WELPCR

User Manual

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1 Introduction to WEL-PCR

WELPCR is a PCR (Polymerase Chain Reaction) machine made by taking OpenPCR as a reference. The main improvement made in WELPCR with respect to OpenPCR is that WELPCR is a standalone device and does not require external device like computer or mobile to configure it.

1.1 System Overview

The PCR base includes:

- **Reaction Module Bay** - It holds the inserted reaction module
- **Reaction module locking bar**-It locks the inserted module in place
- **Control Panel**- It provides access to all the functions needed to create and run PCR protocols .
- **Air vents**-Air Vents allow the thermal cycler to heat and cool quickly .

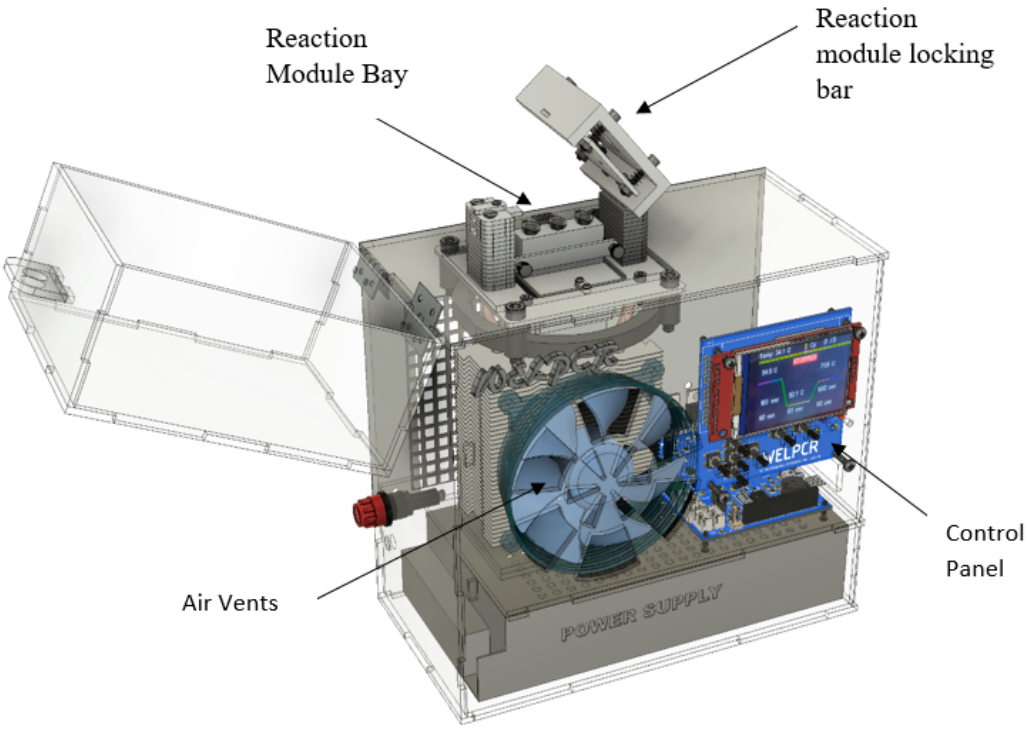

Figure 1: Front view of the WEL-PCR

- **Liquid crystal display(LCD)**-It displays the main menu and the other screens.

- **Command and navigation keys**-We can use these keys to set the desired reaction parameters and to navigate various screens.
- **Tube holder**-The tube holder is the main part of this PCR which can hold 3 microcentrifuge tubes into this block. This block is heated by Peltier.
- **Peltier**-A Peltier is a heat pump that can pump heat from one side to the other side depending on the direction of the current flow. We can heat and cool the same side just by inverting the supply connections. So both rising and lowering the temperature can be controlled precisely.
- **Lid heater**-Lid heater is a ceramic 12v 40W ceramic cartridge heater, commonly used in 3d printers .

