Clontech PCR Thermal Cycler GP

Cat. #WN400

Product Manual

Clontech

【Product covered in this Manual】

This manual covers the Clontech PCR Thermal Cycler GP.

・ Clontech PCR Thermal Cycler GP (Cat. #WN400)

【Introduction】

⚠ **Note: Our products are to be used for Research Use Only. They may not be used for any other purpose, including, but not limited to, use in humans, therapeutic or diagnostic use, or commercial use of any kind.**

・ This instrument must not be used by any person other than those with special knowledge.
・ When this instrument is used for experiments, individual conditions must be carefully examined. Takara Bio Inc. shall not be liable to the results of such experiments and the consequences thereof.
・ The product specifications, appearance, and this product manual may be subject to change without notice for improvement.
・ If the instrument is used in a condition other than those specified in this manual, it may malfunction or be damaged.
・ Takara Bio Inc. shall not be liable for any obligations under the warranty provisions nor any damages resulting therefrom when the instrument is repaired, disassembled or modified (including the use of software other than that included with the instrument, infection by computer virus) or when the instrument is used in neglect of the requirements described in this manual, including "Safety Precautions for Takara Bio Instrument."
・ All trademarks are the property of their respective owners. Certain trademarks may not be registered in all jurisdictions.

【Warranty】

For the warranty period concerning failure, damage, etc., check the contents of the warranty document included with the product.

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Safety Precautions for Takara Bio Instrument

· Before opening the package, setup and operation of the instrument purchased, please read this manual carefully to fully understand the contents.
· After you have read it, keep it in a location that can be accessed at any time when you use the instrument.
· Pay particular attention to the precautions for safety and against possible danger (Danger, Warning, and Caution) described in this manual.
· If the instrument is used in neglect of the Danger, Warning, and Caution requirements, serious personal injury or damage to the product may result.

1. Precaution Symbols

Various precaution symbols are provided on the instrument and in the manual to ensure safe use of the instrument and to prevent hazards to the customer and other people as well as property damage.
Read the descriptions after fully understanding the meanings of these symbols.

⚠	**DANGER**	**May cause death or serious injury of the user.**
⚠	**WARNING**	**If the instrument is operated incorrectly while neglecting this symbol, a serious accident may result.**
⚠	**CAUTION**	**If the instrument is operated incorrectly while neglecting this symbol, an accident may result.**

2. Precautions for Takara Bio Instruments

When using this product, the following precautions must be followed to ensure the performance of the instrument and to prevent the risk of fire and electric shock. Read this manual carefully to ensure correct use.

2.1. Precautions Regarding the Place of Installation

Follow the instructions below for setup.

⚠ **WARNING**

- Do not place the instrument on an unstable place, such as on a wobbly table or on a tilted surface.
- If the instrument falls to the floor or is damaged, immediately turn off the power of the instrument and the peripheral instrument connected to it, then disconnect the power plug from the outlet.
- Do not block the ventilation holes on the instrument if provided. Blocking the holes can cause heat to accumulate inside the instrument, resulting in burns or a fire.

⚠ **CAUTION**

- Keep the instrument away from humid and dusty places. Do not place the instrument in a location subject to vibrations.
- Do not expose the instrument to direct sunlight or high temperatures. The internal temperature may rise, resulting in burns or a fire.
- Do not place any object on the instrument.
- Do not install the product in a location other than a research facility or the equivalent.

2.2. Electrical Precautions

Follow the precautions below when using an electricity powered instruments.

⚠ DANGER	· The unit, power cable, and AC adapter carry high voltage. Do not insert metal or inflammable objects in the instrument or touch it with wet hands. There is a risk of fire or electric shock.

⚠ WARNING	· Do not use the instrument at a voltage other than the specified voltage. · Do not damage, break, modify, excessively bend or twist the power cable or AC adapter. In addition, do not place any object on or apply heat to the cable, and do not pull it forcibly. · To prevent electric shock due to electric leakage, make sure to ground the unit. · Before connecting the instrument to the outlet, always make sure that the maximum current indicated on the instrument does not exceed the allowable current of the outlet. When connecting multiple instrument, be careful that the total power consumption of the instrument to be connected does not exceed the allowable current.

⚠ CAUTION	· Before moving the instrument, make sure to unplug the power cable from the outlet and disconnect the cables from the external instrument. · Before cleaning, unplug the power cable from the outlet for safety.

2.3. Other Precautions

Follow the following precautions:

⚠ DANGER	· Do not attempt repairs of any electrical, mechanical, or tubing components inside the instrument on your own.

