Report on: Cryocooler Controller Manual (Version~1.2)

Arjun Ghosh

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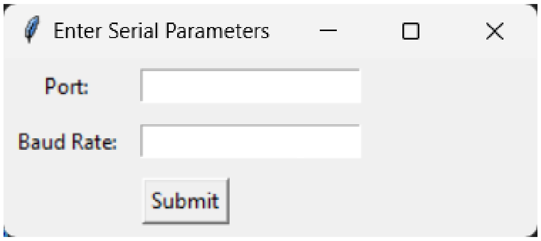
ABSTRACT

The Cryotel-MT Cryocooler (to be used for APSERa) from SunPower, was previously operated via serial communication through Putty. Currently, there is a GUI based communication terminal, that has been developed via which we shall be controlling the Experiment.

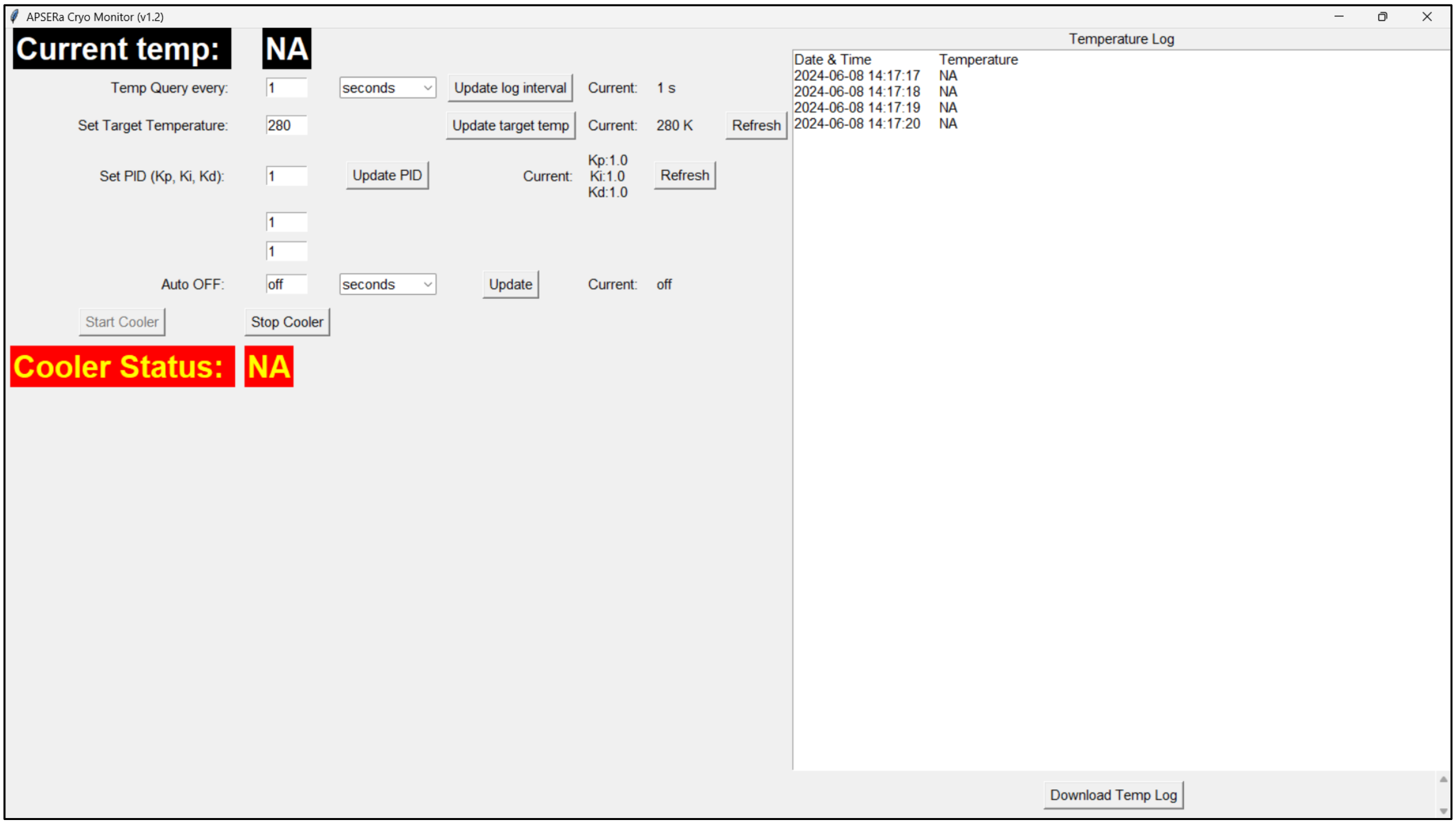
Description of Terminal

How to Run: The code (Cryotel_controller_GUI.py) is available here. We need to download the code and the requirements.txt, for an error free operation. Install the dependencies in a venv. Open terminal in the code directory and then run the py file.

This shall open up this dialog box, where you need to type the port name and baud rate values. And you need to **PRESS SUBMIT** to enter into the GUI.



We will see the GUI like this:



Current temp: NA

Temp Query every: 1 seconds Current: 1 s

Set Target Temperature: 280 Current: 280 K

Set PID (Kp, Ki, Kd): 1 1 1 Current: Kp:1.0 Ki:1.0 Kd:1.0

Auto OFF: off seconds Current: off

Cooler Status: NA

```
Date & Time          Temperature
2024-06-08 14:17:17  NA
2024-06-08 14:17:18  NA
2024-06-08 14:17:19  NA
2024-06-08 14:17:20  NA
```

Explanation of the fields:

Current Temperature: Displays the current temperature of the cryocooler feeding the input from the RTD based thermometer PT-100 put on the copper plate. The temperature is refreshed every 5 seconds. Which can be changed only from code.

Temp query every: We can choose the interval with which the Temperature logger in the right pane logs. On setting the required time interval, by choosing the unit from the drop-down menu, click on **'Update Log Interval'** button to save changes. The current value of Query interval is shown next to the button. No default value.

Set Target Temperature: User can type in the target temperature in Kelvin in the white box and click on **'Update Target Temp'** button to save changes. On pressing the button, the current target temp string also is changed to the present value. We can also at any point of time click **Refresh** button at the end of the row, to update the string to the current Target Temperature by querying. The default value is obtained by querying the controller and is not changed until you set.

