



Thermo Shaker Incubator

NB-12-049A

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Version modification Record:

| Version No. | Date | Modification Description |
|-------------|------------|--|
| V1.0 | 2020.12.01 | > Initial Release |
| V1.1 | 2021.09.01 | > Technical Parameter: Add the Maximum heating and cooling rate, and the Maximum speed |
| V1.2 | 2021.10.28 | > Add touch warning, modify the screen shot of the calibration parameter interface |
| V1.3 | 2024.11.13 | > Chapter 4.9 deleted |

Foreword

We are appreciate that you purchase our Thermo Shaker Incubator. This manual including the function and operating instruction, please read the manual entirely to ensure using instrument correctly. Keep the user manual for future reference during the use of instrument.

Opening Check

Please check the instruments as well as all accessories with packing list when you first open the packaging. If you find any wrong or missing, please contact with distributor or manufacturer.

Safety Warning and Guidelines

Users should have a comprehensive understanding on how to use this instrument before operate, do read this manual carefully.



It is forbidden to operate the instrument without reading this manual. Otherwise, it may cause serious burn or shocked by electricity. Do read manual carefully and operate safely according to this guideline.

1 Security

The operation, maintenance and repair of the instrument should comply with the basic guidelines and the remarked warning below. Or it will have effect on the scheduled using life of the instrument and the protection provided.



This is a normal instrument which conform to the standard GB9706.1-Class I - B type, and for indoor use only.



Please read this manual carefully before using the instrument, or it may cause the injury. Only the skilled person who have been trained for installing and using is allowed to operate.



The operator is not allowed to disassemble or repair the instrument by himself in case of any injury or losing the qualification of warranty. If the repair work is needed, please contact with vendor or manufacturer.

The input wires must be reliable and earthed to prevent from any electric shock accident. The instrument is equipped with three-pin grounding plug, and the 3rd pin is the grounding pin. Please use the matching grounded power socket.



Before power on the device, please ensure the voltage of power supply is consistent with the required voltage and rated load of the power outlet is not lower than required.

If the power cord is damaged, replace it with the same type and specification power cord. Do not cover anything on the instruments and power wire when using. Also do not put power wire in the place where people walking around. Insert and pull the power wire with hand gently and make sure the plug completely insert to the outlet.



The temperature of metal block is high and the liquid might boil over during the operation. Please do not touch the block in case any injury or scald.



The instrument should be placed in low-humidity, less dust, far away from water and strong direct sunlight. The room space should be ventilated well and away from the heating, stove and any heat source. Others, the room space can not be interfered by corrosive gas or in a strong magnetic field. The holes in the instrument is designed for ventilating to avoid overheat temperature. Please do not block or cover the them. When several instruments using simultaneously, the distance between each instrument should not be nearer than 100cm.



CAUTION! Risk of crushing form movable parts.

- Do not replace any consumables during the mixing process.
- Do not remove the block during the mixing process.
- Do not remove the ThermoLid or MabeB Lid during the mixing process.



Power off and pull out the power plug after the operation finished. Cover the instrument by plastic paper or soft cloth to avoid dust if the instrument not use for a long-term.



If the conditions below appeared, please pull out the power plug from the outlet immediately, and contact with vendor or manufacturer for solve:

- There is some liquid flowing into the instrument;
- Instrument get drenched by rain or water;
- Abnormal working, especially abnormal smell and sound;
- Instrument fell down or outer shell damaged;
- The function has obviously changed.

3 Maintenance

Clean the cone-hole regularly by a soft cloth with a little of anhydrous alcohol, Ensure the tube contact the wall of hole fully and good heat conduction, and avoid contamination.

If there is stain drop on the surface of instrument, please clean it by a soft cloth with cleansing cream.

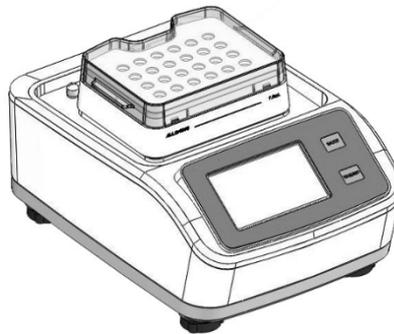


Power off when cleaning the instrument.

Do not drop any liquid on the hole when cleaning the cone holes. Do not cleaning the surface by corrosive cleaning agent.

Thermo Shaker Incubator

#Cat: NB-12-049A



Chapter 1 Brief introduction

NB-12-049A Thermo Shaker Incubator combine incubation and shaking with timing together perfectly. Greatly short the operating time and improve work efficiency. It is an ideal automated tool for samples processing of incubation, catalyzed and mixing etc.

Features:

- 4.3-inch color LCD touchscreen, visualized and simple operation;
- Power recovery function, the instrument can be automatic recovery to original setting when power on again after the electricity off.
- Controlled by microprocessor, excellent linear of temperature control and exact rotating speed of vibrating with small fluctuation.
- Timing function, the incubator time can be set among 0~100 hours at will, remaining running time will be displayed on the touchscreen and alarm at terminal time.
- Variety of standard sample blocks to choose, and blocks can be recognized automatically; It's easy to exchange the blocks without any tools. Customized blocks service is available.
- Equipped with over-heating protection device, much more reliable.
- With temperature calibrating function.
- With short mixing by inching function.
- Driven by DC brushless motor, long-life and maintenance-free.
- With import and export function for testing program.

Chapter 2 Characteristics

1. Basic parameters

| Parameter | Specification |
|----------------------------------|---|
| Ambient temperature | 5°C~ 30°C |
| Relative humidity | ≤70% |
| Power source | 100-240V 50-60Hz |
| Input power | 200w |
| Fuse protector | 125V 2.5A φ5x20 |
| Mixing orbit (Horizontal rotary) | 3mm |
| Mixing frequency | 100 ~3000rpm |
| Display | 4.3 inch capacitance touch display screen |
| Programs number | 50 |
| External interface | USB: for associated to program, printer 7Pin socket: hot lid |
| Dimension (DxWxH) | 318mmx154mmx220mm |
| Weight | 10Kg |