⚠ WARNING	· Do not insert foreign objects like metal or flammable materials into the instrument through the opening. · Do not modify or disassemble the instrument. Doing so may impair the unit's intended performance. Additionally, electric shock or damage may result, or the internally stored settings may be lost. · If you notice smoke, a strange smell, or other abnormal conditions, immediately stop operation, turn off the power, and disconnect the power cable from the outlet. Wait until the abnormal condition has settled before contacting your distributor. · If foreign objects or water enters the instrument, stop operation immediately, turn off the power, disconnect the power cable from the outlet, and then contact the distributor.

⚠ CAUTION	· Do not step on the instrument. · Do not disassemble the instrument. · Do not open the instrument during analysis. · Make sure to use the reaction tubes and reaction plates for this instrument listed at the end of this manual.

3. Warning Labels

Warning symbol labels are affixed to the body to ensure safe operation. Check the details of the associated hazards before use.

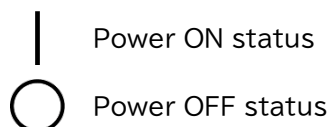| Warning Symbol	Hazard Section	Details of Danger
	Power supply	Warning: Electrical shock! Do not open the power supply. There is a danger of electric shock due to the high voltage of the power supply.
	Power cable	Warning: Make sure to connect the ground wire. To prevent electric shock, this instrument must be grounded. Electric shock or fire may be caused due to electrical leakage.
	Heat block Heat lid	Caution: High temperature! Be careful not to burn your skin as the heat block and heat lid become hot.

∗ PCR tubes used with this instrument must be from "5. Related Products" in this manual.

∗ When using one or two 8-strip tubes, install empty 8-strip tubes as supports in column 1 and 12. This distributes the pressure of the lid suppression and prevents the PCR tubes from collapsing and the reaction liquid from evaporating.
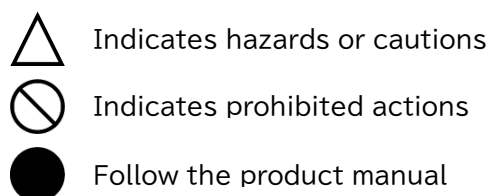
4. Symbols

4.1. Electrical Symbols

Symbols used for the power switch.

	Power ON status
◯	Power OFF status

4.2. Warning Symbols

These symbols are shown in "3. Warning Labels".

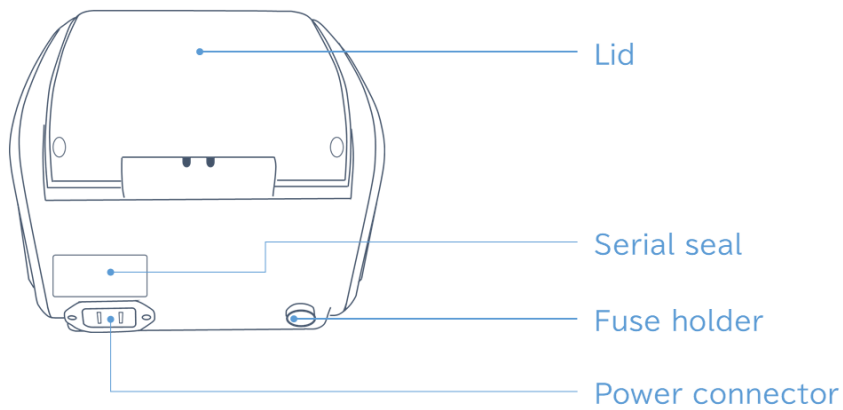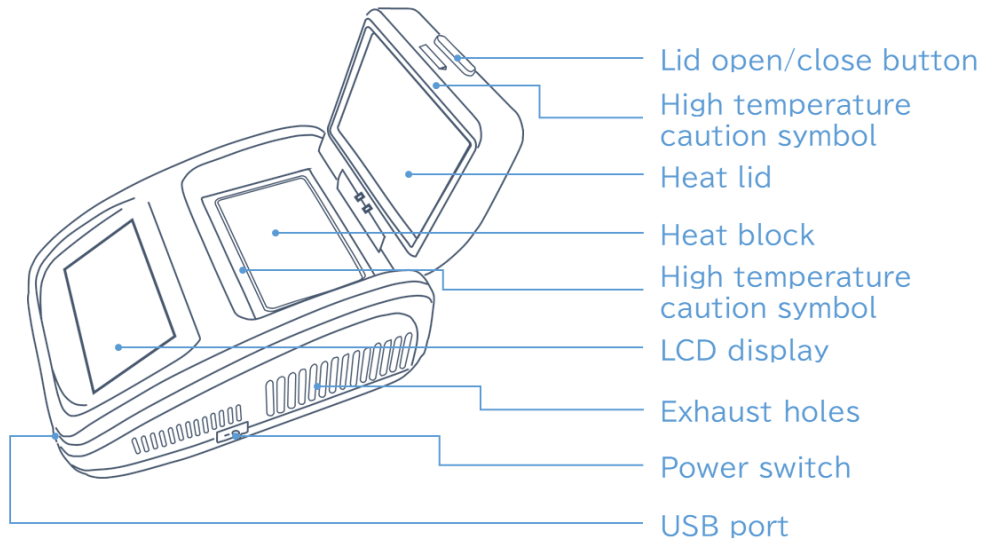|	
△	Indicates hazards or cautions
⊘	Indicates prohibited actions
⬤	Follow the product manual

