Cleaver Scientific Thermal Cycler

GTC96S /GTC96S-230

Operation Manual

Ver.2.1

Cleaver Scientific

Notice

This instrument is licensed for research and development and for uses other than human in vitro diagnostics.

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Safety Precautions

Before using the GTS96 thermal cycler for the first time, please read this entire operating manual carefully. To guarantee problem free, safe operation of the GTS96 thermal cycler, it is essential to observe the following points.

1. Do not use the machine in a potentially explosive environment or with potentially explosive chemicals.
2. Install the machine in location free of excessive dust.
3. Avoid placing the machine in direct sunlight.
4. Choose a flat, stable surface capable of withstanding the weight of the machine.
5. Install the machine in the room temperature 15 ~ 30°C, relative humidity 20 ~80%.
6. DO NOT block the air vents.
7. Keep the side and rear of the machine at least 30cm from the wall or other machine.
8. Make sure the power source conforms to the required power supply specifications.
9. To avoid electric shock, make sure the machine is plugged into a grounded electrical outlet.
10. Do not allow water or any foreign objects to enter the various openings of the machine.
11. Switch off the machine before cleaning or performing service on the machine, such as replacing the fuses.
12. Repairs should be carried out by authorized service personnel only.

High Temperature Label: Please be aware of the heated block.

Warning Label: Please be aware of the danger of electric shock or other dangers.

General Description

The GTS96 thermal cycler is a powerful, reliable and affordable thermal cycler. It is equipped with a gradient function that enables the user to set a maximum 24 °C temperature gradient between the BLOCK＃1 to BLOCK＃6 (16 well/block).

2.1 Features

- Easy-to-operate slide and lever type lid which prevents accidental skin burn
- Large LCD panel enhances visibility and ease-of-operation.
- Graphic display makes programming quick and simple.
- Simple and easy to use graphical interface.
- Extended Temperature return function that makes touchdown possible
- Gradient function enables optimization of annealing temperatures.
- Preset protocols that make starting amplification easier.
- Air intake vents on the front and sides and exhaust vents on the rear that reduce heat-based interference with other equipment.
- Interchangeable blocks.
- Automatically creates operating history and error logs.
- Heated lid to prevent the formation of condensation.
- Robust and attractive design.
- Auto restart after power failure.

2.2 Product Overview

The front panel of GTS96 thermal cycler includes a display panel and 22-key keypad which consists of function keys (F1-F5), alphanumeric keys, directional arrow keys and the **ENTER** key.

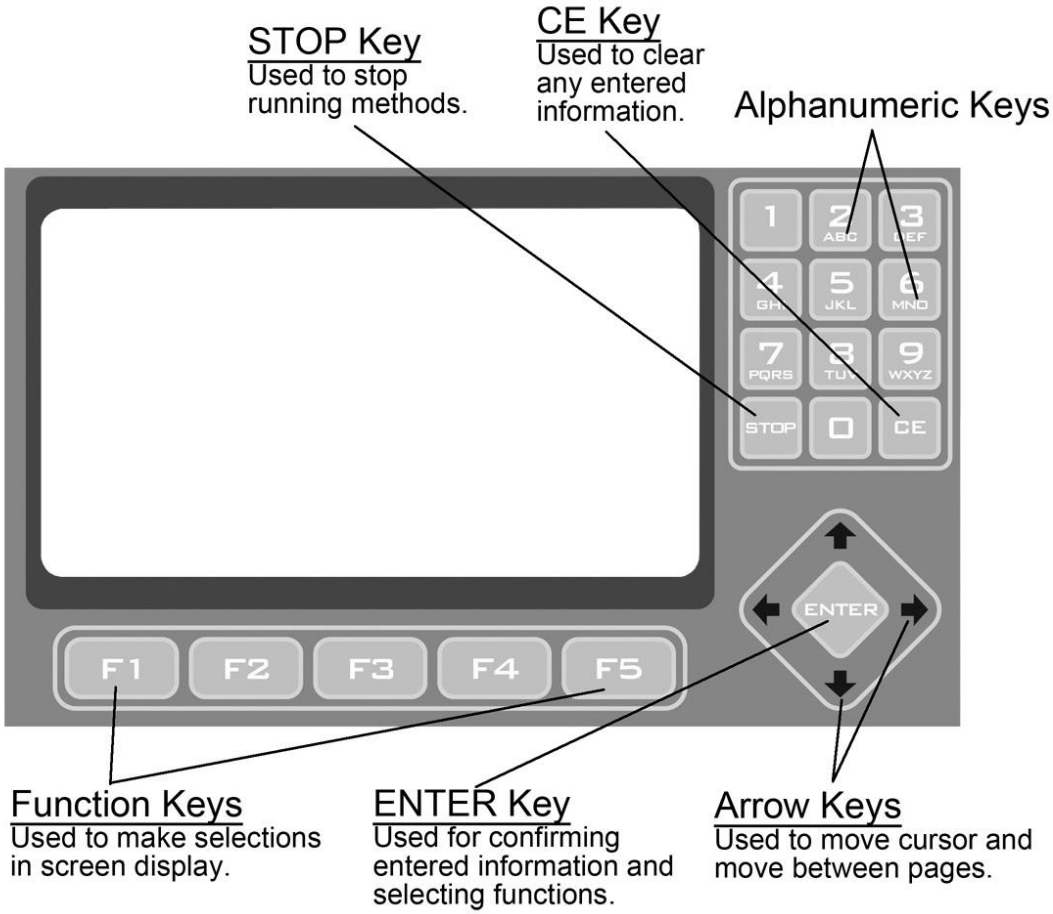


Figure 1. Front Panel Overview

Name	**Function**
Function Keys (F1 to F5)	Use the function keys (F1 to F5) to activate the "button" displayed on the screen above the key; for example, F1 for RUN.
Directional Arrow Keys	The four Directional Arrow keys can move the cursor into different directions.
ENTER key	The current selection is activated or accepted when the ENTER key is pressed.
Alphanumeric Keys (0~9)	The alphanumeric keys are usually used as number keys for the entry of time, temperature, password and cycle numbers. When entering a user name or protocol name, a small screen will pop out to display the letters after pressing the Alphanumeric keys. Press the selected key until the desired letter is highlighted. Press the ENTER key to select the letter or wait 5 seconds.
CLEAR key (CE)	Press CLEAR key will erase the entry in an input field.
STOP key	By pressing STOP, the Protocol current running will be terminated.

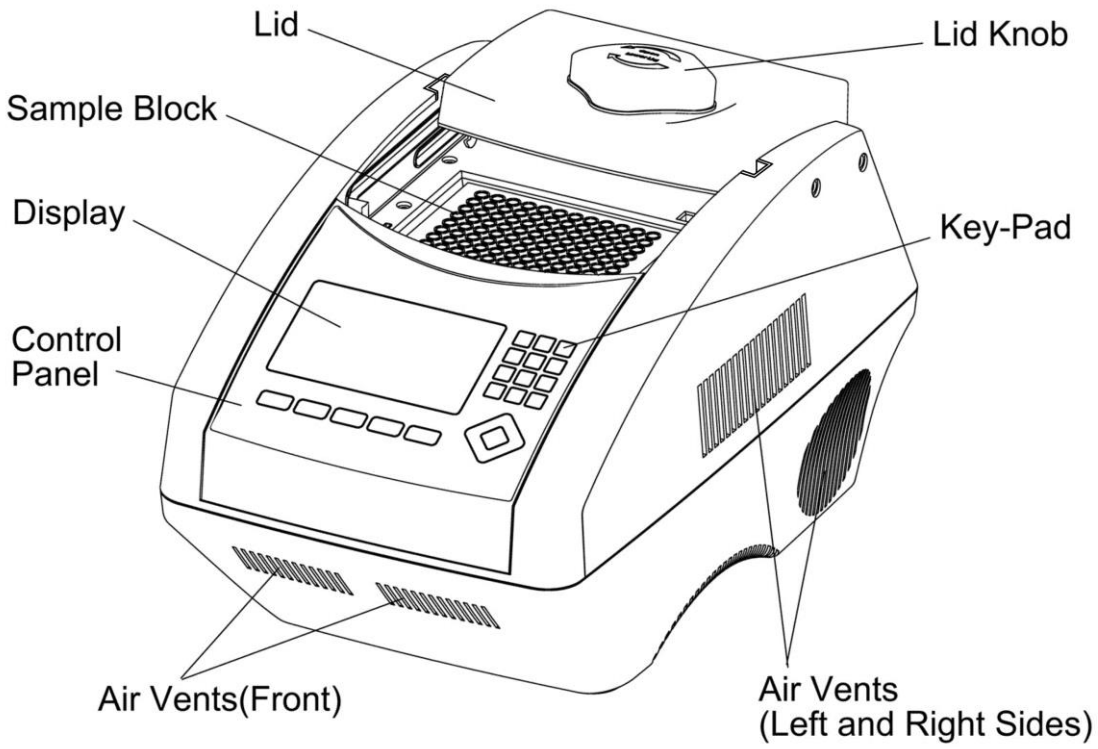


Figure 2. Front View

Name	**Function**
Lid	The lid with heating pad is designed to protect against evaporation resulting from heating of the reaction tube and reaction plate.
Lid Knob	Rotate Lid Knob in clockwise will lower the heating plate to place pressure on the cap of tubes. This forces the tubes to sit firmly in the block for better contact. Rotate Lid Knob in counter-clockwise direction until the Lid pops up. Only after the Lid pops, can users slide the Lid to the rear.
Sample Block	Section of the unit in which sample tubes and plates are placed.
Key-Pad	Used to enter the various Protocols and settings.
Control Panel	which includes Display and Key-Pad
Display	Displays current status of the various system features and functions.
Air Vents (Front)	for air output
Air Vents (Left and Right Sides)	for air output
Air Vents (Bottom)	for air intake

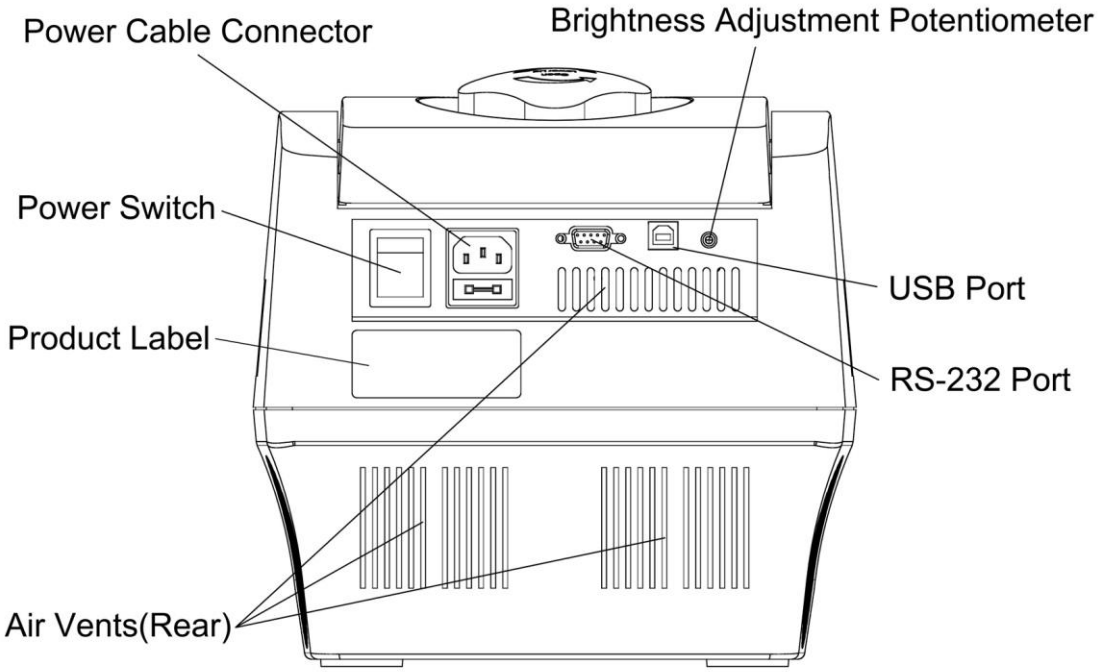


Figure 3. Rear View

Name	Function
Power Cable Connector	Power cable socket and fuse.
Power Switch	Power On/Off switch
Brightness Adjustment Potentiometer	Control the brightness of LCD panel. Please use Philip-head screw driver to adjust it.
USB Port	For run summary download to computer
RS-232 Port	For run summary download to computer
Air Vents(Rear)	For air output
Product Label	Indicate the model name, serial number, power specification, and other important information

Getting Started

3.1 Unpacking

Open the GTS96 thermal cycler package and confirm that all items below are included:

- GTS96 thermal cycler unit
- Electric fuses (7A & 3.15A)
- Warranty card
- Operation manual
- AC power cord

If there are any items missing, damaged, or incorrect items, please contact your distributor or sales representatives immediately.