2. Temperature parameters

| Parameter | Specification |
|------------------------------|--|
| Temperature range | 0°C~105°C |
| Timing range | 1s~99h59min59s |
| Temperature control accuracy | ±0.5°C |
| Temperature uniformity | ±0.5°C (@30-50°C) |
| Heating time | ≤15min, 25°C~100°C (Ambient temperature 20°C~30°C) |
| Cooling time | ≤ 20min (Ambient temperature ≤ 20°C : 20°C~0°C) ≤ 20min ≤ 20min (Ambient temperature ≤ 25°C : RT~4°C) ≤ 20min ≤ 20min (Ambient temperature ≤ 30°C : RT~10°C) |
| Heating rate | Max* ; 3°C/min ; 2°C/min ; 1°C/min ; 0.1°C/min |
| Cooling rate | Max* ; 1°C/min ; 0.5°C/min ; 0.1°C/min |

*Max.heating rate :9°C/min(RT~100°C , @MateB 1.5 ml)

Max.cooling rate :4°C/min(100°C~ RT, @MateB 1.5 ml)

3. Blocks parameters

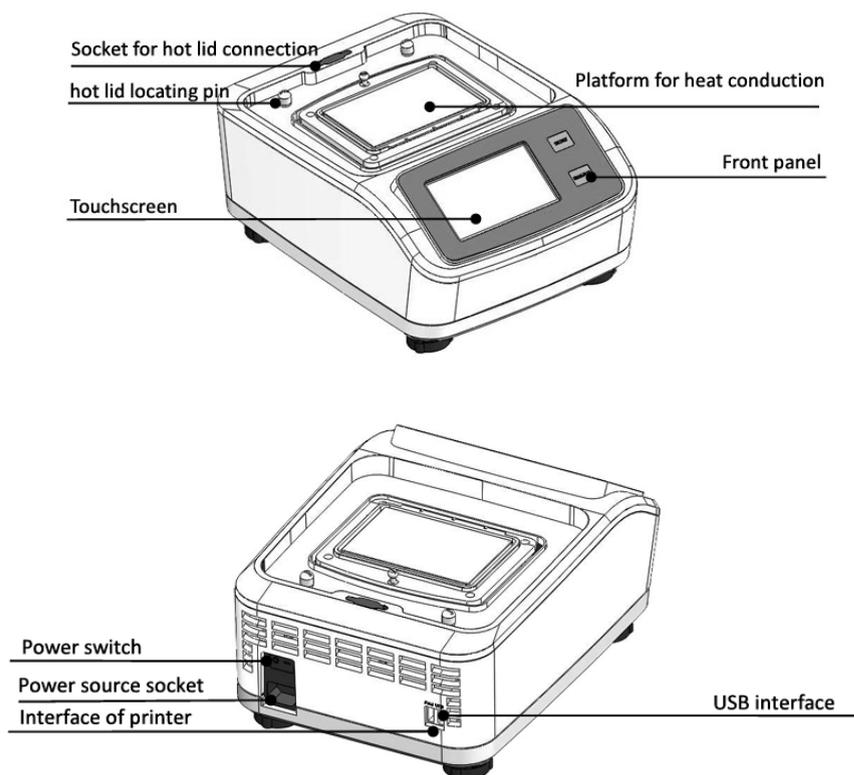
| Model no. | Sample capacity | Max rotate speed | Optional spare |
|-------------------|----------------------------------|------------------|----------------------|
| MateB 0.5mL | 24 x 0.5 mL tube | 2000rpm | ThermoLid/MabeB Lid* |
| MateB 1.5 mL | 24 x 1.5 mL tube | 2000rpm | ThermoLid/MabeB Lid |
| MateB 2.0mL | 24 x 2.0 mL tube | 2000rpm | ThermoLid/MabeB Lid |
| MateB 0.5mL+1.5mL | 15 x 0.5mL+ 20 x 1.5mL tube | 2000rpm | ThermoLid/MabeB Lid |
| MateB 5.0mL | 8 x 5 mL tube | 1000rpm | ThermoLid |
| MateB 12mm | 24 x ϕ 12 mm tube | 2000rpm | - |
| MateB Cryo | 24 x 1.5ml/2.0m Cryogenic Vials | 2000rpm | - |
| MateB 15 mL | 8 x 15 mL tube | 1000rpm | - |
| MateB 50 mL | 4 x 50 mL tube | 1000rpm | - |
| MateB Plate-1 | 96x0.2mL micro plate | 3000rpm | ThermoLid/MabeB Lid |
| MateB Plate-2 | 96x2mL deep well plate | 1000rpm | - |
| MateB PCR 96 | 96x0.2mL PCR plate | 2000rpm | ThermoLid/MabeB Lid |
| MateB PCR 384 | 384 PCR plate | 3000rpm | ThermoLid/MabeB Lid |
| MateB DWP 500 | 96/500 μ L deep well plate | 1600rpm | ThermoLid/MabeB Lid |
| MateB DWP 1000 | 96/1.000 μ L deep well plate | 1600rpm | ThermoLid/MabeB Lid |

***The max rotating speed should be 2000rpm when using ThermoLid or MabeB Lid.**

Chapter 3 Basic operation instruction

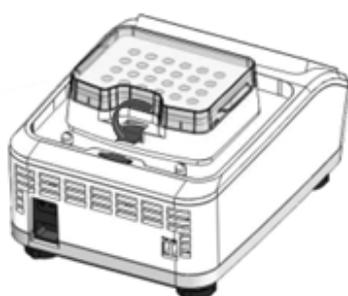
The main structure, touchscreen operation and the preparing job before power on the instrument will be introduced in this chapter. Please learn about this chapter very well before start on.

1. Structure

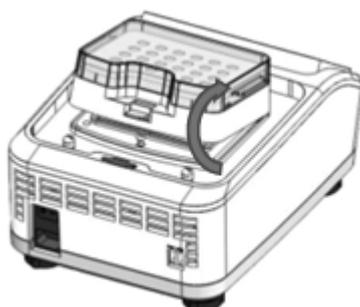


2. Illustration for block changing

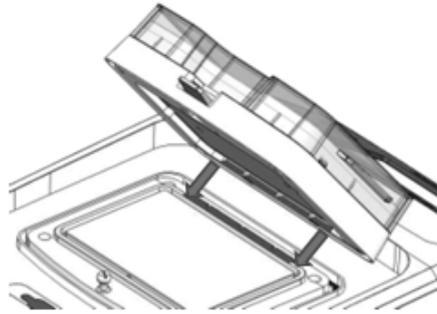
a) Pull down the eccentric wheel handle to a horizontal position



b) Turn up the block then take out it.



c) Take another type block to fix into the buckle of platform



d) Press the block to make it be fit with the heating platform smoothly



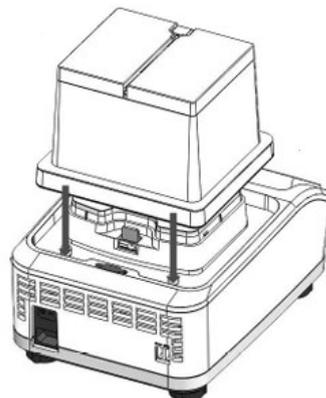
e) Pull up the eccentric wheel handle to a vertical position.