1. Overview of the Product

Clontech PCR Thermal Cycler GP is a compact PCR Product. The 5 inch High-Definition Full Touch TFT LCD color display allows you to view the entire program graphically in real time and to control parameter changes intuitively. In addition, the latest semiconductor technology provides excellent temperature accuracy and uniformity, which provides stable experimental results.

1.1. Features of the Instrument

- Compact size and simple user interface for easy and comfortable operation.
- The latest semiconductor technology provides high temperature uniformity throughout the heat block, making temperature control of the program more accurate.
- The system has a built-in temperature gradient calculation function, which can be set up easily. Precise annealing temperatures can be calculated to help optimize PCR reaction conditions for a variety of experimental samples.

1.2. Structure of the Instrument

The structure of the instrument is shown below. Check the descriptions of each part before using the instrument for the first time.

Lid open/close button

High temperature caution symbol

Heat lid

Heat block

High temperature caution symbol

LCD display

Exhaust holes

Power switch

USB port

Lid

Serial seal

Fuse holder

Power connector

1.3. Specifications of the Product

External dimensions	:	280 mm (D) x 185 mm (W)* x 165 mm (H)
Weight	:	4.3 kg
Power supply	:	AC 100 - 240 V, 50/60 Hz, 6.6 - 3.1 A
Preset temperature range	:	4 to 99.9℃
Sample volume	:	96 x 0.2 ml
Maximum heating rate	:	4.5℃/s
Maximum cooling rate	:	4℃/s
Temperature uniformity	:	≦1.0℃ (50℃)
Temperature accuracy	:	±0.5℃
Temperature indication resolution	:	0.1℃
Temperature gradient range	:	30 to 99.9℃
Temperature gradient difference range:		0.1 to 30℃
Heat lid temperature range	:	30 to 110℃
Maximum number of steps	:	30
Maximum number of cycles	:	99
Time increment/decrement	:	-599 to +599 s
Temperature increase/decrease	:	-9.9 to +9.9℃
Program pause function	:	Available
Display	:	5 inch color touch panel, 800 x 480 pixels
Number of programs saved	:	< 500
Communication port	:	USB 2.0

∗ The stylus stand is not included in 185 mm (W).

2. Setup Instructions

The setup instructions of the instrument are shown below. Read this section carefully before using the instrument for the first time.

2.1. Unpacking

As soon as you receive the instrument, check it and its accessories according to the packing list. Contact your distributor if there is any discrepancy with the packing list.

2.2. Setup

<Setup procedure>
1. Check that the power supply specification satisfies the requirements.
2. Make sure that the Power Switch of the instrument is OFF.
3. Connect the power cable to the instrument and insert the power plug into the grounded power outlet.
4. Turn on the power to the instrument.

⚠ **Caution 1**:   When handling the instrument, follow the instructions below.

- This instrument is designed for use in an indoor environment.
- Connect or disconnect the power cable by holding the plug with your hand. When inserting the plug, make sure that the plug is fully inserted into the outlet. Do not pull the power cable to unplug the instrument.
- Keep the instrument away from moisture and avoid direct sunlight or intense light sources. Use in a well-ventilated room without corrosive gas nor strong magnetic field interference. Keep away from heat sources like heaters, stoves, and the like. Do not place the instrument in a humid or dusty environment.
- Turn off the power once the instrument stops operating. If the instrument is not used for an extended period of time, remove the power plug and protect the instrument with a soft cloth to prevent dust from entering.

⚠ **Caution 2**:   In the following cases, immediately unplug the cable from the outlet and contact your distributor.