Set PID (Kp, Ki, Kd): We can also set the Kp, Ki, Kd in the white box and click on **'Update PID'** button to save changes. On pressing the button, the PID string also is changed to the presently set value. We can also at any point of time click **Refresh** button at the end of the row, to update the string to the current PID values set, by querying. The default value is obtained from querying the controller and is not changed until you set it.

Auto off: We can automatically turn off the cooler after a certain amount of time. We can set the time in the white box and then select the units from the drop-down menu. Press the **Update** button next to it for saving changes. Then we press start cooler button in the next row. The cooler automatically performs the cooling and shuts down. If you wish to turn off this feature just type in **'off'.** The default value is 'off' which is loaded at launch.

Start Cooler and Stop Cooler: Press the **Start Cooler** button to start the cooler (Keep in mind of the preset value of the auto off choice above, which will be off as default).

The **Stop cooler** button is initially disabled and is only enabled, when the Start Cooler button is pressed. If the user did not set the auto off timer or wants to stop the experiment urgently, press the Stop Cooler button. When the experiment is in progress the Start Cooler button is disabled and is enabled when the experiment ends or the Stop Cooler button is pressed.

Downloading the data: On completion of experiment i.e. via auto off or manual shutdown, there will be one header file and another log file saved in the directory of the code. The auto save is called when one automatically finishes the experiment with the help of auto off timer option or presses the Stop Cooler button. At any point in time while the experiment is in progress, user can also download the Log by pressing the **Download Temp Log** button.

For queries or issues, please contact me! @ arjunghosh@ieee.org