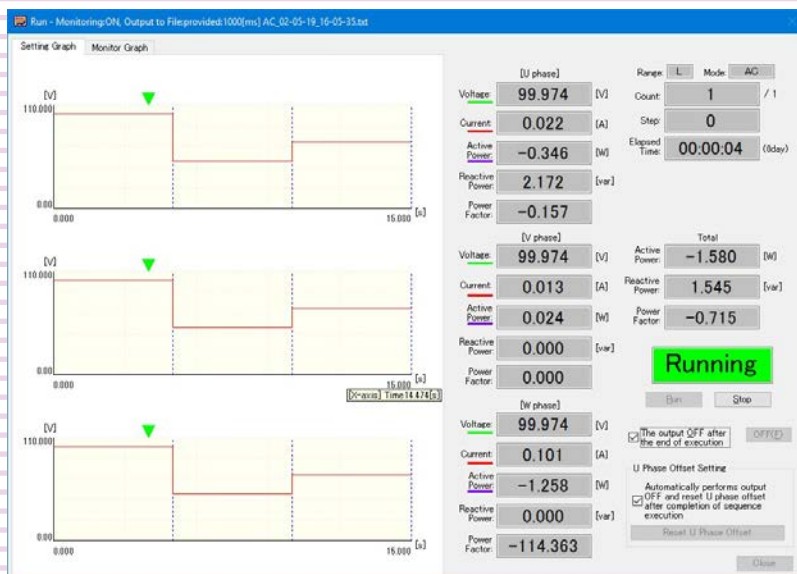


**KIKUSUI**Part No. IX001181
Mar 2019

User's Manual

Sequence Creation Software

SD032-PCR-WE Wavy for PCR-WE**Ver. 6.x**

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Introduction

This manual explains how to use SD032-PCR-WE Wavy for PCR-WE to control the PCR-WE series and PCR-WE2 series (hereafter also collectively referred to as the PCR-WE, including the PCR-WE2R, a model with a regeneration function).

■ Safety Precautions

Before you use Wavy, read the PCR-WE manual, and be sure to make connections and handle the device properly.

Improper connections or handling can lead to serious accidents, injury, and fire.

■ Product versions that this manual covers

This manual applies to version 6.x of SD032-PCR-WE Wavy for PCR-WE. To check the Wavy version, on the Help menu, click About Wavy.

Wavy for PCR-WE applies to PCR-WE with firmware version 1.26 and later. For instructions on how to view the firmware version, see the PCR-WE manual.

■ Intended readers

This manual is intended for users who will use SD032-PCR-WE Wavy for PCR-WE to control the PCR-WE and instructors of such users. The manual assumes that the reader has knowledge about AC power supplies.

■ Trademarks

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■ Notations Used in This Manual

- In this manual, Sequence Creation Software SD032-PCR-WE Wavy for PCR-WE is referred to as Wavy for PCR-WE or Wavy.
- In this manual, the PCR-WE series and PCR-WE2 series (including the PCR-WE2R, a model with a regeneration function) AC power supply is also referred to as the "PCR-WE."
- "PC" in this manual is a generic term for personal computers and workstations.
- In this manual, operations on Windows 10 are described when explaining operations related to the OS.
- The following markings are used in this manual.



WARNING

Indicates a potentially hazardous situation which, if ignored, could result in death or serious injury.

NOTE

Indicates information that you should know.

>

Indicates the menu command you need to select. The menu command to the left of ">" is the higher level command.

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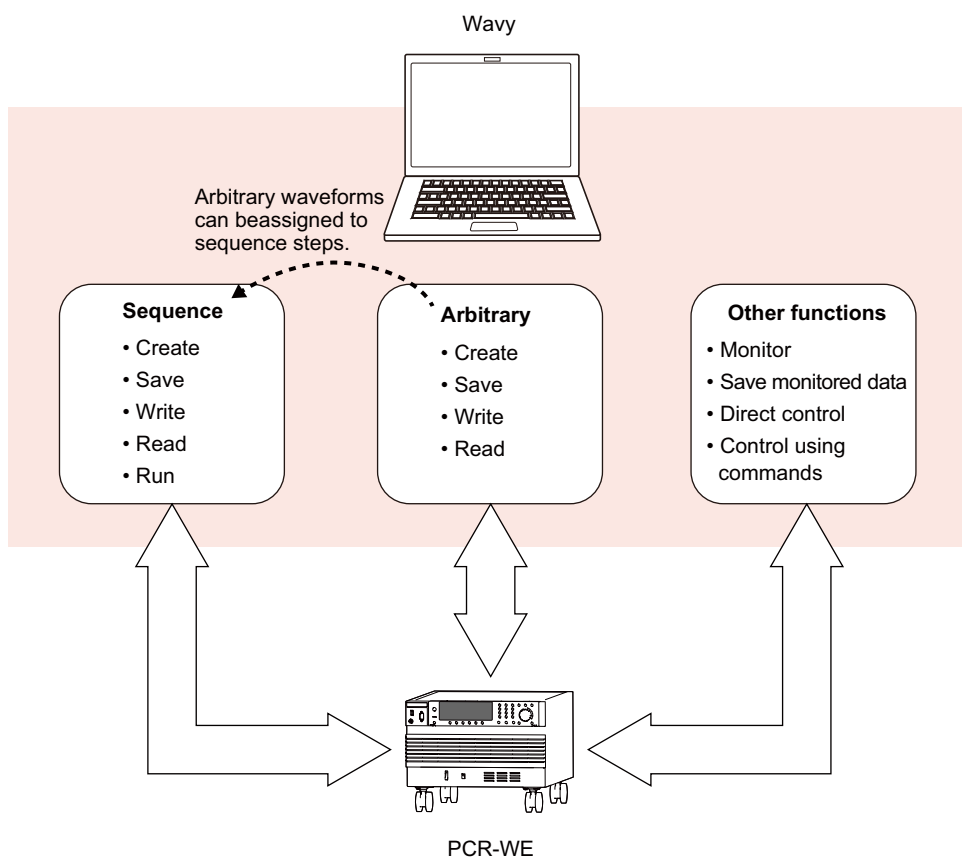
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Wavy Overview

Sequence Creation Software SD032-PCR-WE Wavy for PCR-WE is used to create and execute sequences for Kikusui PCR-WE Series and PCR-WE2 Series AC Power Supplies.

You can use graphs and spreadsheets to intuitively create sequence steps. The sequence data that you create are stored and managed in sequence files (.wvy extension). You can write them to a PCR-WE and execute them when necessary.

Wavy also allows you to create arbitrary waveform data that can be transmitted using the special waveform output feature of the PCR-WE. The arbitrary waveform data that you create is saved and managed in individual arbitrary waveform files (.arb extension). You can write them to waveform banks in the PCR-WE or assign them to steps in sequences created using Wavy. You can also use Wavy to monitor and directly control the PCR-WE as well as control them using commands.



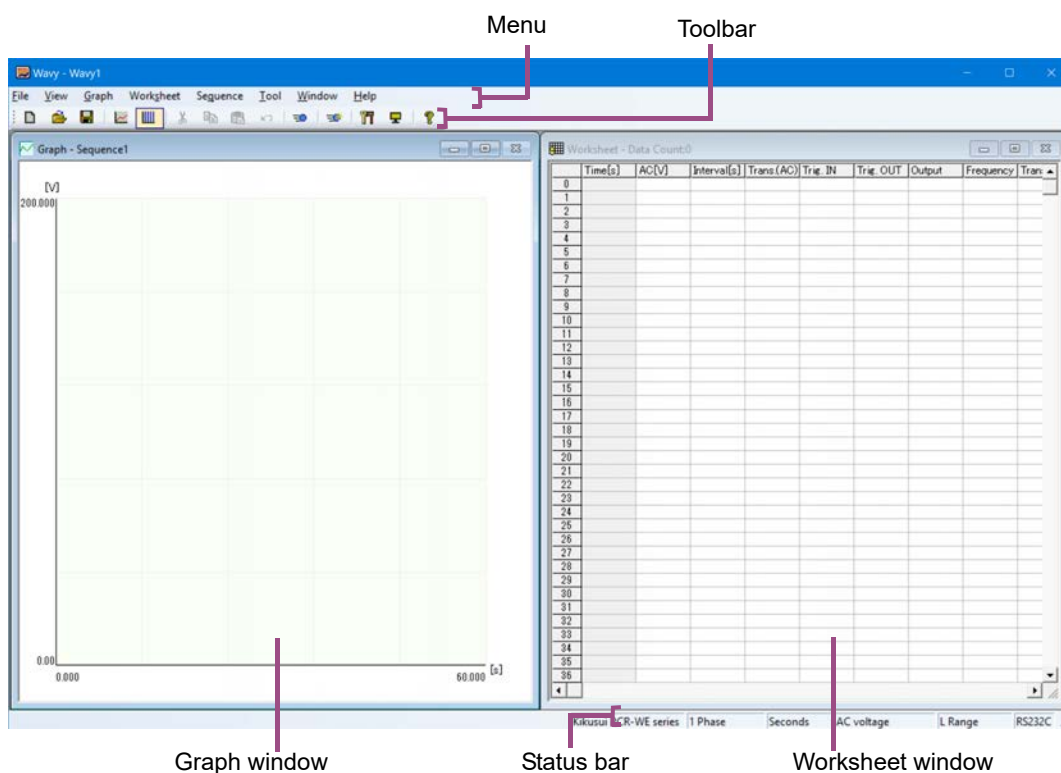
Starting Wavy

NOTE

- Disable the Windows power-saving mode and screen saver. Also, avoid using other applications with Wavy.
- If you are using a PC that has advanced power management (APM) or sleep mode, disable these functions.
- When you change the DPI setting, the display may not appear properly depending on the resolution.

To start Wavy, on the taskbar, click Start, All Programs, Kikusui, and then SD032-PCR-WE>Wavy for PCR-WE.

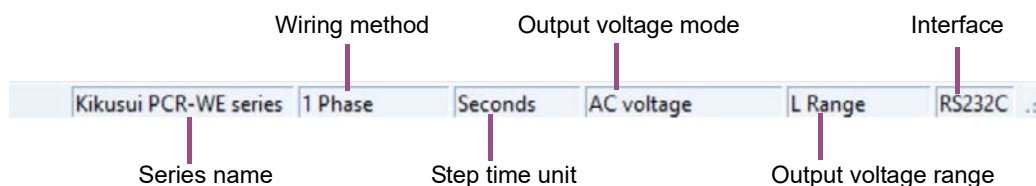
When you start Wavy, the sequence setup window (main window) appears.



The sequence setup window contains a graph window and a worksheet window. Either window can be used to set steps, which are elements of sequences.

- Graph window: Use the mouse to set steps.
- Worksheet window: Enter values and conditions to set steps.

The status bar shows the following items.



Changing the window display format

On the Window menu, click Cascade, Tile Vertically, or Tile Horizontally.

If you select Arrange Icons while windows are minimized, the Graph window and Worksheet window icons are arranged in the bottom area of the window.

View settings at startup

If you select Save Position from the View menu, the position and size of the window are saved and applied the next time Wavy is run.

If you select Previous File, the most recent file that you used will be opened the next time Wavy is run.

If SCPI error codes are displayed

SCPI error codes may be displayed while using Wavy. If an error code is displayed, see the PCR-WE Communication Interface Manual.

Using Wavy on Windows 10

You need to be careful about the auto update function of Windows 10. If you use the default Windows Update settings, Windows may automatically restart while a sequence is running.

See “About Windows updates (Windows 10 only)” in the setup guide, and construct the most stable OS environment possible before running a sequence.

Configuring the Interface

Before using Wavy, configure the interface to connect to PCR-WE. You can select from the following three interfaces:

- RS232C ([p.7](#))
- USB ([p.9](#))
- LAN ([p.10](#))
- GPIB ([p.13](#))

RS232C

Connection

- 1 Turn off the PCR-WE and PC.**
- 2 Connect the PCR-WE to the PC with a RS232C cable.**
Use a D-sub, 9-pin, female-to-female AT crossover cable.

Setup

■ PCR-WE setup

By factory default, the PCR-WE's RS232C is set as follows:

- RS232C: Enabled
- Data rate (baudrate): 19200 bps
- Flow control: Xon/Xoff (on)

NOTE

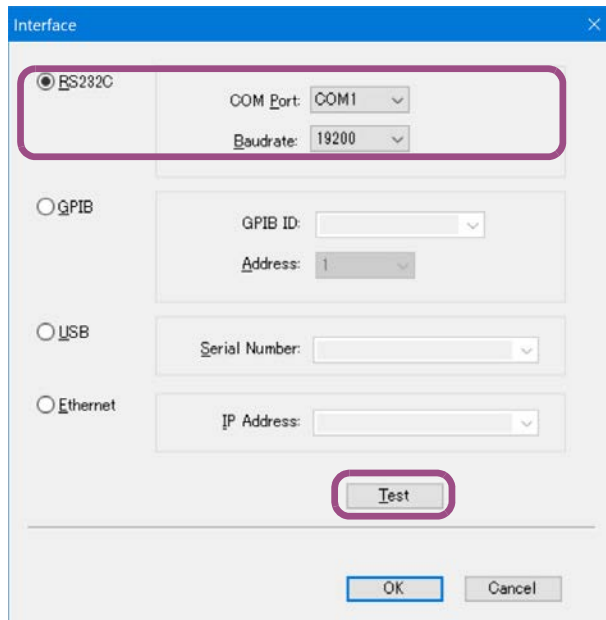
Wavy does not perform flow control when exchanging waveform data (binary data). Follow the procedure below to set flow control to NONE (off).

- 1 On the PCR-WE panel, press CONFIG (SHIFT+OPR MODE) > COM-I/F (F1) > RS232C (F3).**
- 2 Press FLOW CTRL (F4) > NONE (F1).**
- 3 Press ESC > APPLY (F5).**
- 4 Turn the PCR-WE's POWER switch off and then back on.**

■ Wavy setup

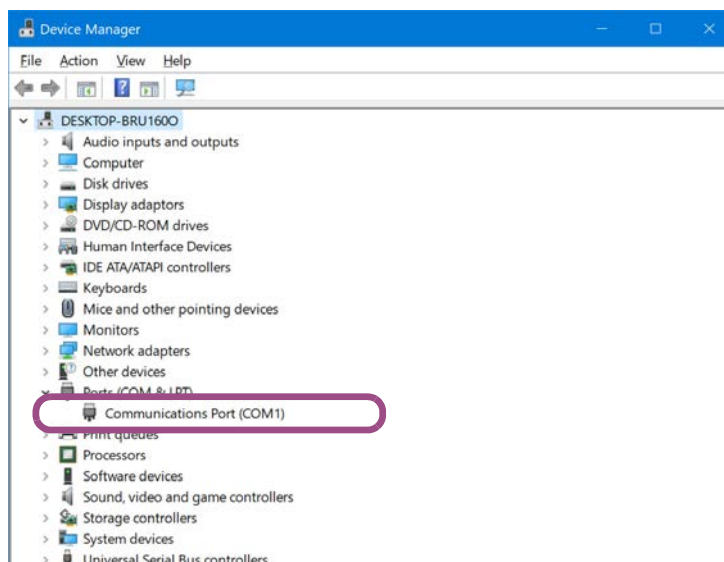
- 1 **Start Wavy.**
- 2 **On the Sequence menu, click Interface.**

The Interface window appears.



- 3 **Select RS232C.**
- 4 **Set the COM port number that the PCR-WE is using.**

Right-click Windows Start, and select Device Manager. Open Port (COM & LPT) to view the port number in use.



- 5 **Set the baudrate set on the PCR-WE.**
- 6 **Click Test to check that Wavy can communicate with the PCR-WE.**
- 7 **Click OK.**

USB

Connection

- 1** Turn off the PCR-WE and PC.
- 2** Connect the USB connector (device) on the rear panel of the PCR-WE to the PC with a USB cable.

Setup

■ PCR-WE setup

By factory default, the PCR-WE's USB is set as follows:

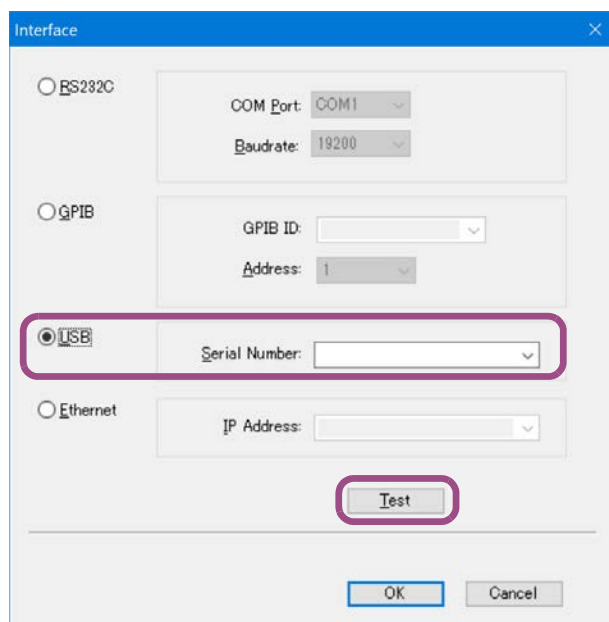
- USB: Enabled

If you are going to use the PCR-WE with the factory default settings, there is no need to configure the PCR-WE. If you want to change the settings, see the PCR-WE Communication Interface Manual.

■ Wavy setup

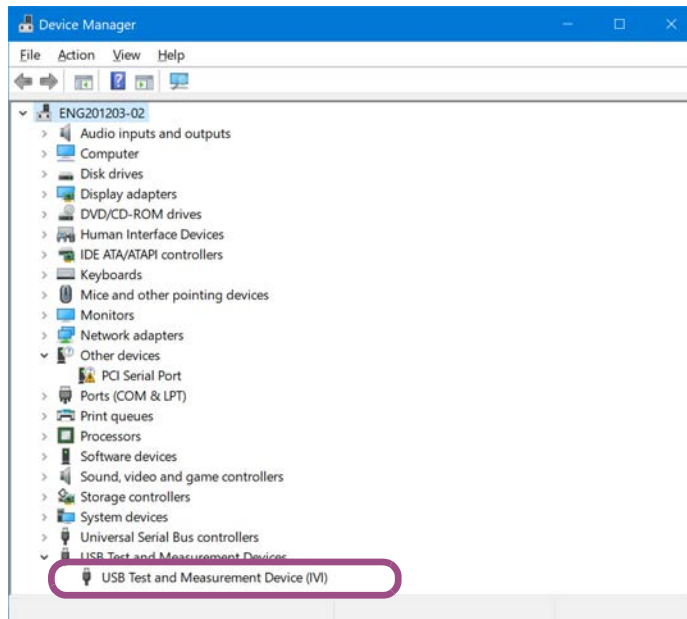
- 1** Start Wavy.
- 2** On the Sequence menu, click Interface.

The Interface window appears.



- 3** Select USB.
- 4** Enter the serial number of the connected PCR-WE.
You can check the serial number on the rear panel of the PCR-WE.

If the serial number does not appear even when the instrument is connected properly, check whether the PC has detected the PCR-WE. Right-click Windows Start, and select Device Manager.



If "USB Test and Measurement Device" is not displayed, VISA is not installed correctly. Reinstall VISA.

5 Click **Test** to check that Wavy can communicate with the PCR-WE.

6 Click **OK**.

LAN



WARNING If a network problem occurs, an unexpected dangerous voltage may occur that may cause electric shock, fire, physical damage to the DUT, and so on. If you are going to remotely control the PCR-WE from a distance, install a Web camera or take other measures to monitor the status.

Connection

- 1** Use a LAN cable (category 5 or greater, straight) to connect the PCR-WE using method (a) or (b).
 - (a) Connect the PCR-WE to a corporate LAN or router.
 - (b) Connect the PCR-WE directly to the PC or through a switching hub.

When connected to the network, the LAN LED on the front panel turns green.

Setup

■ PC setup

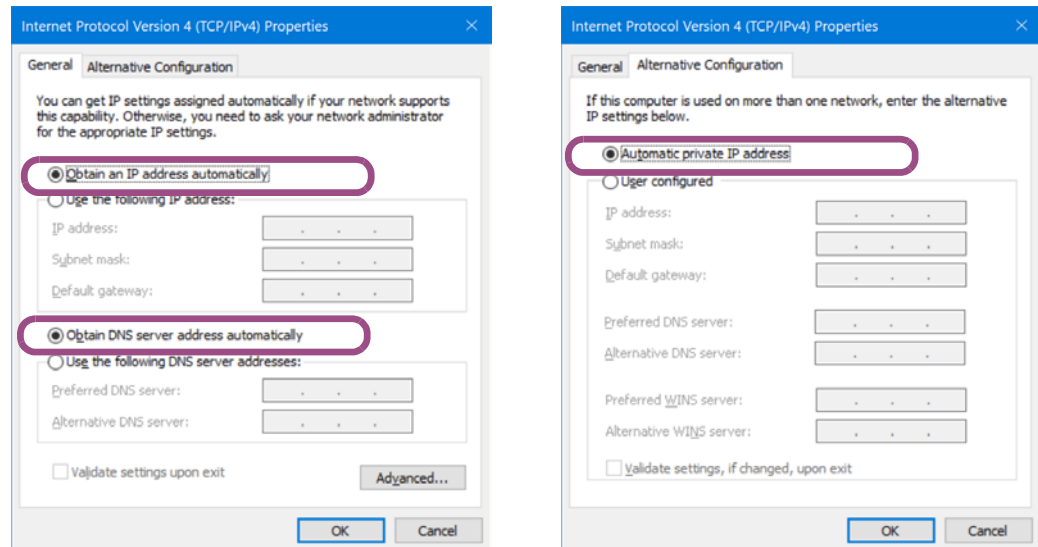
Method (a)

There are no particular settings you need to make.

Method (b)

Set the Internet protocol version 4 (TCP/IPv4) properties as follows:

- Windows Start (right click) > Network connections > Network and Sharing Center > Ethernet > Properties > Internet Protocol Version (TCP/IPv4) > Properties



■ PCR-WE setup

By factory default, the PCR-WE's LAN is set as follows: Unless there is a special reason otherwise, you can simply use these settings for methods (a) and (b).

| Setup item | Setting |
|------------------------------|--------------------|
| LAN interface | LAN: Enabled |
| IP address assignment method | AUTO* ¹ |

*¹ With method (b), it will take about a minute to establish a connection between the PC and PCR-WE.

