TGreat Expert Thermal Cycler
User's Manual

Catalog Number	Product Name
OSE-GP-03	TGreat Expert Thermal Cycler

Table of Contents

Chapter 1 Safety Guidelines

1.1 Safety Warning Labels

Icon	Meaning
	High temperature warning:
	To avoid burns, please do not touch the area where the instrument is labeled with a high temperature warning mark or the high temperature area described in this manual!
	Electric shock warning:
	Please be sure to perform the operation strictly in accordance with the electric shock warning message to avoid electric shock accidents!
	Caution:
	Note that the prompt contains particularly important information, so be sure to read it carefully. If you do not follow the instructions, the instrument may not work properly and may even be damaged!

1.2 Safe Use

Before using this instrument, please read the following instructions carefully and be sure to implement the following basic safety measurements. Failure to implement these measurements or the warnings indicated elsewhere in this manual may affect the use of the instrument or even damage the instrument and cause injury.

(1) Do not use the instrument in humid, dusty, high temperature, strong magnetic, or potentially explosive environments;

(2) Do not open the case or touch the internal components of the instrument without authorization;

(3) Do not block the vents. Beware of gloves or rags drawn into the bottom air inlet of the instrument;

(4) Keep the instrument on a flat, stable and sturdy workbench;

(5) Keep the instrument clean. Contact technicians or perform maintenance under instruction.

Note: In the following cases, the instrument should be unplugged from the power socket immediately and the supplier should be contacted for maintenance.

(1) Instrument damaged by rain, water or other liquid;

(2) The instrument is not working properly, especially if any unusual sounds or smells are present;

(3) Apparent change in instrument function.

Chapter 2 Instrument Installation and Introduction

2.1 Package Contents

After you receive the TGreat Expert Thermal Cycler, please check that the following items are included in the box:

Name	Quantity
TGreat Expert Thermal Cycler	1 set
Power Cord	1 pcs
Spare Fuse	2 pcs
5 mm Heated Lid Silicone Pad	1 pcs
User's Manual	1 copy
Quick Operation Guide	1 copy
Touch Pen	1 pcs
Touch Pen Snap	1 pcs
Support Frame	1 pcs
Warranty Card	1 copy
Certificate of Conformity	1 copy

Note: If the above items are missing, broken or wrong, please keep the original packing box and contact our sales staff immediately.

2.2 Operating Ambient Requirements

(1) Use the instrument indoors only;

(2) Ambient temperature: 10~30°C (50 to 86˚F);

(3) Relative humidity: 10~85%;

(4) It is recommended that the instrument be spaced 10 cm from the wall or other instruments;

(5) This instrument uses a switching power supply, with an applicable voltage range. An AC voltage between 85~264 V and a frequency of 47~63 HZ can work normally. The power cord is single-phase three-wire and must be reliably grounded.

Chapter 3 Product Introduction

3.1 Product Features

Wide temperature differential range: 1~42°C

High variable temperature rate: Maximum variable temperature rate of 5°C/sec, shortening the running time;

Adjustable variable temperature rate: adjust the variable rate from 0.1 to 5°C/sec to meet the needs of different experiments;

Meets multiple amplification needs: Temperature and time increment/decrement can be set to meet Touchdown, Long PCR and other amplification needs;

Heated lid with adaptive lever: Closing and tightening the lid in one step. Adaptive to consumables with different heights. Eliminates reaction system volatilization;

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

Low noise: Operating noise ≤ 50 dB;

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

Real-time monitoring: Displays protocol progress and remaining time; the protocol is modifiable during running.

One-click fast incubation: For denaturation, digestion/enzyme linkage, ELISA, etc.;

Automatic power failure protection: Automatic execution of incomplete cycles after power is restored to ensure safe operation of the amplification process;

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

E-Mail reminder: An email reminder is sent at the end of the experimental procedure.

