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TIANGEN BIOTECH (BEIJING) Co., LTD

Version no.: OS210910

TGreat Expert (384-well) Gradient Thermal Cycler User's Manual



Model	Product Name
OSE-GP-05	TGreat Expert (384-well) Gradient Thermal Cycler

This product is for research use only.

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Chapter 1 Safety guide

1.1 Safety warnings and attention prompts

Identification	Note
	**High temperature warning:** Do not touch the area where the instrument is labeled with a high temperature warning mark and the high temperature areas described in this manual directly with your hands to avoid burns!
	**Electric shock warning:** Be sure to perform operations in strict accordance with the electric shock warning message to avoid electric shock accidents!
	**Attention:** Note that the prompt contains particularly important information, so please read it carefully. Failure to follow the prompts may result in the instrument not working properly or may even damage the instrument!

1.2 Safe use

Before using this instrument, read the following carefully and be sure to observe the basic safety measures below. Failure to observe these measures or the warnings noted elsewhere in this manual may affect the normal use of the instrument or even damage it and injure personnel.

(1) It is prohibited to use the instrument in humid, dusty, high temperature, strong magnetism, or explosion hazardous environment;

(2) It is prohibited to open the startup or to touch the internal components of the instrument with objects;

(3) Do not block the ventilation openings with any objects, and beware of gloves or rags being sucked into the air inlet at the bottom of the instrument;

(4) Keep the instrument on a flat, stable and weight-bearing platform;

(5) Keep the instrument clean and contact a technician or under instruction for maintenance.

Note: In the following cases, immediately remove the power plug from the power outlet and contact the supplier for maintenance.

(1) Instruments are subjected to rain, water or liquid penetration;

(2) The instrument is not working properly, especially with the presence of any unusual sounds or odors;

(3) Instrument function changed significantly.

Chapter 2 Instrument installation and introduction

2.1 Packing content

After you receive your TGreat Expert (384 well) Gradient Thermal Cycler, please check that the following items are included in the box:

Name	Quantity
Whole instrument	1 set
Power cord	1 pcs
Spare fuse	2 pcs
Instruction manual	1 copy
Quick operation guidance	1 copy
2 mm red silicone pad	1 copy
Touch pen	1 pcs
Touch pen buckle	1 pcs
Warranty Card	1 copy
Certificate of Conformity	1 copy

Note: If any of the above items are missing, broken or incorrect, please keep the original packing box and contact our sales staff in time.

2.2 Operating environmental requirements

(1) The instrument is for indoor use only;

(2) Ambient temperature: 10~30°C;

(3) Relative humidity: 10~85%;

(4) It is recommended that the instrument be separated from walls or other instruments by 10 cm;

(5) The instrument adopts switching power supply, applicable voltage range is wide, AC voltage between 85 ~ 264 V can work normally, frequency 47 ~ 63 HZ, the power cord is single-phase three-wire, must be reliably grounded.

Chapter 3 Products

3.1 Features

Wide range of gradients: 1~42°C;

Rapid temperature rise and fall: the rate of temperature rise and fall can be up to 5°C/s, shortening the running time and saving time;

Adjustable speed of temperature rise and fall: 0.1~5°C variable speed adjustable to meet different experimental needs;

Meet a variety of amplification needs: temperature and time increment/decrement can be set to meet the Touchdown, Long PCR and other amplification;

Adaptive lever hot cover: closing and tightening the cap in one step, adapting to different heights of consumables and reducing system volatilization;

Touch screen operation: 10.1-inch capacitive touch screen equipped with Android system, responsive and touch sensitive;

Low noise: running noise ≤ 50 dB;

Preset program templates: 12 built-in standard program file templates for quick file editing;

Real-time monitoring: displays program progress and remaining time, supports intermediate programming of PCR instrument runs;

One-button rapid incubation: meet the needs of denaturation, digestion/enzymatic digestion, ELISA and other experiments;

Automatic power failure protection: automatically execute the unfinished cycle after power supply is restored to ensure the safe operation of the amplification process;

Remote monitoring: built-in WIFI module for remote control;

Email reminder: email reminder is sent at the end of the experimental program.

3.2 Performance parameters

Product model	TGreat Expert (384)
Sample Capacity	384 wells
Temperature setting range	0～105°C
Maximum Ramp-Up Rate	5°C/s
Maximum temperature down rate	5°C/s
Temperature uniformity	≤±0.2°C
Temperature Accuracy	≤±0.1°C
Temperature display resolution	0.1°C
Temperature control method	Block/Tube

Temperature change rate adjustable	0.1～5°C/s
Gradient temperature range	30～105°C
Gradient setting range	1～42°C
Gradient distribution	24 column gradient from left to right
Thermal cover temperature range	30～115°C
Program storage quantity	20000 +(USB FLASH)
Maximum steps of program	30
Maximum cycles of program	200
Time increasing/decreasing	1～600 sec
Temperature increasing/decreasing	0.1～10.0°C
Program pause function	Yes
Power failure data protection	Yes
4°C holding	Forever
Language setting function	Chinese/English
Online function	Yes
LCD screen	10.1 inch，1024×600 pels
Communication interface	USB 2.0 , WIFI
Product dimension	385 mm× 270 mm× 255 mm (L×W×H)
Net weight of product	10 kg
Input power supply	100-240 VAC , 50/60 Hz , 750 W

