

Software Control

Easy to Use Computer Interface To Operate TC-1-100/i controllers

- Set reference temperatures from computers
- Save and read temperature log files
- Tuning the controller for wide temperature range operation
- Generate temperature sequences, including ramps
- Graphical presentation of temperature readings
- Manipulation of temperature data, including ZOOM
- Measurements using cursors



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Automation Software, TC-SOFT

This Windows based software package allows to program TC-1-100 and TC-1-100i 2-channel controllers to automatically tune within wide temperature range, to run temperature sequences (up to eight steps), including ramps, and to save and read temperature log files in Excel format. The graphical presentation of the temperature recordings allows to visualize and measure data using ZOOM features and moveable cursors.

Programming features allow to built the sequence protocol for each channel independently, with sec, min or hour resolution, up to 999 hours long for each step. The sequence can be visualized before execution. It is automatically stored in the controller memory, and retrieved by the program. The protocol can also run as a loop continuously. The protocol execution can be PAUSED in the middle of the protocol.

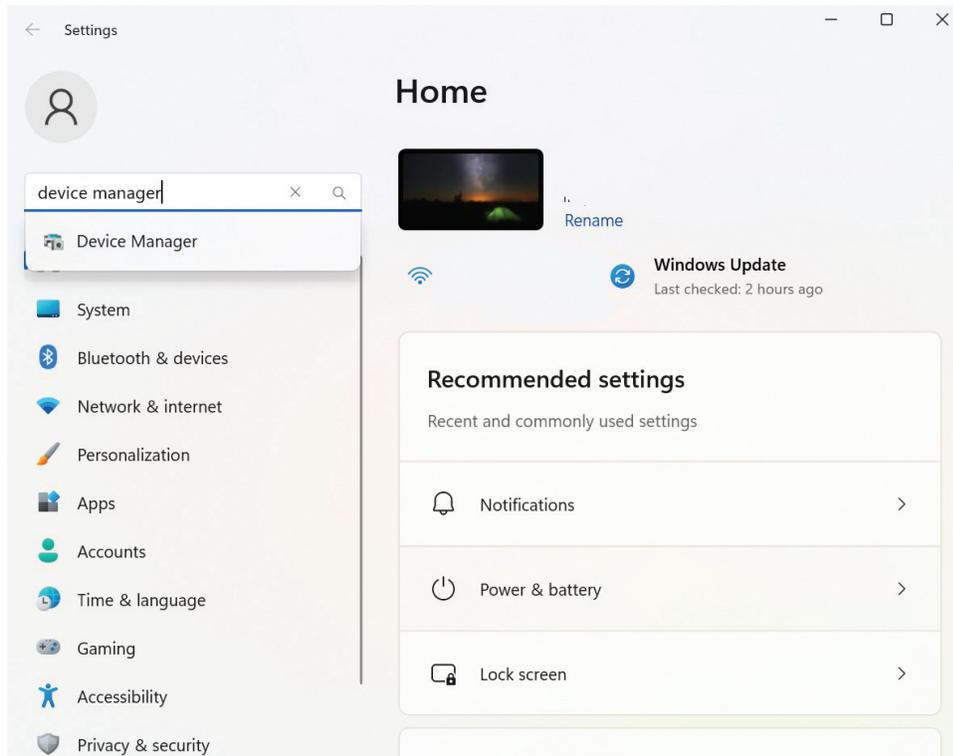
The package comprises two major parts: hardware control (including recording log files) and reading the log files. The first part also allows to edit and execute the temperature protocols, and to tune the controller to work in wider temperature range.

After purchasing, a link to download the installation package will be sent by email. Ships separately: USB adapter and RS232 NULL MODEM cable to connect to the controllers.