3.2 Performance Parameters

Product Model	TGreat Expert
Module Configuration	96-well × 0.2 ml
Temperature Range	0~105°C
Maximum Variable Temperature Rate	5°C/s
Temperature Uniformity	≤ ±0.2°C
Temperature Accuracy	≤ ±0.1°C
Temperature Display Resolution	0.1°C
Temperature Control Mode	Block/Tube
Adjustable Ramp Rate	0.1~5°C/s
Gradient Operational Range	30~105°C
Gradient Setting Range	1~42°C

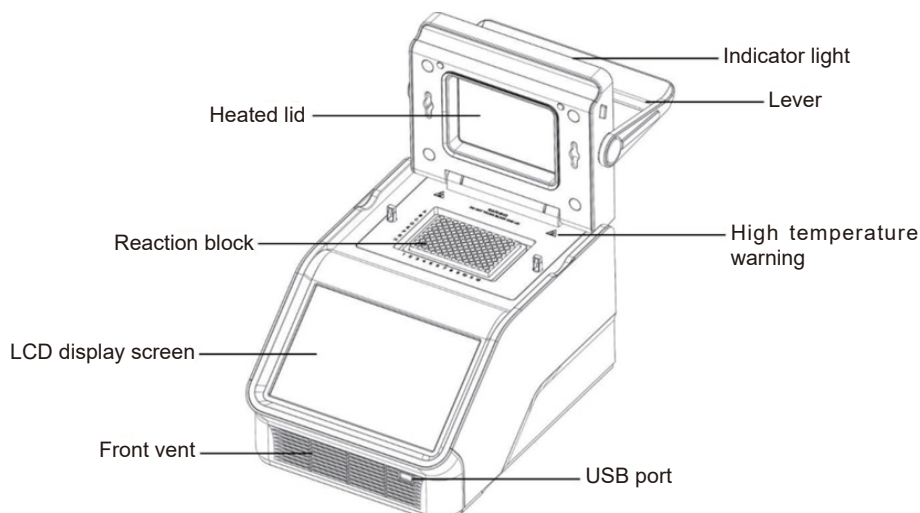|	
Gradient Distribution	12 columns of gradients from left to right
Heated Lid Temperature	30~115°C
Number of Programs	20000 + (USB FLASH)
Maximum Number of Protocol Steps	30
Maximum Number of Protocol Cycles	200
Time Increment/Decrement	1~600 sec
Temperature Increment/Decrement	0.1~10.0°C
Protocol Pause Function	Yes
Power Down Data Protection	Yes
Hold at 4°C	Infinite length
Language	Chinese/English
Online Function	Yes
LCD Display	10.1 inch, 1024×600 pels
Data Transfer Interface	USB 2.0, WIFI
Product Dimension	385 mm× 270 mm× 255 mm (L×W×H)
Product Net Weight	10 kg
Input Power	100~240 VAC, 50/60 Hz, 750 W

3.3 Construction

- Indicator light
- Lever
- Heated lid
- Reaction block
- High temperature warning
- LCD display screen
- Front vent
- USB port

Table 1: Detailed Description of Front Appearance

|	
Heated lid	Adaptive heated lid pressure to ensure uniformity of the tube pressure and tightness of reaction tube
Indicator light	Running and end reminder
Lever	The simple lever design makes it convenient and quick to lock the top cover in one step
High temperature warning	When the protocol is running or has just finished, the temperature of the heated lid and reaction block is high, therefore please do not touch them.
Reaction block	Place the reaction tubes here
LCD display screen	10.1-inch capacitive clear touch screen, sensitive touch
Front vent	Instrument cooling air inlet
USB port	You can connect a USB to import/export files, update software, or use a mouse for control.

(2) Rear diagram

Heat sink

Rear vent

Power switch

Motherboard fan

Power socket   Rear vent
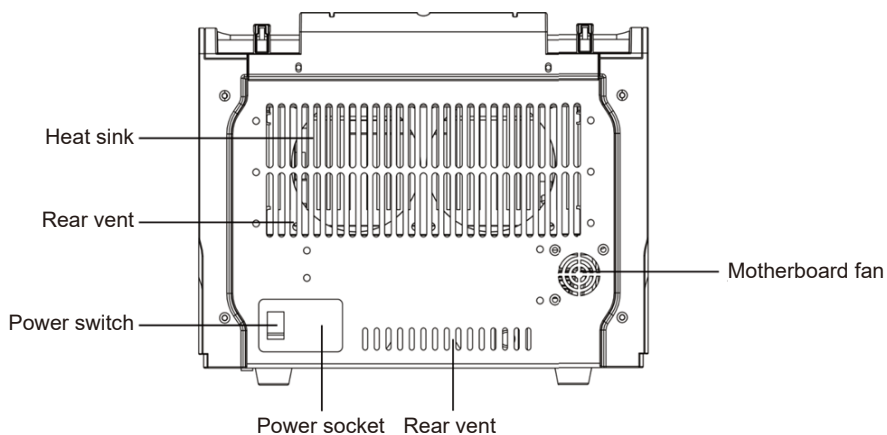
Table 2: Detailed Description of Rear Appearance

