App.by shimbo | 03・28・'14 | Rev.by watanabe | 03・28・'14

Operation Manual

Sequence Creation Software

Wavy for PLZ-U Ver. 3.2

SPEC70402

Version 3.2 Prepared: MARCH 28, 2014

KIKUSUI ELECTRONICS CORPORATION

– Note –

Before contacting us to request repair, inspection, or adjustment, please re-read the Operation Manual and conduct a recheck. If you have any uncertainties or find any abnormalities, contact your Kikusui distributor or agent.

– Safety Precautions –

Before a test using this application software, carefully read the PWR Series operation manual for the specific hardware descriptions found therein to avoid improper connections or incorrect handling. Incorrect connection or handling of any equipment/device in the following configuration may result in serious accidents involving EUT damage or fire.

This manual applies to Wavy for PLZ-U Version 3.2x.

Contents

1 Preface

1.1 Summary of the Product

The sequence-creation software “Wavy” is application software supporting the sequence function incorporated in the PAX, PBX, PCR-LA, PLZ-4W, and PLZ-U series from Kikusui Electronics. In the PAS and PWR series (+PIA4830), PLZ-U series sequences are directly run from the software. “Wavy” allows you to easily create and edit sequence function data using a mouse. Furthermore, the processing status of a sequence can be visually indicated during processing of the sequence, and voltage, current, and other data can be monitored and saved to file. This “Wavy” is PLZ-U series only.

1.2 System Requirements

● Personal computer

CPU	Core2 or better
OS	Windows8(x86/x64), Windows7(x86/x64)
CD-ROM	Required to install Wavy
Mouse	Required
Display	1024 x 768 or higher
Memory	2 GB or more
Hard disk capacity	Enough free disk space to save files must be available

Table 1-1

* If advanced power management (APM) and suspend functions are available in your PC environment, turn them OFF. If left ON, proper operation may be hindered by periodic interrupts called SMIs to the CPU.

● Interface

- RS-232C or GPIB
- For GPIB, any of the interfaces for which a GPIB driver provided by the relevant manufacturer has been installed and is operable

National Instruments	NI-488.2 driver
CONTEC	GPIB communications driver API-GPIB (98/PC) W95, NT Ver. 3.50 or later
Interface	GPF-4301 for Windows Ver. 1.13-05 or later

Table 1-2

* For installation of a GPIB driver, see the operation manual of the relevant manufacturer.
* For RS-232C, use a cross cable as the connection cable.
*When using a USB serial converter with RS-232C connection, there may be the case the function does not perform properly.

1.3 Software Specifications

● Sequence Modes

The “Software Control” is the mode in which the sequence operation is performed by the software, and the “Hardware Control” is the mode in which the sequence operation is performed by the built in sequence function.
Table 1-3 shows the time setting range.

Software Control	Seconds	0.5 to 999.5 [s] (minimum unit: 0.5)
	Minutes	0.1 to 999.9 [min]
	Hours	0.1 to 999.9 [h]
Hardware Control	Seconds	0.001 to 9999.000 [s]

Table 1-3

* If you set Wavy so that the sequence is entered in unit of seconds for a ramp transition, the value settings for the ramp are set every 0.5 second. If you set Wavy so that the sequence is entered in unit of minutes or hours, the value settings for the ramp are set every second. (Software Control only)

* In the Software Control, The maximum number of steps is 1024.
  In the Hardware Control, The maximum number of steps is 255.

* The accuracy of setting time for the step depends on the PC environment in use.(Software Control only)

● Operation Modes

There are five operation modes: constant current, constant voltage, constant resistance, constant current + constant voltage, and constant resistance + constant voltage.
The ranges of the number of significant digits for decimal fractions for these modes are indicated below:

Voltage value	2 to 3 digits	(x.xx to x.xxx)
Current value	2 to 5 digits	(x.xx to x.xxxxx)
Resistance value	4 to 5 digits	(x.xxxx to x.xxxxx)

Table 1-4

* The actual number of significant digits for a decimal fraction varies depending on differences in the instrument series or instrument’s setting range.

* In the Hardware Control, it is only two operation modes: constant current and constant resistance.

* 0[ohm] becomes open.

● Support for five channels

Sequence data can be created and executed for each channel.

2 Setup

The Wavy for PLZ-U package contains the following items.

Item	Quantity
CD-ROM	1
Operation Manual	1

(1) Insert the provided CD-ROM into the CD-ROM drive of the personal computer.

(2) The Setup Start screen, shown in Fig 2-1, should appear automatically after a few moments. If it does not appear, run the “Setup.exe” file on the CD-ROM.

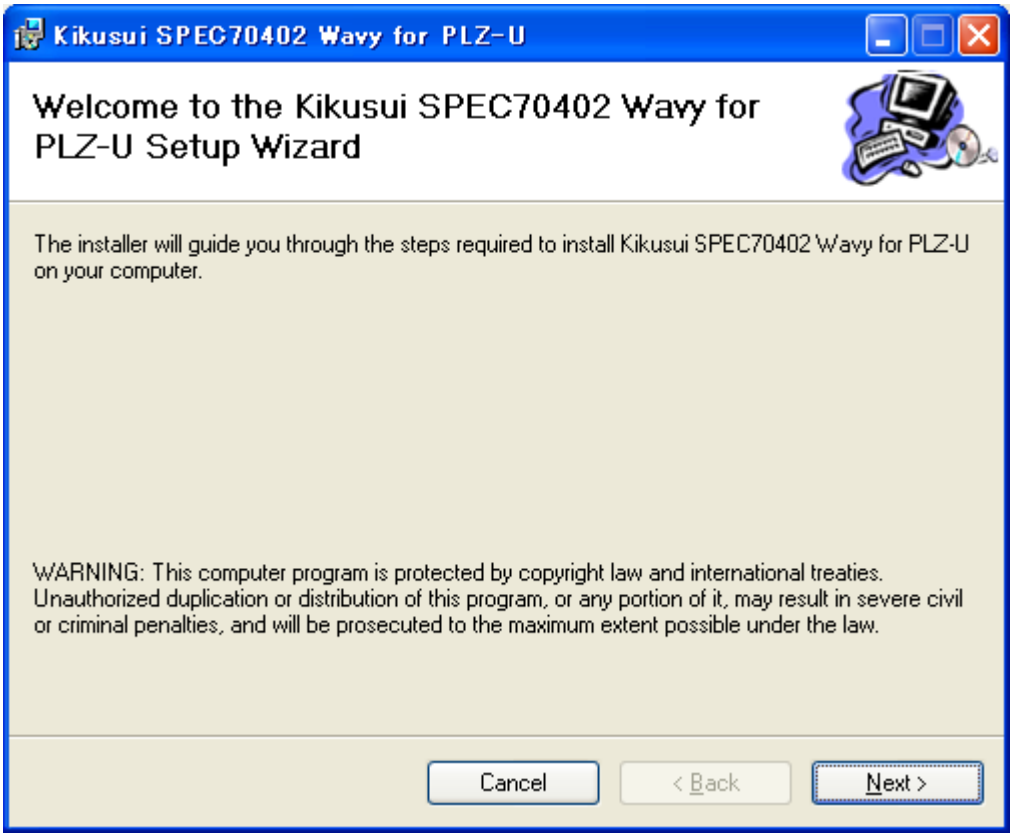


Fig. 2-1 Setup Start Screen

Follow the prompts displayed onscreen to complete the installation.

To uninstall Wavy, from the [Start] menu at the lower left of the Windows screen, select [Settings], click [Control Panel], and double click on [Add/Remove Programs]. From the displayed list, click on “ Kikusui SPEC70402 Wavy for PLZ-U ” and click the [Remove] button. Follow the prompts displayed onscreen to complete the uninstallation.

3 Starting up Wavy

From the [Start] menu at the lower left of the Windows screen, click [Program], “Kikusui SPEC70402 Wavy,” and the Wavy for PLZ-U. The Startup screen shown in Fig. 3-1 should appear.

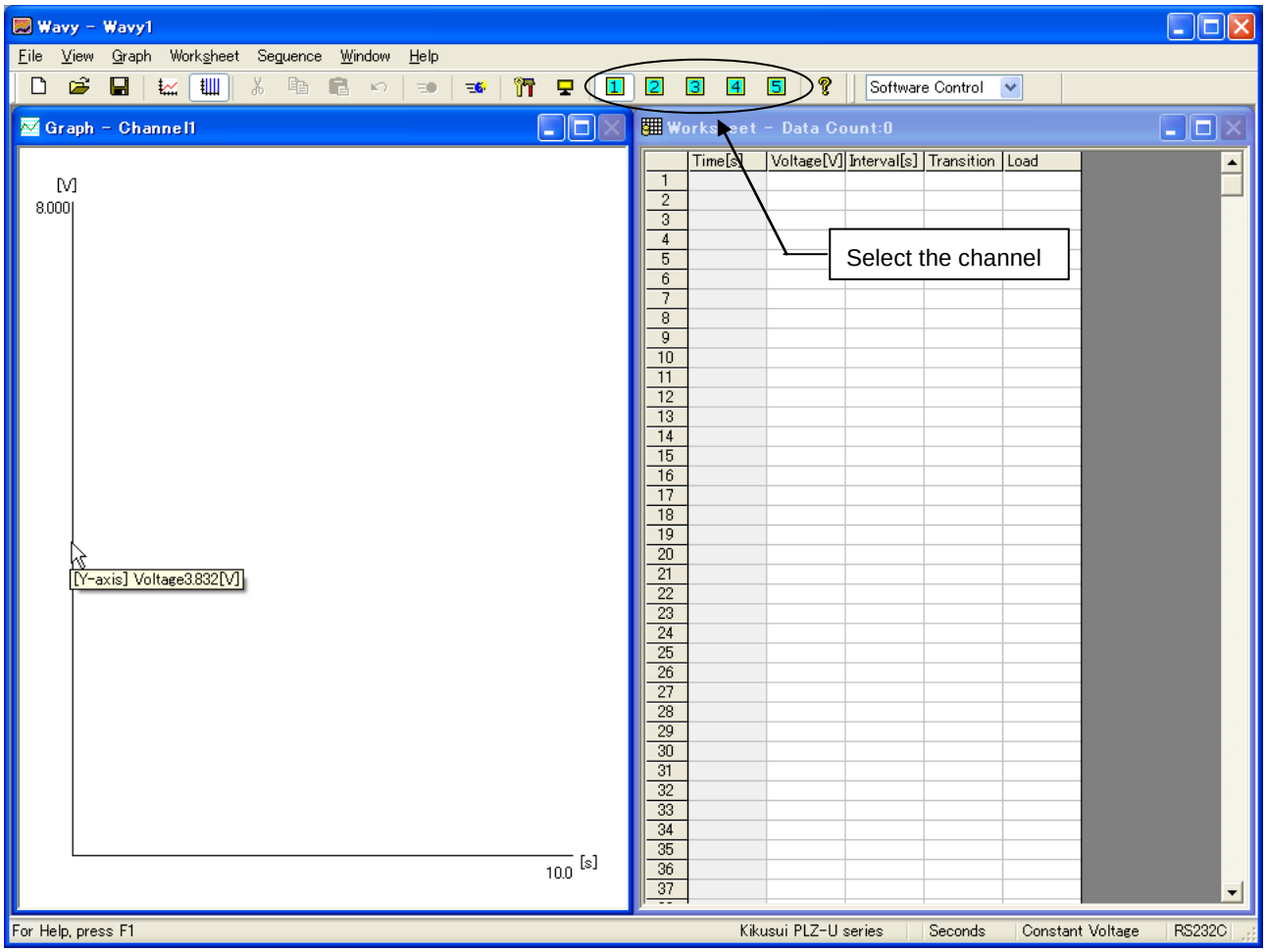


Fig. 3-1 Startup Screen

In the Software Control, the Wavy operation procedure is:

(1) Select the sequence mode and operation mode.
(2) Create sequence data.
(3) Execute the sequence data that you created.

* Before executing the sequence, be sure to set the interface and node.

You can select the channel as shown in the figure above and create/edit the sequence data for each channel.

Fig. 3-2 shows the screen displayed when the “TestData.wvy” file has been loaded into Wavy. “TestData.wvy” is located in the folder in which Wavy has been installed.

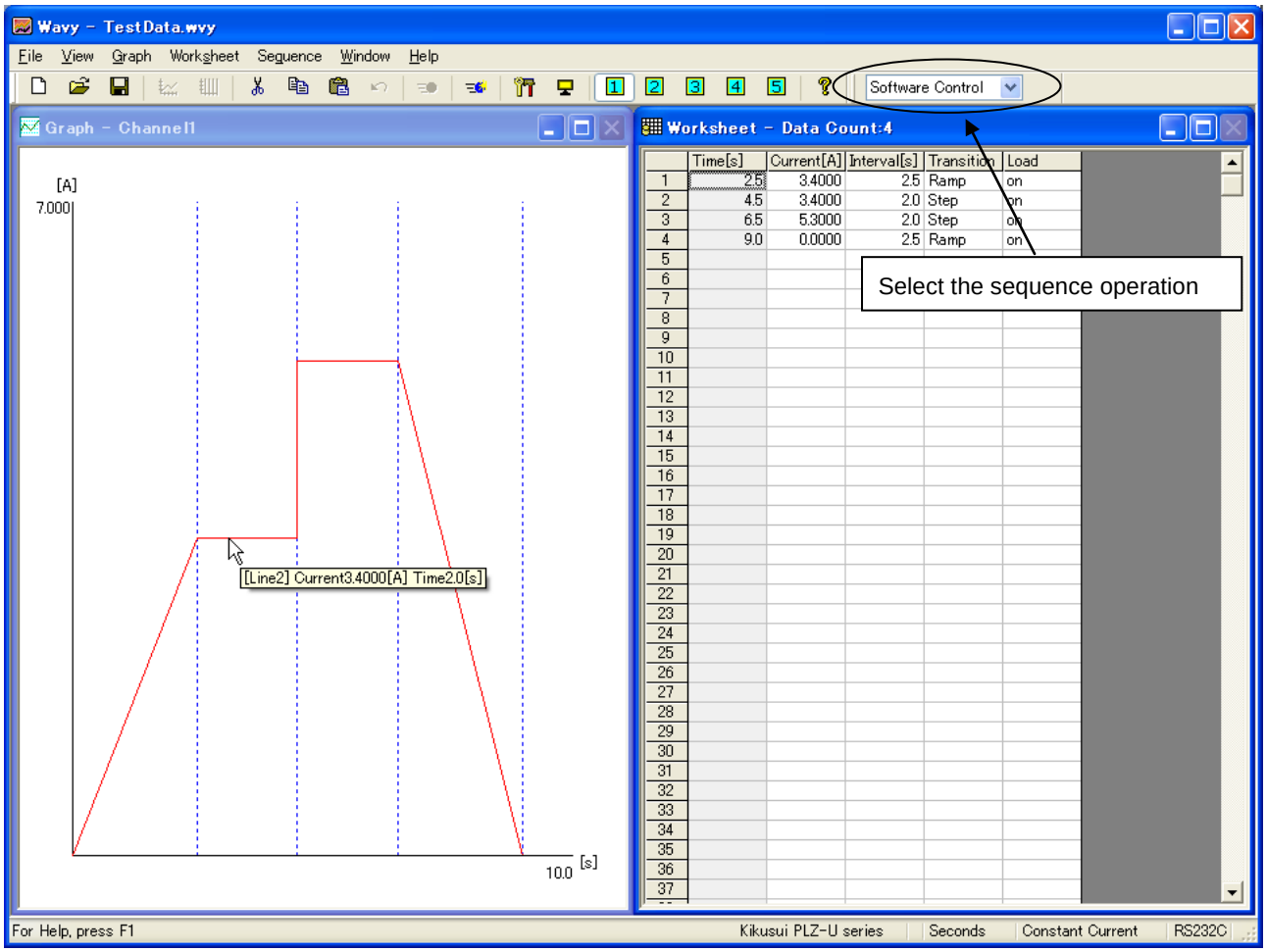


Fig. 3-2 Test Data Screen

You can select the sequence operation as shown in the figure above.
In the Hardware Control, the Wavy operation procedure is:

(1) Select the sequence mode and operation mode.
(2) Create sequence data.
(3) Transfer the sequence data created to the instrument.
(4) Execute the sequence data that you created.

* Perform a change of the initial settings before transferring of the sequence data.

* In the “Software Control”, it is not necessary to transfer the sequence data since the sequence operation is directly performed by the software.

4 Creating and Editing Sequence Data

(1) Move the mouse pointer to the Y-axis. This causes the pointer to change to a crosshair (Fig. 4-1).
At that location, hold down the left mouse button and drag the mouse with the crosshair (Fig. 4-2).
Release the left button at any location to establish that data point (Fig. 4-3).

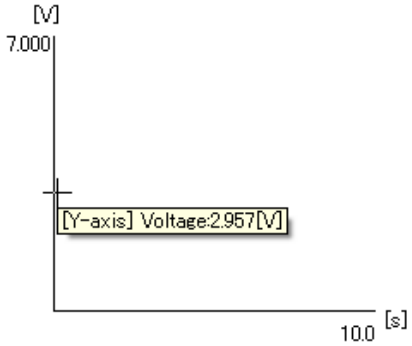


Fig. 4-1 Start Point of the Mouse

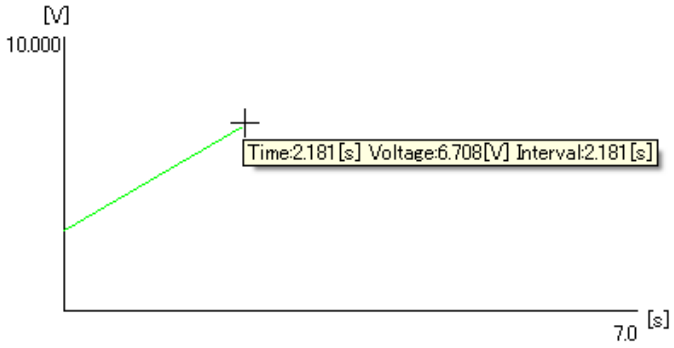


Fig. 4-2 Moving the Mouse

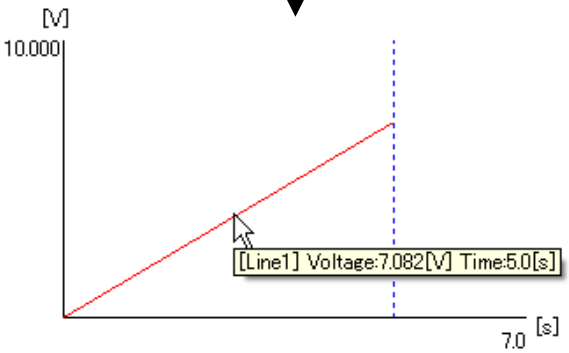


Fig. 4-3 End Point of the Mouse

(2) The data that has just been created with the mouse is indicated as shown below:

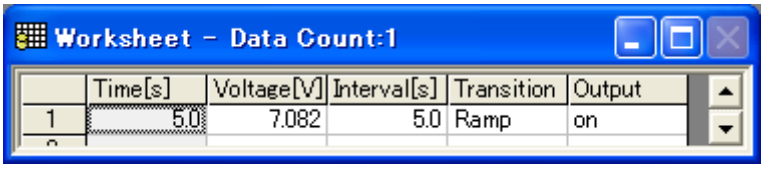


Fig. 4-4 Display of Data in Cells

Data can also be created by directly entering it into the worksheet. In such a case, directly type data in the cell in which you wish to enter data, or select a cell and press the [Enter] key or double click on it to make it available for input. To cancel data entry during input, press the [**Esc**] key. Note that because the time is automatically calculated when the interval is entered, you cannot enter data into the time cell.

(3) To edit data, simply select the cell to be modified. This will allow you to edit the cell (Fig. 4-5). After editing, press the [Enter] key to confirm the change.

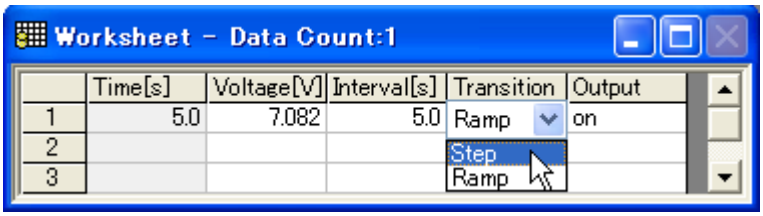


Fig. 4-5 Editing Data in a Cell

(4) To edit data from a graph, double click on the line to be modified.
This will cause the end point of the line to change to a black point (Fig 4-6).
Move the mouse pointer over the black point, and, when the pointer changes to an arrow (Fig. 4-7), hold down the left mouse button to select that point and drag the mouse up or down (Fig. 4-8). Release the left button at any location to establish that data point.