3.3 Instrument structure

(1) Front structural map

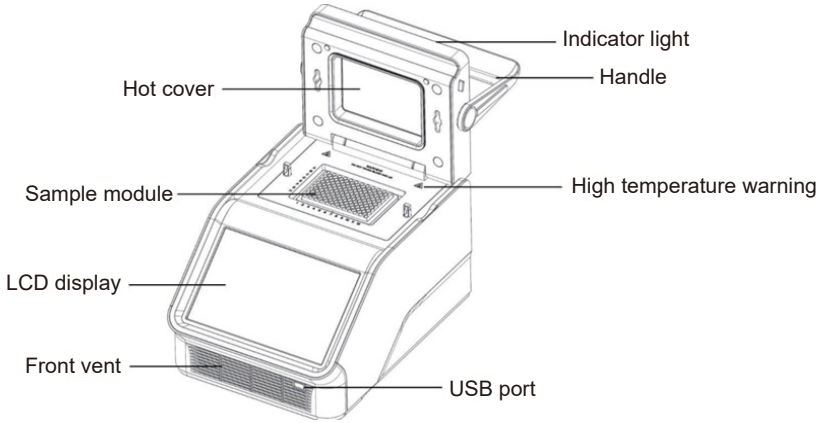


Table 1 Detailed description of front appearance

Name	Function
Hot cover	Adaptive hot cover pressure to ensure uniformity and tightness of reaction tube pressure
Indicator light	Run and end reminders
Handle	Simple handle design for quick and easy one-step locking of the top cover
High temperature warning	The temperature of the heat cover and the sample module is high during and just after the program has finished, please be careful not to touch them.
Sample module	Place reaction tubes
LCD display	10.1-inch capacitive touch screen, clear screen, touch sensitive
Front vent	Instrument cooling air inlet
USB port	USB can be connected to import/export files, software updates, and can also be connected to a mouse for control.

(2) Rear structural map

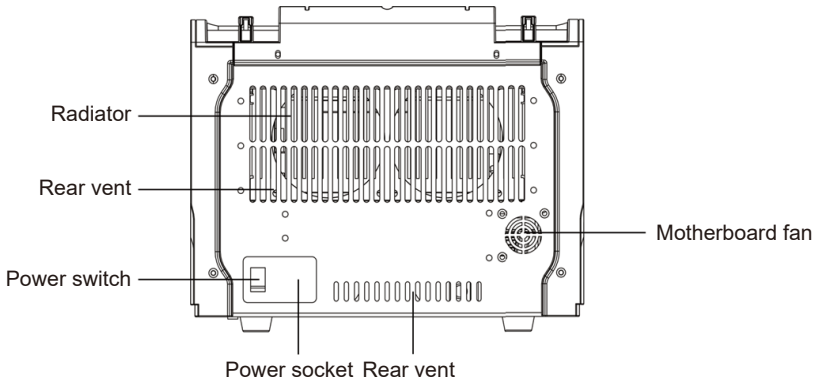


Table 2 Detailed description of rear appearance

Name	Function
Radiator	Instrument operation cooling and heat dissipation
Rear vent	Instrument cooling vent
Power switch	Turn on/off the control instrument switch
Power socket	Adapt to standard power cords
Motherboard fan	For motherboard cooling

3.4 Instructions for use of consumables

The instrument is only suitable for 384-well PCR plate consumables, please do not use other consumables for amplification.

When performing PCR amplification, due to the quality and match of 384-well consumables from different brands, it is recommended that a 2 mm silica gel pad be placed over the top of the sealed 384-well plate after placing it in place to effectively minimize sample volatilization due to the consumables.

Chapter 4 Screen operation guidance

After the instrument is connected to the power supply, open the instrument switch, the instrument emits a "drop" sound, the interface opens (FIG.4.1), and the instrument self-test (FIG.4.2), self-test end of the instrument is no abnormality, enter the main screen (FIG.4.3).



FIG.4.1 Start-up screen



FIG.4.2 Startup screen

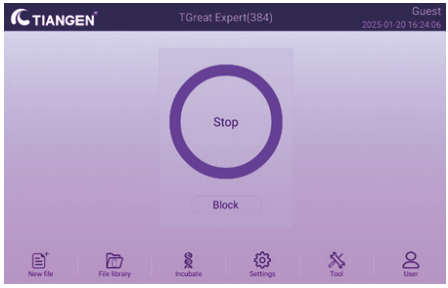


FIG.4.3 Main screen

4.1 Create and edit program

4.1.1 Program editing

Click "New File" in the main screen to enter the program editing screen (FIG.4.4).

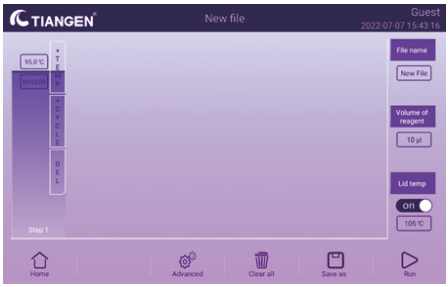


FIG.4.4 Create New File

Or click "File Library" in the main screen to enter the file library screen (FIG.4.5), select the

file that needs to be edited, click "Edit" to enter the program editing screen (FIG.4.6).

