Benchmark Scientific
TC-32 Mini Thermal Cycler
Instruction Manual

Benchmark Scientific

Thank you for purchasing a Benchmark TC-32 Mini Thermal Cycler. Please read this manual carefully before use.

This manual provides instructions on the set up and use of the TC-32 Mini Thermal Cycler. The manufacturer reserves the right to modify this manual at any time without prior notice. Please address any questions or service requests to 908 769-5555 or email info@benchmarkscientific.com.

Upon receipt of the cycler, inspect the outer packaging. Any shipping damage must reported immediately to transportation carrier. Unpack the instrument and any accessories. Keep the box until the cycler is set up and is in working order.

A. Instrument Overview

Specifications

Capacity	32x0.2ml tubes
Heating and cooling	Peltier
Screen	4.3" full color touch screen
Temperature range	0-99°C
Heating/cooling rate	Max 4°C/second
Temperature uniformity	±0.25°C
Temperature Accuracy	±0.25°C
Display Resolution	0.1°C
Control modes	Sim tube and Block
Adjustable ramp rate	Yes
Time/temp increments/decrements	Yes
Hold at 4°C	Yes
Power supply	Universal AC input, 85-265V, 47-83 Hz
Dimensions	232x182x157mm
Weight	2.9kg
Warranty	2 years

Resume when in pause mode) to resume cycling.

Skip - Skips the current step

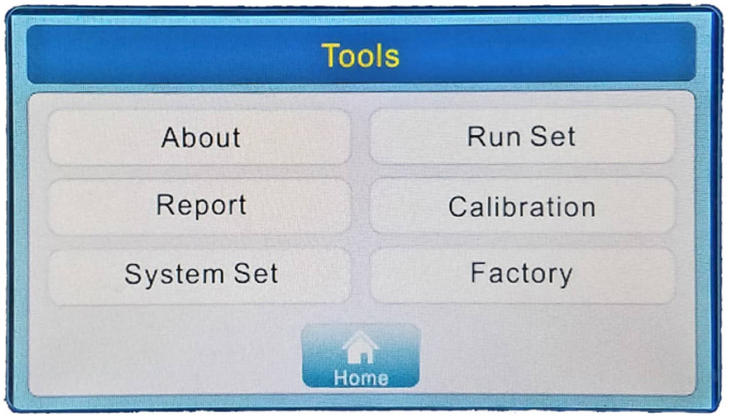
Stop - Stops the current run

F. Tools

The tools menu includes some of the "housekeeping" functions for the cycler as well as service only access. From the home screen, touch **Tools** to enter the Tools screen.

The menu functions are:

About - Touch for model and unit serial number



Report - Gives details of the most recent runs. Touching Report brings up a multi-page screen with the most recent runs. Touch the desired run to obtain the report.

System Set - Touch to set the date and time

Run Set - Touch this icon to change the default lid temperature (or turn the lid off), set the control mode (simtube is the default) and the default sample volume. For most users, the only function where a change may be desired is the default sample volume. All other functions should be left as is for standard operation.

Calibration - password protected, for service use only

Factory - password protected, for service use only

its set temperature.

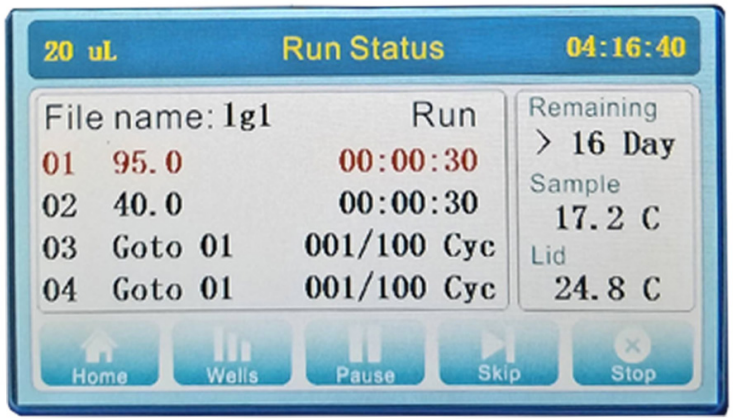
Note: To change the defaults in the Run Set screen, see Section F.

Programs can also be run from the Last Run screen. From the Home screen, Press **All Programs** and then press **Last Run**. Proceed as above to start the run.

3. View Run State and Control the Run

The status of a run can be viewed in the Run Status screen. This is the screen that appears after the run begins. From the home page, pressing the red **Running** icon will also show the Run Status screen.

