User's Manual

PowerViewerPlus Software for the PX8000

YOKOGAWA
Yokogawa Meters & Instruments Corporation

IM 760881-01EN
1st Edition

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This user's manual explains the handling precautions, features, and operating procedures of PowerViewerPlus. To ensure correct use, please read this manual thoroughly before beginning operation.
After reading this manual, keep it in a safe place.
For the handling precautions, features, and operating procedures of the PX8000, see the PX8000 User's Manual.
For information on how to use Windows, see the relevant manuals.

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functionality. The figures given in this manual may differ from those that actually appear on your screen.
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Revisions

- September 2014 1st Edition

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Notes about Using This Software

Storing the CD-R

Keep the original CD for this software in a safe place. To use this software, install it on a PC hard disk, and run it from the PC.

Notes on Using the Software

- To allow a PX8000 to communicate with a PC through the PX8000's USB interface, a USB driver must be installed in the PC. When you install the software in the PC, the USB driver is also installed automatically.
- When you connect a PX to a PC and use the software to control the PX, you cannot use multiple types of communication interface at the same time.
- Do not perform the following operations while using the software. Doing so may cause errors.
  - Using another software application to operate the PX
  - Operating the PX directly
- The software may not be able to continue if the PC enters standby or hibernation mode. Disable standby and hibernation modes when you use the software.
- If a connection error occurs, turn off the PX and then turn it back on.

How to Use This Manual

Structure of the Manual

This manual contains 11 chapters and an index.

Chapter	Title	Description
1	**Product Overview**	Describes the features of the product and the system requirements for using the product.
2	**Configuring PX's Communication Control Settings**	Describes how to connect the PX to a PC.
3	**Installation and Starting and Exiting the Software**	Describes how to install and start the software.
4	**PX-PC Communication**	Describes how to configure the settings for PX-PC communication.
5	**PX Configuration**	Describes how to configure the PX measurement conditions and other settings.
6	**Executing Measurements**	Describes how to start and stop measurement.
7	**Analyzing Measured Data**	Describes how to analyze measured data.
8	**Saving and Loading Setup Parameters**	Describes how to save and load setup parameters.
9	**Other Features**	Describes the help feature and how to view the software version information.
10	**Troubleshooting**	Describes error messages.
11	**Specifications**	Provides the software specifications.
	Index	

Software Version That This Manual Covers

This manual describes PowerViewerPlus software version 1.01.
For instructions on how to view the software version, see section 9.2.

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Contents

1.1 Product Overview

You can use the software to connect the PX8000 (hereafter referred to as the PX) to a PC and use the following features.

- Retrieve, display, and save data that the PX has measured and setup parameters.
- Remotely control the PX.

You can connect a single PX to a PC and use the software to control the PX.

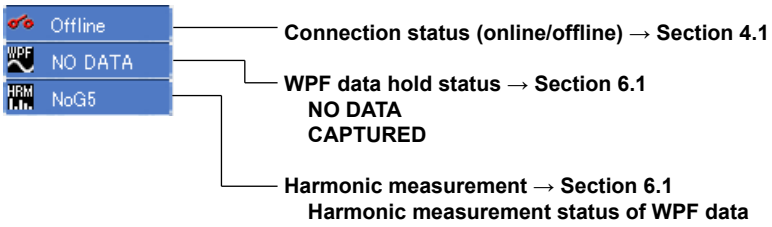
Compatible Measuring Instruments

You can use the software with the following YOKOGAWA measuring instruments.

Product Name	Model
PX8000	PX8000

Information Area

The following information is displayed in the upper left of the screen.



Menus

The software has the following menus.


Connection: Used to configure the communication between the PX and PC.


Setting: Used to set PX's measurement conditions.


Measure: Used to execute measurements.


Analysis: Used to display measured results using numbers, bar graphs, vectors, waveforms, FFT, etc.


Save: Used to save and load setup parameters.


Exit: Used to close the software.

You can use the following menus of the software to process data.
The details of each feature are provided below.

Connection

You can connect a PX to the PC in which the software is installed through a communication interface. You can select any of the three available interfaces and search for devices to view the PXs that you can connect to.

Setting

You can configure the PX settings, such as the voltage range, current range, and wiring system.

Measure

Use this menu to start and stop PX measurements.

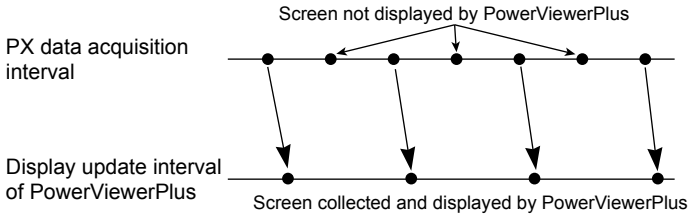
PX Data Update Interval and the Software's Display Update Interval

When you click the Start/Stop button on the software, the PX starts acquiring measured data. The software collects image data from the PX and displays the PX screen in the software window.

- The PX data acquisition interval varies depending on measurement conditions including trigger conditions, record length, and math.
- The software's display update interval is set using the Measure screen (section 6.1).

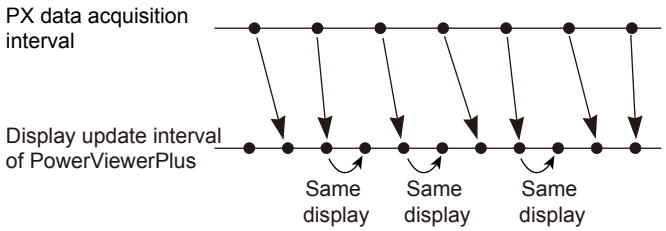
Case 1: PX data acquisition interval < the software's display update interval

When the PX data acquisition interval is shorter than the software's display update interval, there will be measurement screens that will not be displayed on the software.



Case 2: PX data acquisition interval > the software's display update interval

When the PX data acquisition interval is longer than the software's display update interval, the software collects data after the data on the PX is updated, so the data displayed on the software will appear to be in sync with the PX data acquisition interval.



In either case, all the measured waveform data is retained in the PX. When you click the Start/Stop button on the software to stop data acquisition on the PX, the waveform data is collected from the PX into the software. Therefore, even in case 1, no data is left out from the collected waveform data, and you can use the waveform data to calculate numeric data, waveform data, and math data on the software.

Saving Measured Data

Measured waveform data is saved in WPF format (.wpf extension) in the PC. You can also save the waveform data and numeric data based on the waveform data in CSV format (.csv extension) using the Analysis menu, which is described later.

To save PX setup parameters and the software setup parameters, use the Save menu, which is described later.

Analysis

Use this menu to display data that the PX has measured in the following manner.

Types of Display Screens

The following types of display screens are available.

Numeric

Displays PX's measurement data numerically. For models with the harmonic measurement option (/G5), harmonic measurement data is also displayed.

Bar graph

Displays measured harmonic components for each harmonic order.
Bar graphs can be displayed when the PX is equipped with the harmonic measurement option (/G5).

Vector

Displays using vectors the relationship of the phase difference and magnitude (rms value) between the fundamental waves U(1) and I(1) of each element assigned to the selected wiring unit.
Vectors can be displayed when the PX is equipped with the harmonic measurement option (/G5).

Waveform

Displays the waveform data that has been collected from the PX.

FFT

Displays the results of taking the FFT of the waveform data that has been collected from the PX.

Save

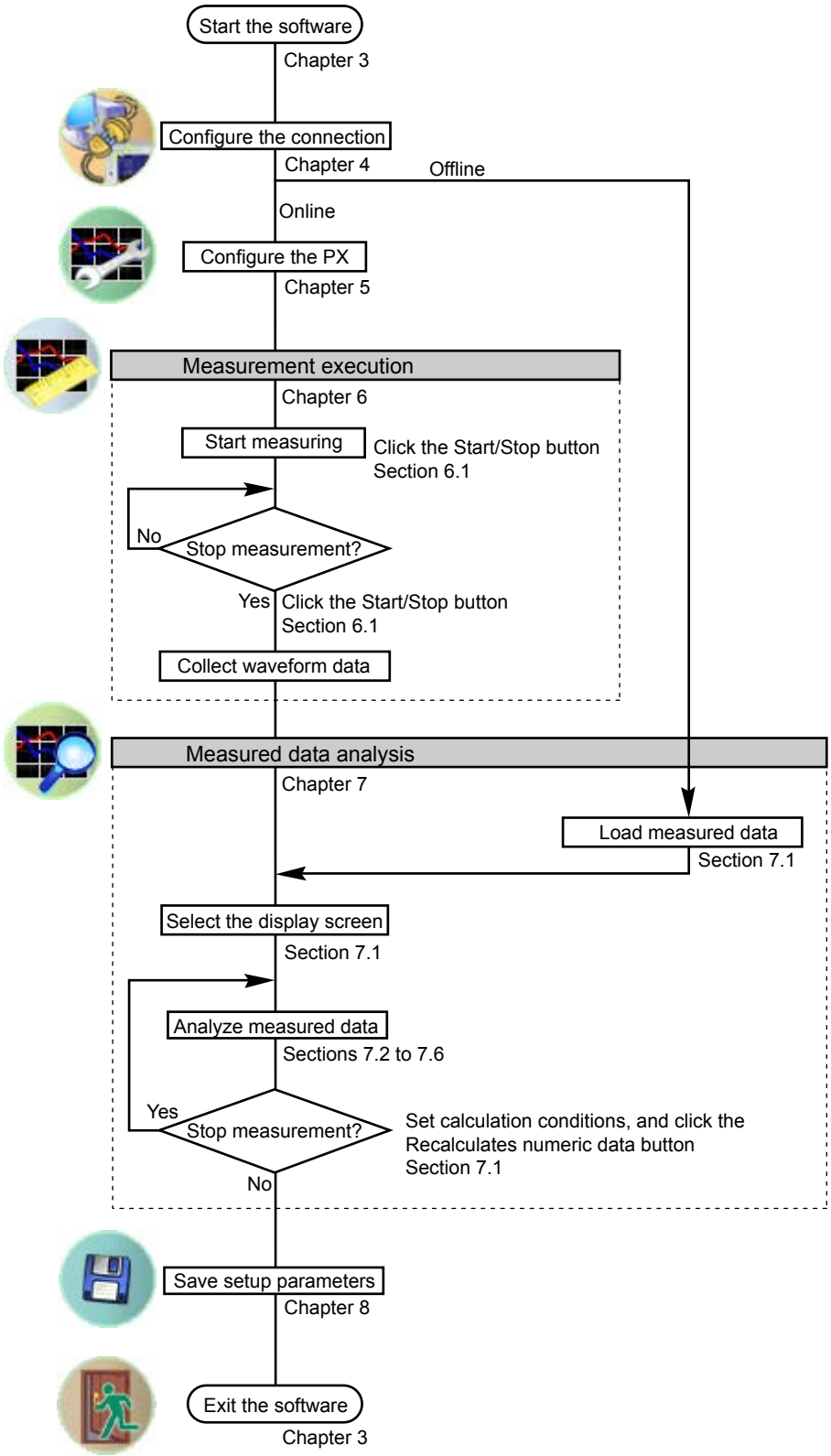
Use this menu to save and load PX setup parameters and the software setup parameters.

Exit

Use this menu to close the software.

1.2 Workflow

The following figure shows the software workflow.



1.3 System Requirements

PC

- **CPU**
  Dual core or more 64-bit processor
- **Memory**
  2 GB or more recommended
- **HDD**
  10GB free space or more

Operating System

English version of Windows Vista,* Windows 7,* Windows 8,* or Windows 8.1*
* Only 64-bit versions are supported.

Communication Board

- **GP-IB**
  NI (National Instruments)
  - PCI-GPIB or PCI-GPIB+[1]
  - PCIe-GPIB or PCIe-GPIB+[1]
    1 On Windows Vista or Windows 7: Use driver NI-488.2 Ver.2.7.2 or later.
    On Windows 8 or Windows 8.1: Use driver NI-488.2 Ver.3.1.0 or later.
  - GPIB-USB-HS[2]
    2 On Windows Vista or Windows 7: Use driver NI-488.2 Ver. 2.8.1 or later.
    On Windows 8 or Windows 8.1: Use driver NI-488.2 Ver.3.1.0 or later.
- **Ethernet**
  An Ethernet port that supports 10BASE-T, 100BASE-TX, or 1000BASE-T
- **USB**
  A USB port that supports USB Revision 1.1 or higher

Display, Disk Drive, Printer, and Mouse

- **Display Resolution**
  1366×768 dots or higher
- **Disk Drive**
  A drive that can read CD-Rs
- **Operating System**
  Operating system mentioned above

PX

Product Name	Model
PX8000	PX8000

Number of PX8000s that can be connected to a PC: 1

System Configuration Example and Performance Reference

For reference, the performance when the following PC and measurement data are used is provided on the next page.

PC

PC 1

Manufacturer: Dell
Model: T1700
CPU: Intel Xeon E3-1240V2 (3.4 GHz/4 core HT 4th generation)
Memory: DDR3 PC3-10600 4 GB
HDD: 250 GB

PC 2 (Customize PC 1)

Manufacturer: Dell
Model: T1700
CPU: Intel Xeon E3-1240V2 (3.4 GHz/4 core HT 4th generation)
Memory: DDR3 PC3-10600 16 GB
SSD: 240 GB

PC 3

Manufacturer: ASUS
Model: U24E PX2430
CPU: Intel i5 2430M (2.4 GHz/2 core HT 2nd generation)
Memory: DDR3 PC3-10600 4 GB
HDD: 750 GB

Measurement Data

Measurement Data 1

Record Length: 1 Mpoint
Time/div: 50 ms/div
Measurement Data: Voltage, current, and active power of elements 1 to 3 (U1, I1, P1, U2, I2, P2, U3, I3, P3)
WPF File Size: 18 MB

Measurement Data 2

Record Length: 100 Mpoint
Time/div: 100 ms/div
Measurement Data: Voltage, current, and active power of elements 1 to 3 (U1, I1, P1, U2, I2, P2, U3, I3, P3)
WPF File Size: 1777 MB

Performance (Reference)

Differences by Communication Interface

Measurement data transfer time [s] between the PC and PX8000 when PC 1 is used

Measurement Data	Communication Interface		
	USB Interface	Ethernet	GP-IB
Measurement Data 1	6	7	27
Measurement Data 2	515	570	2544

The measurement data processing speed and communication speed between the PX and PC increase in the following order.
GP-IB < Ethernet < USB Interface

Differences by Memory and Storage Medium

Measurement data loading and computation time [s] when PC 1 is used

Measurement Data	Memory	Communication Interface		
		SSD	Hybrid Hard Disk Drive	Hard Disk Drive
Measurement Data 1	4 GB	3	4	5
	16 GB	2	3	4
Measurement Data 2	4 GB	55	70	70
	16 GB	40	41	41

Measurement data loading speed and computation speed increase in the following order.

- Memory: 4 GB < 16 GB
- Storage medium: Hard disk drive = Hybrid hard disk drive < SSD

Differences by PC Specifications

Communication, computation, and CSV conversion time [s] when measurement data 1 is used

PC	Communication	Calculation	CSV Conversion		
			Waveform Data	Numeric Data	Direct Conversion*
PC 1	6	5	8	6	13
PC 2	6	2	8	6	13
PC3	6	6	14	8	22

* Converting waveform data (WPF file) directly to CSV format without loading the data in the software.

Communication, computation, and CSV conversion time [s] when measurement data 2 is used

PC	Communication	Calculation	CSV Conversion		
			Waveform Data	Numeric Data	Direct Conversion*
PC 1	515	133	955	91	1135
PC 2	515	60	660	38	726
PC3	515	194	1575	189	1672

Measurement data computation speed and CSV conversion speed increase with higher PC specifications.

Note

The performance data provided above is for reference. It does not guarantee the performance.

2.1 Connecting the PX to Your PC

CAUTION

Be sure to turn off the PC and the PX before you connect or remove communication cables. Otherwise, erroneous operation or internal circuitry damage may result.

When Using the USB Interface

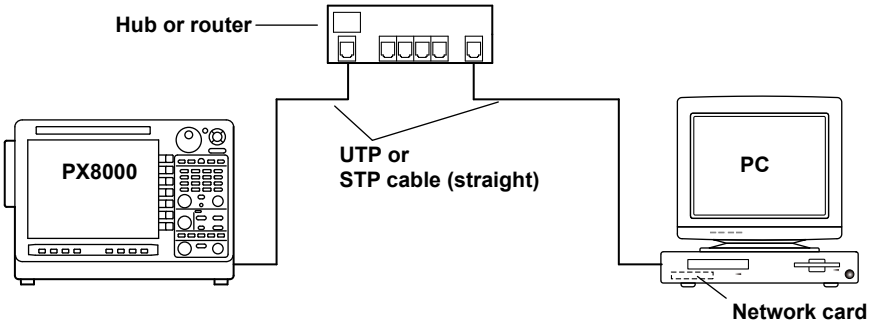
Connect the USB port for PCs (type B connector) on the side panel of the PX to the PC.

When Using the GP-IB Interface

The PX is equipped with an IEEE St'd 488-1978 24-pin GP-IB connector. Use a GP-IB cable that conforms to this standard.
Connect the cable to the GP-IB connector on the side panel of the PX.
Use an appropriate connector to connect the other end of the cable to the PC.

When Using the Ethernet Interface

To connect the PX to the PC, use a straight UTP (Unshielded Twisted-Pair) or STP (Shielded Twisted-Pair) cable through a hub or similar device. Connect the cable to the ETHERNET port on the side panel of the PX. The data rate varies depending on the product. Use a hub, cables, and network card that are appropriate for the data rate.



Note

- When you connect to a 100BASE-TX network, use a category 5 or better UTP (unshielded twisted-pair) or STP (shielded twisted-pair) cable.
- Do not connect the PX to the PC directly. Direct communication is not guaranteed to work.

2.2 Setting USB Control Parameters

Procedure

There are no USB control parameters.
To view the serial number that is used in USB TMC communication, see section 2.4 in the PX8000 Communication Interface User's Manual (IM PX8000-17EN).

Description

Each device that is connected through USB has its own unique ID in the USB system. This ID is used to distinguish between different devices. The PX8000 ID is its instrument number. When you connect the PX to the PC, make sure that the PX ID does not overlap with those of other devices.

Note

- When you connect a PX to a PC and use the software to control the PX, you cannot use multiple types of communication interface at the same time.
- The PX may not operate properly if the PX is connected to the PC through converters (such as a GP-IB to USB converter). For more details, contact your nearest YOKOGAWA dealer.

2.3 Setting GP-IB Control Parameters

Procedure

Follow the procedure in section 3.4 in the PX8000 Communication Interface User's Manual (IM PX8000-17EN) to set the GP-IB control parameters.

Description

Setting the Address

Set the PX address within the following range.
1 to 30

Each device that is connected in a GP-IB system has its own unique address. This address is used to distinguish between different devices. Therefore, you must assign a unique address to the PX when you connect it to a PC or other device.

Note

- When the controller (PC) is using the GP-IB bus, do not change the address of any connected devices.
- When you connect a PX to a PC and use the software to control the PX, you cannot use multiple types of communication interface at the same time.
- On the PC end, use a GP-IB board (or card) made by NI (National Instruments). For details, see section 1.3.
- The PX may not operate properly if the PX is connected to the PC through converters (such as a GP-IB to USB converter). For more details, contact your nearest YOKOGAWA dealer.

2.4 Setting Ethernet Control Parameters

Procedure

Follow the procedure in section 1.4 in the PX8000 Communication Interface User's Manual (IM PX8000-17EN) to set the Ethernet control parameters.

Description

Setting Ethernet Control Parameters

To use the software over a network, set the TCP/IP parameters.

Note

- When the controller (PC) is using the Ethernet interface, do not change the above settings of any connected devices.
- When you connect a PX to a PC and use the software to control the PX, you cannot use multiple types of communication interface at the same time.
- The PX may not operate properly if the PX is connected to the PC through converters (such as a GP-IB to USB converter). For more details, contact your nearest YOKOGAWA dealer.

3.1 Installation and Uninstallation

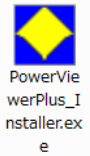
Installation

Prepare the CD that contains the software. Before installing the software, close all programs that are currently running.
If an older version of PowerViewerPlus is installed, uninstall it from Control Panel (see page 3-9).
The following procedure explains how to install the software on Windows 7. The windows that appear will vary depending on the operating system.

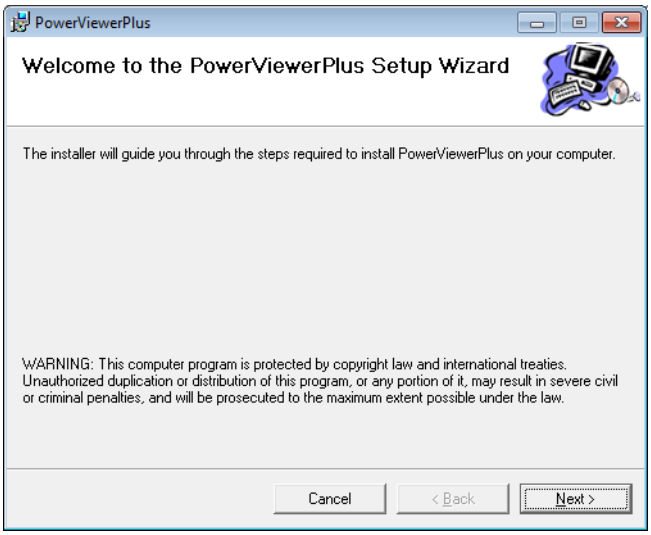
1. Turn on the PC and start Windows. Log on as an administrator.
2. Insert the installation disk that contains this software into the CD drive.
3. On the **PC**, select the CD drive.

Installing PowerViewerPlus

4. Double-click **PowerViewerPlus_Installer.exe**.



5. The “User Account Control” window will appear. Click **Allow** or **Yes** to continue the installation. The installer starts. Follow the instructions on the screen, and then click **Next**.



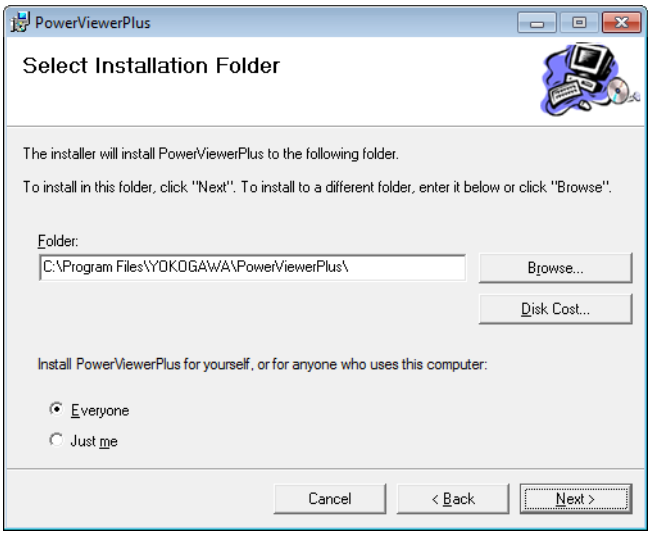
6. If you agree with the license agreement, select **I Agree**, and click **Next**.

   Otherwise, select **I Do Not Agree**. The installation will be canceled.

7. Select the installation destination, and click **Next**.

   Click **Browse** to specify the destination. The default installation destination is as follows:

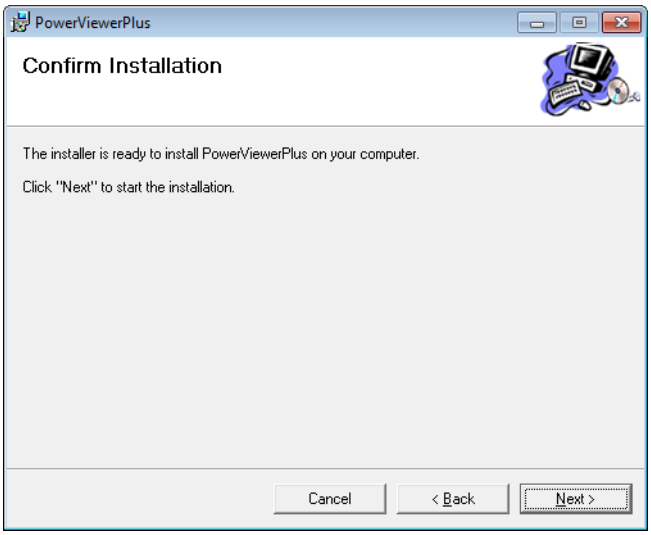
   C:\ProgramFiles\YOKOGAWA\PowerViewerPlus



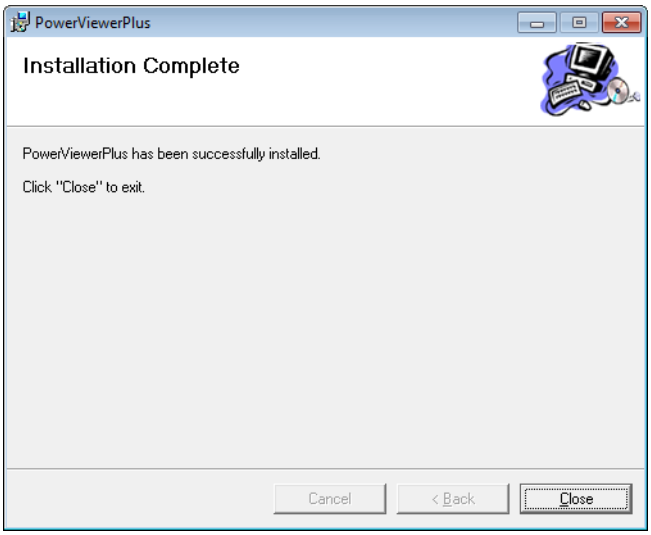
8. A window prompting you to start the installation appears. If the installation settings are okay, click **Next**. The software installation starts.

Click **Back** if you want to change the installation settings.

Click **Cancel** to cancel the installation.



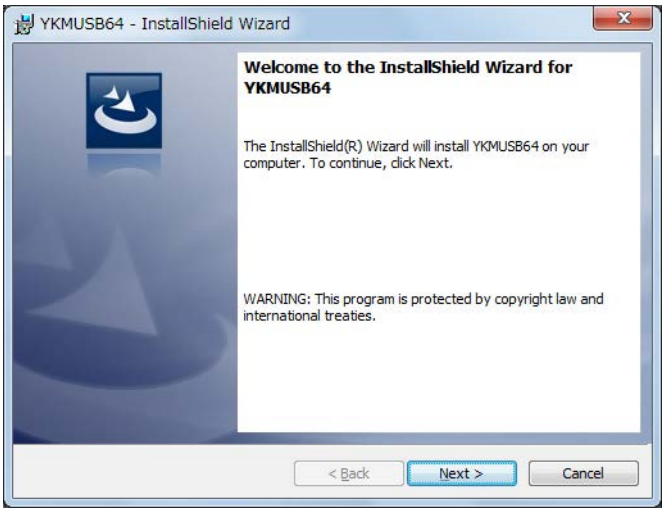
9. When the software installation finishes normally, the following window appears. Click **Finish** to complete the installation. YOKOGAWA > PowerViewerPlus > PowerViewerPlus will be added to All Programs in the Windows Start menu.



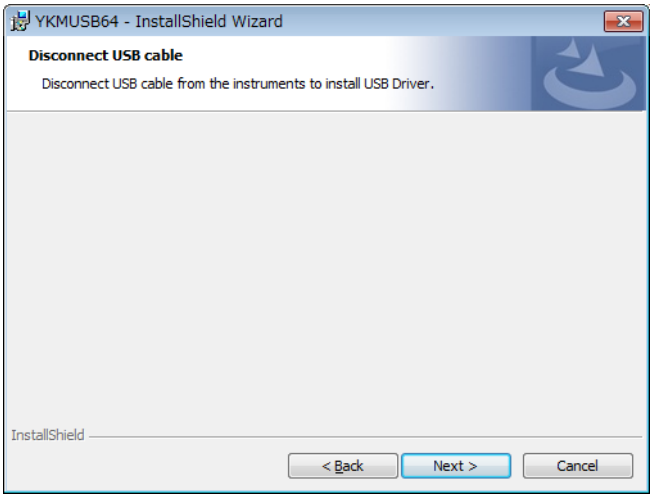
Next, the YKMUSB driver installation wizard starts automatically.

Installing YKMUSB (USB Driver)

1. Follow the instructions on the screen, and then click **Next**.



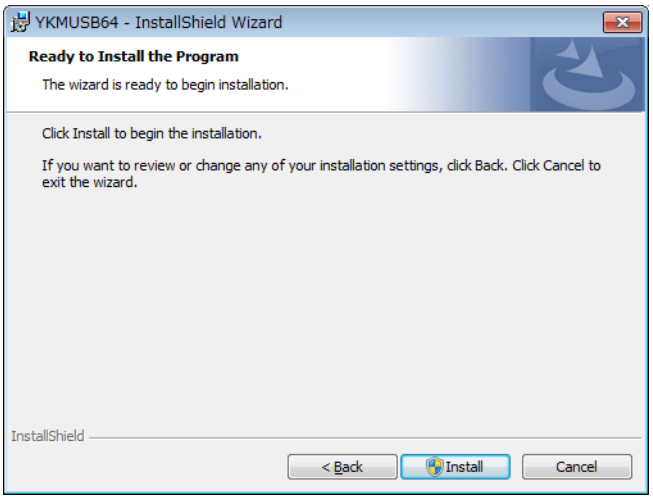
2. If the USB cable is connected to the PC, remove the cable, and click **Next**.



3. A window prompting you to start the installation appears. If the installation settings are okay, click **Install**. The software installation starts.

   Click **Back** if you want to change the installation settings.

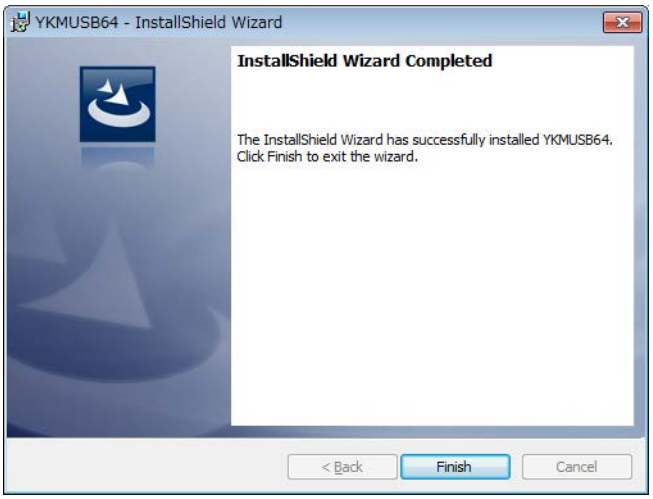
   Click **Cancel** to cancel the installation.



4. The “User Account Control” window will appear during the installation. Click **Allow** or **Yes** to continue the installation. The installation will continue.

5. A “Window Security” window will appear during the installation. Click **Install**. The installation will continue.

6. When the software installation finishes normally, the following window appears. Click **Finish** to complete the installation.

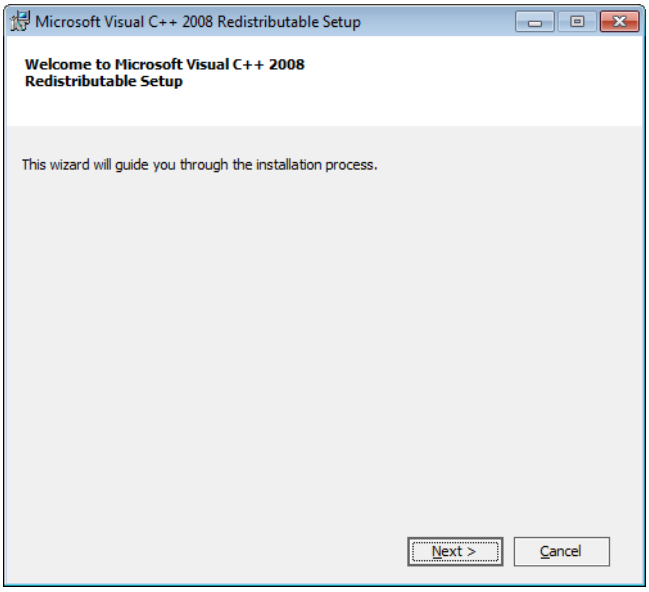


Next, the Microsoft Visual C++ 2008 Redistributable setup wizard starts automatically.

Installing Microsoft Visual C++ 2008 Redistributable Setup

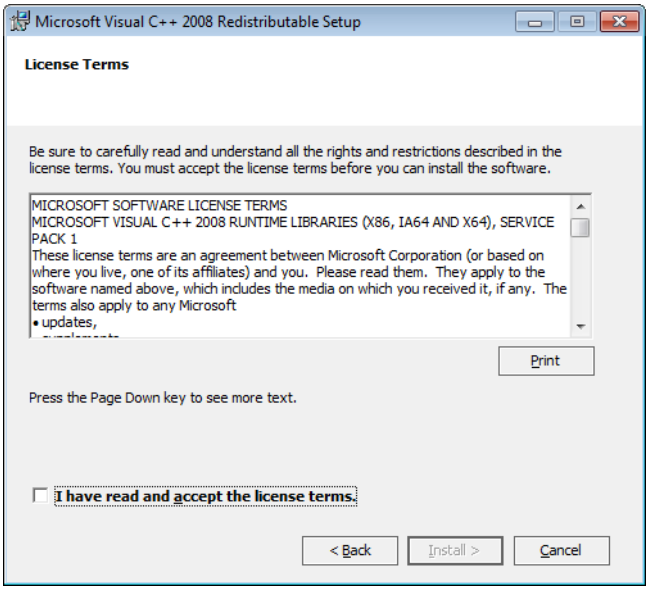
1. The “User Account Control” window will appear during the installation. Click **Allow** or **Yes** to continue the installation. The installation will continue.

2. Follow the instructions on the screen, and then click **Next**.

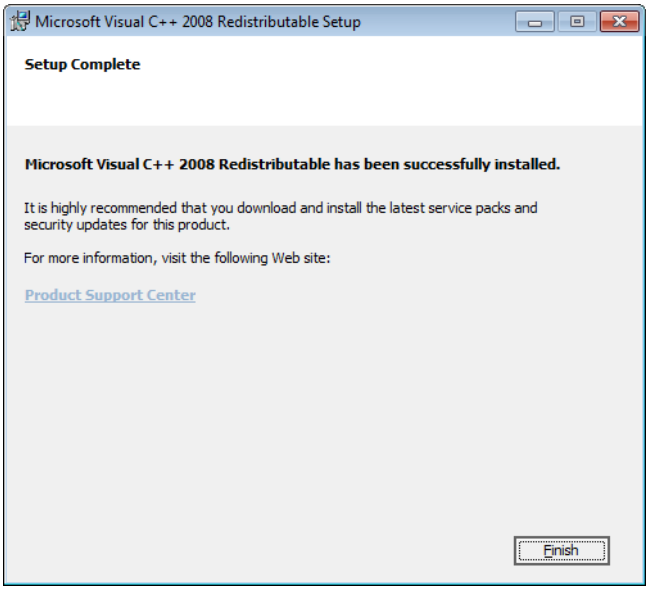


3. If you agree with the license terms, select **I have read and accept the licence terms**, and click **Next**.

   Otherwise, select **Cancel**. The installation will be canceled.



4. When the software installation finishes normally, the following window appears. Click **Finish** to complete the installation.



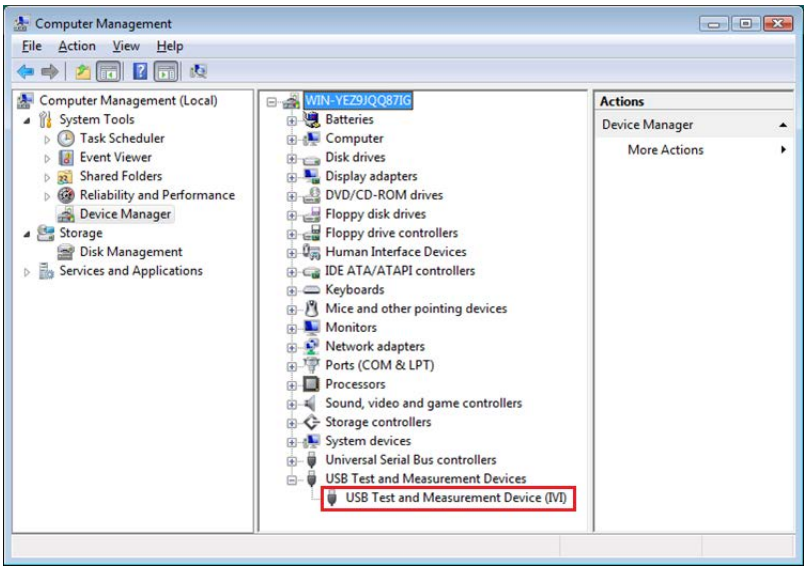
If a National Instrument's (NI's) USB driver is already installed in a Windows Vista system, you must switch the USB driver using the OS device manager according to the procedure on the next page.

Changing the USB Driver

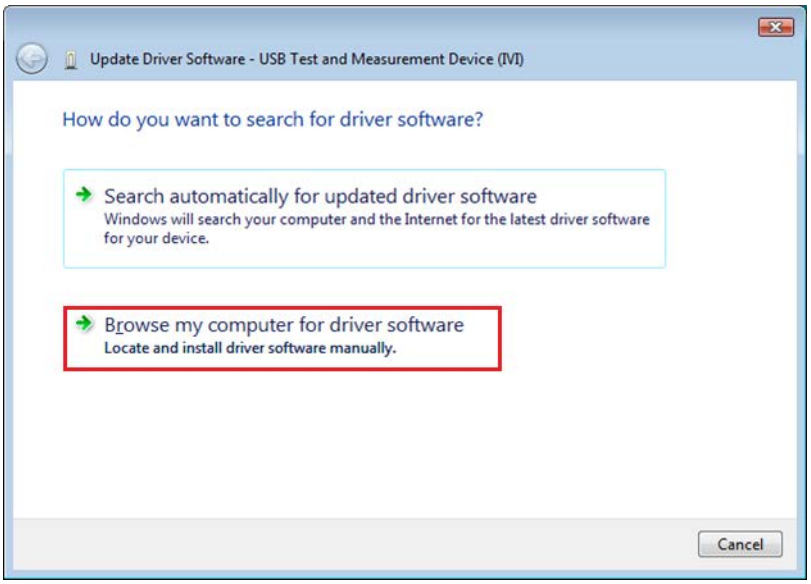
If a National Instrument's (NI's) USB driver is already installed in a Windows Vista system, you must switch the USB driver using the OS device manager according to the following procedure.
This procedure is not necessary on Windows 7, Windows 8, or Windows 8.1.

1. Turn on the PX, and connect the PX to the PC using a USB cable.
2. On the Windows **Start** menu, right-click **Computer**, and click **Manage**.
3. Click **Device Manager**.
4. Right-click **USB Test and Measurement Device (IVI)*** under USB Test and **Measurement Devices**.* Select **Update Device Software**. The Hardware Update Wizard starts.

