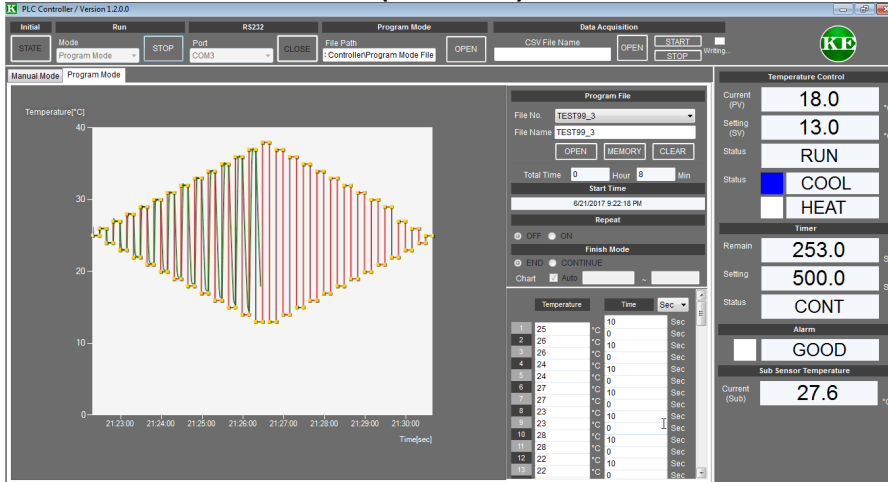# TEC (Peltier) Controller Control Software
"PLC Controller.exe"
Operating Manual
(Rev.1.30)

[Software Version: 1.2.0.0]

Applicable Model	Hardware Version	Firmware Version	Remarks
PLC-15V6A	2.00 -	1.0.0.1 -	
PLC-24V6A	2.00 -	1.0.0.1 -	
PLC-24V10A	2.00 -	1.0.0.0 -	
PLC-24V10AL-PT	3.00 -	1.1.0.0 -	
PLC-24V10AL-TH	3.00 -	1.1.0.0 -	
PLP-300W14A	2.10 -	1.0.0.0 -	

[IMPORTANT]

This software supports a product listed in the applicable model list.
Support for this software is available on Kurag Electronics.
If you have any questions, please contact Kurag Electronics Peltier Controller Support by E-mail.
Kurag Electronics Peltier Controller Support
E-Mail: **kurag.tslab@biz.nifty.jp**
* The developer of original version of this software is T. S. Laboratory Corporation.

July 11, 2017

KURAG ELECTRONICS LLC

Table of contents

1. Install

Create a new folder (ex: "PLC_Controller") on any place of the HDD and copy the software executable file "PLC Controller.exe" to that folder.

Operating Environment

    Supported Operating System
        Microsoft Windows XP
        Microsoft Windows Vista (*1)
        Microsoft Windows 7 (*1)(*2)
        Microsoft Windows 8 / 8.1 (*1)(*2)
        Microsoft Windows 10 (*1)(*2)

    (*1) When the software cannot start correctly, please try to set the Windows XP compatible mode in the properties window.

    (*2) When the software is placed in the "Program Files" folder, the software may not start. In this case, please place the software in the folder other than "Program Files".

The following software environment is required to execute this software:
    Microsoft .NET Framework 4

2. Uninstall

Delete the folder that was created at installation.

    (*) The files, such as the setting files containing the temperature profile for the Program Mode that was saved by this software, are also deleted at same time.

3. Start and Exit

Start
    In order to start this software, select the file of the "PLC Controller.exe" and execute it.

Exit
    In order to exit this software, click the **X** Button on the right top of the window. The confirmation message is shown. Clicking the "Yes" Button exits this software.