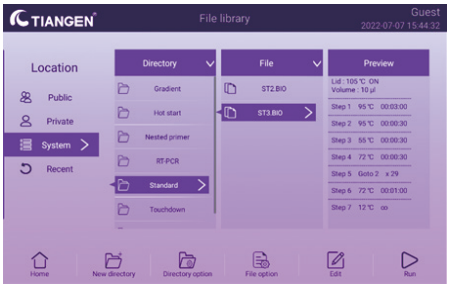


FIG.4.5 File Library

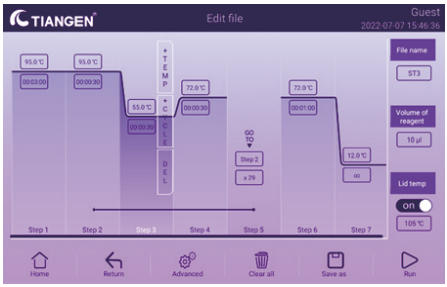


FIG.4.6 Edit File

(1) Addition and modification steps

"+TEMP", "+CYCLE" and "DEL" are the add program step, program cycle and delete step respectively;

Note: This program uses GOTO's cycle mode, when adding cycles, if you need to set up 30 cycles, then GOTO's cycle number setting value only needs to be filled in 29, and the cycle number setting value = total number of cycles - 1.

(2) Temperature and time setting

Click on the temperature edit box to modify the step this temperature, the temperature setting range is 0~105°C (FIG.4.7);

Click the time edit box to modify the step time. The time boxes correspond to hours, minutes, and seconds, respectively; if you set ∞ time, the time is all set to 0 (FIG.4.8).



FIG.4.7 Temperature setting

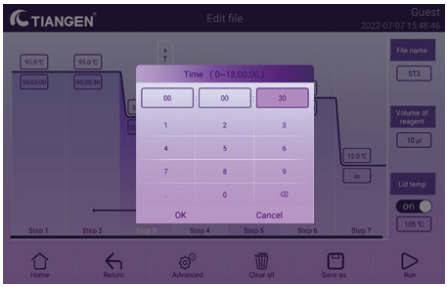


FIG.4.8 Time setting

4.1.2 Advanced setting

Select the step to be edited and make settings for Gradient, Temperature Increment/Decrement, Time Increment/Decrement, and Step Rise and Fall Temperature Speed in the Advanced Settings (FIG.4.9).

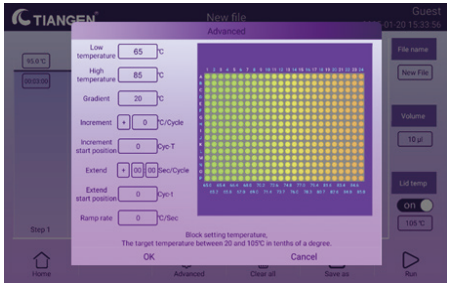


FIG.4.9 Advanced setting

(1) Gradient setting

The gradient range is set for the low and high temperature points respectively, and the gradient temperature is set from 30 to 105°C with a setting width of 1 to 42°C. The right hand side of the well after the gradient temperature is set shows the simulated well temperature for each column of the gradient.

(2) Temperature increasing and decreasing

Set the temperature increment, the setting range is ±0.1~10°C. For example, if the annealing step of the program is checked, the temperature increment is set to +0.5°C, and the opening point of the temperature increment is 1, then after the program is run, the annealing temperature will increase by 0.5°C for each completed cycle, starting from the 1st cycle, to the end of the cycle.

(3) Time increasing and decreasing

Set the time increment, the setting range is ±1 sec~600 sec. For example, if users check the extension step of the program, set the time increment to +10 sec, and the time increment on point to 1, then after the program runs, the extension step time increases by 10 sec for each completed cycle, starting from the 1st cycle, to the end of the cycle.

(4) Temperature change rate

Set the temperature rise and fall speed of the selected step, the setting range is 0.1~5°C/s.

4.1.3 Save file

Click the edit box below the file name, modify the file name (FIG.4.10), enter the reagent volume (setting range 0~50 µl) and the temperature of the hot cover (setting range 30~115°C), click "Save" to enter the file save path (FIG.4.11).

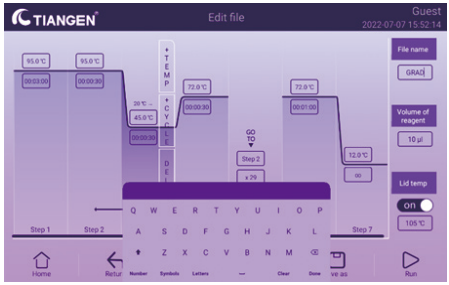


FIG.4.10 Edit file name

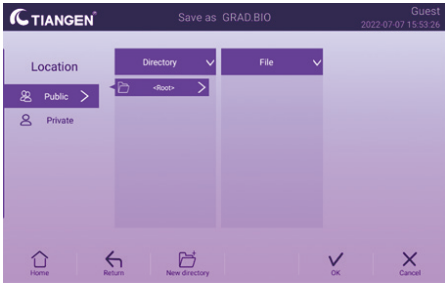


FIG.4.11 Save file

4.1.4 Program running

Select the program in the file editing screen, or in the file library, and click "Run" to start the program (FIG.4.12).