Name	Function
Heat sink	Instrument operation cooling/heat dissipation
Rear vent	Instrument cooling exhaust air inlet
Power switch	Turn on/off the instrument
Power socket	Adapted to standard power cord
Motherboard fan	For motherboard cooling

3.4 Compatible Reaction Vessels and Instructions

Type of consumables	Picture	Instructions
0.2 ml microcentrifuge tube		It is recommended to use the support frame or place empty tubes at the corners to prevent deformation of the reaction tubes due to excessive pressure of the heated lid
0.2 ml tube strips		It is recommended to use the support frame or place empty tubes at the corners to prevent deformation of the reaction tubes due to excessive pressure of the heated lid
Non-skirt 0.2 ml 96-well plate		Without silicone pad
Half-skirted 0.2 ml 96-well plate		Without silicone pad
Full skirted 0.2 ml 96-well plate		**A 5 mm silicone pad should be placed on top of the consumables.**

Chapter 4 Interface Operation Guide

Plug the supplied power cord into the appropriate electrical outlet. Turn on the thermal cycler using the power switch on the back panel. The thermal cycler will make a "beep" sound and display the Startup screen (Figure 4.1). The thermal cycler runs a self-test to verify proper function (Figure 4.2), and then displays the home screen (Figure 4.3).
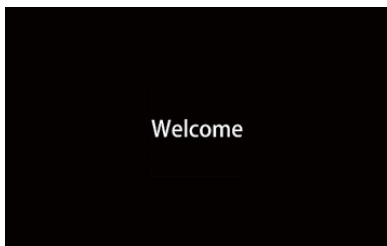

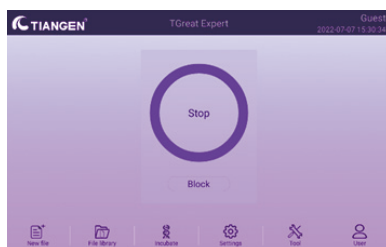Figure 4.1 Instrument ON : Startup Screen

Figure 4.2: Self-test Screen

Figure 4.3: Home Screen

4.1 Protocol Editing

4.1.1 Protocol Editing

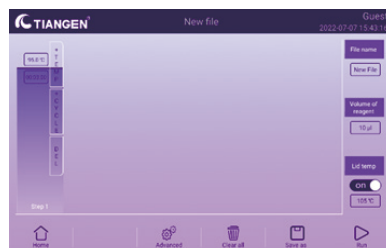Click "New File" from the home screen to enter the protocol editing interface (Figure 4.4).

Figure 4.4: New File

Or click "File Library" on the home screen to enter the file library interface (Figure 4.5). Here, select the file to be edited and click "Edit" to enter the protocol editing interface (Figure 4.6).
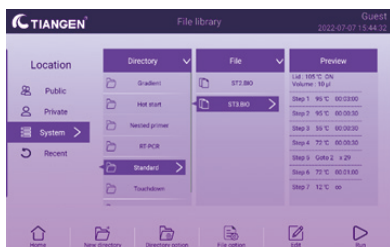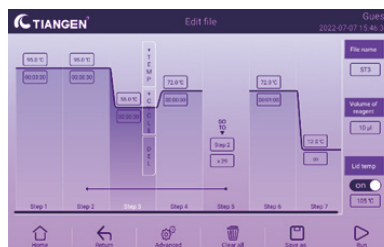
Figure 4.5: File Library

Figure 4.6: Edit File

(1) Adding or deleting protocol steps

Use "+TEMP", "+CYCLE" and "DEL" for adding steps, adding cycles, and deleting steps, respectively.

Note: This program adopts the GOTO cycle mode. When adding cycles, if you need to set 30 cycles, the cycle number setting value of GOTO should be 29. The cycle number setting value = total cycle number - 1.

(2) Temperature and Time Setting

To edit the temperature or time for each step, click on the appropriate box for a step and enter a new value using the popup numeric keypad, then touch OK. The temperature setting range is 0~105°C (Figure 4.7);

Click on the time edit box to modify the hold time. The hold time setting range is between 0 sec to 18 hr in the format of hr:min:sec. To enter an infinite hold, set 00:00:00. (Figure 4.8).

Figure 4.7: Temperature Settings

Figure 4.8: Time Settings

4.1.2 Advanced Settings

Select the step to be edited, and set the gradient, temperature increment/decrement, time increment/decrement, and step ramp up/down rate in the advanced settings (Figure 4.9).