    (*) If the communication is online or the temperature control is running when exiting, the communication and the control will be terminated automatically then this software will exit.
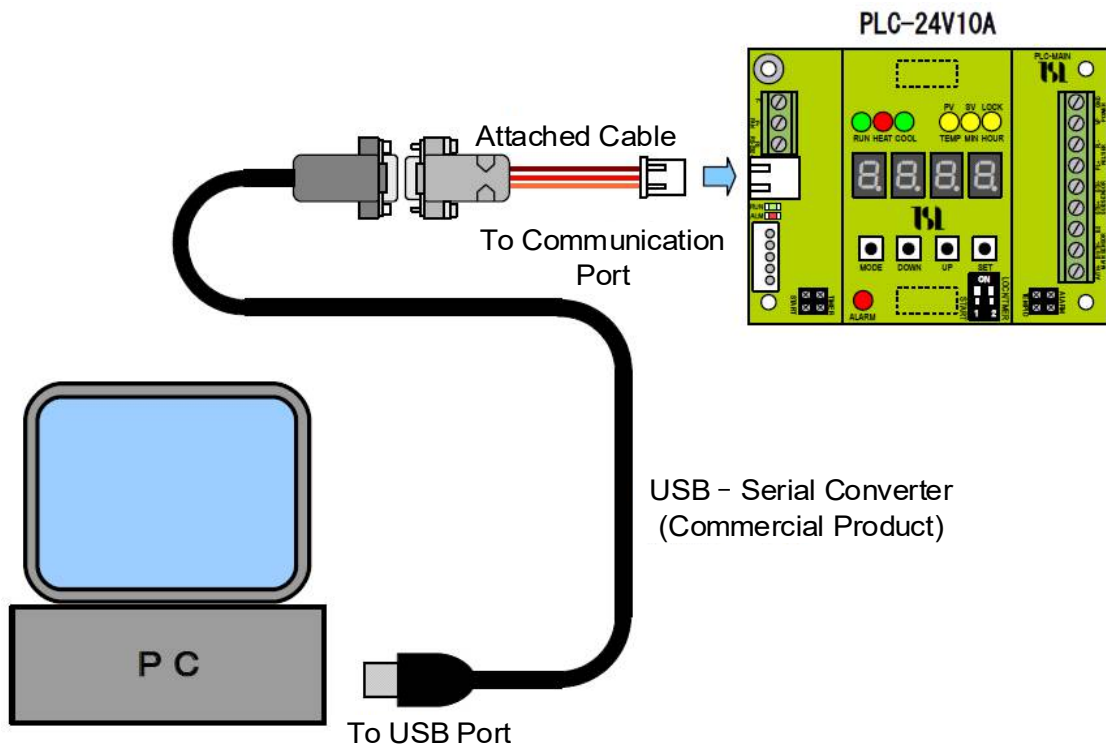
4. Connection

Connect the Peltier Controller to a PC with the communication cable.
* Following figures show connection between PC and PLC-24V10A.
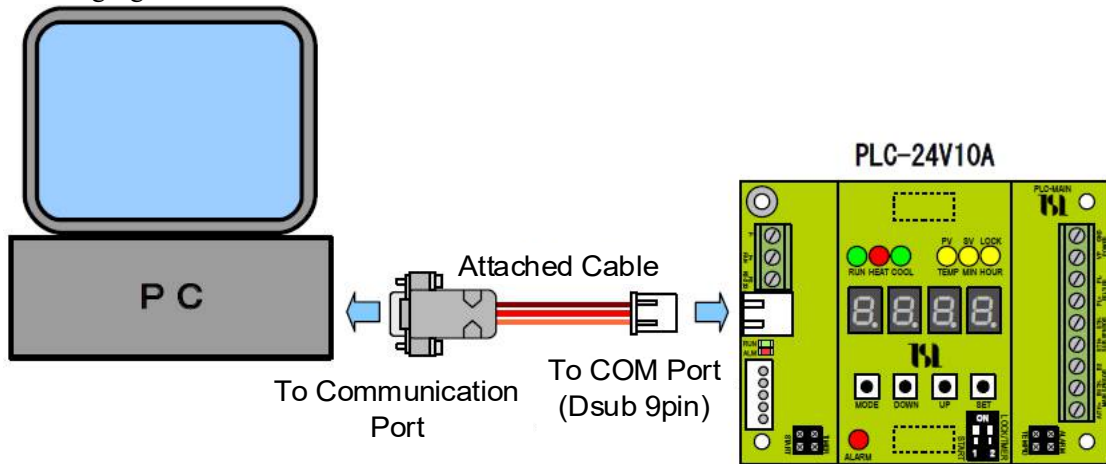
* Please use the Dsub 9 pin female - male straight connection cable to extend the cable.