Note: Please use 7A fuse in power source 100~120/50~60Hz countries, while 3.15A fuse is for power source 200~220V/50~60Hz countries.

3.2 Initial Operation

Place the machine on a steady, flat table. Please keep the machine at least 30cm from the wall or other machine. Connect the power cord to the power socket in the rear of the machine. Check the power source is compatible with your machine's fuse rating input.

Press Power On/Off Button to switch on the machine. The screen will show the software version for 10 seconds and then enter User Folder screen. Pressing any key will go to User Folder screen immediately.

3.3 Heated Lid

The Heated Lid heats the air in the upper part of the sample vessels at higher temperature than the reaction mixture. This prevents condensation of the evaporated water vapor on the vessel walls, keeping the concentration unchanged during the heating and cooling cycles. The top also places pressure on the caps of tubes and film on titer plates to prevent vapor loss and cross contamination of samples.
When using full skirted plates it is highly recommended to use a Silicone Compression Mat (to assist in placing even pressure on the plates.

Note:

1. *If GTS96 is started cold, approximately two to three minutes will be required before heated lid is at operating temperature.*
2. *To avoid heat dissipation, the Heated Lid should be closed and tighten during a*

protocol run. Keeping the heated lid open during a protocol run might cause "HEATER ERROR", because the heated lid fails to reach the set temperature.

3. *To evaporate the condensation water inside sample block, and to avoid "**HEATER ERROR**", users should turn off the **Lid Temperature** under **SYSTEM** mode before heating the sample block and keeping the lid open.*

3.4 Lid Opening/Closing

There are two ways to open the lid: 1) Slide the lid to the rear, 2) lift up the lid. The first method is recommended for common operations and to prevent the skin burn from the heated lid. The second method is used to clean up the heating plate of the lid.

Rotate Lid Knob in a clockwise direction to lower down the heating plate and press down on the cap of tubes, tighten until you feel resistance. This adjustment will provide better contact between the tube or plates and the block for better performance. Rotate the Lid Knob in counter-clockwise direction as shown in Figure 4 until the Lid pops out. Only when the Lid pops out, users can slide the Lid to the rear as shown in Figure 5.

To lift up the lid for heating plate cleaning, please refer Figure 6 ~ 8.

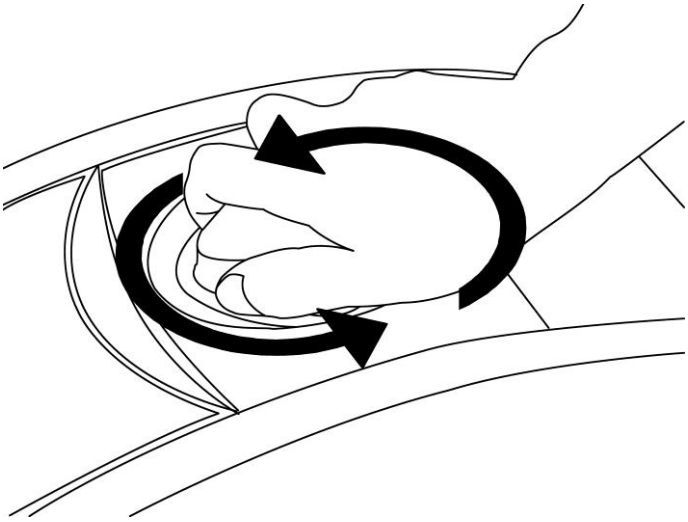


Figure 4. Rotate Lid Knob to open the lid

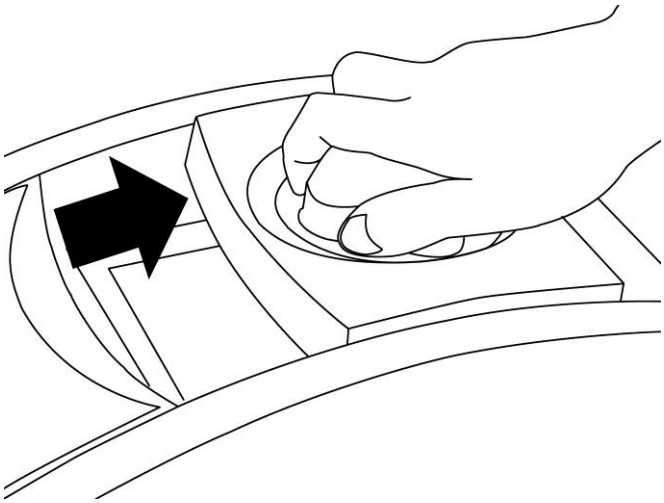


Figure 5. Slide the lid backward to access the block

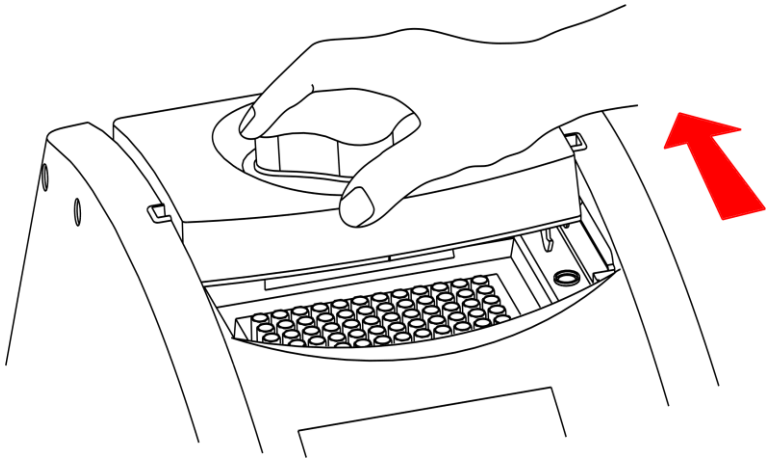


Figure 6. Slide the lid to align the lid hinge with notches of top case

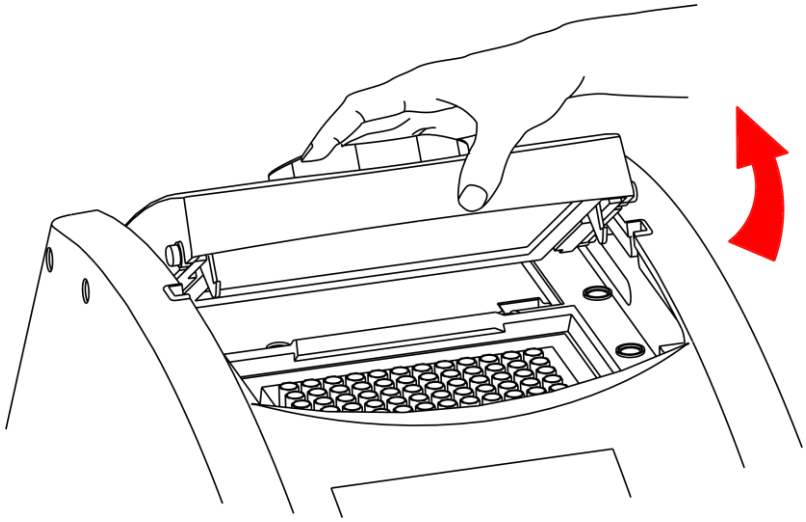


Figure 7. Lift the lid

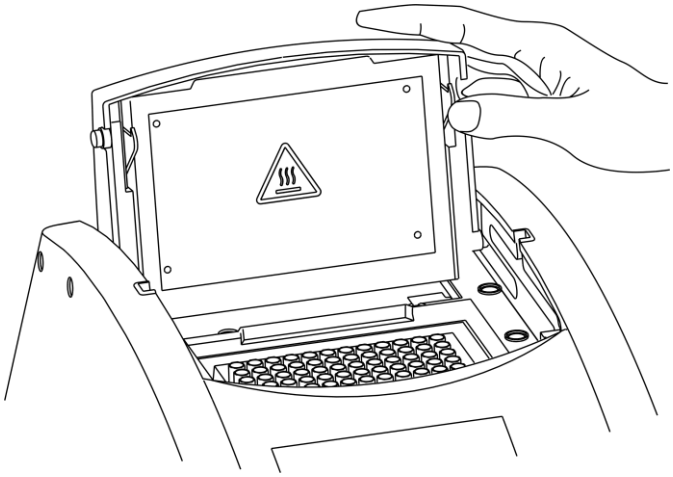


Figure 8. Rest the lid in vertical position

3.5 Function Map

The User Screen includes 5 function options; 1) **VIEW** folders under selected User folder, 2) **NEW**(Create) a User, 3)**EDIT** a User, 4)**DELETE** a User, 5)**SYSTEM**. Once a user folder is selected and the password is approved, users can; 1) **RUN** a Protocol, 2)**NEW**(Create) a protocol, 3) **EDIT(VIEW)** a Protocol, and 4) **DELETE** a Protocol. The function map is shown in Figure 9. Various functions, including Gradient, can be added to the selected/created Protocol.

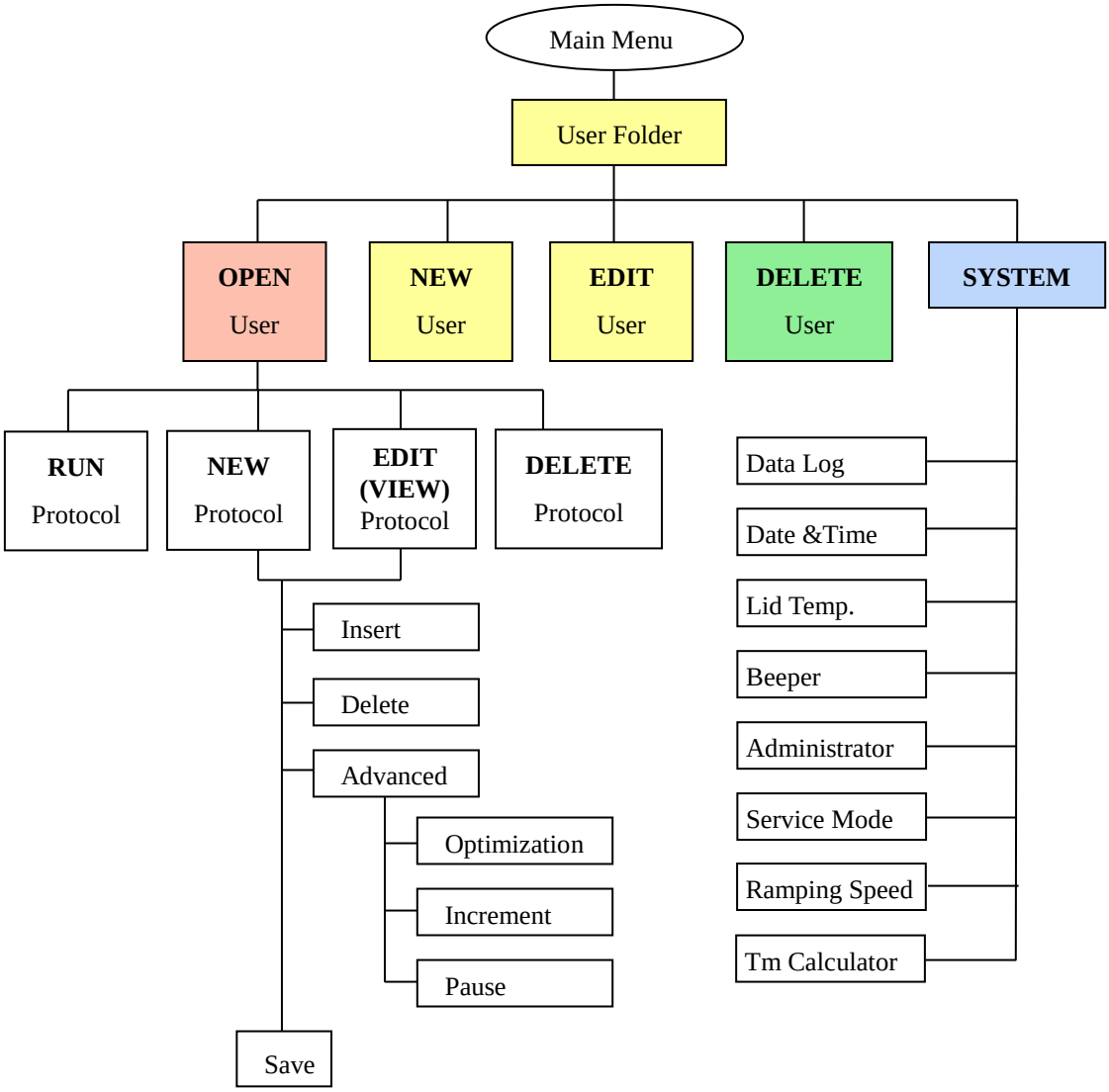


Figure 9. Operation Flowchart

3.6 Key Entry System

Note that the alphanumeric keys are assigned multiple characters, selectable by repeatedly pressing the key to cycle through the available characters. The highlighted character or number will automatically be entered into the name of a newly created or edited Protocol (or User) after a very short period of time, if users don't continue to press the key.