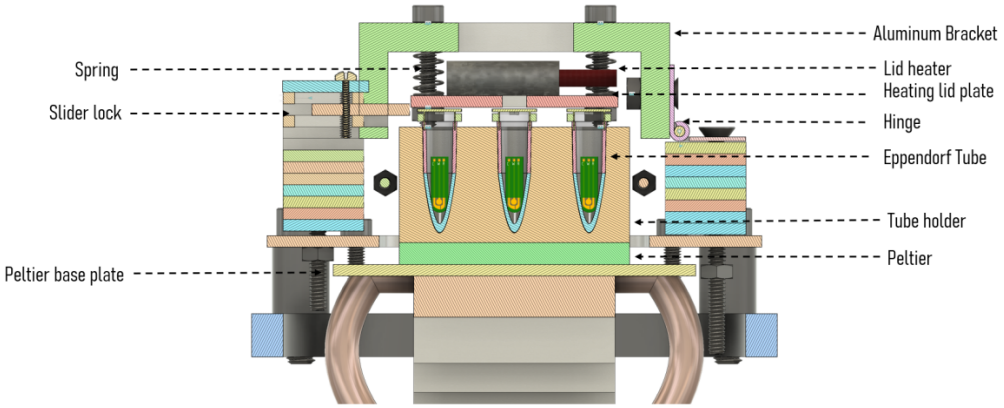

Figure 2: Crosssection view of the WEL-PCR

- **Heating lid plate**-The heating lid plate is heated by a lid heater. This plate is used to heat the lids of tubes to avoid condensation of liquid sample vapor underneath the tube cap.
- **Aluminium Bracket**-:It is a solid square bracket '[' shaped lid. This is the lid that presses the heating lid plate on the lids of the tube. Tension on the heating lid is maintained due to the spring between the bracket and the heating plate.
- **CPU cooler**-There is no CPU in this PCR machine, but this big heat sink with a cooling fan is a part of the desktop CPU used for cooling the microprocessor. This CPU cooler is used to sink(while decreasing the temperature) and source(while increasing the temperature) the heat.
- **Peltier base plate**- Peltier base plate is used as an interface between the CPU cooler and the Peltier. The shape and area of the Peltier and the CPU cooler are not the same ,so to collect heat from the whole area of the Peltier and to pass that heat to the CPU cooler, this Peltier base plate is used.
- **Microcentrifuge tubes**-These are tubes made for preparing, mixing, centrifuging, storing, and transporting solid and liquid reagents and samples. We use 0.2ml eppendorf tubes.

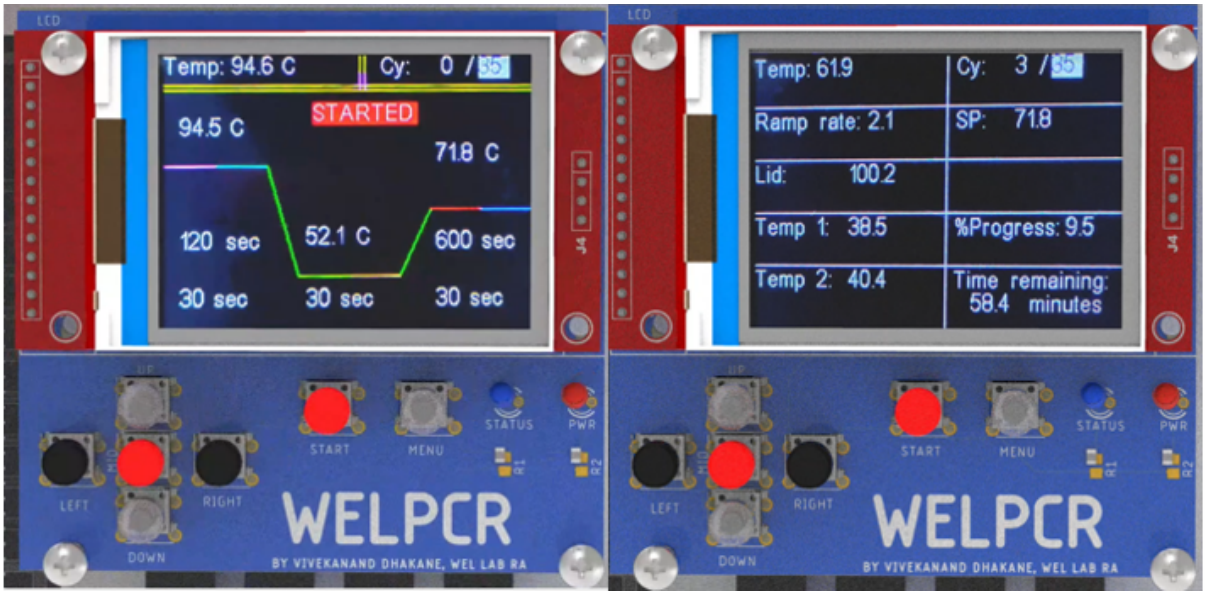

Figure 3: Components of the control panel on WEL-PCR

The main screen is displayed after the power is on. Figure 3 shows the components of the control panel. WELPCR has a 2.4″ touch screen 240x320 display.The display has two windows. The first window is the 'PCR Parameter Window,' and the second window is the 'PCR Parameter Monitor Window'. In the PCR parameter window, we can see the current parameters of the single PCR cycle, which are temperature and time for denaturation, annealing, and extension. These parameters can be selected and changed by the navigation keys. The second window, the 'PCR Parameter Monitor Window', is for monitoring the live parameters.

