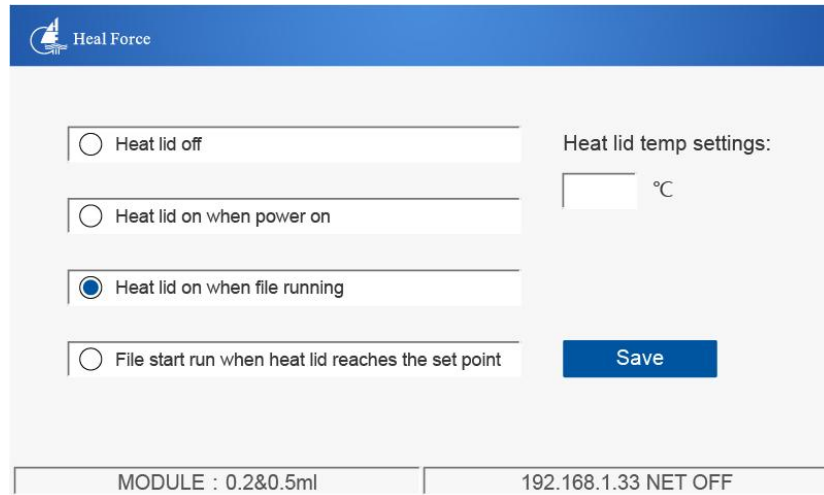


Figure 3-9

Notice: The Heat lid temperature scope is: 20°C ~ 110°C.

### 3.6 Gradient

In the " Main Menu " select " Grads " submenu to get into the " Gradient View " interface. (Figure 3-10)

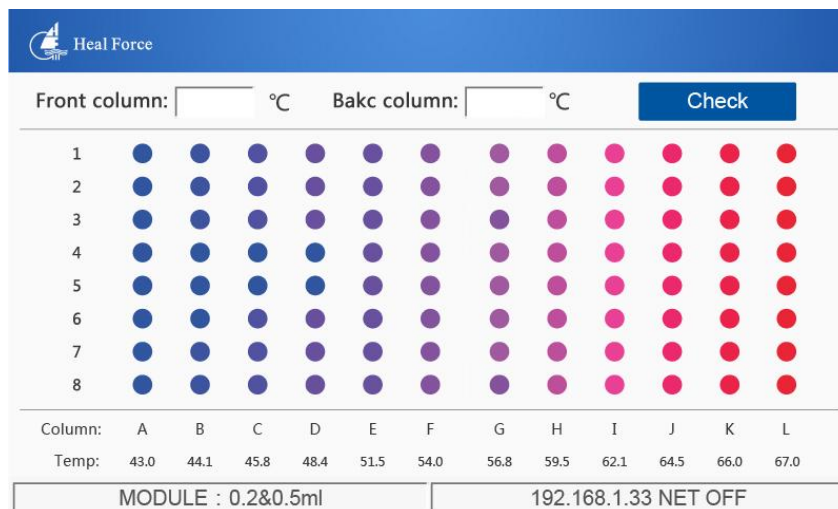


Figure 3-10

Notice: 1. The value of the Front column must above 30°C, the value of the Back column value must be below 100°C, the value of the Front column must not be above the value of the Back column, the D-value between the Front column and Back column must not be more than 30°C.

2.The Gradient graph cannot be used if user put in the 384module since the gradient function of the 384module is not available.

3. The color of the gradient figured above, don' t refer to the temperature and the color of the block, it is the position of every line.



### 3.7 Apply

In the " Main Menu" select "apply" submenu to get into the "Appointment and Alarm Settings" interface. (Figure 3-11)

NO	Name	Start time	End time
1	2015091306	01:15	2015-07-15 10:20
2	2015091306	01:37	2015-07-23 18:20
3	2015091306	02:09	2015-07-27 13:20
4	2015091306	02:25	2015-09-13 19:28

15:23 OPEN

Alarm Settings

Delete Appointment

MODULE : 0.2&0.5ml 192.168.1.33 NET OFF

Figure 3-11

### 3.8 Log

In the "Main Menu" Select "Log" submenu to get into "Log View" interface. (Figure 3-12)

File Name	Running Time (min)	Saving Date
2015091306	01:15	2015-07-15 10:20
2015091306	01:37	2015-07-23 18:20
2015091306	02:09	2015-07-27 13:20
2015091306	02:25	2015-09-13 19:28

Page Up Page Down

MODULE : 0.2&0.5ml 192.168.1.33 NET OFF

Figure 3-12

Notice: If the numbers of all currently created files is below 2000, all the files information will be displayed in this window. If the number of files is above 2000, the most recently created 2000 files' information will be displayed. This information include the file names, running time, and created date, etc.