Key No.	Key Representation
0	0, space, +, =, <, >, &, (,), %
1	1, . , , ,-, ?, ‘, #, : , ; ,/
2	A, B, C, a, b, c, 2
3	D, E, F, d, e, f, 3
4	G, H, I, g, h, i, 4
5	J, K, L, j, k, l, 5
6	M, N, O, m, n, o, 6
7	P, Q, R, S, p, q, r, s, 7
8	T, U, V, t, u, v, 8
9	W, X, Y, Z, w, x, y, z, 9

3.7 Loading the Reaction Vessel

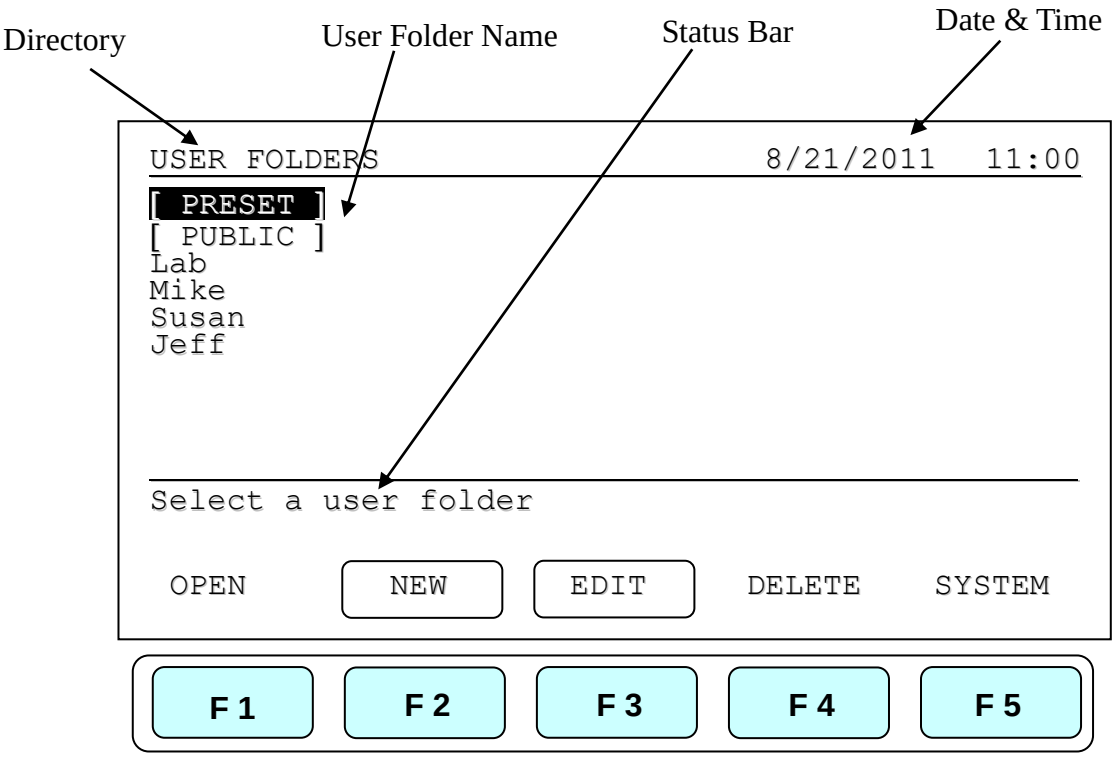
For the optimal performance of the GTS96, we recommend Cleaver tubes and plates.
The recommended sample volume for 0.2 ml tubes or 96-well plates is 5-100ul. If using the heated lid with full skirted 96 well plates it is highly recommended to use a Silicone Compression Mat to assist in placing even pressure on the plates.

Note: To avoid deformation of the sample tubes or Strips, it's important to load at least one tube in each of the four corners and at least four tubes in the center of the block, this will distribute the pressure evenly throughout the surface.

User Folder Management

After the unit is turned on, the initial screen which contains software version and manufacturer's name will show up for 10 seconds and then enter User Folder screen. Pressing any key will go to User Folder screen immediately.

A sample screen is shown below.



Users can use the function keys(**F1~F4**) above to view, create, edit and delete the User folders. **F5:SYSTEM** is used for system settings.

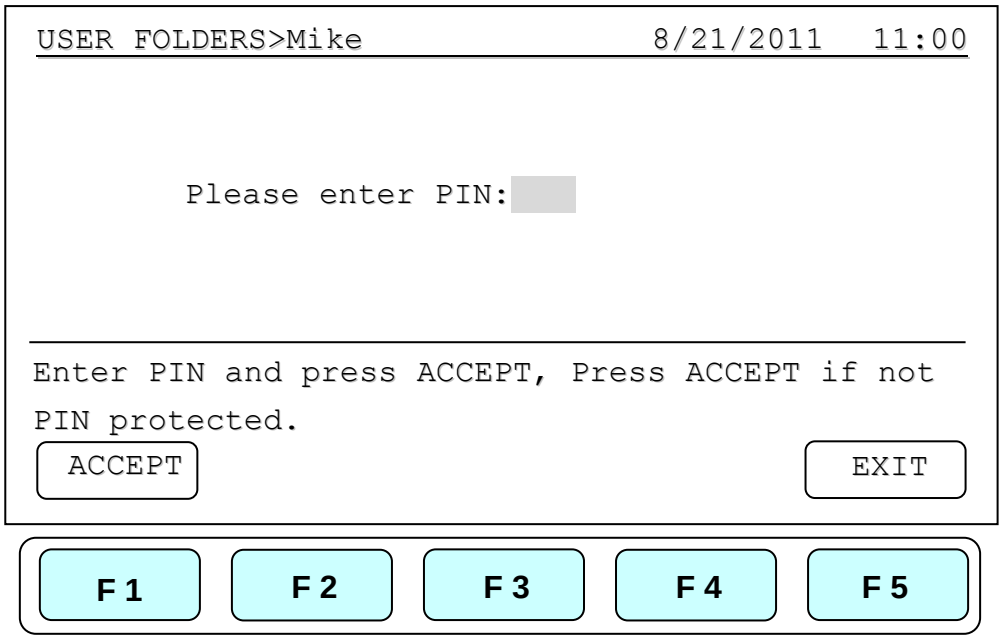
Note:

1. *The [PRESET] and [PUBLIC] folders are pre-registered folders which require no* ***Personal Identification Number(PIN)*** *to enter.*
2. *The [PRESET] folder includes some frequently-used Protocols defined by vendor, while the [PUBLIC] folder is open to all users.*

4.1 Viewing a User Folder

All Protocols are stored inside the User folders. Use directional arrow keys to select a User folder. Press **F1:OPEN** to view the names of all Protocols inside the selected folder. To view the contents of the User, will require you to enter the 4-digit **Personal**

Identification Number(PIN) as shown in the screen below. After the PIN is entered, press **F1:ACCEPT** or **ENTER** key to confirm the PIN. To run a Protocol, please refer Section 5.1.



4.2 Creating a New User Folder

Under User Folder screen, press **F2:NEW** can create a new User folder. After entering the new User name, press **F1:ACCEPT** to accept the new User folder name. The GTS96 will prompt you to enter a 4 digit PIN. Pressing **F1:ACCEPT** will save the new folder name and PIN.

Max. User folder name: 12 characters
Max. User folder no.: 50

4.3 Editing a User Folder

Under the User Folder screen, use directional arrow keys to select a User folder. Press **F3:EDIT** to edit the User name. A PIN is required to edit the User folder name. After editing the User folder name, press **F1:ACCEPT** to save the edited User name.

4.4 Deleting a User Folder

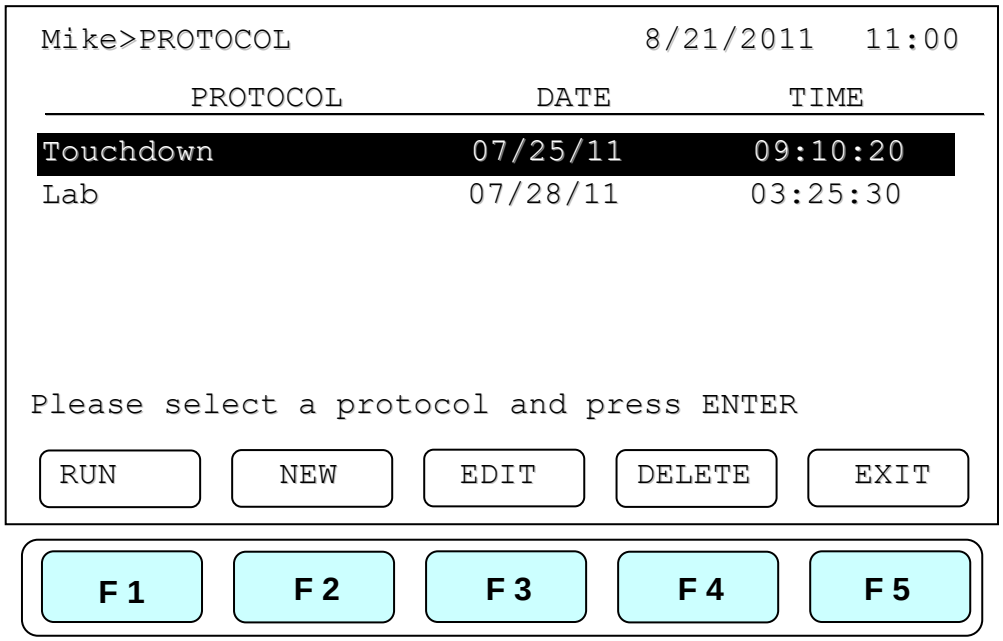
Use directional arrow keys to select a User folder. Press **F4:DELETE** to delete the

selected User folder. You are required to enter the PIN and press **F1:ACCEPT** or **ENTER** . The screen will prompt “Do you want to delete”. Press **F1:ACCEPT** to confirm the deletion. Press **F5:EXIT** to abort the deletion.

Note: User folders which contain any protocols can’t be deleted except by administrator.

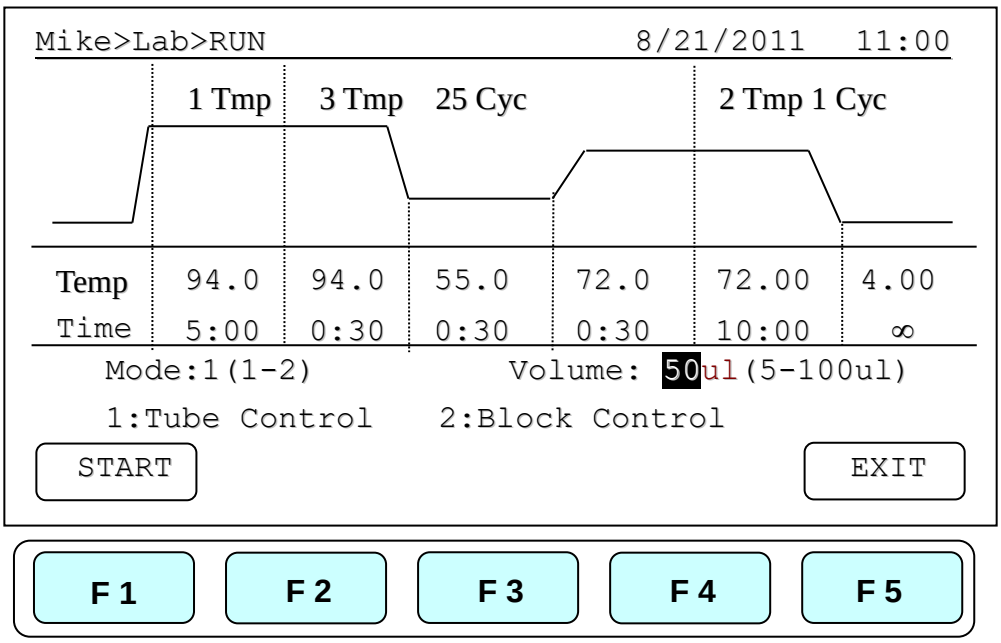
Protocol Management

After entering the selected User Folder, users can press **F1~F4** keys to **Run**, **New(Create)**, **Edit(View)** and **Delete** a selected Protocol as shown below.