To control the PCR-WE from Wavy through LAN, you need to know the PCR-WE's IP address.

If you are going to use the PCR-WE with the factory default settings, the PCR-WE's IP address will be automatically assigned. To check the IP address, follow the procedure below. If you want to change the PCR-WE settings such as when you want to use a fixed IP address, see the PCR-WE Communication Interface Manual.

1 On the PCR-WE panel, press CONFIG (SHIFT+OPR MODE) > COM-I/F (F1) > LAN (F1).

The LAN settings are displayed.

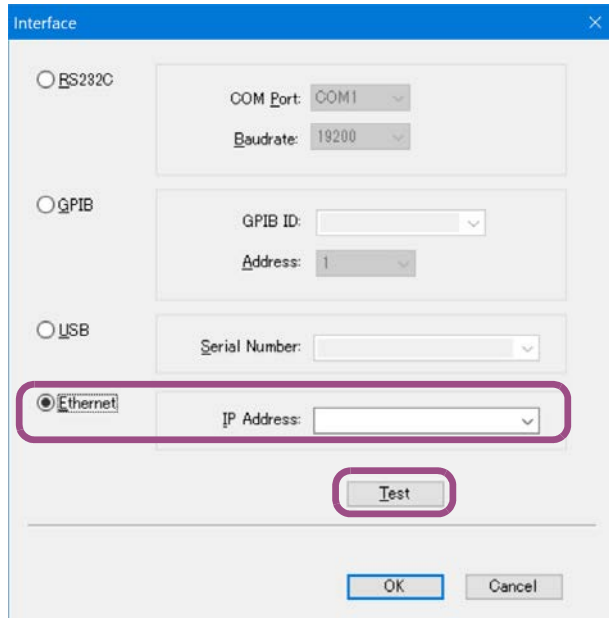
2 Note the IP address.

■ Wavy setup

1 Start Wavy.

2 On the Settings menu, click Interface.

The Interface window appears.



3 Click Ethernet.

4 Enter the IP address of the connected PCR-WE.

The IP address that you enter is not stored in the drop-down list. The drop-down list shows the results of searching the IP addresses registered in VISA.

5 Click Test to check that Wavy can communicate with the PCR-WE.

6 Click OK.

If the PCR-WE is no longer recognized

If you are not using a fixed IP address, the PCR-WE's IP address may change, causing the PC to no longer recognize it. If this happens, check the IP address by following the procedure in "PCR-WE setup" ([p.11](#)).

GPIB

To use GPIB, an optional GPIB interface board (IB07-PCR-WE) must be available in the PCR-WE.

Connection

- 1** Turn off the PCR-WE and PC.
- 2** Connect the PCR-WE to the PC with a GPIB cable.

Setup

■ PCR-WE setup

By factory default, the PCR-WE's GPIB is set as follows:

- GPIB: Enabled
- GPIB address: 5

If you are going to use the PCR-WE with the factory default settings, there is no need to configure the PCR-WE. If you want to change the settings, see the PCR-WE Communication Interface Manual.

■ Wavy setup

- 1** Start Wavy.
- 2** On the Settings menu, click Interface.

The Interface window appears.

The screenshot shows the 'Interface' window in the Wavy software. The 'GPIB' radio button is selected. The 'GPIB ID' field is empty, and the 'Address' field is set to '1'. The 'Test' button is highlighted with a purple box. The 'OK' and 'Cancel' buttons are at the bottom.

3 Click GPIB.

4 Sets the GPIB ID that you want to use.

Normally the GPIB ID is 0 (GPIB0), but if several GPIB boards, USB-GPIB adapter, or the like are connected to the PC, the ID is used to distinguish them. The drop-down list shows the results of searching the GPIB IDs registered in VISA.

If the GPIB ID you want to use is not displayed in the drop-down list, see “When the GPIB ID is not displayed” (p.14).

5 Set the GPIB address of the connected PCR-WE.

To view the GPIB address, on the PCR-WE panel, press CONFIG (SHIFT+OPR MODE) > COM-I/F (F1) > GPIB (F4).

6 Click Test to check that Wavy can communicate with the PCR-WE.

7 Click OK.

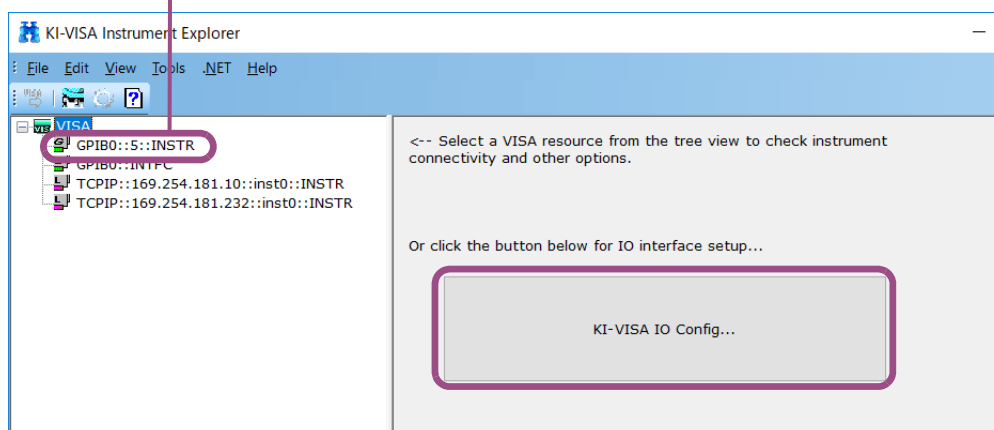
When the GPIB ID is not displayed

You need to register the GPIB ID. The following procedure is for when KI-VISA is used for the VISA library. If you are using another VISA library, see the corresponding manual.

1 From the Windows start menu, select Kikusui io Software > Instrument Explorer.

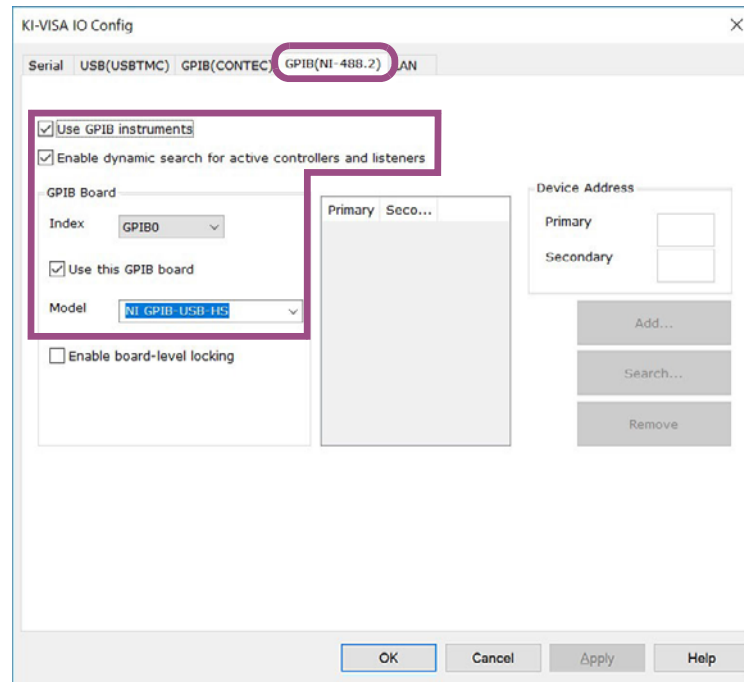
If a GPIB ID is registered in VISA, a character string that starts with GPIB will appear on the left side of the KI-VISA Instrument Explorer window, as shown below.

(Example) ID: 0, Address: 5



2 To register a GPIB ID in VISA, click KI-VISA IO Config.

3 Click the GPIB (NI-488.2) tab.



4 Select the “Use GPIB instrument,” “Enable dynamic search for active controllers and listeners,” and “Use this GPIB board” check boxes.

5 From the Index drop-down list, select the GPIB ID to register.

If you want to additionally register GPIB boards or USB-GPIB adapters, select IDs that do not overlap with the existing IDs.

6 From the Model drop-down list, select the applicable model name.

7 Click OK.

8 Check that the GPIB ID that you registered is displayed on the left side of the KI-VISA Instrument Explorer window.

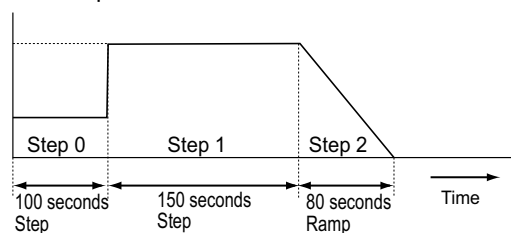
The registered ID will also appear in the GPIB ID drop-down list in the Interface window.

Sequence Overview

Sequences are groups of executable units called steps. In Wavy, first set conditions that apply to all steps in the Sequence Creation Mode window, and then create the individual steps.

You can create steps in the Graph window and Worksheet window. The setup settings that appear in the Worksheet window vary depending on the sequence creation mode settings. You cannot change the sequence creation mode while a step is being created.

When you execute a sequence, the software automatically applies the settings that are recalled in order from step 0.



A single execution of a sequence is complete after the sequence's last step is finished. The maximum number of steps in a sequence is 600. You can specify the sequence repeat count when transferring a sequence to the PCR-WE to run the sequence the specified number of times.

NOTE

Wavy does not check the validity of the settings for the PCR-WE. Do not set the step to a value outside the PCR-WE range specifications. You can transfer a sequence containing invalid values to the PCR-WE, but you will not be able to run it.

Procedure up to Sequence Execution


This section describes the basic procedure up to sequence execution.

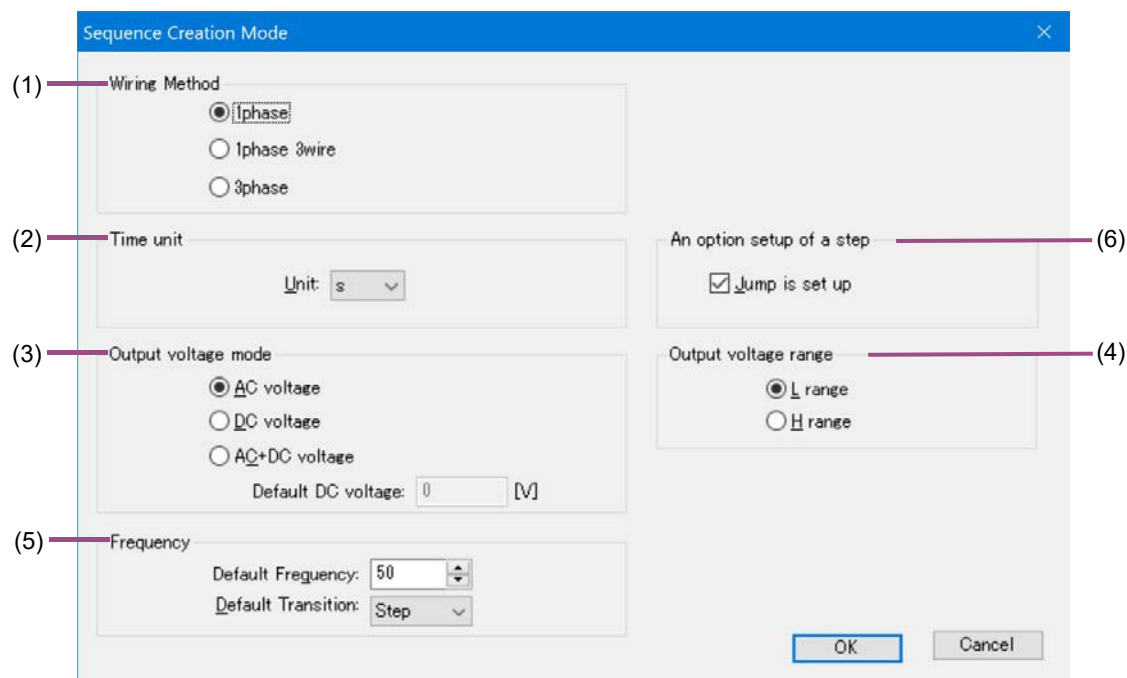
NOTE

To assign an arbitrary waveform to a step, have the necessary arbitrary waveform ready. For details on arbitrary waveforms, see “Creating and Transferring Arbitrary Waveforms” [\(p.63\)](#).

- 1** In the **Sequence Creation Mode Settings** [\(p.18\)](#) window, set global sequence items.
- 2** **Create steps.**
 - Creating and Editing Steps with the Mouse [\(p.30\)](#)
 - Creating and Editing Steps by Entering Values [\(p.34\)](#)
- 3** **Save the sequence you created.**
 - Saving sequence data [\(p.39\)](#)
- 4** **Set items related to monitoring.**
 - Specifying monitor settings [\(p.53\)](#)
- 5** In the **Protection Settings** [\(p.28\)](#) window, set protection items.
- 6** In the **Sequence run window** [\(p.45\)](#), run the sequence.
 - Running a sequence [\(p.48\)](#)

Sequence Creation Mode Settings

You can set the global sequence items in the Sequence Creation Mode window. To open the window, click Sequence Creation Mode on the Sequence menu. Or, click  on the toolbar.



- (1) Wiring Method ([p.18](#))
- (2) Time unit ([p.18](#))
- (3) Output voltage mode ([p.19](#))
- (4) Output voltage range ([p.19](#))
- (5) Frequency ([p.19](#))
- (6) An option setup of a step ([p.19](#))

■ (1) Wiring Method

You can select 1phase, 1phase 3wire, or 3phase. When using single-phase, three-wire output, the V phase will be the waveform of the U phase with reversed polarity.

■ (2) Time unit

You can set the step interval unit that is used to create steps to milliseconds, seconds, minutes, or hours.

| Unit | Interval setting range | Resolution |
|-------------------|------------------------|------------|
| ms (milliseconds) | 0.1 ms to 10000.0 ms | 0.1 ms |
| s (seconds) | 0.001 s to 1000.000 s | 1 ms |
| min (minutes) | 0.1 min to 1000.0 min | 0.1 min |
| h (hours) | 0.1 h to 1000.0 h | 0.1 h |

■ (3) Output voltage mode

Select the output voltage mode for the sequence.

The PCR-WE does not have the concept of output voltage mode and can output AC voltage and DC voltage (AC+DC) at all times. However, on Wavy, you can specify Step Settings (p.20) to use three output voltage modes: AC voltage, DC voltage, and AC+DC voltage.

| Output voltage mode | Items set automatically ^{*1} |
|---------------------|--|
| AC voltage | DC[V]: 0 V |
| DC voltage | AC[V]: 0 V, frequency: 50 Hz, wave No: 0, starting phase: FREE, ending phase: FREE, sudden phase change: off, U phase offset ^{*2} : off, UV phase ^{*2} : off, UW phase ^{*2} : off |
| AC+DC voltage | None |

^{*1} These are not shown as settings in steps. They are internal settings.

^{*2} Only when the wiring method is three-phase.

In AC+DC voltage mode, you can set the default DC voltage to use when you are creating sequence data. In the Default DC voltage box, enter a value (-431.0 V to 431.0 V). There are three significant decimal places (x.xxx). The actual number of significant decimal places varies depending on the PCR-WE that the PC is connected to.

NOTE

When a sequence with the output voltage mode set to AC voltage or DC voltage is transferred to the PCR-WE, the values of the above items in the PCR-WE are overwritten.

■ (4) Output voltage range

Select the output voltage range for the sequence to L or H. The maximum output current varies depending on the output voltage range. The maximum output current of the H range is half of the that of the L range.

The output voltage setting ranges for the L range and H range are shown below.

| | AC voltage | DC voltage/AC+DC voltage |
|---------|----------------|--------------------------|
| L range | 0 V to 152.5 V | -215.5 V to 215.5 V |
| H range | 0 V to 305.0 V | -431.0 V to 431.0 V |

■ (5) Frequency

Set the default frequency for the sequence setup settings (1.00 Hz to 5000 Hz) and default frequency transition (step or ramp).

You can set the frequency when the output voltage mode is set to AC voltage or AC+DC voltage.

■ (6) An option setup of a step

Select the check box to enable the step jump function. If you select the check box, jump settings will appear in the worksheet window. See “Step Settings” (p.20).

NOTE

If you enable the jump function, the marker or bar that indicates the approximate position of execution will no longer be displayed during sequence execution.

Step Settings

Set the conditions for each sequence step. One step corresponds to one operation in the executed sequence.

Create and edit steps in the Graph or Worksheet window. In the Graph window, you can set only the output voltage, voltage transition, and execution time.

NOTE

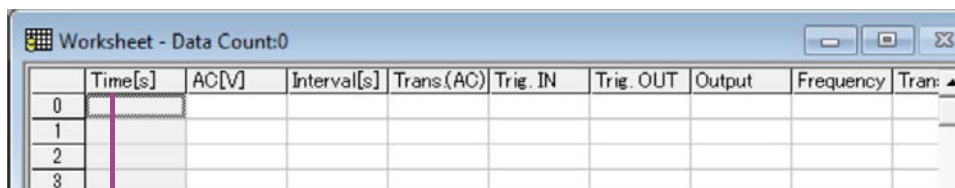
To assign an arbitrary waveform to a step, have the necessary arbitrary waveform ready. For details on arbitrary waveforms, see "Creating and Transferring Arbitrary Waveforms" (p.63).

For each step set the following conditions:

- (1) Setting the execution time (p.22)
- (2) Setting the voltage (p.22)
- (3) Setting the Frequency (p.22)
- (4) Setting the output (p.23)
- (5) Setting the waveform bank number (p.23)
- (6) Setting the phase (p.23)
- (7) Setting the phase difference (only when the wiring method is 1P3W or 3P) (p.25)
- (8) Setting the phase sweep (only when the wiring method is 1P3W or 3P) (p.26)
- (9) Setting the output impedance (p.26)
- (10) Setting the jump function (p.27)

The settings that appear in the Worksheet window vary depending on the wiring method specified in sequence creation mode and output voltage mode. Settings that you cannot change are not displayed.

(Example) Wiring Method: 1phase and Output voltage mode: AC+DC voltage



| | Time[s] | AC[V] | Interval[s] | Trans.(AC) | Trig. IN | Trig. OUT | Output | Frequency | Tran: ▲ |
|---|---------|-------|-------------|------------|----------|-----------|--------|-----------|---------|
| 0 | | | | | | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |

Time represents the cumulative time from step 1. You cannot set this value.

Table of step settings

| | Setting | | | Output voltage mode | | |
|------|----------------------|----------------------|----------------------|---------------------|-----|-------|
| | Wiring: 1P | Wiring: 1P3W | Wiring: 3W | AC | DC | AC+DC |
| (2) | AC[V] | AC U[V] | AC U[V] | Yes | | Yes |
| | | AC V[V] | AC V[V] | Yes | | Yes |
| | | | AC W[V] | Yes | | Yes |
| (1) | Interval[ms/s/min/h] | Interval[ms/s/min/h] | Interval[ms/s/min/h] | Yes | Yes | Yes |
| (2) | Trans.(AC) | Trans.(AC) | Trans.(AC) | Yes | | Yes |
| (4) | Trig. IN | Trig. IN | Trig. IN | Yes | Yes | Yes |
| | Trig. OUT | Trig. OUT | Trig. OUT | Yes | Yes | Yes |
| | Output | Output | Output | Yes | Yes | Yes |
| (3) | Frequency | Frequency | Frequency | Yes | | Yes |
| | Trans.(f) | Trans.(f) | Trans.(f) | Yes | | Yes |
| (2) | DC[V] | DC U[V] | DC U[V] | | Yes | Yes |
| | | | DC V[V] | | Yes | Yes |
| | | | DC W[V] | | Yes | Yes |
| | Trans.(DC) | Trans.(DC) | Trans.(DC) | | Yes | Yes |
| (5) | WB No. U | WB No. U | WB No. U | Yes | | Yes |
| | | | WB No. V | Yes | | Yes |
| | | | WB No. W | Yes | | Yes |
| (6) | S.Phase | S.Phase | S.Phase | Yes | | Yes |
| | Start[deg] | Start[deg] | Start[deg] | Yes | | Yes |
| | E.Phase | E.Phase | E.Phase | Yes | | Yes |
| | End[deg] | End[deg] | End[deg] | Yes | | Yes |
| | Pri. phase | Pri. phase | Pri. phase | Yes | | Yes |
| (8) | | | U offset | Yes | | Yes |
| | | | U offset[deg] | Yes | | Yes |
| | | | U offs. ramp | Yes | | Yes |
| (7) | | | UV phase | Yes | | Yes |
| | | | UV [deg] | Yes | | Yes |
| (8) | | | UV ramp | Yes | | Yes |
| (7) | | | UW phase | Yes | | Yes |
| | | | UW [deg] | Yes | | Yes |
| (8) | | | UW ramp | Yes | | Yes |
| (4) | Stat. Out | Stat. Out | Stat. Out | Yes | Yes | Yes |
| (9) | Outp. Imp. | Outp. Imp. | Outp. Imp. | Yes | Yes | Yes |
| | OutputRESI U[mΩ] | OutputRESI U[mΩ] | OutputRESI U[mΩ] | Yes | Yes | Yes |
| | | OutputRESI V[mΩ] | OutputRESI V[mΩ] | Yes | Yes | Yes |
| | | | OutputRESI W[mΩ] | Yes | Yes | Yes |
| | OutputREAC U[μH] | OutputREAC U[μH] | OutputREAC U[μH] | Yes | Yes | Yes |
| | | OutputREAC V[μH] | OutputREAC V[μH] | Yes | Yes | Yes |
| | | | OutputREAC W[μH] | Yes | Yes | Yes |
| (10) | Jump | Jump | Jump | Yes | Yes | Yes |
| | Jump Step | Jump Step | Jump Step | Yes | Yes | Yes |
| | Jump Count | Jump Count | Jump Count | Yes | Yes | Yes |

■ (1) Setting the execution time

| Setting | Description | Value |
|----------------------------|----------------------|---|
| Interval[ms] ^{*1} | Step execution time. | 0.1 ms to 10000.0 ms (Resolution: 0.1 ms) |
| Interval[s] | | 0.001 s to 1000.00 s (Resolution: 1 ms) |
| Interval[min] | | 0.1 min to 1000.0 min (Resolution: 0.1 min) |
| Interval[h] | | 0.1 h to 1000.0 h (Resolution: 0.1 h) |

*1 Depending on the time unit that you specified in sequence creation mode (s, ms, min, or h), the interval in the worksheet is set to Interval[s], Interval[ms], Interval[min], or Interval[h].