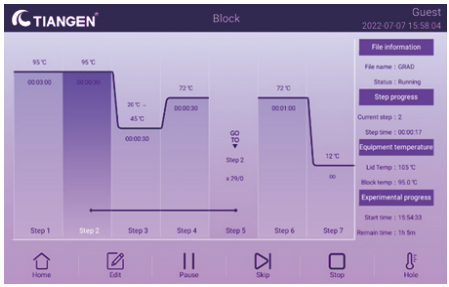


FIG.4.12 Running screen

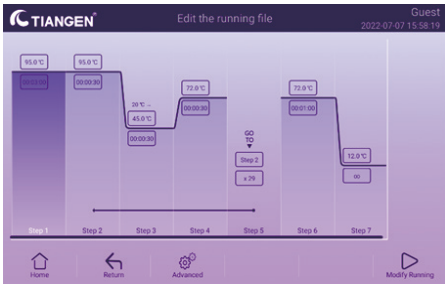


FIG.4.13 Edit running file

(1) It supports the function of programming in the middle of running, clicking "Edit", users can modify the program during the running process (Fig. 4.13), and after clicking "Modify Running", the unfinished steps of the program will continue to run in accordance with the modified program;

(2) Click on the "pause" button during program operation, the program time is suspended, the module always maintains the temperature of the step, click on the "continue" program continues to run;

(3) Click "Next", the screen prompts users to skip the running steps. Returning to the main screen displays the progress of the program run and the remaining time (FIG.4.14).

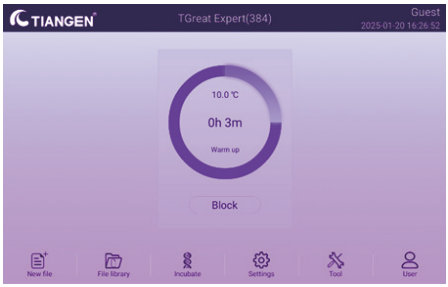


FIG.4.14 Running main screen

4.2 File management

Click "File Library" in the main screen to enter the File Library screen (FIG.4.15).

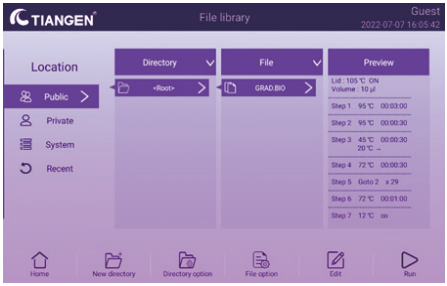


FIG.4.15 File library

4.2.1 System file

The system file comes with 12 default programs, so users can quickly select a program to edit and run.

4.2.2 Copy file

In the file library screen, select the file to be copied, press the "File Options" button, then press the "Copy File" button, select the location where users want to save the file, press "Paste File" to complete the file copy (FIG.4.16). Paste the file to finish copying (FIG.4.16).

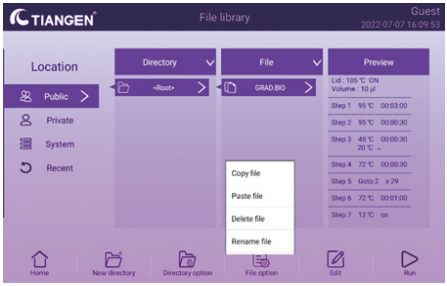


FIG.4.16 File options

4.2.3 Rename file

Select the file that needs to be renamed in the file library screen, press the "File Options" button, and then press the "Rename File" button (FIG.4.16), the screen will pop up the rename input box, enter the desired file name.

4.2.4 Delete file

In the file library interface, select the file to be deleted, and then press the "File Options" button, and then press the "Delete File" button (FIG.4.16), the screen will pop up to ask the dialog box, press the "OK" button to confirm that the file can be deleted (FIG.4.17). Note that this instrument can only select one file for deletion at a time to prevent accidental

deletion of files.

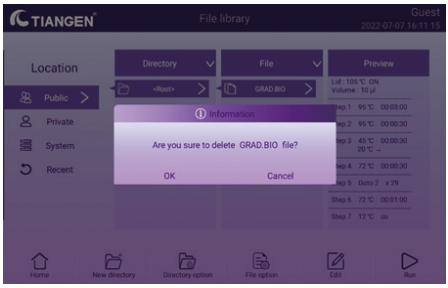


FIG.4.17 Delete file

4.3 Setting menu

Click "Settings" in the main screen to enter the Settings menu screen (FIG.4.18).

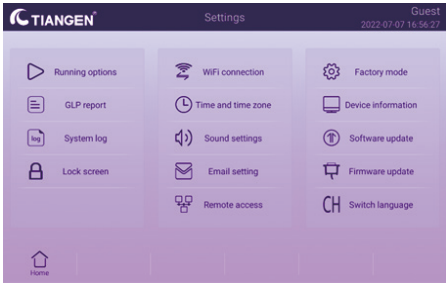


FIG.4.18 Setting menu

4.3.1 Running parameters

Click "Operation Parameter" to enter the screen of operation parameter setting (FIG.4.19).