## 3.9 System

In the " Main Menu" select "System" submenu to get into the "System Settings" interface. (Figure 3-13)

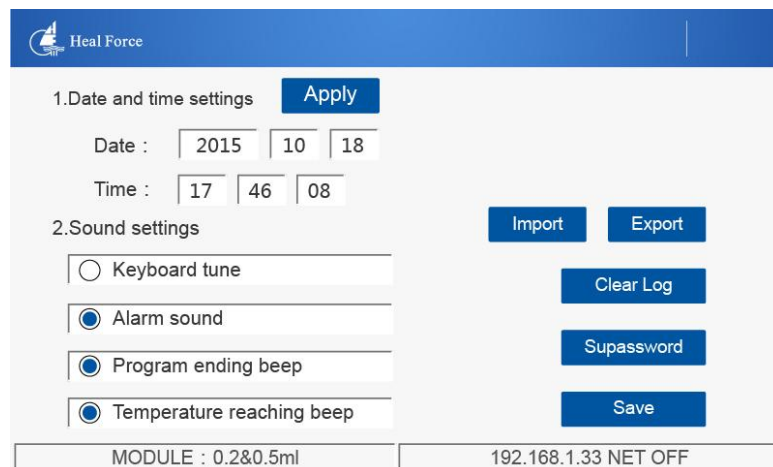


Figure 3-13

Notice: 1.Press the numerical keys on the soft keyboard to set the system date and Time.

2.Press the "Apply" key to modify the system date, alert sound, file list arrangement type, etc.

3.Insert the U disk into your machine, then press the "Export" button, the user's program files will be copied to the "jgFolder" folder in the U disk.

4. Insert the U disk into your machine, then press the "Import" button, all of the user's program files that is copied to the "jgFolder" folder in step 3 will be imported into the application program

## 3.10 Help

In the "Main Menu" select "Help" submenu to get into the "Help" interface. (Figure 3-14)

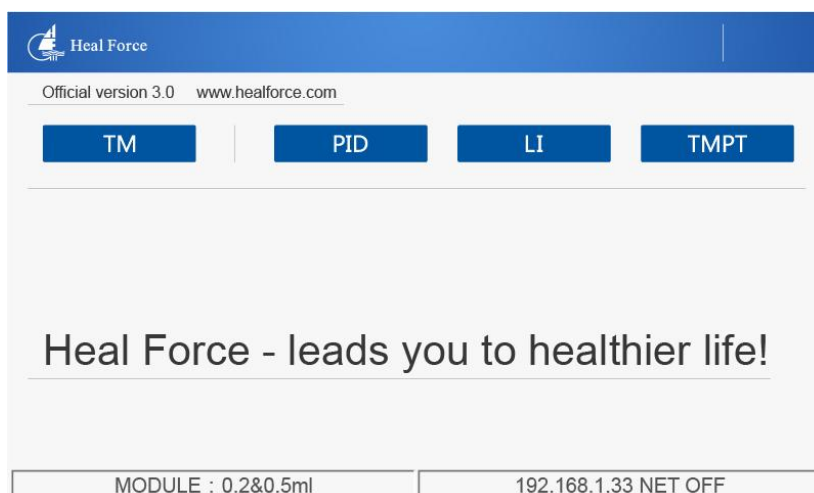


Figure 3-14

Notice: 1 . The “TM” key showed on the interface is for checking the TM value. If the user inputs the value forbidden by the system while setting the parameter, the system will choose the default value, and the forbidden value will not be allowed.

# Chapter4 Programming

## 4.1 Create Files (The following pictures are just for reference only)

The following is a sample(30 cycles, 93°C:45S, 75°C:45s, 55°C:45S, 55°C:45S) of how to program. (Figure 4-1)