If your PC does not have the Serial COM Port (RS-232), please use a USB - Serial Converter.

* USB-Serial conversion cable, please prepare the one with RS-232 connector Dsub male 9 pin.
* Please use the Dsub 9 pin female - male straight connection cable to extend the cable.

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5. Start-up Screen

The following start screen is displayed after launching this software.
Recommended screen resolution is horizontal 1280 pixels x vertical 720 pixels or more.

Reload the current status.
(*) The status is updated automatically while running.

Maximize / minimize window.
Exit this software.

Start / Stop the temperature control.
Click START button to start the temperature control.
The button top will be changed to STOP.

Start / Stop the communication with PLC series.
Select COM port number. and click "OPEN" button to start.
The button top will be changed to "CLOSE".

Specify the save folder for temperature profile data of Program Mode.

Save measuring data.
Specify the data file name.
Start / Stop save.

Click the tab then the tab screen will switch.
   Manual Mode
      Continuous / Timer mode.
   Program Mode

Manual Mode screen
   Configure the target temperature, timer and mode.
Program Mode screen
   Configure the temperature profile.

Display the current status.

Temperature trace screen.
   Chart the time variation of the temperature.

6. Manual Mode
6-1. Continuous Mode

This mode can control the temperature continuously by setting the target temperature.

(5) Click START button then start the temperature control.
   The button top will be changed to STOP.
   Click STOP button then stop the temperature control.

(1) Click OPEN button when the communication is closed.

(3) Input the target temperature and click SET button.

If the Alarm is SENSOR, this displays "---.- ".

(2) Click Manual Mode tab.

(4) Select Continuous.

Indicator upper limit (Dash / Orange)
* Disappear when lower = upper = 0.

Main sensor temperature (Solid / Green)

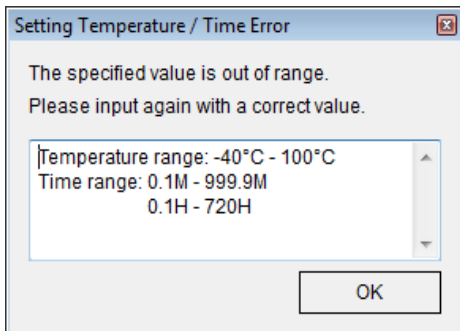Target temperature (Solid / Red)

0°C line (Solid / Pink)

Indicator lower limit (Dash / Aqua)
* Disappear when lower = upper = 0.

Running status icon
Cool: ■ Blue
Heat: ■ Red

If the Alarm is SUBSNS, this displays "---.-".

Configure the vertical (temperature) scale of the temperature trace chart.
If Auto is checked, the scale is adjusted to cover the temperature control range automatically.
The scale can be adjusted manually by unchecking Auto and configuring the Minimum and Maximum.

The temperature trace chart is displayed after starting the temperature control.
The horizontal full scale is 10 minutes.
The chart will scroll automatically if the trace draws closer to the right side.

Setting Temperature / Time Error

The specified value is out of range.
Please input again with a correct value.

Temperature range: -40°C - 100°C
Time range: 0.1M - 999.9M
          0.1H - 720H

OK

The target temperature can be specified in 0.1 °C step.
If the value outside the available range is specified, an input error message as shown in the left image will be displayed. Please input correct value.

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6-2. Timer mode

This mode can control the temperature only for the set time by setting the target temperature and time.

(6) Click START button then start the temperature control.
The button top will be changed to STOP.
Click STOP button then stop the temperature control.

(1) Click OPEN button when the communication is closed.

(3) Input the target temperature and click SET button.

(4) Input the time and click SET button. The selectable time unit is Min or Hour.

(2) Click Manual Mode tab.

Indicator upper limit (Dash / Orange)

Main sensor temperature (Solid / Green)

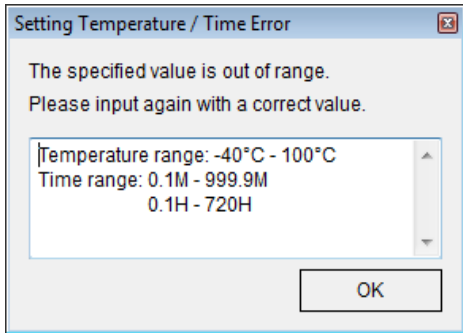(5) Select "Timer".