Quick Tour

Configure USB port

Insert the provided USB adapter into available USB port on your computer. Go to Windows **SETTINGS** and type “device manager” inside **SEARCH** window, and select **Device Manager**:



In **Device Manager** window, find **Ports (COM & LPT)** listed, and extend this list to show:

USB Serial Port

Double-click on this port to open another window to adjust the port settings. The port should be configured to the following settings:

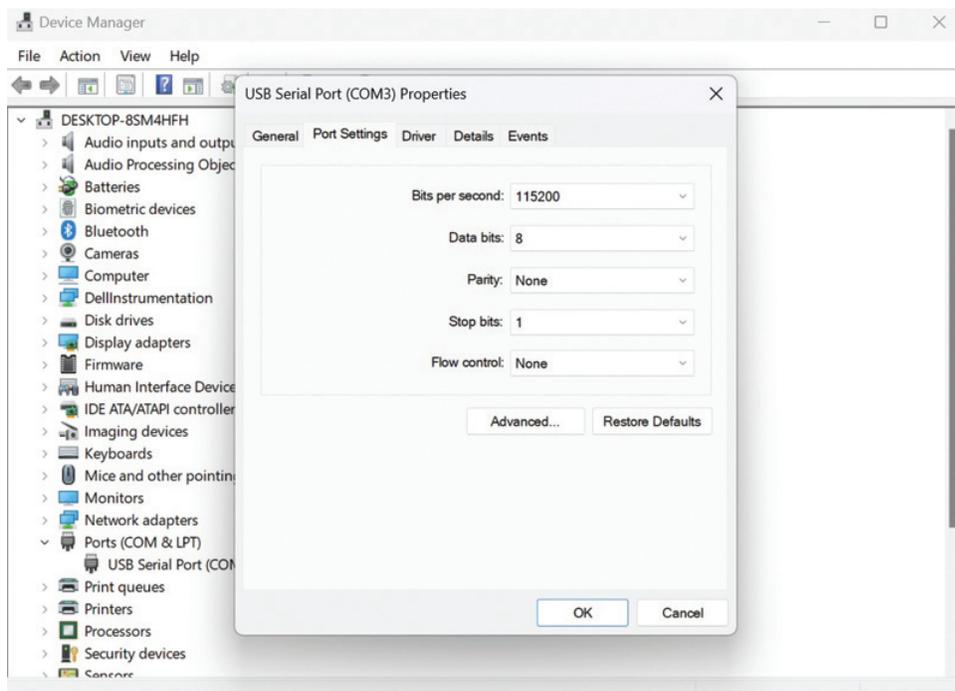
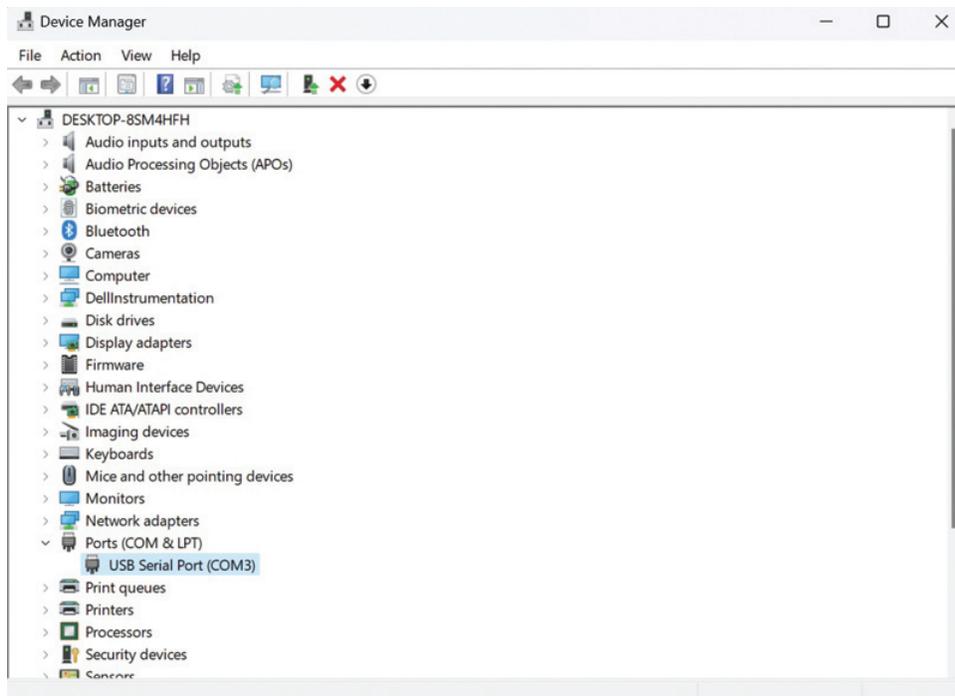
Bits per second: 115,200