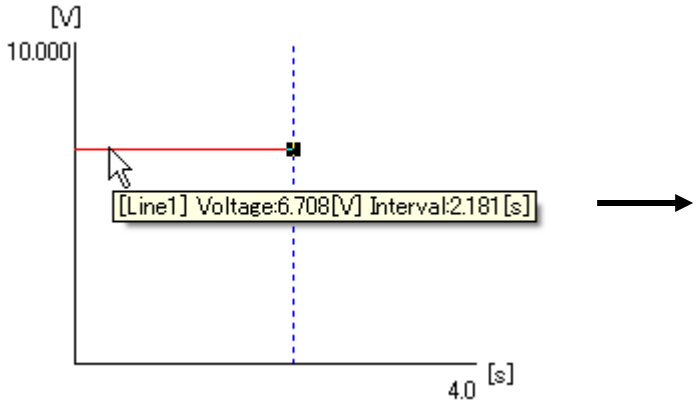


Fig. 4-6 Selecting the Line to be Changed

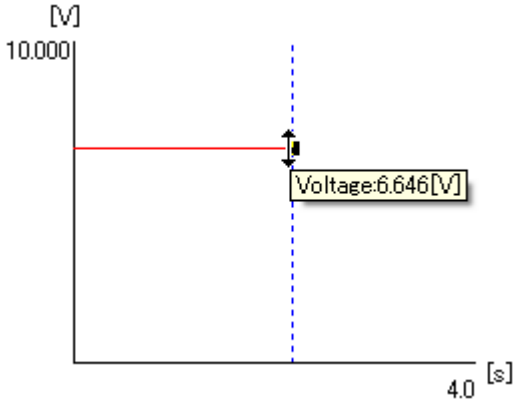


Fig. 4-7 Start Changing the Data

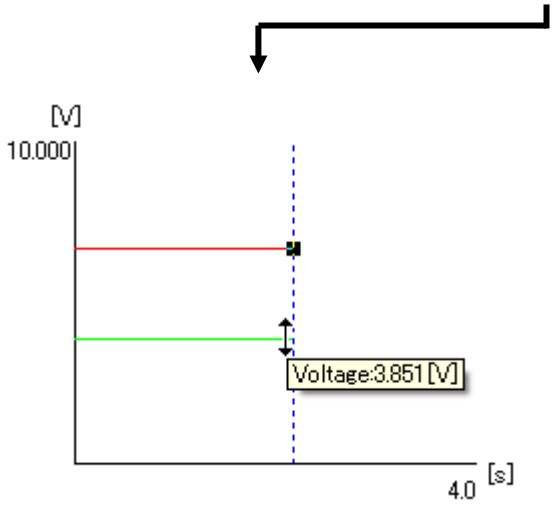


Fig. 4-8 Moving to the Desired Position

* To edit the time interval, double click on the blue dotted line (vertical line).
  The operating procedure is the same as the one noted above.

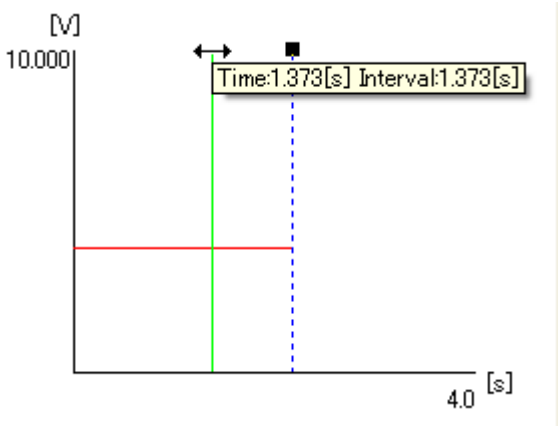


Fig. 4-9 Moving to the Desired Position (Time)

* Transition data can be changed from the graph.
  Double click on the line you wish to change. This will cause the end of the line to change to a black point (Fig. 4-10).
  At this stage, press the right mouse button (Fig. 4-10).

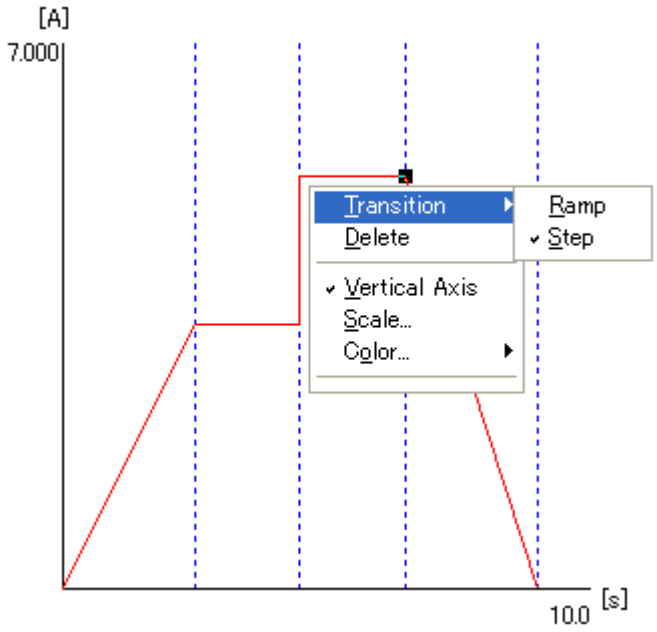


Fig. 4-10 Transition Change

* You can also delete, copy, or insert multiple lines. To perform these actions, press the right mouse button (Fig. 4-11).

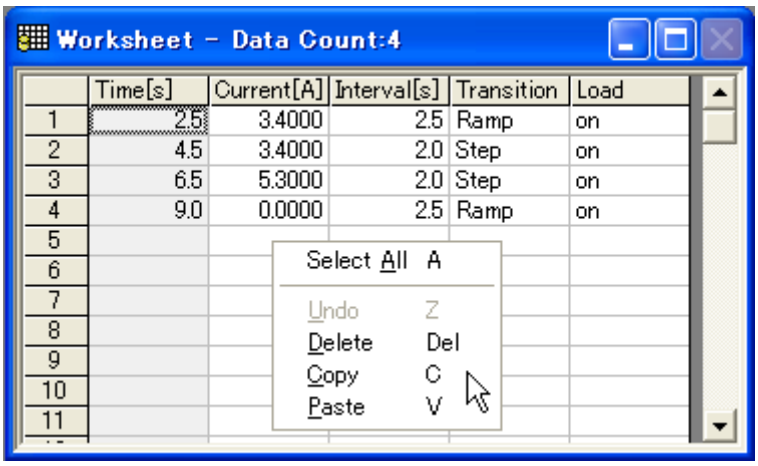
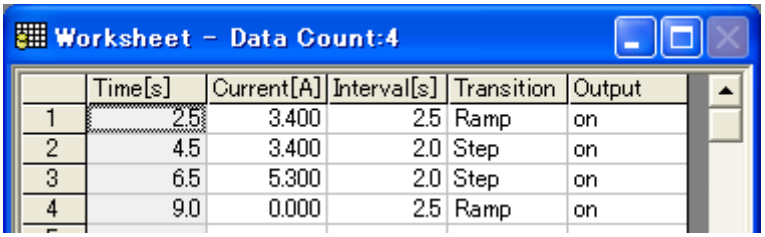


Fig. 4-11 Delete, Copy, and Paste

* When entering the data directly on the sheet, enter the data in order from the first line.
You can only enter the data of the second line (step 2) after you have entered the data of the first line (step 1).
Note that you cannot enter time values, as they are automatically calculated when you enter the interval.

5 Saving Sequence Data as a File

(1) Create sequence data as shown in Fig. 5-1 and save it as a file. After creating the data, select [Save] from the [File] menu. When the [Save As] dialog appears, save the data under the file name “Wavy1.wvy.”



	Time[s]	Current[A]	Interval[s]	Transition	Output
1	2.5	3.400	2.5	Ramp	on
2	4.5	3.400	2.0	Step	on
3	6.5	5.300	2.0	Step	on
4	9.0	0.000	2.5	Ramp	on

Fig. 5-1 Data in Cells

(2) Open the “Wavy1.wvy” file in Notepad (Fig. 5-2).

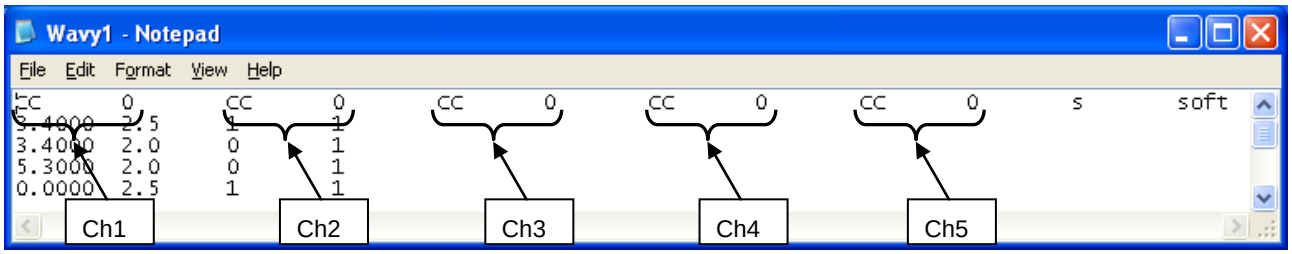


Fig. 5-2 Opening the File in Notepad

The first line shows the data conditions. The contents are as shown below:

1,3,5,7,9 item	CV	Constant voltage mode
	CC	Constant current mode
	CR	Constant resistance mode
	CCV	Constant current + Constant voltage mode
	CRV	Constant resistance + Constant voltage mode
2,4,6,8,10 item	Voltage [V]	CCV, CRV only
11 item	s	In seconds
	min	In minutes
	h	In hours
12 item	soft	Software Control
	hard	Hardware Control

Table 5-1 File Formats

The 2nd and 5th lines are sequence data. The contents are as shown below:

1st data	Voltage [V], current [A], resistance[ohm]
2nd data	Time interval. The units are [s], [min], or [h].
3rd data	Transition. “0” represents step, while “1” denotes ramp.
4th data	Load. “0” represents off, while “1” denotes on.

