

# OPERATION MANUAL

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Peltier-Based Thermal Cycler

**Model MG48+**

**Document Version 3.20**

**LongGene Scientific Instruments Co., Ltd.**

## 1

# INTRODUCTION

## 1 Let's acknowledge MG48+ Thermal Cycler

Thank you for purchasing an MG48+ Thermal Cycler. The MG48+ will meet your need for an easy-to-use, reliable, and compact programmable thermal cycler.

- ☑ Easy-to-learn programming interface for quick and painless programming
- ☑ Choice of simulated tube or block temperature control mode
- ☑ Space-saving design for easy setup and transportation
- ☑ Hot cover for oil-free operation
- ☑ Compact, light and noiseless

## 2 Important Safety Information

Safe operation of the MG48+ Thermal Cycler with a complete understanding of how the machine works. Please review the whole operation manual before attempting to operate the cycler. Do not allow anyone who has not reviewed the manual to operate the MG48+ Thermal Cycler.

## 2

**SPECIFICATIONS****1 Basic Parameters**

<b>BLOCK</b>	
Block Capacity	48 wells × 0.2ml + 48 wells × 0.5ml
<b>TEMPERATURE</b>	
Temperature Control Range	0°C ~ 99.9°C
Max.heating Rate	3°C/s
Max.Cooling Rate	2°C/s
Temp. Uniformity	≤ ± 0.2°C
Temp. Accuracy	≤ ± 0.2°C
Mode of Temp. Control	Simulated Tube & Block
<b>PROGRAMMING</b>	
Max. No. of Cycles	99
Time Increment/Decrement	1 ~ 60s
Temp Increment/Decrement	0.1 ~ 10.0°C
Auto Restart	Yes
Auto Pause	Yes
Ramping Rate	0.3°C ~3.0°C
Hold at 4°C	Forever
Pause/Stop	Yes
No. of keys	20
Running Time Display	Yes
<b>HOT COVER</b>	
Temperature of Hot Cover	105°C
Auto Shut Off	Yes
Hot Cover Adjustable	Yes
<b>DIMENSION</b>	
Size ( L×W×H )	315mm×240mm×275mm
Net Weight	8.8 Kg
Line Voltage	220V ± 25%
Power Supply	50 ~ 60Hz 350W

\*The manufacturer reserves the rights to change the specifications to improve the quality of products.

## 2 Software Functions

- ↘ File editing, saving and resuming
- ↘ Option of simulated tube or block mode
- ↘ Automatic temperature and time increment/decrement during cycling
- ↘ Instantly displaying the information at any phase of program execution
- ↘ Pause of program execution
- ↘ Stop of program execution
- ↘ Auto-restart in case of power failure

## 3 Keyboard

- [0]~[9] Digit key, for file parameter setting.
- [Stop] Terminates a running protocol, and return to the main menu.
- [Pause] Pause a running protocol. Press once more, the protocol will continue.
- [Cancel] Clear the present parameter.
- [Enter] Accepting the current setting, or operating the selection.
- [▼] Page-down key.
- [▲] Page-up key.
- [▶] [◀] cursor key. Moving cursor from the present position to the right or the left.
- [.] Name reception key. Press this key to finish the name of a file.

## 3

# INSTALLATION

## 1 What are packed in the carton box?

After unpacking the MG48+ Thermal Cycler, check to see that you have received the following:

- ✎ One unit of MG48+ Thermal Cycler
- ✎ One piece of power cord
- ✎ Operation Manual of Thermal Cycler model MG48+ ( this document )
- ✎ Warranty Certificate (at the end of this manual )

If any of the above components are missing or damaged, contact LongGene Scientific Instruments Co., Ltd. or the authorized distributor from whom you purchased the machine to obtain a replacement. Please save the original packing materials in case you need to return the thermal cycler for service.

## 2 How to setup the MG48+ Thermal Cycler?

Insert the power cord plug into its jack, then plug the cord into an electrical outlet. Situate the machine according to the instructions below.

## 3 Environmental Requirements

Ensure that the area where the Thermal Cycler is installed meets the following conditions, for reasons of safety and performance:

- ✎ Indoor, nonexplosive environment
- ✎ Ambient temperature 4-32°C
- ✎ Relative humidity between 10% and 90%
- ✎ Protection form excessive heat(eg. Radiators) and accidental spills

## 4 Power Supply Requirements

The MG48+ Thermal Cycler requires 170-270VAC, 50-60Hz power, and a grounded outlet. The machine can use current in the specified range with adjustment.