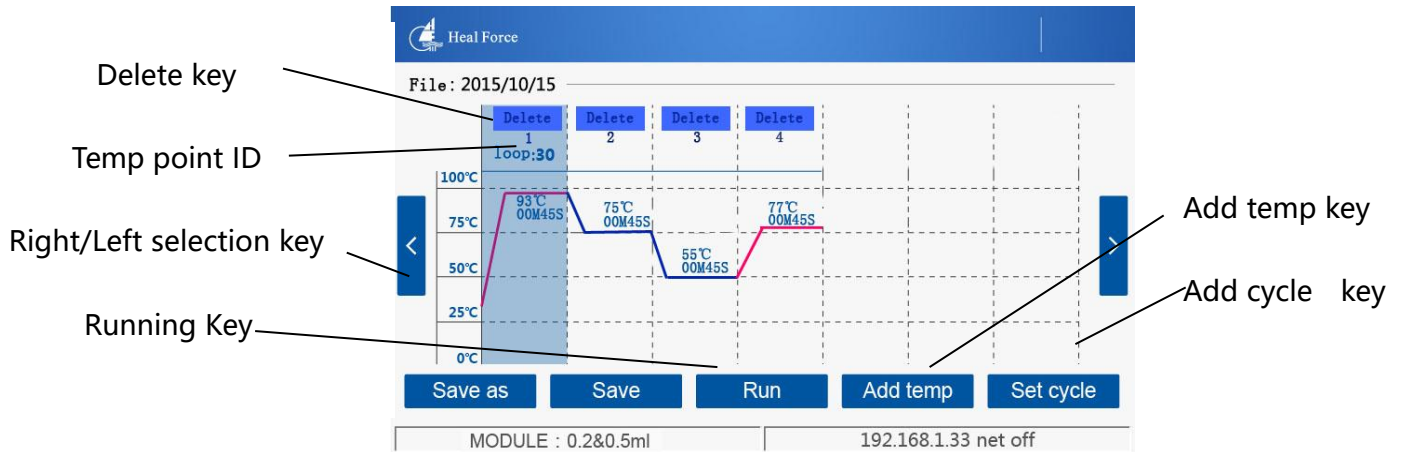


Figure 4-1

Step 1: Open the "File" menu ,then input the file name, to search the file that you want to use (Figure 4-2). Also, you can click the "Create File" key, then input the file name and password (If you need), click the "Confirm" key to confirm after closing the small keyboard(Figure 4-3).

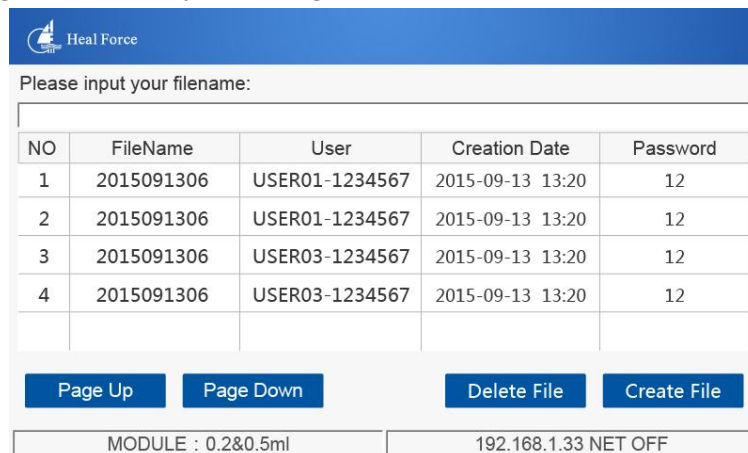


Figure 4-2

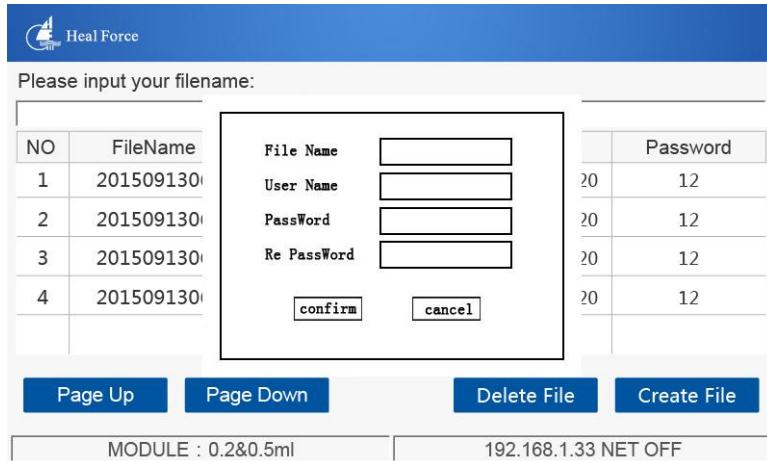


Figure 4-3

STEP 2: Log into the program edit interface, keep pressing the temp point for 2S, it pops out the "temp" or "cycle" edit menu(Figure 4-5), select "temp" to edit temp value(Figure 4-6).