Table 5-2 File Format

*Pieces of data are **separated by tabs**. Note that they are not separated by spaces.

Tab separation can be changed to comma separation (see 12 Environment Settings).
* A blank line separates the sequence data of each channel.

6 Processing Sequence Data

6.1 Data Transfer

To write the sequence data created to the instrument, select [Transfer] from the [Sequence] menu.The [Transfer] dialog appears (Fig. 6-1). (Hardware Control only)

Fig. 6-1 Initial Settings

Clicking the [Run] button in the Write section causes the current sequence data to be written to the instrument. If you wish to read the sequence data that has already been written to the instrument, click the [Run] button in the Read section.
The sequence data is executed only on the channels whose check box is selected.

* When transferring sequence data for the first time, first connect the instrument to the PC using a connection cable and set up the interface.

* For more information on the sequence function, see the operation manual of each instrument.

[CAUTION] Data created using Wavy is not checked for validity of values (values exceeding the instrument's limit) when the sequence data is written to the instrument. As such, there may be cases where erroneous data is recorded by the instrument. In such a case, the sequence data will be insufficient. Do not to set a voltage or current value exceeding the specifications of the instrument.

6.2 Processing

To process the sequence data input, select [Run] from the [Sequence] menu. The [Run] dialog will appear (Fig. 6-2).

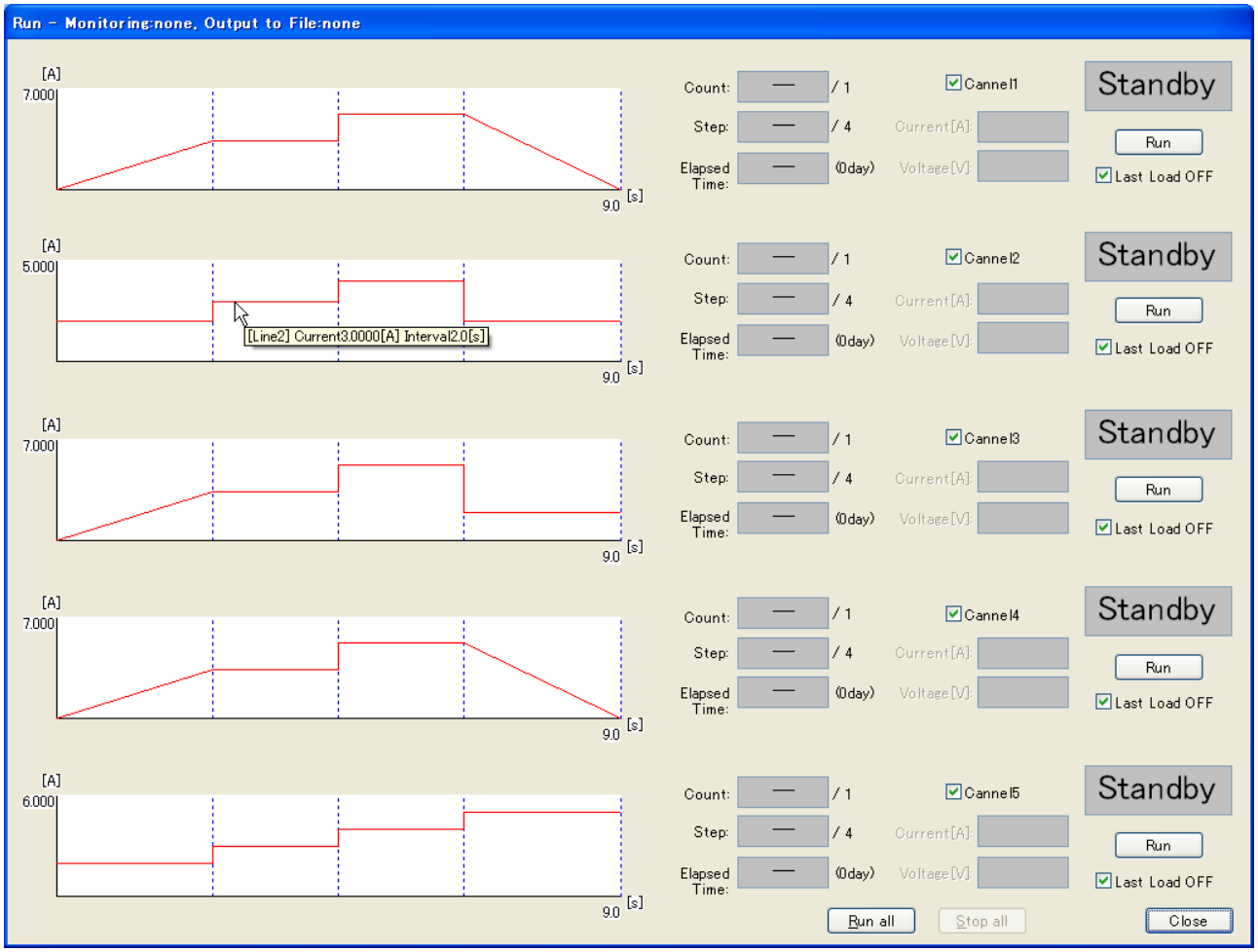


Fig. 6-2 Processing

When you click [Run all] button, the sequence data of selected channel will be performed. It performs synchronously for the first step (selected channels become Load ON state at the same time). If you wish to stop the operation in the middle, click [Stop all] button. When you remove the check mark from the check box (not to be selected), the applied channel is not performed.

When you click [RUN] button, only sequence data of the channel will be performed. During processing, [Run] button becomes [Stop] button.

If the “Last Load OFF” checkbox has been selected (checked), Load is turned OFF when Sequence operation is completed or is stopped during processing. (Software Control only)

The status indications that appear onscreen are as below:

Standby	Gray	Sequence processing is on standby
End	Gray	Sequence processing has been completed.
Running	Green	The [Run] button was pressed, and a sequence is being processed.
Stop	Yellow	The [Stop] button has been pressed.
Error	Red	A communication error or file storage error has occurred. Confirm that the interface settings are correct and that the path to the destination folder is specified correctly.
ALARM	Yellow	Protection was activated. (Software Control only) *Sequence processing continues it.

Table 6-1 Status

Fig. 6-3 shows the screen displayed during processing of a sequence.

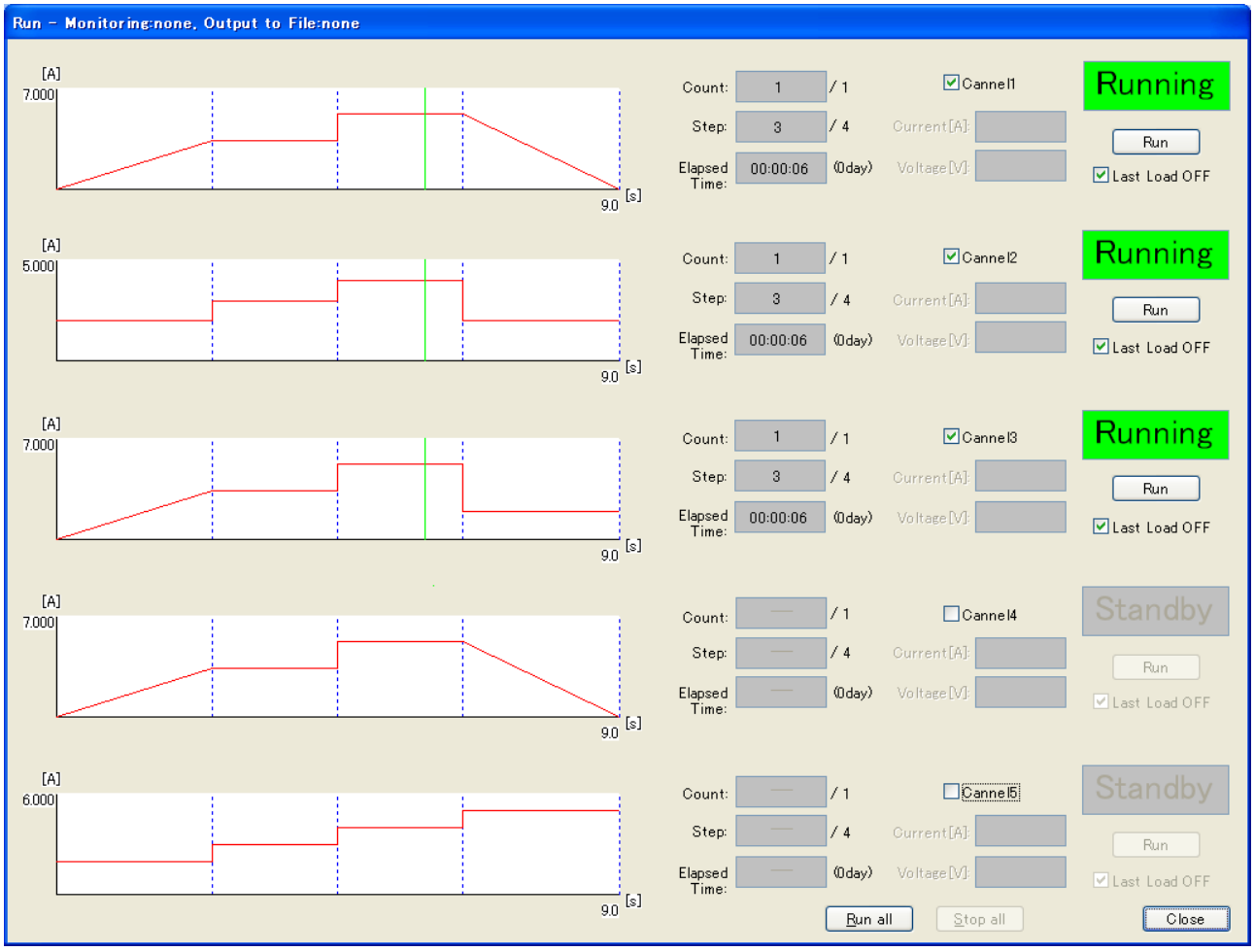


Fig. 6-3 Sequence Being Processed

The screen shows the number of repetitions (counts), step position, and elapsed time.
If current, and/or voltage is selected in the monitoring settings, an input current value, and/or input voltage value will be displayed.

For monitoring settings, see “9 Monitoring Setup.”

* The title of the dialog indicates monitoring and file information.
* The position line (green vertical line in Fig. 6-3) indicates the approximate position of the sequence being processed.