4

# OPERATION

## 1 Inspection Before Power-On

Before switch the power on, please ensure that:

- (1) Supply voltage falls within the specified limits;
- (2) The plug has been inserted into the power socket reliably;
- (3) The grounding of the power line is reliable.

## 2 Turning the MG48+ Thermal Cycler On

Move the power switch to "I" (the "On" position) which is located at the back of the machine, a self-test of the heat pump will usually begin running ( see below ).

```
LONGGENE  MG48+
          Version 3.20
          Self testing .....
```

The screen disappears within 10 seconds, If the self-test does not detect any problems, the Main Menu is displayed:

```
MAIN:      MG48+
RUN       enter
list       edit
file       lid
```

At this time, you could start to use the control panel and open the hot cover to put the PCR tubes into wells.

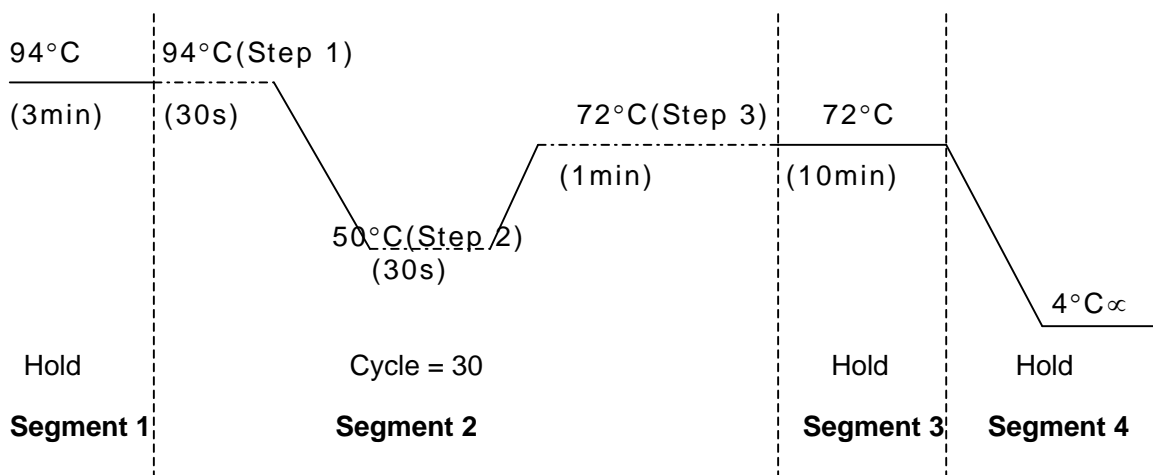
**NOTE:** Be sure not to touch the block or hot cover metal surface in case of being burnt.

**NOTE:** If the hot cover turns on, the protocol will begin after the hot cover reaches 105°C, which needs several minutes.

**Important Note:** Please put 4 tubes (empty ones are also ok) at four corner of the block to balance the hot cover.

### 3 How to create a New PCR Amplification File?

If you want to create a protocol like below,



☺ FOLLOW ME, PLEASE!

#### [Main]

Let's begin with the main menu. After self-test is finished, the screen shows; At any situation, press [Stop] key to return main menu.

MAIN:	MG48+
<u>R</u> UN	enter
list	edit
file	lid

Main menu has six functions – **Run, Enter, List, Edit, File and Lid**. Press [▶], [◀], [▼] or [▲] key to select function, press [Enter] key to confirm.

#### [Run]

Under Main Menu, select **Run** and the screen will show all programs stored. Press [▼] or [▲] key to page-up or page-down, or press [▶] or [◀] key to move the cursor to look for the program you want to run, press [Enter] key to confirm.

RUN:	
<u>A</u> 1	a2
a3	a4
a5	a6

The screen will show:

RUN:	a1
Use heated lid?	
<u>Y</u> ES	no

If you select “Yes”, then the heated lid will work (holding at 105°C) when running. You don't need to add oil in the tube. Attention please, be sure not to add oil in the well of block at any time.

If you select “No”, then you must add oil in the tube, otherwise the sample in the tube will be condensed at the top of the tube.