Figure 4.9: Advanced Settings

(1) Gradient Setting

Set a low temperature and a high temperature in the gradient. Enter a number between 30~105˚C, respectively. The high temperature should be within 42˚C of the low temperature. After setting the gradient temperature, the simulated temperature of each column in the gradient will be displayed on the right side of the well.

(2) Temperature Increment/Decrement

Set the temperature increment from ± 0.1 to 10˚C per cycle. This instructs the thermal cycler to change the target temperature of a step for each cycle, where a positive number increases the temperature and a negative number decreases the temperature. For example, if the annealing step of a protocol is selected, the temperature increment is set to +0.5˚C and the starting point of the temperature increment is 1, then after the protocol starts, the annealing temperature will be increased by 0.5˚C for each cycle completed, starting from the first cycle to the last cycle.

(3) Time Increment/Decrement

Set the time increment from ± 1 to 600 sec. For example, if the extension step of a protocol is selected, the time increment is set to +10 sec and the starting point of the time increment is 1, then after the protocol starts running, the time of the extension step will be increased by 10 sec for each cycle completed, starting from the first cycle to the last cycle.

(4) Variable temperature ramp rate

Set the ramp rate of the selected step between 0.1~5˚C/s.

4.1.3 Protocol Saving

Click the edit box below the file name, modify the file name (Figure 4.10), enter the reagent volume (setting range: 0~100 µl) and heated lid temperature (setting range: 30~115˚C), then click "Save" to choose a folder location and save the protocol (Figure 4.11).
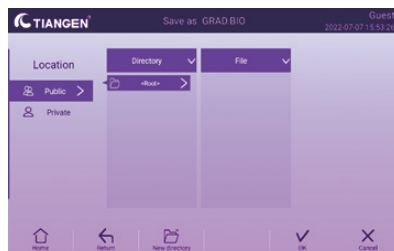

Figure 4.10 Edit File Name   Figure 4.11: Save File

4.1.4 Protocol Running

From the file editing screen, or from the file library, select the protocol and click "Run" to start the protocol (Figure 4.12).
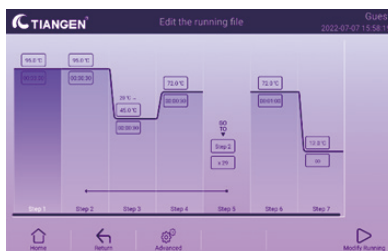
Figure 4.12: Run File

Figure 4.13: Edit the Running File

(1) Click on "Edit" to modify the protocol during the run (Figure 4.13). After confirming the modification by clicking on "Modify Run", the incomplete steps of the protocol will continue to run according to the modification;

(2) Click "Pause" from the Status screen to suspend the protocol and keep the reaction block at the temperature of the current step. Click "Continue" to resume the protocol;

(3) Click "Next" from the Status screen to skip the current step.

(4) Return to the home screen to check the status of the run and the remaining time (Figure 4.14).
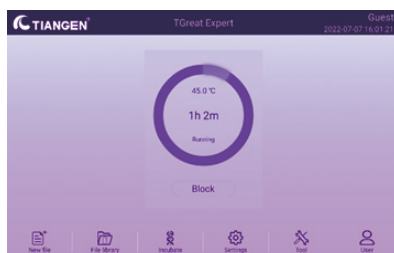

Figure 4.14: Home Running

4.2 File Management

Click "File Library" from the home screen to enter the file library interface (Figure 4.15).
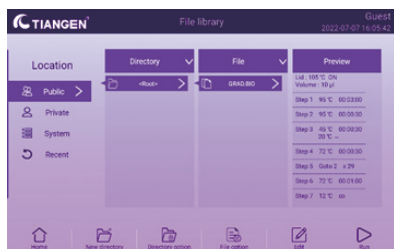

Figure 4.15: File Library

4.2.1 System File

The system file folder contains 12 default protocols for a quick selection of protocols to edit and run.

4.2.2 Copying File

In the file library interface, select the file to be copied, press "File Options", then press "Copy File". Select the location to be saved, and press "Paste File". (Figure 4.16).
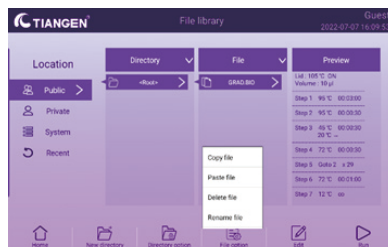

Figure 4.16 File Option

4.2.3 Rename File

Select the file to be renamed from the file library, touch "File Options" > "Rename File" (Figure 4.16). A input box will then pop up, and the new file name can be entered.