If current and voltage are selected in the monitoring settings, the screen will display the following:

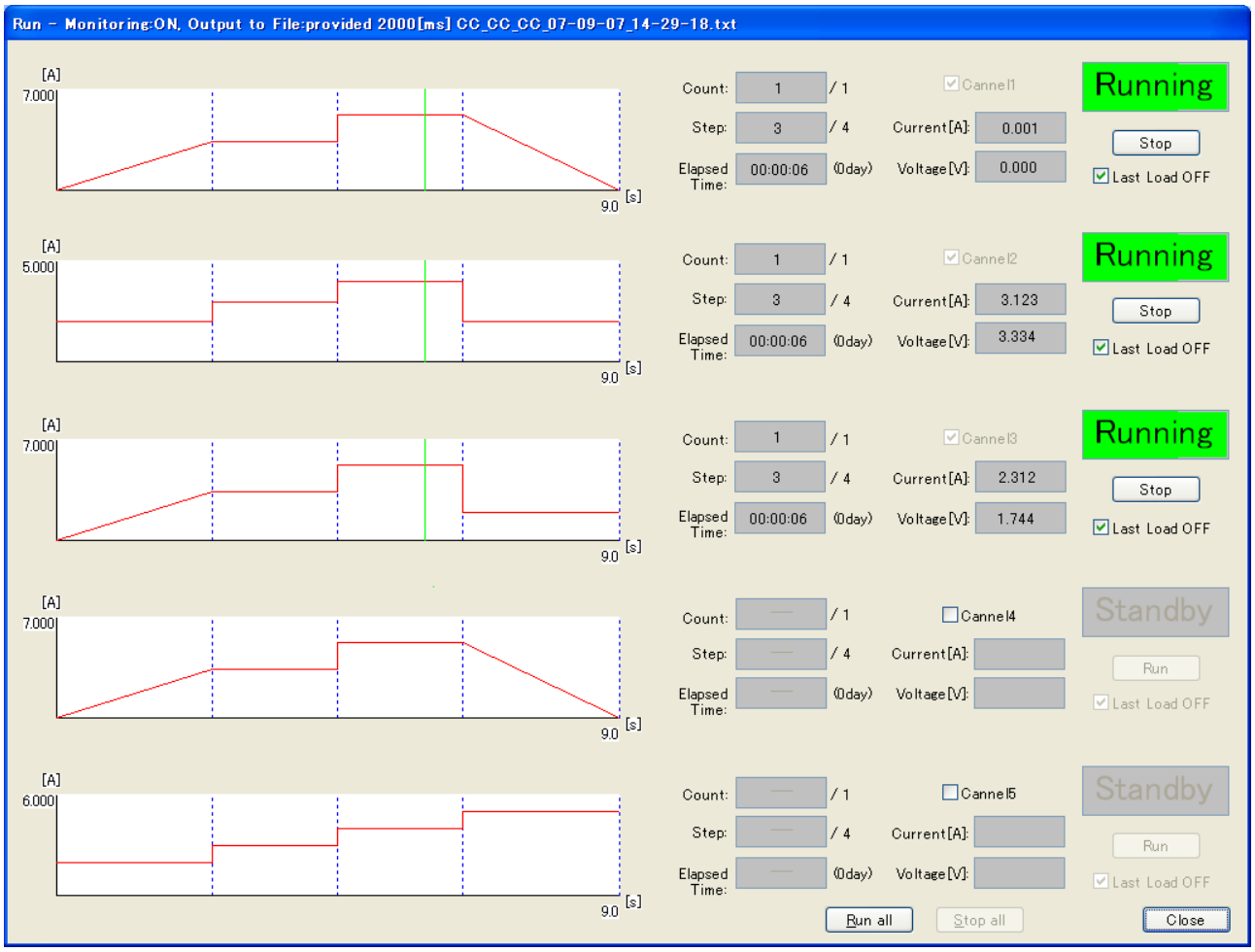


Fig. 6-4 Sequence is being Processed (with Monitoring Activated)

[CAUTION] Data created using Wavy is not checked for validity of values (values exceeding the instrument's limit) when the sequence data is written to the instrument. As such, there may be cases where erroneous data is recorded by the instrument. In such a case, the sequence data will be insufficient. Do not to set a voltage or current value exceeding the specifications of the instrument.

7 Setting the Mode

Select [Mode] from the [Sequence] menu. The [Mode] dialog appears (Fig. 7-1).

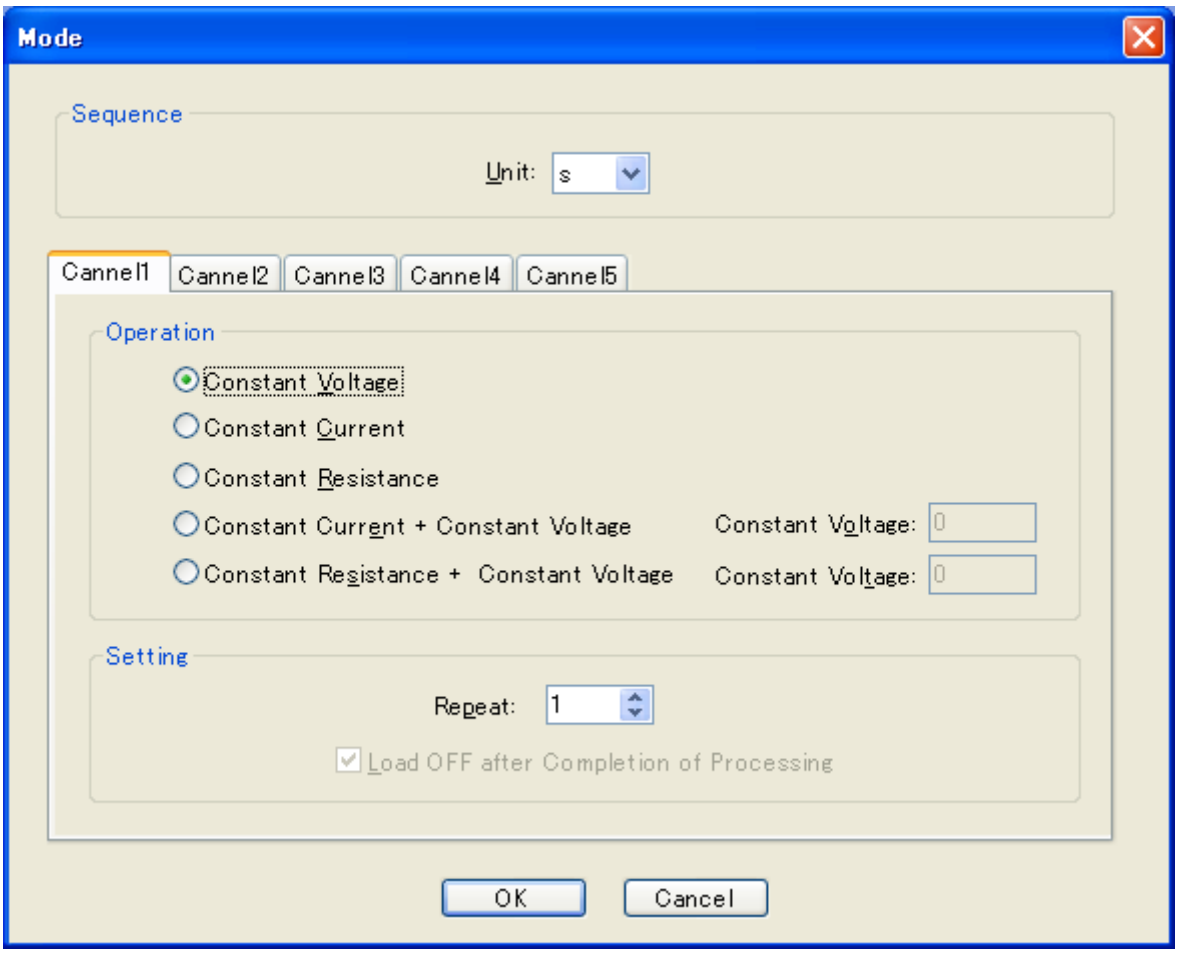


Fig. 7-1 Setting the Mode

The time ranges in the sequence modes are as shown below:

Software Control	Seconds Minutes Hours	0.5 to 999.5 [s] (minimum unit: 0.5) 0.1 to 999.9 [min] 0.1 to 999.9 [h]
Hardware Control	Seconds	0.001 to 9999.000 [s]

Table 7-1 Data Range

If you set Wavy so that the sequence is entered in unit of seconds for a ramp transition, the value settings for the ramp are set every 0.5 second. If you set Wavy so that the sequence is entered in unit of minutes or hours, the value settings for the ramp are set every second. (Software Control only)

In the Hardware Control, it is only two operation modes: constant current and constant resistance. The range of the repeat count is 1 to 9999.

In the “Hardware Control”, set the Load to be OFF after the end of operation.
Be noted that the operating function differs from the “Software Control”.
If the check box of [Load OFF after Completion of Processing] is not checked (not selected), the last setting of sequence data will be performed infinitely and it becomes “Load ON” state.

To adjust the number of significant digits for the decimal fraction of each set value in line with the operation mode, select [Options] from the [Sequence] menu. The [Options] dialog will appear (Fig. 7-2).

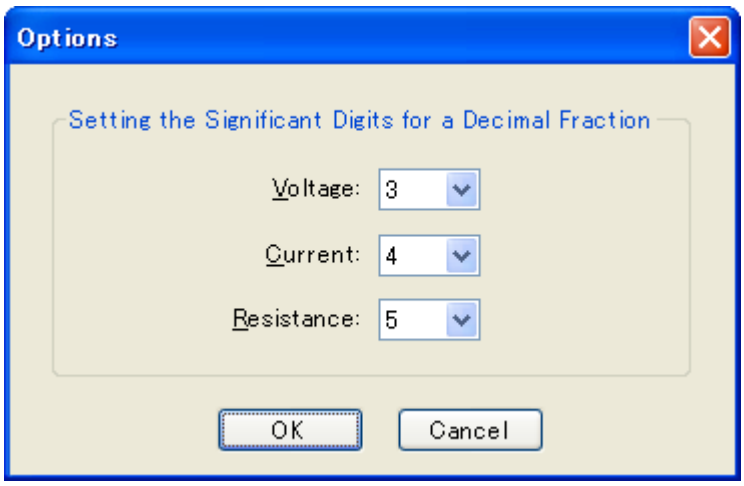


Fig. 7-2 Setting the Number of Significant Digits

The setting ranges of the number of significant digits for decimal fractions are as shown below:

Voltage	2 to 3 digits	(x.xx to x.xxx)
Current	2 to 5 digits	(x.xx to x.xxxxx)
Resistance	4 to 5 digits	(x.xxxx to x.xxxxx)

Table 7-2 Number of Significant Digits for a Decimal Fraction

* 0[ohm] becomes open.