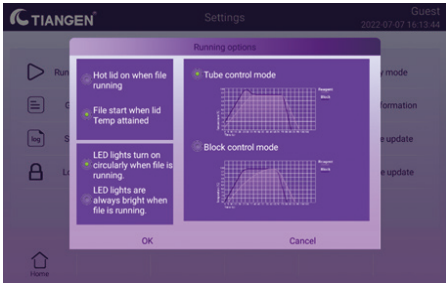


FIG.4.19 Running parameter setting

(1) Hot cover operating mode

There are two working modes for the hot cover, selecting the mode of "simultaneous start of the hot cover and program", the hot cover and the module will start heating at the same time when running, and the program will start running; selecting the

mode of "start the program after the hot cover reaches the set value" (factory default mode), the hot cover will start heating, the module will cool down and keep 10°C, and the program will start running when the temperature of the hot cover reaches more than 90°C. If users choose the mode of "start the program after the hot cover reaches the set value" (factory default mode), then the hot cover will start heating, the module will cool down and keep 10°C, and the program will start running when the temperature of the hot cover reaches more than 90°C.

(2) Indicator light mode

"Run-time indicator light cycle" mode, the indicator light flashes cyclically during operation; "Run-time indicator light always" mode, the indicator light stays always on during operation. The indicator light cycles on when the time at the end of the run is infinite.

(3) Temperature control mode

Module temperature control mode is divided into "analog tube temperature control mode" and "module temperature control mode", "module temperature control mode" can meet the needs of ordinary amplification experiments; if the amplification temperature accuracy requirements are higher, it is recommended to use "analog tube temperature control mode", the program defaults to "analog tube temperature control mode".

4.3.2 GLP Report

The GLP report is a complete run report at the end of the program run. The report meticulously records information such as time cycle steps, temperature, etc. (FIG.4.20).

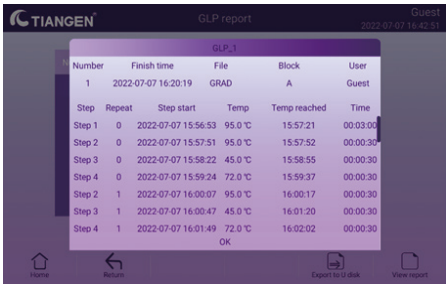


FIG.4.20 Program running report

4.3.3 System setting

(1) Screen lock setting

Users can set the lock screen on or off and the lock screen time (FIG.4.21). For example: set the lock time to 10 min, and select the lock switch as "on", after the program starts to run, without any screen operation in 10 min, the screen will be locked automatically to prevent the screen from being touched by mistake. Click "Unlock" to return to the Run screen.

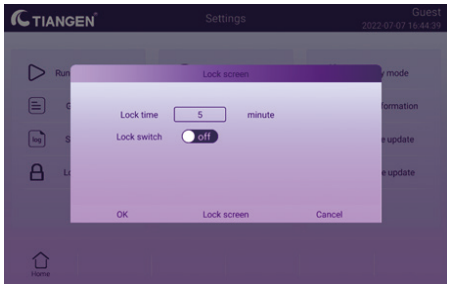


FIG.4.21 Screen lock setting

(2) Time setting

Enter the Time Setting screen to set the instrument's time as well as the time zone (FIG.4.22).

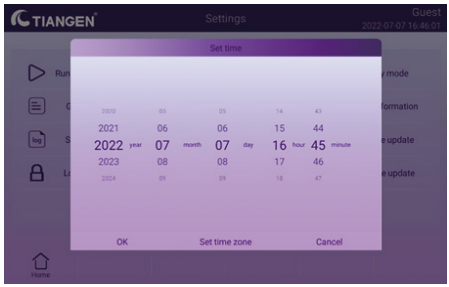


FIG.4.22 Instrument time setting

(3) Sound setting

Key beep, alarm beep, program end beep and temperature arrival beep can be set on and off (FIG.4.23).

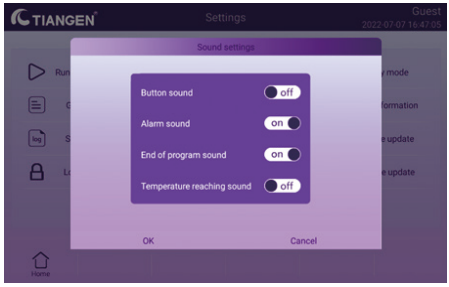


FIG.4.23 Sound setting

(4) Switch language

The instrument is set up with two languages, Chinese and English, which can be switched (FIG.4.24).

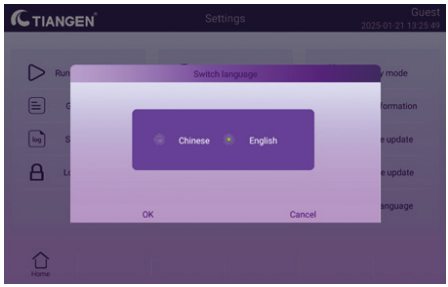


FIG.4.24 Chinese/English switching

(5) Software, firmware upgrading

If the instrument has been upgraded in software or firmware, the upgrade operation can be performed via USB disk.