If you need add a temp point, please select the "add temp" button at the bottom, and input the temp value(Figure 4-6).

If you need delete a temp point, please select the "delete" button on above, if the temp point is with cycle, it pops out the delete menu(Figure 4-8), select the "temp", otherwise, it pops out the confirmation menu, select "OK".

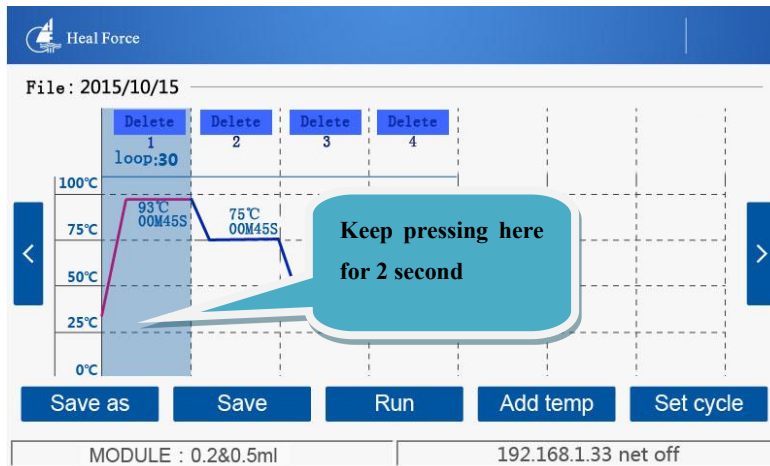


Figure 4-4

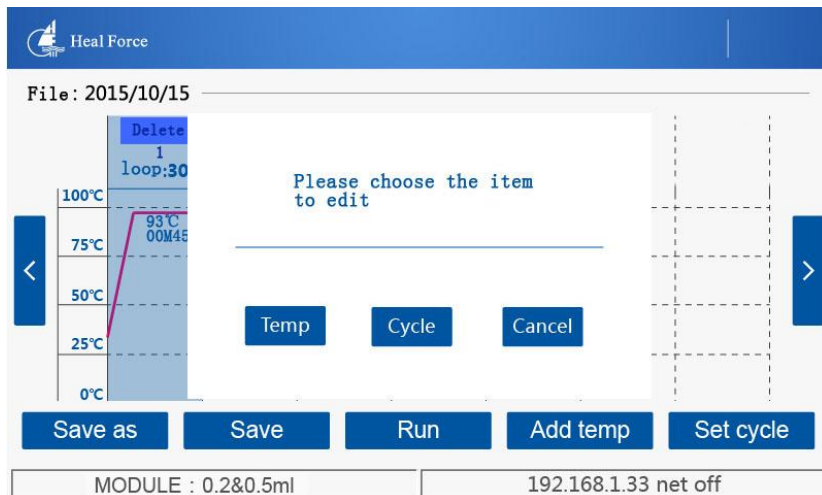


Figure 4-5

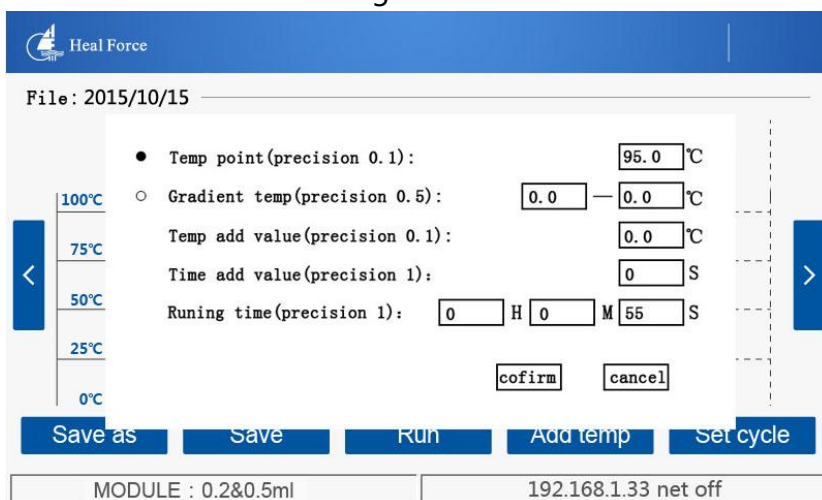


Figure 4-6

Step 3: Log into program edit interface, select “set cycle” button to add cycle, it pops out the menu (figure 4-7), input the cycle start point value (displayed below the delete button) “1”, cycle end point value “4”, times: “30” .