Target temperature (Solid / Red)

(7) The remaining time to the Timer finish is displayed.

Indicator lower limit (Dash / Aqua)

The temperature trace chart is displayed.
The horizontal scale (Time) varies according to Timer setting time.

Temperature indicator
Within limits: 25.1
Over upper limit: 44.9
Under lower limit: 5.7
* When lower = upper = 0,
  the Indicator function is disabled.

Setting Temperature / Time Error

The specified value is out of range.
Please input again with a correct value.

Temperature range: -40°C - 100°C
Time range: 0.1M - 999.9M
          0.1H - 720H

OK

The target temperature can be specified in 0.1 °C step.
The timer time can be specified in 0.1 Min or 0.1 Hour step.
If the value outside the available range is specified, an input error message as shown in the left image will be displayed. Please input correct value.

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7. Program mode

This mode can control the temperature according to the temperature profile set in advance.

(CAUTION)
   If the temperature profile has a faster change than the performance of the in-use Peltier element,
      the Peltier element cannot chase the temperature profile.
   Please configure appropriate profile to match the performance of the in-use Peltier element.

(8) Click START button then start the temperature control.
      The button top will be changed to STOP.
      Click STOP button then stop the temperature control.

(1) Click OPEN button when the communication is closed.

(3) Specify the folder where the temperature profile data file exists. (See 7-1.)

(4) Open or save the temperature profile data. (See 7-2)

(2) Click Program Mode tab.

Indicator upper limit (Dash / Orange)

Starting date and time

(6) Specify Repeat setting (See 7-4.)

(7) Specify Finish Mode. (See 7-5.)

Target temperature (Solid / Red)

Main sensor temperature (Solid / Green)

Indicator lower limit (Dash / Aqua)

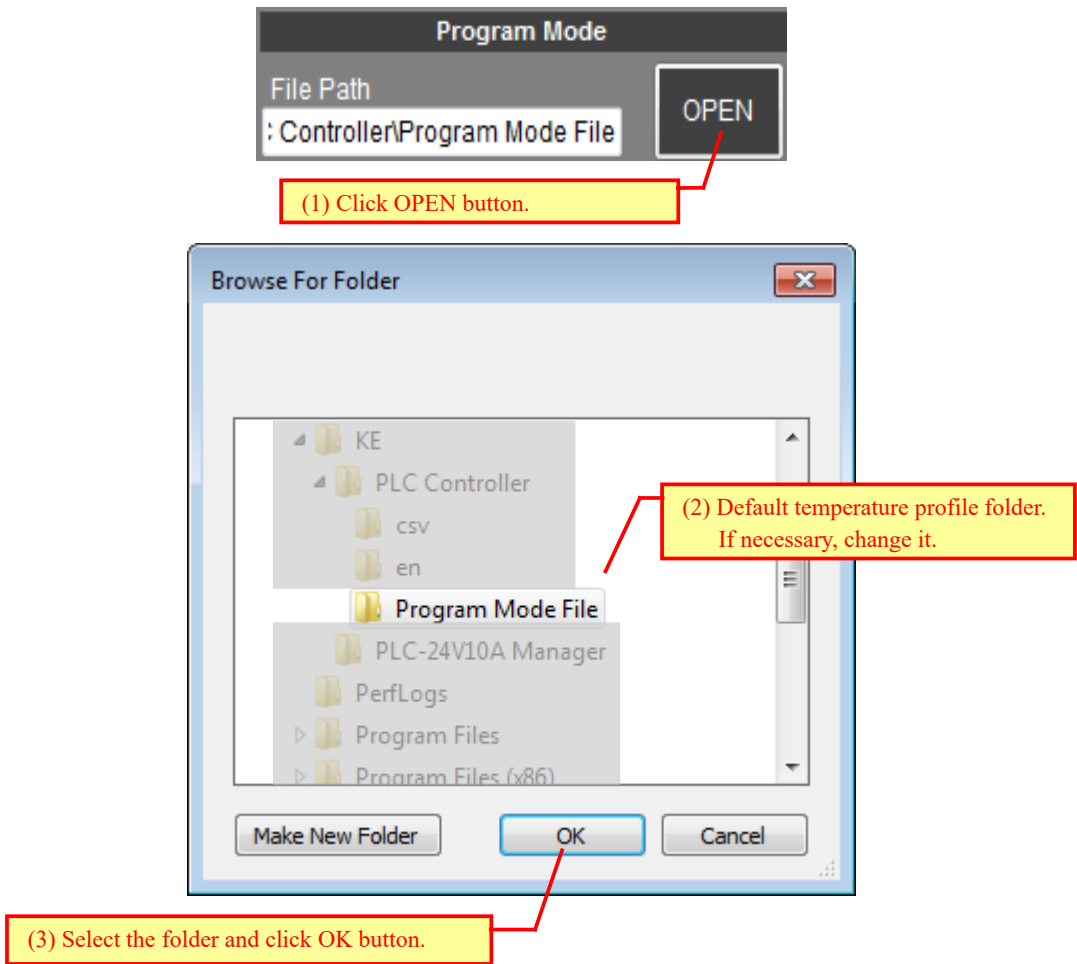(9) Remaining time up to Program end is displayed.