*** The number of significant digits for a decimal fraction varies for each instrument of the PLZ-U series.**
It also differs depending on the current and voltage ranges.
Note that settings here are for creating and editing sequence data.

8 Initial Settings

Select [Initial Settings] from the [Sequence] menu. The [Initial Settings] dialog will appear (Fig. 8-1).

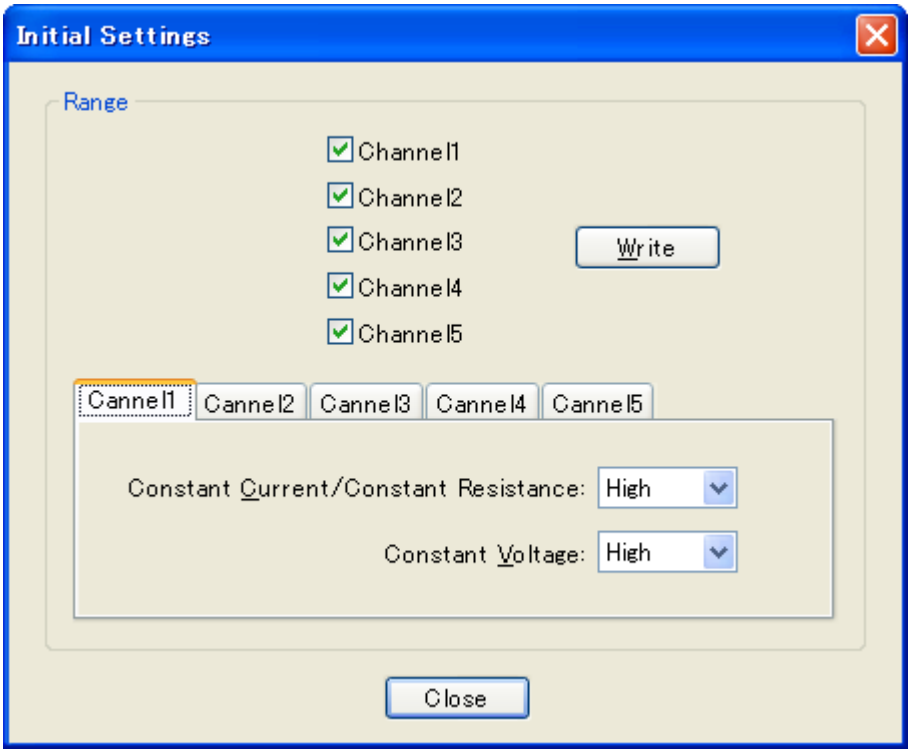


Fig. 8-1 Initial Settings

Each channel can set range setting: constant current / constant resistance and constant voltage. Clicking the [Write] button in the Write section causes the range to be written to the instrument.

When you remove the check mark from the check box (not to be selected), the applied channel is not performed.

*** In the “Hardware Control”, write the sequence data before running or transferring of the sequence operation.**

9 Setting up the Interface

Select [Interface] from the [Sequence] menu. The [Interface] dialog appears (Fig. 9-1).

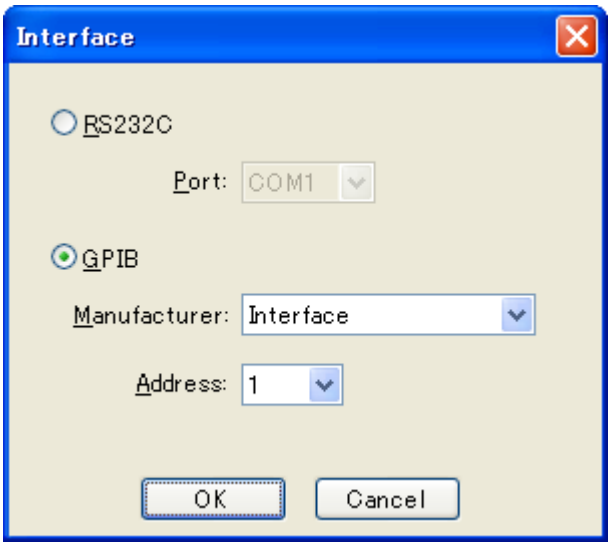


Fig. 9-1 Setting up the Interface

- For the RS-232C, the communications protocol settings are set and fixed at factory shipment of the respective instruments.
  If these settings have been changed on the instrument side, change the settings to the factory default settings.

PIA4830 series	Transfer rate	19,200 bps
	Data bit length	8 bits
	Stop bit length	1 bits
	Parity bits	None

Table 8-1

To conduct a connection test, execute “*IDN? ” using the “Hyper Terminal” communication software provided as standard in Windows.
* Use a cross cable as the RS-232C connection cable.

- For GPIB, select the manufacturer and set the Address to the GPIB address of the interface in use.
  The delimiter setting is fixed to LF + EOI.
  As for operating conditions, check that the GPIB driver provided by the relevant manufacturer has been installed and is operable. For this, conduct a connection test by executing “*IDN? ” using the utility provided by the relevant manufacturer.

National Instruments	NI-488.2 driver
CONTEC	GPIB communications driver API-GPIB (98/PC) W95, NT Ver. 3.50 or later
Interface	GPF-4301 for Windows Ver. 1.13-05 or later

Table 8-2

* For setup of a GPIB driver, see the operation manual of the relevant manufacturer.

10 Monitoring Setup

Select [Monitoring Setup] from the [Sequence] menu. Then the [Monitoring Setup] dialog appears (Fig. 10-1).

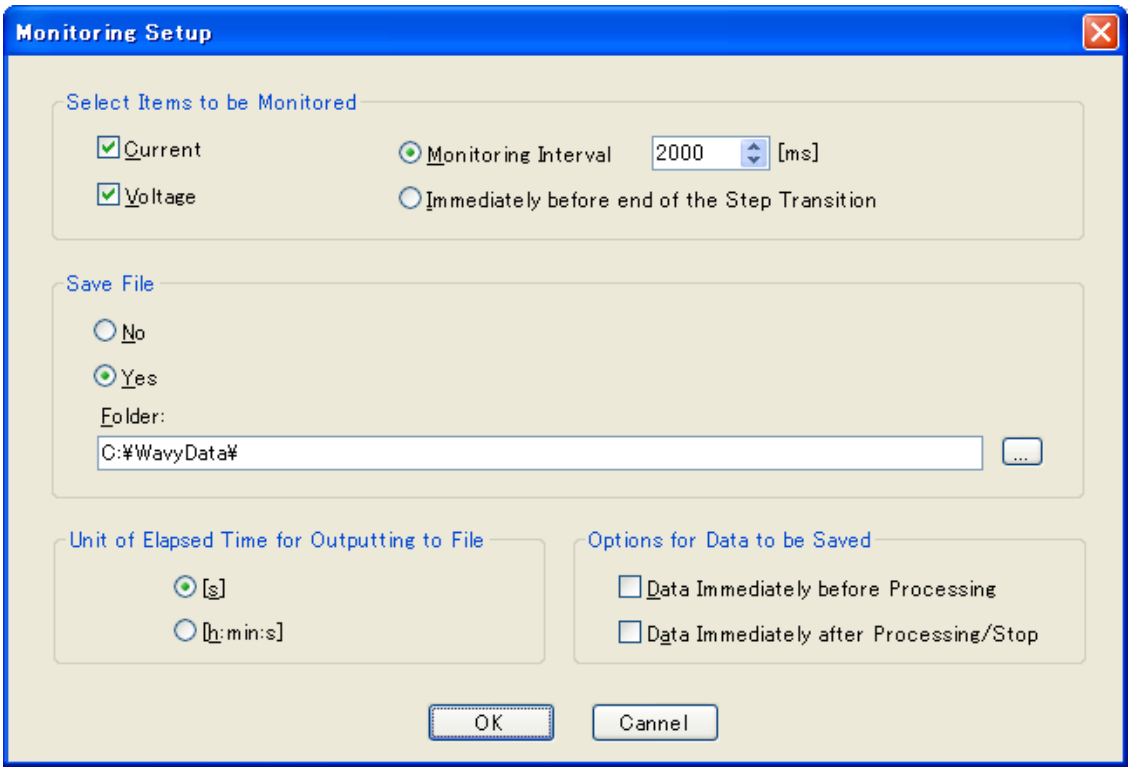


Fig. 10-1 Monitoring Setup

If the Current checkbox has been checked, the “input current value” will be displayed during processing of the sequence.
If the Voltage checkbox has been checked, the “intput voltage value” will be displayed during processing of the sequence.

The type of monitoring can be selected on the screen, check for the “Select items to be Monitored”. When the “monitoring interval” is checked, the monitoring will be performed at the period of setting interval. If the “Immediately before end of the Step Transition” is checked (selected), the monitoring will perform as shown in Fig. 10-2. It monitors just before starting the next step setup value. The monitoring is not performed in the “Ramp transition”. (Software Control only)

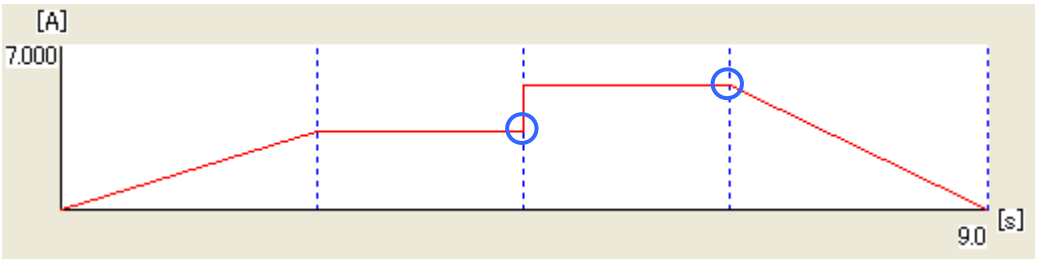


Fig. 10-2 Immediately before end of the Step Transition

The monitoring interval range is 500 to 600,000 [ms] (0.5 to 600 [s]).