■ (2) Setting the voltage

| Setting | Description | Value |
|--------------------------|-------------------|--------------------------------|
| AC[V] ^{*1} | AC output voltage | 0.0 V to 315.0 V ^{*2} |
| DC[V] ^{*3} | DC output voltage | -445.0 V to 445.0 V |
| Trans.(AC) ^{*4} | AC voltage change | Step, Ramp ^{*5} |
| Trans.(DC) | DC voltage change | Step, Ramp ^{*5} |

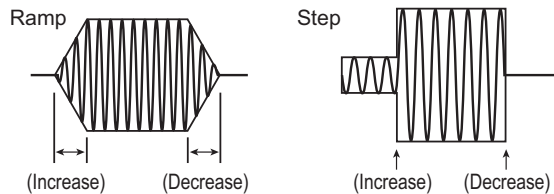
*1 If the wiring method is single-phase, three-wire or three-phase, specify the phase voltage. Phase voltage settings appear as AC U[V], AC V[V], or AC W[V].

*2 You can set the voltage as low as 0.0 V, but even if you do, the actual output voltage will always be in the range of 0.1 V to 0.6 V. (The minimum value varies depending on the output voltage range and temperature.)

*3 If the wiring method is single-phase, three-wire, specify the phase voltage. The value is assigned to the U phase. The V phase is automatically set to the same amplitude as the U phase but with opposite polarity.

*4 In the PCR-WE user's manual, "step" is denoted as "ramp off," and "ramp" as "ramp on."

*5 To change the voltage linearly over a specified time, select Ramp. To change the value as a step, select Step. If the interval (step execution time) is short, a smooth straight line may not be obtained for ramp.

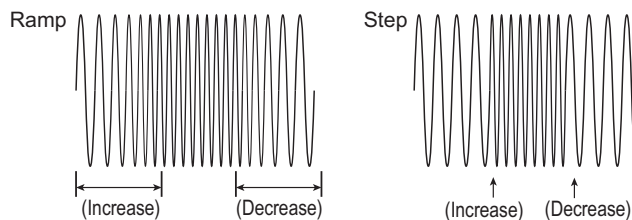


■ (3) Setting the Frequency

| Setting | Description | Value |
|-------------------------|------------------|--------------------------|
| Frequency | Step frequency | 1.00 Hz to 5000 Hz |
| Trans.(f) ^{*1} | Frequency change | Step, Ramp ^{*2} |

*1 In the PCR-WE user's manual, "step" is denoted as "ramp off," and "ramp" as "ramp on."

*2 To change the frequency gradually over a specified time, select Ramp. To change the value as a step, select Step.



■ (4) Setting the output

If Trig. IN, Trig. OUT, or Stat. Out is set to on, set the channel of the PCR-WE's DIGITAL I/O connector. For the setup procedure, see "DIGITAL I/O Settings" (p.59).

| Setting | Description | Value |
|---------------------------|-----------------------|---------|
| Output | Output on/off | on, off |
| Trig. IN ^{*1 *2} | Trigger wait state | on, off |
| Trig. OUT ^{*3} | Trigger signal output | on, off |
| Stat. Out ^{*4} | Status signal output | on, off |

- *1 A sequence pauses and waits for a trigger before executing a step whose Trig. IN is set to on. If you click Continue on the Sequence run window (p.45), the trigger wait state is cleared, and the sequence resumes. In addition, if a SEQ Trigger In (p.61) signal is applied to the PCR-WE's DIGITAL I/O connector, the trigger wait state is cleared, and the sequence resumes.
- *2 Do not set both Pri. phase and Trig. IN to on in the same step. If you do, the sequence cannot be executed.
- *3 If Trig. OUT is set to on, a SEQ Trigger Out (p.62) signal is output from the PCR-WE's DIGITAL I/O connector when the step is executed.
- *4 If Stat. Out is set to on, a SEQ Status Out (p.62) signal is output from the PCR-WE's DIGITAL I/O connector while the waveform of the step is being output.

■ (5) Setting the waveform bank number

| Setting | Description | Value |
|---------------------|----------------------|----------|
| WB No ^{*1} | Waveform bank number | 0 to 256 |

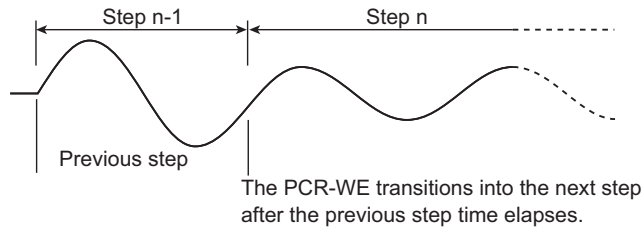
- *1 Specify a waveform bank number that is registered in the list of waveform banks in the waveform view. For details on the list of waveform banks, see "Displaying the Waveform View" (p.71).
Output waveform data is stored in the PCR-WE internal memory. The memory area for storing the data of one output waveform is referred to as a waveform bank. The banks are assigned number from 0 to 256. Waveform bank 0 contains sine wave data that is used in the PCR-WE's reference voltage waveform and cannot be overwritten. In the factory default settings, all waveform banks have the same waveform (sine wave) as the one that is stored in waveform bank 0.

■ (6) Setting the phase

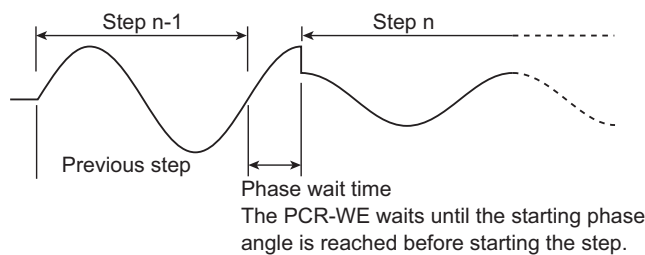
| Setting | Description | Value |
|-----------------------------|------------------------------|----------------------------|
| S. Phase ^{*1 *3} | Starting phase angle control | FREE, FIXED |
| Start[deg] ^{*1 *4} | Starting phase angle | 0 deg to 360 deg (0 = 360) |
| E. Phase ^{*2 *3} | Ending phase angle control | FREE, FIXED |
| End[deg] ^{*2 *4} | Ending phase angle | 0 deg to 360 deg (0 = 360) |
| Pri. phase ^{*5 *6} | Sudden phase change | on, off |

- *1 Steps are managed in terms of time. If you set S. Phase to FIXED and set the starting phase angle, the step will start from the specified phase angle.
For example, if you set the starting phase angle of step (n) to 90° , even if the execution of the previous step (n-1) finishes, the execution of the next step will not begin until the phase angle reaches 90° . The wait time that is inserted after the execution of a step as a result of setting a phase angle is called phase wait time. The phase wait time is dependent on frequency.

When the starting phase angle is not specified (S. Phase: FREE)

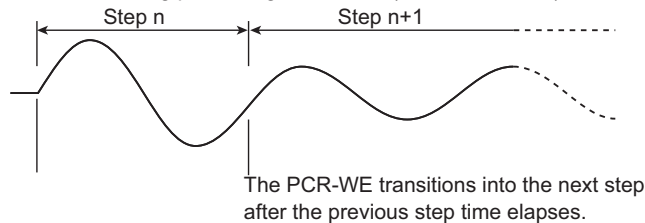


When the starting phase angle is set to 90° (S. Phase: FREE and Start[deg]: 90°)

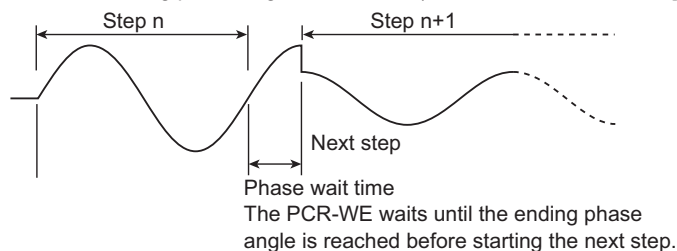


- *2 Steps are managed in terms of time. If you set E. Phase to FIXED and set the ending phase angle, the step will end at the specified phase angle.
For example, if you set the ending phase angle of step (n) to 90° , even if the execution of the step (n) finishes, the execution of the next step (n+1) will not begin until the phase angle reaches 90° . The wait time that is inserted after the execution of a step as a result of setting a phase angle is called phase wait time. The phase wait time is dependent on frequency.

When the ending phase angle is not set (E. Phase: FREE)

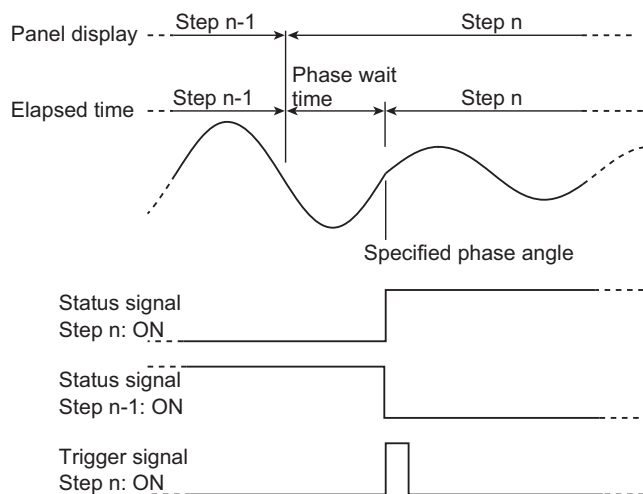


When the ending phase angle is set to 90° (E. Phase: FIXED and End[deg]: 90°)

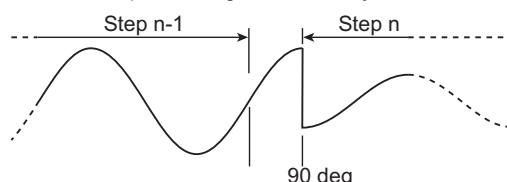


- *3 S.Phase or E.Phase to FIXED will cause phase wait time to be inserted in the sequence. The PCR-WE panel shows the next step during a phase wait time, but the elapsed time remains at 0 until the next step is actually started.

For example, during the phase wait time after the execution of step n-1, the PCR-WE panel will show step n. The status signal is output while the waveform of the step whose status signal is set to on is being output.



- *4 Be careful if you want to output waveforms continuously (without sudden phase changes). For example, if you set the starting phase angle of step n and the ending phase angle of the previous step (n-1), the phase wait time between the completion of step n-1 and the start of step n may be as long as one period. To prevent this sort of confusion, we recommend that you set only the starting phase angle if you want to output waveforms continuously.
- *5 If you set Pri. phase to on, S.Phase of the step and E.Phase of the previous step are automatically set to FIXED, and the phase will make a sudden change. For example, if you set Pri. phase of step n to on, S.Phase of step n and E.Phase of the previous step (n-1) are automatically set to FIXED, and the phase will make a sudden change. If you set Start[deg] of step n to 270° and End[deg] of step n-1 to 90°, when the execution of step n-1 finishes and the phase angle reaches 90°, the execution of step n will begin immediately.



- *6 Do not set both Pri. phase and Trig. IN to on in the same step. If you do, the sequence cannot be executed.

■ (7) Setting the phase difference (only when the wiring method is 1P3W or 3P)

| Setting | Description | Value |
|---------------------------|-----------------------------|----------------------------|
| UV phase ^{*1 *3} | UV phase difference control | on, off |
| UV [deg] ^{*1 *3} | UV phase angle | 0 deg to 360 deg (0 = 360) |
| UW phase ^{*3} | UW phase difference control | on, off |
| UW [deg] ^{*2 *3} | UW phase angle | 0 deg to 360 deg (0 = 360) |

*1 To suddenly change the V phase, set UV phase to on, and set the UV phase angle.

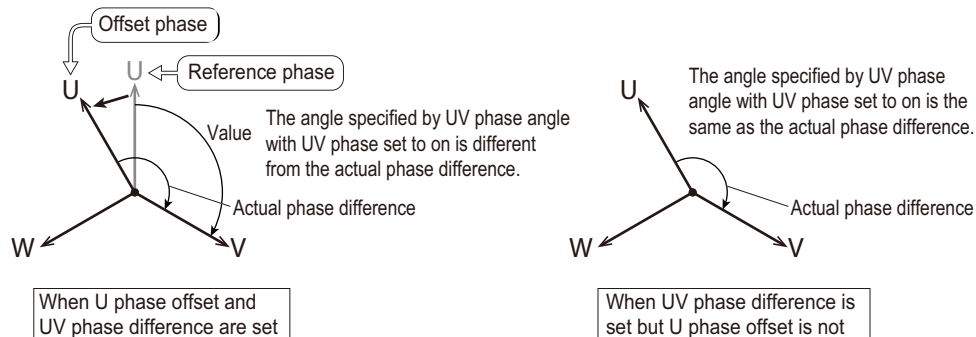
*2 To suddenly change the W phase, set UW phase to on, and set the UW phase angle. (The UW phase difference can be set only when the wiring method is three-phase.)

*3 For details on setting the sudden phase change of the V phase and W phase, see "Sequence Creation Tutorial" in the PCR-WE User's Manual.

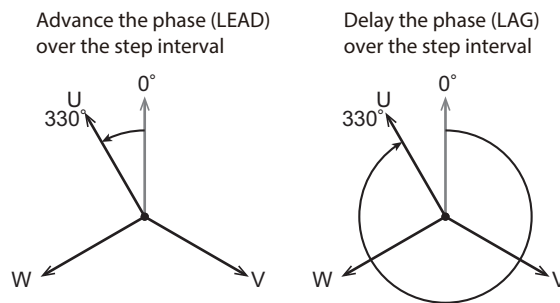
■(8) Setting the phase sweep (only when the wiring method is 1P3W or 3P)

| Setting | Description | Value |
|-----------------------------|------------------------|----------------------------|
| U offset ^{*1} | U phase offset control | on, off |
| U offset[deg] ^{*1} | U phase offset angle | 0 deg to 360 deg (0 = 360) |
| U offs.ramp ^{*2} | U phase transition | off, LEAD, LAG |
| UV ramp ^{*2} | V phase transition | off, LEAD, LAG |
| UW ramp ^{*2} | W phase transition | off, LEAD, LAG |

- ^{*1} If you set U offset to on and set the U phase offset angle, the U phase will be offset from the reference phase by the specified angle. By offsetting the U phase, you can suddenly change the phase of one or two phases and sweep the phase.
If you offset the U phase, the U-V and U-W phase difference settings (the UV and UW phase angles specified by setting UV phase and UW phase to on) will be different from the actual U-V and U-W phase differences. Therefore, if you do not need to sweep the phase, we recommend that you set the U phase offset to off. For details, see "Sequence Creation Tutorial" in the PCR-WE User's Manual.



- ^{*2} The phase change that you specify when you want to sweep the phase. To gradually change the phase over the specified time, set this to LEAD or LAG. This is effective for varying the line voltage. For details, see "Sequence Creation Tutorial" in the PCR-WE User's Manual.



■(9) Setting the output impedance

| Setting | Description | Value |
|----------------|---|-----------------|
| Outp. Imp. | Output impedance | on, off |
| OutputRESI[mΩ] | Output impedance (resistance component) | 0 mΩ to 8000 mΩ |
| OutputREAC[μH] | Output impedance (reactance component) | 0 μH to 8000 μH |

■ (10) Setting the jump function

| Setting | Description | Value |
|-----------------------------|----------------------------|-------------------------|
| Jump ^{*1} | Jump function | on, off |
| Jump Step ^{*1 *2} | Jump destination step | 0 to 599 |
| Jump Count ^{*1 *2} | Number of jump repetitions | 0 to 9999 ^{*3} |

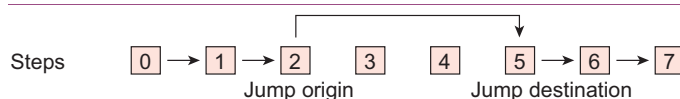
^{*1} This setting is available only when “An option of a step” is enabled in the step option settings in the Sequence Creation Mode window. Normally sequence steps are executed in order from the first step, but you can use the jump function to skip or repeat steps.

^{*2} To set the range of steps to execute repeatedly, set Jump of the jump source step to on, and set Jump Step and Jump Count. This will cause the steps from the jump source step to the jump destination step to be executed repeatedly.

^{*3} 99999 represents infinity.

• Example of skipping steps

| Step | Jump | Jump Step | Jump Count |
|--------------|------|-----------|------------|
| 0, 1, 3 to 7 | off | 0 | 1 |
| 2 | on | 5 | 1 |

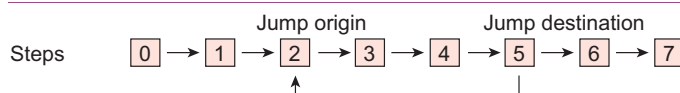


The execution jumps over steps 3 and 4.

The step execution order is 0→1→2→5→6→7

• Example of repeating steps

| Step | Jump | Jump Step | Jump Count |
|--------------|------|-----------|------------|
| 0 to 4, 6, 7 | off | 0 | 1 |
| 5 | on | 2 | 2 |



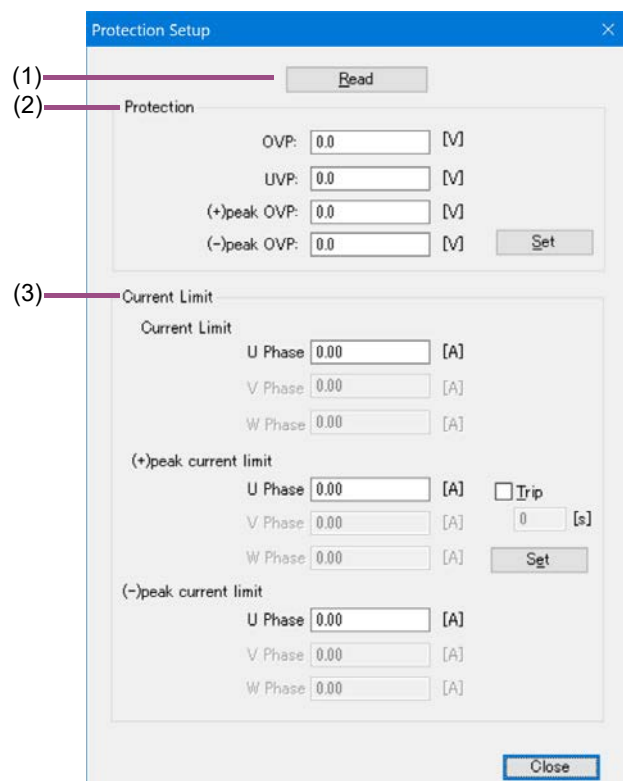
The execution jumps from step 5 to step 2.

Order of step execution: 0→1→2→3→4→5→2→3→4→5→2→3→4→5→6→7

Protection Settings

You can set the PCR-WE protection function and limit values from Wavy. Set these before running a sequence.

On the Sequence menu, click Protection Setup to open the Protection Setup window.



- (1) Read ([p.28](#))
- (2) Protection ([p.28](#))
- (3) Current Limit ([p.29](#))

■(1) Read

The settings applied to the connected PCR-WE are read. Clicking Read shows the values in the Protection and Current Limit items.

■(2) Protection

This function protects the load from overvoltage and undervoltage.

If you set the wiring method to single-phase, three-wire or three-phase, specify a phase voltage. The values apply to all phases.

| Setting | Description |
|---------|---|
| OVP | Set the OVP (output overvoltage protection) value. If the output voltage exceeds this setting and remains there for approximately 1 second, the OVP will be activated. Setting range: 14.0 V to 489.5 V |
| UVP | Set the UVP (output undervoltage protection) value. If the output voltage drops below this setting and remains there for approximately 1 second, the UVP will be activated. Setting range: 0.0 V to 489.5 V |

| Setting | Description |
|-------------|---|
| (+)peak OVP | Set the positive peak OVP value of the output voltage. If the output voltage exceeds this setting and remains there for approximately 1 second, the OVP will be activated. Setting range: 14.0 V to 489.5 V |
| (-)peak OVP | Set the negative peak OVP value of the output voltage. If the output voltage exceeds this setting and remains there for approximately 1 second, the OVP will be activated. Setting range: -489.5 V to -14.0 V |
| Set | Clicking Set will set the values to the PCR-WE, and the settings are updated. |

■ (3) Current Limit

This function limits the current flowing through the load.

The phase that can be set varies depending on the wiring method selection.

| Setting | Description |
|-----------------------|---|
| Current Limit | Set the output current's upper limit with an rms value. Setting range: Maximum output current of L range \times 0.1 to maximum output current of L range \times 1.1 |
| (+)peak current limit | Sets the positive peak current limit. Setting range: Maximum output current \times 0.1 to Maximum output current \times 4.2 |
| (-)peak current limit | Sets the negative peak current limit. Setting range: Maximum output current \times -4.2 to Maximum output current \times -0.1 |
| Trip | Set the action taken when a current flows exceeding the current limit. If you select Trip, the output is turned off when the current limit is activated. You can also set the time (0 s to 10 s) until the output is turned off after the current limit is exceeded. |
| Set | Clicking Set will set the values to the PCR-WE, and the settings are updated. |

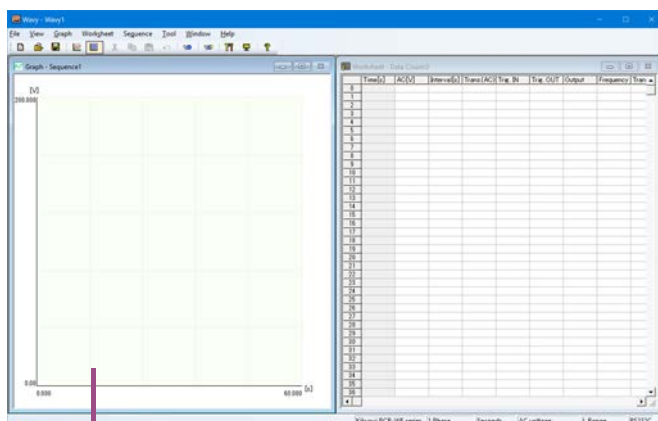
Creating and Editing Steps with the Mouse

In the Graph window, you can create steps by drawing lines with the mouse. The settings that you can specify in the Graph window are output voltage, voltage transition (voltage change), and step execution time (interval). Default values are assigned to step items that cannot be set with the mouse. After creating a step, you can change all the step items in the worksheet window.