4.3.4 Email alert function

The instrument is equipped with a WIFI module, and after connecting to WIFI, the email reminder function can be turned on, so that at the end of the program run (non-cryogenic save state), the run report can be sent to the email address and remind the end of the program run (FIG.4.25). Please refer to Annex I for the detailed setup method.

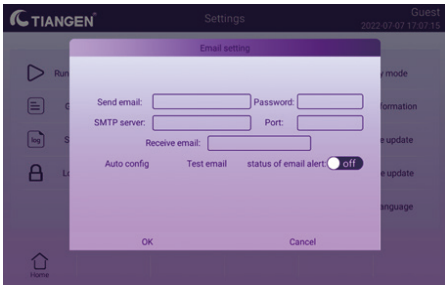


FIG.4.25 Email sending reminder setting

4.3.5 Remote control function

Click remote control, users can use the App to control the running and stopping of the instrument program under the same WIFI connection between the cell phone and the instrument, and pay attention to the running progress in real time.

4.3.6 Local information

Click to enter the information of the instrument, users can modify the name of the instrument, and check the serial number of the instrument and the software version number, the serial number is consistent with the instrument appearance paste label.

4.4 Tool menu

Click the "Tools" button on the main screen to enter the Tools menu (FIG.4.26).

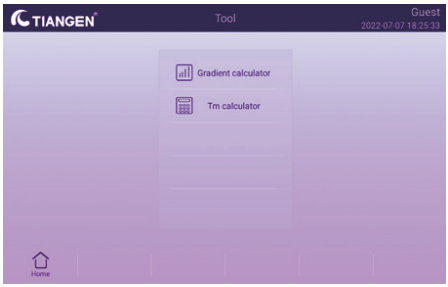


FIG.4.26 Tool menu

4.4.1 Gradient calculator

By entering the temperature low and temperature high, the tool automatically simulates the well temperature for 24 columns (FIG.4.27).

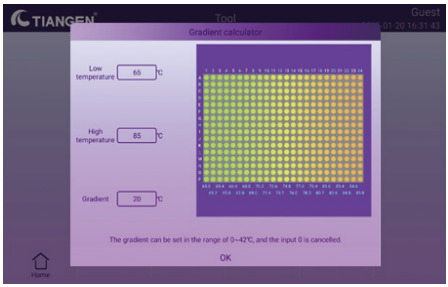


FIG.4.27 Gradient calculator

4.4.2 Tm calculator

Enter the salt concentration, primer concentration, and primer sequence and click Calculate to automatically calculate the primer Tm value (FIG.4.28).

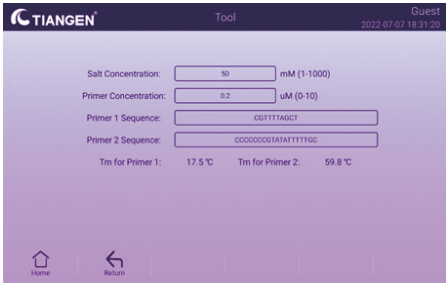


FIG.4.28 Tm calculator

4.5 One-click incubation function

Click "Incubate" in the main screen to enter the incubation wizard screen (FIG.4.29), set the incubation temperature, incubation time and hot cover temperature, click confirm to enter the incubation program, and the program defaults to save at 4°C after the incubation (FIG.4.30).

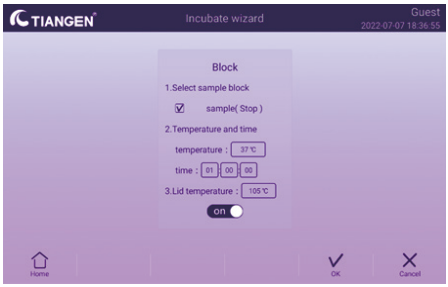


FIG.4.29 Incubation guide

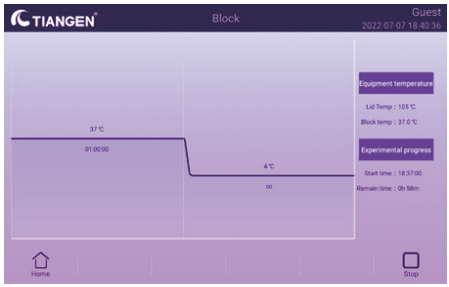


FIG.4.30 Incubation Run Screen

4.6 User setting

In the main screen, click the "User" button to enter the user interface (FIG.4.31).

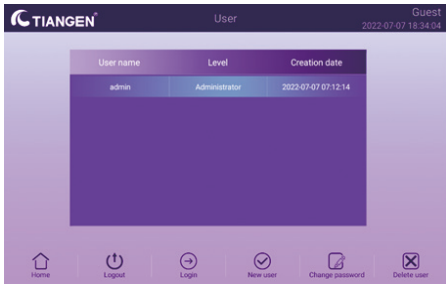


FIG.4.31 User management screen

Note: The administrator (admin) initial password is: "123456", users can change the password after logging in.

4.6.1 Add new customer

Under the "User" screen, press the "Register User" button to enter the "Register User" screen (FIG.4.32), enter user name and password, and then click the "Confirm" button to enter the "User" screen (FIG.4.33), select the users want to log in, and then press the "Login" button (FIG.4.34). "Confirm" button to enter the "User" screen (FIG.4.33), select the user who needs to log in, and then press the "Login" button (FIG.4.34).