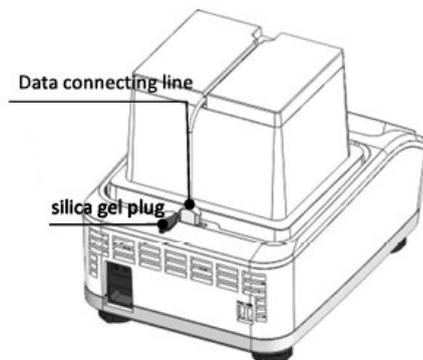
Attentions: Please ensure there is no any junk between the heating platform and block before installing the block!!!

3.Illustration for installing the hot lid

a) Put the hot lid over the instrument, ensure the hot lid locating pin is pointing the locating pin is pointing the locating hole of the hot lid, then fix the hot lid down to make it be fit with instrument.



- b) Take out the silica gel plug in the instrument, insert the data connection line into the socket with is used to connecting with hot lid.



- c) Rotating the knob on the left side of hot lid to get down the heating plate into to a suitable position. The hot lid will go down when knob rotated by counterclockwise direction and go up by clockwise direction.



Attentions: Please ensure the heating plate of hot lid do not touch with block when the instrument mixing function is on.

Attentions: When start hot lid function, the block should be not with clear lid!!!

- d) Remove the hot lid:

Disconnect the data connecting line, and turn over the hot lid forward toward, take out the hot lid after out of locating pin.



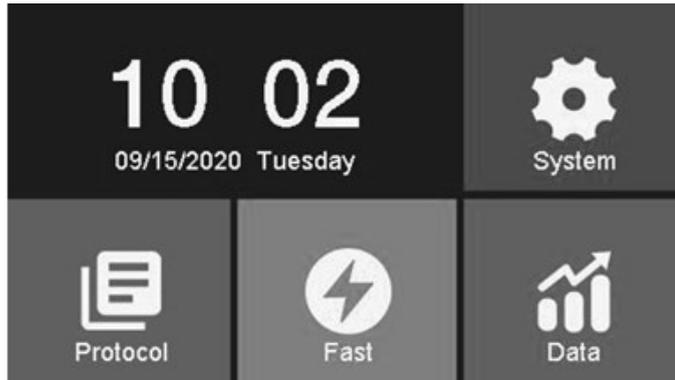
Chapter 4 Software Operation

1. Power on self-test

Connect power source and turn on the switch on the back of instrument, the start-up image appear as below. If self-test failed, the error alarm interface prompt.

2. The main interface

After self-test finished, the main interface display.

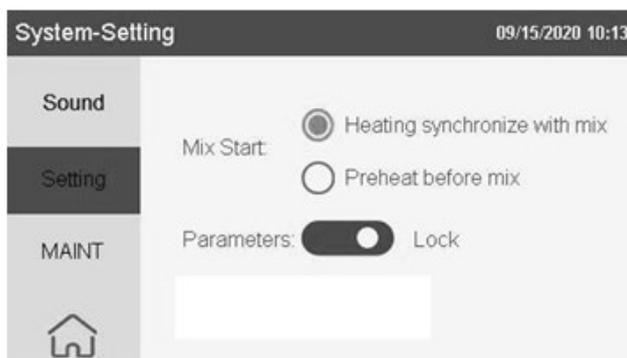


The icon on the main interface as below:



3. System interface

Click the "system" icon on the main interface then into the "System Setting", here is available to set the parameter, voice, language and time as well as data translating, factory data reset, program upgrade etc. Different pages can be switched by sliding the scroll bar on left side.



3.1 Parameter setting

Mix Start point:

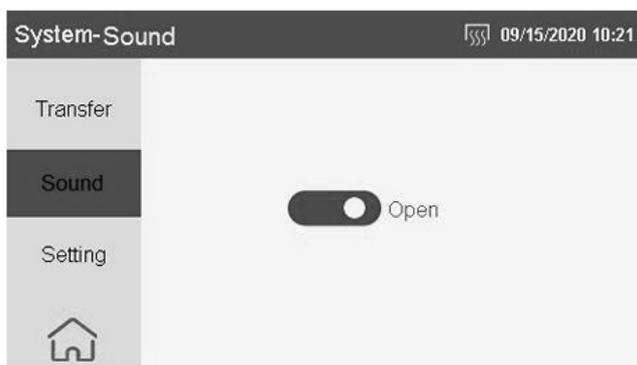
Heating synchronize with mix: temperature-control function and mixing function will run simultaneously after the fast program is starting.

Mix after preheat: After fast program starting, the temperature-control function start firstly, the mixing function will start after it reach to preset temperature.

Operating parameters: When it is locked, the parameters can not be changed on the fast program interface; When it is unlocked, the parameters can be changed on the fast program's running; and the instrument will run according to the updated parameters.

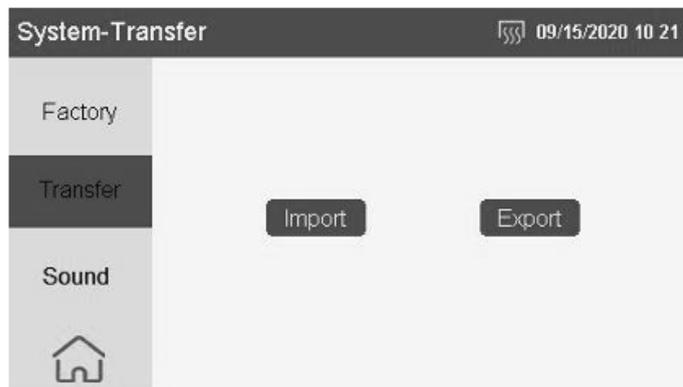
3.2 Sound setting

Open or close the buzzer. If open the buzzer, "Beep" sound alarm when instrument power on and program finished.