- Creating a step (Graph window) (p.30)
- Editing a step (Graph window) (p.31)

Creating a step (Graph window)

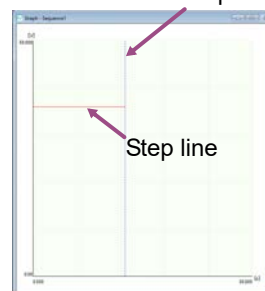
This section explains how to create a step in the Graph window.



Graph window



Move the mouse pointer to the Y-axis.



The step is confirmed.

NOTE

If the wiring method is single-phase, three-wire or three-phase and the output voltage mode is set to AC, you must create steps one step at a time. You cannot draw the next step until you have finished drawing all the phases of the present step. (You cannot enter the steps continuously for a given phase.)

1 Move the mouse pointer over the Y-axis.

The pointer becomes a crosshair, and a voltage is displayed.

2 Drag the pointer to the time and the voltage that you want to set.

The step line is drawn, the setting is confirmed, and the step data is entered in the first row of the worksheet window. The voltage transition of step 0 are fixed to Step. You cannot change them to Ramp.

This completes the creation of step 0.

3 If you want to continue creating steps, move the mouse pointer over the end point of the step that you have just created. When the pointer becomes a crosshair, drag the mouse pointer to the point that corresponds to the time and the voltage that you want to set.

The setting is confirmed, and the step settings are entered in the first blank row of the Worksheet window. You can change the voltage transition later. Repeat this procedure until you have set all the steps.

Changing the Graph window display

You can change the Graph window display items.

See “Graph window display settings” ([p.50](#)).

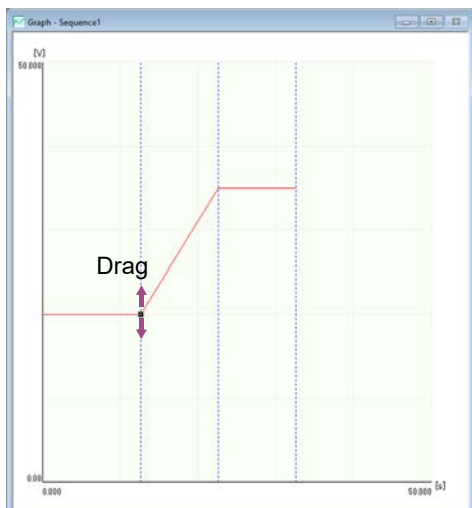
Copying graph images to the clipboard

On the Graph menu, click Copy to copy the graph image to the clipboard.

Editing a step (Graph window)

- Changing the set voltage ([p.31](#))
- Changing the interval (step execution time) ([p.32](#))
- Changing the transition (Step or Ramp) ([p.33](#))
- Deleting steps ([p.33](#))
- Changing the Graph window display ([p.33](#))

Changing the set voltage



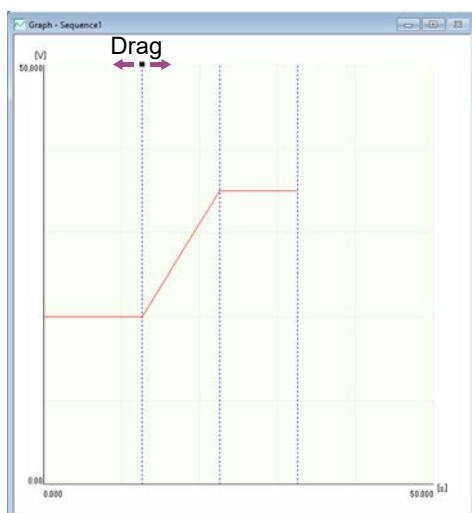
- 1 Double-click the line of the step that you want to edit.**
A black square is displayed at the step's end point, and you can edit the step.
- 2 Move the mouse pointer over the black square.**
The pointer changes to a double arrow.
- 3 Drag the pointer up or down to the value that you want to change to.**
The value changes accordingly.

■ Changing the voltage setting resolution

Right-click the Graph window, click Resolution of setting value and then the resolution that you want to use (Default, 1st digit of integer to 2nd digit of decimal place). The Default is 1st digit of integer.

You can also set it by clicking Resolution of setting value on the Graph menu.

Changing the interval (step execution time)



- 1 Double-click the vertical line (the step-division line) at the end point of the step that you want to edit.**
A black square is displayed at the top of the step-division line, and you can edit the step.
- 2 Move the pointer over the black square.**
The pointer changes to a double arrow.
- 3 Drag the pointer left or right to the value that you want to change to.**
The value changes accordingly.

■ Changing the step execution time resolution

Right-click the Graph window, click Resolution of time period and then the resolution that you want to use (Default, 1st digit of integer to 3rd digit of decimal place). The Default is 1st digit of integer.

You can also set it by clicking Resolution of time period on the Graph menu.

Changing the transition (Step or Ramp)

- 1 Double-click the line of the step that you want to change.**
A black square is displayed at the top of the vertical line, and you can edit the step.
- 2 Right-click to display a shortcut menu. Click Transition and then Ramp or Step.**
The transition of the selected step changes accordingly.

■ Always using step transition

You can fix the transition when setting steps with the mouse to step.

Right-click the Graph window, and then click Draw sequence by step.

You can also set it by clicking Draw sequence by step on the Graph menu.

Deleting steps

- 1 Double-click the line of the step that you want to delete.**
A black square is displayed at the top of the vertical line, and you can edit the step.
- 2 Right-click to display a shortcut menu. Click Delete.**
The step is deleted.

Changing the Graph window display

You can change the Graph window display items.

See “Graph window display settings” ([p. 50](#)).

Copying graph images to the clipboard

On the Graph menu, click Copy to copy the graph image to the clipboard.

Creating and Editing Steps by Entering Values

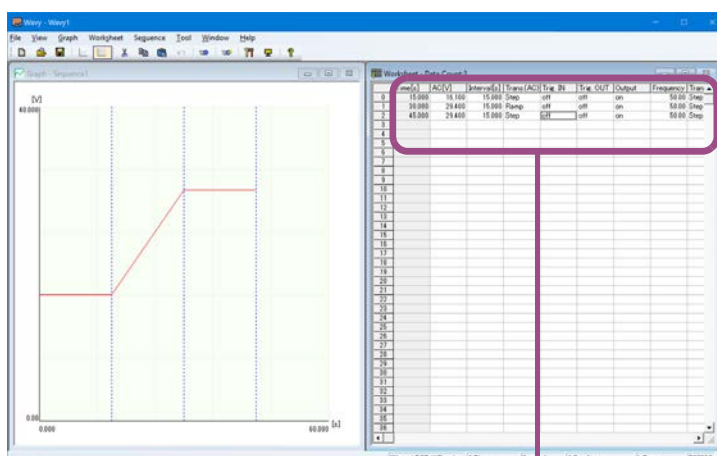
In the Worksheet window, you can create steps by entering values for the settings.

The displayed settings vary depending on the settings specified in the Sequence Creation Mode window. For details on each setting, see “Step Settings” (p.20).

- Creating a step (worksheet window) (p.34)
- Editing a step (worksheet window) (p.35)

Creating a step (worksheet window)

This section explains how to create a step in the worksheet window.



| | Time[s] | AC[V] | Interval[s] | Trans(AC) | Trig. IN | Trig. OUT | Output | |
|---|---------|--------|-------------|-----------|----------|-----------|--------|--------|
| 0 | 15.000 | 16.100 | 15.000 | Step | off | off | on | Step 1 |
| 1 | 30.000 | 29.400 | 15.000 | Ramp | off | off | on | Step 2 |
| 2 | 45.000 | 29.400 | 15.000 | Step | off | off | on | Step 3 |

You cannot edit the Time column.

■ Default step setting values

| | | | | | |
|------------|---------|---------------|-------|----------------|-------|
| Trig. IN | : off | End[deg] | : 0 | UW [deg] | : 240 |
| Trig. OUT | : off | Pri. phase | : off | UW ramp | : off |
| Output | : on | U offset | : off | Stat. Out | : off |
| Frequency | : 50.00 | U offset[deg] | : 0 | Outp. Imp. | : off |
| Trans.(f) | : Step | U offs. ramp | : off | OutputRESI[mΩ] | : 0 |
| WB No. | : 0 | UV phase | : off | OutputREAC[μH] | : 0 |
| S. Phase | : FREE | UV [deg] | : 120 | Jump | : off |
| Start[deg] | : 0 | UV ramp | : off | Jump Step | : 0 |
| E. Phase | : FREE | UW phase | : off | Loop Count | : 0 |

NOTE

- The first row of the worksheet is step 0. Enter data in order, starting from step 0. The voltage transition and frequency transition of step 0 are fixed to Step. You cannot change them to Ramp.
- Time[s] represents the cumulative time from step 0. It is automatically calculated, so you cannot change it. If phase wait time is created as a result of setting starting phase angles or ending phase angles, the actual cumulative time will not match the cumulative time shown in Time[s]. For details on phase wait time, see “(6) Setting the phase” (p.23).
- Values that have been entered in cells cannot be deleted. To delete them, delete the entire step.
- You can cancel the entering or editing of a cell's value by pressing Esc.
- To set WB No. to a value different from the default value of 0, you must create, save, and transfer an arbitrary waveform in advance. For details, see “Creating and Transferring Arbitrary Waveforms” (p.63).
- The settings are transferred to the PCR-WE only when values are assigned to all the step settings.
- If you select one or several voltage or frequency cells and right-click and then select Voltage, Frequency Replaced, a Voltage, Frequency Replaced window appears. Enter a new value and click Replace to collectively overwrite the values of the selected cells.
- If you right-click a cell and select Trigger waiting step addition, a trigger wait step is added below the selected cell.

To preview the sequence that you are working on, see “Previewing a Sequence” (p.37).

1 Set the voltage.

Click the AC[V] or DC[V] cell, enter a value, and press Enter.

2 Set the voltage transition.

Double-click the Trans.(AC) or Trans.(DC) cell, select Step or Ramp from the list, and press Enter.

3 Set the execution time (interval).


Click the Interval[s] cell, enter a value, and press Enter.

4 Configure the other settings.

When you set the voltage, voltage transition, and execution time (interval), all other settings are automatically set to their default values. To change them, click the cells and enter values, or double-click the cells and select the values from the lists.

Editing a step (worksheet window)

You can delete and copy steps that you have created.

Right-click the worksheet window and then click Undo to undo the last step insertion or deletion (only once). You can also click Undo on the Worksheet menu or click  on the toolbar.

Copying and inserting steps

1 Click a cell in the step that you want to copy.

You can click any cell in the step.

You can select consecutive rows by holding down the Shift key.

2 Right-click, and select Copy.

You can also click Copy on the Worksheet menu or click  on the toolbar.

The LoopStart and LoopCount values are not copied. They are set to zero.

3 Click a cell of the appropriate step.

4 Right-click, and select Paste.

You can also click Paste on the Worksheet menu or click  on the toolbar.

The copied step is inserted in the selected cell, and the total number of steps increases.

Deleting steps

1 Click a cell in the step that you want to delete.

You can click any cell in the step.

You can select consecutive rows by holding down the Shift key.

2 Right-click, and select Delete.

You can also click Delete on the Worksheet menu or click  on the toolbar.

When you delete a step, the step contents are copied to the clipboard. If you insert a step immediately after deleting steps, the deleted steps will be inserted.

Keyboard shortcuts

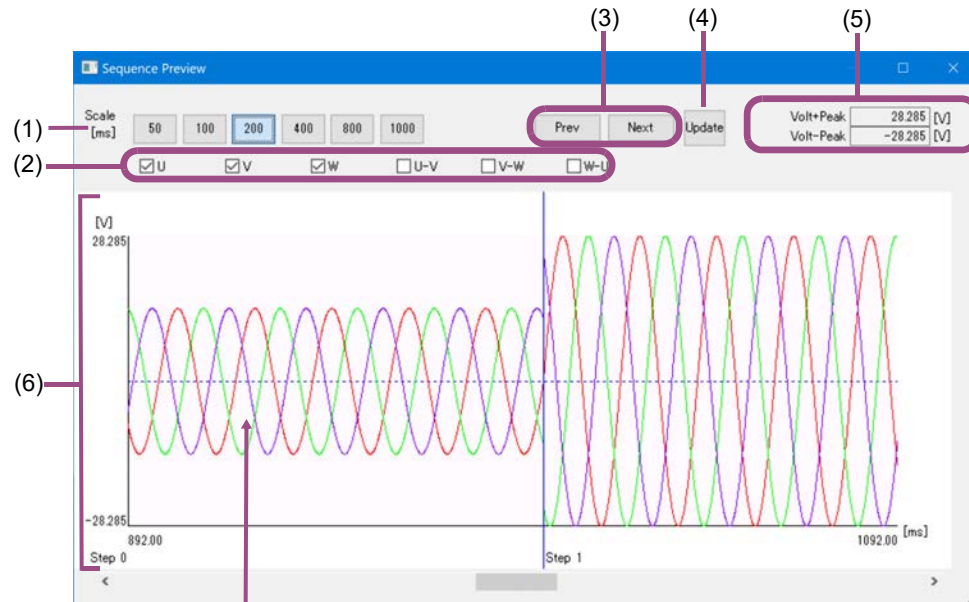
You can use keyboard shortcuts on the [Worksheet] window.

| Operation | Shortcut keys |
|----------------------------|---------------|
| Copy steps | C or Ctrl+C |
| Insert steps ^{*1} | V or Ctrl+V |
| Delete steps ¹ | Delete |
| Undo ¹ | Z or Ctrl+Z |
| Select all rows | A or Ctrl+A |

^{*1}. A confirmation window appears before execution.

Previewing a Sequence

You can view the sequence that you are working on in the Sequence Preview window. To display the window, on the View menu, click Sequence Preview.



Move the cursor over the line to display the voltage (V) and time (ms) at that point.

- (1) Changing the time axis scale ([p.38](#))
- (2) Changing the display item ([p.38](#))
- (3) Moving to step boundaries ([p.38](#))
- (4) Updating the preview ([p.38](#))
- (5) Peak value display ([p.38](#))
- (6) Changing the display item color ([p.38](#))

NOTE

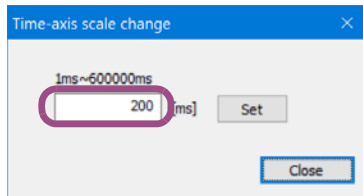
- If S. Phase of step 0 is set to FREE, the starting phase angle of step 0 is displayed as 0° in the sequence preview graph.
- If E. Phase of the step is set to FIXED and End [deg] is set to 0°, one excessive period of the step may be output depending on the interval (step execution time) setting. (One such example is when the frequency is set to 50 Hz and the interval is set to an integer multiple of 20 ms.)

■(1) Changing the time axis scale

Using the Scale setting, you can change the time scale.

You can also set the time span in more detail using the time-axis scale change window.

To display the window, right-click on the graph, and select Scale.



After entering a value, click Set. The time axis display span changes, and Scale [ms] appears next to the display span buttons.

NOTE

If you display a step with the frequency set to 3 kHz or higher at a display span of 800 ms or more, the sequence may not be displayed properly.

■(2) Changing the display item

You can change the display items by selecting the check boxes.

You can also right-click the graph, and select the display items.

■(3) Moving to step boundaries

Click Prev or Next to move to the boundary line of the previous or next step.

■(4) Updating the preview

If you change a step setting while the preview is open, click Update to update the preview.

■(5) Peak value display

The maximum peak voltages among all steps are displayed.

■(6) Changing the display item color

Right-click on the graph to select the item, and specify the color. You can change the color of the line (U/DC, V, W), U-V, U-W, and W-U, step boundary line, background, XY-axes, and XY-axis scale lines.


Saving and Loading Sequences

You can save sequence data that you create and load it whenever necessary.

- Saving sequence data ([p.39](#))
- Loading sequence data ([p.42](#))

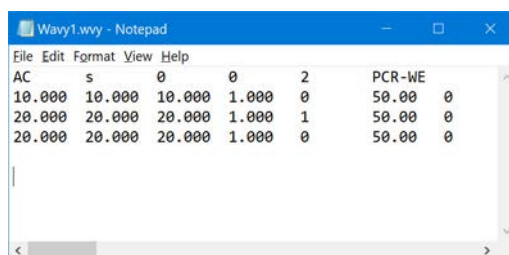
Saving sequence data

To save as a new sequence, on the File menu, click Save As.

To overwrite a file, on the File menu, click Save. Or, click  on the toolbar. The file name extension is “.wvy.”

Viewing saved sequence data

You can use Notepad to view saved sequence data.



(Example)
Wiring method: Three phase
Output voltage mode: AC+DC

By default, data is saved as tab-separated values. You can change this to comma-separated values by using “Environment settings” ([p.58](#)).

■ Displayed items in the first row

The first line contains the conditions common to all steps, which was specified in the Sequence Creation Mode window.

| Column | Item | Description |
|--------|---------------------------------|--|
| 1 | Output voltage mode | AC: AC voltage, DC: DC voltage, ACDC: AC+DC voltage |
| 2 | Time unit | ms: milliseconds, s: seconds, min: minutes, h: hours |
| 3 | Arbitrary waveform availability | 0: arbitrary waveform not available, 1: arbitrary waveform available |
| 4 | Voltage range | 0: L range, 1: H range |
| 5 | Wiring method | 0: 1P, 1: 1P3W, 2: 3P |
| 6 | Model | PCR-WE |

■ Displayed items in the second and subsequent rows

The second and subsequent lines contain settings of individual steps. The contents vary depending on the wiring method.

- Wiring method: Single-phase

| Column | Item | Description |
|--------|---|-----------------------------|
| 1 | AC voltage | Unit: V |
| 2 | Step execution time | The unit is shown in row 1. |
| 3 | AC voltage transition | 0: step, 1: ramp |
| 4 | Frequency | Unit: Hz |
| 5 | Frequency transition | 0: step, 1: ramp |
| 6 | Trig. IN | 0: off, 1: on |
| 7 | Trig. OUT | 0: off, 1: on |
| 8 | Output | 0: off, 1: on |
| 9 | DC voltage | Unit: V |
| 10 | DC voltage transition | 0: step, 1: ramp |
| 11 | WB No | 0 to 256 |
| 12 | Arbitrary waveform file name | .arb file name |
| 13 | Starting phase angle control | 0: FREE, 1: FIXED |
| 14 | Starting phase angle | Unit: degrees |
| 15 | Ending phase angle control | 0: FREE, 1: FIXED |
| 16 | Ending phase angle | Unit: degrees |
| 17 | Sudden phase change | 0: off, 1: on |
| 18 | Status signal output | 0: off, 1: on |
| 19 | Output impedance | 0: off, 1: on |
| 20 | Output impedance (resistance component) | Unit: mΩ |
| 21 | Output impedance (reactance component) | Unit: μH |
| 22 | Jump | 0: off, 1: on |
| 23 | Jump Step | 0 to 599 |
| 24 | Loop Count | 0 to 99999 |

- Wiring method: Single-phase, three-wire

| Column | Item | Description |
|--------|------------------------------|-----------------------------|
| 1 | AC voltage (U phase) | Unit: V |
| 2 | AC voltage (V phase) | Unit: V |
| 3 | Step execution time | The unit is shown in row 1. |
| 4 | AC voltage transition | 0: step, 1: ramp |
| 5 | Frequency | Unit: Hz |
| 6 | Frequency transition | 0: step, 1: ramp |
| 7 | Trig. IN | 0: off, 1: on |
| 8 | Trig. OUT | 0: off, 1: on |
| 9 | Output | 0: off, 1: on |
| 10 | DC voltage | Unit: V |
| 11 | DC voltage transition | 0: step, 1: ramp |
| 12 | WB No | 0 to 256 |
| 13 | Arbitrary waveform file name | .arb file name |
| 14 | Starting phase angle control | 0: FREE, 1: FIXED |
| 15 | Starting phase angle | Unit: degrees |

| Column | Item | Description |
|--------|--|-------------------|
| 16 | Ending phase angle control | 0: FREE, 1: FIXED |
| 17 | Ending phase angle | Unit: degrees |
| 18 | Sudden phase change | 0: off, 1: on |
| 19 | Status signal output | 0: off, 1: on |
| 20 | Output impedance | 0: off, 1: on |
| 21 | Output impedance (U phase, resistance component) | Unit: mΩ |
| 22 | Output impedance (V phase, resistance component) | Unit: mΩ |
| 23 | Output impedance (U phase, reactance component) | Unit: μH |
| 24 | Output impedance (V phase, reactance component) | Unit: μH |
| 26 | Jump | 0: off, 1: on |
| 26 | Jump Step | 0 to 599 |
| 27 | Loop Count | 0 to 99999 |


- Wiring method: Three-wire

| Column | Item | Description |
|--------|--|-----------------------------|
| 1 | AC voltage (U phase) | Unit: V |
| 2 | AC voltage (V phase) | Unit: V |
| 3 | AC voltage (W phase) | Unit: V |
| 4 | Step execution time | The unit is shown in row 1. |
| 5 | AC voltage transition | 0: step, 1: ramp |
| 6 | Frequency | Unit: Hz |
| 7 | Frequency transition | 0: step, 1: ramp |
| 8 | Trig. IN | 0: off, 1: on |
| 9 | Trig. OUT | 0: off, 1: on |
| 10 | Output | 0: off, 1: on |
| 11 | DC voltage (U phase) | Unit: V |
| 12 | DC voltage (V phase) | Unit: V |
| 13 | DC voltage (W phase) | Unit: V |
| 14 | DC voltage transition | 0: step, 1: ramp |
| 15 | WB No (U phase) | 0 to 256 |
| 16 | WB No (V phase) | 0 to 256 |
| 17 | WB No (W phase) | 0 to 256 |
| 18 | Arbitrary waveform file name (U phase) | .arb file name |
| 19 | Arbitrary waveform file name (V phase) | .arb file name |
| 20 | Arbitrary waveform file name (W phase) | .arb file name |
| 21 | Starting phase angle control | 0: FREE, 1: FIXED |
| 22 | Starting phase angle | Unit: degrees |
| 23 | Ending phase angle control | 0: FREE, 1: FIXED |
| 24 | Ending phase angle | Unit: degrees |
| 25 | Sudden phase change | 0: off, 1: on |
| 26 | U phase offset control | 0: off, 1: on |
| 27 | U offset angle | Unit: degrees |
| 28 | U phase transition | 0: off, 1: LEAD, 2: LAG |
| 29 | UV phase difference control | 0: off, 1: on |
| 30 | UV phase angle | Unit: degrees |
| 31 | V phase transition | 0: off, 1: LEAD, 2: LAG |
| 32 | UV phase difference control | 0: off, 1: on |

| Column | Item | Description |
|--------|--|-------------------------|
| 33 | UW phase angle | Unit: degrees |
| 34 | W phase transition | 0: off, 1: LEAD, 2: LAG |
| 35 | Status signal output | 0: off, 1: on |
| 36 | Output impedance | 0: off, 1: on |
| 37 | Output impedance (U phase, resistance component) | Unit: mΩ |
| 38 | Output impedance (V phase, resistance component) | Unit: mΩ |
| 39 | Output impedance (W phase, resistance component) | Unit: mΩ |
| 40 | Output impedance (U phase, reactance component) | Unit: μH |
| 41 | Output impedance (V phase, reactance component) | Unit: μH |
| 42 | Output impedance (W phase, reactance component) | Unit: μH |
| 43 | Jump | 0: off, 1: on |
| 44 | Jump Step | 0 to 599 |
| 45 | Loop Count | 0 to 99999 |

Loading sequence data

You can load saved data and use it.

