Automation of Resistance Measurement - User Manual

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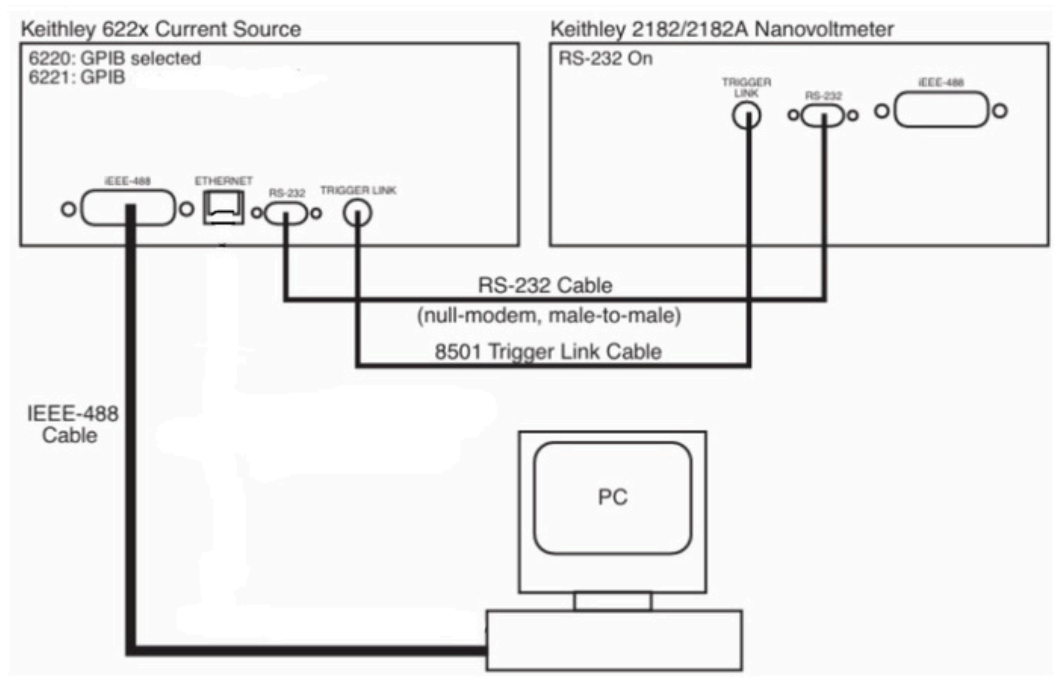
Connections:

Connection of Current Source:

- Connect the Current Source to the CPU with GPIB cable.
- On the model 6221, Set the COMMUNICATIONS SETUP to GPIB:
  - Press COMM to open the COMMUNICATIONS SETUP menu.
  - Select the GPIB interface.
  - Set the GPIB address (0 to 30) and press ENTER.
  - Select SCIP language.