- If any liquid enters the instrument
- If an abnormal sound or smell is detected inside the instrument
- If the instrument becomes wet with water or rain
- If the instrument falls from the table or its enclosure is damaged
- If the function of the instrument is abnormal

2.3. Setup Conditions

Ambient temperature	:	10 - 30℃
Humidity	:	≦70%
Power supply	:	AC 100 - 240 V, 50/60 Hz, 6.6 - 3.1 A

3. Protocol

The basic operations are as follows. Read this section carefully before using the instrument for the first time.

3.1. Start Up

1. When the power switch is turned on, the display screen lights up and the welcome screen appears.

Fig 1. Welcome screen

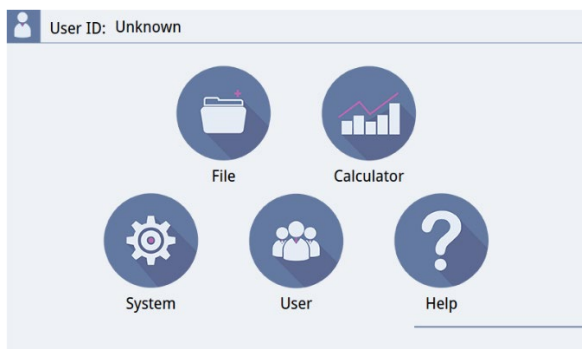2. The main screen is displayed after a moment.

Fig 2. Main Screen

∗ The description of each icon is as follows.

    File   :   Create and run a program.
                    (3.2 Program Operation)
    Calculator :   Simulate the gradient temperature.
                    (3.3. Calculation of the Temperature Gradient)
    System   :   Set various system settings such as heat lid timing.
                    (3.5. System Settings)
    User   :   Set the user information.
                    (3.4. User Registration)
    Help   :   Import and export reaction programs.
                    (3.6. Import/Export of the Reaction Program)

3.2. Program Operation

The PCR reaction program consists of thermal steps and cycling steps. Up to 30 steps can be set in a single program.

3.2.1. File Library

Touch the <File> icon on the main screen to enter the file library screen.

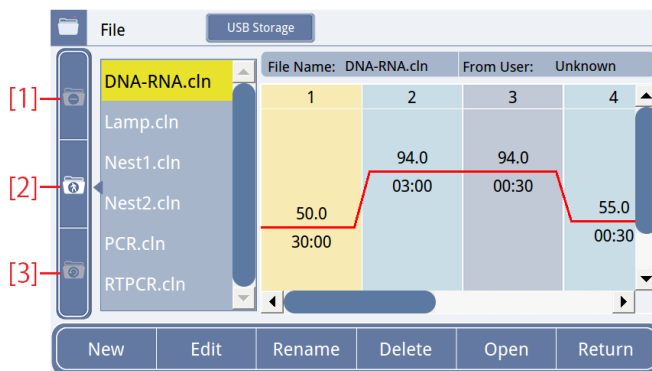∗ This screen shows the file list in the left column and a preview of the selected file on the right side.

Fig 3. File Library Screen

∗ Using the buttons at the bottom of the screen.

New   :   Create a new program.
Edit   :   Edit the selected existing program.
Rename: Change the name of the selected existing program.
Delete :   Delete the selected existing program.
Open   :   Open the Run confirmation screen of the selected existing
               program.
Return :   Return to the previous screen.

∗ The use of each folder icon is as follows.

[1] Private folder :   Saved files by the login account.
[2] Public folder :   Saved files without login.
[3] History folder :   Recent used files by the login account.

3.2.2. Create a New File

1. Select <File> icon from the Main Screen to open the File Library screen.

   * Touch <New> to open the Reaction Program Setting Screen.
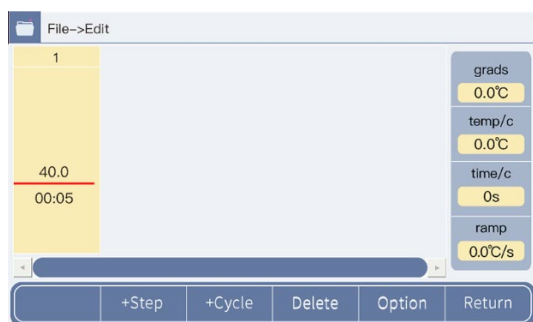

   Fig 4. Reaction Program Setting Screen

2. The temperature and time for each step are preset. Touch the value you wish to change and enter the new setting to overwrite it.

   * Temperature can be entered in the range of 4 to 99.9°C and time in the range of 00:01 to 59:59. If 00:00 is entered, the display changes to ∞ and the Hold setting is set for infinity hold.

3. Add the necessary steps by touching the <+Step> button.

   * Then change the temperature and time. A new step will be added after the selected step (yellow step). The maximum number of steps is 30. (It is easier to add all the necessary steps first and then change the values for each step).