If you select Sim-Tube control mode (refer to P.9) in your protocol, the screen will show at this time:

RUN:	a1
Vessel:	0.2 TUBE
0.5 tube	plate

After you select the tube or plate you use, the screen will show:

RUN:	a1
Volume (ul):	—

Input the volume of your sample, then the instrument will initiate running program. If you turn-on the heated-lid, the lid will firstly enter pre-heating stage. When the heated lid reaches 100°C, the instrument begins running program. The heated lid continues heating until it reaches 105°C.

Whenever the program finishes normally or abnormally, the heated lid will shut off automatically. In addition, you could select **LID** in main menu to set the temperature that the heated lid turn-off automatically. (refer to P.14)

RUN:	a1
Lid temperature :	20°C

If you select turn-off the heated lid, we have to remind you once again that you must add oil in the tube, at this time the protocol will be launched without lid Heating display.

When running, you could see the normal running display from the LCD window:

RUN:	a1
Hold 40C	BLK=39.9C
0m30s	Step 2

If you want to get other running information, press [▼] key, and you could see:

RUN:	a1
Est remain:	1h01m20s
Step # 1	Tot Cyc 35
0h18m20s	Segment # 2

Press [▼] key once more to return to the former display.

If the program is finished normally, the LCD will show as below:

RUN:	
Running finishes at	
1h10m0s	Press Key

Press [Cancel] return to the main menu.

## [Pause]

At any time in running, the protocol could be paused by pressing [Pause].

<<Pause>>	94.0
Timer	//// 0h19m40s

Press [Pause] again, the protocol will continue. You will find if the temperature is ramping while you press [Pause], the pause function will not work till the next temperature point is reached.

## [Stop]

At any time in running, the protocol could be stopped by pressing [Stop]. And the screen will ask you:

Press <Stop> to Abort  
or <Enter> to Continue

Press [Stop] again to confirm stop protocol, or press [Enter] to continue.

## [Auto Restart]

If a power failure occurs when a protocol is running, the instrument will hold the protocol in memory. When power is restored, the protocol will begin running again at the point at which it was stopped, and a notice about the power interruption will be displayed. The LCD window will show like below:

History: Power Lost!

The message could be cleared by pressing [Cancel] key, the protocol's runtime screen will immediately be displayed.

**NOTE:** Please shut off the instrument when the screen shows the main menu. Turning off the instrument does not stop a running protocol. The instrument will assume the protocol was stopped by a power outage and will resume running the protocol when the instrument is turned back on.

**Warning:** When you run the block at 4°C forever, if the ambient humidity is high, the block's surface might absorb moisture in the air and begin to dew. Under such condition, we suggest change 4°C to 10°C or above to avoid condensation water leaking into the cycler.

## [Enter]

To design a new program, select **Enter** from the main menu, then press [Enter]. A naming screen will be displayed:

Enter:     \_abcdefghi#  
           Jklmnopqr#  
Name:     #stuvwxyz#  
           . , - +/ ():=#

Move the cursor to the wanted character, press [Enter] key to confirm, this character will pop out under the **Name**, digits [0] to [9] and [-] could be entered by pressing the key on the panel directly. You could name the program a max eight-character word consisting of any combination of letters, numbers, punctuation marks. If the length of name is less than eight-character, move the cursor to [#] and press [Enter] or press [.] key on the panel directly to accept a file name.

If the name is already in use by a stored program, a screen saying “ Name in use” will be display.

```

Enter:   abcdefghi#
         Jklmnopqr#
Name:    #stuvwxyz#
In Use!  . , - +/ ( ):=#
    
```

If this happens, press [Enter], then enter a different name. After the name has been entered, a screen requesting selection of a temperature control method will be displayed:

```

Enter:    a1
Control Method:
BLOCK    sim-tube
    
```

Select a control method, then press [Enter].  
 Attention please, under **Block** control method, the temperature shown on LCD represents only the temperature of the block. And under **Sim-Tube** control method, the temperature you see represents the temperature of the sample.