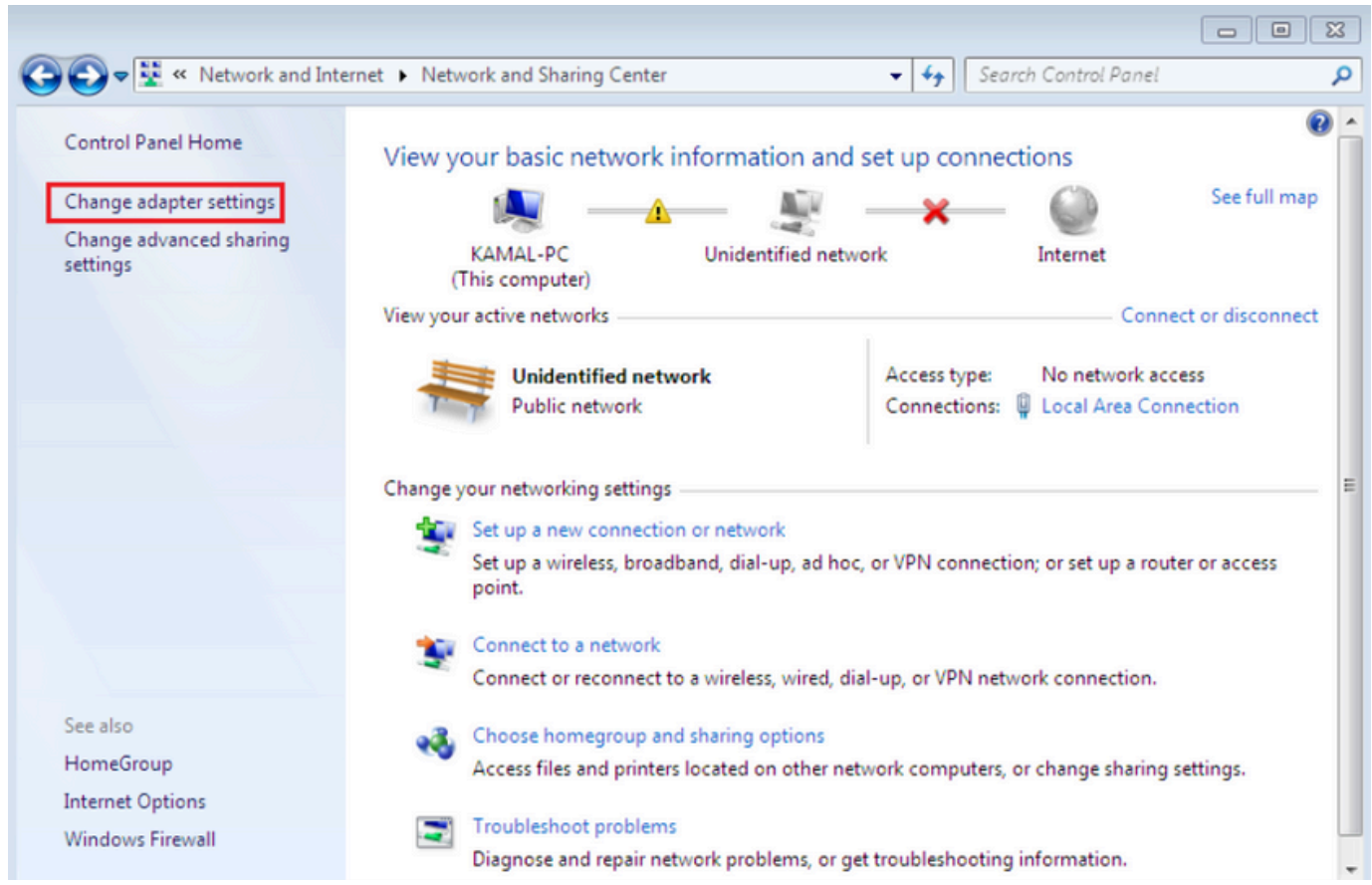
Connection of Nanovoltmeter:

- Connect the Nanovoltmeter to Current source with RS-232 (Male to Male cable) and Trigger link Cable.
- On the Model 2182A, press the **SHIFT** key and then the **RS-232** key to access the RS-232 menu. From this menu, configure the RS-232 as follows:
  - Select **ON** for the RS-232 interface.
  - Select **19.2K** baud rate
  - Select the **NONE** settings for flow control.
- Connect the cables as shown in the figure. (Refer Pg. No: 5-8 in the Current Source Manual).