Data bits: 8

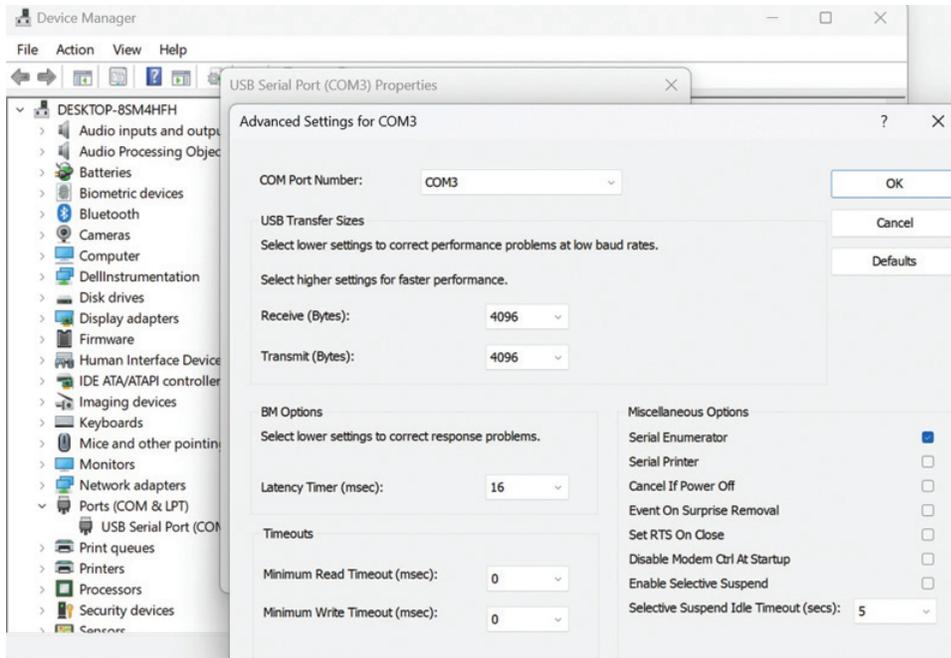
Parity: None

Stop bits: 1

Flow control: None



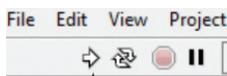
Click button “Advanced”, select the number for the port “COM3”. If for some reasons COM3 is not available, you need to contact us to readjust the software to use another port name/number. Click button “OK” to save the changes and close the window. Click button “OK” again on the next window and close **Device Manager** window and Windows **Settings** window. Connect the provided NULL-MODEM cable to the USB adapter and to the controller.



Before using the software package, the controller has to be powered ON. Otherwise, it will not be recognized by the software.

Start recording

After double-clicking the executable file, TC_WRITE.exe, a general window will open. There are two graphs to show temperature readings from both channels of the 2-channel controller, and a separate area to show readings in real time as a text file. To start recordings, click “START” button on the top of the widow:

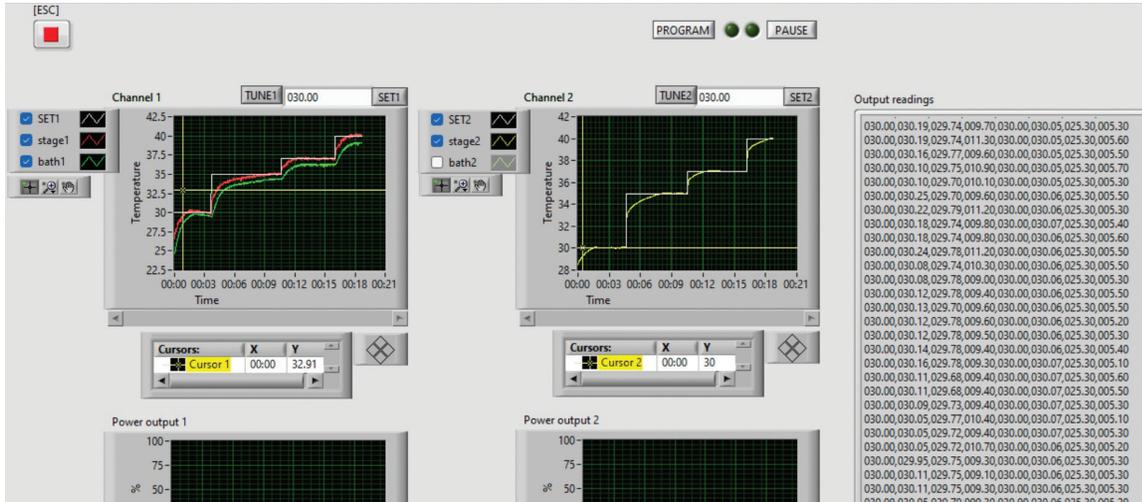


“START” button

The graphs will start showing changes in stage and bath temperatures, as well as in reference SET temperature, which are recorded every second (1 Hz). In case the heating element (stage) or the temperature probe (bath) are not connected, the room temperature will be recorded. A recording can be hidden by un-checking the corresponding box on the left side of the graph.

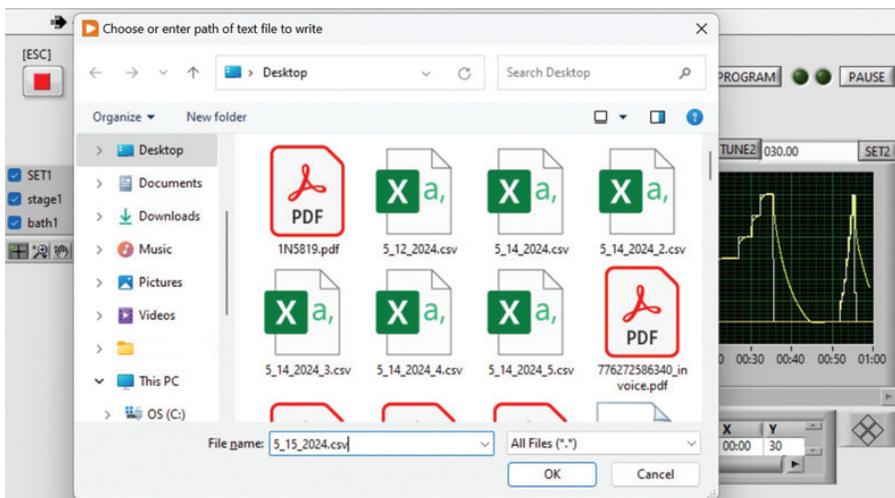
SET reference temperature can be changed by typing new values in the field above of the graph, and clicking button SET1/SET2. The controller should adjust itself to the new SET values automatically. However, if the temperature cannot reach the higher SET level, click button TUNE1/TUNE2 to switch the controller into TUNE mode. This should result in gradual increase in temperature of the heating element, provided the controller has powerful enough

power supply. The graph, that is below the temperature recordings, is the power output, showing percentage of total power used by the controller. If the controller cannot reach higher SET reference levels, it means the controller has reached 100% output available and needs a higher voltage power supply (contact us to upgrade the controller).



Stop Recording

To stop recordings, press “Esc” (escape) button on the computer keyboard, or click “ESC” button on the screen. This will result in opening of another window, that will ask to type a file name for the temperature log file. Type a corresponding name, usually the current date or the type of the experiment. The time and the date will always be associated with the new file inside the computer memory. We recommend typing “.csv” extension at the end of the name, so EXCEL can open and read the file. If the log file is not needed, simply click CANCEL button.