On the File menu, click Open. Or, click  on the toolbar.

NOTE

If you assigned arbitrary waveforms to steps in the sequence, manage the relevant arbitrary waveform files (.arb) along with the sequence file (.wvy) in your PC. When Wavy recalls the sequence, if the arbitrary waveform file is not in the specified location, Wavy may assign an unintended waveform.

For details on where arbitrary waveform files are stored, see “[Environment settings](#)” (p.58).

Writing or Reading a Sequence

To execute a sequence, either write the sequence that you created to the PCR-WE or read the sequence in the PCR-WE into Wavy.

- Writing a sequence ([p.43](#))
- Reading a sequence ([p.44](#))

Writing a sequence

- 1 On the Sequence menu, click Transfer. Or, click  on the toolbar.**

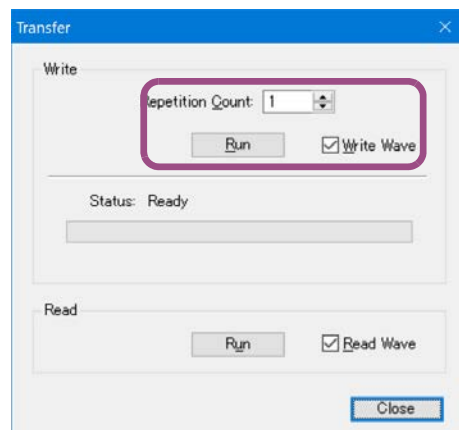
The Transfer window appears.

- 2 Set the number of sequence repetitions (1 to 99999).**

99999 represents infinity.

- 3 If the steps in the sequence that you will write to the PCR-WE contain arbitrary waveforms, select the Write Wave.**

Selecting Write Wave causes arbitrary waveform data and then sequence data to be written in the PCR-WE.



- 4 Click Run.**

The sequence settings in the PCR-WE are initialized, and data created using Wavy is written in the PCR-WE.

NOTE

- The maximum number of arbitrary waveforms that can be transferred to the PCR-WE is 256.
- If there are many steps, transferring may take a while.
- Wavy uses “List of waveform banks” ([p.72](#)) of the waveform view to manage the arbitrary waveforms written to the PCR-WE waveform banks.

Reading a sequence

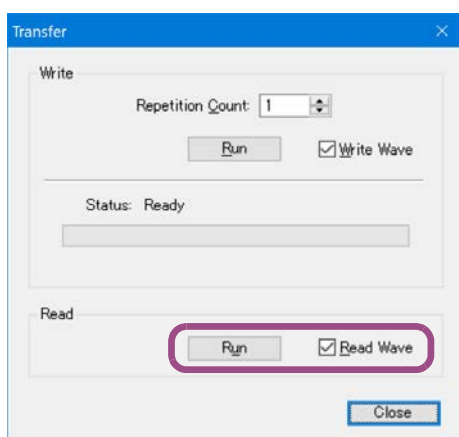
- 1 On the Sequence menu, click Transfer. Or, click  on the toolbar.

The Transfer window appears.

- 2 If the steps in the sequence that you will read from the PCR-WE contain arbitrary waveforms, select the Read Wave.

The waveform data assigned to the steps in the sequence will also be read. Arbitrary waveform data that is read is automatically saved to files with .arb extension.

The file name is automatically assigned according to the waveform bank number (001 to 256). For example, if the waveform bank number is 1, the file name is Wave_001.arb. The file save destination is the arbitrary waveform folder specified in the Environment settings (p.58) window. If a file with the same name exists, it is overwritten.



- 3 Click Run.

NOTE


- If the voltage transition or frequency transition of step 0 in the PCR-WE is set to ramp, it will be changed to Step after reading the data into Wavy.
- For details on the folder in which arbitrary waveforms are saved, see “Environment settings” (p.58).
- Wavy uses “List of waveform banks” (p.72) of the waveform view to manage the arbitrary waveforms written to the PCR-WE waveform banks.

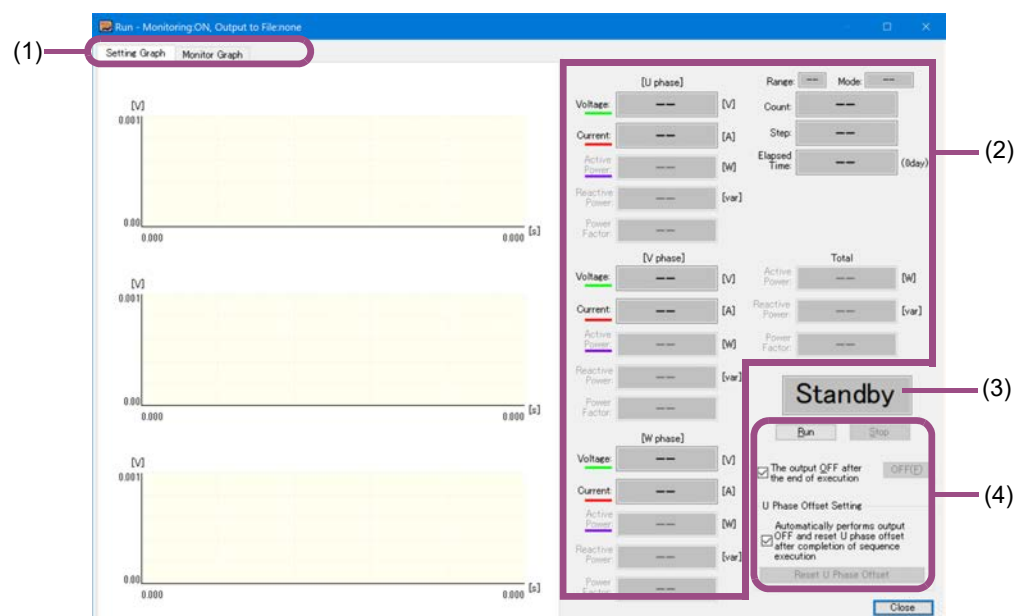
Running Sequences

You can run sequences from the sequence run window.

- Sequence run window (p.45)
- Saving monitored data (p.47)
- Running a sequence (p.48)
- Handling when an alarm occurs on the PCR-WE (p.49)
- Handling when communication is disconnected (p.49)

Sequence run window

On the Sequence menu, click Run. Or, click  on the toolbar. The sequence run window appears. The following figure is an example of a three-phase wiring method.



- (1) Tab (p.45)
- (2) Monitor (p.46)
- (3) Status (p.46)
- (4) Operation (p.47)

■ (1) Tab

If Monitor Graphical Representation is selected in the Monitoring Setup window (p.53), you can select from three types of displays using tabs.

■ (2) Monitor

| Item | Description |
|-----------------|--|
| Range | Displays the output voltage range. |
| Mode | Displays the wiring method. |
| Count | Displays the present iteration. |
| Step | Displays the number of the step that is being executed.* ¹ The update interval of the sequence run window is 1 second. If the Step execution time. (p.22) is less than or equal to 1 second, the step that is displayed and the step that is being executed may not be the same. |
| Elapsed Time | Displays the elapsed time since the sequence execution started.* ² |
| Measured values | Displays the items (current, voltage, active power (total value), reactive power (total value), and power factor (total value)) that are selected in the Monitor Setup window (p.53). You can set the monitoring interval in the Monitor Setup window. |

*1 If the sequence is paused (in a trigger wait state), the number of the step before the step in which Trig. IN is set to on is displayed.

*2 This display may be slightly different from the actual elapsed time.

■ (3) Status

| Status | Description |
|-----------------------------|---|
| Standby | Standing by. |
| Running | The sequence is running. |
| PAUSE | The sequence is paused. The sequence will pause before a step whose Trig. IN has been set to on. |
| End | The sequence is complete. |
| Stop | The Stop button was clicked. |
| Error | A communication error occurred, or a protection setting is out of range. Check Configuring the Interface (p.7) and Protection Settings (p.28). |
| OVP (OVP example) | A protection function was activated (alarm). OVP: overvoltage protection, UVP: undervoltage protection, OHP: overheat protection, OL: Over load protection For instructions on how to clear alarms, see "Handling when an alarm occurs on the PCR-WE" (p.49). |

■ (4) Operation

| Item | Description |
|---|---|
| Run | Runs the sequence. |
| Stop | Stops the sequence. |
| The output OFF after the end of execution | If you select this check box, the output is turned off when the sequence finishes executing, when the sequence is aborted, or when a protection function is activated.* ¹ After the sequence is completed, to manually turn off the output, click OFF. This command is invalid while a sequence is running. |
| U phase Offset Setting* ² | If you select this check box, the output is turned off and the U phase offset is reset when the sequence is completed or aborted or when a protection function is activated. After the sequence is completed, to manually reset the U phase offset, click Reset U phase Offset. This command is invalid while a sequence is running. |

*¹ If you want to accurately control the time when the output is turned off, add a step for turning off at the end of the sequence.

*² This appears when the wiring method is three-phase.

Changing the sequence run window display

You can change the sequence run window display items. See “Sequence run window display settings” (p.55).

Saving monitored data

You can save monitored data to a file while a sequence is running. For details, see “Specifying monitor settings” (p.53).

You can change the file format of monitored output data using Environment settings (p.58) window.

Running a sequence

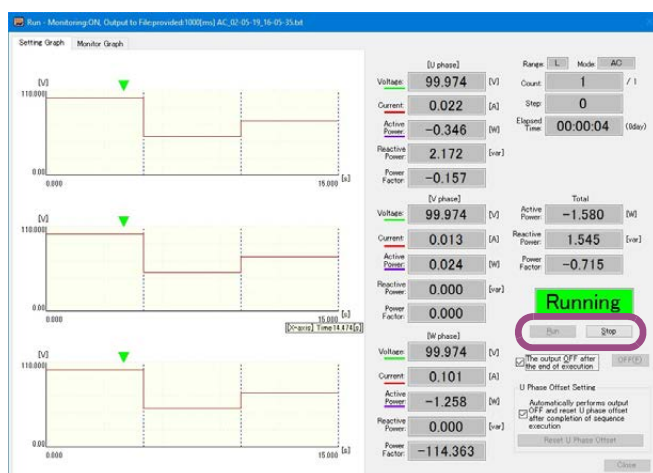
NOTE

When running a long sequence

- The amount of data of the monitor graph may increase and load the PC. This may cause the PC to malfunction. If this occurs, you can reduce the load by setting the Max Data Count ([p.56](#)).
- We recommend that you use Task Manager to check the amount of physical memory being used.

To start a sequence, click Run.

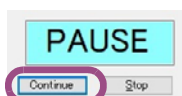
To abort a sequence that is running, click Stop.



The green marker on the setting graph represents the approximate position of execution. For sequences that have a large number of repetitions or those that take a long time to run, the position indicated by the green line may appear offset from the actual position.

You can change this display to a bar display. For the procedure, see “Specifying monitor settings” ([p.53](#)).

If a step whose Trig. IN has been set to on exists, the sequence will pause before executing the step. To resume the sequence, click Continue.



While the sequence is paused, the Run button changes to Continue.

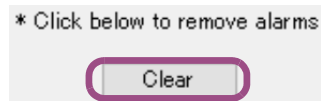
During test execution, the menus and toolbar are disabled. In addition, the window cannot be resized.

Handling when an alarm occurs on the PCR-WE

If an alarm occurs on the PCR-WE while a sequence is running, you can clear the alarm from Wavy's Remote Control Panel window.

Clear the alarm, and then eliminate the cause of the alarm.

- 1 Close the sequence run window.**
- 2 On the Tool menu, click Direct Control.**
A Remote Control Panel window opens.
- 3 Click Clear in the lower left of the Remote Control Panel.**
The PCR-WE alarm will be cleared.



- 4 Close the Remote Control Panel window.**

Handling when communication is disconnected

If communication with the PCR-WE is disconnected while a sequence is running, the status in the sequence run window will change to "Error" or "End."

The PCR-WE continues to run the sequence even when communication is disconnected because the sequence transferred to the PCR-WE is running. Even if communication is restored while the sequence is running, Wavy will not be able to obtain monitored data. An error will occur if you try to run the sequence again.

- 1 Press LOCAL on the PCR-WE panel.**
The PCR-WE control switches from remote to local. If there are steps that have not been executed yet, the sequence will continue to run.
- 2 Press OUTPUT on the PCR-WE panel.**
The output will turn off, and the sequence will be aborted.
- 3 Close the sequence run window.**
- 4 After the communication is restored, run the sequence again.**

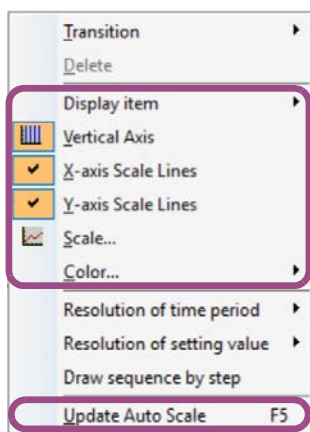
Settings



- Graph window display settings ([p.50](#))
- Specifying monitor settings ([p.53](#))
- Sequence run window display settings ([p.55](#))
- Environment settings ([p.58](#))
- DIGITAL I/O Settings ([p.59](#))

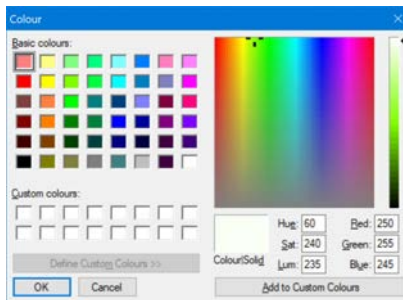
Graph window display settings

You can select Graph window display items from the Graph menu.

You can also right-click the Graph window to display an equivalent shortcut menu (without Copy).



| Graph window display menu | Description |
|---------------------------|--|
| Display item | Select the items (voltage, frequency, starting phase angle, phase difference) to show on the Y-axis. To create steps using the mouse, select Voltage. If you select Start phase angle or Phase difference, see “If you select the starting phase angle or phase difference for the Y-axis” (p.51). |
| Vertical Axis | Shows and hides the vertical-axis lines (step-division lines.) This is equivalent to clicking  on the toolbar. |
| X-axis Scale Lines | Shows and hides the X-axis grid. By default, the scale line color is set to white. |
| Y-axis Scale Lines | Shows and hides the Y-axis grid. By default, the scale line color is set to white. |
| Scale | Changes the X-axis and Y-axis scale lines on the scale window. This is equivalent to clicking  on the toolbar. See “Changing the Graph window scale” (p.52). |

| Graph window display menu | Description |
|---------------------------|--|
| Color | Set the color of items using the Color window. |
| |  |
| Background | Changes the background color of the graph. |
| Line | Changes the step line color. |
| Line to Draw | Changes the color of lines drawn with the mouse. |
| Vertical Axis | Changes the vertical-axis color. |
| X/Y-axis | Changes the X-axis and Y-axis colors. |
| XY-axis Scale lines | Changes the colors of the X-axis and Y-axis grid lines. |
| Update Auto Scale | Applies auto scaling to the graph window. |

If you select the starting phase angle or phase difference for the Y-axis

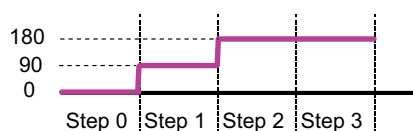
When the Y-axis is displaying the starting phase angle, the absolute position of each phase is displayed. When the Y-axis is displaying the phase difference, the phase difference between each phase is displayed.

(Example) The figure below shows how the graphs appear when the sequence output voltage mode is set to single-phase, three-wire and the starting phase, UV phase, sudden phase change, and U phase offset of steps 0 to 3 are set as shown in the following table.

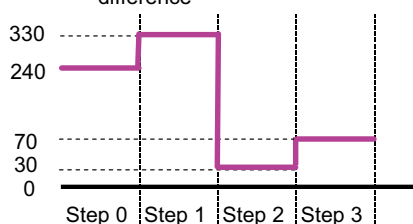
| | S. Phase | Start [deg] | U offset | U offset [deg] | U offs. ramp | UV phase | UV [deg] | Pri. phase |
|-------|----------|-------------|----------|----------------|--------------|----------|----------|------------|
| Step0 | FIXED | 0 | off | 0 | off | on | 120 | off |
| Step1 | FIXED | 90 | off | 0 | off | on | 120 | on |
| Step2 | FIXED | 180 | off | 0 | off | on | 150 | off |
| Step3 | FIXED | 180 | off | 0 | off | on | 110 | off |

When the Y-axis display is set to Start phase angle

U phase Drawn based on the starting phase angle and U phase offset

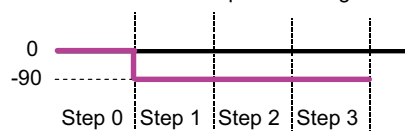


V phase Drawn based on the starting phase angle and U-V phase difference

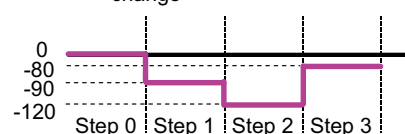


When the Y-axis display is set to Phase difference


U phase Drawn based on the starting phase angle, U phase offset, and sudden phase change

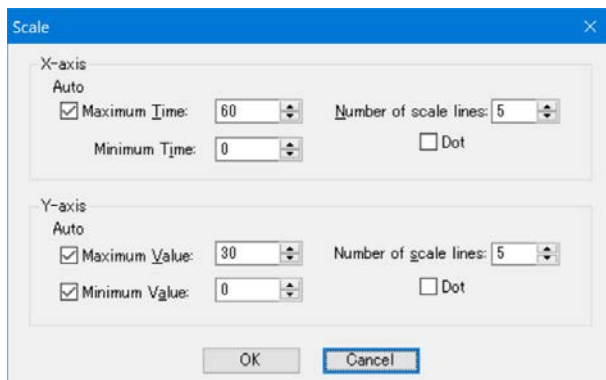


V phase Drawn based on the starting phase angle, U-V phase difference, and sudden phase change




Changing the Graph window scale

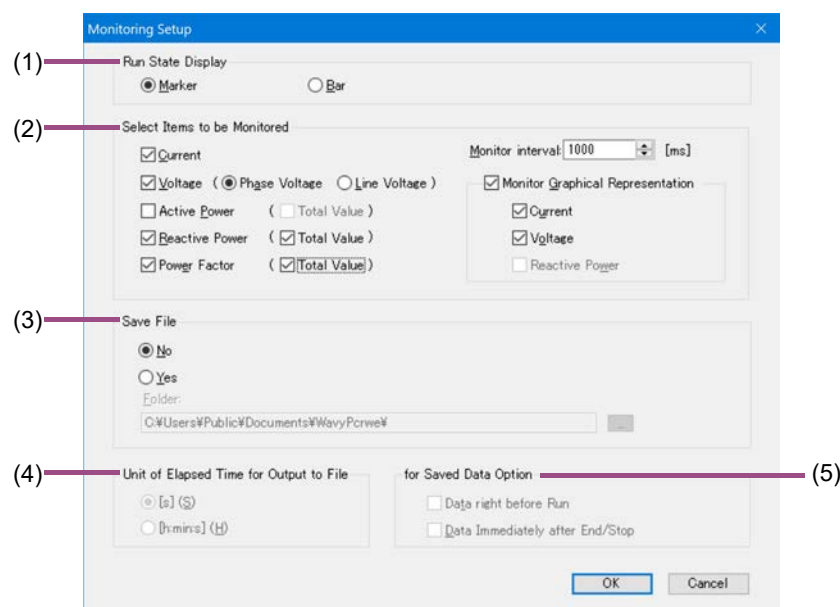
Select the Graph window. Click Scale on the Graph menu or click  on the toolbar to display the Scale window. You can also right-click the graph window and select Scale to display the Scale window.



- If you select Maximum Time, Maximum Value, or Minimum Value, auto scale will be enabled. The scale values will be set to appropriate values when you create steps or when you open a saved file.
- If auto scale is disabled, settings that are outside of the range are not displayed on the graph.
- If you are using the mouse to set steps, the scale will not be updated automatically even if auto scale is enabled. On the Graph menu, click Update Auto Scale, or right-click the Graph window and select Update Auto Scale.
- Use Number of scale lines to set the number of grid lines.
- Select Dot to display the grid lines using dotted lines.