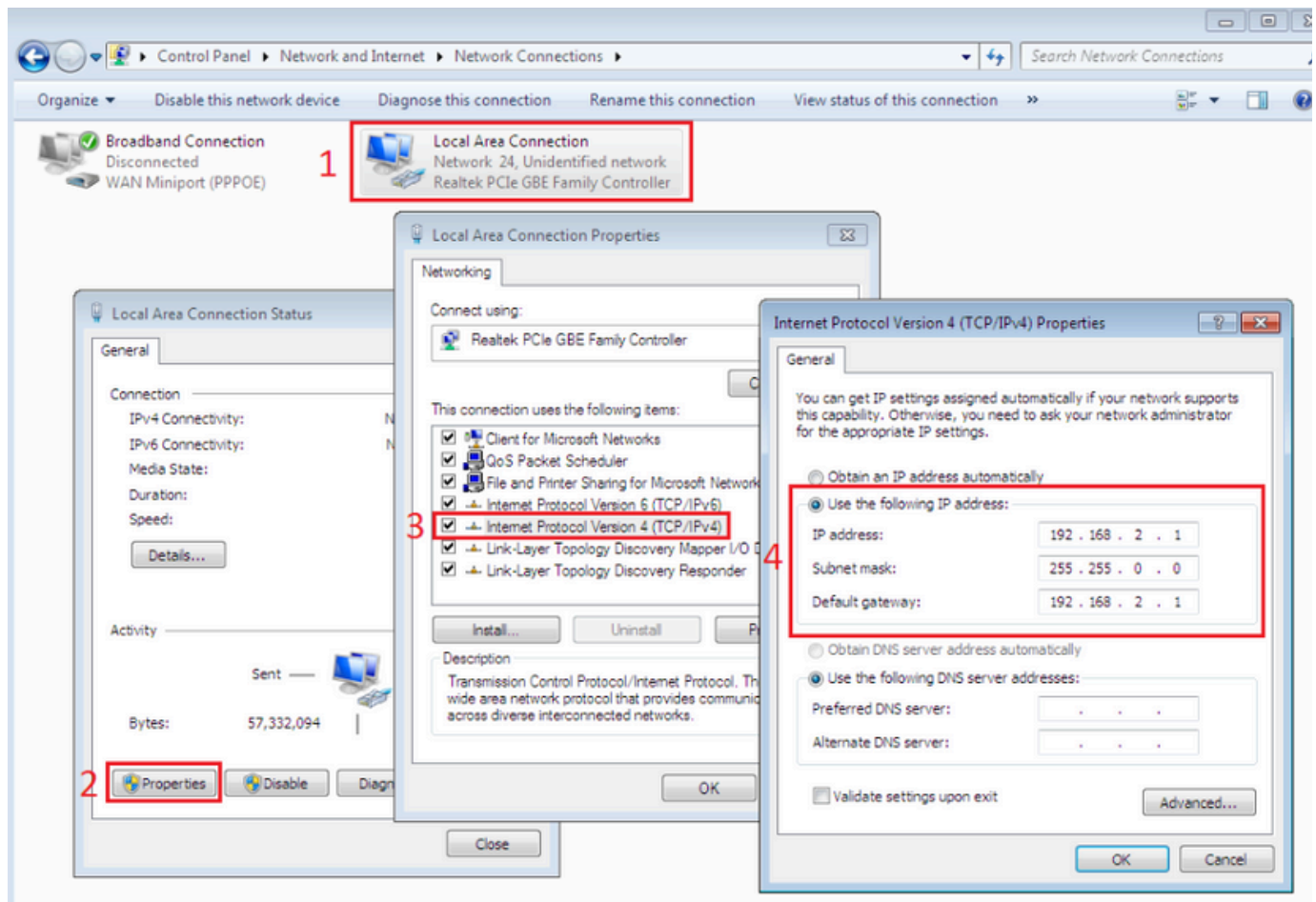


Connection of Temperature Controller (CTC):

- Connect the CTC to the CPU with Ethernet Cable.
- In windows, go to **Control Panel\Network and Internet\Network and Sharing Center** & select Change adapter settings



- Then set the configurations in the following order:

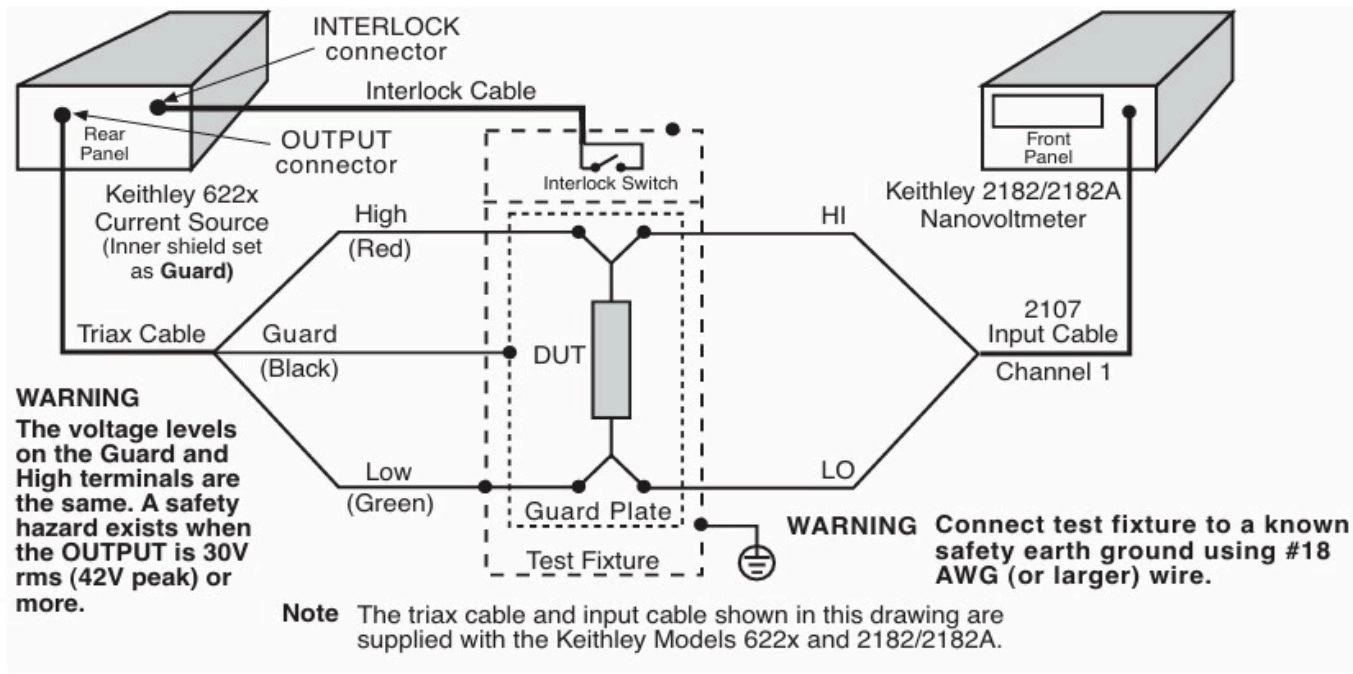


- And in the CTC device make sure that
  Address = 192.168.0.2
  Telnet= 23
  Gateway= 192.168.2.1

(These were the last tested & working configurations, recommended that you follow them)

Connection of Sample to the Instruments:

- Connect the sample to the instruments as shown in the figure. (Refer Pg. No: 5-10 in the Current Source Manual).

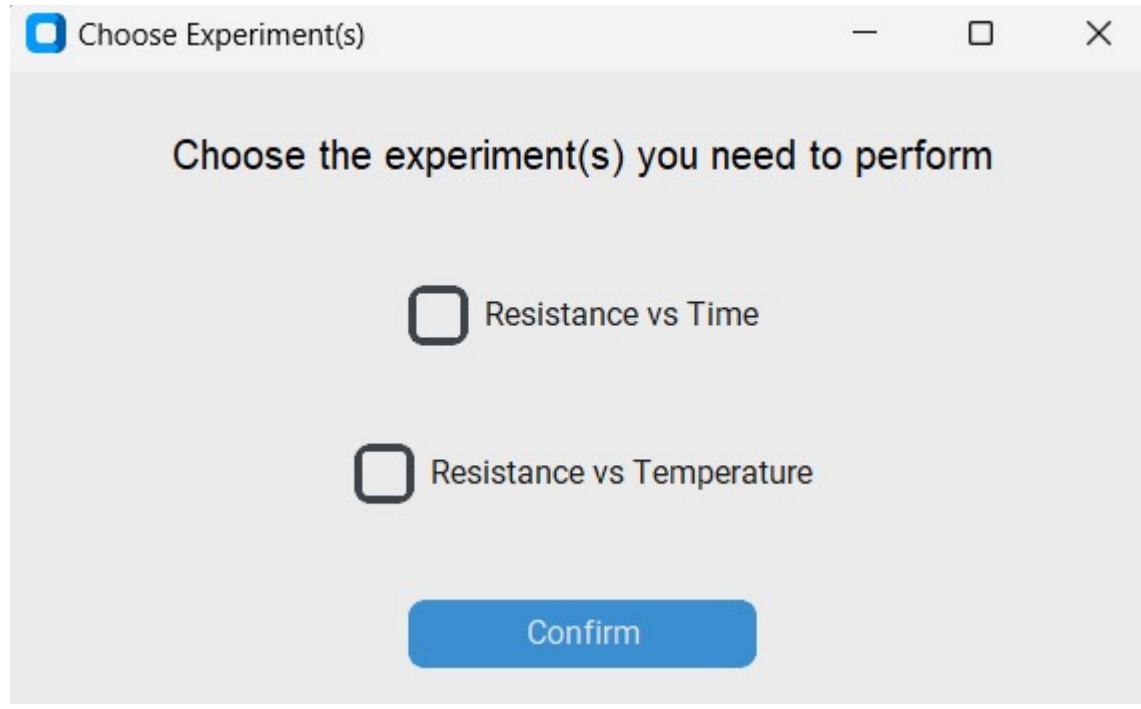


Starting Experiment:

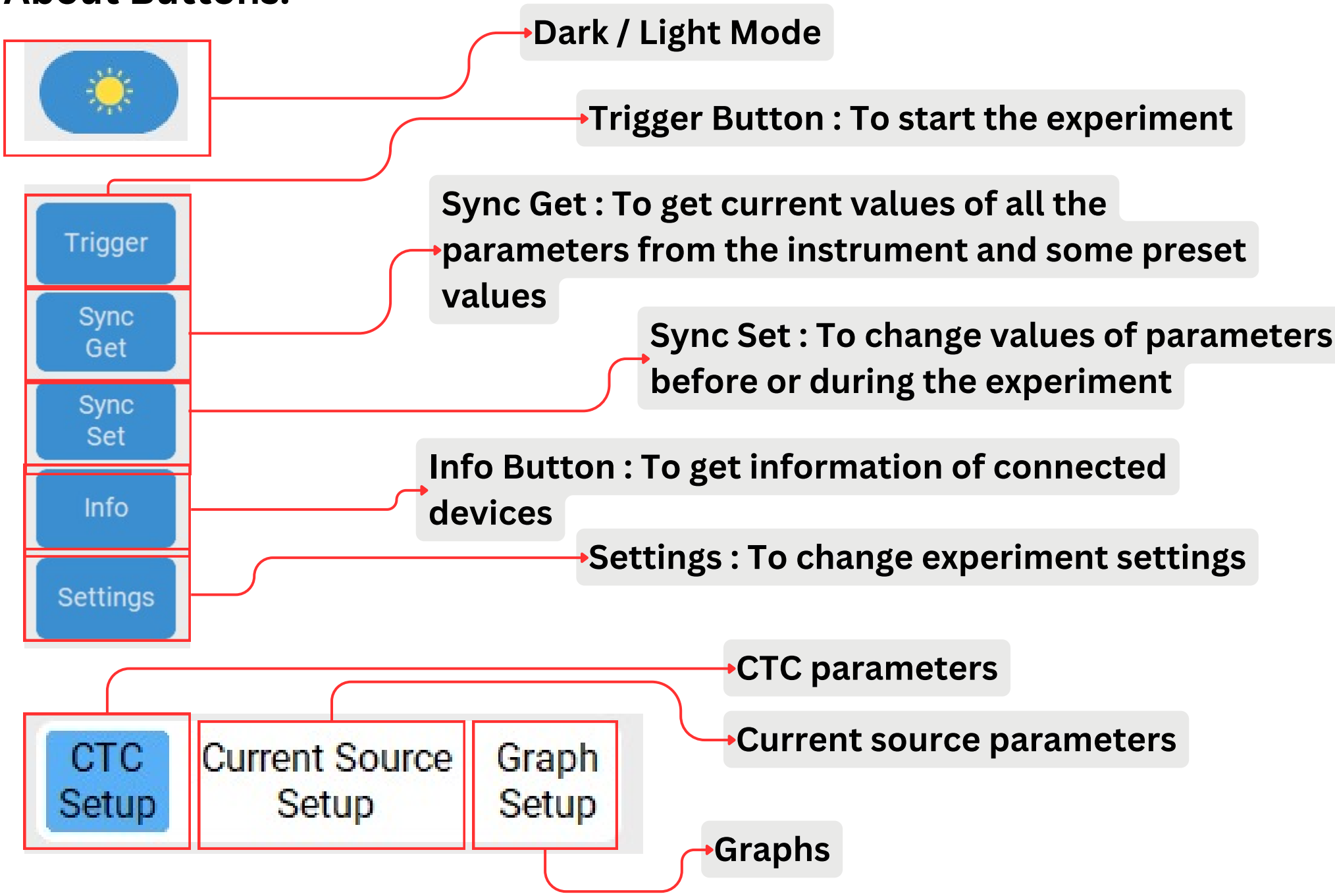
- Double click the shortcut bat file or run the code of the experiment from VS Code.