3.3 Data transfer

Users can import or export the program through the USB socket.



3.3.1 Protocol import



3.3.1 Protocol export



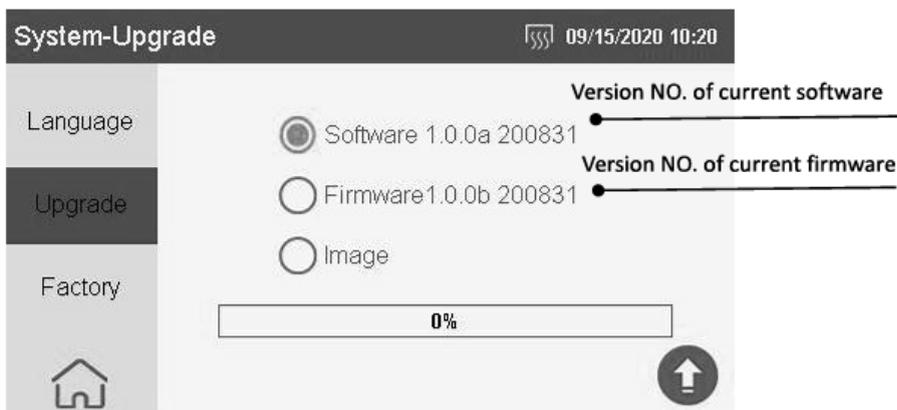
3.4 Factory setting

All the protocols will be deleted and all the parameters should be reset after restoring the factory settings.



3.5 Upgrade

User can upgrade the software, firmware and image through the USB flash disk.



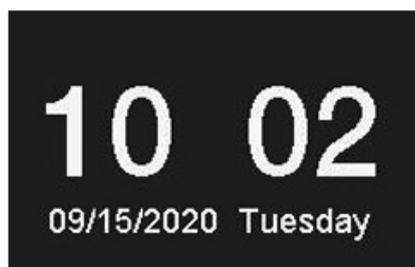
3.6 Language setting

Chinese and English language can be choose through the System-Language interface.



3.7 Time setting

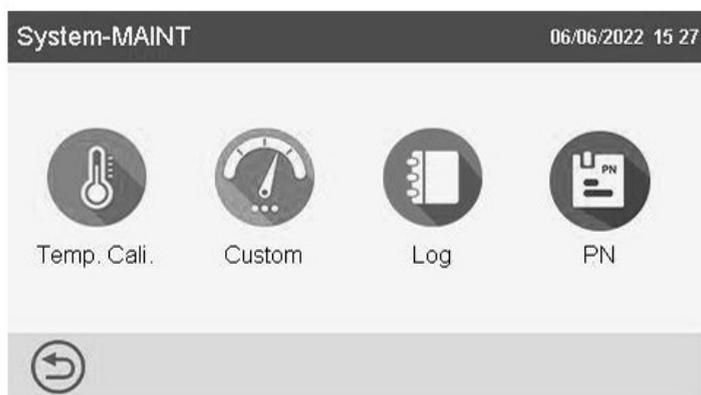
Display date and time is available to change through the System-Time interface



Click the time on main interface also is able to enter time set interface.

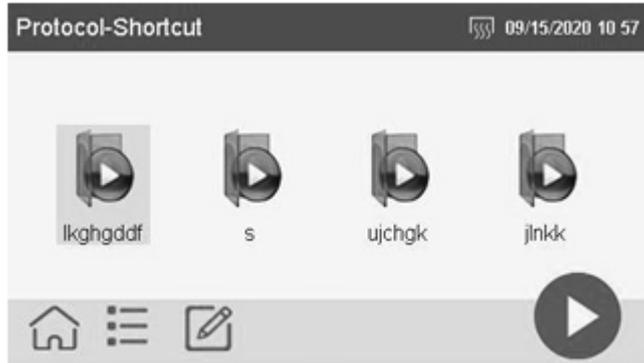
3.8 MAINT

Input the password to enter System-MAINT interface



4. Protocol-Shortcut interface

Click the protocol icon to enter Protocol-Shortcut interface, user can create, edit or run the protocol here.



The function of each icon in Protocol-Shortcut as below:

 Shortcut Protocol (The icon will be highlight after be chosen)

 Back to the main interface

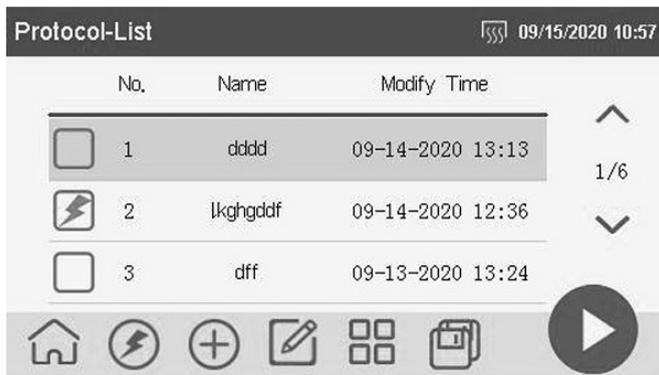
 Enter protocol list interface

 Enter protocol setting interface

 Running the Shortcut Protocol chosen

4.1 Protocol list interface

Click icon  enter the protocol list interface to create, delete, edit or run the protocol there.



The function of each icons in protocol list interface is as below:

 Set shortcut protocol
(Selected shortcut protocol is shown as the icon above, 4 shortcuts protocols can be select at most)

 Back to main interface

 Enter shortcut protocol interface

 Create a new protocol

 Edit selected protocol

 Enter protocol manage interface

-  Save selected protocol as
-  Run selected protocol
-  Page up (turn gray when to top)
-  Page down (Turn gray when to bottom)