If the “Save” checkbox has been checked in the Save File section, monitored data will be output to a file in the folder specified. Fig. 10-3 shows a monitored-data output file.

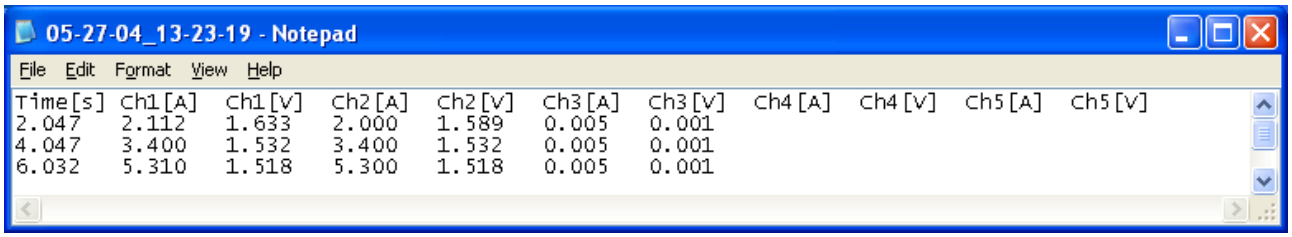


Fig. 10-3 Monitored-data Output File

In the example in Fig. 10-3, the monitored data file name is as shown below (Table 10-1).

CC_ CC_ CC_05-27-04_13-23-19. txt

(1) (2)

(1) CV: Constant Voltage mode, CC: Constant Current mode, CR: Constant Resistance mode, CCV: Constant Current + Constant Voltage mode, CRV: Constant Resistance + Constant Voltage mode

(2) Date and time of the start of sequence processing

Table 10-1 File Name Format

The time interval for output of monitored data to file may be selected using either the [second] or [hour: minute: second] format.

* The accuracy of time measurement (for the monitoring interval) depends on the PC environment in use.
* Pieces of data are **separated by tabs**. Note that they are not separated by spaces. Tab separation can be changed to comma separation (see 12 Environment Settings).

If the “Data Immediately before Processing” checkbox has been checked, the monitored values applied immediately before load is activated (that is, during OFF status) are output to file as 0 [s]. If the “Data Immediately after Processing Completion/Stop” checkbox has been checked, the monitored values obtained immediately after processing is completed or stopped (that is, during OFF status) are output to file at that time (actual data acquisition is done within a range of 0 to 2 seconds).

11 Setting the Graph Scale

Select [Scale] from the [Graph] menu. The [Scale] dialog will appear (Fig. 11-1).

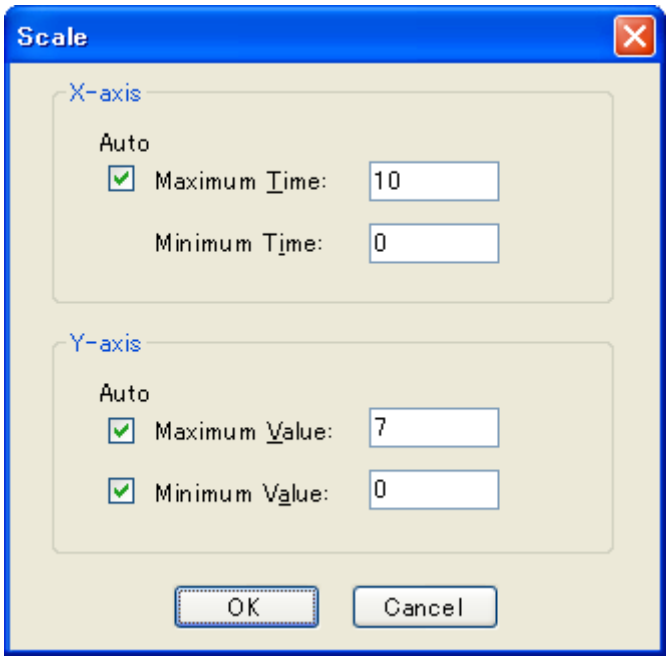


Fig. 11-1 Setting the Graph Scale

If the Auto checkbox has been selected (checked), the scale will change automatically. Whenever a file is loaded into Wavy or sequence data is entered, the maximum or minimum value of the X- or Y-axis of a graph will automatically be changed to an optimum value.

If you do not wish to have the value changed automatically, uncheck the Auto checkbox. Note that if you uncheck the Auto checkbox, nothing will be displayed on the graph if one of the data values is out of range.

12 Environment Settings

Select [Environment Settings] from the [Sequence] menu. The [Set Environment] dialog will appear (Fig. 12-1).

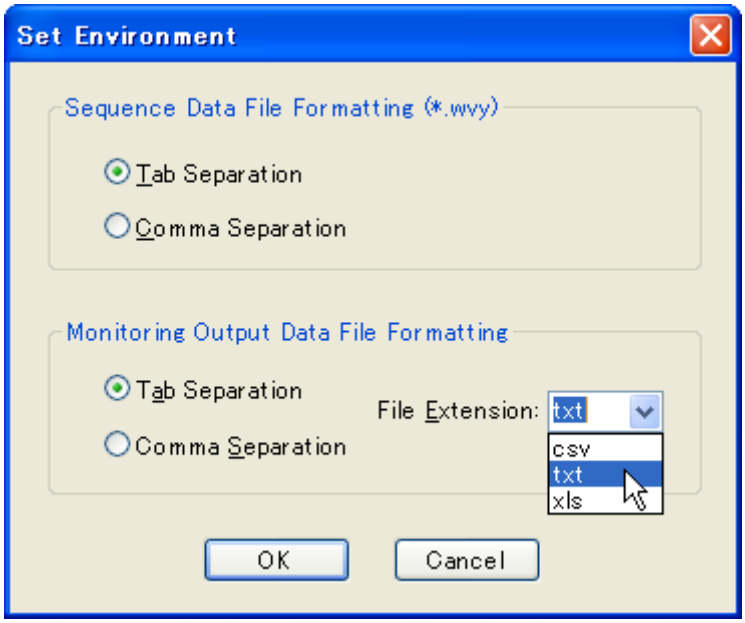


Fig. 12-1 Environment Settings

By default, the Sequence Data File Formatting is set at **Tab Separation** for separating data. When Comma Separation is selected, data will be **separated by commas**.

The Monitoring Output Data File Format section functions the same way as the Sequence Data File Format section. The File Extension can be set by the user.

* For sequence data files, see “5 Sequence Data File.”
* For monitoring output data files, see “10 Monitoring Setup.”

13 Other Settings

The colors of graph items such as the background color can be changed (Fig. 13-1).

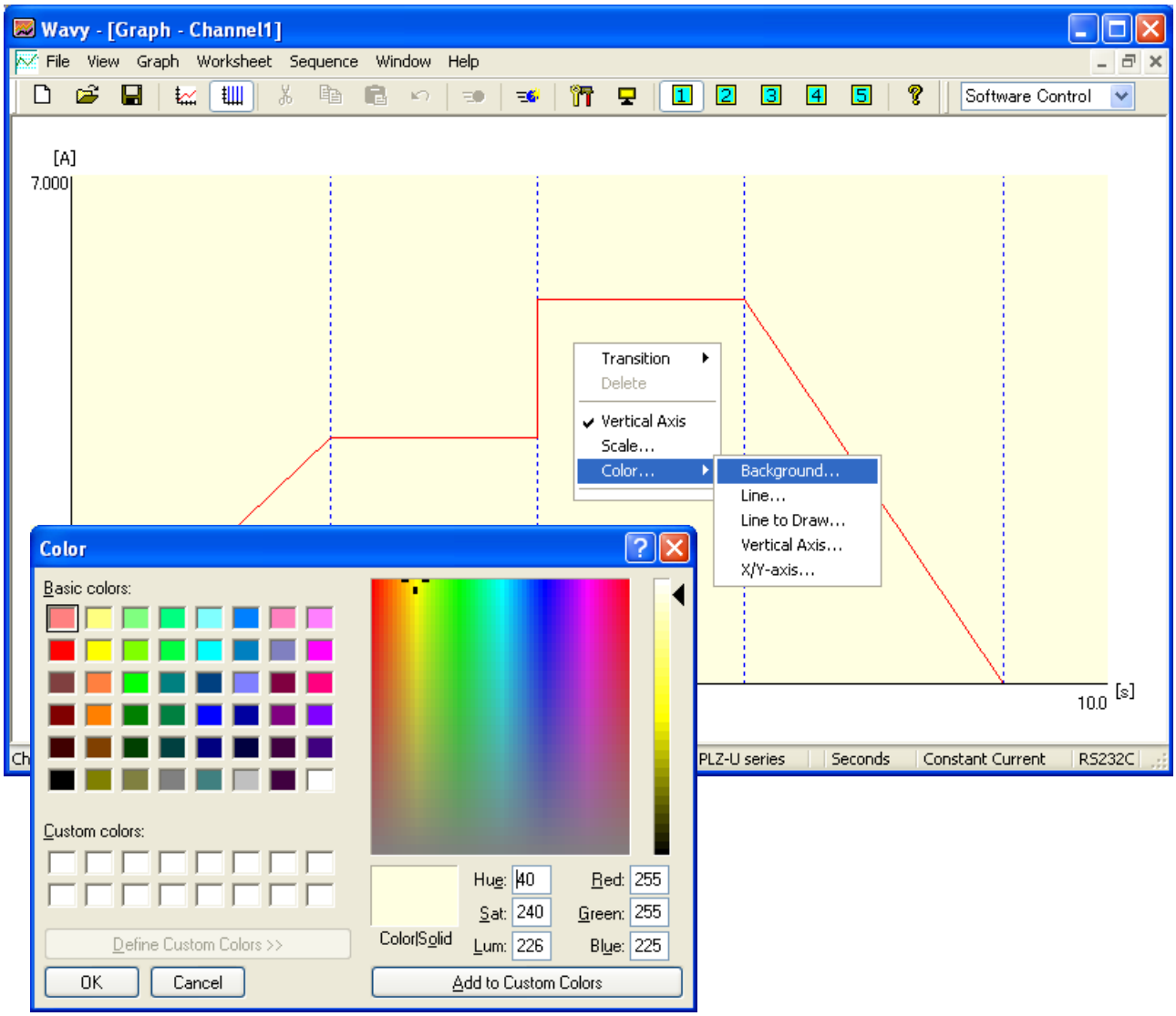


Fig. 13-1 Changing the Colors of a Graph

* [Line to Draw] applies to both the line color of mouse movement (Fig. 4-2) when a graph is drawn and the color of the line showing processing status (Fig. 6-3) when a sequence is processed.