Experiment Selection:

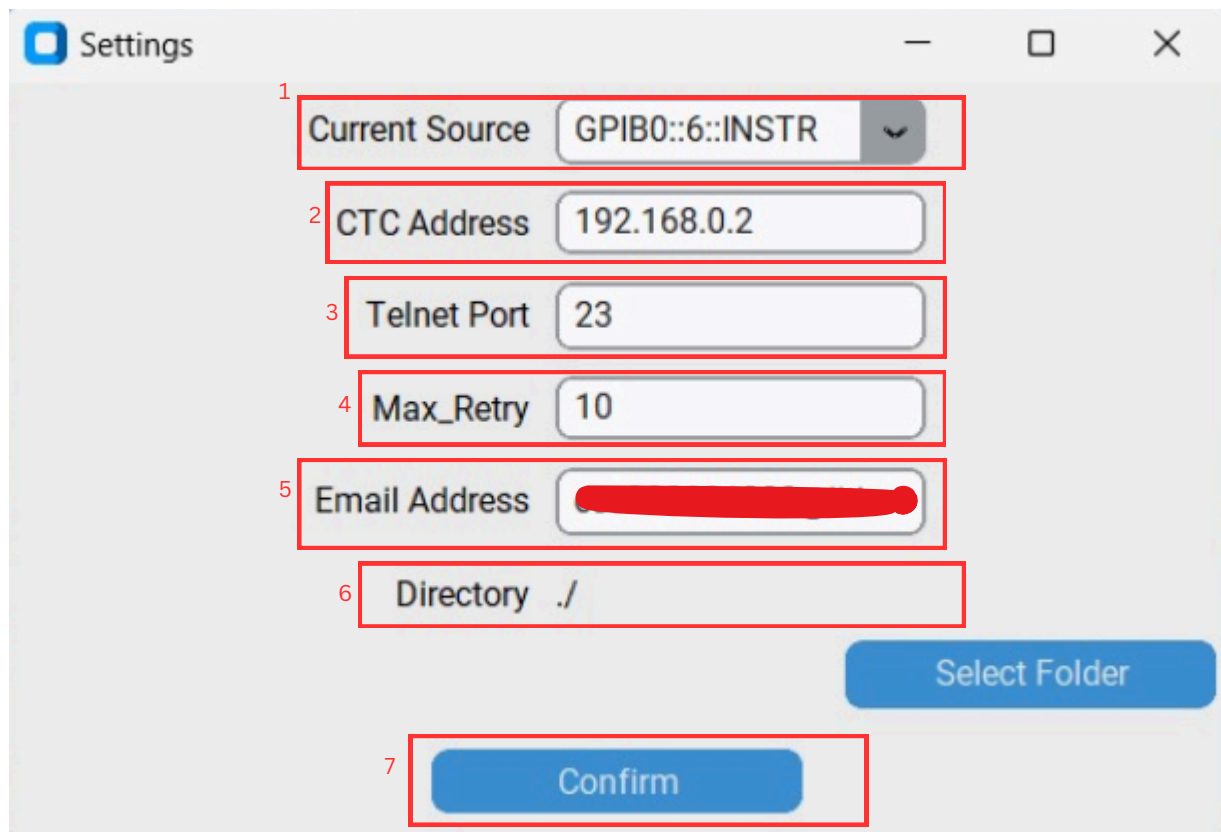
- A popup will be popped like below after running the Experiment. Select the required experiment to perform.
- Select any one or both of the modes



About Buttons:



Settings :