If you need edit the cycle NO, please keep pressing any temp point in the cycle, it pops out the menu (Figure 4-5), select “cycle” (notice: the “cycle” menu only can edit the number of the cycle not the initial or end temp point value).

If you need to delete the cycle, please select the “delete” button on above, it pops out the delete menu (Figure 4-8), select the “cycle” .

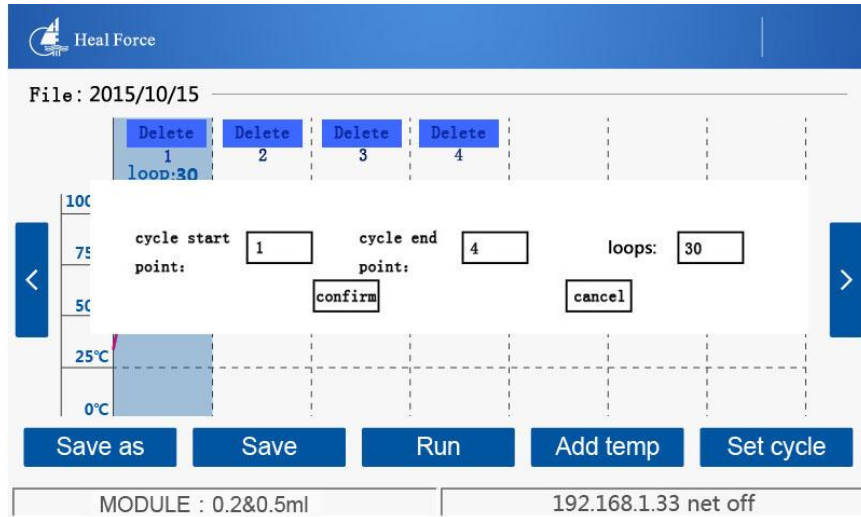


Figure 4-7

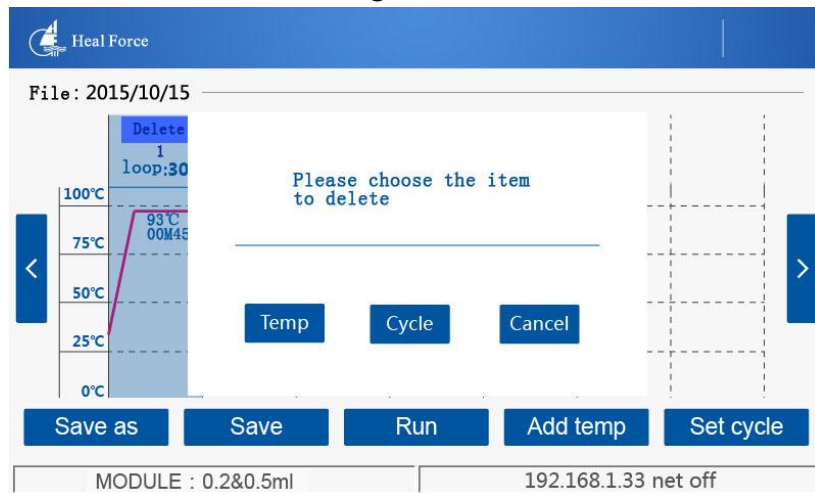


Figure 4-8

Step 4: Creating the file is finished.(Figure 4-9)

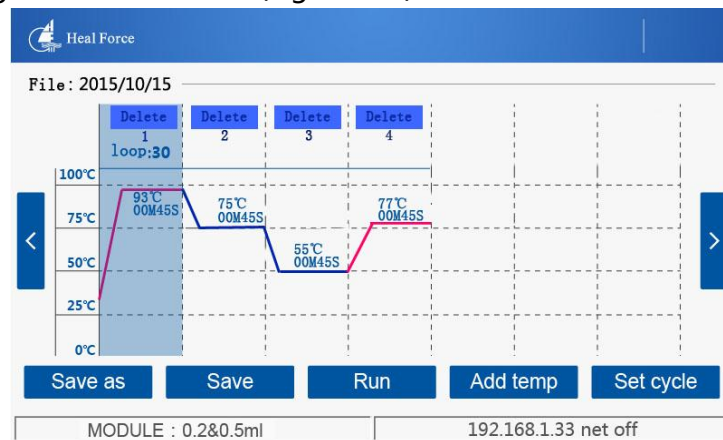


Figure 4-9

## 4.2 Open Files

Click the "File" on the "main menu" interface to get into the "File" interface (Figure 4-10), click the file that you need to get into the "file edit" interface(Figure4-11),then click the "Run" to start running. **click "run" then the program that you choose is running immediately(Figure4-9).**