5.1 Running a Protocol

1. Press **F1:RUN** to run the selected Protocol under the User folder screen. The screen will show as below.



2. Users are required to select a Temperature Control Mode before running the Protocol.

   Mode 1(Tube Control): Enable system operation with simulated temperature control. If Mode 1 is selected, users are required to input the sample volume : 5-100ul. In this mode, temperature control is based on Block temperature and an algorithm which estimates sample temperature based on the block temperature and the sample volume. Recommended for more accurate temperature control.

   Mode 2(Block Control): Enable system operation with maximum temperature control based on the actual block temperature. Recommended for normal operation.

3. Press **F1:START** to run the Protocol.

Note:

1. *The highlighted temperature (**Temp**) value represents the current block temperature during Protocol running. The highlighted time (**Time**) value below represents the remaining running time in the temperature segment. Once the countdown is completed, the highlighted section will continue to move to the next temperature or cycle segment and start counting down the time.*

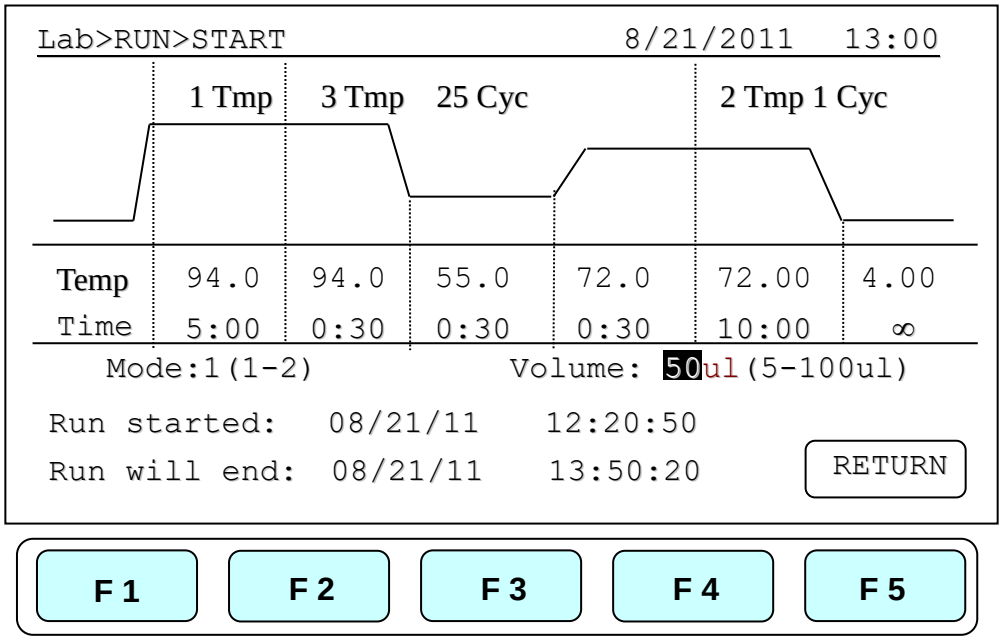
2. *The Lid temperature will flash on the status bar when the Protocol starts and remain on until it reaches 50ºC. When the lid reaches 50°C "HOT!" will appear in the right hand corner and remain until the temperature falls below 40°C The sample block will start to heat up when the lid temperature reaches its set temperature .*

5.2 Pause a Protocol

During running of the Protocol, press **F1:PAUSE** will pause the running Protocol for 10 minutes. The Protocol will continue after the Pause stops. The Protocol won't be paused until set temperature is achieved. To resume running the Protocol, press **F1:RESUME**.

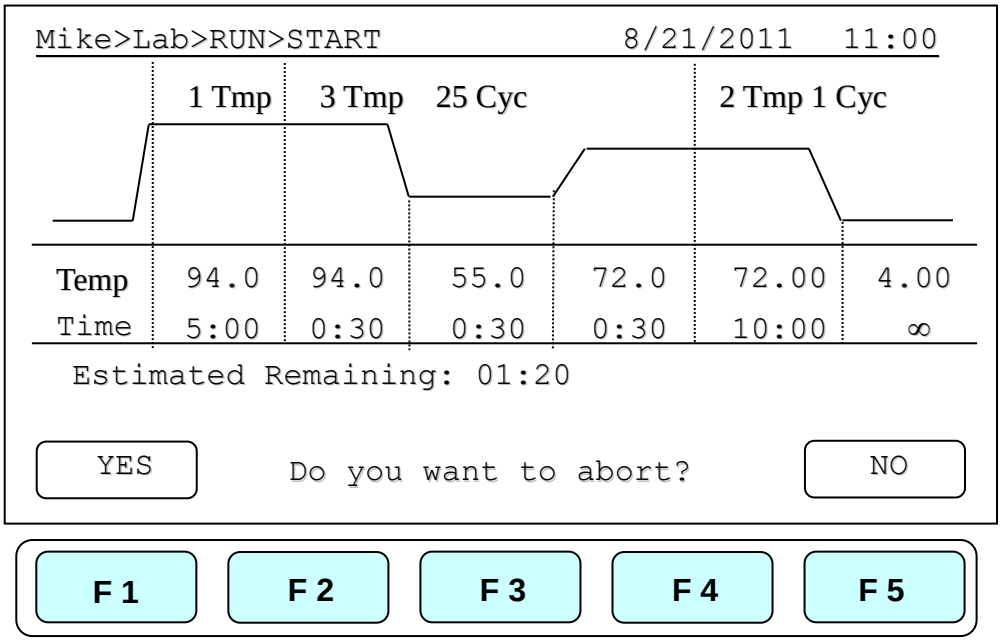
5.3 Viewing Running Protocol Information

Press **F2:INFO** to view the Protocol information screen as shown below during operation. Press **F5:RETURN** to return the running Protocol screen. The Protocol information screen will return to the running Protocol screen in 3 minutes, if **F5:RETURN** is not pressed.



5.4 Terminating a Protocol

1. Press **F5:EXIT** or **STOP** key in the bottom-left side of the Alphanumeric keypad to terminate a running protocol.
2. The display will show message “Do you want to abort?” as below.
3. Press **F1:YES** or **STOP** key again to terminate the Protocol. Press **F5:NO** to return to the running Protocol.
4. The display screen will return to Protocol screen.

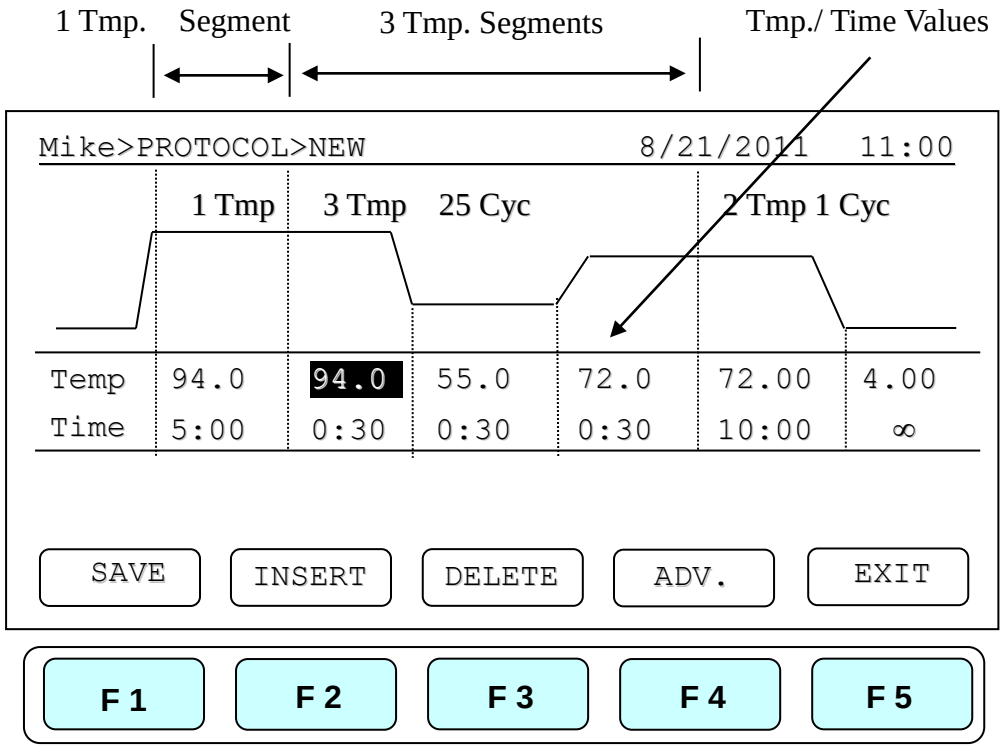


Creating a New Protocol

A new Protocol can be created by going to the User Folder and selecting and editing a basic Protocol format, and then assigning it a new name.

1. Select User name on User screen. Press **F1:OPEN** or **ENTER** button to enter User Folder.
2. Key in PIN to enter the User's folder.
3. Press **F2:NEW** to create a new Protocol by using a standard template, shown below.

*Note: Users can create a new Protocol under **Public** folder without a PIN. Users can edit a new Protocol inside **Preset** folder, **BUT** can not save these changes to the original protocol settings.*



6.1 Changing Temperature/Time Values

1. Press directional arrow keys to move cursor to the temperature or time settings required to be changed.
2. Enter your desired values and press **ENTER** or to move cursor to other values to save the settings.

The temperature and time ranges are shown below.

Temperature range: 4.0 to 99.9 °C
Time range (minute: second): 00:01 to 99:59 (99:99 = ∞)

6.2 Inserting/Deleting Temperature Segment

Temperature Segment can be inserted or deleted by selecting **F2:INSERT** or **F3:DELETE** key. The inserted or deleted temperature segment is dependent upon the location on the temperature segment where the cursor is positioned. If the cursor is positioned inside the first multi-temperature/time segment, pressing **F2/F3** will insert/delete the whole Multi-Temperature Cycle. If the cursor is located in any other Multi-Temperature/Time segment only the selected segment will be inserted/deleted.

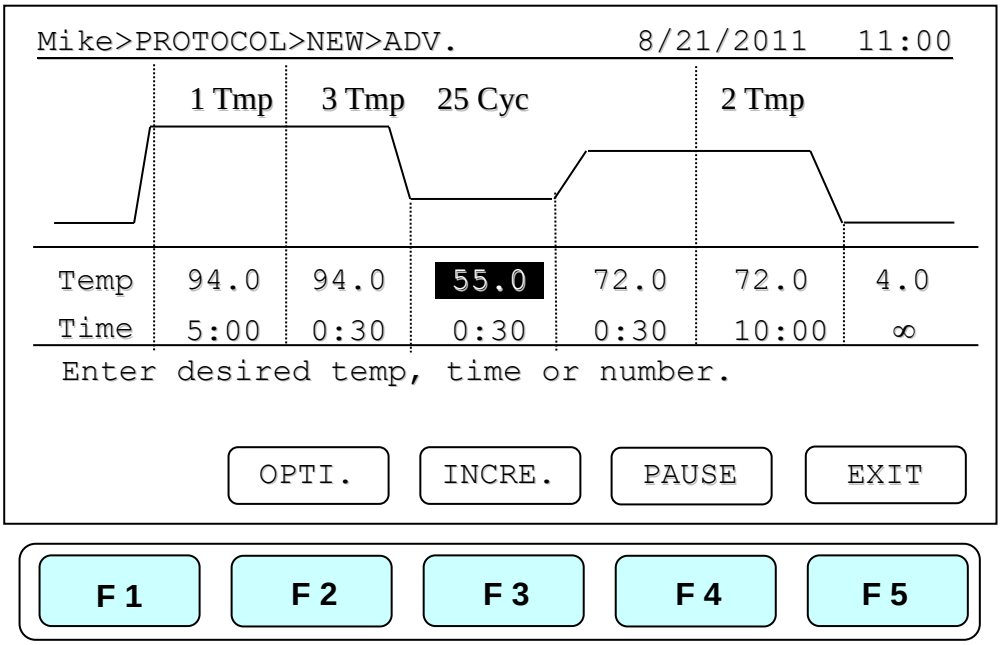
6.3 Changing Temperature Segment Count (Temp) and Cycle Count (Cyc)

The Temperature Segment Count(Temp) can be modified by entering a new value (1 to 20) in the first Temperature position and pressing ENTER. When the Temperature Segment Count is larger than one, the temperature Cycle Count (Cyc) will appear. The Multi-Temperature Segment will cycle during this segment. The maximum temperature segment per protocol is 12 segments. The temperature segment count and cycle count ranges are shown below.