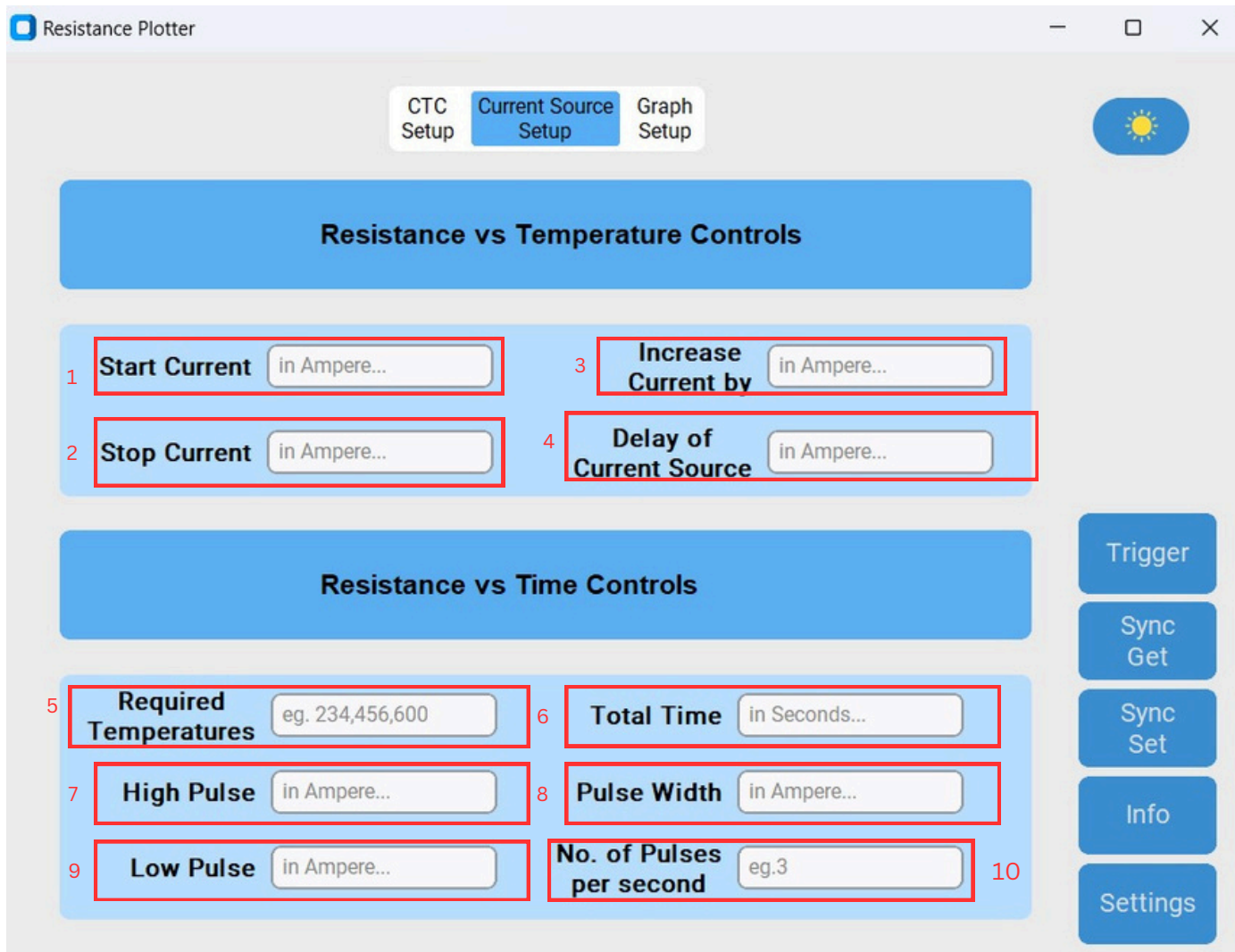


1. Address of Current Source
2. Address of CTC
3. Telnet Port
4. Max Retry for processes like retry number for communication with instruments, stabilizing temperature readings, etc.
5. Email ID for sending notification after the experiment is over.
6. Current selected directory for saving the data of the current experiment. To change this folder you can do so using the Select Folder option.
7. Press Confirm button after doing any change in the Settings.

CTC SETUP :

Inputs for the CTC:

1. Title: the name of the file to be stored.
2. Input channel: the channel through which input is provided.
3. Output channel: the channel through which output will be recorded.
4. Low limit: low limit of power (in Watts).
5. High limit: high limit of power (in Watts).
6. Increase by: the value by which power is to be increased (in Watts).
7. Max limit: maximum power that CTC can supply to increase by any temperature (in Watts).
8. P: P-value.
9. I: I-value.
10. D: D-value.
11. Start temp: the temperature from which you wish to begin to take readings from (in Kelvin).
12. Threshold: error allowed for achieving the final value of temperature at which reading is to be taken (in Kelvin).
13. Stop temp: the temperature at which you wish to stop the readings (in Kelvin).
14. Tolerance: error allowed for stabilizing to the final value of temperature at which reading is to be taken (in Kelvin).
15. Increase temp by: interval by which temperature is to be increased (in Kelvin).
16. Delay of CTC: delay after which CTC will start increasing the temperature (in seconds).
17. Complete cycle: if this button is clicked, the experiment will perform both heating and cooling cycle.