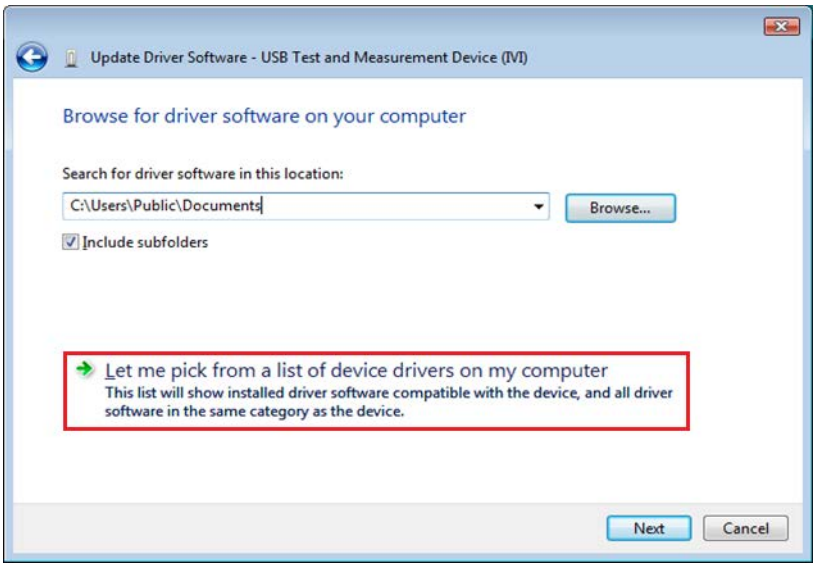
* The folder name varies depending on the type of USB driver, which is made by NI (National Instruments).



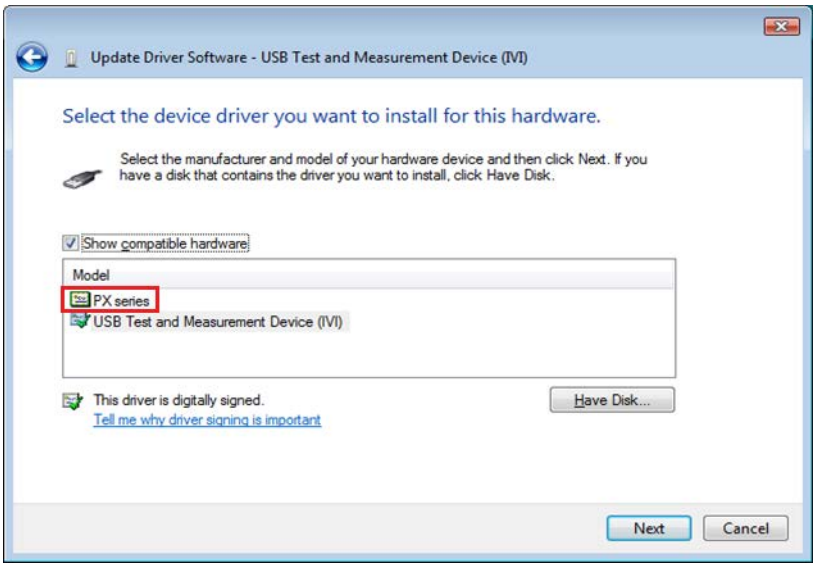
5. Select **Browse my computer for driver software**.



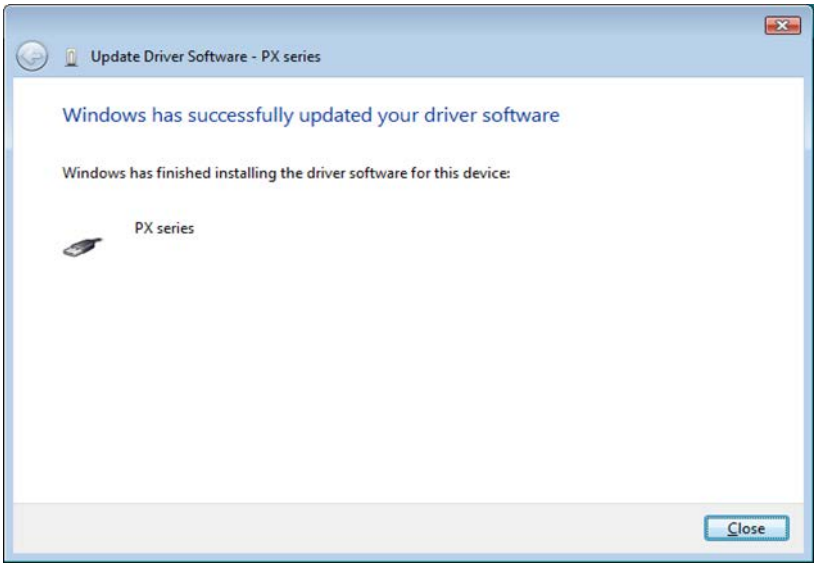
6. Select **Let me pick from a list of device drivers on my compyter**, and then click **Next**.



7. Select **PX series**, and then click **Next**. The software installation starts.

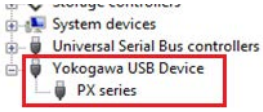


8. When the software installation finishes normally, the following window appears. Click **Close** to complete the installation.



9. Keep the USB cable connected between the PX and PC, turn off the PX, and then turn it back on.

The USB driver folder will be changed as follows.



Uninstallation

This section explains how to uninstall the software on Windows 7.

1. On the Windows **Start** menu, click **Control Panel**.
2. Click **Uninstall a program** in the Control Panel.

Uninstalling PowerViewerPlus

3. Right-click **PowerViewerPlus**, and then click **Uninstall**.
4. A uninstallation confirmation window appears.

   Click **Yes** to uninstall PowerViewerPlus.

   Click **No** to cancel.
5. On Windows Vista or Windows 7, the "User Account Control" window will appear during the uninstallation. Click **Allow** or **Yes** to continue the installation. The uninstallation will continue.

Uninstalling YKMUSB (USB Driver)

6. On the uninstallation window, right-click **YKMUSB**, and then click **Uninstall**. The uninstallation will proceed in a similar manner as described above.

Uninstalling Microsoft Visual C++ 2008 Redistributable

6. On the uninstallation window, right-click **Microsoft Visual C++ 2008 Redistributable**, and then click **Uninstall**. The uninstallation will proceed in a similar manner as described above.

3.2 Starting and Exiting the Software

Preparation before Starting the Software

Do the following before you start the software.

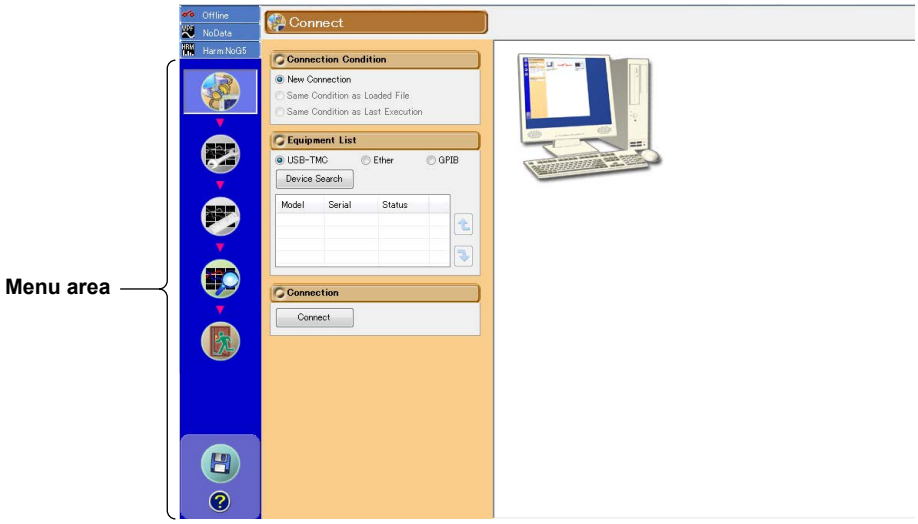
- Turn on the PX8000.
- Connect communication cables, and set communication interface parameters. (See chapter 2.)

Starting the Software

1. To start the software, click the **Start** button, **All Programs**, **YOKOGAWA**, **PowerViewerPlus**, and then **PowerViewerPlus**.

2. The “User Account Control” window will appear during the installation. Click **Allow** or **Yes**.

When the software starts, the Connection menu will appear.

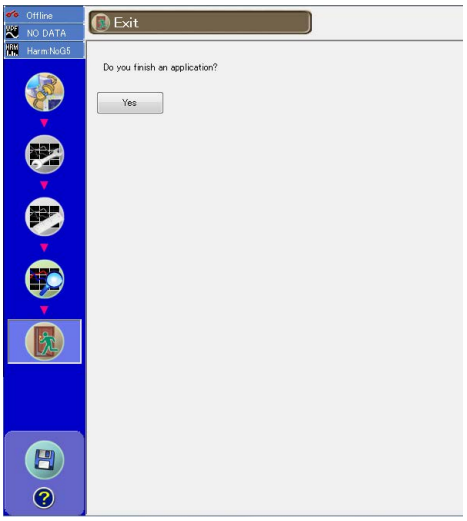


- To switch to online mode and collect data from the PX into the PC, proceed to chapter 4, “PX-PC Communication.”
- To remain in offline mode and perform analysis using the setup parameters and measured data that have already been collected, select  in the menu area, and proceed to chapter 7, “Analyzing Measured Data.”

Exiting the Software

1. Click  in the menu area. The exit screen appears.

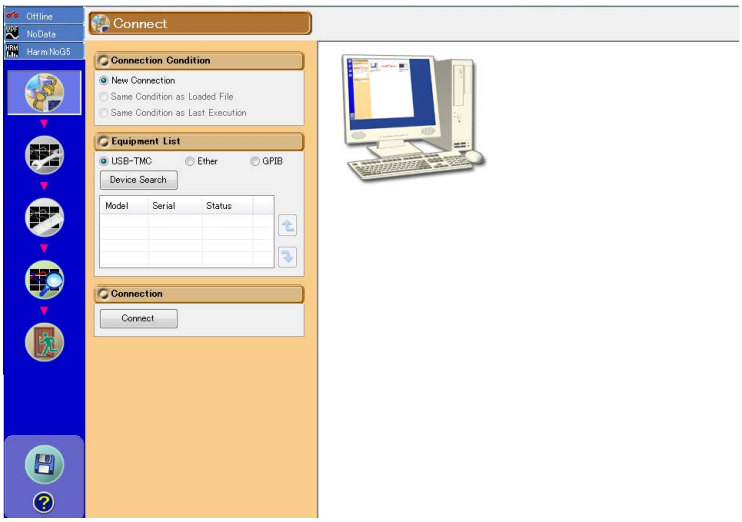
2. Click **Yes**. The software will close.



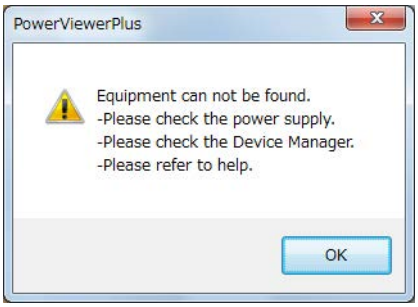
4.1 Configuring a New Set of PX-PC Communication Parameters (New connection)

1. Click  in the menu area. The Connection screen appears.

When you start the software, this screen appears automatically.



If you have connected the PX through the GP-IB or Ethernet interface, the following message appears. Follow the procedure on the next page to set the communication parameters.

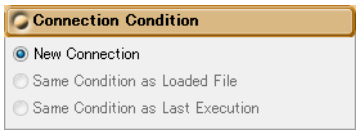


If the above message appears even after you set the communication parameters, check the following items.

- Is the PX turned on?
- Is the communication interface cable connected?
- If a National Instrument's (NI's) USB driver is already installed in a Windows Vista system, you must switch the USB driver using the OS device manager. (See page 3-6.)

Connection Condition

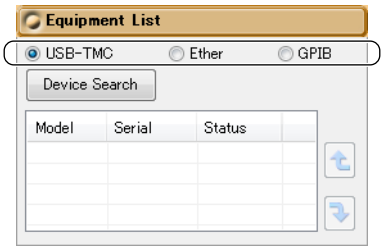
2. To create a new connection, click **New Connection**.



Equipment List

Connection Procedure

3. Select how to connect the PX to the PC from USB-TMC, Ether, and GPIB.

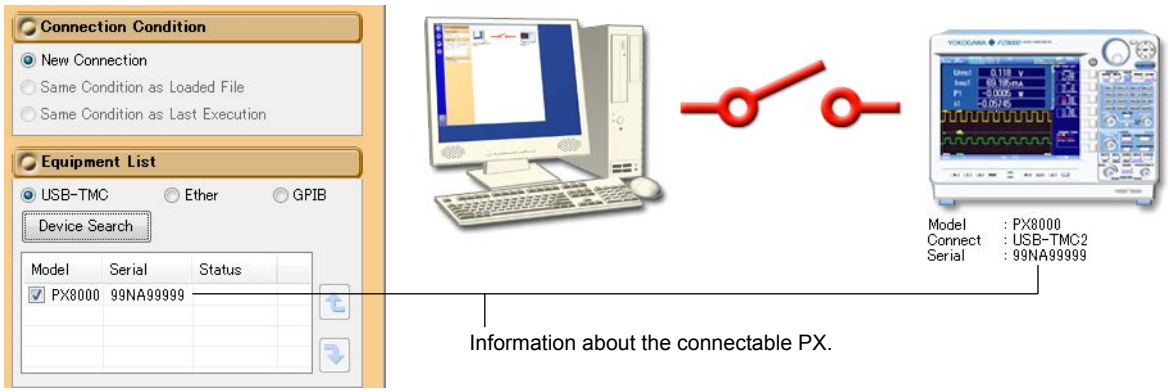


4. Click **Device Search**.

The following information is displayed about the connectable PXs.

- USB connection: Model name, serial number (instrument number)
- GP-IB connection: Model name, serial number (instrument number), GP-IB address
- Ethernet connection: Model name, serial number (instrument number), IP address

Example of a USB Connection



Note

If you connect the PX to the PC through the USB interface, turn on the PX, and then start the software, a list of connectable PXs will appear.

Starting the Connection

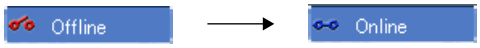
5. Click **Connect**. The communication with the peer PX begins.

If an online connection is established between the PX and PC, the software window changes as follows.

Information Area

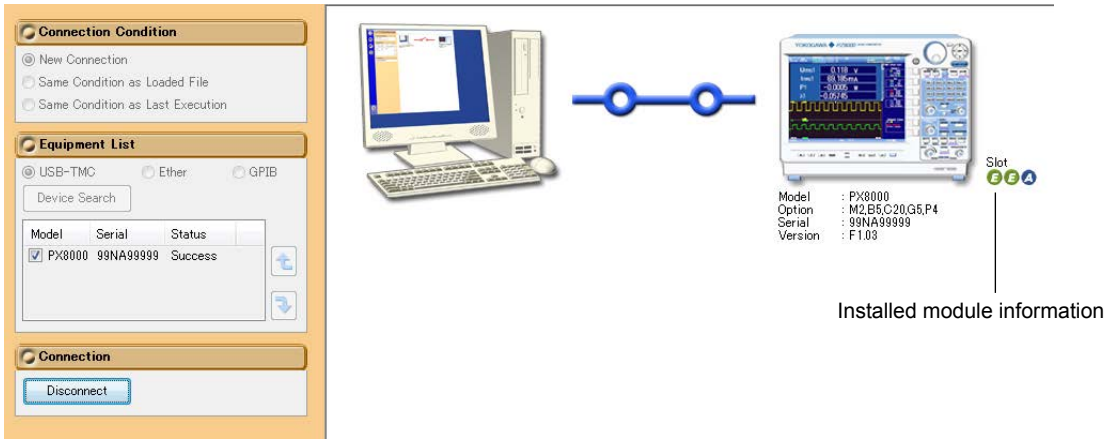
The connection status in the information area shown in the upper left of the window changes as follows.

Offline → Online



Connect Status Illustration

An illustration indicating the connection status is displayed as shown below.



Installed Module Information

- E: Power element (Element, a pair of 760811 voltage module and 760812 current module)
- A: AUX module (MotorMode = OFF)
- M: AUX module (MotorMode = ON)

For example, EEA indicates that two power elements and one AUX module are installed.

Note

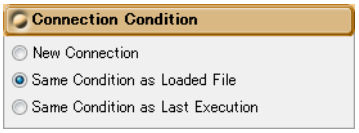
- You cannot proceed to Setting or Measure until an connection is established.
- If any of the following circumstances apply when you click Connection to start communication, a communication error will occur.
  - The peer PX is not ready to measure.
  - The GP-IB address, IP address, user name, or password is incorrect.
  - There is no response from the peer PX.
  - When multiple PXs are connected, not all the PX models or options are the same.
- The following settings on the PX are turned off when an online connection is established. If the connection changes to offline, the settings return to their original states.
  - Averaging
  - Auto range
- The history of the measurement data before online connection is cleared when an online connection is established.

4.2 Making the Communication Settings and Device Settings the Same as Those of the Loaded File

To execute the operation described in this section, load the device settings into this software in advance according to the procedure provided in section 8.1, “Saving and Loading Setup Parameters.”

1. Click  in the menu area. The Connection screen appears.

2. In the Connection Condition dialog box, click **Same Condition as Loaded File**.



Starting the Connection

3. Click **Connect**. The communication with the peer PX begins.

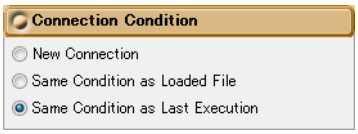
Note

- You cannot proceed to Setting or Measure until an connection is established.
- If any of the following circumstances apply when you click Connection to start communication, a communication error will occur.
  - The peer PX is not ready to measure.
  - The GP-IB address, IP address, user name, or password is incorrect.
  - There is no response from the peer PX.
  - You are trying to connect to a different PX from the last time.
  - When multiple PXs are connected, not all the PX models or options are the same.

4.3 Using the Same Communication Settings as the Last Time

1. Click  in the menu area. The Connection screen appears.

2. In the Connection Condition dialog box, click **Same Condition as Last Execution**.



Note

You cannot select “Same Condition as Last Execution” the first time you start the software.

Starting the Connection

3. Click **Connect**. The communication with the peer PX begins.

Note

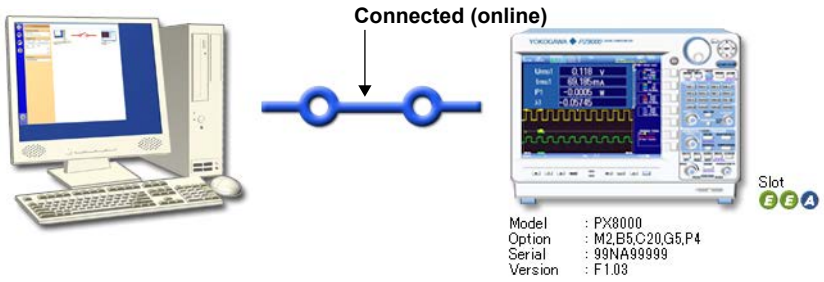
- You cannot proceed to Setting or Measure until an connection is established.
- If any of the following circumstances apply when you click Connection to start communication, a communication error will occur.
  - The peer PX is not ready to measure.
  - The GP-IB address, IP address, user name, or password is incorrect.
  - There is no response from the peer PX.
  - You are trying to connect to a different PX from the last time.
  - When multiple PXs are connected, not all the PX models or options are the same.

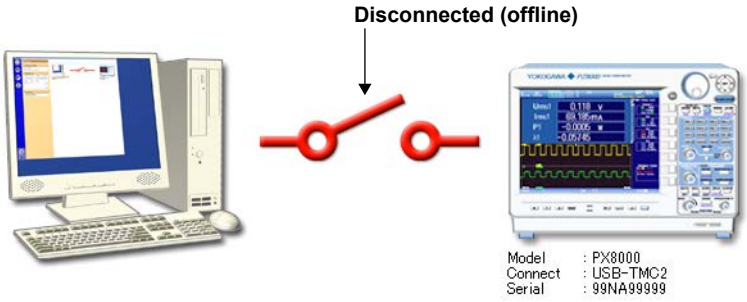
4.4 Switching to Offline

1. Click  in the menu area. The Connection screen appears.

2. While connected, click **Disconnect**. The connection between the PX and PC is disconnected.

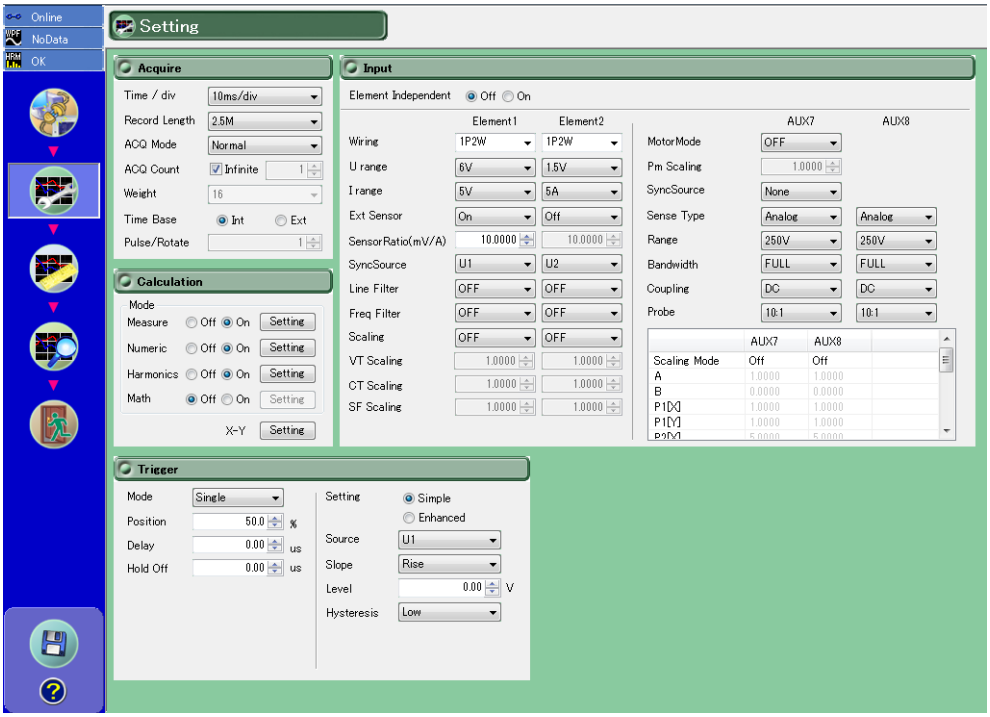
When the connection is cut and the PX and PC are offline, an illustration indicating this state appears.





5.1 PX Configuration

1. Click  in the menu area. The Setting screen appears.



Notes on Operation

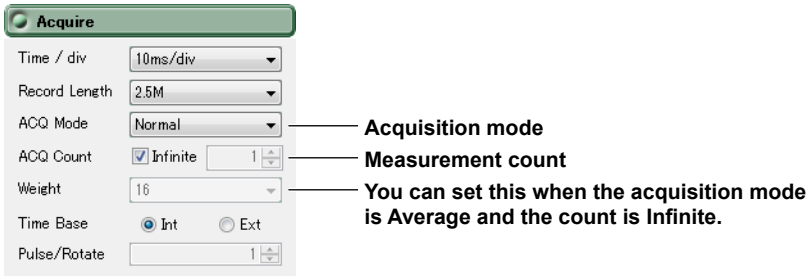
Note the following points when you use the software to configure the PX.

- For details on settings, see the PX User's Manual IM PX8000-01EN.
  There are two ways to view the PX User's Manual.
  - Use the help feature. For details, see page 9-2.
  - View the PDF file in the Manuals folder on the CD-R.

Examples of Setting screens are provided in the remainder of this section.

Unavailable tools, setting boxes, and setup parameters appear dimmed.
If waveform data (WPF file) is loaded in offline mode, all settings appear dimmed, and you can check the settings that were used when the WPF file was saved.

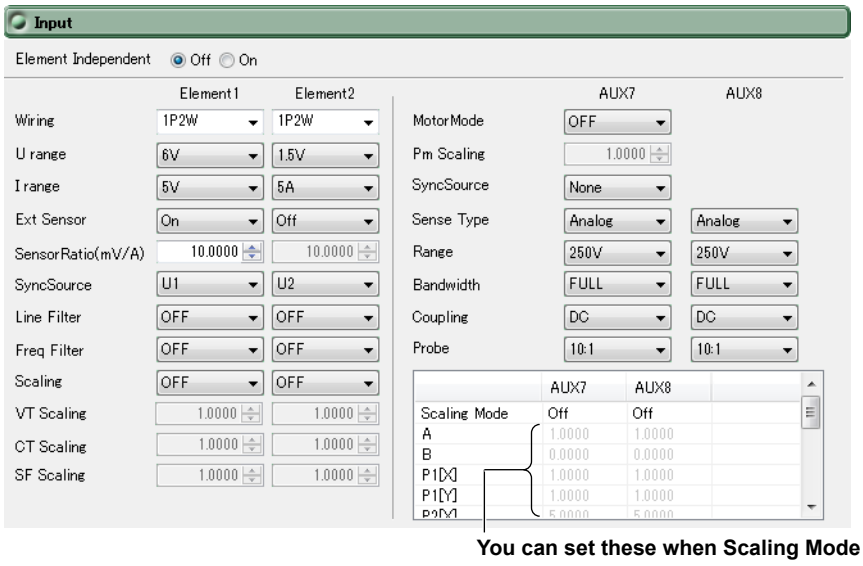
Configuring Waveform Acquisition



For details on settings, see the following chapters in the PX User's Manual IM PX8000-01EN.

- Time/div: Chapter 4
- Record length, acquisition mode, measurement count, attenuation constant, time base, pulse per rotation: Chapter 6

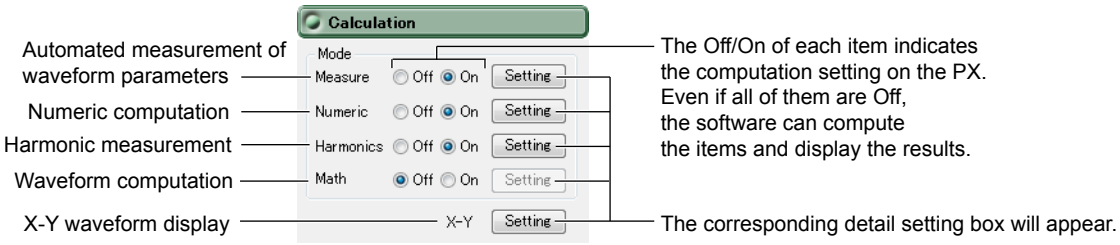
• Input Settings



For details on settings, see the following chapters in the PX User's Manual IM PX8000-01EN.

- Wiring system, synchronization source (Element), line filter, frequency filter, scaling, VT ratio, CT ratio, power coefficient (SF), motor mode, Pm scaling, synchronization source (AUX): Chapter 2
- Voltage range, current range, external current sensor, sensor conversion ratio, scaling mode (AUX), sensor type (input signal type), range (AUX, bandwidth limit, input coupling, probe attenuation: Chapter 3

Calculation Settings

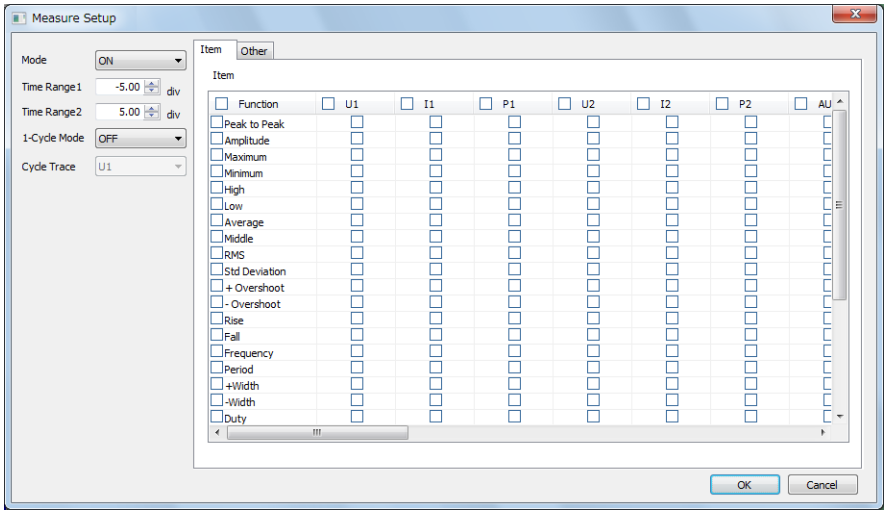


For details on settings, see the following chapters in the PX User's Manual IM PX8000-01EN.

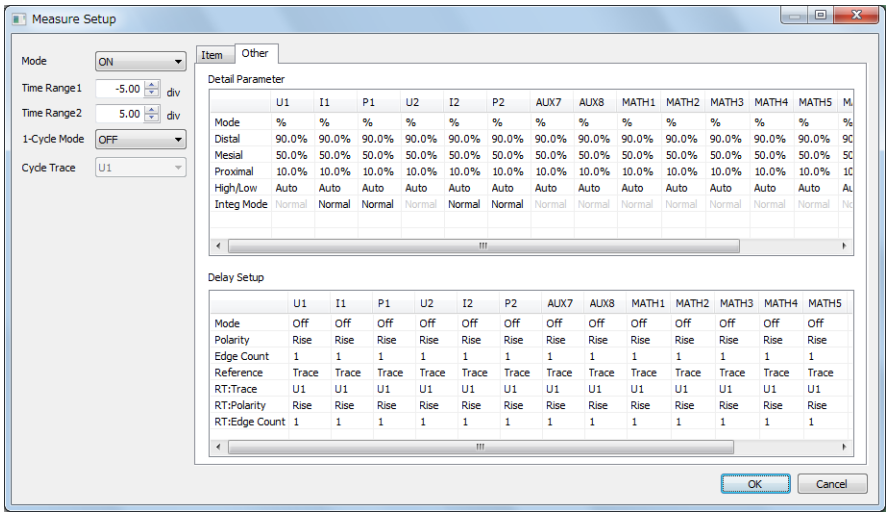
- Automated measurement of waveform parameters: Chapter 16
- Numeric computation, harmonic measurement: Chapters 2 and 9
- Harmonic measurement: Chapter 9
- Waveform computation: Chapter 17 and 18
- X-Y waveform display: Chapter 13

Detailed Setting Box for Automated Measurement Of Waveform Parameters

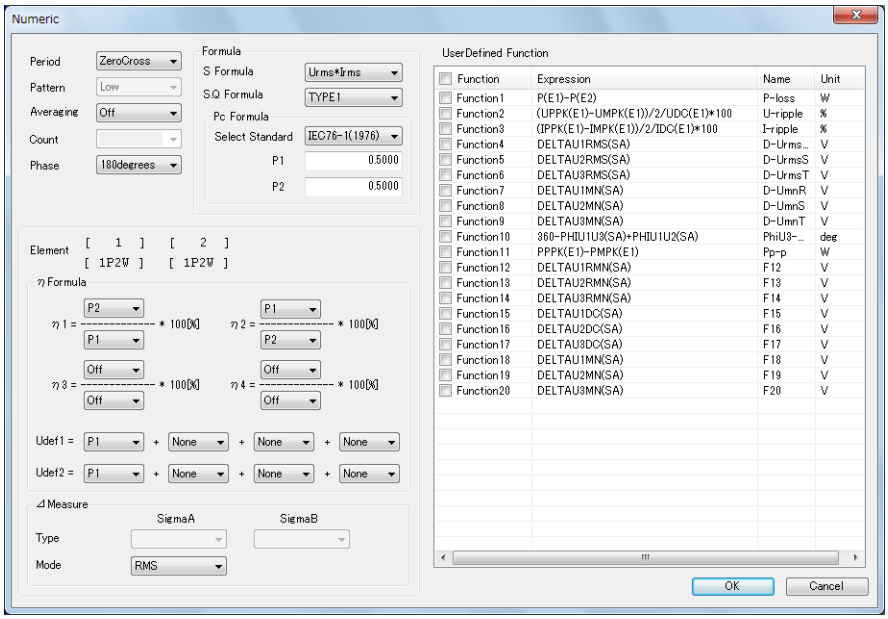
Item tab



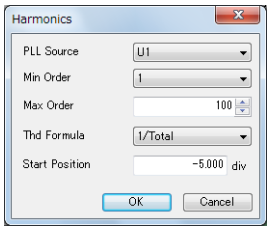
Other tab



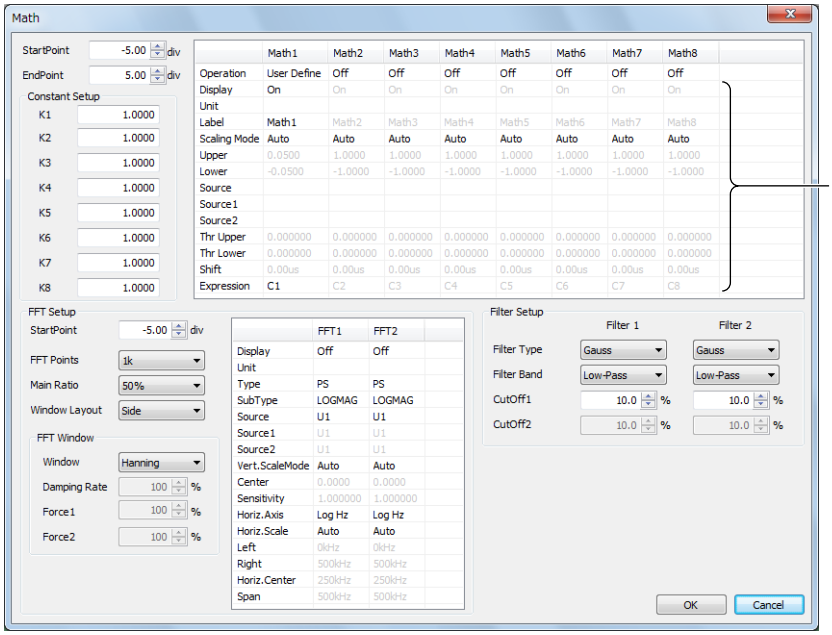
Detailed Setting Box for Numeric Computation



Detailed Setting Dialog Box for Harmonic Measurement

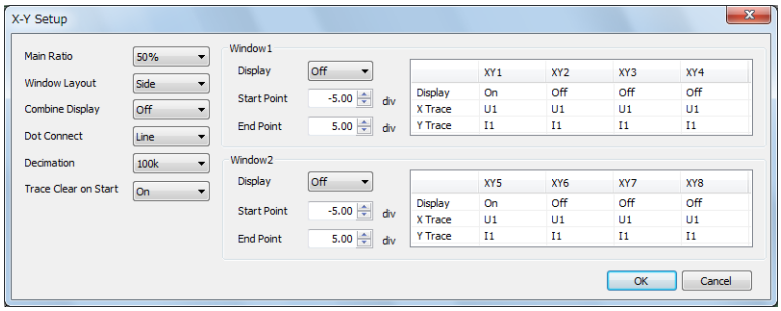


Detailed Setting Box for Waveform Computation



You can set these when Operation is not set to Off

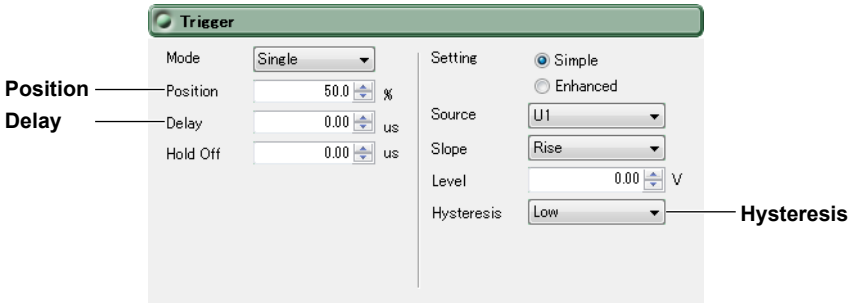
Detailed Setting Box for X-Y Waveform Display



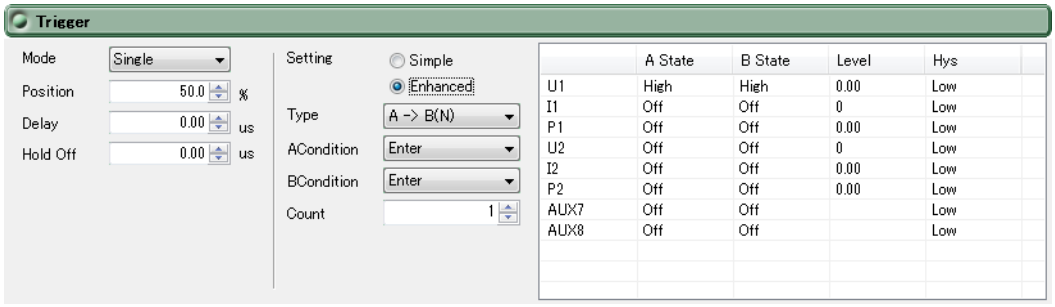
Trigger Settings

The items in the setting box varies depending on the trigger type, trigger source, and so on.

Setting Box Example for When Trigger Type Is Simple



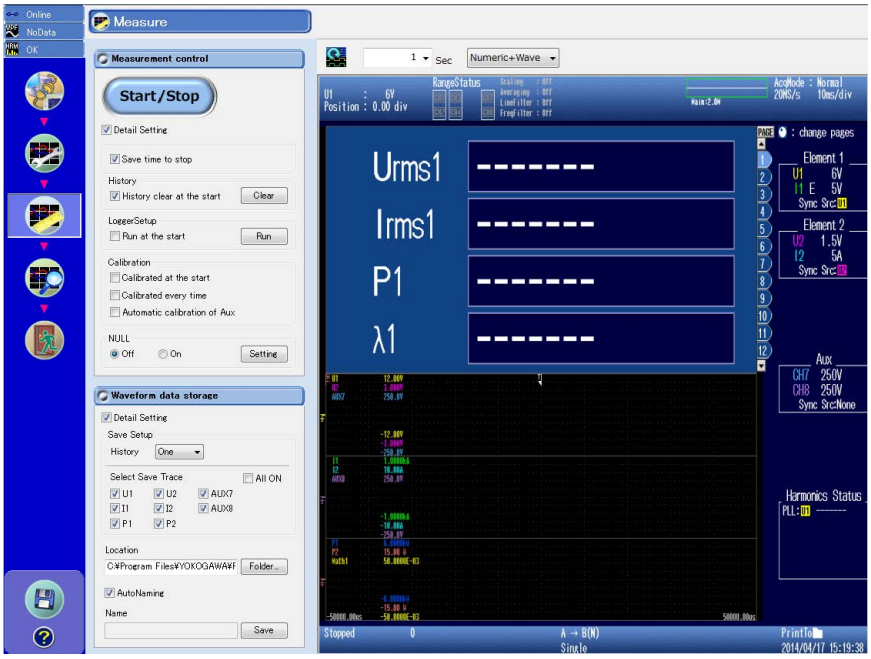
Setting Box Example for When Trigger Type Is Enhanced



For details on settings, see the chapter 5 in the PX User's Manual IM PX8000-01EN.