Temperature Segment Count(Temp.) range: 1 to 20
Cycle Count(Cyc) range: 1 to 99

6.4 Advanced Settings

Users can set up the following advanced functions: 1) **Optimization**, 2) **Temperature/Time Increment/Decrement**, 3) **Pause**,.
F4:ADVANCE button, is used to enter these settings. The screen below will be displayed.



6.4.1 Optimization Temperature Setting

1. To enter an Optimization Temperature setting, place your cursor on the desired Temperature Segment. Select **F2:OPTI.** to enter the screen below.
2. The temperatures of all BLOCK offset are based on BLOCK＃1. If press F2:AUTO to set gradient temperature, each BLOCK will add 4°C automatically based on the preceding BLOCK. Prior to press F3:AVG. users need to enter BLOCK＃6 setting, and the screen will show the calculated temperature gradient from BLOCK＃1 to BLOCK＃6 as show in Figure 10. This reflects the variation of the temperature from the BLOCK＃1 (coolest) to the BLOCK＃6 (hottest).
3. There are specially function in the optimization temperature setting. All temperatures are based on BLOCK＃1 and users can move the cursor to press any higher temperature (Range:0.1~24.0°C) on BLOCK＃2 to BLOCK＃6.
4. Press **F5:EXIT** to confirm the settings. Press **F1:OFF** to re-enter the settings. A capital letter and High-temperature value; "**G70.0**", will appear on the Temperature Segment graph and Low-temperature value will be shown on the Temp value of the section.

To remove the Optimization Temperature setting, place your cursor in the same temperature segment with **"G "** Gradient Temperature symbol. Press **F2:OPTI.** again. The screen will show each BLOCK temperature settings. Press **F1:OFF** to clear the Optimization Temperature setting. Press **F5:EXIT** will delete the Gradient Temperature setting and its symbol.

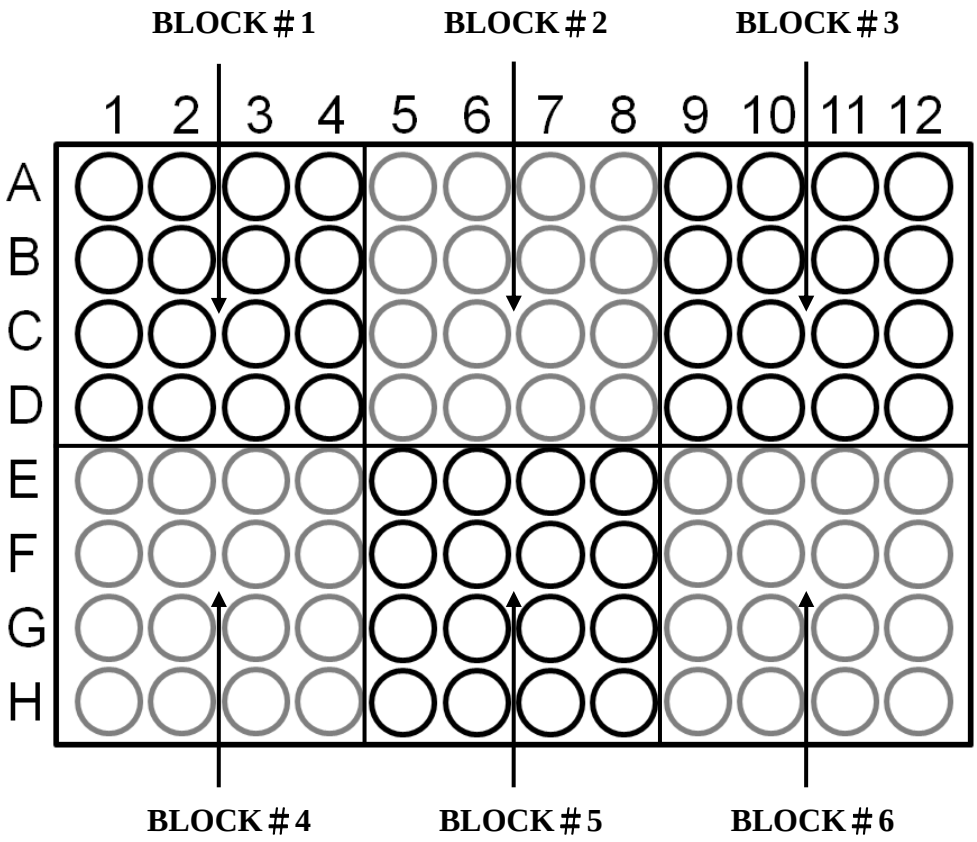
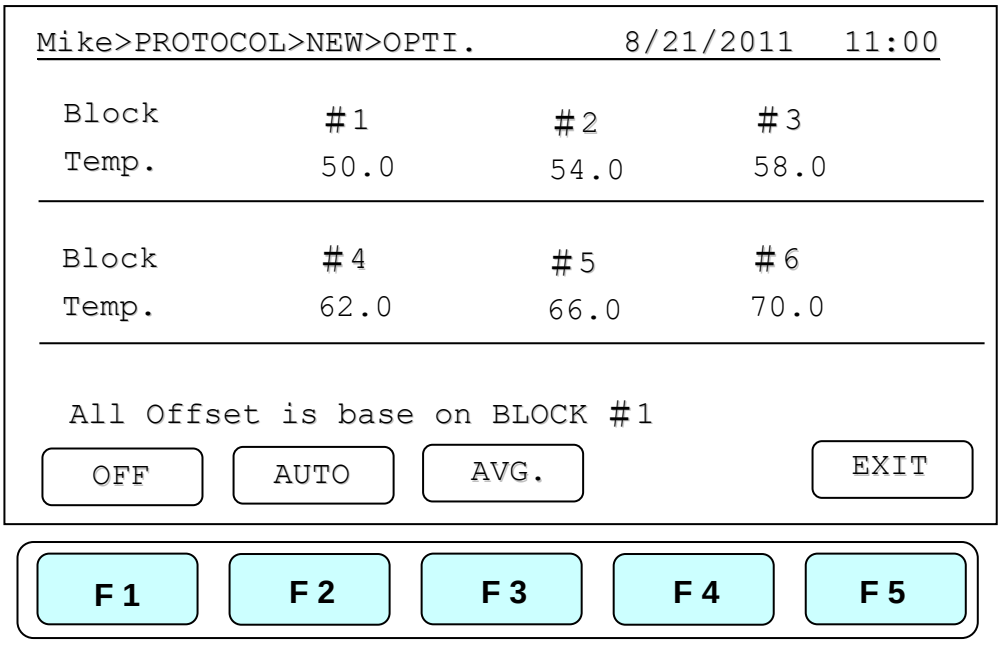


Figure 10. Block layout of 96-well model

The Optimization temperature ranges are shown below.

Temperature setting range: 30.0 to 99.0 °C

Temperature difference: 0.1 to 24.0 °C



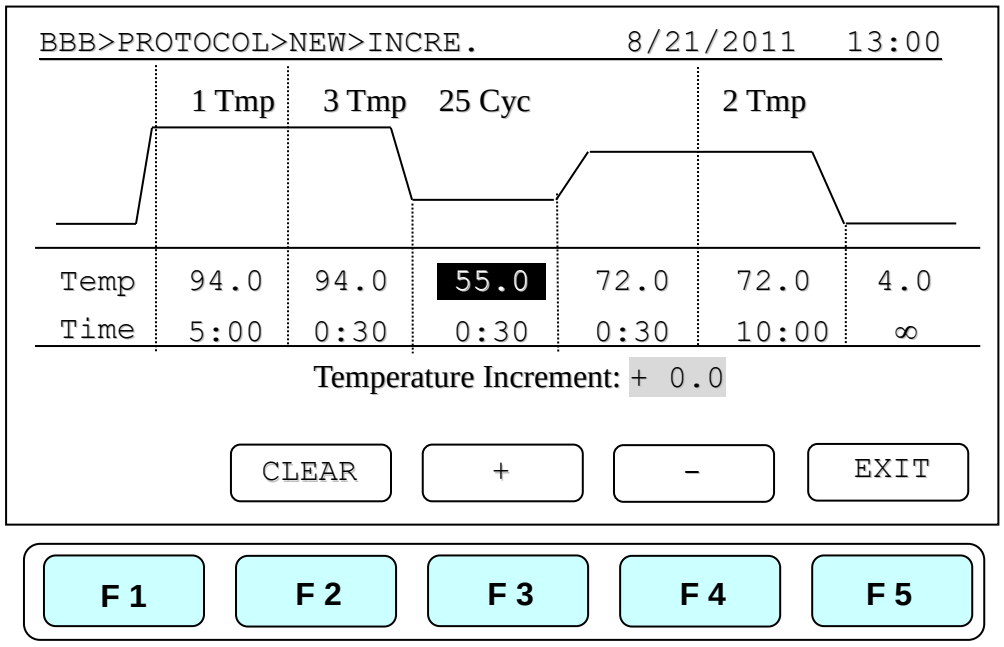
6.4.2 Incremental/Decremental Temperature and Time Settings

To increase or decrease the dwell time or temperature after each repeat you must have more than one cycle repeat. i.e. 55ºC and a dwell time 40 seconds, you could decrement the second step by 5 seconds the second step would be 55ºC and a dwell time of 35 seconds.

1. Place the cursor at the Temperature or Time values. Press **F3:INCRE.**
2. To select increment/decremental values. The screen will ask to input the increment values. Press **F3: +** or **F4: -** to choose increment or decrement.
3. Enter your desired values and press **ENTER**. The graph will show the increment/decrement values.
4. Press **F1:ACCEPT** to accept the values or **F2:CLEAR** to re-enter the values.

To remove the Incremental/Decremental Temperature and Time settings, place the cursor in the temperature segment with "Incremental/Decremental Temperature and Time values". Select **F2:CLEAR** to clear the values. Select **F1:ACCEPT** will remove the incremental/ Decremental Temperature setting and its symbol.

Temperature Increment



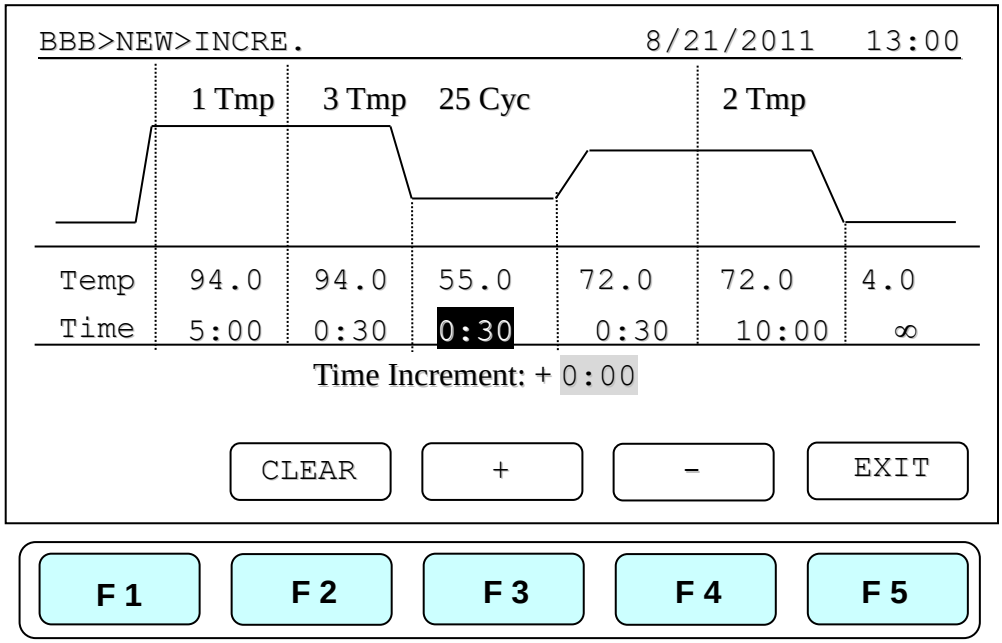
Max. Temperature incremental value: +/- 9.9 °C

Max. Time incremental value (minute:second): +/- 9:59

Note:

1. *Temperature limits 4.0ºC to 99.9ºC. DO NOT exceed.*
2. *Only Multi-cycle segments will have incremental/ decremental time or temperature function.*

Time Increment



6.4.3 Pause Setting

Position your cursor on desired temperature segment. Press **F4:PAUSE** to add a pause action during operation. The "**Pause**" will appear on the Temperature Segment graph. **The pause will last for 10 minutes**, then the Protocol will resume the operation.
To remove the Pause setting, place the cursor under **"P."** Pause symbol. Press **F4:PAUSE** again will remove the Pause setting and its symbol.