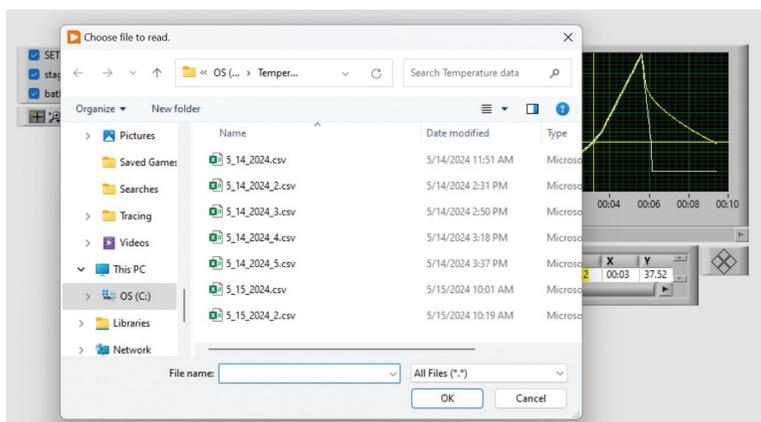


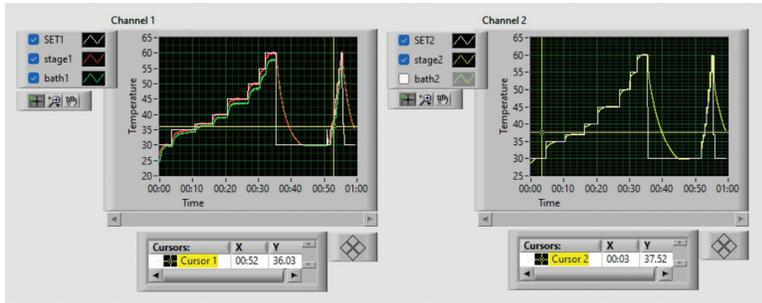
Below is an example of the log file opened within Excel. All three temperatures for each channel, SET, STAGE and BATH, as well as power output (%) were recorded.

	A	B	C	D	E	F	G	H
1	SET1	stage1	bath1	power1 %	SET2	stage2	bath2	power2 %
2	30	29.93	29.72	7.9	30	29.86	26	4.6
3	30	29.97	29.72	7.9	30	29.86	26	3.5
4	30	29.93	29.72	11	30	29.86	26	4.2
5	30	29.95	29.68	8.2	30	29.86	25.9	3.9
6	30	29.95	29.68	8.2	30	29.86	25.8	6
7	30	29.94	29.68	8.2	30	29.86	25.8	4.2
8	30	29.93	29.72	7.5	30	29.86	25.9	4.2
9	30	29.93	29.71	10.5	30	29.86	26.3	5.2
10	30	29.95	29.71	7.5	30	29.87	26	4.2
11	30	29.95	29.67	8.2	30	29.87	26	5
12	30	29.95	29.72	8.3	30	29.86	25.7	4.3
13	30	29.95	29.72	7	30	29.86	25.8	5.1
14	30	29.91	29.71	6.6	30	29.86	25.8	4.3
15	30	29.95	29.71	7	30	29.87	25.8	3
16	30	29.95	29.72	8	30	29.87	25.8	3.6
17	30	29.96	29.72	8.3	30	29.87	25.7	4.7
18	30	29.94	29.71	7.6	30	29.87	25.7	4.3

Reading the log files

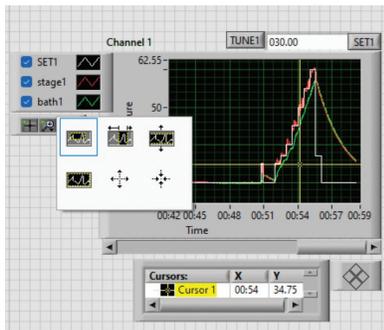
After the recording was stopped, the recording data on the graph can be studied and measured using ZOOM and cursor features, located on the left and on the bottom of the graph. The past recordings can be also retrieved by opening TC_READ.exe executable file. After TC_READ windows opens, click “START” button on the top to choose the file to read. After analyzing the log file, another can be opened by clicking “START” button again.