6.1 Executing Measurements

1. Click  in the menu area. The Measure screen appears.



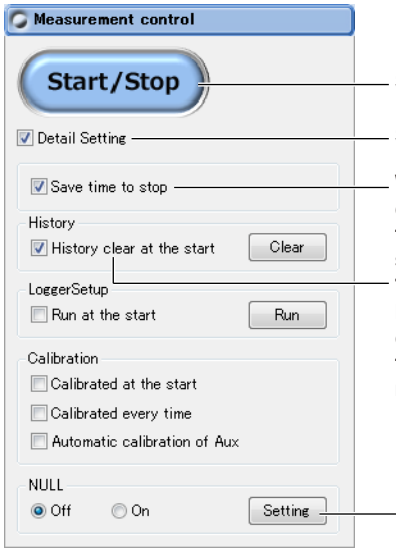
Notes on Operation

Note the following points when you use the software to configure the PX.

- For details on settings, see the PX User's Manual IM PX8000-01EN.
  There are two ways to view the PX User's Manual.
  - Use the help feature. For details, see page 9-2.
  - View the PDF file in the Manuals folder on the CD-R.

Examples of Measure screens are provided in the remainder of this section.

Measurement Control Settings

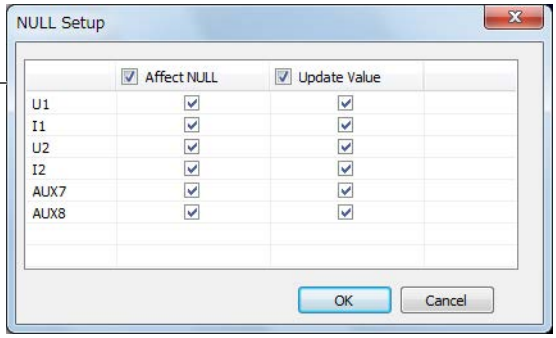


Start or stop a PX measurement (waveform acquisition).

Select the check box to show detail settings.

When waveform acquisition is stopped on the PX, waveform data is downloaded from the PX to the PC and saved. Specify the save destination folder and file name in the waveform data storage dialog box.

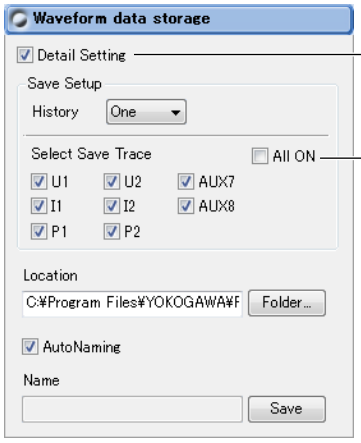
The history is cleared when a PX measurement starts. Even if this check box is not selected, if certain conditions for clearing the history of the PX are met—as a result of changing the input range, for example—the history is cleared when a PX measurement is started.



For details on settings, see the following chapters in the PX User's Manual IM PX8000-01EN.

- History Clear: Chapter 26 (Clear Trace)
- LoggerSetup: Chapter 6
- Calibration: Chapter 26 (Calibration)
- NULL: Chapter 26

Waveform Data Storage Settings



Select the check box to show storage settings (for History and Select Save Trace). For details, see the chapter 24 in the PX User's Manual IM PX8000-01EN.

If you do not select the All ON check box and select the traces to be saved individually, depending on the waveform traces that are not selected (not saved), this software may not be able to compute the following measurement items and computations that are computed on the PX.
Example:

- **Synchronization Source**
- **PLL Source**
- **Measurement Functions of Wiring Unit (Σ Function)**
- **Delta Computation**
- **Harmonic Measurement**

Location

Specify the folder to save the file.

AutoNaming

If you select the AutoNaming check box, files are saved with the name Auto_yyyymmddhhmmss.wpf.
yyyymmddhhmmss is a 14-digit number consisting of the year, month, day, hour, minute, and second. The year is four digits; the hour is based on a 24-hour clock.

Name

To specify the file name, clear the AutoNaming check box, and enter the file name.

- File name: You can assign any name that is allowed on your PC.
- Extension: .wpf

Save Button

Saves the waveform data opened in this software.

Measure Screen

The Measure screen simply displays the PX screen in the software.

Turns on or off software display updating
Appears dimmed when turned off.

Software display update interval
Set the interval for collecting display data from the PX and updating the software display.

PX display setting
For details, see the chapter 7 in the PX User's Manual IM PX8000-01EN.

Staring a Measurement

Click the Start/Stop button to start a measurement on the PX.

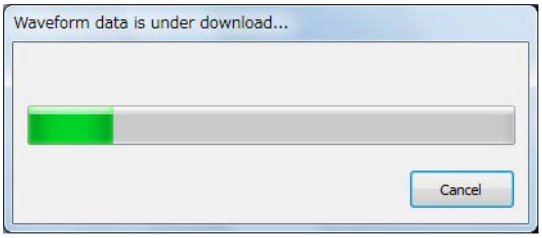
Measurement stopped **Measurement running**

Note

While a measurement is in progress, the icons in the menu area are unavailable. You cannot change to a different mode (connection, analysis, exit, etc.).

Stopping a Measurement

Click the Start/Stop button to stop a measurement.
If the Save time to stop check box is selected in the Measurement control box and you stop a measurement, the waveform data measured by the PX is downloaded to the PC.



In the following situations, waveform data (WPF file) becomes larger, and downloading takes longer in proportion to the file size.

- There are many waveform data values of each channel due to the record length and time scale settings (T/div).
- There are many traces (waveforms) whose Select Save Trace check box is selected.
- There is a large amount of history waveform data as a result of performing a long measurement with History under Save Setup set to ALL.

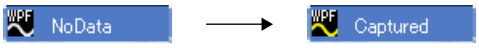
If downloading takes a long time even when the amount of data is reduced, improve the operating environment (see section 1.3).

Information Area

WPF Data Hold Status

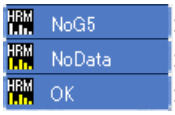
When measured data is collected, the WPF data hold status in the information area shown in the upper left of the window changes as follows.

No data → Data present



Harmonic Measurement

The harmonic measurement indicator in the information area shown in the upper left of the window changes as follows depending on the harmonic measurement status.



: The harmonic measurement (/G5) option is not installed.

: No harmonic measured data present.

: OK is displayed when all the following conditions are met.

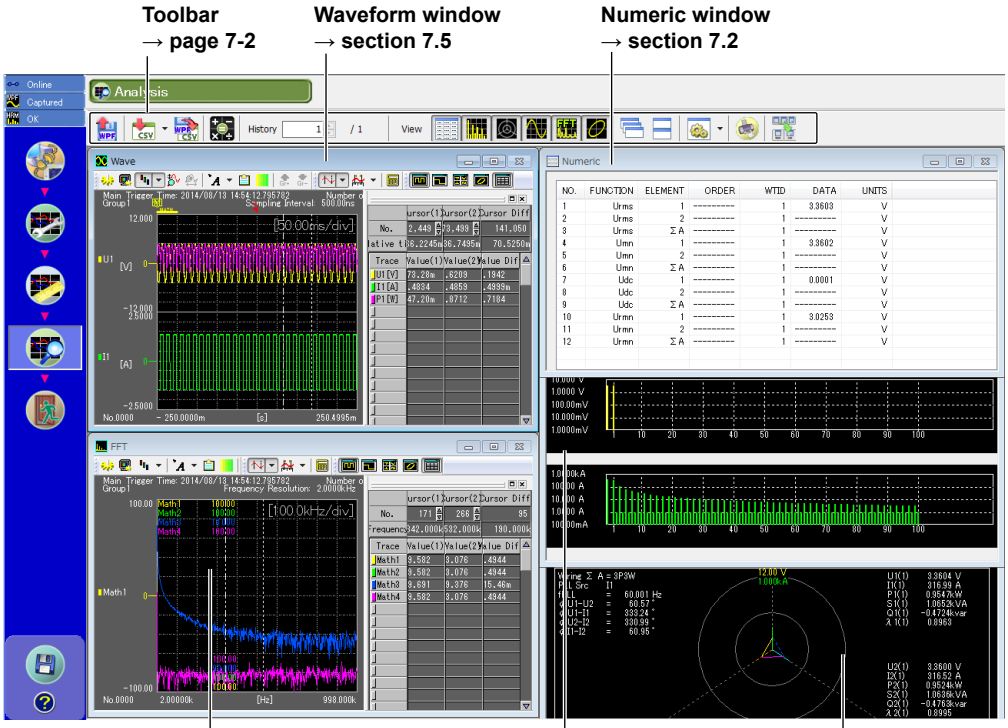
- Acquisition time base: Int
- Sample rate: 2 MS/s or higher
- Time scale (TIME/DIV): 2 ms/div or higher
- PLL source fundamental frequency: 20 Hz to 6.4 kHz range
- Data required for FFT analysis: At least twice the window width

: At least one of the above conditions is not met.
If you move the cursor to harmonic measurement in the information area when an error is occurring, the condition that is not met is displayed.

7.1 Analysis Screen

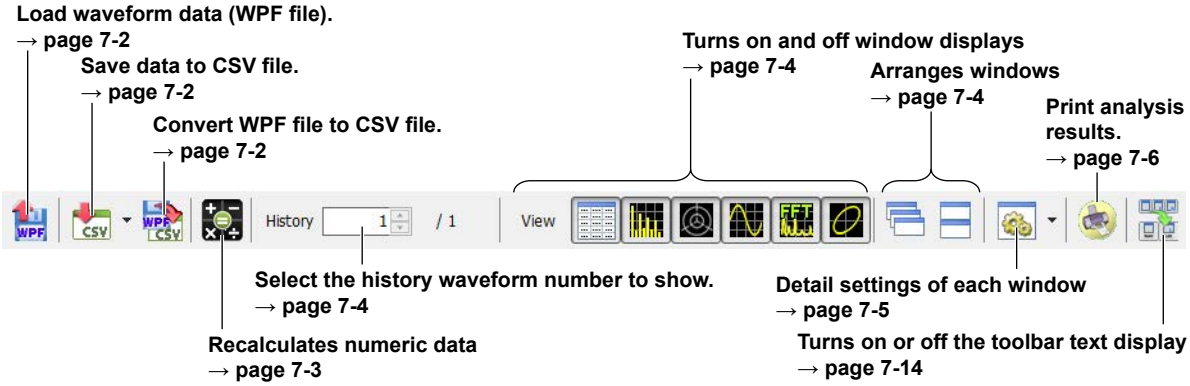
Displaying the Analysis Screen

1. Click  in the menu area. The Analysis screen appears.



Unavailable tools, setting boxes, and setup parameters appear dimmed.

Toolbar



Load Waveform Data (WPF file)

You can load waveform data (WPF file) that has already been collected in the PC into the software and analyze it.

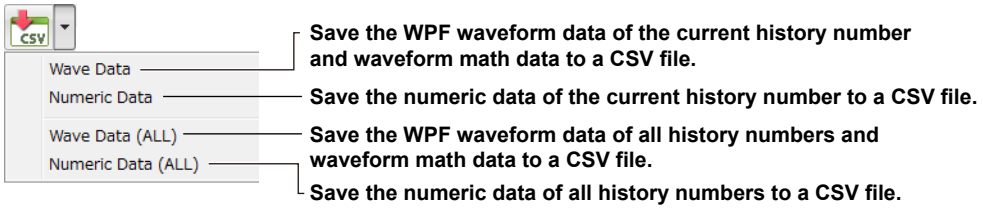
Loading is not possible in online mode. To load data into the software, switch to offline mode by following the message that appears.

Note

- For instructions on how to load the setup parameters of the PX or the software, see chapter 8.
- Numeric data and waveform data saved in CSV format cannot be loaded.

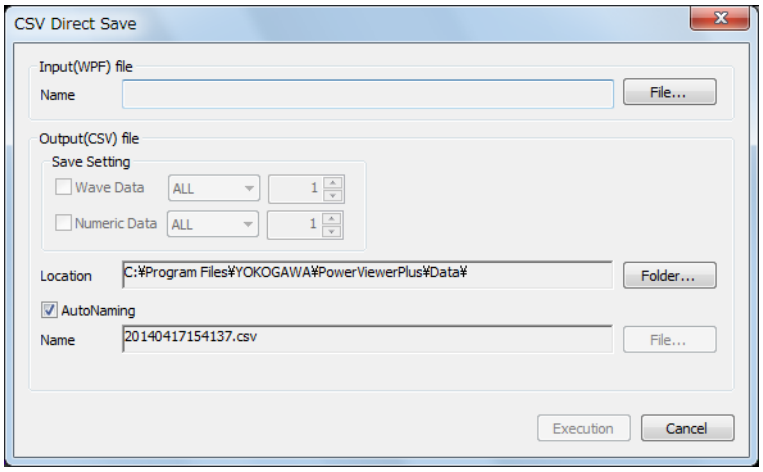
Save Data to CSV File

You can save data in CSV format. Clicking the CSV Save arrow show the following menu.



Convert WPF File to CSV File

You can convert waveform data (WPF file) directly to CSV format without loading the data in the software.



Data saved in CSV format will be as follows.

Waveform Data

- Number of lines: The number of waveform data points. 100 M lines max.
- Number of data values per line: 1

Numeric data

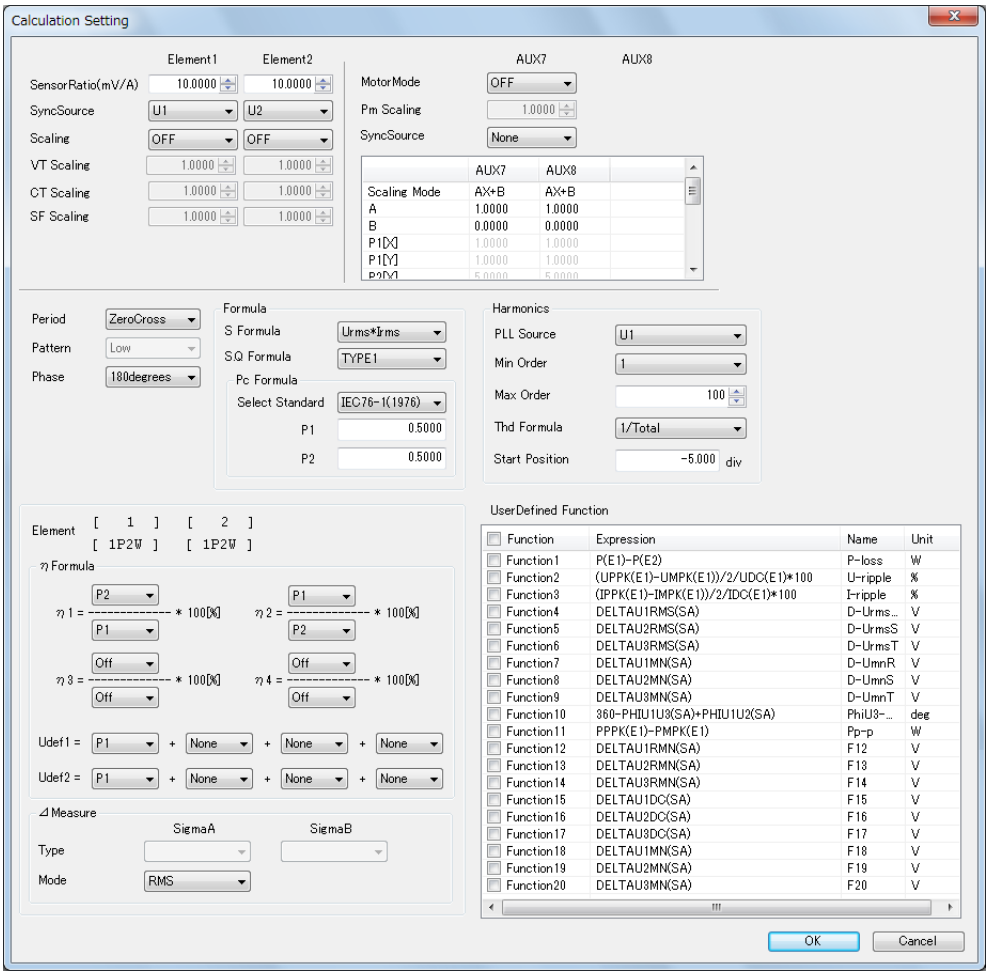
- Number of lines: Measurement count. 99999 max.
- Number of data values per line: The number of items in the numeric data. 40000 max.

Note

The maximum CSV file size that can be opened with Excel 2007 to 2013 is 1,048,576 rows by 16,384 columns. As such, if the number of data values per line exceeds 16,384 in a numeric data CSV file, the portion in excess will not be loaded in Excel.

Recalculate Numeric Data

You can set calculation conditions on numeric data and recalculate the data.



The items that you need to set are the same as those in section 5.1. However, the settings in section 5.1 are for the PX. The settings (calculation conditions) in this section are for the software. Therefore, these settings are not synchronized to those of section 5.1.

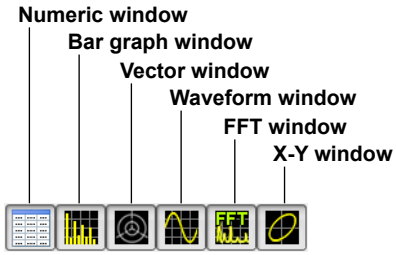
Select the History Waveform Number to Show

You can specify the number of the waveform that you want to analyze from the loaded waveform data (WPF file).

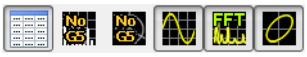
Turn On and Off Window Displays

You can turn on and off the display of each window.

- Models with the harmonic measurement (/G5 option)



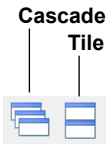
- Models without the harmonic measurement (/G5 option)



Note

The X-Y window is displayed in the waveform window. When you turn on the X-Y window and the waveform window is off, both the waveform window and X-Y window are turned on.

Arrange Windows



Cascade

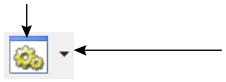
- Displayed windows are cascaded so that all the window titles can be seen.
- The active window will be shown in front of all cascaded windows.
- The order in which the windows are cascaded varies depending on the types of windows that are being displayed.

Tile

- All displayed windows are tiled.
- The order in which the windows are arranged varies depending on the types of windows that are being displayed.

Detail Settings of Each Window

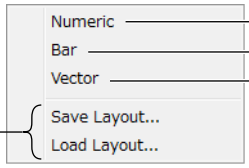
Click the window detail setting button to show the detail setting dialog box for the active window.



Click here to show a menu for selecting the detail setting dialog box.

Window detail setting button

Shortcut menu



Section 7.2

Section 7.3

Section 7.4

Save the layout of each measurement window to a file.
File name extension: mvl
Saved layout information can also be loaded.

Note

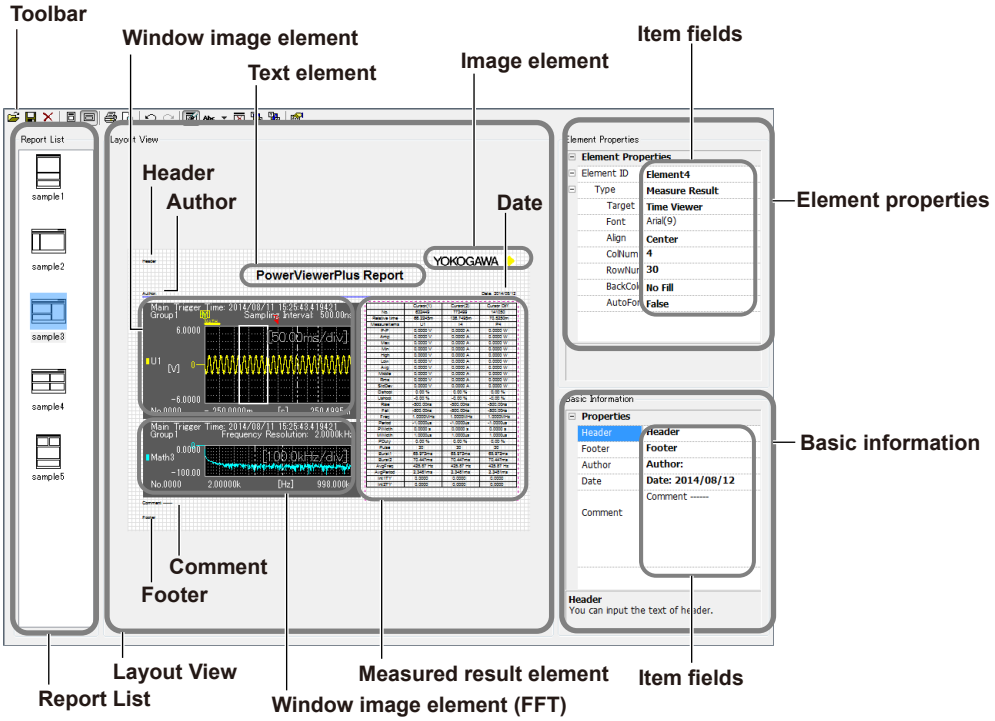
You can set the details of the waveform window and FFT window using the toolbar in the respective window.

Printing Analysis Results

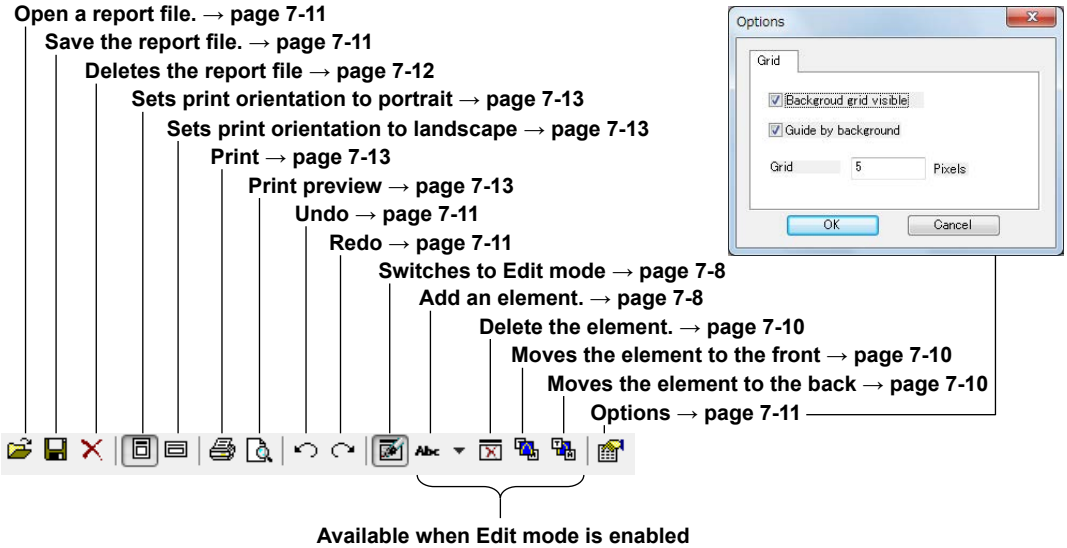
You can print analysis results (Xreport function).

Starting the Report Function

When you start the report function, the Xreport window appears, and the waveform shown in the waveform display area of the software appears in the window.



Toolbar



Xreport window

The Xreport window consists of the following four items.

- Report List: Displays a list of report files with layout images
- Layout View: Displays elements such as waveforms and measured results
- Element Properties: View and edit element properties
- Basic Information: View and edit the header, footer, author, date, and comment

Report List

The report files in the following folder are listed with layout images.

PowerViewerPlus installation folder > Report folder

The default installation folder for Windows 7, Windows 8, or Windows 8.1 is

C:¥Program Files¥YOKOGAWA¥PowerViewerPlus¥Report

The default installation folder for Windows Vista is

C:¥Users¥user name¥Documents¥YOKOGAWA¥PowerViewerPlus¥Report)

- Up to 64 report files can be displayed in the Report List.
- The most recent file is displayed at the top of the list; the oldest file is displayed at the bottom.
- Report files contain position information of elements to be arranged in the Layout View, properties, and basic information. The report file selected in the Report List is laid out in the Layout View.
- Five default report files (Sample1 to 5) are provided. You can edit these files.

Layout View

The Layout View consists of elements and basic information (header, footer, author, date, and comment).

There are four types of elements, and multiple elements can be arranged. When you create an element, a unique sequential ID is assigned to the element. You cannot delete Element1.

- Text element
  An element for arranging text
- Window image element
  An element for arranging an image of the waveform display area. You can select from main, zoom, and XY displays of Time view waveforms or from main, zoom, and XY displays of FFT view waveforms. However, FFT Main, FFT Zoom, and FFT XY can only be arranged when an FFT view is displayed in the waveform display area.
- Measured result element
  An element for arranging measured results of the automated measurement (waveform parameters, history statistics, or cycle statistics). You can arrange a measured result element even if measured results are not displayed in the waveform display area.
- Image element
  An element for arranging image data. You can arrange jpg, bmp, tif, and png images.

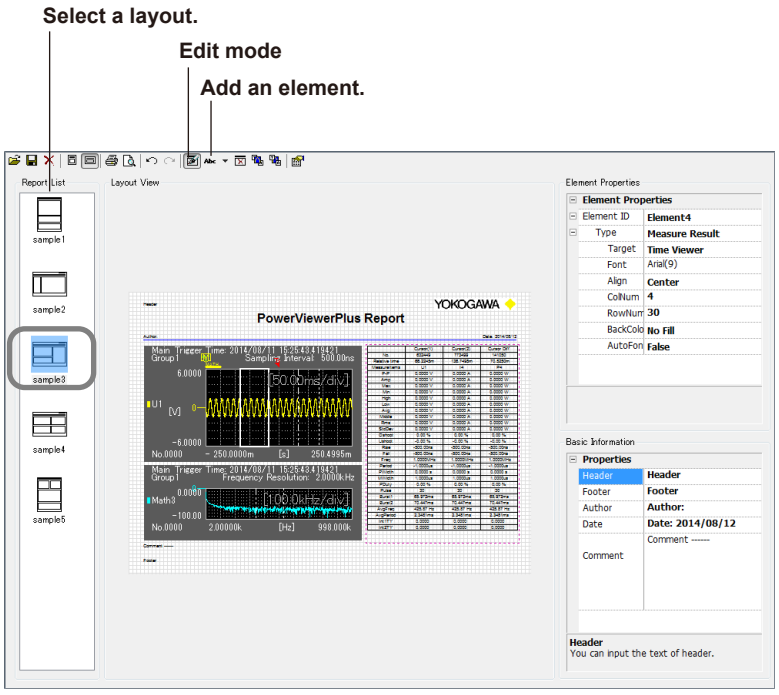
Note

The elements in printing (Xreport function) are the above elements that make up the Layout View. They are not the power elements (the combinations of voltage modules and current modules) of the PX.

Editing Reports

Selecting a Layout

Click the layout that you want to use from the Report List. The Layout View, Element Properties, and Basic Information are arranged according to the selected layout settings.



Switching to Edit Mode

Click **Edit mode** on the toolbar. When Edit mode is enabled, you can add and delete elements and change element properties.

Adding an Element

1. From the **Add element** drop-down list, select the element you want to add. You can select the element from the following.
   - Add Text (text element)
   - Add Window Image (window image element)
   - Add Measure Result (measured result element)
   - Add Image (image element)
2. A crosshair cursor appears in the Layout View. Drag the cursor to add the element of the desired size.

Changing the Element Size

Enable Edit mode and drag the frame of an element to change its size.

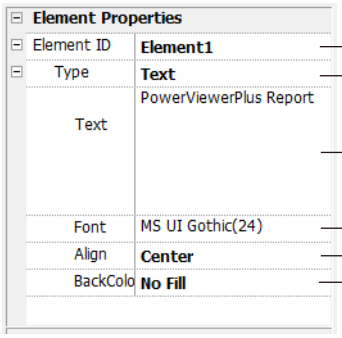
Changing Element Properties

The properties of the selected element are displayed. You can change a property by enabling Edit mode and clicking the field of the target item.

- **Common Property**

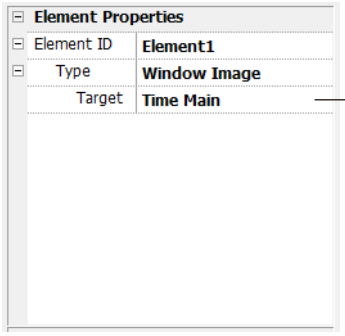
  Element ID: This is automatically assigned when an element is created and cannot be changed.

- **Editing a Text Element (Text)**



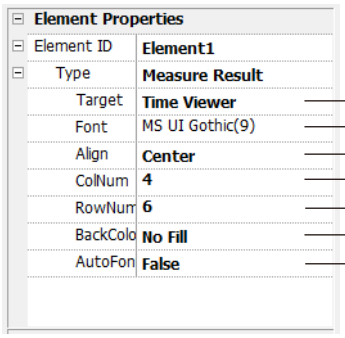
Select the element number.
Select the type (Text, Window Image, Measure Result, Image).
Edit text (can be edited regardless of whether Edit mode is on).
Set the display font.
Select the line alignment (Left, Center, Right).
Set the background color.

- **Editing a Window Image Element**



Select the displayed waveform (Time Main, Time Zoom, Time XY, FFT Main, FFT Zoom, FFT XY).

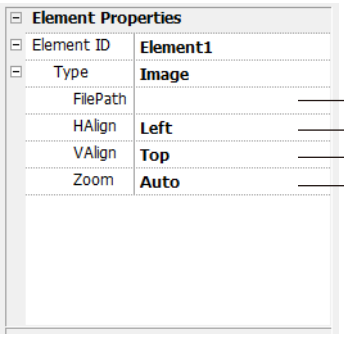
- **Editing a Measured Result Element (Measure Result)**



Select the measurement target (Time Viewer, FFT Viewer).
Set the display font.
Select the line alignment (Left, Center, Right).
Set the number of rows.
Set the number of columns.
Set the background color.
Turns auto font size on or off *

* If AutoFontSize is set to True, the font size setting is disabled.

- **Editing an Image Element (Image)**



* Auto: The size is adjusted so that the image fits within the image element frame.
Fix: The image is displayed in the original size.
0.50: The image is displayed at one-half the original size.
2.00: The image is displayed at twice the original size.
Any: The image is expanded or reduced to the specified size.

Deleting an Element

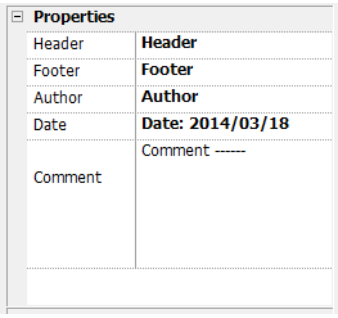
1. In the Layout View, select the element that you want to delete.
2. Click **Delete element** on the toolbar. The selected element is deleted. However, you cannot delete Element1.

Moving and Element to the Front or Back

Select the element you want to move, and click Move to front or Move to back on the toolbar.

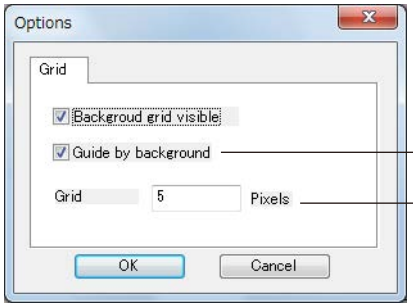
Changing Basic Information

Click the Header, Footer, Author, Date, and Comment fields, and change the information. You can change the information regardless of whether Edit mode is on. Basic information is displayed at a given position in the Layout View. You cannot hide or delete the Basic Information box, but if you edit and empty the text fields, nothing will be displayed.



Arranging the Elements

Click **Options** on the toolbar. The Options dialog box appears.



Selected: The positions are determined based on an equally spaced grid.
Not selected: The positions are determined freely.

Range: 1 to 100

Undoing and Redoing an Edit Operation

In the Layout View, you can **undo and redo** the following edit operations once.

- Add or delete an element
- Move the position or change an attribute of an element
- Set the page style (horizontal or vertical)
- Report's basic information (Header, Footer, Date, Author, Comment)

Saving, Loading, and Deleting Report Files

Loading

You can open a report file that is not shown in the Report List. The type of report files that you can open are reports (.xrt).

1. Click **Open** on the toolbar. An Open dialog box appears.
2. Select the report file you want to open, and click **Open**. The report file is laid out in the Layout View.

When you open a report file, any file that is open is closed.

Saving

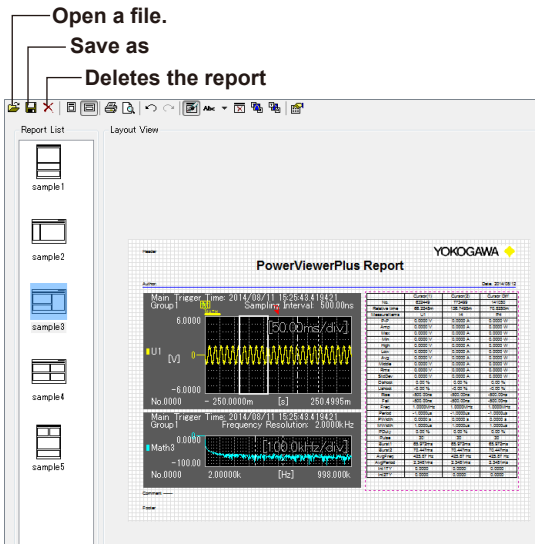
1. Click **Save as** on the toolbar. A Save As dialog box appears.
2. Set the save destination, file name, and file type, and then click **Save**. The current settings are saved.

- If you save a report file in the following folder, the file appears in the Report List.
  PowerViewerPlus installation folder > Report folder
  The default installation folder for Windows 7, Windows 8, or Windows 8.1 is
  C:¥Program Files¥YOKOGAWA¥PowerViewerPlus¥Report
  The default installation folder for Windows Vista is
  C:¥Users¥user name¥Documents¥YOKOGAWA¥PowerViewerPlus¥Report)
- You can save report files in report (.xrt) and rich text (.rtf) formats.
  - If you save a file in report (.xrt) format, it can be opened.
  - If you save a file in rich text format (.rtf), it can be opened in Microsoft Word. You cannot edit the file using WordPad.

Deleting

1. From the Report List, select the file you want to delete.
2. Click **Delete report** on the toolbar. The selected file is deleted.

The report files in the following folder can be deleted.
PowerViewerPlus installation folder > Report folder
The default installation folder for Windows 7, Windows 8, or Windows 8.1 is
C:¥Program Files¥YOKOGAWA¥PowerViewerPlus¥Report
The default installation folder for Windows Vista is
C:¥Users¥user name¥Documents¥YOKOGAWA¥PowerViewerPlus¥Report)



Printing a Report

Selecting the Print Orientation

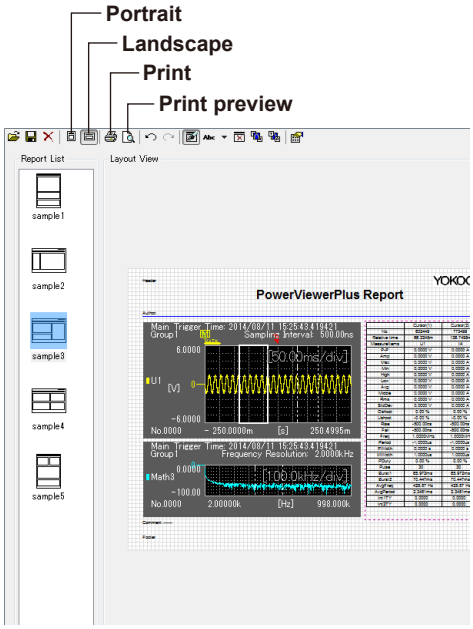
On the toolbar, click **Portrait** or **Landscape**.

Print Preview

On the toolbar, click **Print preview**. A preview appears in a window.

Printing

1. On the toolbar, click **Print**. A Print dialog box appears.
2. Set the printer, print range, copies, and so on, and then click **OK**. A report is output to the specified printer.



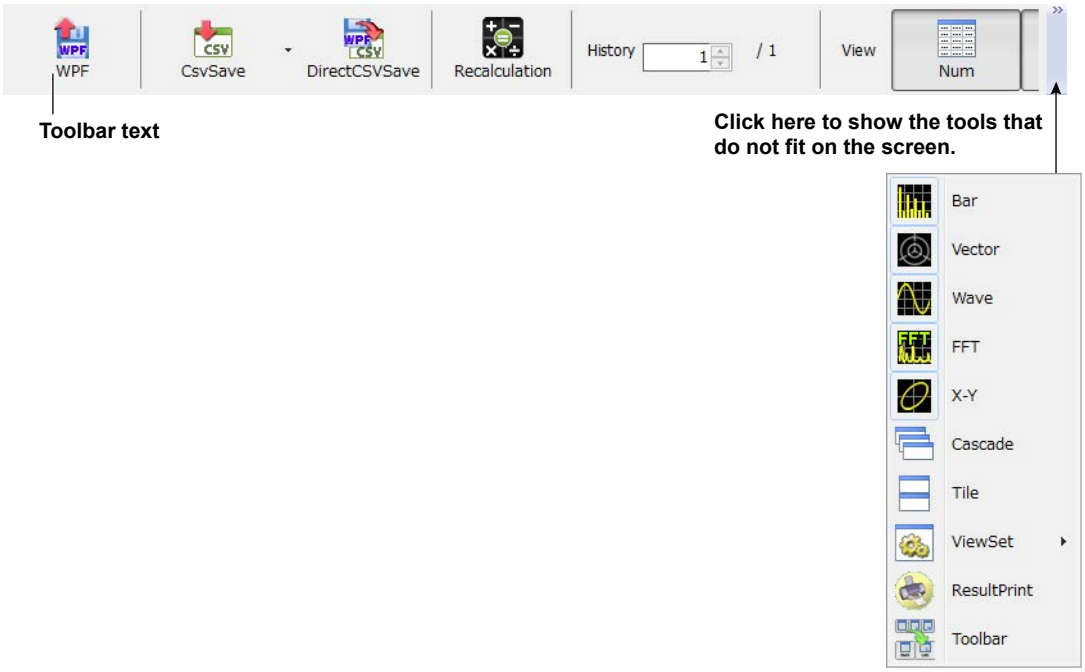
Turning On or Off the Toolbar Text Display

Toolbar text button

The toolbar text display toggles on and off every time you click the Toolbar text button.

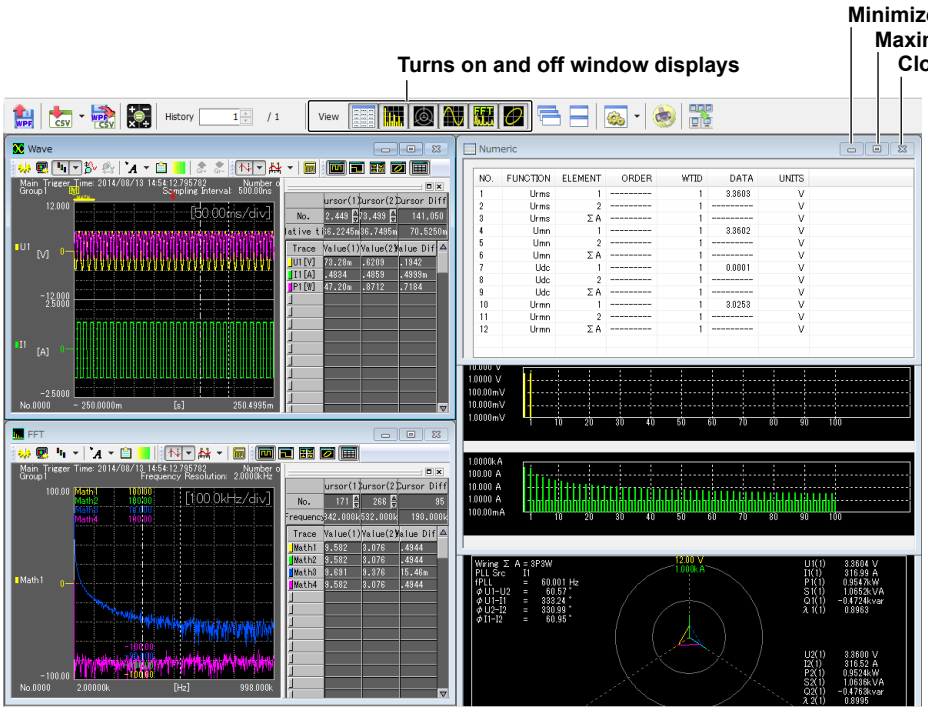
Text display: Off

Text display: On



Measurement Screen

When you start the software for the first time, all possible windows are displayed tiled.