6.5 Saving a Protocol

After all settings are entered, press **F1:SAVE** will store the protocol. Screen will Prompt "Please enter protocol name" A Protocol name is required to be entered.

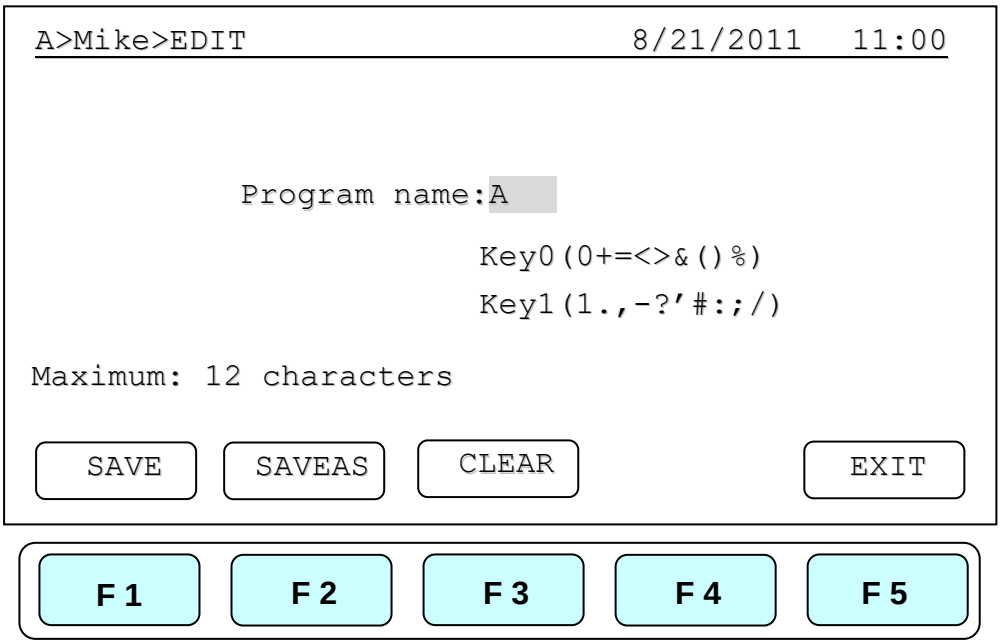
Max. Protocol name: 12 characters

Editing (Viewing) a Protocol

An editing Protocol can be saved under a new name (newly created Protocol) or under the same name (edited Protocol).

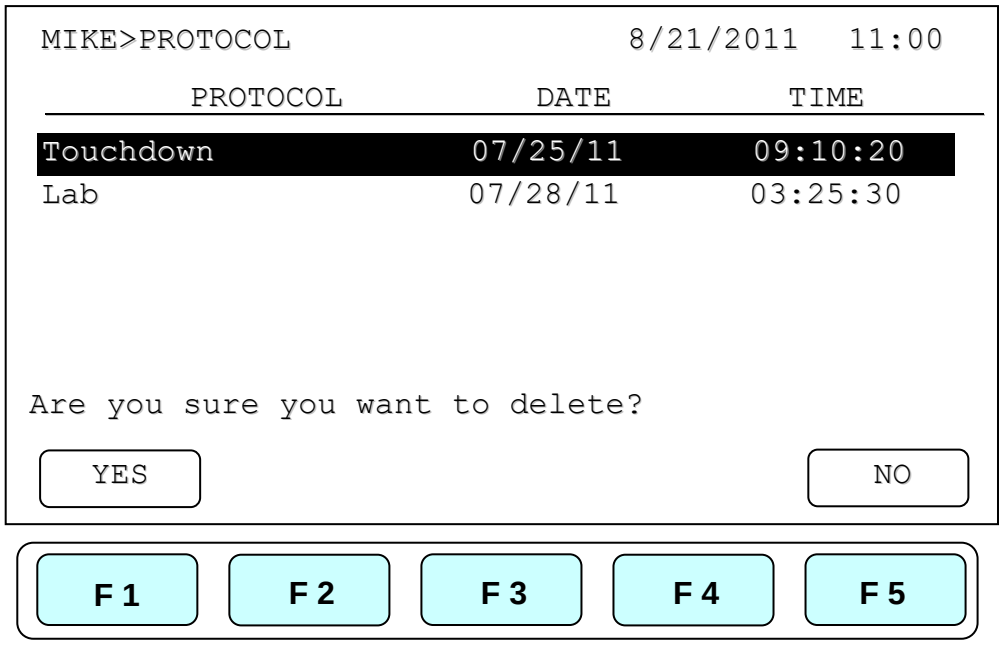
Under the User's Folder, choose the Protocol to be edited. Select **F3:EDIT** to edit the selected Protocol. This displays the existing Protocol and enables editing of the temperature segment and numerical values as shown below.

Please refer **Chapter 6 Creating a New Protocol** to edit the temperature segment and numerical values, and other advanced functions. Press **F1:SAVE** to save the edited Protocol under the original name or **F2:SAVE A** to as a new protocol.



Deleting a Protocol

1. An existing Protocol can be deleted under a User's Folder.
2. Under the User's Folder screen, choose a Protocol. Select **F4:DELETE** to delete the selected Protocol.
3. If **F4:DELETE** is selected the screen will prompt you "Are you sure you want to delete?" Press **F1:YES** to confirm the deletion. Press **F5:NO** to abort the deletion.

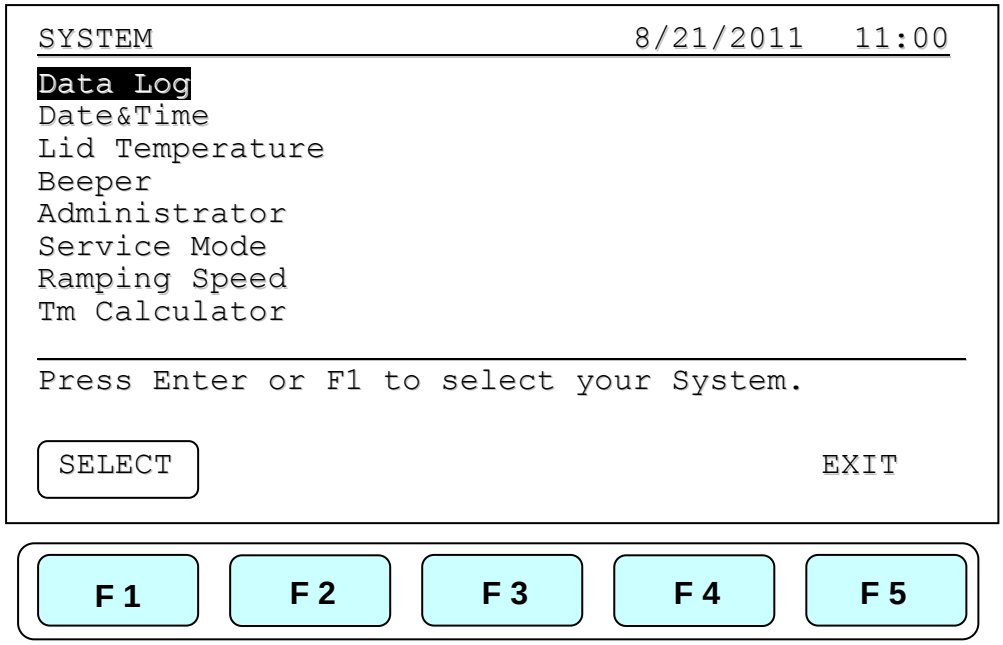


Note: *Protocols in the Preset Protocols Folder can't be deleted, while Protocols in the Public Folder can be deleted by any user if not password protected.*

System Setup

System Setup contains 6 functions:

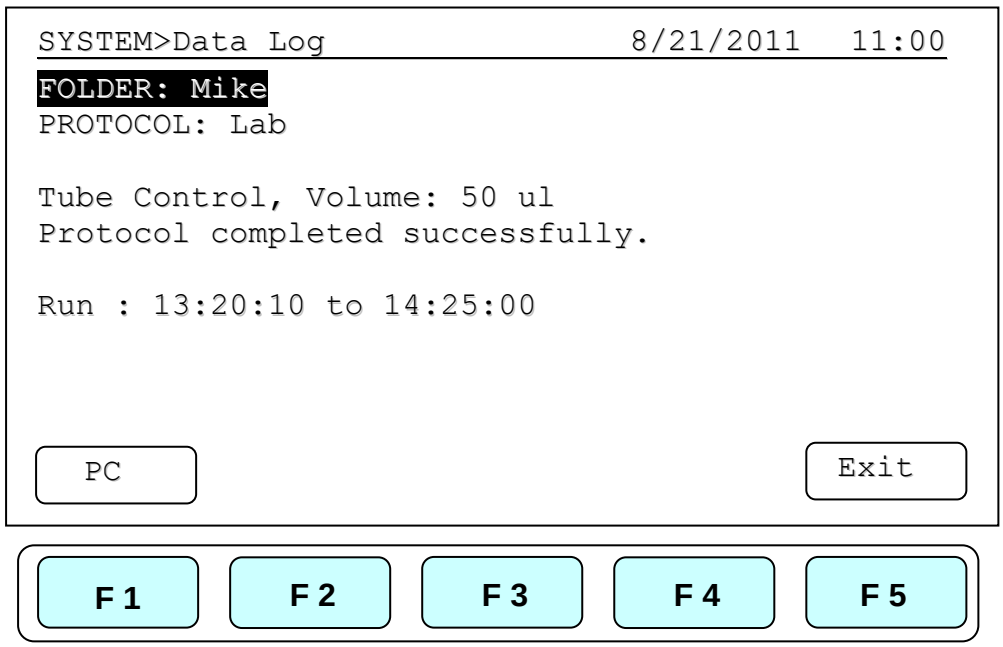
1. Data Log: contains the history of the latest-run Protocol.
2. Date & Time: Users can change the Date and Time settings.
3. Lid Temperature: Users can choose the preferred lid temperature as default setting during running a Protocol.
4. Beeper: Users can turn on/off the audible beep.
5. Administrator: Users can delete unwanted Usernames and their Protocols.
6. Service Mode: is reserved for Service engineers.
7. Ramping Speed: Users can choose the High Ramping Speed or Low Ramping Speed.
8. Tm Calculator: Press A, T, C, and G number of sequence, then users can get the Tm value.



9.1 Data Log

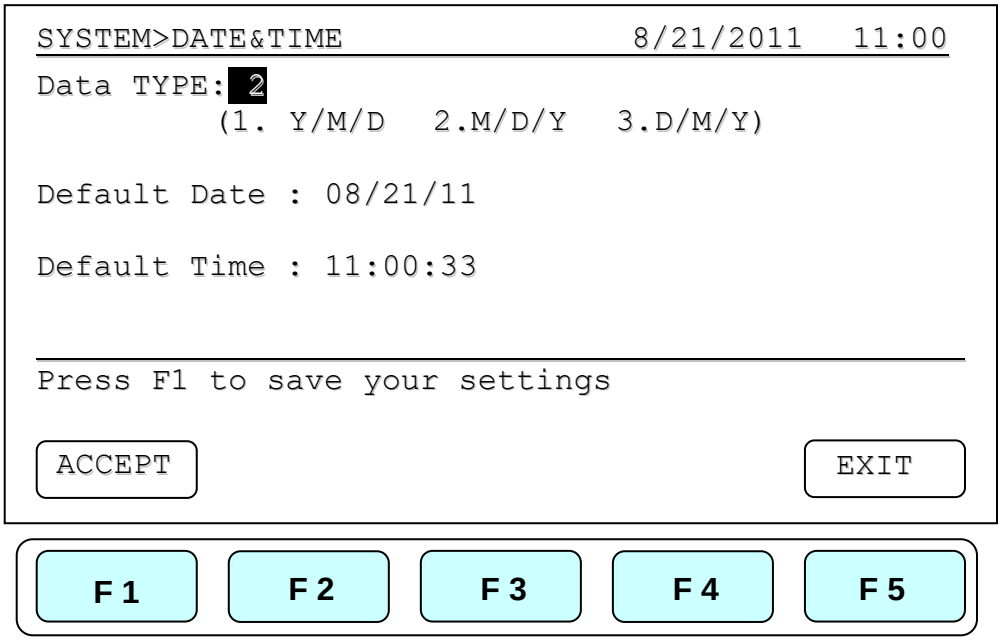
The Data Log records a log of activity for the most recently run Protocol. Executing a new Protocol updates the history log by overwriting previous log. To export log to a PC a Hyper Terminal communication protocol must be installed. Hyper Terminal communication protocol comes free with Windows.