4.2.4 Delete File

From the file library, select the file to be deleted, touch "File Options" > "Delete File" (Figure 4.16). A popup window will appear to ask you for confirmation to delete. Press "OK" to confirm that the file can be deleted (Figure 4.17). Note that this instrument allows you to only select one file at a time for deletion in order to prevent accidental deletion of files.
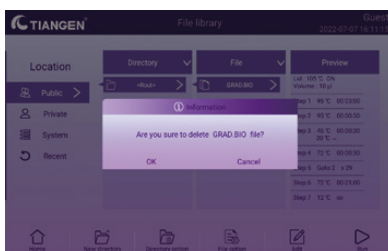

Figure 4.17: File Delete

4.3 Instrument Settings

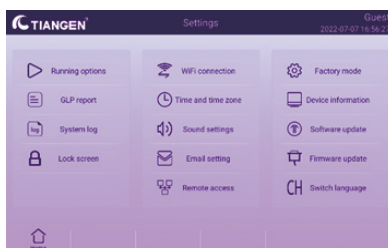Click "Settings" from the home screen to access the Settings menu (Figure 4.18).

Figure 4.18 Settings

4.3.1 Operation Parameters

Select "Run Parameters" from the "Settings" Menu to access the Run Parameters setting interface (Figure 4.19).
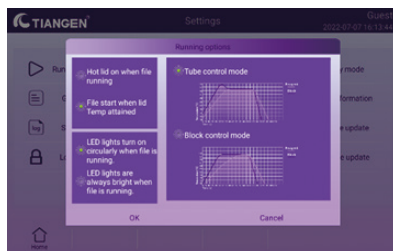

Figure 4.19 Setting: Running Options

(1) Heated Lid Working Mode

There are two working modes for heated lids: Select the **Simultaneous Mode** for the lid and the reaction block to start heating at the same time as the protocol starts running; Select the **Start after the Set Mode (factory default mode)** for the heated lid to start heating and the reaction block will drop and maintain at 10°C after running. When the temperature of the heated lid reaches 90°C or more, the protocol starts to run.
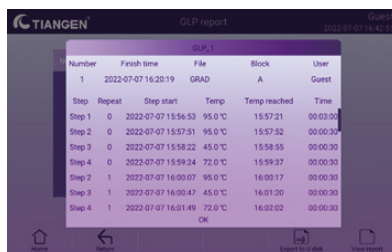
(2) Indicator Light

When selecting "Running with Flashes", the light flashes cyclically during the operation; when selecting "Running with Light Always On", the light stays on during the run. The indicator light continuously flashes cyclically when the hold time at the end of the run is set to ∞ .

(3) Temperature Control Mode

There are two temperature control modes: **Analog tube temperature control mode and Block temperature control mode. Block temperature control mode** can meet the needs of most amplification experiments.. However, if you have a higher requirement for amplification temperature accuracy and precision, it is recommended to use the **Analog tube temperature control mode.** The system default is the **Analog tube temperature control mode.**

4.3.2 GLP Report

A GLP report is generated after the protocol is complete. The report includes detailed time and temperature information for each step (Figure 4.20)

Figure 4.20: GLP Report:View Report

4.3.3 System Setup

(1) Lock Screen Setting

Select "Lock Screen Setting" under the "Settings" Menu. The lock screen function can be set to ON or OFF, and the auto-lock time can be set (Figure 4.21). For example: if the auto-lock time is set to 10 mins, and if there is no screen operation within 10 min after the protocol starts to run, the screen will be automatically locked to prevent unintended touch. Touch "Unlock" to return to the Status screen.

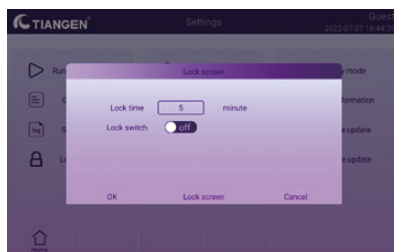Figure 4.21: Lock Screen Settings

(2) Time Settings

Select "Time and Time Zone" under the "Settings Menu" to select a time zone and set time (Figure 4.22).
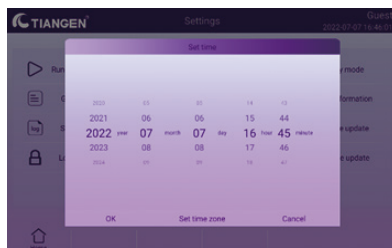