The Run status screen consists of four sections:



Title bar - Located across the top of the screen, this bar shows the entered sample volume and current time. Touching the bar will give a run status report.

Protocol panel - Located in the screen center on the left side, this panel shows the current running step, in red, and the next three following steps. Touch the protocol panel to show the detailed protocol.

Status panel - This panel, opposite the protocol panel in the center of the screen, shows the estimated time remaining in the run, the calculated sample temperature when in sim-tube mode, or block temperature when in block control mode or idle, and the lid temperature. Touch this panel to show a graphical representation of the cycling in real time.

Function icons - along the bottom of the screen are five function icons:

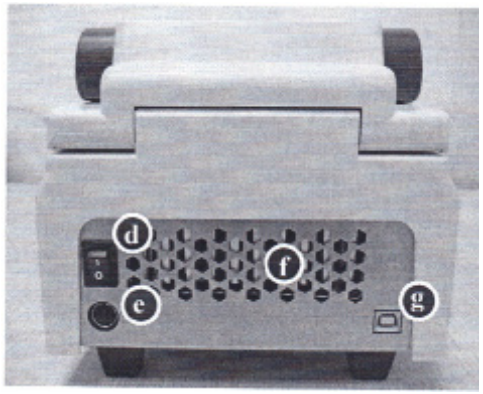
Home - returns to the home screen

Wells - shows the current/calculated temperature of each row

Pause - Pause the running program until the button is touched again (shows

1. Instrument Components

Front of Instrument
a. Lid
b. Lid Handle
c. Touch Screen



Rear of Instrument
d. Power Switch
e. Power Inlet
f. Air Vents
g. USB-B Port

2. Menu Overview

The thermal cycler features a touch screen. All menu items are selected by touching the icon or data entry area on the screen with your finger.

IMPORTANT! Do no use sharp objects on the touchscreen as they may scratch the surface.

There are a number of icons that are common to many of the screens including the following:

Home - returns to home screen
Back - returns to the previous screen
Up and down arrows - move between pages

Right and left arrows - scroll left and right to view graphs
OK - accepts entry
Cancel - Closes the screen without saving the entry
Run - Runs the selected program

The virtual keypad is alpha numeric - it contains both numbers and letters. Simply touch a number or letter to enter. There is no space bar. The hyphen can be used to separate words. To delete the last character in a field, press the backspace key.

B. Getting Started

1. Install the Thermal Cycler

The thermal cycler is intended for indoor use with an ambient temperature from 10 to 30°C and 20-80% noncondensing humidity. Choose a location that is level, and away from heaters, air vents from other equipment. Do not place the cycler next to equipment that vibrates such as a centrifuge or refrigerator. The recommended distance from the back of the cycler to the wall is 20cm. Cyclers may be placed side by side. The location should be near a power supply. The cycler supports universal voltage, 85-265V AC, 47-83 Hz, 4.0A. Be sure that the rated load of the power outlet meets the instrument requirements.

Connect the external power supply to the rear of the instrument. Connect the external power supply to the power cable and connect the power cable to a 3-prong, grounded outlet. Ensure that the power cord is appropriate for your local voltage. To power the unit on, locate the power switch, on the back above the power inlet, and turn to the "I" position. To power off, turn the switch to the "0" position.

The thermal cycler features a spring loaded, heated lid. The lid automatically adjusts to firmly press on the top of the reaction vessels to protect samples from condensation.

CAUTION: The inner lid of the thermal cycler can reach temperatures up to 105°C. Keep hands away from the surface.

To open the lid, lift up on the handle to unlock and then keep opening vertically to expose the block.

To close, press the lid down until it touches the chassis of the instrument and then press the lid handle down until the lid is locked in place. It is important to close the

Press **OK** when finished.

To enter a program without saving, press **Run** from the Edit Program screen.

2. Editing an Existing Program

a. From the Home screen, touch **All Programs**.

b. Touch the name of the program you wish to edit. It will open in the View Program screen.

c. Touch **Edit** to open the Edit Program screen.

d. Edit the program and then save or run without saving as per the instructions in the New Program section above.

Alternatively, a program can be edited from the Last Run screen.

a. From the Home Screen, touch **All Programs**.

b. From the All Programs screen, press **Last Run**.

c. Choose a program from the last run screen and touch to open.

d. Edit as per previous instructions.

E. Performing a Run

1. Load Samples

a. Place the PCR tubes into the sample wells of the sample block.

CAUTION! The block and/or inner lid surface of the cycler may be very hot - 105°C or higher.