Please refer Appendix D: Hyper Terminal and USB Driver Setup.



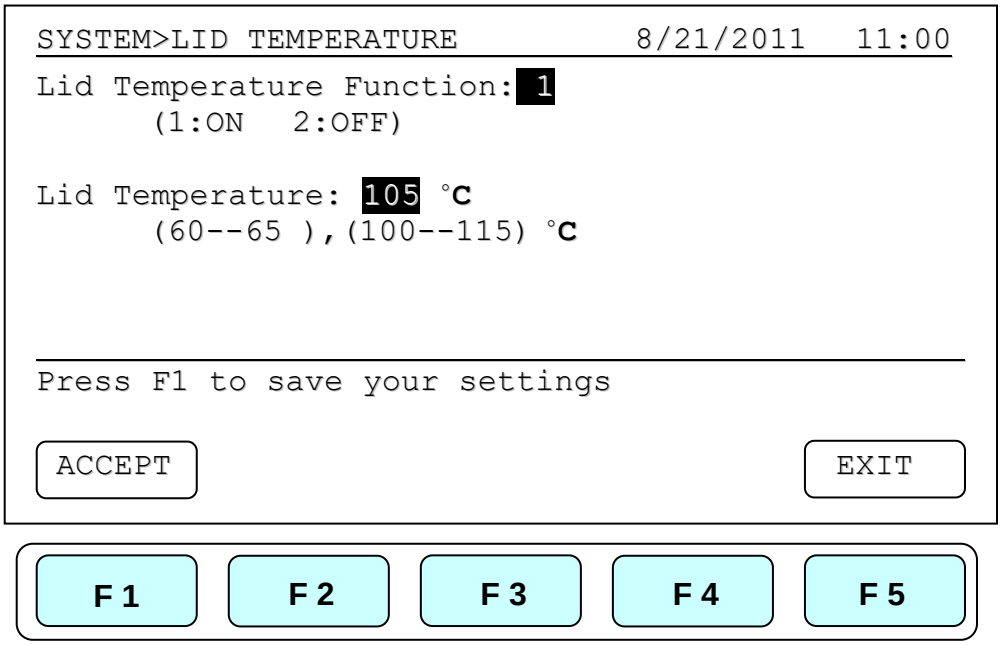
9.2 Date & Time

Users can change the date type, default date and time of this unit by selecting Date &Time screen as shown below under SYSTEM screen. Please remember to press **F1:ACCEPT** to store your settings.



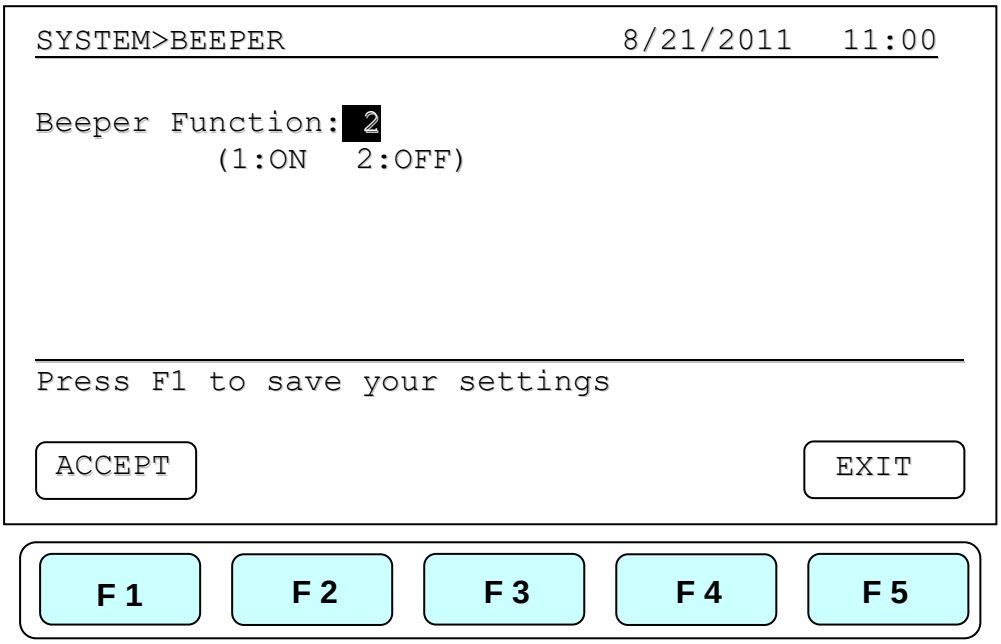
9.3 Lid Temperature

Users can change the temperature of lid of this unit by selecting Lid Temperature screen as shown below under SYSTEM screen. Please remember to press **F1:ACCEPT** to store your settings. Two temperature segments: 60~65 °C and 100~115 °C are available.



9.4 Beeper

Users can turn ON or OFF the sound of this unit by selecting the Beeper screen as shown below under SYSTEM screen. Please remember to press **F1:ACCEPT** to store your settings.



9.5 Administrator

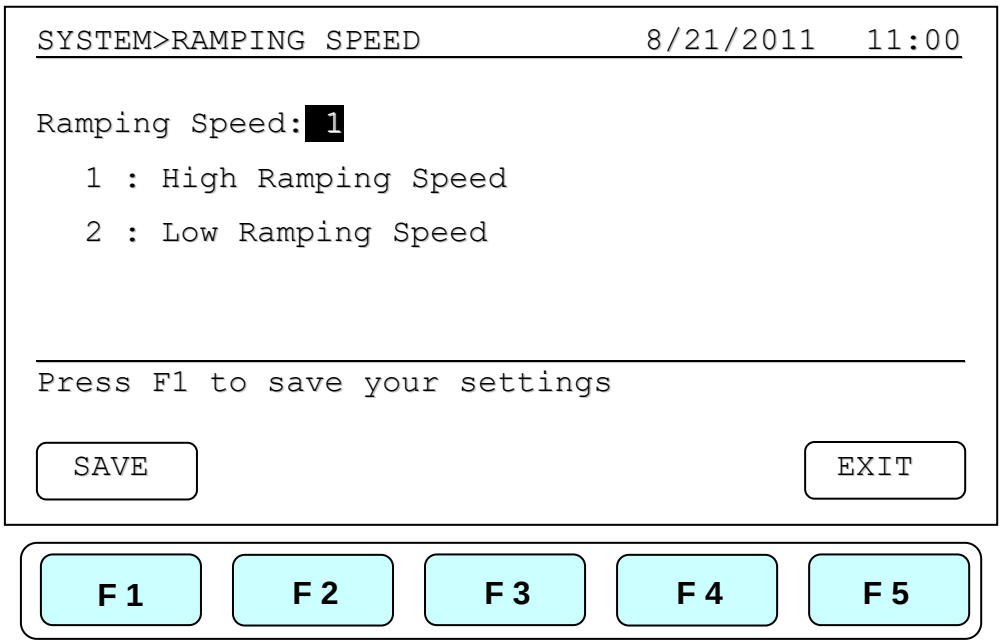
The password of Administrator is "**9610**". The Administrator of this unit has rights to delete any User Folder and any Protocols inside a User's Folder.

9.6 Service Mode

Only authorized service personnel have the password to enter Service Mode and perform necessary maintenance and repairs.

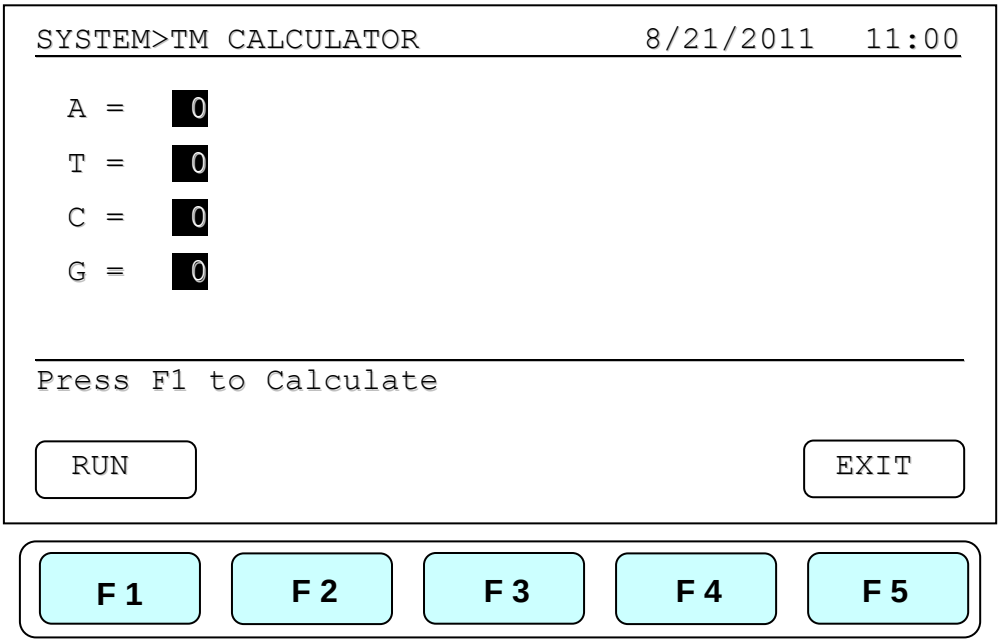
9.7 Ramping Speed

Users can choose the Ramping Speed. High Ramping Speed heating rate about 4°C/sec and cooling rate about 3°C/sec. Low Ramping Speed heating rate about 3°C/sec and cooling rate about 2°C/sec. Please remember to press **F1:SAVE** to store your settings.



9.8 Tm Calculator

Users can press the number of the bases of A, T, C and G in the sequence, then press **F1:RUN** to get the Tm value of the sequence.



Maintenance and Troubleshooting

10.1 Cleaning the unit

Please ensure that no liquid is spilled onto or into the unit. In addition, periodically wipe it clean of dust and other residue that comes with normal operation of the unit. Use a soft, lint-free cloth and deionized water. Air vents should be vacuumed to remove dust.

10.2 Cleaning the heated lid

Make sure the GTS96 is unplugged and cooled down. To clean the heated slide the lid back on the tracks until the front black pins align with the two slots, taking care that the rolleiflex cable is clear. Lift the lid from the front, (be careful of sharp edges) and flip up. Use mild detergents to clean material from the lid. A Kimwipe™ dipped in 70% ethanol will help remove and residue from sealing tape. Make sure the lid is dry prior to lowering it into the tracks. Once the lid in secure in the tracks make sure the lid easily slides forward.

10.3 Replacing a Fuse

The fuse is located in the power socket module, just below the power connector. If the unit does not turn on when the power switch is turned on, then replace the fuse. To replace the fuse:

1. Disconnect the power cord from the unit.
2. Remove the fuse drawer with a small-blade screwdriver.
3. Pull the fuse out of the fuse socket and replace the fuses with one having the correct current rating.
4. For 100V-120V operation: Use 7.0A, 5 x 20mm, Glass Tube.
5. For 220 V- 240 V operation: Use 3.15A, 5 x 20 mm, Glass Tube.
6. Reinsert fuse into the fuse socket. Reinsert the fuse drawer.

10.4 Changing the Thermal block

1. Slide the lid to the furthest point back.
2. Remove the two plastic plugs and two screws holding the face plate.
3. Flip the face plate forward to gain access to the block.
4. Remove the two set screws holding the heating block.
5. Gently slide the Thermal block forward, once clear of the frame remove it from

the unit.