**Note: Under Block control method, the best holding time is about 1 min. And under Sim-tube control method, the best holding time is about 30 seconds.**

**Note: The Screen will show BLK= 94C if block control method is selected, and the screen will show SMP= 94C if sim-tube control method is selected.**

When a temperature control method has been chosen, the Enter menu will be displayed:

```

Enter:    a1
Segment  # 1
Hold Cycle END
    
```

↓ If select hold, move the cursor to **Hold**, then press [Enter]

```

Enter:    a1
Hold at  0.0 C
Hold for 0m 0s
    
```

↓ If select 94°C hold for 5mins, press [9][4][0] and press [Enter] to confirm. At this time, the cursor will move before “m” automatically, press [5] and [Enter], then the cursor will move before “s”.

```

Enter:    a1
Hold at  94.0C
Hold for 5m 0s
    
```

↓ If acceptable, press [Enter] and the screen will display:

```

Enter:    a1
Segment  # 2
hold cycle END
    
```

**IMPORTANT NOTE: Be sure to press [Cancel] to clear the old value before you input a new one, and must press [Enter] to accept a new data.**

**NOTE: Temperature available Range: 0°C~99.9°C**  
**Minute available Range: 0min~99min**  
**Second available Range: 0sec~59sec**

If you want to select "Cycle", move the cursor to **Cycle**.

Enter: a1  
 Segment # 2  
 hold CYCLE end

Press [Enter]

0 step PCR

If select 3-step cycle, input [3]

3 step PCR

Press [Enter]

Step # 1  
 0.0C Hold 0m 0s

If select 94°C hold for 30sec, press [9][4][0] and [Enter], and press [Enter] and [3][0], the screen will display:

Step # 1  
 94.0C Hold 0m 30s

Press[Enter], and the screen will show:

Step # 1  
 Option? NO yes

If **Option** is not needed, move the cursor to **No**, press [Enter] to enter the next step.  
 If **Option** is needed, move the cursor **Yes**, press [Enter] to show an option page

Step # 1  
INC ext ramp pause

If Temp. Increment/Decrement is selected, move the cursor to **Inc**, and then [Enter]

Enter: a1  
 Step # 1  
 Delta temp. = 0.0C

**Four Optional Function:**  
 ①Temp. Increment/ Decrement  
 ②Time Increment/Decrement  
 ③Ramp Rate adjustable  
 ④Auto Pause Settable

**NOTE: Temperature Increment/Decrement could be used in Touchdown PCR experiment. The available range is -10.0°C~ 10.0°C.**

If Temp. increment 0.5°C is needed, press [5]. If Temp. decrement 1°C is needed, press [-][1][0]. If the display is acceptable, press [Enter]. If Time Increment/Decrement is needed, move the cursor to **Ext**, press [Enter]

Enter: a1  
 Step # 1  
 Delta time = 0s

**NOTE: Time Increment/Decrement could be used in Long PCR experiment. The available range is 1~ 60sec.**

If select Time increment 1sec, press [1] and [Enter]. If Time decrement 1sec is needed, press [-][1] and [Enter]. If the display is correct, press [Enter] to return to the option page. Press [▼][▲] or [Stop], the screen will display like below:

Step # 1  
Option? no YES

If you want the ramping rate at 1°C/sec to the finish temp. 94°C, move the cursor to **Ramp**, press [Enter]

Step # 1  
Ramp rate = 0.0C/ s

**NOTE: Ramp Rate Range is 0.3°C ~ 3°C/ sec. If the 0.0°C/s-0.2°C/s is entered, the instrument will run at the max rate. Attention please, the setting point should be the finish temperature instead of start one.**

Press [1][0] and [Enter] and return to the option page.  
If you need auto pause function, move the cursor to **Pause** and press [Enter]

Step # 1  
Pause? OFF on

**NOTE: Auto Pause could be used in hot-start technology.**

Select On or Off to confirm, and then press [▼] [▲] or [Stop] to return to the below page.

Step # 1  
Option? no YES

At this time, you could select **No** to enter next step.