Note: The caps must be tightly sealed to prevent sample evaporation. The height of all tubes should be the same so that even pressure is applied by the lid. Keep sample wells clean.

b. Close the lid.

2. Select the Program to Run

a. From the home screen, touch All Programs.

b. In the All Programs screen, touch the name of the program you wish to run.

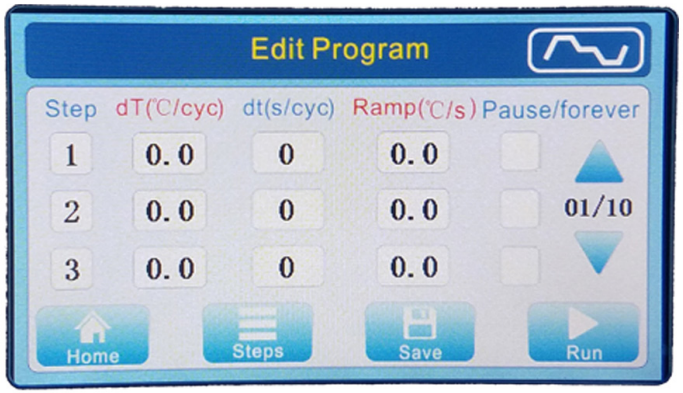
c. The program will open in the View Program Screen. Touch Run to open the Run Set screen.

d. Set the volume in the Run Set screen and press OK. The Run Status screen will open and the program will begin running.

Note: The sample temperature will not start to rise until the heated lid has reached

for the step - **Insert, Delete, Cancel**. Pick the desired operation and continue with programming.

Pressing the **Options** icon at the bottom of the screen brings up the screen below. The following options can be added to the steps and entered in this screen:



dT(°C/cyc) - Add or subtract a temperature increment with each step. Positive or negative vales may be entered. Allowable range is 0.1°C to 9.9°C.

Note: Parameters can not be entered that will allow the temperature of the unit to fall outside of its settable range.

dt (s/cyc) - Add or subtract a time increment with each step. Allowable range is 1 sec to 120 sec.

Note: Parameters can not be set that allow the time to fall below zero seconds.

Ramp(°C/sec) - Allows the setting of a slower (than the default maximum) heating or cooling rate from the previous step to the current one. Allowable values are 0.1°C/sec to 4.0°C/sec.

Pause/Forever - Entering a check mark in this field will automatically pause the program when the desired step temperature is reached. The instrument will beep twice to indicate it is paused. To continue the run, touch the **Resume** icon on the run status page. Pause is useful for adding reagents during PCR or setting a hold sample (ie 4°C) after cycling.

At the top of the Edit Program screen is a small graph. Touching this will show a graphical representation of the program.

After program entry is completed, touch the **Save** icon to name and save the program. The default name is the date and time. This can be changed by touching the name field to bring up the keyboard. Names can be up to 8 characters long.

lid until it locks to place the tops of the tubes and the heated lid into contact with each other.

2. Home Screen

Upon turning the thermal cycler on, the home screen, shown below will appear.

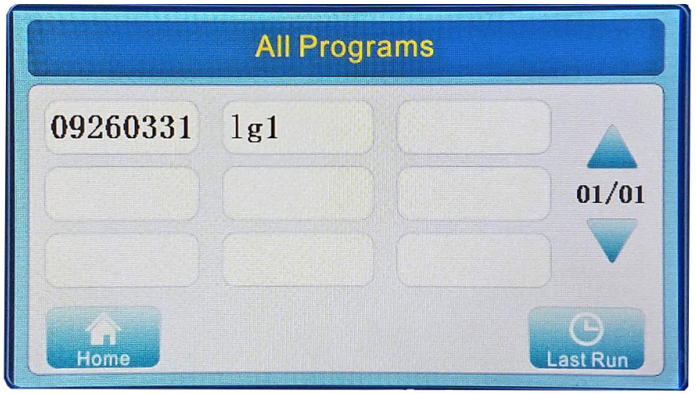
The screen has 4 icons and a bar showing the current date and time. The functions of the four icons are (left to right):

New Program - Create a new program
All Programs - Open a list of all saved programs
Tools - Set time and date, include service access
Status - Open the run status screen (turns red when a program is running)