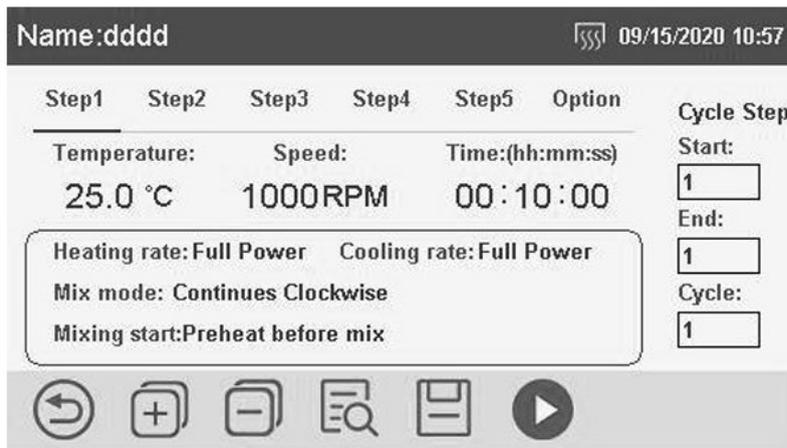
4.2 Create a new protocol

4.2.1 Create protocol's name

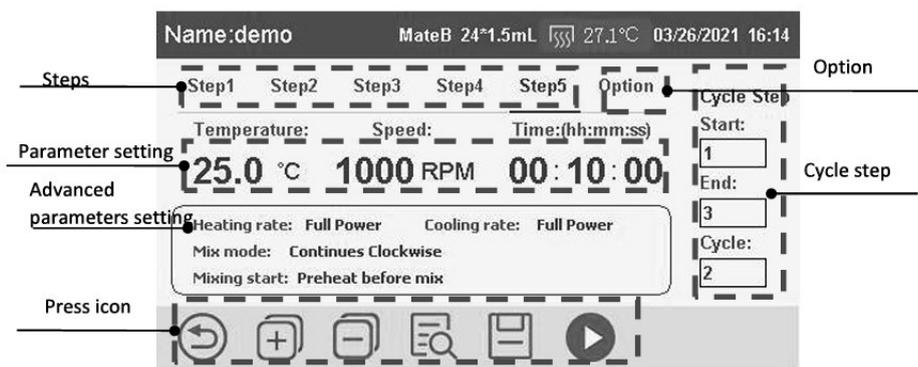
Click icon  on protocol list interface to create a new protocol. At most 8 letters or numbers can be input for protocol name, letters are case sensitive. A prompt pop up when a new protocol name is same as existing protocol name. Fifty protocols can be saved at most.

4.2.2 Protocol edit interface

Input protocol's name and press "Enter" into protocol edit interface.



Each functions of protocol interface is as below



Step: Click the step to display the relevant parameter.

Option: Click the icon to display the relevant parameters.



Keep temp.: Block will maintain the setting temperature after all steps finished, default is 5.0°C. The function open after tick the box.

Hot lid temp. over block: Temperature on hot lid is 5.0°C higher than the block installed in (User can reset the temperature value, range is 0.0~20.0°C, default is 5.0 °C); The function turn on after tick the box. (This function is not available if the block temperature is under 20°C).

Parameter setting: The parameters can be edit directly by clicking it.

Temperature: Temperature range is 0 ~105 ° C. If the temperature setting as "-", it means the temperature is not controlled.

Rotating speed: The rotating speed range is 0~3000rpm.

(Note: the actual rotating speed will be limited by different blocks.)

Time: Time range is 00:00:01~ 99:59:59.

If time "—:—:—"set as means no timing.

Advanced parameters setting: Display advanced parameters, click it to enter advanced parameters setting interface .

Rate:

Temperature mode:

Full Power: Default setting. Heating and cooling at its max rate.

User-defined: Heating rate can be set as: 30°C/min, 2.0°C/min, 1.0°C/min, 0.1°C/min; Cooling rate can be set as: 1.0°C/min, 0.5°C/min, 0.1°C/min

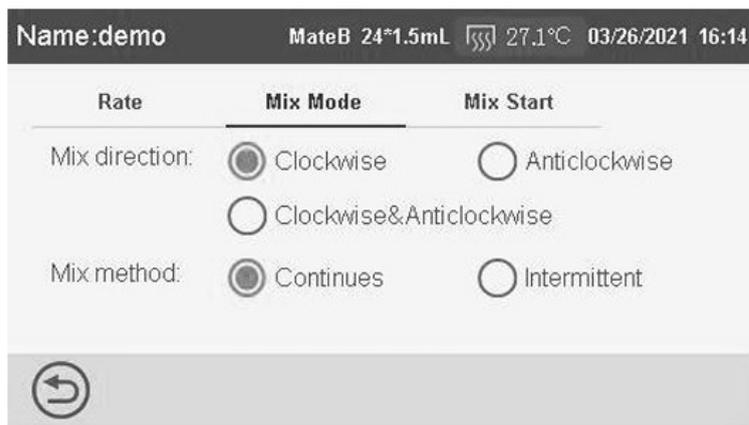


Mixing mode:

Mix direction: There are three directions: Clockwise, Anticlockwise and Oockwise & Anticlodcwise. Default is clockwise.

Mix method: There are two mix methods: continues maxing and intermittent mixing. If choose intermittent mixing, continuous mixing time and the intermittent time can be set.

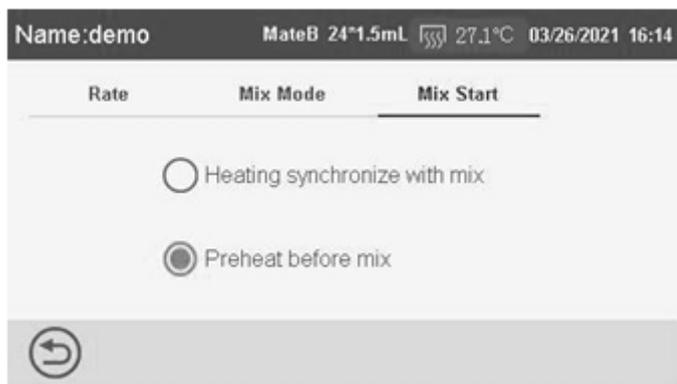
Remark: If choose clockwise & Anticlockwise in "mix direction", then only intermittent mixing can be selected. Default Is continues mixing.



Mix start point:

Heating synchronize with mix: Temperature-control function and mixing function will run simultaneously after the fast program is starting.

Mix after preheat: After fast program starting, the temperature-control function run firstly, the mixing function will run after it reach to preset temperature.