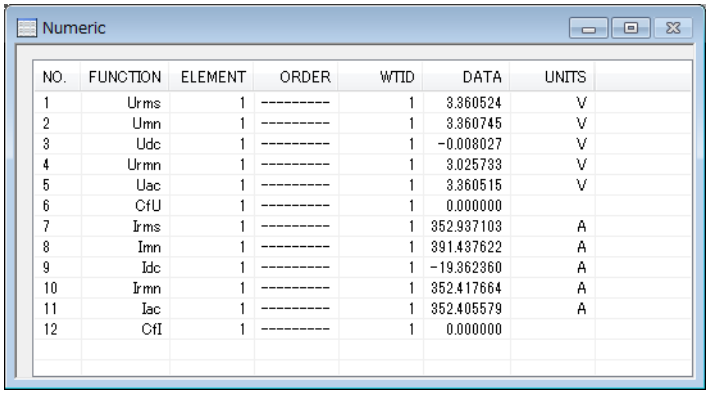


- You can maximize or minimize any measurement window.
- After you maximize a window, you can click a window arrange button (Cascade or Tile) to clear the maximization and arrange the windows as specified.
- The close button in the upper right of each measurement window is unavailable. To close a measurement window, click the appropriate window display on/off button.
- Right-click the measurement window to display the detail setting dialog box of the window. This is not possible from the waveform or FFT window. Use the toolbar in the respective window.
- The bar graph window and vector window can be displayed when the PX is equipped with the harmonic measurement option (/G5).

7.2 Numeric Display

The numeric display shows measured data numerically. You can customize the types of functions to display, the display order, the font size, the color, and so on.

Numeric Window



NO.	FUNCTION	ELEMENT	ORDER	WTID	DATA	UNITS
1	Urms	1	---------	1	3.360524	V
2	Umn	1	---------	1	3.360745	V
3	Udc	1	---------	1	-0.008027	V
4	Urmn	1	---------	1	3.025733	V
5	Uac	1	---------	1	3.360515	V
6	CfU	1	---------	1	0.000000	
7	Irms	1	---------	1	352.937103	A
8	Imn	1	---------	1	391.437622	A
9	Idc	1	---------	1	-19.362360	A
10	Irmn	1	---------	1	352.417664	A
11	Iac	1	---------	1	352.405579	A
12	CfI	1	---------	1	0.000000	

Function

Displays the functions.

For the function symbols and definitions, see section 1.1, “Items That This Instrument Can Measure” in the PX User’s Manual IM PX8000-01EN.

Element

Displays the elements.

Order

Displays the harmonic order of numeric data when the harmonic data display is set to ON (see section 5.1).

“-----” is displayed when the harmonic data display is set to OFF or for functions that harmonic orders cannot be specified.

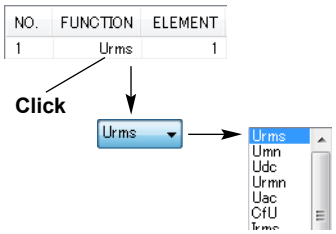
WTID

Displays the ID of the PX from which data was collected.

Setting the Display Items

You can change the function, element, and harmonic order display items by following the procedure below. You cannot change them while measured data collection is in progress.
You can also set the display items using the detail setting dialog box, which is described on the next page.

1. Click a Function, Element, Order, or WT ID cell. A list box appears.
2. Select the item you want to display.



Note

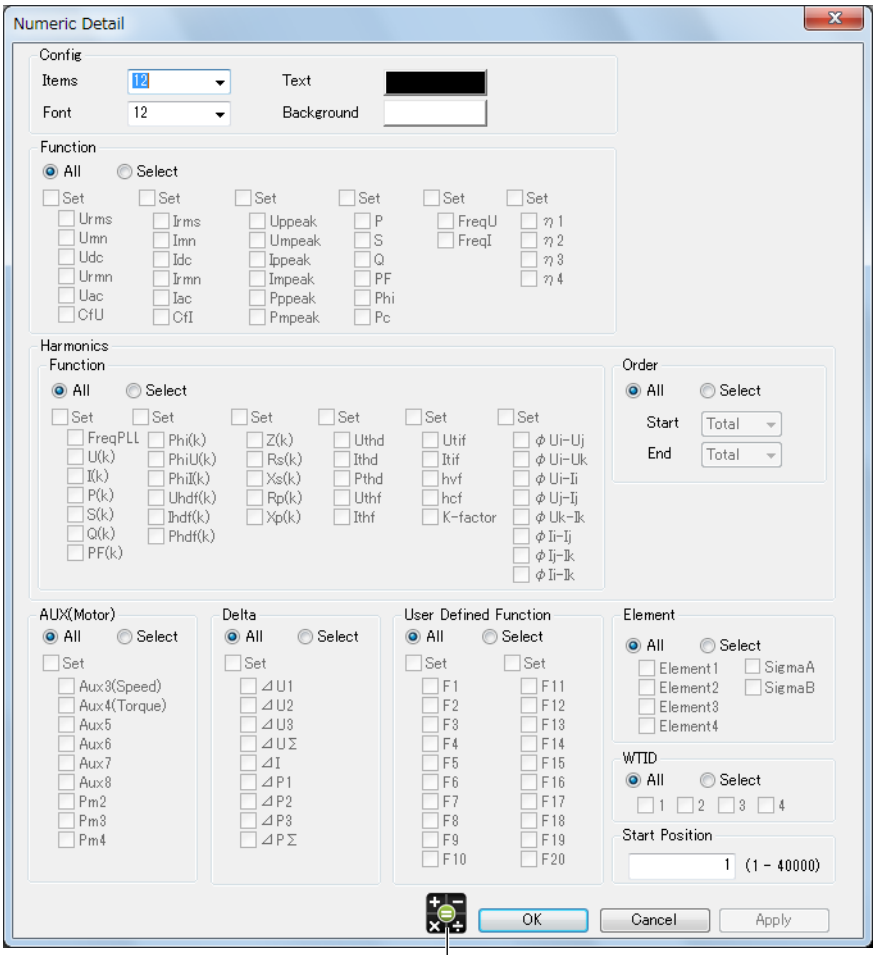
WTID is fixed at 1. You cannot change it.

Detail Setting Dialog Box

You can change the function, element, and harmonic order display items.

A detail setting dialog box appears when you perform any of the following operations.

- Right-click the numeric window.
- Click the window detail setting button when the numeric window is selected (active).
- Select Numeric in the shortcut menu of the window detail setting button.



Recalculate button

Click here to apply the settings in the detail setting dialog box to the display and show the recalculated numeric data.

Items

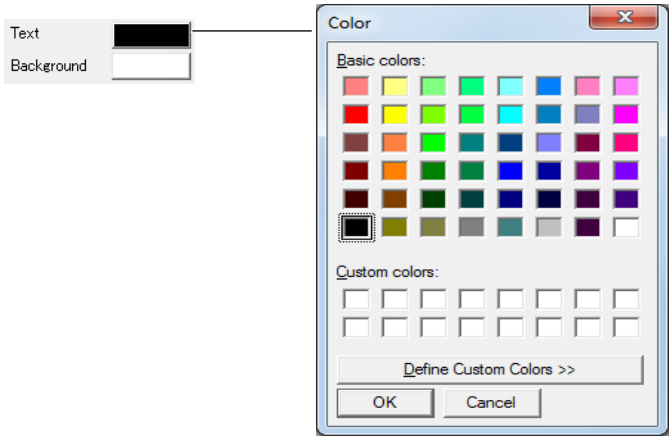
Select the number of numeric data items to display from 12, 24, 48, 200, 400, 800, 1000, 2000, 4000, 8000, 10000, 20000, and 40000.

Font

Set the font size to a value between 6 to 40 in steps of 2.

Text and Background

Select the text and background colors.



Function, Harmonics, AUX(Motor), Delta, and User Defined Function

- If you select **All**, all functions will be selected. The check boxes of each function will remain unchanged and will appear dimmed.
- If you select **Select**, you can select functions individually.
- If you select a **Set** check box, all the check boxes of the functions in the column will be selected. If you clear it, all the check boxes of functions will be cleared.

Harmonics

- If you select **All**, all harmonic orders will be selected. The harmonic selection box conditions will remain unchanged and will appear dimmed.
- If you select **Select**, you can set the start and end harmonic orders.

Element

- If you select **All**, all elements will be selected. The check boxes of each element will remain unchanged and will appear dimmed.
- If you select **Select**, you can select elements individually.

Note

Functions, elements, and harmonic orders that cannot be selected depending on the PX specifications or options will be unavailable.

WTID

The All button is always selected. The Select button is disabled.

Start Position

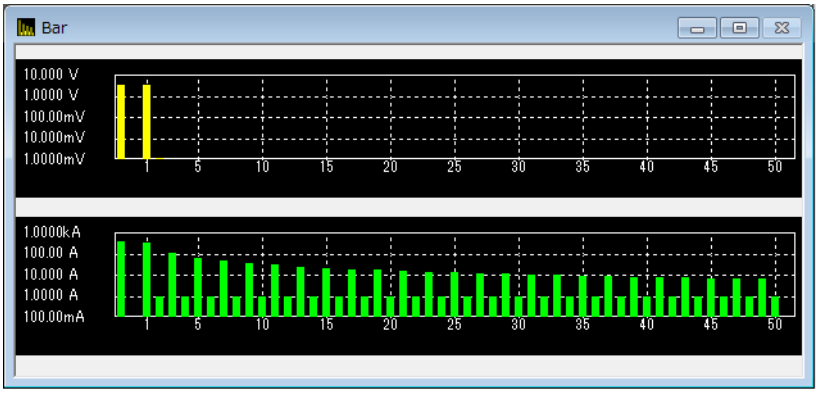
Set the line number in the numeric data display that you want to start applying the above settings to.
Selectable range: 1 to the value specified in the Items box.

Applying the Settings

Click **OK** or **Apply** to apply the settings to the numeric display. Items that cannot be set are not displayed (skipped).

7.3 Bar Graph Display

You can select a wiring unit to display vectors of the phase differences and amplitudes (rms values) of the fundamental signals, U(1) and I(1), in each element in the unit. The positive vertical axis is set to zero (angle zero), and the vector of each input signal is displayed.
The bar graph window can be displayed when the PX is equipped with the harmonic measurement option (/G5).



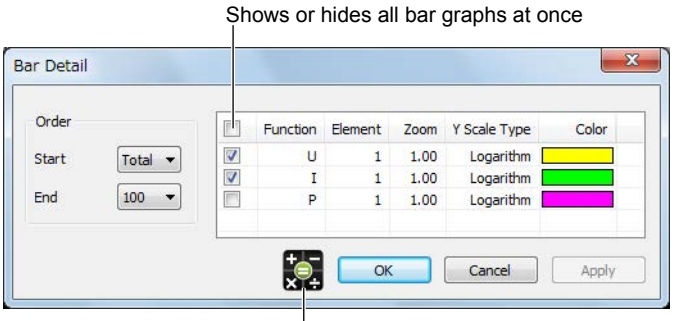
Note

When logarithmic coordinates are used (Log Scale), if a value is negative, its absolute value is displayed with a red bar graph.

Detail Setting Dialog Box

A detail setting dialog box appears when you perform any of the following operations.

- Right-click the bar graph window.
- Click the window detail setting button when the bar graph window is selected (active).
- Select Bar in the shortcut menu of the window detail setting button.



Recalculate button
Click here to apply the settings in the detail setting dialog box to the display and show the recalculated numeric data.

Start and End

Select the harmonic order of the numeric data to display.

- Start harmonic order: Total, DC, 1 to 490
- End harmonic order: 10 to 500

The difference between the start and end harmonic orders must at least be 10.

Function

Select the bar graph to display using the check boxes.
The bar graph is displayed for the combination of the functions and elements that you select.
Up to three bar graphs can be displayed.

Element

Select which element to display the bar graph of.

1. Click an Element cell. An element selection box appears.
2. Select an element.

Zoom

Select the vertical zoom factor of the bar graph.

1. Click a Zoom cell. A zoom factor selection box appears.
2. Set the vertical zoom factor.

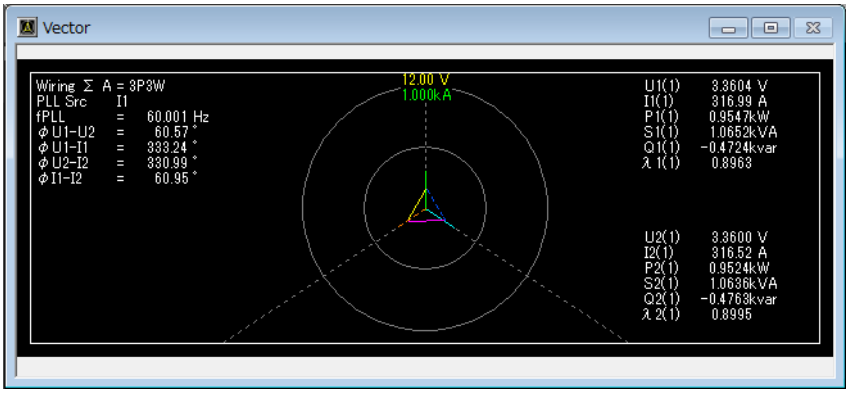
Y Scale Type

The vertical scale of the bar graph is automatically set depending on the function.

Function	Y Scale Type
U, I, P, S, Q	Log
λ, φ, φU, φI, Z, Rs, Xs, Rp, Xp	Linear

7.4 Vector Display

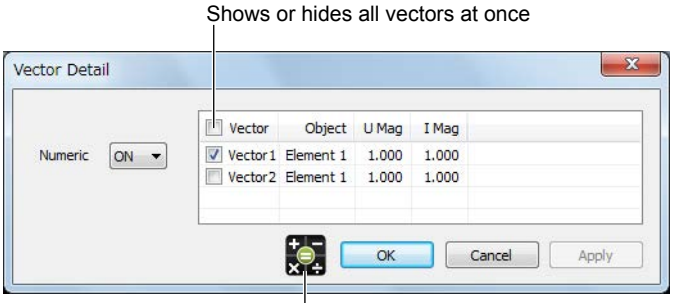
You can select a wiring unit to display vectors of the phase differences and amplitudes (rms values) of the fundamental signals, U(1) and I(1), in each element in the unit. The positive vertical axis is set to zero (angle zero), and the vector of each input signal is displayed.
The bar graph window can be displayed when the PX is equipped with the harmonic measurement option (/G5).



Detail Setting Dialog Box

A detail setting dialog box appears when you perform any of the following operations.

- Right-click the vector window.
- Click the window detail setting button when the vector window is selected (active).
- Select Vector in the shortcut menu of the window detail setting button.



Recalculate button
Click here to apply the settings in the detail setting dialog box to the display and show the recalculated numeric data.

Numeric

Select whether to show numeric data (on or off).

Object

Select the element or wiring unit to display. The available options vary depending on the elements of the waveform data (WPF file) in analysis.

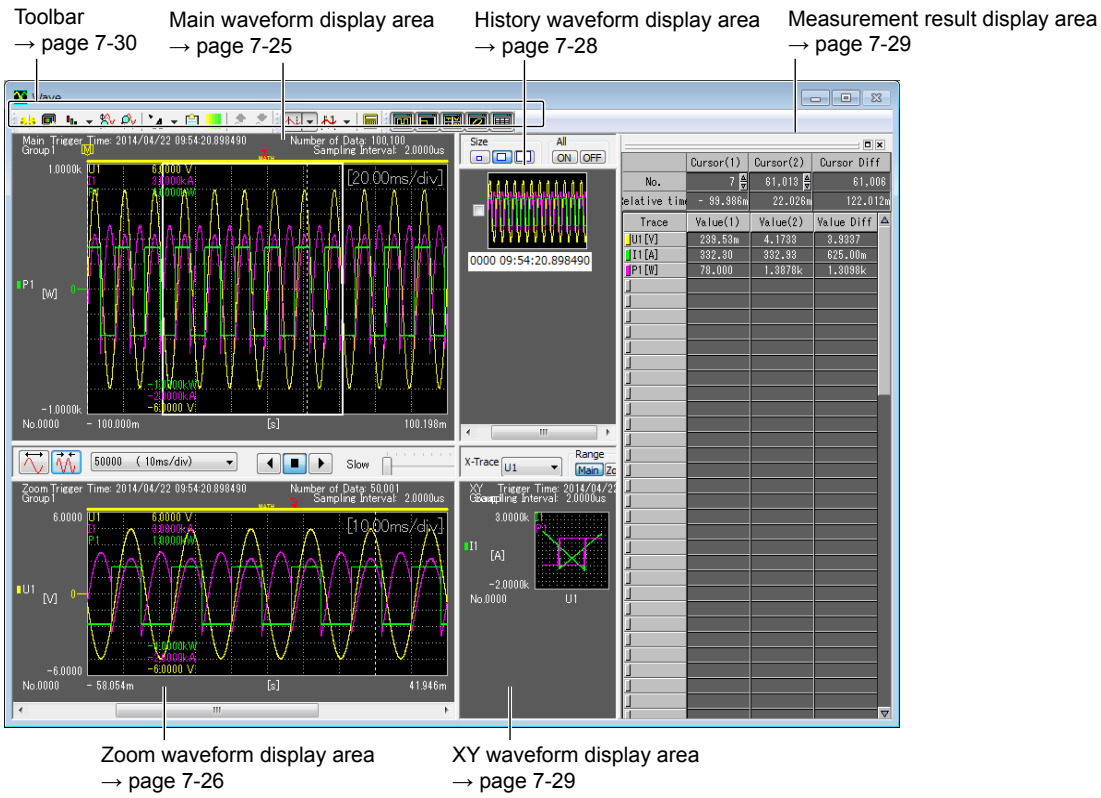
U Mag/I Mag

Set the zoom factor of fundamental wave U(1) and I(1). When you zoom the vectors, the value that indicates the size of the vector display's peripheral circle changes according to the zoom factor.

7.5 Waveform Display

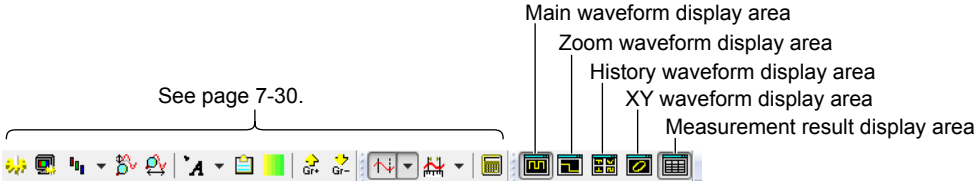
Displays the waveform data that has been collected from the PX.
The waveform window has the following five display areas.

- Main waveform display area: The loaded waveform data is displayed in its entirety.
- Zoom waveform display area: A section of the loaded waveform data is displayed.
- History waveform display area: All records of waveform data collected numerous times using the trigger single(N) mode or history function are displayed.
- XY waveform display area: An X-Y display is shown using the channel (trace name) displayed in the main or zoom waveform display area.
- Measurement result display area: Measured values of cursor measurement, auto measurement, math measurement, and so on are displayed numerically.



Showing and Hiding Display Areas

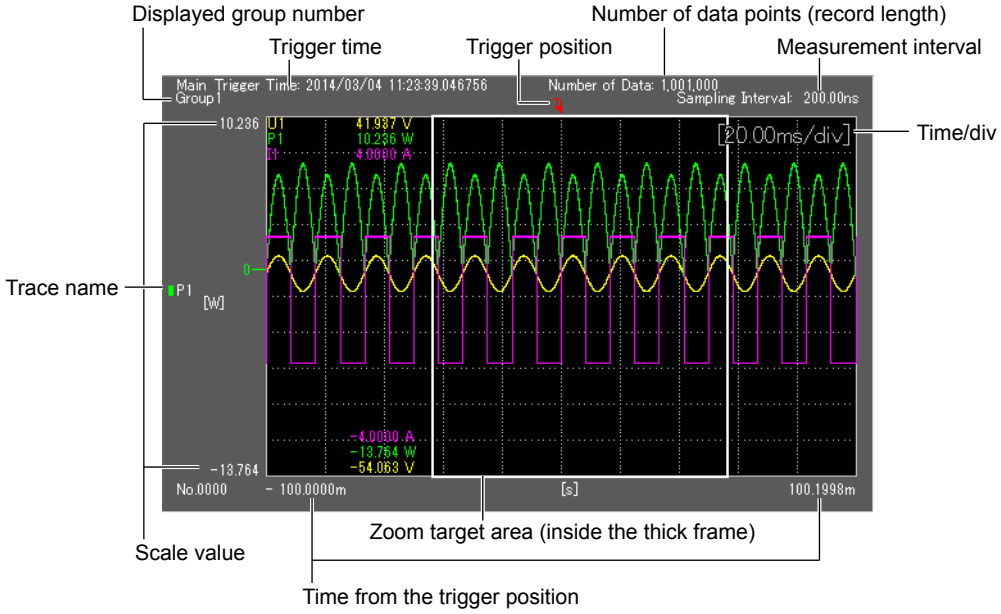
Click a display area button on the toolbar to show or hide the corresponding area.



Display Area Size

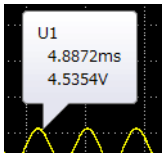
You can drag the boundary of display area to change its size.

Main Waveform Display Area

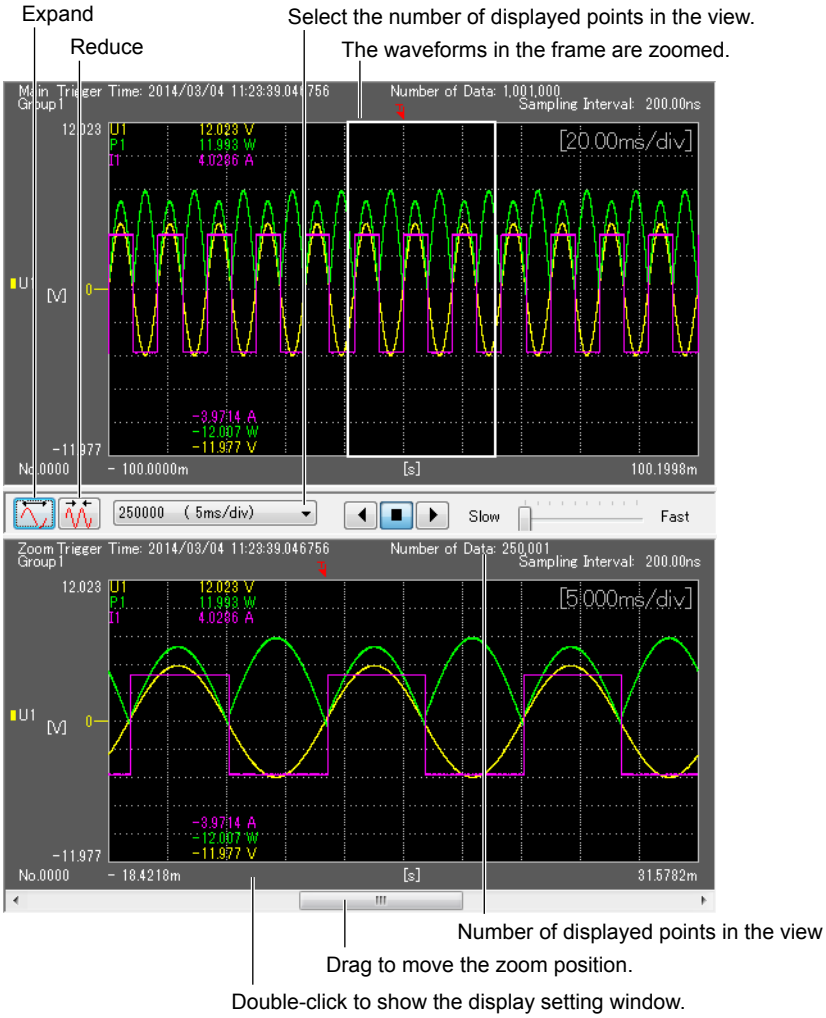


Tooltip display

If you leave the pointer on a waveform for about 1 second, the information about that point appears. For example, in the case of a voltage waveform, the time and voltage will appear. Information is displayed for main and zoom waveforms. It is not displayed for history or XY waveforms.



Zoom Waveform Display Area



Maximum Zoom Factor

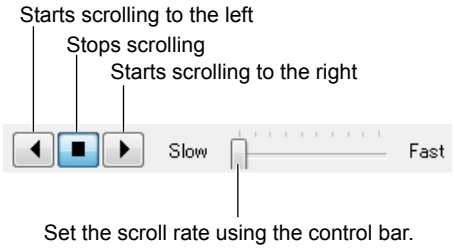
The maximum zoom factor varies depending on the displayed data. Zooming is not possible if it would cause the number of displayed points to be 10 or less.

Moving the Zoom Position

You can move the zoom position using one of the following three methods.

- Dragging
  Drag the thick frame in the main waveform display area. You can use the scroll function to automatically move the zoom position.
- Using the display setting window
  Double-click the bottom edge of the zoom waveform display area to display a display setting window. Enter a value in the zoom start position box, and click OK.
- Page scrolling
  You can drag the scroll box at the bottom of the zoom waveform display area.

Scrolling the Zoom Waveform



Note

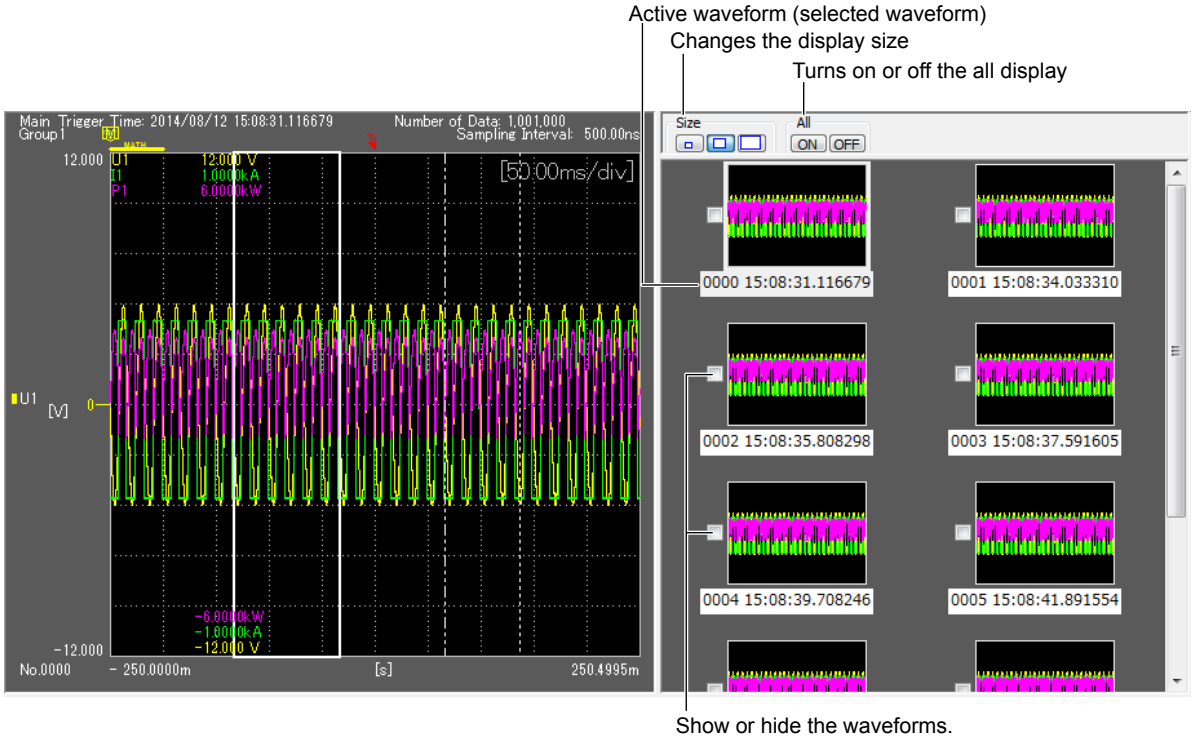
Scrolling is not possible while waveform parameters are being measured or while computation is progress.

Specifying the Zoom Position

To specify the zoom position in the display setting dialog box, enter the value of the left edge of the range you want to zoom. The values that you can specify vary depending on the zoom factor and the displayed waveform.

- By entering the data point
  Enter the data point as an integer to display from that data point.
- By entering the time
  Enter a real number in relative time display mode to display from that point in time. You can use the following unit prefix: m (10^{-3}), u (10^{-6}), n (10^{-9}), p (10^{-12}).
  Examples:
  1.23 → 1.23 s
  1.23 ms → 1.23 ms
  1.23E-3 → 1.23 ms
  0.00123 → 1.23 ms

History Waveform Display Area



Selecting the Displayed Waveform

ALL ON

All history waveforms are displayed in the main waveform display area.

ALL OFF

Only the active waveform is displayed in the main waveform display area.

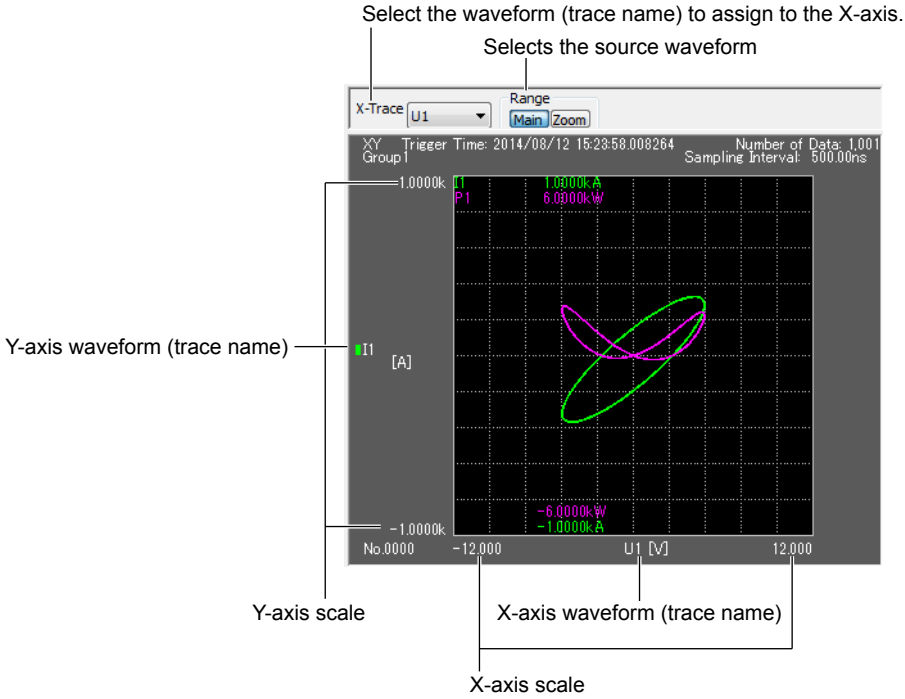
Selecting the check box next to the history waveform shows the corresponding waveform in the main waveform display area.

Selecting the Active Waveform

If you click the history waveform that you want to activate, the waveform is enclosed in a blue frame, the history number is highlighted, and the waveform is displayed in the main waveform display area. If several waveforms are displayed, the active waveform will appear brighter than the other waveforms.

- Cursor measurement is performed on the active waveform.
- The number of the active waveform appears highlighted in the history waveform display area.

X-Y Waveform Display Area



Selecting the Source Waveform

Click Main under Range to display an X-Y waveform using the waveform displayed in the main waveform display area. Click Zoom to display an X-Y waveform using the waveform displayed in the zoom waveform display area.

Setting the X-Axis

From the X-Trace list, select the waveform to assign to the X-axis (trace name). The Y-axis is assigned with a waveform other than that assigned to the X-axis.

Overlaying on the X-Y waveform

The active waveform in the history waveform window can be overlaid on the X-Y waveform display area. If Range is set to Main, the waveform in the main waveform display area is overlaid. If Range is set to Zoom, the waveform in the zoom waveform display area is overlaid.

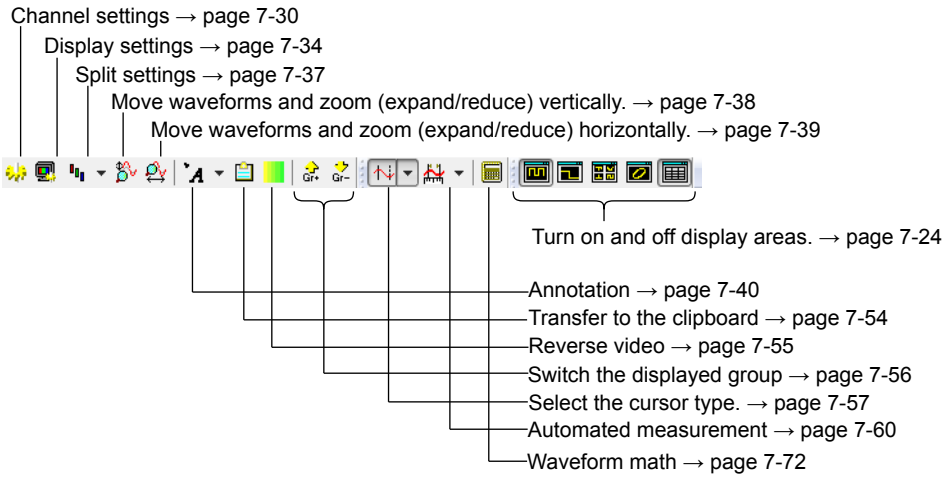
Note

X-Y waveform is displayed using the P-P data shown in the main, zoom, or history waveform display area.

Measurement Result Display Area

Cursor measurement results are displayed in the measurement result area. For details, see “Cursor Measurement” (page 7-57).

Toolbar



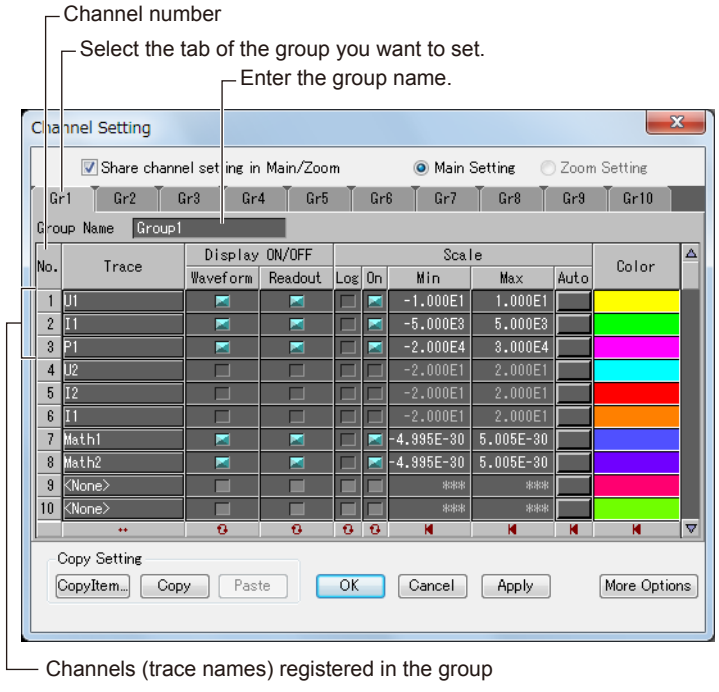
Configuring Channels

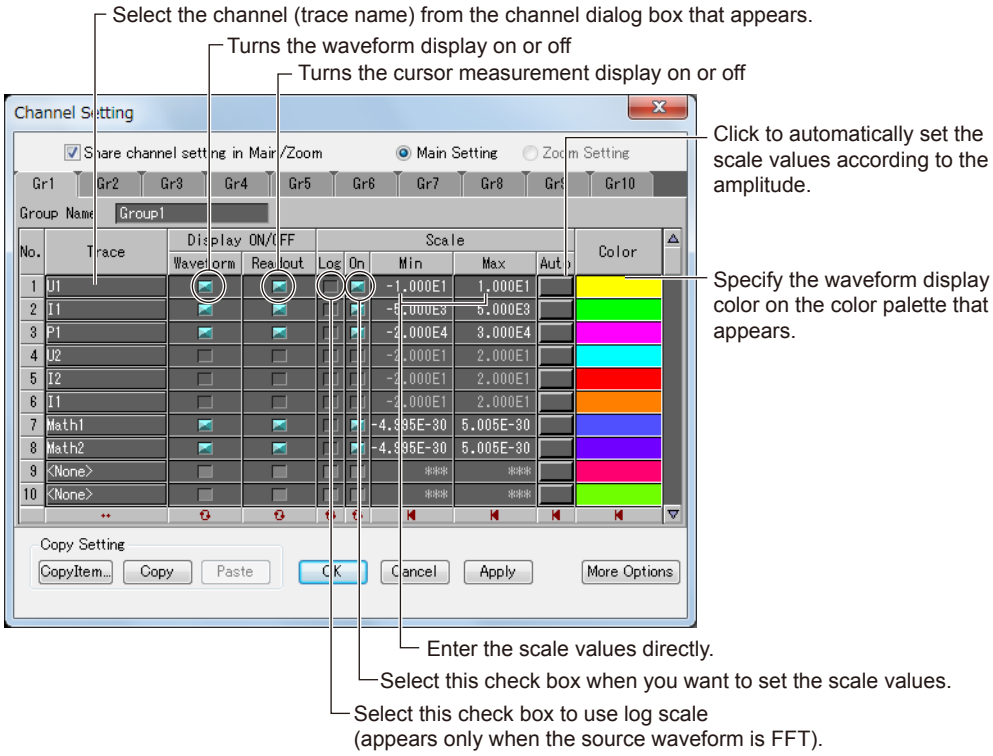
Click to display a channel setting dialog box. For each channel, set the waveform display conditions, groups, and so on.

Setting Groups

You can register channels (trace names) in groups. Channels (trace names) can be divided into up to 10 groups. Displayed waveforms are set in units of these groups. The maximum number of channels that can be registered in a single group is 90.

For the procedure to change the displayed group, see page 7-56.





Manually Setting the Waveform Mapping

Click **Detail setting** to expand the dialog box.