Step # 2  
0.0C Hold 0m0s

As per the above operation, you could manage the next editing. When all steps are set, the screen will display:

Total Cycle = 0

If 35 cycles is needed, press [3][5] and

Total Cycle = 35

**NOTE: You could press [▲] or [▼] to Page Down or Page Up fast.**

Press [Enter]

Segment # 3  
hold cycle END

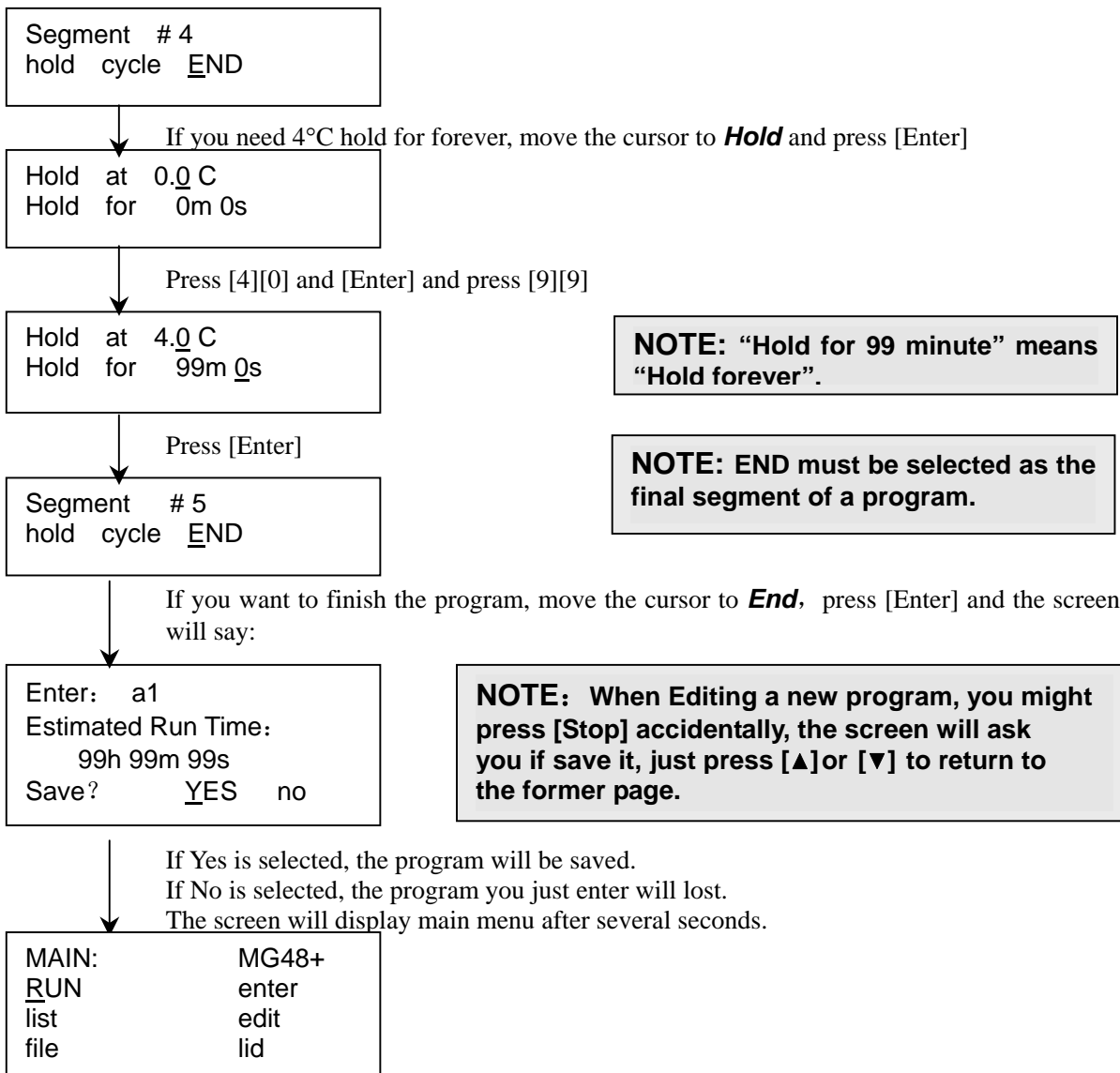
If select 72°C hold for 10min, move the cursor to **Hold**  
Press [Enter]

Hold at 0.0 C  
Hold for 0m 0s

Press [7][2][0] and [Enter] and then press [1][0] and [Enter]

Hold at 72.0C  
Hold for 10m 0s

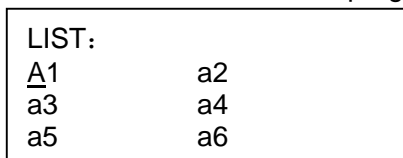
Press [Enter] and the screen will display:



At this time, a new program is finished. From main menu you could select **List** or **Edit** to review or modify it lately.