(5) Input the temperature profile. (See 7-3.)

The temperature profile chart and temperature trace chart are displayed.
The horizontal scale (Time) varies according to profile total setting time.

(CAUTION)
The following procedure is required for the temperature control according to the temperature profile in Program Mode:

1) Input the temperature profile. (Input the temperature and time in figures.)

2) Save the temperature profile data to a file. (MEMORY to a file)

3) Read the temperature profile data from the above file. (OPEN from a file)

Please note that the profile data is not reflected only by inputting each value on the profile window.

7-1. Folder location for the Temperature Profile Data

In default configuration, "Program Mode File" folder is created automatically under the parent folder where the executable file "PLC Controller.exe" was copied.
If necessary, change the temperature profile folder.

Program Mode

File Path
: Controller\Program Mode File   OPEN

(1) Click OPEN button.

Browse For Folder

KE
  PLC Controller
    csv
    en
    Program Mode File
  PLC-24V10A Manager
  PerfLogs
  Program Files
  Program Files (x86)

Make New Folder   OK   Cancel

(2) Default temperature profile folder.
If necessary, change it.

(3) Select the folder and click OK button.
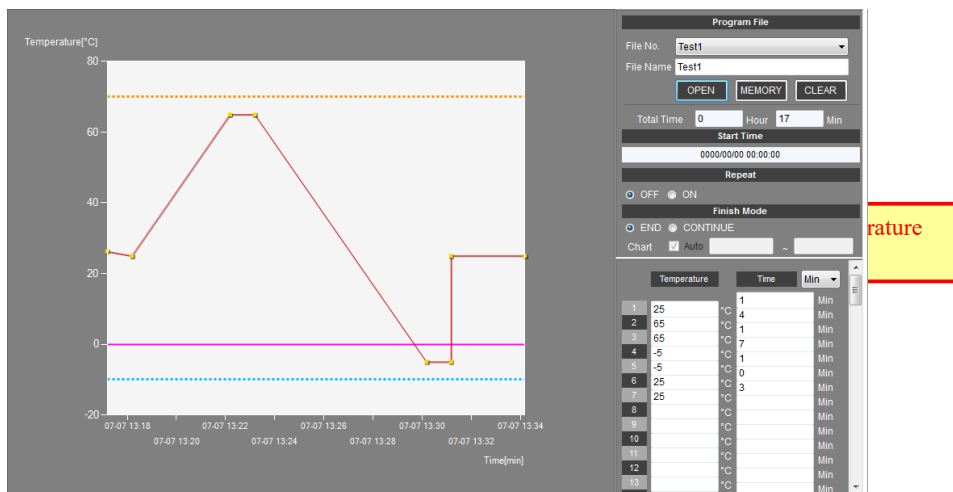
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7-2. Open / Save of the Temperature Profile Data