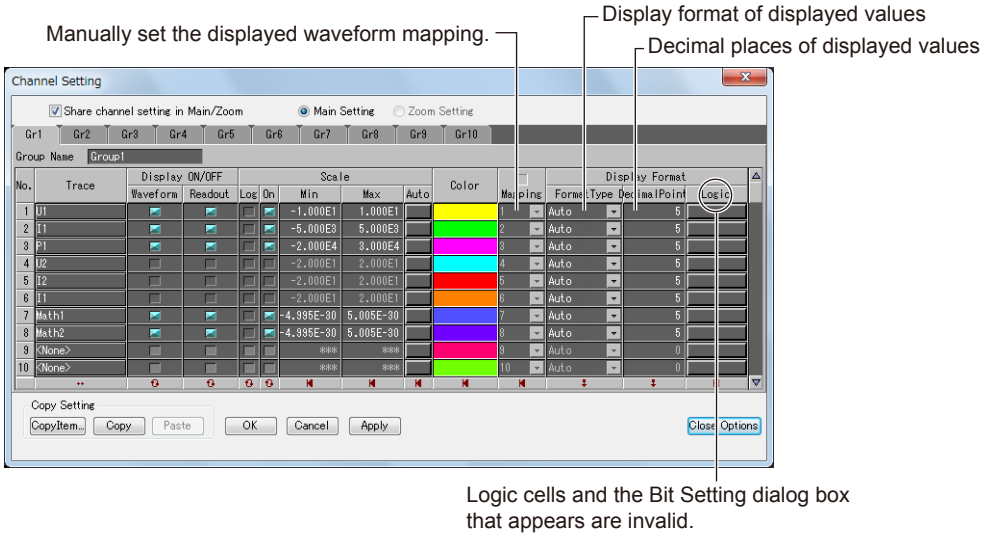
The main waveform display area can be divided into sub areas. For each channel number, you can specify in which sub area to display the waveform using mapping numbers ranging from 1 to 16.

Select the **Mapping** check box, and then select the mapping number from the drop-down menu. If you clear the Mapping check box, the manual mappings are not applied.

Setting the Display Format

Click Detail setting to expand the dialog box.

For each channel number, set the display format and the number of displayed digits.

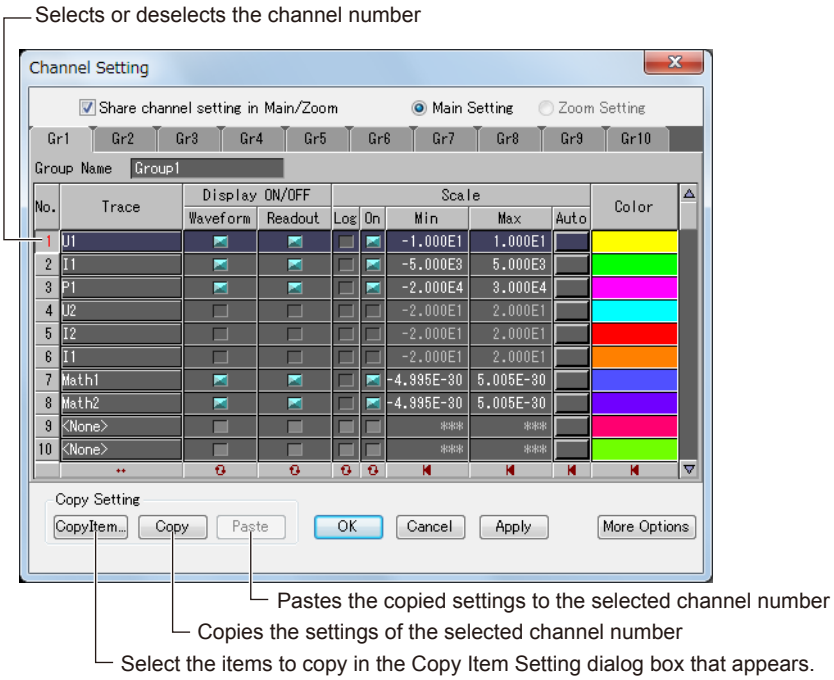


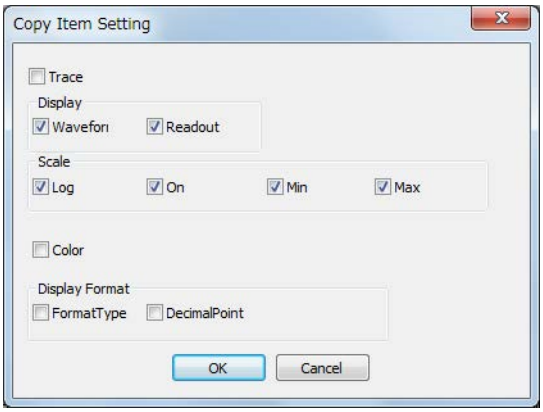
Shared Channel (Trace Name) Settings

Setup parameters are shared between the main waveform display area and zoom waveform display area. Cursor measurement values use the settings of the main waveform display. To use separate settings in each window, clear the **Share channel setting in Main/Zoom** check box. Select **Main Setting** or **Zoom Setting**, and then set the channel (trace name) settings.

Copying and Pasting Settings

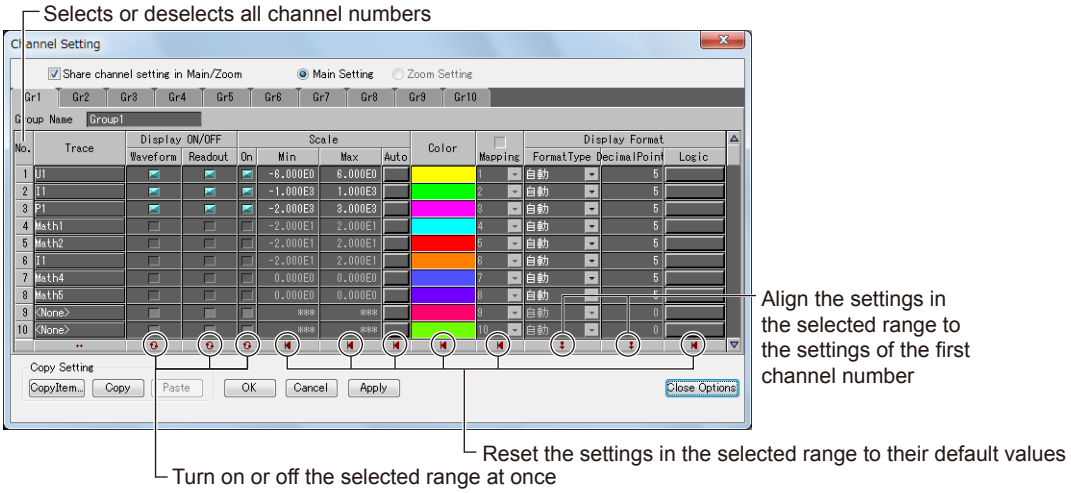
You can copy the settings of the selected channel (trace) and paste them to another channel. You can specify in advance which items to copy in the Copy Item Setting dialog box that appears by clicking **CopyItem**. This dialog box also appears when you paste, so you can remove unneeded items then.





Collective Operation in the Window

The channel setting dialog box has buttons that you can use to select and change items collectively.



Verifying before Updating

If you click Apply after changing some settings, the settings are applied immediately to the display setting window.

Configuring the Display

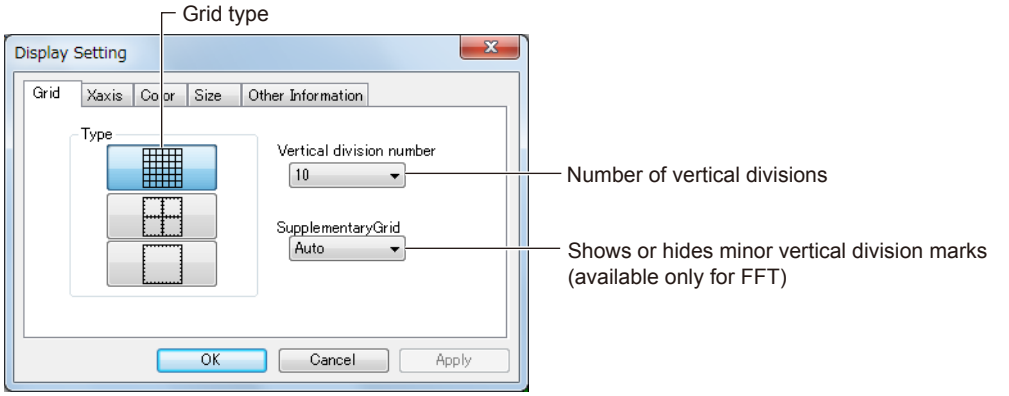
Click to display a display setting dialog box. Click the Graticule, Horizontal Axis, Color, Size, and Other information tabs, and configure the display settings.

Note

You can also double-click the scale display area of the horizontal axis to display the display setting dialog box.

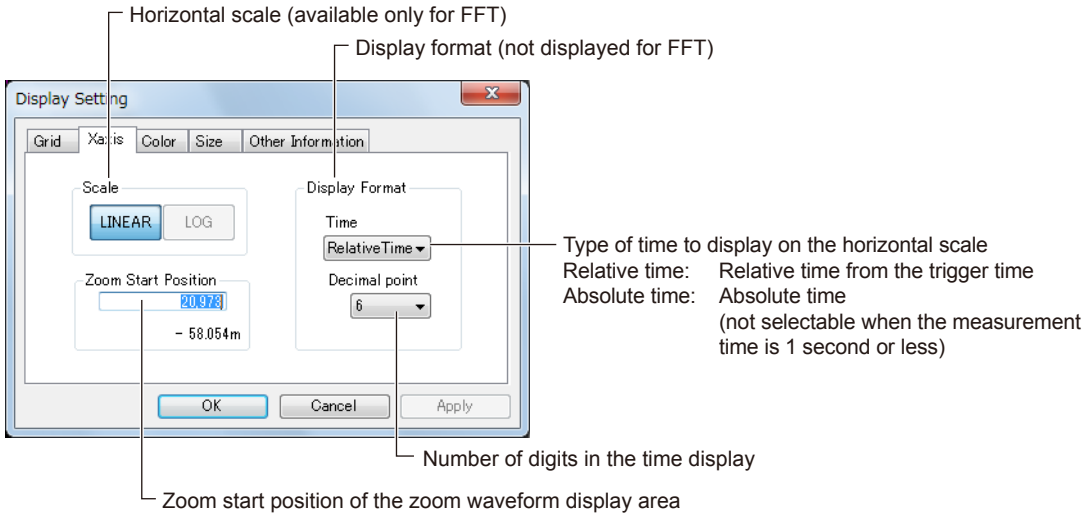
Setting the Grid

Click the **Grid** tab.



Setting the Horizontal Axis

Click the **Xaxis** tab.



Zoom Start Position

If the time display is relative time, the setting varies depending on whether you enter an integer or a real number.

Integer input:

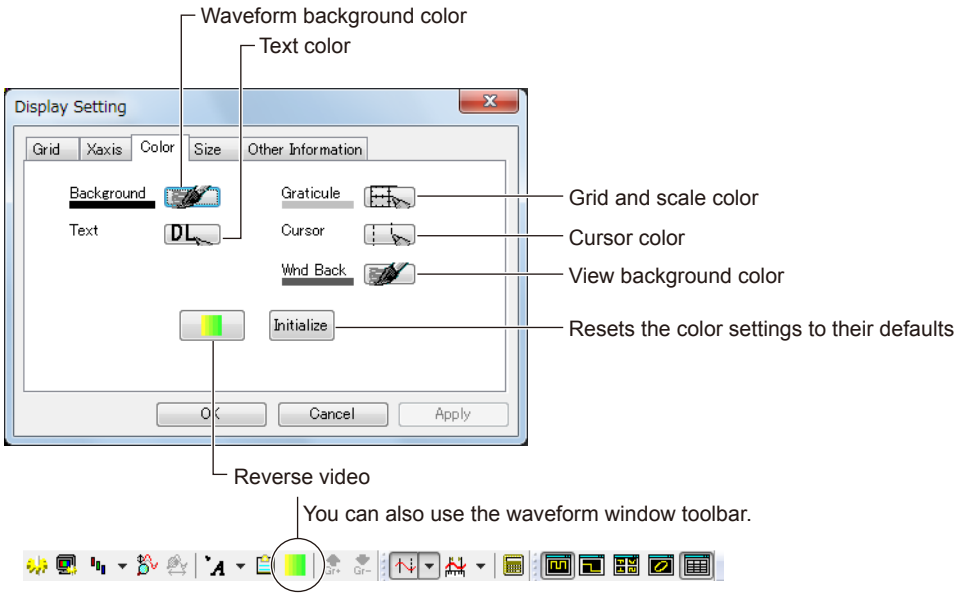
Start data position

Real number input:

Start time (you can use the m, n, u, and P unit prefixes)

Set the display colors.

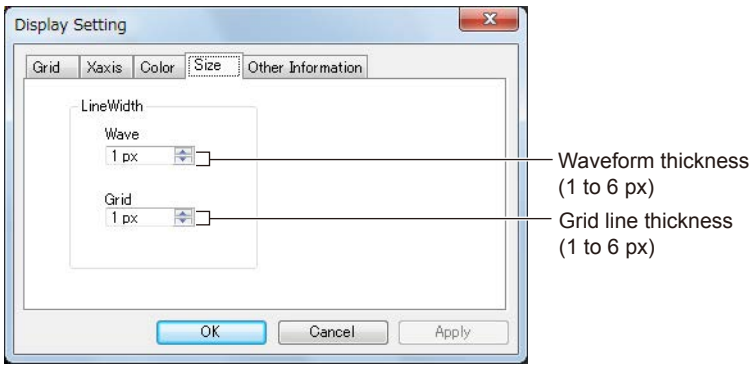
Click the **Color** tab.



To change the waveform color, use the channel setting dialog box. For details, see page 7-30.

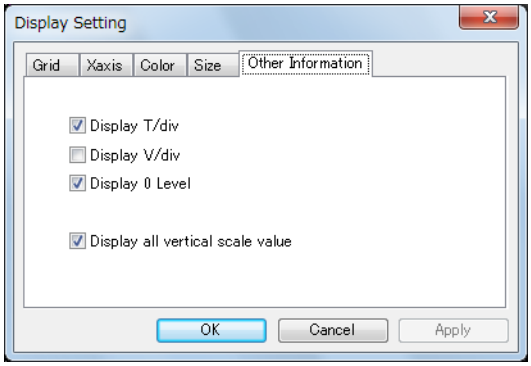
Setting the Waveform Thickness and Grid Line Thickness

Click the **Size** tab.

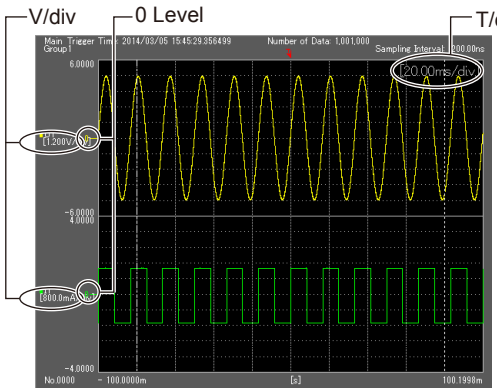


Displaying Scale Information in the Waveform Display Area

Click the **Other Information** tab.



T/div, V/div, 0 Level



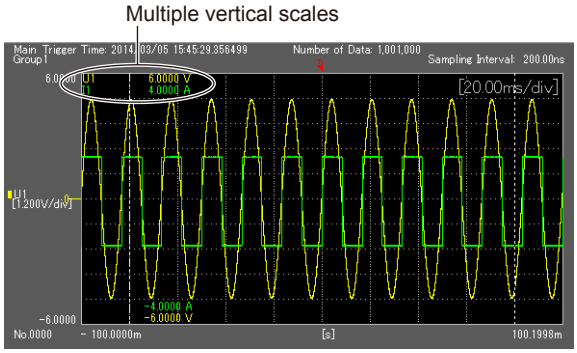
You can change the T/div text size.
Click the T/div value, and then drag any of the four corners of the displayed frame.

(You cannot change this in annotation mode. For details on annotations, see page 7-40.)

If several waveforms are displayed in the waveform display area, the V/div and 0 Level of the active waveform are displayed.

Displaying Multiple Vertical Scales

When several waveforms are displayed in the waveform display area, you can display the vertical axis range of each waveform.



Note

If there is only one waveform in the waveform display area, multiple vertical axes are not displayed.

Verifying the Changed Settings

If you click Apply after changing some settings, the settings are applied immediately to the waveform display while keeping the display setting dialog box open.

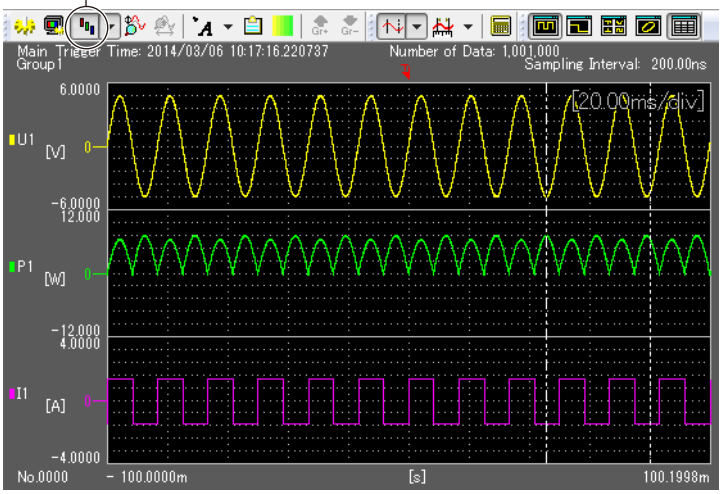
Note

Supplementary Grid on the Grid tab and Scale on the Xaxis tab can be set only when the horizontal axis unit is Hz for an FFT waveform.

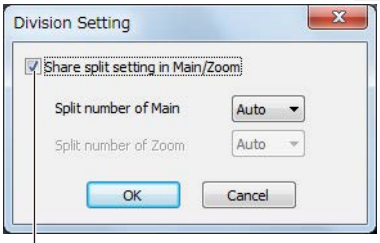
Split Display

Click  to enable or disable split display.

Turns on or off the split display



Clicking the arrow on the right of  displays a split display setting dialog box.



Select this check box to share settings between the main waveform display area and zoom waveform display area.

Setting the Number of Divisions

The number of divisions in the main waveform display area and zoom waveform display area can be set to Auto or a number between 1 to 16. If set to Auto, the area is divided by the number of display source waveforms.

Waveform Mapping

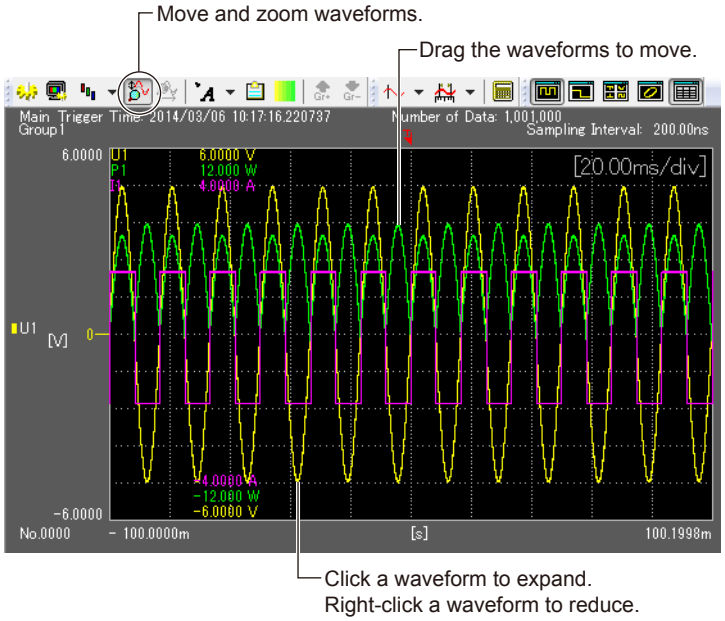
When the window is split, the waveforms are mapped to the split areas in ascending order by channel number. You can also specify how waveforms are mapped. For the procedure to map the waveforms as you like, see page 7-31.

Splitting the History Waveform Display Area

If split display is enabled, the history waveform display area is split under the same conditions as the main waveform display area.

Moving Waveforms and Zooming (Expanding/Reducing) Vertically

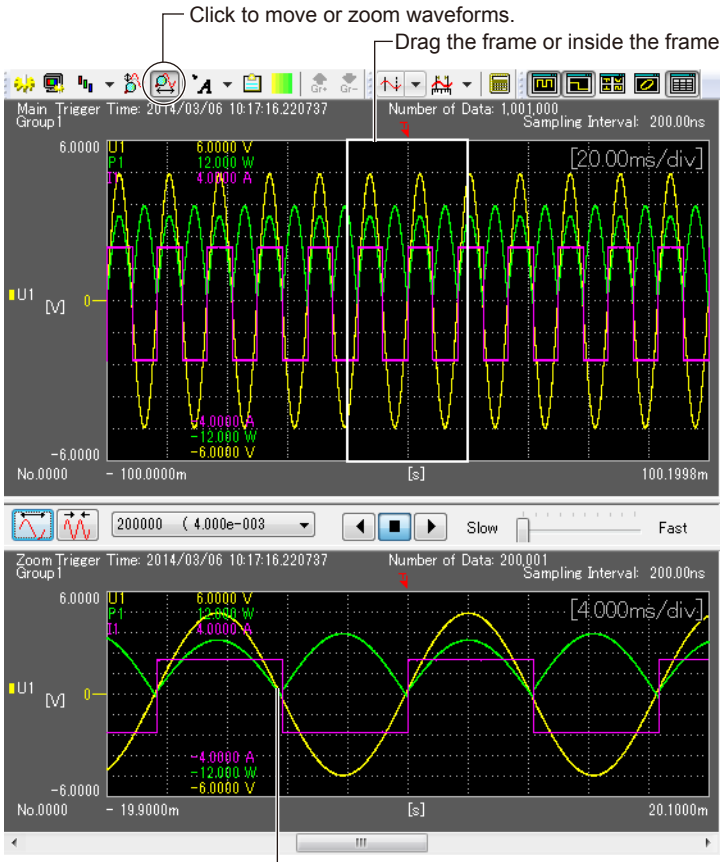
1. Click .
2. Drag the waveform you want to move.
3. Click the waveform you want to zoom. The selected waveform expands relative to the clicked position. Right-click to reduce the waveform relative to the clicked position.



You can move and zoom waveforms in the main waveform display area and zoom waveform display area.

Moving Waveforms and Zooming (Expanding/Reducing) Horizontally

1. Click .
2. Drag the zoom target area (the thick frame or within the thick frame) in the main waveform display area, or drag the zoom waveform display area.
3. Click a point in the main waveform display area or zoom waveform display area to expand the zoom display waveform relative to that point. Right-click to reduce the waveform relative to the clicked position.



You can move and zoom waveforms in the main waveform display area and zoom waveform display area.

Note

is available only when the zoom waveform display area is showing. For instructions on how to display the zoom waveform display area, see page 7-24.

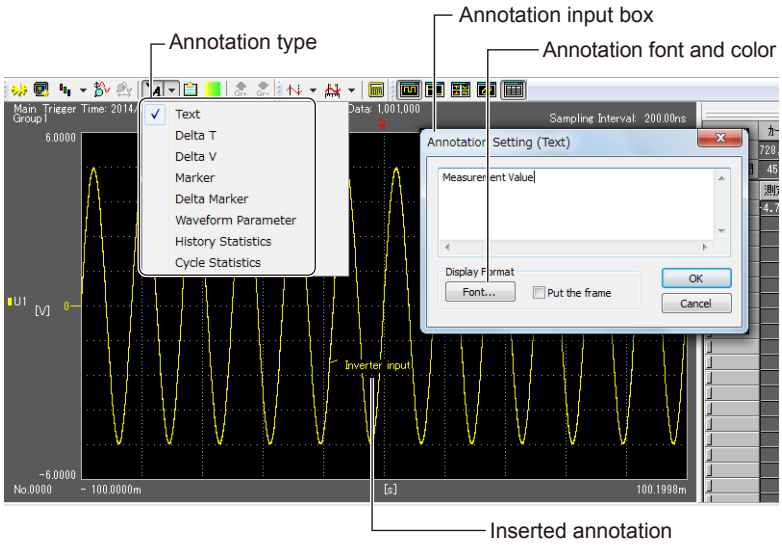
Annotations

You can insert annotations in the waveform view.

1. Click A to enable or disable Annotation mode.
2. Click the arrow on the right of A to select the annotation type.
   The following eight annotation types are available.
   - Text (see page 7-42)
   - Delta T (see page 7-43)
   - Delta V (see page 7-44)
   - Marker (see page 7-45)
   - Delta Marker (see page 7-46)
   - Waveform Parameter (see page 7-48)
   - History Statistics (see page 7-50)
   - Cycle Statistics (see page 7-52)

   Depending on the annotation that you select, the toolbar and the pointer displayed in the waveform view vary.
3. Depending on the annotation that you selected, perform the appropriate operations to insert the annotation.

If an annotation is selected in Annotation mode and you click an annotation of another type that is already inserted, the annotation type changes to that type.

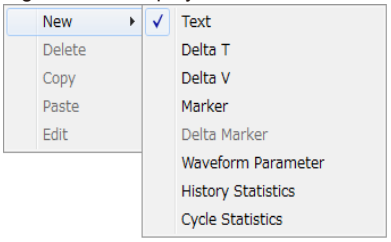


Inserting Annotations Using the (Right-Click) Shortcut Menu

When in Annotation mode, a shortcut menu is displayed when any of the following operations is carried out. Click New and then the type of annotation to insert the annotation in the screen.

- **Shortcut Menu That Appears When You Right-click in the Waveform View**

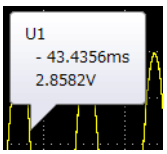
Right-click to display a shortcut menu.



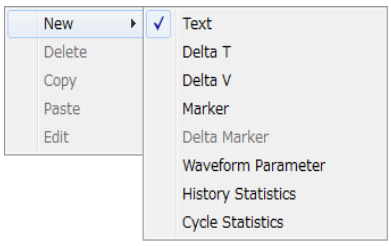
Marker and Delta Marker are not available.

- **Shortcut Menu That Appears When You Right-click on a Waveform**

Move the pointer over the waveform to display the information of that point.



Right-click to display a shortcut menu.



Delta Marker is not available.

Copying and Pasting Annotations

Click the annotation you want to copy to select it, and then right-click to display a shortcut menu. Then, click **Copy**. Right-click the point where you want to paste the annotation, and click **Paste** on the shortcut menu that appears.

Editing an Annotation

Click the annotation you want to edit to select it, and then right-click to display a shortcut menu. Then, click **Edit**. The corresponding annotation dialog box appears. Edit the properties, and click **OK** or **Apply**.

Deleting an Annotation

- Click the annotation you want to delete to select it, and press the **Delete** key.
- Click the annotation you want to delete to select it, and then right-click to display a shortcut menu. Then, click **Delete**.

Annotation Types (Linked and unlinked annotations)

As described earlier, there are eight types of annotations. These annotation can be divided into linked annotations and unlinked annotations.

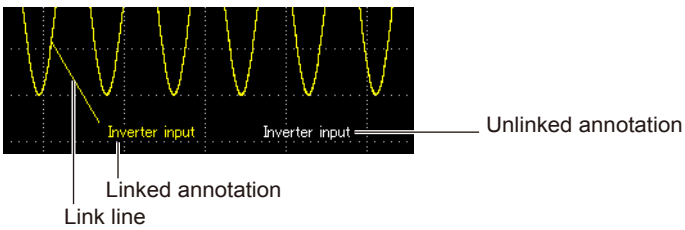
Linked Annotations

- Linked annotations are linked to waveforms.
- You can insert a linked annotation for each waveform. Even if you change the displayed group, these annotations remain linked to their corresponding waveforms.
- Delta T, Delta V, Marker, Delta Marker, Waveform Parameter, History Statistics, and Cycle Statistics are linked annotations.
- Text annotations when they are linked to waveforms are connected with link lines.

Unlinked Annotations

- Unlinked annotations are not linked to waveforms.
- Text annotations that are not connected by link lines are unlinked annotations. Their positions change depending on the window size.

Text annotation example

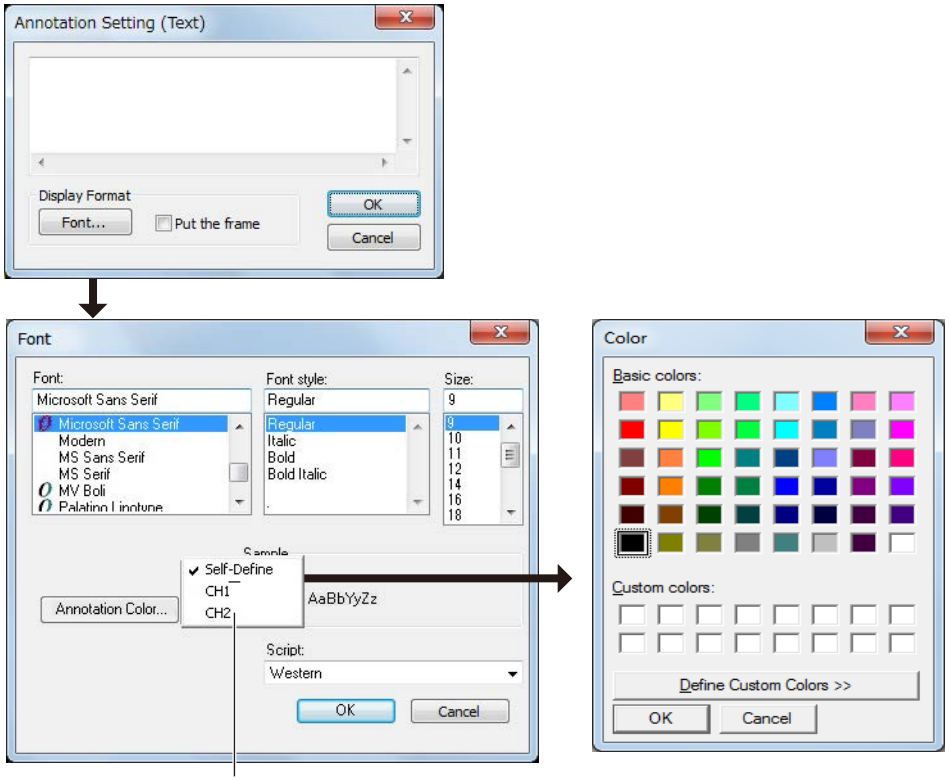


Display Areas in Which Annotations Can Be Inserted

- Text, Delta T, and Delta V annotations can be inserted in the main waveform display area, zoom waveform display area, and XY waveform display area.
- Marker, Delta Marker, Waveform Parameter, History Statistics, and Cycle Statistics annotations can be inserted in the main waveform display area and zoom waveform display area.
- Only Delta T annotations can be inserted for logic waveforms.

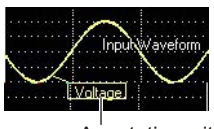
Text Pointer Icon: A

If you select Text annotation and double-click in the waveform view or a waveform, the following setting dialog box appears. You can set the display format of the annotation.
If you double-clicked a waveform, an annotation linked to the waveform is inserted.
You can set the font type and color.



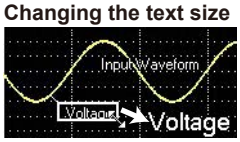
You can select the color assigned to the displayed waveform group.

Display Example



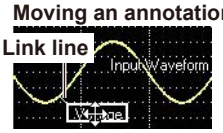
Annotation with a frame

Changing the text size



When you select an annotation, a frame appears.
Drag one of the four corners of the frame.

Moving an annotation

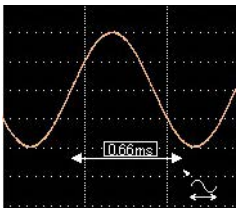


Select the annotation and then drag.
If the linked point flows outside of the waveform view when zooming or changing the scale, the link line disappears.

Delta T Pointer Icon:

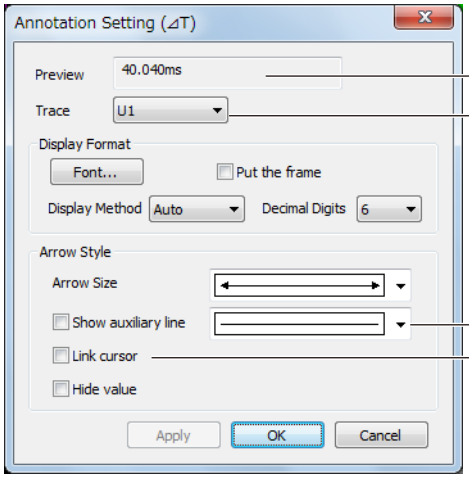
When you select Delta T annotation and perform procedure a or b below in the waveform view, the X value is displayed.

a. Drag horizontally.



b. Double-click to display the dialog box below. You can set the trace (waveform) that the annotation is linked to, the display format, the arrow style, and other items.

The measurement range of the new X value displayed when you double-click is 2 div.



Preview of the value to be displayed (You cannot edit this.)

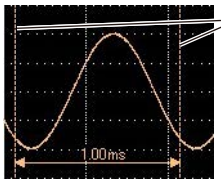
Trace (waveform) to link the annotation to.

Thickness of the auxiliary lines that pass through the arrow tips

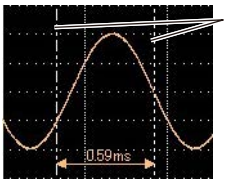
Display a Delta T annotation between vertical cursors.

Display Example

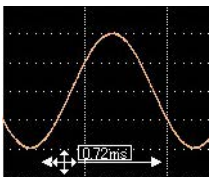
Delta T annotation with auxiliary lines



Delta T annotation between vertical cursors

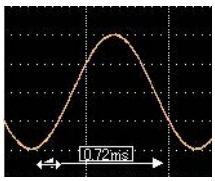


Moving a Delta T annotation



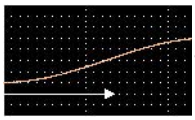
Select an arrow and drag. To only move the value, you can move it in the same manner as with a text annotation.

Changing the length of an arrow line



Select an arrow tip and drag. The value is updated according to the length of the arrow line.

If the arrow flows outside of the waveform view



If an arrow flows outside of the waveform view when zooming or changing the scale, the value is not displayed.

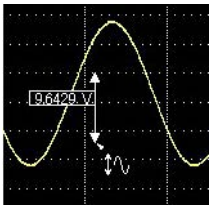
Changing the text size

Same procedure as for text annotations.

Delta V Pointer Icon:

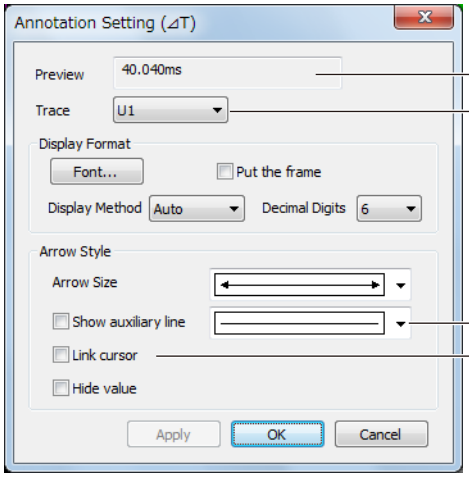
When you select Delta V annotation and perform procedure a or b below in the waveform view, the Y value is displayed.

a. Drag vertically.



b. Double-click to display the dialog box below. You can set the trace (waveform) that the annotation is linked to, the display format, the arrow style, and other items.

The measurement range of the new Y value displayed when you double-click is 2 div.



Preview of the value to be displayed (You cannot edit this.)

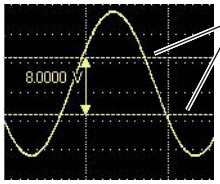
Trace (waveform) to link the annotation to.

Thickness of the auxiliary lines that pass through the arrow tips

Display a Delta V annotation between horizontal cursors.

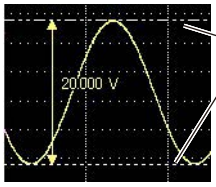
Display Example

Delta V annotation with auxiliary lines



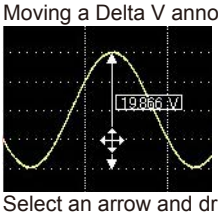
Auxiliary lines

Delta V annotation between horizontal cursors



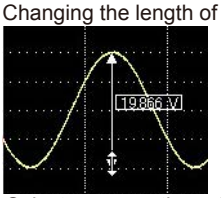
Horizontal cursors

Moving a Delta V annotation



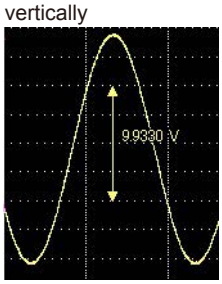
Select an arrow and drag. To only move the value, you can move it in the same manner as with a text annotation.

Changing the length of an arrow line



Select an arrow tip and drag. The value is updated according to the length of the arrow line.

When the waveform is zoomed vertically



The length of the arrow line does not change even if the waveform is zoomed. The value is updated according to the zoom factor.

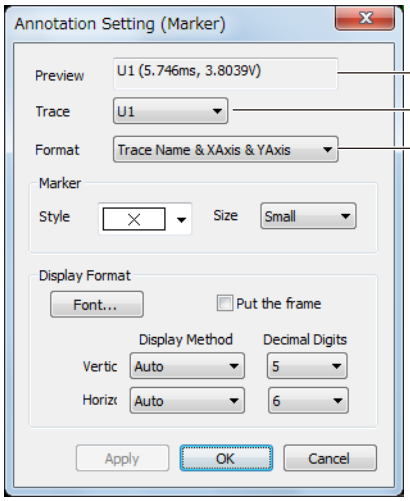
Changing the text size

Same procedure as for text annotations.

Marker Pointer Icon:

A marker annotation displays the trace, X value, and Y value at the double-clicked point.
If you select Marker annotation and double-click a waveform, the following setting dialog box appears.

- You can set the trace (waveform) that the annotation is linked to, the format, the marker shape, and other items.
- There are four marker shapes. Each time a marker annotation is inserted, a shape different from the previous one is used.

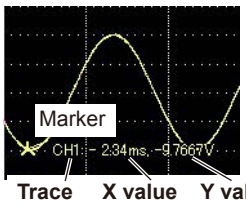


Preview the annotation to be displayed (You cannot edit this.)

Trace (waveform) to link the annotation to.

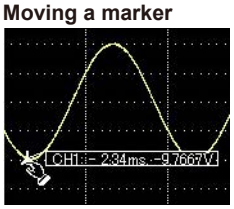
Displayed items

Display Example



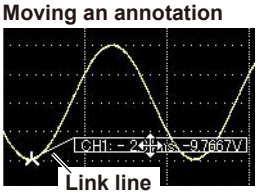
Trace **X value** **Y value**

Moving a marker



Select a marker and drag.
Only the marker moves.
The value is updated according to where the marker moves to.