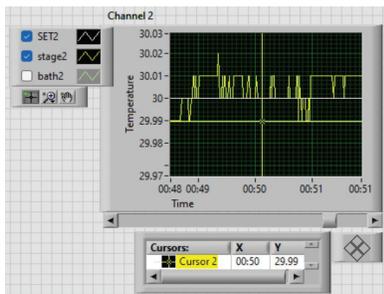


ZOOM and cursors

The recordings can be analyzed using ZOOM and cursor features. After clicking ZOOM button on the left of the graph, a new window will allow to select different zoom modes:

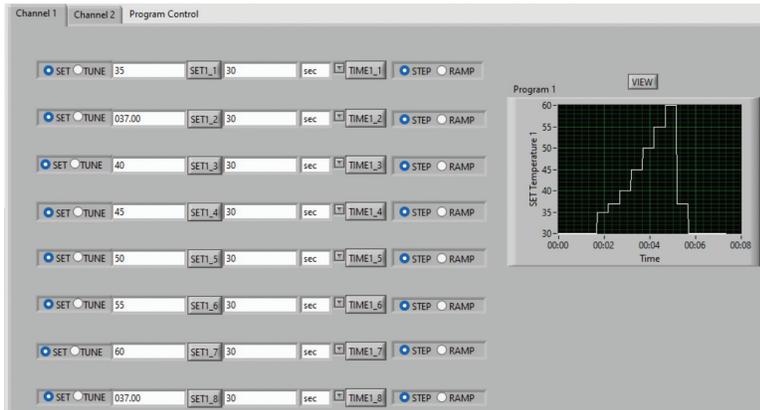


Different parts of the graph can be accessed at the same zoom scale by selecting “HAND” tool on the left of the graph, which allows to move the graph inside the frame. By selecting “CURSOR” tool on the left of the graph, measurements can be performed by moving the cursor along the graph, and reading the values on the bottom of the graph. If the cursor is not visible inside the frame, type coordinates values to corresponding fields to move the cursor inside the frame.



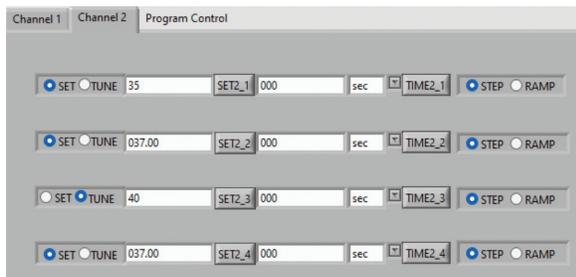
Programming the controller

Programming of the controller can be done through user interface located on the bottom half of TC_WRITE window. Up to eight different SET reference points can be programmed into the controller memory:



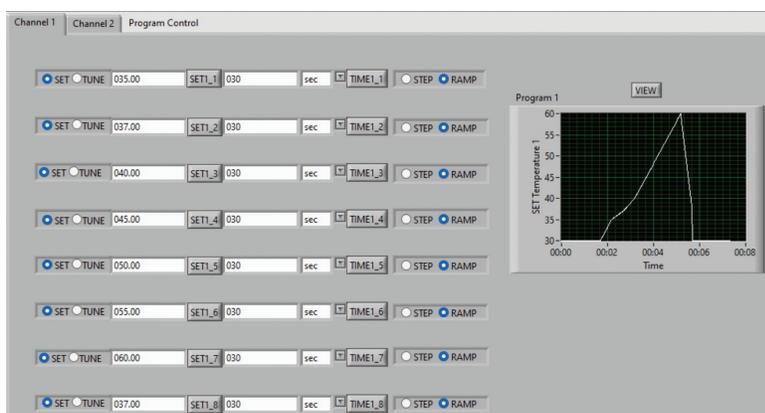
Since different heating elements and different temperatures need different controller parameters, which might require significant time for the controller to self-adjust, it is recommended to tune the controller to work at different SET temperature references within a wide range. This should be done regardless of the mode of operation: manually entered SET references or automatically generated temperature sequences. The programming interface allows to tune the controller at preset levels. Then, the controller can calculate the required parameters, even if the SET level is between the preset points.