Figure 4.22: Instrument Time Settings

(3) Sound Settings

Select "Sound Settings" under the "Settings Menu". The key tone, alarm, protocol end alert and temperature alert can be turned ON/OFF separately (Figure 4.23).
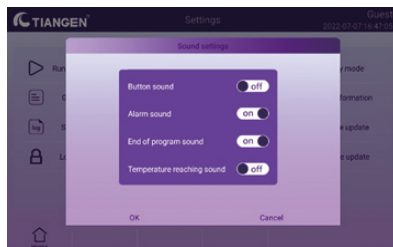

Figure 4.23: Sound Settings

(4) Language Settings

Select "Switching Language" under the "Settings Menu" to change the system language. The system can be displayed in Chinese or English. The language setting can be changed at any time (Figure 4.24).
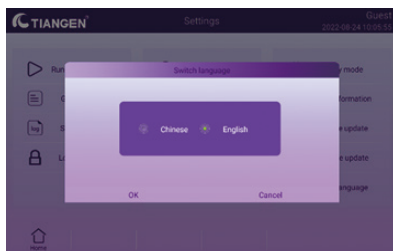
Figure 4.24: Setting System Language

(5) Update Firmware and Software

The firmware and software can be updated via USB.

4.3.4 E-Mail Reminder Function

The email reminder function can be activated after the instrument is connected to WiFi. After the protocol run is completed (at non-cryogenic incubation status), a reminder and the running report will be sent to an email as a reminder (Figure 4.25). Please refer to Appendix I for detailed setting steps.
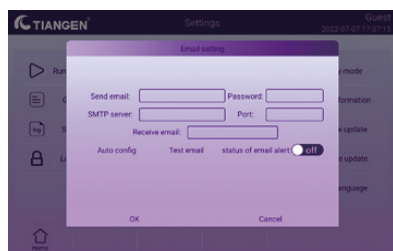
Figure 4.25: E-Mail Reminder Settings

4.3.5 Remote Control Function

Select "Remote Control" to use the app and remotely control running and stopping the protocol in real-time. In order to enable "remote control", make sure your device and the thermal cycler are connected to the same WiFi.

4.3.6 About

The About screen displays the software version and serial number. The serial number should be consistent with the label on the instrument. You can change the name of the thermal cycler.

4.4 Tools Menu

To access the Tools menu, click "Tools" from the home screen (Figure 4.26).
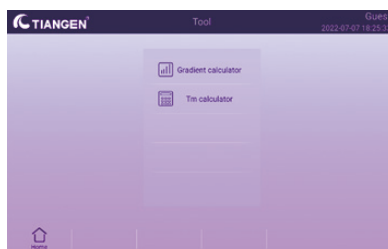
Figure 4.26: Tools Menu

4.4.1 Gradient Calculator

Enter the low temperature and high temperature in the gradient and the tool will automatically calculate the simulated temperatures of 12 columns (Figure 4.27).
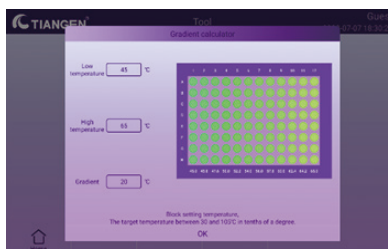
Figure 4.27: Gradient Calculator

4.4.2 Tm Calculator

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

Figure 4.28: Tm Calculator

4.5 One-Click Incubation Function

Click "Incubate" from the home screen to access the incubation wizard interface (Figure 4.29). Set the incubation temperature, duration, and lid temperature, and click Confirm to start the program. By default, the program is held at 4°C after the incubation is completed (Figure 4.30).

Figure 4.29: Incubation Wizard Interface
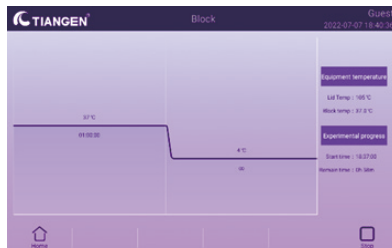
Figure 4.30: Incubation Run Interface

4.6 User Settings

Under the main menu, click "User" to enter the user interface (Figure 4.31).
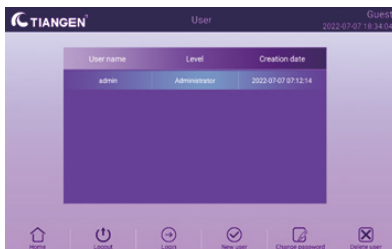
Figure 4.31: User Interface

Note: The initial password for administrator (admin) is: "123456", you may change the password after logging in.