Moving an annotation



Link line

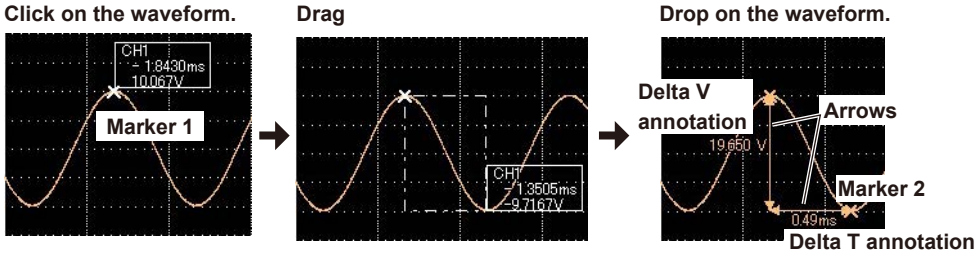
Select the annotation and then drag.
Only the annotation moves.
If the linked point flows outside of the waveform view when zooming or changing the scale, the link line disappears.

Changing the text size
Same procedure as for text annotations.

Delta Marker Pointer Icon:

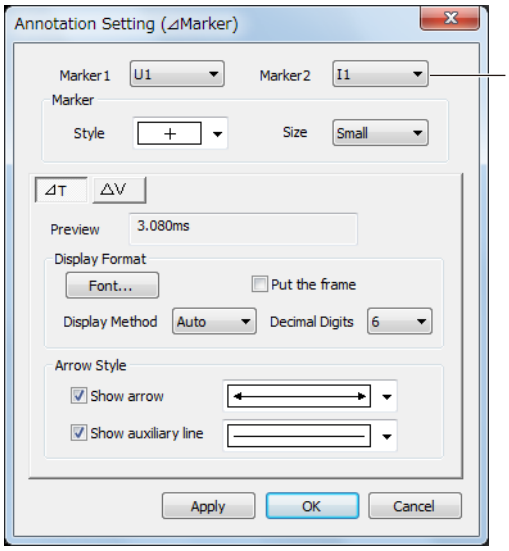
A Delta Marker annotation displays the Delta T (X value) and Delta V (Y value) between two markers.

- If you select Delta Marker annotation and drag between two points on a waveform, the Delta T and Delta V annotations between the two markers are displayed.
- Between two traces (waveforms), only the Delta T marker is displayed.



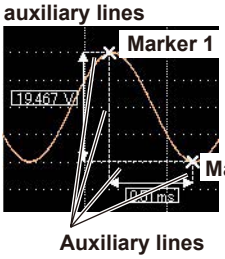
Double-clicking an annotation displays the following setting dialog box.

- For the marker, you can set the source trace (waveform), marker shape, and so on.
- There are four marker shapes. Each time a marker annotation is inserted, a shape different from the previous one is used.
- For Delta T and Delta V markers, you can set the display format, arrow style, and so on. Click the ΔT and ΔV tabs to switch between the two.

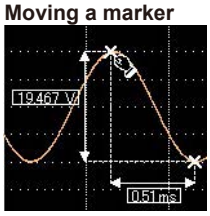


Display Example

Delta Marker annotation with auxiliary lines

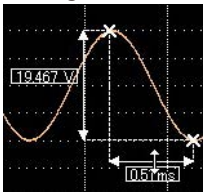


Moving a marker



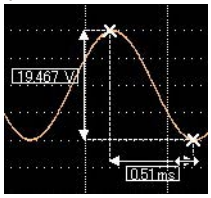
Select a marker and drag. The length of the arrow line, values, and auxiliary lines are updated according to where the marker is moved to.

Moving a Delta T annotation



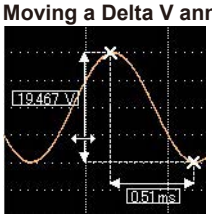
Select the arrow of a Delta T annotation and drag. To only move the value, you can move it in the same manner as with a text annotation.

Changing the length of an arrow line (Delta T annotation only)



Select an arrow tip and drag. The marker moves and the value is updated according to the length of the arrow line.

Moving a Delta V annotation



Select the arrow of a Delta V annotation and drag. To only move the value, you can move it in the same manner as with a text annotation.

If the arrow flows outside of the waveform view

For Delta Markers, if the arrows of Delta T and Delta V annotations flow outside of the waveform view when zooming or changing the scale, the values are not displayed.

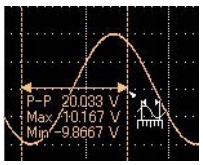
Changing the text size

Same procedure as for text annotations.

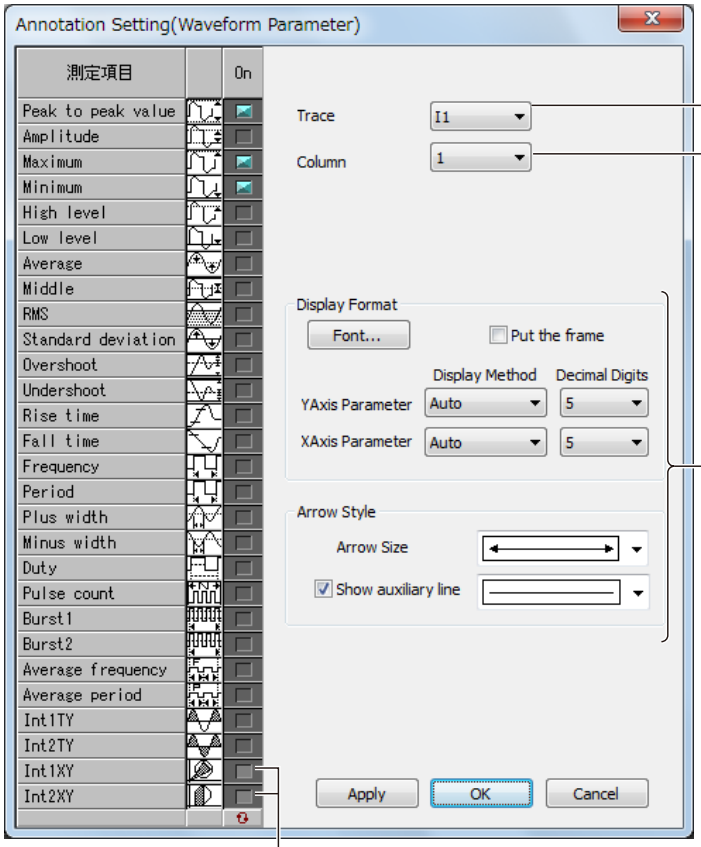
Waveform Parameter Pointer Icon:

When you select Waveform Parameter annotation and perform procedure a or b below in the waveform view, the measured values of waveform parameters is displayed.

a. Drag horizontally.



b. Double-click to display the dialog box below. You can set the measurement items, the trace (waveform) to which the annotation is linked, the display format, the arrow style, and other items. The measurement range of the new waveform parameters displayed when you double-click is 2 div.



Trace (waveform) to link the annotation to.

The number of horizontally-displayed items (columns).

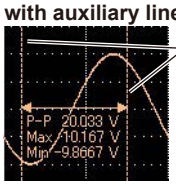
See the descriptions of the Delta T and Delta V annotations.

- Use the controls next to Y Axis Parameter to set the display method and the number of decimal places for the vertical-axis waveform parameters. Use the controls next to X Axis Parameter to set the display method and the number of decimal places for the horizontal-axis waveform parameters.
- There are no Link cursor and Hide value options, which are available for Delta T and Delta V annotations.

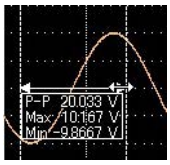
Measurement items Int1XY and Int2XY cannot be selected.

Display Example

Waveform parameter annotation with auxiliary lines

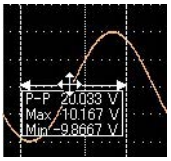


Changing the length of an arrow line

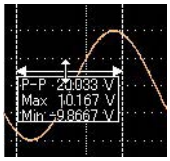


Select an arrow tip and drag. The value is updated according to the length of the arrow line.

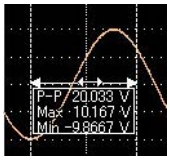
Moving a waveform parameter annotation



Select the arrow of a waveform parameter annotation and drag. To only move the value, you can move it in the same manner as with a text annotation.



When you start moving an annotation vertically, the pointer changes to ↕.



When you start moving an annotation horizontally, the pointer changes to ↔.
The value is updated according to the measurement scope at the new location.

If the arrow flows outside of the waveform view

If an arrow flows outside of the waveform view when zooming or changing the scale, the value is not displayed.

Changing the text size

Same procedure as for text annotations.

Copying and Pasting Annotations

You can perform the following operations by right-clicking an annotation or in the view.

Operation	Right-clicking an annotation	Right-clicking in the view
New	No	Yes
Delete	Yes	No
Copy	Yes	No
Paste	No	Yes
Edit	Yes	No

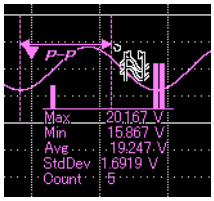
Saving and Loading Annotations

- When setup parameters are saved, only unlinked annotations are saved. When you load setup parameters, only unlinked annotations are restored.
- For details on saving setup parameters, see chapter 8.

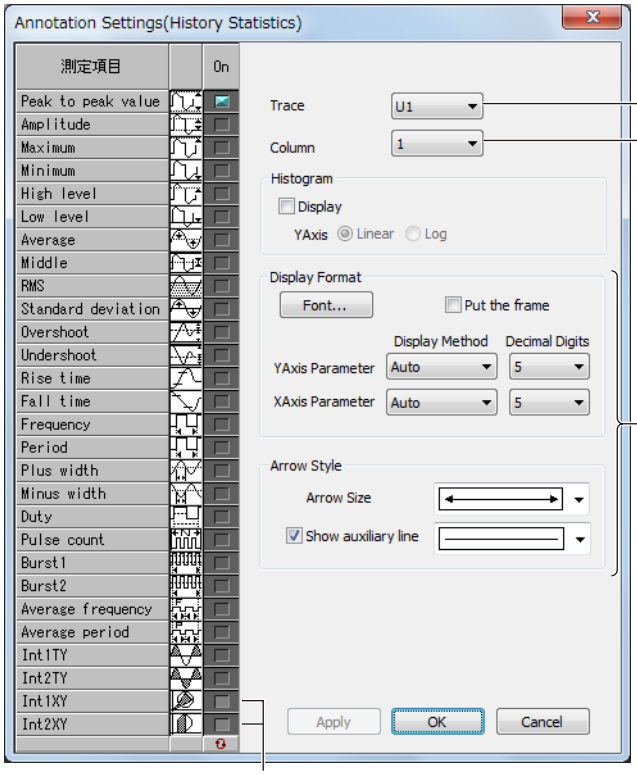
History Statistic Pointer Icon:

When you select History Statistics annotation and perform procedure a or b below in the waveform view, the measured values of the history statistics are displayed.

a. Drag horizontally.



b. Double-click to display the dialog box below. You can set the measurement items, the trace (waveform) to which the annotation is linked, the display format, the arrow style, and other items. The measurement range of the new history statistics displayed when you double-click is 2 div.



Trace (waveform) to link the annotation to.

The number of horizontally-displayed items (columns).

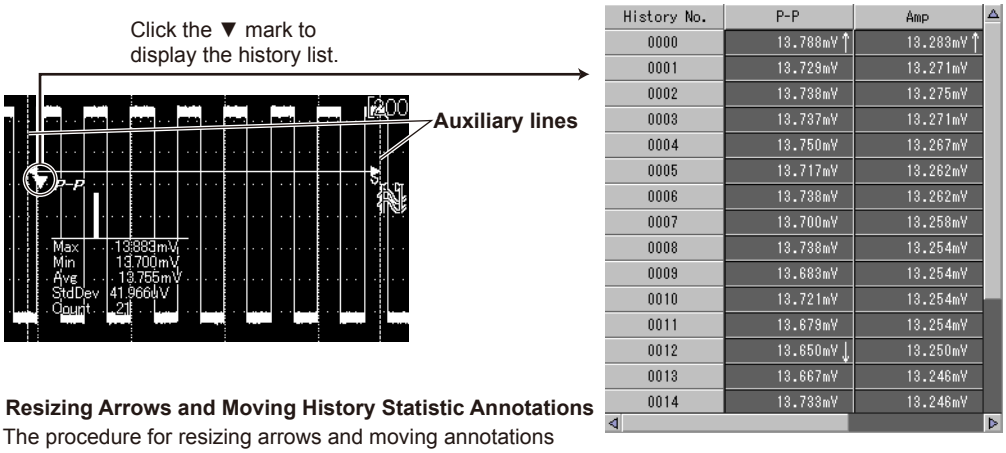
See the descriptions of the Delta T and Delta V annotations.

- Use the controls next to Y Axis Parameter to set the display method and the number of decimal places for the vertical-axis waveform parameters. Use the controls next to X Axis Parameter to set the display method and the number of decimal places for the horizontal-axis waveform parameters.
- There are no Link cursor and Hide value options, which are available for Delta T and Delta V annotations.

Measurement items Int1XY and Int2XY cannot be selected.

Display Example

History statistic annotation with additional lines



Resizing Arrows and Moving History Statistic Annotations

The procedure for resizing arrows and moving annotations are the same as for waveform parameter annotations.

If the arrow flows outside of the waveform view

If an arrow flows outside of the waveform view when zooming or changing the scale, the value is not displayed.

Changing the text size

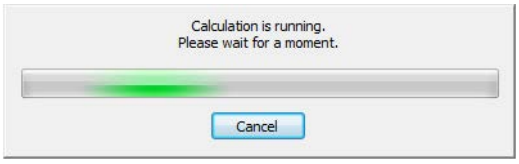
Same procedure as for text annotations.

Note

- Canceling Annotation mode

  In Annotation mode, a cancel button and a progress bar are displayed. Click the Cancel button to cancel Annotation mode.

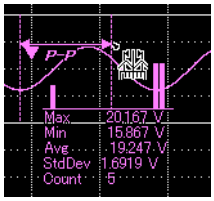
  If you cancel Annotation mode, the waveform display area only shows an arrow that indicates the annotation range and not the values.



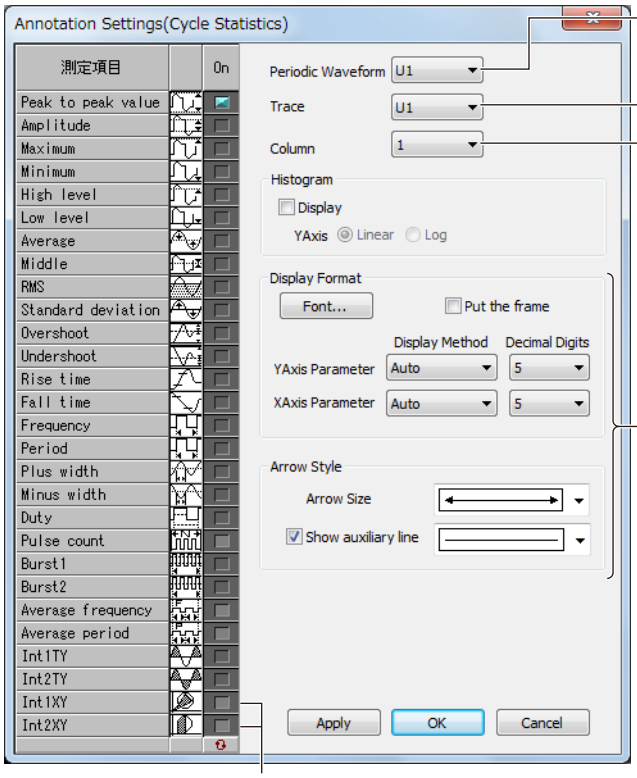
Cycle Statistic Pointer Icon:

When you select Cycle Statistics annotation and perform procedure a or b below in the waveform view, the measured values of the cycle statistics are displayed.

a. Drag horizontally.



b. Double-click to display the dialog box below. You can set the measurement items, the trace (waveform) to which the annotation is linked, the display format, the arrow style, and other items. The measurement range of the new cycle statistics displayed when you double-click is 2 div.



The reference trace for cycle statistic measurements.

Trace (waveform) to link the annotation to.

The number of horizontally-displayed items (columns).

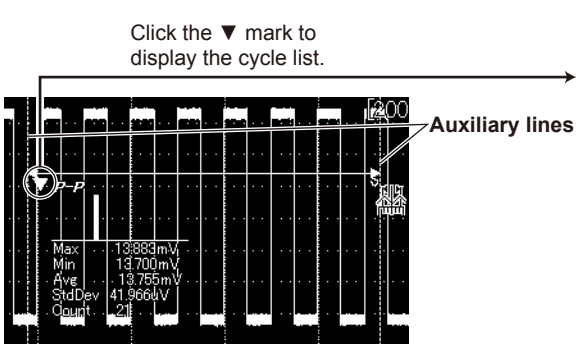
See the descriptions of the Delta T and Delta V annotations.

- Use the controls next to Y Axis Parameter to set the display method and the number of decimal places for the vertical-axis waveform parameters.
  Use the controls next to X Axis Parameter to set the display method and the number of decimal places for the horizontal-axis waveform parameters.
- There are no Link cursor and Hide value options, which are available for Delta T and Delta V annotations.

Measurement items Int1XY and Int2XY cannot be selected.

Display Example

Cycle statistic annotation with additional lines



Cycle No.	P-P	Amp
0000	13.867mV	13.288mV
0001	13.646mV	13.287mV
0002	13.650mV	13.283mV
0003	13.654mV	13.287mV
0004	13.671mV	13.279mV
0005	13.633mV	13.279mV
0006	13.687mV	13.279mV
0007	13.754mV	13.283mV
0008	13.679mV	13.283mV
0009	13.692mV	13.275mV
0010	13.687mV	13.279mV
0011	13.700mV	13.279mV
0012	13.712mV	13.275mV
0013	13.675mV	13.279mV

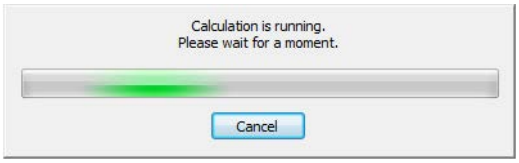
Resizing Arrows and Moving Cycle Statistic Annotations
The procedure for resizing arrows and moving annotations are the same as for waveform parameter annotations.

If the arrow flows outside of the waveform view
If an arrow flows outside of the waveform view when zooming or changing the scale, the value is not displayed.

Changing the text size
Same procedure as for text annotations.

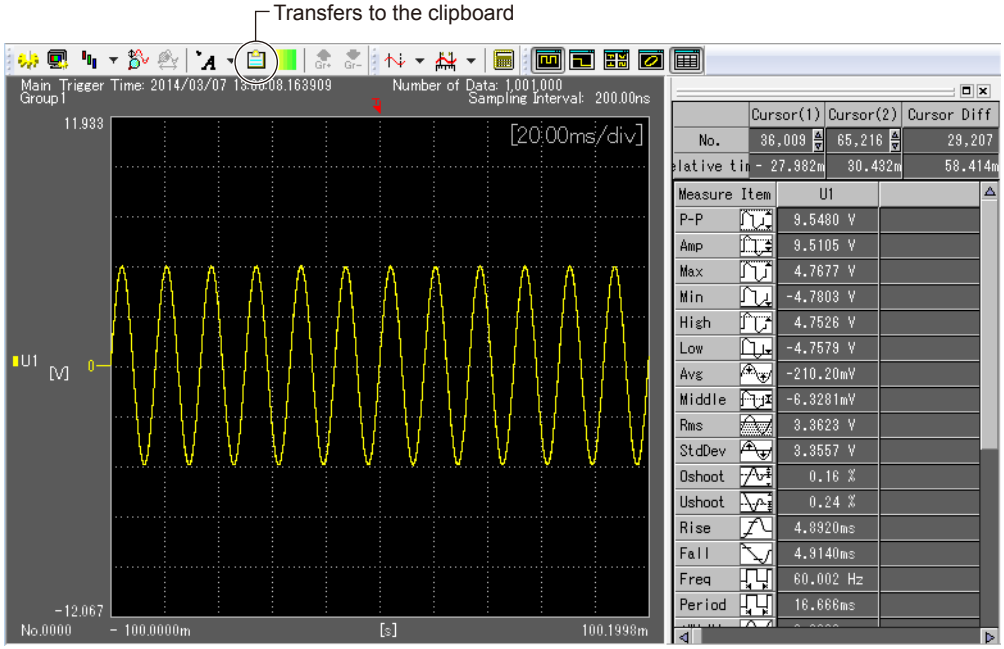
Note

- Canceling Annotation mode
  In Annotation mode, a cancel button and a progress bar are displayed. Click the Cancel button to cancel Annotation mode.
  If you cancel Annotation mode, the waveform display area only shows an arrow that indicates the annotation range and not the values.



Transferring to the Clipboard

Clicking transfers the displayed waveform display area as image data to the clipboard. You can paste the transferred image data in a compatible application.

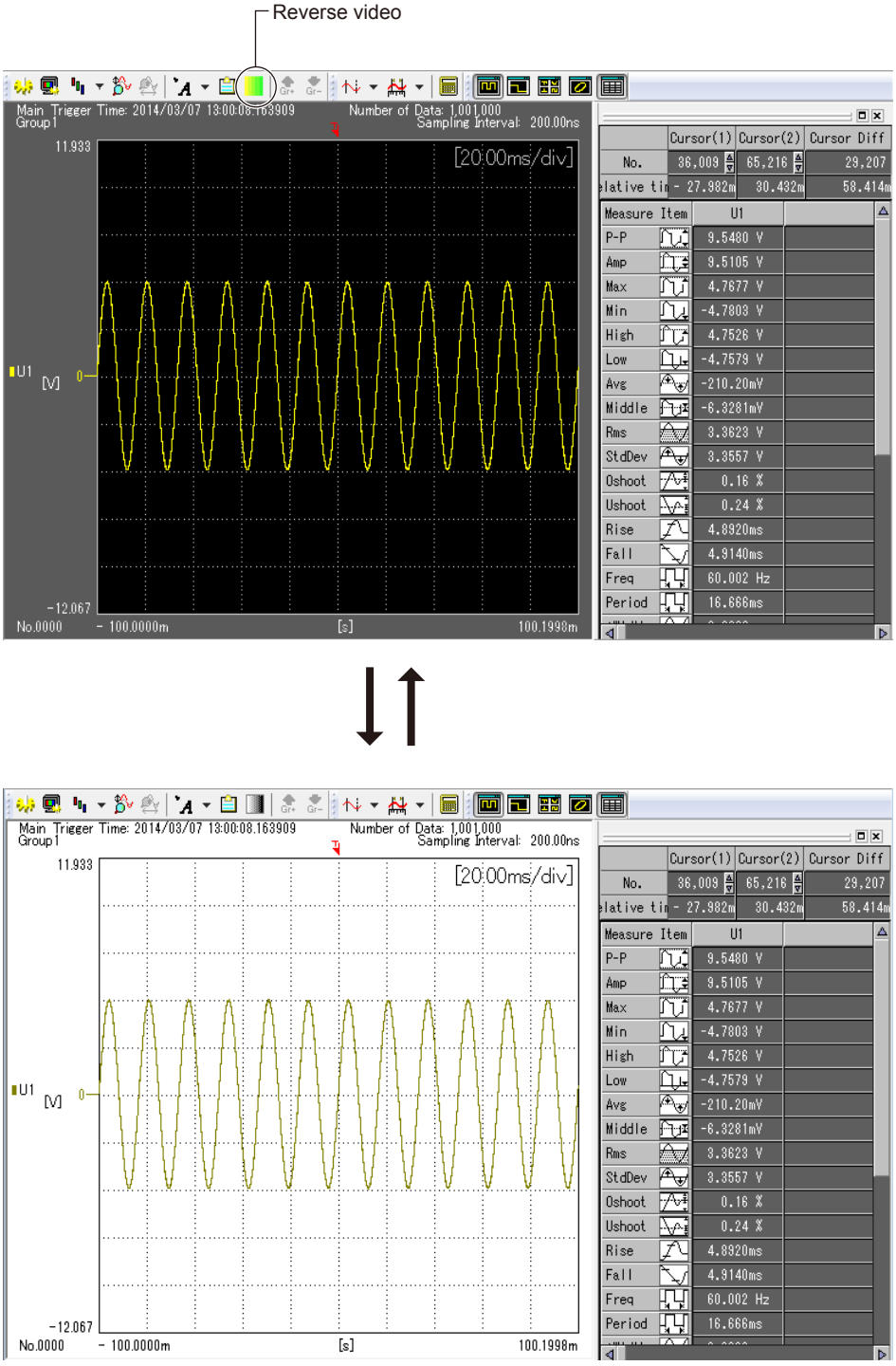


Note

Only the displayed range in the view is transferred.

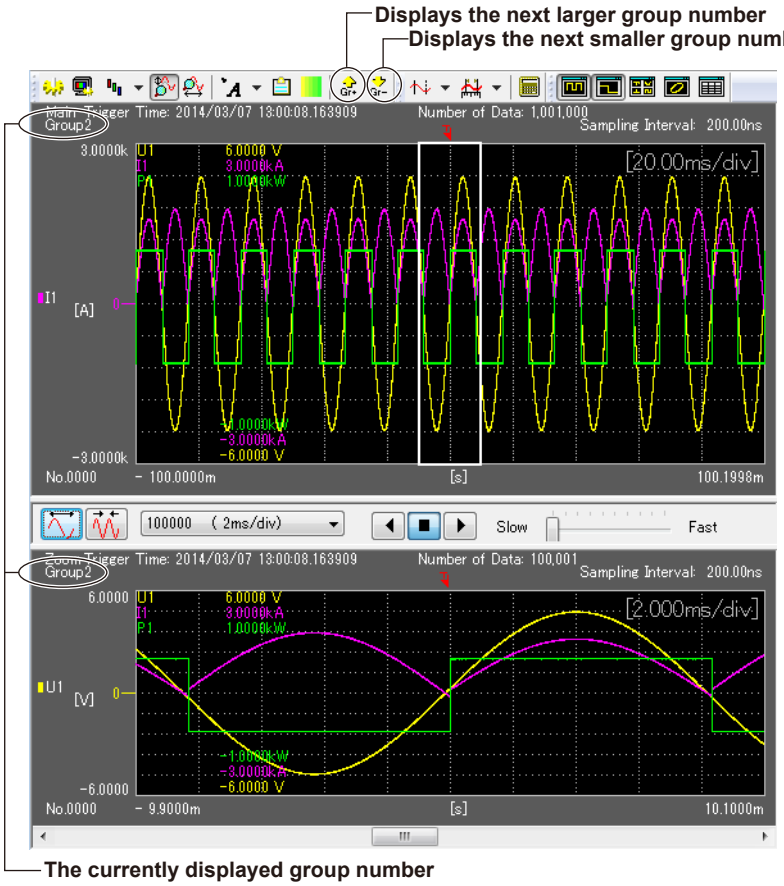
Reverse Video

Clicking automatically sets the colors suitable for monochrome printing.
Clicking the button again sets the colors back to the original colors.



Switching the Displayed Group

If groups have been registered, you can click Gr+ or Gr− to switch the displayed group.



For details on configuring display groups, see page 7-30.

Note

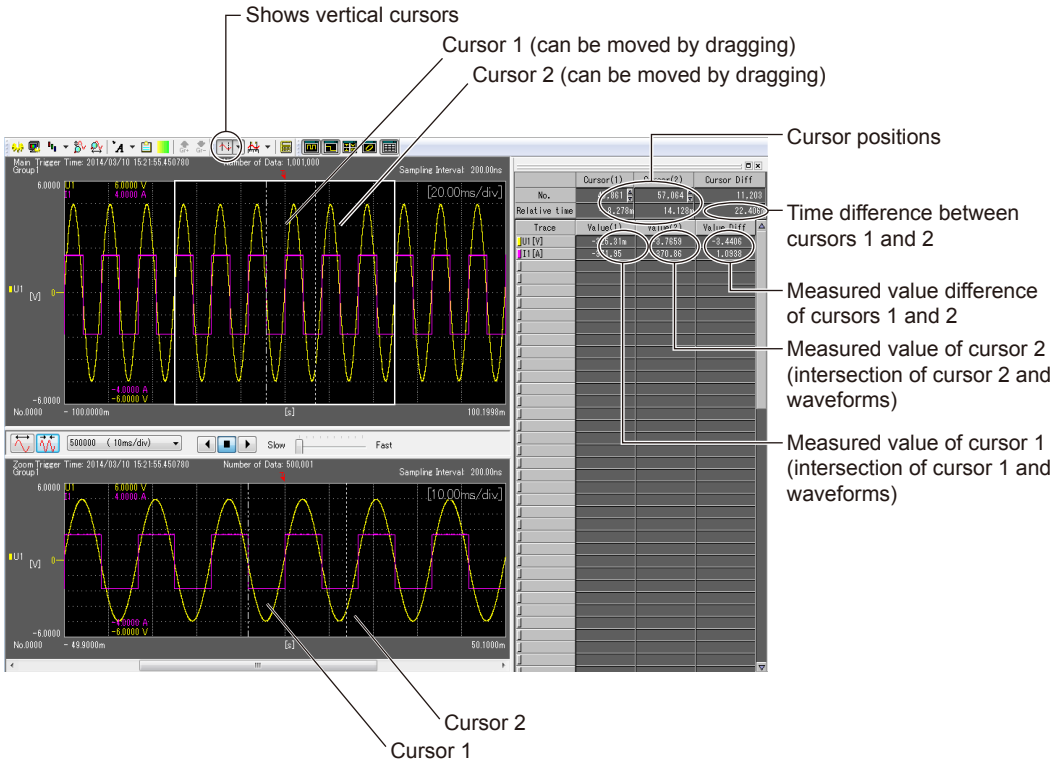
If there are no configured groups, Gr− and Gr+ are unavailable. (Nothing will happen even if you click them).

Cursor Measurement

Measuring with Vertical Cursors

Click the arrow on the right of and select **Vertical Cursor** to display two vertical cursors in the main waveform display area and zoom waveform display area. The measurement result area displays the measured value at each cursor position (time), the differences in times and measured values between the two cursors, and so on.

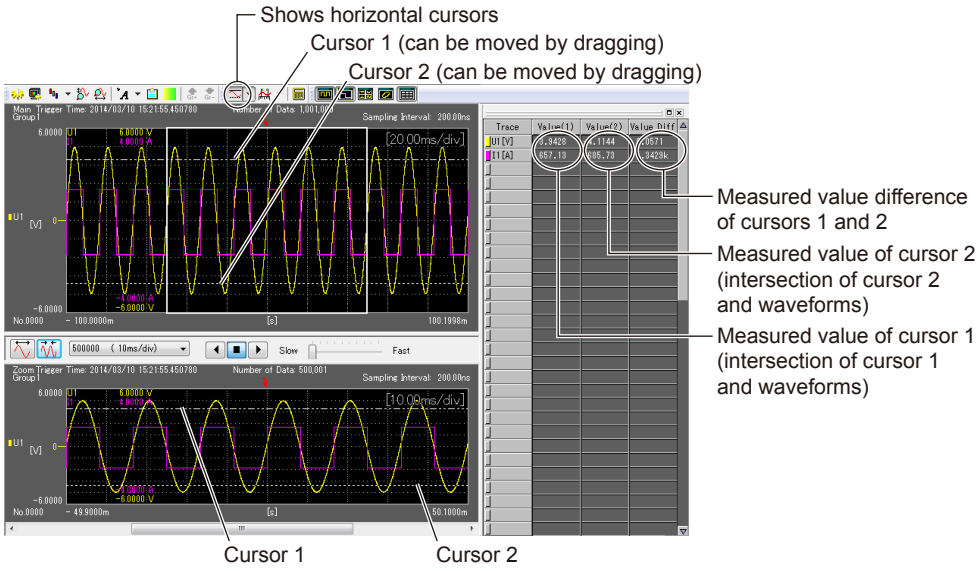
You can drag each cursor. You can click within the window to move Cursor 1 to that position. You can right-click within the window to move Cursor 2 to that position.



Measuring with Horizontal Cursors

Click the arrow on the right of and select **Horizontal Cursor** to display two horizontal cursors in the main waveform display area and zoom waveform display area. The measurement result area displays the measured value at each cursor.

You can drag each cursor. You can click within the window to move Cursor 1 to that position. You can right-click within the window to move Cursor 2 to that position.

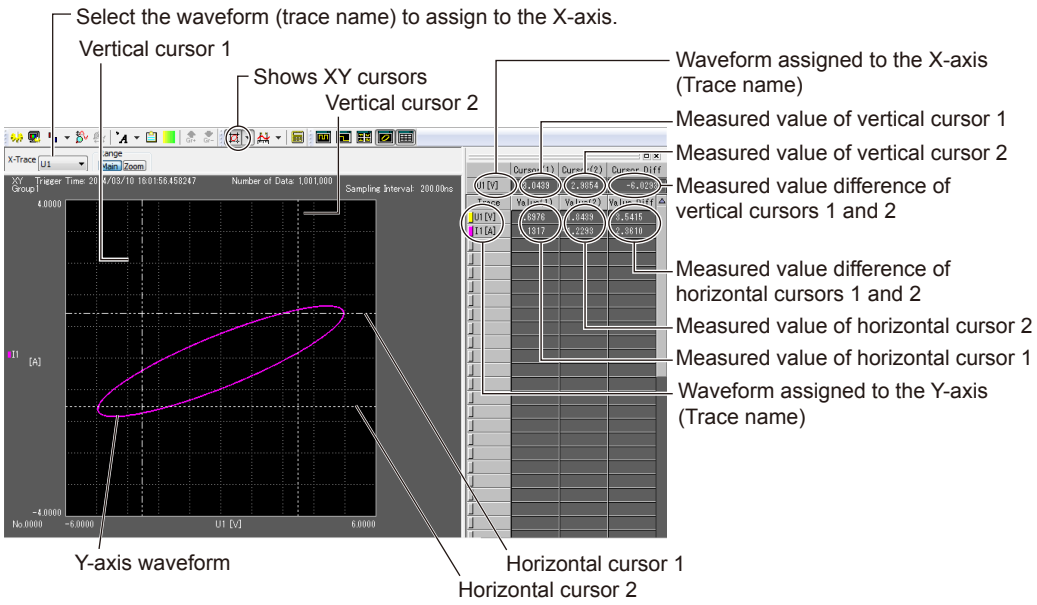


Measuring with Vertical/Horizontal Cursors

Click the arrow on the right of and select **Vertical/Horizontal Cursor** to display four cursors (two vertical cursors and two horizontal cursors) in the main waveform display area and zoom waveform display area. The measurement result area displays the measured value at each cursor and the differences in measured values.

Measuring with XY Cursors

Click the arrow on the right of and select **XY Cursor** to display four cursors in the XY waveform display area (two vertical cursors and two horizontal cursors). You can drag each cursor. The measurement result area displays the measured value at each cursor and the differences in measured values.



Cursor Measurement of History Waveforms

When history waveforms are displayed, only the active waveform is applicable for cursor measurement.

Linking Vertical Cursors or Horizontal Cursors

You can move the two vertical or two horizontal cursors simultaneously by dragging a vertical cursor or horizontal cursor while holding down the Ctrl key.

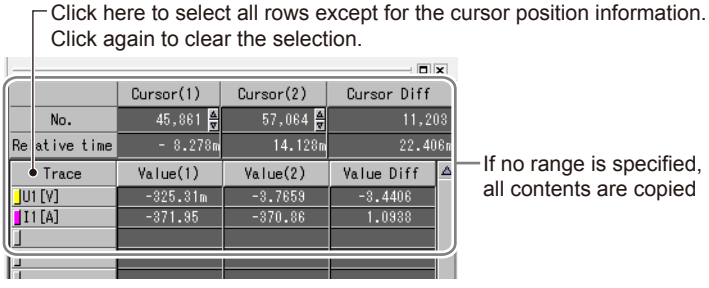
*** Indication

If the measurement result is invalid, "***" is displayed as the measured value.

Note

You can copy the contents of the measurement result display area to the clipboard.
Specify the range to be copied, and press Ctrl+C. The measured results are copied to the clipboard. The following three methods can be used to specify the range.

- Press Ctrl+C without specifying a range to copy
  All the contents in the measurement result display area are copied.
- Click a trace
  All rows are selected except for the cursor position information.
- Click a trace name
  The trace name row that you clicked is selected.



Automated Measurement

For waveforms that are displayed on the screen, various measurement items (waveform parameters), such as maximum and minimum values, can be measured automatically and their statistics can be calculated.

1. Click the arrow on the right of  to select the auto measurement type.
   The following three auto measurement types are available.
   - Automated measurement of waveform parameters (see page 7-60)
   - Automated measurement of history statistics (see page 7-66)
   - Automated measurement of cycle statistics (see page 7-69)

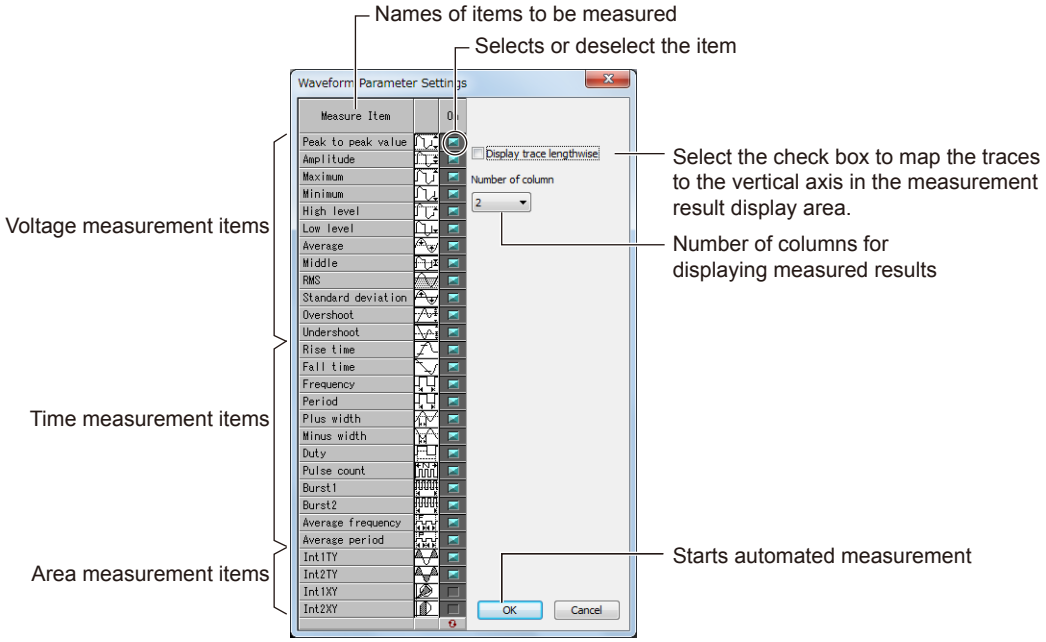
   Depending on the automated measurement that you select, the toolbar controls vary.
2. In the selected automated measurement dialog box, set the measurement items and the conditions for displaying measured results, and then click **OK**.

Automatically Measuring Waveform Parameters

For waveform parameters, you can set and measure voltage parameters, time parameters, and area parameters.

Setting the Measurement Items

Clicking the arrow on the right of  and selecting **Waveform Parameter** displays a Waveform Parameter Settings dialog box.