Cycle step:

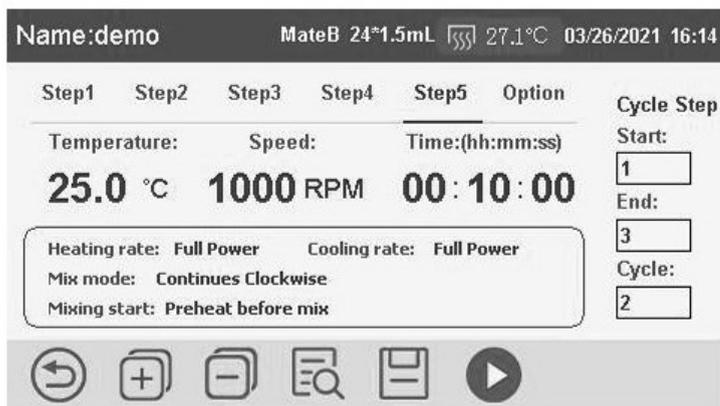
Start: Start the cycle steps;

End: Stop the cycle steps;

Cycle: Cycle times;

Illustration: Cycle start from steel, and end in step3, cycle is repeat twice.

The actual running step I s: step 1 → Step2→, Step3→, Step1→ Step2→ Step3→ Step4→Steps 5



Press icon: the function for each icon is as below:



Back to the protocol list, prompt whether save or not after click.



Increase steps, the max steps number is five.



Delete the current steps, prompt pop up after click.



Preview: Click it to enter the protocol preview interface.



Save protocol, prompt save the current protocol or not.

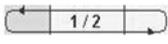


Running the current protocol.

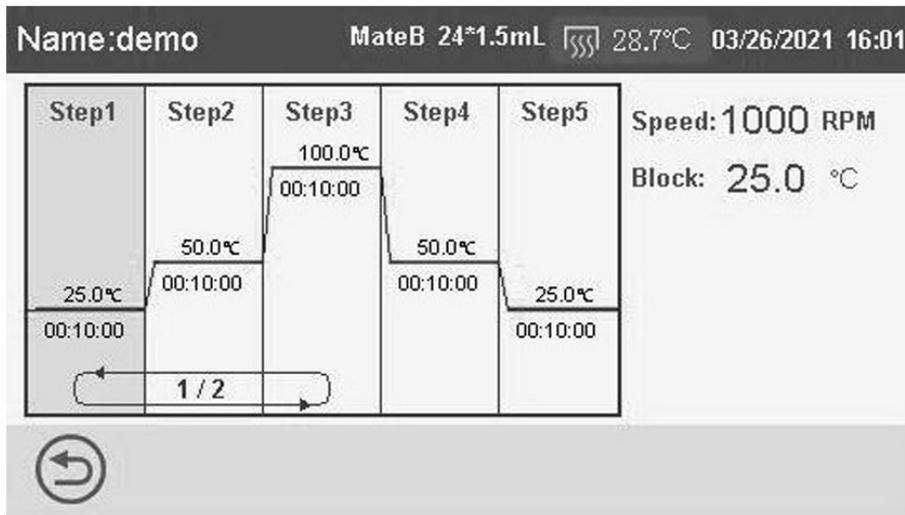
Protocol preview Interface:

Click icon  to enter protocol preview interface, user can check the thumbnail image and detail parameters in this interface.

The icon will be highlight after cricking the step, and the detailed parameters of the step will display in the right side status bar.

 means cycle, the area crossing means the step range of the cycle. As figure below, the starting point of this cycle is step1, ending point is steps 3; 1/2 means total cycle is twice and current is the first cycle.

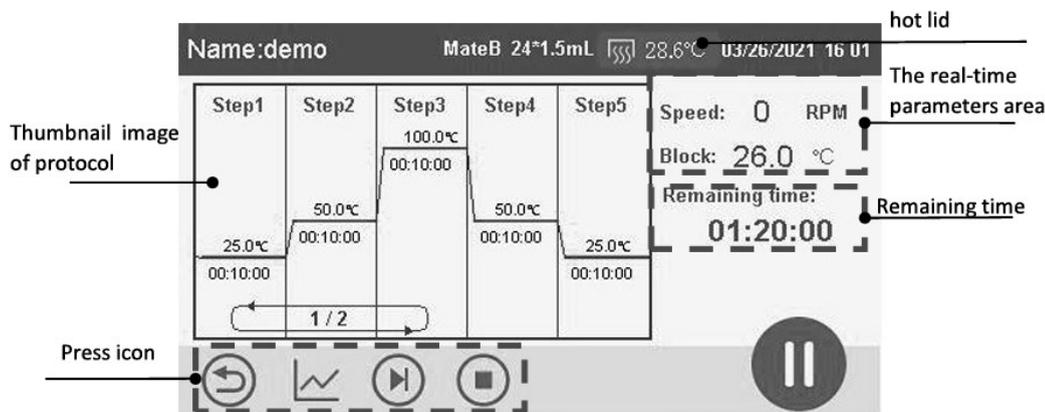
⏪ Back to the protocol edit Interface:



5. Protocol running Interface

5.1 Introduce for running interface

Take the "ddd" protocol mentioned above as example, after clicking icon ▶ enter running interface.



Thumbnail image of protocol: Include the temperature, time, starting point, ending point and cycle times of each steps; the step on running will display as highlight. Its available to modify the parameters on running process when click the step.

Press icon: the function for each icon as below:

⏪ Back to the protocol list, Prompt whether stop the protocol on running.

⏩ Skip over the current step and enter next step; in special, if the current step is on the cycle step, it will enter the next step of this cycle.

For example, when running the step3 of "ddd" protocol, if its on first cycle, it will skip step3 and enter the second cycle to running step1. When all the steps finished, skip icon will change to return icon.

📈 Enter temperature curve interface to see the running curve for current protocol.

⏹ Stop icon: Prompt whether stop the protocol on running.

⏸ Pause: The protocol will pause when click it and will recovery running after click it again.

Icon of hot lid:

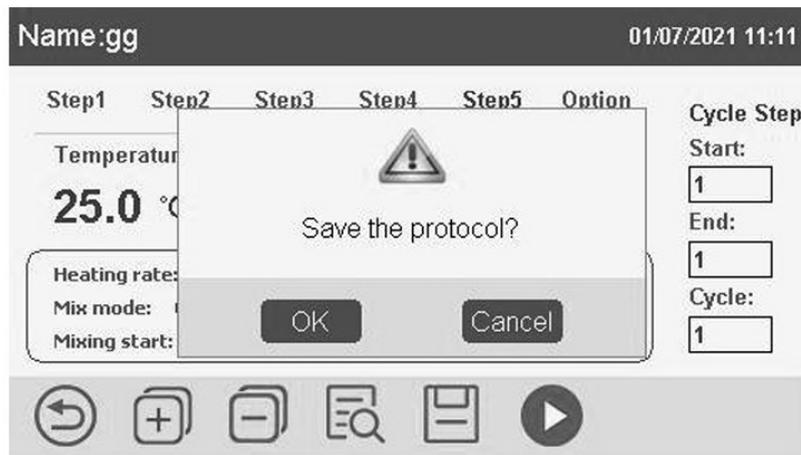
 28.6°C After connecting the hot lid, this icon will show on status bar and will disappear after disconnecting.