4.6.1 Add New User

Click "Register User" in the "User" interface to add a new user (Figure 4.32). Enter a user name and password, and click the "Confirm" (Figure 4.33). Select the user and enter the login information (Figure 4.34) to log in.

Figure 4.32: User Registration
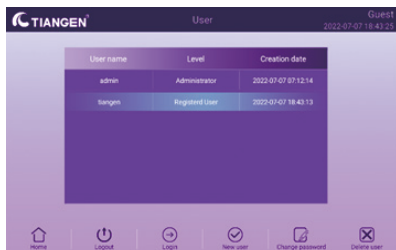
Figure 4.33: New User Added
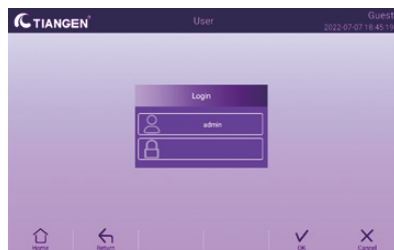
Figure 4.34: Login

4.6.2 Changing Password and Delete User

You can change the password and delete users only after logging in. You can delete other users only after logging into the administrator account.

Chapter 5 Maintenance

5.1 Maintenance of the Instrument

5.1.1 Regular Cleaning

(1) A neutral soap solution should be used to clean the pores on the base (avoid using strong alkali, concentrated alcohol and organic solvent solutions);

(2) The bottom of the thermal cycler and its front and rear air vents should be kept free of other objects. It is important to clean the dust on the air vents in a regular manner;

(3) The reaction block should be cleaned frequently. Once some reaction solution residue has accumulated in the block aperture, the temperature response will be affected. Therefore, regularly cleaning the reaction block with a cotton cloth is recommended.

5.1.2 Replace Fuse

The machine is equipped with two fuses. If damaged, you can refer to the following steps to replace them.

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

(2) Put a screwdriver outward against the inner side of the fuse holder to pull out the fuse;

(3) Remove one 8 A, 250 V fuse, replace it if it is damaged, then reinsert it into the fuse holder and install it back to its original position.

Note: If the machine is still malfunctioning after replacing the new fuse, please inform TIANGEN for an overhaul in time.

5.2 Troubleshooting

(1) Reaction results are not good

When a reaction is performed on this instrument and the desired result is not obtained, the problem may be in the biological aspect, the protocol or the instrument hardware. Common problems are as follows:

A. Wrong reaction items or insufficient quantity;

B. Denaturation temperature is too high or too low. It is recommended to set the denaturing temperature to 90~95°C and hold for 40 sec. The duration can be increased or decreased according to the reaction volume needed;

C. The annealing temperature is not suitable for the primers. You can perform a gradient amplification to pick the optimal annealing temperature. Generally, the annealing temperature is set to 55~70°C, and the steps are repeated for 20 to 30 cycles;

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

E. Preparation process without special treatment.

F. Improper time and temperature in the protocol;

G. Check that the reaction tubes are in place, and use a little mineral oil to coat the wells in the reaction block to increase heat transfer.

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

When the instrument is turned on, it will run a self-test to check the instrument software and hardware and display the results. This is to notify the user of potential problems as early as

possible, and eliminate experimental failure risks. Error messages will be displayed in case of malfunction.

5.3 Caution

(1) Power Supply

A. The thermal cycler has no special requirements for the power supply. A wide range of AC 85 V~264 V is applicable. But the power supply voltage fluctuations cannot be too large, to avoid damaging the device inside the machine. Therefore, the installation of a regulated power supply should be considered.

B. When the instrument is running, it is prohibited to force ending a running protocol by cutting off the power supply for two reasons:

1) It is not good for protocol implementation;

2) After the power is cut off, the fan stops, so that insufficient heat dissipating could easily cause damage to the device components.

(2) LCD Display Screen

Avoid using ultraviolet disinfection to prevent damage to the LCD display. Avoid abrasive detergents or rough materials to prevent scratches to the screen.

(3) Caution while Cleaning

Use a damp cloth or tissue to clean the instrument. When you clean the base of the instrument, you should avoid getting liquid in the inner part of it. If radioactive substances may be introduced during your experiments, you should be extra careful when cleaning. This machine should not be used in a humid or sun exposed environment.