To save the temperature profile setting, input the file name and click MEMORY button.
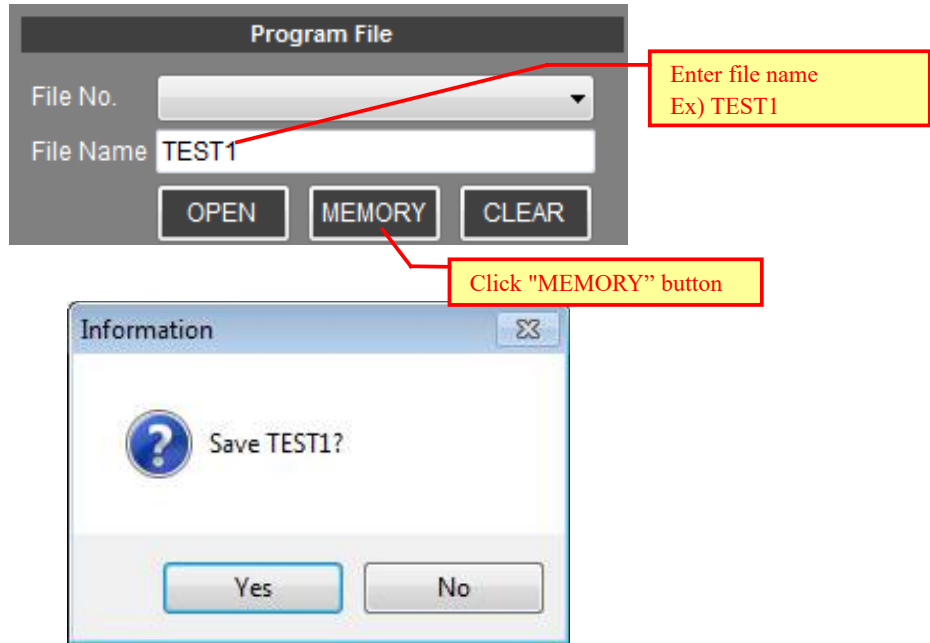
To load the temperature profile setting, select the file name from pull-down menu and click OPEN button.
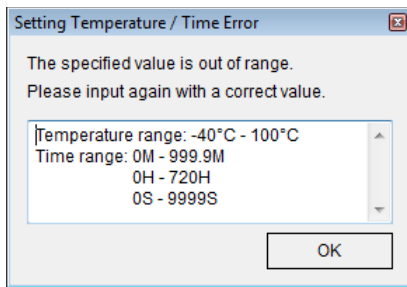
7-3. Temperature Profile Setting

The temperature profile setting is accomplished by alternately input of temperature and time.

The total setting time will be displayed.

Select the unit of time.
You can choose from seconds, minutes or hours.
* Combinations of seconds, minutes, and hours can not be set.

When program operation is started, the temperature of the first step is automatically set to the current temperature.
It will change with the time set here for the target temperature set in STEP-1.
* If the rapid temperature change of the temperature controlled object is undesirable, please set a longer time.

Enter the target temperature of STEP-1.

Enter the time to change from STEP-1 to STEP-2.

Enter the target temperature of STEP-2.

Enter temperature and time alternately.

Specifying "0" for time instantly changes the target temperature.

Please leave the input field blank after the last step.

The maximum temperature profile step is 99.

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Setting Temperature / Time Error

The specified value is out of range.
Please input again with a correct value.

Temperature range: -40°C - 100°C
Time range: 0M - 999.9M
                0H - 720H
                0S - 9999S

OK

The temperature can be specified in 0.1°C basis.
The time can be specified in a second, 0.1 minute or 0.1 hour basis.
If the value is out of range, the input error message as shown in the left image is displayed. Please input the correct value.

ERROR

Cannot enter consecutive Time 0!

OK
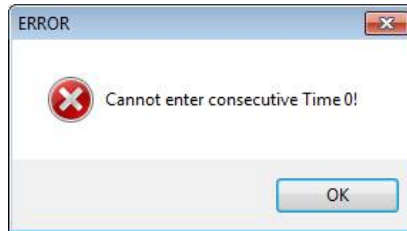
A zero cannot be specified consecutively in the Time input box.
If a zero is specified consecutively, the input error message as shown in the left image is displayed. Please input the correct value.