Real-time parameters: Display rotating speed, the real-time temperature of block.

Remaining time: Display the remaining time of current protocol (not include heating or cooling time).

5.2 Protocol edit interface

Click step in the protocol running interface enter the protocol edit interface, parameter is able to modify during running.



The protocol edit Interface on running is generally same as the interface mentioned in 4.2.2. But it is not allowed to add or reduce steps.

After modify the parameters, click Icon  and prompt whether to save the protocol. After confirm, the remaining steps will be run according to the modified protocol.

5.3 Running curve Interface

Click icon  to enter the running curve interface on the protocol running interface.

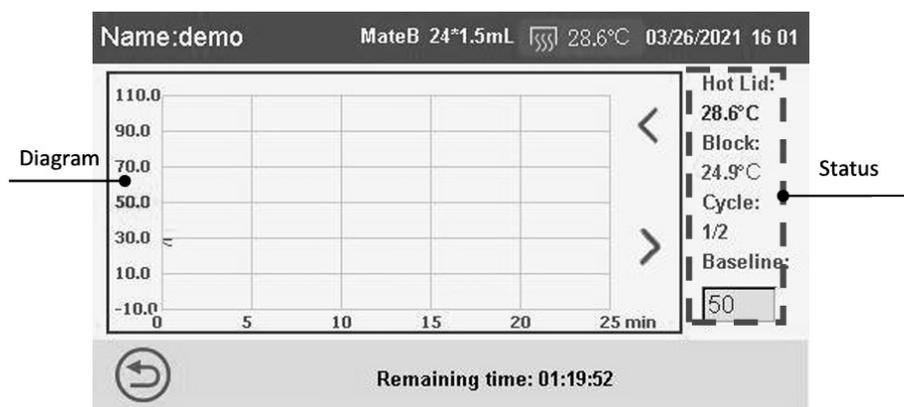


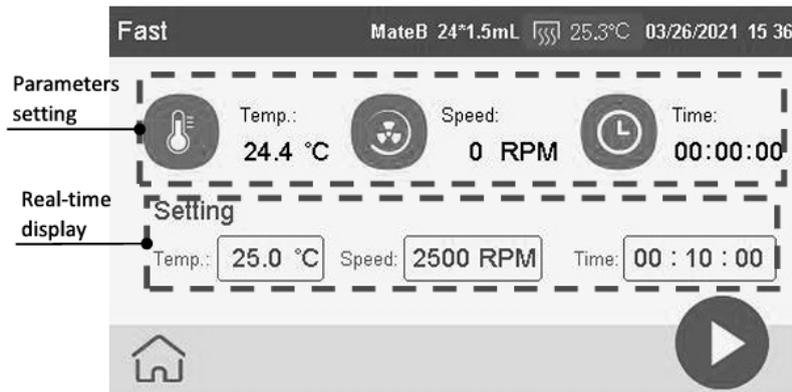
Diagram: Including ordinate temperature, range is -10 ~110°C , the baseline 50°C marked in red; abscissa time, range if 0~25 min, page will be turned after over 25min; the red curve represents the temperature trend of hot lid and the green curve represents the temperature trend of block.

Status: Include the real-time temperature of hot lid (red curve) and block (green curve), current cycle times, baseline temperature number (not allowed to change).

- ↶ Click this icon to back to protocol running interface
- < Turn page left side (it will get gray after arrived top)
- > Turn page right side (it will get gray after arrived bottom)

6. Fast interface

Click the "Fast" icon on the main interface to enter the "Fast" running interface.



Parameters setting:

Temperature: The temperature range is 0~105 ° C. If the temperature is set as "-", It means not control the temperature.

Rotating speed: The rotating speed range is 0~3000rpm. (Attentions: The actual rotating speed would be limited by different blocks.)

Time: the time range is 00:00;01~99:59:59. When it set as "---:---:---" means no timing.

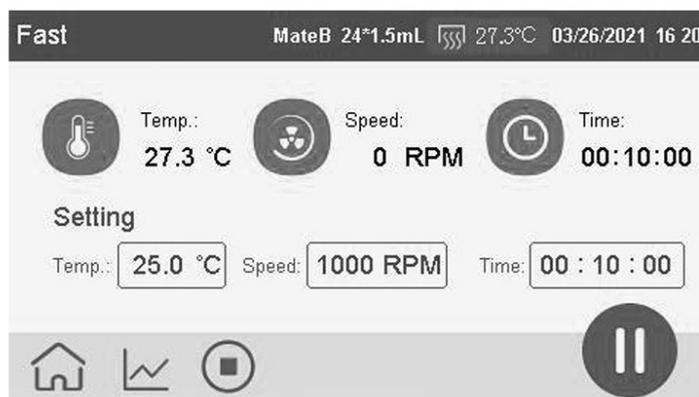
Real-time display: Display the real-time temperature, rotating speed and the remaining time.

28.6°C Icon of hot lid, hot lid temp can be set after click the icon.

Back to main interlace

Run the protocol according to the current parameter

After click the running icon, the interface as below



If the icon get gray, unable to back the main interface during running process

Click this icon enter the temperature curve interface to see the current running protocol temperature curve. (Temperature running interface can be reference the 5.3 running curve interface)

Stop: Prompt whether stop the running protocol after click this icon

Pause: Pause the running protocol after click it and it will recovery after click again.

7. Data interface

Click the data icon on main interface to enter the data interface; it can store 1000 data at most.

| No. | Name | Run Time |
|-----|------|------------------|
| 1 | dddd | 09-15-2020 11:04 |
| 2 | dddd | 09-15-2020 11:03 |
| 3 | dddd | 09-14-2020 13:12 |

Data list: the data is listed by descending order according to the running time, selected data shows as highlight.