Specifying monitor settings

You can change settings related to the sequence run window display and saving of monitored data in the Monitoring Setup window. To open the window, click Monitoring Setup on the Sequence menu or click  on the toolbar.



- (1) Run State Display ([p.53](#))
- (2) Select Items to be Monitored ([p.53](#))
- (3) Save File ([p.54](#))
- (4) Unit of Elapsed Time for Output to File ([p.54](#))
- (5) for Saved Data Option ([p.54](#))

■ (1) Run State Display

The sequence's execution position display can be set to marker display or bar display.

The run state display does not function if Jump function ([p.27](#)) is set to on.

■ (2) Select Items to be Monitored

Select the displayed measured values (current, voltage, active power, reactive power, or power factor). You can select multiple items.

If the wiring method is single-phase three-wire or three-phase, you can also select Phase Voltage, Line Voltage, and Total Value. If you select the total values for active power, reactive power, and power factor, the total of each phase will be displayed.

Using Monitor interval, you can set the monitor update interval (single-phase: 200 ms to 600000 ms, single-phase three-wire or three phase: 500 ms to 600000 ms).

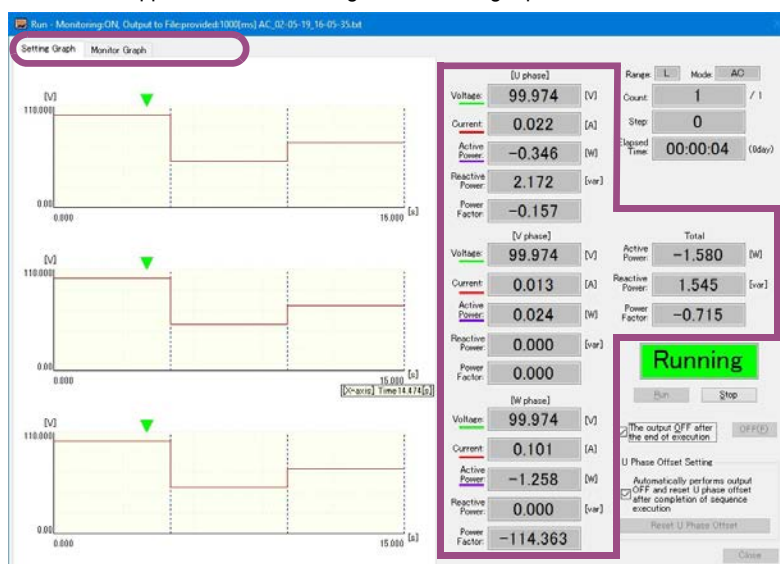
NOTE

If the interface is RS232C and you want to set the monitoring interval to a value less than 500 ms, set the baudrate ([p.8](#)) to 38400 bps or higher to ensure the reception of monitored data. For details on the baudrate setting on the PCR-WE, see the Communication Interface Manual of the PCR-WE.

If you select Monitor Graphical Representation, you can select from three types of displays using tabs.

| Tab | Description |
|---|--|
| Setting Graph | A graph of the sequence to be executed appears. |
| Monitor Graph | A graph of monitored voltages and currents while executing a sequence appears. |
| Setting Graph and Monitor Graph ^{*1} | A setting graph appears in the top half, and a monitor graph appears in the bottom half. |

^{*1} This appears when the wiring method is single-phase.



■ (3) Save File

Select whether to save the monitored data to a text file.

If you select Yes, specify the save destination folder.

The saved data file name consists of the output voltage mode, the execution start date and time, and the file name extension. You can change the file name extension (the default is .txt) using "Environment settings" (p.58).

■ (4) Unit of Elapsed Time for Output to File

You can set the unit of elapsed time (second or hour:minute:second). The accuracy of the elapsed time varies depending on the PC environment that you are using.

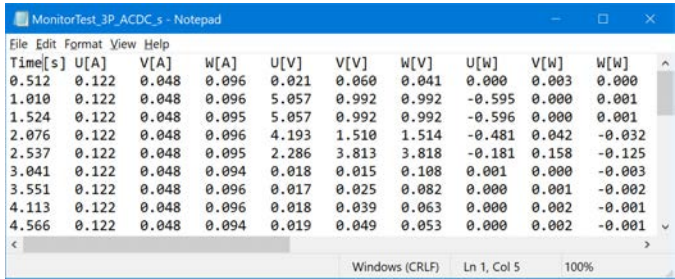
■ (5) for Saved Data Option

If you select Data right before Run, the monitored values before sequence execution (monitored values at time 0 s) will be written at the beginning of the saved data.

If you select Data Immediately after End/Stop, the monitored values after the sequence is completed or aborted will be written at the end of the saved data.

Viewing saved monitored data

You can use Notepad to view saved monitored data.

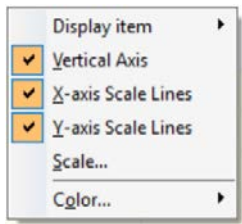


By default, data is saved as tab-separated values. You can change this to comma-separated values by using “Environment settings” [\(p.58\)](#).

Sequence run window display settings

Setting graph display settings

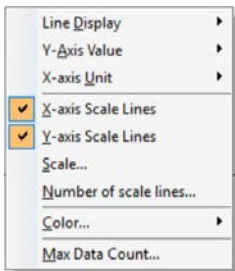
Right-click the setting graph of the sequence run window to display a shortcut menu for the graph display.



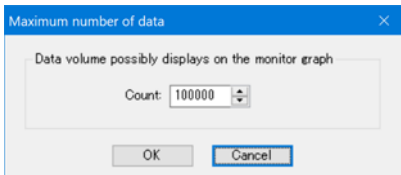
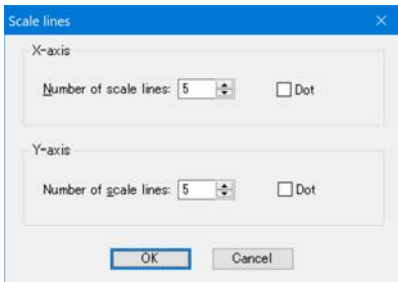
| Setting graph shortcut menu | Description |
|-----------------------------|---|
| Display item | Select the items (voltage, frequency, starting phase angle, phase difference) to show on the Y-axis. If you select Start phase angle or Phase difference, see “If you select the starting phase angle or phase difference for the Y-axis” (p.51) . |
| Vertical Axis | Shows and hides the vertical-axis lines (step-division lines.) |
| X-axis Scale Lines | Shows and hides the X-axis grid. By default, the scale line color is set to white. |
| Y-axis Scale Lines | Shows and hides the Y-axis grid. By default, the scale line color is set to white. |
| Color | See “Color” (p.51) in “Graph window display settings.” |

Monitor graph display settings

Right-click the monitor graph of the sequence run window to display a shortcut menu for the graph display.



| Monitor graph shortcut menu | Description |
|-----------------------------|--|
| Line Display | Shows and hides current, voltage, and power lines. (You can select multiple items.) |
| Y-Axis Value | Select the value (voltage, current or power) that appears when the mouse pointer is placed on the Y-axis. |
| X-axis Unit | Select the unit of X-axis (second [s] or hour:minute:second [h:m:s]). |
| X-axis Scale Lines | Shows and hides the X-axis grid. By default, the scale line color is set to white. |
| Y-axis Scale Lines | Shows and hides the Y-axis grid. By default, the scale line color is set to white. |
| Scale | Changes the X-axis and Y-axis scale lines on the scale window. See "Changing the monitor graph scale" (p.57). |
| Number of scale lines | Set the number and types of grid lines in the Scale lines window. |
| Color | See "Color" (p.51) in "Graph window display settings." |
| Max Data Count | Set the number of data entries that can be displayed (10000 to 1000000, 100000 by default) in the Maximum number of data window. |



Executing a long sequence will increase the amount of monitor graph data. This puts a heavy load on the PC and may cause the PC to malfunction. If this occurs, you can reduce the load on your PC by setting the maximum number of data entries.

Even if you set the maximum data size, all monitored data will be saved.

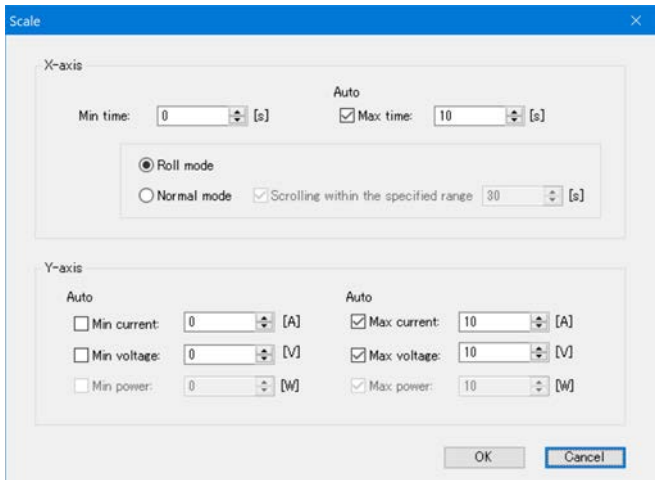
If the number of monitored data entries exceeds the maximum data size, the oldest entries will no longer be displayed.

One monitored data entry uses approximately 200 bytes.

When you run a long sequence, we recommend that you use Task Manager to check the amount of physical memory being used.

■ Changing the monitor graph scale

You can change the X-axis and Y-axis scales of the monitor graph.
To change the scales, right-click the monitor graph, and click Scale to display the Scale window.



If you select Max time, Max current, Max voltage, Max power, Min current, Min voltage, or Min power, auto scale will be enabled. This feature updates the scale values according to the monitored values.
If auto scale is disabled, monitored values that are outside of the range are not displayed on the graph.
If the Max time check box is selected to enable auto scale, you can select between roll mode and normal mode.

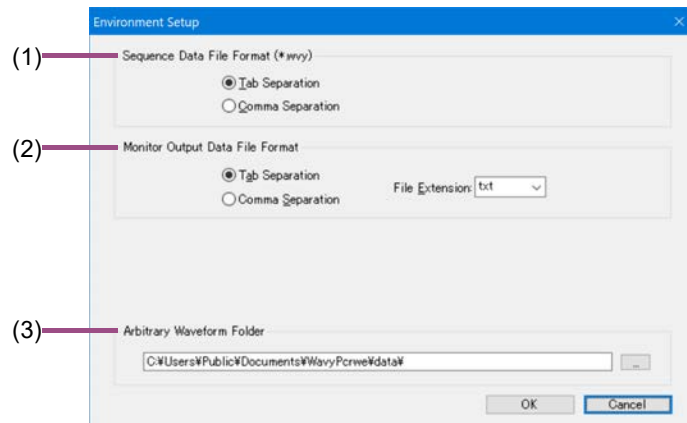
| Mode | Description |
|-------------|---|
| Roll mode | The X-axis and Y-axis are scrolled at the same time. The display range is defined by subtracting the minimum time from the maximum time. |
| Normal mode | The minimum time is fixed. The maximum time is updated to the appropriate value. If you select the Scrolling within the specified range check box, the graph is scrolled when the monitored values exceed the maximum time of the X axis. The scroll start position is determined by subtracting the minimum time and the set scroll time from the maximum time. For example, if the minimum time is set to 0 seconds, the maximum time to 23 seconds, and the scroll time to 10 seconds, scrolling starts after 23 seconds elapse (at 23 - 0 - 10 = 13 seconds). |

NOTE

If the wiring method is single-phase, three-wire or three-phase output and you select normal mode, the “Scrolling within the specified range” check box is always selected (you cannot clear the check box).
The range of scroll time that you can specify is 4 s to 3600 s for single-phase and 4 s to 600 s for single-phase.

Environment settings

On the Setting menu, click Environment Setup to display the Environment Setup window.



- (1) Sequence data file format (*.wvy) (p.58)
- (2) Monitor output data file format (p.58)
- (3) Arbitrary Waveform Folder (p.58)

■ (1) Sequence data file format (*.wvy)

Select Tab Separation or Comma Separation. The default is tab separation.

■ (2) Monitor output data file format

Select Tab Separation or Comma Separation. The default is tab separation.

You can select the extension (txt, csv, log) from the File Extension list. You can also enter an extension of your choice in the box.

■ (3) Arbitrary Waveform Folder

Specify where the arbitrary waveform data files are saved.

NOTE

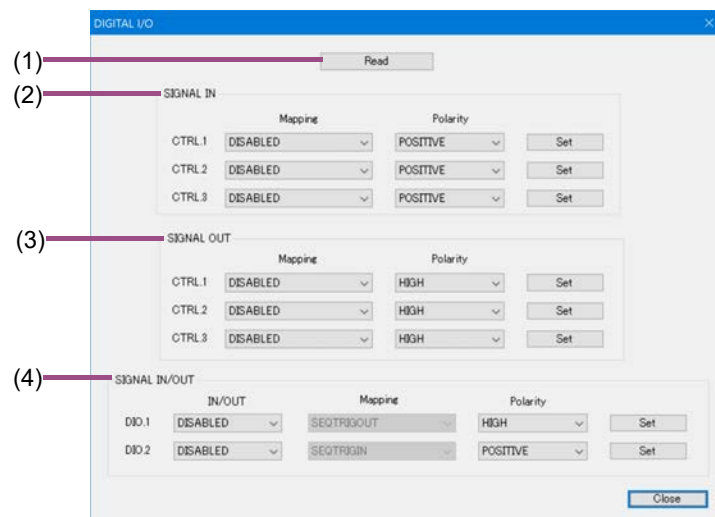
When Wavy recalls a sequence, if the arbitrary waveform files are not in their appropriate location, Wavy may assign unintended waveforms.

DIGITAL I/O Settings

You can set the PCR-WE's DIGITAL I/O connector channels from Wavy. If you set the step setting Trig. IN, Trig. OUT, or Stat. Out to on, set these settings before running a sequence.

Selecting DIGITAL I/O from the Tool menu displays a DIGITAL I/O window.

For details on mapping parameters (control signals), see the PCR-LE Series User's Manual.



- (1) Read ([p.59](#))
- (2) SIGNAL IN ([p.60](#))
- (3) SIGNAL OUT ([p.60](#))
- (4) SIGNAL IN/OUT ([p.61](#))

■ (1) Read

The settings applied to the connected PCR-WE are read. Click Read to display the DIGITAL I/O connector channel (excluding CTRL.4 and STAT.4) settings.

■(2) SIGNAL IN

Assign (map) control signals to channels (CTRL.1 to CTRL.3) controllable using external contacts.

| Item | | | Description |
|----------|--------------|-----------------------|---|
| Mapping | DISABLED | Disabled | Disabled |
| | OUTCTL | Output Control | Output on/off |
| | SEQEXEC | SEQ Execution Control | Sequence run/stop |
| | ALMCLR | Alarm Clear | Alarm Clear |
| | EXTALM | External Alarm | External alarm input |
| | WIRCTRL_1P | Wiring Control 1P | Wiring method change (single-phase) |
| | WIRCTRL_1P3W | Wiring Control 1P3W | Wiring method change (single-phase three-wire) |
| | WIRCTRL_3P | Wiring Control 3P | Wiring method change (single-phase) |
| | VRANGE | Volt Range | Output range change |
| | RCL_A | Recall A Memory | Preset memory A recall |
| | RCL_B | Recall B Memory | Preset memory B recall |
| | RCL_C | Recall C Memory | Preset memory C recall |
| | OUTINH | Output Inhibit | Output-on inhibit |
| | USERPROGIN | Programmable Signal | Programmable signal in |
| Polarity | POSITIVE | | Sets logical true to high. |
| | NEGATIVE | | Sets logical true to low. |
| Set | | | When you click the button, the values are sent to the PCR-WE, and the settings are updated. |

■(3) SIGNAL OUT

Assign (map) control signals to channels (STAT.1 to STAT.3) that can be monitored.

If you set the step setting Stat. Out ([p.23](#)) to on, map any channel from STAT.1 to STAT.3 to SEQSTAT.

| Item | | | Description |
|----------|-------------|---------------------|---|
| Mapping | DISABLED | Disabled | Disabled |
| | OUTON | Output ON Status | Output on status |
| | IPKLIM | I Pk Limit Status | Peak current limit status |
| | OVRTLOAD | Overload Status | Overload status |
| | BUSY | Busy Status | Busy status |
| | WIRING_1P | Wiring 1P Status | Wiring method status (single-phase) |
| | WIRING_1P3W | Wiring 1P3W Status | Wiring method status (single-phase three-wire) |
| | WIRING_3P | Wiring 3P Status | Wiring method status (single-phase) |
| | VRANGE_H | Volt Range H Status | Output voltage H range status |
| | POWON | Power ON Status | POWER switch on status |
| | SEQSTAT | SEQ Status Out | Sequence/power line abnormality simulation status output status |
| | USERPROGOUT | Programmable Signal | Programmable signal status |
| Polarity | HIGH | | Sets status polarity to high. |
| | LOW | | Sets status polarity to low. |
| Set | | | When you click the button, the values are sent to the PCR-WE, and the settings are updated. |

■ (4) SIGNAL IN/OUT

Assign (map) control signals to channels (DIO.1/DIO.2), which allow you to select whether to control using external contacts or monitor the operation status.

If you set the step setting Trig. IN ([p.34](#)) to on, map either DIO.1 or DIO.2 to SEQTRIGIN.

If you set the step setting Trig. OUT ([p.23](#)) to on, map either DIO.1 or DIO.2 to SEQTRIGOUT.

| Item | | Description |
|--------|----------|---|
| IN/OUT | DISABLED | Disabled |
| | IN | Controllable using external contacts. |
| | OUT | The operation status can be monitored. |
| Set | | When you click the button, the values are sent to the PCR-WE, and the settings are updated. |

- If IN/OUT is set to IN

| Item | | Description | |
|----------|--------------|-----------------------|--|
| Mapping | SYNCLK | Sync Clock In | Output reference phase input |
| | SEQTRIGIN | SEQ Trigger In | Sequence trigger input |
| | OUTCTL | Output Control | Output on/off |
| | SEQEXEC | SEQ Execution Control | Sequence run/stop |
| | ALMCLR | Alarm Clear | Alarm Clear |
| | EXTALM | External Alarm | External alarm input |
| | WIRCTRL_1P | Wiring Control 1P | Wiring method change (single-phase) |
| | WIRCTRL_1P3W | Wiring Control 1P3W | Wiring method change (single-phase three-wire) |
| | WIRCTRL_3P | Wiring Control 3P | Wiring method change (single-phase) |
| | VRANGE | Volt Range | Output range change |
| | RCL_A | Recall A Memory | Preset memory A recall |
| | RCL_B | Recall B Memory | Preset memory B recall |
| | RCL_C | Recall C Memory | Preset memory C recall |
| | OUTINH | Output Inhibit | Output-on inhibit |
| | USERPROGIN | Programmable Signal | Programmable signal in |
| Polarity | POSITIVE | | Sets logical true to high. |
| | NEGATIVE | | Sets logical true to low. |

- If IN/OUT is set to OUT

| Item | | Description | |
|----------|-------------|---------------------|---|
| Mapping | STDCLK | Standard Clock Out | Output reference phase output |
| | SEQTRIGOUT | SEQ Trigger Out | Sequence trigger output |
| | OUTON | Output ON Status | Output on status |
| | IPKLIM | I Pk Limit Status | Peak current limit status |
| | OVRTLOAD | Overload Status | Overload status |
| | BUSY | Busy Status | Busy status |
| | WIRING_1P | Wiring 1P Status | Wiring method status (single-phase) |
| | WIRING_1P3W | Wiring 1P3W Status | Wiring method status (single-phase three-wire) |
| | WIRING_3P | Wiring 3P Status | Wiring method status (single-phase) |
| | VRANGE_H | Volt Range H Status | Output voltage H range status |
| | POWON | Power ON Status | POWER switch on status |
| | SEQSTAT | SEQ Status Out | Sequence/power line abnormality simulation status output status |
| | USERPROGOUT | Programmable Signal | Programmable signal status |
| Polarity | HIGH | | Sets status polarity to high. |
| | LOW | | Sets status polarity to low. |

Creating and Transferring Arbitrary Waveforms

Wavy allows you to create, save, and transfer arbitrary waveforms that can be transmitted using the special waveform output feature of the PCR-WE. When you transfer an arbitrary waveform that has been saved, the waveform data is registered in the PCR-WE waveform bank and in the List of waveform banks (p.72) in Wavy. Arbitrary waveforms that are in the list of waveform banks can be assigned to steps in a sequence.

In addition, you can create arbitrary waveforms by importing text data of measurements taken on instruments such as oscilloscopes and data loggers.

NOTE

- For details on the special waveform output feature of the PCR-WE, see “Generating Special Waveforms (Waveform bank)” in the PCR-WE User’s Manual.
- The maximum number of arbitrary waveforms that can be registered in the PCR-WE is 256.

- Creating a new arbitrary waveform and transferring it to the waveform bank (p.63)
- Editing an existing arbitrary waveform and transferring it to the waveform bank (p.69)
- Editing an existing arbitrary waveform and transferring it to the waveform bank (p.69)
- Creating arbitrary waveform data using data from an oscilloscope or other instrument (p.69)

Creating a new arbitrary waveform and transferring it to the waveform bank

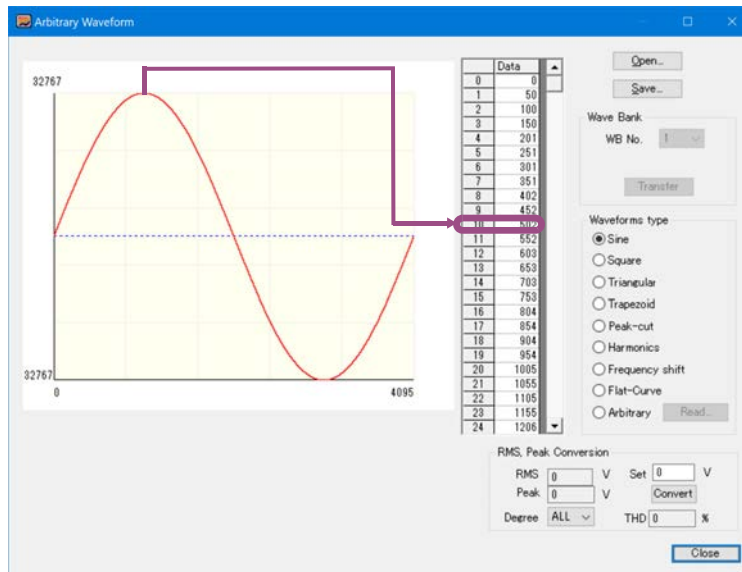
There are nine types of arbitrary waveforms that you can choose from.