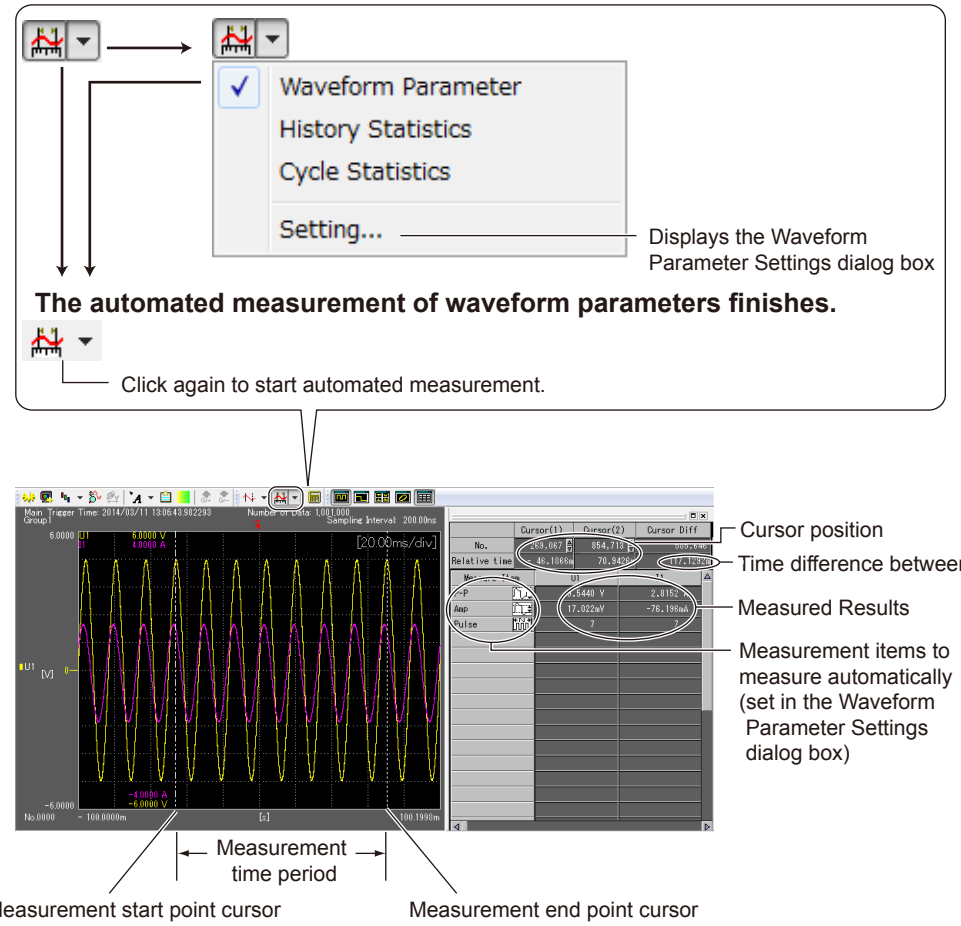


Clicking OK in the Waveform Parameter Settings dialog box begins an automated measurement. Two vertical cursors are displayed in the main waveform display area, and the measured results of waveform parameters are displayed in the measurement results display area.

Specifying the Automated Measurement Range

You can change the range over which to perform automated measurement of waveform parameters. Drag the two vertical cursors to change the measurement start point and the measurement end point. Waveform parameters are remeasured.

Operations in the Waveform Parameter's Automated Measurement Screen



Items That Can Be Measured

For waveform parameters, you can set and measure voltage parameters, time parameters, and area parameters.

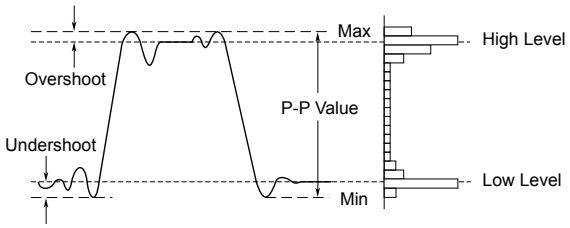
Note

- If there are two or more cycles of a waveform in the measurement scope, time parameters are measured for the first cycle.
- For FFT waveforms, only the maximum and minimum values can be measured.
- Logic waveforms cannot be automatically measured.

- **Voltage measurement items**

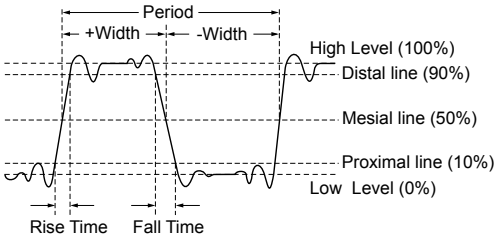
  Peak to peak value: P-P value (Max – Min) [V]
  Amplitude: Amplitude (High − Low) [V]
  Maximum: Maximum voltage [V]
  Minimum: Minimum voltage [V]
  High level: High level voltage [V]
  Low level: Low level voltage [V]
  Average: Average voltage (1/n)Σxi [V]
  Middle: Mean value of amplitude (Max + Min)/2 [V]

RMS: Rms value (1/ $\sqrt{n}$)$(\Sigma(xi)^2)^{1/2}$ [V]
Standard deviation: Standard deviation $(1/n(\Sigma x^2 - (\Sigma x^2)/n)^{1/2}$
Overshoot: Overshoot level (Max – High)/(High – Low)×100 [%]
Undershoot: Undershoot level (Low – Min)/(High – Low)×100 [%]

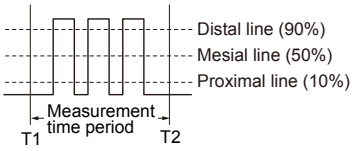


- **Time measurement items**

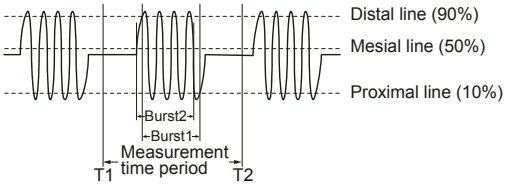
Rise time: Rise time [s]
Fall time: Fall time [s]
Frequency: Frequency [Hz]
Period: Period [s]
Plus width: Time width where the measured values are at or above the mesial value [s]
Minus width: Time width where the measured values are at or below the mesial value [s]
Duty: Duty ratio (+Width/Period×100) [%]



Pulse: Pulse count (Set the measurement scope to the pulse you want to measure.)
When Pulse = 3



Burst1, Burst2: Set the measurement scope to the burst width [s] you want to measure.



- **Area measurement items**

  Int1TY: Area under the positive parts

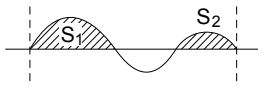
  Int2TY: Area under the positive parts – area under the negative parts

  Int1XY: • Total area in which the start and stop points trace multiple identical closed curves
  - Area enclosed by a curve connecting the start and stop points
  - Area in which the start and stop points trace the shape of a figure eight
  - Area in which the start and stop points trace a closed curve in a spiral loop

  Int2XY: • When each Y data point corresponds to a single X data point
  - When the amplitude contains negative parts
  - When multiple Y data corresponds to X data

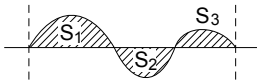
Int1TY

Sum of only the positive curve areas: $S_1 + S_2$



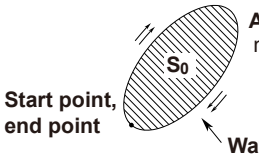
Int2TY

Sum of the positive and negative curve areas: $S_1+S_3–S_2$

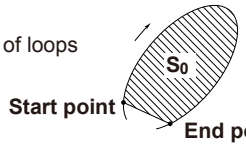


Int1XY

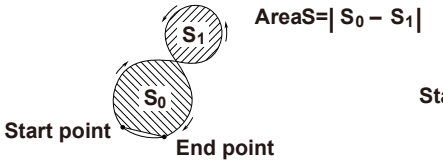
(1) Multiple loops



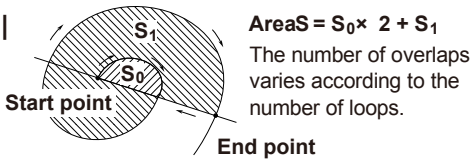
(2) Non-closed curve



(3) Loop tracing a figure-eight

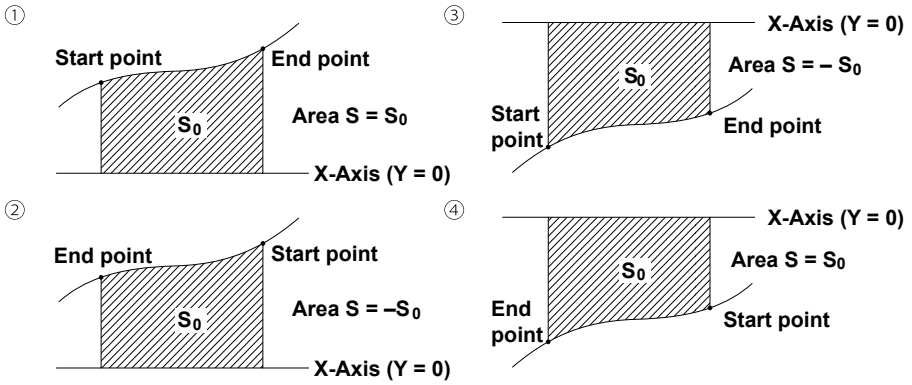


(4) Loop tracing a spiral loop

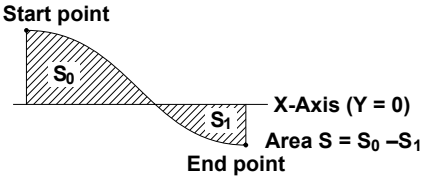


Int2XY

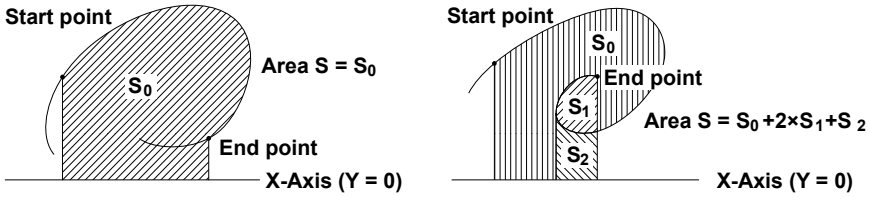
(1) When Each Y Data Point Corresponds to a Single X Data Point



(2) When the Waveform Extends into the Negative Side



(3) When Multiple Y Data Corresponds to X Data



***** Indication**

If the measurement result is invalid or impossible, "***" is displayed as the measured value. Waveforms with small amplitudes may fail to produce correct readings.

Note

- Automated measurement may take some time depending on the conditions such as the measurement scope, the number of measurement items, and the waveforms to be measured.
  For example, if the measurement item is Pulse count, Burst1, Burst2, Average frequency, or Average period and the number of data points exceeds 1 Mpoint, computation will take a long time.
- Canceling automated measurement
  You cannot cancel an automated measurement when it is in progress.

Saving Waveform Parameters' Automated Measurement Data

To save the measured results, save the application settings to a file using the setup parameter save/load function. For details, see section 8.1.

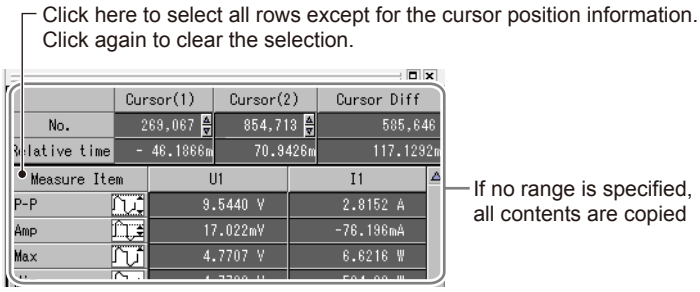
The waveform parameters' automated measurement data that is saved can be loaded into the software along with the waveform data by using the setup parameter save/load function.

Note

You can copy the contents of the measurement result display area to the clipboard.

Specify the range to be copied, and press Ctrl+C. The measured results are copied to the clipboard. The following three methods can be used to specify the range.

- Press Ctrl+C without specifying a range to copy
  All the contents in the measurement result display area are copied.
- Click "Measure Item"
  All rows are selected except for the cursor position information.
- Click a measurement item
  The row of the clicked measurement item is selected.

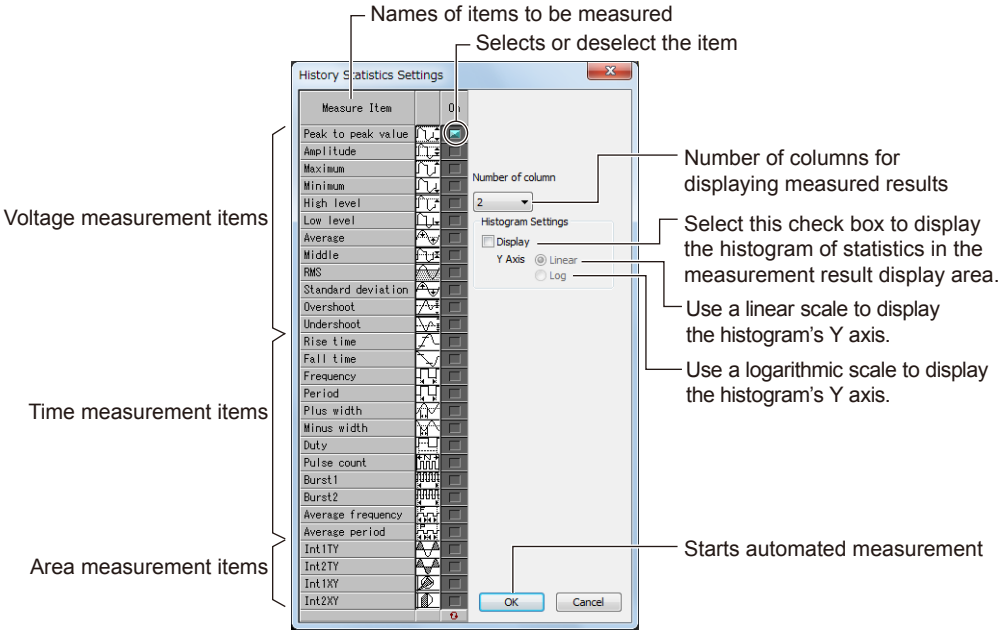


Automated Measurement of History Statistics

The software performs statistical processing on all waveforms (history waveforms) that have been collected while collecting waveforms.

Setting the Measurement Items

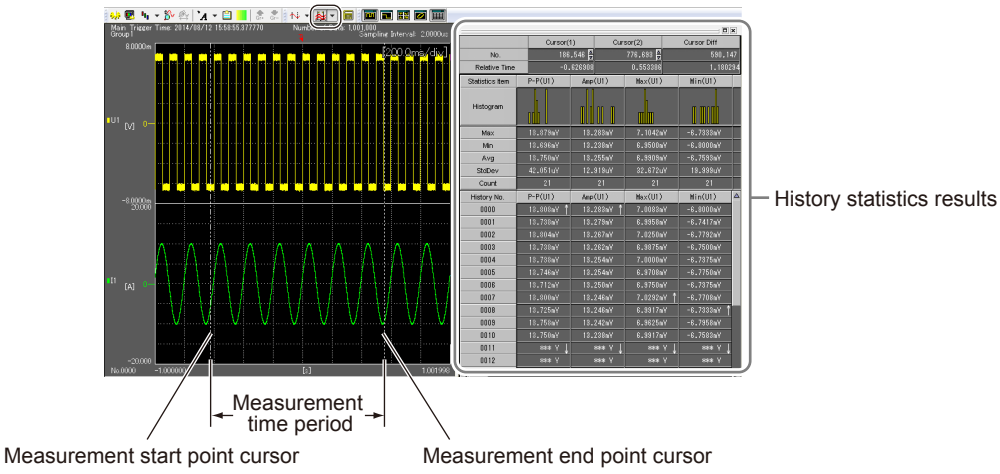
Clicking the arrow on the right of and selecting **History Statistics** displays a History Statistics Settings dialog box.



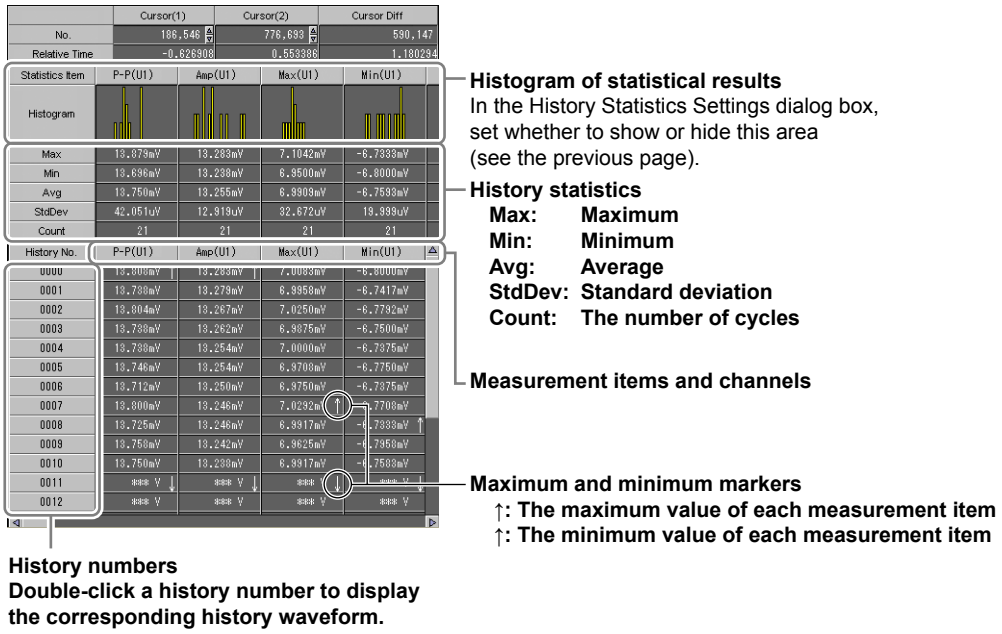
Clicking OK in the History Statistics Settings dialog box begins an automated measurement. Two vertical cursors are displayed in the main waveform display area, and the measured results of history statistics are displayed in the measurement results display area.

Specifying the Automated Measurement Range

You can change the range over which to perform automated measurement of history statistics. Drag the two vertical cursors to change the measurement start point and the measurement end point. History statistics are remeasured.



Displaying History Statistic Results



Items That Can Be Measured

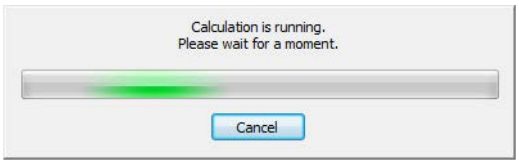
For history waveforms, you can set and measure voltage parameters, time parameters, and area parameters. Items that can be measured are the same as those of the automated measurement of waveform parameters. (see pages 7-61 to 7-64).

*** Indication

If the measurement result is invalid or impossible, "***" is displayed as the measured value. Waveforms with small amplitudes may fail to produce correct readings.

Note

- Canceling history statistic measurement
  While history statistic measurement is in progress, a progress bar and a Cancel button are displayed. Click the Cancel button to cancel history statistic measurement.



- If the total number of items that is determined by the number of history waveforms, the number of channels, and the number of measurement items exceeds 100000, computation may not be possible. Change the number of displayed channels and measurement items so that 100000 is not exceeded.

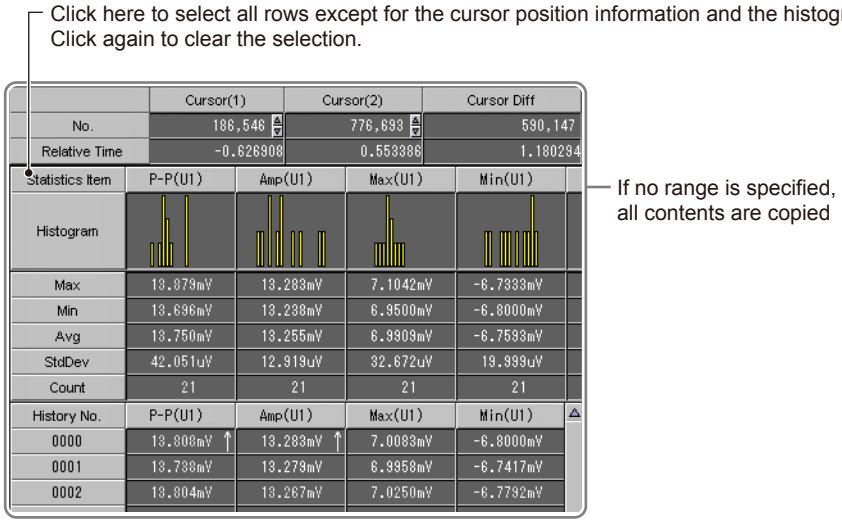
Saving History Statistics' Automated Measurement Data

To save the measured results, save the application settings to a file using the setup parameter save/load function. For details, see section 8.1.
The history statistics' automated measurement data that is saved can be loaded into the software along with the waveform data by using the setup parameter save/load function.

Note

You can copy the contents of the measurement result display area to the clipboard.
Specify the range to be copied, and press Ctrl+C. The measured results are copied to the clipboard. The following three methods can be used to specify the range.

- Press Ctrl+C without specifying a range to copy
  All the contents in the measurement result display area are copied.
- Click "Statistics Item"
  All rows are selected except for the cursor position information and histogram.
- Click a statistics item to copy
  The row of the clicked statistics item is selected.

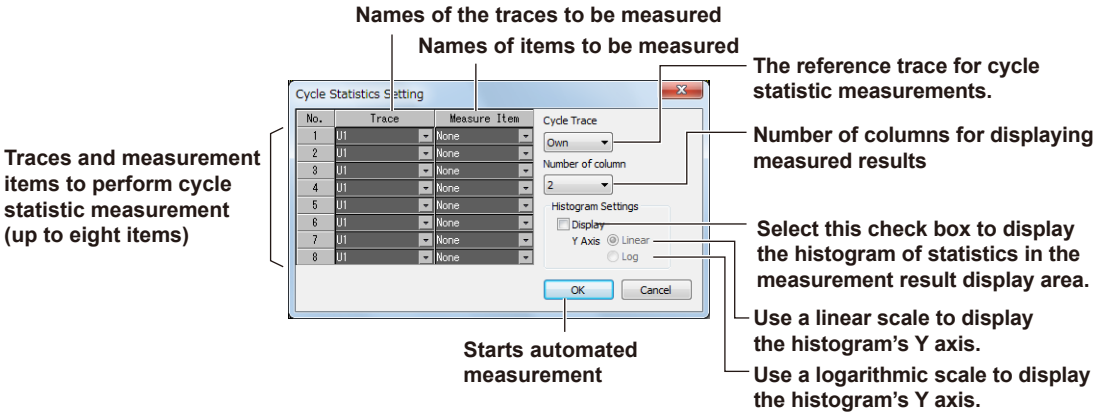


Automated Measurement of Cycle Statistics

The software determines the cycles in the displayed waveform starting with the oldest data, measures the selected automated measurement parameters over the data within the cycles, and performs statistical processing. How the cycle is determined is the same as with the normal waveform parameter Period. You can select whether to apply the cycle of the specified waveform to all waveforms or determine the cycle for each waveform separately.

Setting the Measurement Items

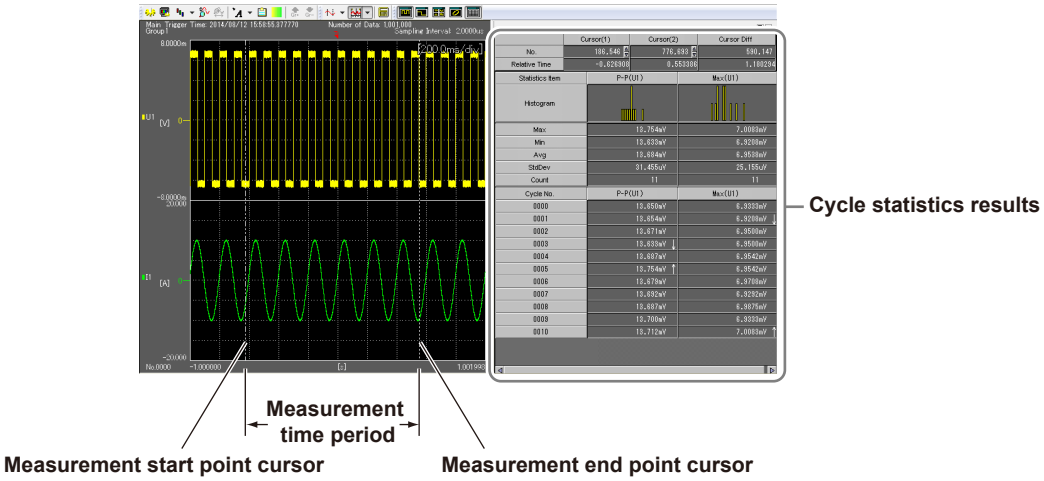
Clicking the arrow on the right of and selecting **Cycle Statistics** displays a Cycle Statistics Settings dialog box.



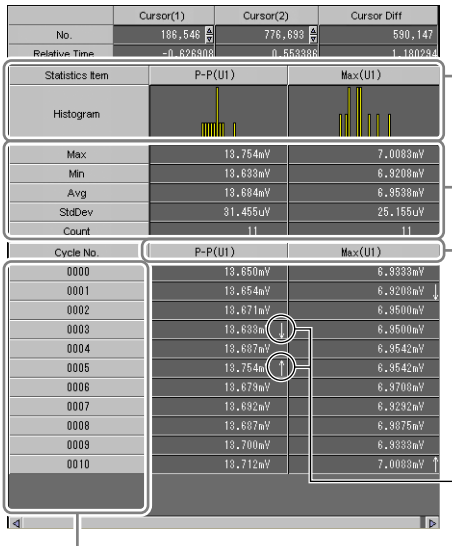
Clicking OK in the Cycle Statistics Settings dialog box begins an automated measurement. Two vertical cursors are displayed in the main waveform display area, and the measured results of cycle statistics are displayed in the measurement results display area.

Specifying the Automated Measurement Range

When the measurement range is set to Cursor range, you can change the range over which to perform automated measurement of cycle statistics. Drag the two vertical cursors to change the measurement start point and the measurement end point. Cycle statistics are remeasured.
When the measurement range is set to All, moving the cursors will not cause cycle statistics to be remeasured.



Displaying Cycle Statistic Results



Histogram of statistical results
In the Cycle Statistics Settings dialog box, set whether to show or hide this area (see the previous page).

Cycle statistics
Max: Maximum
Min: Minimum
Avg: Average
StdDev: Standard deviation
Count: The number of cycles

Measurement items and channels

Maximum and minimum markers
↑: The maximum value of each measurement item
↑: The minimum value of each measurement item

Cycle numbers
Double-click a cycle number to display the corresponding cycle waveform.

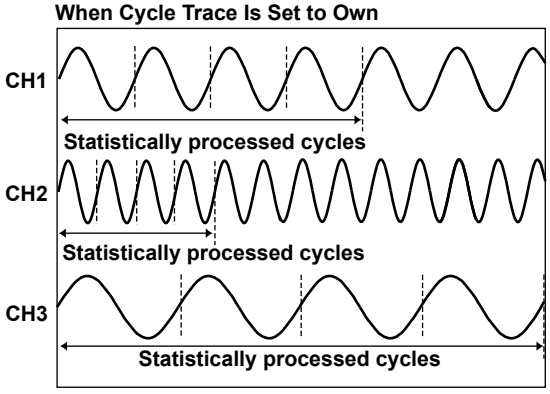
Items That Can Be Measured

On each cycle of the waveforms, you can set and measure voltage, time, and area items. Items that can be measured are the same as those of the automated measurement of waveform parameters. (see pages 7-61 to 7-64).

Cycle Trace

Select the trace that will be used as the reference cycle for performing cycle statistic measurement. If Own has been selected, cycle statistic measurement is performed using each trace's cycle. Cycle statistic result area will show the measured results over the time period for the least number of cycles.

When Cycle Trace Is Set to Own



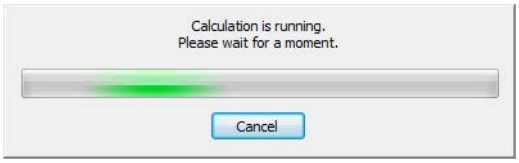
The number of cycles in the channel with the slowest cycle (CH3) is four, so statistical processing is performed on the four oldest cycles of the data for CH1 and CH2.
The remaining data is not used for statistical processing.

***** Indication**

If the measurement result is invalid or impossible, "***" is displayed as the measured value. Waveforms with small amplitudes may fail to produce correct readings.

Note

- Canceling cycle statistic measurement
  While cycle statistic measurement is in progress, a progress bar and a Cancel button are displayed. Click the Cancel button to cancel cycle statistic measurement.



- If the total number of items that is determined by the number of cycles and the number of measurement items exceeds 100000, computation may not be possible. Change the measurement scope and the number of measurement items so that 100000 is not exceeded.

Saving Cycle Statistics' Automated Measurement Data

To save the measured results, save the application settings to a file using the setup parameter save/load function. For details, see section 8.1.

The cycle statistics' automated measurement data that is saved can be loaded into the software along with the waveform data by using the setup parameter save/load function.

Note

You can copy the contents of the measurement result display area to the clipboard.

Specify the range to be copied, and press Ctrl+C. The measured results are copied to the clipboard. The following three methods can be used to specify the range.

- Press Ctrl+C without specifying a range to copy
  All the contents in the measurement result display area are copied.
- Click "Statistics Item"
  All rows are selected except for the cursor position information and histogram.
- Click a statistics item to copy
  The row of the clicked statistics item is selected.

Click here to select all rows except for the cursor position information and the histograms. Click again to clear the selection.

	Cursor(1)	Cursor(2)	Cursor Diff
No.	186,546	776,693	590,147
Relative Time	-0.626908	0.553386	1.180294
Statistics Item	P-P(U1)	Max(U1)	
Histogram			
Max	13.754mV	7.0083mV	
Min	13.633mV	6.9208mV	
Avg	13.684mV	6.9538mV	
StdDev	31.455uV	25.155uV	
Count	11	11	
Cycle No.	P-P(U1)	Max(U1)	
0000	13.650mV	6.9333mV	
0001	13.654mV	6.9208mV	
0002	13.671mV	6.9500mV	

If no range is specified, all contents are copied

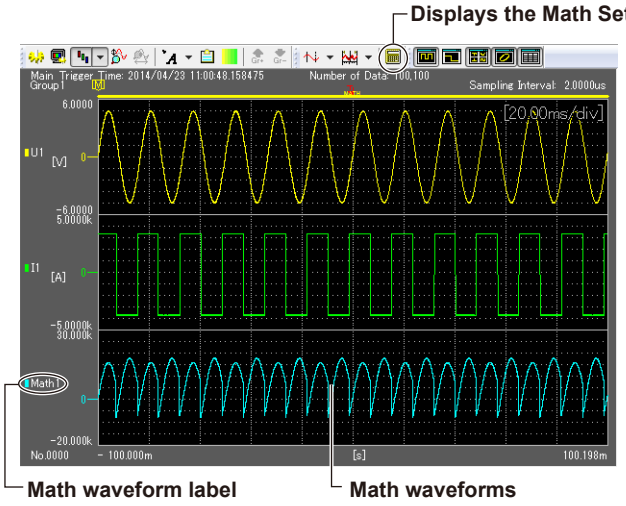
Waveform Computation

Computation can be performed on up to 100 Mpoints of data.*
Computed results can be displayed in Math1 to Math32.

* The maximum number of data points depends on the options that are installed in the PX.
- No /M1 or /M2 option: 10 Mpoints
- /M1 option: 50 Mpoints
- /M2 option: 100 Mpoints

Displaying Math Waveforms

Click to display a Math Setting dialog box for configuring the math waveform display. Set expressions, filters, FFTs, and other math operations to display math waveforms.

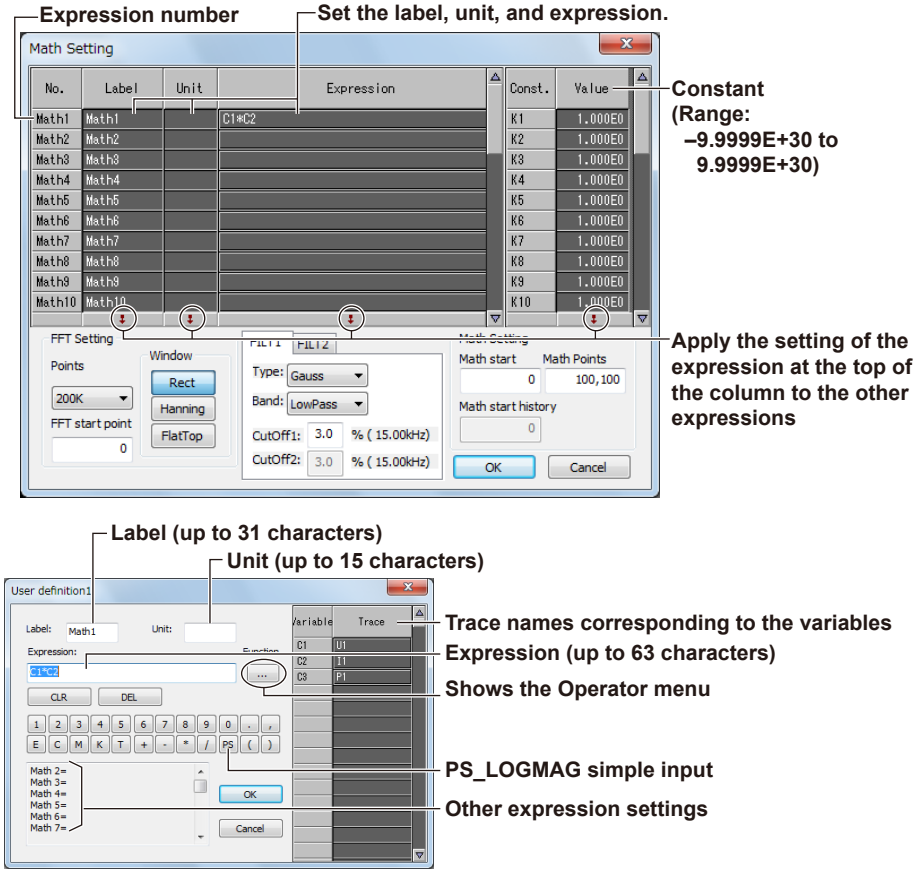


Computation takes time in the following situations.
- The number of data points to be computed is large.
- The expression is complex, or there are many operands.

To reduce the computation time, try the following:
- Turn off unnecessary computations.
- Change the record length and time setting (T/div) to reduce the number of data points to be computed.
- Simplify the expression.
- Improve the operating environment (see section 1.3).

Setting Expressions

Click an Expression cell in the Math Setting dialog box to display a user-defined expression setting dialog box. Create an expression using variables and operators.



Setting Filters

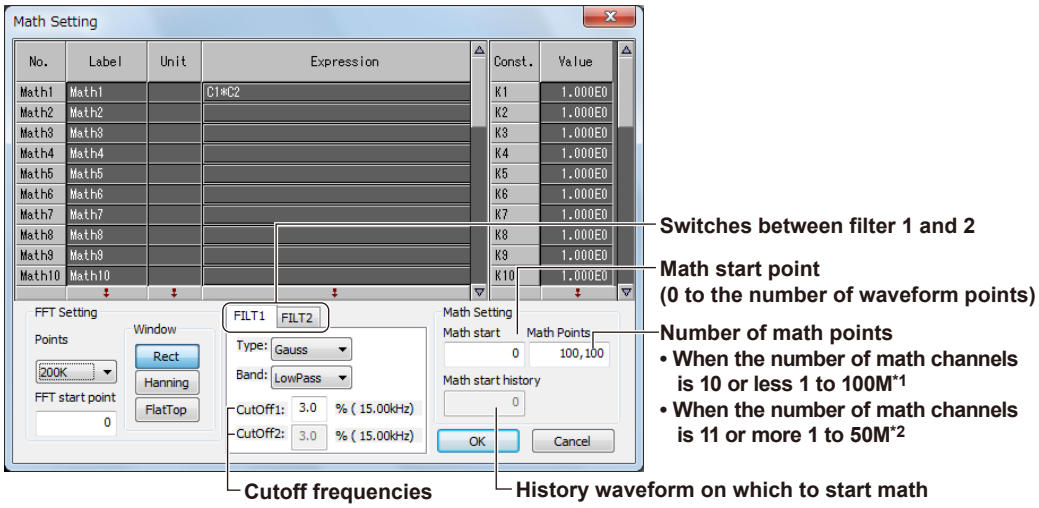
Use the FILT1 and FILT2 tabs in the Math Setting dialog box to set the filters.

Setting the Math Start Point, the Number of Math Points and Math Start History

- You can set the computation range by specifying the math start point and the number of math points. You can also change the computation range by adjusting the math range bar, which is displayed in the waveform display window.
- With history waveforms, you can set the number of the history waveform at which to start computation (math start history), the math start point, and the number of math points. With this computation setting, waveforms are assigned in order from 0 to positive integers starting with the oldest waveform.

Note

The maximum number of math points is 100 Mpoints[*1] (50 Mpoints[*2] if there are 11 or more math channels).

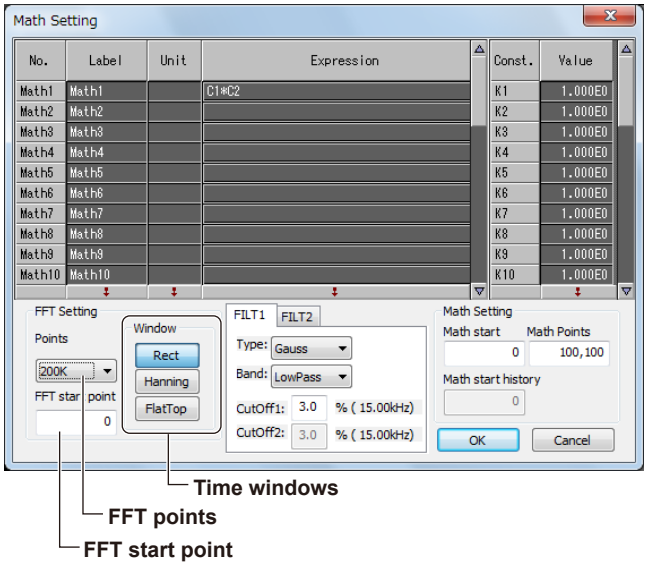


*1,*2 The maximum number of data points depends on the options that are installed in the PX.

- No /M1 or /M2 option: 10 Mpoints for *1 and *2
- /M1 option: 50 Mpoints for *1 and *2
- /M2 option: 100 Mpoints for *1, 50 Mpoints for *2

Specifying FFT Settings

Use the FFT Setting area in the Math Setting dialog box to set the FFT.



Operator menu

The operators that you can specify can be accessed from the Function button in the user-defined expression setting dialog box.