4. Set the cycle. Enter all the steps required for the cycle. Select the last step of the cycle and highlight it in yellow. Then touch the <+Cycle> button and enter the step number of the beginning of the cycle and the number of cycles. (Figure 5)
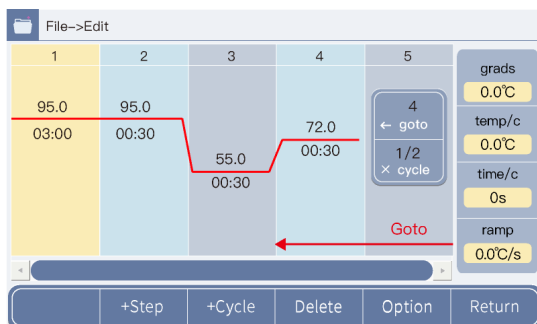

Fig 5. Cycle Setting Screen

[←goto] (Cycle range)	:	Enter the step number to start the cycle
[x cycle] (Number of cycles)	:	e.g., for 30 cycles
		Enter "30", and "1/30" will appear on the screen.

5. To set options such as gradient settings, select the step for which you want to set options, then touch the <Option> button to open the Option Setting Screen. Change the settings and touch <Ok> to save them. (Details: 3.2.3 Setting of Options)

6. Press <Return> and select <Ok> after completing the Reaction Program Settings.

7. As shown in Figure 6-1, enter a file name in the <Name> field, then select <Ok> to return to the file library screen.

   * Touch <Return> to return to the File Library Screen, but the reaction program will not be saved unless <Ok> is pressed.
   * At this point, a new file is saved.

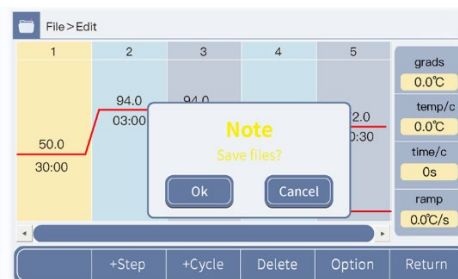Fig 6-1. File name input screen   Fig 6-2. File name edit confirmation screen

3.2.3. Setting of Options

Settings for the gradient function and the temperature change for each cycle can be adjusted.

1. With a step selected in the Reaction Program Edit screen, touch the <Option> button. Then, set the parameters of the steps.
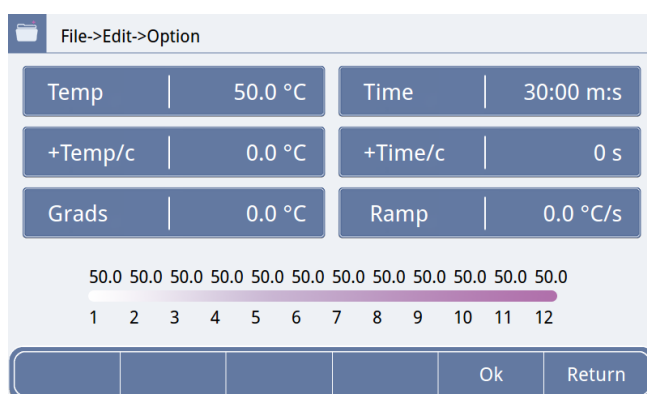

File->Edit->Option

Temp	50.0 °C	Time	30:00 m:s
+Temp/c	0.0 °C	+Time/c	0 s
Grads	0.0 °C	Ramp	0.0 °C/s

50.0 50.0 50.0 50.0 50.0 50.0 50.0 50.0 50.0 50.0 50.0 50.0
1   2   3   4   5   6   7   8   9   10 11 12

Ok   Return

Fig 7. Optional Parameter Setting Screen

∗ Items of each parameter are as follows.

Temp   :   Temperature setting (Setting range 4.0 - 99.9℃)
Time   :   Reaction time (Setting range 00:00 - 59:59)
+Temp/c :   Set this when you want to change the temperature for each cycle, such as when performing a touch-down PCR. If you want to reduce the temperature by 1℃ for each cycle, enter -1.0℃. (Setting range −9.9 - 9.9℃)
+Time/c :   Set this when you want to change the reaction time for each cycle. (Setting range −599 - 599 s)
Grads   :   Set this when the gradient function is used. Enter the range of the gradient. The setting temperature is adapted to the 1st column at the left end of the heat block, and the temperature obtained by adding the gradient range is adapted to the 12th column at the right end of the heat block. Gradient is automatically calculated. (Gradient temperature difference range 0.1 - 30℃)
Ramp   :   The default temperature control is adapted when the ramp rate is 0.0℃/s. If you want to set a heating and/or cooling rate that is slower than the default temperature control, enter the value you want in "ramp". You can enter 0.1 to 5.0℃, but the value cannot exceed the maximum heating/cooling rate of the instrument. This ramp rate setting is reflected in the temperature control when shifting to the set temperature for the selected step.