NO	FileName	User	Creation Date	Password
1	2015091306	USER01-1234567	2015-09-13 13:20	12
2	2015091306	USER01-1234567	2015-09-13 13:20	12
3	2015091306	USER03-1234567	2015-09-13 13:20	12
4	2015091306	USER03-1234567	2015-09-13 13:20	12

Figure 4-10

Figure 4-11

Running information		Total time	01:30:00	Run	Pause
M Temp:	Cur Tem 75.0	Goal Tem 75.0	Run time	00:05:33	Stop
L Temp:	Cur Tem 105	Goal Tem 105	Remain time	00:00:24	

Figure 4-12



When in running interface, the “Run” “Pause” “Stop” “Skip” buttons can be operated (Figure 4-12).

Notice: Do not operate aimlessly in the running interface . if you want back the main menu from the running interface, you must click the “stop” at first, and then click the back key to the main menu.

# Appendix A Maintenance and Troubleshooting

## 1 Maintenance

- The instrument shall be stored in the dry and ventilating environment, keep away from direct sunlight or humidity or shadiness.
- Clean the wells of the block regularly in case the residue left by the experiment affect the accuracy of the experiment, the corrosive solvent or cleaning agent is forbidden, and cleaned by the cotton swab stained with water free alcohol in appropriate amount is suggested, and then an compressed air is used to clean each hole.
- Cotton cloth or non-woven stained with appropriate pure water shall be used for cleaning if there is dirt or dust on the surface of the instrument, organic solvent, alcohol, strong acid, strong alkaline or other corrosive cleaning agent is not allowed in case of any damage to the instrument surface.
- After the experiment, check the instrument and turn off the power, remove all the residues left by the experiment such as the water, reaction solution and impurity in and out of the instrument to keep the instrument clean. The protective cover shall be used to cover the instrument if it will not be used for a long time.

## 2 Troubleshooting

### 2.1 Bad experiment analysis

With the use of this instrument, if the experimental result is poor, then the following problems maybe exist (Only for reference):

- A. The reaction article is wrong, or the quantity is inadequate, or the purity is not enough or the slight mononuclear chain area is incorrect.
- B. The denatured temperature is too high or too low, so the user can add or reduce time according to the reaction amount.
- C. The “annealing” temperature is too high or too low.
- D. The reactant concentration is too high or too low.
- E. The preparation process is not specially treated.

- F. The time and temperature value in the programming is not suitable.
- G. The temperature of the sample or sample electrode is a little low, whereas the base temperature is a little high.
- H. The user shall check if the reaction tube is placed well, if not, little mineral oil can be used to coat the cone hole to increase heat conduction.
- I. Deviation may occur to temperature control if it is not used for a long time, if so the user may require the manufacturer to readjust the temperature control, any personal testing or readjustment of the temperature control is not allowed.

## 2.2 Problem reason analysis and Corresponding solving method

No.	Phenomenon	Analysis	Solutions
1	The screen is dark and there is no "tick" sound after opening the power	The power is not connected	Connect the power
		The fuse is burnout	Change for a new fuse (250V 10A Φ5x20)
		The switch is damaged	Change the switch
		others	Contact the supplier or manufacturer
2	The screen displays wrong box with the sound of "Tick..."	1.The open circuit or short circuit of the cooling block sensor 2 The open circuit or short circuit of the heat lid sensor 3 The open circuit or short circuit of the radiator 4 others	Contact the supplier or manufacturer
3	The slow temp down speed of the block or failure of down	Block of vent	Remove the clogs
		The cryogenic chip is damaged or the ventilator stop working.	Contact the supplier or manufacturer
4	The slow temp up speed of the block or failure of up	Cryogenic chip is damaged	Contact the supplier or manufacturer
5	Failure of heating or cooling of the block	Temperature sensor is damaged	Contact the supplier or manufacturer
		Cryogenic chip is damaged	
6	Failure of heating the heat lid	Heating film is damaged	Contact the supplier or manufacturer
		Temperature sensor is damaged	
		The link line is loose	
7	The screen displays abnormal character	Bad contact of the chip	Contact the supplier or manufacturer
		The chip is damaged	