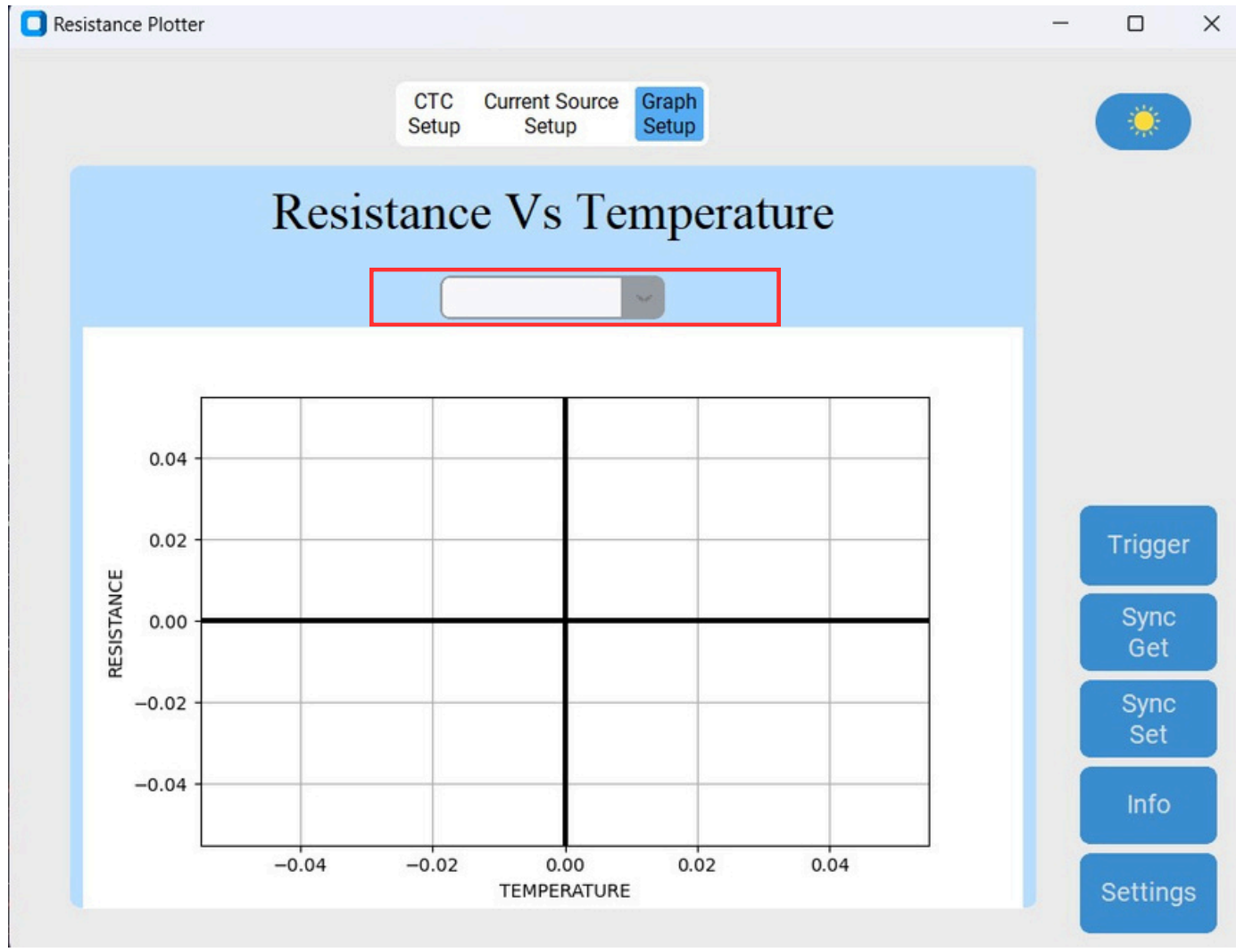


Inputs For Current Source Setup(Based on Modes Selected)

1. Start current: minimum value of current that will be passed.
2. Stop current: maximum value of current that will be passed.
3. Increase current by: value by which current will be increased from start to stop current.
4. Delay of current source: delay after which current source will start supplying current to the sample.
5. Required Temperatures: Temperature values at which Resistance is to be measured with time
6. Total time: Total time for which resistance is to be measured.
7. High pulse: value of high pulse (in Ampere).
8. Pulse width: wavelength of a single pulse (in seconds).
9. Low pulse: value of low pulse (in Ampere).
10. Number of pulses per second: number of pulses that will pass through in one second.

Resistance vs Temperature Mode

Resistance vs Time Mode



Graph Setup

- Shows the variation of resistance vs temperature and resistance vs time based on modes selected
- For graphs at given temperatures in resistance vs time mode select the desired temperature in the combo box
- Upon completion of the experiment an automated email will be sent to the designated recipient as configured in the settings. Additionally, all graphs and plotted data will be saved in the directory set in settings.