ERROR

Cannot enter Time 0 between same temperatures!

OK
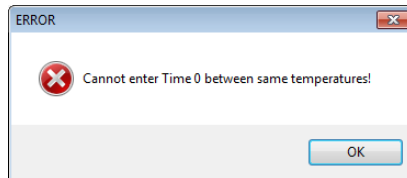
If the temperature is identical between consecutive STEPs, a zero cannot be specified in the corresponding Time input box.
If such temperature or time is specified, the input error message as shown in the left image is displayed. Please input the correct value.

[CAUTION]
   After inputting all temperature profile data, that profile data must be saved to a file and that data must be re-loaded from the file.
   Only these operation can fix the temperature profile and can make this profile data available for temperature control in the Program Mode.

7-4. Repeat Setting of the Temperature Profile

To execute the temperature profile iteratively, specify the Repeat setting.
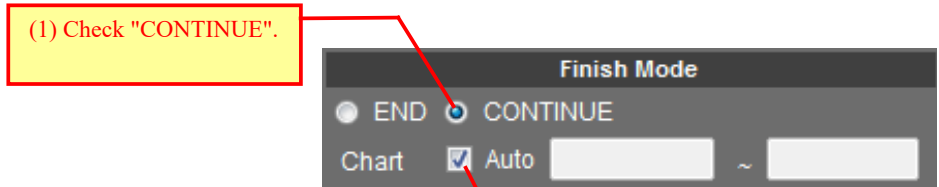
Check "ON".
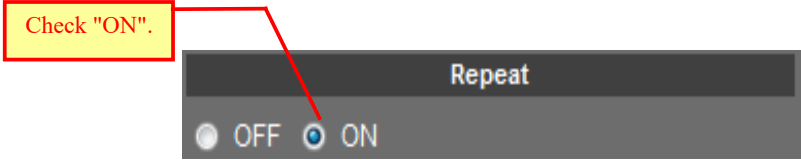
7-5. Finish Mode of the Temperature Profile

To continue temperature control after the end of the temperature profile execution, configure the Finish Mode setting.
(*) If the Repeat setting is ON, this setting is ignored.
(*) The temperature trace chart after the end of the temperature profile execution is same as the Manual Mode.

(1) Check "CONTINUE".

(2) Configure the vertical (temperature) scale of the temperature trace chart.
If Auto is checked, the scale is adjusted to cover the temperature control range automatically.
The scale can be adjusted manually by unchecking.

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8. Alarm indication

When the Peltier controller detects an error, the alarm indicator LED on both the main board and the display board of the Peltier controller blinks and the Peltier controller stops temperature control.
In addition, the Alarm status is displayed in the Alarm indicator area on this software.
(*) For the detail of the Alarm and Protection function, please refer to the manual of the Peltier controller.
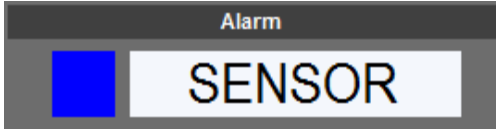
Main Sensor Alarm
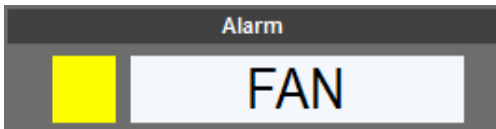This alarm occurs when the main temperature sensor is not connected correctly.

Sub Sensor Alarm
This alarm occurs when the main temperature sensor is not connected correctly. (Applicable products only)

Current Alarm
This alarm occurs when the drive current through the Peltier element exceeds the limit set in advance.

Fan Alarm
This alarm occurs when the rotation stops more than 5 sec.
(*) Only for the fan with a pulse sensor output.

Reverse Protection
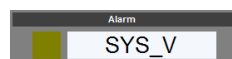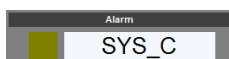This alarm occurs while the Reverse Protection is working.