C. View and Manage Programs

1. View Programs

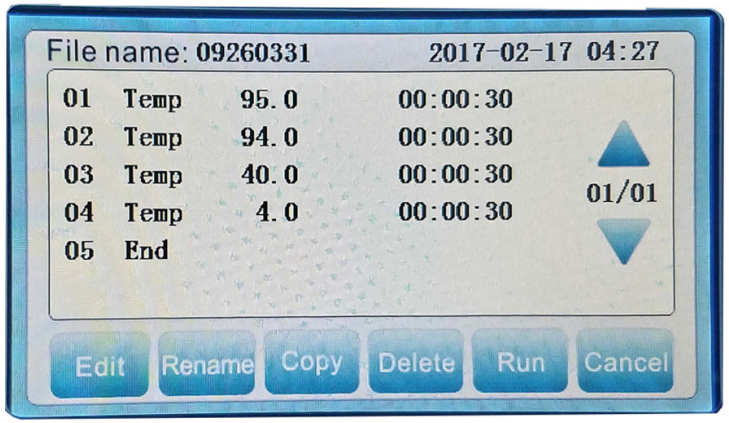
From the home screen, touch **All Programs**. The All Programs screen will open. This screen lists all programs that are saved on the cycler. Use the up and down



arrows to move between the pages. Touch the icon **Last Run** at the right bottom of the screen to see a list of the last 9 programs run on the cycler. Touch any program name to view a program. Touch the **Home** icon to return to the home screen.

2. Manage Programs

From the Home screen, touch **All Programs**. In the All Programs screen, locate the program you want to view and touch the program name. The following screen will appear with 6 function icons along the bottom of the screen. Use the up and down arrows at the right of the program screen to scroll through the program steps.
The icons along the bottom of the screen have the following functions:



Edit - Press to view and/or edit program steps (see section D for details)

Rename - Press to open the Rename screen. Rename the program and touch **OK** to accept the changes or **Cancel** to return to the previous screen.

Copy - Opens the Copy Program screen. Enter a name for the copied program and press **OK** to save or **Cancel** to exit without saving.

Delete - Upon pressing this icon a popup screen appears with the choice to delete the program. Press **Yes** or **No**.

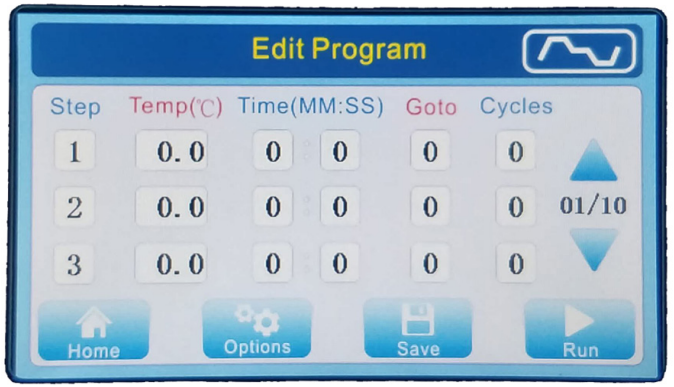
Run - Pressing this icon opens the Run Set screen. You will be prompted to enter the sample volume in µl, then press **OK** to start the run or **Cancel** to return to the previous screen.

Cancel -Press to close the current screen and return to the All Programs screen.

D. Create and Edit Programs

1. Create New Program

From the Home screen press **New Program** to show the edit program screen.
This screen is where program parameters, including time, temperature and number



of cycles are entered. Pressing the **Options** icon at the bottom of the screen allows for temperature and time increments, ramp rates and pauses to be set for individual steps, if desired.

A PCR program is made up of several steps. The maximum number of steps for a program is 30.

Enter Step Temperature and Time: To enter a temperature, touch the **Temp** field for the given step and enter a value. To enter a time, touch the **Time** field and enter a time. There are two fields for time - minutes and seconds.

Note: The allowable temperature range is from 0.1°C to 99.9°C in 0.1° increments. The allowable time range is from 00:00 to 59:59 min:sec.

Set Cycles: Cycles are set with the Goto function. After entering the values of the last step desired in a cycle, select the step below and enter the number of the first step of the cycle in the **Goto** field. Enter the number of cycles in the **Cycles** field.

Note: the number of cycles must be between 1 and 99. The actual number of cycles will be N+1 where N stands for the entered cycle number. If you wish to perform a PCR reaction with 30 cycles, enter a value of 29.

A typical PCR program might be entered as below:

Step	Temp	Time	Go To	Cycles
1	95	1:00		
2	95	0:30		
3	55	0:30		
4	72	0:30		
5			2	29

Steps can be inserted or deleted by simply pressing the step number to be deleted or where a step is to be inserted. A window will open that asks for the operation