- Sine
- Square
- Triangular
- Trapezoidal
- Peak-cut
- Harmonics
- Frequency shift
- Flat curve
- Arbitrary

Selecting Arbitrary enables you to directly edit arbitrary waveform data. If you select any other type, you cannot directly edit the data.

1 On the Sequence menu, click Arbitrary Waveform.

The Arbitrary Waveform window appears.



2 Select the arbitrary waveform type.

Arbitrary waveform data is 16 bits high (-32767 to 32767) and 12 bits wide (0 to 4095).

Double-click the waveform to select the corresponding data in the worksheet.

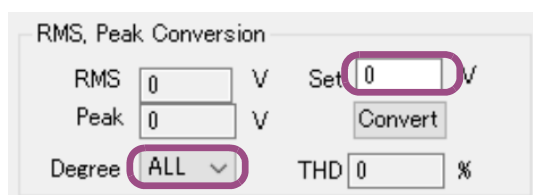
3 Depending on the waveform that you select, set the necessary values.

See "Waveform settings" (p.65).

4 Enter the voltage to output from the PCR-WE in the Set box under RMS, Peak Conversion, select a value from the Degree list, and click Convert.

You can check what kind of values the RMS value (V), peak value (V), and THD (%) will take on when the specified voltage is output when arbitrary waveform data is used.

If you specify the voltage and harmonic (ALL, 1 to 40), other values will be calculated automatically.



THD (total harmonic distortion) is expressed by the following equation.

$$THD = \frac{\sqrt{\sum (V_n^2)}}{V_{rms}} \text{ (where } ^2 \text{ represents squared, } n \text{ is a number between 2 and 40)}$$

V_n: RMS values of the 2nd to the 40th harmonic voltage components

V_{rms}: RMS voltage (ALL)

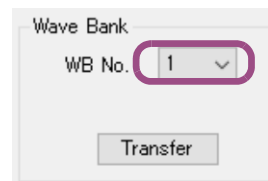
5 To save the arbitrary waveform data that you have created, click Save.

The data is saved to an arbitrary waveform file (.arb extension).

If you do not want to transfer the arbitrary waveform data to the waveform bank, the procedure ends here.

6 Specify WB No. (1 to 256), and click Transfer.

The arbitrary waveform data is written to the PCR-WE waveform bank and is registered in the list of waveform banks in Wavy.



To transfer arbitrary waveform data to a waveform bank, you must save the data to a file first. The waveform bank items are unavailable until you save the data.

7 Click Close.

Waveform settings

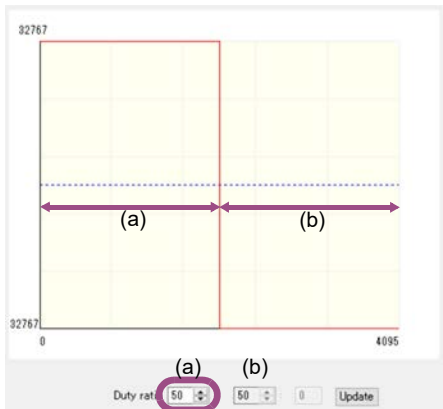
You can directly edit waveform data only when Arbitrary is selected.

■ Sine waveform

There are no settings you can change.

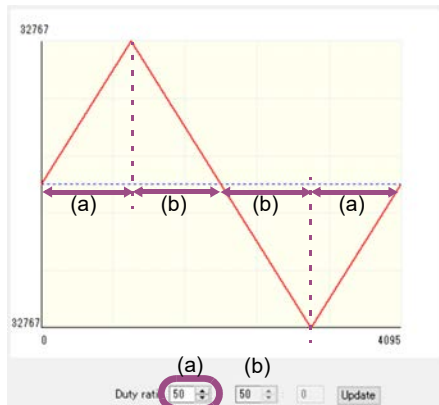
■ Square waveform

Enter a value (0.1 to 99.9) in Duty ratio (a), and click Update or press Enter. (b) is set automatically.



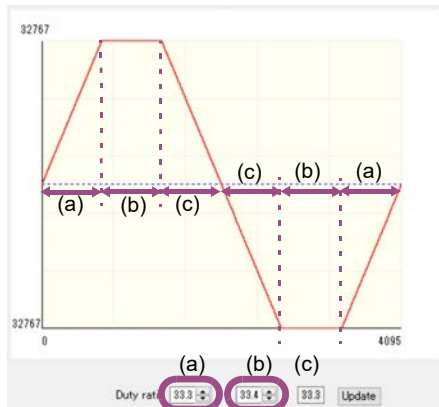
■ Triangular waveform

Enter a value (0.0 to 100) in Duty ratio (a), and click Update or press Enter. (b) is set automatically.



■ Trapezoid waveform

Enter values (0.0 to 100) in Duty ratio (a) and (b), and click Update or press Enter. (c) is set automatically.



■ Peak-cut waveform

Enter the peak-cut factor (0.1 to 100), and click Update or press Enter.



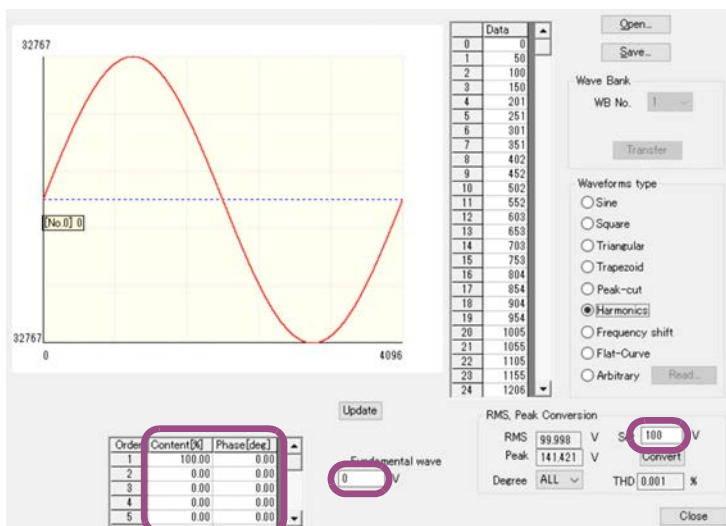
The peak-cut sine waveform is different from the “peak clipped waveform” (special waveform output feature) of the PCR-WE.

■ Harmonics

Enter the level and phase in each harmonic order, and click Update or press Enter.

- Level range: 0.00 % to 100.00 % (in 0.01 % steps)
- Phase range: 0.0 ° to 359.9 °
- Harmonic order range: 1st to 50th

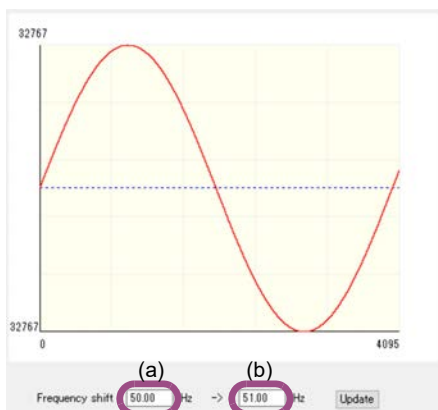
If you specify Fundamental waveform and click Update, the output voltage settings necessary to change the harmonic waveform levels and phases while keeping the fundamental waveform voltage constant are displayed in Set.



■ Frequency shift

Enter values (40.00 to 120.00) in Frequency shift (a) and (b), and click Update or press Enter.

Enter the original frequency in (a) and the shifted frequency in (b).



■ Flat-Curve

Enter a value (0.4 to 1.0) in Specified Clip Factor, and click Update or press Enter.
This is a waveform defined in IEC61000-4-13.



■ Arbitrary

The waveform displayed when Arbitrary is selected depends on the waveform selected previously. For example, if Square is selected and you select Arbitrary, a square wave will be displayed.
To edit the data, change the values in the data sheet cells.
Right-click a cell, and select Copy, Paste, or Series Paste to copy or paste data. To paste to consecutive cells, select the cells, right-click, and select Series Paste. The value of the first selected cell will be pasted to the selected cells.



Editing an existing arbitrary waveform and transferring it to the waveform bank

NOTE

To use in a sequence an arbitrary waveform file (.arb format) stored in a separate PC or memory card, move the file you want to transfer to the folder for saving arbitrary waveforms in advance. You can set the folder for saving arbitrary waveforms in the Environment settings (p.58) window.

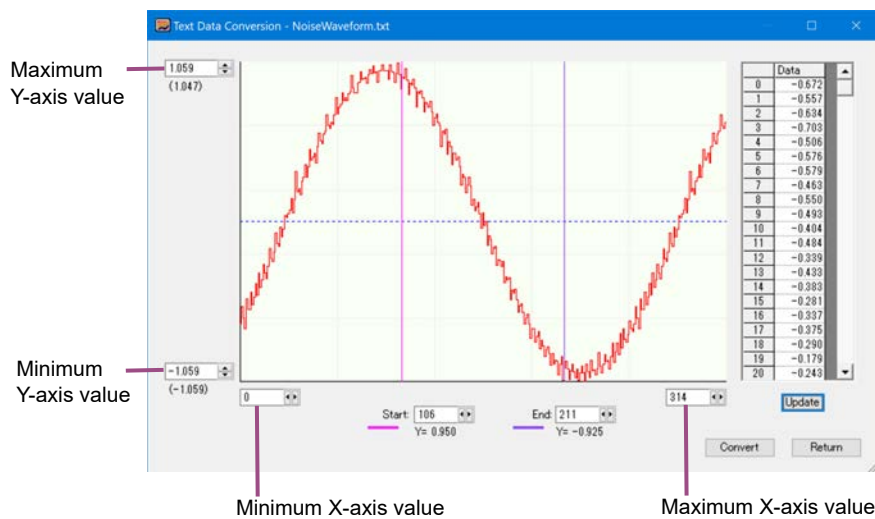
- 1 On the Sequence menu, click Arbitrary Waveform.**
The Arbitrary Waveform window appears.
- 2 Click Open, and select an arbitrary waveform file (.arb).**
The data of the selected file appears.
- 3 Edit the settings, and click Save.**
The edited data is saved to the file.
If you do not want to transfer the arbitrary waveform data to the waveform bank, the procedure ends here.
- 4 Specify WB No. (1 to 256), and click Transfer.**
The arbitrary waveform data is written to the PCR-WE waveform bank and is registered in the list of waveform banks in Wavy.
- 5 Click Close.**

Creating arbitrary waveform data using data from an oscilloscope or other instrument

You can create arbitrary waveform data by importing measurement data files of other instruments such as oscilloscopes and data loggers.

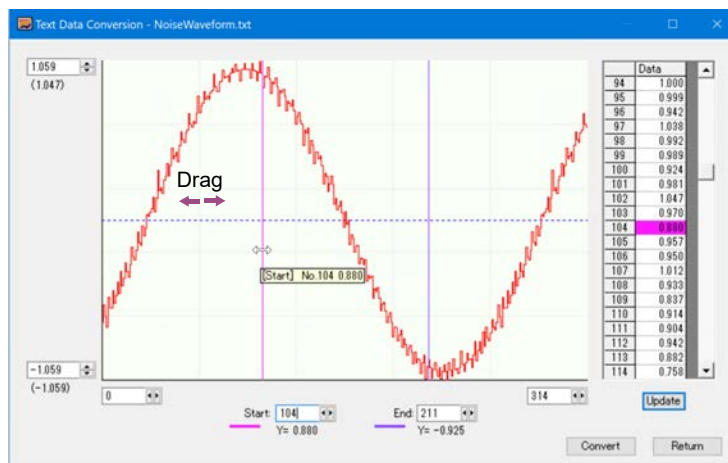
Wavy can import data files in text format. The maximum number of data values that can be imported is 10000. From the imported data, select the arbitrary waveform that you want to use, and then convert it for PCR-WE.

- 1 On the Sequence menu, click Arbitrary Waveform.**
The Arbitrary Waveform window appears.
- 2 Under Waveforms type, select Arbitrary, and then click Read.**
- 3 Select a data file in text format.**
A text data conversion confirmation window appears.
- 4 Set the minimum and maximum values for the X-axis and Y-axis, and then click Update or press Enter.**
The graph display range will change.



5 Set the starting and ending positions of the waveform that you want to use as an arbitrary waveform.

You can also drag the start and end position lines. When you drag a line, the corresponding data entry in the data sheet is highlighted.



You can also set the start and end positions in the following manner.

- While holding down the Shift key, double-click the waveform.
(The start position line moves to the point you double-clicked.)
- While holding down the Ctrl key, double-click the waveform.
(The end position line moves to the point you double-clicked.)

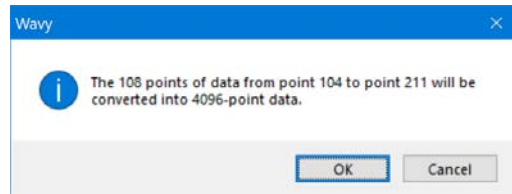
If you double-click the following locations, the corresponding data on the sheet will be highlighted.

- The Start or End character or the start or end position line on the graph
- Any specific point on the waveform

You can right-click the waveform and change the colors of the start and end position lines.

6 Click Convert.

A confirmation window appears.



- 7 Click OK.**
The data will be converted. X values will be converted into 1024 values.
- 8 Check the minimum and maximum Y-axis values.**
- 9 Click Return.**
The Arbitrary Waveform window returns. The converted data appears.
- 10 Click Save.**
- 11 Click Close.**

Displaying the Waveform View

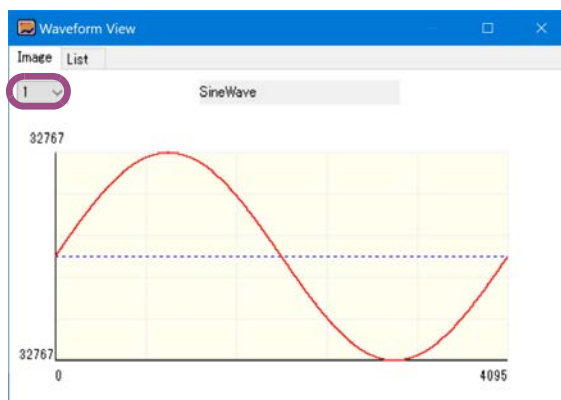
Wavy uses the list of waveform banks to manage arbitrary waveforms that have been written to the PCR-WE from Wavy and arbitrary waveforms that have been read from the PCR-WE into Wavy.

To display the Waveform View window, on the View menu, click Waveform View.

In the Waveform View window, you can display waveform images or the list of waveform banks.

Waveform image

Specify the wave number of an arbitrary waveform from the list of waveform banks and the phase (for single-phase, three-wire and for three-phase) to display an image of the waveform.



List of waveform banks

A list containing the information of the arbitrary waveforms in the list of waveform banks is displayed.

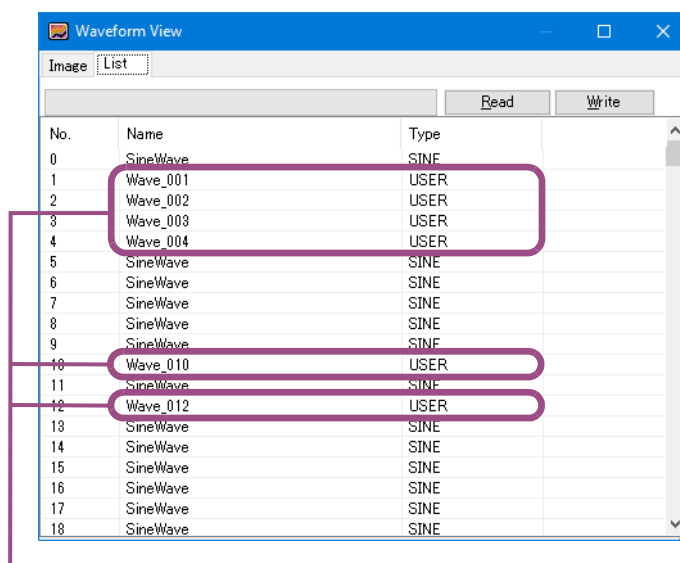
From this list, you can read or write all waveforms (waveforms 1 to 256 excluding 0) to completely synchronize the waveform banks between the PCR-WE and Wavy.

To read waveform data from the PCR-WE, click Read.

To write waveform data to the PCR-WE, click Write.

The list of waveform banks is updated when you execute any of the following operations.

- When waveform data is transferred to the waveform bank from the Arbitrary Waveform window (see “Creating and Transferring Arbitrary Waveforms” (p.63))
- If the Write Wave is selected when writing a sequence to the PCR-WE from the Transfer window (see “Writing a sequence” (p.43))
- If the Read Wave is selected when reading a sequence from the PCR-WE from the Transfer window (see “Reading a sequence” (p.44))



Arbitrary waveform file name of the registered waveform data
All others are default file names.

NOTE

- By default, when Wavy starts, all waveform names are “SineWave.”
- Wavy manages waveform data registered in the list of waveform banks using .arb files. Therefore, when waveform data is read from the PCR-WE, the data is automatically saved in a .arb data file.
File names are automatically assigned on the basis of waveform bank numbers (001 to 256.) For example, the file name “Wave_001.arb” indicates that the waveform bank number is 01. The files are saved to the Arbitrary Waveform Folder that is specified in the Environment settings (p.58) window. If a file with the same name exists, it is overwritten.
- Output waveform data is stored in the PCR-WE internal memory. The memory area for storing the data of one output waveform is referred to as a waveform bank. The banks are assigned number from 0 to 256. Waveform bank 0 contains a sine wave data that is used in the PCR-WE reference voltage waveform. This waveform bank cannot be overwritten. In the factory default settings, all waveform banks have the same waveform (sine wave) as the one that is stored in waveform bank 0.

Direct Control

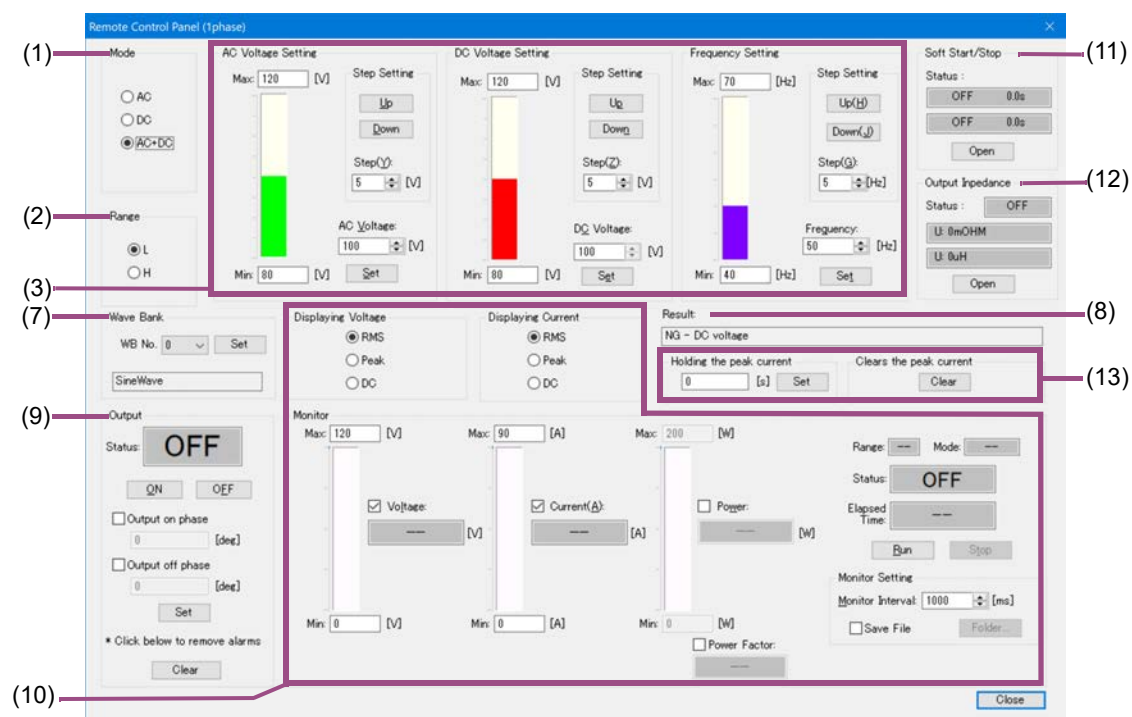
You can use Wavy to remotely control a PCR-WE.

On the Tool menu, click Direct Control to display the Remote Control Panel window.

A window appears corresponding to the selected “(1) Wiring Method” (p.18) of the sequence creation mode.