PCR parameter window:

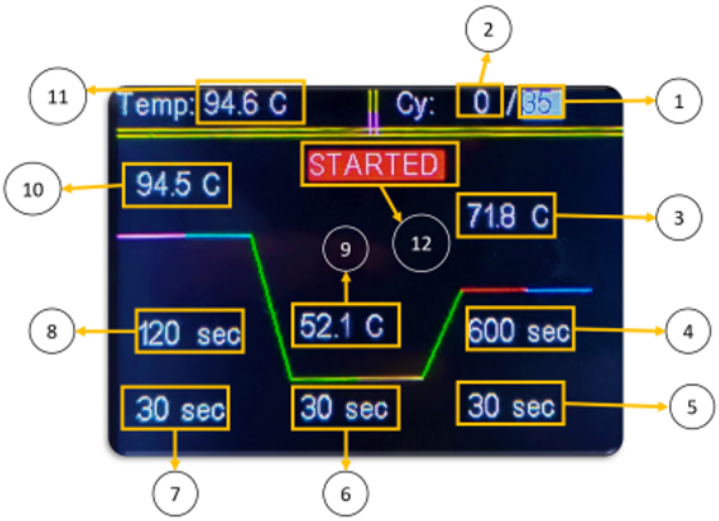

Figure 4: Details about the PCR parameter window

1. The total number of cycles
2. The number of cycles completed
3. Extension temperature
4. Extension time for the last cycle
5. Extension time of a single cycle
6. Annealing time
7. Denaturation time
8. Initial denaturation temperature
9. Annealing temperature
10. Denaturation temperature
11. The current temperature of the tube holder
12. 'STARTED' or 'STOPPED' indicates the current state of PCR.

PCR parameter monitor window:

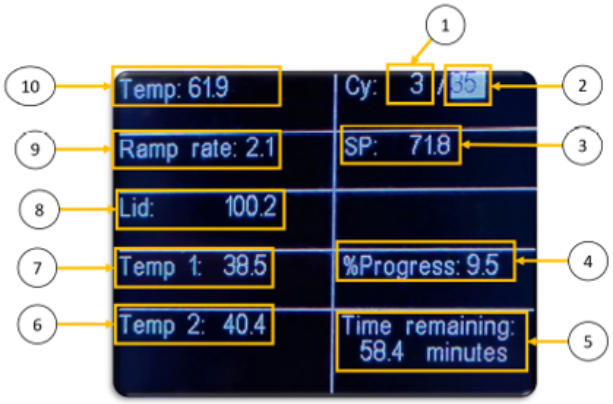

Figure 5: Details about the PCR parameter window

1. The number of cycles completed
2. The total number of cycles
3. The current set point of the PID controller
4. Percentage progress of the current PCR test
5. Time remaining for the current PCR test
6. Temperature measured by the temperature sensor probe
7. Temperature measured by the temperature sensor probe 2
8. Temperature of the heated lid
9. Current Ramp rate
10. Current tube holder temperature

PCR front panel:

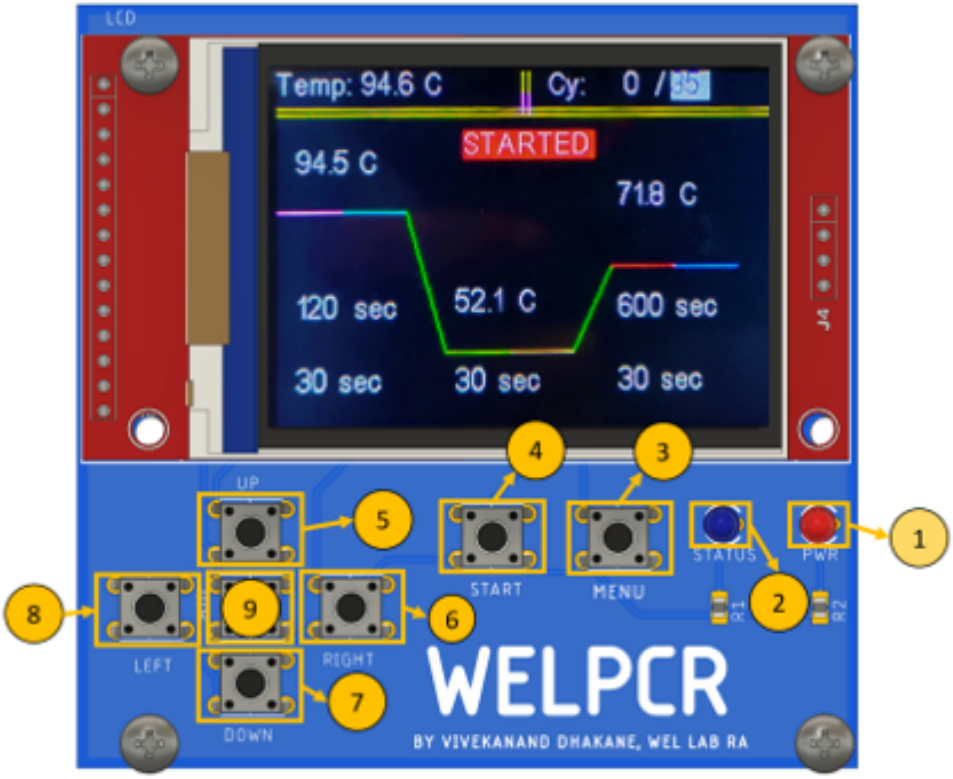

Figure 6: Front panel of WELPCR

1. Power LED
2. Status LED
3. MENU: To change the window
4. START: Long press to start or stop the test
5. UP: Shift the cursor up
6. RIGHT: Shift the cursor right
7. Down: Shift the cursor down
8. LEFT: Shift the cursor left
9. MID: Select the parameters

2 Operating Procedure

1. Set up the PCR reaction as per the protocol. Apply thermal paste to the tube walls and insert the tubes in the tube holder. Carefully lock the lid ensuring no gap between the tube and the lid to avoid condensation.

2. On PCR Parameter Window, navigate using the navigation keys. Select the parameters to be changed using the MID button, the parameter gets highlighted in green, and adjust them using the navigation keys. Once the value is set for a particular parameter again press the MID button. Repeat similar steps until all the values are set as per the reaction conditions. UP and DOWN keys change the parameter by 0.1 if it is temperature and change it by 1 if it is time and cycle. LEFT and RIGHT buttons change the parameters by 10.

3. Once the parameters are set, long-press the START button to start the test. The status on the screen will be changed to STARTED. Change the window using the MENU button to see real-time parameters like remaining time and percentage progress.

4. Once the test is completed, the status on the screen will be changed to STOPPED.

3 Maintenance

3.1 Cleaning

The WEL-PCR requires little maintenance for proper operation and precise thermal control. However,with long and constant use,the thermal cycler requires some cleaning and maintenance .

Do's

1. The WEL-PCR should be cleaned with a soft cloth on a regular basis and occasionally use IPA to remove any debris or dirt that might interfere with proper functioning.

2. To prevent electrical shock,always turn off and unplug the instrument before cleaning it.

Dont's

1. Do not use abrasive detergents or rough material since they scratch the control panel.

2. Never use cleaning solutions that are corrosive to aluminium. Avoid scratching the surface of the bay which interfaces with precise thermal control.

3. Never pour water or other solutions in the reaction module bay. Wet components can cause electrical shock when the thermal cycler is plugged in.

3.2 Important Instructions

1. If the WEL-PCR does not turn on, first check that the power cord is plugged into a functioning power source. Also, check that the power cord and power source are within the specifications of this instrument.

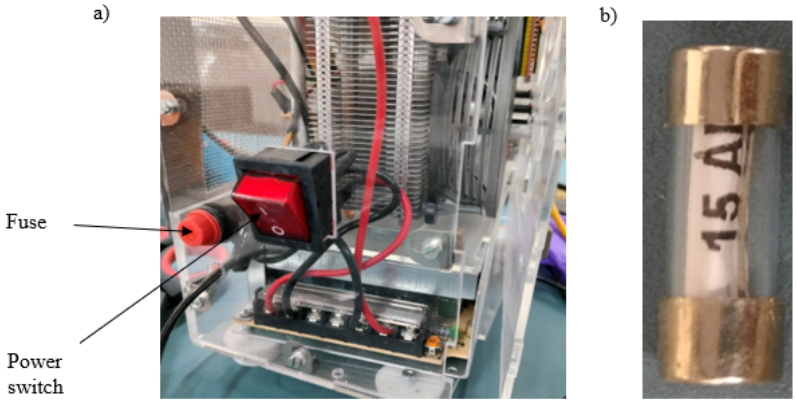

Figure 7: Details of the fuse a) Position of the fuse b) 15A fuse

2. To prevent electrical shock, always turn off and unplug the instrument from an electrical outlet before checking the fuses. If the fuse is damaged, replace it with the correct fuse and close the knob. A bad fuse shows a broken or burned spot in the metal; a good fuse has intact metal.

In case of any problem or queries kindly contact us.

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