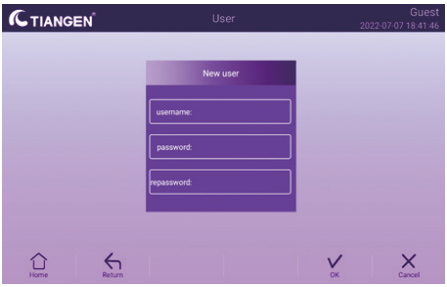


FIG.4.32 Register user

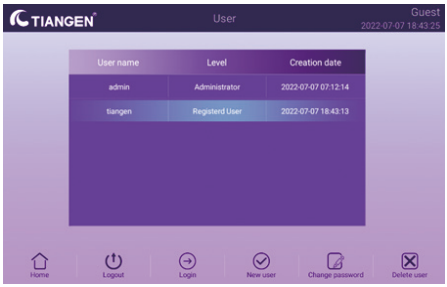


FIG.4.33 New customer addition completed

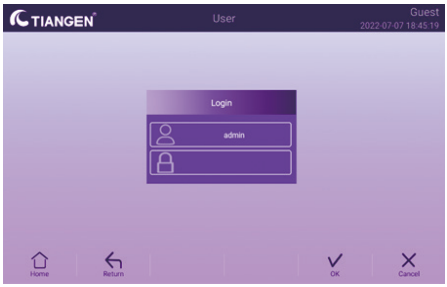


FIG.4.34 Log in

4.6.2 Change password and delete user

Users can't change password and delete users until log in, and users can't delete other users until log in to administrator account.

Chapter 5 Maintenance and care

5.1 Instrument maintenance

5.1.1 Regular cleaning

(1) A neutral soap solution should be used to clean the well above the base (avoid strong bases, concentrated alcohols and organic solvent solutions);

(2) Users should keep the bottom of the instrument and its left and right cooling windows free of other items. The instrument will have some dust adhering to the cooling windows after a period of time, and should be cleaned up in time, which is very important;

(3) The module should be cleaned frequently, once some reactant residue is deposited in the module well, it will affect the temperature response, it is recommended to scrub it regularly with a cotton cloth.

5.1.2 Replace fuses

The unit is equipped with two fuses, which can be replaced in case of damage by referring to the following steps.

(1) Set the power switch to the "O" position and remove the power cord;

(2) Use a one screwdriver to pry outward against the inside of the fuse holder and pull out the fuse;

(3) After removing an 8 A, 250 V fuse, replace it if damaged, then reinsert it into the fuse holder and install it back in place.

Note: If the instrument still malfunctions after replacing the new fuse, please notify us for repair in time.

5.2 Troubleshooting

(1) Poor response result

When a reaction is performed locally and the desired result is not ultimately obtained, the problem may be in the biology, the program, or the instrument hardware; common problems in biology and the program are listed below:

A. Incorrect or insufficient number of reaction items;

B. Denaturation temperature is too high or too low, the instrument is recommended to use 90 ~ 95°C, maintain 40 sec, according to the amount of reaction can be increased or decreased accordingly;

C.If the "annealing" temperature is not suitable for the primers, users can set up a gradient amplification to confirm the optimal annealing temperature. Annealing temperatures of 55 to 70°C for 20 to 30 cycles are generally appropriate for common primers;

D. The concentration of reactants too high or too low;

E. The preparation process is without special treatment;

F. The time and temperature values in the program are not appropriate;

G. Check that the reaction tube is well placed, a little mineral oil can be used to coat the small holes in order to increase heat transfer.

(2) Instrument self-test and self-diagnosis function

During startup operation, the instrument will run a self-test program to test the instrument software and hardware and display the results. In order to notify users of potential problems as early as possible and minimize experimental failures. And, displays an error message when a fault occurs.

5.3 Notes

(1) Power supply

A. This instrument has no special requirements for the power supply, the application range is wide, AC 85 V ~ 264 V, but the power supply voltage fluctuations should not be too large, so as not to avoid damage to the devices inside the instrument, otherwise, users should consider installing a regulated power supply.

B. It is prohibited to end the experiment by cutting off the power supply while the instrument is running the program for two reasons:

First, it is detrimental to program running;

Second, after the power cut off, the fan stops, the component heat dissipation is not smooth, easy to accumulate heat damage.

(2) LCD display

This instrument should avoid the use of ultraviolet disinfection to prevent damage to the LCD liquid crystal display, during use, hard objects should be avoided bumping and scratching to avoid damage.

(3) Cleaning instructions

When users clean the base of this instrument, users should avoid the liquid to enter the inside of the instrument, users are doing the experiment process, maybe add the radioactive material, should be extra careful when cleaning. This instrument should not be used in a humid, exposed environment.

5.4 Error messages and countermeasures

S/N	Error message	Possible cause and countermeasures
1	Filename cannot be empty!	Empty characters are not supported in file names.
2	There are files with the same file name, please rename them!	Multiple files with the same filename are not supported.
3	Module sensor 1 short circuit!	Hardware failure, repair required.
4	Module sensor 1 open circuit!	Hardware failure, repair required.
5	Module sensor 2 short circuit!	Hardware failure, repair required.
6	Module sensor 2 open circuit!	Hardware failure, repair required.