2. After completing the required optional settings, touch <Ok> to return to the Edit screen.

   ∗ To return to the Edit screen, touch the <Return> button. However, the option setting is not updated unless you touch <Ok>.

3.2.4. Running the Reaction Program

1. Select the reaction program in the File Library screen and touch <Open> at the bottom of the screen to open the reaction program confirmation screen. Confirm the program and touch <Run> to start the program.

   The step in progress flashes while the reaction program is running.

Fig 8. Reaction Program Confirmation Screen

* The following items will appear on the screen while the program is running.

Lid On/Lid Off	:	Touching the <Lid On> button turns on the Heat Lid. Touching the <Lid Off> button turns the Heat Lid off. The right side of the screen displays the Heat Lid and Heat Block temperatures, elapsed time, and total time.
Run/Stop	:	Touching the <Run> button starts the reaction program. Touching the <Stop> button stops the reaction program.
Pause/Start	:	Touching the <Pause> button pauses the running reaction program. Touching the <Start> button resumes the program.
Skip	:	Skips the program to the Next Step.

2. The Completion screen is displayed when the reaction program running is finished.

   * The heat block temperature after the reaction program is finished is set to 16°C. Remove the sample immediately after completion of the reaction.

3. After the 2. above is confirmed, stop the reaction program by touching <Stop>.

3.3. Calculation of the Temperature Gradient

The Gradient Calculation screen shows to simulate the temperature of each column of the heat block.

⚠ Note: The values entered in the Gradient Calculation Screen are not automatically reflected in the reaction program.
If you wish to set the gradient function in the reaction program, please refer to "3.2.3. Setting of Options".

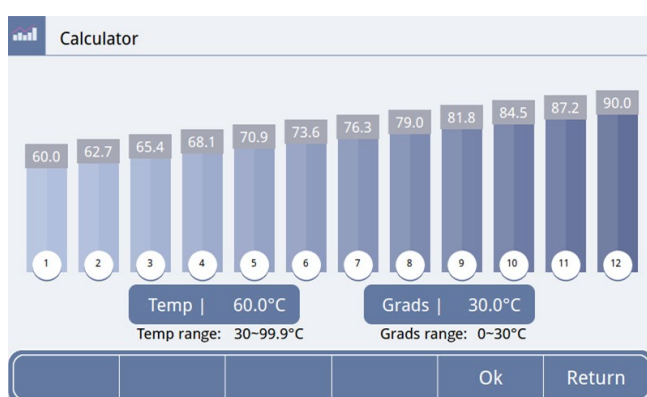1. Touch <Calculator> on the main screen to enter the gradient calculation screen.

Fig 9. Gradient Calculation Screen

2. Enter the heat block temperature in the "Temp" box and the gradient range in the "Grads" box.

   * The heat block temperature entered is applied to the 1st column on the left of the heat block.
   * The range of the gradient entered is added to the heat block temperature entered and applied to the 12th column of the heat block.

3. Touch <OK> after the entry is completed to calculate the temperature setting of respective column.

   * The calculation is executed automatically.

4. Touch <Return> to return to the main screen.

3.4. User Registration

1. Touch the <User> icon on the main screen to enter the user management screen.
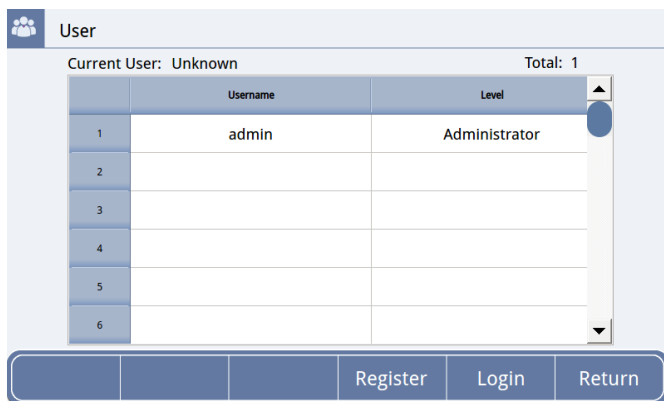

Fig 10. User Setting Screen

2. Touch <Register> and enter your username, password, and other information in the user registration screen, then touch <Ok> to complete registration.