5.4 Error Messages and Corresponding Countermeasures

S/N	Error messages	Possible causes and corresponding countermeasures
1	File name cannot be empty!	The file name does not support null characters.
2	Have the same file name file, please rename it!	Multiple files with the same file name are not supported.
3	Module Sensor 1 short-circuit!	Hardware failure, need to be serviced.
4	Module Sensor 1 open circuit!	Hardware failure, need to be serviced.
5	Module Sensor 2 short-circuit!	Hardware failure, need to be serviced.
6	Module Sensor 2 open circuit!	Hardware failure, need to be serviced.
7	Module Sensor 3 short circuit!	Hardware failure, need to be serviced.
8	Module Sensor 3 open circuit!	Hardware failure, need to be serviced.
9	Radiator sensor short circuit!	Hardware failure, need to be serviced.
10	Radiator sensor open circuit!	Hardware failure, need to be serviced.
11	Lid sensor short circuit!	Hardware failure, need to be serviced.
12	Lid sensor open circuit!	Hardware failure, need to be serviced.
13	Power output short circuit!	Hardware failure, need to be serviced.

14	Module temperature too high!	Blocked vent or circuit failure. The latter requires a repair.
15	Module temperature too low!	The ambient temperature is too low, or the circuit is faulty. The latter requires a repair.
16	Radiator temperature too high!	Blocked vent or circuit failure. The latter requires a repair.
17	Radiator temperature too low!	The ambient temperature is too low, or the circuit is faulty. The. If the latter requires a repair.
18	Lid temperature too high!	The circuit is faulty and requires a repair.

5.5 Causes of Instrument Irregularities and Corresponding Countermeasures

S/N	Fault Description	Possible Causes and Countermeasures
1	There is no display after the instrument is powered on	Verify that the power cord is properly plugged into the outlet. Also check the power output to verify that power is present. Unplug the instrument in the OFF state and test the fuse.
2	After turning on the power, the thermal cycler starts working in the middle of the protocol	The power supply was disconnected before the last protocol ended.
3	Fan is strong and weak at times	Normal. The fan is only used to dissipate heat when the heat pump is working. It is not used to achieve the set temperature.
4	Slight clacking or squeaking sound when the instrument is working	Normal. In the need for high power strong heating or cooling, the machine power automatically adjusts and produces the oscillation sound.
5	Very slow ramp rate of the reaction block	Check the ramp rate setting and fan for proper operation.
6	Misalignment on LCD display	Displays that are misaligned are due to static pulses or power surges. Please power off and restart the unit. It doesn't affect protocol operation.

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

Chapter 6 After-sales Service

1. The warranty period for this product is 12 months. During the warranty period, if the user experiences machine failure under normal use, please contact the sales staff. We will provide you with free maintenance as well as after-sales service.

2. Free repair, replacement and return are not provided even during the warranty period in either of the following cases:

(1) Failure and damage caused by natural disasters such as a fire, earthquake, flood, wind, lightning strike and abnormal voltage, public hazards, or erosion by chemical substances;

(2) Failure or damage caused by use under adverse conditions (fumes, dust, moisture, prolonged direct sunlight exposure, etc.) or by failure to use or maintain the instrument in accordance with the requirements of the operating instructions;

(3) Failure or damage caused by dropping, moving, transporting, foreign objects or products not manufactured by our company.

Appendix I E-mail Reminder Settings

Take a QQ mailbox as an example (common for Netease mailbox) for setting up the email reminder. Please make sure the instrument is connected to WiFi before using this function.

Open a QQ mailbox, click "Settings" above the mailbox to enter the settings interface;
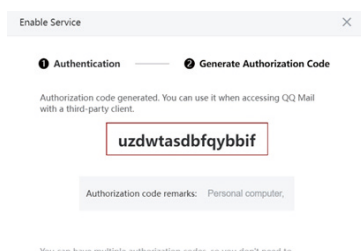

Scroll down to the following location in the settings screen to turn on the IMAP/SMTP service,and click "Enable Service";

After clicking "Enable Service", the following interface will pop up(Note: different account numbers may differ).Please record the authorization code and close the page, click "Save" to save the above settings.

Enter the sending email address and the authorization code as the password in the appropriate fields. Click "Auto Config". The sending server and port number will be filled in with corresponding information by default. The receiving email address can be the same as the sending email address. Click "Email Test", and the mailbox will receive the test email. This means that the mailbox is successfully set.