Basic	SHIFT, ABS, SQRT, LOG, EXP, NEG, SQR, CUBE, F1, F2	
Trigonometric	SIN, COS, TAN, ATAN, PH	
Pulse width	PWHH, PWHL, PWLH, PWLL, PWXX, FV, DUTYH, DUTYL	
DIF & INTG	DIF, DDIF, INTG, IINTG	
Filter	FILT1, FILT2, HLBT, MEAN, BIN	
FFT	LS	LS-REAL, LS-IMAG, LS-MAG, LS-LOGMAG, LS-PHASE
	RS	RS-MAG, RS-LOGMAG
	PS	PS-MAG, PS-LOGMAG, PSD-MAG, PSD-LOGMAG
	CS	CS-REAL, CS-IMAG, CS-MAG, CS-LOGMAG, CS-PHASE
	TF	TF-REAL, TF-IMAG, TF-MAG, TF-LOGMAG, TF-PHASE
	CH	CH-MAG
TREND	TREND	TREND, TREND_HH, TREND_LL, TREND_XX
	TRENDM	TRENDM, TRENDM_HH, TRENDM_LL, TRENDM_XX
	TRENDD	TRENDD, TRENDD_HH, TRENDD_LL, TRENDD_XX
	TRENDF	
ZC	ZC, ZCEXT	

Limitations on Expressions

- When m ≤ n, an expression for Mathm cannot include the variable Mn (operations for Mathn).
  Example of an expression that is not allowed: Math5 = M6 + M3
- Only one source waveform can be specified in an FFT.
  Example of an expression that is not allowed: PS-MAG(C1+C2)
- A computation cannot be performed on the result of an FFT.
  Example of an expression that is not allowed: PS-MAG(C1)+C2

Notes on computation

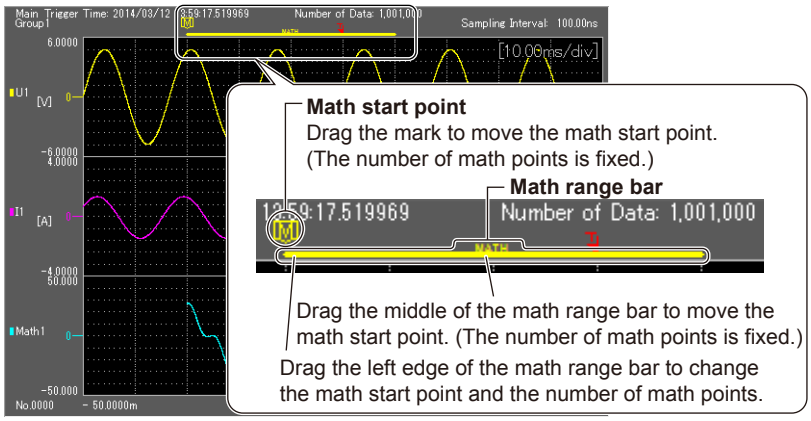
- An FFT is not possible if the display record length of the waveform is less than number of math points that is required.

Filter Settings

- **Type/Band**
  Gauss (gauss): Lowpass
  Sharp (sharp): Lowpass/Highpass/Bandpass
  IIR (Butterworth): Lowpass/Highpass/Bandpass
- **CutOff1/CutOff2**
  Set either or both cutoff frequencies as a ratio to the sampling frequency. The allowable range is 2.0% to 30.0% (0.2% steps). If you set Band to **Bandpass**, specify both the CutOff1 and CutOff2 orders. The higher the filter order, the longer the computation.

Math start point

When computation is executed, the math start point and the math range bar appear. You can move the math start point by dragging the math start point mark or the left edge of the math range bar.



Math points

When you click the left edge of the math range bar, a horizontal arrow cursor appears. You can drag the edge to change the math start point and the number of math points. When you click the right edge of the math range bar, a horizontal arrow cursor appears. In this situation, you can only change the number of math points.

Variables and Operators

The following variables and operators can be used in expressions. You can use up to 63 characters to define an expression. You can register up to 32 expressions.

Variable

Variable	Example	Description
Cx	C1+C2	Value measured on channel CHx
My	ABS(M1)	Computed (Math) value
T	SIN(T)	Integrated data value over time

x: Stands for a number. Specify the number according to the number of channels that are loaded. For example, if three channels, CH1, CH5, and CH8, are loaded, specify the channels as C1, C2, and C3.

y: Number

Operators

Operators	Example	Description
+, –, *, /	C1+C2	Basic arithmetic on the two specified waveforms
SHIFT	SHIFT(C1,time[1])	Phase shift
ABS	ABS(M1)	Absolute value of the specified waveform
SQRT	SQRT(C2)	Square root of the specified waveform
LOG	LOG(C1)	Logarithm of the specified waveform
EXP	EXP(C1)	Exponent of the specified waveform
NEG	NEG(C1)	Inversion
SQR	SQR(C1)	Square of the specified waveform
CUBE	CUBE(C1)	Cube of the specified waveform
F1	F1(C1,C2)	$\sqrt{\lvert C1^2+C2^2 \rvert}$ of the specified waveform
F2	F2(C1,C2)	$\sqrt{\lvert C1^2-C2^2 \rvert}$ of the specified waveform
SIN	SIN(T)	Sine of the specified waveform
COS	COS(C1)	Cosine of the specified waveform
TAN	TAN(C1)	Tangent of the specified waveform
ATAN	ATAN(C1,C2)	Arctangent of the two specified waveforms (a value within ± π)
PH	PH(C1,C2)	Phase between the two specified waveforms
TREND	TREND(C1)	RMS value for each cycle of the specified waveform[2]

Operators	Example	Description
TREND_HH	TREND_HH(C1)	RMS value for each cycle of the specified waveform (rising edge)[2]
TREND_LL	TREND_LL(C1)	RMS value for each cycle of the specified waveform (falling edge)[2]
TREND_XX	TREND_XX(C1)	RMS value for each half cycle of the specified waveform[2]
TRENDM	TRENDM(C1)	MEAN value for each cycle of the specified waveform[2]
TRENDM_HH	TRENDM_HH(C1)	MEAN value for each cycle of the specified waveform (rising edge)[2]
TRENDM_LL	TRENDM_LL(C1)	MEAN value for each cycle of the specified waveform (falling edge)[2]
TRENDM_XX	TRENDM_XX(C1)	MEAN value for each half cycle of the specified waveform[2]
TRENDD	TRENDD(C1)	DC value for each cycle of the specified waveform[2]
TRENDD_HH	TRENDD_HH(C1)	DC value for each cycle of the specified waveform (rising edge)[2]
TRENDD_LL	TRENDD_LL(C1)	DC value for each cycle of the specified waveform (falling edge)[2]
TRENDD_XX	TRENDD_XX(C1)	DC value for each half cycle of the specified waveform[2]
TRENDF	TRENDF(C1)	Frequency for each cycle of the specified waveform[2]
TRENDF_HH	TRENDF_HH(C1)	Frequency for each cycle of the specified waveform (rising edge)[2]
TRENDF_LL	TRENDF_LL(C1)	Frequency for each cycle of the specified waveform (rising edge)[2]
ZC	ZC(C1)	Zero-crossing of the specified waveform[2]
ZC	ZC(EXT)	Zero-crossing of the TRIGGER IN terminal input[2]
K1 to 10	C1+K1	Constant (set a specific value)
PWHH	PWHH(M1,A,B)	Computation of a pulse width between a rising edge and the next rising edge[3]
PWHL	PWHL(C2,A,B)	Computation of a pulse width between a rising edge and the next falling edge[3]
PWLH	PWLH(C1,A,B)	Computation of a pulse width between a falling edge and the next rising edge[3]
PWLL	PWLL(C1,A,B)	Computation of a pulse width between a falling edge and the next falling edge[3]
PWXX	PWXX(C2,A,B)	Computation of a pulse width between a rising/falling edge and the next rising/falling edge[3]
FV	FV(C1,A,B)	Reciprocal of PWHH[3]
DUTYH	DUTYH(C1,A,B)	Duty cycle between a rising edge and the next rising edge[3]
DUTYL	DUTYL(C1,A,B)	Duty cycle between a falling edge and the next falling edge[3]
DIF	DIF(C1)	Derivative of the specified waveform
DDIF	DDIF(C1)	Second-order derivative of the specified waveform
INTG	INTG(C1)	Integral of the specified waveform
IINTG	IINTG(C1)	Second-order integral of the specified waveform
FILT1	FILT1(C1)	Filtering of the specified waveform
FILT2	FILT2(C1)	Filtering of the specified waveform
HLBT	HLBT(C1)	Hilbert function of the specified waveform
Mean	MEAN(C1)	10th order moving average of the specified waveform
BIN	BIN(C1,A,B)	Binarization of the specified waveform[3]
LS-REAL	LS-REAL(C1)	Real part of the linear spectrum of the specified waveform
LS-IMAG	LS-IMAG(C1)	Imaginary part of the linear spectrum of the specified waveform
LS-MAG	LS-MAG(C1)	Amplitude of the linear spectrum of the specified waveform
LS-LOGMAG	LS-LOGMAG(C1)	Logarithmic amplitude of the linear spectrum of the specified waveform
LS-PHASE	LS-PHASE(C1)	Phase of the linear spectrum of the specified waveform
RS-MAG	RS-MAG(C1)	Magnitude of the specified waveform's RMS spectrum
RS-LOGMAG	RS-LOGMAG(C1)	Logarithmic magnitude of the specified waveform's RMS spectrum
PS-MAG	PS-MAG(C1)	Amplitude of the power spectrum of the specified waveform
PS-LOGMAG	PS-LOGMAG(C1)	Logarithmic amplitude of the power spectrum of the specified waveform
PSD-MAG	PSD-MAG(C1)	Amplitude of the power spectrum density of the specified waveform
PSD-LOGMAG	PSD-LOGMAG(C1)	Logarithmic amplitude of the power spectrum density of the specified waveform
CS-REAL	CS-REAL(C1,C2)	Real part of the cross spectrum of the two specified waveforms
CS-IMAG	CS-IMAG(C1,C2)	Imaginary part of the cross spectrum of the two specified waveforms
CS-MAG	CS-MAG(C1,C2)	Amplitude of the cross spectrum of the two specified waveforms
CS-LOGMAG	CS-LOGMAG(C1,C2)	Logarithmic amplitude of the cross spectrum of the two specified waveforms
CS-PHASE	CS-PHASE(C1,C2)	Phase of the cross spectrum of the two specified waveforms
TF-REAL	TF-REAL(C1,C2)	Real part of the transfer function of the two specified waveforms
TF-IMAG	TF-IMAG(C1,C2)	Imaginary part of the transfer function of the two specified waveforms
TF-MAG	TF-MAG(C1,C2)	Amplitude of the transfer function of the two specified waveforms

Operators	Example	Description
TF-LOGMAG	TF-LOGMAG(C1,C2)	Logarithmic amplitude of the transfer function of the two specified waveforms
TF-PHASE	TF-PHASE(C1,C2)	Phase of the transfer function of the two specified waveforms
CH-MAG	CH-MAG(C1,C2)	Amplitude of the coherence function of the two specified waveforms

1 The unit of time is seconds. The number of clocks is used when the time base is an external clock signal (Ext).
2 For details, see the appendix 9, “User-Defined Computation” in the PX User’s Manual IM PX8000-01EN.
3 Set the source waveform and the upper and lower limits of the threshold levels.

FFT Settings

Points (number of math points)

Select 100, 200, 500, 1000, 2000, 5000, 10000, 20000, 50000, 100000, 200000, 500000, 1000000, or 2000000.

Note

If an FFT with 1000000 or more points is executed, only M1 is calculated and displayed.

FFT start point

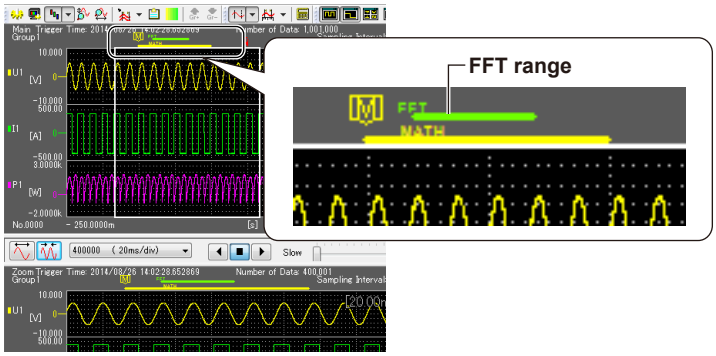
When the number of loaded points is less than 10M: Specify a number between 0 and “the number of loaded points – the number of FFT points.”
When larger than 10M: Specify a number between the math start point and “math start point + 10M – the number of FFT points.”

Window (time window)

Select the Rect (rectangle), Hanning (hanning), or FlatTop (flat-top) window.

Displaying the FFT Range

The FFT range is indicated with a green bar in the main waveform display window and zoom waveform display window.
Drag the bar to move the math range.
If FFT cannot be performed, the bar indicating the range and the word “FFT” turn red.



Icon Displayed during Math Measurement

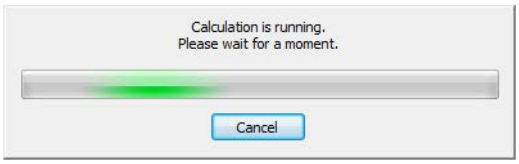
A progress bar is displayed while math measurement is in progress.

Note

Canceling computation

While computation is in progress, a progress bar and a Cancel button are displayed. Click the Cancel button to cancel the computation.

If you cancel a computation, nothing will be displayed in the waveform display area or measurement result area.



Computational accuracy

Single-precision floating-point type

Details of Various Computations

For details on each function, see the appendix 9, “User-Defined Computation” in the PX User’s Manual IM PX8000-01EN.

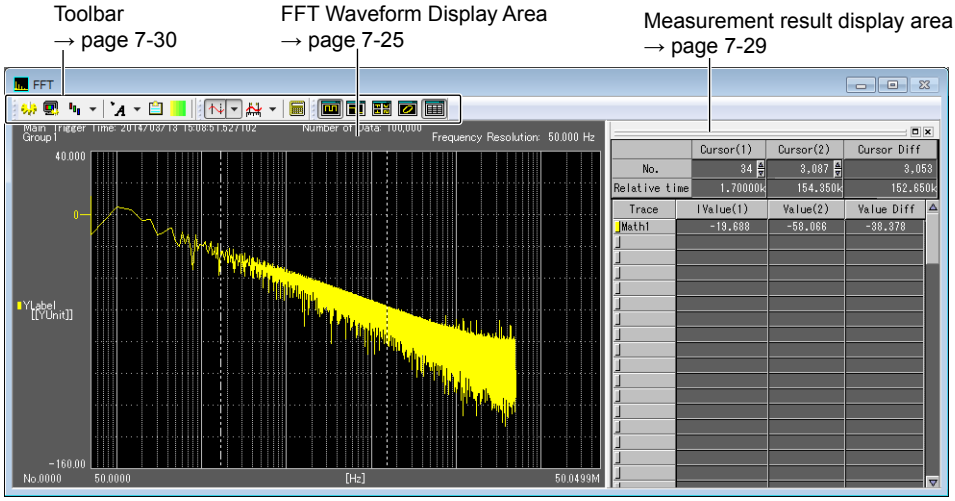
- TREND functions (TREND, TRENDM, TRENDD, TRENDF)
- Zero crossing function (ZC)
- Filter (FILT1/FILT2)
- Hilbert Function (HLBT)
- Phase Function (PH)
- Binary Conversion(BIN)
- Pulse width computation (PWHH/PWHL/PWLH/PWLL/PWXX)
- FFT function
  - Linear spectrum (LS-REAL/LS-IMAG/LS-MAG/LS-LOGMAG/LS-PHASE)
  - Rms spectrum (RS-MAG/RS-LOGMAG)
  - Power spectrum (PS-MAG/PS-LOGMAG)
  - Power spectrum density (PSD-MAG/PSD-LOGMAG)
  - Cross spectrum (CS-REAL/CS-IMAG/CS-MAG/CS-LOGMAG/CS-PHASE)
  - Transfer function (TF-REAL/TF-IMAG/TF-MAG/TF-LOGMAG/TF-PHASE)
  - Coherence function (CH-MAG)
  - Time window of FFT functions

7.6 FFT Display

The FFT waveform display area shows an FFT waveform of the math waveform defined with an FFT function[2] for an expression in the Math Setting dialog box[1] of the waveform window.

1 See page 7-73.

2 See page 7-74.



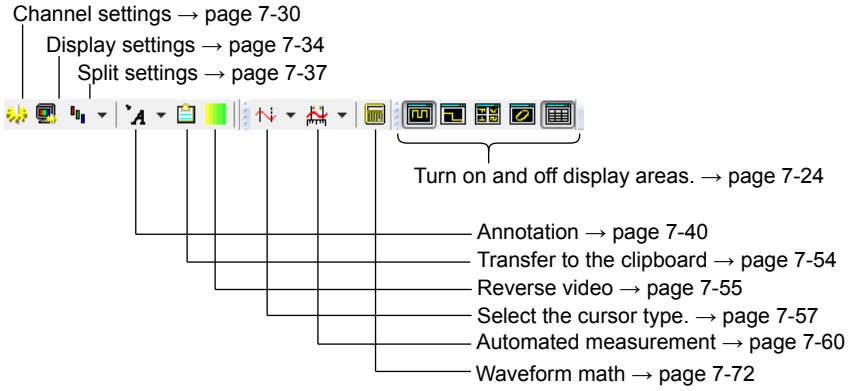
The FFT window has the following five display areas.

- Main waveform display area: The loaded waveform data is displayed in its entirety.
- Zoom waveform display area: A section of the loaded waveform data is displayed.
- History waveform display area: All records of waveform data collected numerous times using the trigger single(N) mode or history function are displayed.
- XY waveform display area: An X-Y display is shown using the channel (trace name) displayed in the main or zoom waveform display area.
- Measurement result display area: Measured values of cursor measurement, auto measurement, math measurement, and so on are displayed numerically.

Toolbar

The toolbar in the FFT window is the same as that in the waveform display window. However, the following four buttons are not available.

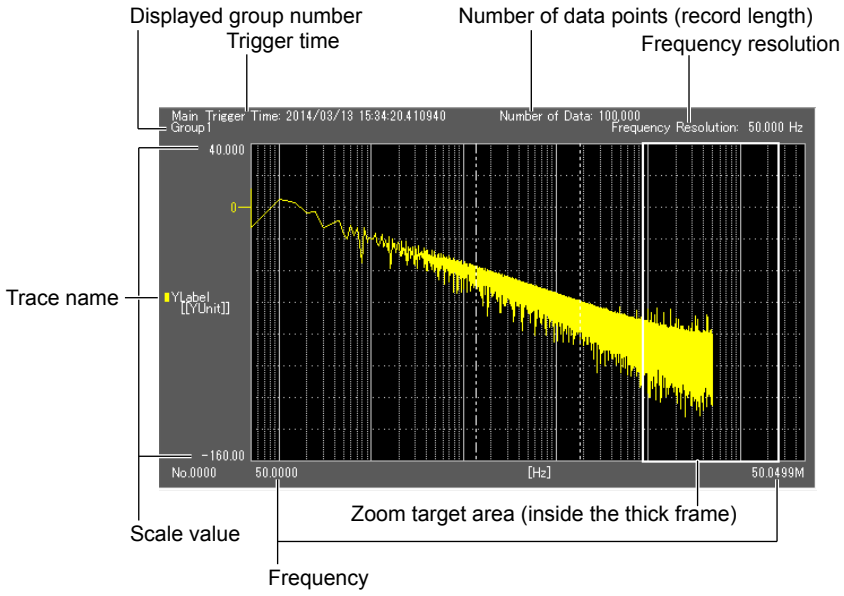
- : Move waveforms and zoom (expand/reduce) vertically
- : Move waveforms and zoom (expand/reduce) horizontally
- , :Switch the displayed group



Note

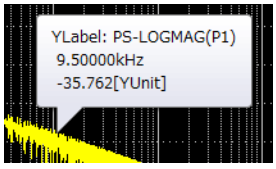
- The display settings of the waveform display window's toolbar are separate from the settings of the FFT display window's toolbar.
- FFT waveforms are not displayed if the expressions in the Math Setting dialog box of the waveform window do not contain FFT functions.

FFT Waveform Display Area



Tooltip display

If you leave the pointer on a waveform for about 1 second, the information about that point appears. Information is displayed for FFT and zoom waveforms.



Zoom Waveform Display Area

This is the same as the zoom waveform display area of the waveform display window. For details, see page 7-26.

History Waveform Display Area

This is the same as the history waveform display area of the waveform display window. For details, see page 7-28.

X-Y Waveform Display Area

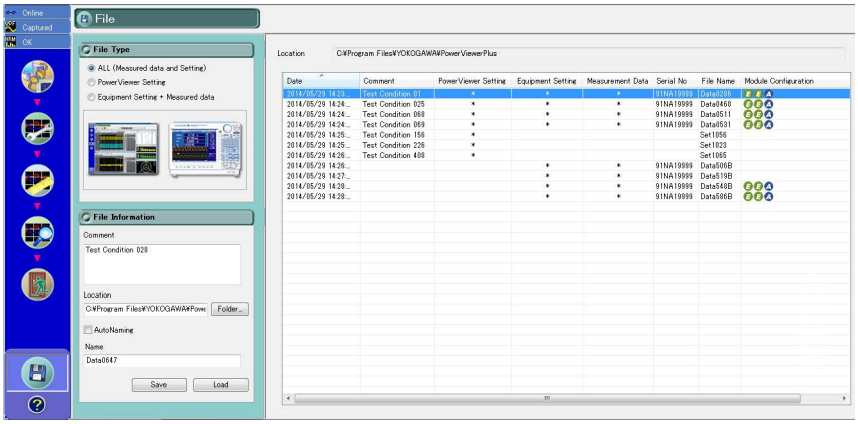
This is the same as the X-Y waveform display area of the waveform display window. For details, see page 7-29.

Measurement Result Display Area

Cursor measurement results are displayed in the measurement result area. For details, see "Cursor Measurement" (page 7-57).

8.1 Saving and Loading Setup Parameters

1. Click  in the menu area. The File screen appears.

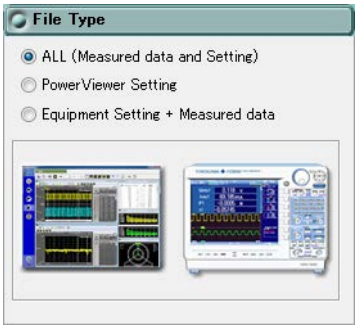


Selecting the Type of File to Save

Select the type of data to save from the following:

- ALL (Measured data and Setting)
- PowerViewer Setting: The software setup parameters will be saved.
- Equipment Setting + Measured data: The PX setup parameters and measured data will be saved.

Depending on the option you select, the illustration changes.

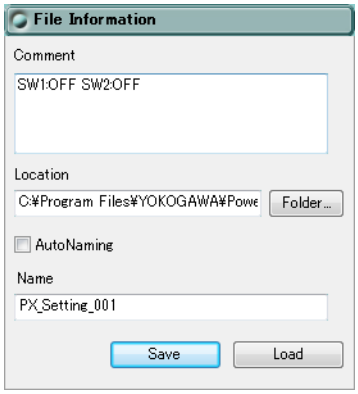


Note

Waveform data is saved in WPF format (.wpf extension) when a measurement stops. For details on the saving of waveform data, see chapter 6.

To save waveform data and numeric data in CSV format (.csv extension), see page 7-2.

Setting the Save Conditions



Comment

You can enter a comment if you like.

Number of characters that you can enter:

Up to 100 characters per line

Up to 6 lines

Location

Specify the folder to save the file.

Auto Naming

If you select the AutoNaming check box, files are saved with the name Auto_yyyymmddhhmmss.cfg. yyyymmddhhmmss is a 14-digit number consisting of the year, month, day, hour, minute, and second. The year is four digits; the hour is based on a 24-hour clock.

Name

To specify the file name, clear the AutoNaming check box, and enter the file name.

- File Name: You can assign any name that is allowed on your PC.
- Extension: .cfg

Save Button

Executes the saving of data.

Load Button

Loads the file that is selected in the saved-file list.

Note

- If a wpf file is loaded in online mode, the mode switches to offline.
- To load setup parameters and apply them to the PX, after loading the setup parameters, connect to the PX according to the procedure described in section 4.2.
- For instructions on how to load waveform data, see “Load waveform data (WPF file)” on page 7-2.

List of Saved Files

Date and time when the file was saved

Path to the file save destination folder

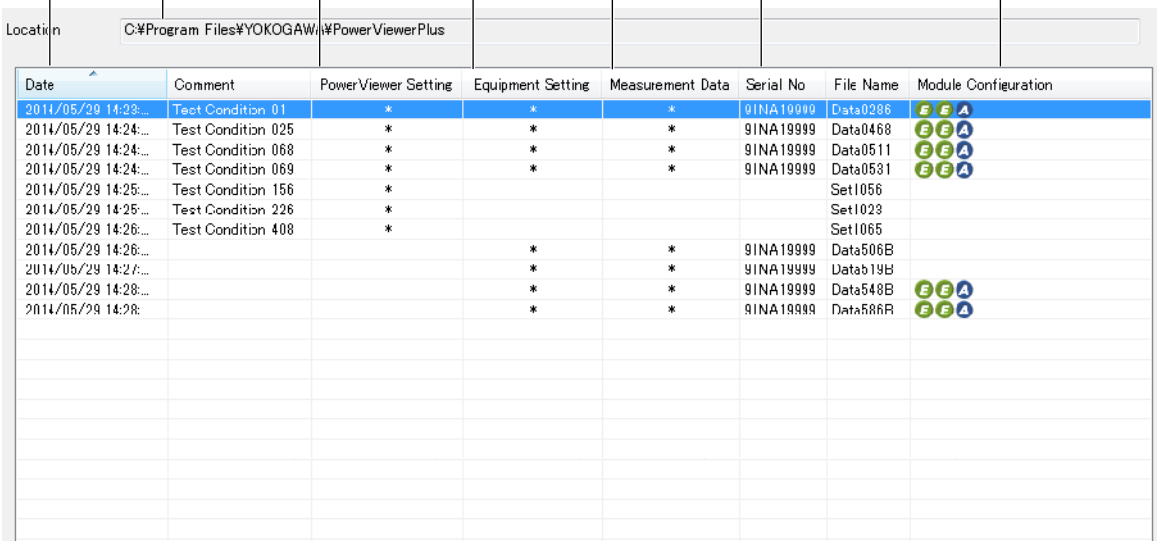
An asterisk appears when the file contains PowerViewer Setting.

An asterisk appears when the file contains Equipment Setting.

An asterisk appears when the file contains Measurement Data.

Instrument number of the PX that was connected when the file was saved

Information about the PX modules when the file was saved
- **E: Power module**
- **A: AUX module (MotorMode = OFF)**
- **M: AUX module (MotorMode = ON)**

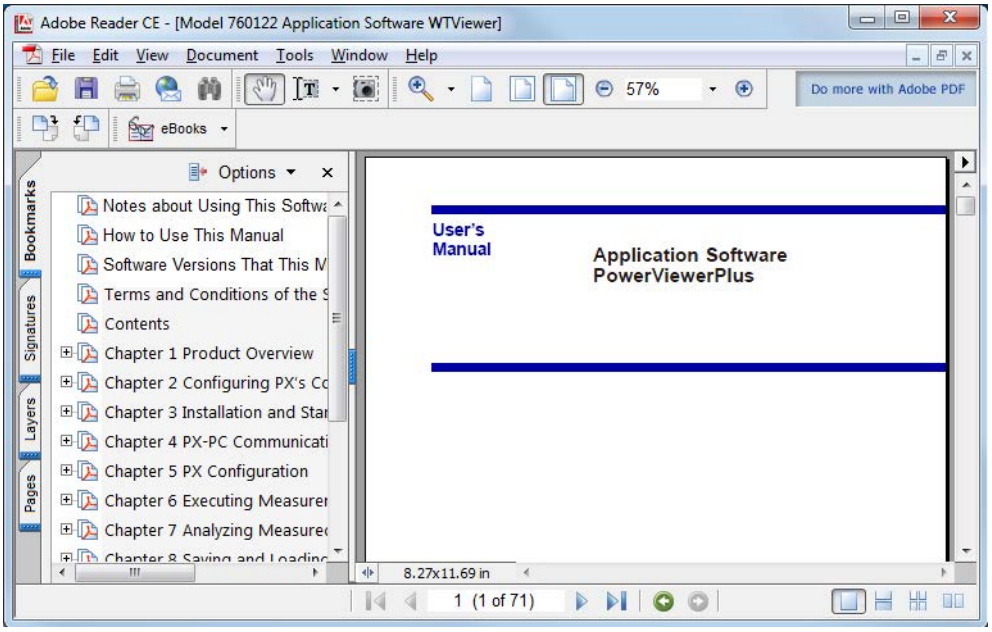


9.1 Help Feature

Displaying Help

Click the help button. If Adobe Reader is installed on your PC, it will start, and the PDF file of the software user's manual will open.

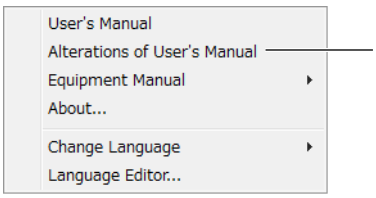
You can look up how to use the software and terminology.



Displaying Alteration Notices

If alteration notices are available, you can view them by following the procedure below.

1. Right-click the **help** button.
2. Click **Alterations of User's Manual**.



Obtaining the Latest User's Manual and Alteration Notices

To obtain the PDF files of the latest user's manual and alteration notices, visit the YOKOGAWA website indicated below, click Y-LINK to show the manual download page. Download the user's manual and alteration notices for the software from this page.

http://tmi.yokogawa.com/service-support/

Change the file name of the manual or alternation notice to that shown below, and overwrite the existing file in the Manuals folder in the software installation folder that you specified in the procedure described on page 3-2. Then, you will be able to view the file by clicking User's Manual or Alteration of User's Manual on the Help menu.

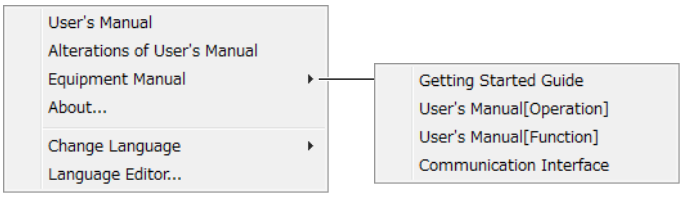
- User's manual file name: JA_PowerViewerPlus Users Manual.pdf
- Alteration notice file name: JA_PowerViewerPlus Alterations.pdf

Note

- You can download Adobe Reader from the Adobe website.
- The latest user's manual and alteration notice that you can download from the YOKOGAWA website correspond to the latest version of this software. If necessary, update the software. You can download updates to the software from the YOKOGAWA website indicated above.

Viewing the PX8000 User's Manual

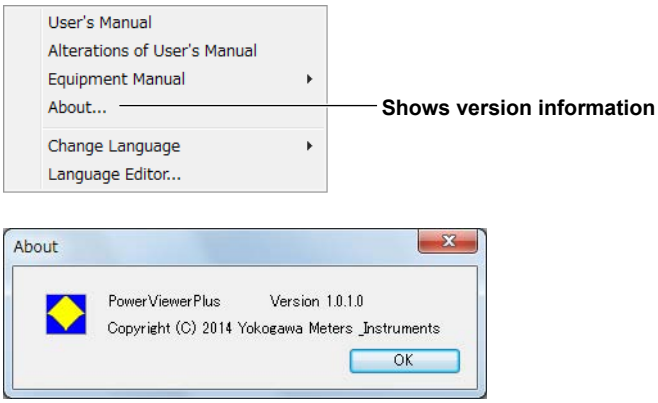
1. Right-click the **help** button.
2. Click **Equipment Manual**.
3. Click the manual you want to view.



- Getting Started Guide
  Describes the installation procedure, precautions, specifications, etc.
- User's Manual [Operation]
  Describes how to use the various functions.
- User's Manual [Function]
  Describes the various functions.
- Communication Interface
  Describes communication commands.

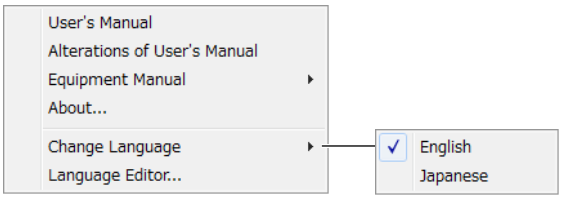
9.2 Viewing the Version Information

1. Right-click the **help** button.
2. Click **About**.



9.3 Setting the Displayed Language

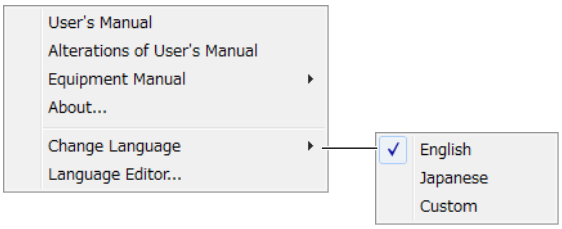
1. Right-click the **help** button.
2. Click **Change Language**.
3. Select the language you want to use.



Customizing the Displayed Language

To customize the displayed language, edit the language file by following the procedure in section 9.4.

If there is a language file that you create (custom file), the submenu will appear as follows:



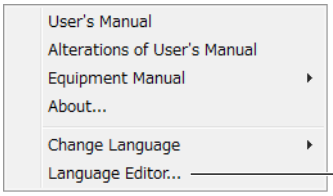
Select Custom to load the custom file.

9.4 Editing the Displayed Language

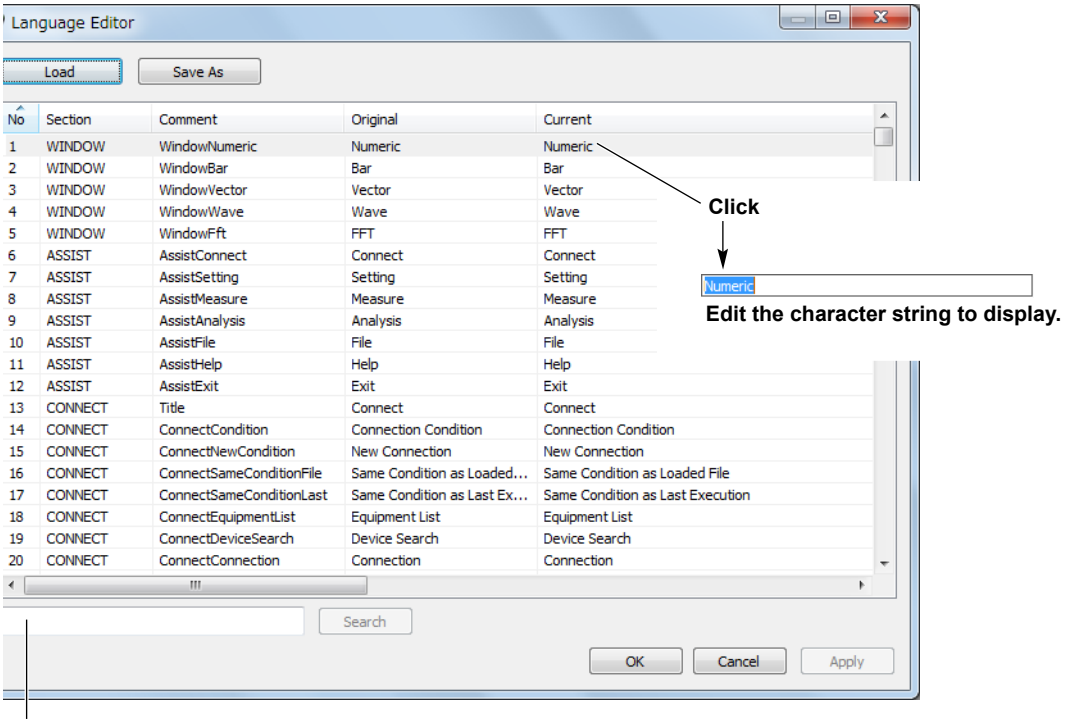
You can edit the text that is displayed in the dialog boxes and windows of the software.

Editing the Displayed Language

1. Right-click the **help** button.
2. Click **Language Editor**.



3. In the Language Editor dialog box, click the cells in the **Current** column to edit the text to display.



Saving the Edited Language Information

Click Save As to save the edited language information to a file. The file name extension is .lang.

Note

The English and Japanese language information files are in the following folder.
C:\Program Files\Yokogawa\PowerViewerPlus\Language

Loading Saved Language Information

Click Load to load a language information file into the Language Editor dialog box.

10.1 If a Problem Occurs

If a message appears on the PC screen, see section 10.2, “Error Messages.” If servicing is necessary, or if the instrument does not operate properly even after you have attempted to deal with the problem according to the instructions in this section, contact your nearest YOKOGAWA dealer.

Problems and Solutions	
Unable to communicate with the PX using GP-IB.	
	Communication may not work properly on GP-IB cards other than those of NI (National Instruments). Use a GP-IB card by NI (see page 1-6).
Unable to change the Function, Element, and Order settings in the dialog boxes.	
	Click a Function, Element, or Order cell to show a combo box. Then select the appropriate item.
Waveforms are not displayed.	
	In the channel setting dialog box, change the Min and Max values under Scale (see page 7-31).
Waveform traces overflow from the screen.	
	In the channel setting dialog box, click Auto under Scale or change the Min and Max values to appropriate values under Scale (see page 7-31).
Even when the **Software display update interval** on the Measure screen is changed, the display update interval of the software does not change.	
	The display update interval of the software is not synchronized to the display update interval of the PX. It is dependent on the performance of your PC and the communication interface (USB, GP-IB, or Ethernet). If the software’s display update interval is set to 1 s, the software cannot keep up, and some of the data points that the PX is measuring will not be collected. Configure your environment by referring to the items below. • The communication interfaces listed in descending order by data rate are as follows: USB, Ethernet, GP-IB. • Use a faster PC.

10.2 Error Messages

Message	Corrective Action
Equipment can not be found. • Check the power supply condition. • Check Device Manager. • Refer to help.	Check the following items. • Is the PX turned on? • Is the GP-IB, Ethernet, or USB cable connected properly? • If you are using GP-IB, are the GP-IB addresses in the same system all unique? Is the GP-IB address set on the PX the same as the GP-IB address set in PowerViewerPlus? Is the GP-IB driver installed correctly in your PC? • If you are using Ethernet, are the IP address, user name, and password set to the same values on the PX and PowerViewerPlus? • If you are using USB, are the ID used in the same system all unique? Is the ID set on the PX the same as the ID set in PowerViewerPlus? Is the USB driver installed correctly in your PC? • If you are using USB, is the USB driver is appropriate for the PX?
Update rate is out of range Stop timer is out of range Wave observe is out of range Please input a value from 0.001 to 9999.	The value that you tried to set is outside the allowed range. Set a value within the allowed range.

11.1 Specifications

Item	Specifications	
Data formats that the software can save to		
	The following table lists the data formats (extensions) that the software can save to. Note that CSV files cannot be loaded into the software.	
	Setup parameters[1]	CFG format (.cfg)
	Numeric data	CSV format (.csv)
	Waveform data	CSV format (.csv), WPF format (.wpf)
	1 Setup parameters cannot be saved to CSV files.	
Data formats that the software can load from		
	The following table lists the files that the software can load from.	
	Model	PX8000
	Setup parameters	CFG format (.cfg)
	Numeric data[2]	—
	Waveform data[2]	WPF format (.wpf)
	2 CSV data cannot be loaded into the software.	
Views	The following types of data are displayed. • Numeric data • Bar graph[3] • Vector[3] • Waveform • FFT 3 Harmonic measurement option must be installed in the PX.	
PX configuration	All functions that are available as communication commands	
System Requirements	See section 1.3.	

Index

R

S

T

U

V

W

X

Y

Z