3. Touch <Login> and enter the registered information on the login page in 2. above to log in.

   * To change an user's password or delete an account, you must be logged in as <Administrator>. The Administrator password is 123456.
   * The number of users that can be registered is 30, including the Administrator.

3.5. System Settings

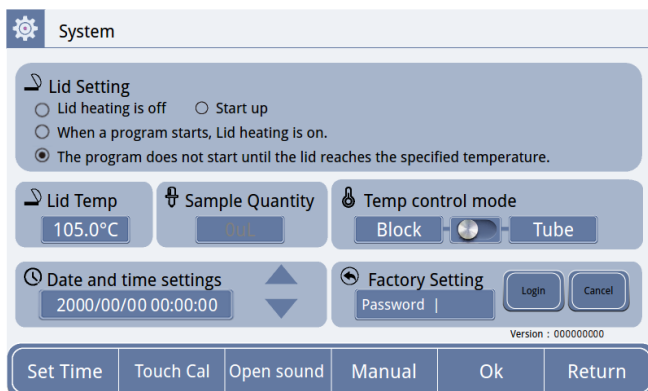1. Touch <System> on the Main screen to enter the system screen.

Fig 11. System Settings Screen

* The details of respective items are as follows.

Lid Setting	Sets the timing of heat lid heating. The functions of each setting are as follows.
	
	Lid heating is off
	  The heat lid heating is turned off. However, the Lid ON setting on the Program Running Screen has the highest priority. To turn off heat lid heating during program execution, Touch the <Lid OFF> button on the Running screen.
	Start up
	  Heating of the heat lid starts as soon as the power is turned on.
	When a program starts, lid heating is on.
	  Heating of the heat lid and PCR cycle starts as soon as the program starts.
	The Program does not start until the lid reaches the specified temperature. (Default setting)
	  Heating of the Heat lid begins at the same time as the program starts. The PCR cycle starts when the heat lid reaches the set temperature. The heat block temperature is set at 10°C until the heat lid reaches the set temperature. The heat lid cannot be turned off while the program is running.

Lid Temp	Sets the heat lid temperature. However, if the block temperature is set to less than 30°C, the heat lid temperature will be 40°C.

Sample Quantity	Enter the quantity of the liquid in the sample tube according to the calculated value when the temperature is reached at the tube temperature. When <Tube> is selected in the next <Temp control mode> step, the temperature control is performed taking the entered quantity of the reaction liquid into consideration.
Temp control mode	When controlling the temperature, select whether the set temperature is reached by attainment of the heat block temperature or by attainment of the tube temperature. When <Tube> is selected, the time required to reach the set temperature is calculated taking the value entered in Sample Quantity into consideration.
Date and time settings	Used to set the date and time of the instrument.
Factory Setting	Used to log in to the Factory mode. The Factory mode should be exclusively used by the service engineer where the settings at the time of shipment from the factory are stored.
Version	Version of the operating software of the instrument.
Set Time	After setting the Date and time settings, touch <Set Time> to save.
Touch Cal	Touching <Touch Cal> three times will switch to the touch screen calibration screen. Touch the five crosshairs that appear on the screen to adjust the screen position. No operation is usually required. If the touch panel becomes unresponsive, connect a mouse to the USB port to enable mouse operation. Perform recalibration using <Touch Cal> in this situation.
Open sound/Close sound	Turn on/off the sound that is played at the end of the program. Touching the <Open sound> button turns on the sound when the program ends. Touching the <Close sound> button turns off the sound when the program ends. (Default setting)
Manual/Automatic	Sets the screen display while the program is running. Touching the <Manual> button sets the screen to scroll manually to display the steps. Touching the <Automatic> button will automatically display the current step. (Default setting)

2. After completing the settings, touch <Ok> to save them, then touch <Return> to return to the Main screen.

3.6. Import/Export of the Reaction Program

This screen is used to transfer reaction programs between users and between devices.

3.6.1. Import of the Reaction Program

1. Turn off the instrument, connect a USB flash drive containing the reaction program you want to import to the instrument.

2. Turn on the instrument and log in as the user who will be importing the reaction program. Touch <Help> on the main screen to display the Help screen.