6. Slide the new block into place and connect the plug.
7. Gently slide the block until the two screw holes are lined up.
8. Replace the two screws and plugs.
9. Shut the face panel and secure it with two screws.

Troubleshooting

Problem	Cause	Action
The display is off even when power is switched on.	1. Power is not reaching the system. 2. Power cord is not plugged into the socket properly. 3. Power fuse is blown out. 4. Block fuse is blown out.	1. Check power source voltage. 2. Reconnect the power cord. 3. Replace the power fuse. 4. Return the unit for service.
Can’t reach 4°C.	1. Operating temperature environment may be unsuitable. 2. Electronic cooling element may be damaged or aged.	1. Operate the unit in a environment temperature between 15 to 30 °C. 2. Return the unit for service.
Cycle time is too long	1. Operating environment temperature may be unsuitable. 2. Electronic cooling element may be damaged or aged. 3. Faulty temp. sensor.	1. Operate the system in a temperature environment between 15 to 30 °C. 2. Return the unit for service. 3. Return the unit for service.
Lid heater does not work.	1. Lid heater is set off. 2. Lid sensor problem	1. Check Lid Temperature setting in System Mode. 2. Return the unit for service.
No key entry sound.	1. Sound may currently be set off. 2. Faulty keys or keypad wiring.	1. Check Beeper setting in System Mode. 2. Return the unit for service.
The display goes off.	1. Faulty backlight.	1. Check the LCD contrast.

	2. Faulty LCD panel	2. Return the unit for service.
Display is too dark or light	Backlight brightness is not adjusted properly.	Adjust Display Brightness Potentiometer.
Lid will not close.	1. Foreign matter, between lid heater and sample block. 2. Faulty lid lock mechanism.	Remove the foreign object or matter.
Error message appears.	Refer to list of error messages below.	Check the nature of the error and take the suggested actions.

11.1 Error Messages

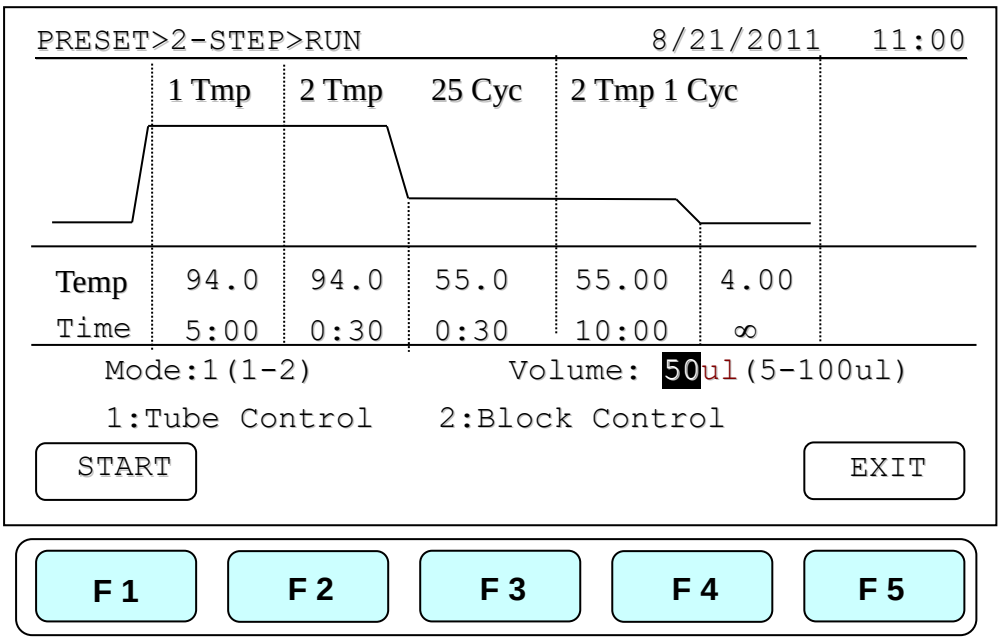
Message	**Cause**	**Action**
HEATER ERROR!	• Lid temperature sensor problem. • Lid temperature exceeds 132 °C. • Lid temperature can't reach the set temperature.	Reboot the unit.
BLOCK ERROR!	• Block temperature sensor or heating element problems. • The unit can't reach the set temperature, because the room temperature is too high. • The block temperature exceeds 108 °C.	Cool down the room temperature. Reboot the unit.
ROOM ERROR!	• Room temperature sensor problem.	Reboot the unit
ROOM > 30 °C	• The room temperature exceeds 30 °C. • Two running units are too close to each other.	Cool down the room temperature. Reboot the unit. Remove any objects blocking the vents. Keep two running units at least 30cm from each other.

Appendix A: Technical specifications

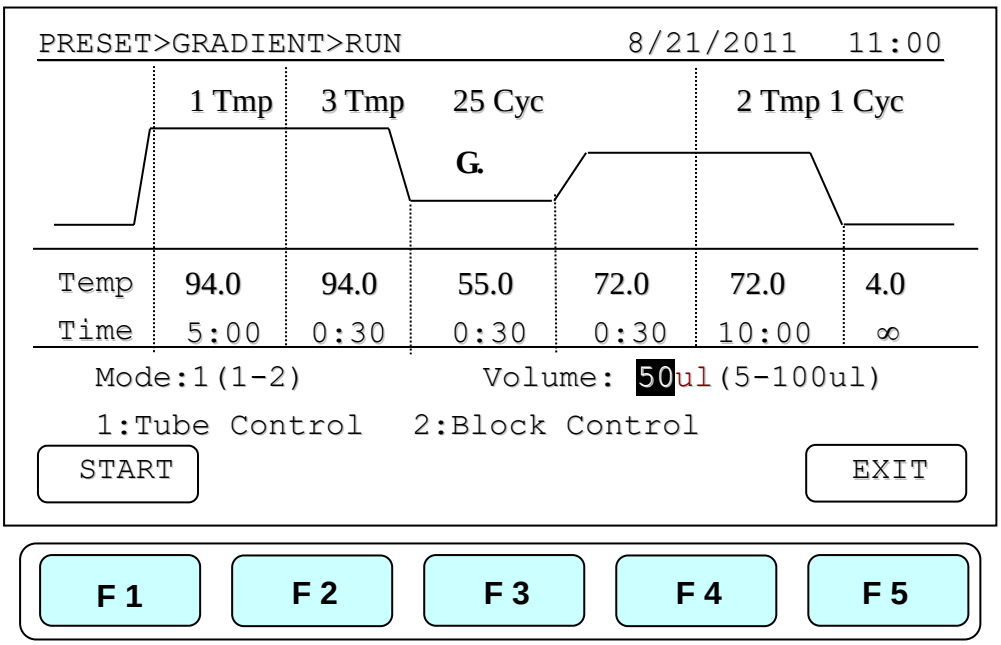
Model Name	**TC9610/TC9610-230V**
Sample Capacity	0.2ml x 96 tubes
Temperature Ranges	4 ~ 99.9 °C
Temperature Accuracy	+/- 0.5°C (30 to 99.9 °C)
Temperature Uniformity	+/- 0.5°C
Max. Temp. Increment/Decrement Rate	4°C / 3 °C
Gradient Temperature	30 ~ 99 °C (Max. temp. difference: 24 °C)
Max. Lid Temperature	60~65/ 100~115 °C
Protocol Capacity	200 sets
Operating Temperature	15 ~ 30 °C
Operating Humidity	20 ~ 80% RH
Networking	1 x RS-232, 1 x USB
Power Supply	100 to 240V AC, 50/60 Hz, 750VA
Dimensions (W x D x H)	24 x 25 x 42cm
Weight (Net)	9 Kg

Appendix B: Protocols in Default Folder

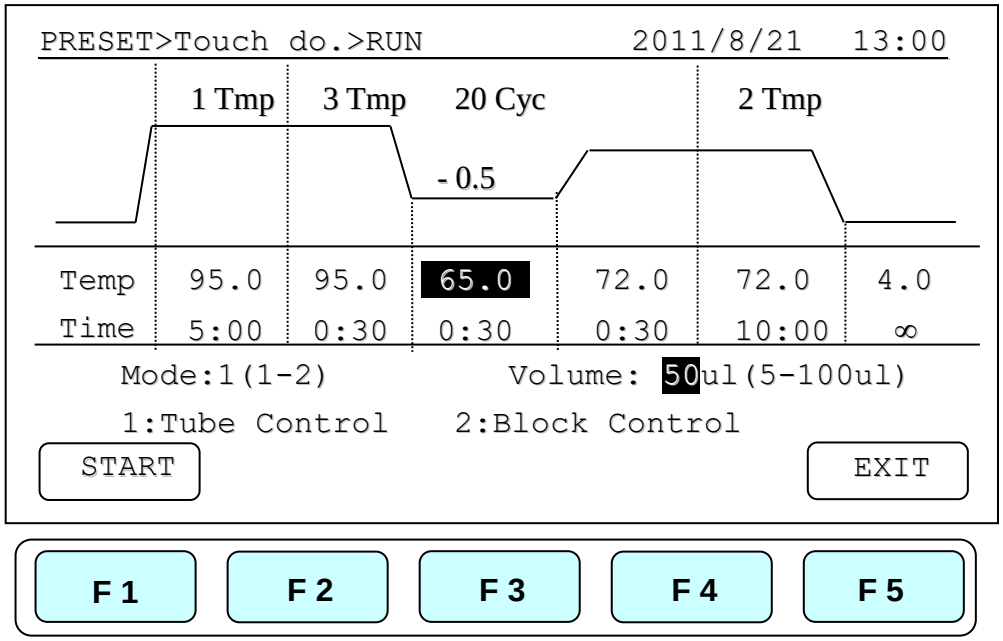
- **2-Step**



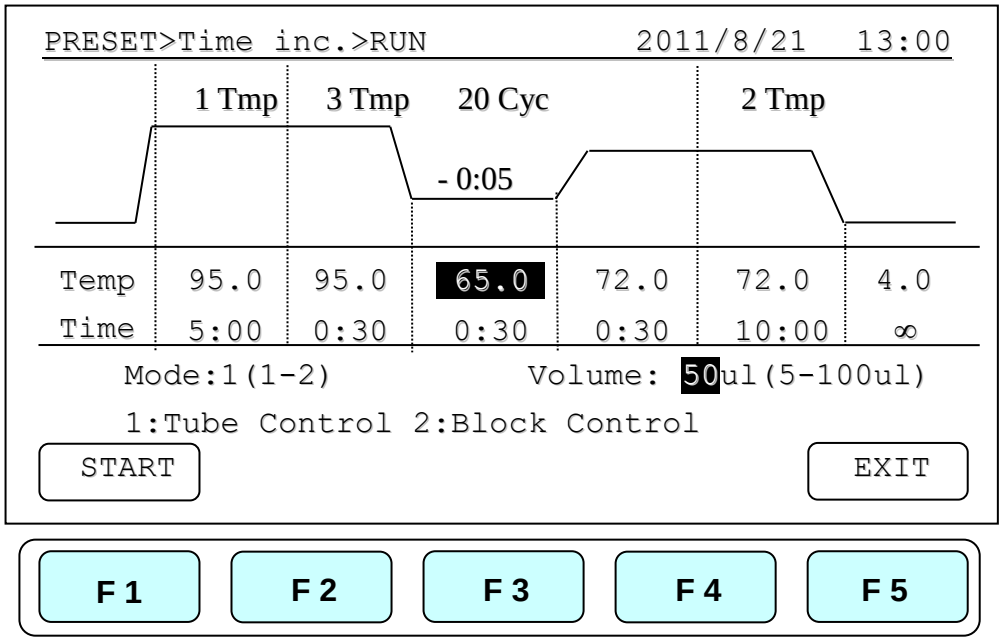
- **Gradient**



- **Touch down**



- **Time Increment**



Appendix C: CE Declaration

CE

Cleaver Scientific Ltd.
Unit 41
Somers Road Ind. Est.
Rugby
Warwickshire
CV22 7DH

Declaration of Conformity

Product Name: GTS96 Thermal Cycler

Model Names: TC9610 /TC9610-230

All models comply with the following European standards:

EMC: EN 61326 (Group 1, Class B)

Safety: EN 61010-1 and EN 61010-2-010

To the best of my knowledge and belief, these units conform to these standards.

Name: Deb Cleaver
Position: Quality Assurance
Issue Date: 2016/08/04

Cleaver Scientific Ltd.
Unit 41 Somers Road Industrial Estate
Rugby
Warwickshire
CV22 7DH