14 Menu Items

14.1 File

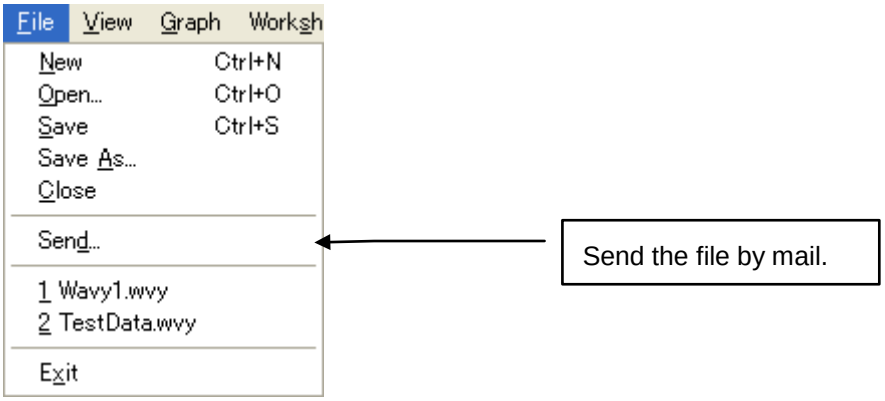


Fig 14-1

14.2 View

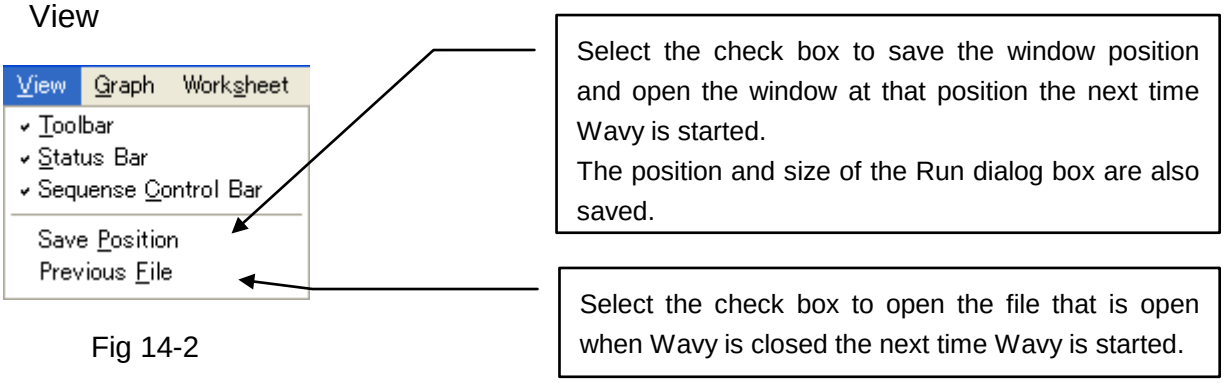


Fig 14-2

14.3 Graphs

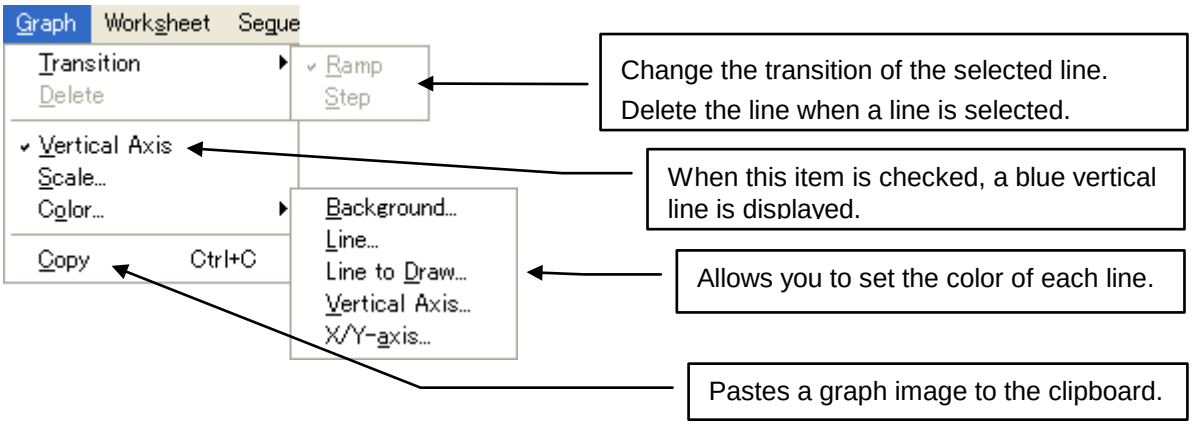


Fig 14-3

14.4 Worksheet

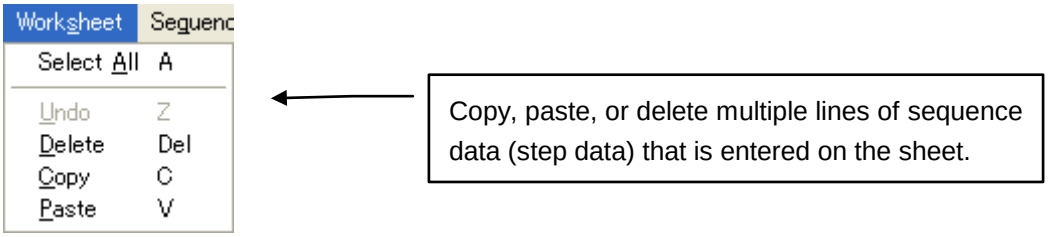


Fig 14-4

14.5 Sequence

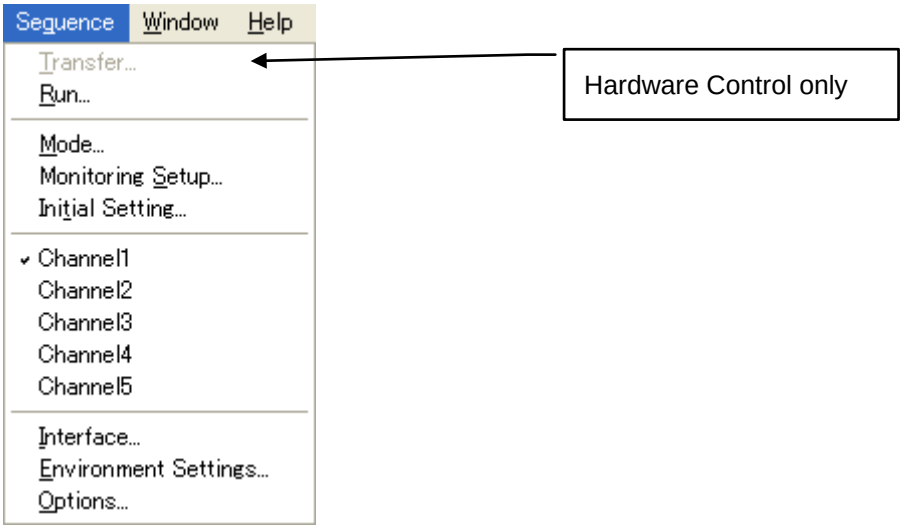


Fig 14-5

14.6 Windows

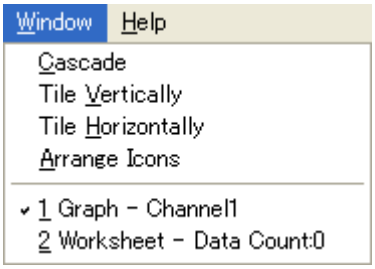


Fig 14-6

14.7 Help

Fig 14-7

15 Toolbar and Status Bar

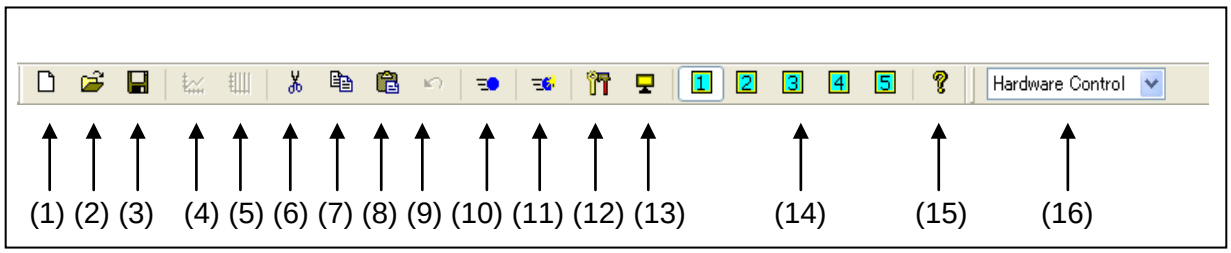


Fig. 15-1 Toolbar

(1) New (Ctrl + N)
(2) Open (Ctrl + O)
(3) Save (Ctrl + S)
(4) Scale
(5) Switch Vertical Line Display
(6) Delete
(7) Copy (C)
(8) Insert (V)
(9) Undo (Z)
(10) Transfer
(11) Run
(12) Mode
(13) Monitoring Setup
(14) Channel 1-5
(15) About Wavy
(16) Sequence operation

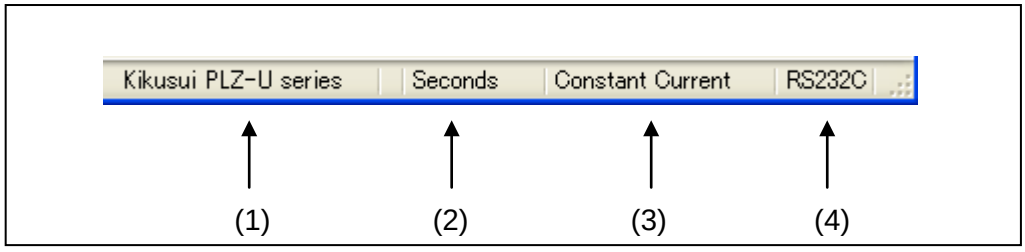


Fig. 15-2 Status Bar

(1) Instrument name
(2) seconds, minutes, or hours
(3) Operation mode: Constant Voltage or Constant Current or Constant Resistance or Constant Current + Constant Voltage or Constant Resistance + Constant Voltage
(4) Interface: RS-232C or GPIB