   * If you do not log in, the public folder will be specified.
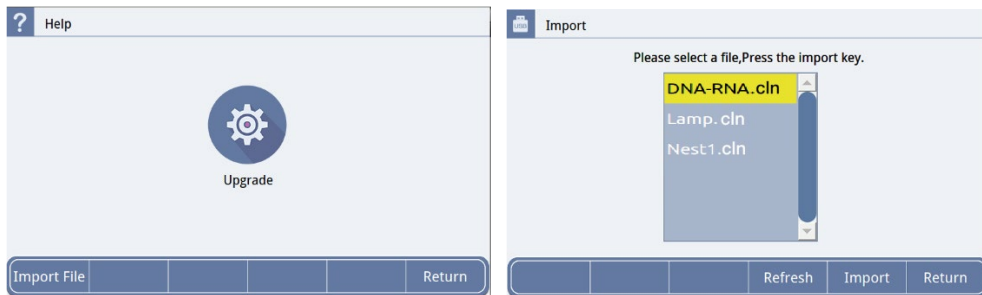

Fig 12. Reaction Program Import Screen

3. Touch <Import File> on the help screen to switch to the import screen, select the reaction program you want to import, then touch <Import> to import the program to the current user.

   * To cancel selection of the selected file, touch <Refresh>. After completing the procedure, restart the instrument.

3.6.2. Export of the Reaction Program

1. Turn off the instrument, connect the USB flash drive to which the reaction program is exported to the instrument, then turn on the instrument.

2. Select the reaction program to be exported and export the reaction program to the USB flash drive by touching <USB Storage> on the screen.

3. Remove the USB flash drive and restart the instrument after completing the procedure.

4. Maintenance and Troubleshooting

4.1. Daily Maintenance

· Keep the heat block clean. Dirt accumulated on the heat block can affect the temperature control.
· Cool the heat block to a temperature that will not cause skin burns before wiping it with a diluted neutral detergent (Do not use a solution of strong bases, alcohol exceeding 70% concentration, or organic solvent).
· Do not place any object around the exhaust holes located at the left and right sides of the instrument.
· Keep the air intake holes located at the bottom of the instrument. Dust will attach to the holes after the instrument is used for certain period of time.

4.2. Replacement of the Fuse

1. Identify the location of the fuse.

   ∗ The fuse is located in the fuse holder on the right side of the rear of the instrument.
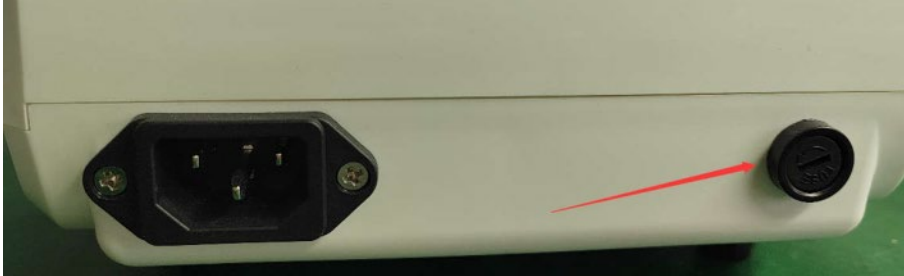
2. Loosen the fuse holder with a flathead screwdriver by turning it 90° counterclockwise.

3. Remove the fuse holder.

    ∗ The holder consists of two pieces and the inner holder can be pulled out.

4. Replace the old fuse in the holder with the new one∗1.

    ∗1 The current rating of the fuse is 5A. A spare fuse comes with the instrument you purchased. However, when you need to purchase a new fuse, contact your distributor.

5. After installing the holder into the position, lock it by turning it 90° clockwise with a flathead screwdriver.

4.3. Error Message

If any of the following error messages appears, checks and repairs are required. Contact your distributor.

No	Error Message
1	Display Error Open:x Short:x
2	Display screen not bright and abnormal
3	Touch failure
4	Block is not heated
5	Block temperature is too high/too low
6	Hot cover is not heated
7	Hot cover temperature is too high
8	Fan can not rotate

5. Related Products

[0.2 ml Single Tube]
0.2 ml Hi-Tube Dome Cap (Cat. #NJ200)
0.2ml Single-Tube Dome Cap (Cat. #NJ204)
0.2ml Single-Tube Flat Cap (Cat. #NJ205)

[0.2 ml 8-Tube & 8-Cap]
0.2 ml Hi-8-Tube (Cat. #NJ300)
0.2 ml Hi-8-Dome Cap (Cat. #NJ301)
0.2 ml Hi-8-Flat Cap (Cat. #NJ302)

[0.2 ml Plate & Cap]
0.2ml 96well-plate for Real Time (Frosted) (Cat. #NJ401)
Flat Cap for PCR Plate (Cat. #NJ402)
96 well snap plate (Cat. #NJ710)
Flat cap for snap plate (Cat. #NJ720)

⚠ Note:
· Please be aware that recommended caps must be used for each tube and plate.
· Using of other caps or seal might decrease reaction volume by vaporization.
· Not available in all geographic locations. Check for availability in your area.

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