7	Module sensor 3 short circuit!	Hardware failure, repair required.
8	Module sensor 3 open circuit!	Hardware failure, repair required.
9	Radiator sensor short circuit!	Hardware failure, repair required.
10	Radiator sensor open circuit!	Hardware failure, repair required.
11	Hot cover sensor short circuit!	Hardware failure, repair required.
12	Hot cover sensor open circuit!	Hardware failure, repair required.
13	Power supply output short circuit!	Hardware failure, repair required.
14	Module temperature too high!	The vent is blocked or the circuit is in failure, if the latter, repair is required.
15	Module temperature too low!	The ambient temperature is too low or the circuit is in failure, if the latter, repair is required.
16	Radiator temperature too high!	The vent is blocked or the fan is in failure, if the latter, repair is required.
17	Radiator temperature too low!	The ambient temperature is too low or the circuit is in failure, if the latter, repair is required.
18	Hot cover temperature too high!	Circuit failure, repair is required

5.5 Causes of instrument irregularities and corresponding countermeasures

S/N	Fault description	Possible cause and countermeasures
1	No display after the instrument is powered on and started up	Make sure the power cord is correctly plugged into the outlet, check the power output to make sure there is power, unplug the instrument in the off state, and test the fuse.
2	When the power is turned on, the instrument starts working in the middle of the program	The power supply was forced to interrupt before the end of the last program run.
3	Fan unstable	Normal. The fan is only used to dissipate heat while the heat pump is operating and is not used to achieve the set temperature.
4	Slight tapping or squeaking sound when the instrument is working	Normal. Oscillating sound made by the automatic adjustment of the power supply in the instrument when high power strong heat or cold is required.
5	Module temperature rise and fall very slow	Check the variable temperature rate setting and the fan for proper operation.
6	Misalignment on LCD	Display misalignment due to static pulse or power surge, please power off and startup again, it will not affect the program operation.

Note: If the problem cannot be solved by the above methods, please contact the supplier promptly!

Chapter 6 After-sales service

1. The warranty period for this product is 12 months. In case of any fault occurred under normal use of the instrument during the warranty period, users may contact our sales personnel, and we will provide users with free maintenance and after-sale service.
2. The following conditions do not provide free repairs, exchanges, or returns even within the warranty period:

   (1) Malfunctions and damages caused by natural disasters such as fire, earthquake, flood, wind, and lightning, as well as abnormal voltages, public hazards, and erosion of chemical substances;

   (2) Malfunctions or damage caused by use under adverse conditions (grease, dust, moisture, prolonged direct sunlight, etc.) or failure to use or maintain the product in accordance with this user's manual;

   (3) Malfunctions or damages caused by human factors such as dropping, moving, transportation, entry of foreign objects or products not manufactured by us.

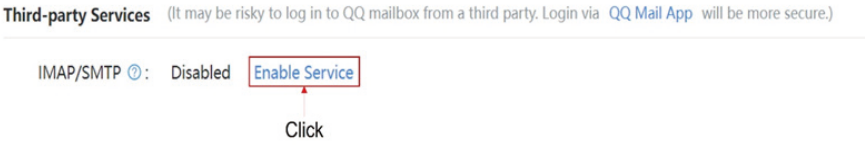
Annex I Email sending reminder setting

Take QQ mailbox as an example (NetEase mailbox is common) to set up email sending reminder. Make sure the instrument WIFI module is turned on and connected before using this feature.

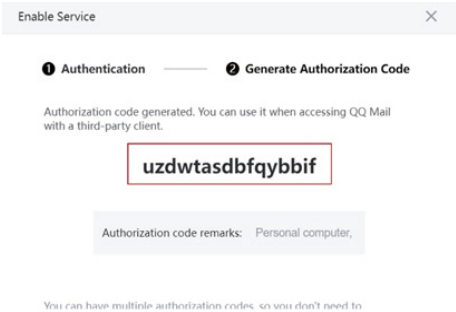
Open QQ mailbox, click "Settings" on the top of the mailbox to enter the settings screen;



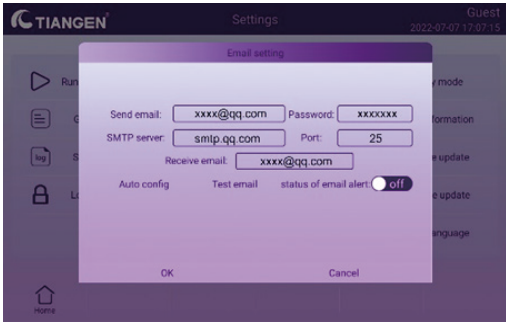
In the Settings screen, click on "Accounts" and scroll down to the following location to enable IMAP/STMP service;



After clicking "Enable Service", the screen will pop up as below, follow the instructions to send SMS (Note: different account numbers may differ).Please record the authorization code, close the screen and click "Save" to save the above settings.



Enter the email address at the sending email address and the recorded authorization code at the password on the instrument and click Auto Configuration, the corresponding information for the sending server and port number will appear by default. The receiving e-mail address can be the same as the sending e-mail address. Click "Email Test", the mailbox will receive the test email, the mailbox setup is successful.



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