Below is an illustration of tuning procedure for 40°C: simply select TUNE circle, enter SET reference point, and click SETxx button. Note: entry into time length field is not required for this procedure. After this, the controller starts tuning at this level. The new parameters will be stored in the controller memory. The results of the procedure can be observed on the temperature recordings graph. After the temperature readings are at the required level, repeat for other levels needed. Tuning can be stopped by returning the controller to original SET level by clicking SET1/SET2 buttons on the top of the window.



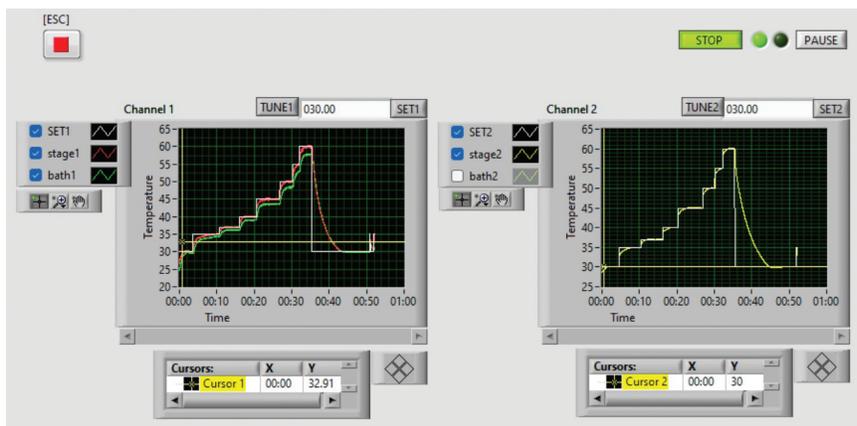
Temperature sequences and ramps

To program temperature sequences and ramps, enter the time length of each step and ramp in the controller memory by typing the time values and clicking the corresponding TIME button. The time scale can be selected as sec, min or hour. The 0 length step will be ignored by the program. To convert the step into ramp, select RAMP circle on the right, before entering the value into the controller memory. The sequence can be visualized by clicking button VIEW. To run the sequence as a continuous loop, the last (number 8) SET level should be the same as the original SET level, which can be entered on the top of the temperature graph. In the case of 0 length of the last step (number 8), the reference temperature will jump/ramp to the first SET level in sequence (after ignoring all 0 length steps). The period of the loop will be determined by the length of all steps. Each channel can be programmed independently by selecting appropriate tab, Channel 1/Channel 2.

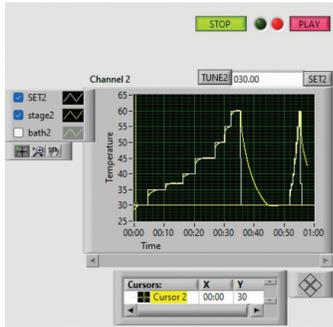


Running the program

To start the programmed protocol, click PROGRAM button on the top of the window. The button will turn GREEN saying STOP. By clicking the STOP button, the protocol can be terminated. The program can be also stopped in the middle of the sequence by entering SET level and clicking SET1/SET2 button on the top of the recordings graph.



The program can be also paused by clicking PAUSE button, and continued again by clicking red PLAY button.



Below is an illustration of “ramp” protocol recordings to show that the controller will “follow” the ramp well, provided the rate of the ramp is slow enough. The last ramp down was too fast for the controller to “follow”.