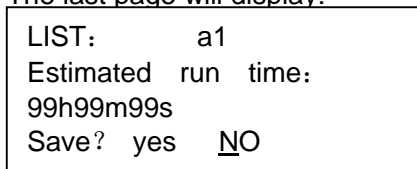
### [List]

To view a program in the LCD window, select **List** from the main menu, then press [Enter], the screen will show all the program stored:



Locate the program to be viewed, then press [Enter], the program will immediately be listed in the LCD window. Listed programs cannot be modified.

The last page will display:



Only [No] could be selected at this time, press [Enter] to return to the main menu.

To modify programs, select **Edit** from the main menu; To delete programs, select **File** from the main menu

## [Edit]

To initiate editing, select **Edit** from the main menu, then press [Enter]. The screen will display:

```

EDIT:
A1      a2
a3      a4
a5      a6
    
```

Select the program to be modified, then press [Enter]. The first editing screen display control method first.

```

EDIT:      a1
Control Method:
BLOCK    sim-tube
    
```

Press [▲] or [▼] to page up and page down fast to the pages you want to modify, **press [Cancel] to clear the old value before you input a new one, and must press [Enter] to accept a new data.** Lastly the LCD window will display:

```

Edit:      a1
Estimated Run Time:
          1h 08m07s
Save?      YES  no
    
```

If "Yes" is selected, the old program will be replaced by the new one after several minutes. If "No" is selected, modified program will be lost. The old program will be reserved.

## [File]

To delete a stored program, select **File** from the main menu and press [Enter], then the LCD window will show:

```

Files:
DELETE
    
```

Press [Enter] and all programs stored will be listed.

```

DELETE:
A1      a2
a3      a4
a5      a6
    
```

Select the program you want to deleted, press [Enter]

```

DELETE:  a1
Delete program?
          YES  no
    
```

If select "Yes", the program will be deleted.  
If select "No", the program will be reserved.

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## [Lid]

To select a minimum block temperature below which the heated lid will automatically turn off, select **Lid** from main menu, then press [Enter], the following screen will be displayed.

LID: Turn off heated Lid below: <u>0</u> C
--

For example, if you hope the lid turn off when the sample is hold at 4°C, press [4] and [Enter].  
The value will not lost unless it is modified again.

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# MAINTENANCE & TROUBLESHOOTING

## 1 Cleaning the Surface and Block of MG48+

Clean the outside of MG48+ Thermal Cycler with a damp, soft cloth whenever something has been spilled on it. A mild soap solution may be used if needed.

Clean the block's wells whenever anything is spilled into them or dust gathers.

Clean the wells with a swab moistened with water, 95% ethanol. If using sodium hypochlorite, swab the wells with water afterward to remove all traces of it. Do not clean the block with caustic or strongly alkaline solutions (e.g., strong soaps, ammonia, sodium hypochlorite) at a higher concentration. These can damage the block's protective anodized coating.

## 2 Cleaning Radioactive or Biohazardous Materials Out of the Block

When cleaning MG48+ that has been running radioactive or biohazardous reactions, consult your institution's radiation safety officer or biosafety officer regarding methods, monitoring, and disposing of contaminated material.

**NOTE:** Be sure to shut-off the MG48+ Thermal Cycler when cleaning the surface and the block.

### 3 Error Messages

Error Message	Cause	Action
Sensor error!	Sensor fails or circuit fails	Shut off the cycler, and call service.
Ambient too hot!	Cycler self-protection	Move the Cycler to a room with low temperature.
Sink too hot!	Cooling fan fails	Call service!

### 4 Troubleshooting

Problem	Probable Cause	Action
No display and no fan moving sound when power on	No line voltage or power cord unreliable	Wait for power restore Check power cord and plug
Abnormal vibrating noise	Unstable bench Uneven bench plane Loose case screw	Change the bench Change the bench plane Fasten the screw
Normal display but heating & cooling terminated	Heat pump fails	Shut off the power and call service
No display but fan is moving when power on	LCD fails or circuit fails	Shut off the power and call service
LCD displays : History : Power Lost!	Lost power during protocol	Cycler is OK, press any key to cancel this message

**WARNING:** Make sure you keep the original packing, in case you ever need to return it for service or repair. The company accepts no responsibility for the damage incurred unless the unit is properly packed and transported in its original packing.