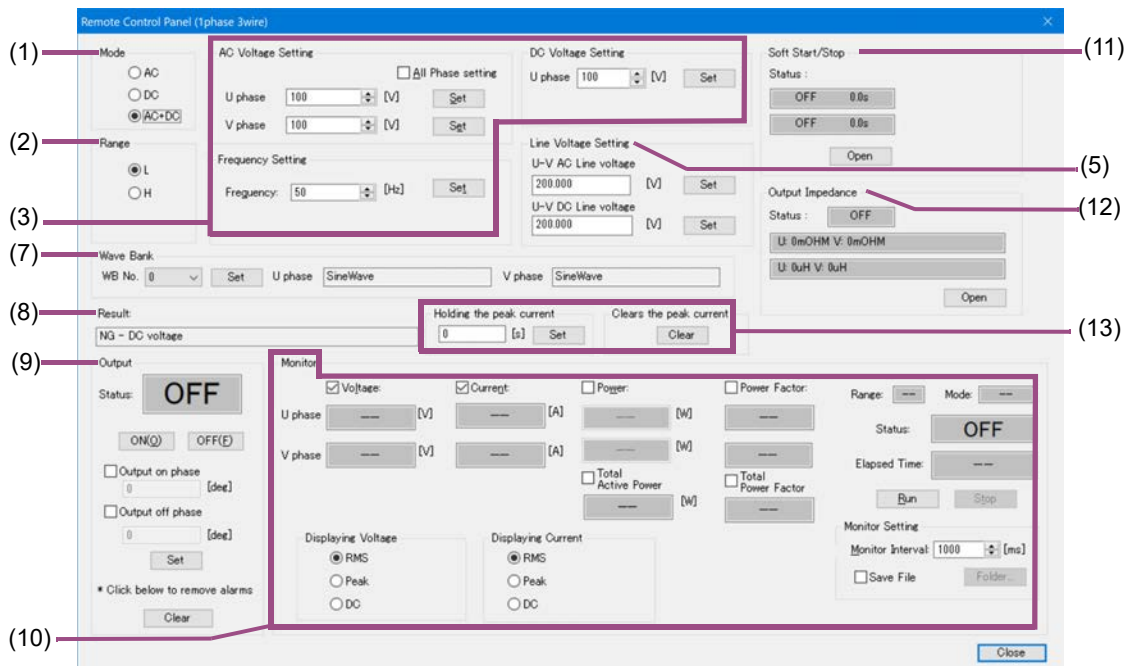
- Wiring method: Single-phase (p.73)
- Wiring method: Single-phase, three-wire (p.74)
- Wiring method: Three-phase (p.75)
- Control parameters (p.76)

Wiring method: Single-phase



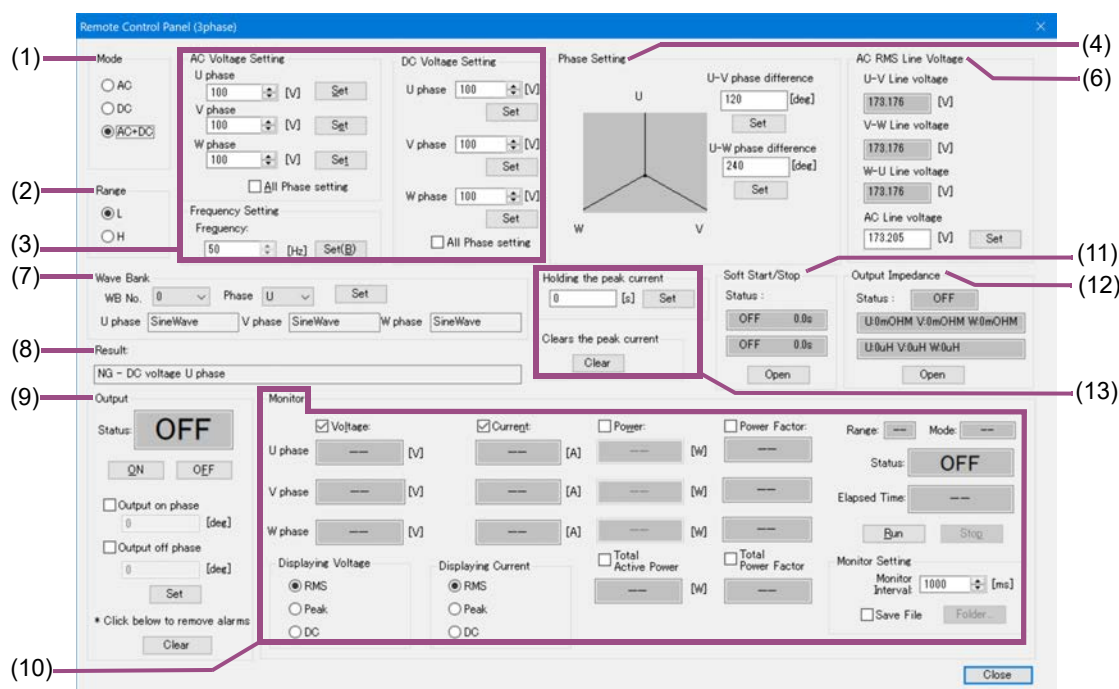
- (1) Mode (p.76)
- (2) Range (p.76)
- (3) AC Voltage Setting/DC Voltage Setting/Frequency Setting (p.76)
- (7) Wave Bank (p.77)
- (8) Result (p.77)
- (9) Output (p.78)
- (10) Monitor (p.78)
- (11) Soft Start/Stop (p.79)
- (12) Output Impedance (p.80)
- (13) Holding the peak current/Clears the peak current (p.80)

Wiring method: Single-phase, three-wire



- (1) Mode ([p.76](#))
- (2) Range ([p.76](#))
- (3) AC Voltage Setting/DC Voltage Setting/Frequency Setting ([p.76](#))
- (4) Phase Setting ([p.76](#))
- (5) Line Voltage Setting ([p.77](#))
- (7) Wave Bank ([p.77](#))
- (8) Result ([p.77](#))
- (9) Output ([p.78](#))
- (10) Monitor ([p.78](#))
- (11) Soft Start/Stop ([p.79](#))
- (12) Output Impedance ([p.80](#))
- (13) Holding the peak current/Clears the peak current ([p.80](#))

Wiring method: Three-phase



- (1) Mode ([p.76](#))
- (2) Range ([p.76](#))
- (3) AC Voltage Setting/DC Voltage Setting/Frequency Setting ([p.76](#))
- (4) Phase Setting ([p.76](#))
- (6) AC RMS Line Voltage ([p.77](#))
- (7) Wave Bank ([p.77](#))
- (8) Result ([p.77](#))
- (9) Output ([p.78](#))
- (10) Monitor ([p.78](#))
- (11) Soft Start/Stop ([p.79](#))
- (12) Output Impedance ([p.80](#))
- (13) Holding the peak current/Clears the peak current ([p.80](#))

Control parameters

■ (1) Mode

Select the output voltage mode.

The PCR-WE does not have the concept of output voltage mode and can output AC voltage and DC voltage (AC+DC) at all times. However, on Wavy, you can specify the following items to use three output voltage modes: AC, DC, and AC+DC.

| Output voltage mode | Items set automatically*1 |
|---------------------|--|
| AC | DC Voltage Setting: All phases 0 V |
| DC | AC Voltage Setting: All phases 0 V, Frequency Setting: 50 Hz, Output on phase and Output off phase: FREE, U-V phase difference: 120 deg, and U-W phase difference: 240 deg |
| AC+DC | None |

*1 The settings are hidden and cannot be changed.

NOTE

If you execute direct control in AC or DC mode, the above values in the PCR-WE will be overwritten.

■ (2) Range

Select the output voltage range (L or H.)

■ (3) AC Voltage Setting/DC Voltage Setting/Frequency Setting

| Item | Description |
|--------------------------|---|
| AC voltage DC voltage | Enter the phase voltages in the boxes. If the wiring method is single-phase, you can also change the phase voltages using the arrow buttons. Clicking a blinking Set sends the value to the PCR-WE. The line voltages displayed in (5) Line Voltage or (6) AC RMS Line Voltage also change according to the specified phase voltages. |
| Frequency | Enter the frequency in the box. If the wiring method is single-phase, you can change the frequency using the arrow buttons. Clicking a blinking Set sends the value to the PCR-WE. |
| Max Min | This appears when the wiring method is single-phase. The ratios of the specified values relative to the minimum and maximum values are displayed with bar graphs. Click the Up and Down to change the values at the specified resolution. |
| All Phase setting | This appears when the wiring method is single-phase three-wire or single-phase. When this check box is selected, phases other than the U phase become unavailable. The voltage set for the U phase is applied to all phases. |

■ (4) Phase Setting

This appears when the wiring method is three-phase.

Set the phase difference of the V phase and W phase (0 deg to 360 deg, 0 = 360) relative to the U phase.

Clicking a blinking Set sends the value to the PCR-WE.

■ (5) Line Voltage Setting

This appears when the wiring method is single-phase three-wire.

| Item | Description |
|---------------------|--|
| U-V AC Line voltage | Enter the line voltages in the boxes. |
| U-V DC Line voltage | If the wiring method is single-phase three-wire, the line voltages are twice the phase voltages. Clicking a blinking Set sends the value to the PCR-WE. The phase voltages displayed in (3) AC Voltage Setting or (6) DC Voltage Setting also change according to the specified line voltages. |

■ (6) AC RMS Line Voltage

This appears when the wiring method is three-phase.

| Item | Description |
|------------------|--|
| U-V Line voltage | Based on the phase voltage, phase difference, and arbitrary waveform data, the converted RMS voltage between phases are displayed. |
| V-W Line voltage | |
| W-U Line voltage | |
| AC Line voltage | Enter the line voltage in the box. If the wiring method is three-phase, the line voltage is $\sqrt{3}$ times the phase voltage. Clicking a blinking Set sends the value to the PCR-WE. The phase voltages displayed in (3) AC Voltage Setting or (6) DC Voltage Setting also change according to the specified line voltages. |

■ (7) Wave Bank

In AC or AC+DC mode, you can set the waveforms registered in the waveform bank.

Before selecting Wave No., be sure to click Read or Write in the Wavy's List of waveform banks (p.72) to synchronize the waveform banks between the PCR-WE and Wavy.

Before selecting Wave No., be sure to click Read or Write in the Wavy's List of waveform banks (p.72) to synchronize the waveform banks between the PCR-WE and Wavy.

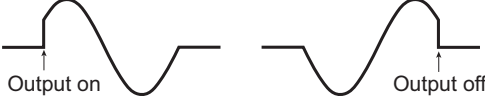
Select the WB No. (0 to 256) and phase (phase to assign the waveform to, only when the wiring method is three-phase), and check the displayed waveform name. Click the blinking Set button to send the settings to the PCR-WE and output the waveform.

■ (8) Result

The response to the sent value returned by the PCR-WE is displayed.

If an SCPI error code is displayed, see the PCR-WE Series Communication Interface Manual.

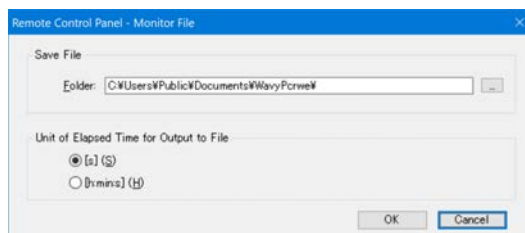
■ (9) Output

| Item | Description |
|-------------------------------------|---|
| ON OFF | Click this to turn the output on or off. |
| Status | Displays the current PCR-WE status. |
| Output on phase Output off phase | <p>In AC or AC+DC mode, you can set the on and off phases for AC output.</p> <p>If the wiring method is single-phase, three-wire or three-phase, specify the U phase.</p>  <p>Select the Output on phase and/or Output off phase, enter the phase angles (0 deg to 360 deg, 0 = 360.)</p> <p>Clicking a blinking Set sends the value to the PCR-WE.</p> |
| * Click below to remove alarms | You can clear the alarms that have been activated by the PCR-WE protection function. |

■ (10) Monitor

| Item | Description |
|---|--|
| Voltage Current Power Power Factor Total Active Power Total Power Factor | <p>When you select the items you want to monitor using Displaying Items, the monitored values will be displayed.</p> <p>In AC or AC+DC mode, you can select the power factor.</p> <p>If the wiring method is single-phase three-wire or three-phase, you can select Total Active Power and Total Power Factor.</p> |
| Max Min | <p>This appears when the wiring method is single-phase.</p> <p>Set the voltage, current and power ranges you want to monitor. The ratios of the monitored values relative to the minimum and maximum values are displayed with bar graphs.</p> |
| Monitoring Voltage | <p>This appears when the wiring method is single-phase three-wire or single-phase.</p> <p>Set the displayed values on the voltage monitor to phase voltage or line voltage.</p> |
| Displaying Voltage | Set the displayed values on the voltage monitor to rms value, peak value, or DC (DC mode only). |
| Displaying Current | <p>Set the displayed values on the current monitor to rms value, peak value, or DC (DC mode only).</p> <p>Wavy measures the maximum instantaneous current and displays the measured peak current with an absolute value. In DC mode, even if you are generating negative voltage, the peak measured current is displayed as a positive value.</p> |
| Range | Displays the set output voltage range. |
| Mode | Displays the set output voltage mode. |
| Status | <p>Displays the current status.</p> <p>OFF Monitoring paused.</p> <p>Monitoring Monitoring running.</p> <p>ERROR A communication error occurred. Check Configuring the Interface (p.7).</p> <p>OVP A protection function was activated (alarm).</p> <p>(OVP example) OVP: overvoltage protection, UVP: undervoltage protection, OHP: overheat protection, OL: Over load protection</p> |
| Elapsed Time | Displays the elapsed monitoring time. |
| Run Stop | Starts or stops the monitor. |
| Monitor Interval | Set the interval (Single-phase: 200 ms to 600000 ms, Single-phase, three-wire and Three-phase: 500 ms to 600000 ms) for updating the monitor. |

| Item | Description |
|-----------|---|
| Save File | Select the check box to save monitored values to a file while monitoring is in progress. Click Folder to select the save destination, and the unit of elapsed time output to the file. |



The accuracy of the elapsed time varies depending on the PC environment that you are using.

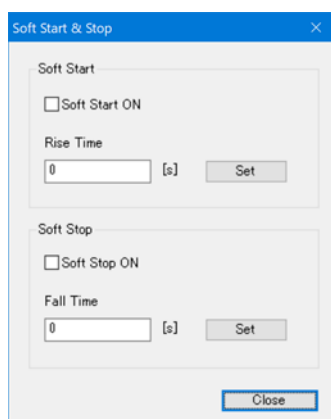
The file name consists of the operation mode, the execution start date and time, and the extension. You can change the extension (.txt by default) using "Environment settings" (p.58).

■ (11) Soft Start/Stop

Set the soft start function, which gradually increases the output voltage when the output is turned on, and the soft stop function, which gradually decreases the output voltage when the output is turned off.

Next to Status, the present settings are displayed in order from the top as follows: soft start and soft stop.

Clicking Open opens a Soft Start & Stop window.



| Item | Description |
|---------------|---|
| Soft Start ON | Selecting this check box enables the soft start function. |
| Rise Time | Set the rise time (0.1 s to 30.0 s). |
| Soft Stop ON | Selecting this check box enables the soft stop function. |
| Fall Time | Set the fall time (0.1 s to 3.0 s). |
| Set | Clicking a blinking Set sends the value to the PCR-WE. |

■(12) Output Impedance

Set the PCR-WE output impedance.

Next to Status, the present settings are displayed in order from the top as follows: output impedance on/off, resistance component, and reactance component.

Clicking Open opens an Output Impedance window.

Output Impedance

Output Impedance ON/OFF

☐ Output Impedance ON Set

Output Impedance

Phase ALL

Resistance 0 [mOHM] Set

Reactance 0 [uH] Set

Close

| Item | Description |
|---------------------|--|
| Output Impedance ON | Selecting this check box enables the output impedance setting. |
| Phase | Select the phase for setting the output impedance. To set all phases collectively, select ALL. |
| Resistance | Set the output impedances (resistance component). |
| Reactance | Set the output impedances (reactance component). |
| Set | Clicking a blinking Set sends the value to the PCR-WE. |

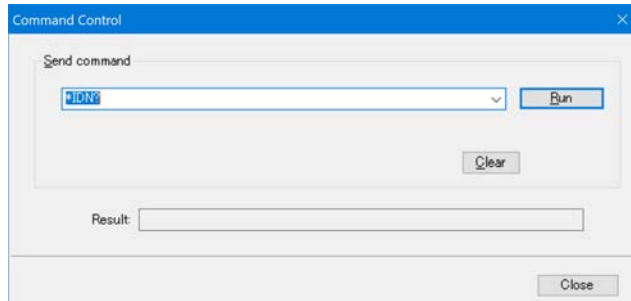
■(13) Holding the peak current/Clears the peak current

| Item | Description |
|--------------------------|--|
| Holding the peak current | If Displaying Current is set to Peak, the peak current measurement can be held. Enter the hold time in the box. You can enter a value between 0 s and 10 s or infinity (enter a value greater than 10). Clicking a blinking Set sends the value to the PCR-WE. |
| Clears the peak current | To clear the peak current, click Clear. |

Control Using Commands

You can send commands from Wavy to control a PCR-WE.

On the Tool menu, click Command Control to display the Command Control window.



Enter a command, and then click Run.

The result will be displayed.

The command transmission log (only the commands that were successfully transmitted and received) is recorded in the list box. You can clear it by clicking Clear.

For details on commands, see the PCR-WE Communication Interface Manual.

Reference

This section describes the main specifications of Wavy and the menus.

- SD032-PCR-WE specifications ([p.82](#))
- Menu reference ([p.83](#))

SD032-PCR-WE specifications

| Item | | Specifications | | | |
|--|--------------------------|--|-----------------------|-----------------------|-------------------|
| Output voltage mode | | AC voltage, DC voltage, AC+DC voltage | | | |
| Number of significant decimal places ^{*1} | | 3 digits | | | |
| Monitor function | | Output current, output voltage, output power | | | |
| Interval ^{*2} | Single-phase | 200 ms to 600000 ms | | | |
| | Single-phase, three-wire | 500 ms to 600000 ms | | | |
| | Three-phase | | | | |
| Number of steps | | 600 | | | |
| Ranges of sequence times (intervals) ^{*2} | Value | 0.1 ms to 10000.0 ms | 0.001 s to 1000.000 s | 0.1 min to 1000.0 min | 0.1 h to 1000.0 h |
| | Resolution | 0.1 ms | 1 ms | 0.1 min | 0.1 h |

*1 The actual number of significant decimal places varies depending on the PCR-WE that the PC is connected to.

*2 The accuracy depends on the PC environment that you are using.

Menu reference

| Menu | | Description |
|-----------------------------|----------------------------|---|
| File | | |
| New ^{*1} | | Creates a new file. |
| Open ^{*1} | | Opens an existing file. |
| Save ^{*1} | | Overwrites the file that you are working on. |
| Save As | | Saves the file with a new name. |
| Close | | Closes the file. |
| Exit | | Exits Wavy for PCR-WE. |
| View | | |
| Toolbar | | Shows/hides the toolbar. |
| Status Bar | | Shows/hides the status bar. |
| Save Position | | Saves the present position and size of the window. |
| Previous File | | Loads the last file that was used when the software starts. |
| Waveform View | | Displays a preview of the arbitrary waveform. |
| Sequence Preview | | Displays a preview of the sequence. |
| Graph | | |
| Transition | Ramp | Changes the transition of the selected line to "ramp". |
| | Step | Changes the transition of the selected line to "step". |
| Delete | | Deletes the selected line. |
| Display item | | Selects the item (voltage, frequency, starting phase angle, or phase difference) to show on the Y-axis. |
| Vertical Axis ^{*1} | | Shows/hides the vertical axis. |
| X-axis Scale Lines | | Shows/hides the X-axis grid |
| Y-axis Scale Lines | | Shows/hides the Y-axis grid |
| Scale ^{*1} | | Changes the scale of X-axis and Y-axis. |
| Color... | Background | Changes the background color of the graph. |
| | Line | Changes the step line color. |
| | Line to Draw | Changes the line color being drawn. |
| | Vertical Axis | Changes the vertical axis color. |
| | X/Y-axis | Changes the color of X-axis and Y-axis. |
| | XY-axis scale lines | Changes the color of X-axis and Y-axis grid lines. |
| Resolution of time period | Default | Changes the setting resolution by dragging. |
| | 1st digit of integer | The default value is three decimal places. |
| | 1st digit of decimal place | |
| | 2nd digit of decimal place | |
| Resolution of setting value | Default | Changes the setting resolution by dragging. |
| | 1st digit of integer | The default value is three decimal places. |
| | 1st digit of decimal place | |
| | 2nd digit of decimal place | |
| | 3rd digit of decimal place | |
| Draw sequence by step | | Draws graphs using steps regardless of the Transition setting. |
| Copy | | Copies the graph to the clipboard. |
| Update Auto Scale | | Applies the auto scaling to the graph. |

| Menu | Description |
|--------------------------------------|---|
| Worksheet | |
| Select All | Selects all cells. |
| Undo ^{*1} | Cancels the previous operation. |
| Delete ^{*1} | Deletes the step data. |
| Copy ^{*1} | Copies the step data. |
| Paste ^{*1} | Inserts the copied step data. |
| Sequence | |
| Transfer ^{*1} | Sends a sequence to the PCR-WE. |
| Run ^{*1} | Executes the sequence. |
| Sequence Creation Mode ^{*1} | Sets Wiring Method, Time unit, Output voltage mode, Output voltage range, Frequency, and An option setup of a step. |
| Monitoring Setup ^{*1} | Configures the monitor settings to be used while the sequence being executed. |
| Protection Setup | Sets Protection and Current Limit. |
| Arbitrary Waveform | Create and edit arbitrary waveforms. |
| Interface | Configures the interface to connect to the device. |
| Environment Setup | Sets the file format. |
| Tool | |
| Direct Control | Controls the device directly without using a sequence. |
| Command Control | Controls the connected device by using commands. |
| Digital I/O | Sets the PCR-WE's DIGITAL I/O connector channels. |
| Window | |
| Cascade | Cascades the windows. |
| Tile Horizontally | Tiles the windows in the horizontal direction. |
| Tile Vertically | Tiles the windows in the vertical direction. |
| Arrange Icons | Arranges icons along the window frame. |
| Help | |
| Help Topics | Opens the help file. |
| About Wavy ^{*1} | Displays the application software information including the version and the copyright. |

^{*1} A button with the same function is available on the toolbar.

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If you find any misplaced or missing pages in the manuals, they will be replaced. If the manual gets lost or soiled, a new copy can be provided for a fee. In either case, please contact your Kikusui agent or distributor. At that time, inform your agent or distributor of the "Part No." written on the front cover of this manual.

Every effort has been made to ensure the accuracy of this manual. However, if you have any questions or find any errors or omissions, please contact your Kikusui agent or distributor.

After you have finished reading this manual, store it so that you can use it for reference at any time.

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The newest version of the operation manual can be downloaded from Download service of Kikusui website.