The function of other icons is as below:

-  Back to main interface
-  Search function, filter the data by time range
-  Data management, click to enter the data management interface
-  Check the data, click to enter the data check interface
-  Turn page upward. (it will get gray after arrived the top)
-  Turn page downward. (It will get gray after arrived the bottom)

7.1 Data manage interface.

Click the icon  to enter the data manage interface.

| <input type="checkbox"/> | No. | Name | Run Time |
|--------------------------|-----|------|------------------|
| <input type="checkbox"/> | 1 | dddd | 09-15-2020 11:04 |
| <input type="checkbox"/> | 2 | dddd | 09-15-2020 11:03 |
| <input type="checkbox"/> | 3 | dddd | 09-14-2020 13:12 |

The function for each icon of data manage interface is as below:

- Selection box: Shown as ticked after click it
-  Return: Back to the data interface
-  Delete: Delete the selected data
-  Data export: Export data into USB flash disk

7.2 Data review interface

Click icon  in the data interface to enter the data review interface, the user is able to check the real-time temperature curve during running process intuitively.

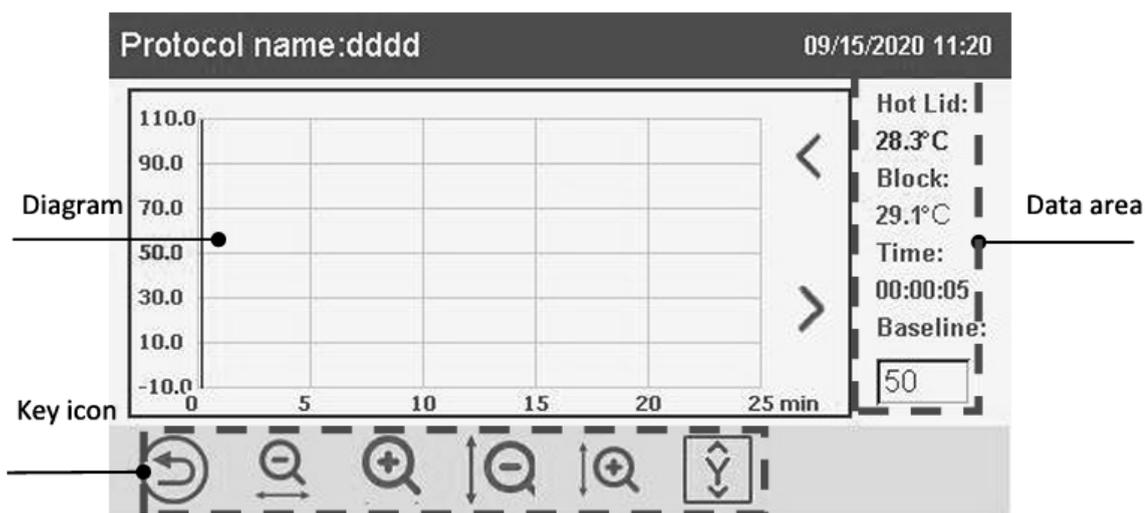


Diagram: User is able to see the real-time temperature curve during the running process intuitively.

Data area: Display the temperature of hot lid and block of blue line's location, as well as the time. user can check the real-time data of different point in the diagram area. In special, the basic line is able to be changed to make it more convenient to check the data curve. (default basic line is 50°C).

Key icon: The function for each icons is as below:

-  Return: back to the data interface
-  Zoom out the abscissa
-  Zoom in the abscissa
-  Zoom out the ordinate
-  Zoom in the ordinate
-  Ordinate self-adaption

8. Front panel

NB-12-049A Thermo Shaker Incubator realize the man-machine interaction through touchscreen, only have two physical keys as below:



SHORT

Short mixing: Press this key constantly, then the instrument will mixing by the max rotating speed of current installed block, and it will stop mixing once release this key.

RUN/STOP

Run/Stop: Protocol will run or pause/run after press this key shortly and if press it for longer time (1 second), the protocol will stop Running.

Chapter 5 Troubleshooting

| No | Description | Reasons | Solution |
|----|--|--|--|
| 1 | Display screen not light after turn on the power switch | Power source is not connected | Check the power source and connect it. |
| | | Fuse is burned | Replace the fuse (250V 2.5A φ5x20) |
| | | Switch is bad | Replace the switch |
| | | Other reasons | Contact the distributor or manufacturer |
| 2 | Display temperature is different with the actual temperature | Temperature sensor is bad or block is not fixed properly | Contact the distributor or manufacturer |
| 3 | Module is neither Heating nor cooling | DC power is bad | Contact the distributor or manufacturer |
| | | TE refrigeration sheet is bad | |
| 4 | Keyboard not work | Front panel is broken | Contact the distributor or manufacturer |
| 5 | Cooling speed is very slow or it can not reach to the lowest | Ambient temperature is too high | Low the ambient temperature |
| | | Block is not fixed properly | Check if the block is installed properly |
| | | Fan is bad | Contact the distributor or manufacturer |
| | | Refrigeration sheet is bad | |
| 6 | Prompt motor is stuck | Motor is stuck | Contact the distributor or manufacturer |
| 7 | Prompt E101-motor's rotating is over speed | Motor lose control | Contact the distributor or manufacturer |
| 8 | Prompt there is no block | No block find | Check if the block is installed properly |
| 9 | Block crash to the instrument when mixing | Block is not installed properly | Check if the block is installed properly |
| 10 | Prompt E011-block_temp_over | Temperature sensor lose control | Contact the distributor or manufacturer |
| 11 | Prompt E015-E015 BLOCK_temps_open | Temperature sensor is open circuit | Contact the distributor or manufacturer |
| 12 | Prompt E016-block_temp_close | Temperature sensor is short circuit | Contact the distributor or manufacturer |
| 13 | Prompt E021-hot_temp_over | Temperature sensor of hot lid lose control | Contact the distributor or manufacturer |
| 14 | Prompt E025-hot_temp_open | Temperature sensor of hot lid is open circuit | Check if the connecting line of hot lid is connected properly. Contact the distributor or manufacturer |
| 15 | Prompt E026-hot_temp_close | Temperature sensor of hot lid is open circuit | Check if the connecting plug of hot lid is short circuit and contact the distributor or manufacturer |
| 16 | Prompt E702-RTC error | The hardware is damaged | Contact the distributor or manufacturer |
| 17 | Prompt E708-Nand flash error | | |
| 18 | Prompting E709-SPI flash error | | |
| 19 | Prompting E801-uart_err | Signal interference | Power off and restart Contact the distributor or manufacturer |

Appendix: NB-12-049A Wiring diagram