Power Supply Alarm
This alarm occurs when the power supply voltage for the Peltier drive is abnormal. (Applicable products only)

Peltier Polarity Alarm
This alarm occurs when the Peltier device is connected in reversed polarity. (Applicable products only)
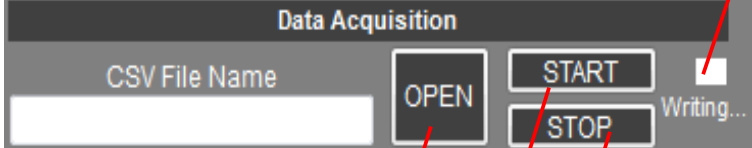
Peltier Alarm
This alarm occurs when the Peltier drive current or voltage is unusual value. (Applicable products only)

[Caution]
Depending on the content of the alarm, some alarms are automatically canceled when the alarm condition is removed, but some alarms are not automatically canceled even if the alarm condition is removed.
In the latter case, please turn off the power once, remove the cause of the error and turn the power ON again. Reverse protection automatically restarts when the protection condition is removed.

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9. Save of measurement data

The data measured while the temperature controlling can be saved into a CSV file.

Indicator
White: Stop
Yellow: Ready
Red: Writing

Data Acquisition

CSV File Name　OPEN　START　STOP　Writing...

(1) Click OPEN button and specify a file

(2) Click START button.
　While the temperature controlling, the "Writing..."
　icon lights in red and the measured data is saved.
　Otherwise the "Writing..." icon lights in yellow to
　indicate the standby state.

(3) The STOP button stops saving.

The CSV file is written in the following format:
"Date","Time","Measured Temperature","Preset Temperature","Sub-Sensor Temperature(*1)","Alarm Status"
(*1) Written only when the sub-sensor is enabled.
　　The measurement cycle is 1 second.

Example)
　　2015/03/11,11:40:53,21.54,5,24.5,GOOD
　　2015/03/11,11:40:54,21.6,5,24.48,GOOD
　　2015/03/11,11:40:55,21.53,5,24.51,GOOD

[CAUTION]
　If the file specified by clicking OPEN button already exists, the file is initialized and over written. Please
　note this is not the append mode.
　Please make a backup for important files.

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10. Troubleshooting

No.	Case	Checkpoint
1	Unable to start this software.	Is the required software installed? (See section "1.Install")
2	Unable to run correctly on the Windows Vista / 7 / 8 / 8.1 / 10 environment. (Unable to start, exit, etc...)	1) Please install in the folder other than "Program Files". 2) Please try to set the Windows XP compatible mode. Please specify the Windows XP compatible mode in the Compatible tab of the properties for this executable file.
3	The communication error is displayed after any operation.	Is the correct COM port number selected? Did you click START button?
4	When inputting the temperature or time, the Out of Range Error message is displayed.	Unable to input the temperature or time with the out of range value. Since the available range is displayed in the error message, please input the value within that range.
5	While running in the Timer or Program mode, the temperature trace chart is not drawn.	If the setting time duration is very long, the chart may be not drawn just after start, because the horizontal (time) scale is so long.
6	Although inputting the value in the temperature profile list, the chart is not drawn.	The chart is not drawn while inputting the value. To update the chart with the inputted temperature profile, please save into a file after inputting the value and open that file again.
7	There are some same scale label in the horizontal axis.	The horizontal scale varies to fit the time span set by user in the Timer mode and Program mode. The horizontal label which is formatted as "Month-Day" and "Hour-Minute" may be identical depending on the setting time.

Memo

Revision History

Rev.	Date	Description	Author
1.00	03/07/2016	Initial release	SAK
1.10	2016/04/01	Add sub sensor temperature for storage of measuring data	SAK
1.20	04/17/2017	Company name change accompanying by business transfer T. S. Laboratory Corporation -> Kurag Electronics LLC Change the support window from T. S. Laboratory to Kurag Electronics Word-processor software change: MS-Word → OpenOffice Writer	Y.O
1.30	07/11/2017	Software version: 1.2.0.0 Change executive file name: PLC-24V10A Controller.exe -> PLC Controller.exe Change screen shot: Logo, icon, back color Increase number of steps of program mode temperature profile: 20 steps -> 99 steps	Y.O

**TEC (Peltier) Controller PLC Series
Control Software
"PLC Controller.exe"
Operating Manual**
（ Rev.1.30 ）

July 11, 2017

KURAG ELECTRONICS LLC
URL http://kurag.o.oo7.jp/kurag-el/